DEA REFERENCE NUMBER: 14/12/16/3/3/2/965

PROPOSED LETSOAI CSP 1 PROJECT

DRAFT ENVIRONMENTAL IMPACT REPORT

PUBLIC

FEBRUARY 2017

WSP | PARSONS BRINCKERHOFF

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DRAFT ENVIRONMENTAL IMPACT REPORT

BioTherm Energy (Pty) Ltd

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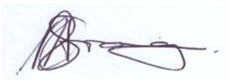
QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Draft EIR – Letsoai CSP 1 DEA Reference Number: 14/12/16/3/3/2/965			
Date	January 2017			
Prepared by	Ashlea Strong			
Signature				
Checked by	Hilary Konigkramer			
Signature				
Authorised by	Nigel Seed			
Signature	 Digitally signed by Seed, Nigel DN: cn=Seed, Nigel, ou=Environmental, email=Nigel.Seed@WSPGroup.co.za Reason: I am the author of this document Date: 2017.02.17 09:24:48 +02'00'			
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Report number	1			
File reference	W:\000 NEW Projects\47579 - Biotherm\42 ES\2-REPORTS\2-EIR\			

CLIENT

BioTherm Energy (Pty.) Ltd.

PROJECT NAME

Proposed Letsoai CSP 1 Project near Aggeneys, Northern Cape

REPORT TYPE

Draft Environmental Impact Report

WSP PROJECT NUMBER

47579

AUTHORITY REFERENCE NUMBER

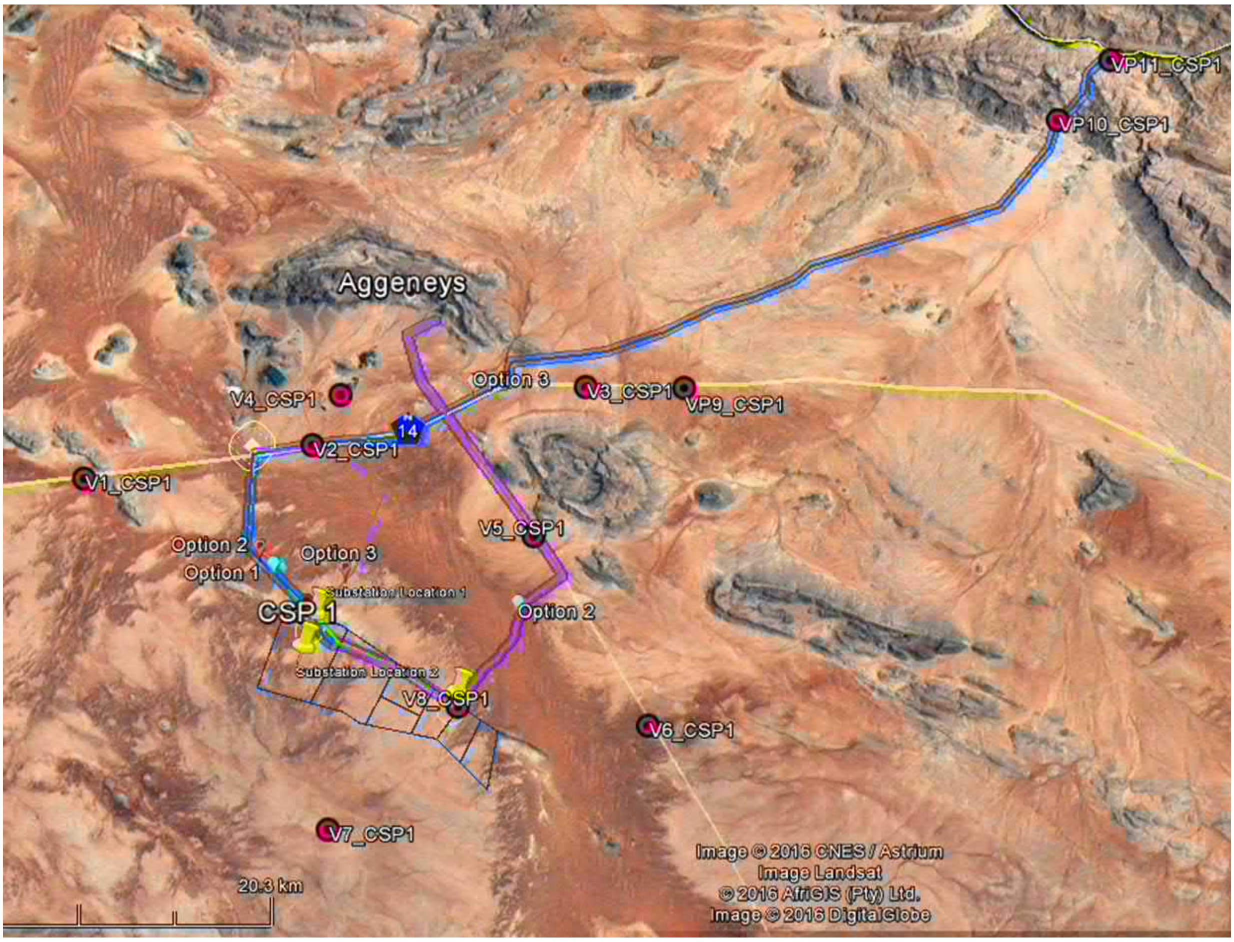
DEA: 14/12/16/3/3/2/965

GENERAL SITE INFORMATION

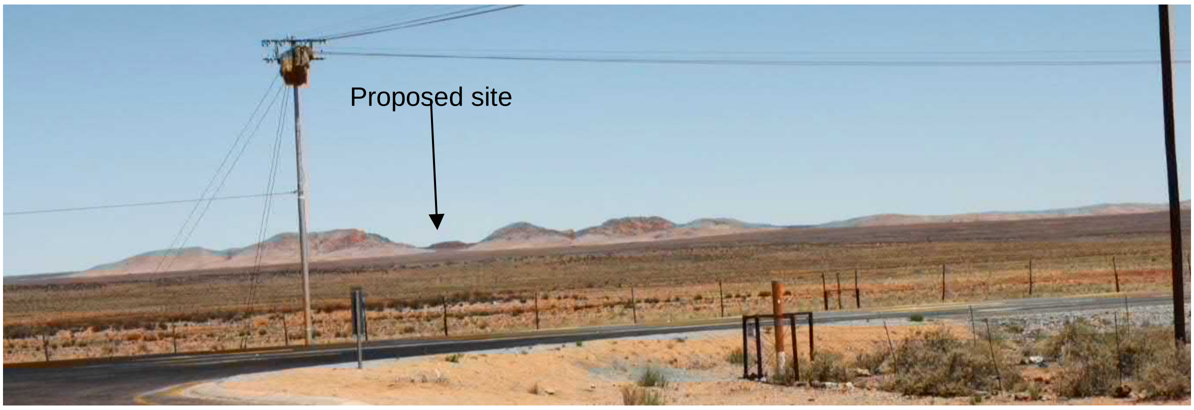
PROJECT COMPONENT	DETAILS / DIMENSIONS / DESCRIPTION
Location of the Site	Farm Hartebeest Vlei 86, approximately 13km southeast of Aggeneys located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality
Facility Area	1 298ha
Area of preferred Solar Field	Typically 930Ha
SG Codes	C05300000000008600000
Site Access	The existing "Namies Lus 10" access at km 110.2 of the N14/1
Technology	CSP – Central Tower
Generation Capacity	150MW
Tower	200 – 250 m high power tower with a central receiver located on the top of a concrete tower.
Power Generation Facility	→ Steam turbine and generator → Auxiliary fossil fuel boilers → Air cooler condenser → Hot and cold molten salt storage tanks
Number of Heliostats	The number of heliostats is still to be confirmed. However, the number of heliostats is anticipated to be between 10 000 and 15 000. The Heliostats will be two-axis mirrors.
Area occupied by each Heliostats	Typically between 12 to 15m^2 per heliostat
Dimensions of Heliostats	Typically, the heliostat is 15m high with a 12 x 12m mirror assembly. It must be noted that this is dependent on the manufacturer
Collector / Receiver Height	Typically between 200-250m
Foundation Specifications and Dimensions	Concrete.
Footprint of Operations and Maintenance building(s)	Approximately 225m^2
Area of Preferred Construction Laydown Area	To be confirmed based on the facility concept layout
Temporary and Permanent Laydown Area Dimensions	→ Temporary laydown of 5Ha → Permanent laydown for the containers will be required for the storage of spares, which is to be located close to the Operations and Maintenance building

Cement Batching Plant	Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The actual mixing of the concrete will take place in the concrete truck. The footprint of the plant will be in the order of 0.25ha. The maximum height of the cement silo will be 20m. This will be a temporary structure during construction.
Width of Internal Roads	Approximately 5m
Length of Internal Roads	To be confirmed based on the facility concept layout
Type and Height of Fencing	Galvanized steel type at approximately 2m high
Water Supply and Treatment	→ Water supply pipeline → Water treatment plant → Raw water storage reservoir / tanks → Evaporation ponds
Sewage	Septic tanks (with portable toilets during the construction phase)
Power Evacuation	
Specifications of Onsite Switching Stations, Transformers, Onsite Cables etc	There will be an onsite substation connected to the facility power island which is comprised of the steam turbine generator transformer. The power-island will be linked to the onsite substation using suitable underground cables (except where a technical assessment suggest that overhead lines are applicable).
Footprint of Onsite Substation	Substation will occupy a footprint area of approximately 2.25ha
On-site Substation Capacity	Up to 132 kV
Capacity of powerlines between Onsite Substation and Common Substation	132kV
Width of the Powerline Servitude (132kV) between Onsite Substation and Common Substation	31-36 m
Powerline Tower Types and Height (between Onsite Substation and Common Substation)	Tower (suspension / strain) / Steel monopole structure, which may be self-support or guyed suspension.
List of Additional Infrastructure to be Built	→ Access roads and internal roads. → Administration, staff accommodation, control, workshops, water treatment plant and warehouse buildings

GENERAL SITE PHOTOGRAPHS



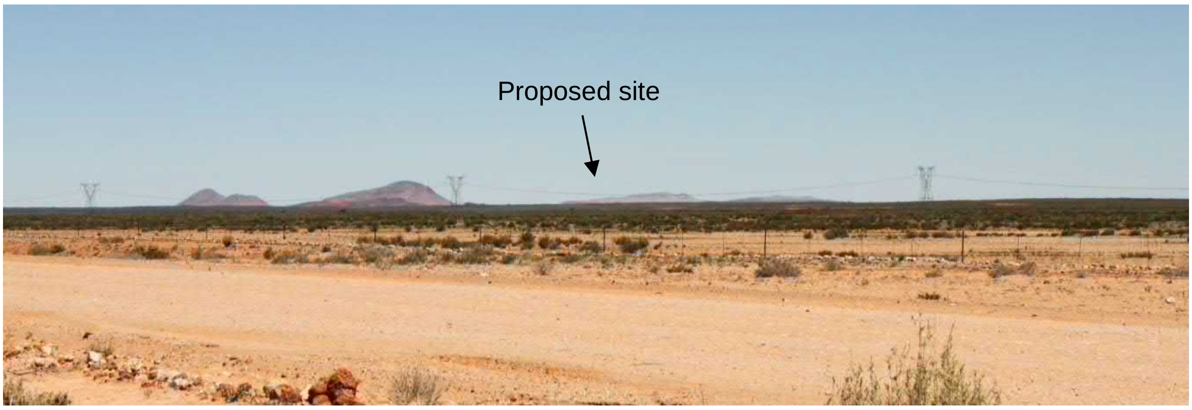
Viewpoint 1 (proposed site not visible)



Viewpoint 2

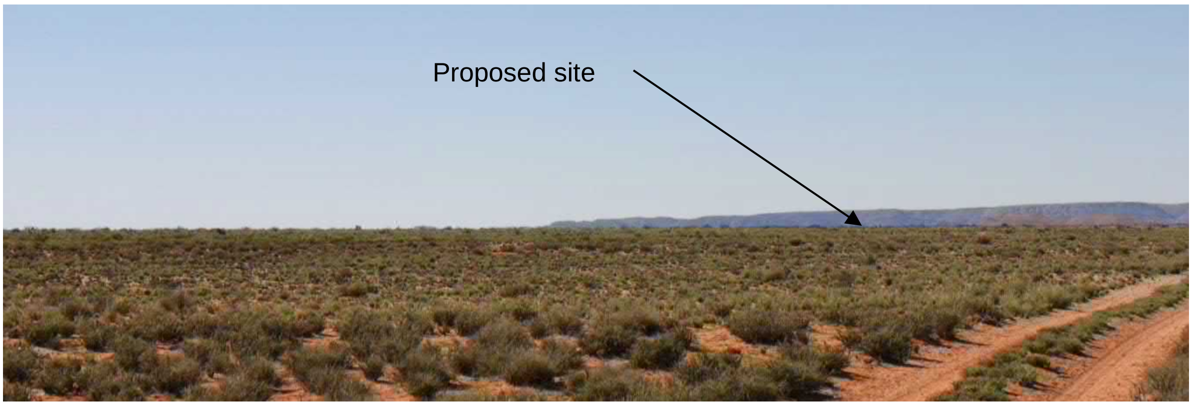
Viewpoint 3 (not visible beyond landforms)

Viewpoint 4 (site not visible, tower may be marginally visible beyond reservoir)



Viewpoint 5

Viewpoint 6



Viewpoint 7

Viewpoint 8

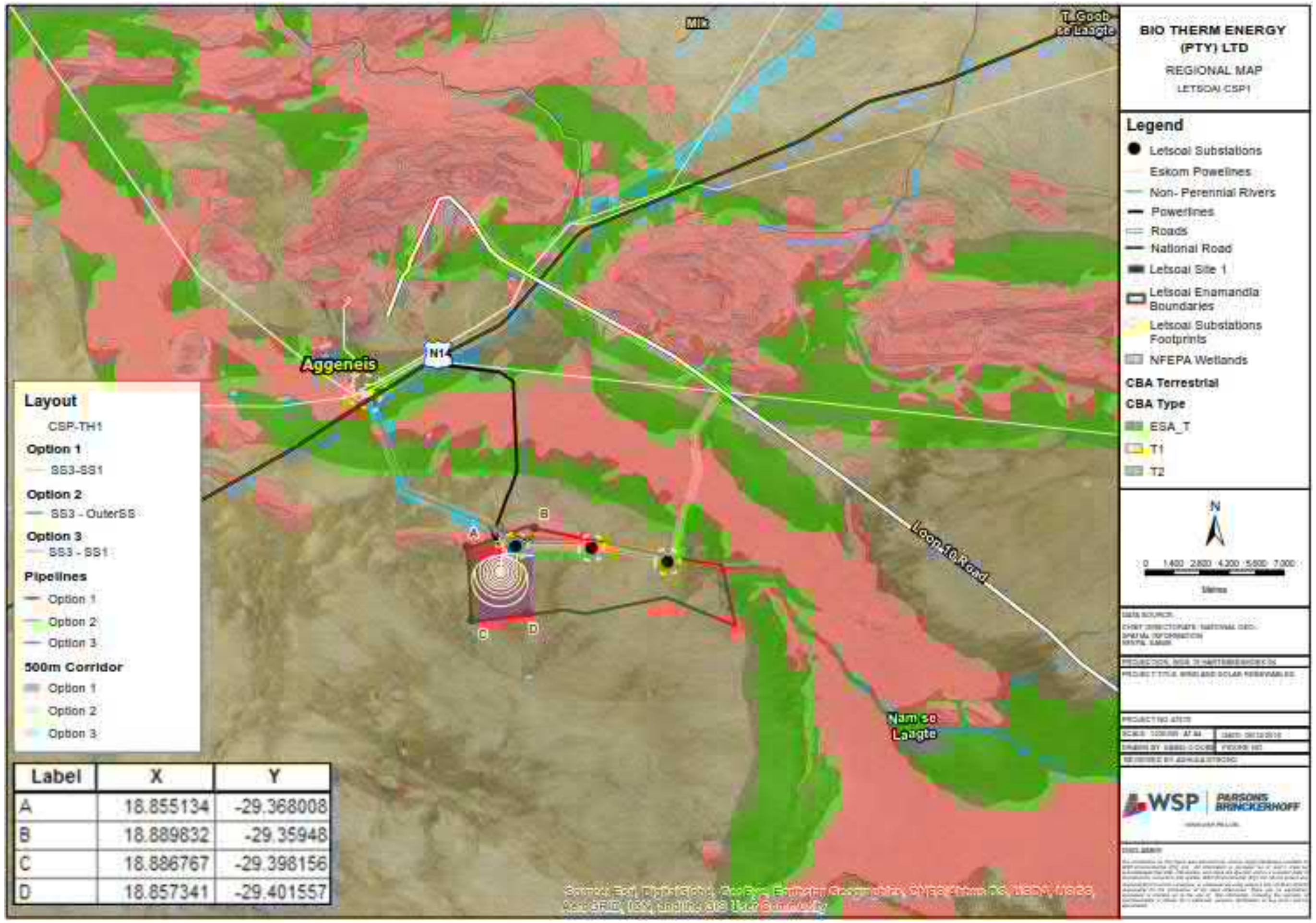
Viewpoint 9 (pipeline will not be visible or very marginally visible on horizon)

Viewpoint 10 (Photo Lita Webly, 2016)

Viewpoint 11 Near Pelladrift close to Orange River (Photo Lita Webly 2016)

STATUS QUO MAP

REGIONAL MAP

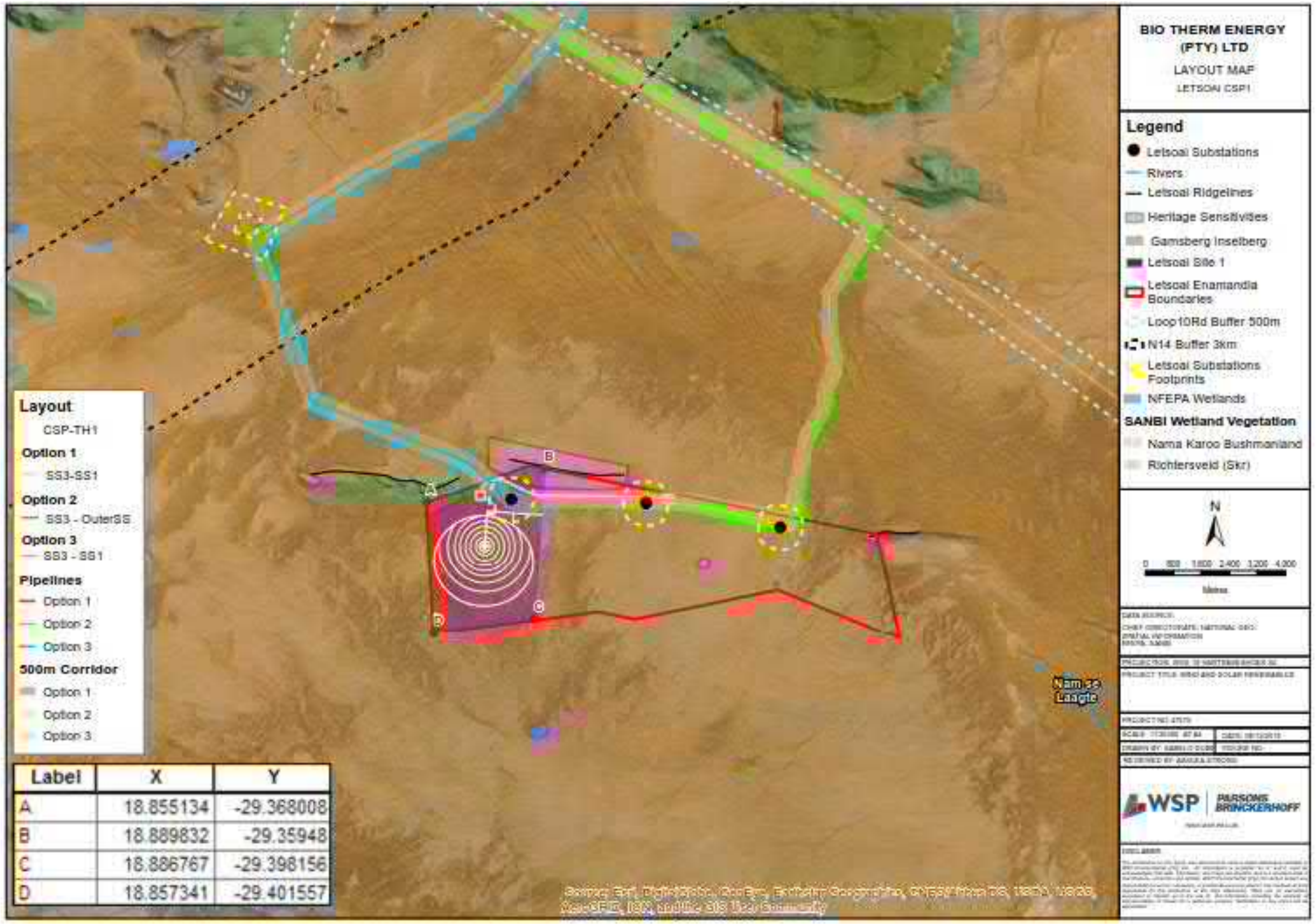


Label	X	Y
A	18.855134	-29.368008
B	18.889832	-29.35948
C	18.886767	-29.398156
D	18.857341	-29.401557

SLOPE ANALYSIS MAP

Label	X	Y
A	18.855134	-29.368008
B	18.889832	-29.35948
C	18.886767	-29.398156
D	18.857341	-29.401557

SITE DEVELOPMENT PROPOSAL MAP



PRODUCTION TEAM

CLIENT

Senior Associate	Michael Barnes
Environmental Manager	Irene Bezuidenhout
Analyst	Siphelele Dunga

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Environmental Consultant	Bronwyn Fischer
Project Manager	Ashlea Strong
Project Director	Nigel Seed
Social Specialists	Danielle Sanderson and Hilary Konigkramer
Soil, Land Capability and Wetlands Specialist	Colin Homes and Greg Matthews
Traffic Specialist	Christo Bredenhann

SUBCONSULTANTS

Heritage Specialist	ACO Associates – Tim Hart, Lita Webley and David Harkett
Avifauna Specialist	Chris van Rooyen
Visual Specialist	Belinda Gebhardt
Biodiversity Specialist	Simon Todd
Air Quality Specialist	Hanlie Liebenburg-Enslin
Noise Specialist	Nicolette von Reiche
Social Peer Reviewer	Tony Barbour - Environmental Consultant and Researcher
Traffic Peer Reviewer	Andrew Bulman – Urban EQ Consulting Engineers
Soils and Land Capability Peer Reviewer	Garry Paterson – Agricultural Research Council
Wetland Peer Reviewer	Michiel Jonker – Ecotone Freshwater Consultants

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1 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This draft environmental impact report (EIR) documents the process and findings of the impact assessment phase of the Scoping and Environmental Impact Reporting (S&EIR) process for the proposed establishment of the Letsoai Concentrating Solar Power (CSP) Site 1 project (hereafter referred to as 'Letsoai CSP 1') which forms part of the establishment of a solar energy development on Farm Hartebeest Vlei 86, located approximately 13km southeast of Aggeneys located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality, South Africa.

1.2 BACKGROUND INFORMATION

BioTherm Energy (Pty.) Ltd. (BioTherm) is the proponent and applicant for the Environmental Authorisation (EA) for Letsoai CSP 1. BioTherm is a leading renewable energy project development and financing company that owns, develops, constructs and operates solar and wind energy projects in South Africa and Sub-Saharan Africa.

BioTherm has proposed a solar energy development on Farm Hartebeest Vlei 86, located approximately 13km southeast of Aggeneys located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality, in the Northern Cape Province of South Africa. The solar energy development will consist of two 150MW Concentrating Solar Power (CSP) projects referred to as Letsoai CSP 1 and 2; and five 75MW Solar Photovoltaic (PV) projects referred to as Enamandla PV 1 – 5 (**Figure 1-1**). The projects are summarised in **Table 1-1**.

Table 1-1: Projects within the Solar Energy Development

PROJECT NUMBER	TECHNOLOGY	LOCATION	PROJECTS
1	CSP	Northern Cape	→ Letsoai CSP 1 (150MW) and associated infrastructure → Letsoai CSP 2 (150MW) and associated infrastructure
2	PV	Northern Cape	→ Enamandla PV 1 (75MW) and associated infrastructure → Enamandla PV 2 (75MW) and associated infrastructure → Enamandla PV 3 (75MW) and associated infrastructure → Enamandla PV 4 (75MW) and associated infrastructure → Enamandla PV 5 (75MW) and associated infrastructure
3	Power Integration	Northern Cape	→ 1 x 400kV Powerline and associated substation

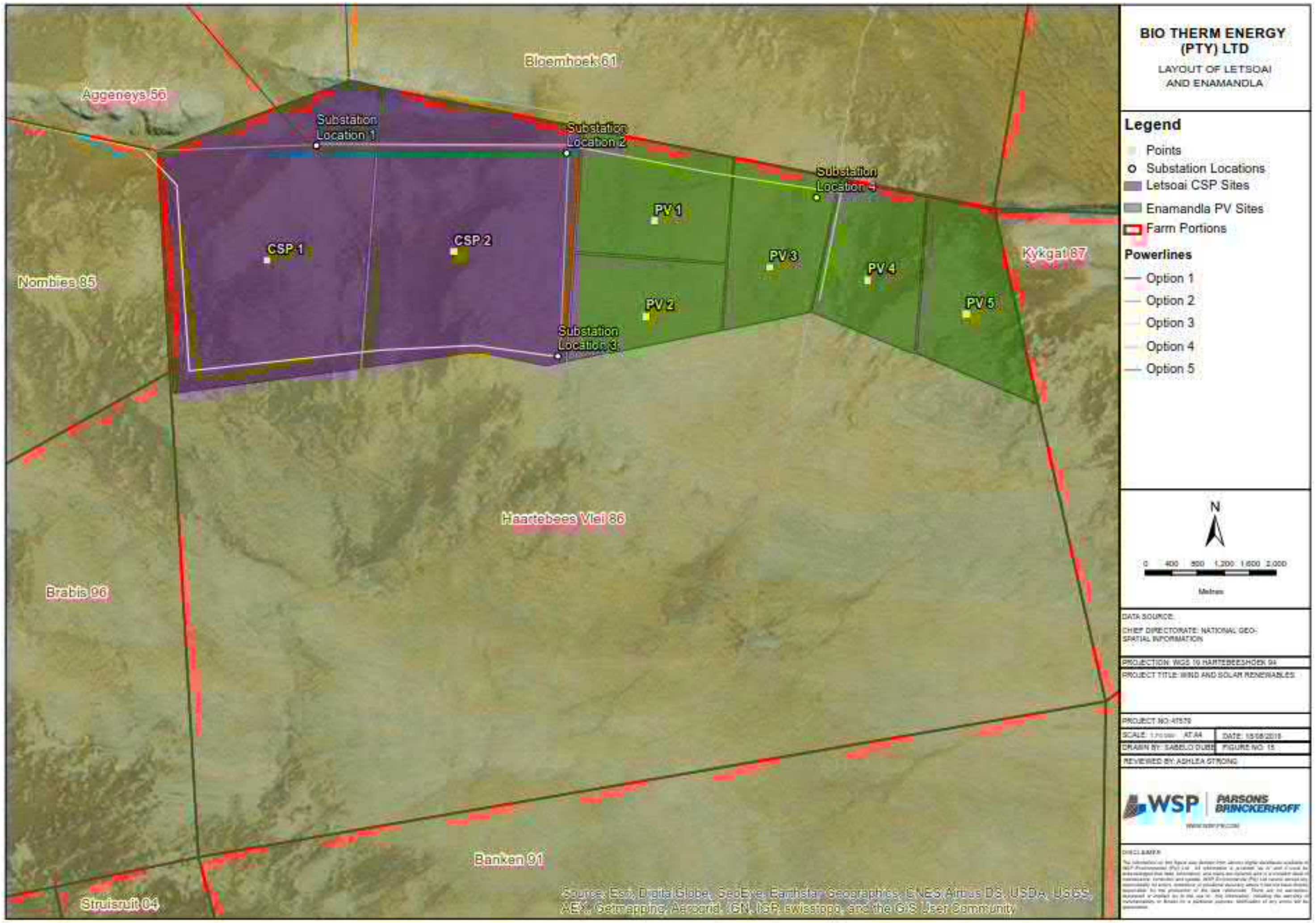

Figure 1-1: The Proposed Solar Energy Development

It is important to note that this S&EIR process is for Letsoai CSP 1 only; the balance of the Enamandla PV and Letsoai CSP projects entail separate EA applications and S&EIR processes.

WSP| Parsons Brinckerhoff, Environment and Energy, Africa (WSP | Parsons Brinckerhoff) has been appointed in the role of Independent Environmental Assessment Practitioner (EAP) to undertake the S&EIR processes for each of the seven projects collectively forming part of the solar energy development. **Table 1-2** outlines the details of the EAP and their expertise. The CVs of the Project Director and Project Manager are available in **Appendix A**. The EAP declaration of interest and undertaking is included in **Appendix B.** In order to adequately identify and assess potential environmental impacts, the EAP was supported by a number of specialists. The signed Specialist Declarations are included in **Appendix C**.

Table 1-2: Details of the Environmental Assessment Practitioner

Name of Consultant:	**WSP Environmental (Pty) Ltd**
Contact Person:	Ashlea Strong
Postal Address:	P O Box 98867 Sloane Park 2152
Telephone:	011 361 1392
Fax:	011 361 1381
E-mail:	Ashlea.Strong@wspgroup.co.za
Expertise to conduct this EIA	Ms A. Strong holds a Masters in Environmental Management; a BTech (Nature Conservation), and a National Diploma (Nature Conservation); She is also a Certified Environmental Assessment Practitioner of South Africa (CEAPSA) with the interim Board of Certification. She has 13 years' experience in the environmental field - she provides technical and strategic expertise on diverse projects in the environmental management field, including environmental scoping and impact assessment studies, environmental management plans, waste management, as well as the provision of environmental management solutions and mitigation measures. She has been involved in the management of a number of large EIAs within South Africa and has environmental auditing and training experience and expertise.

1.3 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The EIA Regulations (GNR 982 of 2014) identify Letsoai CSP 1 as an activity being subject to a S&EIR process due to the applicability of the EIA Listing Notices, Government Notice Regulation (GNR) 983 and 984 (8 December 2014). In order for the project to proceed it will require an EA from the Department of Environmental Affairs (DEA).

WSP | Parsons Brinckerhoff has been appointed as the independent EAP to carry out the S&EIR process in accordance with the EIA Regulations, 2014.

The Scoping Process carried out involved consultation with interested and affected parties and the drafting of the Plan of Study for EIA (POS for EIA), which culminated in the submission of a Final Scoping Report to the DEA. The DEA acceptance of the Final Scoping Report and authorisation to proceed with the EIA was received on 12 December 2016 (**Appendix D**)

PROCEDURAL FRAMEWORK

As defined in Appendix 3 of the EIA Regulations, the objective of the impact assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- Determine the-
  - Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

    Degree to which these impacts-
    - Can be reversed;
    - May cause irreplaceable loss of resources, and
    - Can be avoided, managed or mitigated;
- Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- Identify suitable measures to avoid, manage or mitigate identified impacts; and
- Identify residual risks that need to be managed and monitored.

PUBLIC PARTICIPATION PROCESS

Public participation is a requirement of the S&EIR process; it consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIR decision-making process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the Proposed Project. The objectives of the public participation process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the Proposed Project;
- Clearly outline the scope of the Proposed Project, including the scale and nature of the existing and proposed activities;
- Identify viable Proposed Project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and

→ To inform and provide the public with information and an understanding of the Proposed Project, issues and solutions.

1.4 IMPACT ASSESSMENT REPORT STRUCTURE

Table 1-3 cross-references the sections within the EIR with the legislated requirements as per Appendix 3 of GNR 982 of 2014.

Table 1-3: Legislation Requirements as detailed in GNR 982

APPENDIX 3	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982		RELEVANT REPORT SECTION
(a)	Details of		
	i)	the EAP who compiled the report; and	Section 1.2
	ii)	the expertise of the EAP, including a Curriculum Vitae	Section 1.2 and Appendix A
(b)	The location of the activity, including-		
	i)	The 21 digit Surveyor code for each cadastral land parcel;	Section 2.1
	ii)	Where available, the physical address and farm name	Section 2.1
	iii)	Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property.	Section 2.1
(c)	A plan which locates the proposed activities applied for at an appropriate scale, or, if it is-		
	i)	A linear activity, a description of the corridor in which the proposed activity or activities is to be undertaken; or	Section 2.2
	ii)	On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Section 2.2
(d)	A description of the scope of the proposed activity, including-		
	i).	All listed and specified activities triggered and being applied for;;	Section 3.2
	ii).	A description of the associated structures and infrastructure related to the development;;	Section 7.2
(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;;		Section 7
(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;		Section 6
(g)	A motivation for the preferred development footprint within the approved site		Section 7.4
(h)	A full description of the process followed to reach the proposed development footprint within the approved site, including-		
	i).	Details of the development footprint alternatives considered;;	Section 7.4
	ii).	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 5.3
	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;	Section 5.3 and Appendix H

	iv).	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 8
	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;	Section 9 and 10
	vi).	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 5.2
	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;	Section 9 and 10
	viii).	The possible mitigation measures that could be applied and level of residual risk;	Section 9 and 10 Appendix V
	ix).	If no alternative development locations for the activity were investigated, the motivation for not considering such; and;	Section 7.4
	i).	A concluding statement indicating the preferred alternative development location within the approved site	Section 12.5
(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure 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	Section 9 and 10
	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.	Section 9 and 10
(j)	An assessment of each identified potentially significant impact and risk, including-		
	i).	Cumulative impacts;	Section 11
	ii).	The nature, significance and consequences of the impact and risk;	Section 9 and 10
	iii).	The extent and duration of the impact and risk;	Section 9 and 10
	iv).	The probability of the impact and risk occurring;	Section 9 and 10
	v).	The degree to which the impact and risk can be reversed;	Section 9 and 10
	vi).	The degree to which the impact and risk may cause irreplaceable loss of resources; and	Section 9 and 10
	vii).	The degree to which the impact and risk can be mitigated	Section 9 and 10
(k)	Where applicable, a summary of the findings and recommendations of 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 assessment report;		Section 12
(l)	An environmental impact statement which contains-		
	i)	A summary of the key findings of the environmental impact assessment:	Section 12

	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	Section 12
	iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 12
(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 9 and 10 Appendix V
(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 12.5
(o)	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;	Appendix V
(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.5
(q)	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;	Section 12.6
®	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Not Applicable
(s)	An undertaking under oath or affirmation by the EAP in relation to-	
	i). the correctness of the information provided in the report;	Appendix B
	ii). the inclusion of comments and inputs from stakeholders and I&APs;	Appendix B
	iii). the inclusion of inputs and recommendations from the specialist reports where relevant; and	Appendix B
	iv). any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Appendix B
(u)	an indication of any deviation from the approved scoping report, including the plan of study, including-	
	i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	Not Applicable
	ii) a motivation for the deviation	Not Applicable
(v)	Any specific information required by the competent authority; and	Section 4.2
(w)	Any other matter required in terms of section 24(4)(a) and (b) of the Act.	Not Applicable

1.5 ASSUMPTIONS AND LIMITATIONS

General assumptions and limitations relating to the impact assessment study and the EIR are listed below:

- The EAP hereby confirms that they have undertaken to obtain project information from the client that is deemed to be accurate and representative of the project;

- Site visits have been undertaken to better understand the project and ensure that the information provided by the client is correct, based on site conditions observed;
- The EAP hereby confirms their independence and understands the responsibility they hold in ensuring all comments received are accurately replicated and responded to within the EIA documentation; and
- The comments received in response to the public participation process, are representative of comments from the broader community; and
- The competent authority would not require additional specialist input, as per the proposals made in this report, in order to make a decision regarding the application.

Notwithstanding these assumptions, it is the view of WSP | Parsons Brinckerhoff that this EIR provides a good description of the issues associated with the project and the resultant impacts.

2 BOUNDARY OF THE STUDY AREA

2.1 PROJECT STUDY AREA

The proposed project is to be developed on the Farm Hartebeest Vlei 86 (SG Code: C05300000000008600000) located approximately 13km southeast of Aggeneys located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality.

The site is considered highly suitable for a solar energy project due to the following:

- Climatic conditions;
- Relief and aspect;
- Land availability; and
- Access to the National Grid through Eskom's Aggeneys Substation.

There are a number of Environmental Authorisations (EAs) (either issued or in progress) within a 65km radius (minimum) of the proposed project site. These EAs are illustrated in **Figure 2-1** and detailed in **Table 2-1**.

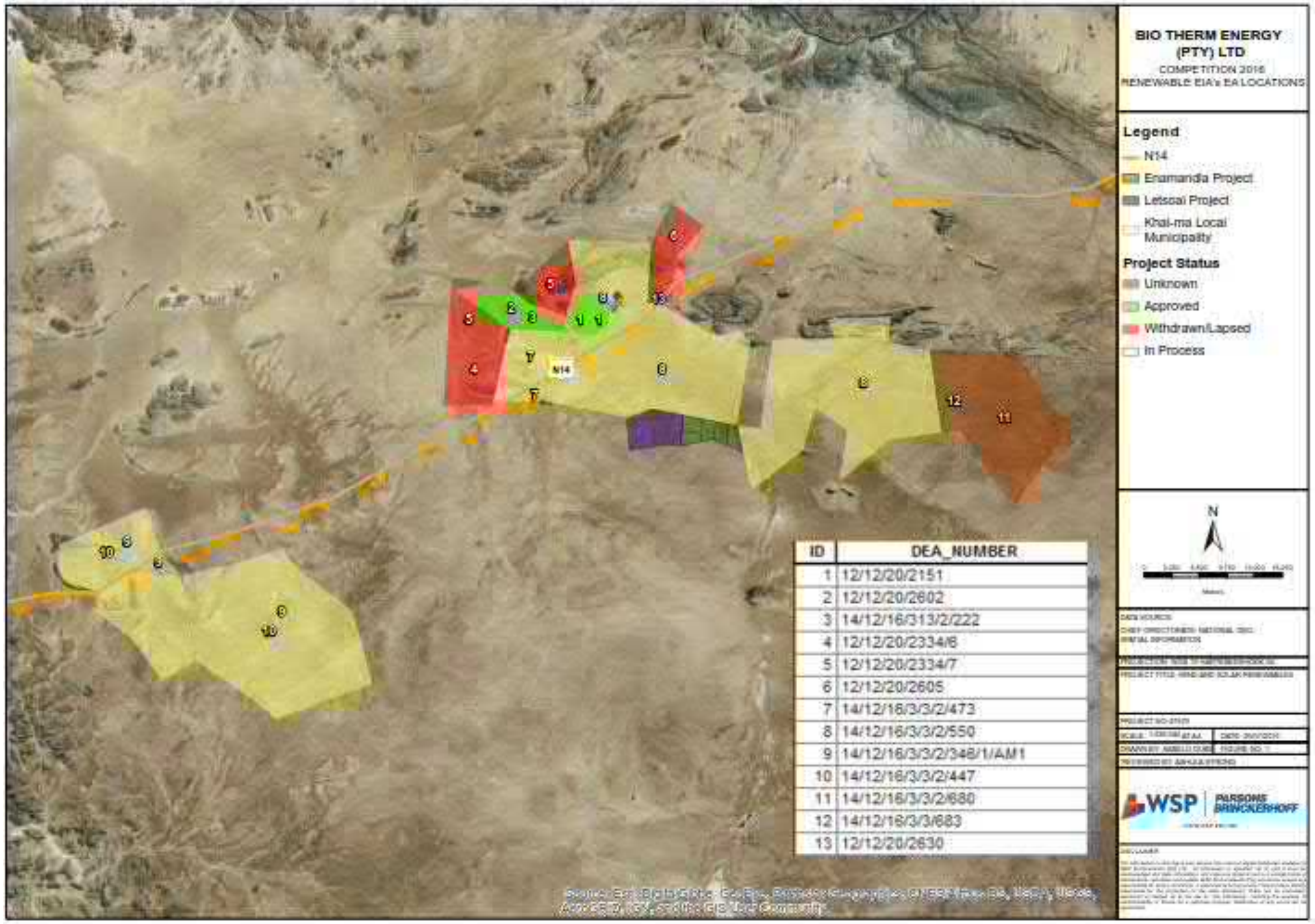

Figure 2-1: The Location of the Existing Environmental Authorisations within 65km of Letsoai CSP 1

Table 2-1: Existing Environmental Authorisations within 65km of Letsoai CSP 1

DEA Reference Number	EIA Process	Project Title	EAP	Technology	MegaWatt	Project Status
14/12/16/3/3/2/346/AM1	Amendment	Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	Aurecon South Africa (Pty) Ltd	Onshore Wind and Solar PV	75	In Process
14/12/16/3/3/2/447	S&EIR	Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, Near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	Aurecon South Africa (Pty) Ltd	Onshore Wind and Solar PV	1000	In Process
12/12/20/2334/7	S&EIR	Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local Municipality, Northern Cape.	SRK Consulting (Pty) Ltd	Solar PV	75	Withdrawn / Lapsed
12/12/20/2602	S&EIR	The Proposed Boesmanland Solar Farm Portion 6 (A Portion Of Portion 2), Farm 62 Zuurwater, Aggeneys, Northern Cape Province.	SRK Consulting (Pty) Ltd	Solar PV	75	Approved
12/12/20/2334/6	S&EIR	Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local Municipality, Northern Cape.	SRK Consulting (Pty) Ltd	Solar PV	75	Withdrawn / Lapsed
14/12/16/3/3/2/473	S&EIR	75MW PV plant on the Farm Zuurwater No 62 in the Namakwa District, Northern Cape Province, Phase 4.	SRK Consulting (Pty) Ltd	Solar PV	75	In Process
14/12/16/3/3/2/222	S&EIR	Proposed Boesmanland Solar Farm Portion 6 (A portion of portion 2) Farm 62 Zuurwater, Aggeneys, Northern Cape.	SRK Consulting (Pty) Ltd	Solar PV	75	Approved

DEA Reference Number	EIA Process	Project Title	EAP	Technology	MegaWatt	Project Status
12/12/20/2334/7	S&EIR	Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local municipality, Northern Cape.	SRK Consulting (Pty) Ltd	Solar PV	75	Withdrawn / Lapsed
14/12/16/3/3/2/550	S&EIR	Proposed Wind Energy Facility and Associated Infrastructure on Namies Wind Farm Pty Ltd, near Aggeneys, Northern Cape Province.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	220	In Process
12/12/20/2151	BAR	The Proposed Construction of a Photovoltaic Power Generation Facility within the Black Mountain Mining Area near Aggeneys in the Northern Cape Province.	SRK Consulting (Pty) Ltd	Solar PV	19	Approved
12/12/20/2605	BAR	Proposed Gamsberg Solar Energy Project on Portion 1 of Farm 57 Aroams near Upington, Khâi-Ma Municipality, Northern Cape.	Savannah Environmental Consultants (Pty) Ltd	Solar PV	Unknown	Withdrawn / Lapsed
14/12/16/3/3/2/683	S&EIR	Proposed 75MW Korana Wind Energy Facility, near Poffader in the Northern Cape.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	Unknown	Unknown
14/12/16/3/3/2/680	S&EIR	Proposed 140MW Khâi-Mai Wind Energy Facility near Pofadder.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	Unknown	Unknown
12/12/20/2630	S&EIR	Construction of the 70MW Orlight SA Photovoltaic Solar Power Plant on portion 1 of the farm Aroams 57 RD near Aggeneys within the Khai-Ma Local Municipality, Northern Cape Province	Digby Wells Environmental	Solar PV	40	Approved

2.2 PROJECT SITE

The site is located within the Springbok Wind REDZ and is therefore considered to be located within the renewable energy hub that is developing in the Aggeneys Area (**Figure 2-2**). The location of Letsoai CSP 1 on the Farm Hartebeest Vlei 86 (SG Code: C05300000000008600000) is illustrated in **Figure 2-3**.

In terms of section 7(1) and 7(2) of the Astronomy Geographic Act (No. 21 of 2007), national government established core astronomy advantage areas. As such, all land within a 3 km radius of the centre of the Southern African Large Telescope (SALT) dome located in the Northern Cape Province falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to core astronomy advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometer Array (SKA) telescope.

Letsoai CSP 1 is outside of the Core SKA area and outside the 3km buffer of the SALT.

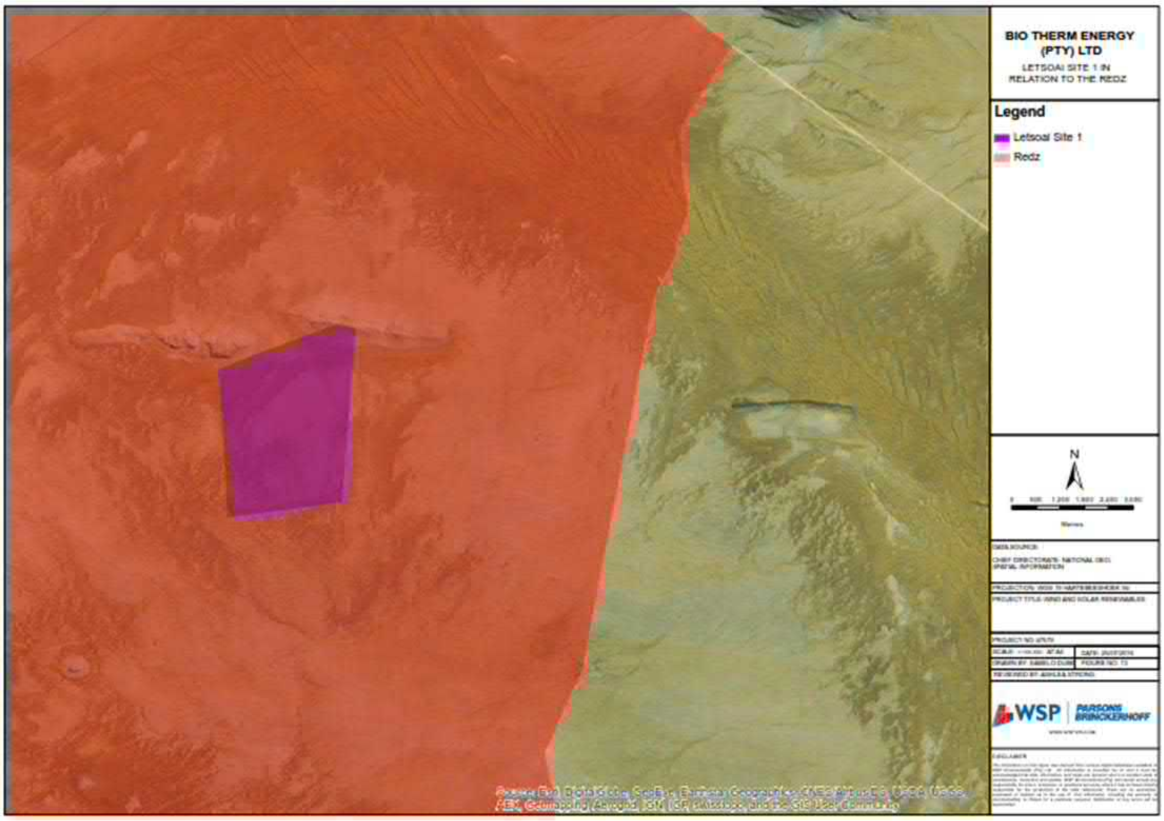

Figure 2-2: The proposed project development site within the Springbok Wind REDZ

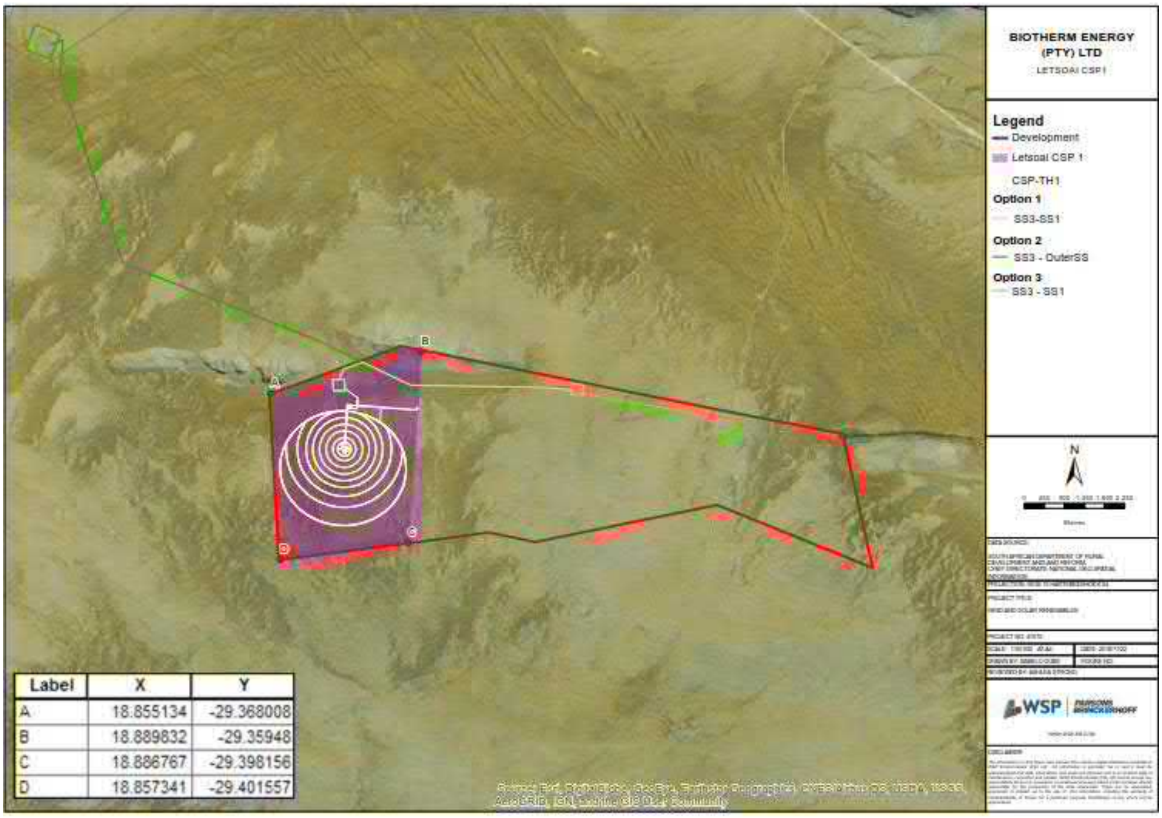

Figure 2-3: The Letsoai CSP 1 Project forming part of the greater Letsoai Project

The proposed water supply pipeline corridor alternatives are located to the north of the proposed Letsoai CSP 1 (**Figure 2-4**) and traverse a number of farms as outlined in **Table 2-2**.

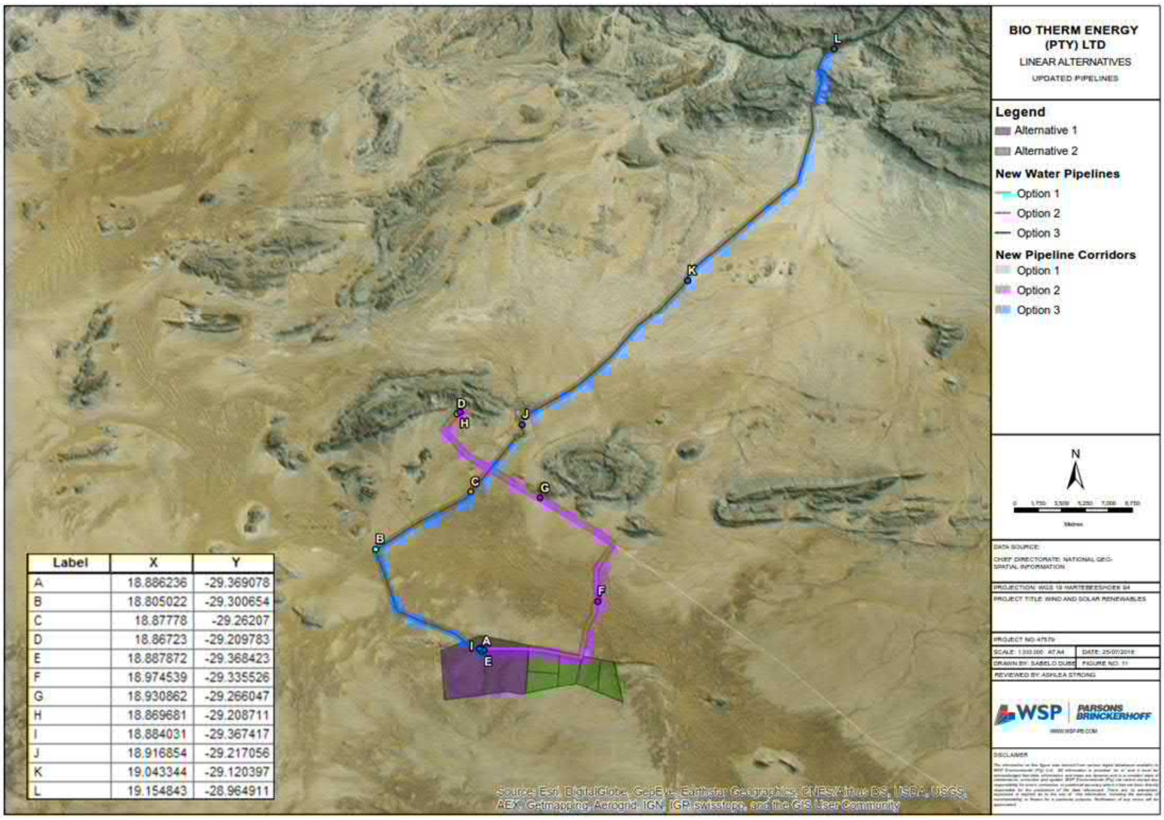

Figure 2-4: Water Supply Pipeline Corridor Alternatives

Table 2-2: Farms traversed by the proposed Water Supply Pipeline Corridor Alternatives

FARM NAME	SG CODE
Pella Mission 39	C05300000000003900000
Portion 1 of Farm Klein Pella 40	C05300000000004000000
Portion 1 of Koups Leegte 58	C05300000000005800000
Portion 2 of Farm Aroams 57	C05300000000005700002
Remaining Extent of Farm Aroams 57	C05300000000005700000
Portion 1 of Farm Aroams 57	C05300000000005700001
Remaining Extent of Farm Aggeneys 56	C05300000000005600000
Portion 1 of Farm Aggeneys 56	C05300000000005600001
Portion 1 of Farm Blomhoek 61	C05300000000006100001
Remaining Extent of Farm Blomhoek 61	C05300000000006100000
Remaining Extent of Farm Hartebeest Vlei 86	C05300000000008600000

2.3 AREAS OF INFLUENCE

The biophysical boundary of the study refers to land cover in the area defined above (**Figure 2-3**); as well as the area covered by the proposed water supply pipeline corridor alternatives which lie to the north of the site.

From a socio-economic perspective indirect and direct project influence areas are defined:

- The area of indirect influence includes the country of South Africa, the Northern Cape Province and the Namakwa District Municipality; given the nature of the project there will be some influences at the national, provincial and district levels.
- The area of direct influence includes the Khâi-Ma Local Municipality and surrounding areas.

3 GOVERNANCE FRAMEWORK

The South African regulatory framework establishes well-defined requirements and standards for environmental and social management of industrial and civil infrastructure developments. Environmental protection functions are carried out by different authorities at both national and regional levels. The following sections outline summaries of:

- Key regulatory authorities and other relevant bodies related to the governance of the proposed activities, the S&EIR process, and other permitting requirements.
- Current national, provincial and local legislative framework in South Africa as it relates to the project during planning, development and operation; including national policies and standards referred to as guidelines for the identification and management (including mitigation) of impacts.

3.1 INSTITUTIONAL FRAMEWORK

The key institutions and their main roles and responsibilities in relation to the S&EIR process are described in the following subsections:

DECISION MAKING AUTHORITY

Due to the fact that this is a renewable energy project it is linked to the Integrated Resource Plan 2010. Section 24C(2)(a) of the National Environmental Management Act (No. 107 of 1998) (NEMA) stipulates that the Minister must be identified as the competent authority if the activity has implications for international environmental commitments or relations. At the 15th Conference of the Parties to the United Nations Framework Convention on Climate change held in 2010, the President, Mr Jacob Zuma, committed the country to voluntary reductions in CO_2 emissions through the Copenhagen Accord. As such, applications which fall within the energy reduction plans of government must be considered by the Minister. Therefore, the DEA is the authorising department.

COMMENTING AUTHORITIES

The following will act as commenting authorities for this application:

- Northern Cape Department of Environment and Nature Conservation (NCDENC);
- Department of Water and Sanitation (DWS). The Department of Water and Sanitation Northern Cape Region will act as a commenting authority for this application and will provide input with regards to water use license requirements. The project falls within the Lower Orange Water Management Area;
- Department of Environmental Affairs: Biodiversity and Conservation;
- South African Heritage Resources Agency (SAHRA);
- Regional Land Claims Commission: Northern Cape;
- Square Kilometre Array (SKA);
- Khâi-Ma Local Municipality; and
- Namakwa District Municipality.

3.2 NATIONAL LEGAL AND REGULATORY FRAMEWORK

THE CONSTITUTION OF SOUTH AFRICA (NO. 108 OF 1996)

Since 1994 South African legislation, including environmental legislation has undergone a large transformation and various laws and policies were promulgated with a strong emphasis on environmental concerns and the need for sustainable development. The Constitution of South Africa (No. 108 of 1996) (The Constitution) provides environmental rights (contained in the Bill of Rights, Chapter 2, Section 24) and includes implications for environmental management. The environmental rights are guaranteed in Section 24 of the Constitution, and state that:

"Everyone has the right –

- *To an environment that is not harmful to their health or well-being and*
- *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*
  - *Prevent pollution and ecological degradation;*
  - *Promote conservation and*
  - *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."*

The Constitution cannot manage environmental resources as a stand-alone piece of legislation hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld on an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NO. 107 OF 1998)

The NEMA provides the environmental legislative framework for South Africa and requires that activities be investigated that may have a potential impact on the environment, socio-economic conditions, and cultural heritage. The results of such investigation must be reported to the relevant authority. Procedures for the investigation and communication of the potential impact of activities are contained in Section 24(7) of the Act.

EIA REGULATIONS 2014

On the 4th December 2014 the Minister responsible for Environmental Affairs promulgated new EIA Regulations (GNR 982) in terms of Chapter 5 of the NEMA. The EIA Regulations contain three listing notices (GNR 983, 984 and 985) which identify activities that are subject to either a Basic Assessment or Scoping and EIA in order to obtain an EA. A Basic Assessment must be completed if the proposed project triggers activities listed in GNR 983 (Listing Notice 1) or GNR 985 (Listing Notice 3).

Table 3-1, Table 3-2 and **Table 3-3** outline the listed activities that are triggered by the proposed project under GNR 983, 984 and 985 respectively.

Table 3-1: Determination of GNR 983 Listed Activities

LISTED ACTIVITY AS DESCRIBED IN GNR 983	APPLICABLE	APPLICABILITY & LICENCE REQUIREMENT
(9) - The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water-	Applicable	The Letsoai CSP 1 facility will require water. The water supply pipeline to be constructed will be longer than 1000m and

(i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more;		will have an internal diameter of more than 0,36 meters.
(11)- The development of facilities or infrastructure for the transmission and distribution of electricity- (i) Outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	Applicable	Letsoai CSP 1 will require the construction of an on-site substation and a 132kV overhead powerline. The powerline will all be outside an urban area and will connect to a common on-site substation prior to the electricity being evacuated to the Eskom Grid.
(12) - The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	Applicable	The pipeline route will cross a watercourse
(13)- The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	Applicable	Letsoai CSP 1 will require water storage tanks / dams and a water treatment plant with a combined capacity that exceeds 50 000 m^3.
(14)- The development 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 metres or more but not exceeding 500 cubic metres.	Applicable	Hazardous substances such as fuel will be required to be stored on site. The storage containers will have a combined capacity of more than $80m^3$ but less than $500m^3$.
(19) - The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse;	Applicable	The pipeline route will cross a watercourse
(24)- The development of- (ii) A road with a reserve wider than 13,5 meters, or where no reserve exists where the road is no wider than 8 meters.	Applicable	Internal access roads will be required for access to Letsoai CSP 1. These roads will be no wider than 8m.
(25)- The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres	Applicable	Letsoai CSP 1 will require a water treatment plant with a daily throughput capacity of more than 2 $000m^3$ but less than 15 000 m^3
(28)- Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (ii) Will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	Applicable	Letsoai CSP 1 is proposed to be developed outside an urban area with a development footprint of more than 1 ha.
(56)- The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-	Applicable	The main access road that connects Letsoai CSP 1 to the main road will require widening.

(i) Where the existing reserve is wider than 13,5 meters; or		

Table 3-2: Determination of GNR 984 Listed Activities

Listed Activity As Described In Gnr 984	Applicable	Applicability & Licence Requirement
(1)- The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.	Applicable	Letsoai CSP 1 will generate electricity from a renewable resource with an electricity output of more than 20 megawatts (75MW).
(4)- The development 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 more than 500 cubic metres	Applicable	In the event that a storage option is required for the Heat Transfer Liquid then hazardous substances such as either molten salt or fuel oil will be required to be stored on site. The storage containers will have a combined capacity of more than 500 m^3.
(6)- The development of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent	Applicable	A water use license will be required for the discharge of wastewater to the evaporation ponds.
(15)- The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	Applicable	Letsoai CSP 1 will require more than 20ha of indigenous vegetation to be cleared.
(16)- The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 m or higher or where the high-water mark of the dam covers an area of 10 ha or more.	Applicable	Letsoai CSP 1 will require water storage (regulation) ponds that exceed the minimum thresholds.
(25)- The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of 15,000m3 or more	Applicable	Wastewater generated by the process will undergo treatment at a wastewater treatment plant.

Table 3-3: Determination of GNR 985 Listed Activities

Listed Activity As Described In Gnr 985	Applicable	Applicability & Licence Requirement
(4) - The development of a road wider than 4 metres with a reserve less than 13,5 metres. In The Northern Cape - (bb) National Protected Area Expansion Strategy Focus area (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans	Applicable	There are no Critical Biodiversity Areas within the Letsoai CSP 1 site. However, the entire proposed development falls within the Kamiesberg Bushmanland Augabies NPAES focus area and the pipeline route alternatives intersect with Critical Biodiversity Areas..
(12) - The clearance of an area of 300 square meters or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in	Applicable	There are no Critical Biodiversity Areas within the Letsoai CSP 1 site. However, the pipeline route alternatives intersect with Critical Biodiversity Areas.

accordance with a maintenance management plan In the Northern Cape - (i) Within critical biodiversity areas identified in bioregional plans		
(14) - The development of – (xii) infrastructure or structures with a physical footprint of 10 square meters or more In the Northern Cape - (bb) National Protected Area Expansion Strategy Focus area (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	Applicable	There are no Critical Biodiversity Areas within the Letsoai CSP 1 site. However, the entire proposed development falls within the Kamiesberg Bushmanland Augabies NPAES focus area and the pipeline route alternatives intersect with Critical Biodiversity Areas..

Based on the determination above, activities listed in GNR 983, GNR 984 and GNR 985 are applicable to the project. The EIA Regulations stipulate that where both Listing Notices are applicable, the more rigorous process is to be followed. In this case a S&EIR process is being undertaken in order to obtain the required necessary EA.

NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (NO. 59 OF 2008)

The National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (NEM:WA) is subsidiary and supporting legislation to the NEMA. The Act is a framework legislation that provides the basis for the regulation of waste management. The Act also contains policy elements and gives a mandate for further regulations to be promulgated.

On 29 November 2013 GNR 921 was promulgated (repealing GNR 718) which contains a list of waste management activities that if triggered require a Waste Management License (WML) and in turn a Basic Assessment (Category A activities) or Scoping and EIA (Category B activities) process to be undertaken in terms of the NEMA EIA Regulations. Category C activities are required to comply with the Norms and Standards for Storage of Waste 2013 (GN. 926) and do not require authorisation.

The requirement for evaporation dams was confirmed subsequent to the submission of the Final Scoping Report to the DEA. Therefore, BioTherm will require a WML. **Table 3-4** outlines the applicable waste management activities that will be triggered by the evaporation dams.

Table 3-4: Determination of Applicable GNR 921 Listed Activities

Listed Activity as Described in GNR 921	Applicable	Applicability and Licence Requirement
Category A - Activity 1: The storage of general waste in lagoons.	Applicable	The Letsoai CSP 1 site will require evaporation dams for the storage of effluent (general waste) from the power generation process.
Category A – Activity 12: The construction of a facility for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity).	Applicable	The evaporation dam will be constructed on site.

Waste handling, storage and disposal during the construction and operational phases of the project must be undertaken in accordance with the requirements of this Act and the Best Practicable

Environmental Options which will be incorporated into the site specific Environmental Management Programme (EMPr).

NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT (NO. 39 OF 2004)

The National Environmental Management Act (No. 39 of 2004) (NEM:AQA) aims to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in South Africa, to prevent air pollution and ecological degradation and to secure ecological sustainable development while promoting justifiable economic and social development.

In line with Section 21 of NEM:AQA, GNR 893 of 2013 provides the listed activities for which an AEL is required and the associated minimum emission standards (MES) by emission category.

In terms of Section 32 of the NEM:AQA The National Dust Control Regulations (GNR 827) were promulgated, which aim at prescribing general measures for the control of dust in both residential and non-residential areas.

Although no AEL will be required for the construction and operation of Letsoai CSP 1, the dust control regulations will be applicable during construction.

NATIONAL WATER ACT (NO. 36 OF 1998)

The National Water Act, 1998 (No. 36 of 1998) (NWA) provides the framework to protect water resources against over-exploitation and to ensure that there is water for social and economic development, human needs and to meet the needs of the aquatic environment.

The Act defines water source to include watercourses, surface water, estuary or aquifer. A watercourse is defined in the Act as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which or from which water flows, and any collection of water which the Minister may declare a watercourse.

Section 21 of the Act outlines water a number of categories which require the water user to apply for a Water Use License (WUL) and Section 22 requires water users to apply for a General Authorisation (GA) with the DWS if they are under certain thresholds or meet certain criteria. The list of water uses that require a WUL under section 21:

(a) Taking water from a water resource;

(b) Storage of water;

(c) impeding or diverting the flow of water in a watercourse;

(d) engaging in a stream flow reduction activity;

(e) engaging in a controlled activity;

(f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;

(g) Disposing of waste in a manner which may detrimentally impact on a water resource;

(h) Disposing in any manner of water which contains waste from, or which has been heated in. any industrial or power generation process;

(i) Altering the bed, banks, course or characteristics of a watercourse;

(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

(k) Using water for recreational purposes.

The preliminary review of the baseline environment shows that ground water resources are limited and discussions are being undertaken with Sedibeng Water as well as other potential water supply partners in order to obtain water without having to abstract from the Orange River. Therefore, it is currently not anticipated that a WUL will be needed for the abstraction of water under Section 21(a).

Due to the fact that there are no surface water resources on the site, it is not anticipated that a WUL will be needed for the crossing of a watercourse in terms of Section 21(c) and (i) *viz.* impeding or diverting the flow of water in a watercourse and the altering of bed, banks, course or characteristics of a watercourse.

Due to the fact that the CSP facility will be required to store raw water as part of the operational activities, it is anticipated that a water use licence for the storage of raw water will be required in terms of Section 21(b). In addition, the potential need for the inclusion of evaporation ponds on site for the disposal of effluent from the steam-cycle and other waste sources may require a water use licence for the disposal (in any manner) of water which contains waste from, or which has been heated in, any industrial or power generation process in terms of Section 21(h).

It should be noted that the WUL application will only be processed by the DWS should the project be selected as a preferred bidder in terms of the REIPPP.

NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT (NO. 10 OF 2004)

The National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEMBA) was promulgated in June 2004 within the framework of NEMA to provide for the management and conservation of national biodiversity. The NEMBA's primary aims are for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. In addition, the NEMBA provides for the establishment and functions of a South African National Biodiversity Institute (SANBI).

SANBI was established by the NEMBA with the primary purpose to report on the status of the country's biodiversity and conservation status of all listed threatened or protected species and ecosystems.

The construction of the project, including the associated infrastructure may negatively impact on the biodiversity of the area, even though Letsoai CSP 1 is within one of the Renewable Energy Development Zones (REDZ). As such, SANBI will be invited to provide comment on the proposed project and any licenses or permits that maybe applicable will be obtained.

The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014.

Specific management measures for the control of alien and invasive plants will be included in the EMPr.

NATIONAL HERITAGE RESOURCES ACT (NO. 25 OF 1999)

The National Heritage Resource Act (No. 25 of 1999) (NHRA) serves to protect national and provincial heritage resources across South Africa. The NHRA provides for the protection of all archaeological and palaeontological sites, the conservation and care of cemeteries and graves by SAHRA, and lists activities which require any person who intends to undertake to notify the responsible heritage resources agency and furnish details regarding the location, nature, and extent of the proposed development.

In terms of the Section 38 of NHRA, any person who intends to undertake a linear development exceeding 300m in length or a development that exceeds 5 000m^2 must notify the heritage resources authority and undertake the necessary assessment requested by that authority.

In the case of Letsoai CSP 1, a Heritage Impact Assessment (HIA) has been undertaken looking at Archaeology, Heritage and Palaeontology. The proposed project has been brought to the attention of SAHRA who will provide comment, and provide the required approval.

CONSERVATION OF AGRICULTURAL RESOURCES ACT (NO. 43 OF 1983)

The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) includes the use and protection of land, soil, wetlands and vegetation and the control of weeds and invader plants. This is the only legislation that is directly aimed at conservation of wetlands in agriculture.

In terms of the amendments to the regulations under the CARA, landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the DEA and DWS, as well as other laws (including local by-laws), spell out the fines, terms of imprisonment and other penalties for contravening the law. Although no fines have yet been placed against landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners cost and risk.

Specific management measures for the conservation of agricultural resources will be included in the EMPr.

CIVIL AVIATION ACT (NO. 13 OF 2009)

Civil aviation in South Africa is governed by the Civil Aviation Act (No. 13 of 2009). This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by the South African Civil Aviation Authority (SA CAA) as an agency of the Department of Transport (DoT). The SA CAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SA CARs). All proposed developments or activities in South Africa that potentially could affect civil aviation must thus be assessed by SACAA in terms of the SA CARs and South African Civil Aviation Technical Standards (SA CATS) in order to ensure aviation safety.

The Obstacle Evaluation Committee (OEC) which consists of members from both the SA CAA and South African Air Force (SAAF) fulfils the role of streamlining and coordinating the assessment and approvals of proposed developments or activities that have the potential to affect civil aviation, military aviation, or military areas of interest. With both being national and international priorities, the OEC is responsible for facilitating the coexistence of aviation and renewable energy development, without compromising aviation safety.

The details of the project will be provided to the SA CAA, which will be required to provide comment and approval of the proposed location and development of Letsoai CSP 1.

ASTRONOMY GEOGRAPHIC ACT (NO. 21 OF 2007)

The Astronomy Geographic Act (No. 21 of 2007) provides for:

- The preservation and protection of areas that are uniquely suited for optical and radio astronomy;

- Intergovernmental cooperation and public consultation on matters concerning nationally significant astronomy advantage areas and matters connected herewith.

In terms of section 7(1) and 7(2) of this Act, national government established core astronomy advantage areas. As such, all land within a 3 km radius of the centre of the Southern African Large Telescope (SALT) dome located in the Northern Cape Province falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to core astronomy advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometer Array (SKA) telescope.

Under section 22(1) of the Act the national government has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such no person may undertake certain activities within a core or central astronomy advantage area. These activities prohibited include the construction, expansion or operation; of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavours.

Comments received from SKA note that the nearest SKA station to the Letsoai CSP 1 Site is 142 km away. Based on the distance to the nearest SKA station, the facility is seen to pose a low risk of detrimental impact on the SKA.

OCCUPATIONAL HEALTH AND SAFETY ACT (NO. 85 OF 1993)

The Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and the relevant regulations under the Act are applicable to the proposed project. This includes the Construction Regulations promulgated in 2014 under Section 43 of the Act. Adherence to South Africa's OHSA and its relevant Regulations, is essential. It is noted that adherence to the South African OHSA will also ensure adherence to the relevant occupational health and safety provisions contained within the International Finance Corporation (IFC) general Environmental, Health and Safety (EHS) Guidelines 2007, given that the South African standards either meet or exceed the relevant IFC guidelines.

3.3 PROVINCIAL CONTEXT

NORTHERN CAPE PROVINCE SPATIAL DEVELOPMENT FRAMEWORK

The Northern Cape Province Spatial Development Framework (PSDF) is a policy document that promotes a 'developmental state' in accordance with national and provincial legislation and directives. It aligns with the Northern Cape Provincial Growth and Development Strategy which has committed the Northern Cape to 'building a prosperous, sustainable and growing provincial economy which reduces poverty and improves social development'

The PSDF is premised upon and gives effect to the following five strategic objectives of the National Development Strategy for Sustainable Development (NSSD 2011-2014):

- Enhancing systems for integrated planning and implementation
- Sustaining our ecosystem and using natural efficiently
- Towards green economy
- Building sustainable communities
- Responding effectively to climate change

The PSDF makes reference to the need to ensure the availability of energy and the potential for renewable energy generation within the province. Under Section B14, Economic Development

Profile, The White Paper on Renewable Energy (2003) discussed a 10 000GWh of energy to be produced from renewable energy sources. The PSDF identifies that the total area of high radiation in South Africa amounts to approximately 194 000km^2, of which the majority falls within the Northern Cape. It is estimated that, if the electricity production per km^2 of mirror surface in solar thermal power stations were 30.2MW and only 1% of the area of high radiation were available for solar generation, generation potential would equate to approximately 64GW. A mere 1.25% of the area of high radiation could thus meet projected South African electricity demand in 2025 (80GW).

In addition the PSDF identifies that the implementation of large CSP plants has been proposed as one of the main contributors to greenhouse gas emission reductions in South Africa. Various solar parks and CSP plants have been proposed within the province.

Under Section B15 the PSDF unpacks the establishment of development regions and corridors of the Northern Cape as a response to the availability of environmental capital and infrastructure capital, which over time has resulted in the creation of distinct development regions and corridors. **Figure 3-1**, shows the development regions and corridors of the Northern Cape. The Solar Corridor centres around Upington and extends from roughly Kakamas in the north to De Aar in the east.

One of the policies outlined with the PSDF is for renewable energy sources to comprise 25% of the province's energy capacity by 2020. The proposed project therefore aids the province in reaching its 2020 target, even though it is not located within the Northern Cape Solar Corridor.

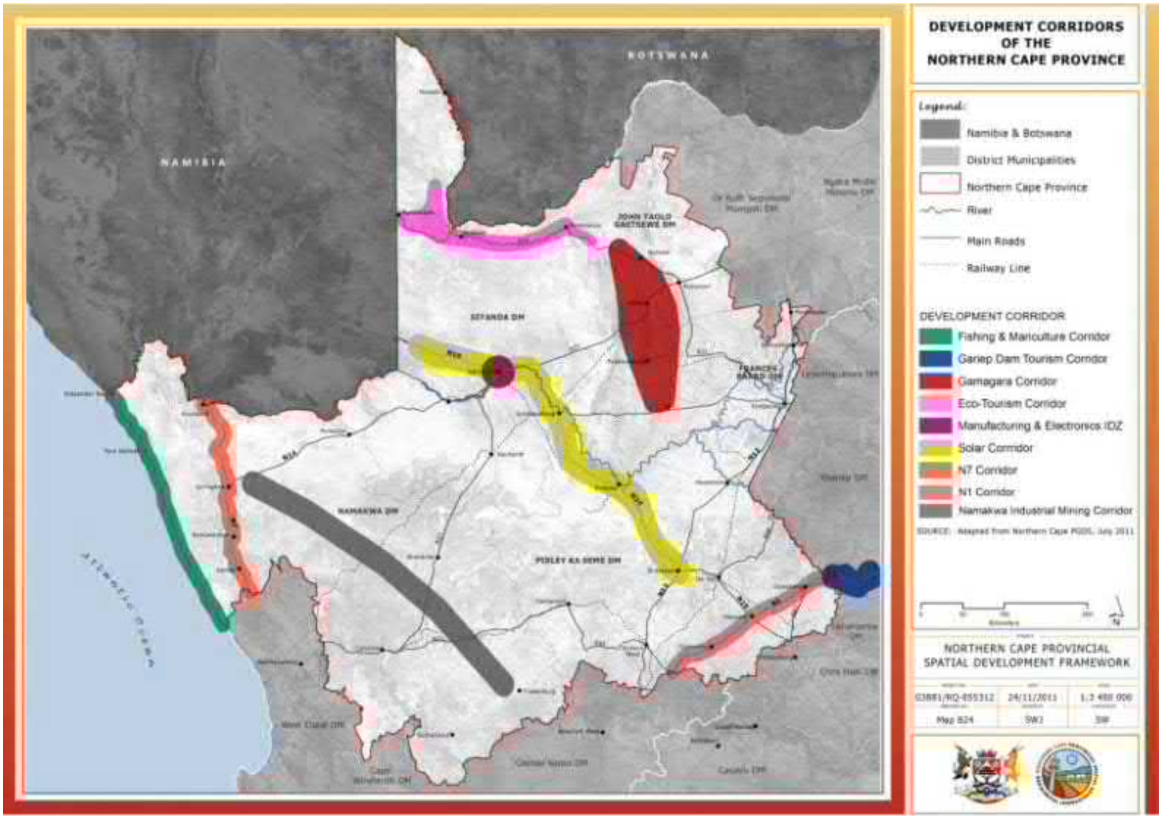

Figure 3-1: Northern Cape Development Regions and Corridors

3.4 MUNICIPAL CONTEXT

NAMAKWA DISTRICT MUNICIPALITY INTEGRATED DEVELOPMENT PLAN

The Namakwa District Municipality (NDM) Integrated Development Plan (IDP) has been developed to align with the National Development Plan (NDP), which has identified various central development challenges. The challenges in the NDP have a direct impact on the development and growth in the Namakwa District. The Key Challenges identified within the NDP are:

- Unemployment;
- Poor quality of education;
- Ineffective economic infrastructure, poorly located, under-maintained and insufficient to support sustainable growth;
- Spatial Development patterns exclude the poor from benefitting from the fruits of development;
- The economy needs transformation in terms of resource management and use;
- Ineffective public health system;
- Public services are uneven and often of poor quality;
- Corrupt activities; and
- Transform in coherent South African society.

