FINAL BASIC ASSESSMENT REPORT

PROPOSED DEVELOPMENT OF PULIDA BATTERY ENERGY STORAGE SYSTEM (BESS) AND ASSOCIATED INFRASTRUCTURE

Letsemeng Local Municipality, Free State Province

DFFE Ref. No: **14/12/16/3/3/1/2574**

REVISION: 000

PREPARED FOR:

Enel Green Power South Africa (Pty) Ltd

DATED: September 22

PREPARED BY:

NCC Environmental Services

T · 021 702 2884

E · info@ncc-group.co.za

PROJECT DETAILS

Pre-application Ref. No.:	2022-01-0007
DFFE Ref. No. (EIA):	14/12/16/3/3/1/2574
Project Title	Proposed development of Pulida Battery Energy Storage System (BESS) and associated infrastructure on Farm Klipdrift No. 20 Remainder
Author	NCC Environmental Services (Pty) Ltd Nick Gates
Reviewer	Ronaldo Retief Reg EAP (2019/181)
Applicant	Enel Green Power South Africa (Pty) Ltd
Applicant Representative	Manuele Battisti
Date	September 2022
Revision	REV00

Amendments on Document			
Date	**Report Reference number**	**Revision No.**	**Description of amendment**
March 2022	00	Original	
September	00	Final	

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

BAR	- Basic Assessment Report
BESS	- Battery Energy Storage System
CLO	- Community Liaison Officer
DWS	- Department of Water and Sanitation
EA	- Environmental Authorisation
EAP	- Environmental Assessment Practitioner
ECO	- Environmental Control Officer
EDM	- Ehlanzeni District Municipality
EMPr	- Environmental Management Programme
DESTEA	- Department of Economic, Small Business Development, Tourism and Environmental Affairs
DFFE	- Department of Forestry, Fisheries, and the Environment
IDP	- Integrated Development Plan
LLM	- Letsemeng Local Municipality
NEMA	- National Environmental Management Act, 1998
NWA	- National Water Act, 1998
OHSA	- Occupational Health and Safety Act, 1993
PPE	- Personal Protective Equipment
PPP	- Public Participation Process
PULIDA	- Pulida BESS
PSDF	- Provincial Spatial Development Framework
SEA	- Strategic Environmental Assessment
SPLUMA	- Spatial Planning and Land Use Management
SUDS	- Sustainable Urban Drainage System

DOCUMENT GUIDE

The table below summarises the requirements of the 2014 NEMA EIA Regulations (as amended in 2017) in terms of the content requirements of EIA reports (Appendix 1 of GNR982) and the relevant sections in the report where these are addressed.

A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include:

	Description	Page / Section in this report
1 (a)	Details of -	**Section 1.3**
	(i) the EAP who prepared the report.	
	(ii) the expertise of the EAP, including a curriculum vitae.	
1 (b)	The location of the activity, including:	**Section 6.1**
	(i) the 21-digit Surveyor General code of each cadastral land parcel.	
	(ii) where available, the physical address and farm name.	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	
1 (c)	A plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale;	**Appendix A - Maps**
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.	
1 (d)	A description of the scope of the proposed activity, including	**Section 1.1 & Section 3**
	(i) all listed and specified activities triggered and being applied for; and	
	(ii) a description of the activities to be undertaken including associated structures and infrastructure.	
1 (e)	A description of the policy and legislative context within which the development is proposed including—	**Section 2**
	(i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report;	
	(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	
1 (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 5**
1 (g)	A motivation for the preferred site, activity and technology alternative	**Section 4 & Section 11**
1 (h)	a full description of the process followed to reach the proposed preferred alternative within the site, including—	
	(i) details of all the alternatives considered;	**Section 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 7**

	Description	Page / Section in this report
	(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 7.5**
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	**Section 6**
	(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts	**Section 9 & 10**
	(aa) can be reversed	
	(bb) may cause irreplaceable loss of resources; and	
	(cc) can be avoided, managed or mitigated.	
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives	**Section 9**
	(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 10 & Section 14**
	(viii) the possible mitigation measures that could be applied and level of residual risk	**Section 10 & Section 14**
	(ix) the outcome of the site selection matrix	**Section 10**
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	**N/A**
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity	**Section 11**
1 (i)	a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including—	**Section 9**
	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	**Section 9**
	(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**
1 (j)	an assessment of each identified potentially significant impact and risk, including	**Section 9**
	(i) cumulative impacts	
	(ii) the nature, significance and consequences of the impact and risk	
	(iii) the extent and duration of the impact and risk	
	(iv) the probability of the impact and risk occurring	
	(v) the degree to which the impact and risk can be reversed	
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	
	(vii) the degree to which the impact and risk can be avoided, managed or mitigated	
1 (k)	where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and	**Section 10.2 & Section 14.2**

	Description	Page / Section in this report
	an indication as to how these findings and recommendations have been included in the final report;	
1(l)	an environmental impact statement which contains—	**Section 11**
	(i) a summary of the key findings of the environmental impact assessment	
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	
1(m)	Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	**Section 10**
1(n)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	**N/A**
1(o)	A description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	**Appendix E - Specialist Reports**
1(p)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	**Section 13 & Section 14**
1(q)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	**N/A**
1(r)	An undertaking under oath or affirmation by the EAP in relation to—	**Section 15.2**
	(i) the correctness of the information provided in the reports;	
	(ii) the inclusion of comments and inputs from stakeholders and I&APs;	
	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	
	(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 and affected parties; and	
1(s)	N/A	**N/A**
1(t)	Any specific information that may be required by the competent authority; and	**Appendix E – Specialist Reports**
1(u)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.	**N/A**
(2)	Where a government notice gazetted by the Minister provides for the basic assessment process to be followed, the requirements as indicated in such a notice will apply.	**N/A**

EXECUTIVE SUMMARY

Enel Green Power South Africa (Pty) Ltd proposes the construction and operation of a Battery Energy Storage System (BESS) and associated infrastructure at the authorised in the proximity of the existing Pulida Solar Photovoltaic Facility (DFFE. No.: 14/12/16/3/3/2/391) located in Letsemeng Local Municipality in the Free State province.

The project will include the development of the BESS of up to 4ha in extent to be located adjacent to (within 100m of) the Photovoltaic Facility (PV) and associated substation.

Associated infrastructure includes:

i. A Substation with a maximum height of - HV busbar up to 10 m max and an HV Building up to 4 m max.
ii. Access road to the BESS (6m wide road surface with side ditch drainage on each side of the road) branching off the existing roads, and internal roads (up to 8m wide) within the footprint of the BESS, as needed. The length of the road will not exceed 700m.
iii. MV Cabling (underground or overhead) between the BESS and the HV/MV BESS substation.
iv. HV Cabling (underground or overhead) between the HV/MV BESS substation and the existing HV substation or for loop in and loop out to the existing HV connection line.
v. Fencing around the BESS and the substation for increased security measures.
vi. Temporary laydown area within the 4ha footprint of the BESS.
vii. Possible firebreak around the BESS facility which is to be located within the 4ha BESS footprint.

The general purpose and utilisation of a Battery Energy Storage System (BESS) is to save and store excess electrical output as it is generated, allowing for a timed release of electricity to the grid when the capacity is required. BESS systems therefore provide flexibility in the efficient operation of the electricity grid through decoupling of the energy supply and demand.

The BESS facility and all associated infrastructure will be located on the Farm Klipdrift No 20 Remainder. The affected property has been identified by the applicant as the preferred project site suitable for the development of a BESS, based on the requirement for the BESS to be located in close proximity to the approved PV Facility and substation to maximize synergies with existing connection infrastructures and to potentially shift the energy injected into the grid from Pulida PV Facility and neighbouring generators to hours of higher demand.

Specialist studies undertaken in support of this application were as identified through the DEFF online screening tool and were required to be undertaken in accordance with the relevant Specialist Protocols (GNR320 of 20 March 2020). In this regard, and based on experience within the study area, the following specialist studies have been undertaken.

From an ecological perspective the following was highlighted by the respective specialists:

Terrestrial Ecological Impacts - Based on the results and conclusions presented in this report, and the outcomes of the field survey, it is the opinion of the specialists that the proposed project can be favourably considered should all the mitigation measures be implemented and monitored against to ensure compliance and included in the Environmental Management Programme. Even though the sites fall within an ESA1 and ESA2 and medium sensitivity, the mitigation measures provided may reduce the negative risks anticipated with the BESS construction.

The ecologist supports the **Alternative 2** site (**Preferred**) as the most suitable site for the proposed activity, as **Alternative 1** is wetter, falls within a wetland system and may impact on wetland vegetation and species dependent on the wetland system.

Aquatic Ecological Impacts - Based on the findings of the desktop literature and historical imagery survey and the in-field observations and results, the depression wetland was found to be in a moderately modified ecological condition. The specialist opinion in terms of this study is that **Alternative 2** is the **preferred alternative** from a freshwater perspective. **Alternative 1** will result in the loss of ~4ha of wetland (2.5% of total wetland area) with a higher risk to soil and water resources to the remaining ~156ha wetland area posed by any leaks or major incidents which may result in releases of electrolyte from the stored batteries into the environment. The need to explore and consider wetland offsets may be necessary if BESS Alternative 1 is authorised.

If all mitigation measures provided in this report are rigorously implemented as well as good environmental practices are followed, the residual risks of the proposed development will pose low risks to freshwater biodiversity and water resource quality and will not compromise the requirements of the ecological reserve and other downstream water users

Agricultural Impacts – It was determined through the site assessment conduct by the EAP and the review of the *Soil and Agricultural Potential Study* (*Henning, 2012)* conducted for the much larger Pulida PV facility that another study was not required as the land use and status of the property has not changed since the initial development. The study indicated that the agricultural potential of soils on the proposed development area is mostly **low.**

Cumulative Impacts - The contribution of the project to cumulative impacts will be of low significance. There are no identified impacts considered as presenting an unacceptable risk.

Based on the specialist cumulative assessment and findings, the development of the BESS and associated infrastructure for the Pulida Facility and its contribution to the overall impact of other energy infrastructure to be developed within the area, it can be concluded that the contribution of the project to cumulative impacts

will be of a low significance. There are no impacts or risks identified to be of a high significance or considered as unacceptable with the development of the BESS and associated infrastructure. In addition, no impacts that would result in whole-scale change are expected to occur.

From a cumulative impact perspective there is no reason why the project should not proceed.

Overall, **no environmental fatal flaws** were identified from the specialist studies conducted for the Pulida BESS provided the BESS is located in preferred alternative (i.e., Alternative 2). Provided that the BESS is located within the low/medium sensitivity parts of the site, the impacts associated with the BESS would be low.

In terms of the **socio-economic** side of the proposed development, the following was highlighted:

The socio-economic benefits of the proposed development would also be lost should the BESS project not be implemented. Economic benefits could be experienced across the entire value chain (e.g., materials, manufacturing, construction and systems installation, operations and maintenance, and employment. The potential exists for South Africa to fabricate major system components (including electrolyte) for flow batteries. Beyond the direct impact associated with the manufacturing, installation and operation of a BESS economic development would be increased through increased system reliability and the reduced cost of energy.

Should this alternative be selected, there would be no direct environmental impacts within the designated BESS footprint. The implementation of the no-go alternative will result in the impossibility to store energy generated from Pulida Solar Energy Facility and other generators in the region and supply sustained electricity to the national grid at times when the PV is not producing optimally or Loadshedding is implemented and will, therefore, result in lost opportunity to dispatch additional electricity with no environmental emissions.

Impacts on Heritage Resources – There are no visible restrictions or negative impacts in terms of heritage associated with the specific sites indicated. In terms of heritage the proposed project may continue; and the discovery of subsurface archaeological and/or historical material as well as graves must be taken into account in the Environmental Management Programme. Please refer to Sections 3.2.6 and 3.2.7.

In terms of the proposed Pulida BESS, it is of the EAPs opinion that the proposed project can be considered favourable as it would contribute greatly to adding sustained electricity to the national grid and assist in addressing the shortfalls resulting in the current energy crisis which South Africa is enduring with no short-term end in sight. The project has assessed viable site placement options and even though **Alternative 1** will result in

the need for a shorter connection between the facility and the existing substation the entire footprint would directly impact an existing water course.

Alternative 2 (Preferred Alternative) is located more than 100m away from the edge of the watercourse and is seen as favourable by the Aquatic specialist. The project area has been identified by the Ecologist as largely degraded due to anthropological activities relating to farming activities. The existing vegetation does not contain any identified species of concern. Due to the current activities on the property, it is unlikely that the vegetation status will change should the facility not be authorised.

Based on the results and conclusions presented, and the outcomes of the field survey/s, it is the opinion of the EAP and Specialists that the proposed project can be **Favourably Considered** should all the mitigation measures be implemented and monitored against to ensure compliance and included in the EMPr contained under Appendix F Environmental Management Programme. The development could be supported.

The following are suggested compulsory recommended conditions for the proposed BESS facility:

1) Adhere to the proposed management and mitigation measures during the construction and operation phases as set out in the EMPr
2) The EMPr must be implemented and monitored by an independent Environmental Control Officer (ECO) and all monitoring reports must be submitted to the relevant authority for review and
3) Conditions as set out by all specialist studies and EAP should form part of the General conditions of the EA.

The EA is required for a period of up to 10 years. The activity would be concluded within a maximum of 2 years from the start of construction. The post monitoring requirements would be finalised within 6-12 months, one month after construction is finalised.

1 INTRODUCTION

1.1 Background Information

Enel Green Power South Africa (Pty) Ltd (**EGP**), the Applicant, intends to apply for Environmental Authorisation for development of a Battery Energy Storage System (**BESS**) in the proximity of the existing Pulida Solar photovoltaic facility (DFFE. No.: 14/12/16/3/3/2/391) located in Letsemeng Local Municipality in the Free State province.

The general purpose and utilisation of a Battery Energy Storage System (BESS) is to save and store excess electrical output as it is generated, allowing for a timed release of electricity to the grid when the capacity is required. BESS systems therefore provide flexibility in the efficient operation of the electricity grid through decoupling of the energy supply and demand.

In recent years battery energy storage at utility scale has increasingly been recognised as an effective solution to several challenges within the current grid system such as inefficiency, network bottlenecks and overloads.

The BESS technology is modular, and the layout is customized depending on specific functional, technical and commercial requirements at the time of system implementation.

Figure 1: Typical configuration of Lithium-Ion BESS installed inside containers and blocks (Renewable Energy World, 2020)

NCC Environmental Services (Pty) Ltd (NCC) has been appointed as the Environmental Assessment Practitioner (EAP) to act on behalf of the applicant to undertake the legally required Environmental Authorisation (EA)

application process as required in terms of the NEMA, 1998 read together with the EIA Regulations, 2014 (as amended).

It has been confirmed that the competent authority is the National Department of Forestry, Fisheries and the Environment (DFFE). In terms of GN779 of July 2016, the DFFE has been determined as the Competent Authority (CA) for all projects which relate to the Integrated Resource Plan for Electricity (IRP) 2010 -2030, and any updates thereto.

In terms of the National Environmental Management Act (No. 107 of 1998) and Environmental Impact Assessment Regulations (Government Notice R982, as amended in 2021), an EA must be obtained prior to the commencement of any listed activities.

Activities **11, 12, 14, 19, 24, 27**, and **28** in **Listing Notice 1** of the 2014 NEMA EIA Regulations (Government Notice R983, as amended in 2021), and Activities **12** and **14** in **Listing Notice 3** of the 2014 NEMA EIA Regulations (Government Notice R985, as amended in 2021) are triggered and therefore the application for an EA will need to be supported by a Basic Assessment Report (BAR) prepared in accordance with the requirements of Government Notice R982, 2014 (as amended in 2017).

A Draft BAR was released for review and comment to all Interested & Affected Parties over two commenting periods between 24th June 2022 to 25th July 2022, and an additional commenting period took place between 26th July 2022 to 26th August 2022.

This report constitutes the Final BAR for submission to the Relevant Authority for consideration.

An Environmental Management Programme (EMPr) has been prepared as part of the EIA process to provide specific environmental guidance to the relevant engineers and Contractors for the construction and rehabilitation, and where required closure, of the road and associated activities about their responsibilities in terms of responsible environmental management. Activity 11 of the Environmental Impact Assessment Regulations Listing Notice 1 of 2014, as amended is triggered for the use of a substation infrastructure and overhead electricity transmission and distribution infrastructure. A generic Environmental Management Programme (EMPr), contemplated in Regulations 19(4) has been used and attached to this report.

An EMPr was drafted in accordance with Section 19 of the EIA Regulations published in Government Notice No. R. 982 of 4th December 2014 (as amended) (EIA Regulations). Section 19 should be read in conjunction with Section 24N of the National Environmental Management Act, 1998 (Act 107 of 1998), as amended and hereby referred to as 'NEMA' throughout this document. The report forms part of the formal application phase.

1.2 Applicant Details Information

Details of the Applicant and responsible contact person are provided for in Table 1.

Table 1 Details of Applicant

Applicant Name:	Enel Green Power South Africa (Pty) Ltd
Contact Person	Manuele Battisti
Position in company	Director
RSA Id No./ Passport No.:	545483711
Postal address:	PO Box 651286, Benmore
Telephone:	(010) 344 0246
E-mail:	Kagiso.mohlamme@enel.com

1.3 Environmental Assessment Practitioner

NCC Environmental Services (Pty) Ltd (**NCC**) was appointed to undertake the required Environmental Authorization (EA) process incorporating the required Environmental Impact Assessment (EIA) and, Environmental Management Programme (EMPr) processes.

Details and expertise of the Environmental Assessment Practitioner (EAP) who prepared the EIA Report are provided in Table 2 **Details of the EAP**

and Curriculum Vitae is appended in APPENDIX J – EAP CV's

Table 2 Details of the EAP

EAP:	Nicholas Gates
Company:	NCC Environmental Services (Pty) Ltd
Qualifications:	B Soc Sci (EGS)
Experience:	14 years
Address:	26 Bell Close, Westlake Business Park, Westlake, Cape Town
Tel:	021 702 2884
Fax:	086 555 0693
Email:	nickg@ncc-group.co.za

Table 3 Details of Reviewer EAP under EAPASA

EAP:	Nico Ronaldo-Retief
Company:	NCC Environmental Services (Pty) Ltd
Qualifications:	Msc. Zoology
EAPASA Reg. No.:	2019/181
Experience:	17 years
Address:	26 Bell Close, Westlake Business Park, Westlake, Cape Town
Tel:	021 702 2884

Fax:	086 555 0693
Email:	ronaldor@ncc-group.co.za

2 POLICY AND PLANNING CONTEXT

This chapter provides an overview of the policy and legislative context within which the new road deviation and associated infrastructure is being operated. It identifies environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process which may be applicable or have relevance to the project.

2.1 NEMA EIA Regulations and Applicable Listed Activities

In accordance with Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), and the Environmental Impact Assessment (EIA) Regulations (GNR 982), as amended, the proposed development of Pulida Battery Energy Storage System (BESS) and associated infrastructure requires an Environmental Authorisation (EA) from the Competent Authority (CA). Figure 1 provides a broad overview of the Basic Assessment Process (BAR).

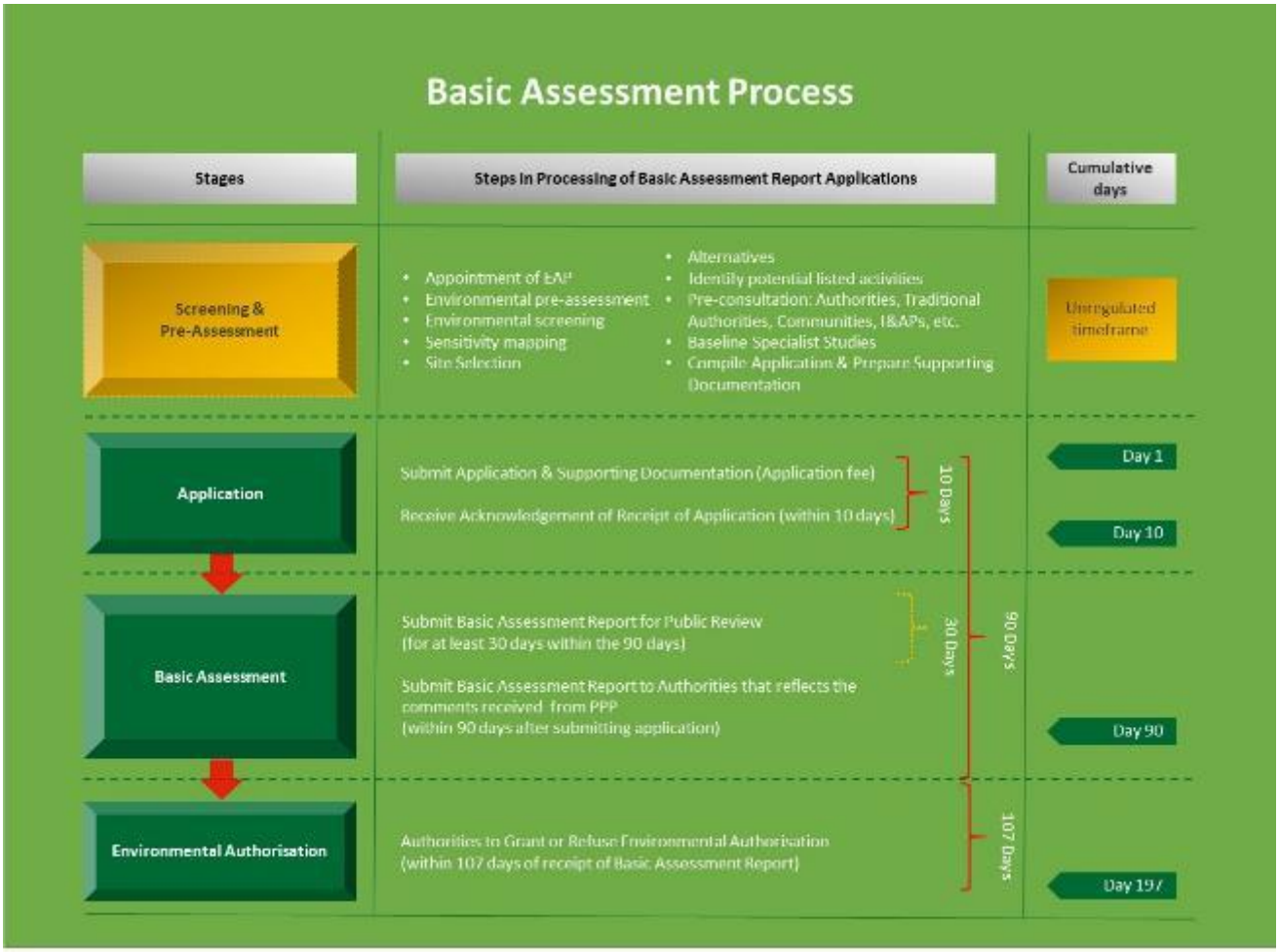


Figure 2: Standard BAR Process timelines

According to section 2, subsections 1, 2 & 3 of NEMA, all organs of state must apply certain principles set out in the Act when taking decisions that may significantly affect the environment. The key principles of this Act include that all "*actions*" approved must be economically, socially, and environmentally sustainable.

It further states that "*environmental management must place people and their needs at the forefront of its concern*" and that their collective interests must be served equitably.

The identified Listed Activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), for which EA is being applied for is listed in.

On 16 February 2018, Minister Edna Molewa published Government Notice (GN) No. 114 in Government Gazette No. 41445 which identified 8 Renewable Energy Development Zones (REDZ) important for the development of large-scale wind and solar photovoltaic facilities. The Government Notice included procedure to be followed when applying for environmental authorisation for large scale wind and solar photovoltaic energy facilities when occurring in these REDZs.

On 26 February 2021, Minister Barbara Dallas Creecy, published GN No. 142, 144 and 145 in Government Gazette No. 44191 which identified 3 additional REDZs for implementation as well as the procedures to be

followed when applying for environmental authorisation for electricity transmission or distribution infrastructure or large-scale wind and solar photovoltaic energy facilities in these REDZs.

The REDZs were identified through the undertaking of 2 Strategic Environmental Assessments, the first being finalised in 2015 and the second being finalised in 2019.

The GN provides for the procedure to be followed in applying for environmental authorisation for large scale wind and solar photovoltaic energy development activities, identified in terms of section 24(2)(a) of the National Environmental Management Act, 1998, as set out in the Schedule hereto. AS this project relates to the retrofitting of a solar photovoltaic energy facility it is deemed that GN 114 is applicable.

The Pulida BESS project falls under REDZ 5, Kimberley. Refer to Figure 5.

The timeframe for decision-making as contained in the Environmental Impact Assessment Regulations, 2014, as amended, for purposes of an application for environmental authorisation or an application for an amendment of an environmental authorisation contemplated in Part 2 of Chapter 5 of the Environmental Impact Assessment Regulations, 2014, as amended, contemplated in this Notice is **57 days**.

Table 4: Listed activity in terms of GNR 983 Listing Notice 1 of 2014 (amended)

Activity No(s):	The relevant **Basic Assessment Activity(ies)** in writing as per **Listing Notice 1** (GN No. R. 983)	Description of the 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; or** ~~(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more~~ excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is— (a) temporarily required to allow for maintenance of existing infrastructure (b) 2 kilometres or shorter in length (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	The site is in a rural area and the capacity of the distribution exceeds 33kV. The BESS would be connected to the grid by means of a cable to connect the BESS substation to the existing HV substation or with a loop in loop out to the existing HV line. The capacity of the cable would be 132kV. The connection will be roughly 600m to 700m in length.
12	The development of— ~~(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or~~ **(ii) infrastructure or structures with a physical footprint of 100 square metres or more** where such development occurs— **(a) within a watercourse** ~~(b) in front of a development setback; or~~ **(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse** — excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies	The construction of the access road and High Voltage (HV) Cabling (underground or overhead) between the BESS and the HV Substation or the loop in loop out to the existing HV line has the potential to exceed 100sqm in size within a water course or within 32m of a watercourse. The BESS and Substation would not be within a watercourse or within 32m of a watercourse

	(dd) where such development occurs within an urban area (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of the development and where indigenous vegetation will not be cleared.	
14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres	Depending on the technology to be considered upon implementation, (specifically for Flow Battery and depending on the battery supplier), there may be instances where a battery is not fully assembled and the electrolyte (or substances making up such electrolyte) intended for such battery, may potentially be stored on site, in a container (e.g. tanks). In this instance, where the electrolyte, or the substances making up the electrolyte, are stored in a container, such facility or infrastructure will indeed be regarded as a facility or infrastructure for the storage, or storage and handling of a dangerous good. The total amount of hazardous materials stored on site, as a result of this development, will not exceed 500 m^3.
19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback (b) is for maintenance purposes undertaken in accordance with a maintenance management plan (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.	The access road and powerlines (underground or overhead) between the BESS and the HV substation or the loop in loop out to the existing HV line would potentially impact on an identified watercourse. These will either excavate or infill more than 10 cubic metres of material from within a water course or within 32m of a watercourse. The **BESS** and **substation** would not be located within a watercourse or within 32m of a watercourse.
24	The development of a road— ~~(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or~~ **(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres** but excluding a road— (a) which is identified and included in activity 27 in Listing Notice 2 of 2014 (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.	The access road leading up to the site has the potential to be wider than 8m in width. The access road would not have any road reserve. Internal roads will be up to 8m wide.

