SITE SENSITIVITY VERIFICATION & HYDROLOGICAL COMPLIANCE STATEMENT

FOR THE PROPOSED CONSTRUCTION AND OPERATION OF THE BATTERY ENERGY STORAGE SYSTEM (BESS) AND ASSOCIATED INFRASTRUCTURE AND INCLUSION OF ADDITIONAL LISTED ACTIVITIES FOR THE AUTHORISED MIERDAM PHOTO VOLTAIC (PV) SOLAR ENERGY FACILITY, THE SIYATHEMBA LOCAL MUNICIPALITY, PIXLEY KA SEME DISTRICT, NORTHERN CAPE PROVINCE OF SOUTH AFRICA

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EXECUTIVE SUMMARY

Objective

The development is located approximately 43 km south west of Prieska in a rural part of the Northern Cape. Access to the proposed development will be via the existing farm gravel road access located on the R357 Provincial Road.

The provincial road is a surfaced road from the N10 National Road running past Prieska which eventually becomes a gravel road up to the access road of the development. The objective is to assess the impacts associated with the installation of a BESS on the Mierdam Photovoltaic (PV) Energy Facility (12/12/20/2320/2/AM3).

Key Findings

Through the impact assessment, the risks identified during construction have the highest impact although it would still be considered to be of low risk. The construction and operation phase associated impacts of the access roads, PV modules, substation, maintenance building and power lines have already been approved by the respective authorities. Therefore, the addition of the BESS to the existing proposed development will have a minimal impact as it falls within the original developable area and is relatively small. The location of the proposed BESS has been strategically placed to be situated away from watercourses. There is a risk of groundwater contamination in the event of leaks from the batteries. However, if solid state batteries are used, this risk will be reduced.

Recommendation

The proposed BESS has been strategically placed to be more than 500 meters from surface water resources. This location has taken cognisance of alternative locations and "no go" areas and is deemed to be the best possible location. The is a risk for groundwater contamination in the event of battery spillage. However, in this area, given the low water use requirement on-site and adherence to specialist recommendations, the site is of low risk of negative groundwater impacts during construction and operation. Furthermore, should solid state batteries be used rather than redox flow, this risk would be significantly lowered as redox flow batteries use vanadium electrolyte solution which is potentially hazardous to groundwater.

The previously approved specialist reports and the subsequent environmental authorisation (EA) are still relevant and these studies covered the proposed BESS footprint. NatureStamp strongly confirms that the hydrological impacts associated with the BESS would be minimal and acceptable and hence the EA should be granted to include the BESS.

Table 1 National Environmental Management Act, 1998 (Act No. 107 Of 1998) and Environmental Impact Regulations, 2014 (As Amended) – Requirements For Specialist Reports (Appendix 6)

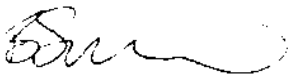
Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Relevant Section
A specialist report prepared in terms of these Regulations must contain details of – i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix 1
A declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 2
An indication of the scope of, and the purpose for which, the report was prepared – i. an indication of the quality and age of base data used for the specialist report; ii. a description of existing impacts on the site, cumulative impacts iii. of the proposed development and levels of acceptable change;	Section 2, 8
The date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 7
An identification of any areas to be avoided, including buffers;	N/A
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 1
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3
A description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 8
Any mitigation measures for inclusion in the EMPr;	Section 8
Any conditions for inclusion in the environmental authorisation;	None
Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
A reasoned opinion i. (as to) whether the proposed activity, activities or portions thereof should be authorized regarding the acceptability of the proposed activity or activities; and ii. ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 9
A description of any consultation process that was undertaken during the course of preparing the specialist report;	No feedback has yet been received from the public participation process.
A summary and copies of any comments received during any consultation process and where applicable all responses thereto	No feedback has yet been received from the public participation process.
Any other information requested by the competent authority.	N/A
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	N/A

Specialist Details & Declaration

This report has been prepared in accordance with Section 13: General Requirements for Environmental Assessment Practitioners (EAPs) and Specialists as well as per Appendix 6 of GNR 982 – Environmental Impact Assessment Regulations and the National Environmental Management Act (NEMA, No. 107 of 1998 as amended 2017) and Government Notice 704 (GN 704). It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows –

Table 1 Details of Specialist

Specialist	Task	Qualification and accreditation	Client	Signature
Bruce Scott-Shaw NatureStamp SACNASP:118673	Design, GIS & report	BSc, BSc Hon, MSc, PhD Hydrology	SiVest	 Date: 28/10/2020

Details of Authors:

Bruce is a hydrologist, whose focus is broadly on hydrological perspectives of land use management and climate change. He completed his MSc under Prof. Roland Schulze in the School of Bioresources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal, South Africa. Throughout his university career he has mastered numerous models and tools relating to hydrology, soil science and GIS. Some of these include ACRU, SWAT, ArcMap, Idrisi, SEBAL, MatLab and Loggernet. He has some basic programming skills on the Java and CR Basic platforms. Bruce completed his PhD at the Center for Water Resources Research (UKZN), which focused on rehabilitation of alien invaded riparian zones and catchments using indigenous trees. Bruce is currently affiliated to the University of KwaZulu-Natal where he is a post-doctoral student where he runs and calibrates hydrological and soil erosion models. Bruce has presented his research around the world, including the European Science Foundation (Amsterdam, 2010), COP17 (Durban, 2011), World Water Forum (Marseille, 2012), MatLab advanced modelling (Luxembourg, 2013), World Water Week (Singapore, 2014), Forests & Water, British Colombia, (Canada, 2015), World Forestry Congress (Durban, 2015), Society for Ecological Restoration (Brazil, 2017). Conservation Symposium (Howick, South Africa, 2018) and SWAT modelling in Siem Reap (Cambodia, 2019). As a consultant, Bruce is the director and principal hydrologist of NatureStamp (PTY) Ltd. In this capacity he undertakes flood studies, calculates hydrological flows, performs general hydrological modelling, stormwater design, dam designs, wetland assessments, water quality assessments, groundwater studies and soil surveys.

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1. INTRODUCTION

1.1 Project Background and Description of the Activity

NatureSTamp (PTY) Ltd. has been appointed by SiVEST (PTY) Ltd, on behalf of South Africa Mainstream Renewable Power Mierdam (Pty) Ltd to undertake the assessment of the development of a Battery Energy Storage System (BESS) and associated infrastructure for the authorised Mierdam Photovoltaic (PV) Energy Facility (12/12/20/2320/2), located near Kimberley in the Sol Plaatje Local Municipality, Francis Baard District Municipality, in the Northern Cape Province of South Africa.

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 and amended on 07 April 2017 [promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017], various aspects of the proposed development are considered listed activities under GNR 327 and GNR 324 which may have an impact on the environment and therefore require authorisation from the National Competent Authority (CA), namely the Department of Environment, Forestry and Fisheries (DEFF), prior to the commencement of such activities. A hydrological impact assessment has been commissioned to assess and verify the BESS under the new Gazetted specialist protocols.