To create a better life for the people of Namakwa the focus and alignment of priorities as identified in the National Development Plan – Vision 2030 are:

- Creating jobs and livelihoods;
- Expanding infrastructure;
- Transitioning to a low-carbon economy;
- Transforming our spatial reality;
- Improving education and training;
- Providing quality healthcare;
- Building a capable state;
- Fighting corruption and enhancing accountability; and
- Transforming society and uniting the nation.

The IDP identifies issues that need to be focused on if the NDM want to maximise service delivery potential. A number of programs of action have been drafted with specific focus areas. One of the programmes of action is economic development, for the promotion of the standard of living and economic health and wealth of the communities in a sustainable qualitative manner by optimal utilization of natural and human resources. One of the focus areas is the optimal utilization of Natural Resources in a sectoral manner, which includes renewable energy.

KHÂI-MA LOCAL MUNICIPALITY INTEGRATED DEVELOPMENT PLAN

The Khâi-Ma Local Municipality's mission is to ensure affordable service delivery and sustainable economic development through good and transparent municipal governance. The strategic objectives of the IDP include the following:

- Provision of sustainable services to the inhabitants and maintain existing resources.

- Develop Khâi-Ma Local Municipality as institution through transformation and capacity building.
- Promotion of local economic development through poverty alleviation, job creation, empowerment of the previous disadvantage people with capacity building in business skills and establishment of a climate for investment.
- Promote Sound financial management and viability.

The Khâi- Ma Local Municipality has set out spatial objectives and goals to optimally develop the “inherent economic opportunities, i.e. mining, agriculture, tourism, to protect and utilize the rich and diverse natural and cultural heritage for the enjoyment of all, and to develop sustainable settlements where residents can live enriched, healthy and convenient lives” (Khâi-Ma Local Municipality IDP 2012-2017).

The IDP lists a number of spatial objectives and describes associated strategies to meet the objectives. One of the spatial objectives detailed in the IDP is to create sustainable urban and rural settlements. The following five spatial strategies have created:

- Strengthen hierarchy of activity nodes.
- Develop residential and employment opportunities close to bulk engineering infrastructure.
- Eradicate basic services backlogs.
- Sustainable land reform along Orange River.
- Upgrade sports and health amenities.
- Employment of renewable energy technology.

The proposed project is aligned to the objectives of the municipal IDP and will therefore contribute to the overall mission of the Municipality.

3.5 STRATEGIC ENERGY PLANNING CONTEXT

NATIONAL ENERGY ACT (2008)

The National Energy Act (No. 34 of 2008) was promulgated in 2008. The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantitates, and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors.

The main objectives of the act-

- Ensure uninterrupted supply of energy to the Republic;
- Promote diversity of supply of energy and its sources;
- Facilitate effective management of energy demand and its conservation;
- Promote energy research;
- Promote as appropriate standards and specifications for the equipment, systems and processes used for producing, supplying and consuming energy;
- Ensure collection of data and information relating to energy supply, transportation and demand;
- Provide for optimal supply, transformation, transportation, storage and demand of energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development;
- Provide for certain safety, health and environment matters that pertain to energy;
- Facilitate energy access for improvement of the quality of life of the people of Republic;

- Commercialise energy-related technologies;
- Ensure effective planning for energy supply, transportation and consumption; and
- Contribute to sustainable development of South Africa’s economy.

The Act provides the legal framework which supports the development of renewable energy facilities for the greater environmental and social good.

ELECTRICITY REGULATION ACT (NO. 4 OF 2006)

The National Energy Regulation Act (No. 4 of 2004) is a national legal framework established for the regulation of the electricity supply industry and is enforced by the National Energy Regulator of South Africa (NERSA).

In 2011, the electricity regulation on new generation capacity was published under Section 35(4) of the Electricity Regulation Act (No. 4 of 2006). These regulations apply to the procurement of new generation capacity by organs of state. The objectives of the regulations include:

- To facilitate planning for the establishment of new generation capacity;
- The regulation of entry by a buyer and a generator into a power purchase agreement;
- To set minimum standards or requirements for power purchase agreements;
- The facilitation of the full recovery by the buyer of all costs efficiently incurred by it under, or in connection with, a power purchase agreement including a reasonable return based on the risks assumed by the buyer thereunder and to ensure transparency and cost reflectivity in the determination of electricity tariffs; and
- The provision of a framework for implementation of an Independent Power Producer (IPP) procurement programme and the relevant agreements concluded.

The Act establishes a National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licenses & registration as the manner in which generation, transmission, distribution, trading & the import & export of electricity are regulated.

INTEGRATED RESOURCE PLAN 2010-2030

The Department of Energy (DoE) published the Integrated Resource Plan (IRP) in March 2011 to cover the period of 2010 - 2030. The IRP is a medium-long term plan which is aimed at providing help and support for the direct expansion of electricity supply including private and own generation and power purchases from regional projects. This plan identifies the need for 300MW of additional PV capacity to be added every year from 2012 until 2024 with a further 4500MW to be added in the years thereafter up to 2030. This amounts to a total of 8.4GWp by 2030.

The overall objectives of the IRP are to evaluate the security of supply, and determine the least-cost supply option through the consideration of various demand side management and supply-side options. In addition, the IRP aims to provide information on the opportunities for investment into new power generating projects.

STRATEGIC INTEGRATED PROJECTS

The South African Government adopted a National Infrastructure Plan in 2012, with the aim of transforming the economic landscape of South Africa, create significant numbers of new jobs, and strengthen the delivery of basic services. It outlines the challenges and enablers which needs to be addressed in the building and developing of infrastructure. The Presidential Infrastructure

Coordinating Commission (PICC) was established by the Cabinet to integrate and coordinate the long-term infrastructure build.

Under the guidance of the PICC, 18 Strategic Infrastructure Projects (SIPs) have been developed through the integration of more than 150 of the individual Infrastructure Plans into one coherent package. The SIPs present five core functions namely to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services, and support the integration of African Economies.

SIPs 8 and 9 of the energy SIPs supports the development of the solar energy facilities 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 envisaged in the Integrated Resource Plan (IRP 2010) and supports bio-fuel production facilities.
- SIP 9: Electricity generation to support socio-economic development: Accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances. Monitor implementation of major projects such as new power stations: Medupi, Kusile and Ingula.

WHITE PAPER ON THE RENEWABLE ENERGY POLICY OF THE REPUBLIC OF SOUTH AFRICA (2003)

In response to overexploitation of resources and climate change, South African government ratified the United Nations Framework Convention on Climate Change (UNFCC) in August 1997 and acceded to the Kyoto Protocol, the enabling mechanism for the convention, in August 2002. In addition, national response strategies have been developed for both climate change and renewable energy.

The White Paper on Renewable Energy was published in 2003 and supplements the National Energy Policy published in 1998.The White Paper on Renewable Energy sets out the vision, policy principles, strategic goals and objectives of the South African Governments for promoting and implementing renewable energy in South Africa. The paper identifies that the medium and long-term potential of renewable energy is significant and that it is the intention of the government to contribute to the global effort to mitigate greenhouse gas emissions. In addition, it states that there is a need for Government to create an enabling environment through the introduction of fiscal and financial support mechanisms within an appropriate legal and regulatory framework to allow renewable energy technologies to compete with fossil-based technologies.

The objectives of the White Paper are considered in six focal areas:

- Financial instruments;
- Legal instruments,
- Technology development,
- Awareness raising,
- Capacity building and education, and
- Market based instruments and regulatory instruments.

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

RENEWABLE ENERGY DEVELOPMENT ZONES

The DEA, in consultation with DoE, has been mandated to undertake a Strategic Environmental Assessment (SEA), to identify geographical areas most suitable for the rollout of wind and solar energy projects and the supporting electricity grid network. These concentrated development zones are referred to as Renewable Energy Development Zone (REDZs). CISR have been appointed to manage the wind and solar SEA processes. The outputs of the SEAs directly relate to several government priorities including:

- Contributing to reducing present current energy constraints by facilitating renewable energy development in strategic areas in South Africa;
- Addressing the major objectives of the National Development Plan, namely transitioning to a low carbon economy, developing infrastructure to create jobs and reducing the regulatory burden and the cost of doing business;
- Contributing to achieving the renewable energy target identified in the Integrated Resource Plan and implementing the renewable energy independent power producers program (REI4P) implemented by the Department of Energy and National Treasury;
- Promoting the green economy and sustainable development; and
- Promoting intergovernmental coordination and integrated authorisations

The outcome of the gazetting process will mean that wind and solar PV activities within the 8 Renewable Development Zones and electricity grid expansion within the 5 Power Corridors will be subjected to a Basic Assessment and not a full EIA process. It is intended that the introduction of the REDZs will lead to:

- A reduction of potential negative environmental impacts or consequences;
- Synchronisation and streamlining of authorisation and approval processes;
- Potentially attractive incentives; and
- Focused expansion of the South African electricity grid.

The DEA and CSIR have released a map with focus areas best suited for the roll-out of wind and solar photovoltaics projects in South Africa. Letsoai CSP 1 falls within the Springbok Wind REDZs, located within the Aggeneys area in the Northern Cape.

DEPARTMENT OF ENERGY PROCESS FOR INDEPENDENT POWER PRODUCERS

The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) was established in August 2011 and was designed to contribute towards the target of 3 725 megawatts (MW), generated from Renewable Energy sources, and towards socio-economic and environmentally sustainable growth and to stimulate growth in the renewable energy industry in South Africa.

The Minister has allocated 100 MW of the 3 725 MW to the procurement of small projects which individually have a maximum contracted capacity of 5 MW (DoE). The projects, with a generation capacity of not less than 1 MW and not more than 5 MW, utilising the following technologies shall be considered for the small projects IPP procurement programme:

- Onshore wind;
- Solar photovoltaic;
- Biomass;
- Biogas; and

- Landfill gas.

3.6 SOUTH AFRICAN STANDARDS AND GUIDELINES

NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NO. 107 OF 1998): ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINE FOR RENEWABLE ENERGY PROJECTS

The DEA promulgated the Environmental Impact Assessment Guidelines for Renewable Energy in 2015 to provide guidance on the environmental management legal framework applicable to renewable energy operations and all the role players in the sector. The guideline seeks to identify activities requiring authorisation prior to commencement of that activity, and provide an interface between national EIA regulations and other legislative requirements of various authorities (DEA 2015).

The guideline provides a review of the different renewable energy technologies types, a summary of the potential impacts of each of the technology types and the authorisation process that will need to be followed as well as an overview of some good industry practice mitigation practices that may be applicable to each technology.

3.7 INTERNATIONAL STANDARDS AND GUIDELINES

IFC PERFORMANCE STANDARDS

The International Finance Corporation (IFC) is an international financial institution that offers investment, advisory, and asset management services to encourage private sector development in developing countries. The IFC is a member of the World Bank Group and is headquartered in Washington, D.C., United States. It was established in 1956 as the private sector arm of the World Bank Group to advance economic development by investing in strictly for-profit and commercial projects that purport to reduce poverty and promote development.

The IFC's stated aim is to create opportunities for people to escape poverty and achieve better living standards by mobilizing financial resources for private enterprise, promoting accessible and competitive markets, supporting businesses and other private sector entities, and creating jobs and delivering necessary services to those who are poverty-stricken or otherwise vulnerable. Since 2009, the IFC has focused on a set of development goals that its projects are expected to target. Its goals are to increase sustainable agriculture opportunities, improve health and education, increase access to financing for microfinance and business clients, advance infrastructure, help small businesses grow revenues, and invest in climate health.

The IFC is owned and governed by its member countries, but has its own executive leadership and staff that conduct its normal business operations. It is a corporation whose shareholders are member governments that provide paid-in capital and which have the right to vote on its matters. Originally more financially integrated with the World Bank Group, the IFC was established separately and eventually became authorized to operate as a financially autonomous entity and make independent investment decisions. It offers an array of debt and equity financing services and helps companies face their risk exposures, while refraining from participating in a management capacity. The corporation also offers advice to companies on making decisions, evaluating their impact on the environment and society, and being responsible. It advises governments on building infrastructure and partnerships to further support private sector development.

The IFC's Sustainability Framework articulates the Corporation's strategic commitment to sustainable development, and is an integral part of IFC's approach to risk management. The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. IFC's Access to Information Policy reflects IFC's commitment to transparency and good governance on its operations, and outlines the Corporation's institutional disclosure obligations regarding its investment and advisory services. The Performance Standards are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation in order to achieve its overall development objectives. The Performance Standards may also be applied by other financial institutions.

The objectives and applicability of the eight Performance Standards are outlined in **Table 3-5**.

Table 3-5: Objectives and Applicability of the IFC Performance Standards

Reference	Requirements	Project Specific Applicability
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts		
Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders. **Objectives:** → To identify and evaluate environmental and social risks and impacts of the project; → To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment; → To promote improved environmental and social performance of clients through the effective use of management systems; → To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately; and → To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.		
1.1	Policy	An Environmental and Social Management System will be developed in the event that the project is identified as a preferred bidder.
1.2	Identification of Risks and Impacts	
1.3	Management Programmes	
1.4	Organisational Capacity and Competency	
1.5	Emergency Preparedness and Response	
1.6	Monitoring and Review	
1.7	Stakeholder Engagement	
1.8	External Communication and Grievance Mechanism	
1.9	Ongoing Reporting to Affected Communities	

Performance Standard 2: Labour and Working Conditions		
Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. **Objectives:** → To promote the fair treatment, non-discrimination, and equal opportunity of workers; → To establish, maintain, and improve the worker-management relationship; → To promote compliance with national employment and labour laws; → To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain; → To promote safe and healthy working conditions, and the health of workers; and → To avoid the use of forced labour.		
2.1	Working Conditions and Management of Worker Relationship → Human Resources Policy and Management → Working Conditions and terms of Engagement → Workers organisation → Non Discrimination and Equal Opportunity → Retrenchment → Grievance Mechanism	Human resource and labour policies will be compiled in the event that the project is identified as a preferred bidder.
2.2	Protecting the Workforce → Child Labour → Forced Labour	
2.3	Occupational health and Safety	
2.4	Workers Engaged by Third Parties	
2.5	Supply Chain	
Performance Standard 3: Resource Efficiency and Pollution Prevention		
Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world. **Objectives:** → To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; → To promote more sustainable use of resources, including energy and water;and → To reduce project-related GHG emissions		
3.1	Resource Efficiency → Greenhouse Gases	The only applicable and material resource efficiency issue is water consumption due to the arid nature of the region

	→ Water Consumption	and general propensity for drought conditions in the country.
3.2	Pollution Prevention → Air Emissions → Stormwater → Waste Management → Hazardous Materials Management → Pesticide use and Management	The project is not GHG emissions intensive and the detailed assessment and reporting of emissions is not required. Dust (air pollution) in the construction phase is anticipated to have a low impact but has been adequately addressed in the EMPr. The project will not result in the release of industrial effluents. Potential pollution associated with sanitary wastewater is low and mitigation measures have been included in the EMPr. Land contamination of the site from historical land use (i.e. low intensity agricultural / grazing) is not considered to be a cause for concern. The waste generation profile of the project is not complex. Waste mitigation and management measures have been included in EMPr. Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel, cement etc.) and stored sanitary sewage in the operational phase. The EMPr and emergency preparedness and response plan identifies these anticipated hazardous materials and recommends relevant mitigation and management measures. The WBG General EHS Guidelines identify Sulphur Hexafluoride (SF6) gas as being commonly used as a gas insulator for electrical equipment. The guidelines require its use to be minimised, and in cases where it is used for applications involving high voltages (>350 kV), equipment with a low leakage- rate (<99%) should be used. It is assumed that this may be present in HV circuit breakers and the 22 kV GIS switchgear for this project. Equipment should be specified to comply with the International Electrotechnical Commission (IEC) which is more stringent than the IFC standard setting a maximum leakage standard of 0.1% per year for equipment operated at above 52 kV and 0.5% per year for equipment below 52 kV.
Performance Standard 4: Community Health, Safety, and Security		
Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. **Objectives:** → To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances; and → To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities		
4.1	Community Health and Safety → Infrastructure and Equipment Design and Safety → Hazardous Materials Management and Safety → Ecosystem Services → Community Exposure to Disease	The requirements included in Performance Standard 4 have been addressed in the S&EIR process and the development of the EMPr. The following generic plans have been included in the EMPr: → Emergency Response Plan; → Transport Management Plan; → HIV Management Plan; and → Security Policy.

	→ Emergency Preparedness and Response	All plans will be made site specific, as part of the financial close process, in the event that Preferred Bidder status is achieved.
4.2	Security Personnel	
Performance Standard 5: Land Acquisition and Involuntary Resettlement		
Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use. **Objectives:** → To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs; → To avoid forced eviction; → To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected; → To improve, or restore, the livelihoods and standards of living of displaced persons; and → To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.		
5.1	Displacement → Physical Displacement → Economic Displacement → Private Sector Responsibilities under Government Managed Resettlement	In terms of the land acquisition and involuntary settlement provisions in Performance Standard 5, the development site is located on privately owned land that is utilised for the sole commercial agricultural use by the landowner. The project will restrict the future use of the land by the farmer as per voluntarily agreement in the lease agreement. There is no other use of the land by communities or persons and as such there will be no involuntary physical or economic displacement. The office of the regional land claims commissioner has confirmed the absence of land claims against the property in terms of the Restitution of Land Rights Act (1994).
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources		
Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. **Objectives:** → To protect and conserve biodiversity; → To maintain the benefits from ecosystem services; and → To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.		
6.1	Protection and Conservation of Biodiversity	The S&EIR and EMPr development process includes a biodiversity assessment (undertaken by Simon Todd) comprising of a combination of literature review, stakeholder engagement and consultation, and in-field surveys. This substantively complies with the Performance Standard 6 general requirements for scoping and baseline assessment for determination of biodiversity and ecosystem services issues. The determination of habitat sensitivity was undertaken within the legal and best practice reference framework for South Africa.

		The entire proposed development falls within the Kamiesberg Bushmanland Augabies NPAES focus area. The associated water supply pipeline does transect a critical biodiversity area and falls within the Haramoep and Black Mountain (SA035) Important Bird Area. The prevalence of invasive alien species on the site is low; however, the S&EIR process had noted the propensity for the spread of alien invasive species in the construction and operational phases and mitigation and management measures are included in the EMPr.

Performance Standard 7: Indigenous People

Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.

Objectives:

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.
- To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.
- To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.

5.1	General → Avoidance of Adverse Impacts → Participation and Consent	Whilst the project development site and the adjacent areas appeared to be uninhabited, PS 7 identifies that cultural heritage in project areas may link to the identity and/or cultural, ceremonial, or spiritual aspects of indigenous peoples. A cultural heritage study has been undertaken and the potential impacts resulting from the installation of a WEF on the heritage resources of the sites are considered to be of low significance. This suggests a low probability of linkages with, and impacts on potential Indigenous Peoples (IP). The office of the regional land claims commissioner has confirmed the absence of land claims against the property in terms of the Restitution of Land Rights Act (1994).
5.2	Circumstances Requiring Free, Prior, and Informed Consent → Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use → Critical Cultural Heritage → Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use	
5.3	Mitigation and Development Benefits	
5.4	Private Sector Responsibilities Where Government is	

	Responsible for Managing Indigenous Peoples Issues	
Performance Standard 8: Cultural Heritage		
Performance Standard 8 recognizes the importance of cultural heritage for current and future generations **Objectives:** → To protect cultural heritage from the adverse impacts of project activities and support its preservation; and → To promote the equitable sharing of benefits from the use of cultural heritage.		
8.1	Protection of Cultural Heritage in Project Design and Execution	A cultural heritage study was performed as part of the S&EIR process. The impact of the proposed development on the cultural heritage resources of the area was assessed to be low. Chance find provisions have been included in the EMPr.

EQUATOR PRINCIPLES

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EP apply globally, to all industry sectors and to four financial products 1) Project Finance Advisory Services 2) Project Finance 3) Project-Related Corporate Loans and 4) Bridge Loans. The relevant thresholds and criteria for application is described in detail in the Scope section of the EP. Currently 84 Equator Principles Financial Institutions (EPFIs) in 35 countries have officially adopted the EPs, covering over 70 percent of international Project Finance debt in emerging markets. EPFIs commit to implementing the EP in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the EP.

While the EP are not intended to be applied retroactively, EPFIs may apply them to the expansion or upgrade of an existing project where changes in scale or scope could result in significant environmental and social risks and impacts, or significantly change the nature or degree of an existing impact.

The EPs have greatly increased the attention and focus on social/community standards and responsibility, including robust standards for indigenous peoples, labour standards, and consultation with locally affected communities within the Project Finance market. They have also promoted convergence around common environmental and social standards. Multilateral development banks, including the European Bank for Reconstruction & Development and export credit agencies through the Organisation for Economic Co-operation and Development (OECD) Common Approaches are increasingly drawing on the same standards as the EPs.

The EPs have also helped spur the development of other responsible environmental and social management practices in the financial sector and banking industry (for example, Carbon Principles in the US, Climate Principles worldwide) and have provided a platform for engagement with a broad range of interested stakeholders, including non-governmental organisations (NGOs), clients and industry bodies.

The Equator Principles include:

→ 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

The requirements and applicability of the Equator Principles are outlined in **Table 3-6**. It should be noted that Principles 8 and 10 amount to a borrower's code of conduct and are therefore not included in this discussion.

Table 3-6: Requirements and Applicability of the Equator Principles

REQUIREMENT	PROJECT SPECIFIC APPLICABILITY
Principle 1: Review and Categorisation	
When a project is proposed for financing, the EPFI will, as part of its internal social and environmental review and due diligence, categorise such project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the IFC. Using categorisation, the EPFI's environmental and social due diligence is commensurate with the nature, scale and stage of the Project, and with the level of environmental and social risks and impacts. The categories are: → 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; and → Category C – Projects with minimal or no adverse environmental and social risks and/or impacts.	Based upon the significance and scale of the project's environmental and social impacts, the proposed project is regarded as a Category B project i.e. a project with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
Principle 2: Environmental and Social Assessment	
For all Category A and Category B Projects, the EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project. The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of	This document comprises the EIA undertaken for the proposed project. The impact assessment comprehensively assesses the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition an EMPr has been compiled and is included in **Appendix V**.

the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). One or more specialised studies may also need to be undertaken.	
Principle 3: Applicable Environmental and Social Standards	
The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC Performance Standard and WBG EHS Guidelines	As South Africa is designated as a non-designated country the reference framework for environmental and social assessment is based on the IFC Performance Standards.
Principle 4: Environmental and Social Management System and Equator Principles Action Plan	
For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.	An Environmental and Social Management System will be compiled in the event that the project is identified as a preferred bidder.
Principle 5: Stakeholder Engagement	
EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. In order to accomplish this, the appropriate assessment documentation, or non-technical summaries thereof, will be made available to the public by the borrower for a reasonable minimum period in the relevant local language and in a culturally appropriate manner. The borrower will take account of and document the process and results of the consultation, including any actions agreed resulting from the consultation. For projects with adverse social or environmental impacts, disclosure should occur early in the Assessment process and in any event before the project construction commences, and on an ongoing basis	The S&EIR process includes an extensive stakeholder engagement process which complies with the South African EIA Regulations. The process includes consultations with local communities, nearby businesses and a range of government sector stakeholders (state owned enterprises, national, provincial and local departments). The stakeholder engagement process solicited interest from potentially interested parties through the placement of site notices and newspaper advertisements. In addition a number of public meetings and focus group meetings were held.

Principle 6: Grievance Mechanism	
The borrower will inform the Affected Communities about the mechanism in the course of its community engagement process and ensure that the mechanism addresses concerns promptly and transparently, in a culturally appropriate manner, and is readily accessible to all segments of the affected communities	The EMPr includes a *Grievance Mechanism Process for Public Complaints and Issues*. This procedure effectively allows for external communications with members of the public to be undertaken in a transparent and structured manner. This procedure will be revised and updated as part of the EMPr amendment process in the event that the project is identified as a preferred bidder.
Principle 7: Independent Review	
For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower will review the Assessment, AP and consultation process documentation in order to assist EPFI's due diligence, and assess Equator Principles compliance	This principle will only become applicable in the event that the project is identified as a preferred bidder.
Principle 9: Independent Monitoring and Reporting	
To ensure ongoing monitoring and reporting over the life of the loan, EPFIs will, for all Category A projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower retain qualified and experienced external experts to verify its monitoring information which would be shared with EPFIs	This principle will only become applicable in the event that the project is identified as a preferred bidder.

4 SCOPING PHASE SUMMARY

4.1 PROCEDURAL PROCESS

The application form was compiled and submitted to the DEA on **15 September 2016**.

The DEA reference number allocated to this application is **14/12/16/3/3/2/965**. This reference number will appear on all official correspondence with the authorities and the public regarding the Proposed Project. A copy of the acknowledgement of receipt of the application is included in **Appendix E**.

The draft scoping report was released for public review between **15 September** and **17 October 2016**. Subsequently the scoping report was finalised and submitted to the DEA on 28 October 2016 for their review and approval. The submission of the final scoping report was within 44 days of receipt of the application by the DEA as required by GNR 982.

The approval of the final scoping report and the PoS for the EIA was received on **12 December 2016** and is included in **Appendix D**.

4.2 AUTHORITY CONSULTATION

A pre-application meeting was held on 23 August 2016 with the DEA in order to discuss the proposed project. The minutes of this meeting are included in **Appendix F**. In addition, WSP | Parsons Brinckerhoff notified a number of commenting authorities of the Proposed Project via a notification letter, these included:

- Northern Cape Department of Environment and Nature Conservation (NCDENC);
- DWS: Northern Cape Region;
- Department of Environmental Affairs: Biodiversity and Conservation;
- SAHRA;
- Regional Land Claims Commission: Northern Cape;
- SKA;
- Khâi-Ma Local Municipality; and
- Namakwa District Municipality

WSP | Parsons Brinckerhoff received comments on the draft scoping report from the DEA on **13 October 2016.** The comments and responses have been outlined in **Table 4-1** and included in **Appendix G**.

Table 4-1: Comments received from the Department of Environmental Affairs regarding the Draft Scoping Report

COMMENT	RESPONSE
Please ensure that all relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description.	WSP | Parsons Brinkerhoff can confirm that all relevant listed activities have been included in the updated application form .
If the activities applied for in the application form differ from those mentioned in the final SR, an amended application form must be submitted. Please note that the Department's application form	The activities listed in the final scoping report were the same as those applied for in the application form. WSP | Parsons Brinkerhoff takes note of the requirement

template has been amended and can be downloaded from the following link; https://www.environment.qov.za/documents/forms.	to amend the application form in the event that activities are added or removed at any time through the S&EIR process. An amended application form has been submitted with the Draft EIR due to the addition of the WML activities.
Please ensure that all issues raised and comments received during the circulation of the draft SR from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Section) in respect of the proposed activity are adequately addressed in the final SR	All issues raised and comments received during the scoping phase are included in the Comment and Response Report.
Proof of correspondence with the various stakeholders must be included in the final SR. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 and 44 of the EIA Regulations 2014.	Proof of correspondence with stakeholders during the scoping phase is included in the Comment and Response Report
The final SR must provide evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development; particularly the Square Kilometre Array South Africa, and the South African Astronomical Observatory	Proof of correspondence with stakeholders during the scoping phase is included in the Comment and Response Report. The project database included the Square Kilometre Array from the inception of the project. The database was updated during the scoping phase to include the South African Astronomical Observatory.
A comments and response trail report (C&R) must be submitted with the final SR. The C&R report must incorporate all historical comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Annexure 1 of this comments letter.	The Comment and Response Report has been updated to include all correspondence received to date and is included in **Appendix H**.
Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity as per Appendix 2 of the EIA Regulations, 2014. Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 2.	The investigation undertaken to identify and motivate why no reasonable or feasible alternatives exist has been outlined in Section 7 of this report. In addition, advantages and disadvantages have been included for all alternatives where appropriate.
Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice.	WSP | Parsons Brinkerhoff has taken note of this requirement. No contradictions have been noted.
Should there be similar applications in the area, all the specialist assessments must include a cumulative environmental impact assessment for all identified and assessed impacts. The cumulative impact assessment must indicate the following: • Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land. • Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of	A cumulative impact assessment has been included in Section 11 of this report.

cumulative impacts and when the conclusion and mitigation measures were drafted for this project. • The cumulative impacts significance rating must also inform the need and desirability of the proposed development. • A cumulative impact environmental statement on whether the proposed development must proceed.	
It is imperative that a reliable water source is secured for the success of this project. The Department requests that a non-binding water confirmation letter from the Department of Water and Sanitation form part of the stakeholders engagement report.	A letter was received from the DWS on 25 October 2016 and is included in **Appendix I**. In addition, a letter from Sedibeng Water has been included in **Appendix J**
The water specialist study must evaluate water source alternatives for the facility and must assess the cumulative impacts of all similar type solar facilities on the property on water resources in the area. The Department also requests that alternatives in terms of water sources required for the development be assessed in detail	The water availability assessment has been included in **Appendix K**. In addition the cumulative impacts have been identified and assessed in Section 11 of this report.
A cumulative assessment must be undertaken for the sourcing of water as there are numerous other facilities in the region.	The cumulative impacts have been identified and assessed in Section 11 of this report.
The terms of reference of the Avifaunal Assessment to be conducted must include, *inter alia* the following: • Determine the impacts that the proposed activity (including the powerline) may have on avifauna; • Must cover at a minimum the summer and winter seasons; • The assessment must include mitigation measures to discourage the avifauna from entering the solar field as well and limit nesting and breeding grounds within the solar field. • The avifaunal specialist study must be expanded to include vantage point surveys as well as flight paths to consider how birds will move through the property. The study must also propose adequate mitigation measures to reduce the facilities impacts on avifauna frequenting the area. • Assess the cumulative impact on avifauna within the site and within the local area.	The additional terms of reference was forwarded to the Avifauna specialist and has been incorporated in the Avifauna Specialist Study included in **Appendix L**.
An Agricultural Specialist Study must be conducted. The terms of reference for the study must include, *inter alia* the following: • Assessment of the loss of agricultural land; • The current state of agricultural activities on land; • The impact of the loss of agricultural land within the property as well as the cumulative impact of the loss of agricultural land on the site and within the area.	The additional terms of reference was forwarded to the agricultural specialist and has been incorporated in the Land Capability Specialist Study included in **Appendix M**.
Scoping specialist studies, if applicable, must be submitted to the Department with the final SR.	The Scoping Specialist studies were included in the final scoping report.
The specialist studies conducted must be specific to each of the sites applied for. The specialist must provide recommendations and mitigation measures specific to each site and the EAP must provide mitigation measures; an assessment and recommendations for each site as well as the cumulative impacts for each of the facilities.	The specialist studies appended to this report are all specific to the Letsoai CSP 1 Site.
The final SR must include comments from Birdlife South Africa.	Comments from Birdlife South Africa have been included in the Comment and Response Report.
This Department requires a cumulative impact assessment to be undertaken in the final SR to determine potential fatal flaws.	A detailed cumulative assessment is included in Section 11 of this report.

This Department requests the EAP to include the specialist consultants who will conduct the specialist assessments.	Specialist consultants have been appointed to conduct the specialist assessments. The Specialist Declarations have also been included in **Appendix C**.
Where specialist studies are conducted in-house or by a specialist other than a suitably qualified specialist in the relevant field, such specialist reports must be peer reviewed by a suitably qualified external specialist in the relevant field. The terms of reference for the peer review must include: • A CV clearly showing expertise of the peer reviewer; • Acceptability of the terms of reference; • Is the methodology clearly explained and acceptable; • Evaluate the validity of the findings (review data evidence); • Discuss the suitability of the mitigation measures and recommendations; • Identify any short comings and mitigation measures to address the short comings; • Evaluate the appropriateness of the reference literature; • Indicate whether a site-inspection was carried out as part of the peer review; and • Indicate whether the article is well-written and easy to understand.	Peer reviewers have been identified and appointed for all relevant in-house specialist studies. The following peer reviews are currently underway and will be appended to the Final EIR: → Land capability and Wetlands → Social Study The Traffic Specialist Study Peer Review has been completed and is included in **Appendix N.** The CV for each independent specialist have been included within **Appendix O**
This Department requests the EAP to familiarise themselves with the requirements of Appendix 2 of GNR 982 of the EIA Regulations, 2014 and ensure that the final SR submitted to this Department for consideration meets the requirements in terms of identifying, assessing and providing mitigation measures of the impacts on the alternative and preferred sites.	The final scoping report was compiled in compliance with Appendix 2 of the GNR 982. Similarly, the draft EIR has taken cognisance of Appendix 3 of the GNR 982.
Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity as per Appendix 1 (2) (e) and 3 (1) (h) (i) of GN R.982 of 2014. Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 1.	The investigation undertaken to identify and motivate why no reasonable or feasible alternatives exist has been outlined in Section 7 of this report. In addition, advantages and disadvantages have been included for all alternatives where appropriate.
In accordance with Appendix 1 (3) {1) (a} of the EIA Regulations 2014,the details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP to carry out Scoping and Environmental Impact assessment procedures; must be submitted.	This has been included in Section 1.2 of this report. In addition, the CV of the Project Manager and Project Director for the project have been included in **Appendix A**.
You are further reminded that the final SR to be submitted to this Department must comply with all the requirements in terms of the scope of assessment and content of Scoping reports in accordance with Appendix 2 and Regulation 21(1) of the EIA Regulations, 2014.	WSP | Parsons Brinkerhoff has taken note of this requirement.
Further note that in terms of Regulation 45 of the EIA Regulations 2014, this application will lapse if the applicant fails to meet any of the time frames prescribed in terms of the these Regulations, unless an extension has been granted in terms of Regulation 3(7).	WSP | Parsons Brinkerhoff has taken note of this requirement.
You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as	WSP | Parsons Brinkerhoff has taken note of this requirement.

amended, that no activity may commence prior to an environmental authorisation being granted by the Department.	

In addition to the above, WSP | Parsons Brinckerhoff received comments on the final scoping report from the DEA on **12 December 2016.** The comments and responses have been outlined in **Table 4-2** and included in **Appendix D**.

Table 4-2: Comments received from the Department of Environmental Affairs regarding the Final Scoping Report

COMMENT	RESPONSE
All comments and recommendations made by all stakeholders and Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the final SR must be taken into consideration when preparing an Environmental Impact Assessment report (EIAr) in respect of the proposed development. Please ensure that all mitigation measures and recommendations in the specialist studies are addressed and included in the finalEIAr and Environmental Management Programme (EMPr)	Please refer to the comment and response report (**Appendix H**) and the EMPr (**Appendix W**) for further details.
Please ensure that comments from all relevant stakeholders are submitted to the Department with the finalEIAr. This includes but is not limited to the Northern Cape Department of Environment and Nature Conservation, the Department of Agriculture, Forestry and Fisheries (DAFF), the provincial Department of Agriculture, the South African Civil Aviation Authority (SACAA), SENTECH, the Department of Transport, the Local Municipality, the District Municipality, the Department of Water and Sanitation (DWS), the South African National Roads Agency Limited (SANRAL), the South African Heritage Resources Agency (SAHRA), the Endangered Wildlife Trust (EWT), Birdlife SA, the Department of Mineral Resources, the Department of Rural Development and Land Reform, the Department of Environmental Affairs: Directorate Biodiversity and Conservation, and the Square Kilometre Array (SKA).	All existing comments received have been included in the comment and response report (**Appendix H**). All the relevant stakeholders have been informed of the draft EIR public review period. Any additional comments received during the public review period will be included in the comment and response report and included in the final EIR.
Please be advised that the contact person for renewable projects at the SKA office is Dr Adrian Tiplady and he can be contacted on Tel: (011) 442 2434 or E-mail: atiplady@ska.ac.za.	WSP | Parsons Brinckerhoff takes note of these contact details. These details have been added to the stakeholder database (**Appendix P**).
Please ensure that the EIAr and EMPr comply with Appendix 3 and Appendix 4 of Regulation 2014, before submission to the Department. You are also required to address all issues raised by organs of state and I&APs prior to the submission of the EIAr to the Department, particularly Birdlife South Africa's comments dated 21 October 2016.	The EIAr and EMPr comply with Appendix 3 (**Table 1.3**) and Appendix 4 (**Appendix V**) of Regulation 2014 respectively. All existing comments received have been included and responded to in the comment and response report (**Appendix H**). The comments from Birdlife Africa have been addressed in the Avifuna Specialist Study (**Appendix L**)
Proof of correspondence with the various stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	Proof of correspondence with stakeholders is included in the comment and response report (**Appendix H**)
The EAP must, in order to give effect to Regulation 8, give registered I&APs access to, and an opportunity to comment on the report in writing within 30 days before submitting the final EIAr to the Department.	I&APs have been afforded 30 days to review the draft EIR. The public review period runs from 27 February 2016 to 27 March 2017.
In addition, the following additional information is required for the EIAr:	

Comment	Response
The draft EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	Please refer to Chapter 9 and 10 of this report.
The listed activities represented in the EIAr and the application form must be the same and correct.	All relevant listed activities included in the draft EIR and included in the amended application form submitted to the DEA with this Draft EIR.
Please ensure that all issues raised and comments received during the circulation of the EIAr from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Section) in respect of the proposed activity are adequately addressed and included in the FinalEIAr. Proof of correspondence with the various stakeholders must be included in the Final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40 41, 42, 43 and 44 of the EIA Regulations 2014.	All existing comments received have been included and responded to in the comment and response report (**Appendix H**). All the relevant stakeholders have been informed of the draft EIR public review period. Any additional comments received during the public review period will be included in the comment and response report and included in the final EIR.
A comments and response trail report (C&R) must be submitted with the final EIAr. The C&R report must incorporate all comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Annexure 1 of this comments letter.	The comment and Response report is included in the Draft EIR in Appendix H and was submitted as a separate report to the DEA.
Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice.	No contradictions have been noted.
The EAP must provide detailed motivation and reasons on the applicability of Item 12, 19, 24 and 56 of GN R. 983 and 4, 5, 12 and 14 of GN R. 985. In addition, the impacts, and any specialist study to assess the impacts for this activity must be provided in the draft EIAr.	Activities 12 and 19 of GNR 983 are applicable as Alterantive 2 for the Pipeline will be required to cross a watercourse. Activities 24 and 56 of GNR 983 are applicable as internal access roads will be required for access to Letsoai CSP 1. These roads will be no wider than 8m. In addition, the main access road that connects Letsoai CSP 1 to the main road will require widening. Activities 4, 5, 12 and 14 of GNR 985 are applicable as the entire proposed development falls within the Kamiesberg Bushmanland Augabies NPAES focus area and the pipeline route alternatives intersect with Critical Biodiversity Areas. The impacts are assedd in Section 9 and 10 of this report.
GN R.983 Item 19: With regards to infilling and excavation of watercourses for the construction of the CSP Energy facility, this Department requires the applicant to provide an indication of the preferred and alternate locations from which the material used for infilling will be sourced and where excavated material will be stored and/or disposed of. In addition, the impacts associated with this activity must be adequately assessed in the EIAr.	Activity 19 of GNR 983 is applicable as Alterantive 2 for the Pipeline will be required to cross a watercourse. The excavated material will be stored adjacent to the trench and reused to fill the trench once construction is complete. Impacts area ssessed in Section 10 of this report.
The relevant provincial authority must be engaged with regards to development in geographic areas triggering activities in GNR 985. In addition, a graphical representation of the proposed	Refer to **Figure 8.17** with regards to the provision of the graphical representation requested.

COMMENT	RESPONSE
development within the respective geographical areas must be provided.	
The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 of the EIA information required for CSP facilities below.	Please refer to **Table 7.1**. In addition, this information has been included at the beginning of this report, as requested.
The EIAr must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.	Please refer to **Figures 2.3 and 2.4.**
The EIAr must provide the following: • Clear indication of the envisioned area for the proposed CSP facility; i.e. placing of power tower and all associated infrastructure should be mapped at an appropriate scale. • Clear description of all associated infrastructure. This description must include, but is not limited to the following: ○ Power lines; ○ Internal roads infrastructure; and; ○ All supporting onsite infrastructure such as laydown area, guard house and control room etc.	Please refer to **Figure 2.3** and **Appendix W.** In addition, please refer to Section 7 of this report for a detailed description of thei nfrastructure.
It is noted that comments were requested from the South African SKA Project Office and no comments were received. This Department requires comments from the South African SKA Project Office to be included in the EIAr.	Comments from the South African SKA have been received and have been included in the Comment and Response Report (**Appendix H**)
This Department requires comments from the Department of Agriculture, Forestry and Fisheries to be included in the EIAr.	The DAFF have been provided with all the relevant information. However no comments have been received as yet.
This Department requires comments from the Department of Water and Sanitation, from the Impact Management and Resource Management Directorates to be included in the EIAr.	Comments from the DWS have been received and have been included in the Comment and Response Report (**Appendix H**) and are provided in **Appendix I**.
Section 19 and Section 21 of the National Water Act No. 36 of 1998 may be triggered as GN R. 983 Activities 12 and 19 were applied for. A hydrological assessment must be conducted and must also assess the impacts on the surface hydrology of the proposed development area and must be included in the EIAr. The terms of reference for the study must include, inter alia the following: • Identification and sensitivity rating of all surface water courses for the impact phase of the proposed development; • Identification, assessment of all potential impacts to the water courses and suggestion of mitigation measures; and, • Recommendations on the preferred placement of the facility and all associated infrastructure and preference must be provided to the avoidance of the watercourses on the property.	The hydrology study is included in the Land Capability and Wetland Study (**Appendix M**)
It is imperative that a reliable water source is secured for the success of this project. The Department requests proof of availability of water for the facility from the relevant authority.	A letter from Sedibeng Water has been included in **Appendix J**

COMMENT	RESPONSE
The EIAr must adequately assess and provide a comparative analysis for alternative water sources for the proposed development.	Please refer to the Water Availability Assessment (**Appendix K**)
A cumulative assessment must be undertaken for the sourcing of water as there are numerous other facilities in the region.	The cumulative impacts have been identified and assessed in Section 11 of this report.
Should a water abstraction point in the Orange River and a pipeline to pipe the water to the facility be required, the impact of these must be assessed	Impacts relating to the water supply pipeline are assessed in Chapter 10 if this report.
An Avifauna! Assessment must be conducted as part of the EIAr. The terms of reference for the study must include, inter alia the following: • Determine the impacts that the proposed activity (including the power line) may have on avifauna; • Must cover at a minimum the summer and winter seasons; • The assessment must include mitigation measures to discourage the avifauna from entering the solar field as well and limit nesting and breeding grounds within the solar field. • The avifauna! specialist study must be expanded to include vantage point surveys as well as flight paths to consider how birds will move through the property. The study must also propose adequate mitigation measures to reduce the facilities impacts on avifauna frequenting the area. • Assess the cumulative impact on avifauna within the site and within the local area.	Please refer to the Avifauna Specialist Study (**Appendix L**).
The terms of reference for the soils, land use and land capability assessment must also include, inter alia the following: • Assessment of the loss of agricultural land; • The current state of agricultural activities on land; • The impact of the loss of agricultural land within the property as well as the cumulative impact of the loss of agricultural land on the site and within the area.	Please refer to the Land Capability and Wetland Study (**Appendix M**).
A significant amount of materials and equipment will be delivered to the site during the construction phase of the development. The EIAr must include a traffic assessment study. The study must determine the specific traffic needs during the different phases of implementation.	Please refer to the Transport Specialist Study (**Appendix X**)
It is noted that the proposed development will include a cement batching plant. As such, you are requested to assess the environmental impacts of this associated infrastructure and provide mitigation measures as well.	The impacts are assessed in Section 9 of this report. Mitigation measures are included in the EMPr (**Appendix V**)
An Air Quality Assessment and Noise Impact Assessment must be conducted as part of the EIAr.	Please refer to the Air Quality and Noise Assessments included in **Appendix Y** and **Appendix Z** respectively.
The specialist studies conducted must be specific to a CSP Tower facility and must assess cumulative impacts of other Renewable Energy projects in the area.	All the specialist studies are specific to the Letsoai CSP 1 Site. A detailed cumulative assessment is included in Section 11.
Where specialist studies are conducted in-house or by a specialist other than a suitably qualified specialist in the relevant field, such specialist reports must be peer reviewed by a suitably qualified external specialist in the relevant field. The terms of reference for the peer review must include:	Peer reviewers have been identified and appointed for all relevant in-house specialist studies. The following peer reviews are currently underway and will be appended to the Final EIR:

COMMENT	RESPONSE
• A CV clearly showing expertise of the peer reviewer; Acceptability of the terms of reference; • Is the methodology clearly explained and acceptable; • Evaluate the validity of the findings (review data evidence); • Discuss the suitability of the mitigation measures and recommendations; • Identify any short comings and mitigation measures to address the short comings; Evaluate the appropriateness of the reference literature; • Indicate whether a site-inspection was carried out as part of the peer review; and • Indicate whether the article is well-written and easy to understand.	→ Land capability and Wetlands → Social Study The Traffic Specialist Study Peer Review has been completed and is included in **Appendix N** The CV for each independent specialist have been included within **Appendix O.**
Due to the number of similar applications in the area, all the specialist assessments must include a cumulative environmental impact assessment for all identified and assessed impacts. The cumulative impact assessment must indicate the following: • Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land. • Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. • The cumulative impacts significance rating must also inform the need and desirability of the proposed development. • A cumulative impact environmental statement on whether the proposed development must proceed.	A detailed cumulative assessment is included in Section 11 of this report
The specialist studies conducted must be specific to a CSP facility and must assess cumulative impacts of other Renewable Energy projects in the area.	All the specialist studies are specific to the Letsoai CSP 1 Site. A detailed cumulative assessment is included in Section 11.
The EIAr must also include a comments and response report in accordance with Appendix 2 h (iii) of the EIA Regulations, 2014.	Please refer to the comment and response report (**Appendix H**)
The EIAr must include the detail inclusive of the PPP in accordance with Regulation 41 of the EIA Regulations.	The PPP methodology is described in Section 5.3 of this report.
Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	At this stage in the process, post De-commissioning options have not yet been defined. It remains a possibility that technologies will evolve over time and the option to upgrade the facility is noted. However, in the event that upgrading the facility is not considered the site will be demolished and rehabilitated to its current state.
Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided.	For such agreements to be in place, the project must first achieve preferred bidder status. These agreement will be negotiated once preferred bidder status has been achieved.
The EIAr must provide a detailed description of the need and desirability, not only providing motivation on the need for clean	Please refer to Chapter 6 of this report

COMMENT	RESPONSE
energy in South Africa of the proposed activity. The need and desirability must also indicate if the proposed development is needed in the region and if the current proposed location is desirable for the proposed activity compared to other sites.	
Please ensure that the draft and final EIAr also includes the undertaking under oath or affirmation by the EAP that is required in terms of Appendix 3 of GN R. 982.	Plesae refer to **Appendix B**.
A copy of the final site layout map and alternatives. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following: • Tower position and its associated infrastructure; • Positions of the power island, steam turbine and generator, molten salt storage tanks, water storage reservoir and tanks, lined evaporation ponds and water supply pipeline; • Permanent laydown area footprint; • Internal roads indicaing witdth (constructino period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); • Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; • The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; • Substation(s) and/or transformer(s) sites including their entire footprint; • Connection routes (including pylon positions) to the distribution/transmission network; • All existing infrastructure on the site, especially roads; • Buffer areas; • Buildings, including accommodation; and • All "no-go" areas.	Please refer to the Site Development Proposal Map included at the beginning of this report. This map is also included in **Appendix W.**
An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	Please refer to Section 12.2 for the sensitivity map. This map is also included in **Appendix W.**
A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	Please refer to Section 12.2 for the sensitivity map overlain by the layout. This map is also included in **Appendix W.**
A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; .dbf; .prj; and, .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title. The shape file must be submitted to: **Postal Address:**	WSP | Parsons Brinckerhoff have taken note of this requirement.

COMMENT	RESPONSE
Department of Environmental Affairs Private Bag X447 Pretoria 0001 **Physical address:** Environment House 473 Steve Biko Road Pretoria For Attention: Muhammad Essop Integrated Environmental Authorisations Strategic Infrastructure Developments Telephone Number: (012) 399 9406 Email Address: MEssop@environment.gov.za	
The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following: • All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted. • The final site layout map. • Measures as dictated by the final site layout map and micro-siting. • An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process. • A map combining the final layout map superimposed (overlain) on the environmental sensitivity map. • An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken. • A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase. • A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats. • An open space management plan to be implemented during the construction and operation of the facility. • A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	Please refer to the EMPr included in **Appendix V**.

COMMENT	RESPONSE
• A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off. • A fire management plan to be implemented during the construction and operation of the facility. • An avifauna monitoring and management plan to be implemented during the construction and operation of the facility. This plan must be drafted by a suitably qualified avifauna specialist. • An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. • Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion. • An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems. • Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	
The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMPr.	WSP | Parsons Brinckerhoff has taken note of this requirement. Please refer to the EMPr included in **Appendix V**.
The EAP must provide the final detailed Site Layout Plan as well as the final EMPr for approval with the final EIAr as this Department needs to make a decision on the EA, EMPr and Layout Plan.	Please refer to Section 12.2 for the sensitivity map overlain by the layout. This map is also included in **Appendix W.** the EMPr included in **Appendix V.** In terms of the central tower and the heliostat layout no deviations from the layout are expected. However, the layout of the associated infrastructure together with the EMPr will only be finalised on confirmation that the project is awarded preferred bidder status.
Please ensure that all the relevant Listing Notice activities are applied for, that the Listing Notice activities applied for are specific and that they can be linked to the development activity or infrastructure in the project description.	WSP | Parsons Brinckerhoff has taken note of this requirement.
You are hereby reminded that should the EIAr fail to comply with the requirements of this acceptance letter, the project will be refused in accordance with Regulation 24(1)(b) of the EIA Regulations, 2014.	WSP | Parsons Brinckerhoff has taken note of this requirement.
The applicant is hereby reminded to comply with the requirements of Regulation 45 with regard to the time period allowed for complying with the requirements of the Regulations, and Regulations 43 and 44 with regard to the allowance of a comment period for interested and affected parties on all reports submitted	WSP | Parsons Brinckerhoff has taken note of this requirement.

COMMENT	RESPONSE
to the competent authority for decision-making. The reports referred to are listed in Regulation 43(1).	
Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the NationalHeritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage resources authority as described in Chapter II, Section 38(8) of the National Heritage Resources Act, Act 25 of 1999. Comments from SAHRA and/or the provincial department of heritage must be provided in the EIAr.	Comments from SAHRA are included in the comment and response report included in **Appendix H**.
You are requested to submit two (2) electronic copies (CD/DVD) and two (2) hard copies of the EIAr to the Department as per Regulation 23(1) of the EIA Regulations, 2014.	WSP | Parsons Brinckerhoff has taken note of this requirement.
Please also find attached information that must be used in the preparation of the EIAr. This will enable the Department to speedily review the EIAr and make a decision on the application.	WSP | Parsons Brinckerhoff has taken note of these requirements.
You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, which stipulates that no activity may commence prior to an Environmental Authorisation being granted by the Department.	WSP | Parsons Brinckerhoff has taken note of this requirement.
COMMENT AND RESPONSE REPORT	
Please record C&R trail report in this format	WSP | Parsons Brinckerhoff has taken note of this requirement.
A. EIA INFORMATION REQUIRED FOR CONCENTRATED SOLAR POWER (CSP) ENERGY FACILITIES	

1. General site information
The following general site information is required:
• Descriptions of all affected farm portions
• 21 digit Surveyor General codes of all affected farm portions
• Copies of deeds of all affected farm portions
• Photos of areas that give a visual perspective of all parts of the site
• Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)
• Concentrated Solar plant design specifications including:
    o Type of technology
    o Structure height
    o Surface area to be covered (including associated infrastructure such as roads)
    o Structure orientation
    o Laydown area dimensions (construction period and thereafter)
    o Generation capacity
• Generation capacity of the facility as a whole at delivery points
This information must be indicated on the first page of any Scoping or EIA document. It is also advised that it be double checked as there are too many mistakes in the applications that
	As requested this information has been included at the beginning of this report.

COMMENT	RESPONSE
have been received that take too much time from authorities to correct.	
2. <u>Sample of technical details for the processed facility</u> • Height ofTower • Height of CSP panels • Area of CSP • Number of inverters required • Area occupied by inverter I transformer stations I • substations • Ca_Qacity of on-site substation • Area occupied by both permanent and construction • laydown areas • Area occupied by buildings • Length of internal roads • Width of internal roads • Proximity to grid connection • Height of fencing • Type of fencing	As requested this information has been included at the beginning of this report.

3. Site maps and GIS information
Site maps and GIS information should include at least the following:
• All maps/information layers must also be provided in ESRI Shapefile format
• All affected farm portions must be indicated
• The exact site of the application must be indicated (the areas that will be occupied by the application)
• A status quo map/layer must be provided that includes the following:
    ○ Current use of land on the site including:
        ▪ Buildings and other structures
        ▪ Agricultural fields
        ▪ Grazing areas
        ▪ Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
        ▪ Critically endangered and endangered vegetation areas that occur on the site
        ▪ Bare areas which may be susceptible to soil erosion
        ▪ Cultural historical sites and elements
    ○ Rivers, streams and water courses
    ○ Ridgelines and 20m continuous contours with height references in the GIS database
    ○ Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs
    ○ High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries
	These maps have been included at the beginning of this report and in **Appendix W**.

COMMENT	RESPONSE
○ Buffer zones (also where it is dictated by elements outside the site): ▪ 500m from any irrigated agricultural land ▪ 1km from residential areas ○ Indicate isolated residential, tourism facilities on or within 1km of the site • A slope analysis map/layer that include the following slope ranges: ○ Less than 8% slope (preferred areas for facility and infrastructure) ○ between 8% and 12% slope (potentially sensitive to facility and infrastructure) ○ between 12%and 14% slope {highly sensitive to facility and infrastructure) ○ steeper than 18% slope (unsuitable for facility and infrastructure) • A site development proposal map(s)llayer(s) that indicate: ○ Foundation footprint ○ Permanent laydown area footprint ○ Construction period laydown footprint ○ Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible) ○ River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used ○ Substation(s) and/or transformer(s) sites including their entire footprint. ○ Cable routes and trench dimensions (where they are not along internal roads) ○ Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM) ○ Cut and fill areas of power tower and heliostats sites along roads and at substation/transformer sites indicating the expected volume of each cut and fill ○ Borrow pits ○ Spoil heaps (temporary for topsoil and subsoil and permanently for excess material) Buildings including accommodation With the above information authorities will be able to assess the strategic and site impacts of the application.	
4. Regional map and GIS information The regional map and GIS information should include at least the following: • All maps/information layers must also be provided in ESRI Shapefile format • The map/layer must cover an area of 20km around the site • Indicate the following:	This map has been included at the beginning of this report and in **Appendix W**.

COMMENT	RESPONSE
○ roads including their types (tarred or gravel) and category (national, provincial, local or private) ○ Railway lines and stations ○ Industrial areas ○ Harbours and airports ○ Electricity transmission and distribution lines and substations ○ Pipelines ○ Waters sources to be utilised during the construction and operational phases ○ A visibility assessment of the areas from where the facility will be visible ○ Critical Biodiversity Areas and Ecological Support Areas ○ Critically Endangered and Endangered vegetation areas ○ Agricultural fields ○ Irrigated areas An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams	
5. Important stakeholders Amongst other important stakeholders, comments from the National Department of Agriculture, Forestry and Fisheries must be obtained and submitted to the Department. Any application, documentation, notification etc. should be forwarded to the following officials: Ms Mashudu Marubini Delegate of the Minister (Act 70 of 1970) E-mail: MashuduMa@daff.gov.za Tel 012-319 7619 Ms Thoko Buthelezi Agriland Liaison office E-mail: ThokoB@daff.gov.za Tel 012-319 7634 All hardcopy applications I documentation should be forwarded to the following address: **Physical address:** Delpen Building Cnr Annie Botha and Union Street Office 270 Attention: Delegate of the Minister Act 70 of 1970 **Postal Address:** Department of Agriculture, Forestry and Fisheries Private Bag X120	These stakeholders have been included in the Stakeholder Database (**Appendix P**).

COMMENT	RESPONSE
Pretoria 0001 Attention: Delegate of the Minister Act 70 of 1970 In addition, comments must be requested from Eskom regarding grid connectivity and capacity. Request for comment must be submitted to: Mr John Geeringh Eskom Transmission Megawatt Park D1Y38 PO Box 1091 JOHANNESBURG 2000 Tel: 011 516 7233 Fax: 086 661 4064 John.geeringh@eskom.co.za	
B. AGRICULTURE STUDY REQUIREMENTS	
• Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following: o Identification of the soil forms present on site o The size of the area where a particular soil form is found o GPS readings of soil survey points o The depth of the soil at each survey point o Soil colour o Limiting factors o Clay content o Slope of the site o A detailed map indicating the locality of the soil forms within the specified area, o Size of the site • Exact locality of the site • Current activities on the site, developments, buildings • Surrounding developments I land uses and activities in a radius of 500 m of the site • Access routes and the condition thereof • Current status of the land (including erosion, vegetation and a degradation assessment) • Possible land use options for the site • Water availability, source and quality (if available) • Detailed descriptions of why agriculture should or should not be the land use of choice • Impact of the change of land use on the surrounding area A shape file containing the soil forms and relevant attribute data as depicted on the map.	Please refer to the Soil and Land Capability and Wetland Specialist Study included in **Appendix M**.
C. ASTRONOMY GEOGRAPHIC ADVANTAGE ACT, 2007 (ACT NO. 21 OF 2007)	
The purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern	Comments received from SKA note that the nearest SKA station to the Letsoai

Comment	Response
Cape Province excluding the Sol Plaatjie Municipality had been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), MeerKAT and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that had to be protected.	CSP 1 Site is 142 km away. Based on the distance to the nearest SKA station, the facility is seen to pose a low risk of detrimental impact on the SKA.
You are requested to indicate the applicability of the Astronomy Geographic Advantage Act, Act No. 21 of 2007 on the application in the BAR/EIR. You must obtain comments from the Southern African Large Telescope (SALT) if the proposed development is situated within a declared astronomy advantage area.	

4.3 STAKEHOLDER CONSULTATION

Stakeholders were identified and will continue to be identified through several mechanisms. These include:

- Utilising existing databases from other projects in the area;
- Networking with local business owners, non-governmental agencies, community based organisations, and local council representatives;
- Field work in and around the project area;
- Advertising in the press:
  - Die Gemsbok published on 7 September 2016;
- Placement of community notices:
  - Site boundary;
  - Aggeneys OK;
  - Aggeneys Public Library;
  - Black Mountain Recreation Club;
  - Khâi-Ma Local Municipality Offices; and
  - Pofadder Public Library.
- Attendance registers at meetings.

All Stakeholders identified to date have been registered on the project stakeholder database. The EAP endeavoured to ensure that individuals/organisations from referrals and networking were notified of the Proposed Project. Stakeholders were identified at the horizontal (geographical) and vertical extent (organisations level). A list of stakeholders captured in the project database is included in **Appendix P**.

Table 4-3 provides a breakdown of stakeholders currently registered on the database while **Figure 4-1** illustrates the number of stakeholders per representative sector.

Table 4-3: Breakdown of Stakeholders Currently Registered on the Database

Representative Sector	Further Explanation	No. of Stakeholders

Government departments	All tiers of government, namely, national, provincial, local government and parastatal organisations including: → Department of Mineral Resources → Eskom Holdings Limited → Northern Cape Department of Roads and Public Works → Northern Cape Department of Rural Development and Land Reform → Randwater → Transnet → Khâi-Ma Local Municipality → Department of Agriculture, Forestry and Fisheries → South African Heritage Resource Agency → National Department of Environmental Affairs → Department of Environmental Affairs: Biodiversity and Conservation → South African Civil Aviation Authority → Department of Water and Sanitation → Northern Cape Department of Water and Sanitation → Northern Cape Department of Environment and Nature Conservation → Northern Cape Department of Finance, Economic Development and Tourism → Northern Cape Department of Economic Development and Tourism → South African National Roads Agency → South African Square Kilometre Array → Northern Cape Economic Development Agency → Namakwa District Municipality → South African Astronomical Observatory	50
Business and consultants	Local and neighbouring businesses in the area. Representatives of consulting organisations that provide services in the area	6
Non-governmental organisations (NGOs) and community based organisations	Agricultural unions, churches, and environmental NGOs	9

General public	Local communities, farmers, and other such individuals who may have an interest in the project	7

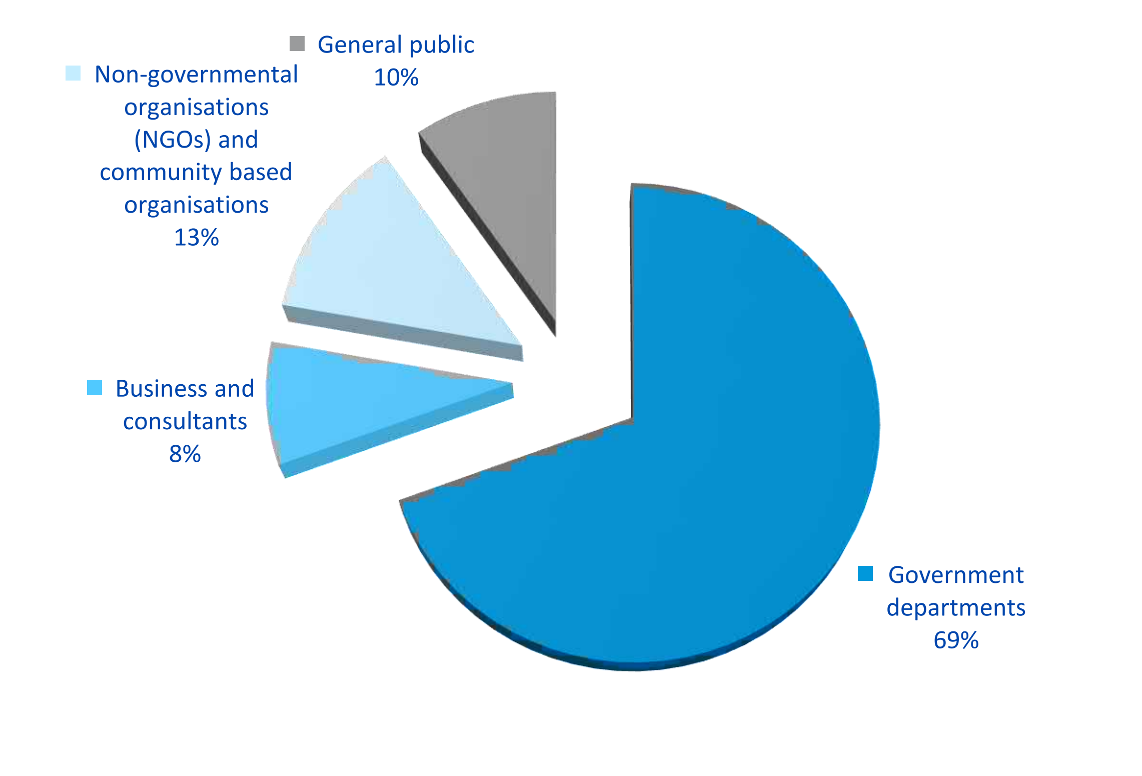

Figure 4-1: Pie chart showing the Breakdown of the Stakeholders currently Registered on the Database per representative sector

All concerns, comments, viewpoints and questions (collectively referred to as 'issues') received to date have been documented and responded to in a Comment and Response Report included in **Appendix H.** The following key issues were highlighted during the scoping phase:

- Water availability and potential water sources for the operational phase of the facility;
- Impacts on avifauna;
- Impacts on agricultural potential;
- Cumulative impact of the authorised renewable projects in the surrounding areas;
- Socio-economic development;
- Job creation;
- Increase in communicable diseases and reduced public health; and
- Access from the N14.

4.4 SCOPING STUDY FINDINGS

The scoping phase identified a number of impacts associated with the Letsoai CSP 1 site and the water supply pipeline. The findings of the preliminary significance ratings undertaken during the scoping phase are included in **Table 4-4** and **Table 4-5** respectively.

Table 4-4: Summary of Scoping Phase Impact Assessment Process for Letsoai CSP 1

Environmental Receptor	Impact	Phase	Character	Significance	Fatal Flaw (Yes/No)	Mitigation Required (Yes/No)	EIA Phase Study Required (Yes/No)
Topography	Change in the site micro-topography	C, O	Negative	**Very Low**	No	No	No
	Change in study area macro-topography	C, O	Negative	**Very Low**	No	No	
Geology	Disturbance to underlying geology	C	Negative	**Low**	No	Yes	No
Climate	Climatic impacts such as greenhouse effect and perceived global warming, as well as the phenomenon of acid rain.	C / O	Negative	**Very Low**	No	Yes	No
	Contribution of cleaner energy to the National Grid	O	Positive	**High**	No	Yes	
Soils and Land Capability	Reduction in land available for grazing animals	C / O / D	Negative	**High**	No	Yes	Yes
	Soil erosion resulting in degradation of soil structure	C	Negative	**Low**	No	Yes	
		O / D	Negative	**Very Low**	No	Yes	
	Degradation of soil due to contamination	C	Negative	**Low**	No	Yes	
		O / D	Negative	**Very Low**	No	Yes	
Natural Vegetation and Animal Life	Disturbance, loss and transformation of vegetation	C	Negative	**High**	No	Yes	Yes
	Impacts on fauna	C / O / D	Negative	**Low**	No	Yes	
	Proliferation of alien invasive plant species	C / O / D	Negative	**Low**	No	Yes	
	Impacts on Broad-Scale Ecological Processes and Loss of Landscape Connectivity	O	Negative	**Low**	No	Yes	
	Reduced ability to meet conservation obligations & targets	O	Negative	**Medium**	No	Yes	
Avifauna	Temporary displacement of avifauna due to construction, operation and decommissioning of the solar plant and associated infrastructure	C, O, D	Negative	**Medium**	No	Yes	Yes

	Permanent displacement of avifauna due to habitat transformation	O	Negative	**High**	No	Yes	
	Collisions with the solar infrastructure (i.e. Heliostats)	O	Negative	**Medium**	No	Yes	
	Burning due to solar flux	O	Negative	**Medium**	No	Yes	
Surface Water	Surface water contamination	C, O, D	Negative	**Very Low**	No	Yes	No
	Increase in surface water flow due to the loss of vegetation cover and soil compaction	C, O, D	Negative	**Very Low**	No	Yes	
	Water demand by the CSP on local and regional water resources (supplied by either Sedibeng or Vedanta)	O	Negative	**Very Low**	No	Yes	
	Water demand by the CSP on local and regional water resources (abstraction from Orange River)	O	Negative	**Low**	No	Yes	
Groundwater	Groundwater contamination associated with the spill or loss of containment of chemicals	C, O, D	Negative	**Very Low**	No	Yes	No
	The discharge of wastewater to the environment	O	Negative	**Low**	No	Yes	
Heritage	Physical disturbance of archaeological sites	C, O, D	Negative	**Low**	No	Yes	Yes
Palaeontology	Physical disturbance of palaeontological sites	C	Negative	**Very Low**	No	Yes	No
	Cumulative impacts	C	Negative	**Very Low**	No	Yes	
Visual	Visual impact during construction and decommissioning	C	Negative	**Low**	No	Yes	Yes
		D	Negative	**Very Low**	No	Yes	
	Visual intrusion on the sense of place, including scenic landscapes	O	Negative	**Low**	No	Yes	
	Visual impacts during operation as a result of glare and the receiver tower on inhabitants and motorists	O	Negative	**Medium**	No	Yes	
	Visual impacts of substation and operation and maintenance building on inhabitants and motorists	O	Negative	**Low**	No	Yes	
	Visual impact of lighting from the tower and security lighting	O	Negative	**Medium**	No	Yes	

	Cumulative visual impacts	O	Negative	**High**	No	Yes	
Traffic	Increased traffic generation around the study area by construction vehicles	C, D	Negative	**Low**	No	Yes	Yes
	Deterioration of the surrounding road network due to an increase of traffic around the site	O	Negative	**Low**	No	Yes	
Socio-economic	Increase in employment and business opportunities	C	Positive	**High**	No	Yes	Yes
		O, D	Positive	**Medium**			
	Decrease in employment and business opportunities	D	Negative	**Medium**	No	Yes	
	Nuisance from noise, dust and traffic disturbances	C	Negative	**Low**	No	Yes	
		D	Negative	**Very Low**	No	Yes	
	Change in sense of place	C	Negative	**Low**	No	Yes	
		O	Negative	**Medium**	No	Yes	
	Disturbances to local communities due to migrant labour	C	Negative	**Medium**	No	Yes	
	Increase in communicable diseases and reduced public health	C	Negative	**Low**	No	Yes	
	Loss of farmland and associated economic implications	C		**Low**	No	Yes	
	Loss of access to natural resources	C	Negative	**Low**	No	Yes	
	Increase risk to neighbouring land users	C, D	Negative	**Medium**			
	Increase risk of veld fires	C, D	Negative	**Medium**			
	Access to water resources	O	Negative	**Medium**	No	Yes	
	Cumulative development effects on local economic development opportunities	C, O	Positive	**High**	No	Yes	
	Cumulative development effects on local service provision	C, O	Negative	**Medium**	No	Yes	

	Cumulative development effects on tourism activities	C, O	Negative	**Medium**	No	Yes	
	Cumulative development effects on employment patterns	C, O	Negative	**Low**	No	Yes	
	Cumulative development effects on access to water resources	O	Negative	**Medium**	No	Yes	

Table 4-5: Summary of Scoping Phase Impact Assessment Process for the Water Supply Pipeline

Environmental Receptor	Impact	Phase	Character	Significance		Fatal Flaw (Yes/No)	Mitigation Required (Yes/No)	EIA Phase Study Required (Yes/No)
				Alternative 1	Alternative 2			
Topography	Change in the site micro-topography	C, O	Negative	**Very Low**	**Very Low**	No	No	No
Geology	Disturbance to underlying geology	C	Negative	**Very Low**	**Very Low**	No	Yes	No
Soils and Land Capability	Reduction in land available for grazing animals	C / O / D	Negative	**High**	**High**	No	Yes	Yes
	Soil erosion resulting in degradation of soil structure	C	Negative	**Low**	**Low**	No	Yes	
		O / D	Negative	**Very Low**	**Very Low**	No	Yes	
	Degradation of soil due to contamination	C	Negative	**Low**	**Low**	No	Yes	
		O / D	Negative	**Very Low**	**Very Low**	No	Yes	
Natural Vegetation and Animal Life	Disturbance, loss and transformation of vegetation	C	Negative	**Medium**	**Medium**	No	Yes	Yes
	Impacts on fauna	C	Negative	**High**	**Low**	No	Yes	
		D	Negative	**Medium**	**Low**	No	Yes	
	Proliferation of alien invasive plant species	C / O / D	Negative	**Low**	**Low**	No	Yes	
	Impacts on Broad-Scale Ecological Processes and Loss of Landscape Connectivity	O	Negative	**Medium**	**Low**	No	Yes	
	Reduced ability to meet conservation obligations & targets	C / O / D	Negative	**Medium**	**Medium**	No	Yes	
Avifauna	Displacement of priority species due to disturbance associated with the construction of the Pipeline	C	Negative	**Medium**	**Medium**	No	Yes	Yes
Surface Water	Surface water contamination	C, O, D	Negative	**Low**	**Low**	No	Yes	No

	Increase in surface water flow due to the loss of vegetation cover and soil compaction	C, O, D	Negative	**Low**	**Low**	No	Yes	
Groundwater	Groundwater contamination associated with the spill or loss of containment of chemicals	C, O, D	Negative	**Very Low**	**Very Low**	No	Yes	No
Heritage	Physical disturbance of archaeological sites	C, O, D	Negative	**Medium**	**Medium**	No	Yes	Yes
Palaeontology	Physical disturbance of palaeontological sites	C	Negative	**Very Low**	**Very Low**	No	Yes	No
Visual	Visual impact during construction and decommissioning	C / D	Negative	**Very Low**	**Very Low**	No	Yes	Yes
	Visual impact of the pipeline during the operational phase	O	TBC	TBC	**TBC**	No	Yes	
Socio-economic	Increase in employment and business opportunities	C, O, D	Positive	**Medium**	**Medium**	No	Yes	Yes
	Nuisance from noise, dust and traffic disturbances	C	Negative	**Very Low**	**Very Low**	No	Yes	
		D	Negative	**Very Low**	**Very Low**	No	Yes	
	Disturbances to local communities due to migrant labour	C	Negative	**Very Low**	**Very Low**	No	Yes	
	Increase in communicable diseases and reduced public health	C	Negative	**Very Low**	**Very Low**	No	Yes	

4.5 SCOPING RECOMMENDATIONS

The scoping report identified and evaluated the feasibility of a range of site and technology options. **Table 4-6** provides a summary of the scoping phase alternatives assessment.

Table 4-6: Alternatives Summary

ALTERNATIVE CATEGORY	ALTERNATIVE IDENTIFIED IN SCOPING	ASSESSMENT IN EIA PHASE (YES/NO)
Alternative Locations	Alternative development regions i.e. falling outside the Springbok Wind REDZ	No
	Alternative development sites i.e. within the Springbok Wind REDZ study area	No
	Letsoai CSP 1 Site	**Yes**
Technology Alternatives	PV Technology	No
	CSP Technology – Parabolic Trough	No
	CSP Technology – Central tower	**Yes**
Layout and Design Alternatives	**None identified**	**Yes**
Access Road Alternatives	**Widening of existing access road**	**Yes**
	New access road	**Yes**
Internal Access Road Alternatives	**None identified**	**Yes**
Internal 132kv Powerline Route Alternatives	**None identified**	**Yes**
Tower Structure Alternatives	**Steel / concrete monopole single circuit structure**	**Yes**
	Steel / concrete monopole double circuit structure	**Yes**
	H-pole structure	**Yes**
Water Source Alternatives	**Supply from Sedibeng Water / Vedanta Mining**	**Yes**
	Abstraction from the Orange River	**Yes**
Water Supply Pipeline Alternatives	Initial Pipeline Alternatives (x2)	No
	Updated Pipeline Alternatives (x3)	**Yes**

5 EIA METHODOLOGY

The EIA process was initiated in accordance with Appendix 3 of GNR 982 pertaining to applications subject to an S&EIR process.

5.1 DETAILED ENVIRONMENTAL ASSESSMENT

SPECIALIST STUDIES

Based on the findings outlined in Chapter 4, no detailed studies are required with regards to topography, geology, climate, ground water or palaeontology. However, mitigation and management measures have been included in the EMPr for these aspects.

Table 5-1 provides a list of the Specialists that have been involved in the detailed studies required for this project during the EIA phase and their areas of expertise.

Table 5-1: Details of the Specialist Consultants

SPECIALIST FIELD	COMPANY NAME	TEAM MEMBERS
Soil, Land Capability and Wetlands	WSP Environmental (Pty) Ltd	Bruce Wickham, Colin Holmes and Greg Matthews
Biodiversity	Simon Todd Consulting	Simon Todd
Avifauna	Chris van Rooyen Consulting	Chris van Rooyen, Albert Froneman
Heritage	ACO Associates	Tim Hart, Lita Webley, David Halkett
Visual	-	Belinda Gebhardt
Social	WSP Environmental (Pty) Ltd	Danielle Sanderson and Hillary Konigkramer
Traffic	WSP Group Africa (Pty) Ltd	Christo Bredenhann
Air Quality	Airshed Planning Professionals	Hanlie Liebenberg-Enslin
Noise	Airshed Planning Professionals	Nicolette von Reiche

PEER REVIEWS

As part of their comments on the draft scoping report the DEA has requested that where specialist studies are conducted in-house or by a specialist other than a suitably qualified specialist in the relevant field, such specialist reports must be peer reviewed by a suitably qualified external specialist in the relevant field. **Table 5-2** outlines the studies that require peer review and the specialists that have been appointed to conduct the required peer reviews. The CVs of the peer reviewers have been included in **Appendix O**.

Table 5-2: Peer Reviewers

IN-HOUSE STUDY	PEER REVIEWER
Water Availability Assessment	Allan Bailey - Royal HaskoningDHV (Pty) Ltd
Soil, Land Capability and Wetland Impact Assessment	Michiel Jonker – Ecotone Freshwater Consultants (Wetlands) Garry Paterson – Agricultural Research Council (Soils and Land Capability)
Social Impact Assessment	Tony Barbour - Environmental Consultant and Researcher
Traffic Impact Assessment	Andrew Bulman – Urban EQ Consulting Engineers

CUMULATIVE ASSESSMENT

Due to the number of renewable energy applications in the area, the DEA has requested that all the specialist assessments must include a detailed cumulative environmental impact statement. The identified cumulative impacts must be clearly defined and where possible the size of the identified impact must be indicated, i.e. hectares of cumulatively transformed land. The significance of the identified cumulative impacts must be rated with the significance rating methodology approved with the acceptance of the scoping report. In addition, the specialist studies must provide proof that other specialist reports conducted for renewable energy projects in the area were reviewed and indicate how the recommendations, mitigation measures and conclusions have been taken into consideration when drafting the conclusion and mitigation measures for this project.

5.2 IMPACT ASSESSMENT METHODOLOGY

The EIA uses a methodological framework developed by WSP | Parsons Brinckerhoff to meet the combined requirements of international best practice and the NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 982) (the "EIA Regulations").

As required by Appendix 3 of the EIA Regulations (2014), the determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact
- Significance of the Impact
- Consequence of the Impact
- Extent of the impact
- Duration of the Impact
- Probability if the impact
- Degree to which the impact:
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- Magnitude: to what extent environmental resources are going to be affected;
- Sensitivity of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- Severity of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

METHODOLOGY

Impacts are assessed in terms of the following criteria:

a) The **nature**, a description of what causes the effect, what will be affected and how it will be affected

NATURE OR TYPE OF IMPACT	DEFINITION
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

b) The physical extent:

SCORE	DESCRIPTION
1	the impact will be limited to the site;
2	the impact will be limited to the local area;
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

c) The duration, wherein it is indicated whether the lifetime of the impact will be:

SCORE	DESCRIPTION
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

d) The magnitude of impact on ecological processes, quantified on a scale from 0-10, where a score is assigned:

SCORE	DESCRIPTION
0	small and will have no effect on the environment.
2	minor and will not result in an impact on processes.
4	low and will cause a slight impact on processes.
6	moderate and will result in processes continuing but in a modified way.
8	high (processes are altered to the extent that they temporarily cease).

