Karusa Battery Energy Storage System (BESS) and associated Infrastructure

Sutherland, Northern Cape, South Africa

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Client

Prepared by:

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Report Name	**Karusa Battery Energy Storage System (BESS) and associated Infrastructure**
Reference	**Karusa BESS**
Submitted to	savannah environmental
Report Reviewer	**Andrew Husted**
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Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

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Document Guide

According to the Government Notice 320 dated 20 March 2020 and the procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation, the following criteria is applicable to that of an agricultural compliance statement;

Requirement	Reference
Specialist Details and CV	Appendix A
Locality of the proposed activity	Section 2
Sensitivity verification	Section 6.2
Acceptability of impacts towards agricultural production capability associated with proposed activities	Section 8
Declaration of specialist(s)	Page vi
Project components with 50 m regulated area superimposed to that of the agricultural sensitivities of the screening tool	Section 6.2
Confirmation from specialist that mitigation to avoid fragmentation has been considered	Section 8
Statement from specialist regarding the acceptability and approval of proposed activities	Section 8
Conditions to acceptability of proposed activities	
Probability of land being returned to current state after decommissioning	N/A
Monitoring requirements and/or any inclusions into EMPr	Section 8
Assumptions and uncertainties	Section 4.4

DECLARATION

I, **Ivan Baker** 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 71 and is punishable in terms of Section 24F of the Act.

Ivan Baker

Soil Specialist

The Biodiversity Company

March 2022

1 Introduction

Enel Green Power South Africa (Pty) Ltd proposes the construction and operation of a Battery Energy Storage System (BESS) and associated grid infrastructure ~45km south of the town of Sutherland along the R354 and 47km north west of the town of Laingsburg along the R323 in the Northern Cape Province. The project will be located on Farm De Hoop 202 within the Karoo Hoogland Local Municipality which lies within the jurisdiction of the Namakwa District Municipality. The BESS will store and supply dispatchable energy as and when required by the off-taker.

The proposed project will include the following infrastructure:

- A BESS with a capacity of up to 2 000 MWh, inside containers with a footprint of up to 6ha in extent and a maximum height of 3 m. Both lithium-ion and Redox-flow technology are being considered for the project, depending on which is most feasible at the time of implementation;
- Access roads to the BESS (10 m in width, approximately 70 m long) branching off of the existing roads, and internal roads (up to 8m wide) to be located within the total BESS footprint area;
- 33kV MV cabling between the BESS and the MV/HV substation and up to 132kV HV cabling to the HV substation;
- Fencing around the BESS for increased security measures;
- Up to 132kV overhead or underground power line to be connected to the existing Hidden Valley Substation;
- Temporary laydown area to be located within the BESS footprint;
- Firebreak to be located within the BESS footprint; and
- A Substation with a maximum height of - HV bus-bar up to10 m max and an HV Building up to 4 m max.

The general purpose and utilisation of a BESS is to save and store electricity from the network, allowing for a timed release of electricity to the grid as and when the capacity is required by the off-taker. BESS systems therefore provide flexibility in the efficient operation of the electricity grid through decoupling of the energy supply and demand.

The following is being considered within the Basic Assessment process for this project:

- Buffer around the BESS site of 200 m;
- Power line corridor (100 m) with 50 m either side of centre line; and
- Buffer around Hidden Valley Substation of 200 m.

The approach adopted for the assessments has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation".

This report aims to present and discuss the findings from the soil resources identified within the regulated 50 m, the agricultural and land potential of these resources, the land uses within the regulated area and also the risk associated with the proposed structure.

2 Project Area

The project area is located immediately east of the R354, approximately 38 km north of Matjiesfontein and 47 km north-west of Laingsburg (see Figure 2-1 and Figure 2-2). The surrounding land use predominantly includes agriculture (grazing), watercourses and mountainous areas.