27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation except 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.	Although the site has transformed grassland due to anthropogenic activities, approximately 3-4 ha of indigenous vegetation would be cleared to accommodate the development of the BESS and associated facilities (This includes the laydown areas, substation, access road and MV and HV cabling to connect the BESS to the HV Substation or the loop in loop out to the existing HV line) more than 1 hectare but up to 4 ha of indigenous vegetation would need to be cleared for the proposed development.
28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: ~~(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or~~ **(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare** excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	The BESS and associated infrastructure represent an industrial development outside of an urban area and will be in excess of 1 ha. The site proposed for the BESS is also currently utilised for agricultural purposes. The Applicant would apply for the necessary rezoning certificate

Table 5: Listed activity in terms of GNR 985 Listing Notice 3 of 2014 (amended)

Activity No(s):	The relevant **Basic Assessment Activity (ies)** in writing as per **Listing Notice 3** (GN No. R. 985)	Description of the activity
12	The clearance of an area of 300 square metres 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. **b. Free State** ~~i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004~~ ~~ii. Within critical biodiversity areas identified in bioregional plans~~ ~~iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or~~ ***iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.***	The construction of the access road and High Voltage (HV) Cabling (underground or overhead) or the loop in loop out to the existing HV line would result in the clearance indigenous vegetation within an identified watercourse.
14	The development of— ~~(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or~~ **(ii) infrastructure or structures with a physical footprint of 10 square metres or more** where such development occurs— **(a) within a watercourse** ~~(b) in front of a development setback; or~~ ~~(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour~~. **b. Free State** **i. Outside urban areas:** ~~(aa) A protected area identified in terms of NEMPAA, excluding conservancies~~ ~~(bb) National Protected Area Expansion Strategy Focus areas~~ ~~(cc) World Heritage Sites~~	The construction of the access road and High Voltage (HV) Cabling (underground or overhead) between the BESS and the HV Substation or the loop in loop out to the existing HV line would exceed 10sqm in size and be located within an identified watercourse. The BESS and substation would not directly impact upon any watercourse

	~~(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority~~ ~~(ee) Sites or areas identified in terms of an international convention~~ **(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans** ~~(gg) Core areas in biosphere reserves; or~~ ~~(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or~~ ~~ii. Inside urban areas:~~ ~~(aa) Areas zoned for use as public open space; or~~ ~~(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose.~~	

2.2 Other Relevant Legislation and/or Guidelines

The following is a broad list of all applicable environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to the proposed development project:

2.1.1 National and Provincial Legislation and Regulations

- The Constitution of the Republic of South Africa (Act 108 of 1996)
- Environment Conservation Act (Act 73 of 1989)
- National Environmental Management Act (Act 107 of 1998) (as amended)
- NEMA EIA Regulations, 2014 (as amended)
- National Road Traffic Act (Act 93 of 1996)
- National Road Traffic Regulations 2000 (as amended)
- National Environmental Management: Waste Management Act (Act 59 of 2008)
- National Environmental Management: Air Quality Act (Act 39 of 2004)
- National Water Act (Act 36 of 1998)
- Water Services Act (Act 108 1997)
- Hazardous Substances Act (Act 15 of 1973)
- Mineral and Petroleum Resources Development Act (Act 28 of 2002)
- National Forest Act (Act 84 of 1998)
- National Veld and Forest Fire Act of 1998 (Act No. 101 of 1998)
- National Environmental Management: Protected Areas Act (Act 57 of 2003)
- Mountain Catchment Areas Act (Act 63 of 1970)
- National Environmental Management: Biodiversity Act (Act 10 of 2004)
- Alien and Invasive Species Regulations, 2014
- Animals Protection Act of 1962 (Act No. 71 of 1962)
- Agricultural Pests Act of 1983 (Act No. 36 of 1983)
- Conservation of Agricultural Resources Act (Act 43 of 1983)
- National Heritage Resources Act (Act 25 of 1999)
- World Heritage Convention Act, 1999
- National Health Act (Act 61 of 2003)
- Health Act (Act 63 of 1977)
- Occupational Health and Safety Act (Act 85 of 1993)
- National Dust Control Regulations, 2013

- Noise Control Regulations GN R 154 in GG No. 13717 of 10 January 1992 (published in terms of Section 25 of the Environment Conservation Act 73 of 1989)
- Hazardous Substances Act (Act 15 of 1973)
- Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947)
- Electricity Regulation Act, 2006 (Act No. 4 of 2006)

2.1.2 Other Documentation

- The White Paper on the Energy Policy of the Republic of South Africa (December 1998)
- The White Paper on Renewable Energy (November 2003)
- Integrated Resources Plan 2010-2030 (IRP 2010)
- Letsemeng Local Municipality Integrated Development Plan 2021/2022
- Xhariep District Municipality Integrated Development Plan 2021/2022
- National Biodiversity Assessment (NBA) & National Vegetation Map
- National Freshwater Ecosystem Priority Area (NEFPA) Assessment
- Final EIA Report, Proposed Establishment of a Renewable Energy Generation Facility (Pulida PV)
- Final Specialist Report, Visual Impact Assessment Report, Proposed Establishment of a Renewable Energy Generation Facility (Pulida PV)

2.3 REGIONAL PLANNING CONTEXT

Renewable Energy Policy in South Africa, 2003

The white paper on renewable energy (DME, 2003) supplements the energy policy and sets out the government's strategic goals, vision, policy principles and objectives implementing and promoting renewable energy in South Africa. South Africa has various sources of renewable resources, particularly solar and wind, and therefore this policy supports the rationale that from a fuel resource perspective, renewable application is proven to be the least costly, especially from an environmental and social perspective. Meeting technical and economic as well other constraints is one of the major concerns of the government policy on renewable energy.

South Africa has set a 10 year 10 000 GWH target for renewable energies by 2013 to be produced mainly from solar, wind and biomass as well small-scale hydro. This amounts to approximately 4% of the country's estimated demand by 2013.

Final Integrated Resource Plan, 2010 -2030

The Ministry of Energy is obligated as per the Energy Act of 2008 to publish and develop an integrated resource plan for energy. The Department of Energy (DOE) in partnership with the National Energy Regulator of South Africa (NERSA) has published the Integrated Resource Plan (IRP) for the time period 2010 to 2030. The main objective of the IRP develops an electricity investment strategy that is sustainable for the transmission infrastructure and generation capacity of South Africa for the next 20 years.

The white paper on renewable energies states that it is of global/national importance to supplement existing energy demand with renewable forms of energy in order to combat climate change. The outcome of this IRP acknowledged that coal fired power generation facilities will still be required over the next 20 years. The DOE released the final IRP in March 2011 and parliament accepted it at the end of March. In addition to all existing and committed power plants the IRP includes 6.3 GW of coal, 9.6 GW for nuclear, 17.8 GW for renewables (including 8.4 GW for solar) and 8.9 GW from other sources.

Integrated Energy Plan (IEP)

The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. Eight key objectives were identified which relate mainly to the security, cost, access, diversity, efficiency, impact in terms of emissions, conservation and social benefits in terms of energy planning. The IEP recognises the potential of renewable energy for power generation. With the additional renewable energy to be generated by Pulida Solar Facility, stored within the proposed Pulida BESS and associated infrastructure and later evacuated to the national grid, a contribution to

this objective will be made. Also, with the previously developed Pulida Solar Facility and the proposed Pulida BESS and associated infrastructure, the eight key objectives in terms of energy planning will be met, even if only to a limited extent.

Provincial Spatial Development Framework (PSDF)

The aim of the Free State Spatial Development Framework (FSSDF) 2007 is to guide spatial planning, land development and land use management in the province. The document provides an overview of areas of development potential and areas of need in the Free State.

An investigation on areas of need in the Free State took place (Chapter 4.1 FSSDF 2007).

Development objectives were set for the four Provincial priority areas, namely:

a. Economic growth, development and employment
b. Social and human development
c. Justice and crime prevention
d. Efficient governance and administration

The most relevant priority area is Economic Growth, Development and Employment, in particular key objective 1.4 which is to provide adequate infrastructure for economic growth and development

Refer to Chapter 4.2.2: Proposed Spatial initiatives and Chapter 4.2.3: Summary of FSSDF Spatial Initiatives and corresponding NSDP Categories for towns and cities indicated as economic hubs, collective economic nodes and specialised economic nodes.

Integrated Development Plan of the Local Municipality

The proposed project does not directly speak to the IDP as it is aimed at addressing the energy crisis at a national level, however as the Municipality is a licensed distributor of electricity it receives electricity from the National Grid, either from Eskom or other service providers therefore this project aides the municipality in delivering on their mandate for the delivery of key services such as electricity.

It has been identified within the IDP that for majority of the wards reliable supply is an issue. This is mainly due to ageing infrastructure however the persist issue of the unreliability of supply by Eskom to municipalities and the aging infrastructure of generation has contributed to supply issue by the municipality.

Other Provincial/Regional Plans

Karoo Small Town Regeneration Program (KSTRI)

The purpose of the Karoo Small Town Regeneration Program (KSTRI) is to highlight the role of small towns in the Karoo region as places of significant economic and social opportunity.

The working problem statement for the Initiative is as follows:

- The Karoo is a water stressed biologically diverse and sensitive bioregion requiring a careful weighing up of development options
- Individual municipalities have limited resources (human, financial, technical) in order to deal with factors that affect the entire region, such as, shale gas and uranium mining, renewable energy investment, climate change and adaption, poverty and unemployment.
- Developing a strategic response to the development challenges will have limited impact, without considering the area as a region.

The Karoo Region Small Town Regeneration and Regional Economic Development Conference was convened by the SALGA in partnership with district and local municipalities from the Western Cape, Eastern Cape, Northern Cape and Free State that are located in the Karoo biophysical region and led to the development of the KSTRI.

District Rural Development Plan

The "District Rural Development Plan" and the "District Rural Development Implementation Plan" as developed by the Department of Rural Development and Land Reform and the Department of Agriculture and Rural Development has been considered and serves in the IDP as a separate Rural Development sector plan for the Municipality.

The plan identified the current renewable energy project (Pulida Solar Park) as a key attribute. Retrofitting the facility with storage capacity will further enhance the capability of the facility to deliver on sustained energy.

2.4 DFFE Screening Tool

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

The requirement for the submission of a Screening Report for the proposed development is applicable as it triggers Regulation 19 of the 2014 EIA Regulations (as amended). The below table provides a summary of the specialist assessment requirements identified for the project site in terms of the screening tool (based on the identified 500m assessment zone surrounding the Pulida Substation) (refer to Appendix L for the report) and responses to each assessment requirement based on the nature and extent of the project.

Table 6: A summary of the proposed specialist studies and sensitivity ratings as per the online tool.

No.	Specialist Assessment	Sensitivity rating as per the online tool	Comment
1	Landscape/Visual Impact Assessment	None specified	The proposed BESS would not be greater that 4ha in comparison to the 195ha Pulida PV Facility. This equates to being 2% of the existing facility Only a district gravel road runs past the site is considered sensitive however this road experiences minimal traffic as the area is largely farms. The impact is further reduced in that the proposed facility falls directly behind the existing PV facility therefore commuters would not be able to see the development without access the property itself. The development of the Pulida BESS and associated infrastructure immediately adjacent to the existing Pulida PV Energy Facility would not result in any additional visual impact not already experienced by virtue of the Pulida PV Facility and its associated infrastructure.

			A visual impact assessment was conducted for the much larger Pulida PV Facility where the outcome indicated that a low visual impact was determined. The existing landscape has not change since. No visual impact assessment was therefore conducted for this Basic Assessment.
2	Archaeological and Cultural Heritage Impact Assessment	Low sensitivity	A heritage study, including Paleo, was commissioned where no findings were noted. See attached as Appendix E3
3	Palaeontology Impact Assessment	Medium sensitivity	
4	Terrestrial Biodiversity Impact Assessment	Low sensitivity	An Ecological assessment (flora, fauna and surface water) has been included for this Basic Assessment, in order to address any terrestrial biodiversity impact anticipated. See attached as Appendix E2
5	Aquatic Biodiversity Impact Assessment	Very high sensitivity	A freshwater specialist study was commissioned for this site and forms part of this assessment. See attached as Appendix E1
6	Socio-Economic Assessment	None specified	The Pulida BESS and associated infrastructure would be located immediately adjacent to the existing PV facility. The development of the BESS is directly adjacent to the existing Pulida PV Facility and will not incur any additional socio-economic impacts not already associated and identified with the Pulida PV Facility development. As the BESS will complement the existing PV facility no socio-economic impact assessment was conducted for this Basic Assessment. Refer to Section 5, *Need and Desirability*, and Section 6.8 *Socio Economic Context* The project is not expected to result in socio-economic impacts which are not able to be assessed by the EAP in the BAR.
7	Plant Species Assessment	Low sensitivity	A Terrestrial biodiversity impact was commissioned and conducted for this project. See attached as Appendix E2
8	Animal Species Assessment	Low sensitivity	A Terrestrial biodiversity impact was commissioned and conducted for this project. See attached as Appendix E2
9	Agricultural Theme	Medium sensitivity (The majority of the proposed site falls within an area of Low Sensitivity)	Agricultural potential however no study was deemed necessary and therefore not commissioned. This was determined through the review of the Soil and agricultural potential study conducted by for the much larger Pulida PV facility which stated the following: *"The results indicate that the agricultural potential of soils on the proposed development area is mostly low (shallow, gravelly soils with limited suitability for grazing). The results obtained from the study were done after field observations were done to verify the soil potential classified by the Department of Agriculture on a small scale. The site should subsequently be considered as low potential grazing land with low potential for arable agriculture*

			considering the climatic conditions, soil physical characteristics and size of land potentially available. Considering that re-growth of grass will take place under the panels as the mounting systems are at least 1m above ground level, the grazing value of the land will not be lost entirely since smaller livestock such as game, goats and sheep will still be able to utilize the grass layer underneath the panels. At the end of the lifetime of the solar plant, structures will be removed, and natural vegetation will re-establish naturally." (Henning, 2012) Based on the outcomes of the above specialist study and considerations from the Screening Report, the following specialist studies have been undertaken as part of this BA process.
10	Civil Aviation	Low sensitivity	No studies were deemed necessary as the structures are not high enough to pose any risk to civil aviation.
11.	Defence Theme	Low sensitivity	No studies were deemed necessary as the site does not fall within the proximity of any defence sites.

Based on the outcomes of the above specialist study and considerations from the Screening Report, the following specialist studies have been undertaken as part of this BA process.

Table 7: Specialist studies undertaken as part of the BA process

Specialist Name	Specialist Company	Specialist Area of Expertise	Appendices
Sean Altern & Nico-Ronaldo Retief	NCC environmental Service (Pty) Ltd	Terrestrial Biodiversity	Appendix E2
Leonie Marias-Botes	Leonie Marais Heritage Practitioner	Heritage (including archaeology and palaeontology)	Appendix E3
Craig Burne	NCC environmental Service (Pty) Ltd	Aquatic Biodiversity	Appendix E1

3 PROJECT DESCRIPTION

The proposed Battery Energy Storage System (BESS) will be housed inside containers or similar structures with a total footprint of up to 4ha in extent. It would be located adjacent to the existing Pulida Solar Facility.

Both Lithium-ion and Redox-flow technology are being considered for the project, depending on which is most feasible at the time of implementation.

The proposed size of the BESS would have a total footprint of up to 4ha in extent.

i. A Substation with a maximum height of - HV busbar up to 10 m max and an HV Building up to 4 m max.
ii. Access road to the BESS (6m wide road surface with side ditch drainage on each side of the road) branching off the existing roads, and internal roads (up to 8m wide) within the footprint of the BESS, as needed. The length of the road will not exceed 700m.
iii. MV Cabling (underground or overhead) between the BESS and the HV/MV BESS substation.
iv. HV Cabling (underground or overhead) between the HV/MV BESS substation and the existing HV substation or for loop in and loop out to the existing HV connection line.
v. Fencing around the BESS and the substation for increased security measures.
vi. Temporary laydown area within the 4ha footprint of the BESS.
vii. Possible firebreak around the BESS facility which is to be located within the 4ha BESS footprint.

Two grid connection options have been explored, option A (connection from the BESS Substation to the existing HV substation) and option B (connection from the BESS Substation to the loop in and loop out to the existing HV connection line).

Storage systems are fundamental to the renewable energies and the energy transition. They store electricity and make it available also when there is greater need and renewable resources are not available, acting as a balance between supply and demand, and helping stabilize the grid. Moreover, BESS could deliver ancillary services to balance network frequency and voltage during normal network operation and be available as reserves during contingency events, replacing the support that is generally provided by thermal generators.

Batteries – connected in series – are now some of the most common storage systems and are going through a significant technological revolution. Year after year, new materials and cutting-edge technological solutions are introduced, providing greater efficiency, lower cost and a design-to-recycle approach, to obtain a more sustainable BESS product.

Batteries may be classified as either solid state or flow batteries. Solid state batteries use solid electrodes and electrolytes. Flow batteries on the other hand use solid electrodes and liquid electrolytes.

Each type has its own particular advantages and disadvantages.

The liquid electrolyte in a flow battery is typically held in tanks separate to the cell (or cells) of the reactor. Flow batteries can be recharged by replacing the electrolyte liquid. The discharge duration of flow batteries can thus be easily increased by adding more electrolyte and additional tanks without having to increase the capacity of the battery itself. This is termed scalability. The layout for flow batteries is flexible due to the separation of the electrolyte and battery stack. In addition, unlike the solid-state batteries, all cells contain the same charge and therefore equalization of the cells, a process which can produce hydrogen gas, is not required. Flow batteries do however require a larger footprint than solid state batteries and have a lower energy density.

Furthermore, the design is more complex than solid state batteries due to the external electrolyte tanks and their associated components. The nature of the electrolytes used pose a flammability and explosion risk.

Solid state batteries have a greater energy density than flow batteries, they are more tolerant to high temperatures and don't store potentially flammable and toxic electrolytes as flow batteries do. The compression of the anode, cathode and electrolyte produces the added benefit of taking up less space than a flow battery.

Lithium Ion

Li-ion batteries get their name from the transfer of lithium ions between the electrodes, both when energy is injected for storage purposes and when it is extracted. Within the lithium family there are a variety of different chemistries and designs from numerous suppliers.

Instead of metallic lithium, Li-ion batteries use lithiated metal oxides as the cathode, and carbon typically serves as the anode. Unlike other batteries with electrodes that change by charging and discharging, Li-ion batteries offer better efficiency because the ion movements leave electrode structures intact.

The solid-state lithium-ion battery differs from the conventional flow version as it uses a solid such as ceramic as the electrolyte rather than the typical lithium salt liquid (Refer to Figure 5 for a comparison). Solid-state batteries compress the anode, cathode, and electrolyte into three flat layers instead of suspending the electrodes in a liquid electrolyte. This makes for a battery with greater energy density and safer conditions.

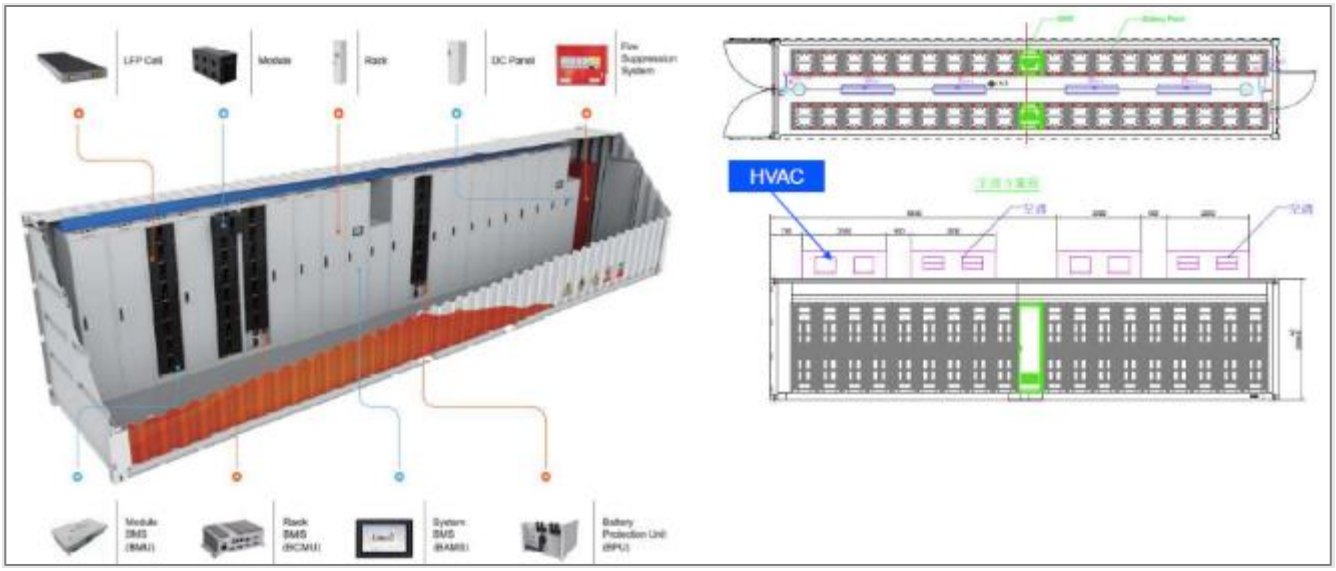


Figure 3: Typical composition of a Lithium-Ion BESS battery container (EGP)

Lithium-ion-based energy storage systems may have cycle durations up to 8 hours. The expected lifetime is related to the cycling Depth of Discharge (DoD). Li-ion batteries' lives are generally limited to less than 80% DoD to ensure an adequate life. Most utility scale applications have an approximate 10-20 year lifetime. Longer lifetimes can be achieved by means of batteries replacement.

The modularity of the Li-ion cells allows them to be constructed as modules and scaled. Battery packs can then be combined with inverters and controls systems and packaged into BESS at manufacturing facilities. When packaged into standard shipping container sizes, shipping the BESS around the world via truck, rail, or ship is greatly facilitated. Containerized BESS can be sited on pads or simple foundations and electrically connected to switchgear. Containerization significantly reduced the costs for local labour and on-site construction.

Figure 4: Typical configuration of Lithium-Ion BESS installed inside containers and blocks (EGP, 2022)

The BESS would be made up of multiple 40ft battery containers or strings of battery blocks, with inverters and transformers spaced between them and 3-5 extra containers for electrical connections and controls.

See image below giving an indicative layout of a BESS for Li-ion technology.

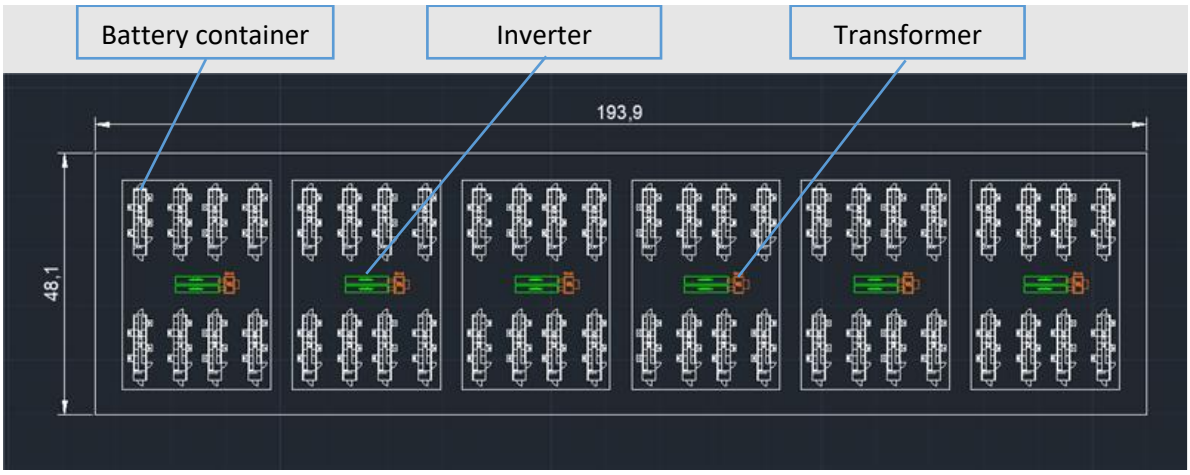


Figure 5: Indicative layout of a Lithium-Ion BESS on a 1 ha site (Enel, 2022)

The greatest maintenance issue for Li-ion batteries is generally the monitoring and replacement of individual cells/modules later in life as replacement can be required. Modularized and packaged systems offer ease of system removal from site for disposal at end of life. Site contamination is unlikely, and site restoration would include infrastructure removal and revegetation. The materials used in Li-ion batteries are typically considered non-hazardous waste. The metals in the system can be recycled, but they do not represent a high salvage value.

Vanadium Redox Flow (VRF)

The VRF is based on redox reactions of different ionic forms of vanadium. During battery charge, V3+ ions are converted to V2+ ions at the negative electrode through the acceptance of electrons. Meanwhile, at the positive electrode, V4+ ions are converted to V5+ ions through the release of electrons. Both of these reactions absorb the electrical energy put into the system and store it chemically. During discharge, the reactions run in the opposite direction, resulting in the release of the chemical energy as electrical energy.

Both electrolytes in the VRF are composed of vanadium ions in an aqueous sulphuric acid solution at very low pH. The acidity of the sulphuric acid is comparable to that of the electrolyte found in lead-acid batteries, with a pH of between 0.1 and 0.5.

The electrodes used in VRF are composed of high-surface area carbon materials. The membrane physically separates the two vanadium-based electrolyte solutions, preventing self-discharge while allowing for the flow of ions to complete the circuit. The vanadium electrolytes are stored in separate large electrolyte tanks outside the cell stack.

The electrolyte tanks and associated pipes, valves etc. must be composed of materials that are resistant to corrosion in the very low pH environment. The cell stack is generally environmentally benign. The only material

in the stack that might be considered toxic is the ion exchange membrane, which is composed of highly acidic (or alkaline) material.