10	very high and results in complete destruction of patterns and permanent cessation of processes.

e) The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

SCORE	DESCRIPTION
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).
5	definite (impact will occur regardless of any prevention measures).

f) 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;

g) The status, which is described as either positive, negative or neutral;

h) The degree to which the impact can be reversed;

i) The degree to which the impact may cause irreplaceable loss of resources; and

j) 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:

OVERALL SCORE	SIGNIFICANCE RATING	DESCRIPTION
< 30 points	**Low**	where this impact would not have a direct influence on the decision to develop in the area
31-60 points	**Medium**	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	**High**	where the impact must have an influence on the decision process to develop in the area

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this EIR

5.3 STAKEHOLDER ENGAGEMENT

STAKEHOLDER AND AUTHORITY CONSULTATION

There will be ongoing communication between WSP | Parsons Brinckerhoff and stakeholders throughout the S&EIR process. These interactions include the following:

- A letter will be sent out to all registered stakeholders providing them with an update of the proposed project once the final scoping report has been approved;
- Interactions with stakeholders will be recorded in the comment and response report;
- Feedback to stakeholders will take place both individually and collectively; and
- Written responses (email, faxes or letters) will be provided to stakeholders acknowledging issues and providing information requested (dependent on availability).
- As per the GNR 982, particular attention will be paid to landowners, and neighbouring communities, specifically where literacy levels and language barriers may be an issue.

PUBLIC REVIEW OF THE DRAFT IMPACT ASSESSMENT REPORT

The draft EIR will be placed on public review for a period of 30 days from **27 February 2017** to **27 March 2017**, at the following venues:

- Aggeneys Public Library;
- Pofadder Public Library; and
- WSP | Parsons Brinckerhoff Website.

All registered stakeholders and authorising/commenting state departments will be notified of the public review period as well as the locations of the draft EIR via email, sms, and the stakeholder meetings.

STAKEHOLDER MEETINGS

FOCUS MEETINGS

Informal one-on-one stakeholder meetings will be held, as required, in order to present the findings of the impact assessment to key stakeholders and to ask the stakeholder to raise concerns or queries. The one-on-one stakeholder meetings will be facilitated at appropriate venues during the draft EIR review period (30 days). WSP | Parsons Brinckerhoff will facilitate the meetings and will be accompanied by the applicant during all meetings.

PUBLIC MEETINGS

Table 5-3 outlines the meetings that are to be held during the draft EIR review period. The meetings will present the findings of the impact assessment and provided opportunities for stakeholders to raise issues, concerns and queries. The meetings will be facilitated by WSP | Parsons Brinckerhoff's EIA team and will be attended by BioTherm representatives. Invitations to the meetings will be sent out in the form of emails and sms's.

Table 5-3: Meetings to be held during the Draft Environmental Impact Report Review Period

DATE	TIME	VENUE
16 March 2017	18:00 – 20:00	Pofadder Community Hall

COMMENT AND RESPONSE REPORT

All concerns, comments, viewpoints and questions (collectively referred to as 'issues') will continue to be documented and responded to adequately in the Comment and Response Report. The Comment and Response Report records the following:

- List of all issues raised;
- Record of who raised the issues;
- Record of where the issues were raised;
- Record of the date on which the issue was raised; and
- Response to the issues.

The updated Comment and Response Report has been included in **Appendix H.**

SUBMISSION AND DECISION-MAKING

The EAP must submit the final EIR to the competent authority within 106 days of the acceptance of the scoping report. Once submitted, the delegated competent authority (i.e. the DEA) will be allocated 107 days to review the final EIR in order to either grant or refuse and environmental authorisation.

The final EIR will be placed on stakeholder review for a reasonable time period during the DEA's final review and decision-making process. The delegated competent authority must issue their decision within this specified timeframe.

NOTIFICATION OF ENVIRONMENTAL AUTHORISATION

All stakeholders will receive a letter at the end of the process notifying them of the authority's decision, thanking them for their contributions, and explaining the appeals procedure as outlined in the national Appeal Regulations, 2014 (GNR 993 of 2014).

6 NEED AND JUSTIFICATION

6.1 NATIONAL RENEWABLE ENERGY REQUIREMENT

In 2010 South Africa had 44157MW of power generation capacity installed. Current forecasts indicate that by 2025, the expected growth in demand will require the current installed power generation capacity to be almost doubled to approximately 74,000MW (SAWEA: 2010).

This growing demand, fuelled by increasing economic growth and social development within Southern Africa, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental impact, climate change and the need for sustainable development. Despite the worldwide concern regarding GHG emissions and climate change, South Africa continues to rely heavily on coal as its primary source of energy. Issues associated with the dependence on coal include:

- The fact that the resource is non-renewable;
- Consumption of coal for use in power generation reduces the availability of coal for other uses; and
- Burning of coal is one of the major producers of carbon dioxide (CO_2), which is commonly accepted as a contributor to climate change, deterioration in urban and rural air pollution and acid rain (Banks and Schaffler, 2006).

These issues associated with the burning of coal as well as the rising prices for other fossil-fuels (such as oil), geopolitical developments and environmental concerns have led to growing demand for renewable energy sources. There is therefore an increasing need to establish a new source of generating power in SA within the next decade.

The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of Eskom's long-term strategic planning and research process. It must be remembered that solar energy is plentiful, renewable, widely distributed, clean and reduces greenhouse gas emissions when it displaces fossil-fuel derived from electricity. In this light, renewable solar energy can be seen as desirable.

The South African Government, through the promulgation of the IRP 2010, and incorporated into the REIPPPP implemented by the DoE, has committed to a target of 17.8 GW of renewables by 2030. This means that by 2030 approximately 42% of all new power generation will be derived from renewable energy forms. Currently South Africa is heavily dependent on coal as its primary source of energy. In addition, it contributes towards socio-economic and environmentally sustainable growth, while stimulating the renewable industry in South Africa.

The REIPPPP has contributed to stimulating local manufacturing and job creation and has led to significant investments in social development in the communities surrounding renewable energy projects. Former South African Wind Energy Association (SAWEA) Chief Executive Officer (CEO), Johan van den Berg, recently stated that:

"Approximately R19.3bn will be ploughed into social development and a further R6bn will go into enterprise development over the twenty-year lives of the projects. Local communities will earn a further R29.2bn through their direct shareholding in the projects. By March 2016 over R30bn had been spent on local content and a further R65.7bn is expected to be spent by projects that have yet to commence construction. Twelve new industrial facilities have been established as a direct result of the programme. Since 2013, the construction and operation of renewable energy projects has already created 111 835 job years for South African citizens."

6.2 SOLAR POWER POTENTIAL IN SOUTH AFRICA AND INTERNATIONALLY

Internationally, PV is the fastest-growing power generation technology, while CSP technology remains less established than other renewable energy markets (REN21: 2015). Solar energy (CSP and PV) is ideally suited for South Africa's climate, as most areas experiences more than 2 500 hours of sunshine per year, and have average solar radiation levels ranging between 4.5 and 6.5kWh/m^2 in one day (DoE).

The current state of progress with regards to the implementation of renewable energy capacity in South Africa is summarised as follows based on the March 2016 IPPPP 'an Overview' it was reported that by March 2016:

- 31% of the 2020 7GW capacity target and 12% of the 2030 17.8GW target had been procured.
- 6.4GW had been procured from 102 IPPs in Bidding Window 1 to Bidding Window 4, with 2.2GW of the procured capacity already constructed and fully operational.
- Of the 6.4GW procured 22 972 MW of PV has been procured with 965 MW being operational and only 600 MW of CSP has been procured with 200 MW being operational.

6.3 REGIONAL AND SITE SUITABILITY

The proposed project will be located on a 4300 ha property approximately 13km South of Aggeneys on Hartebeest Vlei Farm 86. This specific project site has been identified by BioTherm through a pre-feasibility desktop analysis based on the estimation of the solar energy resource as well as weather, dust and dirt effects. The suitability of the Northern Cape Province for solar renewable energy development is based on the following attributes:

- It has the highest solar irradiation potential in South Africa, receiving an annual global horizontal irradiation of approximately 2348 kWh/m^2/year and an annual direct normal irradiation of approximately 3042 kWh/ m^2/year. This high resource value ensures the best value for money is gained for the economy of South Africa.
- The Northern Cape has one of the largest geographic footprints of all the provinces of South Africa and the smallest population number. In addition to the large surface area and low population density it has limited agricultural potential and exceptionally high radiation levels making particularly suited to power generation through solar energy (REIPPPP: 2016).

Within the Northern Cape region, the reasons for the selection of the specific site by BioTherm is based on the following site selection process summary:

- Grid connection suitability is a key criterion. Long connection lines have increased environmental impacts as well as add increased costs to the project development. The proposed project site has favourable grid connection potential, as the project will connect to the existing Aggeneys MTS Substation located approximately 10 km from the site, The need for an extensive grid network upgrade or long powerline runs is therefore mitigated.
- The DoE has introduced REDZs across South Africa following the SEA process undertaken by CSIR. Letsoai CSP 1 falls within the Springbok Wind zone within the Aggeneys area of the Northern Cape.
- The project site has a relatively flat topography which is suitable for solar CSP development. The project has also been located away from the regional view sheds and mountainous regions where the environmental and visual impacts would be relatively greater.
- From a competition perspective, there are several ongoing EIA processes for renewable energy projects in the region; however only one 40MW project has received preferred bidder designation in the immediate area.
- The project site can be accessed easily via the tarred N14 national road which lies approximately 10 km from the site which connects to the R64 and leads to the R359.

This site was selected based on the above criteria ahead of other regional farms due to the cumulative assessment of all criteria. This internal process ensured that the best practical / technically suitable environmental site option was selected.

Additional information on the site selection process is provided in Section 7.4 (Alternatives).

6.4 LOCAL NEED

The proposed site falls within the Khâi-Ma Local Municipality, which is located within the Namakwa District Municipality.

SOCIO-ECONOMICS

The Northern Cape Provincial Growth and Development Strategy highlights the need to ensure the availability of affordable energy, it also notes that, "development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which economic opportunity and activity is generated in the Northern Cape". The Northern Cape Provincial SDF (2011) states that the energy sector could benefit the economy significantly through created economic spin-offs or multiplier effects and it is widely acknowledged that the Northern Cape province's comparative advantage lies, among others, in solar resource. The proposed project is thus expected to contribute to these stated regional economic benefits.

EMPLOYMENT

According to the REIPPPP Focus on Northern Cape Province, Provincial Report 2016, employment creation remains a top priority in the Northern Cape. IPP investments in Bidding Window 1 to Bidding Window 4 within the province alone have contributed new employment opportunities for South African citizens estimated to be more than 66 000 job years[1] over the construction and projected operational life of the plants. Notably, 8 842 or 38% of these new employment opportunities have been retained within the local communities associated with the respective IPP plants. To date, the opportunities for people from local communities have significantly exceeded expectations, achieving 96.4% of what is planned across all 6 Bidding Windows. During the construction phase (approximately 2 – 4 years) the number of people employed on site typically spikes, and then tapers off to a lower and steadier employment number over the extended 20 year operational life of a project. Operational jobs will accrue over 20 years. At this early stage, 913 job years have already been realised by the IPPs that have started operation. Approximately 59% of the total jobs created under the overall REIPPPP in Bidding Window 1 to Bidding Window 4 will be created by IPP projects located in the Northern Cape Province.

Khâi-Ma Local Municipality has a total population of 12 645 people, with an unemployment rate of 22,1 %. Currently there are 5 REIPPP projects operational within the region. 3 of these projects are PV and 2 are CSP projects. The REIPPP operational projects have had the following impacts on the local municipality to date:

- Socio-economic development: R 1 023 million (8.6% of the total for the Northern Cape);
- Employment/ Job Creation: R 8 388 million (12.6% of the total for the Northern Cape); and
- Community Trust (community equity/ shareholding): R 4 081 million (22.4% of the total for the Northern Cape).

[1] Job year = equivalent of a full time employment opportunity for one person for one year.

Based on this data, it is likely that the development of Letsoai CSP 1 will contribute to the socio-economic development of the area, as well as to the economic growth within the province as a whole.

7 PROJECT DESCRIPTION

7.1 SOLAR POWER GENERATION PROCESS

South Africa experiences some of the highest levels of solar radiation in the world between 4.5 and 6.5kWh/m2/day) and therefore, possesses considerable solar resource potential for solar power generation.

In terms of large-scale grid connected applications the most commonly used technologies include PV and CSP; these are described in some detail in the following sections:

PHOTOVOLTAIC SYSTEMS

Internationally, PV is the fastest-growing power generation technology and between 2000 and 2009 the installed capacity globally grew on average by 60% per year. By the end of 2016, cumulative global installed PV installations will surpass 310 GW[2]. In South Africa as much as 8 GW of PV is planned to be installed by 2030, with approximately 1GW already installed and operating.

Large-scale or utility-scale PV systems are designed for the supply of commercial power into the electricity grid (**Figure 7-1**). Large-scale PV plants differ from the smaller units and other decentralised solar power applications because they supply power at the utility level, rather than to local users.

PV cells are made from semi-conductor materials that are able to release electrons when exposed to solar radiation. This is called the photo-electric effect. Several PV cells are grouped together through conductors to make up one module and modules can be connected together to produce power in large quantities. In PV technology, the power conversion source is via PV modules that convert light directly to electricity. This differs from the other large-scale solar generation technology such as CSP, which uses heat to drive a variety of conventional generator systems.

Solar panels produce direct current (DC) electricity, therefore PV systems require conversion equipment to convert this power to alternating current (AC), can be fed into the electricity grid. This conversion is done by inverters. **Figure 7-2** provides a flow diagram to illustrate the PV power generation process.

There are two primary alternatives for inverters in large scale systems; being centralised and string inverters.

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[2] http://www.solarpowerworldonline.com/2016/02/china-u-s-and-japan-to-lead-global-installed-pv-capacity-in-2016/

Figure 7-1: Large-Scale Photovoltaic Power Generation Facility (Source: BioTherm)

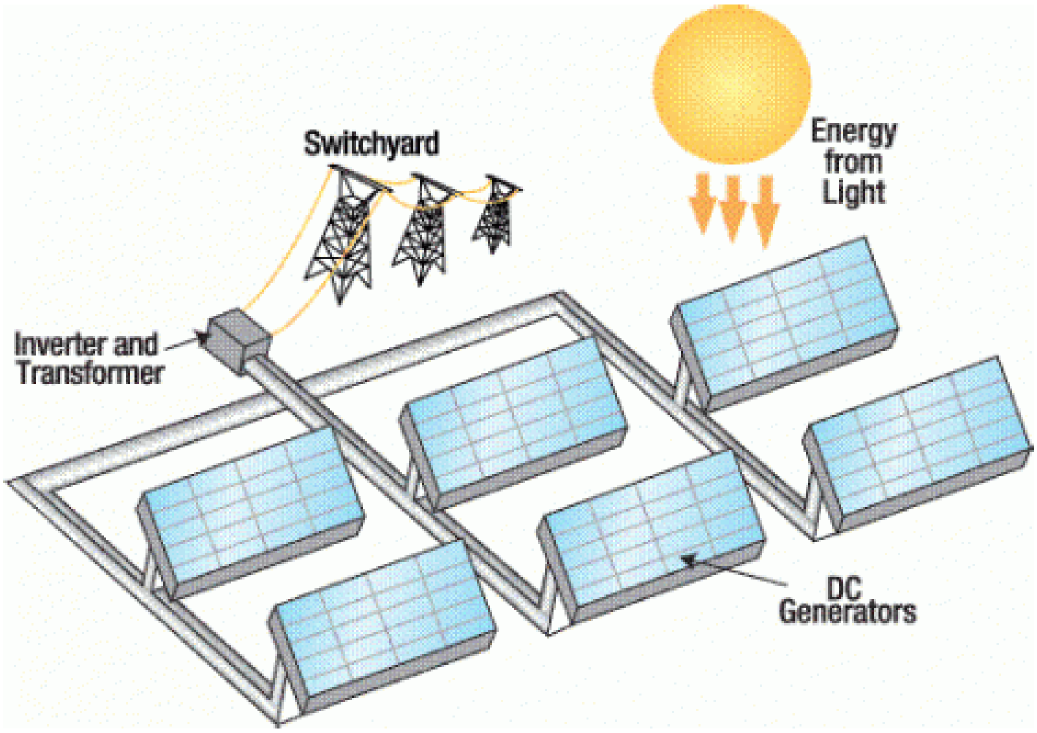


Figure 7-2: Simplified Photovoltaic Power Generation Flow Diagram (Source: www.holbert.faculty.asu.edu)

CONCENTRATED SOLAR POWER

The minimum Direct Normal Radiation (DNR) to justify a CSP plant is 1 800 kWh/m^2 per year. According to the South African Renewable Resource Database (RRDB), the area exceeding the minimum required DNR in South Africa covers approximately 194 000km^2. The 2003 Renewable Energy White Paper calculates that South Africa may have a CSP potential of some 65GW, capable of providing 36 000 GWh/year.

Concentrated solar power (also called concentrating solar power, concentrated solar thermal or CSP) systems use mirrors or lenses to concentrate a large area of sunlight, or solar thermal energy, onto a small area. Electrical power is produced when the concentrated light is converted to heat which is used to produce steam, which drives a heat engine, usually a steam turbine, connected to an electrical power generator.

The process of energy conversion in a CSP plant is illustrated in **Figure 7-3**. Since a thermal intermediary is always involved, a conventional steam power turbine generator can be coupled for power generation. Energy storage is possible usually in thermal form (e.g. steam, molten salt).

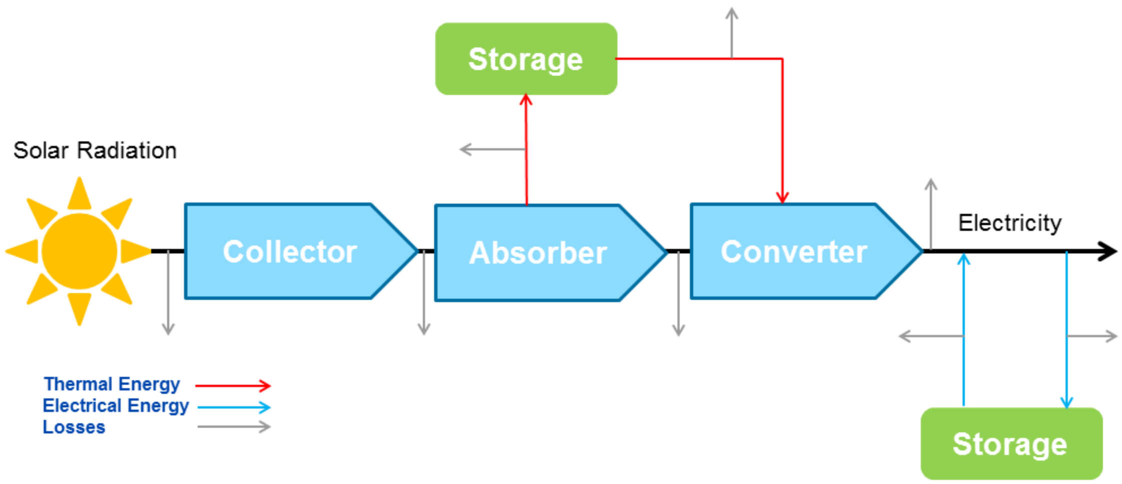


Figure 7-3: Process of Energy Conversion in a CSP Plant

CSP technologies can be categorised by two concentrating methods according to the receiver types - where sunrays are reflected to a line receiver as in parabolic trough (parabolic trough technology) or to a point as in central receiver (central receiver/tower technology).

PARABOLIC TROUGH TECHNOLOGY

In parabolic trough technology, glass mirrors are shaped into the curved parabolic reflectors (troughs) (**Figure 7-4**). Parabolic troughs are usually designed to track the sun along one axis. An absorber tube containing a thermal heat transfer fluid (HTF) is situated along the focal line of the parabolic trough (**Figure 7-5**).

The configuration of a parabolic trough CSP plant with storage is shown in **Figure 7-6** as an example. The HTF is heated to approximately 390°C in the solar field and then circulated through a series of heat exchangers to produce steam (e.g.: 100 bar in Andasol-1, 50 MW, Spain). The steam is converted to electrical energy in the power block, which consists of a conventional steam turbine generator and its associated cooling mechanism.

Figure 7-4: Parabolic Trough (Source: WSP | Parsons Brinckerhoff)

Figure 7-5: Parabolic Trough Absorber Tube (Source: WSP | Parsons Brinckerhoff)

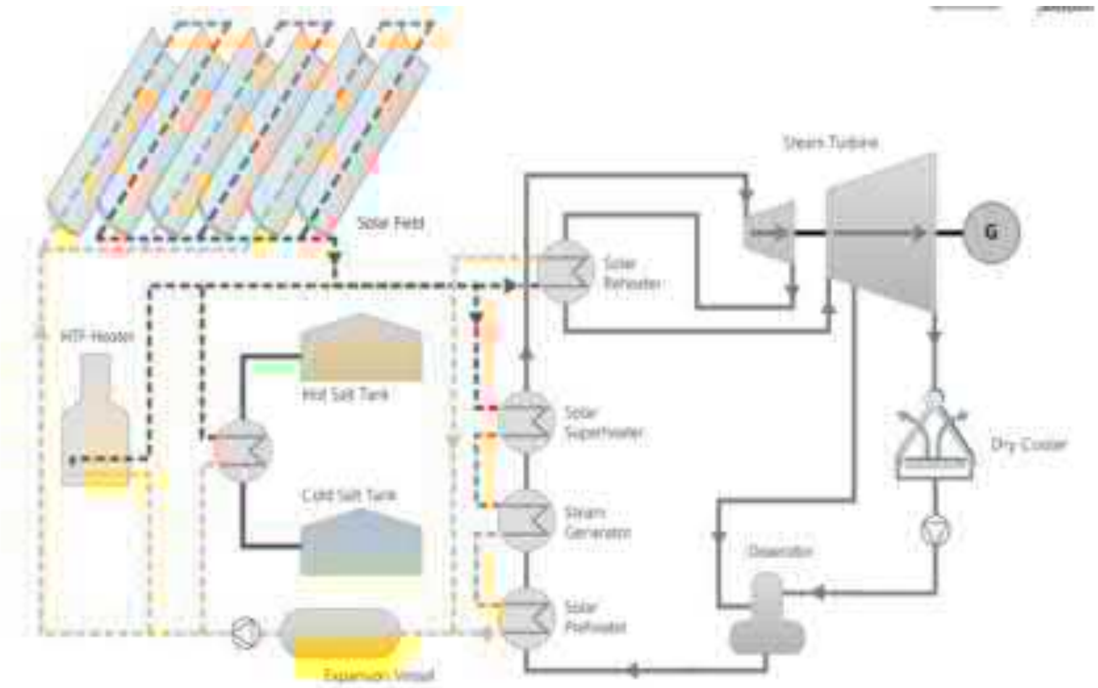


Figure 7-6: Flow Diagram for a Parabolic Trough CSP Facility (Source: www.solarcellcentral.com)

CENTRAL RECEIVER/TOWER TECHNOLOGY

In central receiver technology, sun-tracking mirrors called heliostats (glass mirrors) (**Figure 7-7**) are mounted on a dual-tracking axis which reflects the sunlight to the central receiver (**Figure 7-8**). Heliostats are typically arranged in an elliptical formation around the focal point with the majority of the reflective area focussed to the more effective side of the heliostat field (**Figure 7-9**). Other arrangements are also possible, with rectangular groups of mirrors focused on to a number of smaller central receivers in a modular formation.

In central receiver technology the central receiver is situated on the top of the central tower. This receiver is a heat exchanger which absorbs the concentrated beam radiation, converts it to heat and transfers the heat typically to a HTF which may be thermal oil or molten salt. This is in turn used to generate steam for conventional power generation. **Figure 7-10** provides a flow diagram of the central receiver CSP power generation process (with storage) as an example.

Figure 7-7: Heliostat

Figure 7-8: Central Receiver (Source: www.torresolarenergy.com)

Figure 7-9: Elliptical formation of the Central Tower Solar Field (Source: www.finetubes.co.uk)

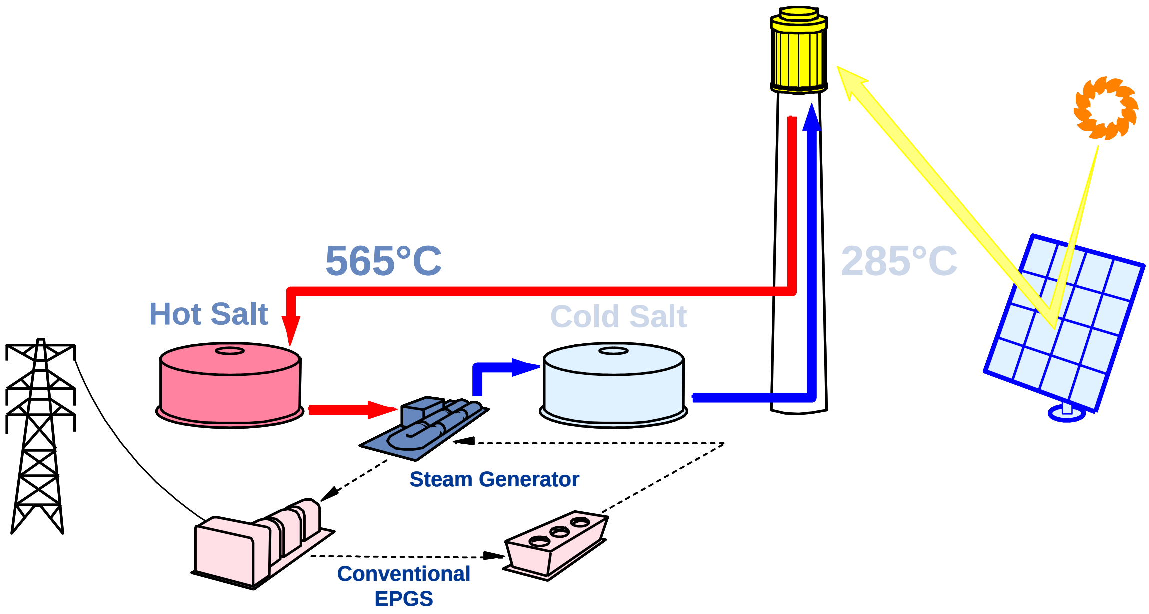


Figure 7-10: Flow Diagram showing the power generation process in a Central Tower CSP facility (Source: www.solarnovus.com)

7.2 PROJECT INFRASTRUCTURE

Letsoai CSP 1 will comprise of central receiver/tower CSP technology with a generating capacity of up to 150MW. A summary of the details of the facility and its associated infrastructure is included in **Table 7-1**.

Table 7-1: Details of the Proposed Central Tower CSP Facility and the Associated Infrastructure

INFRASTRUCTURE	DETAILS / DIMENSIONS
Technology	CSP – Central Tower
Generation capacity	150MW
Tower	200 – 250 m high power tower with a central receiver located on the top of a concrete tower.
Power Generation Facility	→ Steam turbine and generator → Auxiliary fossil fuel boilers → Air cooler condenser → Hot and cold molten salt storage tanks
Number of Heliostats	The number of heliostats is still to be confirmed. However, the number of heliostats is anticipated to be between 10 000 and 15 000. The Heliostats will be two-axis mirrors.
Area occupied by each Heliostats	Typically between 12 to 15m^2 per heliostat
Dimensions of Heliostats	Typically, the heliostat is 15m high with a 12 x 12m mirror assembly. It must be noted that this is dependent on the manufacturer
Collector / Receiver Height	Typically between 200-250m

Area of preferred Solar Field	Typically 930Ha
Foundation specifications and dimensions	Concrete.
Footprint of Operations and Maintenance building(s)	Approximately 225m^2
Area of preferred construction laydown area	To be confirmed based on the facility concept layout
Temporary and permanent laydown area dimensions	→ Temporary laydown of 5Ha → Permanent laydown for the containers will be required for the storage of spares, which is to be located close to the Operations and Maintenance building
Cement Batching Plant	Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The actual mixing of the concrete will take place in the concrete truck. The footprint of the plant will be in the order of 0.25ha. The maximum height of the cement silo will be 20m. This will be a temporary structure during construction.
Access Road	An existing road currently provides access to the site off the N14. It is proposed that this road may be upgraded
Width of internal roads	Approximately 5m
Length of internal roads	To be confirmed based on the facility concept layout
Type and height of fencing	Galvanized steel type at approximately 2m high
Water Supply and Treatment	→ Water supply pipeline → Water treatment plant → Raw water storage reservoir / tanks → Evaporation ponds
Sewage	Septic tanks (with portable toilets during the construction phase)
Power Evacuation	
Specifications of Onsite Switching Stations, Transformers, Onsite Cables etc	There will be an onsite substation connected to the facility power island which is comprised of the steam turbine generator transformer. The power-island will be linked to the onsite substation using suitable underground cables (except where a technical assessment suggest that overhead lines are applicable).
Footprint of Onsite Substation	Substation will occupy a footprint area of approximately 2.25ha
On-site Substation Capacity	Up to 132 kV
Capacity of powerlines between Onsite Substation and Common Substation	132kV
Width of the Powerline Servitude (132kV) between Onsite Substation and Common Substation	31-36 m

Powerline Tower Types and Height (between Onsite Substation and Common Substation)	Tower (suspension / strain) / Steel monopole structure, which may be self-support or guyed suspension.
List of Additional Infrastructure to be Built	→ Access roads and internal roads. → Administration, staff accommodation, control, workshops, water treatment plant and warehouse buildings

7.3 PROPOSED PROJECT DEVELOPMENT ACTIVITIES

DESIGN AND PLANNING PHASE

The main activities during the design and planning phase of Letsoai CSP 1 will include the following:

- Undertaking the EIA and obtaining EA.
- Undertaking of water availability study.
- Conducting a geotechnical survey to identify any geological and topographical constraints that may affect foundation requirements. In addition to this, the survey will also highlight the availability of onsite construction materials.
- Prior to the finalisation of the design layout (including the solar array and associated infrastructure) a final site survey will be undertaken. The final layout will also take into consideration any environmental sensitivity identified during the EIA phase as well as any specific conditions outlined in the EA (once received).

CONSTRUCTION PHASE

The main activities during the construction phase of the CSP facility will include the following:

- **Establishment of an access road to the site** – The CSP site will accessed along an existing road that connects to the N14. This road may require widening to ensure that it is suitable for use. At this stage it is proposed that the road will remain unsurfaced.
- **Establishment of internal access roads** – Internal access roads will be constructed onsite. These roads will be between 4 and 6 m in width. The length of these roads will be determined once the design layouts have been finalised. Currently it is proposed that the internal access roads will be unsurfaced and will remain for use during the operational phase.
- **Site preparation** – Site preparation includes the clearance of vegetation and any bulk earthworks that may be required.
- **Transport of components and equipment to site** – All construction material, machinery and equipment (i.e. graders, excavators, trucks, cement mixers, lifting equipment and cranes etc.) will be transported to site utilising the national, regional and local road network. Some of the larger components may be defined as abnormal loads in terms of the Road Traffic Act (No. 29 of 1989). In such cases a permit may be required for the transportation of these loads on public roads.
- **Establishment of a laydown and assembly area on site** – Construction materials, machinery and equipment will be kept at relevant laydown and/or storage areas. A 5ha laydown area has been proposed for this project. The laydown area will also be utilised for mirror assembly. The laydown area will limit potential environmental impacts associated with the construction phase by limiting the extent of the activities to one designated area.
- **Construction of the central tower and power island** – The central receiver will be located at the top of a 200 – 250m high concrete tower. The power island includes the steam turbine and generator.

- **Construction of substation, inverters and internal powerlines** – The facility output voltage will be stepped up from medium voltage to high voltage in the transformer. The medium voltage cables will be run underground in the facility (except where a technical assessment suggest that overhead lines are applicable) to an onsite substation before being evacuated by 132kV powerlines to the common substation.
- **Establishment of ancillary infrastructure** – Ancillary infrastructure will include the water abstraction point and supply pipeline, water treatment plant and water storage facilities (including both raw water dams and evaporation ponds for wastewater from the generation process), heliostat assembly plant, storage areas, control room, office buildings, chemical storage area, security gate and buildings, and critical staff accommodation.
- **Construction water requirements** – The CSP project will require water for dust suppression, concrete batching and potable water during the construction phase. Approximately 385m^3 per day will be required during the construction phase. It is understood that this water will be available from Sedibeng Water.
- **Construction of water treatment facilities** – A water treatment works will be required together with blow down brine handling. The water treatment works will include a primary treatment plant at the supply source as well as a packaged water treatment plant at the site. The source of operational water supply has not yet been identified, however, a number of alternatives are being investigated.
- **Storage and handling of hazardous substances** – the construction phase will require the handling and storage of hazardous substances including hydraulic oil, fuels, cement and fly ash.
- **Undertake site rehabilitation** – The site will be rehabilitated once the construction phase is complete and all construction equipment and machinery have been removed from site.

OPERATIONAL PHASE

Letsoai CSP 1 is anticipated to have a minimum life of 20 years. It will operate 7 days a week. Maintenance and monitoring activities will be required on site.

Approximately 550m^3 per day will be required during the operational phase. Water use will include:

- Makeup water for the steam generator;
- Water for mirror washing;
- Service water;
- Potable water; and
- Fire protection water.

In order to reduce the overall water consumption and the requisite sizing of the evaporation ponds, service water will first be used as makeup. Water conditioning chemicals may be fed into the makeup water to minimise corrosion and to inhibit mineral scale formation. The blow down from the circulating water will be continually treated by lime-softening clarification and filtration processes and then delivered to a clear well where the water will be treated prior to being used for other plant requirements.

The operational phase will also require the handling and storage of hazardous substances including water treatment chemicals, fuels and oils and molten salts.

DE-COMMISSIONING PHASE

Following the initial 20-year operational period of Letsoai CSP 1, its continued economic viability will be investigated. If it is still deemed viable its life may be extended; if not it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, reused and recycled or disposed. The site will be returned to its current use i.e. agriculture (grazing).

7.4 PROJECT ALTERNATIVES

In terms of the EIA Regulations, feasible alternatives are required to be considered within the scoping study. All identified, feasible alternatives are required to be evaluated in terms of social, biophysical, economic and technical factors.

A key challenge of the EIA process is the consideration of alternatives. Most guidelines use terms such as ‘reasonable’, ‘practicable’, ‘feasible’ or ‘viable’ to define the range of alternatives that should be considered. Essentially there are two types of alternatives:

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

Fundamentally different alternatives are usually assessed at a strategic level, and EIA practitioners recognise the limitations of project-specific EIAs to address fundamentally different alternatives. Any discussions around this topic have been addressed as part of the Integrated Strategic Electricity Plan (ISEP) undertaken by Eskom, as well as the National Integrated Resource Plan (NIRP) from the National Energy Regulator of South Africa (NERSA). Environmental issues are integrated into the ISEP and the NIRP using the strategic environmental assessment approach, focussing on environmental life-cycle assessments, site-specific studies, water-related issues and climate change considerations.

SITE ALTERNATIVES

DEVELOPMENT AREA SELECTION

The selection of a potential solar project development area includes several key aspects including environmental, solar resource, grid connection suitability as well as competition, topography and access as shown in the process flow diagram in **Figure 7-11**.

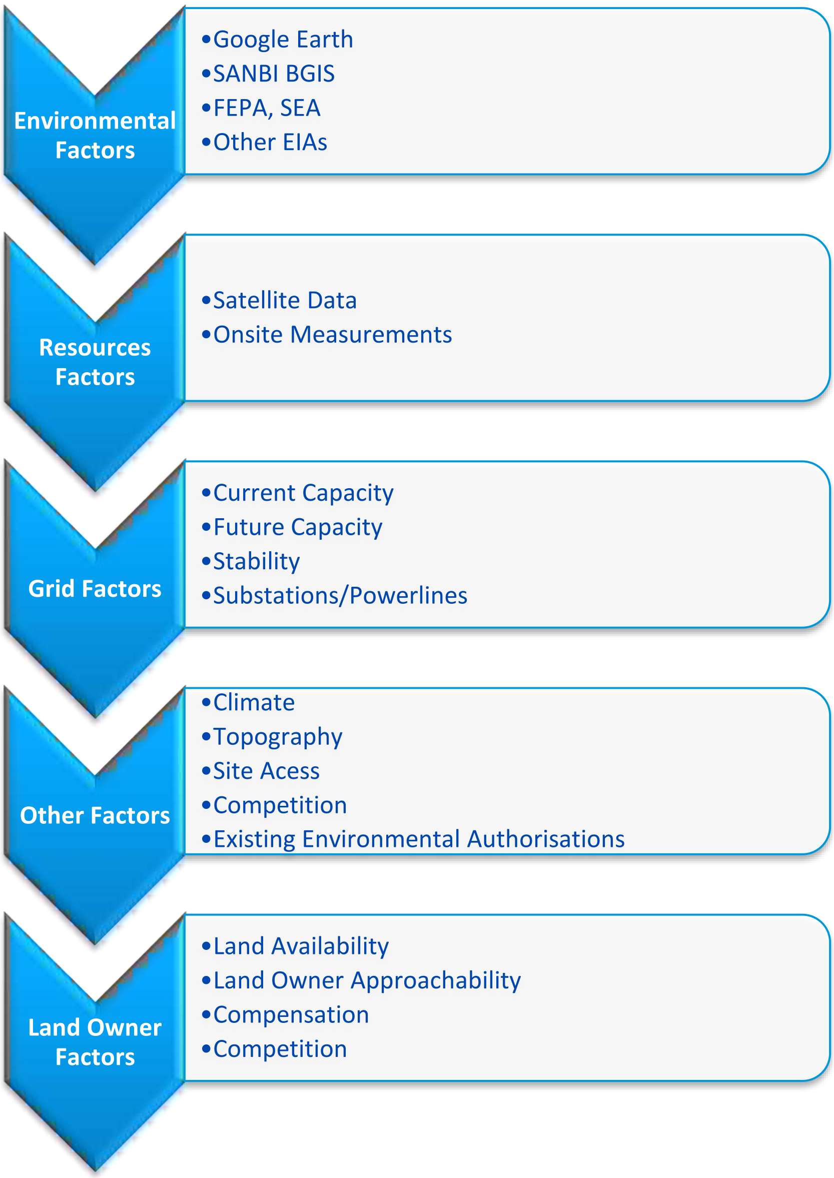


Figure 7-11: Site Selection Process Flow Diagram

ENVIRONMENT

The environment is a key aspect that BioTherm considered when evaluating this potential solar project. The project should be developed in a sustainable and ecologically friendly manner ensuring that its development has the least possible impact on the land on which it will be built. The regional farms were evaluated by BioTherm before the selection of this specific farm and it was concluded that the development on Farm Hartebeest Vlei 86 would result in the least impact of regional fauna and flora. Farms to the north have larger mountainous regions which are deemed sensitive, and other farms show increased vegetation.

SOLAR RESOURCE

The solar resource is one of the main drivers of project viability. This project development area has been identified by BioTherm through a pre-feasibility desktop analysis based on the estimation of the solar energy resource as well as weather, dust and dirt effects. The Northern Cape Province in

South Africa has the highest solar irradiation potential. The project development area receives an annual global horizontal irradiation of approximately 2348 kWh/m^2/year and an annual direct normal irradiation of approximately 3042 kWh/m^2/year suitable for solar CSP. This high resource ensures the best value for money is gained for the economy of South Africa. The general area would experience a similar resource, but as resource is only one driver of site selection, the other aspects should be considered when holistically evaluating a project.

GRID CONNECTION SUITABILITY

Long connection lines have the potential to cause greater environmental impacts, as well as add increased costs to the project development. This project site has good grid connection potential as the project will connect to the existing Aggeneis MTS Substation located approximately 10km from the site, thereby minimising the need for an extensive grid network upgrade or long powerline. In addition, it was identified that there are existing powerline servitudes in close proximity to the site.

TOPOGRAPHY, THE NEIGHBOURING COMPETITION AND ACCESS

The development area has a relatively flat topography which is suitable for the development of Letsoai CSP 1. The project has also been located away from the regional view sheds and mountainous regions where it is expected the environmental and visual impacts would be greater

The region does have several ongoing renewable EIA developments; however only one 40MW PV project has been selected as a preferred bidder in the region, thus currently there is limited impact of additional projects.

The project development area can be accessed easily via the tarred N14 national road which lies approximately 10km from the project development area. There is an existing gravel road which can be used for direct access to the project development area.

LAND AVAILABILITY

With the high solar resources in the area and good grid connection this area has been targeted for development from Developer for several years. This has resulted in large tracks of land being signed up and hence being unavailable for development. This results in limited land available for development. BioTherm, however, though speaking with local land owners identified parcels of land suitable for development.

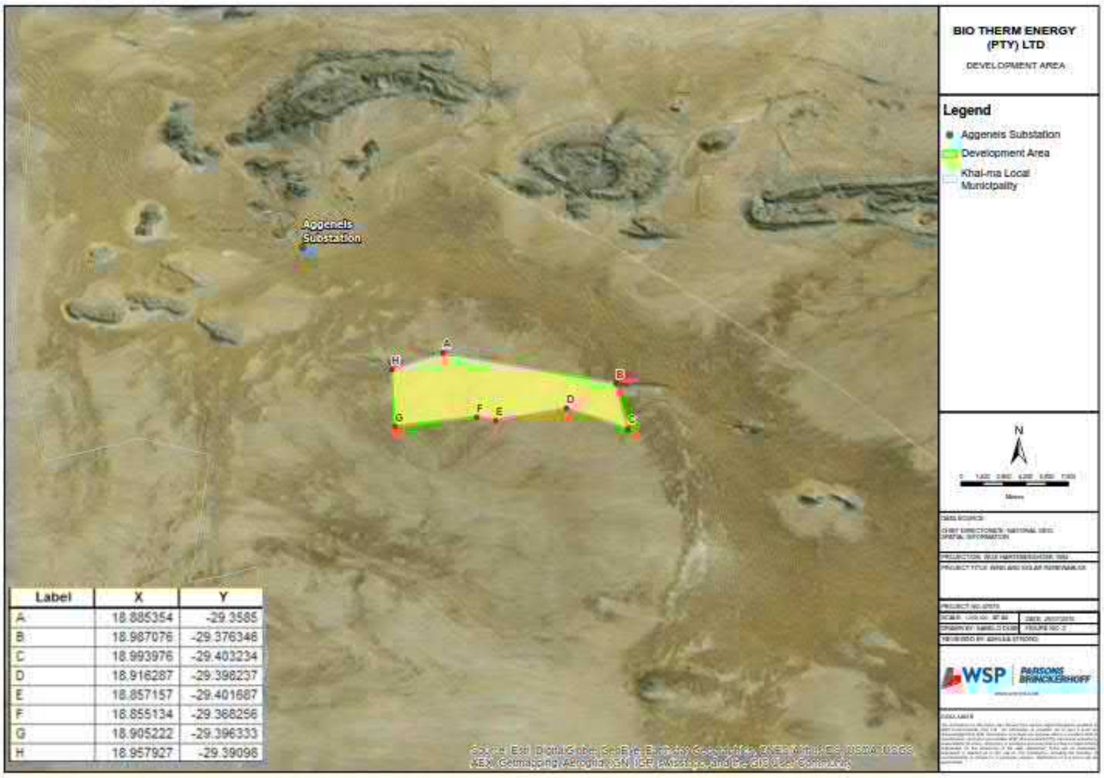
STRATEGIC PLANNING CONSIDERATIONS

The project development area, including Letsoai CSP 1, falls within the Springbok Wind REDZ (**Figure 7-12**). The project development area is also located within a renewable energy hub that has developed in the Aggeneys area.

This project development area was selected based on the above criteria ahead of other regional farms due to the cumulative assessment of all criteria. This internal process ensured that the best practical / technically suitable environmental site option was selected.

Figure 7-13 illustrates the project development area identified through the process described above.

Figure 7-12: Location of the Proposed Site in relation to the Springbok Wind REDZ



Label	X	Y
A	18.885354	-29.3585
B	18.987076	-29.376346
C	18.993976	-29.403234
D	18.916287	-29.398237
E	18.857157	-29.401687
F	18.855134	-29.368256
G	18.905222	-29.396333
H	18.957927	-29.39098

Figure 7-13: Identified Development Area

SITE SELECTION

Letsoai CSP 1 is situated within the project development area, which was subjected to the high level site selection process already described. The assessment criteria are homogenous throughout the project development area, therefore the assessment of site alternatives within the project development area was not deemed necessary. The major advantages and disadvantages of the site selected for Letsoai CSP 1 are provided in **Table 7-2.**

Table 7-3 provides details of a high-level investigation undertaken by BioTherm in terms of possible alternative sites. This table provides further motivation as to why no reasonable or feasible alternatives exist.

This EIR only investigates the identified Letsoai CSP 1 site.

Table 7-2: Advantages and Disadvantage of the Letsoai CSP 1 Site Location

ADVANTAGES	DISADVANTAGES
→ The project development area receives an annual global horizontal irradiation of approximately 2348 kWh/m2/year and an annual direct normal irradiation of approximately 3042 kWh/m2/year suitable for solar CSP. → Farm Hartebeest Vlei 86 would result in the least impact of regional fauna and flora. Farms to the north have larger mountainous regions which are deemed sensitive, and other farms show increased vegetation. → This project site has good grid connection potential as the project will connect to the existing Aggeneis MTS Substation located approximately 10km from the site. → The project development area has a relatively flat topography which is suitable for the development of Letsoai CSP 1. → The project development area can be accessed easily via the tarred N14 national road which lies approximately 10km from the project development area. → The project development area is located within the Springbok Wind REDZ. → The site is approximately 16 km from the relevant Sedibeng Water Reservoirs which are a confirmed source of water.	→ Connection to the N14 will require permission from the South African National Roads Agency. → The site is approximately 60 km from the orange river which is a potential source of water.

Table 7-3: High-level Investigation of Alternative Sites

PROJECT NAME	LOCATION	PROVINCE	RESOURCE	CAPACITY	HECTARES	FEASIBILITY FATAL FLAWS IDENTIFIED
Kathu	Kathu	Northern Cape	2256	3 x 75MW	12 000	Site was excluded due to environmental sensitivity.
Virginia	Virginia	Free State	2149	3 x 75MW	5 000	No grid capacity on 132kV for loop -in loop-out configuration in order to

						connect the facilities to the grid. Grid costs too high to connect facility.
Bloemfontein	Bloemfontein	Free State	2166	3 x 75MW	7 000	Site excluded from a land perspective due to the number of landowners to sign up.
Viljoenskroon	Viljoenskroon	Free State	2109	3 x 75MW	3 000	Resource too low Grid connection cost too high.
Petrusville	Petrusville	Free State	2197	3 x 75MW	5 000	Site located 50km from closest grid connection point and thus the grid connection cost will be too high.
Kimberly	Kimberly	Free State	2108	3 x 75MW	5 000	Lease not extended due to low resource.

TECHNOLOGY ALTERNATIVES

SOLAR POWER GENERATION ALTERNATIVES

Section 3.2 above provided a description of the main solar generating technologies i.e. PV and CSP (including parabolic trough and central receiver) technologies. The technology identified for this project is CSP. The major advantages and disadvantages of the two main CSP technologies are provided in **Table 7-4**.

Table 7-4: Advantages and Disadvantages of CSP Technologies

TECHNOLOGY	ADVANTAGES	DISADVANTAGES
CSP: **Parabolic Trough**	→ It is the most proven CSP technology; → Over 30+ years of operating experience; → Energy storage is feasible and can be added. Therefore, the system could provide energy under cloudy conditions or at night; and → The cost, performance and risk of parabolic trough technology are well established with existing parabolic trough plants around the world	→ Relatively low thermal efficiency; → Requires significant site grading with gradient <3%.
CSP: **Central Receiver**	→ When using tower technology, energy storage could be added. Therefore, the system could provide	→ Central receiver technology needs to proceed from conceptual to demonstration to commercial development. Currently less

	energy, even in cloudy conditions or at night; → Requires minimum site grading (can tolerate gradients >5%); → Energy storage is feasible and can be added; and → The advantage of this design above the parabolic trough design is the higher temperature (up to 550°C compared to 400°C). Thermal energy at higher temperatures can be converted to electricity more efficiently and can be more economically stored for later use.	experience with commercial deployment than trough technology; → Central receiver design is a challenge – specifically in seismic zones.

CSP (central receiver) technology has been identified as the preferred technology and most feasible option for the Letsoai CSP 1 for the following reasons:

- CSP central receiver projects produce heat up to approximately 550℃, whereas parabolic trough projects produce heat up to approximately 400℃ resulting in the central receiver technology being more efficient than the parabolic trough technology.
- Higher temperatures result in the use of more efficient turbines. Higher temperatures also allow for the storage of more energy using the same amount of thermal energy storage media - thus increasing the efficiency of the storage system while reducing capital costs and increasing non-sunlight hours energy production times.
- Space and water usage considerations are similar between the two technologies.
- Although central receiver technology poses a higher risk in terms of impacts to avifauna, the 12-month bird monitoring study has, to date, not identified any high bird sensitivities within this solar development area.
- The topography of the site is less of a constraint for central receiver projects compared to parabolic trough projects which require flatter sites thereby giving tower a greater design and construction flexibility.
- The largest advantage of parabolic trough is its modularity; the plants can be easily increased in size by adding more collectors. However, this advantage is not a consideration for the South African REIPPP Program, as plants allocated under the Program are of a set capacity for the duration of the Power Purchase Agreement (PPA).
- The amount of piping in a central receiver plant is less than that in parabolic trough therefore central receiver projects have lower heat losses.
- The mirrors used in central receiver plants are flat and therefore cheaper than the curved mirrors used in parabolic troughs.
- Central receiver projects can be built at a lower cost than parabolic trough projects and thus will be more competitive for the REIPPP Program.

This EIR only investigates the identified CSP (central receiver) technology.

CSP COOLING ALTERNATIVES

CSP plants are designed to use water for cooling at the back-end of the thermal power generation cycle. There are two cooling alternatives available:

- **Alternative 1 - Dry Cooling**

In this system turbine exhaust steam passes through the heat exchangers (with mechanical draft) forming condensate. Air cooled condensers can reduce the water requirements of a CSP facility considerably. The main advantage of this alternative is that is utilises less water than the wet cooling option.

→ **Alternative 2 - Wet Cooling**

Wet cooling is the most common and economic option usually utilising the conventional cooling tower design. The main disadvantage to wet cooling is that it requires more water than the dry cooling option and also results in significant water losses due to evaporation.

Due to the fact that water is not readily available in the greater study area, the proposed CSP facility will be utilising a dry cooling system. Therefore, no cooling alternative has been assessed.

LAYOUT AND DESIGN ALTERNATIVES

The development area for the proposed site is 1 298ha in extent. The site can adequately accommodate Letsoai CSP 1 with a design capacity of 150 MW.

Figure 7-14 illustrates the environmental sensitivity map developed during the scoping phase. There are no Very-High or High sensitivity areas within the Letsoai CSP 1 site. This information has been utilised to inform the layout and design of the Letsoai CSP 1 project. Three layout and design alternatives have been developed for the Letsoai CSP 1 project. It should be noted that the difference between the layout alternatives is merely the alignment of the internal 132kV powerline that can connect to one of the main substations. The preferred substation will be identified through a separate S&EIR process focussing on the transmission integration of the Letsoai and Enamandla projects to the Aggeneis Substation. **Figure 7-15** illustrates the proposed layouts within the boundaries of the site.

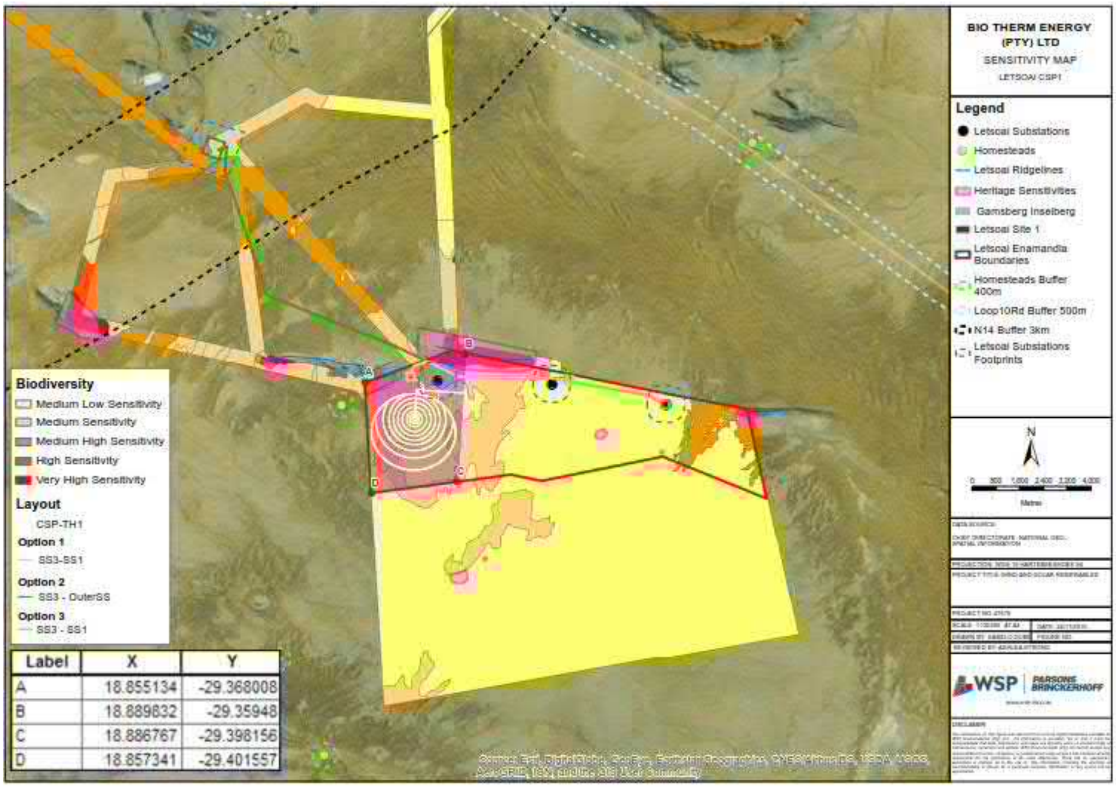


Figure 7-14: Letsoai CSP 1 Sensitivity Map

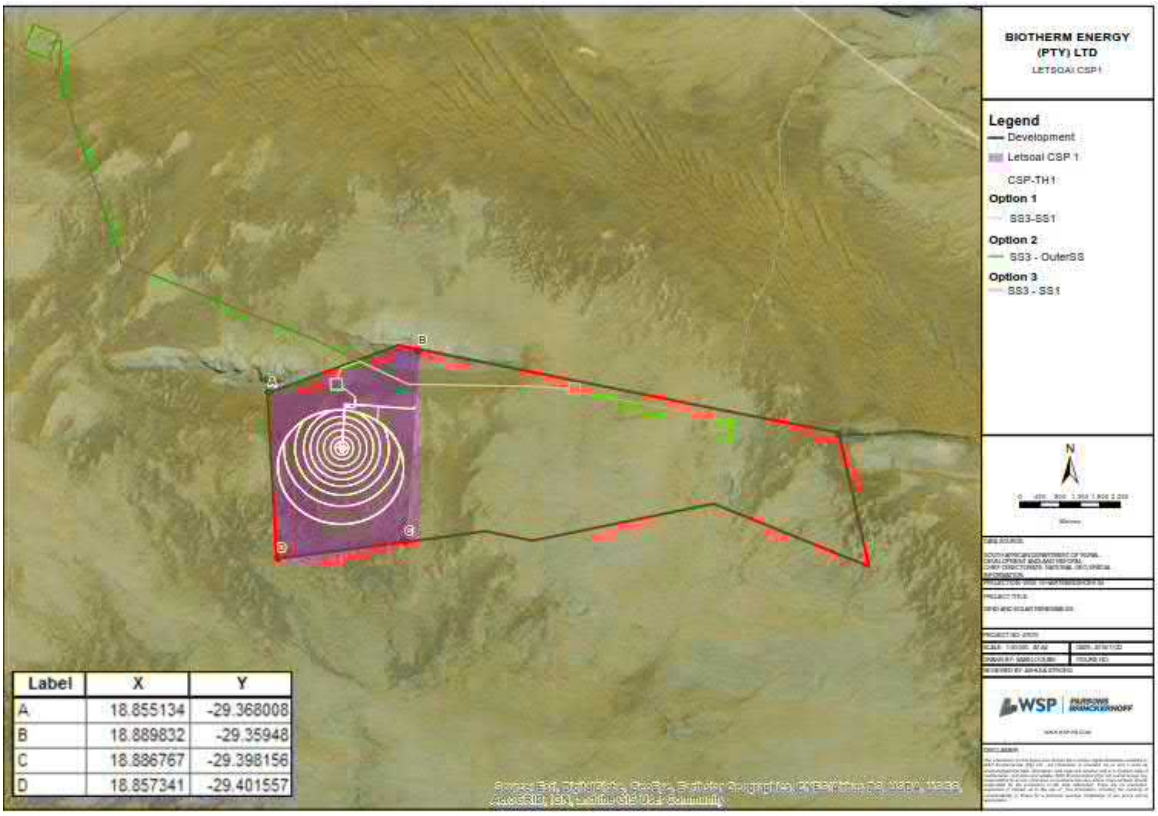


Figure 7-15: Proposed Layout of the Letsoai CSP 1 project (Option 1, 2 and 3)

ACCESS ROAD ALTERNATIVES

MAIN ACCESS ROAD

Appropriate access roads will be constructed to link the proposed site to the existing road network. Two access road alternatives were identified through the scoping process (**Figure 7-16**):

- **Alternative 1** - An existing road connects the N14 to the project area. This road may require widening to ensure that it is suitable for use. At this stage it is proposed that the road will remain unsurfaced. The main advantage of this alternative is that only existing roads will be upgraded and only limited green fields areas will be required.
- **Alternative 2** – Access to the facility could also potentially be obtained via a new 9.5 km road with a direct access off the N14, however due to the fact that the N14 is a National Route an access application will be required to be submitted to the South African National Roads Agency Limited (SANRAL) and/or the Northern Cape Province and would cause additional environmental impact. The main disadvantage of this alternative is that the road would result in the disturbance of green fields areas.

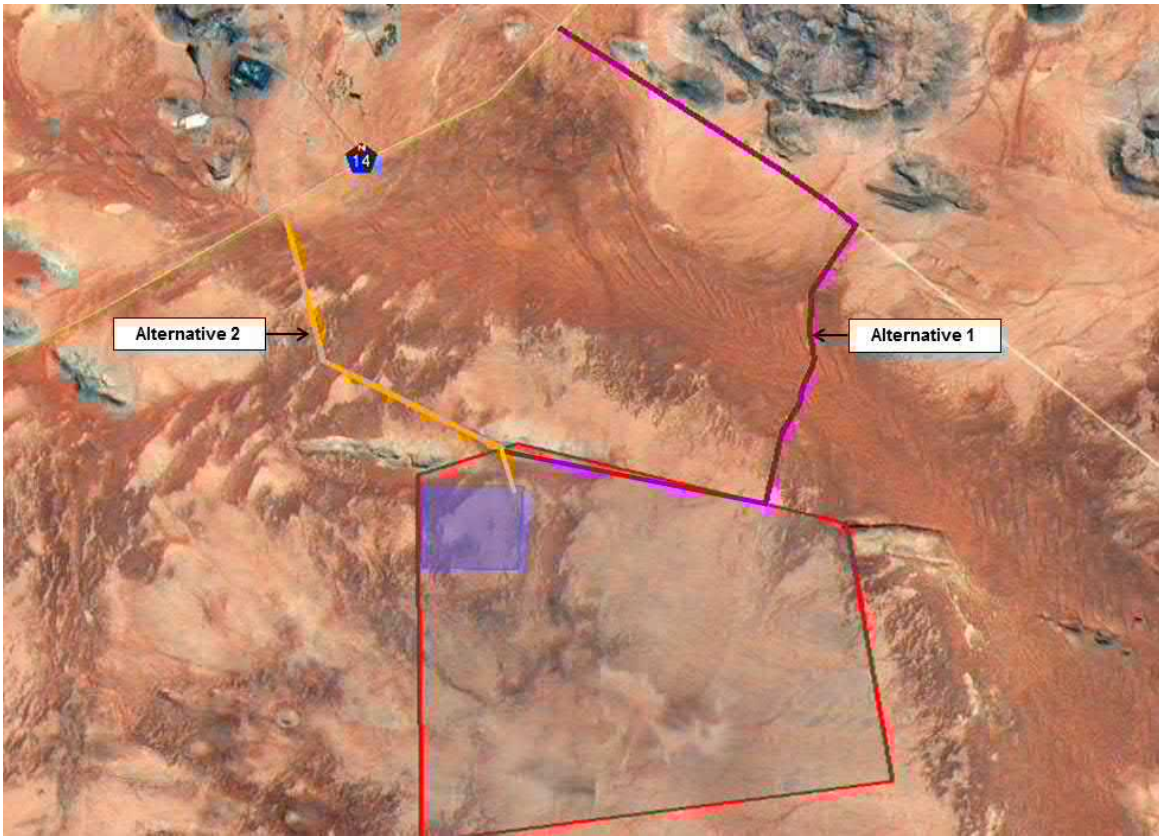


Figure 7-16: Two Alternative Main Access Routes

During the course of the scoping process the EAP received comments from the South African National Roads Agency SOC Limited (SANRAL) with regards to the proposed alternative access roads. SANRAL stated that they are not in favour of creating new accesses on the N14 and would therefore prefer that the existing “Namies Lus 10” access at km 110.2 of the N14/1 is utilised.

INTERNAL ACCESS ROADS

Internal access routes have been included in the layout diagrams included in **Figure 7-15.**

INTERNAL POWER LINE ALTERNATIVES

The power generated by the steam turbine(s) will be evacuated to the national grid via the new 132kV powerlines. These external high voltage (132kV) powerlines will be identified concurrently with the layout and design alternatives. The following 132kV tower structure alternatives are available for the internal powerlines, these will be assessed during the EIA phase:

- Steel / concrete monopole single circuit structure (**Figure 7-17**);
- Steel / concrete monopole double circuit structure (**Figure 7-18**); and
- H-pole structure (usually wooden poles) (**Figure 7-19**).

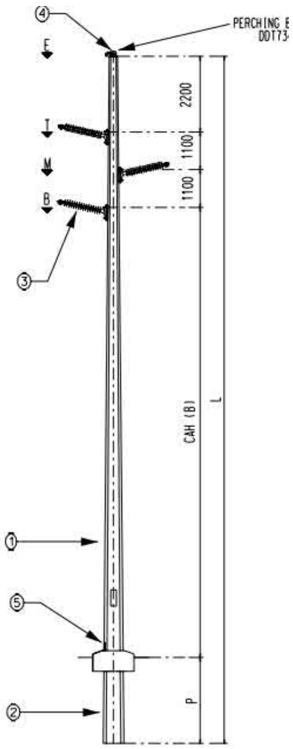


Figure 7-17: Steel / Concrete Monopole Single Circuit Structure

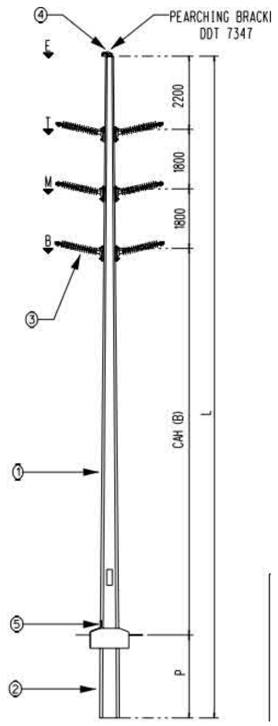


Figure 7-18: Steel / Concrete Monopole Double Circuit Structure

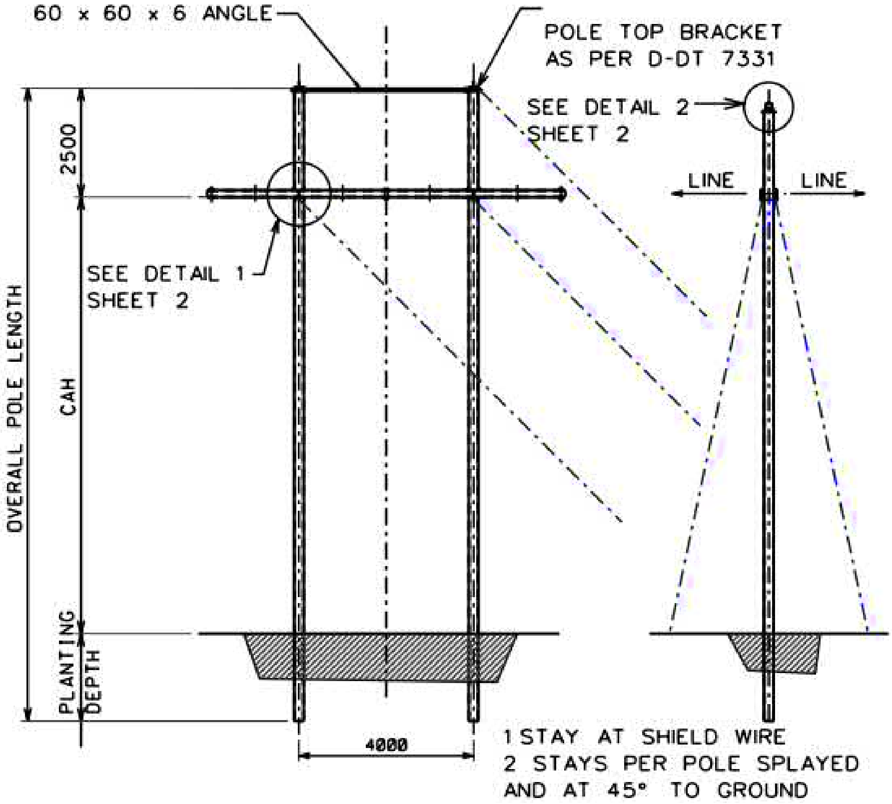


Figure 7-19: H-pole Structure (usually wooden poles)

At the on-site substation, voltage will again be stepped up before being fed to Eskom's Aggeneys Substation. Power will be evacuated by one up to 400kV powerline. Alternative powerline corridors have been identified however; they are being assessed in a separate S&EIR process and will therefore not be included in the scope of this assessment.

There is no preferred alternative with regards to the tower structure utilised for the internal 132kV powerlines due to the fact that none of the proposed structures pose an electrocution risk to the priority avifauna species in the surrounding areas.

WATER SOURCE ALTERNATIVES

In terms of water consumption during the operational phase, approximately 550m^3 of raw water per day will be required. The source of operational water supply has not yet been identified, however, a number of alternatives are being investigated, including:

- **Alternative 1: Supply from Sedibeng Water / Vedanta Mining**

  Currently discussions are underway with Sedibeng as the Water Service Provider for the area, as well as Vedanta Mining. Infrastructure already exists for water supply to the mines and communities in the area. The main advantage of this alternative is that BioTherm has received a letter of approval from Sedibeng Water with regards to water supply for the proposed project. This letter is attached in **Appendix J**.

- **Alternative 2: Abstraction directly from the Orange River**

  The only surface water resource which would be a viable option is the Orange River. The Orange River would be able to supply water at a high assurance of supply, which is necessary for a plant such as this. However, the availably of water and assurance of supply will be affected by the environmental water requirement (EWR), once it has been finalised. The main disadvantage of this alternative is that the EWR has not been finalised as yet and the current water availability for the region is unknown.

WATER SUPPLY PIPELINE ALTERNATIVES

The source of the operational phase water supply has not yet been identified; as such, the initial water supply pipeline alternatives assumed that water will be obtained from the orange river. Due to the outcome of the water availability assessment undertaken during the scoping phase, discussions were initiated with Sedibeng as the Water Service Provider for the area, as well as Vedanta Mining with regards to the potential provision of water for the Letsoai CSP 1 project. As a result, the original corridor alternatives were amended. The revised pipeline alignment alternatives are illustrated in **Figure 7-20**.

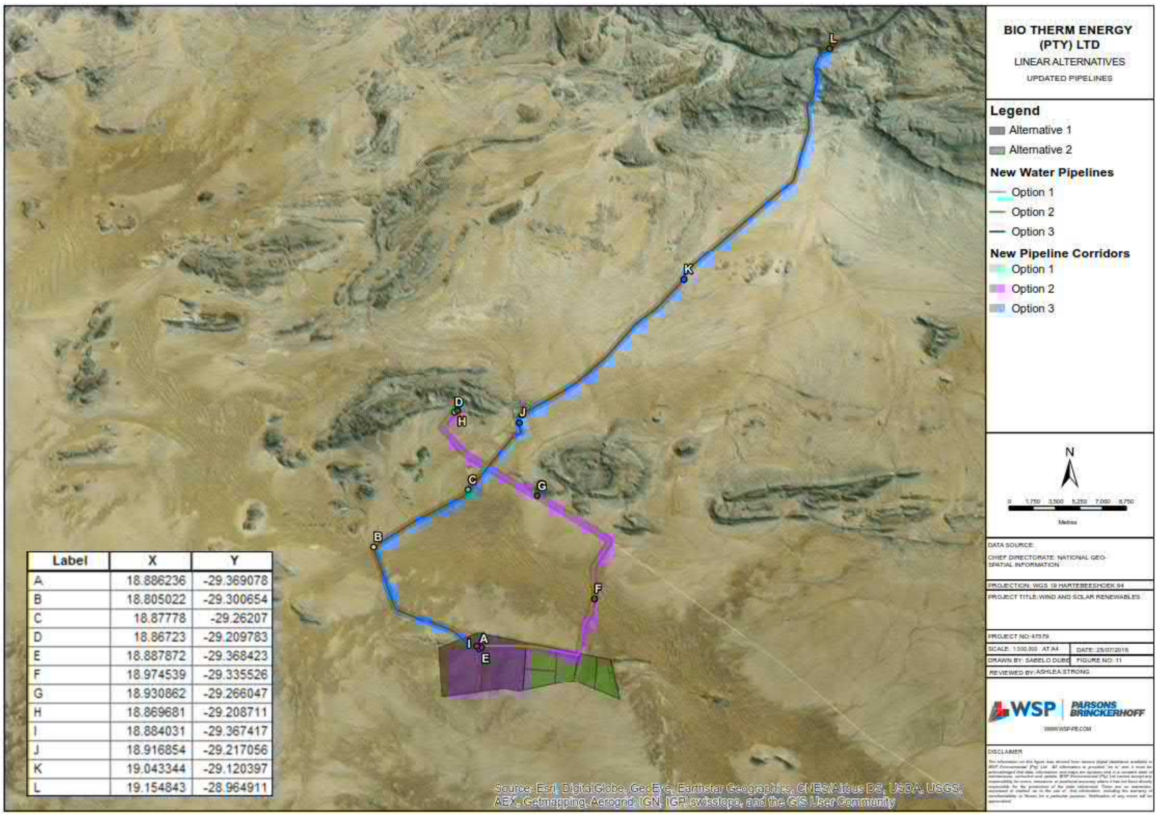


Figure 7-20: Revised Water Supply Pipeline Alternatives

THE "DO-NOTHING" ALTERNATIVE

The 'do-nothing' alternative is the option of not implementing the proposed project.

South Africa currently relies almost completely on fossil fuels as a primary energy source (approximately 90%) with coal providing 75% of the fossil fuel based energy supply. Coal combustion in South Africa is the main contributor to carbon dioxide emissions, which is the main greenhouse gas that has been linked to climate change.

An emphasis has therefore been placed on securing South Africa's future power supply through the diversification of power generation sources. Furthermore, South Africa would have to invest in a power generation mix, and not solely rely on coal-fired power generation, to honour its commitment made under the Copenhagen Accord and to mitigate climate change challenges. Under the Accord, the country committed to reduce its carbon dioxide emissions by 34% below the "business as usual" level by 2020.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports in the country.

Without the implementation of this project, the use of renewable options for power supply will be compromised in the future. This has potentially significant negative impacts on environmental and social well-being.

The no-go option is a feasible option; however, this would prevent BioTherm from contributing to the significant environmental, social and economic benefits associated with the development of the renewables sector (see need and justification of the proposed project in Section 6). Accordingly, the no-go option is not the preferred option.

8 DESCRIPTION OF THE BASELINE ENVIRONMENT

8.1 TOPOGRAPHY

The topography in the study area is flat, gently sloping from about 920masl to 860masl in a north-easterly direction. The surrounding terrain is generally flat with the Aggeneys se Berge and the Gamsberg Inselberg to the north rising to an elevation of about 1140masl. To the south are flat expansive plains. **Figure 8-1** illustrates the elevation profile of the Letsoai CSP 1 Site while **Figure 8-2** shows the elevation profile of the revised water supply pipeline alternatives.

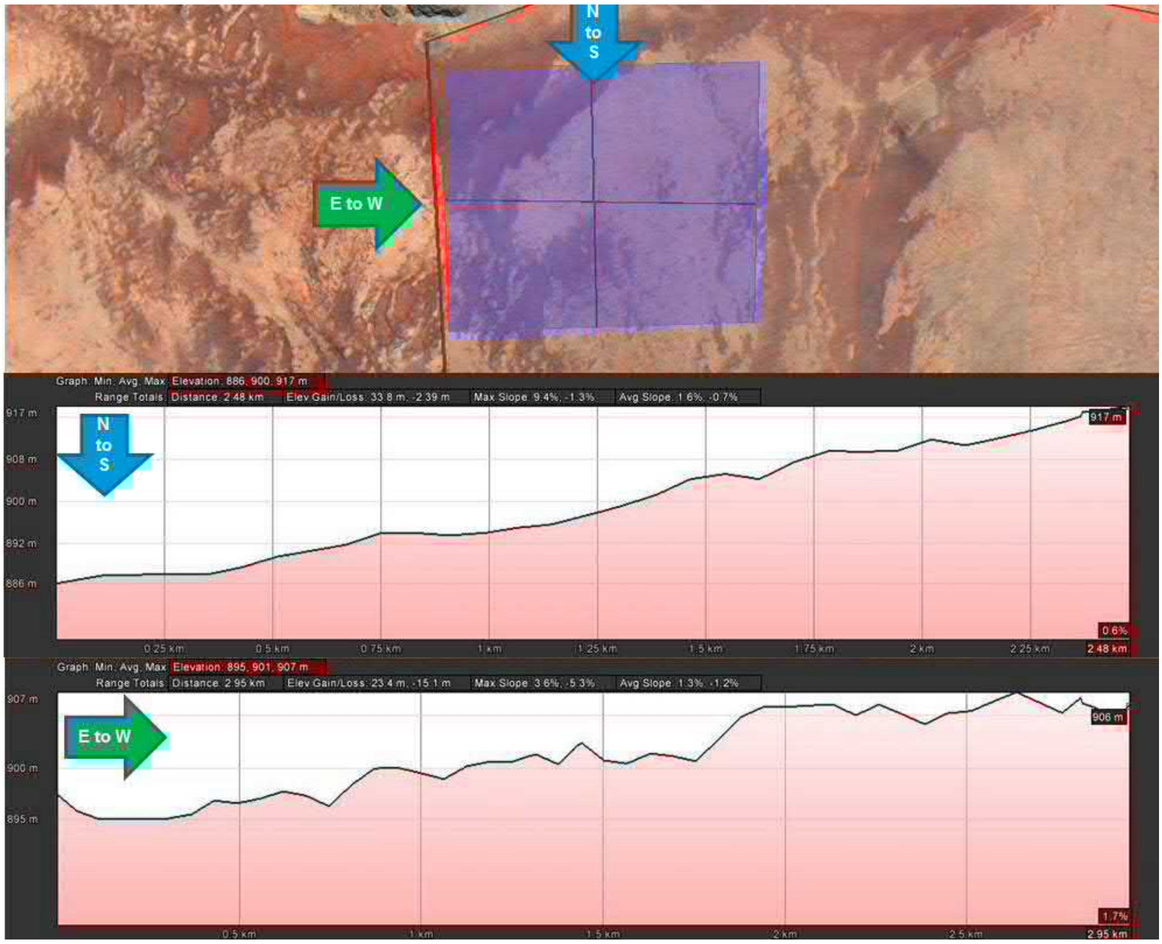


Figure 8-1: Elevation Profile for Letsoai CSP 1

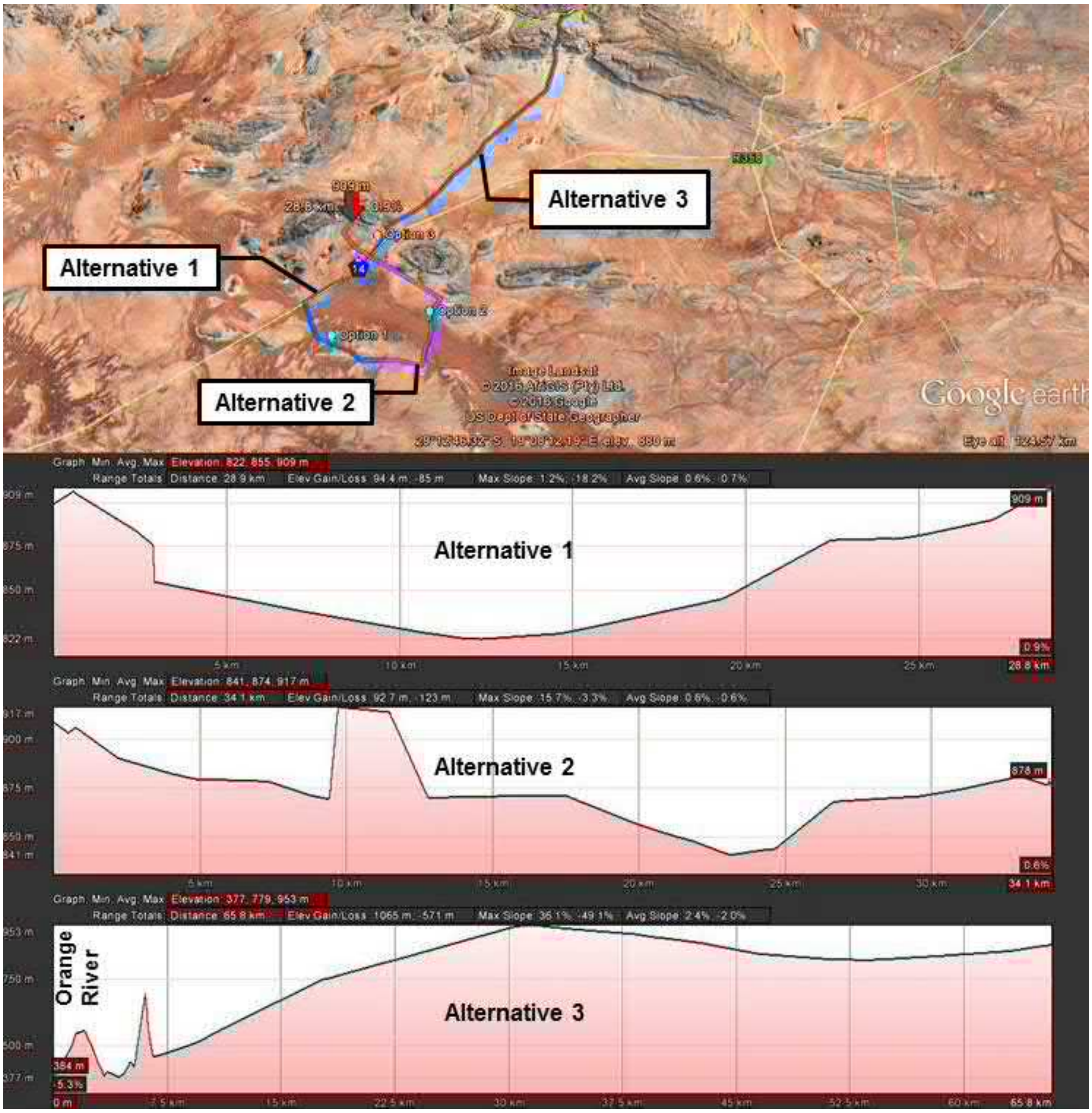


Figure 8-2: Elevation Profile for the Revised Water Supply Pipeline Alternatives 1, 2 and 3

8.2 GEOLOGY

The study area comprises a fairly flat-lying (c. 870 to 920 m amsl), arid area of Bushmanland approximately 20 km southeast of the small town of Aggeneys, Northern Cape. The surface terrain in this region is predominantly sandy to gravelly with low hills and patchy outcrops of basement rocks as well as a number of shallow, ephemeral streams.