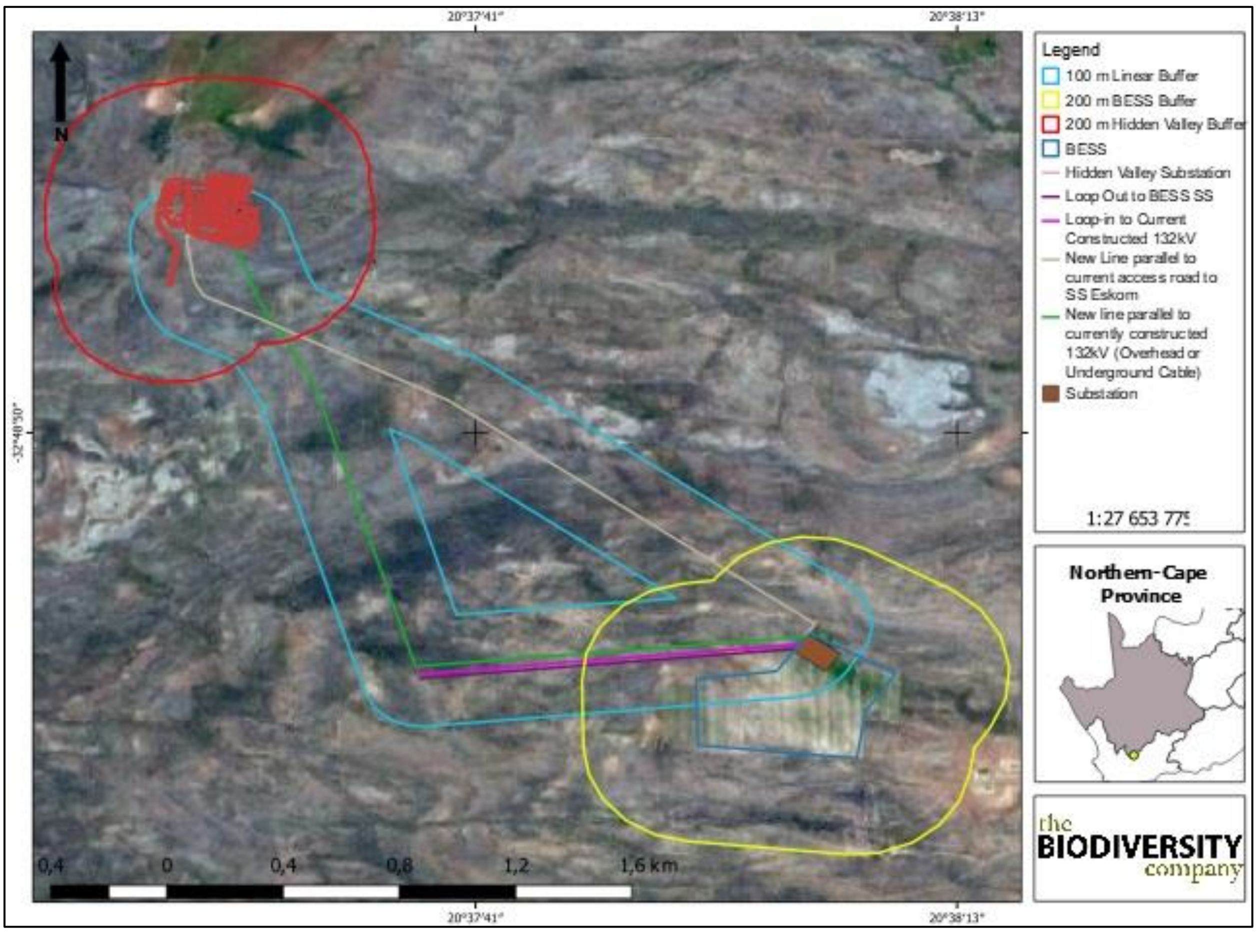

Figure 2-1 Proposed layout

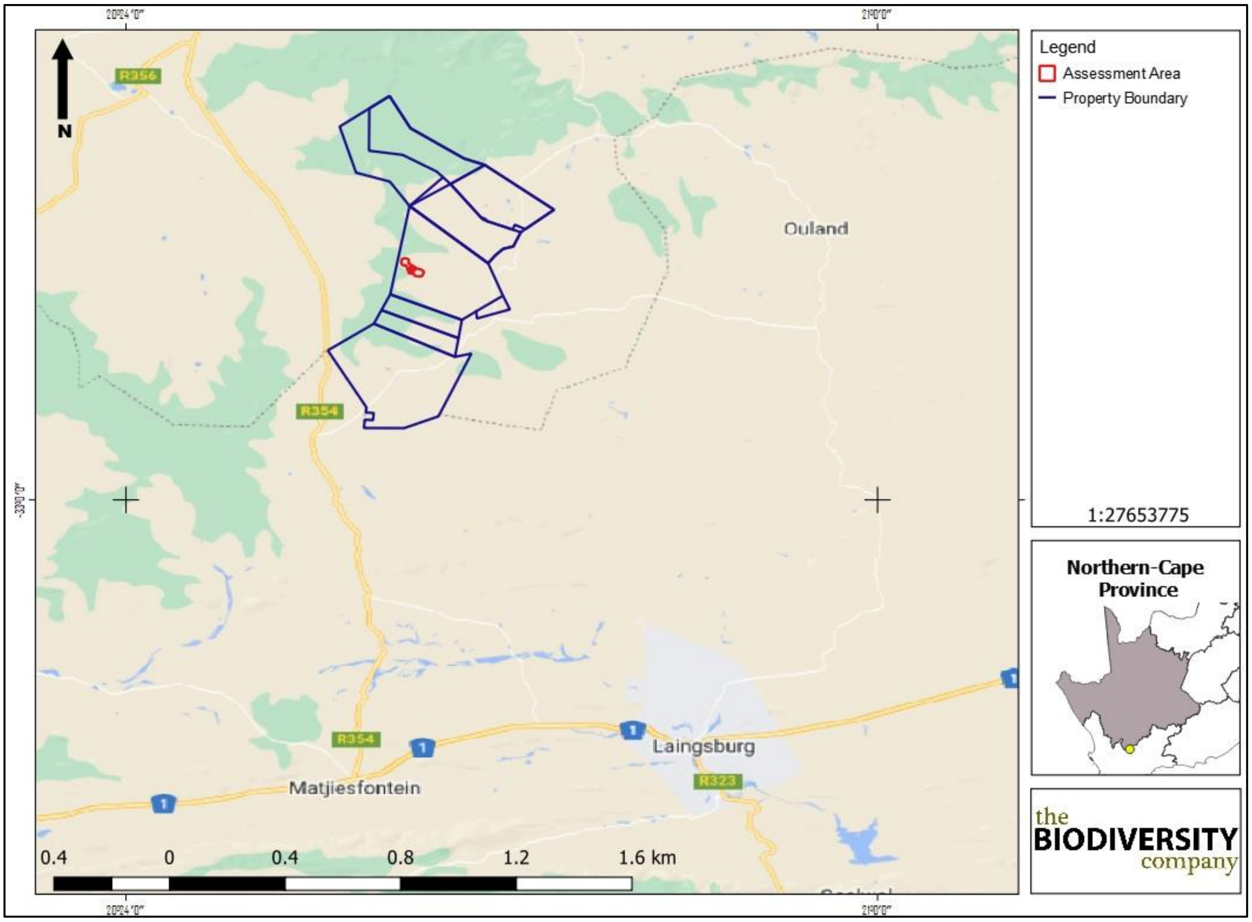

Figure 2-2 Locality map of the project area

3 Expertise of the Specialists

3.1 Andrew Husted

Mr. Andrew Husted is an aquatic ecologist, specializing in freshwater systems and wetlands, who graduated with a MSc in Zoology. He, is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Mr Husted has 12 years' experience in the environmental consulting field.

3.2 Ivan Baker

Ivan Baker is Pr. Sci Nat registered (119315) in environmental science with Cand. Sci. Nat recognition in geological science. Ivan is a wetland and soil specialist with vast experience in wetlands, pedology, hydropedology and land contamination and has completed numerous specialist studies ranging from basic assessments to EIAs. Ivan has carried out various international studies following FC standards. Ivan completed training in Tools for Wetland Assessments with a certificate of competence and completed his MSc in environmental science and hydropedology at the North-West University of Potchefstroom. Ivan is also affiliated with the Fertiliser Society of South Africa after the acquiring a certificate of competence following the completion of the FERTASA training course.Methodology.

4 Scope of Work

According to the National Web based Environmental Screening Tool, the proposed development is located within a "Low" sensitivity land capability area (see Section 6.2). The protocols for minimum requirements (DEA, 2020)[1] stipulates that in the event that a proposed development is located within "Low" or "Medium" sensitivities, an agricultural compliance statement will be sufficient. It is worth noting that according to these protocols, a site inspection will still need to be conducted to determine the accuracy of these sensitivities. After acquiring baseline information pertaining to soil resources within the 50 m regulated areas, it is the specialist's opinion that the soil forms and associated land capabilities concur with the sensitivities stated by the screening tool. Therefore, only an agricultural compliance statement will be compiled. This includes:

- The feasibility of the proposed activities;
- Confirmation about the "Low" and "Medium" sensitivities;
- The effects that the proposed activities will have on agricultural production in the area;
- A map superimposing the proposed footprint areas, a 50 m regulated area as well as the sensitivities pertaining to the screening tool;
- Confirmation that no agricultural segregation will take place and that all options have been considered to avoid segregation;
- The specialist's opinion regarding the approval of the proposed activities; and
- Any potential mitigation measures described by the specialist to be included in the EMPr.

4.1 Desktop Assessment

As part of the desktop assessment, baseline soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types. In addition, a Digital Elevation Model (DEM) as well as the slope percentage of the area was calculated by means of the NASA Shuttle Radar Topography Mission Global 1 arc second digital elevation data by means of QGIS and SAGA software.