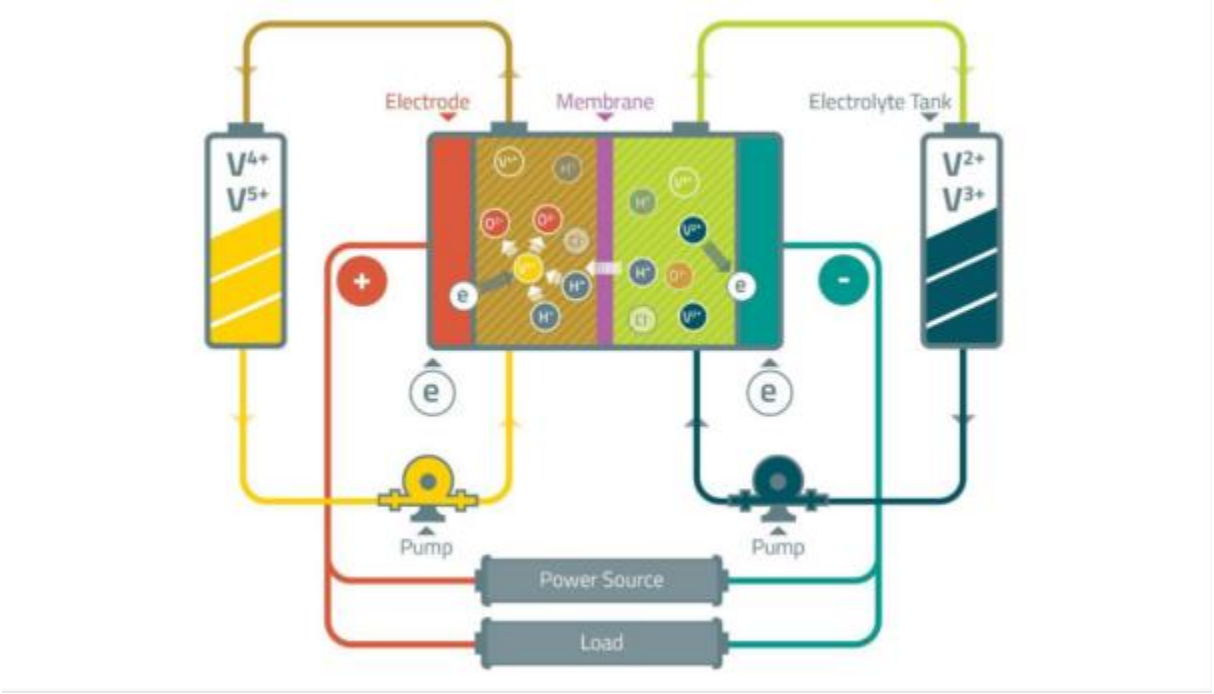


Figure 6: Schematic of Vanadium Redox Flow Battery

The VRF is the most technically mature of the flow-type battery chemistries. The first operational VRF was successfully demonstrated in the late 1980s.

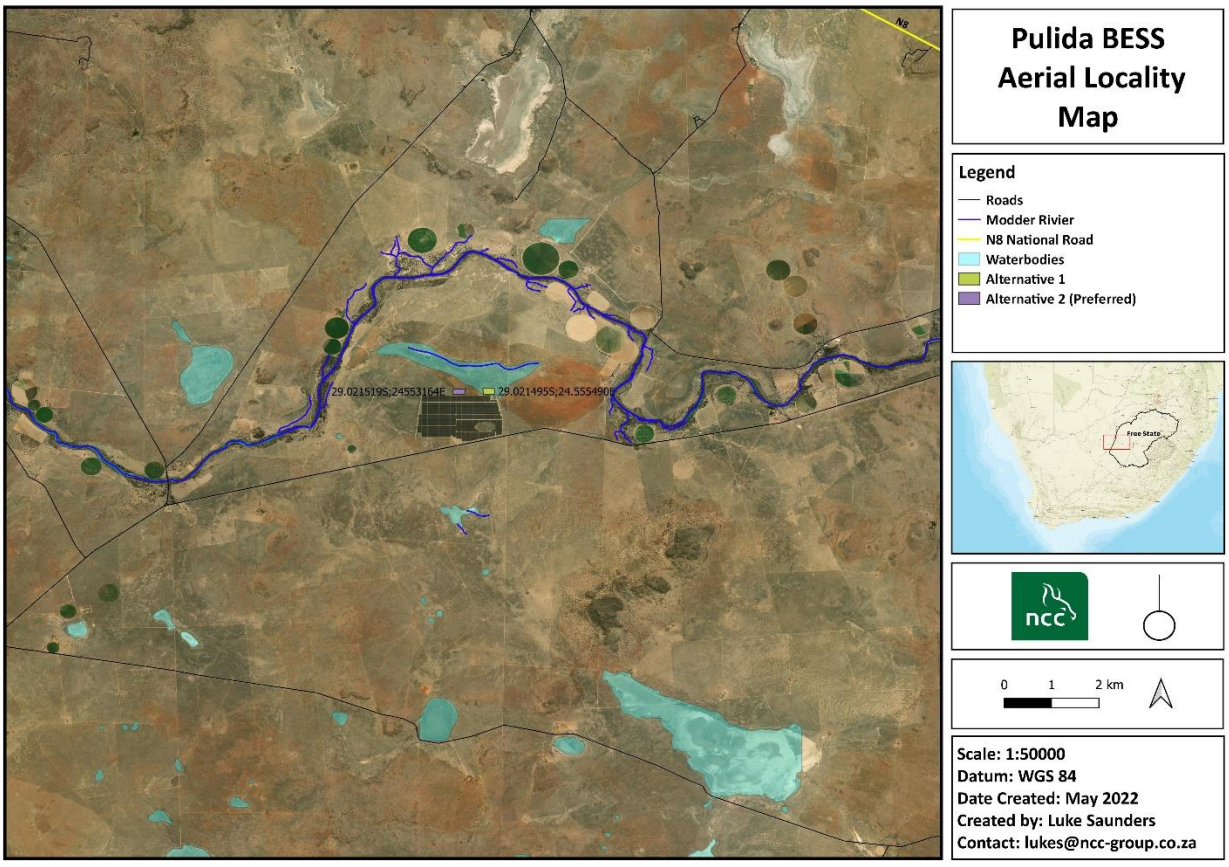
The VRF offers a relatively high cell voltage, which is favourable for higher power and energy density Cross-transport of vanadium ions across the membrane are also reported as a challenge. These membranes can be vulnerable to fouling, wherein vanadium ions become irreversibly trapped in the membrane and increase resistive losses in the cell.

The EA is required for a period of up to **10 years**. The activity would be concluded within a maximum of 2 years from the start of construction. The post monitoring requirements would be finalised within 6-12 months, one month after construction is finalised.

4 PROJECT ALTERNATIVES

4.1 Site alternatives

Description of site alternatives
Two site alternatives were assessed, **Alternative 1** and **Alternative 2**, both are located to the north of the existing Pulida PV facility. Both alternatives are located directly adjacent to the existing facility and in close proximity to the existing substation and transmission line. Both alternatives are located on an agricultural farm. Both alternatives are located at the back of the existing facility out of view of the district gravel road and would be constructed adjacent to the existing PV facility to reduce further impact on the property. The state of the vegetation is degraded, and no red data species occurs, probably as a result of the degraded state. A dry water course is located 120m to the Northeast of the two alternatives. The existing substation is located 600m to the east of both alternatives.



Alternative 1 is located roughly 50m from the existing substation and the BESS and substation is located within the identified watercourse, along with the access road and High Voltage connections potentially impacting upon the identified water course.

Alternative 2 is located roughly 600m from the existing substation and the BESS and substation is located outside of any potential watercourse, with only an access road and High Voltage (HV) connections potentially impacting upon the identified water course.

The state of the vegetation in this vegetation is degraded and no red data species occurs for both sites.

Motivation for the preferred site alternative.

Alternative 2 has been identified as the **Preferred Alternative** site by the EAP with the input of Specialist Reports.

This is due to the entire facility footprint (BESS and substation) not being located within the water course or within a 100m buffer of the watercourse. Associated structures such as the access road and HV connections would be located within water course for both alternatives.

Alternative 1 is located entirely within the watercourse.

The **Alternative 2** is confirmed by the specialist in the Freshwater Assessment report.

See Appendix E1: Freshwater Assessment as the **Preferred Alternative** site.

Both alternatives were identified as impacting on vegetation however the impact would be the same for both **Alternative 1** and **Alternative 2 (Preferred Alternative).**

Both are situated within an area which has been disturbed, both historically and currently.

Alternative 2 is consider the **Preferred Alternative** as the entire facility takes into consideration the existing watercourse and is located outside of the watercourse and the 100m buffer as identified.

Motivation for not considering site alternative/s

Alternative 1 proposed that the entire facility footprint be located in within a dry watercourse therefore is not considered.

4.2 Activity alternatives

Description of preferred activity alternative.
The BESS technology is modular, and the layout is customized depending on specific functional, technical and commercial requirements at the time of system implementation. The BESS would be located in an area no bigger than 4 ha. Final sizing and footprint within the identified area will be defined depending on required applications and selected technology provider. The BESS would have a dedicated HV connection to the grid through its own substation put within the same footprint. The overall BESS facility would be contained within a dedicated security fence to be installed for access restriction measures.
Description of other activity alternatives investigated.
No activity alternatives were considered. BESS is the best suited storage activity for this facility and technology.
Motivation for the preferred activity alternative.
Recent increase in the development of BESS has been driven by a combination of the effects of load shedding coupled with the falling price of Lithium-Ion batteries. The decline in prices of batteries (in this case lithium-ion), as well as their benefits at times of load shedding, have made for a stronger case for the retrofitting of BESS to existing facilities. As a storage system BESS are of interest because of their flexibility of use in many different applications independent of location, in contrast, for example, to pumped hydro storage. A challenge with renewable energy is that resource availability (e.g., the sun) does not always coincide with demand of the customer. This is especially problematic for residential or commercial customers, who are often not allowed to supply their excess PV energy back to the utility (generated when there is more solar supply than demand at their premises). BESSs facilities to save excess energy for later use. BESSs can be charged during low-demand periods at a low cost and sold at a competitive price during high-demand periods. In conclusion no activity alternatives were considered as BESS is regarded as the best suited storage activity for this facility and technology.
Motivation for not considering activity alternatives
No activity alternatives were considered as there is no economically suitable substitute for the battery storage at the facility.

4.3 Technology Alternatives

Description of preferred technology alternative.			
Both Lithium-ion and Redox-flow technology are being considered as the preferred technology alternative for the project, depending on which is most feasible at the time of implementation While Li-ion batteries are dominating the stationary energy storage sector at present different technologies are being developed to be competitive and bring into the market a more competitive energy storage system. This includes the Redox Flow Battery (RFB). The extensive volumetric (Wh/L) and gravimetric (Wh/kg) energy density of Li-ion batteries make this technology well suited to address the EV market. Pushed by the cost decreasing from the EV market, this technology started to also be competitive in the stationary energy storage market, for front-of-meter (FTM), and behind-the-meter (BTM) applications. The capability to address the complete spectrum of the energy storage market is translated in a power range of few kWs for behind-the-meter use, to MWs power output for front-of-meter applications. These properties make Li-ion batteries extremely competitive and difficult to be challenged, although other technologies are starting to appear in the market.			
Description of other technology alternative investigated.			
1.	Lead-Acid Batteries	Lead-acid batteries date from the 19th century and are the most common batteries; they are low-cost and adaptable to numeroususes (e.g., electric vehicles, off-grid power systems, uninterruptible power supplies,etc.). "*Advanced*" lead-acid battery technology adds ultra-capacitors, increasing efficiency, lifetimes and improve partial state of-charge operability	• Poor ability to operate in a partially charged state • Relatively poor depth of discharge and short lifespan • Acid based electrolyte
2.	Sodium batteries	"*High temperature*" / "*liquid-electrolyte-flow*" sodium batteries have high power andenergy density and are designed for large commercial and utility scale projects; "low temperature" batteries are designed for residential and small commercialapplications	• Although mature, inherently higher costs—low temperature batteries currently have a higher cost with lower efficiency • Potential flammability issues for high-temperature batteries • Poor cycling capability
3	Zinc Batteries	Zinc batteries cover a wide range of possibletechnology variations, including metal-air derivatives; they are non-toxic, non- combustible and potentially low-cost due to the abundance of the primary metal; however, this technology remains unproven in widespread commercial deployment	• Currently unproven commercially • Lower efficiency • Poor cycling/rate of charge/discharge
4	Flywheel	Flywheels are mechanical devices that spin at high speeds, storing electricity as rotational energy, which is released by decelerating the flywheel's rotor, releasing quick bursts of energy (i.e., high power and short duration) or releasing energy slowly (i.e., low power and long duration), depending on short-duration or long-duration flywheel technology, respectively	• Relatively low energy capacity • High heat generation • Sensitive to vibrations
5	Pumped Hydro	Pumped hydro storage uses two vertically separated water reservoirs, using low cost electricity to pump water from the lower to the higher reservoir and running as a conventional hydro power plant during high electricity cost periods	• Relatively low energy density • Limited available sites (i.e., water availability required) • Cycling generally limited to once per day

6	Expanding the distribution network	The medium and low voltage networkexpansion can only solve the distributioncapacity limitation and partly the voltageproblems.	• It will not fully solve the power fluctuations and loss • Quick deployment of power supply is not guaranteed • Will not be possible to store the predictable PV & WP generation

Motivation for the preferred technology alternative.

Lithium-ion batteries have historically been used in electronics and advanced transportation industries; they are increasingly replacing lead-acid batteries in many applications, and have relatively high energy density, low self-discharge and high charging efficiency.

Lithium-ion systems designed for energy applications are designed to have a higher efficiency and longer life at slower discharges, while systems designed for power applications are designed to support faster charging and discharging rates, requiring extra capital equipment.

Flow batteries store energy through chemically changing the electrolyte (vanadium) or plating zinc (zinc bromide). Physically, systems typically contain two electrolyte solutions in two separate tanks, circulated through two independent loops, separated by a membrane. Emerging alternatives allow for simpler and less costly designs utilizing a single tank, single loop, and no membrane.

The subcategories of flow batteries are defined by the chemical composition of the electrolyte solution; the most prevalent of such solutions are vanadium and zinc-bromide. Other solutions include zinc-chloride, ferrochrome and zinc chromate.

Both technologies include batteries housed within containers which are fully enclosed and self-contained. It is important to note that while both types are detailed and assessed in this report, no specific technology is proposed as the preferred for authorisation, as both are expected to have similar impacts due to their design and functions being closely related. Therefore, the assessment proposes both technologies for authorisation (i.e., a BESS of either Lithium-Ion or Redox-flow type), to allow the proponent to determine the precise technology when the project is implemented, on the understanding that further investigation into the specific technologies available at the time of being awarded preferred bidder status will allow for one of two to be selected and ultimately developed.

In conclusion:

Given appropriate controls, the impacts associated with the construction, operation, and decommissioning of the facility are anticipated to be similar irrespective of the BESS technology type selected for implementation. Alternatives in terms of technology type are therefore not compared in this Basic Assessment report. The preferred technology would therefore be determined based on technical considerations.

Motivation for not considering technology alternative

Refer to *Description of other technology alternative investigated highlighted in table above in Section 4.3*

4.4 No Go Alternative

The No-go alternative is the option of not constructing the Pulida BESS.

Should this alternative be selected, there would be no direct environmental impacts within the designated BESS footprint. The implementation of the no-go alternative would result in the impossibility to store energy generated from Pulida Solar Energy Facility and other generators in the region and supply additional generated electricity to the national grid at times when the PV is not producing optimally and will, therefore, result in lost opportunity to dispatch additional electricity, and to realise positive environmental impacts.

Based on the outcomes of the specialist studies undertaken (as outlined in this chapter of the report), it can be concluded that limited environmental costs can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures as outlined in the BA report and the EMPr are implemented and adhered to.

These environmental costs could include:

- A loss of biodiversity, flora, and fauna due to the clearing of land approximately 4ha for the construction and utilisation of land for the BESS and associated infrastructure. The ecological assessment predicted the impacts to be low provided that the footprint of the facility is located outside of the identified high sensitivity areas.

These costs are expected at a local level and can be effectively mitigated and managed.

As detailed above, the no-go alternative would result in a number of lost opportunities and would conserve only a minor (~4ha) portion of degraded vegetation and habitat within the broader footprint. The no-go alternative is therefore not considered to have a significant benefit when compared to the implementation of the proposed BESS and is therefore not considered as a preferred alternative and not proposed to be implemented for the development of the facility.

The socio-economic benefits of the proposed development would also be lost should the BESS project not be implemented. Economic benefits could be experienced across the entire value chain (e.g., materials, manufacturing, construction and systems installation, operations and maintenance, and employment. The potential exists for South Africa to fabricate major system components (including electrolyte) for flow batteries. Beyond the direct impact associated with the manufacturing, installation and operation of a BESS economic development would be increased through increased system reliability and the reduced cost of energy.

Environmentally, the no development option assumes the continuation of existing land use, i.e., to maintain the status quo. This would mean no negative environmental impacts such as vegetation loss or the potential

contamination of surface and groundwater. Specifics around the exact contribution of the BESS to the energy network have not been quantified, however both technologies will contribute to a reduced usage of fossil fuel and will support increased renewable energy generation through the smoothing of renewables.

The proposed project is consistent with national and provincial development policy as it provides an opportunity to launch the implementation of the national renewable energy generation programme, with particular reference to solar energy.

The project would make a contribution towards reducing the carbon emissions per unit of electricity generated in South Africa, albeit very small to start with. (GSA, 2012)

The BESS would also aim to contribute to the countries ongoing energy shortage crisis in that it would be able to feed electricity back in the national grid when electricity supply is low.

This is in line with the objectives of the 2011 Integrated Resource Plan for Electricity (2010-2030) to reduce carbon emissions and invest in carbon offset technologies

5 NEED AND DESIRABILITY

Battery Energy Storage Systems (BESS) are devices that enable energy from renewables, like solar and wind, or from any other generator connected to the grid, to be stored and then released when customers/grid operators need most. The role of storage is a key enabler to higher penetration of renewable generation in the energy mix to overcome the fact that wind and sun are unpredictable by nature and, consequently, not fully reliable.

A battery storage system can be charged by electricity generated from renewables for example, and even charging energy from the grid when there is excess, and the cost is lower. The storage of energy makes it available on demand at any time of the day.

Storage systems are fundamental to the renewable energies and the energy transition. They store electricity and make it available also when there is greater need and renewable resources are not available, acting as a balance between supply and demand, and helping stabilize the grid. Moreover, BESS can deliver ancillary services to balance network frequency and voltage during normal network operation and be available as reserves during contingency events, replacing the support that is generally provided by thermal generators.

Everyday engineers operating electricity grids worldwide level must match supply with demand. Managing these peaks and troughs becomes more challenging when the target is to achieve net zero carbon production, by phasing out fossil fuel plants that have traditionally been used as a back-up to provide a reliable, steady energy supply. Storage enables a further renewable generation option, both from an operational and reliability perspective. It's also a key piece of utility customers' ongoing evolution and transition to renewables. It represents a significant opportunity for pairing energy storage with solar/wind projects moving forward all over the world.

More and more grid operators are launching utility scale storage incentive programmes to have energy reserve available when needed for ancillary services, i.e., frequency/voltage regulation.

This approach will not only allow many grid operators in the world to finalize grid corridors upgrades with less concern, but it will also avoid outage of energy supply to many customers at times of highest demand, creating the conditions on having new available energy for the grid and pushing to bring innovation into the Country.[12]

[1] *Concurrence with the ministerial determination on the procurement of new generation capacity from Renewables (Wind and PV), Storage, Gas and Coal technologies By DEPARTMENT OF MINERAL RESOURCES AND ENERGY (DMRE) - No date*
[2] *Consultation Paper Concurrence with the Ministerial Determination on the Procurement of Eskom's 404mw Of New Generation Capacity (Battery Energy Storage Systems And Solar PV) Published On 11 November 2021*

At National level, on 21 February 2020, NERSA received the proposed determination from the Minister in terms of section 34 of the Act, as detailed below.

Determination under section 34(1) of the Electricity Regulation Act, 2006 (Act No. 4 of 2006):

The Minister, in consultation with NERSA, acting under section 34(1) of the Electricity Regulation Act, 2006 (Act No. 4 of 2006) (as amended) (the ERA) and the Electricity Regulations on New Generation Capacity (published as GNR. 399 in Government Gazette No. 34262 dated 4 May 2011 ('the Regulations'), has inter alia determined as follows:

- That new generation capacity needs to be procured to contribute towards energy security, accordingly:
    - 513MW should be procured to be generated from storage, which represents the capacity allocated under the heading 'Storage', for the year 2022, in Table 5 of the Integrated Resource Plan for Electricity 2019 – 2030 (published as GN 1360 of 18 October 2019 in Government Gazette No. 42784 ('IRP 2019').
    - The electricity must be purchased by Eskom Holdings SOC Limited.
    - The electricity must be purchased from Independent Power Producers.

On 6 May 2011, the then Department of Energy (DoE) released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa's forecast energy demand for the 20-year period from 2010 to 2030.

The Integrated Resource Plan (IRP) is a strategic electricity plan for the country to meet the forecast annual peak and energy demand, plus an established reserve margin, through a combination of supply side and demand-side resources over a specified future period. It is developed to ensure security of electricity supply for the country when looking into the future at least cost to the consumer, while ensuring a balance of multiple country policy objectives.

The IRP was updated in 2019 and published on 18 October 2019 and contained the following new generation plan until 2030, as depicted in Table below:

Table 1: The IRP 2019 to 2030 results

	Coal	Coal Decomm	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (DG, CoGen, Biomass, Landfill
Current Balance	37 149		1 860	2 100	2 912	1 474	1 980	300	3 830	499
2019	2 155	-2 373					244	300		Allocation to the extent of the short term capacity and energy gap
2020	1 433	-557				114	300			
2021	1 433	-1 403				300	818			
2022	711	-844			513	400 1 000	1 600			
2023	750	-555				1 000	1 600			500
2024			1 860				1 600		1 000	500
2025						1 000	1 600			500
2026		-1 219					1 600			500
2027	750	-847					1 600		2 000	500
2028		-475				1 000	1 600			500
2029		-1 694			1 575	1 000	1 600			500
2030		-1 050		2 500		1 000	1 600			500
Total Installed by 2030 (MW)	33 364		1 860	4 600	5 000	7 288	17 742	600	6 830	
% Total Installed Capacity (% of MW)	43		2,36	5,84	6,35	10,52	22,53	0,76	8,1	
% Annual Energy Contribution (% of MWh)	58,8		4,5	8,4	1,2	6,3	17,8	0,6	1,3	

	Installed Capacity
	Committed / Already Contracted Capacity
	Capacity Decommissioned
	New Additional Capacity
	Extension of Koeberg Plant Design Life
	Includes Distributed Generation Capacity for own use

Figure 7: New generation plan until 2030

The Integrated Resource Plan (IRP) recognises the fast developments in battery energy storage and in section 5.3.8, it acknowledges that. The IRP model has picked more storage ahead of gas in the period to 2030; storage 2088 MW (513 MW in 2022 and 1575 MW in 2029) is required.

As a portion of the Eskom fleet is reaching its end of life, 5 400MW will be decommissioned by 2022; this will increase to 10 500MW by 2030. Furthermore, the coal fleet's plant performance has declined over the past decade, which has resulted in a loss of security of electricity supply to the country.

The poor performance of the Eskom fleet (currently and in the recent past) combined with the upcoming decommissioning of some of the coal fleet that is reaching its end of life, as well as the environmental commitments that the country has made to reduce greenhouse gas emissions, is resulting in an energy transition within the electricity sector. New capacity is needed to continue to meet the current and future demand. The environmental targets call for cleaner technologies to be included in the energy mix by closing the supply gap and being aligned to the policy position of diversifying energy sources.

This concurrence is aimed at ensuring that, at any given time when looking at the short/medium to long term, the supply–demand balance is maintained. The procured capacity must therefore be built on time, thereby promoting the orderly development of the electricity industry, as well as guaranteeing security of supply. Furthermore, NERSA must assess that the capacity to be procured is still appropriate and aligned to both country imperatives and global best practices.

The IRP 2019 presents an outlook of increased renewable energy share in the South African power system. The shortcomings associated with the renewable energy generation is that it is not dispatchable and it is also variable depending on the resource availability. BESS is required to provide a level of flexibility to the System Operator and provide system security. In addition to energy support, the BESS will be applied for provision of ancillary services to the power system. The BESS's unique capability to operate within milli-seconds of activation dispatch instruction makes it a favourable technology for a grid that has a high RE share.

The following provides details on the impact on the National System that can be anticipated with energy storage:

- 513 MW of energy storage should be procured to be generated from storage to cover short-term variations in electricity generated capacity to meet the demand. The system requirements present an opportunity to diversify the energy mix. The set capacity procured under energy storage will also contribute to ancillary services to ensure that system stability is not compromised.
- The System Operator is encouraged to conduct network studies that are aimed at ensuring that the energy storage technologies can contribute positively to minimise forced outages and partial load losses and can be used as hybrid solution to renewable energy technologies and as reserve requirements.
- The system requires battery storage that can be used as a complementary resource for renewables from IPPs, especially Wind and PV. The System Operator can use the historic profiles from year 2013 to 2019 of all contracted build of REIPP from Bid Window 1 to Bid Window 4, to create a median profile that will determine how much energy can be stored during periods of low demand, to be used later during peak hours.
- The system requires reserves to balance the system when unexpected events occur, such as customer demand fluctuations, changes in the availability of supply capacity, and generation variations from intermittent plant. Therefore, energy storage from the system perspective can play a major role in providing these reserves.

- The energy storage can also help the system from a stability perspective. This would result in a reduced need for demand response that the System Operator normally utilises by reducing certain loads by instruction, thereby increasing Eskom's sales.
- Energy storage has been determined in line with best practices as it will reduce the carbon footprint caused by coalfired power stations.
- Energy storage has been determined in line with best practices, as it can play a major role in the provision of reliable energy generation that the System Operator can dispatch according to the scheduling and dispatch rules. These include:
    - Demand smoothing and energy arbitrage. This concept promotes storing of excess energy produced by renewables to be used later when it is needed most, such as during peak-periods. Energy arbitrage lowers the cost of dumped energy in take-or-pay Power Purchase Agreements and reduces the need to generate more electricity or to use expensive peaking plants like Open Cycle Gas Turbines (OCGTs).
    - Complementing renewables and reducing emissions. In this case, energy storage is used as a solution to store energy from renewable energy sources, such as Wind and Solar power, that are intermittent and variable, so that when the wind is not blowing and the sun is not shining, they can still produce clean energy that has been stored, thus reducing emissions caused by fossil fuels.
    - The above roles of energy storage are the best practices relevant at the time and ensure the mandate of security of supply. It also meets the objective of ensuring the use of diverse energy sources and energy efficiency.
- Energy storage will play a crucial role in enabling the next phase of energy transition due to the expected decommissioning of approximately 24 100 MW of coal power plants in the period beyond 2030, until 2050.
- Storage can bring the following network benefits to the national Grid at different business wires (Generation, Transmission and Distribution).

Over the long-term, the Integrated Resource Plan (IRP 2019) reflects committed and new build options until 2030. Energy Storage will be required in 2022 and 2029 as stipulated on the IRP 2019. The development of new power stations therefore needs to consider a trade-off between three fundamental issues namely (i) security of supply (the country should always have sufficient electricity and primary energy resources as an enabler for economic growth), (ii) environmental concerns (South Africa will pursue low carbon generation options going

forward, to contribute positively to climate change initiatives) and (iii) economic efficiency and cost (electricity infrastructure development and a globally competitive supply chain should be a driver of macro-economic development). The BESS development supports the supply security, environmental sustainability and economic efficiency.

Eskom's integrated report 2020 prioritized strategic initiatives, called "*seven pillars*", which were put in place to enable the utility to achieve sustainability in the current business environment and set up the Eskom of the future.

Under Pillar 5- "*Innovation and transformation to create new revenue sources*", Eskom's strategy is to partner with various role players in battery storage technology to improve dispatchability of variable energy from the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) plants as well as provide alternative solutions of grid support to the distribution-constrained networks.

There is a complementary relationship between Smart Grid systems, energy storage, and non-dispatchable renewable energy technologies based on wind and solar PV. The traditional power delivery model is being disrupted by technological developments related to energy storage, and more renewable energy can be harnessed despite the reality that the timing of its production might be during low-demand periods.