The geology of the Aggeneys region is shown on 1: 250 000 geological map 2918 Pofadder (Council for Geoscience, Pretoria) (**Figure 8-3**) (Agenbacht 2007). The scattered basement inliers 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 are assigned to the Namaqua-Natal Province and are approximately one to two billion years old (Cornell et al. 2006, Moen 2007, Agenbacht 2007). The flatter portions of the study area – including those that will be directly affected by the proposed solar energy facility - are underlain by a spectrum of unconsolidated superficial sediments of Late Caenozoic age. These include Quaternary to Recent sands and gravels of probable braided fluvial or sheet wash origin (Q-s2 in **Figure 8-3**), as well as a veneer of downwasted surface gravels and colluval (rocky scree) deposits that are not indicated separately on the geological map. 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 (Q-s1 in **Figure 8-3**). All these superficial sediments can be broadly subsumed into the Late Cretaceous to Recent Kalahari Group, the geology of which is reviewed by Partridge et al. (2006).

An important Caenozoic geological feature in the Aggeneys area is the Koa River Palaeovalley - a defunct south bank tributary of the River Orange of Late Tertiary (Miocene – Pliocene) age that fed into the palaeo-Orange River near Henkries (Malherbe et al. 1986, De Wit 1990, 1993, 1999, De Wit et al. 2000, Partridge et al. 2006). The palaeovalley runs along a SE-NE line just to the northeast of the project area and then turns west across the transmission line project area. It can be readily seen on satellite images where it is marked by intermittent pans and a veneer of orange-brown Kalahari wind-blown sands (arcuate band of yellow Q-s1 on the geological map **Figure 8-3**).

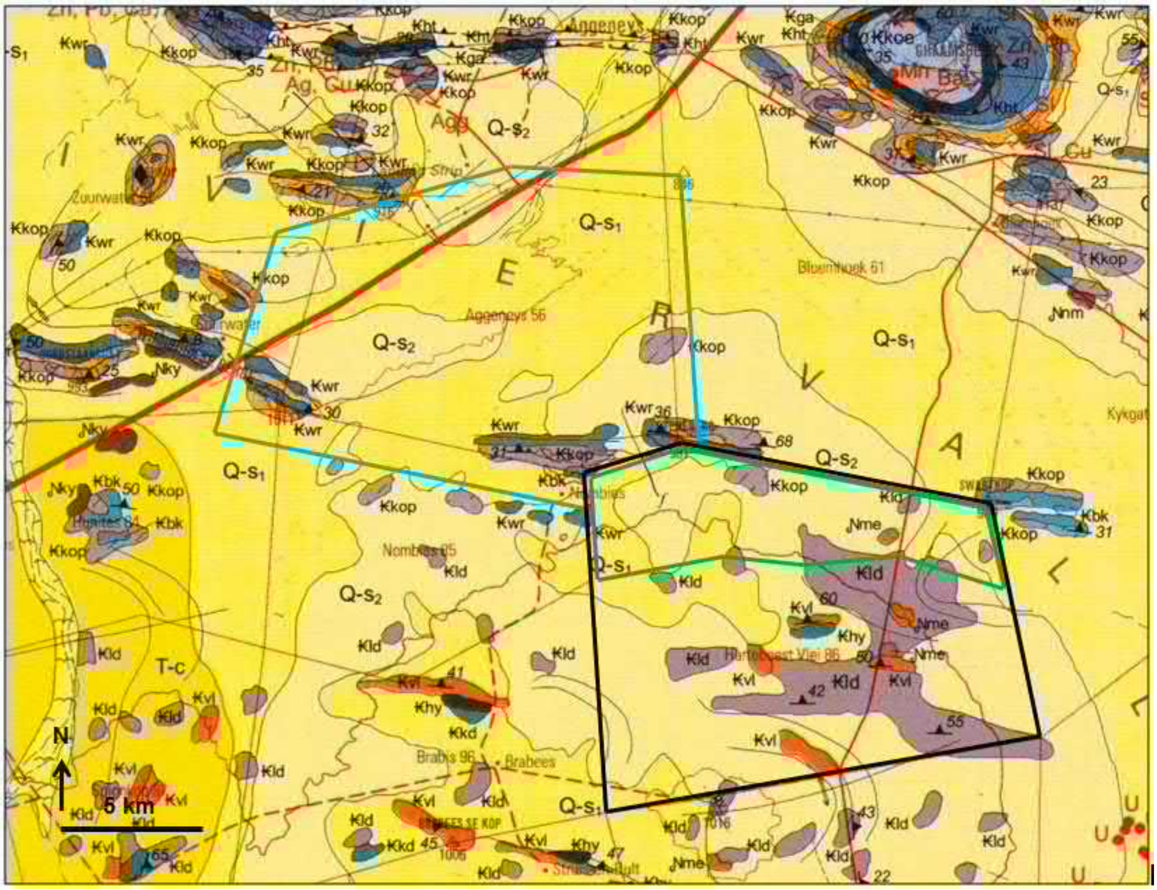


Figure 8-3: Geological Map

8.3 CLIMATE

Aggeneys has an average annual rainfall of around 112mm, with the highest rainfall occurring between January and April. The lowest recorded annual rainfall was in 1992 at approximately 11mm, while the highest recorded rainfall was in 2006, at approximately 220mm.

Average minimum and maximum temperatures in the area are 15°C to 38°C in summer and 0°C to 18°C in winter. The days in the summer are long (sunrise at around 6:00am, sunset close to 8:00pm), and short in the winters (sunrise after 07:30am, sunset before 6:00pm).

Figure 8-4 shows the average temperatures and precipitation for Aggeneys. The "mean daily maximum" (solid red line) shows the maximum temperature of an average day each month of the year. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years.

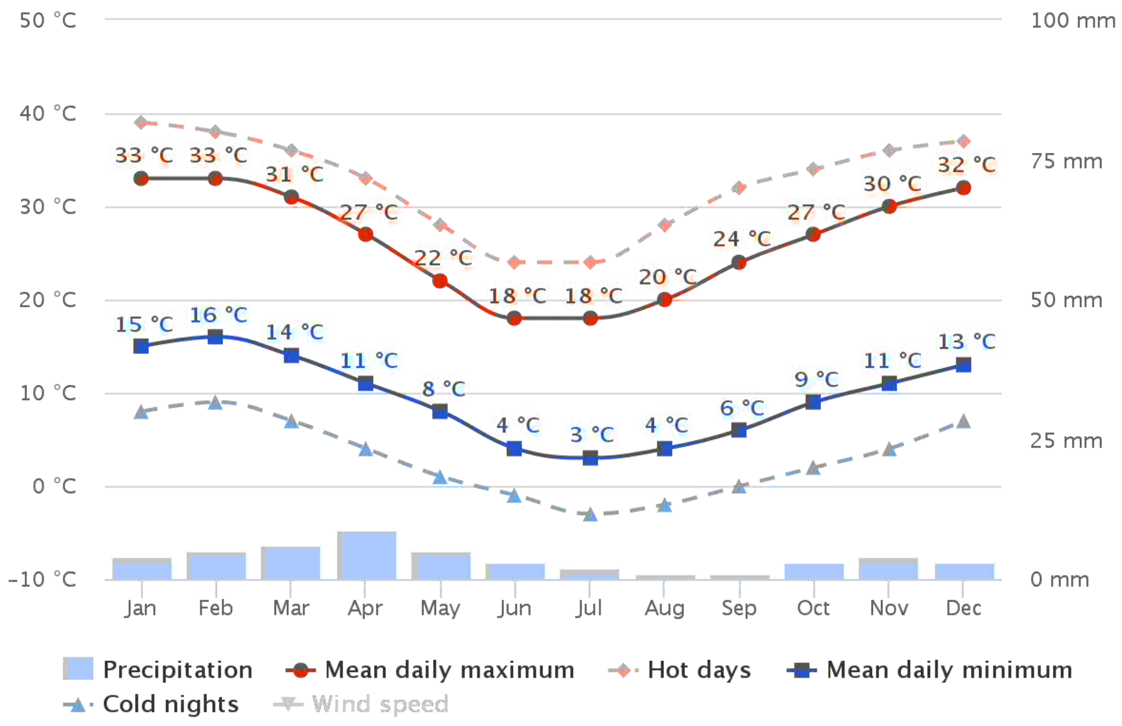


Figure 8-4: Average Temperatures and Precipitation for Aggeneys

Figure 8-5 shows the monthly number of sunny, partly cloudy, overcast and precipitation days. Days with less than 20% cloud cover are considered as sunny, with 20-80% cloud cover as partly cloudy and with more than 80% as overcast.

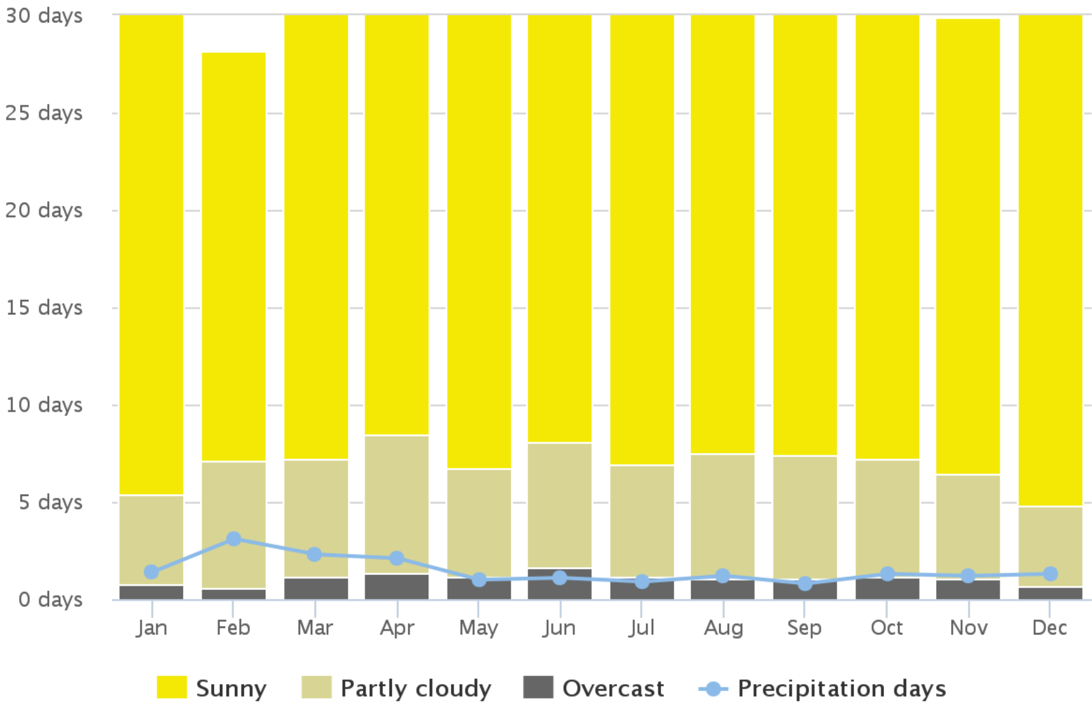


Figure 8-5: The number of Sunny, Partly Cloudy and Overcast Days for Aggeneys

Figure 8-6 shows the maximum temperatures for Aggeneys. The graph displays how many days per month reach certain temperatures.

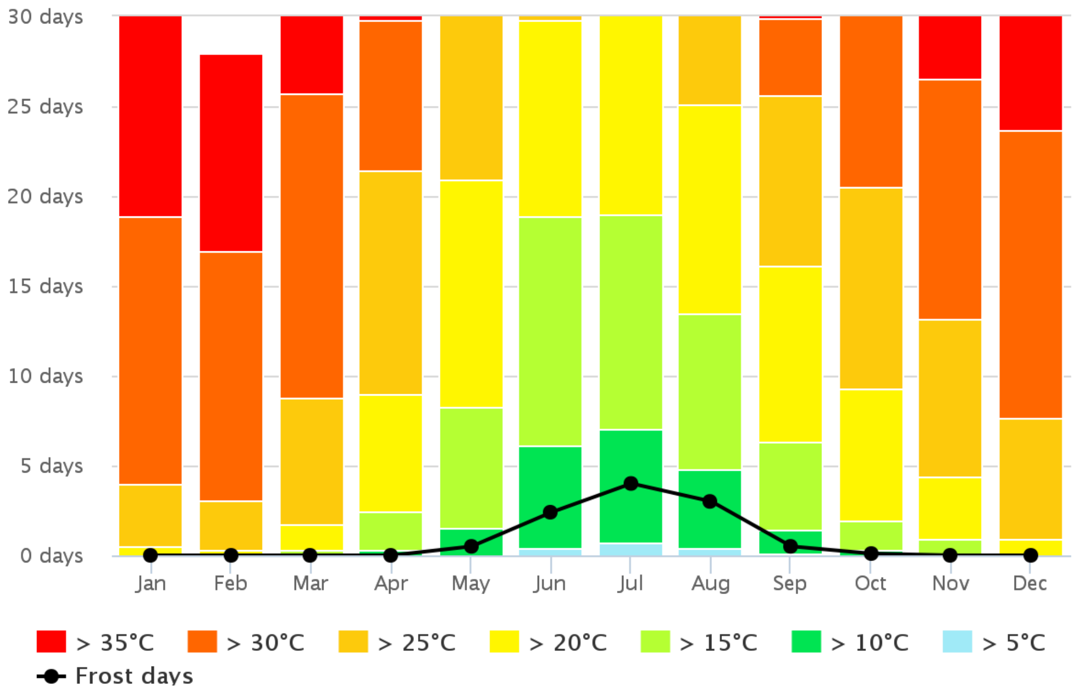


Figure 8-6: Maximum Temperatures for Aggeneys

Figure 8-7 shows the precipitation diagram for Aggeneys. This graph illustrates how many days per month certain precipitation amounts are reached.

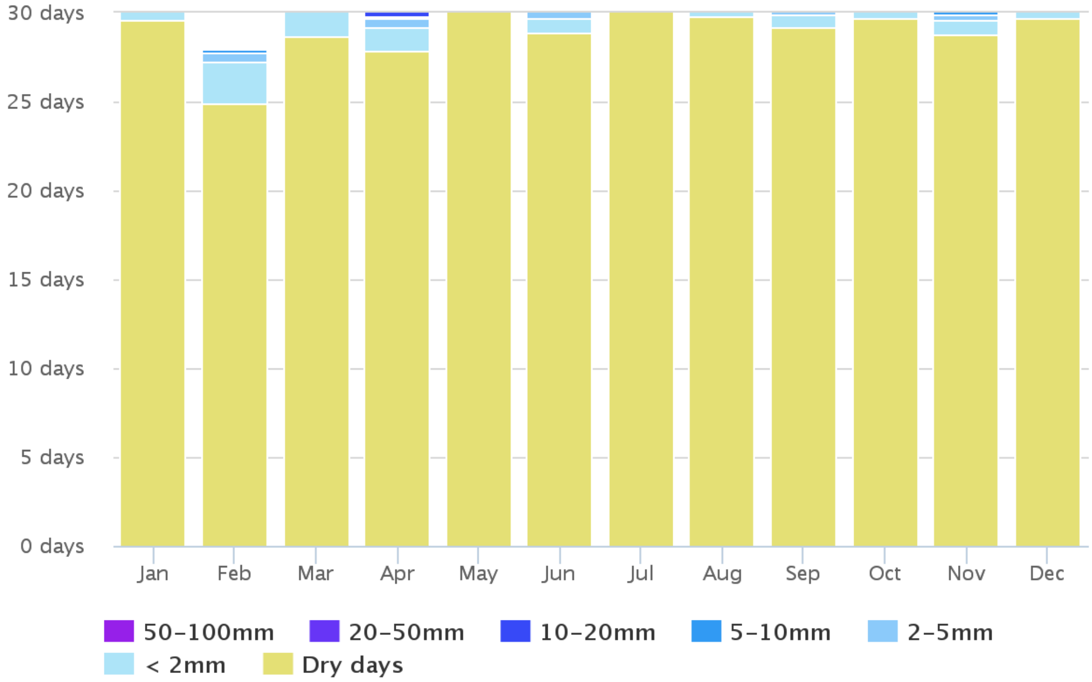


Figure 8-7: Precipitation Days for Aggeneys

Figure 8-8 shows the average wind speeds for Aggeneys. The graph shows how many days within one month can be expected to reach certain wind speeds.

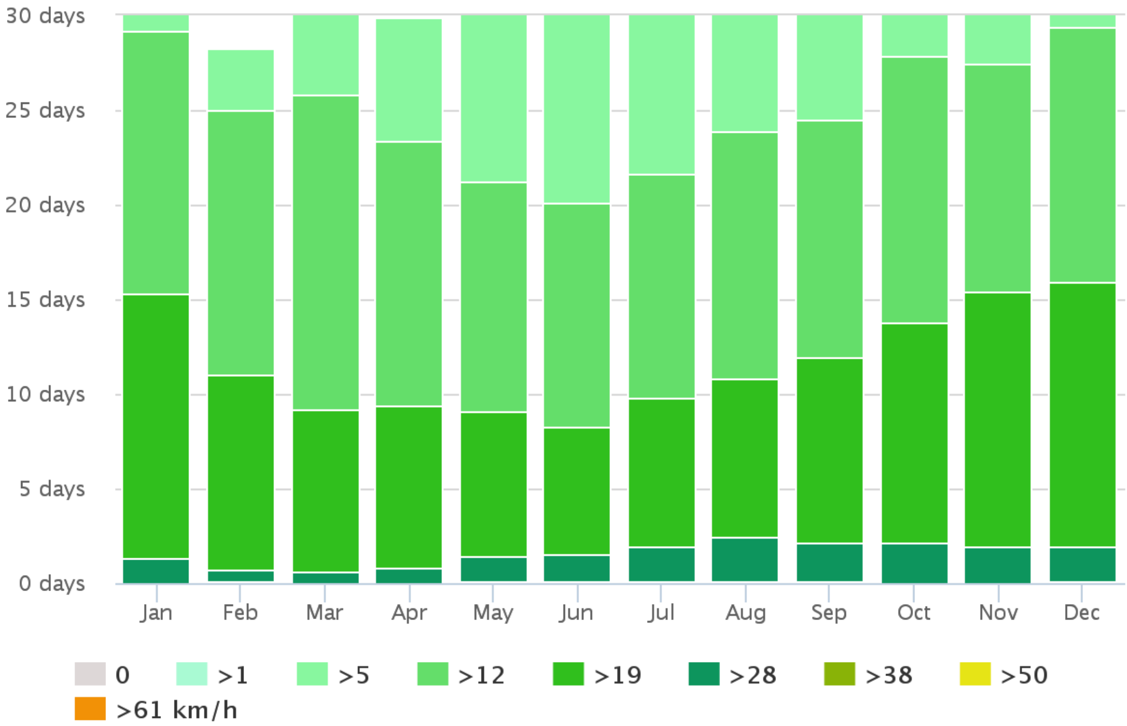


Figure 8-8: Average Wind Speeds for Aggeneys

The wind rose for Aggeneys shows how many hours per year the wind blows from the indicated direction (**Figure 8-9**). The dominate wind direction for Aggeneys is south to south-southeast.

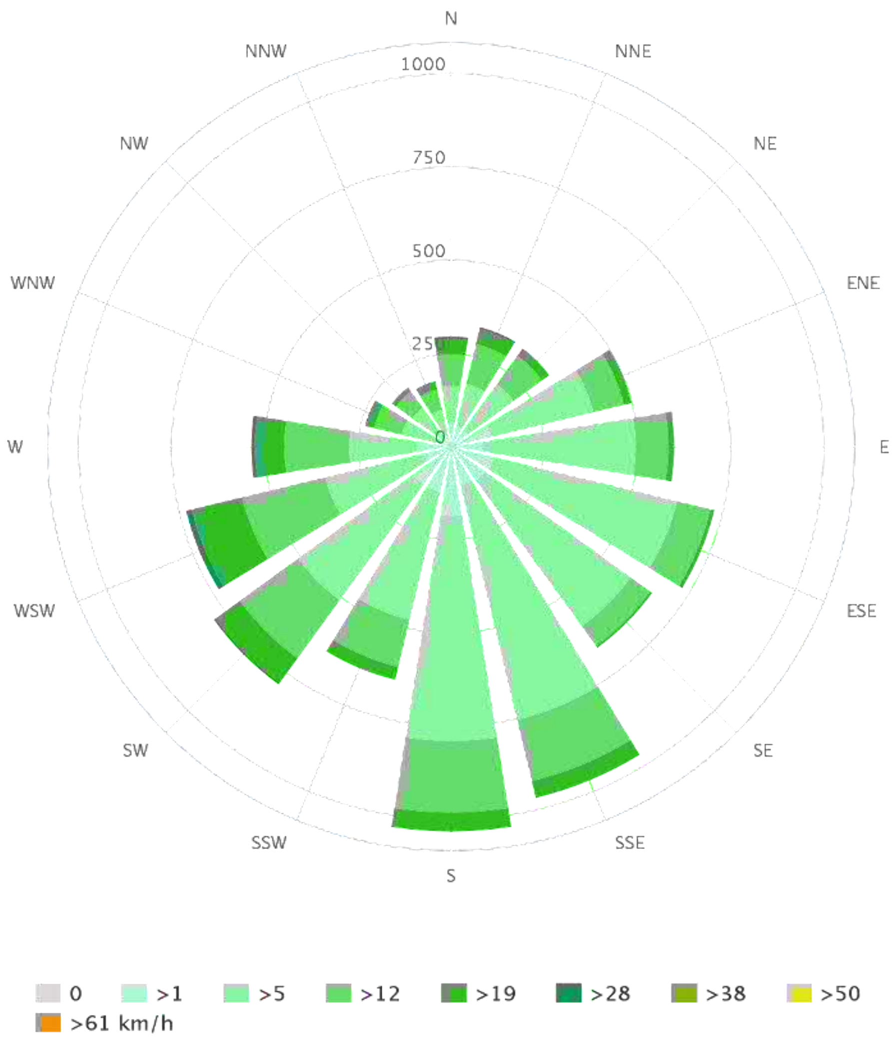


Figure 8-9: Wind Rose for Aggeneys

8.4 SOILS AND LAND CAPABILITY

The soil and land capability specialist study was undertaken by WSP | Parsons Brinckerhoff and is included in **Appendix M**.

SOIL

Based on the land type maps of South Africa (AGIS, 2007) the soils in the area are identified mostly as "Red-yellow apedal, freely drained soils, red, high base status, < 300 mm deep" with minor " Miscellaneous land classes, very rocky with little or no soils" on the inselbergs (small hills) located on the northern boundary of the farm property (**Figure 8-11**). Samples were retrieved from 9 locations in the study area, to describe the soil characteristics of the area (**Figure 8-12**). The location of the soil sampling was determined by the soil land type map as well as on-site observation for changes in the topography and land feature (e.g. wetland) which might induce a change in the soil type. At each location, the soil depth and diagnostics horizons were identified, and a sample was collected for chemical and physical analyses in a soil laboratory. For practical reasons, soil samples that were collected in a similar setting and had the same soil family, were mixed, to provide representative samples for the area (i.e. SS1 + SS2 + SS3; SS4 + SS5 + SS6; SS7 + SS8 + SS9). The representative soil samples were sent for analyse to the SGS soil laboratory situated in Somerset West in the Western Cape, to determine the pH, electrical conductivity, exchangeable sodium and texture.

All the soil samples were identified as Namib soil form (**Figure 8-10**). The characteristics of the soil samples and profiles are described in **Table 8-1**. The erodibility of the soil is carried out by two modes of transport *viz.* wind and water. Based upon the Department of Agriculture, Forestry and Fisheries GIS data (AGIS, 2007) the soil within the farm property has a high susceptibility to wind erosion, and a low to moderate water erosion hazard. This is evident, given the following characteristics of the area:

- Fine sand texture;
- Single grained structure;
- Clay content ranging between 2 and 5%;
- Dominant flat topography with large open spaces of shrub-like vegetation cover; and
- Infrequent occurrence of sheet flow (with no evidence of gully erosion).

Figure 8-10: Red Apedal Namib Soil Form

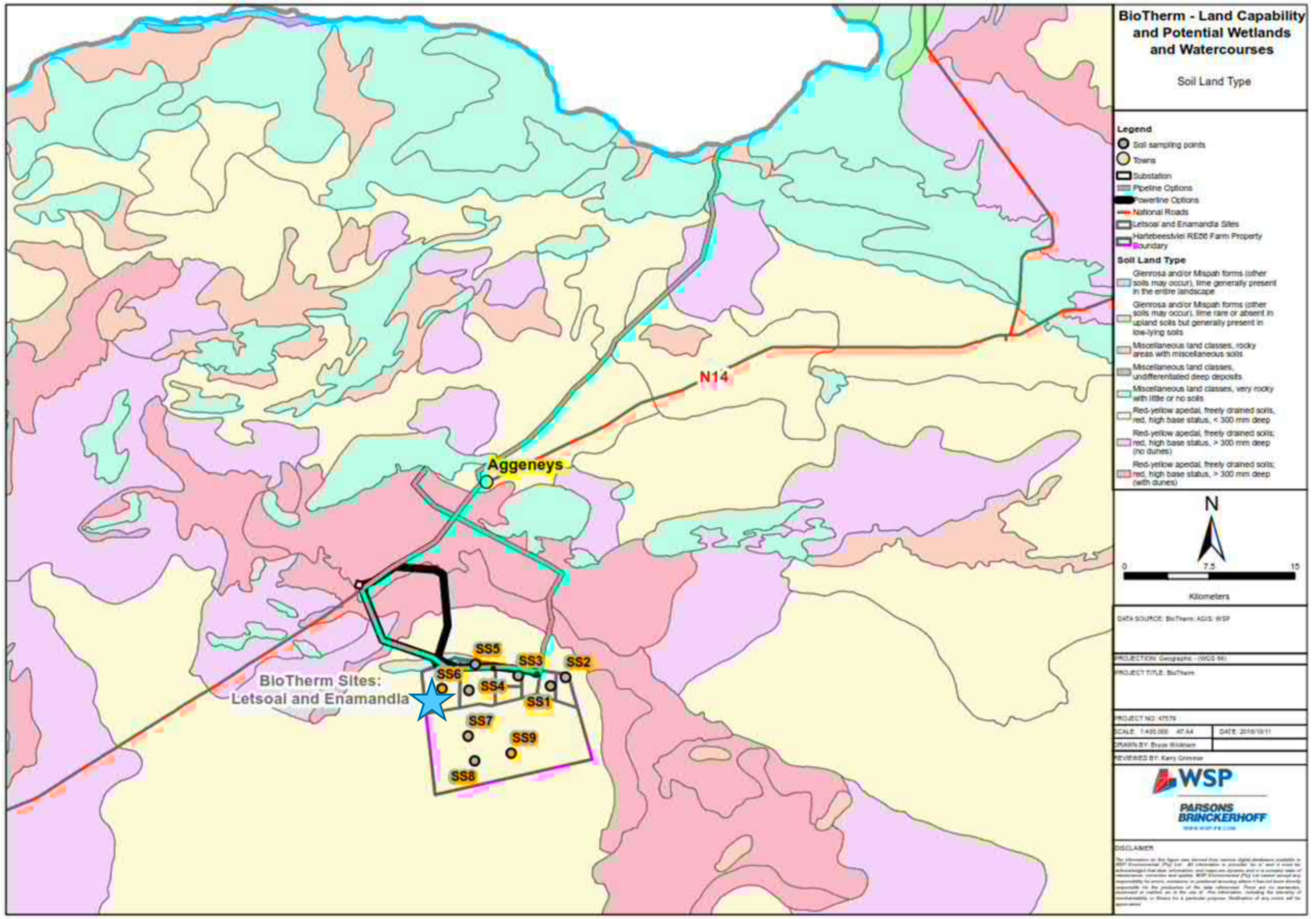


Figure 8-11: Soil land Types for Letsoai CSP 1 (Blue Star) and the water pipeline

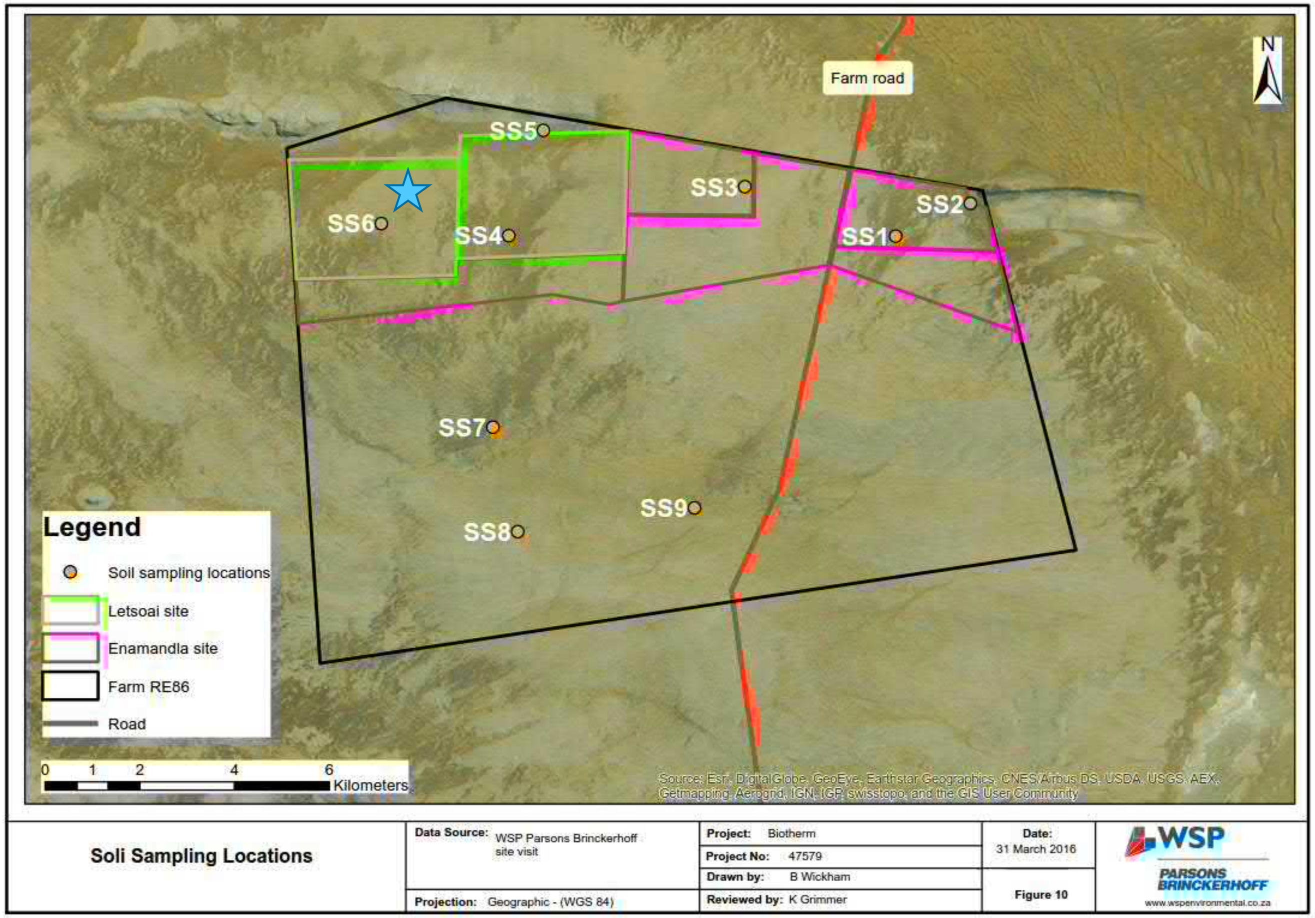


Figure 8-12 Soil Sampling Locations within Farm RE 86 (Letsoai CSP 1 indicated with Blue Star)

Table 8-1: Summary of Soil Sample Characteristics

CHARACTERISTIC	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9
Soil Form	Namib	Namib	Namib	Namib	Namib	Namib	Namib	Namib	Namib
Profile Depth	0.16	0.95	0.23	1.58	1.13	0.33	0.31	0.34	0.22
Dry Colour*, mottling and gleying	Pale orange	Pale orange	Orange	Orange	Orange	Pale orange	Orange	Orange	Orange
	Hue 5 YR	Hue 5 YR	Hue 2.5 YR	Hue 2.5 YR	Hue 2.5 YR	Hue 5 YR	Hue 5 YR	Hue 7.5 YR	Hue 7.5 YR
	Value 8	Value 8	Value 8	Value 8	Value 8	Value 8	Value 7	Value 7	Value 7
	Chroma 4	Chroma 4	Chroma 8	Chroma 8	Chroma 8	Chroma 4	Chroma 8	Chroma 6	Chroma 6
Subjective moisture	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Effective rooting depth (m) Grasses	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Effective rooting depth (m) Shrubs	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Soil structure	Single grained	Single grained	Single grained	Single grained	Single grained	Single grained	Single grained	Single grained	Single grained
Presence of rocks, pedocretes, calcareousness	No	No	No	No	No	No	No	No	No
pH	6.7	6.7	6.7	7.1	7.1	7.1	7.4	7.4	7.4
Electrical conductivity (mS/m)	18.4	18.4	18.4	20.1	20.1	20.1	19.9	19.9	19.9
Exchangeable sodium (%)	1.4	1.4	1.4	2.2	2.2	2.2	1.1	1.1	1.1
Sand (S) Silt (Si) & Clay (C) (%)	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2
Texture**	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand
Estimate permeability (m/d)***	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0
Erodibility K factor #	52	52	52	52	52	52	52	52	52

Sources: ** Colour based on the revised Standard Soil Colour Chart (Fujihara Industry Co.,2001) ;*
*** Texture based upon the United States Department of Agriculture (USDA) Soil texture triangle and grain size*
**** Estimate Permeability based upon soil structure and texture (van der Molen, Beltran, & Ochs, 2007)*
 # Estimated from the soil erodibility nomograph of Wischmeier, Johnson and Cross (1971)

NATURAL LAND COVER AND LAND USE

In the greater area there is extensive mining and associated infrastructure. Electricity is supplied to the Black Mountain Mine (**Figure 8-13**) by the Electricity Supply Commission network at the Hydra sub-station at De Aar, via two overhead powerlines (RHDHV, 2013). The water supply to Aggeneys and the mine is currently supplied from the Orange River via the Pelladrift pump station and a 50km pipeline (DWS, 2016).

Observations during the study area walkover were that the majority of the vegetation was shrub-like arid grassland, which was primarily used for sheep grazing. Cattle grazing activities were also present in the area. In addition, there were herds of Springbok grazing on the land within Farm RE86 property. The boreholes, driven by windmills, provide water to small reservoirs and water tanks throughout the farm for the sheep. The Department of Agriculture, Forestry and Fisheries (DAFF) define the land use within the Hartebeestvlei RE86 farm property, as predominantly Shrubland and Low Fynbos, with smaller pockets of unimproved (natural) Grassland, and minor areas of Woodlands (DAFF, 2012) (**Figure 8-14**).

It should also be noted that the area partially falls within the Springbok Wind REDZ and Northern EGI Corridor. These areas are targeted for renewable energy and electricity grid infrastructure development and so this future intended land use will alter the visual landscape. Although construction has not yet commenced, a concentration of wind energy farms, in close proximity to the study area, will cumulatively significantly alter the vertical landscape and character of the area.

Figure 8-13: Black Mountain Tailings Dam

According to the DAFF Agricultural Geo-Referenced Information System (AGIS, 2007), the land capability within the Hartebeestvlei RE86 farm property is largely classified as non-arable with a low potential for grazing, while the inselbergs on the northern boundary of the farm property constitute as Wilderness (**Figure 8-15**). These two groups correlate to Classes VII and VIII from the Eight-Class Land Capability System described in Klingebiel and Montgomery (1961), as follows:

- VII: Severe limitations that make the land unsuited to cultivation and restrict its use largely to grazing, woodland or wildlife. Restrictions are more severe than those for Class VI due to one or more limitations which cannot be corrected, such as very steep slopes, erosion, shallow soil, stones, wet soil, salts or sodicity (amount of sodium held in a soil) and unfavourable climate.

- VIII: Limitation that preclude its use for commercial plant production and restrict its use to recreation, wildlife, water supply, or aesthetic purposes; limitations that cannot be corrected may result from the effects of one or more of erosion or erosion hazard, sever climate, wet soil, stones, low water-holding capacity, salinity or sodicity.

Based on the Land Capability Classification described in the Chamber of Mines Guidelines the land capability within the Letsoai CSP Site 1 is classified as *Class 3: Grazing Land*, for the following reasons:

- There were no wetlands confirmed within the site during the desktop and site walkover exercises. Thus by definition of the Chamber of Mines classification, it is not a wetland;
- The soils are predominately shallow (average 0.58m). Thus by definition of the Chamber of Mines classification, it is not an arable land;
- The product of the slope (in percent) and erodibility factor (K) in the site is not less than 2 (the lowest value is 161.2). Thus by definition of the Chamber of Mines Guidelines, it is not arable land;
- The land on the site is not irrigated. Thus by definition of the Chamber of Mines Guidelines, it is not an arable land; and
- It meets all the requirements for class 3: grazing land.

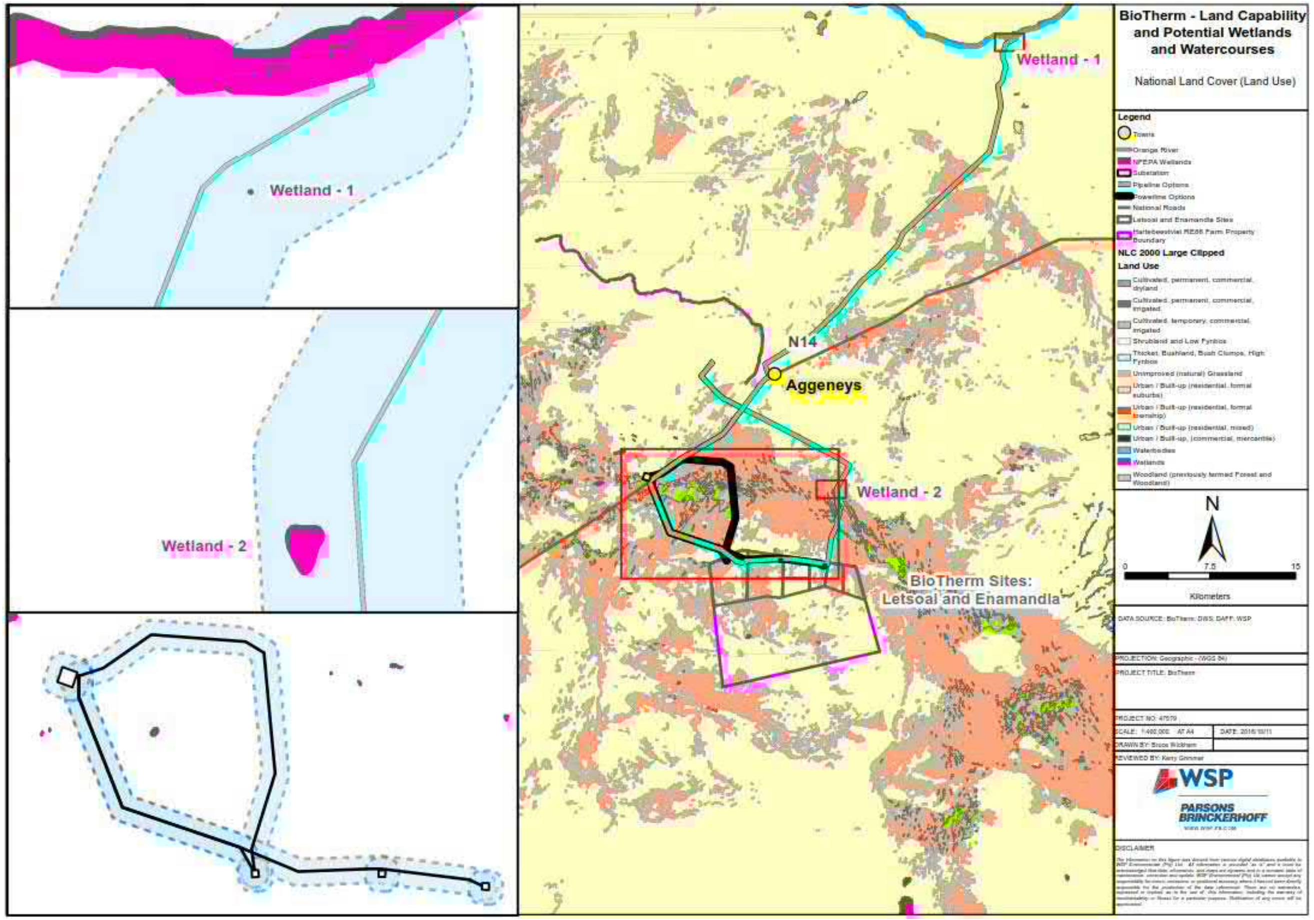


Figure 8-14: National Land Cover for the Study Area

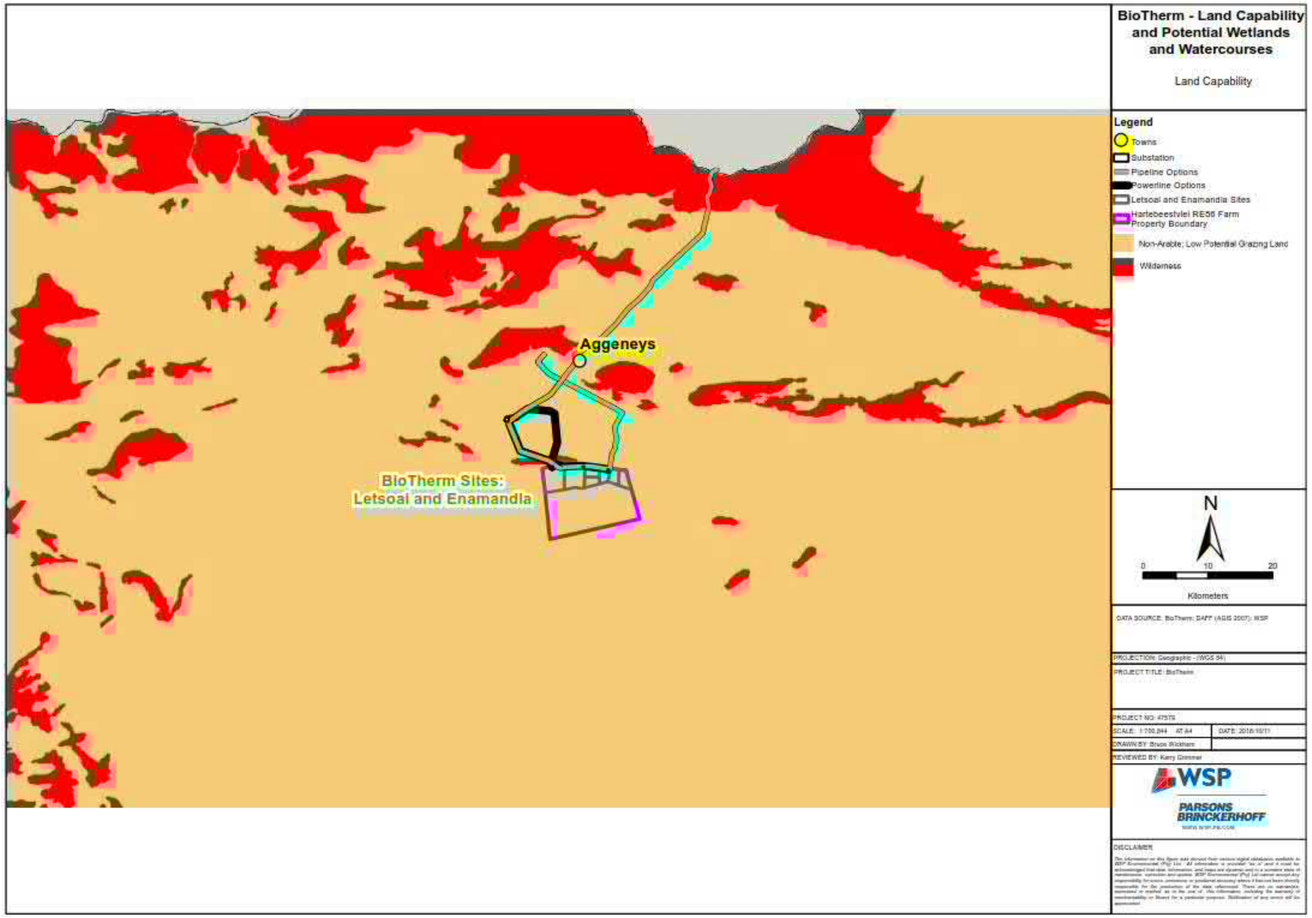


Figure 8-15: Local Land Capability

8.5 NATURAL VEGETATION AND ANIMAL LIFE

The biodiversity specialist study was undertaken by Simon Todd Consulting and is included in **Appendix Q**.

BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Mucina & Rutherford 2006), (**Figure 8-16**) the Letsoai CSP 1 site is restricted to the Bushmanland Arid Grassland vegetation type. The water pipeline alterantives, however, in some places traverse Bushmanland Sandy Grassland, Bushmanland Inselberg Shrubland, Eastern Gariep Rocky Desert and Eastern Gariep Plains Desert.

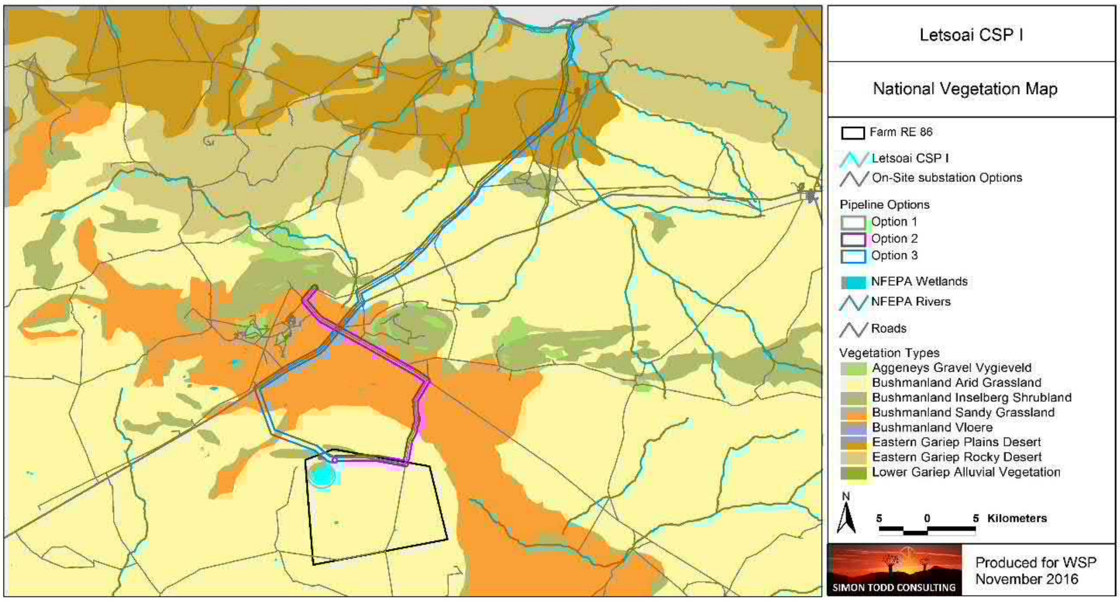


Figure 8-16: Broad-scale overview of the vegetation in and around Letsoai CSP 1

Bushmanland Arid Grassland vegetation type is an extensive vegetation type and is the second most extensive vegetation type in South Africa and occupies an area of 45 478 km^2. It extends from the study area around Aggeneys in the east to Prieska in the west. It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and is mostly less than 300mm deep. Due the arid nature of the unit, which receives between 70 and 200 mm 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. Mucina & Rutherford (2006) lists 6 endemic species for the vegetation type which is a relatively low number is given the extensive nature of the vegetation type.

Bushmanland Sandy Grassland occurs in the surrounds of Aggeneys and the largest intact patch of this vegetation type fills the shadow valley of the intermittent Koa river southeast and west of Aggeneys (Mucina & Rutherford 2006), in close proximity to the current site. The vegetation consists of dense, sandy grassland with dominant white grasses (*Stipagrostis, Schmidtia*) and abundant drought-resistant shrubs. The geology consists of mostly Quarternary sediments (sand, calcrete). Typically the surface is covered by red sands >300mm deep, forming dunes in places (Mucina & Rutherford 2006). The vegetation is Least Threatened with a target for conservation of 21% (Mucina & Rutherford 2006).

Bushmanland Inselberg Shrubland is associated with the hills and inselbergs in northern Bushmanland in the Aggeneys and Pofadder areas at altitudes ranging from 600 to 1120m. This vegetation type does not occur within any of the PV or CSP development sites, but the water pipelines and some of the electrical infrastructure do traverse this vegetation type. It consists of fairly azonal vegetation - shrubland with both succulent (*Aizoaceae, Asphodelaceae, Crassulaceae, Didiereaceae, Euphorbiaceae, Zygophyllaceae*) as well as nonsucculent (mainly *Asteraceae*) elements, with sparse grassy undergrowth (*Aristida, Eragrostis, Stipagrostis*) on steep slopes. The geology consists of inselbergs of high-grade metamorphic rocks on a broad alluvial plain. This vegetation type is threatened by mining (although not immediately) and has a target of 34%. None of it is statutorily conserved (Mucina & Rutherford 2006). In general this is considered to be a sensitive vegetation and habitat type as the diversity is high and it contains a high abundance of listed and endemic plant species. Development within these areas should be reduced as much as possible.

The Eastern Gariep Plains Desert consists of sloping plains of typical wash vegetation, occurring in a broad east-west band between the mountains to the north that fringe or are close to the Orange river and the more broken east-west line of hills and mountains to the south (Annakoppies, Grootberg, Witberg, Heramoebberge, Bantamerg). The grassland is dominated by 'white' grasses, some of which are spinescent (*Stipagrostis* spp) with additional shrubs and herbs in the drainage lines and on the gravely or loamy soil next to the mountains (Mucina & Rutherford 2006). The geology and soils consist of Quarternary sheet-wash alluvial deposits, sands, deep in places, whilst in the south soils are red-yellow apedal, freely drained soils. None of this vegetation type is contained in statutory conservation areas with few intact areas left due to overgrazing and climate and its conservation target is 34% (Mucina & Rutherford 2006). In the east this vegetation unit is transitional to Bushmanland Arid Grassland to the south.

Eastern Gariep Rocky Desert vegetation occurs on all rocky desert areas along the Orange River and smaller mountains between Pella and Vioolsdrif. The vegetation occurs on hills and mountains (up to 650m of relative altitude from their base), mostly with bare outcrops and covered with sparse shrubby vegetation in crevices. This vegetation unit is usually separated by broad sheet-wash plains and habitats are mostly controlled by topography, aspect, local climate and lithology (Mucina & Rutherford 2006). It is a very rocky substrate with little to no soil. The southernmost mapped mountains are transitional to Bushmanland Inselberg Shrubland. None of this unit occurs in statutory conservation areas (Mucina & Rutherford 2006) and it has a conservation target of 34%.

LISTED AND PROTECTED PLANT SPECIES

According to the SANBI SIBIS database, 309 indigenous plant species have been recorded from the quarter degree squares 2918 AB, BA, AD and BC. This includes 11 species of conservation concern as listed below in **Table 8-2**. Only *Hoodia gordonii* can be confirmed present in the study area; it is not likely that any of the other listed species are present. There are some *Boscia albitrunca* trees present on the hills of the area, which is a nationally protected species but would not be affected by the project. There are also some species protected under the Northern Cape Nature Conservation Act of 2009, which are present in the area including *Boscia foetida* subsp. *foetida* and all species within the *Mesembryanthemaceae, Euphorbiaceae, Oxalidaceae, Iridaceae* and all species within the genera *Nemesia* and *Jamesbrittenia*.

Table 8-2: Listed Species known from the broad area around the site

FAMILY	SPECIES	STATUS
CRASSULACEAE	*Crassula decumbens var. brachyphylla*	NT
MESEMBRYANTHEMACEAE	*Conophytum limpidum*	NT
CRASSULACEAE	*Crassula exilis subsp. exilis*	Rare
FABACEAE	*Crotalaria pearsonii*	Rare
HYACINTHACEAE	*Lachenalia polypodantha*	Rare

MESEMBRYANTHEMACEAE	*Conophytum tantillum subsp. eenkokerense*	Rare
OXALIDACEAE	*Oxalis inconspicua*	Rare
ASTERACEAE	*Othonna euphorbioides*	Thr*
HYACINTHACEAE	*Daubenya namaquensis*	Thr*
MESEMBRYANTHEMACEAE	*Cheiridopsis rostrata*	VU
APOCYNACEAE	*Hoodia gordonii*	DDD
AMARYLLIDACEAE	*Brunsvigia namaquana*	DDT
ASTERACEAE	*Senecio glutinarius*	DDT
MESEMBRYANTHEMACEAE	*Drosanthemum breve*	DDT
AMARYLLIDACEAE	*Boophone disticha*	Declining

ALIEN PLANT SPECIES ABUNDANCE

Alien species abundance at the site is generally low, which can be ascribed to the very arid nature of the area. However, with disturbance and increased runoff from the project during construction and operation, alien species may become more prevalent. The most conspicuous alien on the site is *Prosopis glandulosa* which has been planted to provide shade for livestock, but it has not spread and is not currently invading the site. The only other alien observed was *Salsola kali* which was present near to some of the watering points. It was however relatively dry at the time of sampling and additional species are likely to appear after rains. Overall, the site can currently be considered largely free of alien plant species and has not been significantly impacted by aliens in any way.

CRITICAL BIODIVERSITY AREAS AND BROAD-SCALE PROCESSES

The site falls within the planning domain of the Namakwa Biodiversity Sector Plan (Desmet & Marsh 2008). However, this map has been replaced by the Northern Cape Conservation Plan which will be released in early 2017 (Oosthuysen & Holness, 2016). The Northern Cape Conservation Plan defines CBAs for the whole Northern Cape. In terms of this map, the CSp itself lies within an ecological support area (**Figure 8-17**). The extent of the ESA is large and the development of the CSP plant would not significantly compromise the overall functioning of the ESA. However, there a number of developments associated with the Enamandla and Letsoai facilities and cumulative impacts may be more significant. Several sections of the pipeline corridors within CBA 2 areas, with a small section of the Pipeline Option 3 within a CBA 1. This area can be confirmed sensitive with the confirmed presence of several species of conservation concern. Within the CBA 2 areas, Option 1 and Option 3 traverse the Black Mountain Conservation area northwest of the site. This area is not considered highly sensitive as there are no specific biodiversity features of significance in this area and the CBA relates to the existing conservation status of the area, which would not be significantly compromised by an underground pipeline. The area towards the Black Mountain Storage Reservoir is however considered sensitive as there are areas of quartz on the plains on the approach to the reservoir which contain species of concern.

The site falls within a NPAES focus area, meaning that the area has been identified as a large currently intact area which has high biodiversity potential and is not currently well represented within the existing protected area network. The major concern in this regard is the availability of other similar habitat in the area. While the broader landscape contains several features and vegetation types of concern, these are outside of the study area. The typical Bushmanland grassy plains habitat within the site is very widely available in the area and the development of the site would not be likely to affect the availability of this habitat in the broader area. Therefore it is not likely that the development of the sites would significantly affect the Focus Area or the ability to meet conservation targets for the affected habitat types.

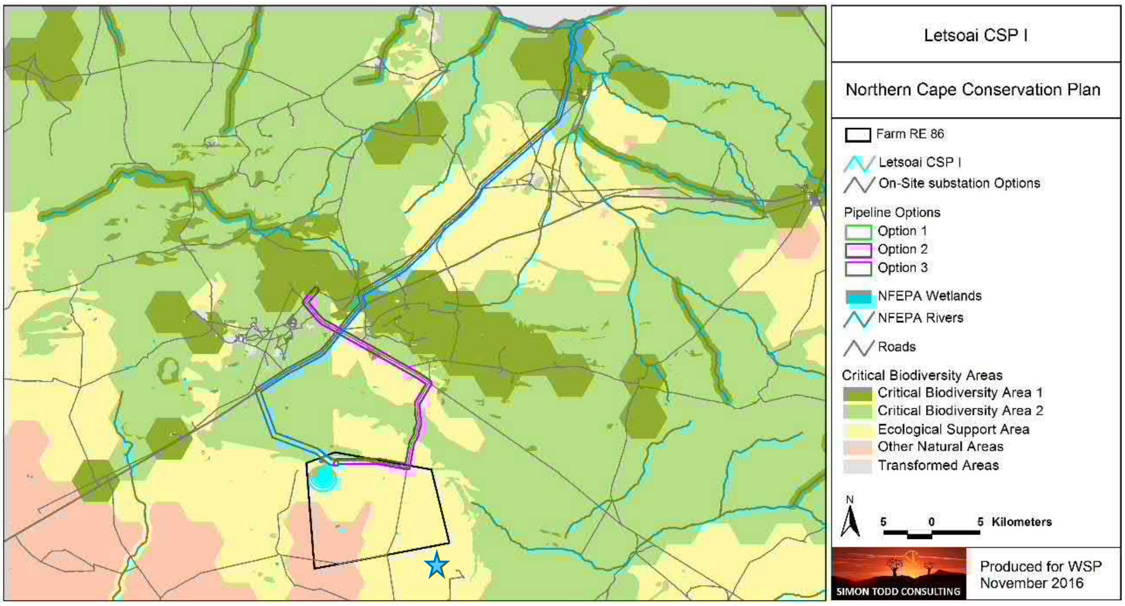


Figure 8-17: Critical Biodiversity Areas map of the area around Letsoai CSP 1 and the proposed water supply pipeline

FAUNAL COMMUNITIES

MAMMALS

The study area falls within the distribution range of 46 terrestrial mammals, although only around 20 are recorded in the area on a regular basis based on records from the MammalMap database[3]. Species that can be confirmed present in the area based on previous site visit to the area include Black-backed Jackal, African Wildcat, Cape Fox, Rock Hyrax, South African Ground Squirrel, Steenbok, Springbok, Gemsbok, Cape Porcupine, Yellow Mongoose, Cape Hare, Aardvark and Round-eared Elephant Shrew.

Species associated with the rocky outcrops of the area include Rock Hyrax *Procavia capensis*, Klipspringer *Oreotragus oreotragus*, Pygmy Rock Mouse *Petromyscus collinus*, Namaqua Rock Mouse *Aethomys namaquensis* and Western Rock Elephant Shrew *Elephantulus rupestris*. The open plains which characterise the development areas are likely to be dominated by species associated with open hard or sandy ground such as various gerbils including the Hairy-footed Gerbil *Gerbillurus paeba*. There were also many burrows of Ground Squirrels and Yellow Mongoose in the study area; these appear to be the most commonly occurring fauna. There are no areas of particular significance for mammals in the study area 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* (Near Threatened). Given the extremely low cover in the study area it is

[3] The aim of MammalMAP is to update the distribution records of all African mammal species. Through collaborations with professional scientists, conservation organisations, wildlife authorities and citizen scientists across Africa (www.mammalmap.adu.org.za)

not likely that Leopard are present in the study area. The habitat is however suitable for the Black-footed Cat which favours a mix of open and more densely vegetated areas. However this species is widely distributed across the arid and semi-arid areas of South Africa, and the development would not amount to a significant amount of habitat loss for this species, although some cumulative impact in the area is a developing threat.

The major impact to mammals associated with the development of the study area, would be habitat loss for resident species and potentially some disruption of the broad-scale connectivity of the landscape.

REPTILES

Although reptile diversity in the broader area is high with as many as 60 species known from the area, only a fraction of these are likely to be present within the study area. A large proportion of the reptiles of the area consist of species associated with the inselbergs and rocky hills along the Orange River and would not occur on the open plains characteristic of the study area. More typical plains species are likely to dominate the study area and is likely to include Verrox'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*.

As with mammals, there are not likely to be any highly significant impacts on reptiles besides some habitat loss in the project footprint. Some species such as geckos will probably increase within the development on account of the increased vertical structure and shelter provided by the heliostats and their supports.

AMPHIBIANS

Only eight frog species are known from the area around the study area; and even this is a gross overestimate of the number of amphibian species likely to be present within the study area. There are few freshwater features present and only species able to live independently of water will be present in the study area. As such the only species likely to be present within the study area would be the Karoo Toad *Vandijkophrynus gariepensis*. Given the very low likely abundance of amphibians in the study area, impacts on amphibians are likely to be local in extent and of low significance.

8.6 AVIFAUNA

The avifauna specialist study was undertaken by Chris van Rooyen Consulting and is included in **Appendix L**.

The habitat in the study area is highly homogenous and consists of extensive sandy and gravel plains. The study area lies just south of the Koa River Valley, a fossil river of red dunes which is considered to be the core habitat for the globally threatened Red Lark Calendulauda burra. To the north of the study area, isolated mountains (Namiesberge, Achab se Berge, Ghaamsberg) are present. The vegetation in the study area itself consists mostly of grasses and shrubs scattered between bare patches of red sand and gravel. The main vegetation type is Bushmanland Arid Grassland, which is dominated by white grasses (Stipagrostis species) giving this vegetation the character of semi-desert “steppe”.

South African Bird Atlas Project 1 (SABAP1) recognises six primary vegetation divisions within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison et al 1997). The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. It is important to note that no new vegetation unit boundaries were created, with use being made only of previously published data. Using this classification system, the natural vegetation in the study area can be classified as Nama Karoo.

Peak rainfall in the study area occurs mainly in summer and averages around 71mm per year, which makes it an extremely arid area. Because rainfall in the Nama Karoo falls mainly in summer, while peak rainfall in the Succulent Karoo occurs mainly in winter, it provides opportunities for birds to migrate between the Succulent and Nama Karoo, to exploit the enhanced conditions associated with rainfall. Many typical karroid species are nomads, able to use resources that are patchy in time and space, e.g. Sclater's Lark (Barnes 1998).

The study area is located close to the Haramoep and Black Mountain (SA035) Important Bird Area (IBA). Situated near Aggeneys, this IBA is characterised by an arid landscape of extensive sandy and gravel plains with sparse vegetation scattered between bare sand patches. Inselbergs form islands of rocky habitat in a sea of red sand. Large sand dunes fill the fossil course of the Koa River. The gravel plains are covered by sparse dwarf shrubs and short bushman grasses and they hide dwarf succulents. The dry riverbeds support taller woody vegetation, including *Boscia* species. Although much of the land area remains natural, large areas are overgrazed and degraded. Approximately 90% of the land is natural and utilised for ranching. The rest has been transformed by agriculture, mining activities, homesteads, settlements, erosion, roads and power-line servitudes.

This IBA is one of only a few sites protecting the globally threatened Red Lark *Calendulauda burra*, which inhabits the red sand dunes and sandy plains with a mixed grassy dwarf shrub cover; and the near-threatened Sclater's Lark *Spizocorys sclateri*, on the barren stony plains. It also holds 16 of the 23 Namib-Karoo biome-restricted assemblage species as well as a host of other arid-zone birds. Ludwig's Bustard *Neotis ludwigii* and Kori Bustard *Ardeotis kori* are regularly seen. Martial Eagle *Polemaetus bellicosus*, Secretarybird *Sagittarius serpentarius*, Verreauxs' Eagle *Aquila verreauxii*, Booted Eagle *Hieraaetus pennatus*, Cape Eagle-Owl *Bubo capensis* and Spotted Eagle-Owl *Bubo africanus* are present.

The following species are classified as trigger species for the IBA, several of which could potentially occur at the study area (highlighted in **bold**):

→ Globally threatened birds
  - **Red Lark (*Calendulauda burra*)**;
  - Sclater's Lark (*Spizocorys sclateri*);
  - **Martial Eagle (*Polemaetus bellicosus*)**;
  - Kori Bustard (*Ardeotis kori*);
  - **Ludwig's Bustard (*Neotis ludwigii*)**; and
  - **Secretarybird (*Sagittarius serpentarius*)**.

→ Regionally threatened birds
  - **Karoo Korhaan (*Eupodotis vigorsii*)**; and
  - **Verreauxs' Eagle (*Aquila verreauxii*).**

→ Restricted-range and biome-restricted birds
  - **Stark's Lark (*Spizocorys starki*)**;
  - **Karoo Long-billed Lark (*Certhilauda subcoronata*)**;
  - **Black-eared Sparrow-lark (*Eremopterix australis*)**;
  - **Tractrac Chat (*Cercomela tractrac*)**;
  - **Sickle-winged Chat (*Cercomela sinuate*)**;

- **Karoo Chat (Cercomela schlegelii)**;
- Layard's Tit-Babbler (*Sylvia layardi*);
- **Karoo Eremomela (Eremomela gregalis)**;
- Cinnamon-breasted Warbler (*Euryptila subcinnamomea*);
- Namaqua Warbler (*Phragmacia substriata*);
- **Sociable Weaver (Philetairus socius)**;
- **Pale-winged Starling (Onychognathus nabouroup)**; and
- **Black-headed Canary (Serinus alario)**.

Figure 8-18 and **Figure 8-19** show the Letsoai CSP 2 site and water supply pipelines relative to the Haramoep and Black Mountain (SA035) Important Bird Area respectively.

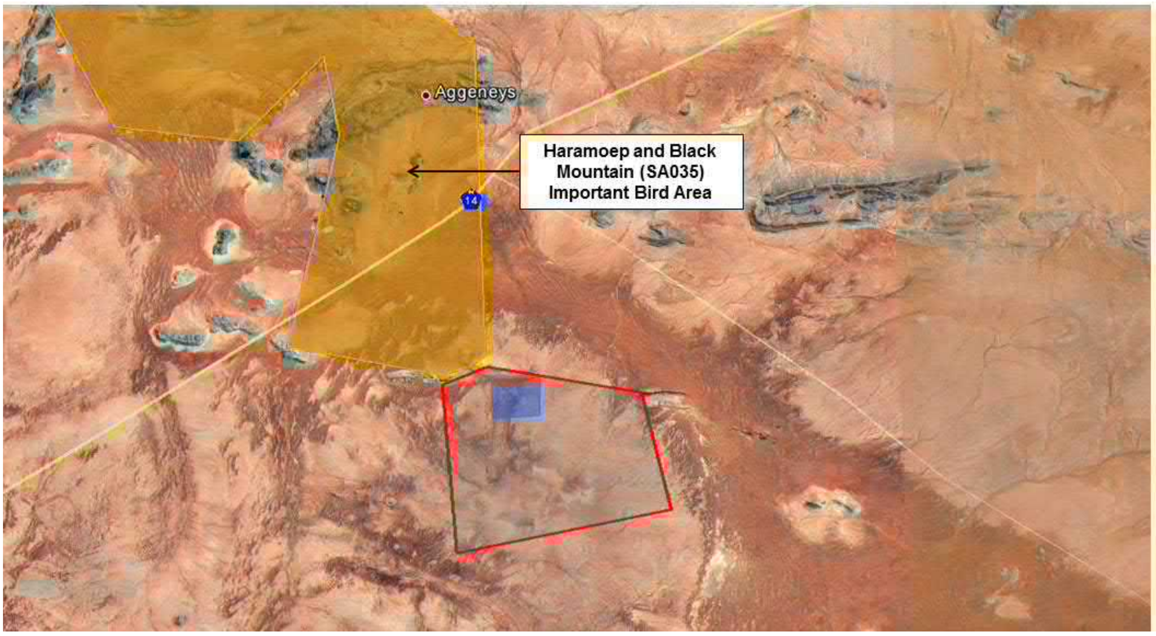


Figure 8-18: The Proposed Letsoai CSP 2 (Purple) in relation to the Haramoep and Black Mountain (SA035) Important Bird Area

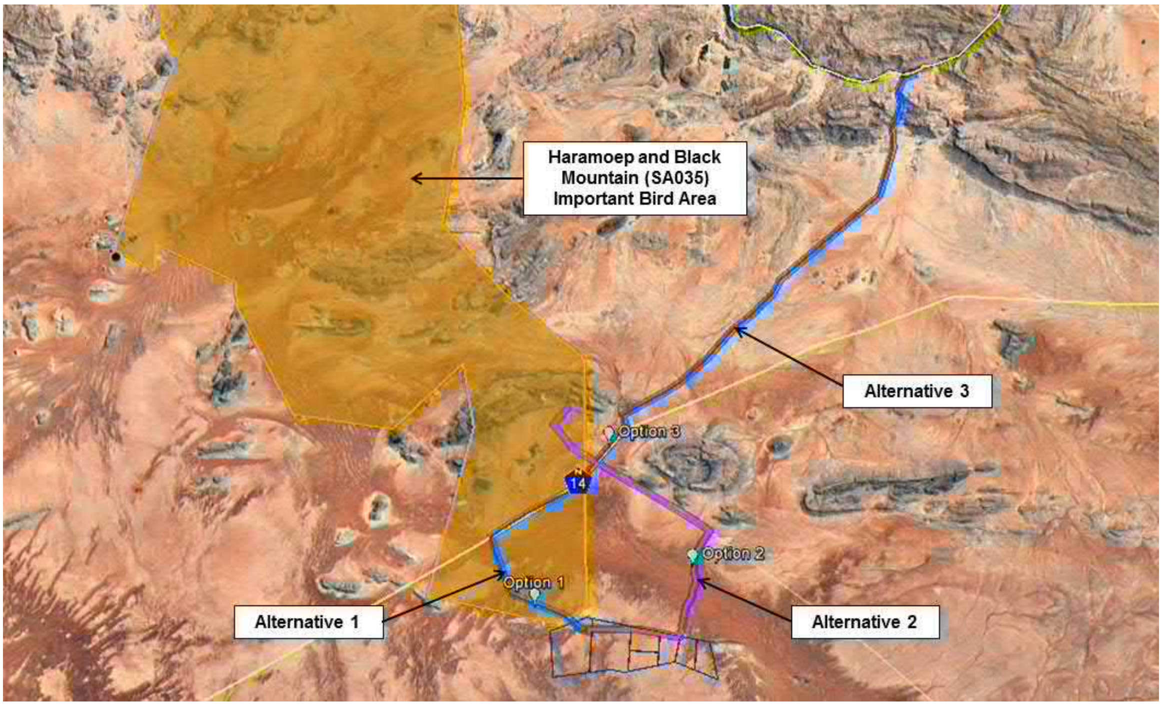


Figure 8-19: The Revised Water Supply Pipeline Alternatives in relation to the Haramoep and Black Mountain (SA035) Important Bird Area

Whilst the distribution and abundance of the bird species in the study area are mostly associated with natural vegetation, as this comprises virtually all the habitat, it is also necessary to examine a few external modifications to the environment that might have relevance for priority species.

The following anthropogenic avifaunal-relevant habitat modifications were recorded within the study area:

- **Water points**: The land use in the study area is mostly sheep farming, with some game and cattle also present. The entire area is divided into fenced off grazing camps, with a few boreholes with associated water reservoirs and drinking troughs. These troughs and reservoirs are a big draw card for several bird species. Priority species that could regularly visit waterholes are Southern Pale Chanting Goshawk, Red Lark, Sclater's Lark, Martial Eagle, Booted Eagle, Secretarybird, Black-eared Sparrowlark Lanner Falcon and Black-chested Snake-Eagle. Large flocks of Namaqua Sandgrouse descend to water troughs to drink, which in turn draw in raptors.
- **Transmission lines, reticulation lines, telephone lines and fence lines**: The Aggeneys – Aries 400kV transmission line runs to the north of the study area. There are also several high voltage lines west of the N14 which converges into the Aggeneys MTS. The transmission towers are used by raptors for perching and roosting, and potentially also for breeding. An active Martial Eagle nest was recorded on a tower which is approximately 20km away from the study area. The transmission lines, reticulation lines and telephone lines are all used as perches by a number of priority raptors, e.g. Greater Kestrel, Black-chested Snake-eagle, Martial Eagle and Rock Kestrel. Smaller species such as Red Lark and Sclater's Lark also often perch on the fence lines, as do Greater Kestrel and Rock Kestrel. The transmission lines in the study area pose a major risk of collisions to Ludwig's Bustard, Karoo Korhaan and Secretarybird.

A total of 113 species could potentially occur in the study area; of these, 42 are classified as priority species. **Table 8-3** lists the priority species that could potentially occur in the study area, as well as the potential impact on these species.

In order to get an accurate assessment of the abundance and variety of avifauna at the proposed development area, a pre-construction monitoring programme was instituted which ran over four seasons. Data was collected through drive and walk transect counts, incidental sightings and the recording of flight behaviour from vantage points. **Table 8-4** lists all 43 species which were recorded during the course of the pre-construction monitoring at the development area.

Figure 8-20 shows the spatial distribution of transect recorded priority species at the development area. The spatial distribution of the flight activity of the various priority species which were recorded during vantage point (VP) watches are presented in **Figure 8-21**.

The transect counts indicate a low density of priority species at the development area. The index of kilometre abundance (IKA) for drive transects for all priority species were 1.27 birds/km, and for walk transects it was 1.9 birds. This is to be expected from a very arid area.

As far as the spatial distribution of priority species are concerned, the most obvious pattern that emerges is the clustering of Red Lark records in sandy areas. This correlates with the habitat description for the species in Hockey et al. 2005 i.e. red sand dunes and sandy plains with scattered large seeded grasses.

The VP watches indicate very low flight activity of priority species, with a passage rate of 0.12 birds/h. Greater Kestrel emerged with the highest level of flight activity, but even that is still very low with a passage rate of 0.048 birds/h. The spatial distribution of priority species flights does not provide evidence of any clear flight paths. All the flight activity was concentrated in the eastern half of the development area, but no apparent reason can be detected for this spatial distribution, as the habitat is very uniform.

The habitat descriptions and avifaunal composition described for the development area in the preceding sections are perfectly applicable to the CSP 1 site, which consists of a mixture of gravelly and sandy areas. There no specific habitat features relevant to avifauna to distinguish it from the surrounding greater study area. The only notable points are that the CSP 1 site is not bisected by any high voltage lines, and does not contain any boreholes. There are several fence lines which divides the entire area into grazing camps.