The BESS will be located on a previously identified buildable area. It will be contained within shipping containers placed on a raised concrete plinth. The BESS allows for the storage of electricity and supply thereof during peak-demand will mean that the facility is more efficient, reliable and electricity supply more constant. The typical setting of the site is provided in Figure 1 with the location/layout of the site indicated in Figure 2.

Figure 1 The Mierdam site prior to the Energy Facility

1.2 Scope and Objectives

Assess the hydrological impacts associated with the installation and operation of a BESS on the Mierdam Photovoltaic (PV) Energy Facility (12/12/20/2320/2).

1.3 Terms of Reference

The terms of reference for the assessment consist of the Site Verification Report and a specialist study/compliance statement as per Government Notice 320 of 20 March 2020. The Terms of Reference (ToR) applicable to this specialist study are:

i. A Site Verification Report and Compliance Statement / Specialist Report in line with the DEA Screening Tool Specialist theme Protocols (As gazetted 20 March 2020) if they apply. If they do not, the report is written in accordance with Appendix 6 of the EIA Regulations, 2014 (as amended);
ii. A thorough overview of all applicable legislation, policies, guidelines. etc.;
iii. Identification of sensitive and/or 'no-go' areas to be avoided;
iv. Recommend mitigation measures in order to minimise the impact of the proposed development;
v. Provide implications of specialist findings for the proposed development (e.g. permits, licenses etc.);
vi. Specify if any further assessment will be required;
vii. Include an Impact Statement, concluding whether any fatal flaws have been identified and ultimately whether the proposed development can be authorised or not (i.e. whether EA should be granted / issued or not); and
viii. A copy of the Specialist Declaration of Interest (DoI) form, containing original signatures.

2. METHODOLOGY

A detailed description of the methods has been provided. The regional context and desktop analysis were used as the point of departure. A detailed site visit was undertaken by SiVest in 2012, prior to the approval of the wind facility. Much of this information was used to confirm the sensitivity of this site.

The verification assessment of these systems considered the following databases where relevant:

Table 2 Data type and source for the site verification assessment

Data Type	Year	Source/Reference
Aerial Imagery	2013, 2016, present	Surveyor General
1:50 000 Topographical	2011	Surveyor General
5m Contour	2010	Surveyor General
River Shapefile	2011	NFEPA
Geology Shapefile	2011	Council of Geoscience, 2015/National Groundwater Archive
Borehole Data	Ongoing	National Groundwater Archive, WARMS
Land Cover	2006/present	SANBI
Water Registration	2013, 2016	WARMS - DWS
Previous Assessments	2012	SiVest

*Data will be provided on request

The following methods were used to undertake the site verification:

- General area desktop site inspection;
- Site photographs from previous studies;
- Satellite imagery (Google Earth/Landsat);
- Review of existing approvals/authorisations for the site.

The following methods were used to undertake the compliance statement:

- Assessment of alternative sites and "no go" areas;
- summarize previous assessment and identify any areas not covered by this assessment;
- revision of impacts as per the additional BESS; and
- Final recommendations and compliance statement.

The aim of the impact assessment is to identify the impacts that the proposed activity, including the construction and operational phase, will have on the receiving environment. If avoidance is not possible, mitigation is required in the form of practical actions (Ramsar Convention, 2008). Mitigation actions can be grouped into the following:

i. **Pre-construction:** This may take the form of changes in the scale of the development (e.g. reduce the size of the development), location of development (e.g. find an alternative area with less impact), and design (e.g. change the structural design to accommodate flows and continuity).
ii. **Construction:** This may take the form of a process change (e.g. changes in construction methods), siting (e.g. locality to sensitive areas), sequencing and phasing (e.g. construction during seasonal periods).
iii. **Operational:** This may take the form of changes in post management (e.g. change management to match unpredicted impacts), monitoring (e.g. frequent checks by an ECO), rehabilitation (e.g. if mitigation actions are not effective).

An impact rating table is derived through the population of the following parameters, pre- and post-mitigation measures:

- Extent - The area over which the impact will be expressed
- Probability - The chance of occurrence of an impact
- Reversibility - The degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity
- Irreplaceable loss of resources - The degree to which resources will be irreplaceably lost as a result of a proposed activity
- Duration - The lifetime of the impact as a result of the proposed activity
- Intensity/Magnitude - A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily
- Significance Rating - A brief description of the importance of an impact which in turn dictates the level of mitigation required (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity).

3. LIMITATIONS AND ASSUMPTIONS

In order to apply generalized and often rigid scientific methods or techniques to natural, dynamic environments, a number of assumptions are made. Furthermore, a number of limitations exist when assessing such complex ecological systems. The following constraints may have affected this assessment –

- As an extensive site visit has already been undertaken by SiVest, an additional site visit was not required.
- The impacts for the site are specific to the BESS.
- The databases used may not, at times, be recent as is the nature of these databases.
- This statement assumes that the work undertaken by SiVest (2012) is unbiased and the methods adopted appropriately followed.

4. TECHNICAL DESCRIPTION

4.1 Project Location

The BESS is located on the authorised Mierdam Photovoltaic (PV) Energy Facility located near the town of Prieska, in the Siyathemba Local Municipality, Pixley ka Seme District in the Northern Cape Province of South Africa.

4.2 Site Description

The study area is situated approximately 45km south-west of Prieska and is accessed via the R357 and R386 respectively. The site is approximately 12 853 ha in size of which a smaller area will be required for the establishment of the proposed wind and solar facility. The study area is dominated by relatively short natural shrubland which is used as general grazing land for sheep, with no sign of formal agricultural fields or cultivation. The area within and surrounding the proposed site is largely vacant with a relatively low human footprint in the form of scattered farmsteads. Vast grazing land is interspersed with seasonal pans and non-perennial streams.

The closest built up area (approximately 15km to the north-west) is the small mining town of Copperton and the defunct Prieska Copper Mine, which was closed in 1996. Other built form includes transmission and distribution power lines which traverse the study area and a network of gravel access roads both within the boundaries of the site and in the surrounding area (SiVEST, 2011).

Although limited, the access roads which exist are in a good condition. Water is the major limiting factor to local agricultural enterprises and the assessed area contains no perennial rivers nor does the project area border a perennial river.