4.2 Field Survey

An assessment of the soils present within the project area was conducted during a field survey from the 1st to the 2nd of March 2022. The site was traversed on foot. A soil auger was used to determine the soil form/family and depth. The soil was hand augured to the first restricting layer or 1,5 m. Soil survey positions were recorded as waypoints using a handheld GPS. Soils were identified to the soil family level as per the "Soil Classification: A Taxonomic System for South

[1] A site identified by the screening tool as being of 'High" or "Very High" sensitivity for agricultural resources must submit a specialist assessment unless the impact on agricultural resources is from an electricity pylon (item 1.1.2).

Africa" (Soil Classification Working Group, 2018). Landscape features such as existing open trenches were also helpful in determining soil types and depth.

4.3 Land Capability

Given the nature of the compliance statement and the fact that baseline findings correlate with the screening tool's sensitivities, land capability was solely determined by means of the National Land Capability Evaluation Raster Data Layer (DAFF, 2017). Land capability and land potential will also briefly be calculated to match to that of the screening tool to ultimately determine the accuracy of the land capability sensitivity from (DAFF, 2017).

Land capability and agricultural potential will briefly be determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes.

Land capability is divided into eight classes and these may be divided into three capability groups. Table 4-1 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use increases from class I to class VIII (Smith, 2006).

Table 4-1 Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	Arable Land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						Grazing Land
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									Wildlife
W - Wildlife		**MG - Moderate Grazing**			**MC - Moderate Cultivation**					
F- Forestry		**IG - Intensive Grazing**			**IC - Intensive Cultivation**					
LG - Light Grazing		**LC - Light Cultivation**			**VIC - Very Intensive Cultivation**					

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 4-2. The final land potential results are then described in Table 4-3.

Table 4-2 The combination table for land potential classification

Land capability class	Climate capability class							
	C1	C2	C3	C4	C5	C6	C7	C8

I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 4-3 The Land Potential Classes.

Land potential	Description of land potential class
L1	Very high potential: No limitations. Appropriate contour protection must be implemented and inspected.
L2	High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L3	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L4	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.
L5	Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall.
L6	Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L7	Low potential: Severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L8	Very low potential: Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable

4.4 Limitations

The following limitations are relevant to this agricultural potential assessment;

- None are expected for this project.

5 Project Area

5.1 Soils and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006) the assessment corridor to be focused on falls within the Fc 266 and Ib 288 land types. The Fc land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is rare or absent within this land type in upland soils but generally present in low-lying areas. The Ib land type consists of miscellaneous land classes including rocky areas with miscellaneous soils. The terrain units and expected soils for the Fc 266 land type is illustrated in Figure 5-1 and Table 5-1 respectively. Similarly, those for the Ib 288 land type is depicted in Figure 5-2 and Table 5-2.

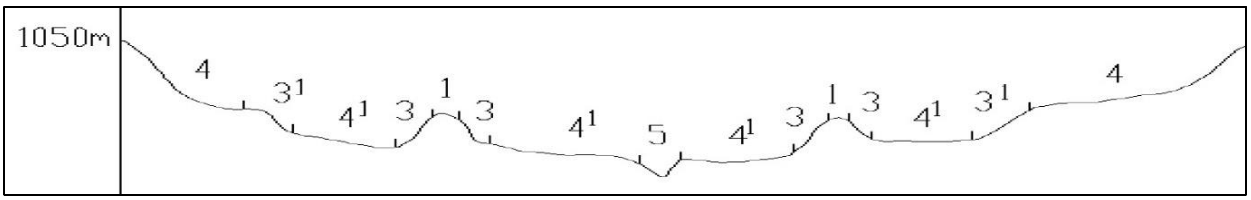

Figure 5-1 Illustration of land type Fc 266 terrain unit (Land Type Survey Staff, 1972 - 2006)

Table 5-1 Soils expected at the respective terrain units within the Fc 266 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (10%)		3 (20%)		4 (60%)		5 (10%)	
Bare Rock	50%	Bare Rock	59%	Oakleaf	80%	Oakleaf	70%
Mispah	30%	Mispah	20%	Oakleaf	40%	Bare Rock	10%
Glenrosa	15%	Glenrosa	18%	Bare Rock	28%	Mispah	10%
Oakleaf	3%	Oakleaf	2%	Mispah	15%	Dundee	10%
Swartland	2%	Valsrivier	1%	Glenrosa	15%		
				Valsrivier	1%		
				Swartland	1%		