Table 8-3: Priority Species that could potentially occur in the study area (EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern)

Family name	Taxonomic name	Reporting rate	Global status	Regional status	Endemic - South Africa	Endemic - Southern Africa	Priority species	Recorded during pre-construction monitoring	Displacement due to disturbance	Displacement due to habitat transformation	Collisions with heliostats	Burning through solar flux	Collision with powerlines
Bustard, Ludwig's	*Neotis ludwigii*	7.41	EN	EN		Near-endemic	x	x	x	x		x	x
Chat, Tractrac	*Cercomela tractrac*	14.81				Near-endemic	x	x	x	x	x		
Harrier, Montagu's	*Circus pygargus*						x	x		x	x	x	x
Kestrel, Greater	*Falco rupicoloides*	37.04					x	x	x	x	x	x	
Korhaan, Karoo	*Eupodotis vigorsii*	14.81	LC	NT		Endemic	x	x	x	x			x
Lark, Red	*Calendulauda burra*	66.67	VU	VU	Endemic	Endemic	x	x	x	x	x		
Secretarybird	*Sagittarius serpentarius*	0	VU	VU			x	x	x	x		x	x
Snake-eagle, Black-chested	*Circaetus pectoralis*	7.41					x	x	x	x		x	
Sparrowlark, Black-eared	*Eremopterix australis*	11.11			Near endemic	Endemic	x	x	x	x	x		
Buzzard, Jackal	*Buteo rufofuscus*	3.7			Near endemic	Endemic	x		x	x		x	
Canary, Black-headed	*Serinus alario*	11.11			Near endemic	Endemic	x		x	x	x		

Family name	Taxonomic name	Reporting rate	Global status	Regional status	Endemic - South Africa	Endemic - Southern Africa	Priority species	Recorded during pre-construction monitoring	Displacement due to disturbance	Displacement due to habitat transformation	Collisions with heliostats	Burning through solar flux	Collision with powerlines
Chat, Karoo	*Cercomela schlegelii*	44.44				Near-endemic	x		x	x	x		
Chat, Sickle-winged	*Cercomela sinuata*	7.41			Near endemic	Endemic	x		x	x	x		
Coot, Red-knobbed	*Fulica cristata*	11.11					x				x		x
Duck, Maccoa	*Oxyura maccoa*	7.41	NT	NT			x				x		x
Duck, Yellow-billed	*Anas undulata*	3.7					x				x		x
Eagle, Booted	*Hieraaetus pennatus*	3.7					x		x	x	x	x	
Eagle, Martial	*Polemaetus bellicosus*	3.7	VU	EN			x		x	x		x	
Eagle, Verreaux's	*Aquila verreauxii*	7.41	LC	VU			x		x	x		x	
Eremomela, Karoo	*Eremomela gregalis*	7.41			Near endemic	Endemic	x		x	x	x		
Falcon, Lanner	*Falco biarmicus*	3.7	LC	VU			x		x	x	x	x	
Falcon, Pygmy	*Polihierax semitorquatus*	7.41					x			x	x		
Flamingo, Greater	*Phoenicopterus roseus*		LC	NT			x				x	x	x
Flamingo, Lesser	*Phoenicopterus minor*		LC	NT			x				x	x	x

Family name	Taxonomic name	Reporting rate	Global status	Regional status	Endemic - South Africa	Endemic - Southern Africa	Priority species	Recorded during pre-construction monitoring	Displacement due to disturbance	Displacement due to habitat transformation	Collisions with heliostats	Burning through solar flux	Collision with powerlines
Flycatcher, Fairy	*Stenostira scita*	3.7			Near endemic	Endemic	x		x	x	x		
Goose, Egyptian	*Alopochen aegyptiaca*	11.11					x				x	x	x
Grebe, Little	*Tachybaptus ruficollis*	11.11					x				x		x
Kestrel, Rock	*Falco rupicolus*	40.74					x	x	x	x	x	x	
Kite, Black-shouldered	*Elanus caeruleus*	3.7					x		x	x	x	x	
Lark, Cape Clapper	*Mirafra apiata*	11.11			Near endemic	Endemic	x		x	x	x		
Lark, Karoo Long-billed	*Certhilauda subcoronata*	48.15				Endemic	x		x	x	x		
Lark, Stark's	*Spizocorys starki*	14.81				Near-endemic	x		x	x	x		
Ruff	*Philomachus pugnax*	3.7					x				x		
Sandpiper, Common	*Actitis hypoleucos*	3.7					x				x		
Sandpiper, Wood	*Tringa glareola*	3.7					x				x		
Shelduck, South African	*Tadorna cana*	14.81				Endemic	x				x		x
Shoveler, Cape	*Anas smithii*	7.41				Near-endemic	x				x		x

Family name	Taxonomic name	Reporting rate	Global status	Regional status	Endemic - South Africa	Endemic - Southern Africa	Priority species	Recorded during pre-construction monitoring	Displacement due to disturbance	Displacement due to habitat transformation	Collisions with heliostats	Burning through solar flux	Collision with powerlines
Starling, Pale-winged	*Onychognathus nabouroup*	77.78				Near-endemic	x		x		x		
Stilt, Black-winged	*Himantopus himantopus*	7.41					x				x		
Stint, Little	*Calidris minuta*	3.7					x				x		
Teal, Cape	*Anas capensis*	11.11					x				x		
Weaver, Sociable	*Philetairus socius*	77.78				Endemic	x		x	x	x		
Courser, Burchell's	*Cursorius rufus*	0	LC	VU			x	x	x	x	x		
Chanting Goshawk, Southern Pale	*Melierax canorus*	55.56				Near-endemic	x	x	x			x	x

Table 8-4: Species recorded during the pre-construction monitoring at the proposed development sites

SPECIES	SCIENTIFIC NAME	STATUS	DRIVE	WALK	VANTAGE POINT	INCIDENTAL
Priority Species						
Snake-eagle, Black-chested	*Circaetus pectoralis*	Raptor				X
Sparrowlark, Black-eared	*Eremopterix australis*	Near endemic	X	X	X	X
Courser, Burchell's	*Cursorius rufus*	VU	X	X		X
Kestrel, Greater	*Falco rupicoloides*	Raptor	X	X	X	X
Chat, Karoo	*Cercomela schlegelii*	IBA trigger Species		X		
Korhaan, Karoo	*Eupodotis vigorsii*	NT	X	X		X
Bustard, Ludwig's	*Neotis ludwigii*	EN				X
Harrier, Montagu's	*Circus pygargus*	Raptor		X		
Lark, Red	*Calendulauda burra*	VU	X	X	x	X
Secretarybird	*Sagittarius serpentarius*	VU	X	X		X
Chanting Goshawk, Southern Pale	*Melierax canorus*	Raptor				X
Chat, Tractrac	*Cercomela tractrac*	IBA trigger species	X	X	X	X
Eagle, Verreaux's	*Aquila verreauxii*	VU			X	X
		Priority Species Sub-total	**7**	**9**	**5**	**11**
Non-Priority Species						
Alpine Swift	*Tachymarptis melba*	-		X		
Anteating Chat	*Myrmecocichla formicivora*	-	X	X		
Barn Swallow	*Hirundo rustica*	-	X	X		
Bokmakierie	*Telophorus zeylonus*	-	X	X		
Cape Crow	*Corvus capensis*	-	X	X		
Cape Sparrow	*Passer melanurus*	-	X	X		
Capped Wheatear	*Oenanthe pileata*	-	X	X		
Chat Flycatcher	*Bradornis infuscatus*	-		X		
Common Fiscal	*Lanius collaris*	-	X	X		
Common Swift	*Apus apus*	-	X	X		

Double-banded Courser	*Rhinoptilus africanus*	-	X	X		
Eastern Clapper Lark	*Mirafra {apiata} fasciolata*	-	X	X		
Familiar Chat	*Cercomela familiaris*	-	X			
Fawn-coloured Lark	*Calendulauda africanoides*	-		X		
Greater Striped Swallow	*Hirundo cucullata*	-	X	X		
Grey-backed Sparrowlark	*Eremopterix vertcalis*		X	X		
House Sparrow	*Passer domesticus*		X			
Lark-like Bunting	*Emberiza impetuani*		X	X		
Mountain Wheatear	*Oenanthe monticola*		X			
Namaqua Dove	*Oena capensis*			X		
Namaqua Sandgrouse	*Pterocles Namaqua*		X	X		
Northern Black Korhaan	*Afrotis afraoides*		X	X		
Pied Crow	*Corvus albus*		X	X		
Pink-billed Lark	*Spizocorys conirostris*		X	X		
Red-capped Lark	*Calandrella cinerea*		X	X		
Red-headed Finch	*Amadina erythrocephala*		X			
Rock Martin	*Hirundo fuligula*		X	X		
Rufous-eared Warbler	*Malcorus pectoralis*		X	X		
Scaly-feathered Finch	*Sporopipes squamifrons*		X	X		
Speckled Pigeon	*Columba guinea*		X			
Spike-heeled Lark	*Chersomanes albofasciata*		X	X		
White-throated Canary	*Crithagra albogularis*		X			
Yellow-bellied Eremomela	*Eremomela icteropygialis*			X		
		Non-Priority species Sub-total	**28**	**27**		
		Grand Total	**35**	**36**	**5**	**11**

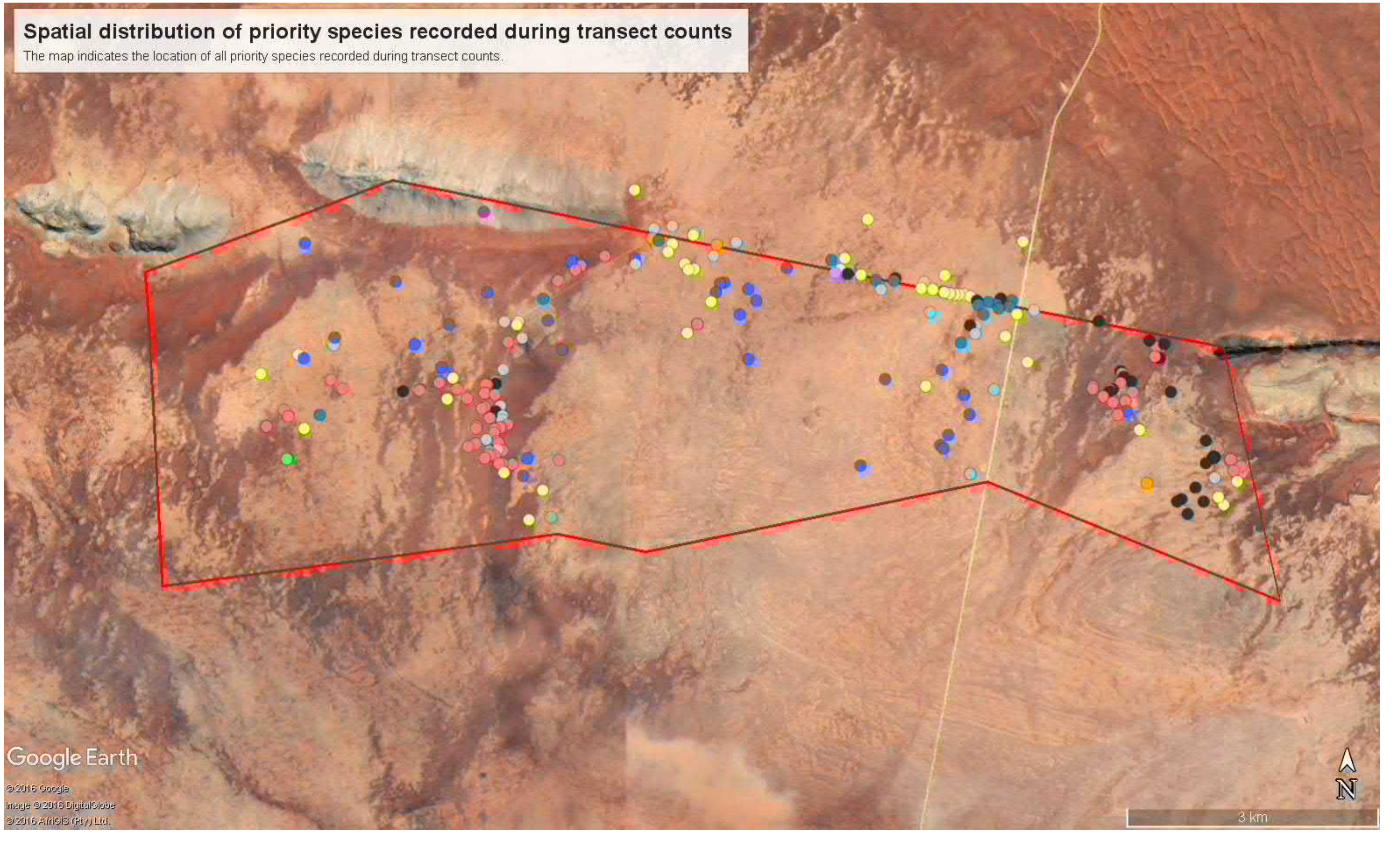


Figure 8-20: The spatial distribution of transect recorded priority species at the development area

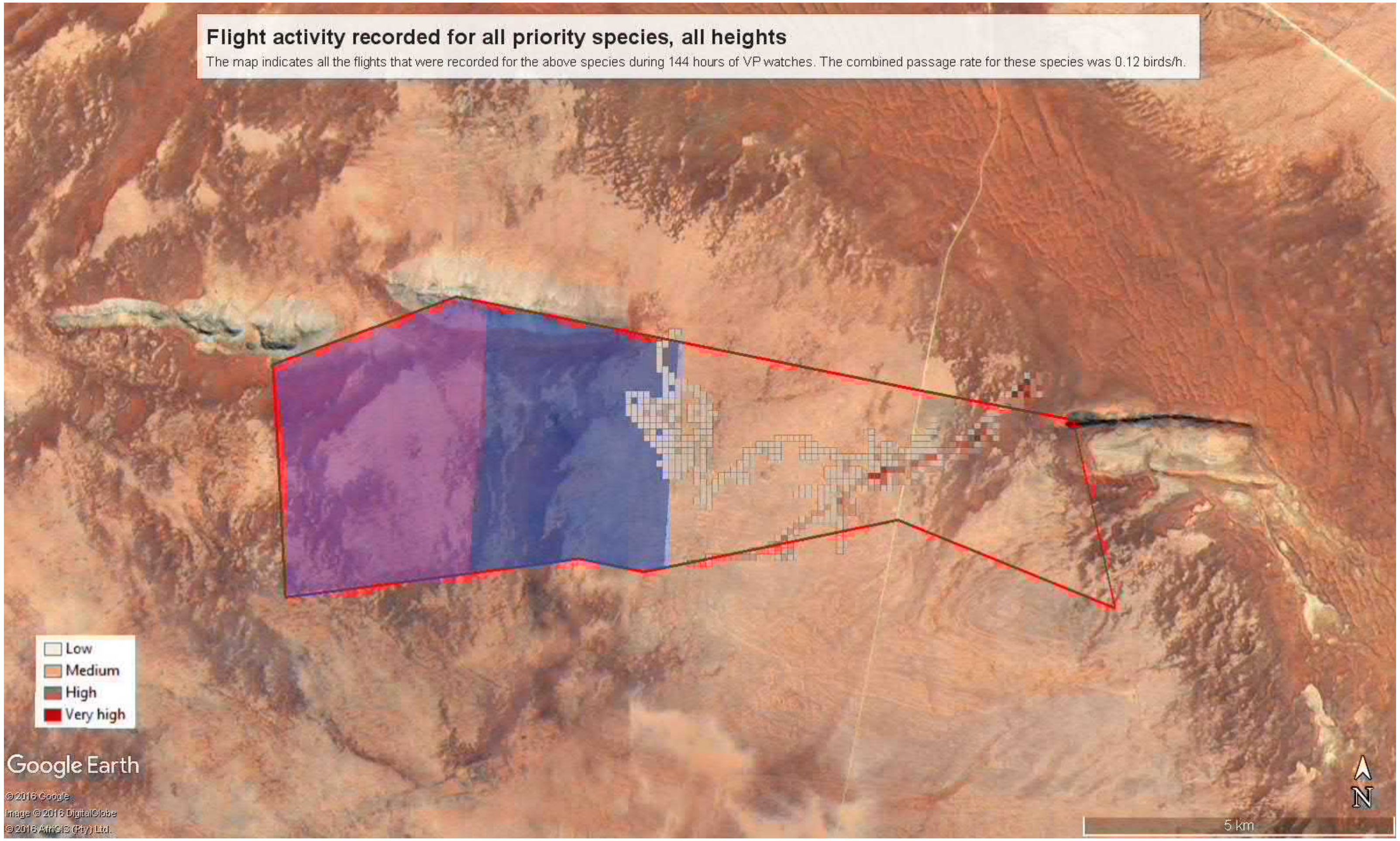


Figure 8-21: Distribution of flight activity of all priority species

8.7 SURFACE WATER

The surface water specialist study was undertaken by WSP | Parsons Brinckerhoff and is included in **Appendix M.**

The Water Resources 2012 (WR2012) Study (Water Research Commission/Department of Water and Sanitation i.e. WRC/DWS, 2012) was used to obtain the climatic and hydrological data for the area. This study modelled South Africa (including Lesotho and Swaziland) on a quaternary basis. Catchments were delineated into primary (e.g. D), secondary (e.g. D8), tertiary (e.g. D82) and quaternary (e.g. D82B), with quaternary catchments considered to be the generally accepted level of analysis or modelling.

South Africa is divided into 9 Water Management Areas (WMAs); the study area situated in the Lower Orange WMA. This WMA makes up the downstream portion of the Orange River Basin, which starts in the Lesotho Highlands headwaters of the Senqu River. The Upper Orange WMA, as well as the Upper, Middle and Lower Vaal WMA's all contribute to the Orange River Basin as a whole. As one moves westward along the Orange River, from the headwaters in Lesotho to the Atlantic Ocean, the drier the climate becomes (lower precipitation and higher evaporation).

Within the Lower Orange WMA, the study area lies within tertiary D82, and overlays parts of the D82B and D82C quaternary catchments (**Figure 8-22**).

The study area is situated approximately 55km south of the Orange River, the longest river in South Africa with the largest catchment area of almost 1 000 000km^2. The headwater of the Orange River is the Senqu River in Lesotho, flowing west towards the Atlantic Ocean, where it exits at Alexander Bay.

Upon the site visit, there were no watercourses identified within the proposed Letsoai CSP Site 1. The nearest evidence of a watercourse was the Kao River (and associated tributaries) which is located north of the project site (**Figure 8-23**). During the site visit there was no water present in the Kao River. At a high level desktop review, all three pipeline options traverse the Kao River drainage area with the option 3 intersecting the Goob se Laagte River near the Orange River. The topography or the area is predominantly flat with average slope of 3.5% from the Letsoai CSP Site 1 towards the Orange River. The low rainfall and endoreic characteristic for the region means that rivers in the region are mostly ephemeral (excluding the Orange), and are likely to only convey water during infrequent high rainfall events.

There are three potential wetlands located approximately 3.4km ,5.2km and 1.7km south of the proposed Letsoai CSP Site 1. At a desktop level, there are two wetlands within 500m of pipeline option 2 and 3 (**Figure 8-24**)..

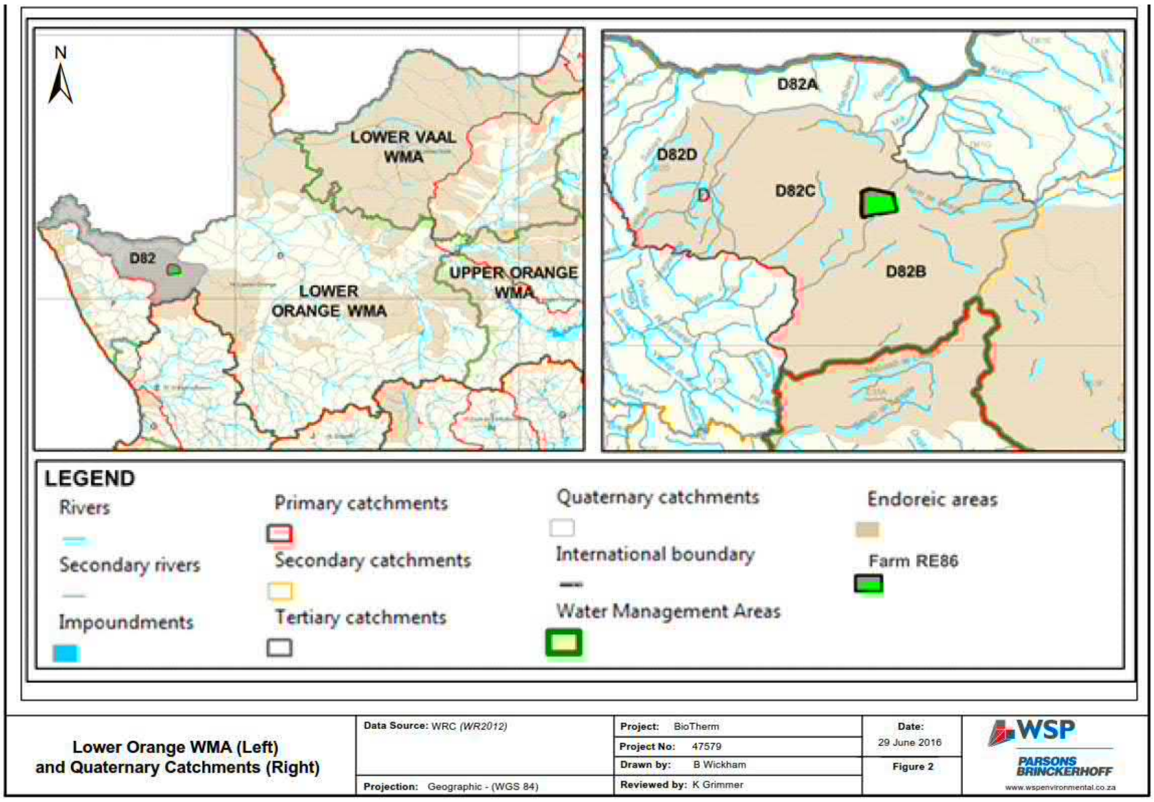


Figure 8-22: Lower Orange WMA (left) and Quaternary Catchments (right)

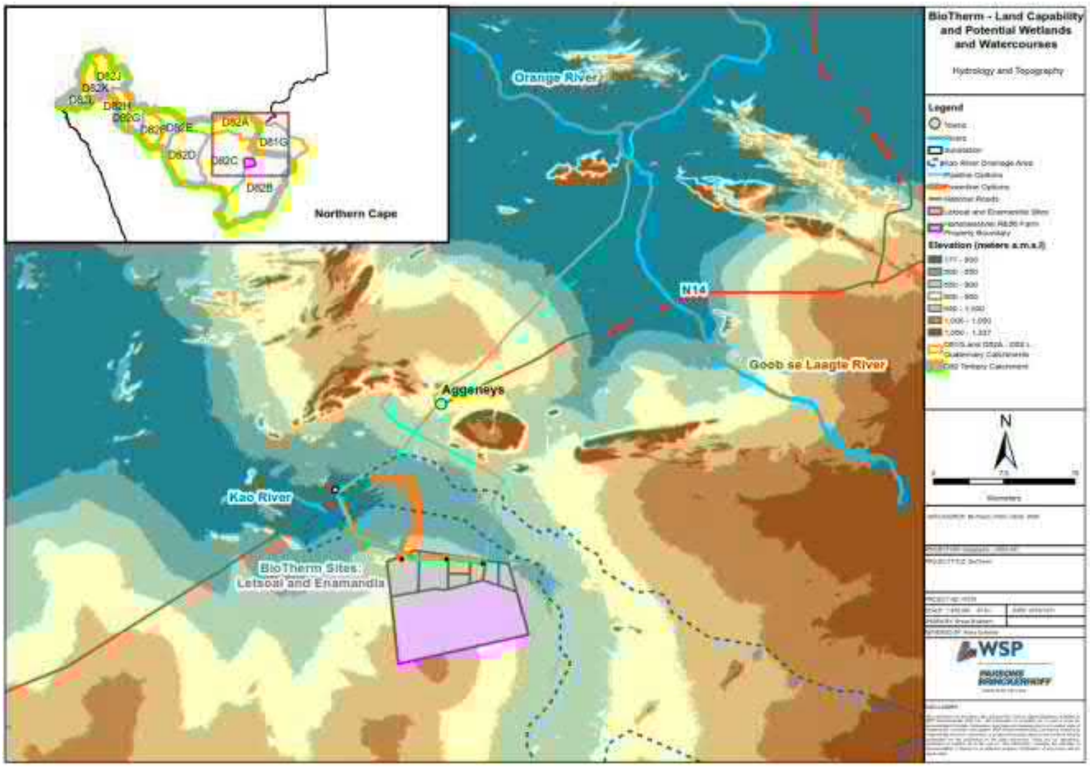


Figure 8-23: Local Hydrology

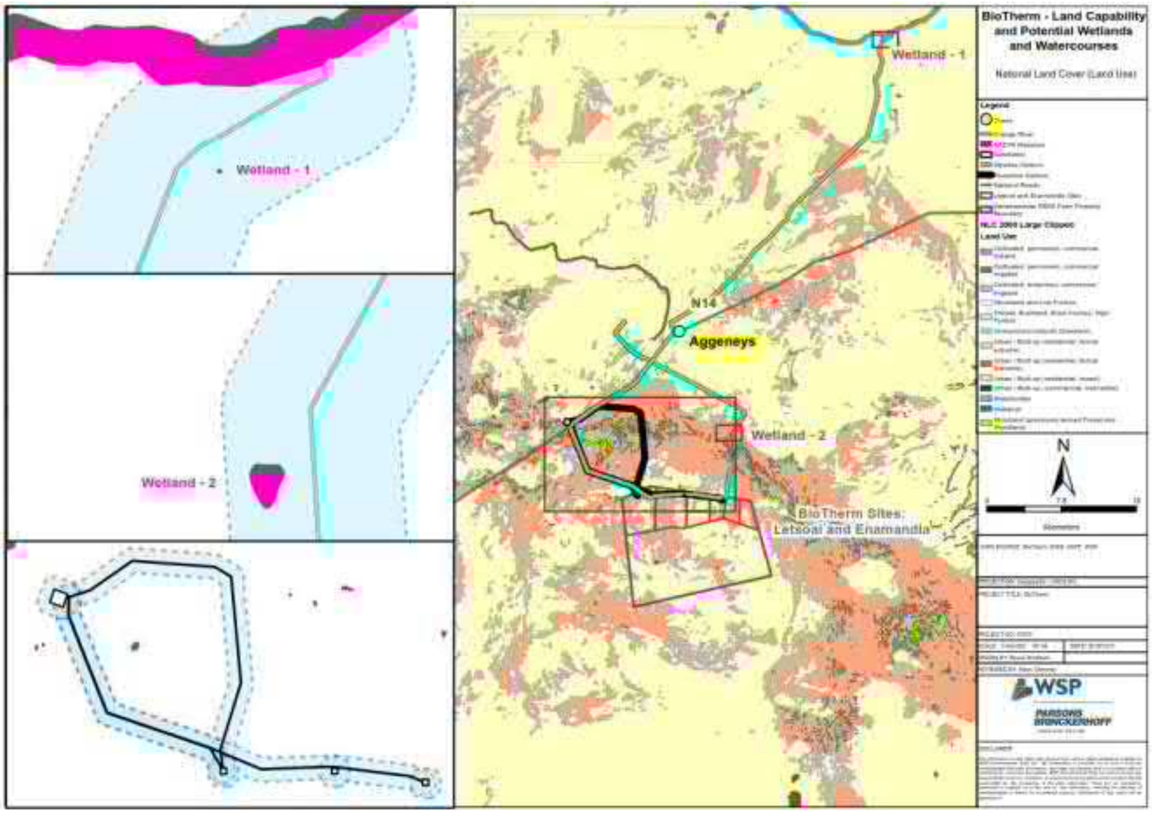


Figure 8-24: Local Land Cover including the identified wetland system

WATER USERS

The DWS WARMS Database was used to identify the water use within the D82 tertiary. Water use within D82B and D82C is associated with livestock watering, water supply services (towns), and mining. The detailed volumes of water use used for irrigation are shown in **Table 8-5**. All irrigation in the tertiary is supplied via water schemes connected to the Orange River, excluding two areas which are supplied directly from a river/stream. The DWS WARMS database does not indicate any irrigation in D82B or D82C; however, there may be small areas of irrigation on the farms which has not been captured on the WARMS database.

Table 8-5: Irrigation Water Use within Tertiary D82

QUATERNARY	VOLUME (M^3/A)	AREA (HA)
D82A	36 486 000	1 880.2
D82B	45 000	3
D82F	1 975 500	131.7
D82G	7 474 500	498.3
D82K	0	0
D82L	8 290 990	555.6
Total	**54 271 990**	**3068.8**

Source: DWS WARMS Database

There are many water supply schemes along the length of the Orange River, as the water resources around the downstream Orange River are scarce, and therefore are supplied by the Gariep and Vanderkloof Dams, limiting the main water use to be alongside the river. Irrigation along the Orange

River is the principal water use. The major schemes connected to the Orange River include (ORASECOM, 2012):

- Douglas Irrigation Scheme (part of the Orange-Vaal Transfer Scheme): The Scheme is located between 400-500 km's away from the study area at the downstream end of the Vaal River (its primary water source).
- Middle Orange Irrigation Area (includes irrigation along the riparian zone between Hopetown and Boegoeberg Dam: The area stretches from Hopetown to Boegoeberg Dam. The irrigators are not part of a formalised scheme with a common supply system, but rather abstract water directly from the Orange River individually. The scheme is located 300+ km's away from the study area.
- Keimoes Canal Irrigation Area: Keimoes irrigation area consists of various Irrigation Boards, each with its own diversions from the Keimoes Canal which obtains its water from the Orange River. The scheme is located 400+ km's away from the study area.
- Namakwaland Irrigation Area: The water for the Namakwaland Irrigation Area is abstracted from the Orange River. Water is released from Vanderkloof Dam to supply users in this area. The scheduled area is about 2 439 ha and too extensive to study in any further depth.
- Vioolsdrift and Noordoewer Irrigation Area (extends into Namiba): The irrigation areas are supplied through a canal system fed by the Vioolsdrift Weir on the Orange River. The scheme is operated by the Vioolsdrift and Noordoewer Joint Water Authority over a vast area.

Table 8-6 shows volumes of the remainder of water users within the tertiary.

More information regarding water availability is included in the water availability study included in **Appendix K**.

Table 8-6: Water Users within Tertiary D82 (excluding irrigation)

QUATERNARY	VOLUME (m^3/a)	SECTOR	SOURCE
D82A	12 000	Water supply service	Orange River
	4 000 000	Industry (urban)	Scheme
D82B	20 280	Livestock Watering	Borehole
D82C	16 060 000	Water supply service	Scheme
	3 500	Mining	Borehole
D82G	4 000	Water supply service	Scheme
D82H	35 200	Water supply service	Borehole
D82K	528 000	Industry (urban)	Scheme
	724 100	Industry (urban)	Scheme
	1 800	Mining	Scheme
D82L	2 000 000	Mining	Scheme

Source: DWS WARMS Database

8.8 GROUNDWATER

The topography of Farm RE86 is predominantly flat, with an average slope of 3.1% declining from the south west towards the north east. The elevation of the property ranges between 835 – 1009 meters above mean sea level (a.m.s.l), and characterised by 2 small mountain tops, which is typical of the area on the northern boundary.

The ranges of hills, mountains and inselbergs in the area display some of the most diverse and complex geology in Southern Africa including some of the richest known concentrations of copper, lead and zinc (Mining Technology, accessed 2016).

The Aggeneys deposits occur in the Precambrian metavolcanic metasedimentary Bushmanland Group which forms part of the Namaqualand Metamorphic Complex. The Bushmanland Group is located within the Namaqualand-Natal Mobile Belt, with and area of approximately 18 000km^2 (RHDHV, 2013).

The project falls within the northern Aggeneys terrain of the Bushmanland Terrane group. The orebody at Gamsberg is hosted by iron sulphide-rich pelitic rocks and iron formation, and the economic mineralisation comprises sphalerite (zinc) and minor galena (lead).

The area includes deposits of zinc, lead, copper, and silver suitable for mining. A major zinc deposit containing mineral resources of 194Mt has been identified in the nearby Gamsberg inselberg (Mining Technology, accessed 2016). The underlying natural geology is considered to be representative of a poor aquifer, a low-yielding system of poor water quality with a low vulnerability to contamination and low susceptibility to anthropogenic activities.

Several boreholes over the area were identified with three representative boreholes chosen to be analysed for both yield and chemical constituents. It was found that the groundwater yield may be able to supplement the demand of the proposed solar energy facility.

The underlying natural geology is considered to be representative of a poor aquifer, a low-yielding system of poor water quality with a least vulnerability to contamination and the low susceptible to anthropogenic activities.

A water yield assessment was carried out by VSA Leboa Consulting (Pty) Ltd on three selected representative boreholes for the area. This data was used to determine the constant yield, sustainable yield and water quality.

It was found that the regional depth to groundwater is 30–50m bgl. However, from the water level measured from the boreholes, the water level is between 27.74 m and 79.59m bgl. Due to deep underground mining, it can be expected that the groundwater level will be induced to drop. Average borehole yields are less than 0.5l/s, mean annual recharge is between 1-5mm per annum with the mean annual precipitation of between 20-150mm per annum. Groundwater quality is dominated by sodium, potassium, chloride and sulphate ions, with dissolved solids typically ranging from 1000–1500mg/l.

Based on the pumping test conducted on BH133 and BH155, the hydraulic parameters are summarised in **Table 8-7**.

Table 8-7: Hydraulic parameters for boreholes

BH ID.	BH Depth (m)	Static Water Level (m)	Drawdown available (m)	Drawdown achieved (m)	Drawdown achieved (%)	Recovery		Constant Q (l/s)
						%	Hrs	
BH133	77.28	41.24	36.04	12.09	33.55	97.78	8	1.56
BH155	59.55	27.74	31.81	22.26	69.98	91.25	10	1.29

No test was conducted for the third borehole as it failed during the step test. Each borehole comprise of three steps of one hour each

8.9 HERITAGE

The heritage specialist study was undertaken by ACO Associates and is included in **Appendix R**.

ARCHAEOLOGICAL BACKGROUND

EARLY AND MIDDLE STONE AGE

There is a widespread, but ephemeral distribution of stone artefacts of Pleistocene age across Bushmanland. The Early Stone Age (ESA), according to Morris (2013) includes Victoria West cores, long blades and a low incidence of handaxes and cleavers. According to Morris (2013) there is a Middle Stone Age (MSA) site on the top of the Gamsberg and at the base of hills. Orton (2013b) collected both ESA and MSA material from the top of the mountain. Webley & Halkett (2012) also recorded MSA stone artefact scatters to the north-east of the proposed development on the farm Aroams.

In their assessment of the Korana WEF, Hart et al (2014) recorded a few concentrations of MSA scatters, but otherwise no definable archaeological sites. Smith (2012) recorded a low density distribution of ESA and MSA flakes on the Zuurwater Solar Facility.

LATER STONE AGE

According to Morris (2013) the predominant archaeological resource in the area belongs to the Late Holocene Later Stone Age. Orton & Webley (2013) note that the pre-colonial archaeology is strongly linked to landscape features. Ephemeral later stone age (LSA) scatters are found across the area and are generally in close proximity to fountains, small, seasonal pans or hollows in the bedrock which collect seasonal rainfall ("klipbakke"). More substantial herder encampments are found along the Orange River floodplain (Morris & Beaumont 1990), reflecting "the higher productivity and carrying capacity" along the river. After good rains, herders may have moved from the Orange River into Bushmanland, as indicated at sites near Aggeneys with pottery and the archaeological site of Schuitdrift South east of Pofadder (Morris 1999a). Beaumont et al (1995) have argued that the arrival of the herders around 2000 years ago, may have led to competition for resources and the marginalisation of hunter-gatherers who may have made more frequent use of the Bushmanland resources.

Morris (2013) refers to grinding grooves in the rock outcrops of the Aggeneys/Gamsberg area. Similar grinding grooves in the bedrock have been recorded on the Pofadder WEF (Orton & Webley (2012b) to the east of the study area and at the Kangnas WEF (Orton & Webley 2012a) to the west of the study area. A single site with rock paintings (consisting of simple finger paintings including two star motifs and an indented oval shape image) has been recorded from a boulder alongside the Aggeneys/Black Mountain aggregate quarry. Morris (2013) also refers to some engraved cupule sites at two sites on the Black Mountain Mining Property, Aggeneys and at the foot of the Swartberg on Zuurwater 62 (Morris 2013). This appears to be similar to the cupule site recorded by Orton & Webley (2012a) on the Kangnas WEF site some distance to the west.

In fieldwork conducted by Webley & Halkett (2011) for a new transmission line commencing at the Aggeneis substation, it was observed that LSA sites (consisting mainly of quartz flakes) were concentrated at the base of small koppies.

HISTORICAL BACKGROUND

Penn (1995) has summarised the colonial history of this frontier zone for the Aggeneys and Gamsberg areas. The area adjacent Aggeneys was visited by eighteenth and nineteenth century explorers (Thompson 1827; Dunn 1931; Robinson 1978). Many of the local place names are of Khoe -San origin. Thompson (1827) recorded that the local people were known as the "Obseses", they were a formidable amalgamation of various tribes who had been involved in conflict with bands of Afrikander.

The indigenous groups faced onslaughts from the 1770s and by the end of the 19th century the independent San groups had disappeared. There are references to a massacre of San groups in a kloof at Aggeneys although other sources link the killing of the Bushmen with Gamsberg rather than Aggeneys. Morris (2010) notes that recently appreciation as started to emerge regarding the “genocide of the Bushmen in this area, with certain mountainous areas (like the Gamsberg) being likely massacre sites”.

There are various interpretations of the name Aggeneys (original spelling Aggeneis). Nienaber & Raper (1977) list “Place of Water”, “Place of Blood”, “Place where they slaughtered” or possibly “Place of red clay”. Pella was originally known as “Kammas”, which means “fountain with water”.

According to a British Intelligence Map of 1900 (**Figure 8-25**), the wagon track across Bushmanland ran past Aggeneys, and then south of the Gamsberg, through the village of Namies which now lies in ruins. We know from Burke (1995) that during the Anglo-Boer War skirmishes in the Northern Cape around 1901, there were approximately 200 Boers at Namies. Aggeneys itself, which also had an important water source, was also held by a small Boer commando unit. The farm at Aggeneys was acquired by a former British soldier in 1905 and the ruins of the original farmhouse are still visible. There was some Boer war action around Aggeneys and the old fortifications are apparently visible on the valley sides.

The village of Namies was an important water supply point for people trekking across Bushmanland and was the last water stop before Gamoep, some 100km to the southwest (Eksteen 2012; Orton & Webley 2013). After good rains, the Trekboers used to camp at Namies. Namies was abandoned around 1923, when Pofadder became the most important town in the area. According to **Figure 8-25**, there was a track which ran through the eastern section of the Hartebeest Vlei 86. A pan in the south part of farm was called Goneroop.

The first known investigation of the mineral potential of the Aggeneys area dates to 1928, while the first mining at Swartberg (Black Mountain) dates to the 1970s.

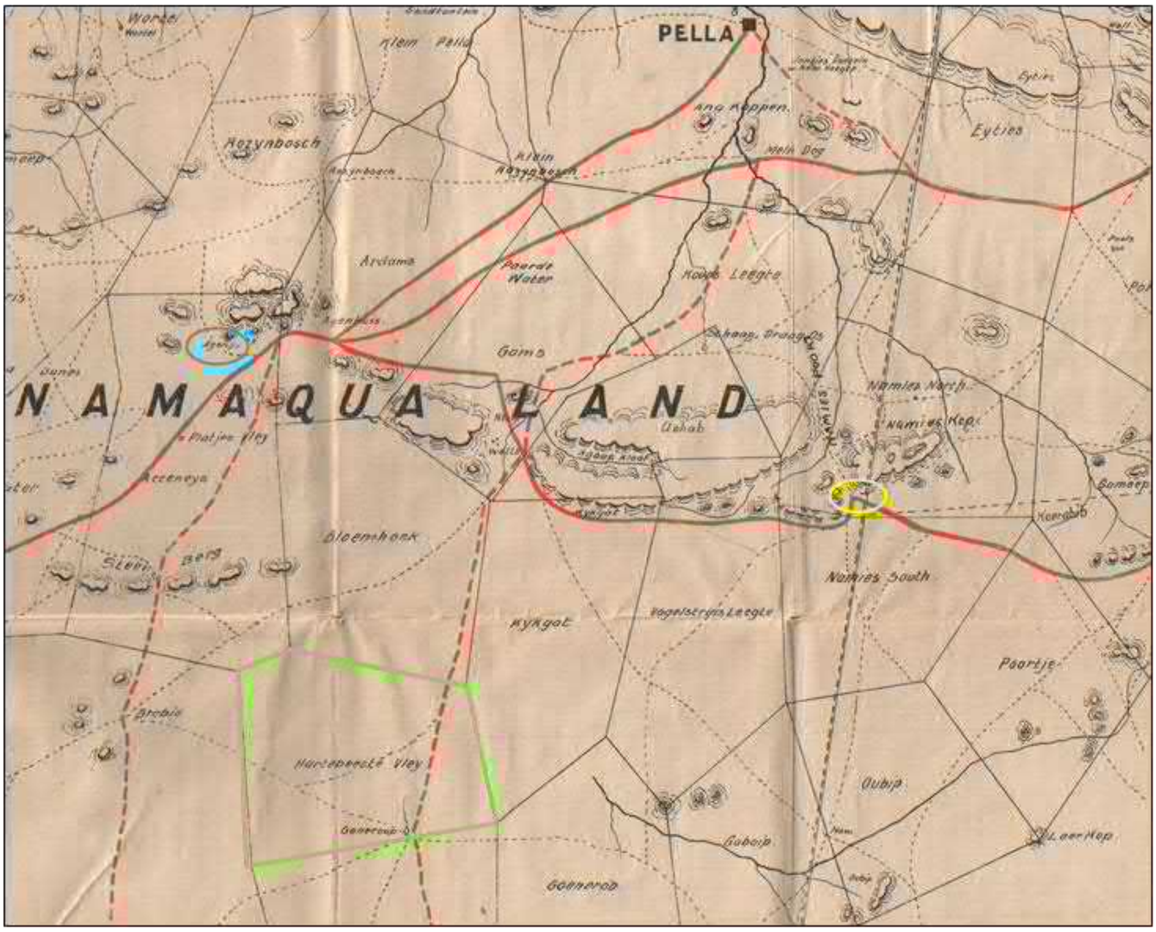


Figure 8-25: Map compiled by the British Intelligence Department (1900) of Bushmanland (scale 1:250 000). Note the position of Hartebeest Vlei. The location of Aggeneys in shown in blue, and Namies is shown in yellow

CEMETERIES AND GRAVES/CAIRNS

Graves are occasionally recorded next to old farmsteads. Morris (2011) recorded some stone cairns, possibly pre-colonial burials, to the north-west of the Gamsberg.

LANDSCAPE AND SCENIC ROUTES

The only aspect of the landscape which has been identified as being of cultural significance is the Gamsberg some 12km to the north-east. Morris (2010) observes that there has been some discussion around including the Gamsberg into a potential / Xam and Khomani Heartland World Heritage Site, but there has been no progress on this matter since 2010.

The N14 which runs 10km north of the study area can be considered a scenic route because of the aesthetic qualities of the surrounding landscape.

ARCHAEOLOGY OF THE WATER PIPELINE ALIGNMENT ALTERNATIVES

Briefly, the pre-colonial archaeology of the southern section of both pipeline options comprises sparse scatters of Middle Stone Age material, generally on gravel pavements, or on the slopes of small rocky koppies. In fieldwork for a new transmission line commencing at the Aggeneis substation, Webley & Halkett (2011) observed that LSA sites, consisting mainly of quartz flakes, were concentrated at the base of small koppies. Smith (2012) reported a few ESA and MSA pieces during his survey of the Zuurwater PV facility but the low density of archaeological remains was confirmed by Morris (2011) who notes “extremely minimal traces were found on the plains”.

It is anticipated that the distribution of pre-colonial archaeological material between the N14 and the Orange River will be low, with the exception of those areas around fountains, springs and pans. There is also a possibility that rock paintings and/or engravings may be found in rocky outcrops. Similarly, small settlements and farm complexes may include family cemeteries or isolated graves.

The Orange River itself, however, was an important focus for human settlement from pre-colonial times. It is known that that Khoekhoen pastoralists, known as the Einiqua, were living along the lower and middle Orange River by the late 18th century, although the earliest inhabitants of the Pella area were apparently San hunter-gatherers (Penn 1995). Important archaeological sites, such as Jakkalsberg, have been found on the banks of the Orange River further downstream in the Richtersveld (Webley 1997).

Archaeological excavations by amateur archaeologists of graves and burial cairns along the Orange River, particularly between the Augrabies Falls and Prieska, have produced large collections of human skeletal material (Morris 1992). Since the stretch of the Orange River between Pella and Goodhouse has not been subjected to systematic archaeological field surveys, it may be equally sensitive to those areas upstream and downstream.

8.10 PALAEONTOLOGY

Mid Proterozoic basement rocks of the Namaqua-Natal Province are entirely unfossiliferous (Almond & Pether 2008). Fossil biotas recorded from each of the main sedimentary rock units mapped in the Aggeneys region and along the Orange River to the north have been reviewed in several previous palaeontological heritage assessments by the author Almond (e.g. 2011, 2012, 2013a, 2013b, 2014; see also Almond & Pether 2008, Almond 2009, Almond in Macey et al. 2011 and extensive references therein).

An important Early to Middle Miocene vertebrate faunule has been recorded from alluvial deposits (gravels, grits and lenses of sand, clay) of the Koa River Palaeo-valley system at Bosluis Pan, some 50 km SSW of Aggeneys. The fossil fauna has been dated to 15-16 Ma and is reviewed by Senut et al. (1996; see also Malherbe et al. 1986, De Wit 1999, Partridge et al. 2006, Agenbacht 2007, Almond in Macey et al. 2011). It includes rare bones, tusks, molars and numerous tooth fragments of Gomphotherium, a four-tusked, browsing proboscidean with characteristic rounded (mastodont) tooth cusps. There are also crocodile teeth and tortoise shell fragments, as well as remains of grazing elephant shrews, giraffids, bovids, a rhinocerotid and air-breathing catfish. However, fossiliferous fluvial sediments have not yet been recorded from the northern sector of the Koa River Valley near Aggeneys; if present, they are likely to be deeply buried beneath superficial sediments (e.g. younger alluvium, aeolian sands). Significant impacts on subsurface fossils within the study area - where deep excavations are not involved - are therefore not anticipated.

The various younger superficial deposits of the Kalahari Group in Bushmanland, including aeolian sands, alluvium, calcretes and pan deposits, are poorly known in palaeontological terms. The fossil record of the Kalahari Group as a whole is generally sparse and low in diversity; no fossils are recorded here in the Pofadder and Onseepkans geology sheet explanations by Agenbacht (2007) and Moen and Toogood (2007) respectively. The Kalahari beds may very occasionally contain important Late Caenozoic fossil biotas, notably the bones, teeth and horn cores of mammals as well as remains of reptiles like tortoises, non-marine molluscs (bivalves, gastropods), ostrich egg shells, trace fossils (e.g. calcretised termitaria, coprolites), plant remains such as peats or palynomorphs (pollens, spores) in organic-rich alluvial horizons as well as siliceous diatoms in pan sediments. Calcrete hardpans might also contain trace fossils such as rhizoliths, termite nests and other insect burrows, or even mammalian trackways.

Potentially fossiliferous Tertiary or Pleistocene “high level gravels” are not mapped along the Orange River within the pipeline study area and are probably not present there (Moen & Toogood 2007). Small relict patches of older silty alluvium at 50m above modern river level with subfossils of freshwater snails in the Onseepkans sheet area have been recorded but it is unlikely that similar deposits will be excavated for the proposed water supply development.

8.11 VISUAL

The visual specialist study was undertaken by Belinda Gebhardt and is included in **Appendix S**.

VISUAL CHARACTER

Landscape character is the description of the pattern of the landscape, resulting from particular combinations of natural (physical and biological) and cultural (land use) factors. It focuses on the inherent nature of the land. The basis for the visual character of the area is therefore provided by the underlying geology and climate.

The area is very arid and hot with very low average rainfall. This, together with the geology has resulted in expansive dry plains, with low growing, xerophytic plants interspersed with protruding rocky land forms.

These land forms provide dramatic, rugged focal points, emphasised by the flat, low nature of the plains and the high clear skies and serve as backdrops to the landscape, when viewed from a distance (**Figure 8-26**). The colours of the land are soft greys and muted greens against rich reddish browns which contrast dramatically with the high blue skies, sometimes scattered with cloud. Occasional clusters of trees, the only taller vegetation in the region, dot the landscape and are visually conspicuous features in the landscape.

The land-use in the area does not significantly alter the natural visual character. The study area is remote and sparsely populated, with less than 1 person per km^2. Patterns of the long straight roads, powerlines and fences, with few dwellings or other man-made structures add to the sense of barrenness and isolation. As noted above, this character is likely to change when proposed Wind Energy Facilities in the vicinity are constructed. The tall, clean lines of the turbines will create a more futuristic, modern character which is likely to dominate the immediate visual landscape.

Figure 8-26: Visual Character, clear skies flat plains and koppies

SENSE OF PLACE

An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Lynch defines 'sense of place' as "the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own" (Lynch, 1992:131).

The visual character of the study area, while strikingly unique regionally, is typical of large areas of the Northern Cape and southern Namibia. The greater area is definable by its stark, dry landscape and feeling of remote stillness. The sites are recognisable in the landscape by the two koppies which flank them, but are not strikingly different or recognisable from the vast areas of surrounding land. The Gamsberg inselberg to the north-west of the study area is a unique landform, with a very distinct visual character, primarily due to its unusual topographical form.

VISUAL QUALITY

Aesthetic value is an emotional response derived from our experience and perceptions. As such, it is subjective and difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity (Crawford, 1994). Landscape quality can be said to increase when:

- Natural landscape increases and man-made landscape decreases;
- Well-preserved, compatible man-made structures are present;
- Diverse or vivid patterns of grasslands and trees occur;
- Water forms are present;
- Topographic ruggedness and relative relief increases; and
- Where land use compatibility increases (Crawford, 1994, Arriaza, 2004).

Greater aesthetic value is also attached to places where:

- Rare, distinguished or uncommon features are present;
- The landscape/townscape evokes particularly strong responses in community members or visitors;
- The landscape/townscape has existing, long-standing meaning or significance to a particular group; and
- Landmark quality features are present. (Ramsay, 1993).

Visual quality therefore is an estimation of the composition of landscape and man-made elements and their resulting visual or scenic excellence.

The vast, arid plains of the Northern Cape and southern Namibia interspersed with rugged rocky, koppies contrast dramatically with the striking blue skies and create a landscape which is appealing in its expanse and remote, arid nature.

While not symbolic, the vastness of this desolate and remote landscape is evocative. These visual features create a landscape pattern that can be said to currently have a relatively high visual quality due to the high visual integrity, the general absence of intrusive, man-made features and the unusual visual character of the desolate arid plains interrupted by koppies. When the area is developed as a REDZ the concentration of turbines will alter the visual character, compromising the rural character and providing a cleaner, more futuristic or modern character. The aesthetic appeal of this altered landscape is subjective.

8.12 SOCIAL ENVIRONMENT

The social specialist study was undertaken by WSP | Parsons Brinckerhoff and is included in **Appendix T**.

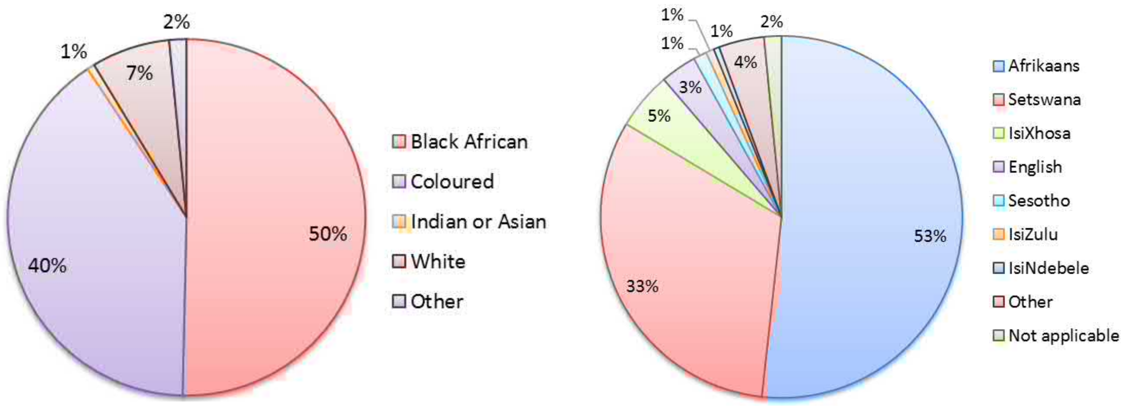
SOCIO-ECONOMIC CONTEXT

The proposed project is located within Northern Cape Province. This is one of the largest provinces within South Africa's, taking up nearly a third of the country's land area (372 889 km²), but has the country's smallest population of approximately 1.1 million people (Statistics South Africa, 2012). The population density of the province is therefore very low (approximately 1 person per square kilometre) (Statistics South Africa, 2016). The population comprises predominantly Black African (50%) and Coloured (40%) population groups (**Figure 8-27**). The two main first languages spoken within the province are Afrikaans (53%) and Setswana (33%) (**Figure 8-27**).

The split between urban and rural populations is 76% and 24% respectively (Statistics South Africa, 2012). This indicates that the majority of the population lives in urban centres, which likely to be a result of sparse natural resources within the province.

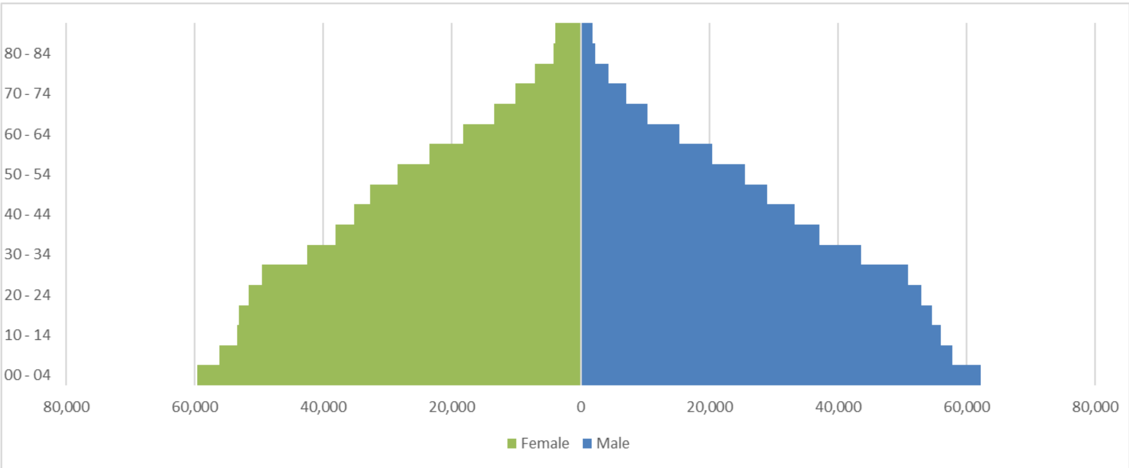
On a geographical basis, the province shares borders with Namibia in the north and stretches as far as the Atlantic Ocean in the west. The Northern Cape also shares borders with the Western Cape to the south, the Eastern Cape to the southeast, and the Free State and the North West Province to the east. The largest centres in the Northern Cape are Kimberley and Upington. Kimberley was founded on the mining industry, but most mineshafts in Kimberley have been closed, thus the traditional economic base of the city has been eroded, and there is a need to look for alternative activities to sustain its local economy. Upington's (population ~47000) local economy is based on services, agriculture and agro-industry, and long-term sustainability is not a particular issue. It is, however, an issue in the northern areas of the province where mining has taken over from extensive agriculture.

The current unemployment rate, as of the first quarter of 2016, is 27.8% (Statistics South Africa, 2016). The total dependency ratio is 55.7%, which is slightly higher than the national average which was 52.14% in 2015 (Indexmundi, 2016). **Figure 8-28** provides a population pyramid for the Northern Cape indicating a high population below the age of 35. The total percentage of people over the age of 20 years of age who do not have schooling is 24%, which is three times the national level of 8% (Statistics South Africa, 2016). The total number of people above the age of 20 that have a matric or higher is 30%, which is lower than the national level of 41% (Statistics South Africa, 2012).



Source: Statistics South Africa (2012)

Figure 8-27: Population groups and Languages spoken – Northern Cape



Source: Statistics South Africa (2012)

Figure 8-28: Population Pyramid – Northern Cape

The sparse, arid landscape is dominated by extensive sheep, goat, and cattle rearing, as well as mining (including diamonds, iron, titanium, zinc, lead, and copper). The Northern Cape mining industry makes up nearly 7% of South Africa's total mining value and contributes 23.4% to the provinces total economy. Farmers in the province contribute to 6.1% to South African agriculture and 6.6% of the province's economy (Statistics South Africa, 2012). The Orange River provides a source of fertile land and water within the northern region of the province. The areas immediately adjacent to Orange River are therefore characterised by a concentration of vineyards and other intensive agricultural activities, producing products such as export-quality table grapes, wine, dried and preserved fruit. The Northern Cape is also home to the world's largest telescope, the Square Kilometre Array (SKA). The province has numerous parks and conservation areas. The Kgalagadi Transfrontier Park is Africa's first cross-border game park and one of the largest conservation areas in southern Africa.

The Namakwa District Municipality, in which the site is located, is one of five districts of the Northern Cape Province and comprises six local municipalities. Namibia forms the northern border and the

Atlantic Ocean the western border. This municipality has the lowest population within the province, with just over 100 000 people spread over the municipality, and concentrated within small to medium-sized settlements and towns.

The local economy is natural resource-based, primarily dependant on extensive livestock farming. The mining sector, however, is the dominant economic sector (52% to Gross Domestic Product). Recent trends in the mining sector, however, show the sector to be in decline. Increasing levels of unemployment have resulted in increased pressure on the employed population and a high dependency on the State for support. A decline in employment opportunities in the mining sector emphasises the need to prioritise alternative sectors (Namakwa IDP, 2012).

LOCAL CONTEXT

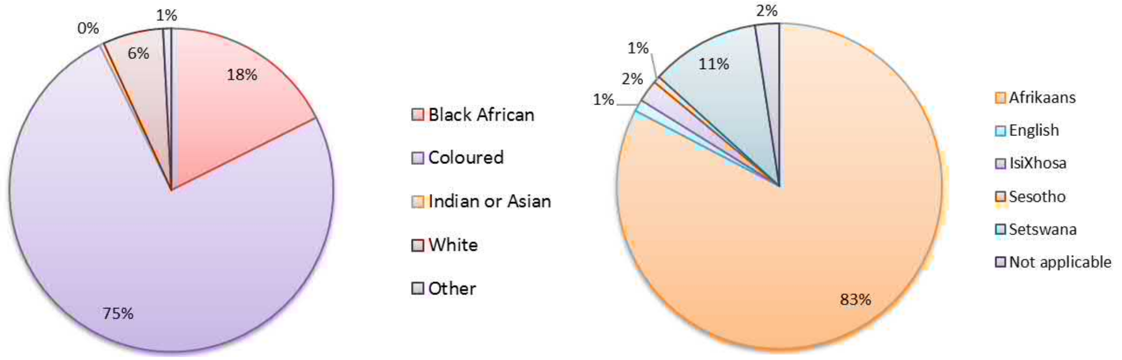
The local context refers to the area surrounding the site contextualised within local municipality. The proposed project site is located within Ward 4 of the Khâi-Ma Local Municipality, which lies in the northern region of the Namakwa District Municipality, bordering on Namibia. The seat of local government is located in the town of Pofadder, and the four main economic sectors are livestock grazing, agriculture, mining and tourism (Khâi-Ma IDP, 2012).

The Khâi-Ma Local Municipality covers an area of approximately 16 600 km^2, and has a population of approximately 12 500 people, resulting in a very low population density of less than 1 person per square kilometre (Statistics South Africa, 2012). The dominant population is coloured (75%), followed by Black African (18%), as depicted in **Figure 8-29**. The main languages spoken are Afrikaans (83%) and English (11%), as shown in **Figure 8-29**. The dependency ratio is 46%, which is low compared to the National level of 52.14% in 2015 (Indexmundi, 2016), which could be explained by the proportionally high number of young adults (20 – 35 years) (**Figure 8-30**).

The municipality is characterised by vast tracts of flat, undeveloped and arid Karoo landscape, with scattered mountainous areas, and ephemeral rivers. The majority of the population live within urban areas (82.8%), with only 17.2% living in rural areas (Statistics South Africa, 2012). As a result, the local service levels are reasonable, with 89.6% of the households having access to electricity for lighting 84.3% for cooking and 50.8% for heating. Almost 70% of potable water is provided by the municipality and other water service providers, and 8.4% is sourced from boreholes.

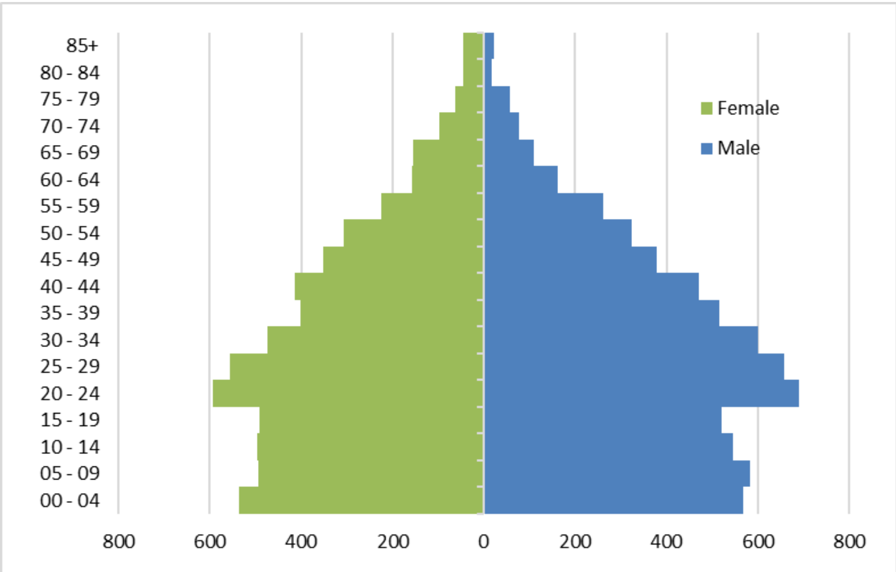
Forth-seven percent of the population over 20 years have a matric or higher education, which is marginally higher than the national level of 41%. Ten percent of people over 20 have had no schooling which is marginally higher the national level of 8%. This indicated a relatively high level of education within the local municipality.

The unemployment levels are high with 31.8% of the potential labour force being unemployed, compared to the current national unemployment rate of 25.4% (Statistics South Africa, 2016). The main economic sectors within the Khâi-Ma Local Municipality are mining, agriculture, tourism, and community and social services. The majority (77%) of employed persons fall within the formal sector, and 15% within the informal sector (Statistics South Africa, 2012).



Source: Statistics South Africa (2012)

Figure 8-29: Population groups and Languages spoken- Khâi-Ma Local Municipality



Source: Statistics South Africa (2012)

Figure 8-30: Population Groups - Khâi-Ma Local Municipality

LOCAL ECONOMIC ACTIVITIES

The main activity within the local area is mining. Approximately 16 km northeast of the study area lies the town of Aggeneys, which is a mining town that was developed in support of the Black Mountain Mine (BMM), located in the same vicinity. This mine primarily produces zinc and lead, as well as copper and silver, and is the main source of employment within the local area. BMM employs approximately 1 300 people, 700 permanently and the remainder on a contract basis (ERM, 2013). BMM provides basic services (including free potable water) to the staff housed at Aggeneys, as well as water to surrounding the towns of Pofadder and Pella, and surrounding farmers (a total of 11 200 people) (ERM, 2013). In 2015, BMM commenced excavation on the Gamsberg Mine, located approximately 10 km northeast of the study area. This mine is proposed to employ up to 3 200 people during the construction phase (highly skilled to low-skilled) over 30 months of construction, and approximately 100 people during the operational phase (ERM, 2013).

After mining, there are two other key local economic activities namely agriculture and tourism. Agricultural activities include intensive crop and fruit farming along the Orange River, and extensive sheep and goat farming. Tourism related activities are centred around the Orange River, the Namaqualand region (wildflowers, cultural and nature conservation tourism), and national wildlife reserves within the Northern Cape such as the Richtersveld and Kgalagadi National Parks.

Development in the area appears to be centred on renewable energy generation and associated infrastructure. Currently there are several proposed projects within a 100 km radius of the study area, and one existing facility.

LOCAL COMMUNITIES

The key centres within the Khâi-Ma Local Municipality are Pofadder, Aggeneys, Pella, Witbank and Onseepkans. The remote nature of the study area from public services (i.e. local towns) means that there are few rural or farming settlements on or within the vicinity of the study area. Scattered farming settlements are present north of the study area along the Orange River near Pella, Witbank and Onseepkans, as well as to the northeast around Pofadder. **Table 8-8** provides a summary of these communities, and their relative distance from the study area.

Table 8-8: Description of Local Communities

Town	Description	Distance & direction from study area
Aggeneys	The small town of Aggeneys is located adjacent to the BMM. The town was developed in the 1970s to accommodate mine staff, and comprises residential housing, a police station, basic retail and a private airstrip. The population is estimated at 2 053 with approx. 666 households (Khâi-Ma IDP, 2011).	14 km northeast
Pella	Pella is a small town, located at the base of the Pella Mountains on the Orange River, with a population of approximately 2 500 people (Statistics South Africa, 2012). The town supports the local farming and the Aggeneys mining communities.	40 km northeast
Pofadder	The town is situated along the N14, and is an agricultural centre for the surrounding farming community. The town has approximately 808 households and estimated population of 2919 people (Khâi-Ma IDP, 2011)	50 km northeast
Witbank	Witbank is a hamlet of approximately 80 households. Although little information is available about the settlement, it is likely to support the local agricultural sector.	60 km north, northwest
Onseepkans	Onseepkans is a small, scattered settlement located on the Orange River. The community comprises farming settlements (farm houses and staff accommodation) and is a border post between South Africa and Namibia.	80 km northeast

8.13 AIR QUALITY

The air quality specialist study was undertaken by Airshed Planning Professionals and is included in **Appendix Y.**

The consideration of the existing air quality is important so as to facilitate the assessment of the potential for cumulative air pollutant concentrations arising due to the proposed development. Sources of atmospheric emission in the study region include: mining activities, vehicle entrainment on paved and unpaved roads, and wind-blown dust from exposed areas. Given the restricted vehicle activity in the area, vehicle exhaust emissions are anticipated to be minimal. There are no industrial operations in the area.

MINING OPERATIONS

Operations at the Black Mountain Mine are most likely the largest contributor to particulate emissions in the vicinity. The proposed Gamsberg Opencast Mine will likely be the main source of particulate emissions in the area once it becomes operational. The air quality assessment concluded that the air quality in the area is likely to be affected negatively by the operational phase of the mine but that it can be reduced to a Minor significance with wet suppression methods (Dracoulides & Xu, March 2013).

Particulate emissions sources from mining operations mainly comprise of land clearing operations (i.e. scraping, dozing and excavating), mining operations (drilling and blasting, loading and unloading), materials handling operations (i.e. tipping, off-loading and loading, material transfer points), vehicle entrainment from roads, wind erosion from open areas and ventilation shaft emissions. These activities mainly result in fugitive dust releases with small amounts of NOx, CO, SO2, methane and CO2 being released during underground and proposed opencast blasting operations.

FUGITIVE DUST SOURCES

These sources are termed fugitive because they are not discharged to the atmosphere in a confined flow stream. Sources of fugitive dust identified to potentially occur in the study area include paved and unpaved roads; agricultural tilling operations; and wind erosion of sparsely vegetated surfaces.

UNPAVED AND PAVED ROADS

Emissions from unpaved roads constitute a major source of emissions to the atmosphere in the southern African context. The force of the wheels from vehicles travelling on unpaved road surfaces cause pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong turbulent air shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Dust emissions from unpaved roads vary in relation to the vehicle traffic and the silt loading on the roads.

Emission from paved roads are significantly less than those originating from unpaved roads, however they do contribute to the particulate load of the atmosphere. Particulate emissions occur whenever vehicles travel over a paved surface. The fugitive dust emissions are due to the resuspension of loose material on the road surface.

WIND EROSION OF OPEN AREAS

Emissions generated by wind erosion are dependent on the frequency of disturbance of the erodible surface. Every time that a surface is disturbed, its erosion potential is restored (US EPA, 2006). Further erodible surfaces may occur as a result of agriculture and/or grazing activities.

MEASURED DATA

A baseline air quality study conducted by SRK between June and October 2009, found that PM10 concentrations at Aggeneys were well below the daily NAAQ limit of 75 µg/m^3, except for one exceedance at the end of October 2009. Dust fallout, collected at and around the proposed Gamsberg Mine site, were high (> 1 200 mg/m^2/day – non-residential level) during the months of July and September 2009 but below the residential limit (600 mg/m^2/day) during the months of June, August and October 2009 (Dracoulides & Xu, March 2013).

8.14 NOISE

The noise specialist study was undertaken by Airshed Planning Professionals and is included in **Appendix Z.**

NOISE RECEIVERS

Noise receivers generally include places of residence and areas where members of the public may be affected by noise generated by industrial/mining activities. No farmsteads or residences could however be identified within a 5 km radius of the CSP 1 Site.

SAMPLED BASELINE AND REPRESENTATIVE PRE-DEVELOPMENT NOISE LEVELS

A summary of broadband results for the full measurement period is provided in Table 4.

An LAeq of 42.1 dBA was recorded between 21-Dec-16 and 1-Jan-17. As per the definitions of SANS 10103, overall noise levels are similar those typically found in rural areas (35 dBA to 45 dBA). The small differences between day and night-time noise levels are indicative of the area's rural nature. It is typical of areas away from communities and infrastructure.

90% of all logged values were above 20.7 dBA (LA90) which is at the lower range of the SLM's range. The large difference between recorded LAeq and LA90 generally indicates the frequent occurrence of noisy incidents (refer to peaks in Figure 6). During the specialist's time, on-site, it was observed that wind generated noise contributed notably to ambient levels. From the record kept by the landowner on certain days during the measurement, other such incidents may include;

- The arrival and departure of private vehicles;
- Farm activities (animals, vehicles, implements);
- Birds and insects; and
- Air conditioning units during their start-up, operational or shutdown cycles.

3rd octave frequency spectra indicate the presence of tones at 6.3 kHz (Figure 8). The source of acoustic energy within the 6.3 kHz frequency band could not be determined. It was however found that peaks at 6.3 kHz occurred daily but only during day-time hours. Without the contribution of the acoustic energy contained in the peaks at 6.3 kHz, the overall LAeq reduces from 42.1 dBA to approximately 41.7 dBA. The difference is considered immaterial.

Table 8-9: Summary of logged broadband results

PERIOD	21-DEC-16 TO 1-JAN-17		
	Overall	**Day-time**	**Night-time**
$L_{Aeq\ (T)}$	42.1	41.8	42.7
L_{A90}	20.7	20.4	28.4
L_{AFmin}	15.5		
L_{AFmax}	81.1		

9 IMPACT ASSESSMENT – CSP SITE

9.1 PHASES OF DEVELOPMENT

Potential impacts have been identified and assessed according to the phases of the project's development. For purposes of this report, these phases have been generically defined below.

→ **Construction Phase:**

The construction phase includes the preparatory works/activities typically associated the creation of surface infrastructure, access and electrical power. The activities most relevant to this phase include:

- Topsoil stripping;
- Cut and fill activities associated with site preparation (if required); and
- Construction of the surface infrastructure including the central tower, power island, heliostats, water treatment facilities, inverters, site substation and internal powerlines (132kV and medium voltage).

→ **Operation Phase:**

The operational phase includes the daily activities associated with CSP facility.

→ **De-commissioning Phase:**

The decommissioning phase includes the activities associated with the removal/dismantling of machinery/equipment/infrastructure no longer necessary to the operation.

9.2 ACTIVITIES MATRIX

The impacts below have been assessed according to environment. **Table 9-1** provides an indication of how these environments are linked to the various NEMA listed activities outlined in Section 3.2.

Table 9-1: Activities Matrix (C – Construction, O – Operation, D – De-commissioning)

Activity Description	Topography	Geology	Climate	Soil and Land Capability	Natural Vegetation and Animal	Avifauna	Surface Water	Ground Water	Heritage	Palaeontology	Visual	Traffic	Social
GNR 983- Listing Notice 1													
Activity 11: The development of facilities or infrastructure for the transmission and distribution of electricity- (i) Outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	**C D**	-	-	**C O D**	**C D**	**C O D**	**C D**	-	**C D**	**C D**	**C O D**	-	**C D**
Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014	**C D**	-	-	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	-	-	-
Activity 14: The development 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 metres or more but not exceeding 500 cubic metres.	**C D**	-	-	**C D**	**C D**	**C D**	**C D**	**C O D**	**C D**	**C D**	-	-	-
Activity 24: The development of- (ii) A road with a reserve wider than 13,5 meters, or where no reserve exists where the road is no wider than 8 meters.	**C D**	**C D**	-	**C O D**	**C D**	**C O D**	**C D**	-	**C D**	**C D**	**C O D**	**C O D**	**C O D**

Activity 25: The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres	C D	-	-	C O D	C D	C D	C D	C O D	C D	C D	-	-	-
Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (ii) Will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	C D	C D	-	C O D	C O D	C O D	C O D	-	C D	C D	C O D	C D	C O D
Activity 56: The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) Where the existing reserve is wider than 13,5 meters; or (ii) Where no reserve exists, where the existing road is wider than 8 metres.	C D	C D	-	C O D	C D	C O D	C D	-	C D	C D	C O D	C O D	C O D
GNR 984- Listing Notice 2													
Activity 1: The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.	C D	C D	-	C O D	C O D	C O D	C O D	C O D	C D	C D	C O D	C D	C O D
Activity 4: The development of facilities or infrastructure, for the storage, or storage and handling of a dangerous good,	C D	-	-	C O D	C D	C D	C D	C O D	C D	C D	-	-	-

where such storage occurs in containers with a combined capacity of more than 500 cubic metres													
Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent	C D	-	-	C O D	C D	C D	C D	C O D	C D	C D	-	-	-
Activity 15: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	C D	C D	-	C O D	C O D	C O D	C O D	-	C D	C D	C O D	C D	C O D
Activity 16: The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 m or higher or where the high-water mark of the dam covers an area of 10 ha or more.	C D	-	-	C D	C D	C D	C D	C D	C D	C D	-	-	-
Activity 25: The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of 15,000m3 or more	C D	-	-	C O D	C D	C D	C D	C O D	C D	C D	-	-	-
GNR 985 - Listing Notice 3													
Activity 4: The development of a road wider than 4 metres with a reserve less than 13,5 metres.	C D	-	-	C D	C D	C D	C D	C D	C D	C D	C D	-	-

In The Northern Cape - (bb) National Protected Area Expansion Strategy Focus area (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans													
Activity 12: The clearance of an area of 300 square meters or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan In the Northern Cape - (i) Within critical biodiversity areas identified in bioregional plans	**C D**	**-**	**-**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**-**	**-**
Activity 14: The development of – (xii) infrastructure or structures with a physical footprint of 10 square meters or more In the Northern Cape - (bb) National Protected Area Expansion Strategy Focus area (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	**C D**	**-**	**-**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**-**	**-**
GNR 921 – Category A													
Category A - Activity 3: The storage of general waste in lagoons.	**C D**	**-**	**-**	**C O D**	**C D**	**C D**	**C D**	**C O D**	**C D**	**C D**	**-**	**-**	**-**

Category A – Activity 12: The construction of a facility for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity).	**C** **D**	**-**	**-**	**C** **O** **D**	**C** **D**	**C** **D**	**C** **D**	**C** **O** **D**	**C** **D**	**C** **D**	**-**	**-**	**-**

9.3 SOILS AND LAND CAPABILITY

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

The anticipated impacts for Letsoai CSP 1 during the construction phase are associated with the site preparation and construction of solar power facility and associated infrastructure, including:

- Loss of grazing land current utilised for grazing mostly sheep farming, cattle farming and indigenous antelope.
- Increased potential of soil erosion, especially wind driven, due to vegetation clearance, soil disturbance and a high traffic movement on site.
- Potential land contamination from hazardous substances. This includes spillage of concrete onto soil surface, as well as oils, fuel, grease (from construction vehicles) and sewage from temporary on-site ablution facilities.

There are no fatal flaws identified for the construction phase associated with the proposed Letsoai CSP 1 project. The loss of gazing land is a negative impact and was assigned a medium environmental significance rating score, after mitigation measures. This impact is unavoidable given the fact that during the construction phase the project will physically occupy portions of the land located within the project footprint. The other identified impacts (i.e. soil erosion and spillage of hazardous substances) were classified as negative impacts, but had a low environmental significance rating before and after mitigation measures.

OPERATIONAL PHASE

The anticipated impacts for Letsoai CSP 1 during the operational phase of the project are associated with the day-to-day operational activities during the normal functioning of the solar power facility, including maintenance. These impacts include:

- Loss of grazing land current utilised for mostly sheep farming, cattle farming and indigenous antelope.
- Increased potential of soil erosion due to vegetation clearance (wind driven), and more run-off from harden surfaces (i.e. roads and array of heliostats).
- Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from site operational and maintenance vehicles) and permanent onsite sewage systems.

Similar to the construction phase, there were no fatal flaws identified during this phase of the project. The loss of grazing land was assigned a high environmental significance rating however this negative impact is unavoidable given the fact that associated solar power infrastructure will permanently occupy a portion of the land within the proposed project footprint. With mitigation measures in place, this impact was brought down to a medium environmental significance. The other negative impacts of potential pipe leaks, soil erosion and spillage of hazardous substances were assigned a low environmental significance before and after mitigation measures.

DECOMMISSIONING PHASE

The anticipated impacts for Letsoai CSP 1 during the decommissioning phase include:

- Increased potential of soil erosion due to removal of solar power infrastructure (i.e. heliostats) and pipelines, soil disturbance and a high traffic movement on site.

- Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.

The decommissioning phase exhibited the lowest environmental significance rating scores for the associated impacts of the proposed Letsoai CSP 1 project. There were no fatal flaws identified during this phase of the project.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-2**.

Table 9-2: Assessment of Soil and Land Capability Impacts for Letsoai CSP 1

Ref.		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)
Construction Phase								
SLC1	**Impact**	Loss of grazing land current utilised for grazing mostly sheep farming, cattle farming and indigenous antelope.						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	Low						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	5	**45**	**Medium**	-ve
SLC2	**Impact**	Increased potential of soil erosion, especially wind driven, due to vegetation clearance, soil disturbance and a high traffic movement on site						
	Without Mitigation	2	2	6	4	**40**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	4	3	**21**	**Low**	-ve
SLC3	**Impact**	Potential land contamination from hazardous substances. This includes spillage of concrete onto soil surface, as well as oils, fuel, grease (from construction vehicles) and sewage from temporary on-site ablution facilities.						
	Without Mitigation	2	2	2	2	**12**	**Low**	-
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	0	1	**3**	**Low**	-ve
Operational Phase								

SLC4	**Impact**	Loss of grazing land current utilised for mostly sheep farming, cattle farming and indigenous antelope.						
	Without Mitigation	2	4	8	5	**70**	**High**	-ve
	degree to which impact can be reversed:	Low						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	6	5	**55**	**Medium**	-ve
SLC5	**Impact**	Increased potential of soil erosion due to vegetation clearance (wind driven), and more run-off from harden surfaces (i.e. roads and array of heliostats).						
	Without Mitigation	2	4	4	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	2	2	**14**	**Low**	-ve
SLC6	**Impact**	Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from site operational and maintenance vehicles) and permanent onsite sewage systems.						
	Without Mitigation	2	4	2	2	**16**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	2	1	**7**	**Low**	-ve
Decommissioning Phase								
SLC7	**Impact**	Increased potential of soil erosion due to removal of solar power infrastructure (i.e. Heliostats) and pipelines, soil disturbance and a high traffic movement on site.						
	Without Mitigation	2	2	4	3	**24**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	2	2	10	Low	-ve
SLC8	**Impact**	Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.						

	Without Mitigation	2	2	2	2	12	Low	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	0	1	3	Low	-ve
No Go Alternative								
	Impact	No impacts are associated with the No-Go alternative as the status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures are recommended:

- Loss of land previously used for sheep, cattle and antelope grazing will be occupied by the solar power facility and associated infrastructure.
  - Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum.
- Increased potential for soil erosion (especially wind driven) due to vegetation clearance, soil disturbance and high traffic movement on site.
  - Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum. Traffic of construction vehicles should be kept to a minimum to reduce soil compaction, and limited to existing or proposed roadways where practical. Soils excavated during construction of the facility should be appropriately stored in stockpiles which are protected from erosion (wind and water) (i.e. through use of vegetation cover in the case of long-term stockpiles- this should form part of the rehabilitation process after the construction phase). Wind erosion is dominant for the region, however the array of heliostats will act as an artificial wind break and reduce the effect in the site footprint. Water erosion action is considered limited, however backfilling with soil and use of gabions or Reno Mattresses should be used where evidence of erosion is present.
- Potential spillage of hazardous substances such as oils, fuel, grease from construction and operational vehicles, and sewage from on-site sanitation systems
  - The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper upkeep of machinery and vehicles. A complete spill kit must be onsite at all times.