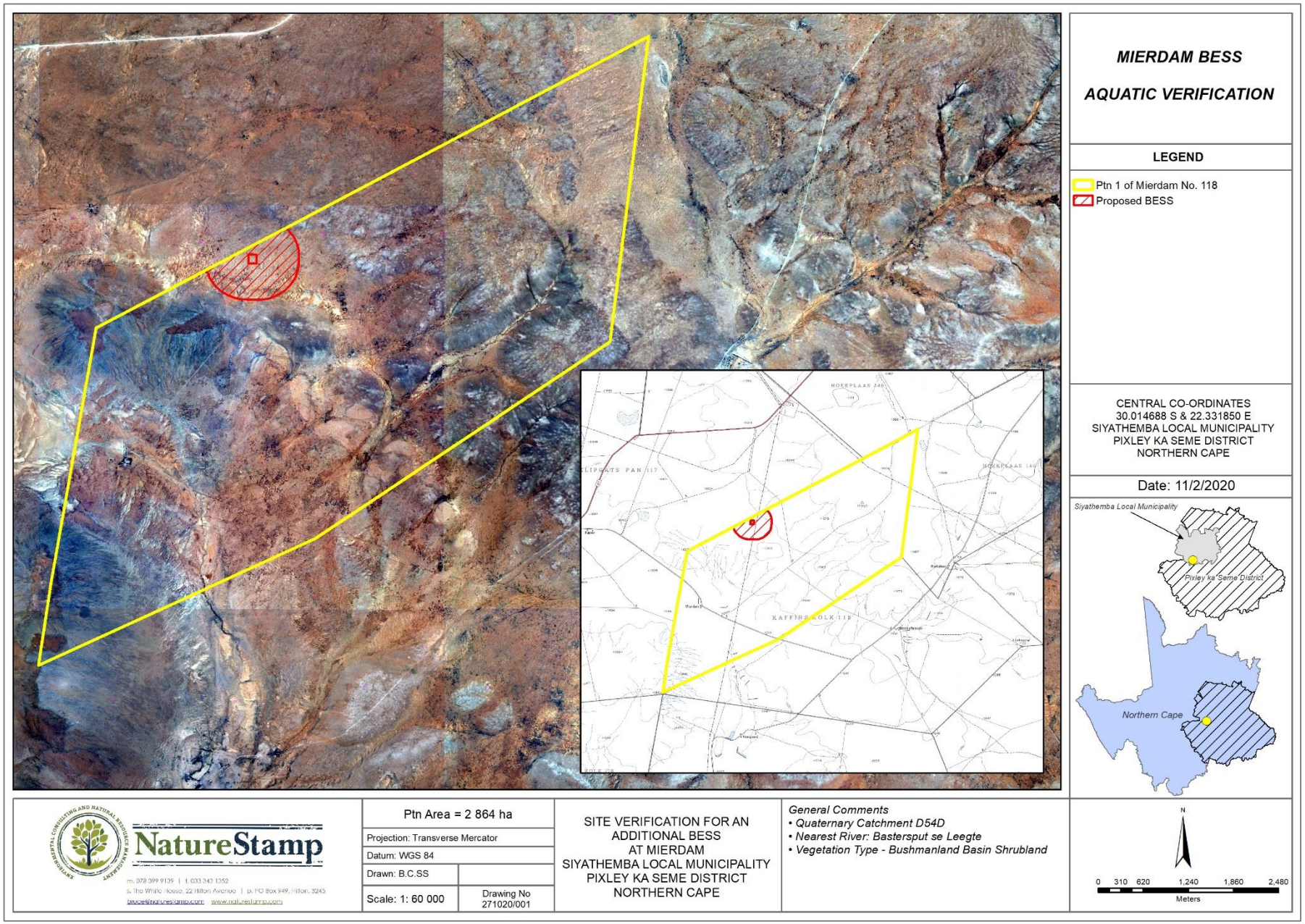

Figure 2 Locality map of the proposed BESS and a 500m buffer at Mierdam

4.3 Location and Technology Alternatives

No site alternatives for this proposed development were considered as the placement of the proposed BESS is dependent on the location of the Mierdam Solar Photovoltaic (PV) Energy Facility.

Technology alternatives are limited to two battery options. These are solid state Li-ion and Vanadium Redox flow batteries. For Li-ion batteries, prevailing site temperature instability can have an impact on these battery types which can include fire, or permanent structural damage to the batteries. The volatility of the battery system, prior to any mitigation, could result in significant fire danger. In addition to this, there is a risk associated with the chemicals contained within the actual battery storage system itself.

BESS Specifications	
BESS Footprint	Up to 2Ha
BESS Capacity	200MWh
BESS Technology	Lithium Ion
BESS Type Alternative- Solid State Batteries	Containerised systems assembled within shipping containers and delivered to the project site. Dimensions are approximately 17 m long x 3.5 m wide x 4 m high. Containers will be placed on a raised concrete plinth (30 cm) and may be stacked on top of each other to a maximum height of approximately 15 m. Additional instrumentation, including inverters and temperature control equipment, may be positioned between the battery containers.

Redox Flow batteries can have a corrosive character, the vanadium electrolyte solution is classified as toxic and hazardous to groundwater. The electrolyte is used in a closed system and vanadium can escape solely through electrolyte leaks. There will always be a small amount of hydrogen produced during charging at high states of charge, which is a safety risk due to the possible explosive reaction with atmospheric oxygen. The amount is extremely small, but must be taken into account when installing the battery.

Both battery types were assessed separately for risk associated with surface water resources.

<u>The design of the Li-ion system includes:</u>

- Insulated containers
- High powered HVAC (Heating, Ventilation and Air-Conditioning) System, monitored centrally
- Multiple temperature sensors for both the cells and air temperature
- Automated shut down mechanism if temperatures get too high
- Containers sealed and douse in case of fire to prevent the spread
- Battery management system to prevent overuse and maintain good battery condition
- Fire detection and suppressant systems
- Gas level monitoring for several different gases (related to degradation of the batteries that increases risk of fire)
- Heat sensors
- Battery condition monitoring
- Dousing mechanism for emergency cooling and fire suppression
- Density limits in the containers
- Spacing limits between containers

The design of the Vanadium Redox Flow Battery Technology (VRFBs) includes:

- Battery condition monitoring
- Fire detection and suppressant systems
- Leak detection and monitoring system
- A secondary containment to prevent the escape of vanadium solution into the environment during operation (storage and refilling when required). The VRFBs will be placed within a 2.5 m high berm wall.
- Hydrogen gas is discharged from the negative tank into the environment through a simple pipe and the battery room or container is well ventilated and flushed with fresh air to prevent any build-up of hydrogen gas.
- A Major Hazards Risk Assessment must be undertaken prior to construction (should VRFBs be used), and the recommendations of the assessment implemented.

4.4 'No-Go' Alternatives

The 'no-go' alternative is the option of not constructing and operating a BESS in support of the authorised Renewable Energy (RE) facility. This alternative would result in no additional environmental impact other than that assessed during the EIA for the RE facility

The 'no-go' option is an option; however, this would prevent the Mierdam Solar Energy Facility from contributing to the environmental, social and economic benefits associated with the development of the renewables sector.

The areas identified as "no go" areas by SiVest (2012), are still relevant for the additional area. However, the BESS does not encroach upon "no go" areas.

5. LEGAL REQUIREMENTS AND GUIDELINES

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 and amended on 07 April 2017 [promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017], various aspects of the proposed development are considered listed activities under GNR 327 and GNR 324 which may have an impact on the environment and therefore require authorisation from the National Competent Authority (CA), namely the Department of Environment, Forestry and Fisheries (DEFF), prior to the commencement of such activities.