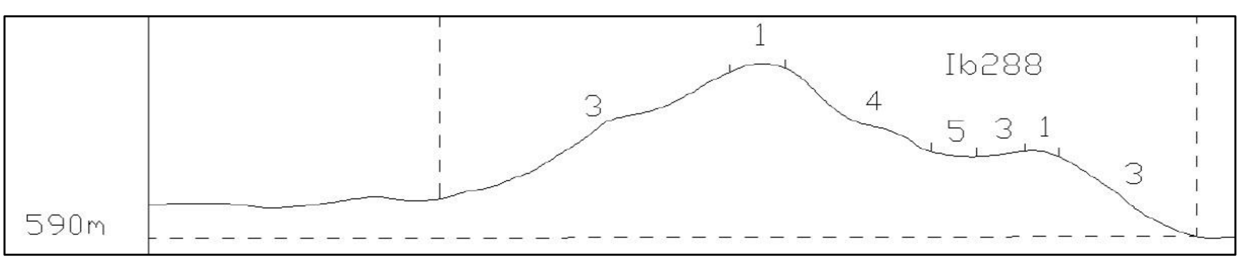

Figure 5-2 Illustration of land type IB 288 terrain unit (Land Type Survey Staff, 1972 - 2006)

Table 5-2 Soils expected at the respective terrain units within the IB 288 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units					
1 (15%)		**3 (75%)**		**5 (10%)**	
Bare Rock	60	Bare Rock	70	Bare Rock	40
Glenrosa	30	Glenrosa	25	Hutton	25
Hutton	10	Hutton	5	Streambeds	20
				Shortlands	10
				Glenrosa	5

5.2 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure 5-3. The majority of the regulated area is characterised by a slope percentage between 0 and 10%, with some smaller patches within the project area characterised by a slope percentage up to 35. This illustration indicates a non-uniform area with undulating slopes, mountainous areas and ridges. The Digital Elevation Model (DEM) of the project area (Figure 5-4) indicates an elevation of 1 125 to 1 237 Metres Above Sea Level (MASL).