9.4 NATURAL VEGETATION AND ANIMAL LIFE

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

IMPACTS ON VEGETATION AND PROTECTED PLANT SPECIES

It is confirmed that some protected plant species such as *Hoodia gordonii* occur within the site and it is highly likely that some individuals will be impacted on by the development. However, as the abundance of such species is low, the major impact would be on vegetation loss in a general sense and not on any particular species. Within solar PV plants, it is usually possible to leave some intact vegetation between the rows of panels but CSP footprints are usually sterilized and so the assessed assumes the total loss of all vegetation within the development footprint.

Impacts on vegetation and protected plant species will occur due to vegetation clearing and disturbance associated with the construction of the CSP 1 plant. As the entire area is likely to be cleared and levelled, there is little scope for mitigation and post mitigation impacts will remain medium.

DIRECT FAUNAL IMPACTS

Construction phase noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area 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 mammals or reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

Disturbance, transformation and loss of habitat during construction of the CSP plant will have a negative effect on resident fauna. However, faunal diversity and density within the site is low and post mitigation impacts are likely to be Low and of local significance only. Large amounts of noise and disturbance at the site during construction is largely unavoidable due to the operation of heavy machinery. 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 other vulnerable fauna.

INCREASED EROSION RISK

Disturbance at the site due to construction and the operation of heavy machinery will significantly increase the risk of erosion at the site, both from wind and water. Although rainfall in the area is low, sediment yields from arid ecosystems are high because the vegetation cover is too low to limit erosion and occasional thunder storms or rare heavy rainfall events can cause significant erosion in a single event. In addition, the loose red sands of the area are vulnerable to mobilsation as the red dunes of the Koa River attest. Dust suppression during construction will be required and erosion risk will extend into the operational phase until bare areas have been revegetated or protected with a less mobile substrate.

Areas disturbed during construction will be vulnerable to disturbance from wind and rain erosion. Although the site is arid, exceptional rainfall events can cause significant erosion events, as the low vegetation cover does not provide adequate protection for the loose soils. Disturbance will raise the possibility of wind erosion and dust suppression will be required during construction. With mitigation, this impact can however be reduced to a Low level.

OPERATIONAL PHASE

DIRECT FAUNAL IMPACTS

Operational phase noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area 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. During operation, the site will be inhospitable for many fauna and this will contribute to the disruption of faunal habitat and movement in the area. In addition, night-lighting and electrical fencing may also generate negative impacts and if there are any evaporation or other water ponds present, these should either be covered or fenced to prevent fauna from falling in.

The presence and operation of the facility will cause some impact to fauna due to disturbance or direct impact from electrical fencing, night lighting etc. Some fauna will inevitably find their way into the facility and want to live inside the plant. This is common for smaller mammals such as ground squirrels and mongoose. These should be tolerated and not persecuted but also not provided with food or other enticements. The presence of these animals in the site can be seen as beneficial because the mongoose will prey on rodents that can build up in PV and CSP plants and which might otherwise attract a lot of snakes, which also occurs.

INCREASED ALIEN PLANT INVASION

Alien plants are likely to invade the site and disturbed areas around the margins of the site as a result of the large amounts of disturbance created during operation. However as the construction phase would be about 2 years, this is not long enough for significant alien problems to develop and the major impact and required mitigation measures would be expressed in the Operational phase. Current levels of plant invasion at the site are low. Alien species such as *Prosopis* are however present and would potentially invade the site along with other typical weedy species such as *Salsola kali*.

Alien plants are likely to invade the site as a result of the large amounts of disturbance created during construction. Alien plant invasion would contribute to cumulative habitat degradation in the area, but if alien species are controlled, then cumulative impact from alien species would not be significant during the operational phase

INCREASED EROSION RISK

Disturbance at the site due to the operation of heavy machinery will significantly increase the risk of erosion at the site, both from wind and water. Although rainfall in the area is low, sediment yields from arid ecosystems are high because the vegetation cover is too low to limit erosion and occasional thunder storms or rare heavy rainfall events can cause significant erosion in a single event. In addition, the loose red sands of the area are vulnerable to mobilsation as the red dunes of the Koa River attest. Dust suppression will be required and erosion risk will extend into the operational phase until bare areas have been revegetated or protected with a less mobile substrate.

Areas disturbed during construction will remain vulnerable to disturbance for some time into the operational phase and will require regular maintenance to ensure that erosion is minimised. With mitigation, this impact can however be reduced to a Low level.

DE-COMMISSIONING PHASE

DIRECT FAUNAL IMPACTS

De-commissioning phase noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area 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.

Disturbance or persecution of fauna during the decommissioning phase may occur. The operation of heavy machinery and human presence at the site during decommissioning would impact fauna in and near the development. However, this would be temporary and faunal diversity and density within the site is low and post mitigation impacts are likely to be Low.

INCREASED EROSION RISK

Disturbance at the site due to the operation of heavy machinery will significantly increase the risk of erosion at the site, both from wind and water. Although rainfall in the area is low, sediment yields from arid ecosystems are high because the vegetation cover is too low to limit erosion and occasional thunder storms or rare heavy rainfall events can cause significant erosion in a single event. In addition, the loose red sands of the area are vulnerable to mobilsation as the red dunes of the Koa River attest.

Areas disturbed during decommissioning will remain vulnerable to disturbance for some time and erosion should be minimised through site rehabilitation and erosion management. With mitigation, this impact can be reduced to a Low level.

INCREASED ALIEN PLANT INVASION

Alien plants are likely to invade the site and disturbed areas around the margins of the site as a result of the large amounts of disturbance created during de-commissioning. Current levels of plant invasion at the site are low. Alien species such as *Prosopis* are however present and would potentially invade the site along with other typical weedy species such as *Salsola kali*.

Alien plants are likely to invade the site as a result of the large amounts of disturbance created during decommissioning. Alien clearing will be required for several years after decommissioning until the natural vegetation has retuned sufficiently to suppress invaders.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-2**.

Table 9-3: Assessment of Biodiversity Impacts for Letsoai CSP 1

Ref.		Extent	Duration	Magnitude	Probability	Significance		Status
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)		(+ve or -ve)
Construction Phase								
BIO1	**Impact**	Impacts on vegetation and protected plant species						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	2	8	5	**55**	**Medium**	-ve
BIO2	**Impact**	Faunal impacts due to construction activities						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-
	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
BIO3	**Impact**	Increased Soil Erosion risk during construction						

	Without Mitigation	2	2	6	5	**50**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
Operational Phase								
BIO4	**Impact**	Faunal impacts due to operational activities and human presence during maintenance activities						
	Without Mitigation	2	4	6	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
BIO5	**Impact**	Alien plant invasion						
	Without Mitigation	2	4	6	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
BIO6	**Impact**	Erosion						
	Without Mitigation	2	4	6	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
Decommissioning Phase								
BIO7	**Impact**	Faunal impacts due to decommissioning and operation of heavy machinery on-site						
	Without Mitigation	2	4	4	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	High						

	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
BIO8	**Impact**	Erosion						
	Without Mitigation	2	2	6	5	**50**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	4	3	**21**	**Low**	-ve
BIO9	**Impact**	Alien plant invasion						
	Without Mitigation	2	2	6	5	**50**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	4	3	**21**	**Low**	-ve
No Go Alternative								
	Impact	No impacts are associated with the No-Go alternative as the status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

CONSTRUCTION PHASE

- Impacts on vegetation and protected plant species
  - Preconstruction walk-though of the final development footprint to ensure that sensitive habitats and species can be avoided where possible.
  - Species suitable for search and rescue to be identified in the preconstruction walk through.
  - Clearing & translocation permit should be obtained from NC-DENC before construction commences.
  - The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas.
  - Sensitive features near to construction areas should be demarcated as no-go areas with construction tape or similar and signposted as such.
- Faunal impacts due to construction activities

- During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
- No fires should be allowed within the site as there is a risk of runaway veld fires.
- No fuelwood collection should be allowed on-site.
- No dogs or cats should be allowed on site apart from that of the landowners.
- If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards.
- 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.
- No unauthorized persons should be allowed onto the site and site access should be strictly controlled.
- All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises. Speed limits should apply within the facility as well as on the public gravel access roads to the site.
- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes and tortoises which are often persecuted out of fear or superstition.
- Any trenches that need to be dug for construction should not be left open for extended periods of time as smaller fauna will fall in and become trapped. Where trenches are dug and must be left open for several days, there should be loose soil ramps at regular intervals for fauna to escape. Alternatively, the trenches should be inspected regularly and trapped fauna removed.
- The plant should be fenced in a manner which does not negatively affect fauna. If the fence is electrified, the live strands should be on the inside of the fence and not the outside. Where, this is not possible, the lowest live strand should not be less than 30cm from the ground.

→ Areas disturbed during construction will be vulnerable to wind and water erosion

- Dust suppression and erosion management should be an integrated component of the construction approach.
- Disturbance near to drainage lines should be avoided and sensitive drainage areas near to the construction activities should be demarcated as no-go areas.
- Sediment traps and wind shields may be necessary to prevent erosion and soil movement if there are topsoil dumps exposed for extended periods of time.
- A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.
- All roads and other hardened surfaces should have runoff control features.
- Runoff from the facility should be captured in ponds to allow sediment and pollution to settle before the water is released or allowed to evaporate.

OPERATIONAL PHASE

→ Faunal Impacts due to Operation

- Management of the site should take place within the context of an Open Space Management Plan.

- No unauthorized persons should be allowed onto the site.
- Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.
- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except landowners with the appropriate permits where required.
- 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.
- Any dams or evaporation ponds at the site should be covered or fenced to prevent larger animals from accessing these areas. If not covered, there should however also be a ramp or ladder present where fauna that fall into the water can escape. These dams are often lined with plastic of some or other slippery surface and animals may drown if they fall in and are unable to get out due to the steep or slippery sides.

→ Alien invasive plants impacts

- Problem woody species such as Prosopis are already present in the area and are likely to increase rapidly if not controlled.
- Regular (annual) monitoring for alien plants within and near the development footprint.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible, although for some species, such as those that are strong resprouters, this may be the best-practice method.

→ Following construction, disturbed areas will remain vulnerable to erosion for some time

- Regular (annual) monitoring for erosion problems along the access roads and other cleared areas.
- Erosion problems should be rectified on a regular basis and this may include the revegetation of bare or eroded areas.

DE-COMMISSIONING PHASE

→ Impacts on fauna

- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes and tortoises.
- Any fauna threatened by the decommissioning activities should be removed to safety by the ECO or appropriately qualified environmental officer.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.
- Any trenches that need to be dug should not be left open for extended periods of time as smaller fauna will fall in and become trapped.
- All waste and material on-site that is not recycled as part of decommissioning, should be removed from the site to a suitable waste disposal site.
- The site should be rehabilitated using locally occurring grasses and shrubs.

→ Following decommissioning, the site will remain vulnerable to erosion

- All cleared and disturbed areas should be re-vegetated after decommissioning with locally occurring species.

- The site should be inspected annually for erosion problems for at least 5 years after decommissioning or until such time as the vegetation has recovered to levels equivalent to the adjacent rangeland.

→ Following decommissioning, the site will remain vulnerable to alien plant invasion

- Problem woody species such as Prosopis are already present in the area and are likely to increase rapidly if not controlled.
- Regular (annual) monitoring for alien plants within disturbed areas created by decommissioning.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned and should be conducted for at least 5 years after decommissioning or until the natural vegetation has returned.

9.5 AVIFAUNA

FINDINGS AND IMPACT DESCRIPTION

The full spectrum of impacts of CSP facilities on birds is only now starting to emerge from compliance reports from existing facilities. These can be summarised as follows:

→ Temporary displacement due to disturbance associated with the construction of the solar plant and associated infrastructure;

→ Collisions with the heliostats;

→ Burning due to solar flux;

→ Permanent displacement due to habitat transformation;

→ Drowning in evaporation ponds;

→ Entrapment in perimeter fences; and

→ Collisions with the associated power lines resulting in mortality.

CONSTRUCTION PHASE

DISPLACEMENT DUE TO DISTURBANCE ASSOCIATED WITH THE CONSTRUCTION OF THE SOLAR PLANT AND ASSOCIATED INFRASTRUCTURE

The construction of the CSP plant and associated infrastructure (roads, cables and buildings) will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site. It is highly likely that most priority species will vacate the area for the duration of these activities.

OPERATIONAL PHASE

DISPLACEMENT DUE TO HABITAT TRANSFORMATION ASSOCIATED WITH THE CSP PLANT AND ASSOCIATED INFRASTRUCTURE

The construction of the CSP plant and associated infrastructure will result in the radical transformation of the existing natural habitat. The vegetation will be cleared prior to construction commencing. Once operational, the construction of the heliostats will prevent sunlight from reaching the vegetation below, which is likely to result in stunted vegetation growth and possibly complete eradication of some plant species. The natural vegetation is likely to persist in the rows between the heliostats, but it will be a fraction of what was available before the construction of the plant. Small birds are often capable of surviving in small pockets of suitable habitat, and are therefore generally less affected by habitat fragmentation than larger species. It is, therefore, likely that many of the smaller priority species will continue to use the habitat available within the solar facility albeit at lower densities e.g. larks, chats, sparrow-larks and many non-priority small species. This will however differ from species to species and it may not be true for all the smaller species. Larger species which require contiguous, un-fragmented tracts of suitable habitat (e.g. large raptors, korhaans and bustards) are more likely to be displaced entirely from the area of the proposed plant although in the case of some raptors (e.g. Southern Pale Chanting Goshawk and Lanner Falcon) the potential availability of carcasses or injured birds due to collisions with the heliostats may attract them to the area. Rock Kestrels, Southern Pale Chanting Goshawks and Greater Kestrel might be attracted to the heliostats as convenient perches from where they can hunt rodents.

COLLISIONS WITH THE HELIOSTATS

The so-called “lake effect” could act as a potential attraction to some species and it is expected that non-priority flocking species i.e. Grey-backed Sparrow-lark *Eremopterix verticalis*, Namaqua Sandgrouse, and several species of doves as well as other passerines would be most susceptible to this impact as they habitually arrive in flocks at surface water to drink. Multiple mortalities could potentially result from this, which in turn could attract raptors e.g. Booted Eagle, Southern Pale Chanting Goshawk and Lanner Falcon which will feed on dead and injured birds which could in turn expose them to collision risk, especially when pursuing injured birds. The “lake effect” may also potentially draw various water birds to the area, including Greater and Lesser Flamingo, which may result in collision with the heliostats, or resulting in them getting stranded and unable to take off again. The presence of evaporation ponds and water treatment plants may be additional aggravating factors in this respect.

BURNING DUE TO SOLAR FLUX

The centrally located tower-mounted heat exchanger (receiver) will be located at an altitude of 200m- 250m. Given the height of the receiver, some priority raptor and waterbird species could potentially be exposed to solar flux if they venture close to the tower. The presence of evaporation ponds and water treatment plants may be additional aggravating factors in this respect, by drawing waterbirds and raptors to the area. Based on observations at the site, raptors that could be exposed to this impact include Verreaux’s Eagle, Greater Kestrel, Black-chested Snake-eagle, Montagu’s Harrier, Southern Pale Chanting Goshawk and Secretarybird. Lanner Falcon and Booted Eagle, may be attracted to the vicinity of the tower to prey on other birds which are singed by solar flux resulting in impaired flight ability, making them easy targets to catch e.g. aerial foragers such as swifts and swallows which are preying on insects attracted to the bright receiver. The tower might also attract raptors as a convenient perch, as they are normally drawn to high structures in the landscape for this purpose, and in the process they could be exposed to solar flux at nearby standby points. The biggest risk seems to be associated with standby points, i.e. when the heliostats are in stand-by mode and not focusing on the tower receiver. During standby they are not aimed at the tower receiver, but somewhere in the air above or next to the tower.

DROWNING IN EVAPORATION PONDS

Several raptor species and priority passerines could be exposed to this impact, as the evaporation ponds are likely to attract a variety of species. Many non-priority species could also be vulnerable, especially Namaqua Sandgrouse and Grey-backed Sparrowlark, both of which were regularly recorded at the site.

ENTRAPMENT IN PERIMETER FENCES

Large-bodied priority species such as Ludwig’s Bustard, Karoo Korhaan and Secretarybird may be vulnerable to entrapment between double perimeter fences. Apart from these priority species, non-priority species such as and Northern Black Korhaan *Afrotis afraoides* may also be vulnerable to this impact.

COLLISIONS WITH THE INTERNAL POWERLINES

The most likely candidates for collision mortality on the proposed powerlines are Ludwig's Bustards, Karoo Korhaan and Secretarybird. Waterbirds might also be at risk if the birds mistake the solar panels for water and descend to the perceived surface water.

DECOMMISSIONING PHASE

DISPLACEMENT DUE TO DISTURBANCE ASSOCIATED WITH THE DE-COMMISSIONING OF THE SOLAR PLANT AND ASSOCIATED INFRASTRUCTURE

The decommissioning of the CSP plant and associated infrastructure (roads, cables and buildings) will result in a significant amount of movement and noise, which will lead to temporary displacement of avifauna from the site. It is highly likely that most priority species will vacate the area for the duration of these activities. However, once the activities have ceased, the site should be re-colonised in due course.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-4**.

Table 9-4: Assessment of Avifauna Impacts for Letsoai CSP 1

REF.		EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE		STATUS
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)		(+ve or -ve)
Construction Phase								
AV1	**Impact**	The construction of the CSP plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site due to disturbance. It is highly likely that most priority species will vacate the area for the duration of these activities.						
	Without Mitigation	1	1	8	5	**50**	**Medium**	-ve
	degree to which impact can be reversed:	The impact can be partially reversed. Some species will be able to re-colonise the area, although probably at lower densities.						
	degree of impact on irreplaceable resources:	High						
	With Mitigation	1	1	8	4	**40**	**Medium**	-ve
Operational Phase								
AV2	**Impact**	Displacement due to habitat transformation associated with the CSP plant and associated infrastructure						
	Without Mitigation	1	4	8	5	**65**	**High**	-ve
	degree to which impact can be reversed:	Low. The impact will only be reversed if the facility is decommissioned and the area rehabilitated						
	degree of impact on irreplaceable resources:	High						
	With Mitigation	1	4	8	4	**52**	**Medium**	-ve
AV3	**Impact**	Collisions with the heliostats						

	Without Mitigation	1	4	6	3	**33**	**Medium**	-ve
	degree to which impact can be reversed:	Medium. The impact can be reduced through mitigation measures						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
AV4	**Impact**	Burning due to solar flux						
	Without Mitigation	1	4	8	4	**52**	**Medium**	-ve
	degree to which impact can be reversed:	High. Effective mitigation is available						
	degree of impact on irreplaceable resources:	Medium. The impact can be reduced through mitigation measures						
	With Mitigation	1	4	2	2	**14**	**Low**	-ve
AV5	**Impact**	Drowning in evaporation ponds						
	Without Mitigation	2	4	8	3	**42**	**Medium**	-ve
	degree to which impact can be reversed:	High. Effective mitigation is available						
	degree of impact on irreplaceable resources:	Medium. The impact can be reduced through mitigation measures						
	With Mitigation	2	4	2	2	**16**	**Low**	-ve
AV6	**Impact**	Entrapment in perimeter fences						
	Without Mitigation	1	4	8	3	**39**	**Medium**	-ve
	degree to which impact can be reversed:	High. Effective mitigation is available						
	degree of impact on irreplaceable resources:	Medium. The impact can be reduced through mitigation measures						
	With Mitigation	1	4	2	2	**14**	**Low**	-ve
AV7	**Impact**	Collision with internal powerlines						
	Without Mitigation	3	4	10	4	**68**	**High**	-ve
	degree to which impact can be reversed:	Medium. The impact can be mitigated to some extent						
	degree of impact on irreplaceable resources:	High						
	With Mitigation	3	4	10	3	**51**	**Medium**	-ve

Decommissioning Phase									
AV8	**Impact**	The decommissioning of the CSP plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site due to disturbance. It is highly likely that most priority species will vacate the area.							
	Without Mitigation	1	2	8	5	**55**	**Medium**	-ve
	degree to which impact can be reversed:	High. Once the activities cease natural re-colonisation will happen							
	degree of impact on irreplaceable resources:	Low							
	With Mitigation	1	2	8	4	**44**	**Medium**	-ve
No Go Alternative									
	Impact	There will be no additional impacts on avifauna. The ecological integrity of the site as it currently functions will be preserved.							

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

- The construction of the CSP plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site due to disturbance. It is highly likely that most priority species will vacate the area for the duration of these activities.
  - Construction activity should be restricted to the immediate footprint of the infrastructure.
  - Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
  - Measures to control noise and dust should be applied according to current best practice in the industry.
  - Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical.
  - The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.
- Displacement due to habitat transformation associated with the CSP plant and associated infrastructure.
  - The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of transformed areas is concerned.
- Collisions with the heliostats
  - Depending on the results of the carcass searches, a range of mitigation measures will have to be considered if mortality levels turn out to be significant, including minor modifications of panel and mirror design to reduce the illusory characteristics of heliostats. What is considered to be significant will have to be established on a species specific basis by the avifaunal specialist, in consultation with BirdLife South Africa.
- Burning due to solar flux

- Various aiming strategies should be employed to reduce the airspace where 50 kW/m² or more solar flux is generated during standby mode. Any alternative standby aiming methodology should be designed to reduce the peak flux as well as the volume of airspace with flux exceeding the desired minimum threshold level, while at the same time minimizing negative impacts on plant operations. Ideally, the standby points must be spread over several hundred meters to reduce the peak flux to less than 4 kW/m² (4 suns).
- If technically feasible, evaporation ponds should be placed where the risk of attracting birds into high risk areas will be minimised.

→ Drowning in evaporation ponds

- The sides of the evaporation ponds should be covered with netting or canvas to prevent birds from slipping into the water.
- If technically feasible, water diffusers should be used to maximize evaporation, or ponds should be covered with nets.

→ Entrapment in perimeter fences

- A single perimeter fence should be considered and if not an option for security reasons, the perimeter fence should be patrolled daily to look for trapped birds.

→ Collisions with the earthwire of the 132kV lines

- The powerlines should be marked with bird flight diverters for their entire length on the earth wire of the line, 5m apart, alternating black and white.

→ The de-commissioning of the CSP plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site due to disturbance. It is highly likely that most priority species will vacate the area:

- Activity should be restricted to the immediate footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical.
- The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the footprint and rehabilitation of disturbed areas is concerned.

9.6 SURFACE WATER

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

The anticipated impacts for the Letsoai CSP Site 1 during the construction phase are associated with the site preparation and construction of solar power facility and associated infrastructure, including:

→ Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.

There are no fatal flaws identified for the construction phase associated with the proposed Letsoai CSP Site 1 project.

OPERATIONAL PHASE

The anticipated impacts for the Letsoai CSP Site 1 during the operational phase of the project are associated with the day-to-day operational activities during the normal functioning of the solar power facility, including maintenance. These impacts include:

→ Alterations of flow regimes of watercourses, in close proximity to the site, or where the pipeline traverses the watercourse.

Similar to the construction phase, there were no fatal flaws identified during this phase of the project.

DECOMMISSIONING PHASE

The anticipated impacts for the Letsoai CSP Site 1 during the decommissioning phase include:

→ Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.

The decommissioning phase exhibited the lowest environmental significance rating scores for the associated impacts of the proposed Letsoai CSP Site 1 project. There were no fatal flaws identified during this phase of the project.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-5**.

Table 9-5: Assessment of Surface Water Impacts for Letsoai CSP 1

REF.		EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE		STATUS
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)		(+ve or -ve)
Construction Phase								
SW1	**Impact**	Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.						
	Without Mitigation	2	2	6	4	**40**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	2	4	3	**24**	**Low**	-ve
Operational Phase								
SW2	**Impact**	Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.						
	Without Mitigation	2	5	6	4	**52**	**Medium**	-ve
	degree to which impact can be reversed:	High						

	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	1	2	2	**10**	**Low**	-ve
Decommissioning Phase								
SW3	**Impact**	Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.						
	Without Mitigation	2	3	6	5	**55**	**Medium**	-
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	1	2	2	**10**	**Low**	-ve
No Go Alternative								
	Impact	No impacts are associated with the No-Go alternative as the status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures are recommended:

- Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.
  - Construction of the pipeline should occur during the dry season, as far as practically possible, and the site rehabilitated before major rainfall events occur. Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. It is understood that the proposed pipelines would be located aboveground therefore they should be positioned above the 1:100 floodline of any watercourse. Regular pipeline inspections during operation are required to ensure there are no leaks which would alter the local hydrological regime. These crossings have a potential of needing a Water Use Licence in terms of the National Water Act.
- Potential spillage of hazardous substances such as oils, fuel, grease from construction and operational vehicles, and sewage from on-site sanitation systems
  - The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper upkeep of machinery and vehicles. A complete spill kit must be onsite at all times.

9.7 HERITAGE

FINDINGS AND IMPACT DESCRIPTION

The archaeology of the study area is characterised by a very ephemeral and patchy distribution of quartz artefacts (cores, flakes and chunks) which are found predominantly on gravel surfaces.

There is no evidence for increased archaeological settlement closer to the hills located to the north of the site although the hills themselves have been excluded from the development proposals.

Similarly, a field survey of the “pan” identified from aerial imagery (Google Earth) showed no evidence of any archaeological concentrations.

The only dense scatter of archaeological material recorded during the site visit, was the bedrock exposure outside of the study area which contained evidence of numerous bedrock grooves and stone artefacts, ostrich eggshell, pottery and bone. This large site is evidence that where water is present, we may expect evidence for pre-colonial, and specifically, LSA settlement.

This survey did not identify any graves or burial cairns. In addition, there are no buildings or structures in the study area of the CSP and PV facilities.

The following impacts were identified:

- Construction Phase:
  - During the construction phase, a number of physical activities may result in direct impacts to the landscape and any heritage that lies on it. However, this study has identified the archaeological remains to be of very low significance, and no impacts are expected;
  - The stone artefact scatters are of low significance. They are randomly scattered across the landscape, in low quantities and do not provide any significant information regarding prehistoric settlement of the area. Our confidence with regard this is high. The destruction of these artefacts scatters does not require any mitigation.
  - There is a very small possibility that buried human remains (graves) may be uncovered during construction. If they are uncovered during earthworks, the remains will be disturbed. Human remains are considered highly sensitive heritage resources and appropriate mitigation measures must be undertaken to conserve them.
- Operational Phase:
  - Generally, no impacts are expected except for potential vandalism of heritage sites by staff operating the facility. However, no impacts are expected because of the relatively low significance of heritage resources;
- De-commissioning Phase:
  - Impacts resulting from the de-commissioning of the solar facility may include the dumping of electrical infrastructure on heritage sites. However, in this case no heritage resources are of low significance.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-6**.

Table 9-6: Assessment of Heritage Impacts for Letsoai CSP 1

<table>
<tr><th rowspan="2">REF.</th><th rowspan="2"></th><th>EXTENT</th><th>DURATION</th><th>MAGNITUDE</th><th>PROBABILITY</th><th colspan="2">SIGNIFICANCE</th><th>STATUS</th></tr>
<tr><th>(E)</th><th>(D)</th><th>(M)</th><th>(P)</th><th colspan="2">(S=(E+D+M)*P)</th><th>(+ve or -ve)</th></tr>
<tr><td colspan="9">Construction Phase</td></tr>
<tr><td rowspan="3">H1</td><td>Impact</td><td colspan="7">Potential impacts to scatters of stone artefacts</td></tr>
<tr><td>Without Mitigation</td><td>2</td><td>5</td><td>2</td><td>3</td><td>27</td><td>Low</td><td>-ve</td></tr>
<tr><td>degree to which impact can be reversed:</td><td colspan="7">Destruction of archaeological material cannot be reversed.</td></tr>
</table>

	degree of impact on irreplaceable resources:	The archaeological material is of low significance, the impacts will be low.						
	With Mitigation	1	5	2	3	**24**	**Low**	-ve
H2	**Impact**	Potential impacts to human remains/graves						
	Without Mitigation	2	5	8	2	**30**	**Low**	-ve
	degree to which impact can be reversed:	Destruction to human remains cannot be reversed.						
	degree of impact on irreplaceable resources:	Human remains are considered a very sensitive heritage resource and impacts should be avoided.						
	With Mitigation	2	5	4	2	**22**	**Low**	-ve
No Go Alternative								
	Impact	There will be no additional impacts on heritage resources. The status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

- If any high concentrations of archaeological material, such as stone artefacts are recovered, SAHRA must be notified; and
- If any human remains are uncovered during the excavations for the CSP plant, work must stop in that area and SAHRA must be alerted immediately.

9.8 VISUAL

FINDINGS AND IMPACT DESCRIPTION

VIEWSHED

The viewshed is the topographically defined area, including all the major observation sites, from which proposed structures/activities may be visible. The boundary of the viewshed connects high points in the landscape and demarcates an area of potential visibility. The viewshed calculations are based on worst-case scenario using 360o line-of-sight calculations on a Digital Elevation Model (at 20m contour intervals). The height of existing buildings, trees and small undulations in the surrounding area are not included in the calculation of the viewshed. It is therefore important to remember that the proposed development will not be visible from all points within the viewshed, as views may be obstructed by visual elements such as built structures, minor local variations in topography and vegetation. For this reason, it is often referred to as the ‘zone of theoretical visibility’.

The viewshed for Letsoai CSP Site 1 (**Figure 9-1**) indicates the area from which the receiver tower (at 250m high) is potentially visible; it is calculated within a 30km radius, but visibility beyond 15km will be marginal. As can be seen from the figure:

- Almost the entire area within the 15km radius is included in the viewshed area, due to the flat topography and the height of the receiver tower. Some pockets within this area are screened by the local topography.
- A stretch of approximately 40km along the N14 to the west of Loop 10 Road is included in the viewshed but the proposed facility is not likely to be visible along the N14 to the east.

- Within the 15km radius, Loop 10 Road falls within the viewshed area.
- The town of Aggeneys is included within the viewshed, as well as some surrounding farmsteads.
- Beyond the 15km radius, the facility will not be visible from the north or east as it is screened by the Aggeneys se Berge and Gamsberg Mountains.
- Although elevated the Gamsberg Inselberg is excluded from the viewshed area

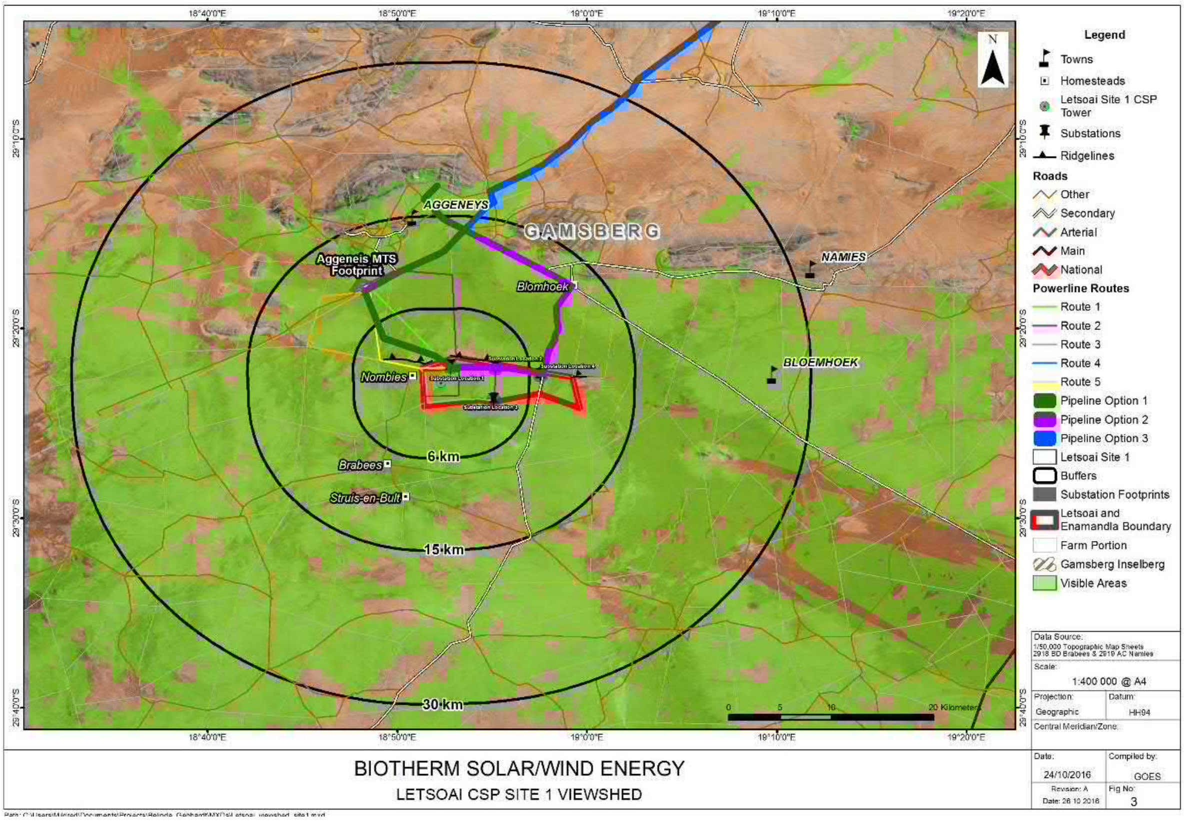


Figure 9-1: Viewshed for Letsoai CSP 1

CONSTRUCTION PHASE

CONSTRUCTION EQUIPMENT AND DUST

Construction vehicles, dust and equipment will have a visual impact on viewers and general visibility (clarity of the air) within close proximity to the site. The visual impacts during construction are over a limited time period and will be temporary.

CLEARING

Loss of vegetation during land clearing increases the visibility of contrasting soils, resulting in changes to the colour and texture of the site. Clearing vegetation will also result in increased windblown dust, reducing visibility of both day and night skies.

OPERATIONAL PHASE

INTRUSION ON THE SENSE OF PLACE AND SCENIC LANDSCAPE

The remote and rural character of the area is typical of the Northern Cape Karoo. It is characterised by the flat topography with rugged koppies and hills, low vegetation and clear air. The strongly regular geometric patterns and highly reflective surfaces will differ from the current visual landscape and will have an impact on the current sense of place and scenic nature of the landscape.

RECEIVER TOWER

Receiver towers can typically be seen for long distances and their light is generally steady, regardless of viewer location and movement. Reflected light from dust particles in the air can usually be observed as light streaming outwards from the tower. This reflected light is not visible over such long distances, but in cases has been observed for up to about 8km. The height of the CSP 1 tower is 250m high which will make it highly visible in the flat landscape. Visibility of the tower is likely to be limited by the Aggeneys se Berge in the north and the Gamsberg and other hills to the north-east and east of the site. Additionally, viewer numbers are low.

SOLAR COLLECTORS, SUBSTATION AND OTHER BUILDINGS AND INFRASTRUCTURE

Solar collectors (heliostats) will form strong geometrical patterns and lines, and this together with the reflective surfaces will have an impact on viewers in close proximity to the site. The proposed substation will have a maximum height of 35m-40m and, together with, the operation and maintenance facility, power generation facility, water tanks, cooling plumes and security fencing may have visual impacts on inhabitants and motorists.

REFLECTION AND SHIMMER FROM FACILITIES

The lower profile and lower refection potential of the heliostat field (compared to troughs) will reduce their impact when viewed at low elevations but shimmer may still impact inhabitants and motorists. The area is however, sparsely populated, with very few homesteads. Nombies, Brabees, Struis-en-Bult and Blomhoek are situated with 15km radius and the town of Aggeneys is located approximately 13km away. Motorists/tourists on the N14 and Loop 10 Road may also be affected along stretches of these roads.

132KV POWER LINES

The 132kV internal power lines will be mounted on power towers with a steel monopole structure, which may be self-support or guyed suspension. These are similar to other power lines already existing in the landscape, but may have an impact on viewers in close proximity to the lines (very limited number of viewers).

LIGHTING

Security and other lighting around and on support structures and buildings could contribute to light pollution. Maintenance activities conducted at night, such as mirror or panel washing, might require vehicle-mounted lights, which could also contribute to light pollution.

ROADS AND /OR ROAD WIDENING

Access and on-site roads could also contribute to visual impacts during operations. In addition to vegetative clearing, roads may introduce long-term visual contrasts to the landscape colour and texture.

DE-COMMISSIONING PHASE

CONSTRUCTION EQUIPMENT AND DUST

In terms of visual impact, the decommissioning process is anticipated to be broadly similar to that of the construction phase, effects on visual receptors and landscape character during decommissioning are anticipated to be consistent with those assessed for the construction phase.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-7**.

Table 9-7: Assessment of Visual Impacts for Letsoai CSP 1

REF.		EXTENT (E)	DURATION (D)	MAGNITUDE (M)	PROBABILITY (P)	SIGNIFICANCE (S=(E+D+M)*P)		STATUS (+ve or -ve)
Construction Phase								
V1	**Impact**	Visual impact during construction due to dust, vehicles and equipment						
	Without Mitigation	2	2	6	4	**32**	**Medium**	-ve
	degree to which impact can be reversed:	The visual impact can completely reversed if vehicles, equipment, rubble and any other construction materials are removed after construction.						
	degree of impact on irreplaceable resources:	Dust and equipment are not likely to impact on any irreplaceable visual resources.						
	With Mitigation	2	2	4	3	**18**	**Low**	-ve
V2	**Impact**	Visual impact during construction due to vegetation clearing						
	Without Mitigation	2	2	6	4	**32**	**Medium**	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if vegetation is rehabilitated.						
	degree of impact on irreplaceable resources:	Vegetation is classified as Least Threatened, and from a visual perspective can be re-established. The value of vegetation loss is considered in the ecological report.						
	With Mitigation	2	2	4	4	**24**	**Low**	-ve
Operational Phase								
V3	**Impact**	Intrusion on sense of place and rural landscape						
	Without Mitigation	2	4	6	4	**48**	**Medium**	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if structures and buildings removed and vegetation rehabilitated.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.						
	With Mitigation	2	4	4	4	**40**	**Medium**	-ve
V4	**Impact**	Visual impact of receiver tower						
	Without Mitigation	2	4	8	5	**70**	**High**	-ve

	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if tower removed.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.						
	With Mitigation	2	4	8	5	**70**	**High**	-ve
V5	**Impact**	Visual impact of solar collectors, substation and other buildings and infrastructure						
	Without Mitigation	2	4	8	4	**56**	**Medium**	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if structures and buildings removed.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.						
	With Mitigation	2	4	6	4	**48**	**Medium**	-ve
V6	**Impact**	Visual impact of reflection and shimmer from facility						
	Without Mitigation	3	4	6	3	**39**	**Medium**	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if removed.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.						
	With Mitigation	3	4	4	3	**33**	**Medium**	-ve
V7	**Impact**	Visual impact of 132kV powerlines						
	Without Mitigation	2	4	4	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if power infrastructure is removed and vegetation rehabilitated.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.						
	With Mitigation	2	5	2	3	**27**	**Low**	-ve
V8	**Impact**	Visual impact of lighting from facility						
	Without Mitigation	2	4	4	3	30	Low	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if lighting removed.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.						
	With Mitigation	2	4	2	3	24	Low	-ve
V9	**Impact**	Visual impact of additional roads and road widening						

	Without Mitigation	2	4	4	3	30	Low	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, but visible roads may remain.						
	With Mitigation	2	4	2	3	**24**	**Low**	-ve
De-commissioning Phase								
V10	**Impact**	The de-commissioning of the CSP plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site due to disturbance. It is highly likely that most priority species will vacate the area. Visual impact during decommissioning due to dust, vehicles and equipment.						
	Without Mitigation	2	2	4	4	**32**	**Medium**	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if structures and buildings removed and vegetation rehabilitated.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.						
	With Mitigation	2	2	2	3	**18**	**Low**	-ve
No Go Alternative								
	Impact	No visual impacts are associated with the no-go alternative.						

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

- Detailed design and specification
  - Design structures and buildings close together in clusters as far as possible.
  - Cables and pipelines should be located underground wherever possible.
  - When specifying lighting:
    - Use light fixtures that provide precisely directed illumination;
    - If possible, use lighting that is activated only on movement of illegal entry to the site; and
    - Avoid high pole top security lighting if possible.
  - Specify wire mesh or Clear-Vu type fencing for perimeter fencing.
  - Signage related the project must be discreet and confined to the entrances.
  - Logos and signage on the receiver tower must be avoided.
  - The colour of the solar array structures, such as the supports and the rear of the panels, should be carefully selected, and be in the dark grey or green range, to minimise visibility and avoid reflectivity.
- Site clearing

- The construction footprint must be kept as small as possible, to avoid unnecessary disruption to the existing vegetation.
- No blanket clearing or removal of vegetation outside of the building zone is allowed.

→ Excavation and construction of facility

- Site perimeter (building zone) must be clearly demarcated.
- The handling and transportation of materials which may generate dust must be avoided during high wind conditions.
- Ground level at site boundary should remain natural ground level.
- The building site and construction facilities must be well maintained and strictly controlled.
- Dust and litter control measures must be included in the EMPr.
- No dumping in unauthorised and/or highly visible areas is permitted.

→ Operations

- Establishing vegetative screens around Nombies should be considered in consultation with the owner.
- An ecologist (preferably the ecological specialist appointed to undertake the assessment) must be appointed to assist with the plant selection for vegetative screening.
- Natural vegetation must be re-established on disturbed areas after construction.
- No corporate or advertising signage is to be permitted on receiver tower.
- Roads and drainage for runoff should be appropriately stabilised to avoid erosion and visual scars.
- Ensure all colour treated surfaces are well maintained.

→ Rehabilitation

- A detailed rehabilitation plan must be prepared.
- An ecologist must be appointed to assist with the plant selection and methods for vegetative rehabilitation.
- Mitigation measures applicable to the construction phase are also applicable to decommissioning.

9.9 TRAFFIC AND TRANSPORTATION

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

The construction phase of the facility will generate the only notable vehicle volumes that requires assessment. Construction traffic will include vehicles for material and component deliveries, construction staff and all other associated personnel. Trips may include the delivery of over-sized components such as generators. The route/s between the origin of the material and components and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of any oversized or weight components.

The construction phase traffic was estimated based on the assumptions listed per traffic type below.

CONSTRUCTION STAFF TRIP GENERATION

→ An estimated construction period of 24 months per facility, with a variable number of staff required depending on the construction phase.

- Approximately 500 workers will be on-site every day during the peak of the construction period. It should be noted that this will be for the peak only, and the numbers will normally be lower for the duration of the construction phase.
- Workers will not be accommodated on-site.
- 85% of the work force (unskilled and semi-skilled workers) will utilise public transport to site from Pofadder, Aggeneys and Pella. It is unlikely that staff will travel from Kakamas or Springbok to the site, as these towns are located too far.
- Skilled personnel will travel by private car with an average occupancy of 1.5 persons.
- 80% of Public Transport will be by bus, with a 65 person per bus occupancy.
- 20% of Public Transport will be by mini-bus, with a 16 person per vehicle occupancy.
- Staff will not utilise Non-motorised transport (NMT) to site due to the excessive distances to the closest towns.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all these vehicles will arrive and again depart during the AM and PM peaks..

CONSTRUCTION MATERIAL TRIP GENERATION (PER FACILITY TYPE)

- An estimated 10 000 heliostats are required per CSP facility.
- Each heliostat can consist of various types and numbers of mirrors. The technical specifications of a Spanish designed heliostat were used to estimate the number of vehicle trips required to transport the heliostats to site.
  - Type: Colon 70 Heliostat
  - Each heliostat consists of 21 mirrors of 1.1m x 3.0 m.
  - 210,000 mirrors will be required.
  - Each heliostat installation, including metal frame, drive motors etc. weigh approximately 4,000 tonnes.
- Mirrors will be manufactured locally or internationally and transported to site in standard shipping containers.
- Standard 40 foot containers of 27 tonnes capacity will be used to transport the heliostat components, except the foundations.
- Approximately 1482 fully loaded 40 foot containers will be required, at 1 container per heavy vehicle.
- If the heliostats are delivered over a period of 6 months on workdays only, approximately 12 containers will be delivered per day.
- The delivery of containers in the AM and PM peak hours will therefore be low, as trucks will arrive and depart throughout the day. Assume 2 container deliveries and departures for the peak hours.
- Heliostats: concrete foundations of 2.0m by 2.0m by 1.0m deep.
- Central tower: concrete, 250m height and 5.0m by 5.0m.
- Central tower: Concrete foundation of 10m by 10m and 15m deep.
- Concrete will be batched on-site, and the aggregate and cement will be delivered in 22-ton truck loads.
- Deliveries will take place over a period of 12 months to stock the batching plant

OPERATIONAL PHASE

The operational phase of the facility will require very few permanent staff. The vehicle trips that will be generated by the personnel will be low and the associated traffic impact on the surrounding road network will therefore be negligible.

DECOMMISIONING PHASE

Following the initial 20-year operational period of the facility, its continued economic viability will be investigated. If it is still deemed viable its life may be extended; if not, it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, reused and recycled or disposed of. The site will be returned to its current use i.e. agriculture (grazing).

It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the Lus 10 gravel road will be lower than during the construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-8**. The overall significance of each impact during the construction phase is low or medium. The impacts are limited to the peak construction period only, local in nature, and minor and will not result in an impact on processes or low and will cause a slight impact on processes.

Table 9-8: Assessment of Traffic Impacts for Letsoai CSP 1

REF.		EXTENT (E)	DURATION (D)	MAGNITUDE (M)	PROBABILITY (P)	SIGNIFICANCE (S=(E+D+M)*P)		STATUS (+ve or -ve)
Construction Phase								
T1	**Impact**	Noise, dust and exhaust pollution due to vehicle trips on-site						
	Without Mitigation	2	2	2	4	24	Low	-ve
	degree to which impact can be reversed:	Temporary impact, no long term effect						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	2	4	**24**	**Low**	-ve
T2	**Impact**	Noise and exhaust pollution due to additional vehicle trips on Lus 10 Road						
	Without Mitigation	2	2	4	4	**32**	**Medium**	-ve
	degree to which impact can be reversed:	Temporary impact, no long term effect						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	4	4	**32**	**Medium**	-ve
T3	**Impact**	Noise and exhaust pollution due to additional vehicle trips on N14						

	Without Mitigation	2	2	2	4	**24**	**Low**	-ve
	degree to which impact can be reversed:	Temporary impact, no long term effect						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	2	4	**24**	**Low**	-ve
No Go Alternative								
	Impact	There will be no additional traffic impact. The status quo will remain.						

MITIGATION MEASURES

The impacts are limited to the peak construction period only, local in nature, and minor and will not result in an impact on processes or low and will cause a slight impact on processes. Therefore, mitigating measures are not recommended for the expected trip generation of the facilities.

9.10 SOCIAL ENVIRONMENT

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

INCREASE IN EMPLOYMENT OPPORTUNITIES

It is anticipated that the construction phase, which will span an 18 to 24 month period, for the Letsoai CSP Site 1 will generate approximately 95 new skilled employment opportunities and approximately 375 new unskilled employment opportunities. Of the total of 470 employment opportunities to be generated in the construction phase, is it anticipated that 70% of these will accrue to historically disadvantaged individuals.

Due to the specialised nature of some of the construction activities, and the low level of skills development, it is most likely that the skilled labour required during the construction phase will need to be sourced from outside of the Khâi-Ma Local Municipality. The construction phase will, however, also generate a significant number of unskilled employment opportunities. The majority of the employment opportunities are likely to be associated with contractors appointed to construct the proposed facility and associated infrastructure. As contractors tend to use their own staff, the potential for direct employment opportunities for locals during the construction phase may be limited. Members of the local community are likely to benefit from the low skilled employment opportunities. The high unemployment rate (31.8%) indicates that the generation of local employment opportunities will have an impact on the local population, and it will be possible to source unskilled labour from the population living within the towns within the Khâi-Ma Local Municipality.

The potential benefits in terms of short-term employment are therefore likely to be recognised at both a local, regional and national level. The proposed project has the potential to provide a significant number of unskilled employment opportunities within the local municipal area. In line with the REIPPP requirements, the intention is to employ local labour. Provision of employment opportunities to approximately 329 historically disadvantaged individuals has the potential to significantly impact numerous households and extended family units in respect of household income, education and other downstream social impacts.

Employment for previously disadvantaged people could contribute to social upliftment and poverty alleviation. Local opportunities will contribute to the development goals of the Khâi-Ma Local Municipality.

INCREASED ECONOMIC DEVELOPMENT OPPORTUNITIES

The proposed project has the potential to generate positive socio-economic outcomes through the provision of Local Economic Development (LED) opportunities. Local content is a primary focus of the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement Programme (REIPPP) which emphasises the need to promote job growth, domestic industrialisation, community development, and black economic empowerment.

Construction phase LED opportunities can be identified and implemented on a national, regional and local levels as follows:

- Ensuring participation of South African entities in the project.
- Sourcing of materials locally as far as possible (steel, aluminium, etc.).
- Manufacturing of primary components locally (i.e. mountings for solar panels).
- Utilising local service providers as far as possible (i.e. transportation, accommodation, catering, vehicle repairs, etc.).

The total capital expenditure for the construction phase of the Letsoai CSP Site 1 is estimated at R15 billion. This expenditure will generate business opportunities for the local, regional and national economy. Larger-scale manufacturing and specialised services for the proposed project are likely to be sourced from a regional and national level, however there are likely to be opportunities for local contractors and engineering companies at a local and regional level.

The project offers a business focus within a rural environment that would not ordinarily be realised. The proposed project has the potential to stimulate economic development within the local area if local social and economic development opportunities are prioritised. The local service industry is most likely to benefit from the proposed project. The opportunities for the local service sector include accommodation, catering, cleaning, transport, security etc. The nearest town of Aggeneys could provide services such as accommodation and cleaning services. Other local towns that could also be positively impacted include Pofadder, as the key local centre and Springbok, as a regional centre.

DISRUPTION DUE TO INFLUX OF JOB SEEKERS

The construction phase may lead to the influx of skilled and unskilled employment seekers from outside the immediate area. This could lead to social conflict over the resources and employment opportunities. This in-migration may have an impact on the Khâi-Ma Local Municipality and their ability to service additional people within the municipal area.

Khâi-Ma Local Municipality representative, Mr Alfredo Green, stated that development projects do result in an influx of people into the small towns. People come from as far as the Eastern Cape and Mpumalanga looking for employment. It is very difficult to manage the influx of job seekers and this poses a number of challenges for the local municipality such as the establishment of informal settlements and provision of basic services (*pers comm*, A Green, 2016).

INCREASE IN COMMUNICABLE DISEASES AND REDUCED PUBLIC HEALTH

Skilled labour requirements are likely to be sourced from outside the local municipality. This skilled labour force of approximately 470 individuals will need to be housed during the construction period. Anticipated housing arrangements have not yet been defined by the project proponent. It is likely that skilled labour will be housed in nearby towns (within a 60 – 80km radius of the site) or alternatively within the development footprint.

It is anticipated that unskilled labour will be largely contractor staff, with additional labour requirements sourced from within the local municipality, as far as possible. Temporary housing and service provision for the unskilled labour force have not been defined by the project proponent. As the majority of the population within the local municipality live within urban areas, and due to the fact that the site is located within a rural context some distance from urban centres, it is considered likely that unskilled labour will be temporarily housed within close proximity to the development site, within the farm boundary.

Temporary housing of both skilled and unskilled labour could result in a number of short-and long-term localised social issues, such as increased prostitution, and drug and alcohol abuse. The presence of an outside labour force, as well as the influx of job seekers, could potentially negatively affect local public health, due to a higher likelihood of a spread of communicable diseases such as Tuberculosis (TB), as well as HIV/AIDS and other sexually transmitted diseases. HIV/AIDS is known to be a significant issue within the Northern Cape (Department of Health, 2012).

Khâi-Ma Local Municipality representative, Mr Alfredo Green, confirmed that the municipality has experienced significant increase in the spread of communicable diseases and reduce public health as a result of past development projects. Mr Green states that the percentage of the population affected by HIV/AIDS and TB increased drastically as a result of a recent development in the local municipal area (*pers comm* A Green, 2016).

CHANGE IN SENSE OF PLACE

The sense of place is a social construct of individuals and communities and their interaction within the landscape in which they live and work, creating a unique identity for a geographical area. The site of the proposed project is located within a predominantly flat, desert landscape, with a sparse, scattered population and limited agricultural and mining activities. The change in the nature of the site as a result of the construction activities of the proposed project, as well as presence of construction staff, is likely to change the local sense of place. This local change is likely to have a direct impact on the closest town of Aggeneys through economic development and a potential increase in population. The other settlements within the local area (namely, Pofadder and Pella) may be affected indirectly.

NUISANCE FROM NOISE, DUST AND TRAFFIC DISTURBANCES

The construction of the proposed project is likely to result in a number of localised disturbances that may indirectly affect local activities, such as farming (on neighbouring sites) and tourism (passing through the area). These may include the generation of dust, noise and traffic associated with the construction of the proposal solar facility and associated infrastructure such as the establishment of the water pipeline. The closest community, Aggeneys, is located 9 km north of the N14 Highway, and therefore between 4 km from the preferred pipeline route and 14 km from the proposed solar development. The impacts of the construction activities may, therefore, affect this community through increased traffic and activities in the local area. There are no other known sensitive receptors, such as tourism establishments or farming communities within close proximity to the proposed project site.

The Traffic Impact Assessment specialist study has assessed that anticipated construction phase impacts associated with site clearing activities and traffic movements. Appropriate mitigation measures have been identified to manage potential traffic impacts. The Environmental Management Programme (EMPr) will include mitigation measures to reduce dust and noise generation during the construction phase in order to adequately mitigate the potential nuisance to social receptors.

INCREASED RISK TO NEIGHBOURING LAND USERS

There is the potential for increased risk to neighbouring land users, particularly farmers, as the presence of labour force could result in petty theft of stock and damage to infrastructure. Theft and damage in infrastructure could result in economic losses for neighbouring farmers and land users, and could extend to greater community issues such as mistrust and conflict. This may occur in areas surrounding the proposed project site (solar facility and water pipeline route) and areas near to where labour is housed (if different).

The accommodation of labour during the construction phase has not yet been defined by the project proponent. It is likely that labour will be accommodated within the broader development or farm footprint thereby potentially affecting surrounding farmers. Past development projects within the Khâi-Ma Local Municipality have not resulted in an increased risk to neighbouring land owners or users (*pers comm* A Green, 2016).

INCREASED RISK OF VELD FIRES

Construction phase activities could result in veld fires which may impact neighbouring farmers and pose a threat to livestock. This is particularly relevant considering the arid climate and the reliance on grazing land in the development area. This risk would be increased should labour be temporarily housed within the development footprint. This may impact on the livelihoods of neighbouring farmers through the potential loss of grazing, stock and infrastructure.

OPERATIONAL PHASE

INCREASED EMPLOYMENT OPPORTUNITIES

It is anticipated that the operational phase for the Letsoai CSP Site 1 will generate a total of 20 new employment opportunities over a minimum operational period of 20 years. Of the total of 20 new employment opportunities, 30 new skilled opportunities and 10 unskilled opportunities will be generated. The expected current value of the employment opportunities for the Letsoai CSP Site 1 during the first 10 years is estimated at R132 million of which 70% is anticipated to accrue to historically disadvantaged individuals.

Professional, technical and management employment is likely to be sourced from outside the Northern Cape, due to the specialised nature of this development. Unskilled employees are likely to be sourced from the local municipality area.

The potential benefits in terms of long term employment are therefore likely to be recognised at both a local, regional and national level. Whilst the operational employment opportunities are limited to 30 skilled and 10 unskilled individuals, these opportunities have the potential to uplift a small number of households and family units.

INCREASED ECONOMIC DEVELOPMENT OPPORTUNITIES

The proposed project has the potential to generate positive socio-economic outcomes through the provision of LED opportunities during the operational phase. Local content is a primary focus of the DoE’s REIPPP which emphasises the need to promote job growth, domestic industrialisation, community development, and black economic empowerment.

The total capital expenditure for the operational phase of the Letsoai CSP Site 1 is estimated at R10 billion.

Operational phase LED opportunities can be identified and implemented on a national, regional and local levels as follows:

- Ensuring participation of South African entities in the project.
- Utilising local service providers as far as possible (i.e. security, transportation, accommodation, catering, fuel provision and vehicle repairs, cleaning, etc.).

- Sourcing of specialised services regionally and nationally as far as possible.
- Investing in social and economic upliftment projects in the local communities surrounding the facility.

As local resources are limited, it is anticipated that the majority of the specialist services are likely to be sourced from regional or national service providers resulting in economic development opportunities in the relevant sectors, including solar power generation equipment and associated infrastructure suppliers. The local hospitality industry is likely to benefit from professionals visiting the site during the operational phase.

Local social and economic development opportunities need to be promoted as far as possible. In accordance with the DoE's REIPPP, the proponent is required to assess the needs of the local communities in the vicinity of the proposed facility and ensure that a portion of the revenue generated from the facility is used to contribute to social upliftment in these communities. The proposed project therefore has the potential to contribute to social improvement through investment into community upliftment projects. It is important that local community benefits and development targets are defined and aligned to local municipality objectives. This may include aspects such as supporting new local emerging entrepreneurs and youth and business skills development programmes.

CHANGE IN SENSE OF PLACE

The operation of the proposed project is likely to change the overall nature of the area, specifically related to the development of infrastructure such as CSP towers. A change in the sense of place will primarily result from the visual impact of the proposed facility which is characterised by a central receiving tower of approximately 250m high surrounded by a field of solar heliostats. A Visual Impact Assessment has been undertaken in support of the application which has identified and assessed the anticipated visual impacts of the project and where possible relevant recommendations in respect of mitigation of these impacts have been made.

Due to the location of the site in a sparsely populated area there are no settlements or communities within close proximity of the site. The change in sense of place during the operational phase is likely to be limited to local residents and tourists traveling on the N14 road network closest to the site. As tourism is not an important contributor to the Khâi-Ma Local Municipality and tourism interest in the immediate area is negligible, the change in landscape is not likely to have significant impact on the local economy.

ACCESS TO WATER RESOURCES

During the operational phase the project will require 550m^3 of water per day (approximately 200 000m^3 per annum) for makeup water for the steam generator; mirror washing; potable water requirements; and service water including fire protection. It is proposed that water will be supplied via pipeline from the Orange River. The operational phase of the proposed project could result in additional pressure on available water resources.

Currently 100% of local households in the Khâi-Ma Local Municipality are supplied with water (*pers comm* A Green, 2016). Currently BMM owns and operates the Sedibeng Water provides which provides households, in Pella, Pofadder and Aggeneys, with water drawn from the Orange River. Supply to the Letsoai CSP Site 1, via dedicated pipeline from the Orange River, will therefore not directly impact on current household supply. Opportunities for water efficiency to be affected within the operational requirements of the facility should be condered.

DE-COMMISSIONING PHASE

LOSS OF PERMANENT EMPLOYMENT

There is the potential for the loss of the 30 skilled and 10 unskilled permanent employment positions following the closure and decommissioning of the Letsoai CSP Site 1 facility. Due to the low number of permanent employees the overall impact of the loss of these jobs is not likely to be significant. Skills developed by employed individuals during the operational phase will be transferable to other similar facilities in the area or to other sectors.

GAIN OF SHORT TERM EMPLOYMENT

The decommissioning phase may require a limited number of short-term unskilled or semi-skilled labour to decommission the facility. These employees are likely to be sourced locally for a short term period. The number of decommissioning employment opportunities and the duration of the decommissioning phase are unknown at this stage. The sourcing of local labour has the potential to provide short term opportunities for social improvement for those employed individuals.

NUISANCE FROM DUST, NOISE AND TRAFFIC

The decommissioning phase of the proposed project will generate dust nuisance from the demolishing and dismantling of the facility. Noise and traffic impacts are likely to increase with the movement of trucks transporting rubble away from the site. There of no immediate sensitive receptors that are likely to be directly affected by these activities. The Traffic Impact Assessment study has identified and assessed impacts associated with the decommissioning phase of the project and suitable mitigation recommended to reduce impacts as far as possible. Adequate mitigation to reduce dust and noise generation during the decommissioning phase must be included in the decommissioning EMPr.

Following the decommissioning and removal of the Letsoai CSP Site 1 facility and subsequent rehabilitation of the site, there is likely to be a long term overall positive impact on local aesthetics and the broader landscape.

INCREASED RISK TO NEIGHBOURING LAND USERS

The decommissioning phase could result in an increased risk to neighbouring farmers, due to the presence of a labour force. This is likely to occur in areas surrounding the proposed project site and areas near to where labour is housed (if different). This could result in direct economic losses for these farmers (loss of stock, and damage to infrastructure), and could extend to greater community issues such as mistrust and conflict.

INCREASED RISK OF VELD FIRES

The decommissioning activities could result in veld fires which may impact neighbouring land users and farmers. This is particularly relevant considering the arid climate and the reliance on grazing land in the development area. This has the po.

NO-GO ALTERNATIVE IMPACTS

LOSS OF EMPLOYMENT AND LOCAL ECONOMIC DEVELOPMENT OPPORTUNITIES

Should the proposed Letsoai CSP Site 1 facility not be developed, there will be a loss of 470 new employment opportunities in the construction phase and 40 permanent operational employment opportunities. In addition, the opportunities for local, regional and national economic development associated with this proposed project will not be realised.

MAINTENANCE OF THE EXISTING LANDSCAPE AND SENSE OF PLACE

In the event that the proposed Letsoai CSP Site 1 facility is not developed, the existing landscape on the site will remain unchanged (farming). As there are a number of renewable energy projects proposed for the area, some of which are likely to be implemented within the next five to ten years, there is likely to be a change in the sense of place regardless of the implementation of Letsoai CSP Site 1.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-4**.

The most significant positive impacts associated with the construction phase is the potential for increased employment and economic development opportunities. There are a number of recommendations that can result in an enhancement of these impacts including appointment of local contractors and use of local labour as far as possible; use of local suppliers and manufacturers; and implementation of skills development programmes. A number of potential of negative impacts have been identified and were assessed as being of low to medium significance.

The operational phase provides permanent employment and local economic development opportunities; both of these positive impacts are considered to be of medium significance. Measures have been identified to enhance these opportunities as far as possible. The change in sense of place as a result of an altered landscape was identified to be of medium significance. It is unlikely that an altering of the landscape will have impacts on the limited tourism sector, however the change in the nature of the area will occur and there is action that can be taken to mitigate this impact. Access to water resources is a potential negative impact of the operational phase, however as supply to the proposed project will not impact on current household supply this impact is considered to be of low significance.

The most significant social impacts associated with the decommissioning phase are associated with loss of permanent jobs and associated income. The decommissioning phase will however create additional, construction type jobs which can, with enhancement, provide local opportunities to contractors and community members. A number of typical construction type impacts, such as nuisance factors (noise, dust and traffic) and risk to neighbouring farmers may occur, however with adequate mitigation these can be managed appropriately.

Table 9-9: Assessment of Social Impacts for Letsoai CSP 1

REF.		EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE		STATUS
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)		(+ve or -ve)
Construction Phase								
SE1	**Impact**	Increase in employment opportunities						
	Without Mitigation	4	2	6	4	**48**	**Medium**	+ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	4	2	8	5	**70**	**High**	+ve
SE2	**Impact**	Increased economic development opportunities						
	Without Mitigation	4	2	6	3	**36**	**Medium**	+ve

	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	4	2	6	4	**48**	**Medium**	+ve
SE3	**Impact**	Disruption due to influx of job seekers						
	Without Mitigation	2	2	6	5	**50**	**Medium**	-ve
	degree to which impact can be reversed:	Low						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	6	4	**40**	**Medium**	-ve
SE4	**Impact**	Increase in communicable diseases and reduced public health						
	Without Mitigation	2	2	8	4	**48**	**Medium**	-ve
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	6	4	**40**	**Medium**	-ve
SE5	**Impact**	Change in sense of place						
	Without Mitigation	2	2	4	4	**32**	**Medium**	-ve
	degree to which impact can be reversed:	Low.						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	4	3	**24**	**Low**	-ve
SE6	**Impact**	Nuisance from noise, dust and traffic disturbances						
	Without Mitigation	2	2	4	4	**32**	**Medium**	-ve
	degree to which impact can be reversed:	High degree of reversibility through the implementation of EMPr measures to reduce noise, dust and traffic related impacts.						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	4	3	**24**	**Low**	-ve
SE7	**Impact**	Increased risk to neighbouring land users						
	Without Mitigation	2	2	6	3	**30**	**Low**	-ve

	degree to which impact can be reversed:	Can be reversed through the provision of compensation to farmers for damage to infrastructure, theft, etc.						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	4	3	**24**	**Low**	-ve
SE8	**Impact**	Increased risk of veld fires						
	Without Mitigation	2	2	6	4	**40**	**Medium**	-ve
	degree to which impact can be reversed:	Can be reversed through the provision of compensation to farmers for losses resulting from veld fires						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	4	3	**24**	**Low**	-ve
Operational Phase								
SE9	**Impact**	Increased employment opportunities						
	Without Mitigation	4	4	4	3	**36**	**Medium**	+ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	4	4	4	4	**48**	**Medium**	+ve
SE10	**Impact**	Increased economic development opportunities						
	Without Mitigation	4	4	4	3	**36**	**Medium**	+ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	4	4	4	4	**48**	**Medium**	+ve
SE11	**Impact**	Change in sense of place						
	Without Mitigation	2	4	4	4	**40**	**Medium**	-ve
	degree to which impact can be reversed:	Can be reversed through the removal of the facility.						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	4	4	4	**40**	**Medium**	-ve
SE 12	**Impact**	Access to water resources						

	Without Mitigation	3	4	6	2	**26**	**Low**	-
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	3	4	6	2	**26**	**Low**	-ve
Decommissioning Phase								
SE13	**Impact**	Loss of permanent employment						
	Without Mitigation	2	5	4	3	**33**	**Medium**	-ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	5	2	3	**27**	**Low**	-ve
SE14	**Impact**	Gain of short term employment						
	Without Mitigation	2	1	6	3	**27**	**Low**	+ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	1	6	4	**36**	**Medium**	+ve
SE15	**Impact**	Nuisance from dust, noise and traffic						
	Without Mitigation	2	1	4	4	**28**	**Low**	-ve
	degree to which impact can be reversed:	High degree of reversibility through the implementation of EMPr measures to reduce noise, dust and traffic related impacts						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	1	4	3	**21**	**Low**	-ve
SE16	**Impact**	Increased risk to neighbouring land users						
	Without Mitigation	2	1	6	3	**27**	**Low**	-ve
	degree to which impact can be reversed:	Can be reversed through the provision of compensation to farmers for damage to infrastructure, theft, etc.						

	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	1	4	3	**21**	**Low**	-ve
SE17	**Impact**	Increased risk of veld fires						
	Without Mitigation	2	2	6	4	**40**	**Medium**	-ve
	degree to which impact can be reversed:	Can be reversed through the provision of compensation to farmers for losses resulting from veld fires						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	4	3	**24**	**Low**	-
No-Go Alternative								
SE18	**Impact**	Lost opportunity for provision of clean, renewable energy and associated employment and economic benefits						
	Without Mitigation	4	5	6	5	**75**	**High**	-ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	4	5	6	5	**75**	**High**	-ve

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

- Maximise local employment and business opportunities
  - Appointment of local contractors and use of local suppliers and manufacturers where possible.
  - Development of a database of local companies for service provision.
  - Target 40% of the construction labour and 60% during operation, particularly semi and unskilled opportunities could be sourced locally.
  - Communication with Khâi-Ma Local Municipality and community representatives in respect of employment opportunities.
  - Ongoing engagement with the Khâi-Ma Local Municipality in respect of anticipated community investment and upliftment projects.
  - Review of Department of Labour skills audits and undertake relevant skills development programmes targeted at local community members.
- Minimise disruption caused by influx of job seekers

- Communicate employment opportunities to Khâi-Ma Local Municipality, and community representatives to manage employment expectations as far as possible and to allow these parties to manage potential issues associated with influx of people.
- Engage with, and gain support from, the Khâi-Ma Local Municipality in respect of accommodation of labour brought into the area by contractors / developers.

→ Minimise the increase in communicable diseases and reduced public health

- Preparation and implementation of a labour force Health and Safety Plan.
- In consultation with local HIV/AIDS organisations and government structures all contractors must design and implement a proactive and ongoing HIV/AIDS awareness and prevention campaign.
- Provide opportunities for workers to go home over the weekends or regularly. The cost of transporting workers home and back should be the responsibility of the contractor.
- All workers are to be transported back to their homes within 2 days of completion of the construction contract at the cost of the contractor.

→ Minimise nuisance from dust, noise and traffic

- Implement EMPr conditions in respect of mitigating dust, noise and traffic related impacts.
- Establish a grievance mechanism to provide a means for affected stakeholders to communicate.

→ Minimise risk to neighbouring land users

- Development of a code of conduct for workers, signed by the contractor, and communicated to work force.
- Contractor to be held liable for compensating farmers for any losses / damage that can be linked to workers.

→ Minimise risk of veld fires

- EMPr to include mitigation in respect of activities that may pose a fire risk:
  - No open fires allowed for cooking / heating;
  - Activity that pose a fire risk to be properly managed and confined to a designated area;
  - Adequate fire-fighting equipment to be provided on site, and appropriate training conducted; etc.

→ Minimise impacts of loss of permanent employment

- Relocation of employees to other renewable energy facilities where possible.
- Provision of adequate retrenchment packages, that as a minimum meet relevant South African Labour legislation.

9.11 AIR QUALITY

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

The construction phase normally comprises a series of different operations including land clearing, topsoil removal, road grading, material loading and hauling, stockpiling, compaction, etc. Each of these operations will have their own duration and potential for particulate emission generation. It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions.

The temporary nature of the construction activities, and the likelihood that these activities will be localised and on small areas at any given time, reduces the potential for significant off-site impacts. According to the Australian Environmental Protection Agency on recommended separation distances from various activities, a buffer zone of 300 m from the nearest sensitive receptor is required when quarry type operations occur without blasting and a distance of 500 m when blasting will take place (AEPA, 2000).

Only the potential impacts from PM_{10} emissions on the surrounding environment and human health were assessed. Modelling was done using SCREEN3[4] to get an indication of the potential health impact distance and significance. The SCREEN3 model cannot simulate dust fallout rates and it was therefore not assessed.

The closest residential receptors are located approximately 21 km to the north-east (Achab Farm) and 14 km to the north (Aggeneys) from the proposed CSP 1 project location.

POTENTIAL IMPACTS FROM THE CSP 1 CONSTRUCTION SITE

The calculated PM_{10} emissions from the mining operations were combined for modelling. Emission rates were combined for scraping, grading, tipping, concrete batching and wind erosion and modelled as an area source. Modelled impacts are shown as a line graph – PM_{10} concentrations in relation to the distance from the construction site – for the unmitigated option (**Figure 9-2**) and the mitigated option (**Figure 9-3**).

The maximum impact from the construction operations are at a distance of 100 m from the CSP 1 site with 24-hour PM_{10} unmitigated ground level concentration of 41.7 µg/m³, falling within the NAAQ limit of 75 µg/m³. With the listed mitigation measures applied, the PM_{10} daily concentration reduces by 61% to 16.2 µg/m³ at 100 m from the site. From 5 km from the site, there are no impacts predicted.

The assessment could not account for dust fallout impacts from the construction operations and these are expected to be high on-site but also would reduce significantly with distance from the site. Larger particles of between 10 and 30 µm would typically settle within 500 m with coarse particles (greater than 30 µm) deposited within 100 m from the source.

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[4] The South African Regulations on Dispersion Modelling (DEA, 2014) indicates that screening models, such as the US EPA SCREEN3, are adequate in Level 1 screening assessments which aim to reflect the worst-case air quality impacts. The purpose of these Level 1 assessments is to preliminary identify air quality issues associated with new sources and to determine if more detailed assessments are needed. SCREEN3, a Gaussian plume model that can provide maximum ground level concentrations for point, area, flare, and volume sources were used in this assessment (US EPA, 1992).

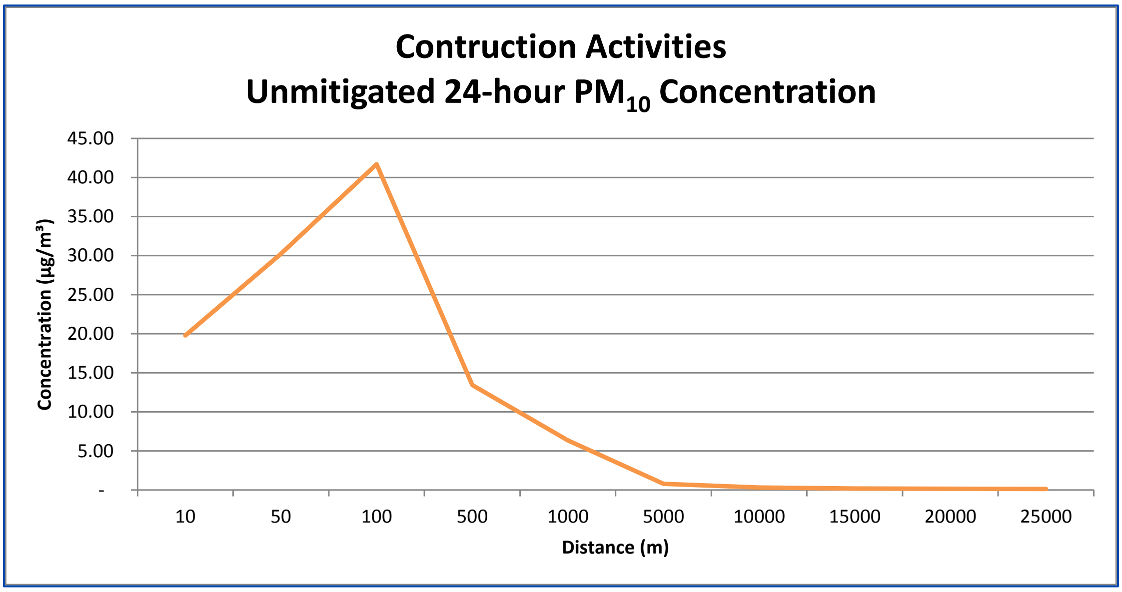

Figure 9-2: Predicted PM_{10} concentrations as a distance from the CSP 1 construction site – Unmitigated

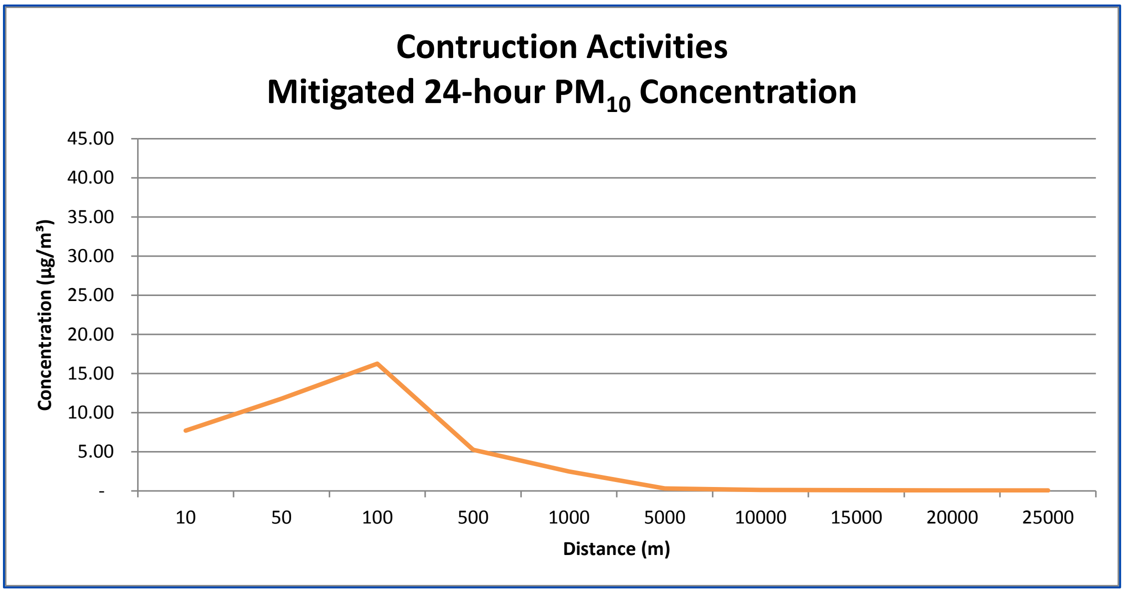

Figure 9-3: Predicted PM_{10} concentrations as a distance from the CSP 1 construction site – Mitigated

POTENTIAL IMPACTS FROM ALTERNATIVE ROUTES 1 AND 2

Two access road alternatives were provided, with Alternative 1 (12.4 km long) and Alternative 2 (29.7 km long). The access road was modelled using SCREEN3 with the road as an area source, assuming a width of 6 m and a modelling length of 60 m (the model has an aspect ratio of 1:10). The predicted impacts are therefore a “snapshot” of what amount of PM_{10} concentrations would result from any 60 m portion of the road, at any given time. This would be the same for both routes since the number of truck trips would be the same. The only difference is that the impacts would be along a longer road for Alternative 2.

The PM_{10} 24-hour ground level concentrations for the unmitigated unpaved road are shown in **Figure 9-4** and the mitigated, assuming 75% control efficiency due to water sprays, in **Figure 9-5**.

The maximum impact distance from the access road for the unmitigated scenario is between 50 m and 100 m with a 24-hour PM_{10} ground level concentration of 6.7 µg/m³ and 7.5 µg/m³, respectively. The impacts deplete rapidly within 500 m down to a concentration of less than 1 µg/m³. These are well below the selected ambient AQ PM_{10} limit of 75 µg/m³. With mitigation applied, the predicted impacts reduce by 77%, with no impacts from a distance of 500 m from the road.

