SITE SENSITIVITY VERIFICATION & AQUATIC BIODIVERSITY COMPLIANCE STATEMENT

Proposed construction and operation of the Battery Energy Storage System (BESS) and associated infrastructure 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.

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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.

1. INTRODUCTION

1.1 Project Background and Description of the Activity

Mainstream Renewable Power (Pty) Ltd (MRP) requested a baseline assessment of the soil, land use and agricultural characteristics for the area affected by a proposed establishment of a Concentrated Photovoltaic Plant / Photovoltaic Plant (PV) plant (12/12/20/2320/2/AM3) near Prieska in the Northern Cape Province. The objective of the project is to generate electricity to feed into the national grid by installing a solar plant of 40 MW capacity. The terrain of the site is typically very flat with wide, very gently undulating plains occurring across much of the site. The nature of the terrain over most of the site has implications for surface water drainage on the site. Most of the site is very poorly drained, and parts of the site are endorehic (inward draining). Over the rest of the site where drainage lines typically occur they are very shallow and poorly defined in cross-sectional profile, rather than being incised. The nature of rainfall entails that they are ephemeral and episodic in nature, i.e. only flowing on very rare occasions when sufficient rainfall occurs to generate sufficient surface runoff.

Mainstream is proposing the establishment of a photovoltaic (PV) plant on the development site near Prieska.The objective of the solar project is to generate electricity to feed into the national grid. The photovoltaic (PV) plant will have a maximum capacity of 40 MW. The project will consist of two components:

- PV Power Plant
    - Solar field
    - Buildings
    - Electrical infrastructure

In accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a site sensitivity verification has been undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool). The purpose of this report/statement is to verify the site sensitivity as identified by the screening tool and compile a statement confirming the identified impacts and any changes with the revised layout. 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