Storage technologies including battery systems, compressed air energy storage, flywheel energy storage, hydrogen fuel cells etc. are developments which can address this issue, especially in the South African context where over 6 GW of renewable energy has been introduced, yet the power system does not have the requisite storage capacity or flexibility.

BESS projects offer several benefits and solutions to some of the challenges which is faced by the energy crisis:

- Reduction in carbon emissions in the country's power generation infrastructure
- Unlocking constrained networks (Reduction in loading/ congestion of upstream High Voltage networks)
- Reducing voltage drops and improve quality of supply
- Deferment or replacement of future capital expansion projects
- Supports mini grids in areas with limited access to bulk power; and
- Peak load reduction - 4 hours of battery storage increases dispatch time (thereby extending baseload and offset carbon emissions).

The BESS project has the potential to reduce carbon emissions in South Africa's power generating infrastructure and can be achieved in two ways:

a) By reducing the reliance on fossil fuel powered peaking plants that are used to managed variability on the power from renewable energy installations, and

b) By storing excess power generated by renewable energy projects when demand is low, but wind (for example, is high) and feeding this back into the grid when demand is high and power generation from renewables is low.

The use of batteries is preferred as a greener energy alternative to fossil-fuel plants to reduce carbon dioxide emissions. A further advantage is that a BESS can respond in milliseconds to increased grid demand, which can usually take up to a few hours to ramp up if fossil fuel plants are used.

Retrofitting a BESS to an existing renewable/cleaner energy further enhances the desires of the National Deployment Plan (NDP) in its efforts in ensuring South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution.

The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development

Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation (Act No. 4) of 2006. The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity. Besides capacity additions, a number of assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs.

From an overall environmental sensitivity and planning perspective, the proposed BESS facility supports the broader strategic context of the municipality as it would be an integral part of an existing renewable energy facility.

It is also in line with broader societal needs and the public interest as it is linked to a renewable energy facility (Pulida Solar Park Energy Facility), for which there is national policy and support.

Energy storage technologies could achieve other socio-economic objectives. These include:

I. use of local content through, inter alia, increased local manufacturing and installation;

II. fostering rural development and involving communities;

III. enterprise development through the promotion of small businesses packages for new entrants; and

IV. socio-economic development and participation by historically disadvantaged citizens and marginalised regions in the mainstream of the industry economy.

No exceedance of social, ecological, heritage or avifaunal limits would result from the construction of the proposed BESS, and no significant disturbance of biological diversity is anticipated, as detailed in this Basic Assessment Report.

The project would not compromise IDP objectives but will assist in reaching these objectives as the IDP of the municipality aims to ensure that the quality of life of the Letsemeng Local Municipality and the Xhariep District Municipality community through purposeful and quality service, and the effective and optimal utilisation of resources is achieved. This project would assist in supporting the local and national electricity supply through its contribution to the National Eskom Grid as the BESS facility is directly linked to the same substation of Pulida Solar Park Energy Facility. Moreover, the BESS will allow energy generated by the authorised PV Facility as well as energy from other generators in the region to be stored and released in response to electricity demand, thus ensuring an extended energy supply window. The project would further assist in minor local job creation which will further help achieve IDP objectives and inject money into the local and regional economy.

Table 8: The Guideline on the Need and Desirability's list of questions to determine the "*Need and Desirability*" of a proposed project

QUESTION	RESPONSE
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area)?	
How were the following ecological integrity considerations taken into account? 1.1.1. Threatened Ecosystems 1.1.2. Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure 1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs") 1.1.4. Conservation targets 1.1.5. Ecological drivers of the ecosystem	Specialists have utilised national and international standards and recommendations and relevant guidelines in terms of South African law in their respective reports. These reports accompany the Final BAR as Appendix E. Threatened ecosystems, sensitive habitats, etc are indicated in the respective specialist studies and maps, if any.

1.1.6. Environmental Management Framework 1.1.7. Spatial Development Framework, and 1.1.8. Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	
1.2. How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The EAP has indicated the recommendations and mandatory requirements for inclusion before any decision could be taken by the competent authority in the draft BAR. Refer to Section 4 Project Alternatives, Section 8 Environmental Management Programme and Appendices E1 (Freshwater), E2 (Ecological) and E3 (Heritage).
1.3. How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Mitigation measures are provided in the EMPr and these consider the findings by the specialists.
1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether; what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	The waste to be generated will be construction related waste, and domestic waste during the operation. Waste management measures and other related waste activities have been included in this final BAR and managed within the EMPr.
1.5. How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	A heritage specialist report provided their opinion on the proposed development in which they indicated that no heritage resources will be impacted upon. Refer to Appendix E3
1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non- renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	A wetland, ecological and heritage assessment are appended to the DFAR. The BESS facility itself will will not impact on any watercourse, however, the OHL and access road will be located within the outer edges of a watercourse. The significance of the ecological aspects on the site is low. Two alternatives were explored and assessed which resulted in a preferred alternative. See Section 4, *Project Alternatives.*

1.7. How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life) 1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources of the proposed development alternative?) 1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	The proposed project will strive to not only supply renewable energy to support the green economy but should itself be developed in a 'green' and sustainable way. The facility will form part of a renewable energy programme which aims to reduce reliance on non-renewable natural resources.
1.8 How were a risk-averse and cautious approach applied in terms of ecological impacts? 1.8.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 1.8.2 What is the level of risk associated with the limits of current knowledge? 1.8.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Each specialist has indicated their assumptions and limitations for performing their respective specialist studies. These are contained in Section 11.5 and under Appendix E.
1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following: 1.9.1. Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if	An impact assessment and input from specialist studies has been added to this Final BAR.

avoidance is not possible, to minimise, manage and remedy negative impacts? 1.9.2. Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	
1.10. Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Refer to Section 5 *Needs and Desirability*.
1.11. Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	An impact assessment and input from specialist studies has been added to this Final BAR under Section 10. Environmental aspects had low to medium negative significance which included aquatics, fauna, flora, wetlands, while positive social and economic impacts are anticipated. Please refer to Section 10.
1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	The specialists utilised the best practice and recommendations in their specialist studies respectively. Note that the proposed development footprint devised for all alternatives assessed have been equally conscientious in terms of avoiding identified sensitive areas and that the impact significance would be similarly low for all alternatives.
1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Refer to Section 9.4 which highlights some of the Cumulative Impacts anticipated as per the specialist studies contained under Appendix E. More cumulative impacts are found in this appendix under each specialist study respectively.
2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	
2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,	Refer to Section 2 which elaborates on the projects role in the context of a policy and planning context.
2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.)	Refer to Section 2 which elaborates on the projects role in the context of a policy and planning context.
2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.)	The location factors favour this land use for a number of reasons e.g.: • The size of the land is appropriate in that it is large enough for the type of development proposed. • The energy grid network will be enhanced. • The area will contribute with the positive economic and social impacts. • No cultural landscapes are within the study site. Please refer to Section 2 for more details.

2.1.4. Municipal Economic Development Strategy ("LED Strategy").	Refer to Section 2 which elaborates on the projects role in the context of a policy and planning context.
2.2. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programmes? 2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities? 2.4. Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	Refer to Section 2 which elaborates on the projects role in the context of a policy and planning context.
2.5. In terms of location, describe how the placement of the proposed development will:	
2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other	There are employment opportunities created in areas which would benefit from such opportunity and economic upliftment.
2.5.2. reduce the need for transport of people and goods	The proposed project would reduce the need for transporting people and goods through requiring employment of local labour and goods as far as possible.. The project does not give access to public transport, but it is not a public transport project. 2.5.6 N/A 2.5.7 existing access roads and transport networks, existing electrical infrastructure, etc are available.
2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport)	
2.5.4. compliment other uses in the area	
2.5.5. be in line with the planning for the area	
2.5.6. for urban related development make use of underutilised land available with the urban edge	
2.5.7. optimise the use of existing resources and infrastructure	
2.5.8. opportunity costs in terms of bulk infrastructure expansions in non- priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement)	The project does not relate to bulk infrastructure provision; however, you can note that it would improve supply of green energy/electricity.
2.5.9. discourage "urban sprawl" and contribute to compaction/ densification	The Project does not contribute to urban sprawl, but the site was selected to make use of land that has limited agricultural viability and no conservation value
2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs	
2.5.11. encourage environmentally sustainable land development practices and processes	The project supports sustainable development because it is a renewable energy project. Also, other aspects of sustainable development are reflected in the EMPr.

2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.)	The site is best suited as it is located directly adjacent to an existing solar PV facility which the BESS will be an extension of.
2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential)	The project is not an income generating project for the local area but will assist in terms of income generation at a national level.
2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area	The project site location was selected due an existing PV facility. The BESS project is a retrofitting to the existing facility in order to create storage capacity to feed into the national grid. No heritage resources of importance were identified.
2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	This aspect is not relevant for this proposed project. Only integrated settlement is that local labour and skills can be used, as far as possible.
2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	
2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Assumptions and Limitations are highlighted in Section 11.5 of this BAR, while each specialist had to comply with the EIA Regulations, 2014 (as amended) to include their respective assumptions. Please refer to Appendix E. The risk averse approach was followed by the EAP and specialists.
2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	
2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
2.7. How will the socio-economic impacts resulting from this development impact on people's environmental rights in terms following:	
2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Various ecological specialist studies were undertaken to assess the area, the site is deemed to be of low to medium significance. The property is largely degraded due to anthropological influences such as farming and PV facility. The proposed project is intended to deliver on a much larger scale than at a local level. The project is in support of a national programme to rectify the countries energy crisis. The BESS project is a retrofitting to much larger PV facility which is consistent with national and provincial development policy as reflected in the extracts of policy documents which were reviewed during the EIA process conducted for the PV and provided in the accompanying specialist report. (GSA, 2012)
2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	
2.8. Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.9. What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	

2.10. What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	
2.11. What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	
2.12. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	All specialist mitigation measures have been included in the EMPr for all phases of development.
2.13. What measures were taken to:	
2.13.1. ensure the participation of all interested and affected parties	Public Participation had been undertaken in terms of legislated requirements, and further pre-application distribution of a BID was provided. Please refer to Section F of this BAR.
2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation	
2.13.3. ensure participation by vulnerable and disadvantaged persons	
2.13.4. promote community well-being and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means	The EMPr contains an environmental education component for workers, and the EMPr (and socio-economic report) indicate the requirement for use of local labour and materials where possible.
2.13.5. ensure openness and transparency, and access to information in terms of the process	All documents would be made available in full to I&APs can indicate the manner in which they'd like to receive the information. Please refer to Section 7 of this BAR.
2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge	The EIA process has, thus far, taken cognisance of all interests, needs and values adopted by all interested and affected parties via the socio-economic impact assessment (and incorporation of the associated recommendations in the EMPr) and also through the PPP process, noting that this report is currently under a 30-day public review period.
2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein was promoted.	Public participation of all I&APs has been promoted and opportunities for engagement have been provided during the EIA process.

2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	The BESS project is considered a project of national importance. Local companies, labour and employment will be utilized as far as possible.

6 DESCRIPTION OF THE RECEIVING ENVIRONMENT

6.1 Location

The proposed site is located on the Remainder of the Farm Klipdrift 20, Jacobsdal Registration Division, 2256.1868 hectares in extent (Letsemeng Local Municipality, Xhariep District Municipality, Free State Province) for the establishment of a retrofitted BESS to associated to the existing solar energy facility with associated infrastructure and structures.

Table 9: Property Details

Property Details		
GPS co-ordinates	29° 2'15.12"S	24°55'31.14"E
District Municipality	Xhariep District Municipality	
Local Municipality	Letsemeng Local Municipality	
Ward	3(41601003) / 7 (41601007)	
SG	F01800000000002000000	

The Letsemeng Local Municipality is situated in the south-western part of the Free State province. Its geographical area is approximately 10 192 km², which makes up 29,8% of the total Xhariep District Municipality geographical area. The five towns within Letsemeng Local Municipality are Koffiefontein, where the municipality head office is situated, Jacobsdal, Luckhoff, Oppermansgronde and Petrusburg.

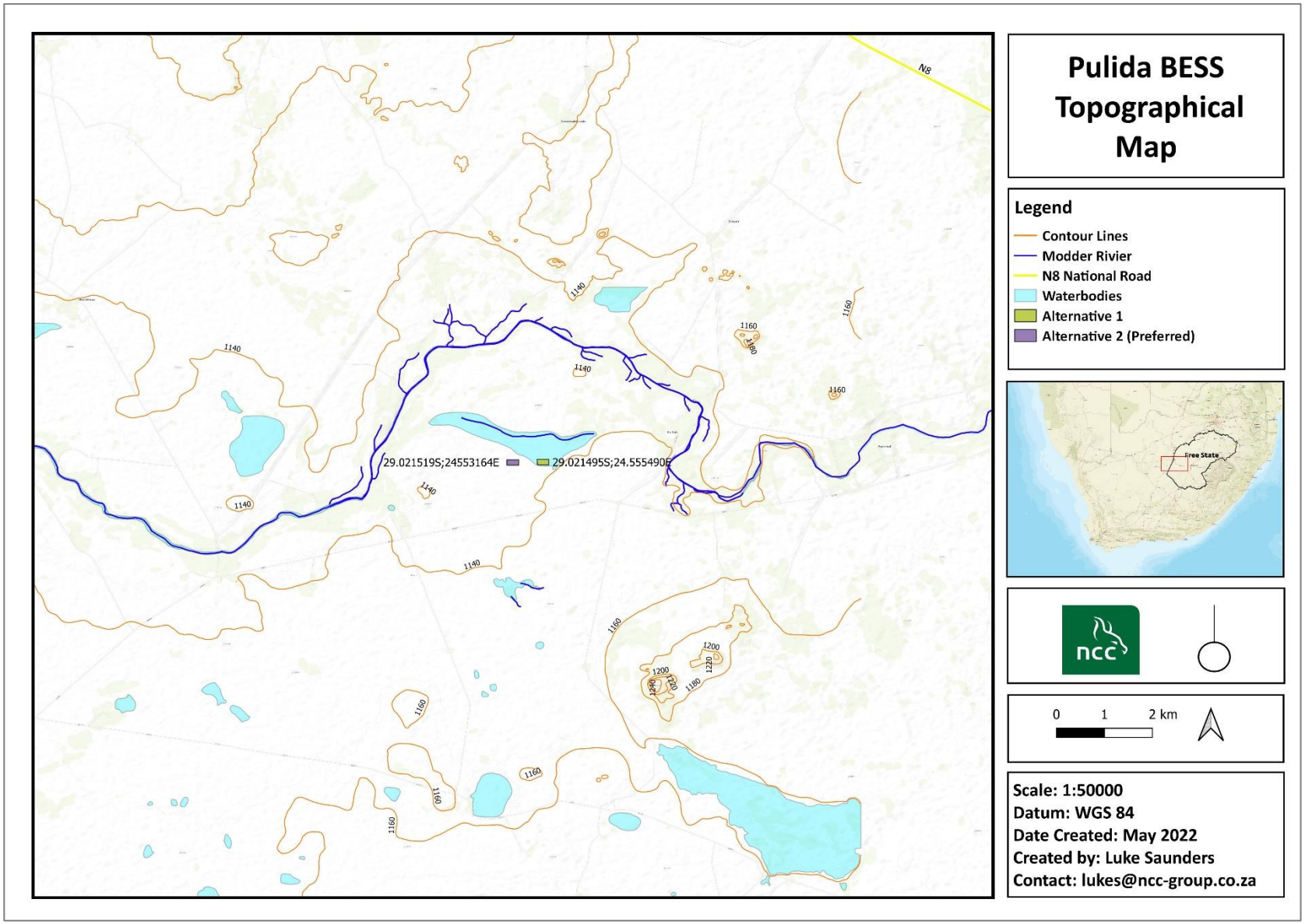


Figure 8: Site Locality Map (Overall project view – relevant section to the north)

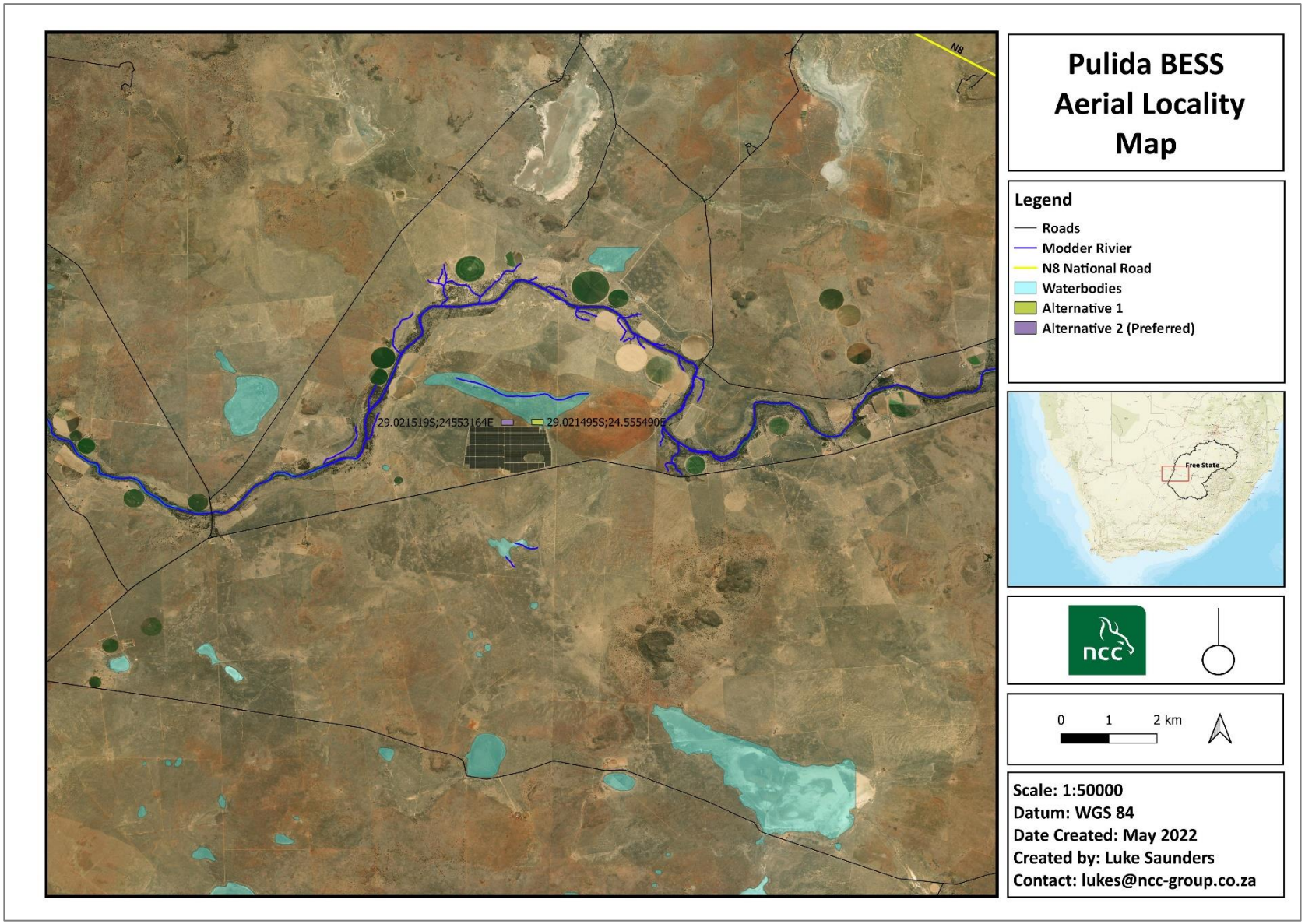


Figure 9: Site Locality Map (Aerial Photograph)

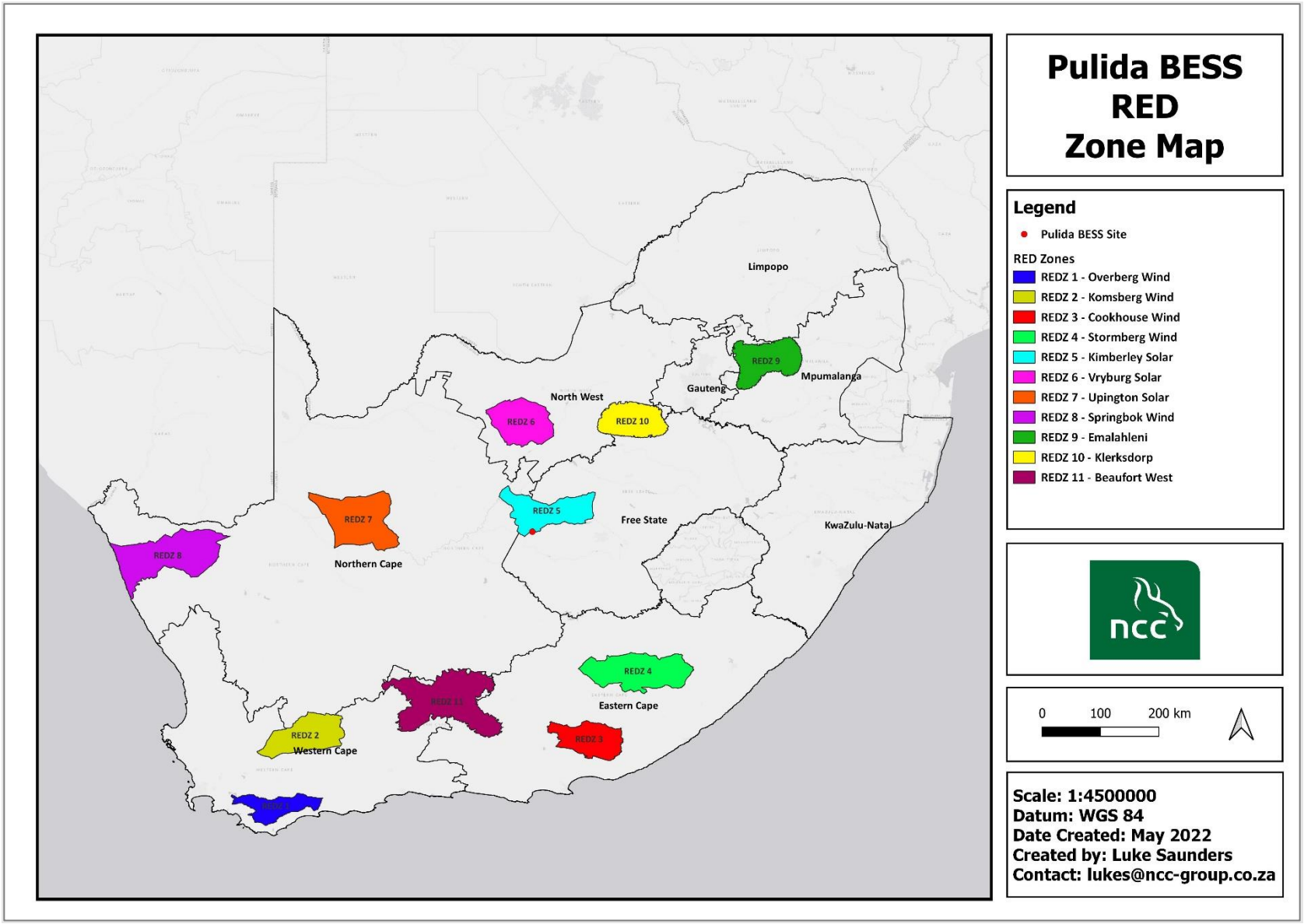


Figure 10: Renewable Energy Development Zones

6.2 Proposed site and surrounds

The proposed project is located on the same property to the Pulida Solar Park a photovoltaic (PV) facility with a maximum generating capacity of up to 75 MW.

The footprint (fenced area) of the Solar Park development is up to 200 hectares on an overall area measuring 220 hectares (lease portion), within the Remainder Portion of the Farm Klipdrift 20.

The entire facility (BESS and Substation) is envisaged to be 4ha in size and is located directly adjacent to the existing facility as illustrated in Figure 9.

Table 10: GPS positions of BESS Facility (Option A Substation-to-Substation Overhead line)

Activity – BESS Facility		
Point	**Latitude (S)**	**Longitude (E)**
A	29° 2'13.13"S	24°55'24.26"E
B	29° 2'13.16"S	24°55'33.29"E
C	29° 2'16.64"S	24°55'33.30"E
D	29° 2'16.66"S	24°55'24.35"E

Table 11: GPS positions of substation (Option A Substation-to-Substation Overhead line)

Activity – BESS Substation		
Point	**Latitude (S)**	**Longitude (E)**
A	29° 2'13.21"S	24°55'33.88"E
B	29° 2'13.25"S	24°55'35.97"E
C	29° 2'14.74"S	24°55'35.95"E
D	29° 2'14.70"S	24°55'33.86"E

Table 12: GPS positions of BESS Facility (Option B: Loop In & Loop Out Overhead line)

Activity – BESS Facility		
Point	**Latitude (S)**	**Longitude (E)**
A	29° 2'13.29"S	24°55'24.21"E
B	29° 2'13.22"S	24°55'31.91"E
C	29° 2'14.88"S	24°55'31.99"E
D	29° 2'14.83"S	24°55'35.05"E
E	29° 2'16.51"S	24°55'35.02"E
F	29° 2'16.51"S	24°55'24.26"E

Table 13: GPS positions of substation (Option B: Loop In & Loop Out Overhead line)

Activity – BESS Substation		
Point	**Latitude (S)**	**Longitude (E)**
A	29° 2'13.22"S	24°55'31.94"E
B	29° 2'13.19"S	24°55'36.04"E
C	29° 2'14.74"S	24°55'36.01"E
D	29° 2'14.76"S	24°55'32.02"E

Table 14: GPS positions linear structures – Access Road

Activity – Access Road		
Point	**Latitude (S)**	**Longitude (E)**
Start	29° 2'19.13"S	24°56'1.72"E
Middle	29° 2'16.93"S	24°55'49.80"E
Finish	29° 2'16.35"S	24°55'35.60"

Table 15: GPS positions linear structures – Overhead Lines (Option A: Substation to Substation)

Activity – Overhead Lines		
Point	**Latitude (S)**	**Longitude (E)**
Start	29° 2’18.86”S	24°55’59.58”E
Middle	29° 2’15.01”S	24°55’49.81”E
Finish	29° 2’14.19”S	24°55’35.99"E

Table 16: GPS positions linear structures – Overhead Lines (Option B: Loop In & Loop Out)

Activity –Loop In & Loop Out Overhead Lines		
Point	**Latitude (S)**	**Longitude (E)**
Start (BESS Substation)	29° 2'13.83"S	24°55'36.05"
Middle	29° 2'13.73"S	24°55'48.51"E
Finish (Existing Line)	29° 2'13.70"S	24°56'1.10"E

Co-ordinates provided above are for that of the preferred alternative location.

Co-ordinates provided above are for that of the preferred alternative location.

Two grid connection options have been explored, option A (connection from the BESS Substation to the existing HV substation) and option B (connection from the BESS Substation to the loop in and loop out to the existing HV connection line)..

The Modder River is located approximately 2.6km to the north, 3km to the west, and 2.6km to the east.

To the immediate south is the Pulida Solar Park followed by a rural gravel access road approximately 1.2km in distance. An existing 132kV transmission line servicing the current facility is to the east of the proposed site.

The site property and surrounding properties are utilized for agricultural purposes.