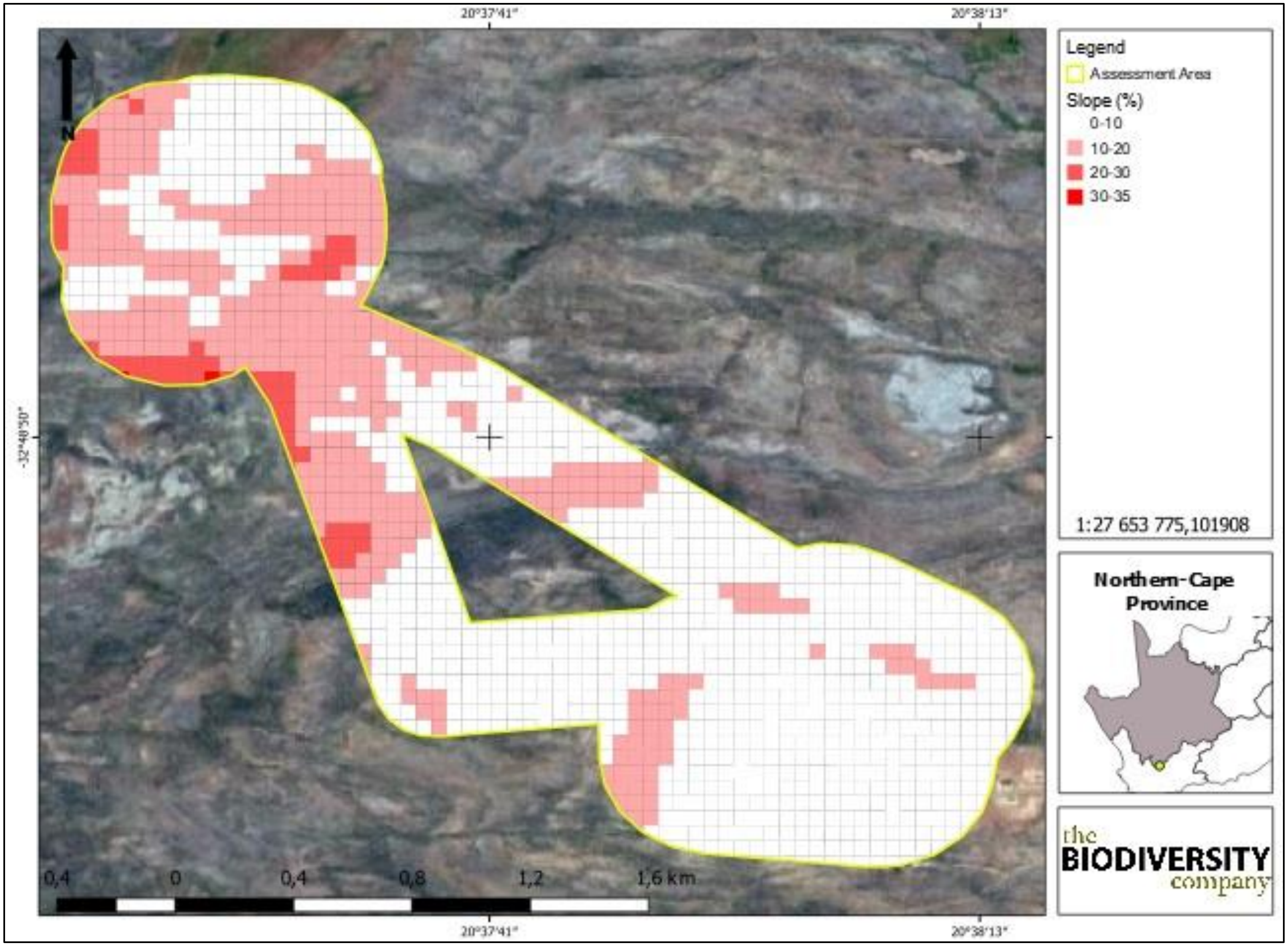

Figure 5-3 Slope percentage map for the assessment area

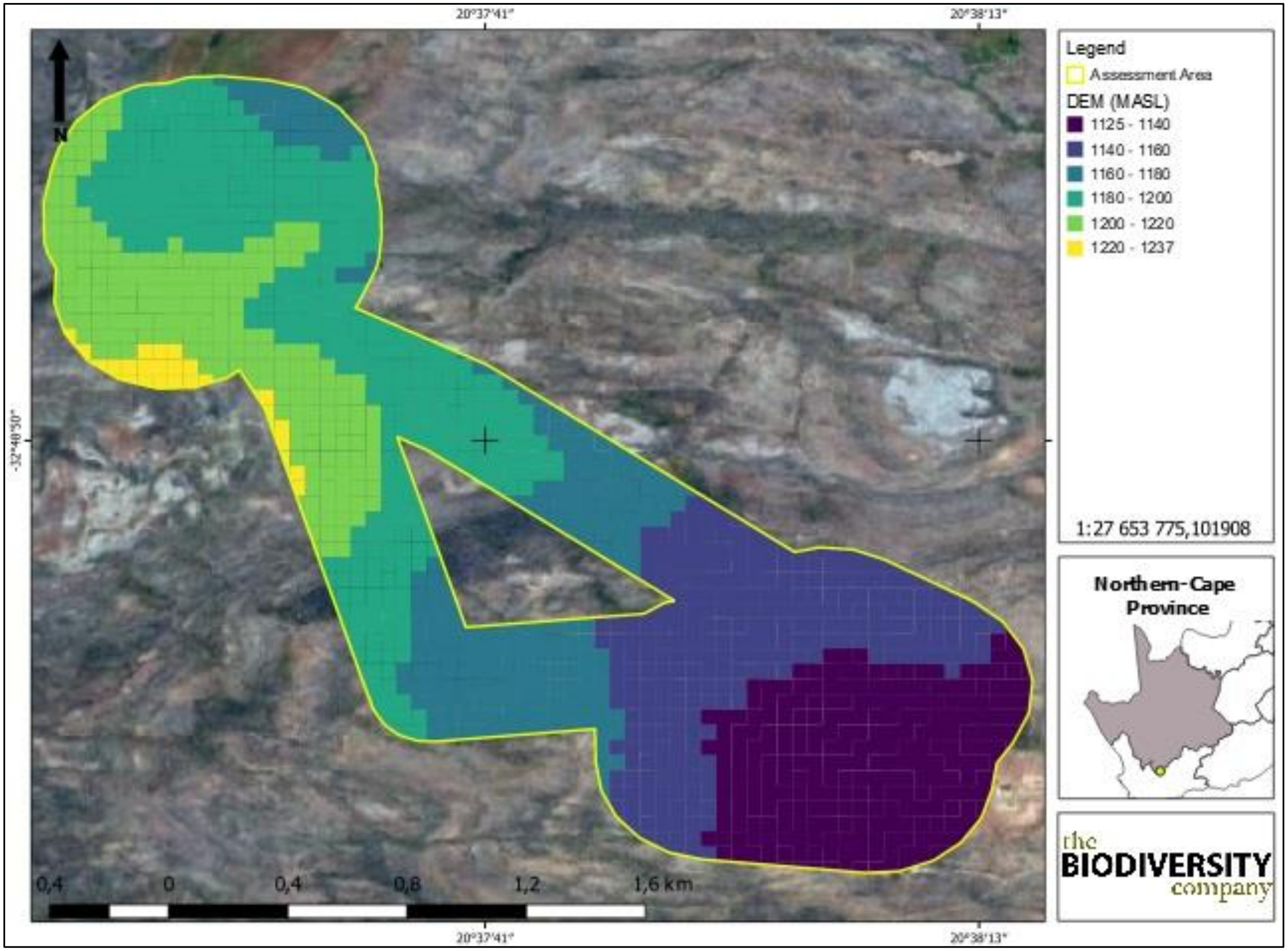

Figure 5-4 ***Digital Elevation Model of the assessment area (metres above sea level)***

6 Results and Discussion

6.1 Baseline Findings

The one main dominant sensitive soil form was identified as the Oakleaf soil form (see Figure 6-1). The Oakleaf soil forms consists of an orthic topsoil on top of a deep neocutanic horizon.