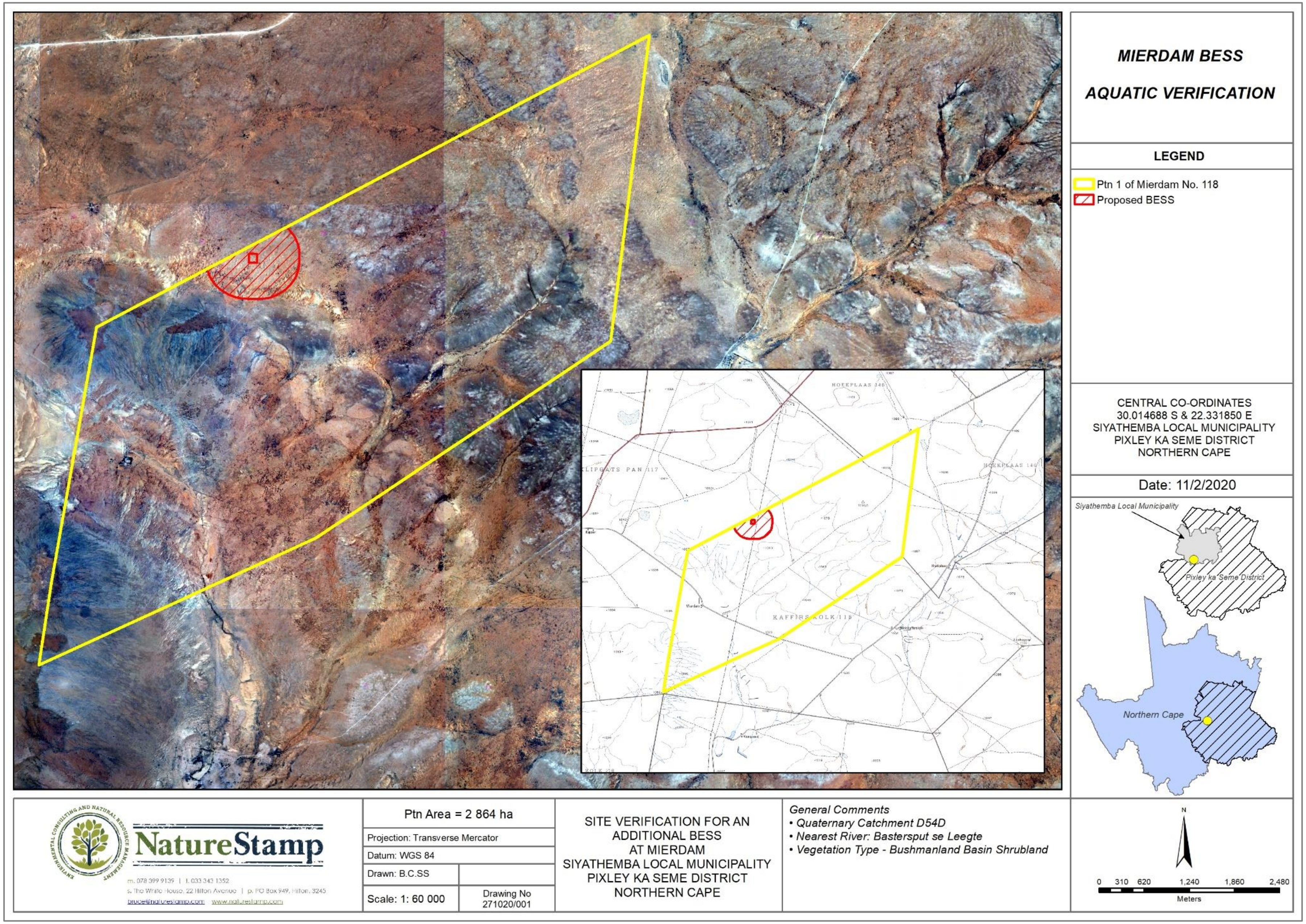


Figure 2 Locality map of the proposed BESS and a 500m buffer at Mierdam

1.2 Terms of Reference

As per the screening tool, the proposed development area environmental sensitivity is considered to have a low sensitivity for the aquatic biodiversity theme. As such, the following scope of works are required:

i. The compliance statement must:
- be applicable to the preferred site and the proposed development footprint;
- confirm that the site is of "low" sensitivity for aquatic biodiversity; and
- indicate whether or not the proposed development will have an impact on the aquatic features.

ii. The compliance statement must contain, as a minimum, the following information:
- contact details of the specialist, their SACNASP registration number, their field of expertise and a *curriculum vitae;*
- a signed statement of independence by the specialist;
- a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
- a baseline profile description of biodiversity and ecosystems of the site;
- the methodology used to verify the sensitivities of the aquatic biodiversity features on the site including the equipment and modelling used where relevant;
- in the case of a linear activity, confirmation from the aquatic biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;
- where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;
- a description of the assumptions made as well as any uncertainties or gaps in knowledge or data; and
- any conditions to which this statement is subjected.
- A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

1.3 Identified Theme Sensitivities

The site sensitivity as identified by the National Web-Based Environmental Screening Tool Shows that the aquatic biodiversity them is of **very high sensitivity**.

Table 2 Site sensitivity themes for Mierdam BESS

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Agriculture Theme				X
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Civil Aviation Theme				X
Defense Theme				X
Paleontology Theme		X		
Plant Species Theme			X	
Terrestrial Biodiversity Theme				X

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 3 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.

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. 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.

5. 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.

5.1 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**.