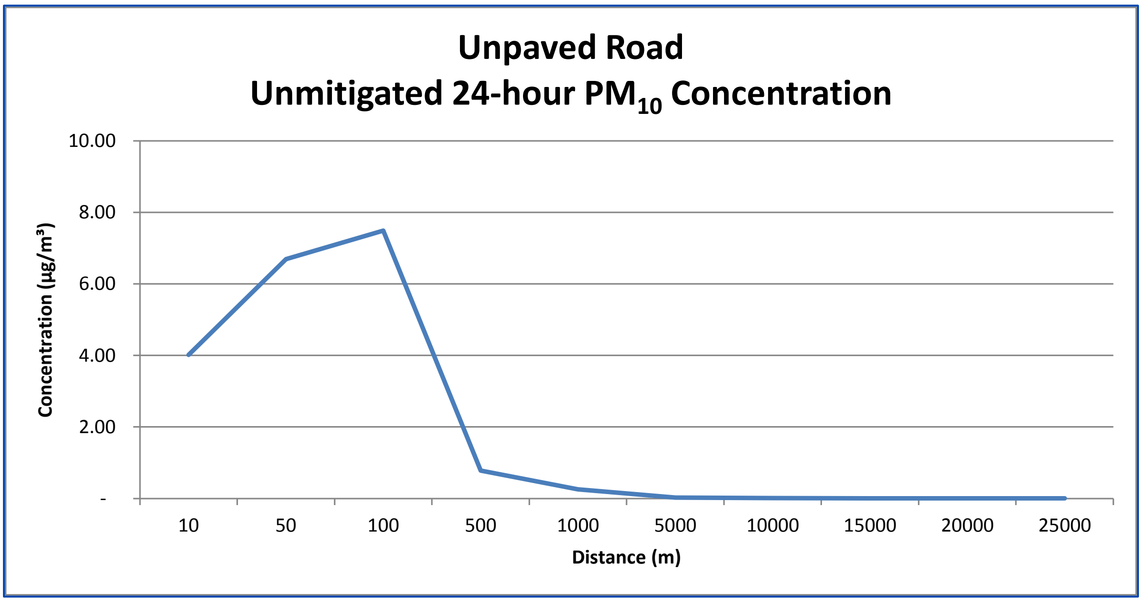

Figure 9-4: Predicted PM_{10} concentrations as a distance from the access road – Unmitigated

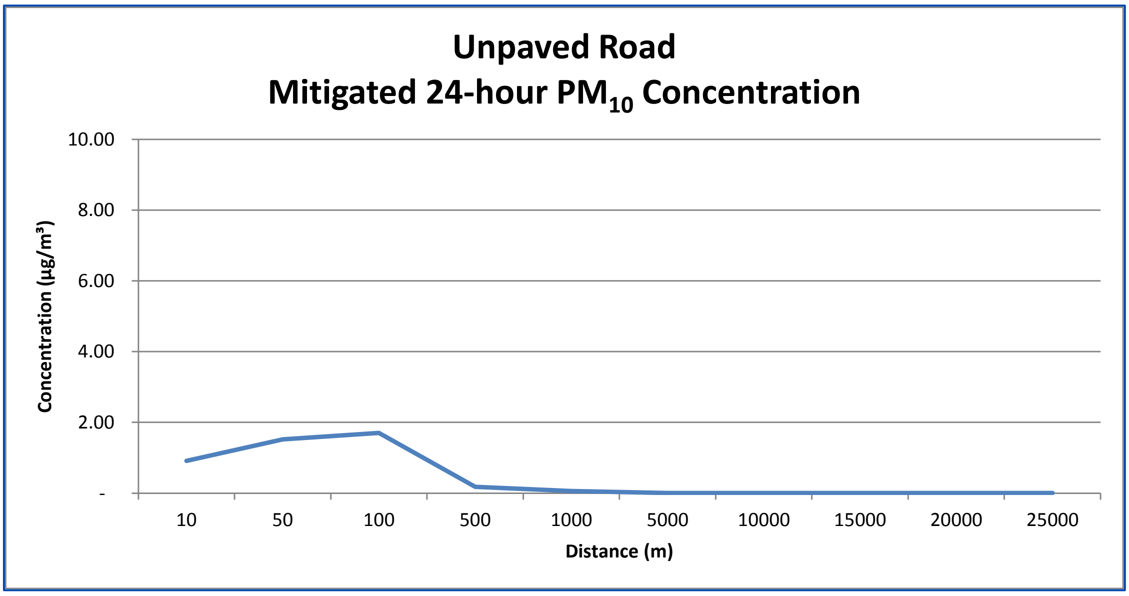

Figure 9-5: Predicted PM_{10} concentrations as a distance from the access road – Mitigated

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-10**.

Table 9-10: Assessment of Air Quality Impacts for Letsoai CSP 1

REF.		EXTENT (E)	DURATION (D)	MAGNITUDE (M)	PROBABILITY (P)	SIGNIFICANCE (S=(E+D+M)*P)		STATUS (+ve or -ve)
Construction Phase								
AQ1	**Impact**	Increased Air Emissions						
	Without Mitigation	2	2	6	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	Reversable						
	degree of impact on irreplaceable resources:	Not applicable						
	With Mitigation	1	2	4	3	**21**	**Low**	-ve
Operational Phase								
AQ2	**Impact**	Increased Air Emissions						
	Without Mitigation	1	5	0	3	**18**	**Low**	-ve
	degree to which impact can be reversed:	Reversable						
	degree of impact on irreplaceable resources:	Not applicable						
	With Mitigation	1	5	0	3	**18**	**Low**	-ve
De-Commissioning Phase								
AQ3	**Impact**	Increased Air Emissions						
	Without Mitigation	2	2	4	3	**24**	**Low**	-ve
	degree to which impact can be reversed:	Reversable						
	degree of impact on irreplaceable resources:	Not applicable						
	With Mitigation	2	2	2	3	**18**	**Low**	-ve
No Go Alternative								
	Impact	There will be no additional impacts on heritage resources. The status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures are recommended:

- Land clearing activities such as dozing and scraping of vegetation and topsoil
  - Water sprays to be applied at the area to be cleared should significant amounts of dust be generated.
  - Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles.
  - As much vegetation as possible should be retained, including patches and strips to minimise dust.
  - Ensure travel distance between clearing area and topsoil piles to be at a minimum.
- Material transfer points
  - Water sprays to be applied at all transfer points (I.e. loading and unloading of trucks, moving of topsoil and aggregates, etc.).
  - Minimise the tip height as far as possible to reduce the potential for dust to be blown away.
  - Ensure travel distance between clearing area and topsoil piles to be at a minimum.
- Concrete batching
  - The raw material should be stored in on-site silos with bag filters to control the dust emissions.
  - A central mix hood would result in 98% control efficiency.
  - All other fugitive sources (transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic, and wind erosion from sand and aggregate storage piles) can be controlled through the application of water sprays, enclosures, hoods, curtains, etc.,
- Vehicle entrainment on unpaved roads
  - Regular water sprays on unpaved roads to ensure at least 75% control efficiency.
  - Conduct regular visual inspections to ensure the surface remains moist
- Wind erosion from exposed areas
  - Ensure exposed areas remain moist through regular water spraying during dry, windy periods.
  - Vegetate topsoil stockpiles as soon as possible.
  - Have an enclosed area (even if with netting to act as wind breaks) around the aggregate and sand stockpiles.

9.12 NOISE

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

Given the nature of a typical screening level assessment construction phase noise emissions were estimated by applying the recommended factors as proposed for use by the European Commissions (EC) Working Group on the Assessment of Environmental Noise (WG-AEN).

The WG-*AEN "Good Practice Guide for Strategic Noise Mapping and the Production of Associated Data on Noise Exposure"*, provides default sound power levels, L_W's, for different types of industry, to be used when sufficient information for a detailed noise emissions inventory is not available. For the construction phase, the default L_{WA} of 65 dBA/m^2 for heavy industrial areas was applied to the CSP plant site 1 infrastructure footprint area. This factor was applied to take into account all on site vehicle movement, materials handling, feed hoppers, conveyors, electrical motors, motor driven pumps and fans, pumping and compressed air noise, cement batching, assembly, etc. The construction laydown area is 5 ha (50 000 m^2). The total noise emission over the 5 ha area was estimated at 112 dBA.

Noise from construction phase traffic along access routes need also be considered. The 2017 traffic assessment by WSP | Parsons Brinckerhoff indicated that traffic will be generated by construction workforce, the delivery of heliostats and bulk construction materials. They estimated 74 trips during AM and PM peak hours for workforce transport (32% heavy vehicles), 22 trips per day for the delivery of bulk construction materials, and 12 trips per day for the delivery of the heliostats. A typical AM or PM peak traffic hour would therefore include ~76 vehicle trips (35% heavy vehicles) and a typical day-time traffic hour ~3 vehicle trips (100% heavy vehicles). It was assumed that these vehicles will travel at an average speed of 60 km/h on unsurfaced roads and 100 km/hour on the N14.

The construction phase's noise impact profiles are presented in **Figure 9-6** and **Figure 9-7**. Whereas **Figure 9-6** shows $L_{Req,d}$ as a function of distance from the source, the increase above the baseline is shown in **Figure 9-7**.

Simulations indicate that activities within the construction laydown area may result in noise levels exceeding 55 dBA up to 190 m from construction activities, with the 3 dBA increase impact criteria exceeded over a distance of 625 m. Road traffic along unsurfaced roads and along the N14 may result in noise levels of over 55 dBA up to 25 m and 12 m from the road's centreline respectively. An increase of more than 3 dBA may be expected up to 325 m and 175 m from the unsurfaced road and N14 respectively.

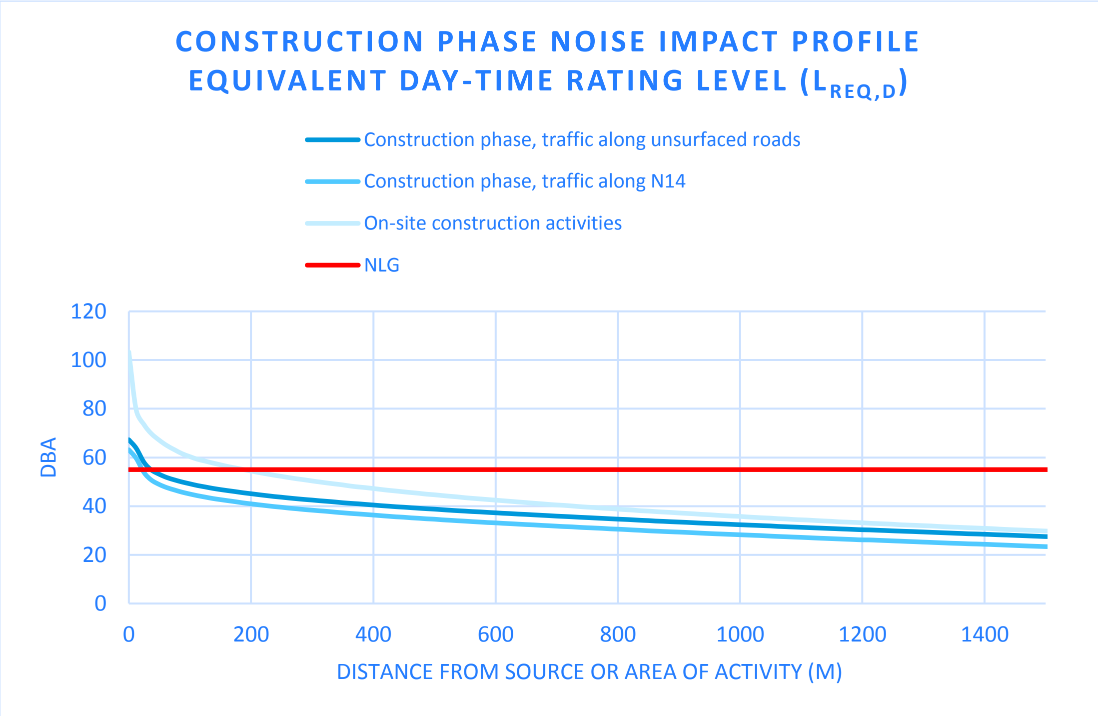

Figure 9-6: Construction phase noise impact profile, equivalent day-time rating level ($L_{Req,d}$)

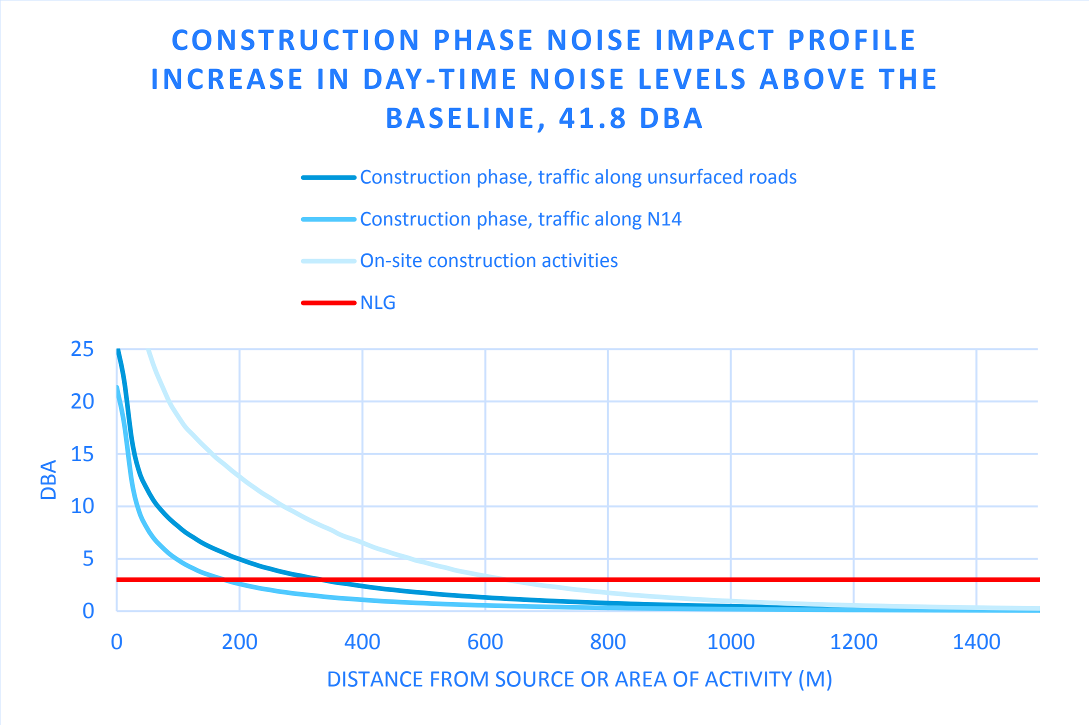

Figure 9-7: Construction phase noise impact profile, increase in day-time noise levels

OPERATIONAL PHASE

The power island is expected to be the most notable source of noise during the operational phase. Whereas the power island will consist of many noise generating activities, sufficiently detailed information was not available to determine source specific noise emissions. The operational phase source inventory therefore consists of the noise emissions typically associated with a 150 MW_e turbine generator unit as calculated using the method stipulated by Crocker (1998) and general noise quantified over an area wide basis by applying the EC WG-EAN factor of 60 dBA/m^2 for light industries. A steam turbine-generator L_{WA} of 110.2 dBA was calculated. The power island footprint area is approximately 3 ha with the L_{WA} of other operational phase sources therefore at 104.8 dBA.

Note that operational phase traffic is considered negligible from a noise impact perspective.

The operational phase's noise impact profiles are presented in **Figure 9-8** and **Figure 9-9**. **Figure 9-8** shows noise levels as a function of distance from the source. The increase above the baseline is shown in **Figure 9-9**. Note, there is no difference in the impact profiles of day- and night-time noise

Simulations indicate that operational phase activities may result in noise levels exceeding the day-time noise level guideline of 55 dBA up to 250 m and the night-time noise level guideline of 45 dBA up to 750 m. A 3 dBA increase in nose levels can be expected up to 1 km from the power island.

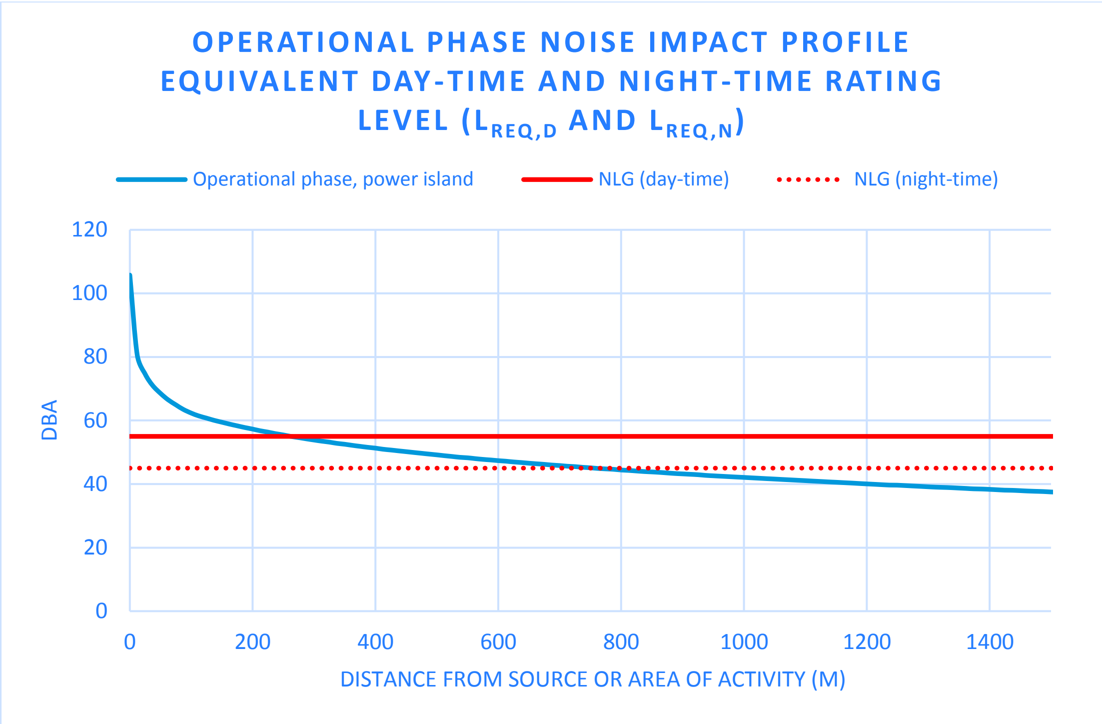

Figure 9-8: Operational phase noise impact profile, equivalent day-time and night-time rating level ($L_{Req,d}$ and $L_{Req,n}$)

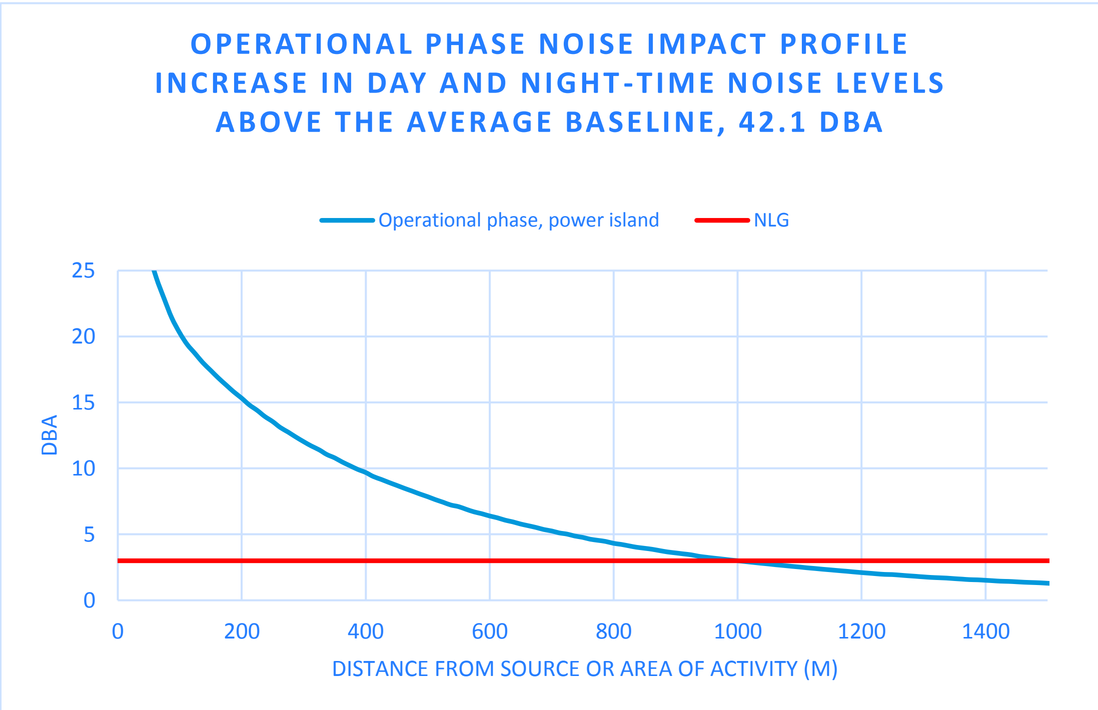

Figure 9-9: Operational phase noise impact profile, increase in day-time and night-time noise levels

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 9-11**.

Table 9-11: Assessment of Noise Impacts for Letsoai CSP 1

REF.		EXTENT (E)	DURATION (D)	MAGNITUDE (M)	PROBABILITY (P)	SIGNIFICANCE (S=(E+D+M)*P)		STATUS (+ve or -ve)
Construction Phase								
N1	**Impact**	Disturbance as a result in increased environemntal noise levels, human receptors						
	Without Mitigation	2	2	4	3	**24**	**Low**	-ve
	degree to which impact can be reversed:	Reversable						
	degree of impact on irreplaceable resources:	Not applicable						
	With Mitigation	2	2	2	3	**18**	Low	-ve
Operational Phase								
N2	**Impact**	Disturbance as a result in increased environemntal noise levels, human receptors						
	Without Mitigation	2	4	4	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	Reversable						
	degree of impact on irreplaceable resources:	Not applicable						
	With Mitigation	2	4	2	3	**24**	**Low**	-ve
De-Commissioning Phase								
N3	**Impact**	Disturbance as a result in increased environemntal noise levels, human receptors						
	Without Mitigation	2	2	4	3	**24**	**Low**	-ve
	degree to which impact can be reversed:	Reversable						
	degree of impact on irreplaceable resources:	Not applicable						
	With Mitigation	2	2	2	3	**18**	**Low**	-ve
No Go Alternative								
	Impact	There will be no additional impacts on heritage resources. The status quo will remain.						

MITIGATION MEASURES

From a noise perspective, the project may proceed if best practice management and mitigation measures listed below are implemented as part of the conditions of environmental authorisation to ensure minimal impacts on the surrounding environment.

GOOD ENGINEERING AND OPERATIONAL PRACTICES

For general activities, the following good engineering practice should be applied:

- All diesel-powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.
- To minimise noise generation, vendors should be required to guarantee optimised equipment design noise levels.
- A mechanism to monitor noise levels, record and respond to complaints and mitigate impacts should be developed.

TRAFFIC

The measures described here are considered good practice in reducing traffic related noise. In general, road traffic noise is the combination of noise from individual vehicles in a traffic stream. The following general factors are considered the most significant with respect to road traffic noise generation:

- Traffic volumes i.e. average daily traffic.
- Average speed of traffic.
- Traffic composition i.e. percentage heavy vehicles.
- Road gradient.
- Road surface type and condition.
- Individual vehicle noise including engine noise, transmission noise, contact noise (the interaction of tyres and the road surface, body, tray and load vibration and aerodynamic noise).

In managing noise specifically related to traffic, efforts should be directed at:

- Minimizing individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.
- Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration.
- Maintain road surface regularly to avoid corrugations, potholes etc.
- Avoid unnecessary idling times.
- Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level near the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' (Burgess & McCarty, 2009).

OPERATIONAL HOURS

- Noise generating activities should be limited to day-time hours as far as possible.

MONITORING

- If noise related complaints are received short term (24-hour) ambient noise measurements should be conducted as part of investigating the complaints. The results of the measurements should be used to inform any follow-up interventions.
- It is further recommended that at least one survey be included during the construction phase and one at the commencement activities to confirm simulation results

10 IMPACT ASSESSMENT – WATER SUPPLY PIPELINE

10.1 PHASES OF DEVELOPMENT

Potential impacts have been identified and assessed according to the phases of the pipeline's development. For purposes of this report, these phases have been generically defined below.

→ **Construction Phase:**

The construction phase includes the preparatory works/activities typically associated the construction of the water supply pipeline. The activities most relevant to this phase include:

- Topsoil stripping;
- Trenching activities associated with site preparation; and
- Construction of the pipeline (aboveground and underground – as required).

→ **Operation Phase:**

Although there are no daily activities associated with the pipeline, occasional maintenance activities may be required during the operational phase.

→ **De-commissioning Phase:**

The decommissioning phase includes the activities associated with the dismantling and removal of the pipeline.

10.2 ACTIVITIES MATRIX

The impacts below have been assessed according to environment. **Table 4-4** provides an indication of how these environments are linked to the various NEMA listed activities outlined in Section 3.2.

Table 10-1: Activities Matrix (C – Construction, O – Operation, D – De-commissioning)

Activity Description	Topography	Geology	Climate	Soil and Land Capability	Natural Vegetation and Animal	Avifauna	Surface Water	Ground Water	Heritage	Palaeontology	Visual	Traffic	Social
GNR 983- Listing Notice 1													
Activity 9: The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more;	C D	-	-	C D	C D	C D	C D	C D	C D	C D	C D	-	C D
Activity 12: The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	C D	-	-	C D	C D	C D	C D	C D	C D	C D	C D	-	-
Activity 19: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse;	C D	-	-	C D	C D	C D	C D	C D	C D	C D	C D	-	-

GNR 985 - Listing Notice 3													
Activity 12: The clearance of an area of 300 square meters or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan In the Northern Cape - (i) Within critical biodiversity areas identified in bioregional plans	**C D**	**-**	**-**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**-**	**-**
Activity 14: The development of – (xii) infrastructure or structures with a physical footprint of 10 square meters or more In the Northern Cape - (bb) National Protected Area Expansion Strategy Focus area (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	**C D**	**-**	**-**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**C D**	**-**	**-**

10.3 SOILS AND LAND CAPABILITY

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

The anticipated impacts for the water pipeline during the construction phase are associated with the site preparation and construction of water pipeline, including:

- Loss of grazing land current utilised for grazing mostly sheep farming, cattle farming and indigenous antelope.
- Increased potential of soil erosion, especially wind driven, due to vegetation clearance, soil disturbance and a high traffic movement on site.
- Potential land contamination from hazardous substances. This includes spillage of concrete onto soil surface, as well as oils, fuel, grease (from construction vehicles) and sewage from temporary on-site ablution facilities.

The loss of gazing land is a negative impact and was assigned a medium environmental significance rating score, after mitigation measures. The other identified impacts (i.e. soil erosion and spillage of hazardous substances) were classified as negative impacts, but had a low environmental significance rating before and after mitigation measures.

OPERATIONAL PHASE

The anticipated impacts for the water pipeline during the operational phase of the project are associated with the day-to-day operational activities during the normal functioning of the pipeline, including maintenance. These impacts include:

- Pipeline water leaks, leading to soil erosion at leakage point and establishment of an artificial wetland
- Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from site operational and maintenance vehicles) and temporary onsite ablution facilities.

The negative impacts of potential pipe leaks, soil erosion and spillage of hazardous substances were assigned a low environmental significance before and after mitigation measures.

DECOMMISSIONING PHASE

The anticipated impacts for the water pipeline during the de-commissioning phase include:

- Increased potential of soil erosion due to removal of the pipeline, soil disturbance and a high traffic movement on site.
- Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from temporary onsite ablution facilities.

The decommissioning phase exhibited the lowest environmental significance rating scores for the associated impacts of the proposed water pipeline. There were no fatal flaws identified during this phase of the project.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 10-2**.

Table 10-2: Assessment of Soil and Land Capability Impacts for the water pipeline

REF.		EXTENT (E)	DURATION (D)	MAGNITUDE (M)	PROBABILITY (P)	SIGNIFICANCE (S=(E+D+M)*P)		STATUS (+ve or -ve)
Construction Phase								
Alternative 1, 2 and 3								
SLC1	**Impact**	Loss of grazing land current utilised for grazing mostly sheep farming, cattle farming and indigenous antelope.						
	Without Mitigation	2	2	2	2	**12**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	0	1	**3**	**Low**	-ve
SLC2	**Impact**	Increased potential of soil erosion, especially wind driven, due to vegetation clearance, soil disturbance and a high traffic movement on site						
	Without Mitigation	2	2	2	2	**12**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	0	1	**3**	**Low**	-ve
SLC3	**Impact**	Potential land contamination from hazardous substances. This includes spillage of concrete onto soil surface, as well as oils, fuel, grease (from construction vehicles) and sewage from temporary on-site ablution facilities.						
	Without Mitigation	2	2	2	2	**12**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	1	0	1	**2**	**Low**	-ve
Operational Phase								
Alternative 1, 2 and 3								
SLC4	**Impact**	Pipeline water leaks, leading to soil erosion at leakage point and establishment of an artificial wetland						
	Without Mitigation	2	4	4	2	**20**	**Low**	-ve
	degree to which impact can be reversed:	High						

	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	1	0	1	**2**	**Low**	-ve
SLC5	**Impact**	Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from site operational and maintenance vehicles) and temporary onsite sewage systemsablution facilities .						
	Without Mitigation	2	2	2	2	**12**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	1	0	1	**2**	**Low**	-ve
De-commissioning Phase								
Alternative 1, 2 and 3								
SLC6	**Impact**	Increased potential of soil erosion due to removal of the pipeline, soil disturbance and a high traffic movement on site.						
	Without Mitigation	2	2	2	2	**12**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	0	1	**3**	**Low**	-ve
SLC7	**Impact**	Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.						
	Without Mitigation	2	2	2	2	**12**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	1	0	1	**2**	**Low**	-ve
No Go Alternative								
	Impact	No impacts are associated with the No-Go alternative as the status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures are recommended:

- Loss of land previously used for sheep, cattle and antelope grazing will be occupied by the solar power facility and associated infrastructure.
  - Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum.
- Pipeline water leaks, leading to soil erosion at leakage point and establishment of an artificial wetland.
  - The entire pipeline route should be inspected regularly (no more than 3 months for the entire length of pipeline), by a competent individual. Similarly, the management of the pipeline and pump house should be overseen by competent individuals.
- Increased potential for soil erosion (especially wind driven) due to vegetation clearance, soil disturbance and high traffic movement on site.
  - Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum. Traffic of construction vehicles should be kept to a minimum to reduce soil compaction, and limited to existing or proposed roadways where practical. Soils excavated during construction of the facility should be appropriately stored in stockpiles which are protected from erosion (wind and water) (i.e. through use of vegetation cover in the case of long-term stockpiles- this should form part of the rehabilitation process after the construction phase). Wind erosion is dominant for the region, however the array of heliostats will act as an artificial wind break and reduce the effect in the site footprint. Water erosion action is considered limited, however backfilling with soil and use of gabions or Reno Mattresses should be used where evidence of erosion is present..
- Potential spillage of hazardous substances such as oils, fuel, grease from construction and operational vehicles, and sewage from on-site sanitation systems
  - The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper upkeep of machinery and vehicles. A complete spill kit must be onsite at all times.

10.4 NATURAL VEGETATION AND ANIMAL LIFE

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

IMPACTS ON VEGETATION AND PROTECTED PLANT SPECIES

It is confirmed that some protected plant species such as *Hoodia gordonii* occur within the site and it is highly likely that some individuals will be impacted on by the development. However, as the abundance of such species is low, the major impact would be on vegetation loss in a general sense and not on any particular species. Within solar PV plants, it is usually possible to leave some intact vegetation between the rows of panels but CSP footprints are usually sterilized and so the assessed assumes the total loss of all vegetation within the development footprint.

Impacts on vegetation and protected plant species will occur due to vegetation clearing and disturbance associated with the construction of the water supply pipeline. Option 1 is most favourable in this regard, followed by Option 2 with Option 3 being considered least favourable on account of the confirmed presence of species of conservation concern along the route.

DIRECT FAUNAL IMPACTS

Construction phase noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area 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 mammals or reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

Disturbance, transformation and loss of habitat during construction of the pipeline will have a negative effect on resident fauna. However, disturbance will be transient post-mitigation impacts are likely to be Low and of local significance only. Although there are no highly significant faunal habitats along any of the options, the Koa River valley is identified as a sensitive faunal habitat and Option 3 is also significantly longer than the other options, increasing the relative impact and there are also some rocky areas of significance for reptiles along the route. As with vegetation impacts, Option 1, followed by Option and then Option 3 would generate increasing impact.

INCREASED EROSION RISK

Disturbance at the site due to construction and the operation of heavy machinery will significantly increase the risk of erosion at the site, both from wind and water. Although rainfall in the area is low, sediment yields from arid ecosystems are high because the vegetation cover is too low to limit erosion and occasional thunder storms or rare heavy rainfall events can cause significant erosion in a single event. In addition, the loose red sands of the area are vulnerable to mobilsation as the red dunes of the Koa River attest. Dust suppression during construction will be required and erosion risk will extend into the operational phase until bare areas have been revegetated or protected with a less mobile substrate.

Areas disturbed during construction will be vulnerable to disturbance from wind and rain erosion. Although the site is arid, exceptional rainfall events can cause significant erosion events, as the low vegetation cover does not provide adequate protection for the loose soils. Disturbance will raise the possibility of wind erosion and dust suppression will be required during construction. With mitigation, this impact can however be reduced to a Low level for Option 1 but there will be higher residual risk from Option 2 and 3, due to the disturbance of the Koa River valley along Option 2 and the long route and vulnerable nature of large parts of Option 3.

OPERATIONAL PHASE

DIRECT FAUNAL IMPACTS

Operational phase noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area 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. During operation, the site will be inhospitable for many fauna and this will contribute to the disruption of faunal habitat and movement in the area. In addition, night-lighting and electrical fencing may also generate negative impacts and if there are any evaporation or other water ponds present, these should either be covered or fenced to prevent fauna from falling in.

The presence and operation of the pipeline will cause some impact to fauna due to disturbance during maintenance or preventing fauna from crossing the pipeline, above or below ground. However with mitigation, this can be reduced to a low level for all options.

INCREASED ALIEN PLANT INVASION

Alien plants are likely to invade the site and disturbed areas around the margins of the site as a result of the large amounts of disturbance created during operation. However as the construction phase would be about 2 years, this is not long enough for significant alien problems to develop and the major impact and required mitigation measures would be expressed in the Operational phase. Current levels of plant invasion at the site are low. Alien species such as *Prosopis* are however present and would potentially invade the site along with other typical weedy species such as *Salsola kali*.

Alien plants are likely to invade the disturbed areas long the pipeline route as a result of the large amounts of disturbance created during construction. Alien plant invasion would contribute to cumulative habitat degradation in the area, but if alien species are controlled, then cumulative impact from alien species would not be significant during the operational phase. This is however likely to be a persistent impact along Option 3 as the route through the canyon to the Orange River is highly vulnerable to alien invasion, especially *Prosopis* as it is regularly disturbed during flood events of the Goob se Laagte river which runs through the canyon.

INCREASED EROSION RISK

Disturbance at the site due to the operation of heavy machinery will significantly increase the risk of erosion at the site, both from wind and water. Although rainfall in the area is low, sediment yields from arid ecosystems are high because the vegetation cover is too low to limit erosion and occasional thunder storms or rare heavy rainfall events can cause significant erosion in a single event. In addition, the loose red sands of the area are vulnerable to mobilsation as the red dunes of the Koa River attest. Dust suppression will be required and erosion risk will extend into the operational phase until bare areas have been revegetated or protected with a less mobile substrate.

Areas disturbed during construction will remain vulnerable to disturbance for some time into the operational phase and will require regular maintenance to ensure that erosion is minimised. With mitigation, this impact can be reduced to a Low level for Option 1 and 2. However, Option 3 traverses some vulnerable areas and erosion problems are likely to be a persistent problem into the operational phase.

DE-COMMISSIONING PHASE

DIRECT FAUNAL IMPACTS

De-commissioning phase noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area 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.

Disturbance or persecution of fauna during the decommissioning phase may occur. The operation of heavy machinery and human presence along the pipeline during decommissioning would impact fauna in and near the route. However, this would be temporary and faunal diversity and density within the site is low and post mitigation impacts are likely to be Low.

INCREASED EROSION RISK

Disturbance at the site due to the operation of heavy machinery will significantly increase the risk of erosion at the site, both from wind and water. Although rainfall in the area is low, sediment yields from arid ecosystems are high because the vegetation cover is too low to limit erosion and occasional thunder storms or rare heavy rainfall events can cause significant erosion in a single event. In addition, the loose red sands of the area are vulnerable to mobilsation as the red dunes of the Koa River attest.

Areas disturbed during decommissioning will remain vulnerable to disturbance for some time and erosion should be minimised through site rehabilitation and erosion management. With mitigation, this impact can be reduced to a Low level for Options 1 and 2 and Medium for Option 3.

INCREASED ALIEN PLANT INVASION

Alien plants are likely to invade the site and disturbed areas around the margins of the site as a result of the large amounts of disturbance created during de-commissioning. Current levels of plant invasion at the site are low. Alien species such as *Prosopis* are however present and would potentially invade the site along with other typical weedy species such as *Salsola kali*.

Alien plants are likely to invade the site as a result of the large amounts of disturbance created during decommissioning. Alien clearing will be required for several years after decommissioning until the natural vegetation has retuned sufficiently to suppress invaders.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 10-3**.

Table 10-3: Assessment of Biodiversity Impacts for the Water Pipeline

Ref.		Extent	Duration	Magnitude	Probability	Significance		Status
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)		(+ve or -ve)
Construction Phase								
Alternative 1								
BIO1	**Impact**	Impacts on vegetation and protected plant species						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-
	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
BIO2	**Impact**	Faunal impacts due to construction activities						
	Without Mitigation	2	4	4	3	**30**	**Low**	-
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
BIO3	**Impact**	Increased Soil Erosion risk during construction						
	Without Mitigation	2	4	4	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						

	With Mitigation	1	2	6	3	**27**	**Low**	-ve
Alternative 2								
BIO1	**Impact**	Impacts on vegetation and protected plant species						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
BIO2	**Impact**	Faunal impacts due to construction activities						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
BIO3	**Impact**	Increased Soil Erosion risk during construction						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
Alternative 3								
BIO1	**Impact**	Impacts on vegetation and protected plant species						
	Without Mitigation	1	4	8	5	**65**	**High**	-
	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	4	8	4	**52**	**Medium**	-ve
BIO2	**Impact**	Faunal impacts due to construction activities						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve

	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	4	8	4	**52**	**Medium**	-ve
BIO3	**Impact**	Increased Soil Erosion risk during construction						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
Operational Phase								
Alternative 1								
BIO4	**Impact**	Faunal impacts due to operational activities and human presence during maintenance activities						
	Without Mitigation	2	4	4	3	**30**	**Low**	-
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
BIO5	**Impact**	Alien plant invasion						
	Without Mitigation	2	4	6	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
BIO6	**Impact**	Erosion						
	Without Mitigation	2	4	6	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						

	With Mitigation	1	4	4	3	**27**	**Low**	-ve
Alternative 2								
BIO4	**Impact**	Faunal impacts due to operational activities and human presence during maintenance activities						
	Without Mitigation	2	4	6	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
BIO5	**Impact**	Alien plant invasion						
	Without Mitigation	2	4	6	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
BIO6	**Impact**	Erosion						
	Without Mitigation	2	4	6	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
Alternative 3								
BIO4	**Impact**	Faunal impacts due to operational activities and human presence during maintenance activities						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	6	3	**27**	**Low**	-ve
BIO5	**Impact**	Alien plant invasion						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve

	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	4	8	4	**52**	**Medium**	-ve
BIO6	**Impact**	Erosion						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	4	8	4	**52**	**Medium**	-ve
Decommissioning Phase								
Alternative 1 and 2								
BIO7	**Impact**	Faunal impacts due to decommissioning and operation of heavy machinery on-site						
	Without Mitigation	2	4	4	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	4	3	**27**	**Low**	-ve
BIO8	**Impact**	Erosion						
	Without Mitigation	2	2	6	5	**50**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	4	3	**21**	**Low**	-ve
BIO9	**Impact**	Alien plant invasion						
	Without Mitigation	2	2	6	5	**50**	**Medium**	-ve
	degree to which impact can be reversed:	High						

	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	4	3	**21**	**Low**	-ve
Alternative 3								
BIO7	**Impact**	Faunal impacts due to decommissioning and operation of heavy machinery on-site						
	Without Mitigation	2	2	6	5	**50**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	4	3	**21**	**Low**	-ve
BIO8	**Impact**	Erosion						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	4	8	4	**52**	**Medium**	-ve
BIO9	**Impact**	Alien plant invasion						
	Without Mitigation	2	2	8	5	**60**	**Medium**	-ve
	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Medium						
	With Mitigation	1	4	8	4	**52**	**Medium**	-ve
No Go Alternative								
	Impact	No impacts are associated with the No-Go alternative as the status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

CONSTRUCTION PHASE

→ Impacts on vegetation and protected plant species

- Preconstruction walk-though of the final development footprint to ensure that sensitive habitats and species can be avoided where possible.
- Species suitable for search and rescue to be identified in the preconstruction walk through.
- Clearing & translocation permit should be obtained from NC-DENC before construction commences.
- The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas.
- Sensitive features near to construction areas should be demarcated as no-go areas with construction tape or similar and signposted as such.

→ Faunal impacts due to construction activities

- Any trenches that need to be dug for construction should not be left open for extended periods of time as smaller fauna will fall in and become trapped. Where trenches are dug and must be left open for several days, there should be loose soil ramps at regular intervals for fauna to escape. Alternatively, the trenches should be inspected regularly and trapped fauna removed.
- During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
- No fuelwood collection should be allowed on-site.
- If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards.
- 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.
- No unauthorized persons should be allowed onto the site and site access should be strictly controlled.
- All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises. Speed limits should apply within the facility as well as on the public gravel access roads to the site.
- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes and tortoises which are often persecuted out of fear or superstition.

→ Areas disturbed during construction will be vulnerable to wind and water erosion

- Dust suppression and erosion management should be an integrated component of the construction approach.
- Disturbance near to drainage lines should be avoided and sensitive drainage areas near to the construction activities should be demarcated as no-go areas.
- Sediment traps and wind shields may be necessary to prevent erosion and soil movement if there are topsoil dumps exposed for extended periods of time.
- All roads and other hardened surfaces should have runoff control features.

OPERATIONAL PHASE

→ Faunal Impacts due to Operation

- Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.
- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except landowners with the appropriate permits where required.
- If any parts of 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.
- Any storage ponds, overflow dams or evaporation ponds at the site should be covered or fenced to prevent larger animals from accessing these areas. If not covered, there should however also be a ramp or ladder present where fauna that fall into the water can escape. These dams are often lined with plastic of some or other slippery surface and animals may drown if they fall in and are unable to get out due to the steep or slippery sides.

→ Alien invasive plants impacts

- Problem woody species such as Prosopis are already present in the area and are likely to increase rapidly if not controlled.
- Regular (annual) monitoring for alien plants within and near the development footprint.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible, although for some species, such as those that are strong resprouters, this may be the best-practice method.

→ Following construction, disturbed areas will remain vulnerable to erosion for some time

- The pipeline should be checked for leaks on a regular basis, as excessive water can damage arid-adapted plants and also cause erosion problems.
- Regular (annual) monitoring for erosion problems along the pipeline and other cleared areas.
- Erosion problems should be rectified on a regular basis and this may include the revegetation of bare or eroded areas.

DE-COMMISSIONING PHASE

→ Impacts on fauna

- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes and tortoises.
- Any fauna threatened by the decommissioning activities should be removed to safety by the ECO or appropriately qualified environmental officer.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.
- Any trenches that need to be dug should not be left open for extended periods of time as smaller fauna will fall in and become trapped.
- All waste and material on-site that is not recycled as part of decommissioning, should be removed from the site to a suitable waste disposal site.
- The disturbance footprint should be rehabilitated using locally occurring grasses and shrubs.

→ Following decommissioning, the site will remain vulnerable to erosion

- All cleared and disturbed areas should be re-vegetated after decommissioning with locally occurring species.

- The site should be inspected annually for erosion problems for at least 5 years after decommissioning or until such time as the vegetation has recovered to levels equivalent to the adjacent rangeland.

→ Following decommissioning, the site will remain vulnerable to alien plant invasion

- Problem woody species such as Prosopis are already present in the area and are likely to increase rapidly if not controlled.
- Regular (annual) monitoring for alien plants within disturbed areas created by decommissioning.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned and should be conducted for at least 5 years after decommissioning or until the natural vegetation has returned.

10.5 AVIFAUNA

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

DISPLACEMENT DUE TO DISTURBANCE ASSOCIATED WITH THE CONSTRUCTION OF THE PIPELINE

The construction of the pipeline will result in a significant amount of movement and noise, which will lead to the temporary displacement of avifauna from the immediate vicinity of the construction activities. It is highly likely that most priority species listed in Table 2 will vacate the immediate area for the duration of these activities. The only difference between the various alternatives is that alternative 3 is much longer and will run next to the Midway - Pelladrift 1 66kV sub-transmission line for the first 7km between the Orange River and the town of Pella. There is some risk of disturbance of raptors breeding on the aforementioned powerline (if any) during the construction of the pipeline, should alternative 3 be selected.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 10-4**.

All three alternatives are acceptable from an avifauna perspective, but due to its length and partial location along an existing high voltage line which may contain breeding raptors, alternative 3 is the least preferred option.

Table 10-4: Assessment of Avifauna Impacts for the water pipeline

REF.		EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE		STATUS
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)		(+ve or -ve)
Construction Phase								
Alternative 1								
AV1	**Impact**	Displacement due to disturbance associated with the construction of the pipeline						
	Without Mitigation	1	1	4	4	**24**	**Low**	-
	degree to which impact can be reversed:	High. Once the construction activities are completed, the habitat should recover completely						

	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	1	4	3	**18**	**Low**	-ve
Alternative 2								
AV2	**Impact**	Displacement due to disturbance associated with the construction of the pipeline						
	Without Mitigation	1	1	4	4	24	Low	-
	degree to which impact can be reversed:	High. Once the construction activities are completed, the habitat should recover completely						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	1	4	3	**18**	**Low**	-ve
Alternative 3								
AV3	**Impact**	Displacement due to disturbance associated with the construction of the pipeline						
	Without Mitigation	1	1	8	4	**40**	**Medium**	-ve
	degree to which impact can be reversed:	High. Once the construction activities are completed, the habitat should recover completely						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	1	4	3	18	Low	-ve
No Go Alternative								
	Impact	There will be no additional impacts on avifauna. The ecological integrity of the site as it currently functions will be preserved.						

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

- The construction of the pipeline will result movement and noise, which will lead to displacement of avifauna from the immediate vicinity due to disturbance. It is highly likely that most priority species will temporarily vacate the area for the duration of these activities:
  - Construction activity should be restricted to the immediate footprint of the infrastructure.
  - Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
  - Measures to control noise and dust should be applied according to current best practice in the industry.
  - Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical.
  - The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.

- Prior to construction commencing, an inspection should be performed by the avifaunal specialist to record any large raptor nests on the existing Midway - Pelladrift 1 66kV that could be impacted by the construction of the proposed pipeline, should alternative 3 be utilised.
- Should any nests be recorded, it would require management of the potential impacts on the breeding birds once construction commences, which would necessitate the involvement of the avifaunal specialist, and the Environmental Control Officer. An effective communication strategy should be implemented whereby the avifaunal specialist is provided with a construction schedule which will enable him/her to ascertain when and where breeding priority raptors could be impacted by the construction activities. This could then be addressed through the timing of construction activities during critical periods of the breeding cycle, once it has been established that a particular nest is active.

10.6 SURFACE WATER

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

The anticipated impacts for the water pipeline during the construction phase are associated with the site preparation and construction of pipeline, including:

→ Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.

→ Temporary degradation of wetland/riparian habitat due to the proposed traversing pipelines.

The surface water assessment identified potential wetlands located with 500m of pipeline alternatives 2 and 3.

OPERATIONAL PHASE

The anticipated impacts for the water pipeline during the operational phase of the project are associated with the day-to-day operational activities during the normal functioning of the pipeline, including maintenance. These impacts include:

→ Alterations of flow regimes of watercourses, in close proximity to the site, or where the pipeline traverses the watercourse.

→ Pipeline water leaks, leading to soil erosion at leakage point and establishment of an artificial wetland.

→ Permanent degradation of wetland habitat due to the proposed traversing pipelines.

The surface water assessment identified potential wetlands located with 500m of pipeline alternatives 2 and 3.

DECOMMISSIONING PHASE

The anticipated impacts for the water pipeline during the de-commissioning phase include:

→ Temporary and permanent degradation of wetland habitat due to the removal of the traversing pipelines.

The decommissioning phase exhibited the lowest environmental significance rating scores for the associated impacts of the proposed water pipeline. There were no fatal flaws identified during this phase of the project.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 10-5**. A portion of the pipeline alternative 3 would follow the same servitude as an existing pipeline while alternative 1 and 2 would be new infrastructure within the landscape. However, alternative 3 is significantly longer than the other two. As stated above, all three cross the Kao River drainage region and the area as whole is considered homogenous. Therefore, all alternatives have a potential to negatively impact the surrounding environment and no one alternative is significantly preferred over the other.

Table 10-5: Assessment of Surface Water Impacts for the water pipeline

REF.		EXTENT (E)	DURATION (D)	MAGNITUDE (M)	PROBABILITY (P)	SIGNIFICANCE (S=(E+D+M)*P)		STATUS (+ve or -ve)
Construction Phase								
Alternative 1, 2 and 3								
SW1	**Impact**	Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.						
	Without Mitigation	2	2	6	4	**40**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	2	4	3	**24**	**Low**	-ve
SW2	**Impact**	Temporary degradation of wetland/riparian habitat due to the proposed traversing pipelines						
	Without Mitigation	2	2	6	4	**40**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	2	4	3	**21**	**Low**	-ve
Operational Phase								
Alternative 1, 2 and 3								
SW3	**Impact**	Alterations of flow regimes of watercourses, in close proximity to the site, or where the pipeline traverses the watercourse.						
	Without Mitigation	2	5	6	4	**52**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	1	2	2	**10**	**Low**	-ve

SW4	**Impact**	Pipeline water leaks, leading to soil erosion at leakage point and establishment of an artificial wetland						
	Without Mitigation	2	4	4	2	**20**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	1	0	1	**2**	**Low**	-ve
De-commissioning Phase								
Alternative 1, 2 and 3								
SW5	**Impact**	Temporary and permanent degradation of wetland habitat due to the removal of the traversing pipelines						
	Without Mitigation	2	3	6	5	**55**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	1	2	2	**10**	**Low**	-ve
No Go Alternative								
	Impact	No impacts are associated with the No-Go alternative as the status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures are recommended:

- Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.
  - Construction of the pipeline should occur during the dry season, as far as practically possible, and the site rehabilitated before major rainfall events occur. Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. It is understood that the proposed pipelines would be located aboveground therefore they should be positioned above the 1:100 floodline of any watercourse. Regular pipeline inspections during operation are required to ensure there are no leaks which would alter the local hydrological regime. These crossings have a potential of needing a Water Use Licence in terms of the National Water Act.
- Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland
  - The entire pipeline route should be inspected regularly, by a competent individual. Similarly, the management of the pipeline and pump house should be overseen by competent individuals.
- Potential spillage of hazardous substances such as oils, fuel, grease from construction and operational vehicles, and sewage from on-site sanitation systems

- The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper upkeep of machinery and vehicles. A complete spill kit must be onsite at all times.

→ Degradation of wetland habitat due to the proposed positioning of the pipelines

- Should BioTherm be recognised as a Preferred Bidder, the required application for a WUL in terms of Section 21 of the NWA may commence. This application (WULA) will require detailed functional assessments (i.e. present ecological state (PES), ecological importance and sensitivity (EIS) and EcoServices) of freshwater habitats potentially affected by the site and pipelines. At this stage design details should be available allowing the freshwater specialist to assess specific areas within the site. Therefore, a more in-depth and thorough freshwater functional assessment should be conducted should BioTherm be recognised as a Preferred Bidder. The detailed freshwater habitat assessment must provide recommendations in terms of road access in relation to freshwater habitats.

10.7 HERITAGE

FINDINGS AND IMPACT DESCRIPTION

The proposed water pipeline will run in parallel with the existing water pipeline from the Pelladrift pump station on the Orange River to the mine at Black Mountain (Aggeneys).

The specialist's findings are supported by the findings of Morris (2011) who noted that LSA sites are the predominant archaeological trace in the Aggeneys – Pofadder region. He concluded that the area is not rich in archaeological or colonial era heritage traces and as a rule "over virtually the entire area stone artefacts were found to occur in extremely low densities".

There are two small koppies near the proposed pipeline which seemed to offer a possibility of shelter for pre-colonial inhabitants. Both koppies were examined closely and both had a light scatter of quartz artefacts around their base. Neither area is significant.

With respect the route of the water pipeline to the Orange River, there is a single structure situated along the route of the pipeline. Since this building is located inside a fenced (and locked) area, it was not possible to provide a detail assessment of its heritage significance. However, it appears from aerial photographs, to be a modern warehouse.

The following impacts were identified:

→ Construction Phase:

- During the construction phase, several physical activities may result in direct impacts to the landscape and any heritage that lies on it. However, this study has identified the heritage remains to be of very low significance and no impacts are expected.
- The stone artefact scatters are of low significance. They are randomly scattered across the landscape in low quantities and do not provide any significant information regarding prehistoric settlement of the area. Our confidence with regard this is high. The destruction of these artefacts scatters does not require any mitigation.
- There is a very small possibility that buried human remains (graves) may be uncovered during construction. If they are uncovered during earthworks the remains will be disturbed. Human remains are considered highly sensitive heritage resources and appropriate mitigation measures must be undertaken to conserve them.

→ Operational Phase:

- Generally, no impacts are expected except for potential vandalism of heritage sites by staff operating the facility. However, no impacts are expected because of the relatively low significance of heritage resources;

→ De-commissioning Phase:

- Impacts resulting from the de-commissioning of the water pipeline may include the dumping of material on heritage sites. However, in this case no heritage resources are of low significance.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 10-6**. The impact ratings for the alternative options are considered to be the same. Pipeline alternative 2 is the preferred option because the potential of impacts to heritage are likely to be the lowest.

Table 10-6: Assessment of Heritage Impacts for the water pipeline

REF.		EXTENT (E)	DURATION (D)	MAGNITUDE (M)	PROBABILITY (P)	SIGNIFICANCE (S=(E+D+M)*P)		STATUS (+ve or -ve)
Construction Phase (Alternatives 1, 2 and 3)								
H1	**Impact**	Potential impacts to scatters of stone artefacts						
	Without Mitigation	2	5	2	3	**27**	**Low**	-ve
	degree to which impact can be reversed:	Destruction of archaeological material cannot be reversed.						
	degree of impact on irreplaceable resources:	The archaeological material is of low significance, the impacts will be low.						
	With Mitigation	1	5	2	3	**24**	**Low**	-ve
H2	**Impact**	Potential impacts to human remains/graves						
	Without Mitigation	2	5	8	2	**30**	**Low**	-ve
	degree to which impact can be reversed:	Destruction to human remains cannot be reversed.						
	degree of impact on irreplaceable resources:	Human remains are considered a very sensitive heritage resource and impacts should be avoided.						
	With Mitigation	2	5	4	2	**22**	**Low**	-ve
No Go Alternative								
	Impact	There will be no additional impacts on heritage resources. The status quo will remain.						

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

→ If any high concentrations of archaeological material, such as stone artefacts, are recovered SAHRA must be notified; and

→ If any human remains are uncovered during the excavations for the pipeline, work must stop in that area and SAHRA must be alerted immediately.

10.8 VISUAL

FINDINGS AND IMPACT DESCRIPTION

CONSTRUCTION PHASE

CONSTRUCTION EQUIPMENT AND DUST

Construction vehicles, dust and equipment will have a visual impact on viewers and general visibility (clarity of the air) within close proximity to the site. The visual impacts during construction are over a limited time period and will be temporary.

CLEARING

Loss of vegetation during land clearing increases the visibility of contrasting soils, resulting in changes to the colour and texture of the site. Clearing vegetation will also result in increased windblown dust, reducing visibility of both day and night skies.

OPERATIONAL PHASE

The proposed pipeline will be situated on concrete plinths above the ground and is therefore likely to be visible from locations in very close proximity to the route or from elevated viewpoints. The height above ground level is unknown, but assuming it is less than 0,5m high, visibility will be limited and viewer numbers are very low.

DE-COMMISSIONING PHASE

CONSTRUCTION EQUIPMENT AND DUST

In terms of visual impact, the decommissioning process is anticipated to be broadly similar to that of the construction phase, effects on visual receptors and landscape character during decommissioning are anticipated to be consistent with those assessed for the construction phase.

IMPACT ASSESSMENT

The impact assessment for the above mentioned impacts is included in **Table 10-7**. Pipeline alternative 1 is preferred from a visual perspective as it is much shorter, with some infrastructure already existing.

Table 10-7: Assessment of Visual Impacts for the water pipeline

REF.		EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE		STATUS
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)		(+ve or -ve)
Construction Phase (Alternative 1, 2 and 3)								
V1	**Impact**	Visual impact during construction due to dust, vehicles and equipment						
	Without Mitigation	2	2	6	4	**32**	**Medium**	-ve
	degree to which impact can be reversed:	The visual impact can completely reversed if vehicles, equipment, rubble and any other construction materials are removed after construction.						

	degree of impact on irreplaceable resources:	Dust and equipment are not likely to impact on any irreplaceable visual resources.						
	With Mitigation	2	2	4	3	**18**	**Low**	-ve
V2	**Impact**	Visual impact during construction due to vegetation clearing						
	Without Mitigation	2	2	6	4	**32**	**Medium**	-ve
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if vegetation is rehabilitated.						
	degree of impact on irreplaceable resources:	Vegetation is classified as Least Threatened, and from a visual perspective can be re-established. The value of vegetation loss is considered in the ecological report.						
	With Mitigation	2	2	4	4	**24**	**Low**	-ve
Operational Phase								
Alternative 1								
V3	**Impact**	Visual impact of pipeline						
	Without Mitigation	2	4	2	3	**24**	**Low**	-ve
	degree to which impact can be reversed:	The visual impact can completely reversed after closure of facility, if pipeline removed.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.						
	With Mitigation	2	4	2	2	**16**	**Low**	-ve
Alternative 2 and 3								
V3	**Impact**	Visual impact of pipeline						
	Without Mitigation	2	4	4	3	30	Low	-ve
	degree to which impact can be reversed:	The visual impact can completely reversed after closure of facility, if pipeline removed.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.						
	With Mitigation	2	4	4	2	20	Low	-ve
De-commissioning Phase (Alternative 1, 2 and 3)								
V4	**Impact**	Visual impact during decommissioning due to dust, vehicles and equipment						
	Without Mitigation	2	2	4	4	**32**	**Medium**	-
	degree to which impact can be reversed:	The visual impact can completely reversed after closure of facility, if structures and buildings removed and vegetation rehabilitated.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.						

	With Mitigation	2	2	2	3	**18**	**Low**	-ve
No Go Alternative								
	Impact	No visual impacts are associated with the no-go alternative .						

MITIGATION MEASURES

The following mitigation and management measures have been recommended:

- Site clearing
  - The construction footprint must be kept as small as possible, to avoid unnecessary disruption to the existing vegetation.
  - No blanket clearing or removal of vegetation outside of the building zone is allowed.
- Excavation and construction of pipeline
  - Site perimeter (building zone) must be clearly demarcated.
  - The handling and transportation of materials which may generate dust must be avoided during high wind conditions.
  - Dust and litter control measures must be included in the EMPr
  - No dumping in unauthorised and/or highly visible areas is permitted.
- Rehabilitation
  - A detailed rehabilitation plan must be prepared.
  - An ecologist must be appointed to assist with the plant selection and methods for vegetative rehabilitation.
  - Mitigation measures applicable to the construction phase are also applicable to decommissioning.

10.9 SOCIAL ENVIRONMENT

The social impacts associated with the water pipeline are directly linked to the impacts associated with the Letsoai CSP 1 site. Therefore, refer to **Chapter 9.10** for the detailed impact assessment. There is no preferred pipeline alternative with regards to social impacts.

11 CUMULATIVE IMPACT ASSESSMENT

Although the S&EIR process is essential to assessing and managing the environmental and social impacts of individual projects, it often may be insufficient for identifying and managing incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

The IFC Good Practice Handbook: Cumulative Impact Assessment and Management defines cumulative impacts as follows:

"Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity (collectively referred to in this document as "developments") when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities."

With reference to Letsoai CSP 1, there are a number of EAs (either issued or in progress) within a 65km radius (minimum) of the proposed project site, over and above the other projects within the larger BioTherm Solar Energy Development. These EAs are illustrated in **Figure 11-1** and detailed in **Table 11-1**.

Due to the number of similar applications in the area, all the specialist assessments include a cumulative environmental impact assessment. The total extent of the potentially affected land is approximately 58 097 ha.

It must be noted that while there are several approved EA's for various wind and solar energy projects, surrounding the proposed development site, EA's for these projects do not equate actual 'development'. The surrounding projects, except for the Preferred Bidders, are still subject to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bidding process like the Letsoai CSP 1 project. Depending on the next bid window Letsoai CSP 1, due to its competitive nature may be selected as a Preferred Bidder. Similarly other proposed renewable energy projects have received their EA several years ago, but have yet to secure Preferred Bidder status.

The specialist recommendations, mitigation measures and conclusions from the various similar developments in the area have been taken into consideration in the assessment of cumulative impacts and have informed the mitigation measures drafted for this project (**Appendix U**).

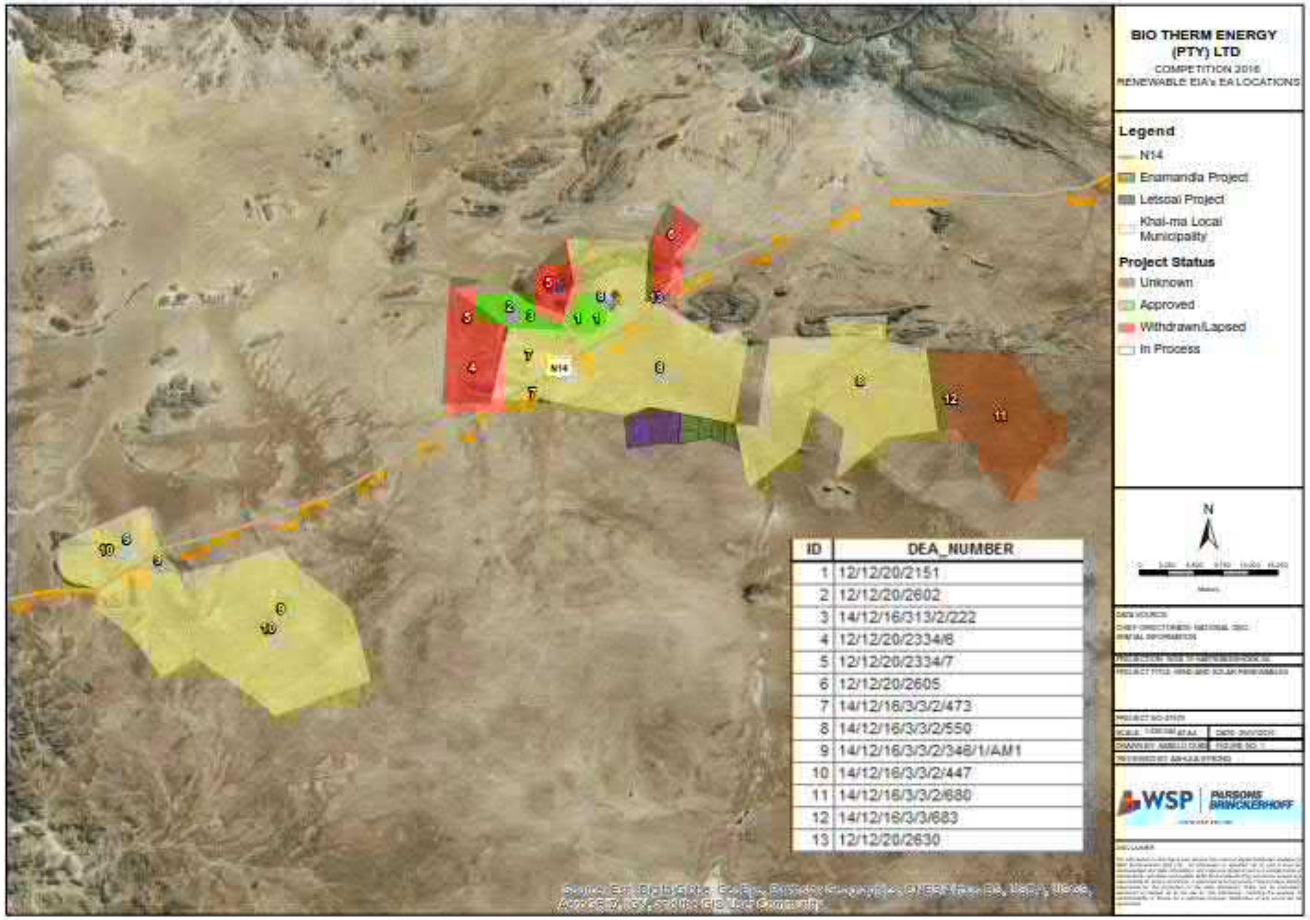

Figure 11-1: The Location of the Existing Environmental Authorisations within 65km of Letsoai CSP 1

Table 11-1: Existing Environmental Authorisations within 65km of Letsoai CSP 1

DEA Reference Number	EIA Process	Project Title	EAP	Technology	MegaWatt	Hectares	Project Status	EIA Studies Obtained (Y/N)
14/12/16/3/3/2/346/AM1 (Map ref: 9)	Amendment	Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the construction of the Wind and PV Substations and Gridline Connections, near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	Aurecon South Africa (Pty) Ltd	Onshore Wind and Solar PV	75	46 535	In Process	**Y**
14/12/16/3/3/2/447 (Map ref: 10)	S&EIR	Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the construction of the Wind and PV Substations and Gridline Connections, Near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	Aurecon South Africa (Pty) Ltd	Onshore Wind and Solar PV	1000	46 535	In Process	**Y**
12/12/20/2602 (Map ref: 2)	S&EIR	The Proposed Boesmanland Solar Farm Portion 6 (A Portion Of Portion 2), Farm 62 Zuurwater, Aggeneys, Northern Cape Province.	SRK Consulting (Pty) Ltd	Solar PV	75	200	Approved	**Y**
12/12/20/2334/6 (Map ref: 4)	S&EIR	Proposed Sato Energy Holdings Photovoltaic Project, Khâi Ma Local Municipality, Northern Cape.	SRK Consulting (Pty) Ltd	Solar PV	75	-	Withdrawn / Lapsed	**N/A**
14/12/16/3/3/2/473 (Map ref: 7)	S&EIR	75MW PV plant on the Farm Zuurwater No 62 in the	SRK Consulting (Pty) Ltd	Solar PV	75	222	In Process	**Y**

DEA Reference Number	EIA Process	Project Title	EAP	Technology	MegaWatt	Hectares	Project Status	EIA Studies Obtained (Y/N)
		Namakwa District, Northern Cape Province, Phase 4.						
14/12/16/3/3/2/222 (Map ref: 3)	S&EIR	Proposed Boesmanland Solar Farm Portion 6 (A portion of portion 2) Farm 62 Zuurwater, Aggeneys, Northern Cape.	SRK Consulting (Pty) Ltd	Solar PV	75	200	Approved	**N**
12/12/20/2334/7 (Map ref: 5)	S&EIR	Proposed Sato Energy Holdings Photovoltaic Project, Khâi Ma Local municipality, Northern Cape.	SRK Consulting (Pty) Ltd	Solar PV	75	-	Withdrawn / Lapsed	**N/A**
14/12/16/3/3/2/550 (Map ref: 8)	S&EIR	Proposed Wind Energy Facility and Associated Infrastructure on Namies Wind Farm Pty Ltd, near Aggeneys, Northern Cape Province.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	220	15	In Process	**Y**
12/12/20/2151 (Map ref: 1)	BAR	The Proposed Construction of a Photovoltaic Power Generation Facility within the Black Mountain Mining Area near Aggeneys in the Northern Cape Province.	SRK Consulting (Pty) Ltd	Solar PV	19	19.5	Approved	**N**
12/12/20/2605 (Map ref: 6)	BAR	Proposed Gamsberg Solar Energy Project on Portion 1 of Farm 57 Aroams near Upington, Khâi-Ma Municipality, Northern Cape.	Savannah Environmental Consultants (Pty) Ltd	Solar PV	Unknown	-	Withdrawn / Lapsed	**N/A**
14/12/16/3/3/2/683 (Map ref: 12)	S&EIR	Proposed 75MW Korana Wind Energy Facility, near Poffader in the Northern Cape.	Savannah Environmental	Onshore Wind	Unknown	3 257	Unknown	**Y**

DEA Reference Number	EIA Process	Project Title	EAP	Technology	MegaWatt	Hectares	Project Status	EIA Studies Obtained (Y/N)
			Consultants (Pty) Ltd					
14/12/16/3/3/2/680 (Map ref: 11)	S&EIR	Proposed 140MW Khâi-Mai Wind Energy Facility near Pofadder.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	Unknown	3 257	Unknown	Y
12/12/20/2630 (Map Ref: 13)	S&EIR	Construction of the 70MW Orlight SA Photovoltaic Solar Power Plant on portion 1 of the farm Aroams 57 RD near Aggeneys within the Khai-Ma Local Municipality, Northern Cape Province	Digby Wells Environmental	Solar PV	40	116.18	Approved	Y
14/12/16/3/3/2/965	S&EIR	Proposed Letsoai CSP Site 1	WSP Environmental (Pty) Ltd	Solar CSP	150	1298	In Process	Y
14/12/16/3/3/2/964	S&EIR	Proposed Letsoai CSP Site 2	WSP Environmental (Pty) Ltd	Solar CSP	150	1203	In Process	Y
14/12/16/3/3/2/968	S&EIR	Proposed Enamandla PV Site 1	WSP Environmental (Pty) Ltd	Solar PV	75	405	In Process	Y
14/12/16/3/3/2/969	S&EIR	Proposed Enamandla PV Site 2 (Alternative)	WSP Environmental (Pty) Ltd	Solar PV	75	309	In Process	Y
14/12/16/3/3/2/970	S&EIR	Proposed Enamandla PV Site 3 (Alternative)	WSP Environmental (Pty) Ltd	Solar PV	75	345	In Process	Y

DEA Reference Number	EIA Process	Project Title	EAP	Technology	MegaWatt	Hectares	Project Status	EIA Studies Obtained (Y/N)
14/12/16/3/3/2/971	S&EIR	Proposed Enamandla PV Site 4 (Alternative)	WSP Environmental (Pty) Ltd	Solar PV	75	337	In Process	**Y**
14/12/16/3/3/2/972	S&EIR	Proposed Enamandla PV Site 5 (Alternative)	WSP Environmental (Pty) Ltd	Solar PV	75	378	In Process	**Y**

11.1 SPECIALIST FINDINGS

SOILS AND LAND CAPABILITY

The renewable energy projects that have received Environmental Authorisation were investigated to determine any identified potential impacts on land capability. Overall the cumulative impact of the proposed Letsoai CSP Site 1 and pipelines is deemed to be of 'Low' significance.

There was no fatal flaw identified in the cumulative impacts for the proposed BioTherm sites and the five proposed renewable energy projects. The loss of grazing land is unavoidable. If all the BioTherm Letsoai and Enamandla projects as well as the neighbouring facilities are built that will result in a total area of 54 523.5 ha being affected by the loss of grazing land. This impact was initially assigned a high environmental significance, which can be reduced to medium with the implementation of mitigation measures (i.e. keep the affected area to a minimal during the construction, operational and decommissioning phases). Potential impacts of soil erosion and spillage of hazardous substances were both classified with a low environmental significance, before and after mitigation measures.

BIODIVERSITY

The potential for cumulative impacts from renewable energy development in the area is a potential concern in the area given the large number of different renewable energy developments in the area. Although there are currently few preferred bidders in the area, the projects are concentrated around the Aggeneys area and in the longer term a node of development is developing in this area. The total estimated direct footprint of the existing projects is estimated at around 800ha, with the proposed Letsoai and Enamandla projects adding approximately 2500ha to this. In context, this is within an area of approximately 5000 square kilometers giving an impact of 0.66% of this area, which is not a significant direct impact at the landscape scale. Although this tends to be concentrated on the open plains habitat, mostly within the Bushmanland Arid Grassland vegetation type, this does not significantly increase the potential for high cumulative impact on specific habitats. Bushmanland Arid Grassland is one of the most extensive vegetation types in South Africa and the loss of 3000ha of this vegetation type is not significant either locally or regionally and the as mentioned already, the more sensitive elements of the landscape are currently outside of the development footprint.

In addition, not all of the authorized projects will ever be built under the REIPPP and ultimately, it is highly likely that the total extent of habitat lost to renewable energy development will remain relatively low at the landscape level. The contribution of the current project, which can be estimated at approximately 774ha, to cumulative habitat loss in the area would be relatively high based on the extent of the development, but the significance of this would be relatively low. This is because although the Letsoai and Enamandla projects would potentially have a large footprint should they all be built, they are adjacent to one another within a concentrated area and as such their impact would be lower than if they were dispersed more widely. In addition, the potential for indirect impact from noise and other disturbance factors is relatively low compared to the wind farms in the area which despite having a relatively low footprint, may generate indirect impacts on fauna through noise and vibration.

The contribution of the Letsoai CSP 1 development to cumulative impacts will be relatively low at approximately 200ha of low sensitivity habitat. The development does however occur as part of a larger development consisting of 5 solar PV plants and 2 CSP plants, with a total footprint of more than 1000ha. As it is not possible to tell which of these will actually be built under the REIPPP, it is not possible to firmly predict the contribution of the CSP 1 plant to cumulative impact in the area. However, at a broad scale, the area is not heavily developed and even with the development of several of the other proposed developments in the area, the overall level of cumulative impact in the area is likely to remain low. The current site is also located on the open plains of the area, which is considered to be the least sensitive habitat of the area. Provided that the deep sands of the Koa River valley itself and the inselbergs with their plateaus and surroundings toeslopes remain relatively free of development, then the overall impact of development on biodiversity in the area will be relatively low.

The loss of unprotected vegetation types may impact the countries' future ability to meet its conservation targets. The area has been identified as a NPAES focus area and development within this area may compromise the value of the area for future conservation area expansion. However, the affected Bushmanland Arid Grassland vegetation type is extensive and the extent of habitat loss from the development (200ha) would not significantly impact the remaining extent of this vegetation type, either locally or regionally. In addition, the main habitats of conservation concern, the rocky hills and specialised edaphic habitats such as quartz or calcrete patches would not be affected by the development.

AVIFAUNA

Possible impacts by renewable energy projects on birds within this area are temporary displacement due to disturbance associated with the construction of the solar plant and associated infrastructure, collisions with the solar panels and solar panels, burning due to solar flux (only relevant to power tower CSP plants), permanent displacement due to habitat transformation, drowning in evaporation ponds, entrapment in perimeter fences and collisions with the associated power lines resulting in mortality. The total estimated area that could potentially be affected by renewable projects are approximately 50 366 ha, or 3.7% of the land surface within the 65km radius. The actual footprint is likely to be smaller, as this figure is based largely on land parcel size, and not the actual infrastructure footprint.

Apart from renewable energy developments, several other threats are currently facing avifauna within this area (Marnewick et al. 2015):

- There is a history of overstocking in this region, which has led to degradation of habitat. Many ranchers trying to make a living on properties that are economically unviable overexploited the vegetation. Trampling by cattle added to the reduction in vegetation cover and caused erosion and the shifting of dunes. Approximately 75% of optimal habitat for the Red Lark has been lost over the past century. The disappearance of the Red Lark from ranches where dune grassland has been replaced by ephemerals is probably linked to the reduction in grass awns for nesting, shelter and invertebrate and plant foods. In recent years, there has been a shift from cattle ranching to raising sheep and goats on many farms in the region. However, overstocking and overgrazing continue to pose a threat.
- There is a serious threat from climate change. It is predicted that temperatures will increase and rainfall decrease sharply in arid areas such as Bushmanland. Locally resident endemic larks are at risk. Vegetation change will have marked effects on species such as the restricted-range, habitat-specific Red Lark. Increased CO2 can lead to the increase of shrubs at the expense of grasses, causing a shift in vegetation diversity and structure and making habitat unsuitable for some species. It is expected that the Red Lark will not meet the challenge of global warming.
- Droughts are expected to become more severe because of climate change, and birds will have to cope with greater food variability, unsuitable habitats, different predators, parasites and diseases, and competition. Nomadic species, such as Stark's Lark, may find it easier to cope, only having to decide where to go. But resident species, like Sclater's Lark and Red Lark, are more likely to remain in their patch and use available resources as best they can. Large, mainly resident species that depend on rainfall are also at risk. They would include territorial eagles, such as Verreauxs' Eagle and Martial Eagle. Certain behavioural traits of these birds, such as extended parental care and slow reproductive rates, are likely to increase their vulnerability to climate change.
- Other significant threats are the development of new mines, the expansion of irrigation along the Orange River, the extensive invasion of mesquite (Prosopis sp.) along the Orange River

banks and drainage lines, and new power lines and transmission lines from substations to renewable energy facilities.

The CSP 1 site is approximately 1 300 ha in extent, which is approximately 0.09% of the total land surface within a 65km radius around the proposed development. The greatest potential concern is for the Red Lark, due to its highly restricted range. This area also contains the whole of the Koa River Valley. Dean et al. 1991 estimated the total suitable habitat dune habitat for Red Larks at about 140 000 ha, centred around the Koa Valley. This figure is probably too conservative for the following reasons:

- Dean makes the following statement in the Red Lark SABAP 1 species account (Harrison et al. 1997)" …. atlas records, particularly in the eastern parts of its range, suggest it may be more common and widespread than previously thought"
- Red Larks are regularly recorded in what would be considered sub-optimal habitat e.g. at wind farm sites 80km south of the Koa Valley near Loeriesfontein. The implication of this is that the species is in all likelihood more common outside of typical dune habitat than was previously thought. It seems therefore that Bushmanland Basin Shrubland, of which a total of more than 3 million hectares is contained within the distribution range of the Red Lark, could potentially contain much larger numbers of the species than has been assumed up to now, especially in areas with an abundance of "white grasses".

Red Larks were not encountered in high densities at the site during the pre-construction monitoring, indicating that the habitat may not be optimal for the species. It is speculated that the almost total lack of any shrubs at the development area might be an inhibiting factor, as the species likes to perch on a shrub when calling (pers. obs). The relatively small size of the footprint, coupled with the low densities of priority species, particularly Red Lark, leads to the conclusion that the cumulative impact of the CSP 1 facility on priority avifauna should, with appropriate mitigation, in all likelihood be low.

SURFACE WATER

The renewable energy projects that have received Environmental Authorisation were investigated to determine any identified potential impacts on freshwater habitats. Overall the impact of the proposed Letsoai CSP Site 1 and pipelines is deemed to be of 'Low' significance.