Access to the site is via rural gravel roads coming from the N8, which is roughly 14km to the north as the crow flies.

Photo 1: Rural Road leading to the existing PV facility and proposed BESS facility

Photo 2: View facing west towards the existing PV facility from the proposed site location

Photo 3: View facing east from the proposed site location

Photo 4: View facing west

Photo 5: View facing North

6.3 Topography

The topography of the terrain is flat with a maximum slope of approximately 5% and an average slope of around 1.5%.

6.4 Geology

The site is underlain by quaternary calcrete overlying Karoo shale of the Prins Albert Formation and in the south a dolerite sill represents the local topographical high The Prince Albert Formation consists of mainly black mica rich shale and subordinate sandstone and mudstone.

In invading the Karoo strata, the dolerite sills have almost without exception selected the weaker, predominantly argillaceous horizons along which to intrude and generally represent positive erosion features.

The surface calcrete (Qc) occurs as discontinuous layers and concretions and are associated with mudstone, shale tillite, dolerite and dolomite. The calcrete is generally associated with low relief and depressions in the landscape. Three types of calcretes are represented in the area.

- Hardpan calcrete
- Nodular Calcrete and
- Cliff Calcrete

According to the classification presented by Weinert (1980) where the N value is above 10, disintegration is the major contributor to weathering. Disintegration is the process whereby the rock breaks down to progressively smaller sizes until eventually the individual minerals becomes separated. The end-product is usually a gravely sand composed of the unaltered primary minerals

6.5 Climate

Kimberley normally receives about 380 mm of rain per year, with most rainfall occurring mainly during summer. It receives the lowest rainfall (0 mm) in July and the highest (59 mm) in March. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Kimberley range from 18°C in June to 32°C in January. The region is the coldest during July when the mercury drops to 0.3°C on average during the night.

Letsemeng falls in the rainfall area of between 350 mm and 500 mm mean annual rainfall. Temperatures are extremely, and the area experiences hot mid-summer conditions and very cold winters. (www.letsemeng.fs.gov.za)

6.6 Freshwater Resources

The proposed BESS falls within the Orange Water Management Area (6) based on the 2012 Water Management Areas by the Department of Water and Sanitation and is represented by quaternary catchment C52L.

The Modder River runs to the West (2.6km), North (2.7km) and East (3.4km) of the facility.

A dry watercourse/pan is located to the north of the proposed BESS site.

The datasets reflect the feature and label it a ‘depression wetland’ which is based on the National Wetland Map Layer version 5 (NWM5).

Photo 6: The Modder River

Photo 7: Location of dry water course

6.7 Terrestrial Ecology

The development site lies within the Nama Karoo biome which occurs on the central plateau and western half of South Africa, at altitudes between 500 and 2000 m, with most of the biome. The dominant vegetation is a grassy, dwarf shrubland. Grasses tend to be more common in depressions and on sandy soils, and less abundant on clayey soils. The geology underlying the biome is varied, as the distribution of the biome is determined primarily by rainfall. This also determines the predominant soil type with over 80% of the area covered by lime-rich weakly developed soil over rock (Low & Rebelo, 1996). The most recent classification of the area by Mucina & Rutherford (2006) shows that the site is classified as Northern Upper Karoo.

The vegetation features of this vegetation type are shrubland dominated by dwarf Karoo shrubs, grasses, and *Acacia mellifera* subsp. *detinens* and some other low trees. Landscape features include flat to gently sloping, with isolated hills of Vaalbos Rocky Shrubland and many interspersed pans. The conservation status of the Northern Upper Karoo is Least Threatened with none conserved in statutory reserves and 4% transformed for cultivation (Mucina & Rutherford, 2006). The pans on the proposed development site represent the Highveld Salt Pans vegetation type on site. These pans represent depressions containing temporary water bodies. On the pan edges open to sparse dwarf shrubland may develop, especially when under heavy grazing pressure.

6.8 Socio-Economic

The Letsemeng Local Municipality is situated in the south-western Free State and forms parts of the Xhariep district. It has a surface area of 10 192 square kilometres, which is 29, 8% of the total Xhariep surface area. According to Community Survey 2016, Letsemeng Local Municipality has a total population of 40 044, of whom 66% are black African, 21% are coloured and 12% are white. (*Community Survey, 2016)*

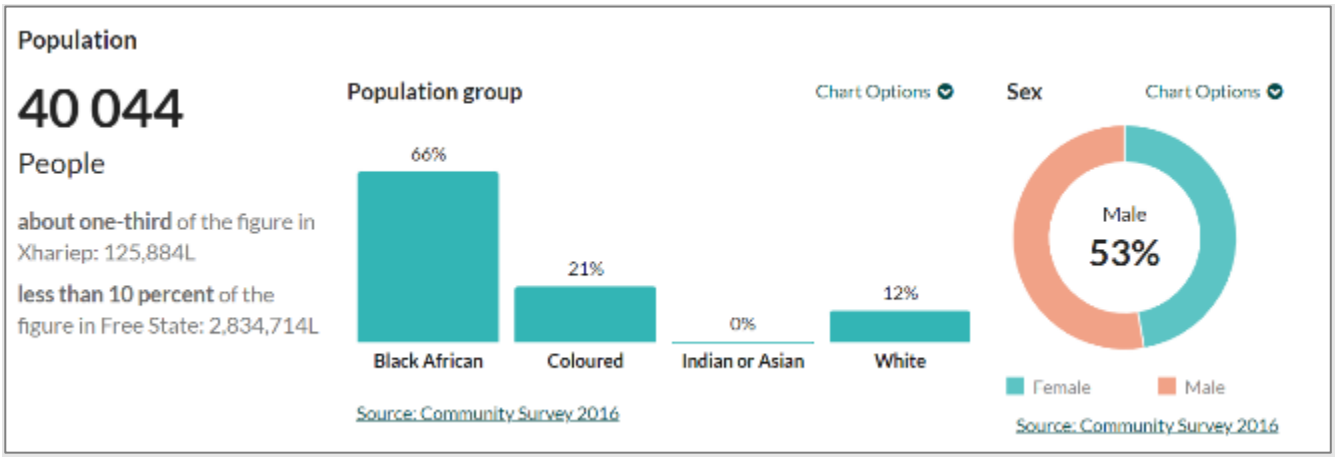


Figure 11: Population breakdown *(Community Survey, 2016)*

The population is largely Afrikaans and represents 70% of the population, 27% is made up of Setswana, Sesotho and IsiXhosa. English makes up 2%.

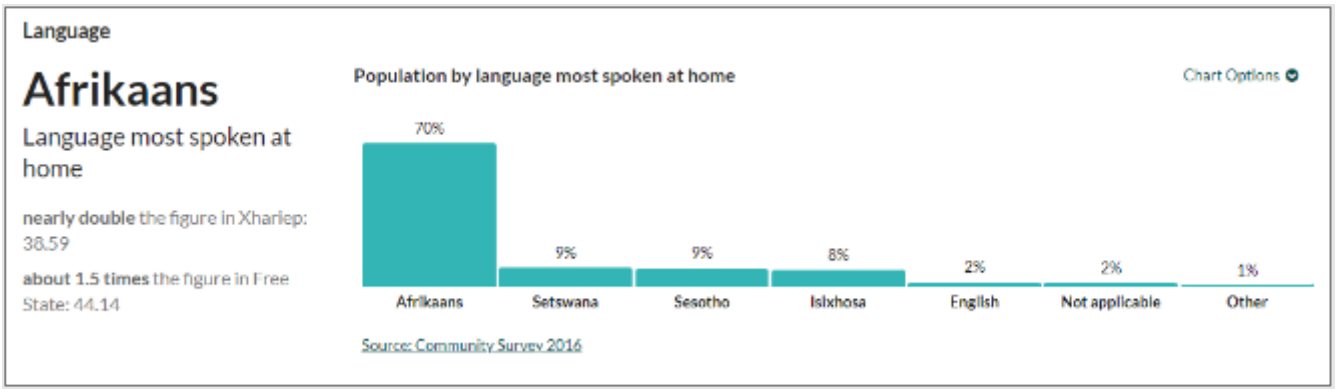


Figure 12: Language breakdown (*Community Survey, 2016)*

The area has a low employment rate of 36.6% which are actively largely in the formal sector.

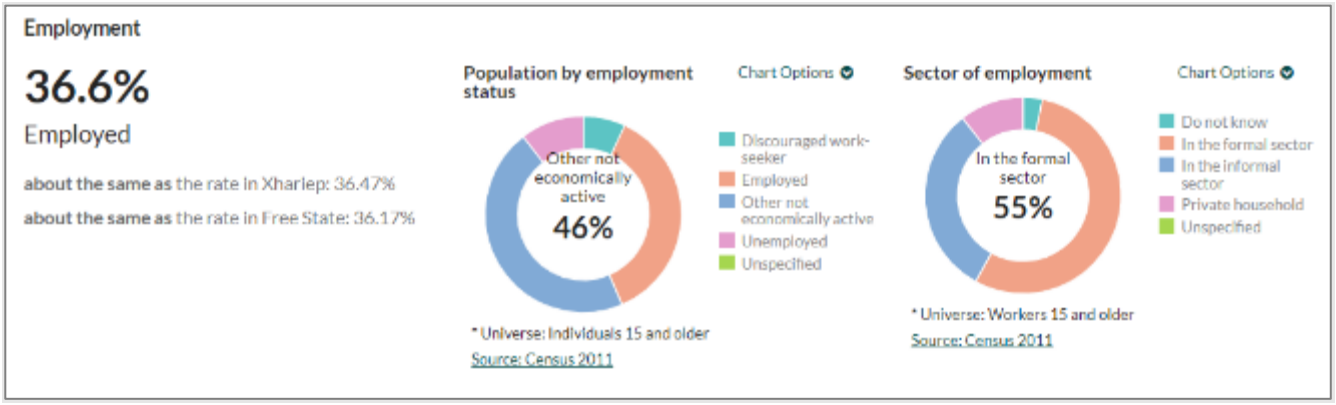


Figure 13: Employment breakdown *(Census, 2011)*

The annual average income is R15000 which is half that of the average annual income of the Free State province.

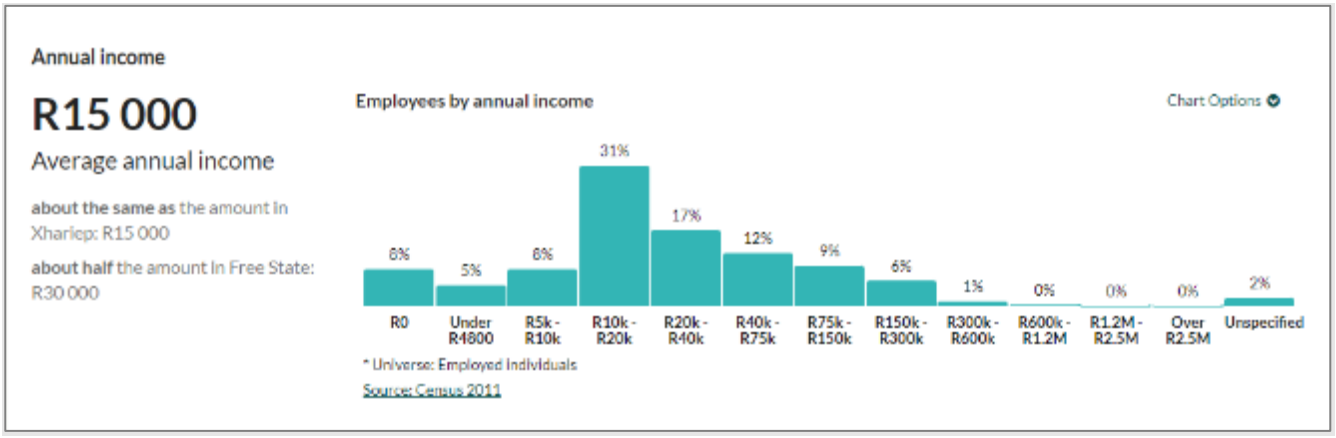


Figure 14: Breakdown of income *(Census, 2011)*

7 PUBLIC PARTICIPATION PROCESS

7.1 Description of the Process Undertaken

In undertaking an Environmental Impact Assessment (EIA), which is undertaken in terms of the National Environmental Management Act (NEMA), Act No. 107 of 1998, as amended, a formal ***public participation process*** **(PPP)** is undertaken as detailed in Regulation 39-44 of the EIA Regulations, 2014 (as amended).

As prescribed in the EIA Regulation's in Regulation 40 of Chapter 6, the purpose of public participation in relation to a basic assessment *report must give all potential or registered interested and affected parties, including the competent authority, a period of at least 30 days to submit comments on each of the basic assessment report, EMPr, scoping report and environmental impact assessment report, and where applicable the closure plan, as well as the report contemplated in regulation 32, if such reports or plans are submitted at different times.*

It goes on further to state:

The public participation process contemplated in this regulation must provide access to all information that reasonably has or may have the potential to influence any decision about an application unless access to that information is protected by law and must include consultation with—

(a) The competent authority.
(b) Every State department that administers a law relating to a matter affecting the environment relevant to an application for an environmental authorisation.
(c) All organs of state which have jurisdiction in respect of the activity to which the application relates; and
(d) All potential, or, where relevant, registered interested and affected parties (I&APs).

The aim of the public participation process is primarily to ensure that:

- Information containing all relevant facts in respect of the project is made available to potential stakeholders and I&APs.
- Participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the project.
- Comments received from stakeholders and I&APs are recorded and incorporated into the basic assessment report.

Therefore, various stakeholders (Government entities) have been identified and informed, whilst potential I&APs were notified of the project through various platforms, refer to Section 7.3.

All I&APs were provided with the opportunity to register and provide comment on the application and associated documents.

Two 30-day commenting periods were conducted during the statutory phase (After application submission). An initial statutory period followed by an additional 30-day period which provided I&AP further time to review and comment on the Draft Basic Assessment Report.

I&APs are afforded the opportunity to register and provide comment throughout the commenting period.

The commenting periods included:

- **Initial Commenting Period:** 24th June 2022 to 25th July 2022
- **Additional Commenting Period:** 26th July 2022 to 26th August 2022

Proof of all PPP efforts are be included with this report. After the commenting period a Comments & Response Report was compiled and is included as part of the final submission as Appendix G6.

7.2 Identified Interested and Affected Parties (I&APs)

Identification of I&APs was undertaken by NCC through existing contacts and databases, recording responses to site notices and newspaper advertisements, as well as through the process of networking. The key stakeholder groups identified include authorities, the metropolitan municipality, organs of state departments, state- owned companies and non-governmental organisations.

The following I&APs were identified:

Organs of State
National Government Departments
• Department of Agriculture, Forestry and Fisheries (DAFF)
• Department of Water and Sanitation (DWS)
• Department of Mineral Resources and Energy (DMRE)
• Government Bodies and State-Owned Companies
• South African Heritage Resources Agency (SAHRA)
Provincial Government Departments
• Free State Department of Agriculture and Rural Development
• Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs
Local Government Departments
• Letsemeng Local Municipality
• Xhariep District Municipality
Other Stakeholders
• Affected landowners and tenants
• Ward Councilor (Ward 7)
• Eskom SOC Limited
• NERSA

7.3 Notifications

To accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their comments regarding the proposed BESS project, various opportunities for stakeholders and I&APs to be involved in the process have been provided, as follows:

- Opportunity to register as an I&AP and review of the draft Basic Assessment Report for a 30-day period. Comments received from I&APs during this period are captured within a Comments and Response Report, which is included within the Final BAR, for submission to the DFFE for final decision.
- Initial Commenting period ran form the 23rd of June to 25th July 2022.
- Additional Commenting period 26th July 2022 to 26th August 2022

I&APs were notified in writing by means of the following:

- Emails
- Bulk SMS
- Advertisement in the *Noordkaap Bulletin* newspaper
- Site notices (Section 7.3.3) placed up at the site

I&APs could obtain the Draft BAR and associated documents from the following:

- www.ncc-group.co.za
- Pulida Solar Park Security Office

Notifications were compiled in accordance with the guidelines provided by in NEMA: EIA Regulations.

In addition, a Background Information Document (**BID**) was provided along with the notification in certain cases.

Background Information Document (BID) & Notifications Letter

A BID and Notification letter was sent to all pre-identified I&APs highlighting the various avenues to register and provide comment. A copy was supplied to the local Communications Liaison Officer (CLO) and/or ward councillors where the residents will be able to review, register, and provide comment.

A copy of the written notice was sent via email to the ***relevant organs of state and other potential I&APs***.

Newspaper Advertisement

An advert was be published in ***Noordkaap Bulletin*** on the 23rd June 2022 informing the public of the opportunity to register and provide comment for proposed project. A tear out of the advert is included under Appendix G2.

Site Notice

Site notices was placed at the entrance to the Pulida Solar Park facility.

Figure 15: Notice placed at access gate leading to the proposed site.

7.4 Registration & Commenting Period

The draft Basic Assessment Report was made available for comment to all registered interested and affected parties and relevant organs of state for two periods of 30 days:

- Registration and Commenting period were initially from 23rd June to 25th July and additional between 26th July to 26th August 2022.
- Any comments received from I&AP's during these periods were considered and incorporated into the Final Basic Assessment Report through a Comments & Response Report before final submission to the DFFE.

7.5 Summary of Issues Raised by I&APs

All comments, if received, are responded in a Comments and Response Report.

A Comments and Response Summary is attached as Appendix G6 with the submission of the Final BAR.

8 ENVIRONMENTAL MANAGEMENT PROGRAMME

The Environmental Management Programme (EMPr) indicates the roles and responsibilities of all parties involved during all phases of the development. This legally binding document will provide recommendations for the implementation of avoidance strategies (where possible) and mitigation and management measures (if required) to ensure that the project retains an acceptable environmental impact and considers all highly sensitive features located within the project site.

As the applicant has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is required to be recommended. Assessment of impacts with mitigation are made to demonstrate the effectiveness of the proposed mitigation measures.

Refer to **Appendix F** for the complete standalone Environmental Management Programme (EMPr).

9 METHODOLOGY AND ASSESSMENT OF ALTERNATIVES

9.1 Methodology to determine the significance ratings of the potential environmental impacts and risks associated with the alternatives.

The standard methodology used in the environmental impact assessment to determine the significance rating of the potential impacts are outlined in this section.

Significance

The **significance** of an impact is defined as the combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The nature and type of impact may be direct or indirect and may also be positive or negative, refer to Table 172 below for the specific definitions.

Table 17: Nature and type of impact.

	Nature and Type of Impact:		
IMPACT	**Direct**	Impacts that are caused directly by the activity and generally occur at the same time and place as the activity	
	Indirect	Indirect or induced changes that may occur because of the activity. These include all impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity	
	Cumulative	Those impacts associated with the activity which add to, or interact synergistically with existing impacts of past or existing activities, and include direct or indirect impacts which accumulate over time and space	
	Positive	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will benefit significantly, and includes neutral impacts (those that are not considered to be negative	**+**
	Negative	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will be comprised	**-**

Table 18 14 presents the defined criteria used to determine the **consequence** of the impact occurring which incorporates the extent, duration, and intensity (severity) of the impact.

Table 18: Consequence of the Impact occurring.

CONSEQUENCE		
	Extent of Impact:	
	Site	Impact is limited to the site and immediate surroundings, within the study site boundary or property (immobile impacts)
	Neighbouring	Impact extends across the site boundary to adjacent properties (mobile impacts)
	Local	Impact occurs within a 5km radius of the site
	Regional	Impact occurs within a provincial boundary
	National	Impact occurs across one or more provincial boundaries
	Duration of Impact:	
	Incidental	The impact will cease almost immediately (within weeks) if the activity is stopped, or may occur during isolated or sporadic incidences
	Short-term	The impact is limited to the construction phase, or the impact will cease within 1 - 2 years if the activity is stopped
	Medium-term	The impact will cease within 5 years if the activity is stopped
	Long-term	The impact will cease after the operational life of the activity, either by natural processes or by human intervention
	Permanent	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient
	Intensity or Severity of Impact:	
	Low	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are not affected
	Low-Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are modified insignificantly
	Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are altered
	Medium-High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes are severely altered
	High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will permanently cease

The probability of the impact occurring is the likelihood of the impacts occurring and is determined based on the classification provided in Table 15.

Table 19: Probability and confidence of impact prediction.

	Probability of Potential Impact Occurrence:	
PROBABILITY	**Improbable**	The possibility of the impact materialising is very low either because of design or historic experience
	Possible	The possibility of the impact materialising is low either because of design or historic experience
	Likely	There is a possibility that the impact will occur
	Highly Likely	There is a distinct possibility that the impact will occur
	Definite	The impact will occur regardless of any prevention measures

The **significance** of the impact is determined by considering the consequence and probability without considering any mitigation or management measures and is then ranked according to the ratings listed in 16. The level of confidence associated with the impact prediction is also considered as low, medium, or high (Table 17).

Table 20: Significance rating of the impact.

	Significance Ratings:	
SIGNIFICANCE	**Low**	Neither environmental nor social and cultural receptors will be adversely affected by the impact. Management measures are usually not provided for low impacts
	Low-Medium	Management measures are usually encouraged to ensure that the impacts remain of Low-Medium significance. Management measures may be proposed to ensure that the significance ranking remains low-medium
	Medium	Natural, cultural and/or social functions and processes are altered by the activities, and management measures must be provided to reduce the significance rating
	Medium-High	Natural, cultural and/or social functions and processes are altered significantly by the activities, although management measures may still be feasible
	High	Natural, cultural, and/or social functions and processes are adversely affected by the activities. The precautionary approach will be adopted for all high significant impacts and all possible measures must be taken to reduce the impact

Table 21: Level of confidence of the impact prediction.

	Level of Confidence in the Impact Prediction:	
CONFIDENCE	**Low**	Less than 40% sure of impact prediction due to gaps in specialist knowledge and/or availability of information
	Medium	Between 40 and 70% sure of impact prediction due to limited specialist knowledge and/or availability of information
	High	Greater than 70% sure of impact prediction due to outcome of specialist knowledge and/or availability of information

Once significance rating has been determined for each impact, management and mitigation measures must be determined for all impacts that have a significance ranking of Medium and higher to attempt to reduce the level of significance that the impact may reflect.

The EIA Regulations, 2014 (as amended) specifically require a description be provided of the degree to which these impacts:

- Can be reversed.
- May cause irreplaceable loss of resources; and
- Can be avoided, managed, or mitigated.

Based on the proposed mitigation measures the EAP will determine a mitigation efficiency (Table 18) whereby the initial significance is re-evaluated and ranked again to affect a significance that incorporates the mitigation based on its effectiveness. The overall significance is then re-ranked, and a final significance rating is determined.

Table 22: Mitigation efficiency.

MITIGATION EFFICIENCY	Mitigation Efficiency	
	None	Not applicable
	Very Low	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact. Positive impacts will remain the same
	Low	Where the significance rating reduces by one level, after mitigation
	Medium	Where the significance rating reduces by two levels, after mitigation
	High	Where the significance rating reduces by three levels, after mitigation
	Very High	Where the significance rating reduces by more than three levels, after mitigation

The reversibility is directly proportional the "*Loss of Resource*" where no loss of resource is experienced, the impact is completely reversible; where a substantial "*Loss of resource*" is experienced there is a medium degree of reversibility; and an irreversible impact relates to a complete loss of resources, i.e. irreplaceable (Table 19).

Table 23: Degree of reversibility and loss of resources.

DEGREE REVERSABILITY & LOSS OF RESOURCES	**Loss of Resources:**	
	No Loss	No loss of social, cultural and/or ecological resource(s) are experienced. Positive impacts will not experience resource loss
	Partial	The activity results in an insignificant or partial loss of social, cultural and/or ecological resource(s)
	Substantial	The activity results in a significant loss of social, cultural and/or ecological resource(s)
	Irreplaceable	The activity results in the complete and irreplaceable social, cultural and/or ecological loss of resource(s)
	Reversibility:	
	Irreversible	Impacts on natural, cultural and/or social functions and processes are irreversible to the pre-impacted state in such a way that the application of resources will not cause any degree of reversibility
	Medium Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if less than 50% resources are applied
	High Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if more than 50% resources are applied
	Reversible	Impacts on natural, cultural and/or social functions and processes are fully reversible to the pre-impacted state if adequate resources are applied

Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of a proposed project in proximity to other similar developments in the area. These include loss of habitat through clearing, risk to fauna, agricultural potential, loss of heritage, and loss of aquatic processes.

It is important to assess the natural environment using a systems approach that would consider the cumulative impact of various actions. Cumulative impact refers to the impact on the environment, which results from the incremental impact of the actions when added to other past, present, and reasonably foreseeable future actions regardless of what agencies or persons undertake such actions. Cumulative impacts can result from individually minor, but collectively significant actions or activities taking place over a period. Cumulative effects can take place frequently and over a period that the effects cannot be assimilated by the environment.

9.2 Mitigation

An Environmental Management Programme (EMPr) has been developed based on the findings of the impact assessment of the EIA. This would be amended if any significant comments come from the PPP.

The EMPr was compiled as a site-specific mitigation measure for all medium to high (significant) impacts.

9.3 Impact Assessment

The negative and positive impacts assessed in this section has already occurred and would therefore be assigned two assessment ratings, namely the impact rating assigned to the status (without mitigation) and the impact significance after the management measures have been implemented (with mitigation).

Management measures for the above-described impacts are discussed in the table below. A re-evaluation of the impacts has been made after consideration of implementing the management measures.