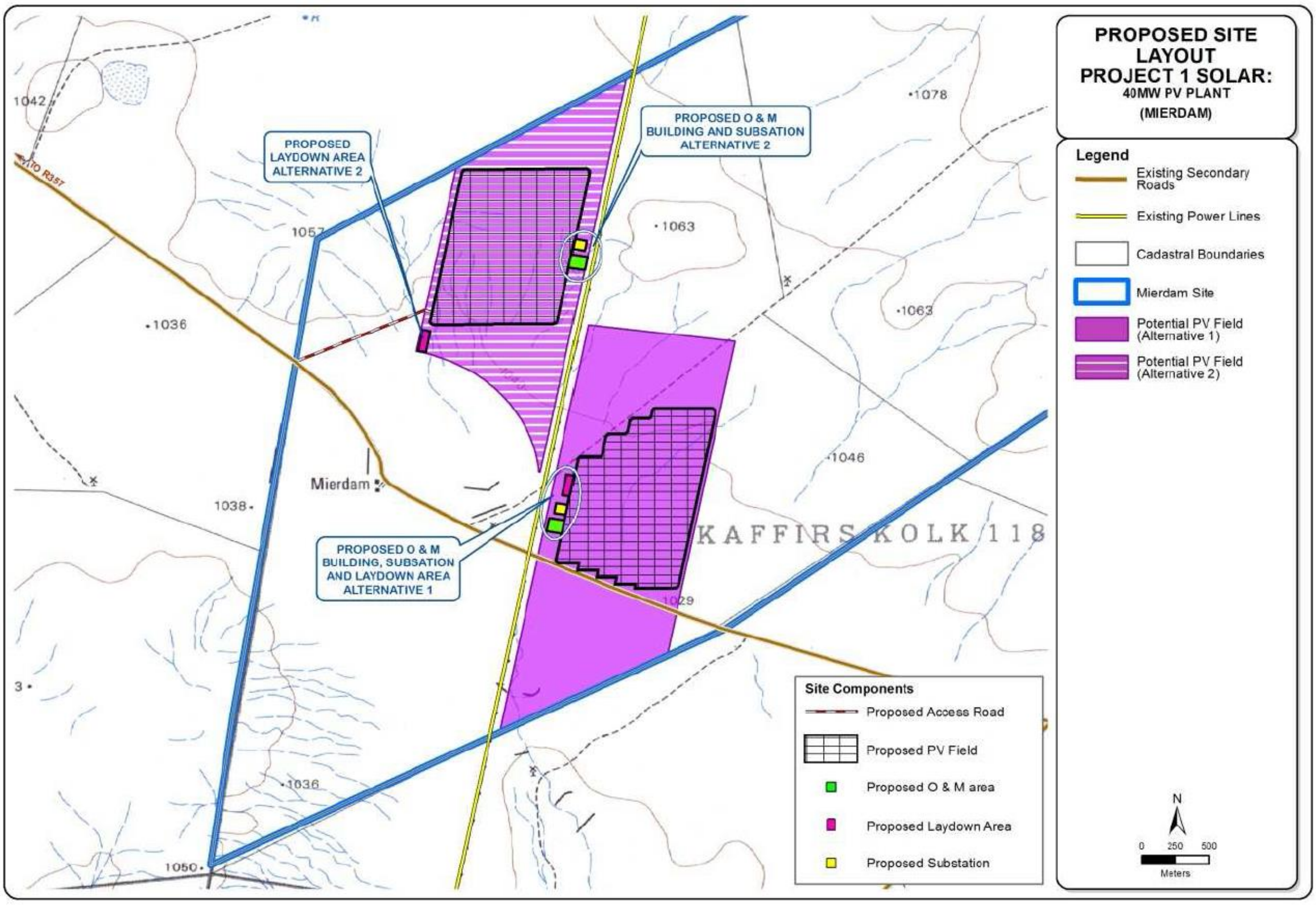


Figure 3 Previous watercourse study developable area

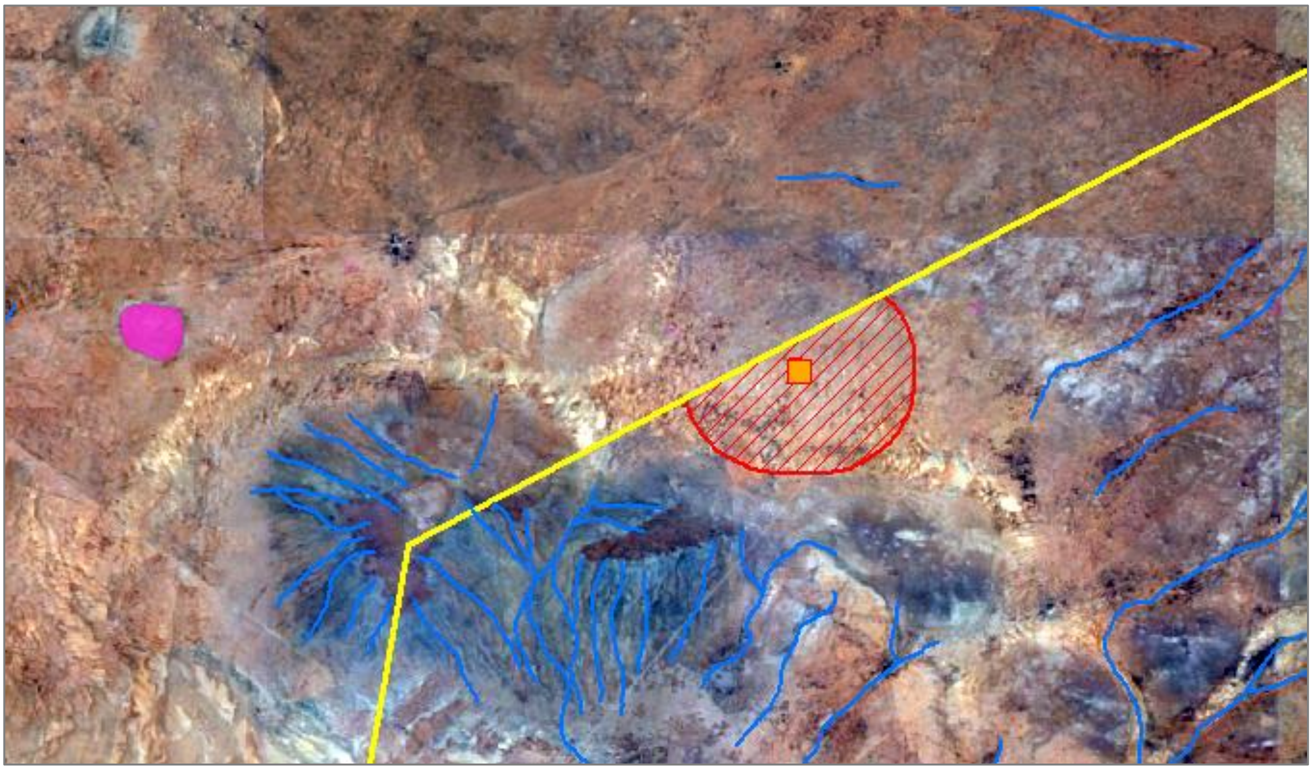


Figure 4 Proximity of NFEPA wetlands (pink) in relation to the preferred BESS site and a 500 m buffer

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.

5.2 Confirmation of Site Sensitivity

Through the interrogation of various databases, imagery and the previous surface water assessment, it is clear that no wetlands are present within or near the proposed footprint. As such, NatureStamp confirms that the site should be considered to have **Low Sensitivity.**