The proposed Letsoai CSP Site 1 pipeline alternatives as well as the neighbouring renewable energy developments potentially intersect freshwater habitat systems however the CSP's Site are not located within watercourses. Each of these pipeline crossings should not have a regional impact on water resources therefore limiting the cumulative impact on the greater landscape. There was no fatal flaw identified for the cumulative impacts for the proposed Letsoai CSP Site 1. The assessment of these potentially affected ecological features within the four neighbouring renewable energy developments is beyond the scope of this study, and will require an individual assessment for the respective projects in their own scoping and EIA studies. It is assumed that the impacts during the construction, operational and de-commissioning phases are expected to be the same as those summarised above for the Letsoai CSP Site 1.

HERITAGE

In general, archaeological material which is scattered across the landscape is of low significance and no mitigation has been proposed to mitigate potential impacts. There are occasional archaeological sites, usually around stone basins ("klipbakke") in which water accumulate, which are of high significance. These sites are highly visible and need to be avoided. Only one such site was found during our survey, and it is outside the study area.

In general, the farms in this area are large, and there are very few sites which have buildings older than 60 years. Cumulative impacts to the built environment are equally low. The only exception which has been recorded in this general area, is the abandoned village of Namies to the east.

The cumulative impacts to graves are very low. Very few graves have been recorded in this general area.

The only impact which may be anticipated is that of the cumulative impacts on the cultural landscape. The only landscape feature which is of cultural significance in this area is the Gamsberg. Morris (2010) has reviewed the literature of a possible Bushmen massacre in a kloof on the Gamsberg and he has noted that "recently appreciation has emerged regarding the genocide against the Bushmen in this area, with certain mountains, like the Gamsberg, being likely massacre sites". It must be emphasized that no further information is available with respect to possible declaration of the Gamsberg. Clearly, the increase in renewable energy facilities around the Gamsberg will result in a cumulative visual impact on the Cultural Landscape.

VISUAL

Cumulative effects, relate to alterations to the perception of character arising from the visibility of the proposed development in conjunction with other solar and wind farms within the study area. Such cumulative effects would be expected to arise during the latter stages of the construction phase and throughout the operational phase.

The assessment considers two types of cumulative visual effect, namely effects arising from combined and sequential views. These comprise:

- Combined views which "occur where the observer is able to see two or more developments from one viewpoint. Combined visibility may either be in combination (where several facilities are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various facilities)"
- Sequential views which "occur when the observer has to move to another viewpoint to see different developments" (Vissering, 2011).

It is not possible to accurately estimate the significance of the cumulative impacts as not all facilities granted environmental approval will be constructed. Without knowing which combination of the 16 applications (10 listed above and 6 other potential BioTherm projects) will be built, there are 65 535 possible scenarios. However, what should be taken into consideration by the decision making authorities regarding cumulative visual impact is noted below:

- The total area affected by all 10 projects considered above is 50364.5ha. If all the BioTherm Letsoai and Enamandla projects are approved that will result in a total area of 54 639.5 ha.
- A high concentration of solar and wind energy developments will have a greater impact on the visual landscape and will alter the visual character to a greater degree.
- If constructed, Namies Wind, Zuurwater PV, Boesmanland PV, Orlight PV and Springbok Solar and Wind facilities are likely to be sequentially visible from the N14. The BioTherm Letsoai and Enamandla projects may contribute to this impact, but are unlikely to be highly visible from the N14, particularly if Namies is constructed, as they lie inland from the N1, behind the Namies Wind facility site.
- If constructed, Namies Wind, Korona Wind and Poortjies Wind facilities together with the BioTherm facilities are likely to be sequentially visible from the Loop 10 Road. Again the BioTherm projects are sited the further away from the road than the other sites and are likely to be obscured from view by the other wind farms (assuming they are all constructed).
- Projects within a 15km radius of Letsoai CSP Site 1 may have a combined visual impact from some viewpoints, these include Letsoai CSP Site 2, the 5 Enamandla Projects and a number of the Namies Wind Facility sites.

- The impact of Letsoai CSP Site 1 on the landscape is rated as medium impact in this VIA and it is reasonable to assume that the cumulative impact of any combination of the above projects will therefore have a higher impact on the landscape, particularly those projects highly visible from the N14. Note that the BioTherm sites are the further away from both the N14 and Loop 10 Road and are least likely to contribute to the cumulative impact from these roads.
- There are not many mitigation measures that can significantly reduce the cumulative visual impacts, but screening along the N14 is possible and the consistent implementation of mitigation measures across all projects can help to reduce visual impact to some extent. Additionally koppies and mountains in the area breaks up views and will partially obscure developments from some viewpoints along the N14.
- In considering the bigger picture, having energy projects concentrated in identified areas or zones can be preferable, but opinion regarding this differs and some literature indicates that from a visual perspective greater distance between projects is less visually intrusive.
- If the planning and environmental authorities have decided and approved the REDZ as a guiding tool/strategy, it follows that there will be higher cumulative visual impact within these zones. The other alternative is to ensure developments are specified distances away from any other development, which would result in lower cumulative visual impact but smaller visual impacts scattered across a greater area. Guidelines specific to this are not yet available and given the high number of approved applications that are never constructed, this could put potential renewable energy providers at a significant and unnecessary disadvantage. Guidelines and timeframes will therefore need to be carefully co.

TRAFFIC

The maximum traffic generation of each site occurs at an unknown future time period that cannot be determined from the information available. It is unlikely that these impacts will occur at the same time, therefore no cumulative traffic impact is foreseen. It should be noted that the significance of the traffic impact of each of these facilities is expected to be similar to the Letsoai and Enamandla facilities, namely Low or Medium.

SOCIAL

The implementation of numerous renewable energy project in the local municipal area will result in significant increased employment and local economic development opportunities which are considered highly significant in the context of high unemployment and the need to generate local economic growth. The projects proposed for the area have the potential to change local employment patterns and provide more versatility in respect of skills and service offerings. A number of negative impacts may occur as a result of the combined implementation of energy projects including increased pressure on local services as a result of the influx of labour and job seekers into the area. The rural character of the landscape will change as a result of the visual impacts associated with collective projects. Currently there are no significant constraints on water resources, however the collective implementation of numerous renewable projects as well as other sector requirements for water may place pressure on available water resources.

The mitigation of cumulative impacts needs to be addressed on a cumulative scale i.e. one project cannot seek to address the cumulative issues associated with a series of projects. The relevant authorities, and particularly Khâi-Ma Local Municipality, therefore need to be involved in the identification of suitable mitigation measures in respect of renewable energy development at a strategic level in the area. There is an existing development forum which meets monthly and includes representation from all the renewable energy companies in the Khâi-Ma Local Municipality, community trusts, and the municipality (pers comm, A Green, 2016). It is recommended that this forum is used to address potential cumulative impacts. In respect of water provision, the Department of Water and Sanitation is responsible for the equitable allocation of water across all development sector.

INCREASED LOCAL ECONOMIC DEVELOPMENT OPPORTUNITIES

Currently BMM is the principle employer within the local municipality, pinning mining as the key local economic driver. One PV facility (Scuit-Klip) has been constructed 72 km northeast of the site, and a few of the nearby proposed facilities have been awarded preferred bidder status include two BioTherm developments. There are no other significant economic activities within the local area, with agricultural, tourism and social services sectors currently providing the main source of (limited) employment in the local economy.

The construction and operation of a number of solar and wind projects within the area between Springbok and Pofadder will contribute collectively towards a significant increase in local employment and business development opportunities within the local municipality. The proposed development of numerous renewable projects in the municipal area provides the impetus for the development of Small, Medium, and Micro-Sized Enterprises (SMME) which has the potential to drive economic growth and provide employment.

The provision of services by existing local communities, and the development of new opportunities through the presence of new residents (temporary and permanent) during construction and operational phases could present numerous economic development opportunities through services such as accommodation, transport provision, catering, and cleaning services.

Through the evaluation of specialist studies undertaken in support of application for EA for other renewable energy projects, the positive impacts associated with job creation and economic development are clearly identified.

INCREASED PRESSURE ON LOCAL SERVICE PROVISION

The development of numerous renewable energy projects within the Khâi-Ma Local Municipality is likely to put significant pressure on the local municipalities and communities. The proposed project is one of eight proposed solar facilities within the local area, and could potentially contribute towards this pressure.

The most significant challenge which faces the local municipality relates to the accommodation of large numbers of people related to the development of multiple projects. This poses both housing and services related implications for the municipality (*pers comm* A Green, 2016). There may be opportunities for these developments to assist the local municipalities by supplying services and infrastructure to local communities in addition to the proposed projects. These opportunities need to be identified and discussed between the development proponents and the Khâi-Ma Local Municipality.

CHANGE IN SENSE OF PLACE

The nature of the landscape will change significant as a result of the development of numerous renewable energy projects. The Visual Impact Assessment has considered the cumulative impacts as part of the scope of this study. A change in sense of place can impact on other aspects such as tourism.

Tourism is not a significant contributor to the Khâi-Ma Local Municipality, and as such it is unlikely that the development of multiple renewable projects will have negative economic impacts in respect of the tourism sector (*pers comm* A Green, 2016).

CHANGE TO EMPLOYMENT PATTERNS

With the development of a number of solar facilities within the local area, there is potential for the broad change in nature of businesses and employment patterns within the local area. The potential economic investment, business development in the area, and an overall awareness of different types of employment opportunities could result in people changing employment sectors.

Currently local employment is predominantly in mining and agriculture-based sectors. There is a potential for this to shift towards construction and services sector employment as new opportunities could be perceived as more favourable to existing opportunities. In addition, the proposed renewable project will provide the incentive for entrepreneurship and development of SMME's to support and service the renewable energy sector. Creation of employment opportunities and a change in employment patterns provides the foundation for skills development and in the long term will provide a level of resilience within the work force in the local area.

ACCESS TO WATER RESOURCES

There are numerous proposed renewable energy projects, as well as a new mining operation within the local area (Gamsberg Mine). Currently there is no storage of water in respect of supply to residents and activities in the area (*pers comm* A Green, 2016). Should all of the proposed renewable energy project be authorised and constructed, there may be pressure on water supply from the Orange River.

There are a number of agricultural development projects that are being considered and implemented for Pella, Onseepkans and Witbank. It is important that there is sufficient water to support all of these projects, and to sustain the existing agricultural activities established along, and highly dependent on, the Orange River (*pers comm* A Green, 2016). The cumulative impact on water resources has the potential to impact on the local socio-economic environment if this resource is not managed equitably and responsibly. Alternative water supply options, such as groundwater, may need to be considered. Abstraction of ground and surface water is licensed by the Department of Water and Sanitation, who is ultimately responsible for its allocation.

11.2 CUMULATIVE ASSESSMENT

The results of the cumulative impact assessment are included in **Table 11-2**.

Table 11-2: Assessment of cumulative impacts associated with the BioTherm Solar Energy Development together with proposed surrounding developments

REF.		EXTENT	DURATION	MAGNITUDE	PROBABILITY	SIGNIFICANCE		STATUS
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)		(+ve or -ve)
Soils and Land Capability								
SLC–C1	**Impact**	Cumulative loss of land previously used for sheep, cattle and antelope grazing will be occupied by the solar power facility and associated infrastructure						
	Without Mitigation	2	4	8	5	**70**	**High**	-ve
	degree to which impact can be reversed:	Medium						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	1	4	6	5	**55**	**Medium**	-ve
Biodiversity								
B-C1	**Impact**	Cumulative habitat loss and impacts on broad-scale ecological processes and loss of landscape connectivity						
	Without Mitigation	2	5	6	4	**52**	**Medium**	-ve
	degree to which impact can be reversed:	Medium						

	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	4	4	2	**20**	**Low**	-ve
B-C2	**Impact**	Reduced ability to meet conservation targets						
	Without Mitigation	2	4	4	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	4	4	2	**20**	**Low**	-ve
Avifauna								
AVI-C3	**Impact**	Cumulative impacts on priority avifauna: disturbance, habitat transformation, solar flux, collisions, drowning, entrapment in fences						
	Without Mitigation	2	4	4	3	**30**	**Low**	-ve
	degree to which impact can be reversed:	Low. The impact of habitat transformation cannot be effectively mitigated						
	degree of impact on irreplaceable resources:	Low. The total available habitat taken up by renewable energy projects are still relatively small						
	With Mitigation	2	4	4	2	**20**	**Low**	-ve
Surface Water								
SW-C4	**Impact**	Cumulative impact of water resources and wetlands						
	Without Mitigation	2	5	6	4	**52**	**Medium**	-ve
	degree to which impact can be reversed:	High						
	degree of impact on irreplaceable resources:	Low						
	With Mitigation	2	1	2	2	**10**	**Low**	-ve
Heritage								
H-C5	**Impact**	Cumulative impacts to scatters of stone artefacts						
	Without Mitigation	2	5	2	3	**27**	**Low**	-ve
	degree to which impact can be reversed:	Destruction of archaeological material cannot be reversed.						
	degree of impact on irreplaceable resources:	The archaeological material is of low significance, the impacts will be low.						
	With Mitigation	1	5	2	3	**24**	**Low**	-ve
H-C6	**Impact**	Potential impacts to human remains/graves						

	Without Mitigation	2	5	8	2	**30**	**Low**	-ve
	degree to which impact can be reversed:	Destruction to human remains cannot be reversed.						
	degree of impact on irreplaceable resources:	Human remains are considered a very sensitive heritage resource and impacts should be avoided.						
	With Mitigation	2	5	4	2	**22**	**Low**	-ve
Visual								
V-C7	**Impact**	Cumulative visual impact of renewable energy facilities						
	Without Mitigation	2	4	8	5	**70**	**High**	-ve
	degree to which impact can be reversed:	The visual impact can completely reversed after closure of facility, if tower removed.						
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if landforms remain unaffected as proposed.						
	With Mitigation	2	4	8	5	**70**	**High**	-ve
Traffic								
T-C8	**Impact**	Cumulative traffic impact						
	Without Mitigation	2	2	2	4	**24**	**Low**	-ve
	degree to which impact can be reversed:	Temporary impact, no long term effect						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	2	2	2	4	**24**	**Low**	-ve
Social								
SE-C1	**Impact**	Increased local economic development opportunities						
	Without Mitigation	3	4	8	5	**75**	**High**	+ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	3	4	8	5	**75**	**High**	+ve
SE-C2	**Impact**	Increase pressure on local service provision						
	Without Mitigation	3	4	6	4	**52**	**Medium**	-ve
	degree to which impact can be reversed:	N/A						

	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	3	4	6	4	**52**	**Medium**	-ve
SE-C3	**Impact**	Change in sense of place						
	Without Mitigation	3	4	4	3	**33**	**Medium**	-ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	3	4	4	3	**33**	**Medium**	-ve
SE-C4	**Impact**	Change in employment patterns						
	Without Mitigation	3	4	2	3	**27**	**Low**	+ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	3	4	2	3	**27**	**Low**	+ve
SE-C5	**Impact**	Access of water resources						
	Without Mitigation	3	4	6	4	**52**	**Medium**	-ve
	degree to which impact can be reversed:	N/A						
	degree of impact on irreplaceable resources:	N/A						
	With Mitigation	3	4	6	4	**52**	**Medium**	-ve

11.3 CUMULATIVE SUMMARY

Table 11-3 provides a summary of the overall impact significance per aspect per project within a 65 km radius of the BioTherm Solar Development.

Table 11-4 provides a summary of the overall impact significance per aspect for the BioTherm Solar Development.

In order to graphically illustrate this information, the impact ratings were allocated the following numerical values:

- Low = 1
- Medium = 2
- High = 3
- No information available = 0

Figure 11-2 and **Figure 11-3** provide graphical illustrations of the overall cumulative impact per aspect with and without the BioTherm Development respectively.

Table 11-3: Summary of the Overall Impact Significance per Aspect per Project (excluding the BioTherm Development)

DEA REFERENCE	IMPACTS							
	Avifauna	Biodiversity	Heritage	Land Capability	Surface Water	Social	Visual	Traffic
14/12/16/3/3/2/346/AM1	1 (-)	1 (-)	1 (-)	1 (-)	1 (-)	2 (+)	2 (-)	2 (-)
14/12/16/3/3/2/447	1 (-)	1 (-)	1 (-)	1 (-)	1 (-)	2 (+)	2 (-)	2 (-)
12/12/20/2602	2 (-)	2 (-)	1 (-)	1 (-)	1 (-)	0	0	0
14/12/16/3/3/2/473	1 (-)	2 (-)	1 (-)	2 (-)	1 (-)	3 (+)	2 (-)	1 (-)
14/12/16/3/3/2/550	1 (-)	1 (-)	1 (-)	1 (-)	1 (-)	3 (+)	3 (-)	2 (-)
14/12/16/3/3/2/683	1 (-)	2 (-)	1 (-)	2 (-)	1 (-)	3 (+)	2 (-)	1 (-)
14/12/16/3/3/2/680	1 (-)	2 (-)	1 (-)	2 (-)	1 (-)	3 (+)	2 (-)	1 (-)
12/12/20/2630	1 (-)	2 (-)	1 (-)	1 (-)	1 (-)	3 (+)	2 (-)	1 (-)

Table 11-4: Summary of the Overall Impact Significance per Aspect per Project (including the BioTherm Developments)

DEA REFERENCE	IMPACTS							
	Avifauna	Biodiversity	Heritage	Land Capability	Surface Water	Social	Visual	Traffic
14/12/16/3/3/2/346/AM1	1 (-)	1 (-)	1 (-)	1 (-)	1 (-)	2 (+)	2 (-)	2 (-)
14/12/16/3/3/2/447	1 (-)	1 (-)	1 (-)	1 (-)	1 (-)	2 (+)	2 (-)	2 (-)
12/12/20/2602	2 (-)	2 (-)	1 (-)	1 (-)	1 (-)	0	0	0
14/12/16/3/3/2/473	1 (-)	2 (-)	1 (-)	2 (-)	1 (-)	3 (+)	2 (-)	1 (-)
14/12/16/3/3/2/550	1 (-)	1 (-)	1 (-)	1 (-)	1 (-)	3 (+)	3 (-)	2 (-)
14/12/16/3/3/2/683	1 (-)	2 (-)	1 (-)	2 (-)	1 (-)	3 (+)	2 (-)	1 (-)
14/12/16/3/3/2/680	1 (-)	2 (-)	1 (-)	2 (-)	1 (-)	3 (+)	2 (-)	1 (-)
12/12/20/2630	1 (-)	2 (-)	1 (-)	1 (-)	1 (-)	3 (+)	2 (-)	1 (-)
14/12/16/3/3/2/965	1 (-)	1 (-)	1 (-)	2 (-)	2 (-)	3 (+)	3 (-)	1 (-)
14/12/16/3/3/2/964	1 (-)	1 (-)	1 (-)	2 (-)	2 (-)	3 (+)	3 (-)	1 (-)
14/12/16/3/3/2/968	1 (-)	1 (-)	1 (-)	2 (-)	1 (-)	3 (+)	3 (-)	1 (-)
14/12/16/3/3/2/969	1 (-)	1 (-)	1 (-)	2 (-)	1 (-)	3 (+)	3 (-)	1 (-)
14/12/16/3/3/2/970	1 (-)	1 (-)	1 (-)	2 (-)	1 (-)	3 (+)	3 (-)	1 (-)
14/12/16/3/3/2/971	1 (-)	1 (-)	1 (-)	2 (-)	1 (-)	3 (+)	3 (-)	1 (-)
14/12/16/3/3/2/972	1 (-)	1 (-)	1 (-)	2 (-)	1 (-)	3 (+)	3 (-)	1 (-)

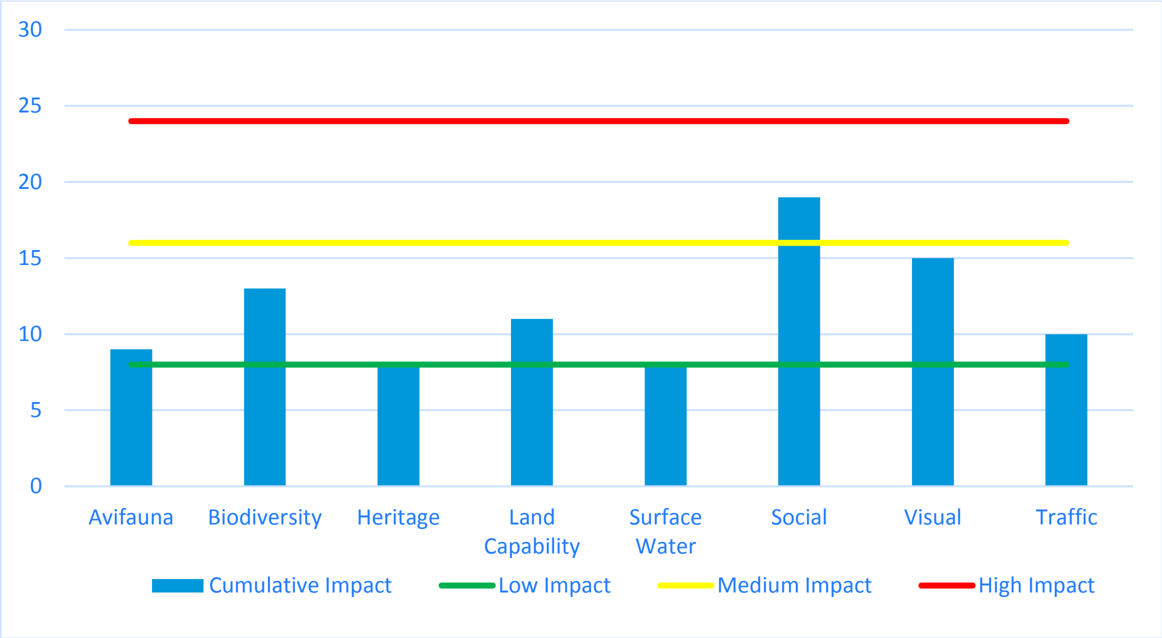

Figure 11-2: Graphical Illustration of the Overall Cumulative Impact per Aspect (excluding the BioTherm Development)

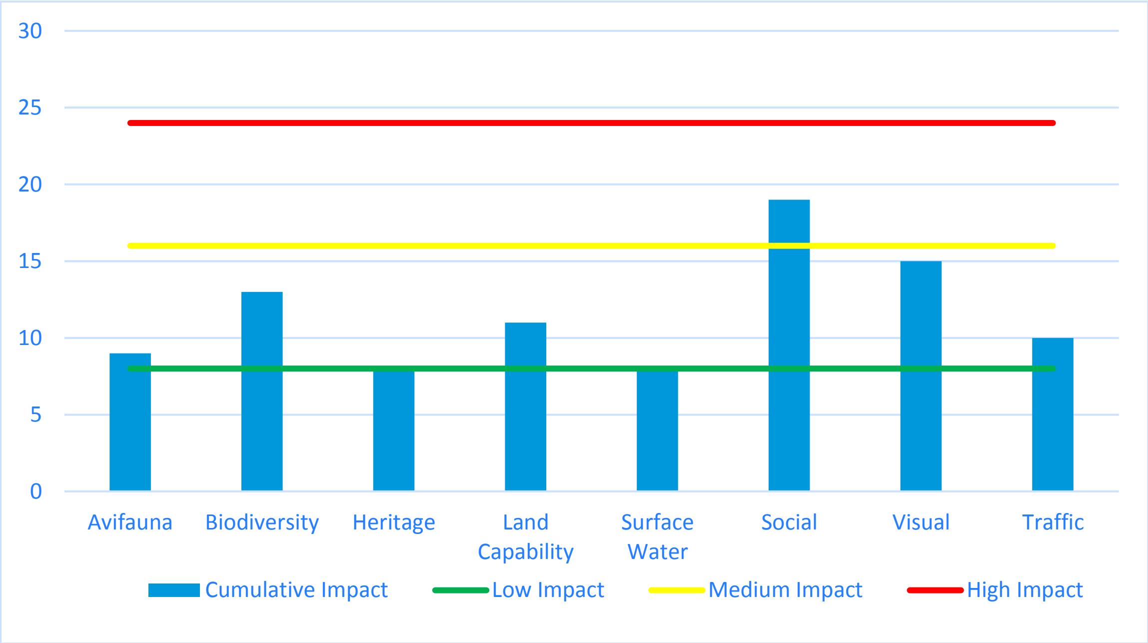

Figure 11-3: Graphical Illustration of the Overall Cumulative Impact per Aspect (including the BioTherm Developments)

Considering the findings of the specialist assessments together with the consolidated information presented in the graphs above, the cumulative impacts for the proposed Letsoai CSP 1 project will be acceptable. The cumulative impact can be rated as medium to low for all aspects except social, which can be rated as a medium to high positive impact. It can be concluded that the development of the Letsoai CSP 1 project and the other renewable energy projects in the region are acceptable and will not result in an unacceptable loss or risk or an increase in impacts.

It is important to note that in terms of water supply requirements, the only other CSP project within 65km of the Letsoai CSP 1 site, is the Letsoai CSP 2 project. Sedibeng Water has provided a letter with regards to their ability to supply water to the greater solar development within their existing water allocation (taking the pending infrastructure upgrade into acount). Therefore, the need to abstract additional water from the Orange River is considered to be low. The cumulative impact on water supply in the regional is, therefore, considered to be low.

With regards to the cumulative impact of Letsoai CSP 1 with other CSP facilities in the surrounding area, it is noted that there are no CSP facilities within a 65 km radius of Letsoai CSP 1 other than Letsoai CSP 2. The closest CSP (parabolic trough) facility to the Letsoai CSP sites is approximately 85km away, while the closed CSP (central tower) facility is approximately 200km away.

12 ENVIRONMENTAL IMPACT STATEMENT

The essence of any S&EIR process is aimed at ensuring informed decision-making, environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that "development must be socially, environmentally and economically sustainable…. and requires the consideration of all relevant factors…". NEMA also imposes a duty of care, which places a positive obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA's preventative principle, potentially negative impacts on the environment and on people's environmental rights (in terms of the Constitution of the Republic of South Africa, Act No. 108 of 1996) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of "reasonable measures".

In assessing the environmental feasibility of Letsoai CSP 1, the requirements of all relevant legislation have been considered. The identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience and the relevant legislation (where applicable).

The conclusions of this EIA are the result of comprehensive assessments. These assessments were based on issues identified through the S&EIR process and the parallel process of public participation. The public consultation process has been undertaken according to the requirements of NEMA and every effort has been made to include representatives of all stakeholders within the process.

12.1 PROJECT SUMMARY

BioTherm has proposed a solar energy development on Farm Hartebeest Vlei 86 (SG Code: C05300000000008600000), located approximately 13km southeast of Aggeneys located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality, in the Northern Cape Province of South Africa. The solar energy development will consist of two 150MW Concentrating Solar Power (CSP) projects referred to as Letsoai CSP 1 and 2; and five 75MW Solar Photovoltaic (PV) projects referred to as Enamandla PV 1 – 5. **This EIA report is specifically applicable to the Letsoai CSP 1 project. Table 12-1** provides a summary of the Letsoai CSP 1 project.

Table 12-1: Letsoai CSP Project Summary

PROJECT COMPONENT	DETAILS / DIMENSIONS / DESCRIPTION
Location of the Site	Farm Hartebeest Vlei 86**,** approximately 13km southeast of Aggeneys located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality
Facility Area	1 298ha
Area of preferred Solar Field	Typically 930Ha
SG Codes	C05300000000008600000
Site Access	The existing "Namies Lus 10" access at km 110.2 of the N14/1
Technology	CSP – Central Tower

PROJECT COMPONENT	DETAILS / DIMENSIONS / DESCRIPTION
Generation Capacity	150MW
Tower	200 – 250 m high power tower with a central receiver located on the top of a concrete tower.
Power Generation Facility	→ Steam turbine and generator → Auxiliary fossil fuel boilers → Air cooler condenser → Hot and cold molten salt storage tanks
Number of Heliostats	The number of heliostats is still to be confirmed. However, the number of heliostats is anticipated to be between 10 000 and 15 000. The Heliostats will be two-axis mirrors.
Area occupied by each Heliostats	Typically between 12 to 15m^2 per heliostat
Dimensions of Heliostats	Typically, the heliostat is 15m high with a 12 x 12m mirror assembly. It must be noted that this is dependent on the manufacturer
Collector / Receiver Height	Typically between 200-250m
Foundation Specifications and Dimensions	Concrete.
Footprint of Operations and Maintenance building(s)	Approximately 225m^2
Area of Preferred Construction Laydown Area	To be confirmed based on the facility concept layout
Temporary and Permanent Laydown Area Dimensions	→ Temporary laydown of 5Ha → Permanent laydown for the containers will be required for the storage of spares, which is to be located close to the Operations and Maintenance building
Cement Batching Plant	Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The actual mixing of the concrete will take place in the concrete truck. The footprint of the plant will be in the order of 0.25ha. The maximum height of the cement silo will be 20m. This will be a temporary structure during construction.
Width of Internal Roads	Approximately 5m
Length of Internal Roads	To be confirmed based on the facility concept layout
Type and Height of Fencing	Galvanized steel type at approximately 2m high
Water Supply and Treatment	→ Water supply pipeline → Water treatment plant → Raw water storage reservoir / tanks → Evaporation ponds
Sewage	Septic tanks (with portable toilets during the construction phase)

PROJECT COMPONENT	DETAILS / DIMENSIONS / DESCRIPTION
Power Evacuation	
Specifications of Onsite Switching Stations, Transformers, Onsite Cables etc	There will be an onsite substation connected to the facility power island which is comprised of the steam turbine generator transformer. The power-island will be linked to the onsite substation using suitable underground cables (except where a technical assessment suggest that overhead lines are applicable).
Footprint of Onsite Substation	Substation will occupy a footprint area of approximately 2.25ha
On-site Substation Capacity	Up to 132 kV
Capacity of powerlines between Onsite Substation and Common Substation	132kV
Width of the Powerline Servitude (132kV) between Onsite Substation and Common Substation	31-36 m
Powerline Tower Types and Height (between Onsite Substation and Common Substation)	Tower (suspension / strain) / Steel monopole structure, which may be self-support or guyed suspension.
List of Additional Infrastructure to be Built	→ Access roads and internal roads. → Administration, staff accommodation, control, workshops, water treatment plant and warehouse buildings

12.2 ENVIRONMENTAL SENSITIVITIES

The specialist studies undertaken during both the scoping and EIA phases of the project identified a number of sensitive areas within the broader solar development area. These areas were confirmed through site visits and further detailed investigations. A sensitivity map for the broader solar development area was developed and was utilised to inform the layout and design of the Letsoai CSP 1 project. **Figure 12-1** illustrates the layout of Letsoai CSP 1 relative to the environmental sensitivity map developed. It can be confirmed that no layout changes are required as the entire site falls within medium and medium-low sensitivity areas. The following sensitive areas were identified:

- **Ecological Sensitivities:** The sensitivity of the Letsoai CSP 1 site is indicated below in **Figure 12-2** and shows that the development area is within an area that is considered medium to medium-low sensitivity. The areas of deeper soils are considered somewhat more sensitive than the surrounding areas of shallow soils due to the greater risk of wind erosion in these areas as well as their likely greater significance for fauna. The internal grid connection options are also within areas considered to be Medium-Low sensitivity, except for the option in the west (substation 1) which is within an area considered to be Medium sensitivity. There are no highly sensitive features or significant species of conservation concern within the CSP 1 development footprint. Since CSP development requires the near-total clearing of the development footprint, options for avoidance are minimal and all vegetation within the development area will likely be lost. Although this is a potentially significant impact in terms of direct habitat loss, the diversity of the affected area is low and the affected habitats are widely available in the area. As such, the significance of this impact is moderated by the low sensitivity of affected area and would be of local significance only. In terms of the preferred on-site substation option, all three are considered acceptable and the preferred option should be the alternative which results in the least overall footprint and extent of power line based on the whole project and not just based on CSP 1. As such, this is likely to be either substation option 1 or substation option 3 and from an ecological perspective, these two options can be considered equivalent. In terms of the water supply pipeline options (**Figure 12-3**), Option 1 traverses the least sensitive areas and is clearly the preferred option. Option 2 is somewhat more sensitive overall as it traverses the Koa River valley, where the loose dune sands are vulnerable to erosion. The route is however adjacent to the access road through this area which would reduce the impact to some extent. As such this is considered an acceptable but less preferred option. Option 3 goes all the way to the Orange River and traverses several areas with significant populations of species of conservation concern. In addition, mitigating impacts through the final section of the route along the gorge to the Orange River would be problematic. This option would generate a significantly higher impact than the other two options and is not considered a favourable option.

- **Heritage Sensitivities**: A number of rocky outcrops were identified within the development area. Rocky outcrops are considered sensitive due to the fact that archaeological sites are often located near rocky outcrops or low exposures of bedrock, particularly those which collect rainwater. In addition, Rock paintings and/or engravings can be found in rocky outcrops.
- **Visual Sensitivities**: Topographic features including prominent ridgelines and the Gamsberg inselberg were identified as potentially sensitive areas. Although largely uninhabited settlements such as Nombies, Struis-en-bult, Brabees, and Blomhoek were identified together with towns such as Aggeneys and Poffadder. Buffers were also included along the Lus 10 road and the N14.

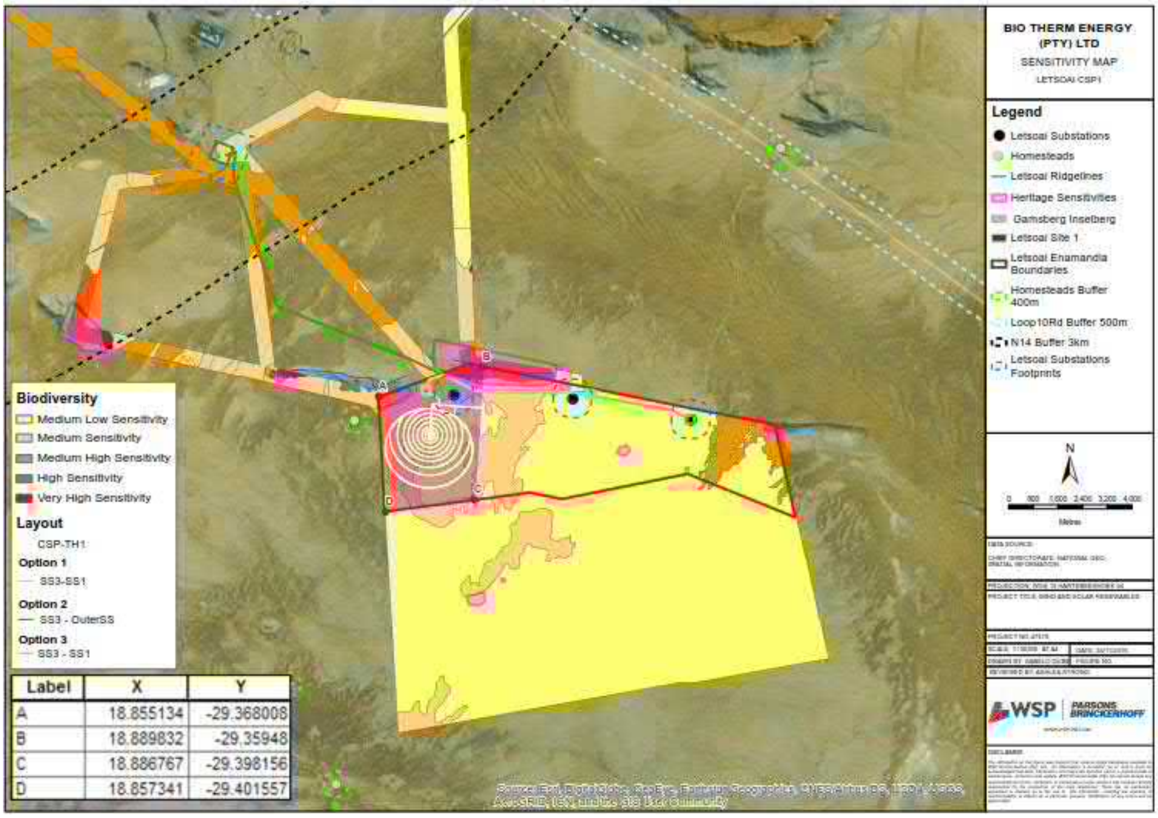

Figure 12-1: The layout of Letsoai CSP 1 relative to the environmental sensitivity map

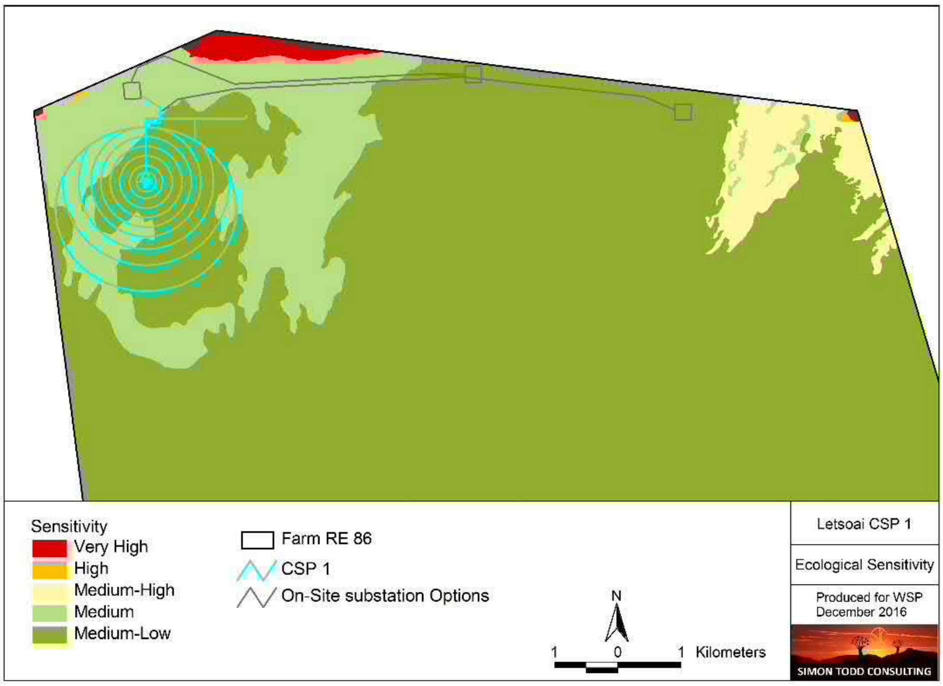

Figure 12-2: Biodiversity Sensitivity Map for Letsoai CSP 1

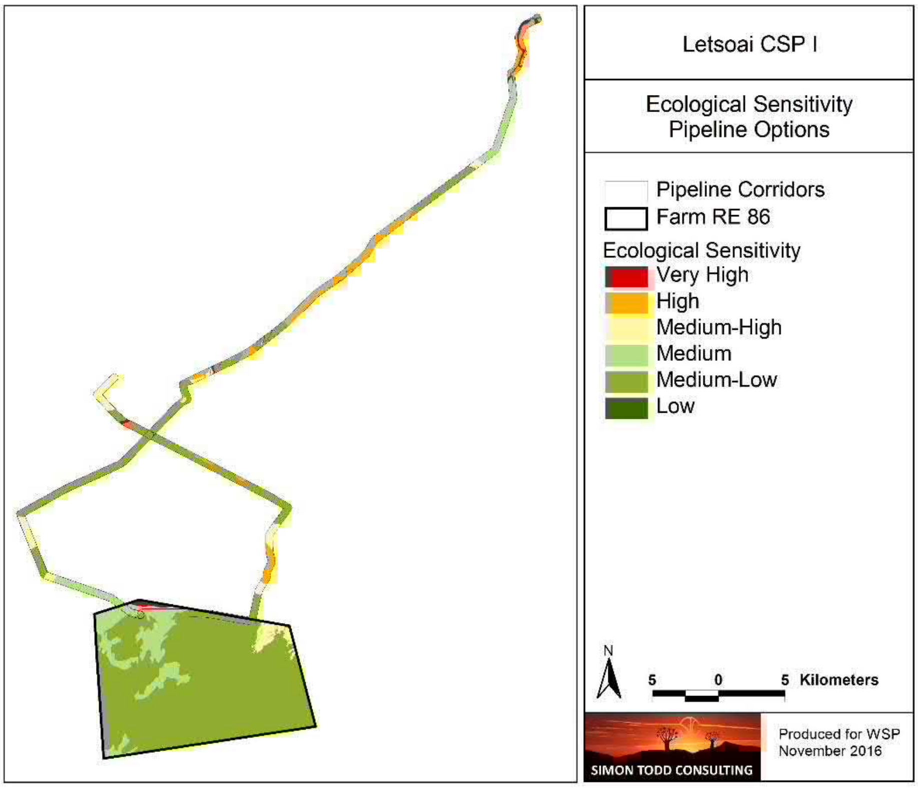

Figure 12-3: Biodiversity Sensitivity Map for the Water Supply Pipeline

12.3 SPECIALIST CONCLUSIONS

SOILS AND LAND CAPABILITY

The land capability of the proposed Letsoai CSP site 1 is defined as non-arable with a low potential for grazing. Grazing activities (mainly sheep) are the dominant land use for the region and has the largest potential to be impacted by the activities of the proposed Letsoai CSP Site 1 project. Indirect impacts of increased soil erosion are expected at the site given the dry, fragile environment of the region. Furthermore, spillage of hazardous substances onto the land as a result of the activities of the Letsoai CSP Site 1 project, is a possibility. However, all these potential impacts on the current land capability for the area were classified with a low environmental significance risk, should the appropriate mitigation measure be followed during the construction, operational and decommissioning phases of the project.

BIODIVERSITY

The Letsaoi CSP 1 footprint is located on the open plains of the study site, which are considered to be medium to medium-low sensitivity. Although there are certainly some sensitive features and areas in the wider area, the effected sandy plains habitat exhibits relatively low diversity and a low abundance of fauna or flora of conservation concern. Although there are no features of high sensitivity within the site, the areas of deeper soils are considered somewhat more sensitive than the surrounding areas of shallow soils due to the greater risk of wind erosion in these areas as well as their likely greater significance for fauna.

The major impact associated with the development of the CSP plant would be the near-total loss of habitat within the 700ha plus development footprint. Consequently, options for avoidance are minimal and all vegetation within the development area will likely be lost. Although this is a potentially significant impact in terms of direct habitat loss, the diversity of the affected area is low and the affected habitats are widely available in the area. As such, the significance of this impact is moderated by the low sensitivity of affected area and would be of local significance only and considered to be of Medium significance after mitigation.

In terms of the three pipeline options, Option is clearly the preferred option and there are no highly sensitive features along the route and impacts are likely to be low and of a local nature only. Option 2 is similar to Option 1, but takes a different route to the N14 that includes the Koa River valley, which is considered sensitive and vulnerable to disturbance due to the dunes in this area. Option 3 is not a preferred option and would generate significantly higher impact than the other two options due to the longer route and the confirmed presence of significant populations of species of conservation along the route, that are highly likely to be impacted by the development.

The potential for cumulative impacts from renewable energy development is a concern associated with the development given the large number of proposed renewable energy projects in the wider area. There are however few preferred bidders and even in the long-term, the total extent of habitat that might be lost to renewable energy development will remain relatively low at the landscape level. Even if all current projects are built it is estimated that this would amount to 0.66% of the landscape and this is concentrated within the Bushmanland Arid Grassland vegetation type which is very widespread. Although the footprint of the Letsoai CSP 1 footprint is relatively high, the other proposed developments which form part of the greater Letsoai and Enamandla project are concentrated within a relatively small area and their overall impact would be less than a more dispersed configuration. As such the overall cumulative impact of development in the area is still considered relatively low and a significant impact on biodiversity is not likely as the more sensitive elements of the landscape are currently outside of the development footprint of the PV and wind farms.

Due to the arid nature of the area, it is important that the mobility of fauna in the area is not compromised, as many arid-adapted fauna respond to the unpredictability of these systems by moving extensively across the landscape. These impacts can be reduced by maintaining the connectivity of the landscape and reducing the extent of electrified fencing or similar impenetrable obstacles. As such, if several of the CSP and PV plants of the Enamandla/Letsoai site are developed, then provision should be made to maintain some undeveloped corridors between some of the facilities to maintain the connectivity of the landscape and facilitate movement through this area.

Overall and with the suggested mitigation measures implemented, then the impact of the Letsoai CSP 1 development would be of low magnitude and of local significance only. As such, the development is considered acceptable from a terrestrial ecological perspective

AVIFAUNA

The proposed CSP 1 power tower facilities will have several impacts on avifauna at a site level which will, unless mitigated, range from High to Medium.

The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as High. This impact can be partially reversed through mitigation, but it will remain at a Medium level, even after mitigation. The impact of mortality due to collisions with the internal 132kV powerlines is rated as High but can be mitigated to a Medium level. The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level despite after mitigation. The remaining envisaged impacts, i.e. mortalities in the operational phase due to collisions with the heliostats and burning as a result of solar flux, drowning in evaporation ponds and entrapment in perimeter fences are all rated as Medium and should be mitigatable to a Low level with appropriate mitigation.

The relatively small size of the footprint, coupled with the low densities of priority species at the site, particularly Red Lark, leads to the conclusion that the cumulative impact of the facility on priority avifauna should in all likelihood be low, taking into account the current impacts on avifauna within a 65km radius around the development area.

From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented.

The proposed pipelines will have a displacement impact due to disturbance during the construction phase on avifauna in the immediate vicinity. This impact will be Medium but reduced to Low with appropriate mitigation in the case of Alternative 3, and Low in the case of Alternatives 1 and 2, which will be further reduced through mitigation.

All three alternatives are acceptable from a bird impact assessment perspective, but due to its length and partial location along an existing high voltage line which may contain breeding raptors, Alternative 3 is the least preferred option.

The small footprint of the pipeline and the fact that the habitat will recover completely once the pipeline is operational leads to the conclusion that the cumulative impacts of the pipeline will be Low. From an avifaunal impact perspective, the proposed development could go ahead, provided the proposed mitigation measures are strictly implemented development could go ahead, provided the proposed mitigation measures are strictly implemented.

SURFACE WATER

There were no freshwater habitat systems identified within the proposed Letsoai CSP Site 1. There is however, the concern for the Kao River and the potential wetlands that may lie within 500m of the site and pipeline options 2 and 3, however this need to be investigated further and confirmed onsite by an aquatic specialist. Consequently, there are no fatal flaws anticipated for the proposed Letsoai CSP Site 1 project, from a land capability and freshwater habitat perspective. It is recommended that the mitigation and management measures outlined in this report be followed throughout all phases of the project.

A portion of the pipeline Option 3 would follow the same servitude as an existing pipeline while Option 1 and 2 would be new infrastructure within the landscape. However, Option 3 is significantly longer than the other two. As stated above, all three cross the Kao River drainage region and the area as whole is considered homogenous. Therefore, all options have a potential to negatively impact the surrounding environment and no one option is significantly preferred over the other. This report provides an initial high-level identification and description of the land capability and freshwater habitat systems within the site boundary. This is due to the extent of the site, accessibility constraints and lack of information relating to the positioning of operational and road infrastructure.

Should BioTherm be recognised as a Preferred Bidder, the required application for a Water Use Licence (WUL) in terms of Section 21 of the National Water Act (NWA) (Act 36 of 1998) may commence. This application (WULA) will require detailed functional assessments (i.e. PES, EIS and EcoServices) of freshwater habitats potentially affected. Therefore, it is recommended that a more in-depth and thorough study be conducted by a land capability and aquatic specialist should BioTherm be recognised as a Preferred Bidder.

It is also recommended that an aquatic specialist must conduct an in-depth site walkover prior to the construction phase commencing, after the proposed construction footprint has been confirm and demarcated. This is to assess the footprint for any freshwater habitats, allowing for slight alterations in the footprint, to prevent any impacts on the freshwater habitats due to the actions conducted during the construction phase.

HERITAGE

There are no significant heritage resources in the study area which will be impacted by the Letsoai CSP 1 project. This conclusion is supported by numerous other assessments which have been conducted for renewable energy projects on adjoining properties. In addition, there are no significant heritage resources in the study area which will be impacted by the proposed water pipeline. Pipeline alternative 2 is the preferred option, from a heritage perspective, because the potential of impacts to heritage are likely to be the lowest.

The following heritage conditions must be included in the EMPr:

→ If any high concentrations of archaeological material, such as stone artefacts are recovered, SAHRA must be notified;

→ If any human remains are uncovered during the excavations for the CSP plant, work must stop in that area and SAHRA must be alerted immediately.

VISUAL

The following findings and recommendations are pertinent:

→ The proposed facility is situated in a remote, arid landscape of relatively high visual value. The visual absorption capacity is moderate, with screening primarily due to the mountains to the north and east and particularly the Steneberg.

→ The area is remote and viewer numbers are low but inhabitants generally have a great affinity for the land and landscape.

→ The geometric patterns and reflection from the heliostats and the other installations are of a scale and size that is not highly congruent with the natural environment and agricultural activities, but generally congruent with mining and existing power facilities in the area.

- The CSP tower is very tall and will be highly visible in the relatively flat landscape. The impact of this is difficult to mitigate. However, the viewshed is limited to the north and east by mountains and viewer numbers are very low.
- Other buildings and infrastructure associated with the facility will result in a number of lesser visual impacts, which can be mitigated.
- Visual impacts resulting from the pipeline and the clearing of land for the pipeline are likely only to be visible from elevated positions and in very close proximity to the route. Route Alternative 1 is preferred from a visual perspective as it is much shorter, with some infrastructure already existing.
- The greatest visual concern is the cumulative impact on the landscape. If REDZ and ECI are established, containing the visual impacts within these zones has merit, but will increase the cumulative visual impact on the landscape within these zones.
- If the 16 potential projects within a 70 km radius of the site are considered, there are 65 535 possible scenarios or combinations of renewable energy projects that may be built. It is therefore not possible to accurately estimate the significance of the cumulative impact; however, it is reasonable to assume the visual impact on the landscape will be greater than the project considered in isolation. Notwithstanding this, given the location of the possible facilities, if constructed, the BioTherm sites are the least likely to contribute to sequential visual impacts from the N14 and the Loop 10 Road, as they are situated further away behind other proposed development sites.
- The visual impacts, including that of the tower, can be completely reversed after decommissioning, if all the structures are removed and the land suitably rehabilitated. No landscape forms or features will be permanently affected. It is critical that decommissioning and rehabilitation are well controlled and enforced after the life of the facility.
- Although the no-go option is preferred from a visual perspective, the visual impacts can be mitigated to an acceptable degree.

TRAFFIC

Based on the Transport Study, the following key conclusions and recommendations are relevant:

- The proposed Letsoai Solar CSP and Enamandla Solar PV Facilities will be located near Aggeneys in the Northern Cape Province.
- The facilities will be located over the Remaining Extent of the Farm Hartebeestvlei 86, located in the Khai-Ma Municipality, Division of Namaqualand, in the Northern Cape Province. The extent of the facilities will be approximately 13,214 ha.
- Letsoai will be 2 x 150MW CSP Facilities, and Enamandla will be 5 x 75MW PV Facilities.
- The Scope of the TIA was informed by the Committee of Transport Officials' South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012.
- A single short term (2 year) implementation was assumed for analysis purposes.
- There are no known planned road upgrades in the study area.
- There are no known large scale latent developments in the vicinity of the site that may have an impact on the local road network.
- There are 2 site access alternatives off the N14, and the N14 is a single carriageway 2-way surfaced road (1 lane per direction) with narrow surfaced shoulders at both access alternatives:
  - Alternative 1 is a new route via the Lus 10 gravel road with an existing intersection with the N14.
  - Alternative 2 is a new road with a new direct access off the N14. The exact site access location for Alternative 2 has not been determined.

- SANRAL has confirmed that access Alternative 1 will be permissible
- A separate access application will be required by SANRAL for the Alternative 2 access.
- Construction and operational phase parking will be accommodated on-site.
- There is no need for public transport services or non-motorised transport infrastructure to serve the site for the construction and operational phase.
- The likely trip generation of the construction phase of each of the facilities are estimated as follows (AM weekday peak):
  - Letsoai 1 & 2 (each): 68 veh/hr (In), 18 veh/hr (Out), 86 veh/hr (Total)
  - Enamandla 1 – 5 (each): 62 veh/hr (In), 12 veh/hr (Out), 74 veh/hr (Total)
  - Total combined: 446 veh/hr (In), 96 veh/hr (Out), 542 veh/hr (Total)
- The total number of peak hour vehicle trips are moderate, and would normally require capacity analysis of the adjacent intersections. However, it is highly unlikely that the maximum vehicle trips will be generated seeing as the expected combined trip generation for all 7 facilities listed above is the absolute maximum with all facilities constructed during the same 2-year period and peak construction activities on each site taking place during the same period. It is unlikely that the peak construction activities of all 7 facilities and associated highest vehicle trips will occur at the same time.
- The vehicle volumes on the N14 are low, and the Lus 10 access is an approved low volume access intersection. The upgrade of the intersection is therefore not regarded as a requirement for the estimated traffic generation of the facilities, and the temporary duration of this increased volume during the construction phase only.
- A capacity analysis of the access intersection of the Lus 10 Road with the N14 was not undertaken, and is not deemed necessary for a development with such low daily and peak hour traffic generation. However, the safety of the intersection may be compromised due to the increase in especially heavy vehicle volumes along the routes. The current traffic volumes along the N14 and the expected low construction traffic volumes does not justify the construction of additional turning lanes. However, the following recommendations are made to improve the safety of the intersection:
- Provide additional warning signs as follows:
  - Side road junction warning sign (W108) on the southern approach of the N14, located approximately 100 m from the intersection.
  - Provide a temporary truck crossing warning sign (TW345) on the same road sign pole as the W108 sign.
  - Side road junction warning sign (W107) on the northern approach of the N14, located approximately 100 m from the intersection.
  - Provide a temporary truck crossing warning sign (TW344) on the same road sign pole as the W110 sign.
- The estimated total E80 loading for the duration of the construction period is 0.014 million, and no mitigating measures are deemed necessary on the Lus 10 Road or the N14. However, the expected traffic increase on the Lus 10 gravel road during the construction phase may result in deterioration of the road, as it is not designed for abnormal and heavy traffic volumes. The cost of maintaining and repairing this road during the Construction phase of any number of the 7 facilities should be borne by the developer.
- It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant transport impact on the Lus 10 gravel road will be lower than during the Construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.

- The transport route/s of the construction materials, components and any oversized/weight components may be National, Provincial or Local roads; and approval will have to be obtained from each authority for the transportation of any oversized or abnormally heavy components. Upgrades to the vertical or horizontal alignment of the local gravel access roads may be required depending on the length and width of any abnormal vehicles. These alignment upgrades cannot be determined at this stage as the specific abnormal loads, if any, are unknown.
- It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry of the components become known. This plan should will cover all aspects such as horizontal and vertical requirements, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.
- The overall significance of each traffic related impact during the Construction Phase of the facilities are Low or Medium. The impacts are limited to the peak construction period only, local in nature, and minor and will not result in an impact on processes or low and will cause a slight impact on processes. Mitigating measures are therefore not recommended for the expected trip generation of the facilities.
- Cumulative impact assessment: The maximum traffic generation of the latent sites may occur at an unknown future time period that cannot be determined from the information available. The implementation programme of these sites has also not been determined. It is unlikely that these impacts will occur at the same time, therefore no cumulative transport impact is foreseen. It should be noted that the Significance of the transport impact of each of these facilities is expected to be similar to the Letsoai and Enamandla facilities, namely Low or Medium. Note that the maintenance and repair of the Lus 10 gravel road due to damage by construction vehicles is stated as the responsibility of each of the developers of the latent energy facilities that will take access via the route.

It is concluded that the proposed Letsoai Solar CSP and Enamandla Solar PV Facilities will have a negligible short-term transport impact on the adjacent road network, and it is recommended that the TIA should be accepted as part of the EIA application.

SOCIAL

The social impact assessment has identified a number of key socio-economic impacts (both positive and negative) associated with the proposed Letsoai CSP Site 1 facility. The findings of the study indicate that the development will create employment and business opportunities at a local, regional and national level during the construction and operational phase, and to a lesser extent the decommissioning phase, of the project. The project will result in a change in the rural sense of place and character.

During the construction phase the influx of job seekers and the increase in communicable disease are likely to pose various challenges for the Khâi-Ma Local Municipality. These two impacts are considered the most significant negative impacts (both negative, medium significance) on the socio-economic landscape for the operational lifespan (minimum 20 years), which cannot be readily mitigated. A number of negative impacts such as nuisance factors (dust, noise and traffic), potential risks to neighbouring farmers (including veld fires) were identified to be of low negative significance after the implementation of mitigation and management measures. The potential for cumulative impacts also exist due to the number of other renewable energy projects proposed for within the Khâi-Ma Local Municipality.

None of the impacts identified are considered fatal flaws that should prevent the project from going ahead. There are significant employment and economic benefits that can be derived from the projects, as such it is recommended that the Letsoai CSP Site 1 is authorised. The mitigation and management measures are to be included in the EMPr prepared in support of the EA application.

WATER AVAILABILITY

In terms of water consumption during the operational phase, approximately 550m^3 of raw water per day will be required. Infrastructure already exists for water supply to the mines and communities in the area. In addition, planned infrastructure expansions and upgrades will result in a capacity increase from 12 000 m^3/day to 24 000m^3/day. Sedibeng Water has approved water supply for the proposed projects. This letter is attached in **Appendix J**.

AIR QUALITY

The main findings from the semi-quantitative assessment of the proposed CSP Central Power Project 1 are as follow:

- Construction operations: The screening assessment indicates that the area most likely to be impacted on by construction activities are at maximum 100 m from the proposed CSP 1 site, but with 24-hour PM10 ground level concentrations below the AQ limit of 75 µg/m³ and 61% lower with the application of the proposed mitigation measures. For the access road (both Alternative 1 and 2) the impacts are the highest between 50 m and 100 m but PM10 concentrations are well below the NAAQ limit of 75 µg/m³. With mitigation in the form of water sprays, the impacts are likely to reduce by 77%. Dust fallout rates could not be determined but the potential exists for exceedances of the residential dustfall limit (600 mg/m2/day) near the Construction site (up to 100 m away) and close to the road (within 50 m). With mitigation in place, primarily comprising of water sprays, these impacts would be limited.
- Operational Phase operations: Emissions to air associated with the operational phase would only result from maintenance vehicles. These are regarded as insignificant.
- Decommissioning phase: The decommissioning phase will mainly include materials handling activities, wind erosion and to a lesser extent vehicle and equipment movement on-site and on the access road.

From an air quality perspective the construction of the proposed Letsoai CSP Central Tower Project 1 is likely to have low impacts on the receiving environment and human health provided mitigation measures are in place. Alternative 2 is the preferred access road since it is shorter and would result in lower particulate emissions.

NOISE

In the quantification of noise emissions and screening simulations of noise levels because of the proposed CSP plant at site 1, it was calculated that ambient noise evaluation criteria for human receptors will only be exceeded within approximately 625 m from areas of activity during the construction phase and 1 km during the operational phase. To the author's knowledge there are no permanent human receptors within 1 km of the site and impacts are therefore unlike. The site does however fall within an area of very low noise levels and efforts should be made minimise the impact on the acoustic environment.

12.4 IMPACT SUMMARY

A summary of the identified impacts and corresponding (initial and residual) significance ratings for Letsoai CSP 1 and the water supply pipeline are provided in **Table 12-2** and **Table 12-3** respectively.

Table 12-2: Impact Significance Summary – Letsoai CSP 1

REF.	RECEIVING ENVIRONMENT	IMPACT DESCRIPTION	PHASE	STATUS	SIGNIFICANCE (PRE-MITIGATION)	RESIDUAL SIGNIFICANCE (POST-MITIGATION)
SLC1	Soils and Land Capability	Loss of grazing land current utilised for grazing mostly sheep farming, cattle farming and indigenous antelope.	Construction	Negative	**Medium**	**Medium**
SLC2		Increased potential of soil erosion, especially wind driven, due to vegetation clearance, soil disturbance and a high traffic movement on site		Negative	**Medium**	**Low**
SLC3		Potential land contamination from hazardous substances. This includes spillage of concrete onto soil surface, as well as oils, fuel, grease (from construction vehicles) and sewage from temporary on-site ablution facilities.		Negative	**Low**	**Low**
SLC4		Loss of grazing land current utilised for mostly sheep farming, cattle farming and indigenous antelope.	Operation	Negative	**High**	**Medium**
SLC5		Increased potential of soil erosion due to vegetation clearance (wind driven), and more run-off from harden surfaces (i.e. roads and array of heliostats).		Negative	**Low**	**Low**
SLC6		Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from site operational and maintenance vehicles) and permanent onsite sewage systems.		Negative	**Low**	**Low**
SLC7		Increased potential of soil erosion due to removal of solar power infrastructure (i.e. heliostats) and pipelines, soil disturbance and a high traffic movement on site.	De-commissioning	Negative	**Low**	**Low**
SLC8		Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.		Negative	**Low**	**Low**

REF.	RECEIVING ENVIRONMENT	IMPACT DESCRIPTION	PHASE	STATUS	SIGNIFICANCE (PRE-MITIGATION)	RESIDUAL SIGNIFICANCE (POST-MITIGATION)
BIO1	Natural Vegetation and Animal Life	Impacts on vegetation and protected plant species	Construction	Negative	**Medium**	**Medium**
BIO2		Faunal impacts due to construction activities		Negative	**Medium**	**Low**
BIO3		Increased Soil Erosion risk during construction		Negative	**Medium**	**Low**
BIO4		Faunal impacts due to operational activities and human presence during maintenance activities	Operation	Negative	**Medium**	**Low**
BIO5		Alien plant invasion		Negative	**Medium**	**Low**
BIO6		Erosion		Negative	**Medium**	**Low**
BIO7		Faunal impacts due to decommissioning and operation of heavy machinery on-site	De-Commissioning	Negative	**Low**	**Low**
BIO8		Erosion		Negative	**Medium**	**Low**
BIO9		Alien plant invasion		Negative	**Medium**	**Low**
AV1	Avifauna	The construction of the CSP plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site due to disturbance. It is highly likely that most priority species will vacate the area for the duration of these activities	Construction	Negative	**Medium**	**Medium**
AV2		Displacement due to habitat transformation associated with the CSP plant and associated infrastructure	Operation	Negative	**High**	**Medium**
AV3		Collisions with the heliostats		Negative	**Medium**	**Low**
AV4		Burning due to solar flux		Negative	**Medium**	**Low**
AV5		Drowning in evaporation ponds		Negative	**Medium**	**Low**

Ref.	Receiving Environment	Impact Description	Phase	Status	Significance (Pre-Mitigation)	Residual Significance (Post-Mitigation)
AV6		Entrapment in perimeter fences		Negative	**Medium**	**Low**
AV7		Collision with internal powerlines		Negative	**High**	**Medium**
AV8		The de-commissioning of the CSP plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site due to disturbance. It is highly likely that most priority species will vacate the area.	De-commissioning	Negative	**Medium**	**Medium**
SW1	Surface Water	Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Construction	Negative	**Medium**	**Low**
SW2		Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Operation	Negative	**Medium**	**Low**
SW3		Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	De-commissioning	Negative	**Medium**	**Low**
H1	Heritage	Potential impacts to scatters of stone artefacts	Construction	Negative	**Low**	**Low**
H2		Potential impacts to human remains/graves		Negative	**Low**	**Low**
V1	Visual	Visual impact during construction due to dust, vehicles and equipment	Construction	Negative	**Medium**	**Low**
V2		Visual impact during construction due to vegetation clearing		Negative	**Medium**	**Low**
V3		Intrusion on sense of place and rural landscape	Operation	Negative	**Medium**	**Medium**
V4		Visual impact of receiver tower		Negative	**High**	**High**
V5		Visual impact of solar collectors, substation and other buildings and infrastructure		Negative	**Medium**	**Medium**

REF.	RECEIVING ENVIRONMENT	IMPACT DESCRIPTION	PHASE	STATUS	SIGNIFICANCE (PRE-MITIGATION)	RESIDUAL SIGNIFICANCE (POST-MITIGATION)
V6		Visual impact of reflection and shimmer from facility		Negative	**Medium**	**Medium**
V7		Visual impact of 132kV powerlines		Negative	Low	Low
V8		Visual impact of lighting from facility		Negative	Low	Low
V9		Visual impact of additional roads and road widening		Negative	Low	Low
V10		The de-commissioning of the CSP plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of avifauna from the site due to disturbance. It is highly likely that most priority species will vacate the area. Visual impact during decommissioning due to dust, vehicles and equipment	De-commissioning	Negative	**Medium**	Low
T1	Traffic	Noise, dust & exhaust pollution due to vehicle trips on-site	Construction	Negative	Low	Low
T2		Noise and exhaust pollution due to additional vehicle trips on Lus 10 Road		Negative	**Medium**	**Medium**
T3		Noise and exhaust pollution due to additional vehicle trips on N14		Negative	Low	Low
SE1	Social	Increase in employment opportunities	Construction	Positive	**Medium**	**High**
SE2		Increased economic development opportunities		Positive	**Medium**	**Medium**
SE3		Disruption due to influx of job seekers		Negative	**Medium**	**Medium**
SE4		Increase in communicable diseases and reduced public health		Negative	**Medium**	**Medium**
SE5		Change in sense of place		Negative	**Medium**	Low
SE6		Nuisance from noise, dust and traffic disturbances		Negative	**Medium**	Low

Ref.	Receiving Environment	Impact Description	Phase	Status	Significance (Pre-Mitigation)	Residual Significance (Post-Mitigation)
SE7		Increased risk to neighbouring land users		Negative	Low	Low
SE8		Increased risk of veld fires		Negative	Medium	Low
SE9		Increased employment opportunities	Operation	Positive	Medium	Medium
SE10		Increased economic development opportunities		Positive	Medium	Medium
SE11		Change in sense of place		Negative	Medium	Medium
SE12		Access to water resources		Negative	Low	Low
SE13		Loss of permanent employment	De-commissioning	Negative	Medium	Low
SE14		Gain of short term employment		Positive	Low	Medium
SE15		Nuisance from dust, noise and traffic		Negative	Low	Low
SE16		Increased risk to neighbouring land users		Negative	Low	Low
SE17		Increased risk of veld fires		Negative	Medium	Low
AQ1	Air Quality	Increased Air Emissions	Construction	Negative	Low	Low
AQ2		Increased Air Emissions	Operation	Negative	Low	Low
AQ3		Increased Air Emissions	De-commissioning	Negative	Low	Low
N1	Noise	Disturbance as a result in increased environemntal noise levels, human receptors	Construction	Negative	Low	Low
N2		Disturbance as a result in increased environemntal noise levels, human receptors	Operation	Negative	Low	Low

REF.	RECEIVING ENVIRONMENT	IMPACT DESCRIPTION	PHASE	STATUS	SIGNIFICANCE (PRE-MITIGATION)	RESIDUAL SIGNIFICANCE (POST-MITIGATION)
N3		Disturbance as a result in increased environemntal noise levels, human receptors		Negative	**Low**	**Low**

Table 12-3: Impact Significance Summary – Water Supply Pipeline

REF.	RECEIVING ENVIRONMENT	IMPACT DESCRIPTION	PHASE	STATUS	SIGNIFICANCE					
					Alternative 1		Alternative 2		Alternative 3	
					Pre-Mit	Post-Mit	Pre-Mit	Post-Mit	Pre-Mit	Post-Mit
SLC1	Soil and Land Capability	Loss of grazing land current utilised for grazing mostly sheep farming, cattle farming and indigenous antelope.	Construction	Negative	Low	Low	Low	Low	Low	Low
SLC2		Increased potential of soil erosion, especially wind driven, due to vegetation clearance, soil disturbance and a high traffic movement on site		Negative	Low	Low	Low	Low	Low	Low
SLC3		Potential land contamination from hazardous substances. This includes spillage of concrete onto soil surface, as well as oils, fuel, grease (from construction vehicles) and sewage from temporary on-site ablution facilities		Negative	Low	Low	Low	Low	Low	Low
SLC4		Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland	Operation	Negative	Low	Low	Low	Low	Low	Low
SLC5		Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from site operational and maintenance vehicles) and permanent onsite sewage systems.		Negative	Low	Low	Low	Low	Low	Low
SLC6		Increased potential of soil erosion due to removal of the pipeline, soil disturbance and a high traffic movement on site.	De-commissioning	Negative	Low	Low	Low	Low	Low	Low

Ref.	Receiving Environment	Impact Description	Phase	Status	Significance					
					Alternative 1		Alternative 2		Alternative 3	
					Pre-Mit	Post-Mit	Pre-Mit	Post-Mit	Pre-Mit	Post-Mit
SLC7		Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.		Negative	Low	Low	Low	Low	Low	Low
BIO1	Natural Vegetation and Animal Life	Impacts on vegetation and protected plant species	Construction	Negative	Medium	Low	Medium	Low	High	Medium
BIO2		Faunal impacts due to construction activities		Negative	Low	Low	Medium	Low	Medium	Medium
BIO3		Increased Soil Erosion risk during construction		Negative	Low	Low	Medium	Low	Medium	Low
BIO4		Faunal impacts due to operational activities and human presence during maintenance activities	Operation	Negative	Low	Low	Medium	Low	Medium	Low
BIO5		Alien plant invasion		Negative	Medium	Low	Medium	Low	Medium	Medium
BIO6		Erosion		Negative	Medium	Low	Medium	Low	Medium	Medium
BIO7		Faunal impacts due to decommissioning and operation of heavy machinery on-site	De-commissioning	Negative	Low	Low	Low	Low	Medium	Low
BIO8		Erosion		Negative	Medium	Low	Medium	Low	Medium	Medium
BIO9		Alien plant invasion		Negative	Medium	Low	Medium	Low	Medium	Medium
AV1	Avifauna	Displacement due to disturbance associated with the construction of the pipeline	Construction	Negative	Low	Low	Low	Low	Medium	Low

Ref.	Receiving Environment	Impact Description	Phase	Status	Significance					
					Alternative 1		Alternative 2		Alternative 3	
					Pre-Mit	Post-Mit	Pre-Mit	Post-Mit	Pre-Mit	Post-Mit
SW1	Surface Water	Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Construction	Negative	**Medium**	**Low**	**Medium**	**Low**	**Medium**	**Low**
SW2		Temporary degradation of wetland/riparian habitat due to the proposed traversing pipelines		Negative	**Medium**	**Low**	**Medium**	**Low**	**Medium**	**Low**
SW3		Alterations of flow regimes of watercourses, in close proximity to the site, or where the pipeline traverses the watercourse.	Operation	Negative	**Medium**	**Low**	**Medium**	**Low**	**Medium**	**Low**
SW4		Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland		Negative	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**
SW5		Temporary and permanent degradation of wetland habitat due to the removal of the traversing pipelines	De-commissioning	Negative	**Medium**	**Low**	**Medium**	**Low**	**Medium**	**Low**
H1	Heritage	Potential impacts to scatters of stone artefacts	Construction	Negative	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**
H2		Potential impacts to human remains/graves		Negative	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**
V1	Visual	Visual impact during construction due to dust, vehicles and equipment	Construction	Negative	**Medium**	**Low**	**Medium**	**Low**	**Medium**	**Low**
V2		Visual impact during construction due to vegetation clearing		Negative	**Medium**	**Low**	**Medium**	**Low**	**Medium**	**Low**
V3		Visual impact of pipeline	Operation	Negative	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**

Ref.	Receiving Environment	Impact Description	Phase	Status	Significance					
					Alternative 1		Alternative 2		Alternative 3	
					Pre-Mit	Post-Mit	Pre-Mit	Post-Mit	Pre-Mit	Post-Mit
V4		Visual impact during decommissioning due to dust, vehicles and equipment	De-commissioning	Negative	Medium	Low	Medium	Low	Medium	Low
SE1	Social	Increase in employment opportunities	Construction	Positive	Medium	High	Medium	High	Medium	High
SE2		Increased economic development opportunities		Positive	Medium	Medium	Medium	Medium	Medium	Medium
SE3		Disruption due to influx of job seekers		Negative	Medium	Medium	Medium	Medium	Medium	Medium
SE4		Increase in communicable diseases and reduced public health		Negative	Medium	Medium	Medium	Medium	Medium	Medium
SE5		Change in sense of place		Negative	Medium	Low	Medium	Low	Medium	Low
SE6		Nuisance from noise, dust and traffic disturbances		Negative	Medium	Low	Medium	Low	Medium	Low
SE7		Increased risk to neighbouring land users		Negative	Low	Low	Low	Low	Low	Low
SE8		Increased risk of veld fires		Negative	Medium	Low	Medium	Low	Medium	Low
SE9		Increased employment opportunities	Operation	Positive	Medium	Medium	Medium	Medium	Medium	Medium
SE10		Increased economic development opportunities		Positive	Medium	Medium	Medium	Medium	Medium	Medium
SE11		Change in sense of place		Negative	Medium	Medium	Medium	Medium	Medium	Medium
SE12		Access to water resources		Negative	Low	Low	Low	Low	Low	Low
SE13		Loss of permanent employment	De-commissioning	Negative	Medium	Low	Medium	Low	Medium	Low

REF.	RECEIVING ENVIRONMENT	IMPACT DESCRIPTION	PHASE	STATUS	SIGNIFICANCE					
					Alternative 1		Alternative 2		Alternative 3	
					Pre-Mit	Post-Mit	Pre-Mit	Post-Mit	Pre-Mit	Post-Mit
SE14		Gain of short term employment		Positive	Low	Medium	Low	Medium	Low	Medium
SE15		Nuisance from dust, noise and traffic		Negative	Low	Low	Low	Low	Low	Low
SE16		Increased risk to neighbouring land users		Negative	Low	Low	Low	Low	Low	Low
SE17		Increased risk of veld fires		Negative	Medium	Low	Medium	Low	Medium	Low

12.5 ALTERNATIVES ASSESSMENT

Table 12-4 outlines the preferred alternatives identified through the EIA and relevant specialist studies.

Table 12-4: Preferred Alternatives

ALTERNATIVE	PREFERRED	COMMENT
Site	Farm Hartebeest Vlei 86 Letsoai CSP 1 development area	No site alternative was assessed. Letsoai CSP 1 is situated within the project development area which was subjected to the high level site selection process already described in Chapter 7, Section 7.4. The assessment criteria are homogenous throughout the project development area, therefore the assessment of site alternatives within the project development area was not deemed necessary.
Technology	CSP – Central Receiver	CSP (central receiver) technology has been identified as the preferred technology and most feasible option for the Letsoai CSP 1.
CSP Cooling	Alternative 1 - Dry Cooling	Air cooled condensers can reduce the water requirements of a CSP facility considerably.
Layout and Design	Letsoai CSP 1 - Layout Alternative 1 - Layout Alternative 2 - Layout Alternative 3	The environmental sensitivity information was utilised to inform the layout and design of the Letsoai CSP 1 project. Three layout and design alternatives have been developed for the Letsoai CSP 1 project. There is no preference with regards to the layout alternatives. It should be noted that the difference between the layout alternatives is merely the alignment of the internal 132kV powerline that can connect to one of the main substations. The preferred substation will be identified through a separate S&EIR process focussing on the transmission integration of the Letsoai and Enamandla projects to the Aggeneis Substation.
Access Roads	Alternative 1 – existing access road Alternative 2 – New access road connecting to the N14	There is no preference in terms of the alternative access roads. However, alternative 1 follows existing farm tracks which will result in a slightly lower environmental impact. In addition, SANRAL stated that they are not in favour of creating new accesses on the N14 and would therefore

Alternative	Preferred	Comment
		prefer that the existing "Namies Lus 10" access at km 110.2 of the N14/1 is utilised.
Internal 132kV Powerlines	- Alternative 1 - Steel / concrete monopole single circuit structure - Alternative 2 - Steel / concrete monopole double circuit structure - Alternative 3 - H-pole structure (usually wooden poles)	There is no preferred alternative with regards to the tower structure utilised for the internal 132kV powerlines due to the fact that none of the proposed structures pose an electrocution risk to the priority avifauna species in the surrounding areas.
Water Supply	Alternative 1 – Supply form Sedibeng Water / Vedanta Mining	BioTherm has received a letter of approval from Sedibeng Water with regards to water supply for the proposed project.
Pipeline Alternative	Alternative 1 or Alternative 2	Alternative 3 is the least preferred pipeline option due to its length and due to its potential avifauna and biodiversity impacts. Alternative 1 is preferred from a biodiversity point of view. Alternative 2 is the preferred option from a heritage perspective although it is within 500m of a watercourse and would therefore require a WUL.

12.6 IMPACT STATEMENT

The overall objective of the EIA is to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

It is the opinion of WSP | Parsons Brinckerhoff that the information contained in this document (read in conjunction the final scoping report) is sufficient for the DEA to make an informed decision for the environmental authorisation being applied for in respect of this project.

Mitigation measures have been developed where applicable for the above aspects and are presented within the EMPr (**Appendix V**). It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

13 CONCLUSION

BioTherm has proposed a solar energy development on Farm Hartebeest Vlei 86, located approximately 13km southeast of Aggeneys located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality, in the Northern Cape Province of South Africa. The solar energy development will consist of two 150MW Concentrating Solar Power (CSP) projects referred to as Letsoai CSP 1 and 2; and five 75MW Solar Photovoltaic (PV) projects referred to as Enamandla PV 1 – 5. **This report is specific to the Letsoai CSP 1 project**.

The anticipated environmental impacts associated with the Proposed Project have been evaluated according to their significance, which is determined as a result of their extent, magnitude, probability and duration. All impacts were assessed with and without management measures in place. Where the overall environmental impact significance was determined to be low-medium and higher, these impacts were assessed in more detail with the relevant management measures recommended.

This Draft EIR has been structured to comply with the requirements of the Appendix 3 of GNR 982. The report provides a description of the proposed project and details the aspects associated with the construction, operation and decommissioning. The report also includes the methodology followed to undertake the S&EIR process. A detailed description on the existing environment (bio-physical as well as socio-economic) is provided based on findings from the specialist surveys. Stakeholder engagement was undertaken from the onset of the project in a transparent and comprehensive manner. Outcomes of all meetings and comments received from the public review periods were recorded and responded to in the EIR. Based on the environmental description, specialist surveys as well as the stakeholder engagement a detailed EIA rating has been undertaken and where relevant the necessary management measures have been recommended.

In summary, the S&EIR process assessed both biophysical and socio-economic environments and identified appropriate management and mitigation measures. The biophysical impact assessment revealed that there are no environmental fatal flaws and no significant negative impacts associated with the proposed project should mitigation and management measures be implemented. In addition, it should be noted that the overall socio-economic impacts associated with the project are positive and include the creation of job opportunities and contributions to the local, regional and national economies.

WSP | Parsons Brinckerhoff is of the opinion that should the identified mitigation and management measures be implemented.

The Draft EIR has been made available for public review from **27 February 2017** to **27 March 2017**. All issues and comments submitted to WSP | Parsons Brinckerhoff, to date, have been incorporated in the Comment and Reponses Report and have been included in **Appendix H**.

The Draft EIR has been submitted to the delegated competent authorities responsible for authorising this project.

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