Potential Impacts	Status
Soil compaction / erosion / pollution	[-ve]
Pollution of surface and/or groundwater	[-ve]
Damage to freshwater resources / watercourses	[-ve]
Loss of terrestrial biodiversity	[-ve]
Emergence and establishment of invasive alien vegetation and noxious weeds	[-ve]
Landscape change and visual/aesthetic impacts	[-ve] [+ve], or [0];
Socio-economic impacts	[+ve]
Cultural, historical, archaeological and/or palaeontological impacts	[-ve] or [0];

Table 24: Alternative 2 (Preferred Alternative) – Construction

ALTERNATIVE 2 (PREFERRED ALTERNATIVE)											
Aspects	**IMPACTS**				**SIGNIFICANCE (WOM)**	**CONFIDENCE**	**MANAGEMENT & MITIGATION MEASURES**	**MITIGATION EFFICIENCY**	**SIGNIFICANCE (WM)**	**DEGREE**	
	TYPE	**DESCRIPTION**	**CUMULATIVE**	**NATURE**						**LOSS RESOURCE**	**REVERSABILITY**
CONSTRUCTION PHASE											
Atmospheric Emissions	Direct	Dust Nuisance	No	Negative	Low	Medium	• Dust suppression measures will be implemented during the construction phase to minimise dust generated by construction activities.	High	Low	No Loss	Reversible
	Indirect	Noise Pollution	No	Negative	Low	Medium	• All construction vehicles will be maintained such as to operate efficiently. • Operations shall not occur before or after normal working hours. • Noise mufflers should be utilized to reduced noise. • Keep an open channel of communication between all stakeholders and keep record of any concerns raised.	High	Low	No Loss	Reversible
Effects on Freshwater Ecosystem	Direct	Loss of wetland	low to moderate	Negative	Medium	Medium	• Clearly demarcate the construction footprint and restrict all activities to within this corridor. • Demarcate the road and trench construction corridor with high visibility (colour coded) durable barricading materials e.g., steel crowd barriers/fencing, barrier safety netting or roadside plastic barriers. • Minimise the disturbance footprint and the unnecessary clearing of vegetation outside of this area. • Only primary activities such as trench excavations, cable installations and road construction should be allowed within this corridor. All secondary activities and storages areas should be restricted to outside of the wetland boundary. • Appropriately contain any generators, fuel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. cement) in such a way as to prevent them leaking and entering the wetland. • Mixing of cement to produce concrete must under no circumstances take place within the wetland. Areas where storage and mixing of sand and cement does take place should be scraped and clean once finished. • Every attempt should be made to construct the road and cable trench during no or low rainfall periods/seasons i.e. winter. • Where necessary, install sandbags around soil stockpiles and silt curtains along the corridor to prevent soil being washed away (erosion) causing sedimentation of the wetland. • Appropriate stormwater measures such as culverts with stone-pitched surfaces should be placed at regular intervals along the road to prevent wetland scouring. A combination of 'hard' and 'soft' methods can be utilised e.g. bioswales, hay or hessian geotextile fabrics such as geo-jutte, culverts with stone pitching or vegetation at outlets into wetland and re-vegetation. • Ensure that soil is backfilled and compacted to appropriate geotechnical specifications. Document the soil profile on removal and ensure the soil is backfilled into the trench in the same horizon order in which it was removed. Topsoil should be separated from sub-soil, stored separately and backfilled last into the trench. • Apply for a Water Use Authorisation (WUA). • Develop a routine monitoring programme in terms of an EMPr for monitoring construction activities in or within close proximity to the wetland. • Adhere to conditions of EA and EMPr. • Compile a stormwater management plan/ method statement. • Compilation of and implementation of an alien vegetation management method statement / plan. • Develop and implement an method statement for integrated management of waste. • Design of infrastructure by a competent engineer. • If applicable, compile a method statement for any construction activities in or within 32m from the wetland. • Fence of the site before construction to prevent site creep into the wetland. All construction activities must remain within the construction footprint. • Suitable signage must be established at the site before commencement of any land clearing or construction activities, to highlight the need to protect sensitive biophysical features on the site and prevent site creep.	High	Low	None	N/A
	Direct	Impaired water quality	Yes	Negative	Medium	Medium		Medium	Low	Partial	Reversible
	Direct	Altered hydrological regime	Yes	Negative	Medium	Medium		Medium	Low	Partial	High Degree
	Direct	Erosion and sedimentation of wetlands	No	Negative	Medium	Medium		High	Low	Partial	Medium Degree
	Direct	Spread and/or establishment of alien and/or invasive species	Yes	Negative	Medium	Medium		Medium	Low	Partial	High Degree

	Direct	Loss of freshwater biodiversity	Yes	Negative	Low	Medium	• All workers to attend an environmental induction prior to the commencement of construction activities. • Cease construction activity during rainfall and wet/ waterlogged soil conditions. • Monitor the establishment of alien invasive vegetation and take corrective action where invasive species are observed to establish. • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction earthworks in that area and returning it where possible afterwards. • Develop a method statement for the handling and transportation of the battery components and electrolytes. All cargo must be checked and transported to the site (by an authorised, • If flow batteries are used for the BESS, a primary and secondary containment system should be placed around the BESS. This should include a bunded platform which can contain up to 110% of the liquid contents. • Training and suitably equipping of staff to deal with emergencies (fires, floods, explosions, etc) • Stockpile and conserve topsoil and re-use where necessary. Small stockpiles can be covered with a tarpaulin to prevent erosion. • Larger stockpiles can be stabilised by anti-erosion blankets and or silt curtains to reduce losses through erosion. Excavations must be limited to the construction footprint only. Clearing and grading should occur only where absolutely necessary to build and provide access to structures and infrastructure. Clearing should be done immediately before construction, rather than leaving soils exposed for months or years. • Design of an adequate stormwater drainage system and energy dissipation structures (e.g. stone-pitching, grassed earth berms) to re-direct and allow natural rainfall to percolate into surrounding vegetated surfaces and enter the sub-surface soil layer. Runoff from disturbed/exposed areas must be directed to silt traps (e.g. silt fences, sandbags) to remove sediment and reduce the sedimentation of the wetland.	Medium	Low	Partial	High Degree
Waste Generation	Direct	Domestic waste	No	Negative	Low	Medium	• A waste management system to be formulated and implemented on site. • All employees will be subjected to induction to understand the environmental management requirement on site. • Domestic waste will be removed from to a landfill facility. • Waste disposal certificates will be kept on record.	Medium	Low	Partial	Reversible
	Direct	Construction waste	No	Negative	Low	Medium	• All construction waste will be placed in a demarcated area and disposed of accordingly. • This area will be bermed to prevent the dispersal of said waste by wind and rain. • Waste disposal certificates will be kept on record.	Medium	Low	Partial	Reversible
	Direct	Hazardous waste	No	Negative	Low	Medium	• All hazardous waste will be stored in a bunded and lockable area. Hazardous waste will be removed from the site by a certified waste contractor. Waste disposal certificates will be kept on record.	Medium	Low	Partial	High Degree
Resource Consumption	Direct	Water consumption	No	Negative	Low	High	• Monitor water usage. • Ensure not leaking infrastructure, such as pipes, taps, etc	Medium	Low	Partial	Reversible
	Indirect	Fuel consumption	No	Negative	Low	High	• All construction vehicles will be maintained such as to operate efficiently. • Idling times of machinery to be minimised.	Medium	Low	Partial	Medium Degree
	Indirect	Raw materials consumption	No	Negative	Low	High	• Raw materials will be used efficiently. • Recycled material should be used where possible	Low	Low	Partial	Medium Degree

	IMPACTS				SIGNIFICANCE (WOM)	CONFIDENCE	MANAGEMENT & MITIGATION MEASURES	MITIGATION EFFICIENCY	SIGNIFICANCE (WM)	DEGREE	
	TYPE	DESCRIPTION	CUMULATIVE	NATURE						LOSS RESOURCE	REVERSABILITY
Effects on Terrestrial Biodiversity	Direct	Direct habitat destruction	Yes	Negative	Medium	High	• The impact on the loss of habitat will be limited to the servitude of the interchange development. • Search & Rescue prior to clearing of area is recommended. • It is recommended that the area to be developed be specifically demarcated so that during the construction phase, only the demarcated area be impacted upon and preventing movement of workers into sensitive surrounding environments. • Where possible, existing access routes and walking paths must be made use of, and new routes limited. • All laydown, storage areas etc should be restricted to within the project area, not beyond the wetland area. • No construction rubble should be dropped into the wetland. • All building materials should be mixed off site and no mixing should take place in the wetland.	Low	Medium	Substantial	Medium Degree
	Direct	Habitat fragmentation	No	Negative	Medium	Medium	• Use existing facilities (e.g., access roads, degraded areas) to the extent possible to minimize the amount of new disturbance. • Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to the sensitive habitats on site during construction • During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts.	Low	Medium	Substantial	Medium Degree
	Direct	Spread and establishment of alien invasives	Yes	Negative	Medium	Medium	• Institute strict control over materials brought onto site, which should be inspected for potential invasive invertebrate species and steps taken to eradicate these before transport to the site. • Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish. • Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. • Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented.	Medium	Low	Substantial	Medium Degree
	Direct	Displacement of faunal community	No	Negative	High	Medium	• The removal of the isolated indigenous trees and shrubs should only occur on the footprint area of the development and not over the larger area. No trees may be trimmed or removed without the prior permission of the landowner. • Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. • Monitoring should be implemented during the construction phase to ensure that minimal impact is caused to the fauna of the area. • The Environment Site Officer (ESO) should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ESO should enforce any measures that he/she deem necessary. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation. • Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during pipeline construction. • Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist. Furthermore, a maintenance management plan should be developed for the control of termites already within the PV facility and outside in the study area	Medium	Medium	Partial	Medium Degree
	Direct	Erosion and topsoil loss	No	Negative	Low	High	• Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Institute a stormwater management plan including strategies • Install detention or retention facilities with graduated outlet control structures, if necessary. • Have both temporary (during construction) and permanent erosion control plans. • Limitations on access for heavy machinery and the storage of materials to avoid soil compaction. • Permanent erosion control plans should focus on the establishment of stable native vegetation communities. • Ensure the amount of bare soil exposed is minimized by staging earthworks in phases and leaving as much ground cover intact as possible during construction.	Medium	Low	Partial	High Degree

							• Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth.				
	Direct	Soil and water pollution	No	Negative	Medium		• Water falling on areas polluted with oil/diesel or other hazardous substances must be contained. • Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ESO should enforce this rule rigorously. • Dry chemicals to be stored on an impervious surface protected from rainfall and stormwater run-off. • Ensure that refuelling stations on site are constructed so as to prevent spillage of fuel or oil onto the soil and put in place measures to ensure that any accidental spillages can be contained and cleaned up promptly. • Sewage should either be treated in a suitable plant or removed from the site for treatment elsewhere. • Spill kits should be on-hand to deal with spills immediately • Spillages or leakages must be treated according to an applicable procedure as determined by a plan of action for the specific type of disturbance for instance the maintenance management plan. • All construction vehicles should be inspected for oil and fuel leaks regularly and frequently	Medium	Medium	Partial	Reversible
	Direct	Air pollution	No	Negative	High	Medium	• Dust suppression must be undertaken in conjunction with a dust monitoring programme that places dust deposition gauges or receiving buckets, directional dust collection receptacles, high volume active air samplers or continuous particle monitors or even personal exposure samplers at generation sites, around the mine and in adjacent areas. • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation. • A speed limit (preferably 60 km/hour) should not be exceeded on dirt roads.	Medium	Medium	Low loss	Reversible
Social	Direct	Visual impact	No	Negative	Low	Medium	• Ensure all disturbed areas are rehabilitated accordingly. • Vegetation is to be reinstate where possible	Low	Low	No Loss	Reversible
	Direct	Traffic Safety	No	Negative	Medium	Medium	• Site security will ensure that the site is secured, and only authorised access allowed. • Safety signal erected on approach to the facility • Incorporation traffic safety and rules into induction • Include traffic safety into toolbox talks	High	Medium	Partial	High Degree
Soil Alteration	Indirect	Loss of land capability	No	Negative	Medium	High	• Impact on the land lost capability is expected to be minimal. • Monitor disturbed areas for signs of erosion. • Store topsoil stockpiles in the most appropriate method possible in consultation with onsite Environmental personnel.	None	Medium	Substantial	Medium Degree
	Direct	Clearing of vegetation	Yes	Negative	Medium	Medium	• The impact on the environment is expected to be medium as the area is in a rural setting	High	Low	Partial	High Degree
	Direct	Soil contamination	No	Negative	Low	Medium	• Measures will be implemented to ensure that no hydrocarbons and/or other pollutant liquids are spilt, and if so, they are contained, and a clean-up protocol followed. • No hydrocarbons are to be stored with water course or within proximity.	High	Low	Partial	High Degree
Incidents, Accidents and Potential Emergency Situations	Direct	Pollution incidents	No	Negative	High	Medium	• Compilation of incident management plan. • Conduct toolbox talks. • Ensure plant and equipment are in good working order. • Store all hazardous materials in an appropriate manner, bunded impermeable surface.	Medium	Low	Substantial	Medium Degree
	Direct	Traffic Incidents	No	Negative	High	Medium	• Installation of safety barriers • Installation of warning traffic signs	Medium	Low	Partial	High Degree
	Direct	Storage of hydrocarbons	No	Negative	High	Medium	• All hazardous materials will be stored in a bunded and lockable area. • Material Safety Data Sheet (MSDS) sheets will be available for all hazardous products.	High	Low	Substantial	Medium Degree

	Direct	Fire	No	Negative	High	Medium	• Fire and emergency plans will be implemented during construction. • Adequate firefighting equipment will be instituted as recommended.	Medium	Low	Substantial	Medium Degree
Economic	Direct	Sustain provision of energy into the national grid	Yes	Positive	High (-ve)	High	• Construction on site will provide employment and skills to the local community. • The local economy will benefit in terms of supply of building materials and services. • Will provide sustained energy to the national grid	Very High	High (+ve)	No Loss	N/A
	Direct	Temporary Employment	Yes	Positive	Medium	Medium	• Construction on site will provide employment and skills to the local community. Wherever possible labour, materials and services will be sourced locally.	High	High	No Loss	N/A
Heritage Resource	Direct	Discovery of archaeological deposits and loss of or discovery of heritage resources	No	Negative	Low - Medium	Medium	• Demarcate find and manage via the Chance Find Procedure • If sub-surface archaeological material is discovered work must stop and a heritage practitioner preferably an archaeologist contacted to assess the find and make recommendations	Low	Low	No Loss	High Degree
	Direct	Discovery of graves or burial grounds and loss of or discovery of heritage resources	No	Negative	Low - Medium	Medium	• Demarcate find and manage via the Chance Find Procedure • If sub-surface graves are discovered work should stop and a professional preferably an archaeologist contacted to assess the age of the grave/graves and to advice on the way forward.	Low	Low	No Loss	High Degree

Table 25: Alternative 2 (Preferred Alternative)

ALTERNATIVE 2 (PREFERRED ALTERNATIVE)											
Aspect	**IMPACTS**				**SIGNIFICANCE (WOM)**	**CONFIDENCE**	**MANAGEMENT & MITIGATION MEASURES**	**MITIGATION EFFICIENCY**	**SIGNIFICANCE (WM)**	**DEGREE**	
	TYPE	**DESCRIPTION**	**CUMULATIVE**	**NATURE**						**LOSS RESOURCE**	**REVERSABILITY**
Operational Phase											
Atmospheric Emissions	Direct	Dust Nuisance	No	Negative	Medium	Medium	• Dust suppression measures will be implemented during the operational phase to minimise dust generated by activities.	High	Low	No Loss	Reversible
	Indirect	Noise Pollution	No	Negative	Medium	Medium	• All construction vehicles will be maintained such as to operate efficiently. • Operations shall not occur before or after normal working hours. • Noise mufflers should be utilized to reduced noise. • Keep an open channel of communication between all stakeholders and keep record of any concerns raised.	High	Low	No Loss	Reversible
Effects on Freshwater Ecosystem	Direct	Loss of wetland	low to moderate	Negative	Medium	Medium	• Adhere to conditions of EA and EMPr. • Develop and implement an OEMPr for monitoring the operation and maintenance of all new installed infrastructure which includes stormwater management. • A maintenance schedule and checklists should be developed and implemented prior to operation. • Any access road should be maintained by removing any debris, unblocking drains and ensuring that stormwater releases into the wetland are controlled and dissipative so as to not result in scouring and erosion. • Any cracks and / or damage should be repaired as regularly as required. • Where identified and if applicable, wetland scouring can be prevented using a combination of 'hard' and 'soft' methods e.g. bioswales, hay or hessian geotextile fabrics such as geo-jutte, culverts with stone pitching or vegetation at outlets into wetland and re-vegetation. • Implement a general routine maintenance / environmental monitoring plan which includes aspects of erosion control, weed control, general rehabilitation as and when required, repair/correction of structures if siltation becomes excessive, etc. • The wetland should remain as a 'No-go' area during operations and routinely inspected (manually on foot) for any scour/erosion, litter, alien vegetation, siltation, etc. • With proper construction methods followed, limited erosion should occur. Erosion should be monitored, and corrective measures taken if observed. • Any areas where active erosion is observed should be rehabilitated in such a way as to ensure that the hydrology of the area is re-instated to conditions which are as natural as possible. • Further cutting/ clearing of vegetation or soil from within the wetland should be prohibited so as to retain soil stability provided by the grass-root structure.	High	Low	None	N/A
	Direct	Impaired water quality	Yes	Negative	Medium	Medium		Medium	Low	Partial	Reversible
	Direct	Altered hydrological regime	Yes	Negative	Medium	Medium		Medium	Low	Partial	High Degree
	Direct	Erosion and sedimentation of wetlands	No	Negative	Medium	Medium		High	Low	Partial	Medium Degree
	Direct	Spread and/or establishment of alien and/or invasive species	Yes	Negative	Medium	Medium		Medium	Low	Partial	High Degree
	Direct	Loss of freshwater biodiversity	Yes	Negative	Low	Medium		Medium	Low	Partial	High Degree
Effects on Terrestrial Biodiversity	Direct	Obstruction of Ecological Corridors	No	Negative	High	Medium	• Waste should be managed as not to be aesthetically appealing or attract pests or rodents. • Control of alien invasive plants is encouraged. • Rehabilitation and landscaping with indigenous vegetation within the development should be encouraged and made a condition within the Environmental Authorisation. • Mitigation Measure Objectives for biodiversity.	High	Medium	No Loss	Reversible
	Indirect	Noise Pollution	No	Negative	High	Medium	• All construction vehicles will be maintained such as to operate efficiently. • Operations shall not occur before or after normal working hours. • Noise mufflers should be utilized to reduced noise. • Keep an open channel of communication between all stakeholders and keep record of any concerns raised.	High	Medium	No Loss	Reversible

Aspect	IMPACTS				SIGNIFICANCE (WOM)	CONFIDENCE	MANAGEMENT & MITIGATION MEASURES	MITIGATION EFFICIENCY	SIGNIFICANCE (WM)	DEGREE	
	TYPE	DESCRIPTION	CUMULATIVE	NATURE						LOSS RESOURCE	REVERSABILITY
Waste Generation	Direct	Domestic waste	No	Negative	Medium	Medium	• A waste management system to be formulated and implemented on site. • All employees will be subjected to induction to understand the environmental management requirement on site. • Domestic waste will be removed from to a landfill facility. • Waste disposal certificates will be kept on record.	Medium	Low	Partial	Reversible
	Direct	Hazardous waste	No	Negative	Medium	Medium	• All hazardous waste will be stored in a bunded and lockable area. Hazardous waste will be removed from the site by a certified waste contractor. Waste disposal certificates will be kept on record.	Medium	Low	Partial	High Degree
Resource Consumption	Direct	Water consumption	No	Negative	Low	High	• Monitor water usage. • Ensure not leaking infrastructure, such as pipes, taps, etc	Medium	Low	Partial	Reversible
	Indirect	Fuel consumption	No	Negative	Medium	High	• All vehicles will be maintained such as to operate efficiently. • Idling times of machinery to be minimised.	Medium	Low	Partial	Medium Degree
	Indirect	Raw materials consumption	No	Negative	Medium	High	• Raw materials will be used efficiently. • Recycled material should be used where possible	Low	Low	Partial	Medium Degree
Soil Alteration	Direct	Erosion and topsoil loss	No	Negative	Medium	High	• Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Institute a stormwater management plan including strategies • Install detention or retention facilities with graduated outlet control structures, if necessary. • Limitations on access for heavy machinery and the storage of materials to avoid soil compaction. • Permanent erosion control plans should focus on the establishment of stable native vegetation communities. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within the facility • Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth.	Medium	Low	Partial	High Degree
	Direct	Soil contamination	No	Negative	Medium	Medium	• Measures will be implemented to ensure that no hydrocarbons and/or other pollutant liquids are spilt, and if so, they are contained, and a clean-up protocol followed. • No hydrocarbons are to be stored with water course or within proximity.	High	Low	Partial	High Degree
Incidents, Accidents and Potential Emergency Situations	Direct	Pollution incidents	No	Negative	High	Medium	• Compilation of incident management plan. • Conduct toolbox talks. • Ensure plant and equipment are in good working order. • Store all hazardous materials in an appropriate manner, bunded impermeable surface.	Medium	Medium	Substantial	Medium Degree
	Direct	Traffic Incidents	No	Negative	High	Medium	• Installation of safety barriers • Installation of warning traffic signs	Medium	Medium	Substantial	High Degree
	Direct	Storage of hydrocarbons	No	Negative	High	Medium	• All hazardous materials will be stored in a bunded and lockable area. • Material Safety Data Sheet (MSDS) sheets will be available for all hazardous products.	High	Medium	Substantial	Medium Degree
	Direct	Fire	No	Negative	High	Medium	• Fire and emergency plans will be implemented during operations. • Adequate firefighting equipment will be instituted as recommended.	Medium	Medium	Substantial	Medium Degree

Table 26: Alternative 1 – Construction

	ALTERNATIVE 1										
	IMPACTS				SIGNIFICANCE (WOM)	CONFIDENCE	MANAGEMENT & MITIGATION MEASURES	MITIGATION EFFICIENCY	SIGNIFICANCE (WM)	DEGREE	
	TYPE	DESCRIPTION	CUMULATIVE	NATURE						LOSS RESOURCE	REVERSABILITY
CONSTRUCTION PHASE											
Atmospheric Emissions	Direct	Dust Nuisance	No	Negative	Low	Medium	• Dust suppression measures will be implemented during the construction phase to minimise dust generated by construction activities.	High	Low	No Loss	Reversible
	Indirect	Noise Pollution	No	Negative	Low	Medium	• All construction vehicles will be maintained such as to operate efficiently. • Operations shall not occur before or after normal working hours. • Noise mufflers should be utilized to reduced noise. • Keep an open channel of communication between all stakeholders and keep record of any concerns raised.	High	Low	No Loss	Reversible
Effects on Freshwater Ecosystem	Direct	Loss of wetland	low to moderate	Negative	High	Medium	• Clearly demarcate the construction footprint and restrict all activities to within this corridor. • Demarcate the road and trench construction corridor with high visibility (colour coded) durable barricading materials e.g., steel crowd barriers/fencing, barrier safety netting or roadside plastic barriers. • Minimise the disturbance footprint and the unnecessary clearing of vegetation outside of this area. • Only primary activities such as trench excavations, cable installations and road construction should be allowed within this corridor. All secondary activities and storages areas should be restricted to outside of the wetland boundary. • Appropriately contain any generators, fuel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. cement) in such a way as to prevent them leaking and entering the wetland. • Mixing of cement to produce concrete must under no circumstances take place within the wetland. Areas where storage and mixing of sand and cement does take place should be scraped and clean once finished. • Every attempt should be made to construct the road and cable trench during no or low rainfall periods/seasons i.e. winter. • Where necessary, install sandbags around soil stockpiles and silt curtains along the corridor to prevent soil being washed away (erosion) causing sedimentation of the wetland. • Appropriate stormwater measures such as culverts with stone-pitched surfaces should be placed at regular intervals along the road to prevent wetland scouring. A combination of 'hard' and 'soft' methods can be utilised e.g. bioswales, hay or hessian geotextile fabrics such as geo-jutte, culverts with stone pitching or vegetation at outlets into wetland and re-vegetation. • Ensure that soil is backfilled and compacted to appropriate geotechnical specifications. Document the soil profile on removal and ensure the soil is backfilled into the trench in the same horizon order in which it was removed. Topsoil should be separated from sub-soil, stored separately and backfilled last into the trench. • Apply for an Environmental Authorisation (EA) and a Water Use Authorisation (WUA). • Develop a routine monitoring programme in terms of an EMPr for monitoring construction activities in or within close proximity to the wetland. • Adhere to conditions of EA and EMPr. • Compile a stormwater management plan/ method statement. • Compilation of and implementation of an alien vegetation management method statement / plan. • Develop and implement an method statement for integrated management of waste. • Design of infrastructure by a competent engineer. • If applicable, compile a method statement for any construction activities in or within 32m from the wetland. • Fence of the site before construction to prevent site creep into the wetland. All construction activities must remain within the construction footprint. • Suitable signage must be established at the site before commencement of any land clearing or construction activities, to highlight the need to protect sensitive biophysical features on the site and prevent site creep. • All workers to attend an environmental induction prior to the commencement of construction activities. • Cease construction activity during rainfall and wet/ waterlogged soil conditions. • Monitor the establishment of alien invasive vegetation and take corrective action where invasive species are observed to establish.	High	High	None	N/A
	Direct	Impaired water quality	Yes	Negative	Medium	Medium		Medium	Medium	Partial	Reversible
	Direct	Altered hydrological regime	Yes	Negative	Medium	Medium		Medium	Medium	Partial	High Degree
	Direct	Erosion and sedimentation of wetlands	No	Negative	Medium	Medium		High	Low	Partial	Medium Degree
	Direct	Spread and/or establishment of alien and/or invasive species	Yes	Negative	Medium	Medium		Medium	Low	Partial	High Degree
	Direct	Loss of freshwater biodiversity	Yes	Negative	Low	Medium		Medium	Low	Partial	High Degree

							• Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction earthworks in that area and returning it where possible afterwards. • Develop a method statement for the handling and transportation of the battery components and electrolytes. All cargo must be checked and transported to the site (by an authorised, • If flow batteries are used for the BESS, a primary and secondary containment system should be placed around the BESS. This should include a bunded platform which can contain up to 110% of the liquid contents. • Training and suitably equipping of staff to deal with emergencies (fires, floods, explosions, etc) • Stockpile and conserve topsoil and re-use where necessary. Small stockpiles can be covered with a tarpaulin to prevent erosion. • Larger stockpiles can be stabilised by anti-erosion blankets and or silt curtains to reduce losses through erosion. Excavations must be limited to the construction footprint only. Clearing and grading should occur only where absolutely necessary to build and provide access to structures and infrastructure. Clearing should be done immediately before construction, rather than leaving soils exposed for months or years. • Design of an adequate stormwater drainage system and energy dissipation structures (e.g. stone-pitching, grassed earth berms) to re-direct and allow natural rainfall to percolate into surrounding vegetated surfaces and enter the sub-surface soil layer. Runoff from disturbed/exposed areas must be directed to silt traps (e.g. silt fences, sandbags) to remove sediment and reduce the sedimentation of the wetland.				
Waste Generation	Direct	Domestic waste	No	Negative	Low	Medium	• A waste management system to be formulated and implemented on site. • All employees will be subjected to induction to understand the environmental management requirement on site. • Domestic waste will be removed from to a landfill facility. • Waste disposal certificates will be kept on record.	Medium	Low	Partial	Reversible
	Direct	Construction waste	No	Negative	Low	Medium	• All construction waste will be placed in a demarcated area and disposed of accordingly. • This area will be bermed to prevent the dispersal of said waste by wind and rain. • Waste disposal certificates will be kept on record.	Medium	Low	Partial	Reversible
	Direct	Hazardous waste	No	Negative	Low	Medium	• All hazardous waste will be stored in a bunded and lockable area. Hazardous waste will be removed from the site by a certified waste contractor. Waste disposal certificates will be kept on record.	Medium	Low	Partial	High Degree
Resource Consumption	Direct	Water consumption	No	Negative	Low	High	• Monitor water usage. • Ensure not leaking infrastructure, such as pipes, taps, etc	Medium	Low	Partial	Reversible
	Indirect	Fuel consumption	No	Negative	Low	High	• All construction vehicles will be maintained such as to operate efficiently. • Idling times of machinery to be minimised.	Medium	Low	Partial	Medium Degree
	Indirect	Raw materials consumption	No	Negative	Low	High	• Raw materials will be used efficiently. • Recycled material should be used where possible	Low	Low	Partial	Medium Degree
Effects on Terrestrial Biodiversity	Direct	Direct habitat destruction	Yes	Negative	Medium	High	• The impact on the loss of habitat will be limited to the servitude of the interchange development. • Search & Rescue prior to clearing of area is recommended. • It is recommended that the area to be developed be specifically demarcated so that during the construction phase, only the demarcated area be impacted upon and preventing movement of workers into sensitive surrounding environments. • Where possible, existing access routes and walking paths must be made use of, and new routes limited. • All laydown, storage areas etc should be restricted to within the project area, not beyond the wetland area. • No construction rubble should be dropped into the wetland. • All building materials should be mixed off site and no mixing should take place in the wetland.	Low	Medium	Substantial	Medium Degree
	Direct	Habitat fragmentation	No	Negative	Medium	Medium	• Use existing facilities (e.g., access roads, degraded areas) to the extent possible to minimize the amount of new disturbance. • Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to the sensitive habitats on site during construction • During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts.	Low	Medium	Substantial	Medium Degree