The abovementioned soil has been determined to have a land capability of class "III" and "IV" as well as a climate capability level 8 given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. The combination between the determined land capabilities and climate capabilities results in a land potential of "L6", which is defined as having *very restricted potential. Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable.* The sensitivity of this land potential is characterised by a "Low Sensitivity".

Figure 6-1 Example of a neocutanic diagnostic horizon

6.2 Sensitivity Verification

The following land potential level has been determined;

- Land potential level 6 (this land potential level is defined as having very restricted potential. Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable. The sensitivity of this land potential is characterised by a "Low Sensitivity").

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which eight potential land capability classes are located within the proposed footprint area's assessment corridor, including;

- Land Capability 1 to 5 (very low to low); and
- Land Capability 6 to 8 (moderately low to moderate).

The baseline findings and the sensitivities as per the Department of Agriculture, Forestry and Fisheries (DAFF, 2017) national raster file concur with one another. It therefore is the specialist's opinion that the land capability and land potential of the resources in the regulated area is characterised by "Low" to "Moderate" sensitivities (see Figure 6-2), which conforms to the requirements of an agricultural compliance statement only.

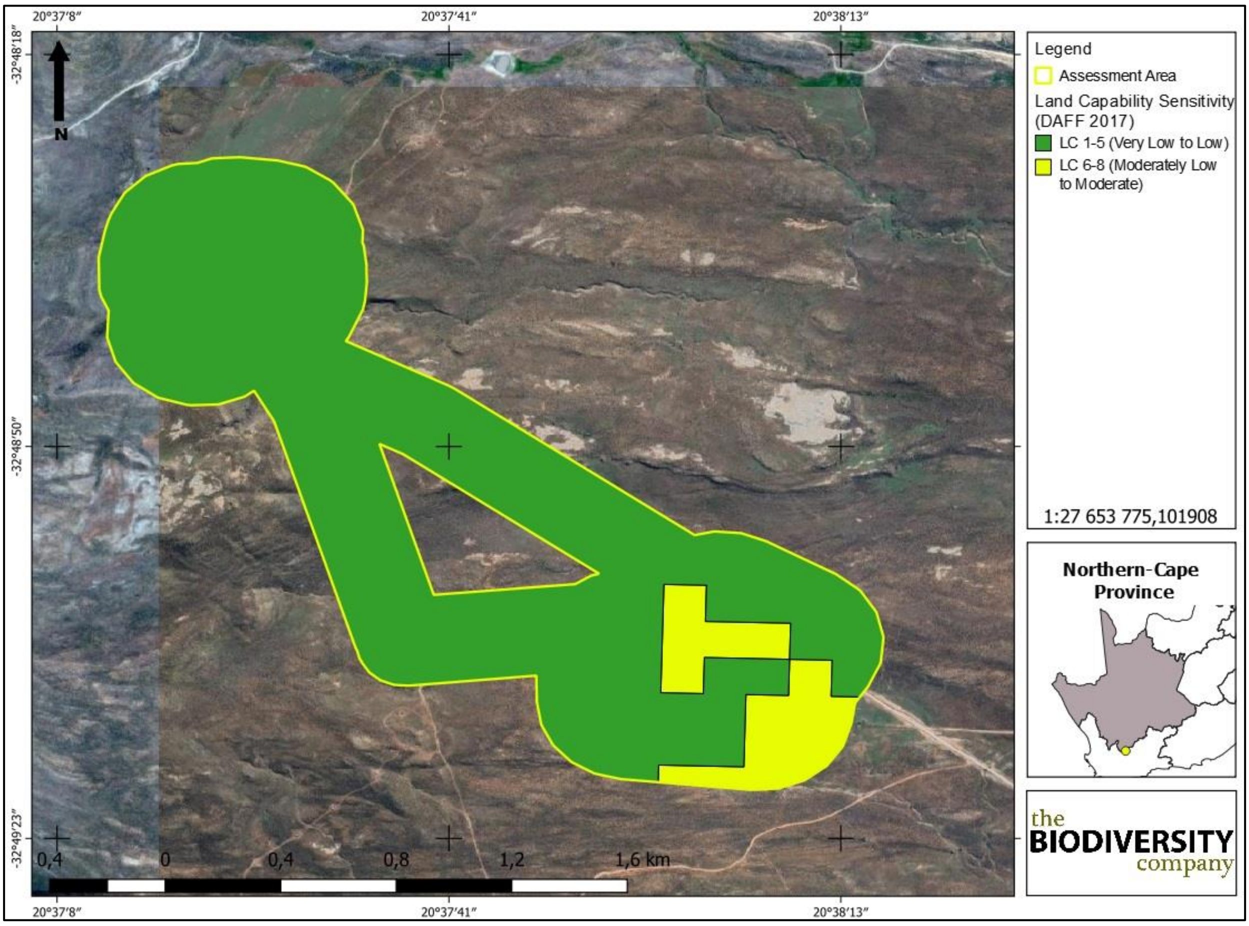

Figure 6-2 Land Capability Sensitivity (DAFF, 2017)

7 Mitigation

7.1 General Mitigation

General mitigations will ensure the conservation of all soil resources, regardless of the sensitivity of resources and the intensity of impacts.

- Ensure that proper stormwater management designs are set in place;
- Only the proposed access roads are to be used to reduce any unnecessary compaction;
- Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks;
- Proper invasive plant control must be undertaken quarterly;
- All excess soil (soil that are stripped and stockpiled to make way for foundations) must be stored, continuously rehabilitated to be used for rehabilitation of eroded areas; and
- If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities.

7.2 Restoration of Vegetation Cover

Restoring vegetation cover is the first step to successful rehabilitation. Vegetation cover decreases flow velocities and minimises erosion.

7.2.1 Ripping Compacted Areas

All areas outside of the permanent infrastructure footprint areas that will be degraded (by means of vehicles, laydown yards etc.) must be ripped where compaction has taken place. According to the Department of Primary Industries and Regional Development (Agriculture and Food) (2017), ripping tines must penetrate to just below the compacted horizons (approximately 300 – 400 mm) with soil moisture being imminent to the success of ripping. Ripping must take place within 1-3 days after seeding, and also following a rain event (as far as possible) to ensure a higher moisture content.

To summarise;

- Rip all compacted areas outside of the developed areas that have been compacted;
- This must be done by means of a commercial ripper or TLB that has at least two rows of tines; and