6. DESCRIPTION OF THE RECEIVING ENVIRONMENT

The development is located ±43km south west of Prieska in a rural part of the Northern Cape. Access to the proposed development will be via the existing farm access located on the R357 Provincial Road. The provincial road is a surfaced road from the N10 National Road running past Prieska which eventually becomes a gravel road up to the access road of the development.

7. SITE SENSITIVITY VERIFICATION

The site verification aims to confirm or dispute the **very high sensitivity** identified by the screening tool. This is done through a desktop investigation using more recent databases and aerial/remote imaging. A site visit was undertaken by NatureStamp in December 2019

7.1 Preferred Site Location

An extensive investigation has been undertaken at the site. The land cover is uniform throughout the site. The selected site is located away from NFEPA systems. However, as per the delineation undertaken by SiVest, both

alternatives fall within drainage lines but these would be avoided in the development footprint. For the BESS, which need to be located close to the sub-station, the identified location is further than 500 m from any watercourse/wetland. The nearest NFEPA wetland is 2.89 km from the edge of the BESS (Figure 3 & 4).

NatureStamp proposes that the BESS is sited in the best possible location as it has been placed to be more than 500m from any site delineated watercourse. If this location is adopted, the site could be considered to have a **low sensitivity**.

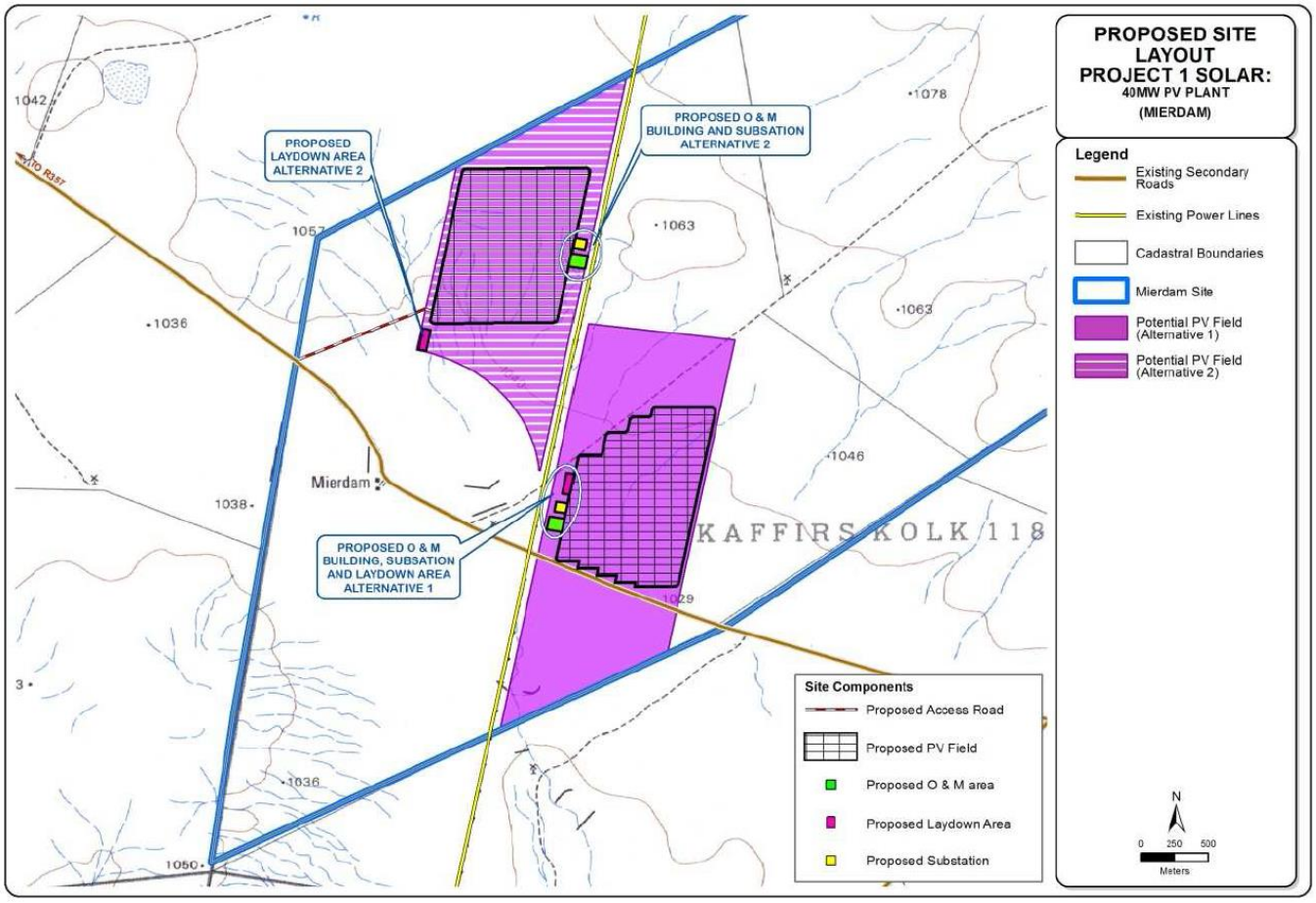

Figure 3 Previous watercourse study developable area

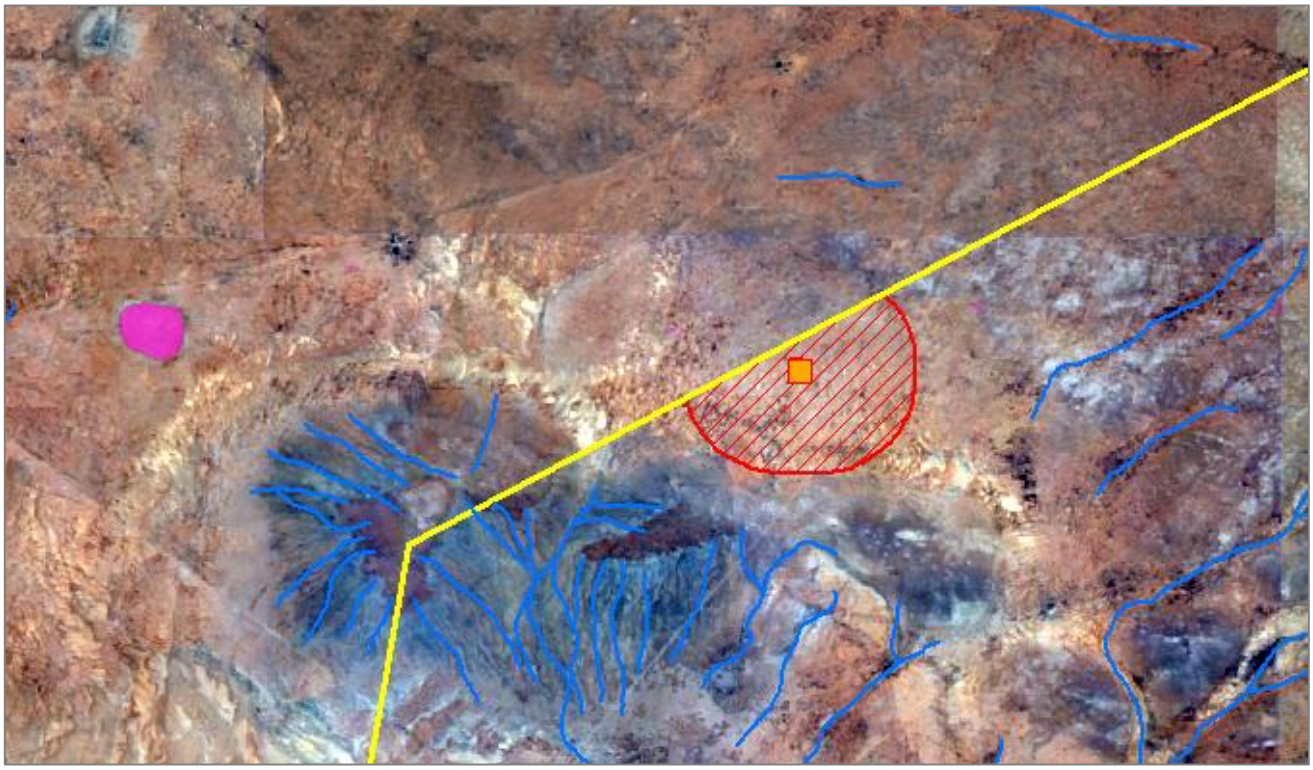

Figure 4 Proximity of NFEPA wetlands (pink) in relation to the preferred BESS site and a 500 m buffer

The areas identified as "no go" areas by SiVest (2012), are still relevant for the additional area. However, the BESS does not encroach upon "no go" areas.

7.2 Confirmation of Site Sensitivity

Through the interrogation of various databases, imagery and the previous surface water assessment, it is clear that no sensitive surface water or groundwater resources are at a greater risk due to the proposed footprint. As such, NatureStamp confirms that the site should be considered to have **Low Sensitivity.**

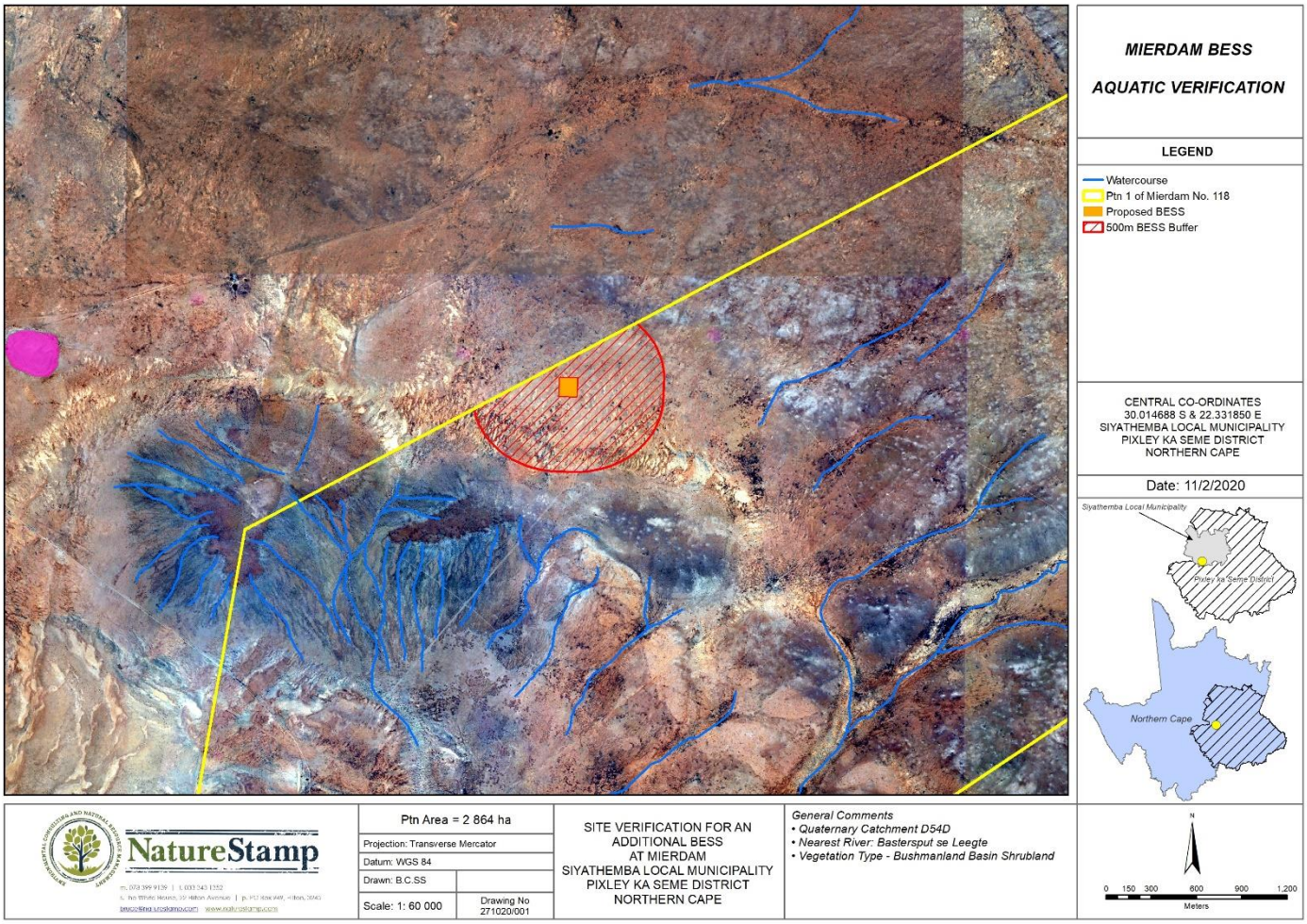

Figure 5 Hydrological verification showing the preferred Mierdam BESS location

8. SPECIALIST FINDINGS/ASSESSMENT OF IMPACTS

8.1 Significance of impacts

The key impacts identified for the proposed BESS are:

- Increase in impervious surface reducing the infiltration/groundwater recharge;
- Abstraction of groundwater for construction;
- Abstraction of groundwater for operation;
- Increase in stormwater leading to an increase of peak flows entering watercourse systems;
- Potential oil spills/leaks during construction; and
- Potential for leaks from batteries leading to contamination of watercourses.
- Potential for leaks from batteries leading to contamination of groundwater.