	Direct	Spread and establishment of alien invasives	Yes	Negative	Medium	Medium	• Institute strict control over materials brought onto site, which should be inspected for potential invasive invertebrate species and steps taken to eradicate these before transport to the site. • Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish. • Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. • Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented.	Medium	Low	Substantial	Medium Degree
	Direct	Displacement of faunal community	No	Negative	High	Medium	• The removal of the isolated indigenous trees and shrubs should only occur on the footprint area of the development and not over the larger area. No trees may be trimmed or removed without the prior permission of the landowner. • Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. • Monitoring should be implemented during the construction phase to ensure that minimal impact is caused to the fauna of the area. • The Environment Site Officer (ESO) should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ESO should enforce any measures that he/she deem necessary. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation. • Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during pipeline construction. • Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist. Furthermore, a maintenance management plan should be developed for the control of termites already within the PV facility and outside in the study area	Medium	Medium	Partial	Medium Degree
	Direct	Erosion and topsoil loss	No	Negative	Low	High	• Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Institute a stormwater management plan including strategies • Install detention or retention facilities with graduated outlet control structures, if necessary. • Have both temporary (during construction) and permanent erosion control plans. • Limitations on access for heavy machinery and the storage of materials to avoid soil compaction. • Permanent erosion control plans should focus on the establishment of stable native vegetation communities. • Ensure the amount of bare soil exposed is minimized by staging earthworks in phases and leaving as much ground cover intact as possible during construction. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth.	Medium	Low	Partial	High Degree
	Direct	Soil and water pollution	No	Negative	Medium		• Water falling on areas polluted with oil/diesel or other hazardous substances must be contained. • Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ESO should enforce this rule rigorously. • Dry chemicals to be stored on an impervious surface protected from rainfall and stormwater run-off. • Ensure that refuelling stations on site are constructed so as to prevent spillage of fuel or oil onto the soil and put in place measures to ensure that any accidental spillages can be contained and cleaned up promptly. • Sewage should either be treated in a suitable plant or removed from the site for treatment elsewhere. • Spill kits should be on-hand to deal with spills immediately • Spillages or leakages must be treated according to an applicable procedure as determined by a plan of action for the specific type of disturbance for instance the maintenance management plan. • All construction vehicles should be inspected for oil and fuel leaks regularly and frequently	Medium	Medium	Partial	Reversible
	Direct	Air pollution	No	Negative	High	Medium	• Dust suppression must be undertaken in conjunction with a dust monitoring programme that places dust deposition gauges or receiving buckets, directional dust collection receptacles, high volume active air samplers or continuous particle monitors or even personal exposure samplers at generation sites, around the mine and in adjacent areas.	Medium	Medium	Low loss	Reversible

							• Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation. • A speed limit (preferably 60 km/hour) should not be exceeded on dirt roads.				
Social	Direct	Visual impact	No	Negative	Low	Medium	• Ensure all disturbed areas are rehabilitated accordingly. • Vegetation is to be reinstate where possible	Low	Low	No Loss	Reversible
	Direct	Traffic Safety	No	Negative	Medium	Medium	• Site security will ensure that the site is secured, and only authorised access allowed. • Safety signal erected on approach to the facility • Incorporation traffic safety and rules into induction • Include traffic safety into toolbox talks	High	Medium	Partial	High Degree
Soil Alteration	Indirect	Loss of land capability	No	Negative	Medium	High	• Impact on the land lost capability is expected to be minimal. • Monitor disturbed areas for signs of erosion. • Store topsoil stockpiles in the most appropriate method possible in consultation with onsite Environmental personnel.	None	Medium	Substantial	Medium Degree
	Direct	Clearing of vegetation	Yes	Negative	Medium	Medium	• The impact on the environment is expected to be medium as the area is in a rural setting	High	Low	Partial	High Degree
	Direct	Soil contamination	No	Negative	Low	Medium	• Measures will be implemented to ensure that no hydrocarbons and/or other pollutant liquids are spilt, and if so, they are contained, and a clean-up protocol followed. • No hydrocarbons are to be stored with water course or within proximity.	High	Low	Partial	High Degree
Incidents, Accidents and Potential Emergency Situations	Direct	Pollution incidents	No	Negative	High	Medium	• Compilation of incident management plan. • Conduct toolbox talks. • Ensure plant and equipment are in good working order. • Store all hazardous materials in an appropriate manner, bunded impermeable surface.	Medium	Low	Substantial	Medium Degree
	Direct	Traffic Incidents	No	Negative	High	Medium	• Installation of safety barriers • Installation of warning traffic signs	Medium	Low	Partial	High Degree
	Direct	Storage of hydrocarbons	No	Negative	High	Medium	• All hazardous materials will be stored in a bunded and lockable area. • Material Safety Data Sheet (MSDS) sheets will be available for all hazardous products.	High	Low	Substantial	Medium Degree
	Direct	Fire	No	Negative	High	Medium	• Fire and emergency plans will be implemented during construction. • Adequate firefighting equipment will be instituted as recommended.	Medium	Low	Substantial	Medium Degree
Economic	Direct	Sustain provision of energy into the national grid	Yes	Positive	High (-ve)	High	• Construction on site will provide employment and skills to the local community. • The local economy will benefit in terms of supply of building materials and services. • Will provide sustained energy to the national grid	Very High	High (+ve)	No Loss	N/A
	Direct	Temporary Employment	No	Positive	Medium	Medium	• Construction on site will provide employment and skills to the local community. Wherever possible labour, materials and services will be sourced locally.	High	High	No Loss	N/A
Heritage Resource	Direct	Discovery of archaeological deposits and loss of or discovery of heritage resources	No	Negative	Low - Medium	Medium	• Demarcate find and manage via the Chance Find Procedure • If sub-surface archaeological material is discovered work must stop and a heritage practitioner preferably an archaeologist contacted to assess the find and make recommendations	Low	Low	No Loss	High Degree
	Direct	Discovery of graves or burial grounds and loss of or discovery of heritage resources	No	Negative	Low - Medium	Medium	• Demarcate find and manage via the Chance Find Procedure • If sub-surface graves are discovered work should stop and a professional preferably an archaeologist contacted to assess the age of the grave/graves and to advice on the way forward.	Low	Low	No Loss	High Degree

Table 27: Alternative 1 – Operational

ALTERNATIVE 1											
Aspect	**IMPACTS**				**SIGNIFICANCE (WOM)**	**CONFIDENCE**	**MANAGEMENT & MITIGATION MEASURES**	**MITIGATION EFFICIENCY**	**SIGNIFICANCE (WM)**	**DEGREE**	
	TYPE	**DESCRIPTION**	**CUMULATIVE**	**NATURE**						**LOSS RESOURCE**	**REVERSABILITY**
Operational Phase											
Atmospheric Emissions	Direct	Dust Nuisance	No	Negative	Medium	Medium	• Dust suppression measures will be implemented during the construction phase to minimise dust generated by construction activities.	High	Low	No Loss	Reversible
	Indirect	Noise Pollution	No	Negative	Medium	Medium	• All construction vehicles will be maintained such as to operate efficiently. • Operations shall not occur before or after normal working hours. • Noise mufflers should be utilized to reduced noise. • Keep an open channel of communication between all stakeholders and keep record of any concerns raised.	High	Low	No Loss	Reversible
Effects on Freshwater Ecosystem	Direct	Loss of wetland	low to moderate	Negative	Medium	Medium	• Adhere to conditions of EA and EMPr. • Develop and implement an OEMPr for monitoring the operation and maintenance of all new installed infrastructure which includes stormwater management. • A maintenance schedule and checklists should be developed and implemented prior to operation. • Any access road should be maintained by removing any debris, unblocking drains and ensuring that stormwater releases into the wetland are controlled and dissipative so as to not result in scouring and erosion. • Any cracks and / or damage should be repaired as regularly as required. • Where identified and if applicable, wetland scouring can be prevented using a combination of 'hard' and 'soft' methods e.g. bioswales, hay or hessian geotextile fabrics such as geo-jutte, culverts with stone pitching or vegetation at outlets into wetland and re-vegetation. • Implement a general routine maintenance / environmental monitoring plan which includes aspects of erosion control, weed control, general rehabilitation as and when required, repair/correction of structures if siltation becomes excessive, etc. • The wetland should remain as a 'No-go' area during operations and routinely inspected (manually on foot) for any scour/erosion, litter, alien vegetation, siltation, etc. • With proper construction methods followed, limited erosion should occur. Erosion should be monitored, and corrective measures taken if observed. • Any areas where active erosion is observed should be rehabilitated in such a way as to ensure that the hydrology of the area is re-instated to conditions which are as natural as possible. • Further cutting/ clearing of vegetation or soil from within the wetland should be prohibited so as to retain soil stability provided by the grass-root structure.	High	Low	None	N/A
	Direct	Impaired water quality	Yes	Negative	High	Medium		Medium	Low	Partial	Reversible
	Direct	Altered hydrological regime	Yes	Negative	Medium	Medium		Medium	Low	Partial	High Degree
	Direct	Erosion and sedimentation of wetlands	No	Negative	Medium	Medium		High	Low	Partial	Medium Degree
	Direct	Spread and/or establishment of alien and/or invasive species	Yes	Negative	Medium	Medium		Medium	Low	Partial	High Degree
	Direct	Loss of freshwater biodiversity	Yes	Negative	Low	Medium		Medium	Low	Partial	High Degree
Effects on Terrestrial Biodiversity	Direct	Obstruction of Ecological Corridors	No	Negative	High	Medium	• Waste should be managed as not to be aesthetically appealing or attract pests or rodents. • Control of alien invasive plants is encouraged. • Rehabilitation and landscaping with indigenous vegetation within the development should be encouraged and made a condition within the Environmental Authorisation. • Mitigation Measure Objectives for biodiversity.	High	Medium	No Loss	Reversible
	Indirect	Noise and Lighting Pollution	No	Negative	High	Medium	• All construction vehicles will be maintained such as to operate efficiently. • Operations shall not occur before or after normal working hours. • Noise mufflers should be utilized to reduced noise. • Keep an open channel of communication between all stakeholders and keep record of any concerns raised.	High	Medium	No Loss	Reversible

Aspect	IMPACTS				SIGNIFICANCE (WOM)	CONFIDENCE	MANAGEMENT & MITIGATION MEASURES	MITIGATION EFFICIENCY	SIGNIFICANCE (WM)	DEGREE	
	TYPE	DESCRIPTION	CUMULATIVE	NATURE						LOSS RESOURCE	REVERSABILITY
Waste Generation	Direct	Domestic waste	No	Negative	Medium	Medium	• A waste management system to be formulated and implemented on site. • All employees will be subjected to induction to understand the environmental management requirement on site. • Domestic waste will be removed from to a landfill facility. • Waste disposal certificates will be kept on record.	Medium	Low	Partial	Reversible
	Direct	Hazardous waste	No	Negative	Medium	Medium	• All hazardous waste will be stored in a bunded and lockable area. Hazardous waste will be removed from the site by a certified waste contractor. Waste disposal certificates will be kept on record.	Medium	Low	Partial	High Degree
Resource Consumption	Direct	Water consumption	No	Negative	Low	High	• Monitor water usage. • Ensure not leaking infrastructure, such as pipes, taps, etc	Medium	Low	Partial	Reversible
	Indirect	Fuel consumption	No	Negative	Medium	High	• All vehicles will be maintained such as to operate efficiently. • Idling times of machinery to be minimised.	Medium	Low	Partial	Medium Degree
	Indirect	Raw materials consumption	No	Negative	Medium	High	• Raw materials will be used efficiently. • Recycled material should be used where possible	Low	Low	Partial	Medium Degree
Soil Alteration	Direct	Erosion and topsoil loss	No	Negative	Medium	High	• Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Institute a stormwater management plan including strategies • Install detention or retention facilities with graduated outlet control structures, if necessary. • Limitations on access for heavy machinery and the storage of materials to avoid soil compaction. • Permanent erosion control plans should focus on the establishment of stable native vegetation communities. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within the facility • Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth.	Medium	Low	Partial	High Degree
	Direct	Soil contamination	No	Negative	Medium	Medium	• Measures will be implemented to ensure that no hydrocarbons and/or other pollutant liquids are spilt, and if so, they are contained, and a clean-up protocol followed. • No hydrocarbons are to be stored with water course or within proximity.	High	Low	Partial	High Degree
Incidents, Accidents and Potential Emergency Situations	Direct	Pollution incidents	No	Negative	High	Medium	• Compilation of incident management plan. • Conduct toolbox talks. • Ensure plant and equipment are in good working order. • Store all hazardous materials in an appropriate manner, bunded impermeable surface.	Medium	Medium	Substantial	Medium Degree
	Direct	Traffic Incidents	No	Negative	High	Medium	• Installation of safety barriers • Installation of warning traffic signs	Medium	Medium	Substantial	High Degree
	Direct	Storage of hydrocarbons	No	Negative	High	Medium	• All hazardous materials will be stored in a bunded and lockable area. • Material Safety Data Sheet (MSDS) sheets will be available for all hazardous products.	High	Medium	Substantial	Medium Degree
	Direct	Fire	No	Negative	High	Medium	• Fire and emergency plans will be implemented during construction. • Adequate firefighting equipment will be instituted as recommended.	Medium	Medium	Substantial	Medium Degree

9.4 Cumulative Impacts

The scale at which the cumulative impacts are assessed is important. The significance of the cumulative impact on the regional or national economy will be influenced by energy developments with BESS throughout South Africa, while the significance of the cumulative impact on loss of land within a concentrated area may only be influenced by developments that are in closer proximity to each other.

A scale of 30km has been selected for this cumulative impact evaluation.

There are **no existing** BESS developments are located within an 30km radius of the proposed BESS there is however the authorised Pulida PV facility which is located adjacent to the proposed site. This included associated infrastructure such as power line and substation.

No.	EIA Reference No.	Classification	Status of application	Distance from proposed
1	14/12/16/3/3/2/660	Solar CSP	Approved	17
2	12/12/20/2582	Solar PV	Approved	12.8
3	14/12/16/3/3/2/392	Solar PV	Approved	15.4
4	14/12/16/3/3/2/578	Solar PV	Approved	17
5	12/12/20/2579	Solar PV	Approved	9.7
6	14/12/16/3/3/392	Solar PV	Approved	15.4
7	14/12/16/3/3/1/469	Solar PV	Approved	28.2
8	14/12/16/3/3/1/438	Solar PV	Approved	12.8

The facility would be located immediately adjacent to the existing PV facility where an area of roughly **4ha** of area will be cleared. This is significantly smaller in comparison to the **193ha** cleared for the authorised PV facility, it represents **2.07%** of the size of the authorised facility and **0.33%** of the entire property which is **1195ha**.

The development of the BESS and associated infrastructure would not introduce a new type of infrastructure to the area but would merely be adding to the already developed landscape. Considering the limited extent of the proposed BESS and associated infrastructure, the addition will be limited with the BESS not conflicting with the planned land use in the area

In addition, the area assessed for the BESS and associated infrastructure is located within a Renewable Energy Development Zone (REDZ) (i.e. the Kimberley REDZ), and a Strategic Transmission Corridor (i.e. the Central Transmission Corridor). These areas form part of the areas identified by the DFFE as geographical areas of strategic importance for the development of commercial renewable energy developments (REDZ)

and large-scale grid infrastructure development projects (transmission corridors). Therefore, these areas are considered as nodes for the development of renewable energy and grid infrastructure projects

Cumulative Impacts on Ecological Processes

The following are the cumulative impacts assessed as being a likely consequence of the development of the Pulida BESS. This is assessed in context of the extent of the proposed development area, other developments in the area, as well as general habitat loss and transformation resulting from agriculture and other activities in the area.

Nature:	Impact on CBAs and broad-scale ecological processes	
The development of Pulida BESS will contribute to cumulative habitat loss and other broad-scale cumulative impacts on ecological processes in the wider area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Low	Moderate
Probability	Improbable	Improbable
Significance	Low	Low
Status	Negative	Negative
Reversibility	High	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated	To some degree, but the majority of the impact results from the presence of the various already approved PV which cannot be well mitigated.	
Mitigation:		
• Ensure that sensitive habitats such as drainage features, are not within the development footprint of the BESS. • Ensure that the fencing around the facility is wildlife friendly and does not impede fauna from moving through the area or result in electrocutions. • Ensure that an alien invasive management plan and erosion management plan compiled for the BESS project is effectively implemented at the site.		

Nature:	Reduced ability to meet conservation obligations and targets	
The loss of unprotected vegetation types on a cumulative basis from the broader area impacts the country's ability to meet its conservation targets.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local	Local
Duration	Long Term	Long-Term
Magnitude	Low	Low
Probability	Improbable	Improbable
Significance	Low	Low
Status	Slightly Negative	Slightly Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	No

Can impacts be mitigated	Yes, to a large extent	
Mitigation:		
• The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas. • Reduce the footprint of the facility within sensitive habitat types as much as possible		
Nature:	Avifauna	
The cumulative impact of the BESS facility on priority avifauna within a 30km radius around the proposed development is assessed to be low, mainly due to the small size of the proposed BESS development, and the no additional renewable energy projects. Mortality and displacement of priority avifauna due to the construction of the PV facility and associated infrastructure		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Moderate	Moderate
Probability	Highly probable	Highly probable
Significance	Moderate	Moderate
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated	Yes, to a large extent	
Mitigation:		
• 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 degradation of habitat. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. • It is recommended that a single perimeter fence is used. • A bird-friendly pole design must be implemented.		

Cumulative Impacts on Heritage (including archaeology, palaeontology, and cultural landscape)

The proposed BESS development will form part of the infrastructure required for the Pulida PV and is located immediately adjacent to the substation and operations and maintenance facilities associated with the Pulida PV. Furthermore, the proposed BESS is located within close proximity to the already approved PV which is also located within a REDZ. In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise culturally significant landscape. The construction of the proposed BESS is therefore unlikely to result in unacceptable risk or loss, nor would the proposed BESS development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact.

Cumulative Impacts on Freshwater

It was determined by the Specialist that considering the state of the landscape, the sensitivity of the area, the nature and extent of the proposed development, the potential for cumulative impacts are expected

to be low to moderate. Freshwater resources within the general study area catchment (C52K) have historically been modified as a result of surrounding agricultural land use activities. It can be argued that given the current existence of a 209ha solar plant, any potential cumulative effects of a 4ha BESS will be of relatively low significance (if Alternative 2 is authorised) on the adjacent freshwater ecosystem including the downstream ecological reserve.

The cumulative impact of BESS Alternative 1 would be greater and can be quantified as 4ha of the original depression wetland (160ha) being modified and lost. It is possible to minimise cumulative impacts to a level of ecosystem disturbance that currently exists if BESS Alternative 2 is authorised

Conclusion regarding Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The most significant of these will be the contribution towards a reduction in greenhouse gas emissions and consequent assistance with climate change mitigation, as well as the increase in energy production and efficiency.

The alignment of renewable energy developments (and associated BESS such as that proposed) with the IRP and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The assessment of the cumulative impacts associated with the Pulida BESS was undertaken through the consideration of the impacts in isolation and compared to the cumulative impacts of the BESS and other energy related facilities in the area. Cumulative impacts are expected to occur with the development of the Pulida BESS and associated infrastructure throughout all phases of the project life cycle and within all areas of study considered as part of this BA report. The main aim for the assessment of cumulative impacts considering the development of the Pulida BESS and associated infrastructure is to identify associated cumulative impacts and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

Based on the specialist cumulative assessment and findings, the development of the BESS and associated infrastructure for the Pulida Facility and its contribution to the overall impact of other energy infrastructure to be developed within the area, it can be concluded that the contribution of the project to cumulative impacts will be of a low significance. There are no impacts or risks identified to be of a high significance or considered as unacceptable with the development of the BESS and associated infrastructure. In addition, no impacts that would result in whole-scale change are expected to occur.
From a cumulative impact perspective there is no reason why the project should not proceed.

10 FINDINGS, IMPACT MANAGEMENT AND MITIGATION MEASURES

10.1 Summary of the findings

Terrestrial Ecology

In the case of this study site, the grasslands have been transformed through anthropogenic activities. These have been transformed to secondary grasslands.

- Two alternatives, an Alternative 1 and Alternative 2 (Preferred Alternative) were investigated.
- Anthropogenic impacts identified within the study site included alien vegetation encroachment, road construction, natural vegetation removal, signs of erosion, hardening of surfaces to establish the Pulida Solar Facility.
- Alternative 1 is located with a **ESA2** which fulfils an ecological function still, while Alternative 2 (Preferred Alternative) falls within the **ESA1**.
- The study site still has a functional role to play in regional ecological functioning and biological functions at the site even though it has been influenced by human-related impacts.
- Ecological connectivity between the grassland and pans located towards the north as well as the Modder River cannot be excluded in the overall study area.

Construction activities would impact on the medium sensitive terrestrial biota. Mitigation measures should be implemented to mitigate to satisfactory standards if all mitigatory actions are implemented with due care. Alien eradication and rehabilitation must be encouraged through the development of an alien and invasive species plan. Monitoring of the termite and prevention of termites should be encouraged at the site.

Based on the results and conclusions presented in the specialist ecological report, and the outcomes of the field survey, it is the opinion of the specialists that the proposed project can be favourably considered should all the mitigation measures be implemented and monitored against to ensure compliance and included in the Environmental Management Programme (EMPr). Even though the sites fall within an ESA1 and ESA2 and medium sensitivity, the mitigation measures provided may reduce the negative risks anticipated with the BESS construction.

The ecologist supports the **Alternative 2 (Preferred Alternative)**, as Alternative 1, in particular the BESS and substation, falls within a watercourse and may impact on wetland vegetation and species dependent on the watercourse.

Freshwater

Based on the results of the combined desktop review and site sensitivity verification in the field, it is concluded with a relatively high degree of confidence that the sensitivity of aquatic and wetland biodiversity at the proposed Pulida BESS sites is regarded to be **Low** at both site alternatives.

The depression wetland was found to be in a moderately modified ecological condition.

The development would not significantly impact on any freshwater biodiversity features and no specific impact management interventions or monitoring requirements for freshwater biodiversity is considered necessary or provided in this respect.

Based on the findings of the desktop literature and historical imagery survey and the in-field observations and results, the depression wetland was found to be in a moderately modified ecological condition. The specialist opinion in terms of this study is that BESS ***Alternative 2*** is the **preferred alternative** from a freshwater perspective. BESS ***Alternative 1*** would result in the loss of ~4ha of wetland (2.5% of total wetland area) with a higher risk to soil and water resources to the remaining ~156ha wetland area posed by any leaks or major incidents which may result in releases of electrolyte from the stored batteries into the environment. The need to explore and consider wetland offsets may be necessary if BESS ***Alternative 1*** is authorised.

If all mitigation measures provided in this report are rigorously implemented as well as good environmental practice followed, the residual risks of the proposed development will pose low risks to freshwater biodiversity and water resource quality and will not compromise the requirements of the ecological reserve and other downstream water users.

It is the opinion of the author that if the ***Alternative 2 (Preferred Alternative)*** is authorised, a water uses licence (WULA) in terms of section 21 (c) and (i) of the National Water Act (Act 36 of 1998) would not be required based on the low residual risks after mitigation measures are implemented. There is no reason or fatal flaw from a freshwater biodiversity perspective that an environmental authorisation (EA) applied for under the framework of the National Environmental Management Act (Act 107 of 1998) and in terms of the 2014 EIA Regulations (as amended) should not be considered favourably by the competent authority. An EA being issued to the applicant is however contingent on the outcomes of the other specialist studies including input from other authorities, stakeholders and interested and affected parties.

Heritage Resource

During the site visit no heritage items nor sites were identified.

There are no visible restrictions or negative impacts in terms of heritage associated with the specific sites indicated. In terms of heritage the proposed project may continue utilizing either alternative.

10.2 List of impact management mitigation measures that were identified by all Specialists.

Terrestrial Biodiversity

Design and Construction

- To preserve these footprints, need to be demarcated and then adhered to.
- Construction activities should be limited to between 07:00 and 17:00 or in conjunction with the ECO. There will be nightworks during the construction period. In such cases, nearby landowners will be informed prior and appropriate lighting will be used.
- A complaints register should be available onsite whereby the public or community in close connection of the proposed development can issue their concerns, if need be.
- Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas.
- Any soil must be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure to wind and water erosion and to minimise dust generation.
- Use existing ablutions or provide to a max of 10 per ablution.
- Induction awareness training should be undertaken.
- Onsite waste management and removal, waste not to sit longer than 7 days. Bins to have lids.
- Separation of waste should be encouraged.
- Erosion control measures should be in place.
- Any buffers identified should be maintained by the contractor.
- As far as possible, the proposed development should be restricted to areas that have already been disturbed, and limited further loss of secondary vegetation, wetland areas, drainage lines should be permitted
- It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon and preventing movement of workers into sensitive surrounding environments
- Where possible, existing access routes and walking paths must be made use of, and new routes limited
- All laydown, storage areas etc should be restricted to within the project area, not beyond the wetland clusters towards the north
- All building materials should be mixed off site and no mixing should take place near the wetland clusters
- Prefabricated material must be used (or prioritised) to limit the fabrication and mixing on site
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species.

- Fauna species such as frogs and reptiles that have not moved away should be carefully and safely removed to a suitable location beyond the extent of the development footprint by a suitably qualified ECO trained in the handling and relocation of animals
- No trapping, killing, or poisoning of any wildlife is to be allowed on site, including snakes, birds, lizards, frogs, insects, or mammals
- All building materials should be mixed off site and no mixing should take place near the wetland clusters
- Have action plans onsite, and training for contactors and employees in the event of spills, leaks, and other impacts to the surrounding environment.
- It is worth noting that by applying relevant mitigation measures to the system to ensure that the functionality of the watercourse not be lost will directly ensure that the surrounding system's functionality be retained and that impacts to the water resources be limited.
- The footprint area associated with the construction must be minimised, avoiding the wetland areas where possible. Areas earmarked for development must be marked to ensure a controlled disturbance footprint area to minimise negative impacts.
- Erosion prevention and sediment control measures are imperative and need to be implemented throughout the entire project footprint area, access roads and temporary laydown / storage sites. Temporary and permanent erosion control methods may include silt fences, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching
- Further, unstable, and exposed soil embankments should be protected from erosion with a combination of retainer wall bricks / blocks and vegetation
- The contractors used for the construction should have spill kits available prior to construction to ensure that any fuel, oil, or hazardous substance spills are cleaned-up and discarded correctly
- It is preferable that construction takes place during the dry season (as much as possible) to reduce the erosion potential of the exposed surfaces
- During construction activities, all rubble generated must be removed from the site and not dumped in the instream, within the wetland habitat towards the north of the site.
- An alien invasive plant management plan needs to be compiled and implemented post construction to control current invaded areas and prevent the growth of invasive species on cleared areas.
- A maintenance management plan should accompany the EIA to DFFE on how to prevent and contain the termite problems currently at the Pulida facility and in the study area.