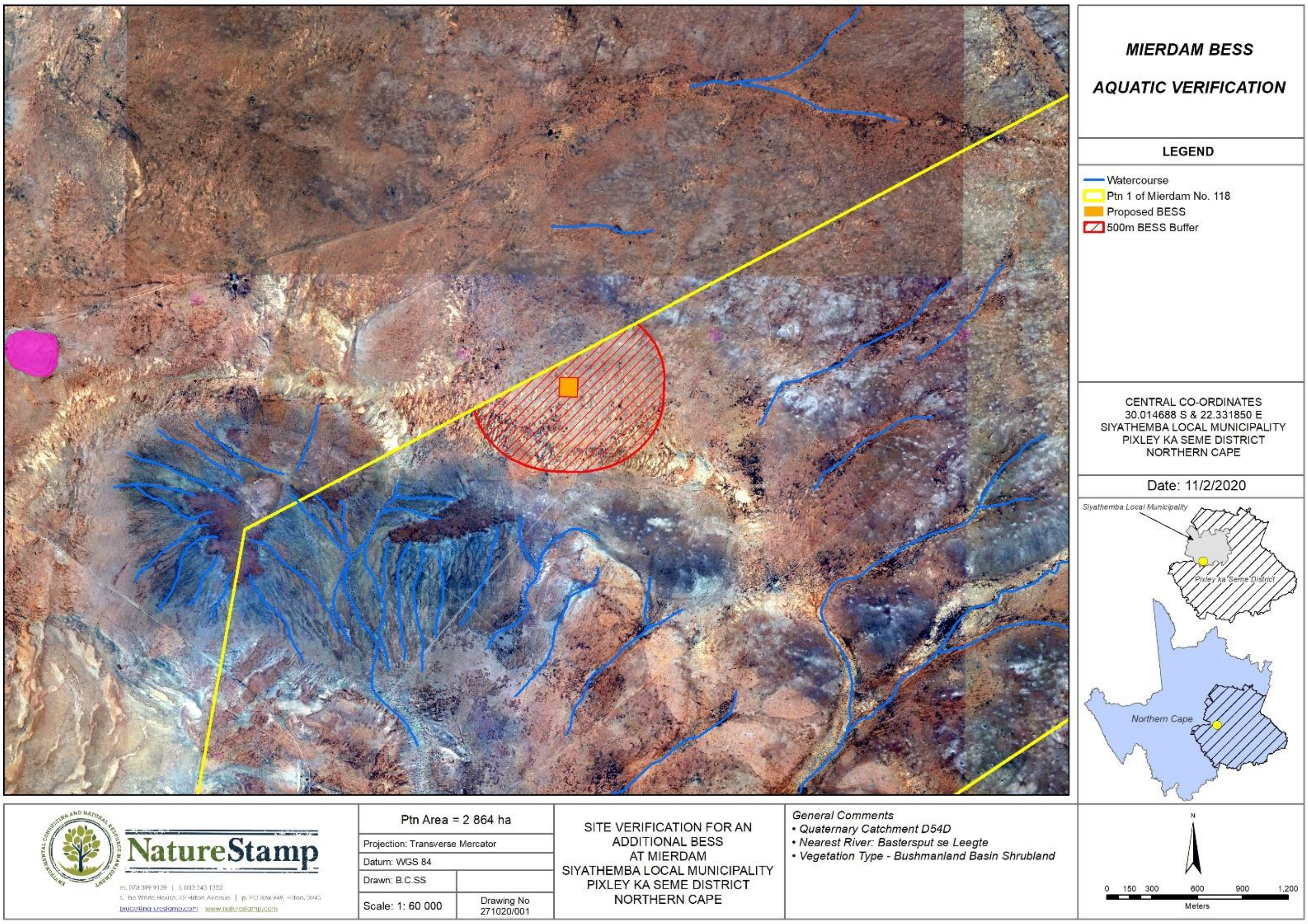


Figure 5 Aquatic verification showing the preferred Mierdam BESS location

6. ASSESSMENT OF IMPACTS

6.1 Significance of impacts

The key impacts identified for the proposed BESS are:

- Clearing of natural vegetation forming part of surface water catchment areas;
- Increase in stormwater leading to an increase of peak flows entering wetland systems;
- Potential oil spills/leaks during construction; and
- Potential for leaks from batteries leading to contamination of watercourses.

6.2 Battery Storage Options

Two battery options are considered for the BESS. 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.

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.

The design of the Li-ion system includes:

- 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.

Table 4 Impact rating table and risk significance (after Taylor, 2012)

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																				
Aquatic Biodiversity	Clearing of vegetation for the BESS	1	4	3	3	4	3	-	45	Low	o *The loss of vegetation is inevitable and necessary for the proposed development to take place. Hence, the impact of vegetation clearance will be definite.* o *Mitigation measures primarily will relate to the cumulative impacts associated with exposed open stretches of land. Run-off is to be mitigated by the use of structures that will reduce the rate and volume of run-off so as to prevent erosion and siltation impacts affecting nearby wetlands.* o *Structures can include silt nets, grass blocks and any other related structure that can prevent silt build-up and erosion.* o *In terms of potential impacts associated with wind erosion, regular but light watering must take place whilst surfaces are left exposed.* o *Revegetation must occur in areas outside of the operational phase footprint.*	1	4	3	3	4	2	-	30	Low
Hydrology	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.*	1	2	1	1	3	1	-	8	Low
Water Quality/ Biodiversity	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.*	1	1	1	1	3	1	-	7	Low