Table 3 Impact rating table and risk significance

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	STATUS (+ OR -)	TOTAL	S		E	P	R	L	D	I / M	STATUS (+ OR -)	TOTAL	S
Construction Phase																				
Surface and groundwater Water Quantity	Change in impervious surface preventing infiltration and harvesting of rainwater/ground water abstraction	1	3	2	2	2	4	-	40	Low	○ *The development must recycle water on site and reuse it for plant maintenance but stay within catchment limits.* ○ *The development must follow suitable contamination measures to ensure no contamination occurs.* ○ *Storm water structures should promote infiltration to ensure the recharge of the groundwater aquifer.* ○ *Existing boreholes should be used in order to not over utilize groundwater resources.*	1	3	2	2	2	3	-	30	Low
Flood Hydrology/ Storm Water	Increase in Storm Water	1	2	1	1	3	3	-	24	Low	o *The mitigation measures required relates to the development and implementation of an adequate storm water management plan to be designed by an appropriate engineer.* o *The engineer should account for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial run-off generated by the proposed BESS development structures.* o *Attenuation dams and evaporation ponds are examples that can contain storm water run-off. Other structures that may be considered are semi-permeable surfaces that can absorb artificial run-off but releases a certain amount into the landscape. Energy dissipating structures can also be used.* o *Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion.* o *The development must stay outside of the 1:100 year flood extent.*	1	2	1	1	3	1	-	8	Low
Surface and Groundwater Water Quality	General spills/Leaks	1	2	3	3	3	3	-	36	Low	o *All vehicles will need to be checked for leakage before and after entering the construction area.* o *Areas where fuels are either kept or transferred will need to be bunded so as to contain spillage.* o *Cement mixing sites will also need to be strategically positioned and bunded to prevent spillage.* o *Ablution facilities must be provided to prevent workers urinating near or in the wetlands.* o *Ablution facilities must be positioned at least 100metres away from the wetland areas and buffer zones.* o *Soakaways must be located away from any active boreholes.*	1	1	1	1	3	1	-	7	Low

Operational Phase –Solid State Li-Ion																				
Surface Water Quality	Battery Spills/Leaks during Operation	1	2	3	3	4	3	-	39	Low	○ *BESS component oils/chemicals mitigation measures - Standard measures are typically accommodated in the design of the BESS to ensure that should an accidental spillage occur, it would not pollute the surrounding soils or any runoff from the BESS.* ○ *Solid State Batteries are unlikely to leak, as they are housed in containers that accommodate spills.* ○ *Should contaminated water leak from the batteries, this would typically be removed from the site, and would be recycled off-site as part of the remediation process.* ○ *It is important that such design-related mitigation measures be incorporated into the BESS design to minimise the risk of any oil/chemical spillage being transported off the site.* ○ *Implement the storm-water management plan and ensure appropriate water diversion systems are put in place.* ○ *Compile (and adhere to) a procedure for the safe handling of battery cells.* ○ *Compile an emergency response plan and implement should an emergency occur.* ○ *Ensure that spill kits (if appropriate) are available on site for clean-up of spills and leaks.* ○ *Drip-trays or containment measures must be placed under equipment that poses a risk when not in use.* ○ *Immediately clean up spills and dispose of contaminated soil at a licensed waste disposal facility.* ○ *Dispose of waste appropriately to prevent pollution of soil and groundwater.* ○ *Install monitoring systems to detect leaks or emissions.* ○ *On-site battery maintenance should be done over appropriate drip trays/containment measures and any hazardous substances must be disposed of appropriately.* ○ *Record and report all fuel, oil, hydraulic fluid or electrolyte spills to the PM / Engineer / ERP so that appropriate clean-up measures can be implemented.*	1	2	1	1	3	1	-	8	Low
Operational Phase – Redox Flow																				
Surface Water Quality	Battery Spills/Leaks during Operation	2	2	4	2	4	3	-	42	Low	○ *BESS component oils/chemicals mitigation measures - Standard measures are typically accommodated in the design of the BESS to ensure that should an accidental spillage occur, it would not pollute the surrounding soils or any runoff from the BESS.* ○ *Flow batteries are typically housed within a concrete bund that would accommodate spills within the footprint of the BESS.* ○ *Should contaminated water leak from the batteries, this would typically be removed from the site, and would be recycled off-site as part of the remediation process.* ○ *It is important that such design-related mitigation measures be incorporated into the BESS design to minimise the risk of any oil/chemical spillage being transported off the site.* ○ *Implement the storm-water management plan and ensure appropriate water diversion systems are put in place.* ○ *Compile (and adhere to) a procedure for the safe handling of battery cells.* ○ *Compile an emergency response plan and implement should an emergency occur.*	2	2	4	1	1	1	-	10	Low

											o *Ensure that spill kits (if appropriate) are available on site for clean-up of spills and leaks.* o *Drip-trays or containment measures must be placed under equipment that poses a risk when not in use.* o *Immediately clean up spills and dispose of contaminated soil at a licensed waste disposal facility.* o *Dispose of waste appropriately to prevent pollution of soil and groundwater.* o *Install monitoring systems to detect leaks or emissions.* o *On-site battery maintenance should be done over appropriate drip trays/containment measures and any hazardous substances must be disposed of appropriately.* o *Record and report all fuel, oil, hydraulic fluid or electrolyte spills to the PM / Engineer / ERP so that appropriate clean-up measures can be implemented.*									
Decommissioning Phase																				
Water Quality/ Hydrology	Sediments and spills entering water resources	1	1	4	1	3	1	-	10	Low	o *All vehicles will need to be checked for leakage before and after entering the construction area.* o *Areas where fuels are either kept or transferred will need to be bunded so as to contain spillage.* o *Ablution facilities must be provided to prevent workers urinating near or in the wetlands.* o *Ablution facilities must be positioned at least 100metres away from the wetland areas and buffer zones.* o *Revegetation must occur immediately following the decommission.*	1	1	4	1	3	1	-	10	Low
Cumulative																				
Water Quality/ Hydrology	Compounded impacts from surrounding development	2	2	2	1	3	1	-	10	Low	o *The mitigation measures required relates to the development and implementation of an adequate storm water management plan/structures to be designed by an appropriate engineer.* o *Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion downstream.*	2	1	2	1	2	1	-	8	Low
No-go options																				
Water Quality/ Hydrology	N/A	/	/	/	/	/	/	/	/	Low	o *The No-Go alternative entails no change to the status quo.*	/	/	/	/	/	/	/	/	Low

8.2 Environmental Management Programme (EMPr) Input

The objectives of the amendment to the EMPr is to ensure that any impacts remain at a low risk/sensitivity. Furthermore, this also allows for the additional battery area to be incorporated into the existing EMPr.