Operational Phase

The following mitigation and management measures should be implemented during the operation phase to minimise potential environmental impacts:

- Waste should be managed as not to be aesthetically appealing or attract pests or rodents.
- Control of alien invasive plants is encouraged.
- Rehabilitation and landscaping with indigenous vegetation within the development should be encouraged and made a condition within the Environmental Authorisation.
- Mitigation Measure Objectives for biodiversity impacts on flora and fauna should be encouraged. The EMPr will make further provision for this.

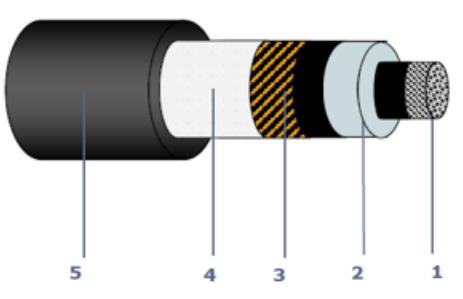
The focus of mitigation measures should be to reduce the significance of potential impacts associated with the proposed water pipeline and thereby to:

- Prevent the destruction of, and fragmentation, of the vegetation community.
- Prevent the loss of the faunal community associated with this vegetation community.

Termite Presence

For the prevention of termite damage to infrastructure such as underground cabling the Applicant should consider preventative measures. The first is to include a physical barrier, while the second is the use of a chemical barrier. The latter option is used successfully on small sites such as homes, but the potential of soil contamination and secondary poisoning on a larger scale may pose a significant risk, when considering the length of the cables within a project on this scale.

Any protection consists of a protective layer installed under the cable oversheath (also said external jacket). If the termite pierces the oversheath, it meets the barrier of this protection.



1	Core conductor + semiconductive layer
2	Main insulation + semiconductive layer
3	Concentric neutral / metallic shield
4	Protective layer (termite proof)
5	Oversheath / external jacket

(EGP, 2021)

Prior to considering the second option it is recommended to install monitoring stations within the site, typically the very sandy areas where the termites are found. Using these small bait stations will allow for

correct identification of the species present, but also allow for the opportunity to place small sections of the proposed cable inside the monitoring system to see if the termites are causing significant damage to the cable outers. These can be placed throughout the site, to assist if required which portions of the underground cables will require physical barriers.

The second option of is the consideration of applying surface spray with suitable and legal termite control spray. A product which is a suspension concentrate residual contact and stomach insecticide for the control of termites and is based on a delayed action which allows the bait to be taken back to the nest by foraging ants so that the entire colony, as well as the queen, is destroyed.

Aquatic Biodiversity

Recommended mitigation measures to reduce impacts/risks to the wetland during the construction and operational phases of the BESS (Alternative 1 & Alternative 2(Preferred)) are provided in the watercourse risk assessment matrix found in say Appendix E1 of the *Aquatic specialist report* contained under Appendix G. The mitigation measures described in the RAM are recommended as standard best practice measures applicable to a development of this nature and should be implemented during both construction and where applicable, the operational phase. These are made in support of ensuring the protection of the wetland in the receiving environment i.e., adjacent to the proposed development.

Mitigation measures have been provided for further in the EMPr.

Generic mitigation measures

A list of generic impact management outcomes and monitoring requirements for inclusion in the EMPr are provided to manage alien invasive plants, stormwater around the BESS and to manage spills during construction and operations in order to reduce the risk of potential groundwater pollution.

Mitigation measure include:

Objective Action Frequency	Objective Action Frequency	Objective Action Frequency
Manage alien invasive plants	i. Manage the invasive alien plants at any disturbed or spoil areas. With immediate effect	With immediate effect
	ii. Manage the invasive alien plants around the BESS during operation.	With immediate effect
	iii. Ensure appropriate storm water infrastructure is installed to dissipate flow and direct away from concentrated paths.	During rainfall season

Objective Action Frequency	Objective Action Frequency	Objective Action Frequency
Manage stormwater run-off from the BESS	iv. Ensure drip trays are used under vehicles/machinery and that impervious floor surfaces are constructed to ensure chemicals and waste do not enter the sub-surface.	With immediate effect throughout construction
	v. Where practical, plant appropriate grass species or install energy dissipation structures in stormwater drains around the BESS.	With immediate effect
Manage spills during Construction	vi. Ensure drip trays are used under vehicles/machinery and erosion control measures are implemented.	With immediate effect ECO to check every 2 months
	vii. Ensure a spill contingency plan is put into place	
Manage spills during operation	viii. Record and report any fuel, oil, hydraulic fluid or electrolyte spills to the Site Manager/Engineer so that appropriate clean-up measures can be implemented. ix. Spills must be completely removed from the site. x. Appropriate fire extinguisher equipment installed within the BESS. xi. Temperature of battery systems monitored continually. xii. Ensure air circulation to prevent the build-up of chemicals. xiii. Implement the storm-water management plan and ensure appropriate water diversion systems are put in place. xiv. Compile (and adhere to) a procedure for the safe handling of battery cells. xv. Compile an emergency response plan and implement should an emergency occur. xvi. Ensure that spill kits (if appropriate) are available on site for clean-up of spills and leaks. xvii. Drip-trays or containment measures must be placed under equipment that poses a risk when not in use. xviii. Immediately clean up spills and dispose of contaminated soil at a licensed waste disposal facility. xix. Dispose of waste appropriately to prevent pollution of soil and groundwater. xx. Completely lined infrastructure (concrete bunded area), with the capacity to contain 120% of the total amount of chemicals stored within the BESS. xxi. Install monitoring systems to detect leaks or emissions.	With immediate effect/Ongoing

Heritage

No heritage items were identified on site. There are no visible restrictions or negative impacts in terms of heritage associated with the specific sites.

Mitigation proposed included:

- The discovery of subsurface archaeological and/or historical material as well as graves must be taken into account in the Environmental Management Programme.

10.3 How the findings and recommendations of the different specialist studies have been integrated.

As indicated in the impact assessment, all the specialist studies as well as other elements were rated before mitigation and after in terms of their significance. This resulted in the proposal of which mitigation measures should be implemented. Please refer to the EMPr attached as Appendix F regarding additional information relating to mitigation that the applicant will implement during the different phases of the project development.

11 ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account this statement sums up the impact that the proposed project and alternatives may have on the environment after the management and mitigation of impacts have been considered.

11.1 Alternative 2 (Preferred Alternative)

When considering the potential impacts involved with the proposed development, the preferred alternative has a Medium to Low significance; however, these impacts can be mitigated to an acceptable level, based on the following:

- The study site falls does not fall within an identified CBA.
- The study area has been influenced by anthropogenic activities ranging from transformation of grasslands and alien infestation, overgrazing, and hardening of surfaces.
- A high number of termite mounts were observed within the existing PV site and in the study area. Medium sensitivity is expected as the area may provide nesting for birds, hiding spots for reptiles and observation points for mammalian species on the termite mounts.
- The state of the vegetation in the study is degraded, with the occurrence of no red data species, probably as a result of this degraded state. The vegetation is classified as having a moderate sensitivity due to the indigenous component still being present.
- No individuals of the endemic or biogeographically important plants were observed during the survey, although it may have previously been found in the larger area.
- No red data species potentially occur in the study area according to the SIBIS database. No other red data species was also found in the area, although the potential habitats were surveyed to the extent representative of the area.
- Anthropogenic impacts identified included grazing, infrastructure development (Pulida Solar PV Facility), hardening of surfaces, Stormwater infrastructure and alien invasive species occurring at the site.
- Based on the DEFF Screening tool the site falls within a Low Plant species sensitivity as indicated through the application of the Environmental Screening Tool however from the site visit it can be confirmed that the sensitivity of the site is medium.
- From the site visit it can be confirmed that the onsite sensitivity of the site is Medium (grasslands have been degraded and modified). The site still has a functional role to play for ecological connectivity with drainage towards the north and the wetland clusters located in the north.
- The preferred alternative is located outside of the identified drainage line.

- Even though the identified sites fall within an ESA1 and ESA2 with medium sensitivity, the mitigation measures provided may reduce the negative risks anticipated with the BESS construction.
- Based on the results of the combined desktop review and site sensitivity verification in the field, it is concluded with a relatively high degree of confidence that the sensitivity of aquatic and wetland biodiversity at the preferred alternative site is regarded to be Low. The preferred alternative will not significantly impact on any freshwater biodiversity features and no specific impact management interventions or monitoring requirements for freshwater biodiversity is considered necessary or provided in this respect.
- The preferred alternative is chosen as it takes the local wetland features into consideration.
- Additionally, it is likely that the access road and connecting power line will traverse the dry water course feature.
- If all mitigation measures provided for are rigorously implemented as well as good environmental practice followed, the residual risks of the proposed development will pose low risks to freshwater biodiversity and water resource quality and will not compromise the requirements of the ecological reserve and other downstream water users. If the Preferred Alternative is authorised, a Water Use Licence (WUL) in terms of section 21 (c) and (i) of the National Water Act (Act 36 of 1998) will not be required based on the low residual risks after mitigation measures are implemented.
- There is **no reason or fatal flaw** from a terrestrial or freshwater biodiversity perspective that an environmental authorisation should not be considered favourably by the competent authority.
- There were **no heritage** items and/ resources which would be impacted upon from the development of the facility.

11.2 Alternative 1

BESS Alternative 1 would result in the loss of ~4ha of wetland (2.5% of total wetland area) with a higher risk to soil and water resources to the remaining ~156ha wetland area posed by any leaks or major incidents which may result in releases of electrolyte from the stored batteries into the environment. The need to explore and consider wetland offsets may be necessary if BESS Alternative 1 is authorised.

There are higher impacts (risks) to the depression wetland which will result in the event that BESS Alternative 1 is constructed as this is located directly within the depression i.e., watercourse.

Wetlands are still ecologically sensitive ecosystems which provide important ecosystem services.

Based on the information provided and assessed during the EIA and the utilisation of specialist investigations the alternative is not preferred.

11.3 No-Go Alternative

The no-go alternative is the option of not constructing the Pulida BESS Facility.

Should this alternative be selected, there would be no direct environmental impacts within the designated BESS footprint. The implementation of the no-go alternative would result in the Pulida Solar Energy Facility not being able to store additional generated energy or supply sustained electricity to the national grid at times when the PV is not producing optimally or Loadshedding is implemented and will, therefore, result in lost opportunity to dispatch additional electricity from the facility.

To ensure a positive environmental impact, the environmental benefits of the energy storage technology must out-weigh the potential negative impacts.

Based on the outcomes of the specialist studies undertaken (as outlined in this chapter of the report), it can be concluded that limited environmental costs can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures as outlined in the BA Report and the EMPr are implemented and adhered to. These environmental costs could include:

> A loss of biodiversity, flora and fauna due to the clearing of land approximately 4-6ha for the construction and utilisation of land for the BESS and associated infrastructure. The ecological assessment predicted the impacts to be low provided that the footprint of the facility is located outside of the identified high sensitivity areas.

These costs are expected at a local level and can be effectively mitigated and managed.

As detailed above, the no-go alternative will result in a number of lost opportunities and will conserve only a minor (~4ha) portion of degraded vegetation and habitat. The no-go alternative is therefore not considered to have a significant benefit when compared to the implementation of the proposed BESS, and is therefore not considered as an alternative and not proposed to be implemented for the development of the facility

Environmentally, the no go option assumes the site remains in its current state, i.e., degraded agricultural land. This would mean low negative environmental impacts such as vegetation loss.

Specifics around the exact contribution of the BESS to the energy network have not been quantified, however the BESS would contribute to a reduced usage of fossil fuel plants and will support increased renewable energy generation through the smoothing of renewables. This is in line with the objectives of the 2011 Integrated Resource Plan for Electricity (2010-2030) to reduce carbon emissions and invest in carbon offset technologies

If the project does not proceed a reduction in carbon emissions in South Africa's power generating infrastructure will potentially not be achieved and we will maintain our reliance on fossil fuel powered

peaking plants that are used to managed variability on the power from renewable energy installations, and there will be no capacity to store excess power generated by renewable energy projects when demand is low, but wind (for example, is high) and feeding this back into the grid when demand is high and power generation from renewables is low.

Several benefits and solutions will be lost which is faced by the energy crisis:

- Reduction in carbon emissions in the country's power generation infrastructure
- Unlocking constrained networks (Reduction in loading/ congestion of upstream High Voltage networks)
- Reducing voltage drops and improve quality of supply
- Deferment or replacement of future capital expansion projects
- Supports mini grids in areas with limited access to bulk power; and
- Peak load reduction - 4 hours of battery storage increases dispatch time (thereby extending baseload and offset carbon emissions).

11.4 Decommissioning And Salvage

Pulida plans to maintain the BESSs in the long-term. Replacement of battery components may be required however no decommissioning of the system as a whole is planned in the foreseeable future. Maintenance management measures (e.g., the return to supplier clause) that cover the disposal of certain components such as have been included in the EMPr under the operational phase

The typical life expectancy for the BESS system is between 15 to 20 years, all depending on the technology used, operations and application of the system and maintenance regimes applied etc. The system is modular, which allows premature equipment failures to be counteracted by replacing the specific sections, without major impact on the holistic system.

As with the other equipment, the decommissioning process for BESS involves dismantling and removing the equipment and waste from the site in compliance with applicable federal and local rules governing its safe transport and disposition.

The actual scope of decommissioning shall allow for the energy storage system to be safely de-energized, disassembled, readied for shipment or storage, and removed from the premises.

Once a used battery is removed from service and diverted toward end-of-life management, it would be disposed as per the most relevant measures as identified at the time. These could include the following.

- Recordkeeping
- Labelling
- Specified storage methods that keep material out of the environment
- Outline approved recycling or disposal pathways and structures

The balance of plant represents a significant quantity of materials, including:

- Concrete pads or foundations
- steel enclosures or containers
- cabling
- array of electronics that are part of the entire energy storage system package (conversion units)

Concrete and steel are readily recyclable, and many enclosures can be reused. Inverters, control systems, and other electronic equipment share many of the challenges of e-waste more broadly, but useful materials often can be recovered.

The cost and environmental implications of BESS end of life decommissioning are considerable. However, especially considering the growth of the battery energy recycling market, these costs and environmental outcomes would evolve, and these changes would arise from individual companies adopting best practices, industry-wide initiatives to support sustainable market expansion, and changes to policies and

regulations at the federal, state and local levels. Improvements in costs and environmental outcomes will apply as the market evolves to cater for these technologies – reuse and safe disposal at a fraction of the cost.

The descriptions of the dismantling activities are indicated in the table below. Their cost is derived by accounting for dismantling of equipment on site, transport to Battery OEM or to the disposal / recycling facility, dedicated recycling cost. There is a possible salvage cost of the batteries since they can be sold as second-hand systems, or the batteries carry some recycle value to be reused.

Key Equipment	Description
Power Conversion Units	Removal and demolishing of Inverter Modules, Inverter Step-Up transformers, Switchgear, Canopies and Enclosures, Rebar of Concrete Foundations
Cable Reticulation System	Removal and Demolish of Cable Trays, Racks, Ladders, Supports, Conduit etc.
Low Voltage Cabling	Removal of DC, LV and Communication Cabling
Medium Voltage Cabling	Partial removal of MV Cabling - above ground and up to a level
Cable Trench Rehabilitation	Opening and Closing of Cable Trenches - Rehabilitating the Route
Batteries and Container	Removal of Batteries and Containers, Rebar of Concrete Foundations
Transport to Recycling Facility	Current batteries to be transported back to manufacturer
Recycling of Lithium-Ion Batteries	Depending on recycling plant (cost of recycling and salvaging could be included)
Storm Water Management System	Removal and Demolish of Storm water Pipes, Culverts, Headwalls etc
Fencing	Removal and Demolish of Plant Perimeter Fence
Topsoil Strip	Strip and Store of Topsoil from Formed areas now impacted by Decommissioning
Import and Replace Topsoil	Import Topsoil from Commercial Sources

11.5 Assumption and Limitations

Aquatic Biodiversity

The following limitations and assumptions were identified by the specialist

The determination of the watercourse boundary and assessment thereof is confined to the study area (properties) of the identified wetland features

The databases consulted may not at all times be recent or as fully reliable as is the nature databases

This study assumes the previous EIA and assessments undertaken during 2014 by the previous EAP and specialists are unbiased where appropriate assessment methods were followed

Description of the depth of the regional water table and geohydrological and hydropedological processes falls outside the scope of this assessment

Since environmental impact studies of this nature deal with dynamic natural systems which evolve and change over time, obtaining higher accuracy interpretations with a greater degree of confidence is better achieved over several years and seasons based on iterative field sampling and observations to account for fluctuations in environmental conditions

Any recommended watercourse buffer zones do not account for any impacts of future climate change or any future changes resulting from other activities in the immediate catchment

Terrestrial Biodiversity

The following limitations with respect to the assessment of the property are applicable to this report:

Sampling, by nature, implies that not all species in a study site will be recorded due to factors such as plant phenology as affected by seasonality, seasonal climatic conditions, microhabitats and both historical and current management practices

The site inspection was a single site visit and no specialist sampling techniques utilised.

Sampling was undertaken during the summer period and the flowering period of the summer rainfall season.

Field assessment notes are supplemented by making use of literature sources and existing data bases (SANBI, Reference books, Articles etc.); and

The main ecological and floristic observations, forming the basis for recommendations, are, however, based on the field assessment observations.

Heritage

There are no visible restrictions or negative impacts in terms of heritage associated with the specific sites indicated.

EAP

Some EAP assumptions and limitations considered are:

It is assumed that all information provided by the project team and other parties are true and correct and that the intention of the Applicant is indeed to contain the proposed development within the proposed footprint. It is also assumed that the proposed development scope would be developed as per the description provide in this report, noting that deviations from this may trigger provisions of the NEMA, NWA or NHRA.

Note that assumptions related to specialist assessments are indicated in the relevant specialist reports in Appendix E. There are, however, no significant gaps in knowledge in any of those assessments that would reduce confidence in the findings. There are no uncertainties directly pertaining to the proposal. The general political climate and management priorities within Free State and other state departments are uncertain, however this is not considered material in terms of the DEA&DP's ability to decide on the application.

It is uncertain whether the Contractor would implement the EMPr as required, however there are legal mechanisms in place to avoid this and the EMPr (and EIA Regulations, as amended) includes a requirement for auditing and the Applicant/Holder of the Environmental Authorisation would be required to include the EMPr in all contract documentation.

The impacts indicated for the "no-go" alternative have not been contemplated "with mitigation" as, in some cases, there is no legal provision for implementation of specific measures in the form of an EMPr beyond the general laws that apply under existing rights (e.g., Municipal By-Laws and NEMA "duty of care").

These aspects on a cautionary approach on the ecological resources will be provided with the specialist studies to accompany the release of the final BAR.

11.6 Recommendation

After assessing the environmental related impact in terms of bio-physical and social **the Preferred Alternative (Alternative 2)** was selected as it has the least impact on the environment, in particular the water course located on site.

Based on the findings by the freshwater specialist a depression wetland was found on site which is in a moderately modified ecological condition. The specialist is of the opinion that the Preferred Alternative was the best choice as it was located entirely outside of the wetland area, whereas Alternative 1 is located within the outer edges of the wetland and would result in the loss of ~4ha of wetland (2.5% of total wetland area) with a higher risk to soil and water resources to the remaining ~156ha wetland area posed by any leaks or major incidents which may result in releases of electrolyte from the stored batteries into the environment.

Only the access road and medium voltage cabling would potentially impact on the very outer edges of the wetland however with the mitigation measures proposed the impact is deemed as low.

From the terrestrial biodiversity point of view anthropogenic impacts identified within the study site included alien vegetation encroachment, road construction, natural vegetation removal, signs of erosion, hardening of surfaces to establish the Pulida Solar Facility.

Disturbance of both alternatives will be identical as highlighted in the ecological report as they are both located on the same property with the terrestrial ecology status being near identical for both alternatives.

The heritage study revealed that there are no signs of any heritage resources within the study area. Although, if any items of heritage or cultural significance are identified, construction activities will immediately cease and the SAHRA will be notified of the findings. Mitigation measures mentioned in the EMPr contained in Appendix F, have been developed to assist the contractor during the construction, and post-construction phases of the project to minimize any impacts on the environment.

The proposed layout was selected as it avoids total conflict with the water course identified on the property, although it will have the impact on the freshwater environment, through the establishment of the access road and MV lines, the impact is far less than if the facility had to be constructed within the water course.

In terms of flora, and fauna, the current status of the vegetation is seen as degraded with no red data species identified on site, this is most likely as a result of the degraded state of the property.

The EAP believes the **preferred alternative (Alternative 2)** will not drastically affect the current status of the environment and surrounds if the various mitigation measures are implemented.

After conducting the EIA process and in consultation with specialist studies (Wetlands, Ecological, Heritage and Engineering), no environmental fatal flaws are anticipated and those identified can be mitigated against by conditions of the EMPr and specialist studies.

The proposal is therefore the best suited to minimize or have the least impact on the built, natural, and social environments as being the most cost-effective solution and can proceed accordingly.

Based on the results and conclusions presented, and the outcomes of the field survey/s, it is the opinion of the EAP and Specialists that the proposed project can be favourably considered should all the mitigation measures be implemented and monitored against to ensure compliance and included in the EMPr contained under Appendix F Environmental Management Programme. The development could be supported. The herbaceous layer may be preserved in areas outside of the BESS facility.

The following are suggested compulsory recommended conditions for the proposed BESS facility:

1) Adhere to the proposed management and mitigation measures during the construction and operation phases as set out in the EMPr
2) The EMPr must be implemented and monitored by an independent Environmental Control Officer (ECO) and all monitoring reports must be submitted to the relevant authority for review.
3) Conditions as set out by all specialist studies should form part of the General conditions of the EA.

12 DECLARATION

12.1 Declaration of the Applicant

I…… **Manuele Battisti** ……., ID number ……in my personal capacity or duly authorised thereto hereby declare/affirm that all the information submitted or to be submitted as part of this application form is true and correct, and that:

- I am fully aware of my responsibilities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), the Environmental Impact Assessment ("EIA") Regulations, and any relevant Specific Environmental Management Act and that failure to comply with these requirements may constitute an offence in terms of relevant environmental legislation.
- I am aware of my general duty of care in terms of Section 28 of the NEMA.
- I am aware that it is an offence in terms of Section 24F of the NEMA should I commence with a listed activity prior to obtaining an Environmental Authorisation.
- I appointed the Environmental Assessment Practitioner ("EAP") (if not exempted from this requirement) which:
    - meets all the requirements in terms of Regulation 13 of the NEMA EIA Regulations; or
    - meets all the requirements other than the requirement to be independent in terms of Regulation 13 of the NEMA EIA Regulations, but a review EAP has been appointed who does meet all the requirements of Regulation 13 of the NEMA EIA Regulations.
- I will provide the EAP and any specialist, where applicable, and the Competent Authority with access to all information at my disposal that is relevant to the application.
- I will be responsible for the costs incurred in complying with the NEMA EIA Regulations and other environmental legislation including but not limited to –
    - costs incurred for the appointment of the EAP or any legitimately person contracted by the EAP.
    - costs in respect of any fee prescribed by the Minister or MEC in respect of the NEMA EIA Regulations.
    - Legitimate costs in respect of specialist(s) reviews; and
    - the provision of security to ensure compliance with applicable management and mitigation measures.
- I am responsible for complying with conditions that may be attached to any decision(s) issued by the Competent Authority, hereby indemnify, the government of the Republic, the Competent

Authority and all its officers, agents, and employees, from any liability arising out of the content of any report, any procedure, or any action for which I or the EAP is responsible in terms of the NEMA EIA Regulations and any Specific Environmental Management Act.

Signature of the Applicant

Enel Green Power South Africa (Pty) Ltd

Name of Organisation

Date

12.2 Declaration of the EAP

I ……**Nicholas Anthony Gates**……., EAPASA Registration number ……**NA**……. as the appointed EAP hereby declare/affirm the correctness of the:

- Information provided in this BAR and any other documents/reports submitted in support of this BAR;
- The inclusion of comments and inputs from stakeholders and I&APs.
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties, and that:
- In terms of the general requirement to be independent:
    - other than fair remuneration for work performed in terms of this application, have no business, financial, personal, or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
    - am not independent, but another EAP that meets the general requirements set out in Regulation 13 of NEMA EIA Regulations has been appointed to review my work (Note: a declaration by the review EAP must be submitted);
- In terms of the remainder of the general requirements for an EAP, am fully aware of and meet all of the requirements and that failure to comply with any the requirements may result in disqualification.
- I have disclosed, to the Applicant, the specialist (if any), the Competent Authority and registered interested and affected parties, all material information that have or may have the potential to influence the decision of the Competent Authority or the objectivity of any report, plan or document prepared or to be prepared as part of this application.
- I have ensured that information containing all relevant facts in respect of the application was distributed or was made available to registered interested and affected parties and that participation will be facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments.
- I have ensured that the comments of all interested and affected parties were considered, recorded, responded to and submitted to the Competent Authority in respect of this application.
- I have ensured the inclusion of inputs and recommendations from the specialist reports in respect of the application, where relevant.
- I have kept a register of all interested and affected parties that participated in the public participation process; and
- I am aware that a false declaration is an offence in terms of Regulation 48 of the NEMA EIA Regulations.

Signature of the EAP

NCC Environmental Services (Pty) Ltd

Name of Organisation

April 2021

Date

12.3 Declaration of the Reviewer EAP

I …… **Ronaldo Retief**……, EAPASA Registration number …… **2019/181**……as the appointed Review EAP hereby declare/affirm that:

- I have reviewed all the work produced by the EAP.
- I have reviewed the correctness of the information provided as part of this Report.
- I meet all of the general requirements of EAPs as set out in Regulation 13 of the NEMA EIA Regulations.
- I have disclosed to the applicant, the EAP, the specialist (if any), the review specialist (if any), the Department and I&APs, all material information that has or may have the potential to influence the decision of the Department or the objectivity of any Report, plan or document prepared as part of the application; and
- I am aware that a false declaration is an offence in terms of Regulation 48 of the NEMA EIA Regulations.

Signature of the Reviewer EAP **Date**: 20 September 2022

Name of company (if applicable): **NCC Environmental Services (Pty) Ltd**

APPENDIX A – MAPS

APPENDIX B – SITE PLANS

APPENDIX C – PHOTOGRAPHS

APPENDIX D – BIODIVERSITY OVERLAY MAP

APPENDIX E – SPECIALIST REPORTS

Appendix E1 - Freshwater Report

Appendix E2 - Ecological Report

Appendix E3 - Heritage Report

APPENDIX F – ENVIRONMENTAL MANAGEMENT PROGRAMME

APPENDIX G – PUBLIC PARTICIPATION INFORMATION

Appendix G1 – Background Information Document

Appendix G2 – Advertisement

Appendix G3 – Site Notices

Appendix G4 – Written Letter

Appendix G5 – Stakeholder List

Appendix G6 – Comments & Response Report

Appendix G7 – Stakeholder Engagement

APPENDIX H – ENVIRONMENTAL SCREENING TOOL

APPENDIX I – PROPERTY DETAILS

APPENDIX J – EAP CV's