Operational Phase –Solid State Li-Ion																				
Water Quality/ Biodiversity	Battery Spills/Leaks during Operation	1	2	3	3	4	3	-	39	Low	o *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.* o *Solid State Batteries are unlikely to leak, as they are housed in containers that accommodate spills.* o *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.* o *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.* o *Implement the storm-water management plan and ensure appropriate water diversion systems are put in place.* o *Compile (and adhere to) a procedure for the safe handling of battery cells.* o *Compile an emergency response plan and implement should an emergency occur.* 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.*	1	2	1	1	3	1	-	8	Low
Operational Phase – Redox Flow																				
Water Quality/ Biodiversity	Battery Spills/Leaks during Operation	2	2	4	2	4	3	-	42	Low	o *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.* o *Flow batteries are typically housed within a concrete bund that would accommodate spills within the footprint of the BESS.* o *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.* o *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.* o *Implement the storm-water management plan and ensure appropriate water diversion systems are put in place.* o *Compile (and adhere to) a procedure for the safe handling of battery cells.*	2	2	4	1	1	1	-	10	Low

										o *Compile an emergency response plan and implement should an emergency occur.* 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																			
Aquatic Biodiversity/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																			
Aquatic Biodiversity/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																			
Aquatic Biodiversity/Water Quality/ Hydrology	N/A	/	/	/	/	/	/	/	/	Low	o *The No-Go alternative entails no change to the status quo.*	/	/	/	/	/	/	/	/	Low

6.3 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 5 Rehabilitation actions for inclusion into the EMPr

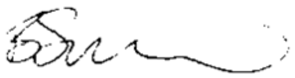
Objective	Action	Timing
Manage alien invasive plants	1. Manage the invasive alien plants at any disturbed or spoil areas	With immediate effect
	2. Manage the invasive alien plants around the BESS during operation	With immediate effect
Manage stormwater from the BESS	3. Ensure appropriate storm water infrastructure is installed to dissipate flow and direct away from concentrated paths.	During winter months
	4. 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.
	5. Where practical, plant obligate wetland species or dissipation structures in drains around the BESS.	With immediate effect
Manage spills during construction	6. Ensure drip trays are used under vehicles/machinery and erosion control measures are implemented. 7. Ensure a spill contingency plan is put into place.	With immediate effect ECO to check every 2 months
Manage spills during operation	8. Completely lined infrastructure (concrete bunded area), with the capacity to contain 120% of the total amount of chemicals stored within the BESS. 9. Spills must be completely removed from the site. 10. Fire extinguisher equipment installed within the BESS. 11. Temperature of battery systems monitored continually. 12. Ensure air circulation to prevent the buildup of chemicals. 13. Implement the storm-water management plan and ensure appropriate water diversion systems are put in place. 14. Compile (and adhere to) a procedure for the safe handling of battery cells. 15. Compile an emergency response plan and implement should an emergency occur. 16. Ensure that spill kits (if appropriate) are available on site for clean-up of spills and leaks. 17. Drip-trays or containment measures must be placed under equipment that poses a risk when not in use. 18. Immediately clean up spills and dispose of contaminated soil at a licensed waste disposal facility. 19. Dispose of waste appropriately to prevent pollution of soil and groundwater. 20. Install monitoring systems to detect leaks or emissions. 21. On-site battery maintenance should be done over appropriate drip trays/containment measures and any hazardous substances must be disposed of appropriately. 22. 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

7. AQUATIC COMPLIANCE STATEMENT

Through the site verification, background investigation and impact assessment, 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 context.
3. The proposed BESS is more than 500 m from any watercourse/wetland.
4. The proposed location of the BESS is the best possible location on the site.
5. 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. Through an investigation undertaken in this report, it is confirmed that nothing has changed since the previous study and a **reassessment is not required**.
6. Impacts have been identified with proposed mitigation measures. Should these measures be adhered to, the additional BESS area would remain a low sensitivity.
7. A list of conditions has been provided that should be included in the EMPr.
8. 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.
9. 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. Thus it is recommended that the solid state Li-ion battery be considered as the preferred choice of battery due to its lower risk.

Yours sincerely



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