Table 4 Rehabilitation actions for inclusion into the EMPr

Objective	Action	Timing
Manage Surface and groundwater Water Usage	1. Use existing boreholes to abstract groundwater	With immediate effect (Construction & Operation)
	2. Ensure storm water structures promote infiltration	With immediate effect (Construction)
Mitigate any flood risk	3. Ensure structure is outside of 1:100 year flood event	Planning and Construction
Ensure groundwater quality is not impacted upon	4. In the event of a spill, implement a spill contingency plan and monitor groundwater for 6 months if spill is not contained.	Construction and Operation
Manage stormwater from the BESS	5. Ensure appropriate storm water infrastructure is installed to dissipate flow and direct away from concentrated paths.	During winter months
	6. 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.
	7. Where practical, plant obligate wetland species or dissipation structures in drains around the BESS.	With immediate effect
Manage spills during construction	8. Ensure drip trays are used under vehicles/machinery and erosion control measures are implemented. 9. Ensure a spill contingency plan is put into place.	With immediate effect ECO to check every 2 months
Manage spills during operation	10. Completely lined infrastructure (concrete bunded area), with the capacity to contain 120% of the total amount of chemicals stored within the BESS. 11. Spills must be completely removed from the site. 12. Fire extinguisher equipment installed within the BESS. 13. Temperature of battery systems monitored continually. 14. Ensure air circulation to prevent the buildup of chemicals. 15. Implement the storm-water management plan and ensure appropriate water diversion systems are put in place. 16. Compile (and adhere to) a procedure for the safe handling of battery cells. 17. Compile an emergency response plan and implement should an emergency occur. 18. Ensure that spill kits (if appropriate) are available on site for clean-up of spills and leaks. 19. Drip-trays or containment measures must be placed under equipment that poses a risk when not in use. 20. Immediately clean up spills and dispose of contaminated soil at a licensed waste disposal facility. 21. Dispose of waste appropriately to prevent pollution of soil and groundwater. 22. Install monitoring systems to detect leaks or emissions. 23. On-site battery maintenance should be done over appropriate drip trays/containment measures and any hazardous substances must be disposed of appropriately. 24. Record and report all fuel, oil, hydraulic fluid or electrolyte spills to the PM / Engineer / ERP so that appropriate clean-up measures can be implemented.	With immediate effect/Ongoing

9. CONCLUSION AND SUMMARY

9.1 Summary of Findings

Through the impact assessment, the risks identified during construction have the highest impact although it would still be considered to be low. The construction and operation phase associated impacts of the access roads, PV modules, substation, maintenance building and power lines have already been approved by the respective authorities. Therefore, the addition of the BESS to the existing proposed development will have a minimal impact as it falls within the original developable area and is relatively small. The location of the proposed BESS has been strategically placed to be situated away from watercourses. There is a risk of groundwater contamination in the event of leaks from the batteries. However, if solid state batteries are used, this risk will be reduced.

9.2 Hydrological Impact Statement

With reference to this report and previous assessments done on the site, including that of NatureStamp (2019), the approved EA for the greater development footprint and the impact assessment undertaken in this report, NatureStamp is of the opinion that the impacts of the BESS would be minimal and acceptable and hence the EA should be granted for this EIA process.

Additionally, the following are confirmed by the specialist:

1. The site was identified as very high sensitivity by the screening tool as there are watercourses within the Mierdam property, which is a very large property.
2. The preferred BESS site is however of **low sensitivity** in an aquatic and hydrological context.
3. The proposed BESS is more than 500 m from any watercourse/wetland.
4. Given the low water use requirement on-site and adherence to specialist recommendations, the site is of low risk of negative groundwater impacts during construction and operation. However, appropriate preventative measured need to be taken to ensure that this low risk is still minimised.
5. The proposed location of the BESS is the best possible location on the site.
6. The site is mostly flat, located on sparse vegetation and is a significant distance from wetlands/watercourse. This is confirmed by SiVest (2012) who's study covered the whole BESS area.
7. Impacts have been identified with proposed mitigation measures. Should these measures be adhered to, the additional BESS area would remain a low sensitivity.
8. A list of conditions has been provided that should be included in the EMPr.
9. For nearby solar energy facilities, there have been no visible impacts from the existing PV areas, indicating that the impact of this activity is low and that the EMPr has been adhered to in such cases.
10. Although potential spillage from batteries has been noted, the recent technology upgrades and enclosed nature of solid state batteries further reduces the risk of contamination, particularly of groundwater resources.
11. No further assessments are required given the location of the BESS.
12. NatureStamp hereby acknowledges that there are no fatal flaws associated with the proposed BESS and should be authorized.

Appendix A *Curriculum Vitae*

Dr Bruce Scott-Shaw
Hydrologist

Carter High School
Pietermaritzburg, South Africa

The University
of KwaZulu-Natal
Pietermaritzburg, South Africa
BSc, BSc Honours, MSc,
PhD Hydrology

REFERENCES

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Professor
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Hydrologist/Director (Isikhungusethu Environmental Services)
Phone: +27 79 490 6963
Email: nick@isik.co.za

CONTACT INFORMATION

Phone: +2778 3999 139
E-mail: bruce@naturestamp.com
Linkedin: www.linkedin.com/in/bruce-scott-shaw-58b20231
Address: 22 Hilton Ave, Hilton, 3245, South Africa

ABOUT ME

I am an experienced, motivated and dynamic hydrologist, with a passion for sustainable land-use management and global change issues. Throughout my academic and consulting career I have mastered numerous models and tools relating to hydrology, soil science and GIS. Some of these include ACRU, SWAT, HEC-RAS, ArcGIS, WRSM, Idrisi, SEBAL, MatLab and Loggernet. I have basic programming skills on the Java and CR Basic platforms. I have vast experience in hydro-meteorological monitoring, including automatic weather stations, eddy covariance, heat pulse velocity, flow and ecological monitoring.

I completed my MSc under Prof Roland Schulze where I developed an agro-hydrological grassland biomass model for applications in management and climate change studies. Subsequently, I completed my PhD at the School of Bioresources Engineering and Environmental Hydrology (BEEH) which focused on quantifying the water-use of alien invaded riparian forests and catchments for rehabilitation programmes. I have presented my research around the world, where I have gained a wide network of academic contacts and experience.

As a consultant, I am the director and principal hydrologist of NatureStamp (PTY) Ltd. In this capacity I undertake flood studies, calculate hydrological flows, perform general hydrological modelling, stormwater design, dam designs, wetland assessments, water quality assessments, groundwater studies and soil surveys.

I am affiliated to the University of KwaZulu-Natal where I am a part-time lecturer for undergraduate hydrology and dam design. I am also a post-doctoral student where I run and calibrate hydrological and soil erosion models.

SKILLS

Hydrological Modelling ●●●●●	GIS ●●●●●	General Computing Skills ●●●●○
MS Office ●●●●●	Field Assessments ●●●●●	Soil Surveys ●●●●○
Communication Skills ●●●●○	Networking ●●●●○	Scientific Writing ●●●●●

WORK EXPERIENCE

Director March 2015 – Present
NatureStamp (PTY) Ltd.
Environmental consulting company, offering a range of services to promote sound natural resource management. We are a team of qualified, experienced and dedicated people, who take pride in producing a high quality of work and providing a personalized, professional service.

Hydrology Lecturer January 2016 – Present
University of KwaZulu-Natal
Part-time lecturer for Hydrology modules. This includes dam design, hydrology basics and modelling. I also run a Soil Water Assessment Toll (SWAT) workshop through ArcGIS to provide students with the skills to run the model for their research purposes.