- Ripping must take place between 1 and 3 days after seeding and following a rainfall event (seeding must therefore be carried out directly after a rainfall event).

7.2.2 Revegetate Degraded Areas

Vegetation within the footprint areas will be cleared to accommodate the excavation activities coupled with the proposed footprint areas' foundations. This impact will degrade soil resources, ultimately decreasing the land capability of resources and increasing erosion. According to Russell (2009), areas characterised by a loss of soil resources should be revegetated by means of vegetation with vigorous growth, stolons or rhizomes that more or less resembles the natural vegetation in the area.

It is recommended that all areas surrounding the development footprint areas that have been degraded by traffic, laydown yards etc. must be ripped and revegetated by means of indigenous grass species. Mixed stands or monocultures will work sufficiently for revegetation purposes. Mixed stands tend to blend in with indigenous vegetation species and are more natural. Monocultures however could achieve high productivity. In general, indigenous vegetation should always be preferred due to various reasons including the aesthetical presence thereof as well as the ability of the species to adapt to its surroundings.

Plant which are characterised by fast growing and rapid spreading conditions. Seed germination, seed density and seed size are key aspects to consider before implementing revegetation activities. The amount of seed should be limited to ensure that competition between plants are kept to a minimum. During the establishment of seed density, the percentage of seed germination should be taken into consideration. *E curvula* is one of the species recommended due to the ease of which it germinates. This species is also easily sown by means of hand propagation and hydro seeding.

The following species are recommended for rehabilitation purposes;

- *Eragrostis teff;*
- *Cynodon species* (Indigenous and altered types);
- *Chloris gayana;*
- *Panicum maximum;*
- *Digitaria eriantha;*
- *Anthephora pubescens;* and
- *Cenchrus ciliaris.*

8 Conclusion and Impact Statement

One main low sensitivity soil form was identified within the assessment area, namely the Oakleaf soil form. The land capability sensitivities (DAFF, 2017) indicate land capabilities with “Low” and “Moderate” sensitivities, which correlates with the findings from the baseline assessment.

The assessment area is not associated with any arable soils, due to the type of soil as well as the climate, which in itself limits crop production significantly. The land capabilities associated with the regulated area are only suitable for grazing, which corresponds with the current land use.

It is the specialist’s opinion that the proposed developments will have no impacts on the agricultural production ability of the land. Additionally, the proposed activities will not result in the segregation of any high production agricultural land. Therefore, the proposed development may be favourably considered. From an agricultural potential perspective, the overhead power line is preferred, however either alternative is acceptable.

9 References

Land Type Survey Staff. 1972 - 2006. Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

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