Post-doctoral Researcher June 2018 – Present
University of KwaZulu-Natal
Assess the impact of erosion and sediment yield from different land uses in farming and forestry systems and their effect on water resources in selected catchments of South Africa. This is done by measuring and modelling soil erosion losses under different land uses and management practices.

PUBLICATIONS

1. Paper for the 14th SANCHIAS symposium, 2009. Development and Verification of a Dynamic Grassland Biomass Model for Agrohydrological Applications under Different Scenarios of Climate and Management. B.C. Scott-Shaw and R.E. Schulze.
2. Water-Use Dynamics of a Peat Swamp Forest and a Dune Forest in Maputaland, South Africa. A.D. Clulow, C.S. Everson, J.S. Price, G.P.W. Jewitt, and B.C. Scott-Shaw. Hydrol. Earth Syst. Sci -2013-31.
3. Use of an Agrohydrological Model for Applications in Management Studies Related to Tall and Short Grassveld in South Africa. B.C. Scott-Shaw and R.E. Schulze (In Press).
4. Water-Use Dynamics of An Alien Invaded Riparian Forest Within the Mediterranean Climate Zone of the Western Cape, South Africa, Hydrol. Earth Syst. Sci., 21, 4551–4562, 2017. Scott-Shaw, B.C., Everson, C. S., and Clulow, A. D.
5. Handbook on Adaptation to Climate Change for Farmers, Officials and Others in the Agriculture Sector of South Africa (Released 2018): Short and Tall Natural Grasslands in South Africa and Climate Change. B.C. Scott-Shaw and R. E. Schulze.
6. Water-use dynamics of an alien invaded riparian forest within the summer rainfall zone of South Africa. Hydrol. Earth Syst. Sci., Discussion, 2018. Scott-Shaw, B.C., Everson, C. S.
7. Rehabilitation of alien invaded riparian zones and catchments using indigenous trees: an assessment of indigenous tree water-use. Scott-Shaw B.C, Everson C.S, Geldenhuys C.J, Starke, A, Atsame-Edda A, Schutte S, R, Mupemba Mwamba. Water Research Commission Report K5/2081. 2016.
8. Water-efficient production methods and systems in agroforestry, woodlands and forestry plantations. Everson C.S, Scott-Shaw B.C, Kelbe, B.E, Starke, A, Pearton T, Geldenhuys, C, Vather, T, Maguire, M. Water Research Commission Report K5/2554. 2018.
9. Assessing the impact of erosion and sediment yield from different land uses in farming and forestry systems and their effect on water resources in selected catchments of South Africa. This is done by measuring and modelling soil erosion losses under different land uses and management practices. Hill, T.R, Scott-Shaw B.C, Gilham, J.S, Dickey, M, Duncan, G.E, Everson, C.S, Everson, T.M, Zuma, K, Birkett, C.K. Water Research Commission Report K5/2402. 2019.
10. Assessment of soil erosion under rainfed sugarcane in KwaZulu-Natal, South Africa" by Abdalla, Khatab; Dickey, Matthew; Hill, Trevor; Scott-Shaw, Bruce. Natural Resources Forum. Under Review.

Research and Training

- Hydro-pedological characterization of degraded soils with the Institute de recherche pour le development (IRD)
- Advanced international training programme on Climate Change: Mitigation and Adaptation in Norrkoping, Sweden at the Swedish Meteorological and Hydrological Institute (SMHI)
- Advanced international training programme on Climate Change: Mitigation and Adaptation in Kasane, Botswana. Regional follow up course. Swedish Meteorological and Hydrological Institute (SMHI)
- Advanced MatLab ® course: Model building, inference and hypothesis testing in hydrology. Gabriel Lippmann, Luxembourg. April 2013.
- Advanced training course on Eddy Covariance. Mike Savage, Pietermaritzburg, 2018.
- Advanced training course on Surface Renewal. Mike Savage, Pietermaritzburg, 2018.
- Environmental Law training: 2014 E+EIA Regulations in Context. Shepstone & Wylie, Umhlanga. 2016.
- KZN Wetlands Forum Buffers workshop. Umngeni Valley, September, 2014.
- Advanced SWAT modelling course, Siem Reap, Cambodia, 2019.

Presentations/Showcase/Awards

- European Science Foundation (Amsterdam, 2010),
- COP17 (Durban, 2011),
- World Water Forum (Marseille, 2012),
- MatLab advanced modelling (Luxembourg, 2013),
- World Water Week (Singapore, 2014),
- Forests & Water, British Colombia, (Canada, 2015),
- World Forestry Congress (Durban, 2015),
- Society for Ecological Restoration (Brazil, 2017).
- Conservation Symposium (Howick, South Africa, 2018)
- Roland Schulze award for the top third year hydrology student.
- Golden Key award for obtaining marks in the top 15 % of the University of KwaZulu-Natal.
- NRF scholarship for being a top achiever.

Personal Information

Date of Birth	7th January 1986
Place of Birth	Pietermaritzburg, South Africa
Citizenship	South African, UK Ancestry, Italian citizen pending (through marriage)
Language	English
Sex	Male
Marital Status	Married
Children	Two
Hobbies	All sports & outdoors, tree species, geology

Appendix B Declaration of Independence

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

PROPOSED CONSTRUCTION AND OPERATION OF THE BATTERY ENERGY STORAGE SYSTEM (BESS) AND ASSOCIATED INFRASTRUCTURE AND INCLUSION OF ADDITIONAL LISTED ACTIVITIES FOR THE AUTHORISED MIERDAM PHOTO VOLTAIC (PV) SOLAR ENERGY FACILITY LOCATED NEAR LOCATED THE TOWN OF PRIESKA, IN THE SIYATHEMBA LOCAL MUNICIPALITY, PIXLEY KA SEME DISTRICT IN THE NORTHERN CAPE PROVINCE OF SOUTH AFRICA.

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

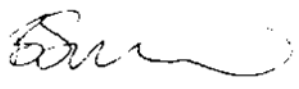
1. SPECIALIST INFORMATION

Specialist Company Name:	NatureStamp (PTY) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	0
Specialist name:	Dr Bruce Scott-Shaw			
Specialist Qualifications:	BSc, BSc Hons, MSc, PhD Hydrology			
Professional affiliation/registration:	KZN Wetland Forum, Natural Scientist (118673)			
Physical address:	22 Hilton Avenue, Hilton, PMB			
Postal address:	22 Hilton Avenue, Hilton, PMB			
Postal code:	3245	Cell:	0783999139	
Telephone:	033 343 1352	Fax:		
E-mail:	bruce@naturestamp.com			

2. DECLARATION BY THE SPECIALIST

I, **Bruce Scott-Shaw**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

NatureStamp (PTY) Ltd

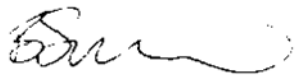
Name of Company:

09/11/2020

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Bruce Scott-Shaw**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



Signature of the Specialist

NatureStamp (PTY) Ltd

Name of Company

10/11/20

Date

Signature of the Commissioner of Oaths

11/11/20

Date