SiVEST SA (PTY) LTD

PROPOSED DEVELOPMENT OF THE KLIPKRAAL WIND ENERGY FACILITY (WEF) 1 AND ASSOCIATED INFRASTRUCTURE NEAR FRASERBURG IN THE NORTHERN CAPE PROVINCE

Paleontological Impact Assessment

DEFF Reference: TBA

Report Prepared by: Banzai Environmental Pty Ltd

Issue Date: 28 November 2022

Version No.: 01

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological 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 favorable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting palaeontological impact assessments, 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 will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- 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;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

PALAEONTOLOGICAL CONSULTANT: Banzai Environmental (Pty) Ltd

CONTACT PERSON: Elize Butler

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Email: elizebutler002@gmail.com

SIGNATURE 

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PROPOSED DEVELOPMENT OF THE KLIPKRAAL WIND ENERGY FACILITY (WEF) 1 AND ASSOCIATED INFRASTRUCTURE NEAR FRASERBURG IN THE NORTHERN CAPE PROVINCE

Paleontological Impact Assessment

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) has been commissioned by SiVEST (PTY) Ltd (hereafter referred to as"SiVEST"), on behalf of Klipkraal Wind Energy Facility 1 (Pty) Ltd (hereafter referred to as 'Klipkraal 1') to conduct the Heritage Scoping Report that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed construction of the Klipkraal Wind Energy Facility (WEF), BESS and associated infrastructure near the towns of Beaufort West and Fraserburg in the Northern Cape Province of South Africa. In turn Banzai Environmental has been commissioned to conduct the Palaeontological Impact Assessment (PIA) for the Klipkraal Wind Energy Facility 1. In accordance with the National Environmental Management Act 107 of 1998 (NEMA) and to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PIA is necessary to confirm if fossil material could potentially be present in the planned development area, to evaluate the potential impact of the proposed development on the Palaeontological Heritage and to mitigate possible damage to fossil resources.

The proposed wind farms make up a larger wind energy facility (WEF) (with associated BESS) which will be referred to as the Klipkraal WEF, consisting of up to five (5) phases, with a combined generation capacity of up to approximately 1 500 MW, as follows:

- Klipkraal Wind Energy Facility 1: up to 300MW + BESS (**this application**)
- Klipkraal Wind Energy Facility 2: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
- Klipkraal Wind Energy Facility 3: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
- Klipkraal Wind Energy Facility 4: up to 300MW + BESS (part of a separate EIA process which

forms part of separate application)

• Klipkraal Wind Energy Facility 5: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)

• Klipkraal On-site Switching / Collector Substation and associated 132kV/400kV Power Line (part of a separate BA application).

The 3220 Sutherland Geological Map (Council of Geosciences, Pretoria) indicates that a small portion of the proposed Klipkraal WEF 1 is underlain by the Jurassic Dolerite while the rest of the footprint is underlain by the Adelaide Subgroup (Beaufort Group). The PalaeoMap of the South African Heritage Resources Information System) indicates that the Palaeontological Sensitivity of the Jurassic Dolerite is Zero as it is igneous in origin and thus unfossiliferous while that of the Adelaide Subgroup is Very High (Almond and Pether, 2009; Almond *et al*., 2013). Large areas of the development on the PalaeoMap are underlain by white and indicates that these areas have not been allocated so a specific Palaeontological Sensitivity. The updated Geology (Council of Geosciences, Pretoria); refines the geology of the 1983 Geological Map and indicates that the north-eastern portion is underlain by Jurassic dolerite, the largest portion of the development is underlain by the Middleton Formation with the south western portion underlain by the Balfour Formation. Both the Middleton and Balfour Formations forms part of Adelaide Subgroup (Beaufort Group).

In the last few decades extensive research and collecting have been conducted by palaeontologists in this part of the basin and the Fraserburg area was found to be highly fossiliferous. A two day-site-specific field survey of the development footprint was conducted on foot 24-26 September 2021. Various fossiliferous sites, where fossils were found to be well-preserved, has been identified in the development footprint.

As the site visit was conducted in 2021 the layout of the WEF was not yet known. The specific layout of the Klipkraal WEF 1 development was thus not investigated in detail. It is thus recommended that a Palaeontological Walkdown of the development is conducted pre-construction once the final design details are available. The appointed Palaeontologist will also have to include a Chance Find Protocol for the Klipkraal WEF 1 development and training of accountable supervisory personnel by a qualified palaeontologist in the recognition of fossil heritage is necessary.

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	**Section of Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) 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;	Section 1, Appendix B
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 1
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1 and 9
e) a description of the methodology adopted in preparing the report or carrying out the specialized process inclusive of equipment and modelling used;	Section 1
f) 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 5
g) an identification of any areas to be avoided, including buffers;	Section 1 and 9
h) 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 5

i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) 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 1 and 9
k) any mitigation measures for inclusion in the EMPr;	Section 1 and 9
l) any conditions for inclusion in the environmental authorisation;	Section 1 and 9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 1 and 9
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and 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 1 and 9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) 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.	Section 4

SiVEST SA (PTY) LTD

PROPOSED CONSTRUCTION OF THE KLIPKRAAL WIND ENERGY FACILITY 1, NEAR FRASERBURG, NORTHERN CAPE PROVINCE, SOUTH AFRICA

Palaeontological Impact Assessment

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PROPOSED CONSTRUCTION OF THE KLIPKRAAL WIND ENERGY FACILITY 1, NEAR FRASERBURG, NORTHERN CAPE PROVINCE, SOUTH AFRICA

Palaeontological Impact Assessment

1. INTRODUCTION

Aura Development Company (Pty) Ltd (hereafter referred to as 'Aura') are proposing to develop up to seven (7) wind farms and associated infrastructure [including substations and Battery Energy Storage Systems (BESS)] on a number of properties, majority being adjacent, near the towns of Beaufort West and Fraserburg in the Northern Cape Province of South Africa. The proposed wind farm projects will have maximum export capacities of up to approximately 200 megawatts (MW) respectively. The proposed wind farms make up a larger wind energy facility (WEF) (with associated BESS) which will be referred to as the Klipkraal WEF, consisting of up to seven (7) phases, with a combined generation capacity of up to approximately 1 400 MW, as follows:

The proposed wind farms make up a larger wind energy facility (WEF) (with associated BESS) which will be referred to as the Klipkraal WEF, consisting of up to five (5) phases, with a combined generation capacity of up to approximately 1 500 MW, as follows:

- Klipkraal Wind Energy Facility 1: up to 300MW + BESS (**this application**)
- Klipkraal Wind Energy Facility 2: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
- Klipkraal Wind Energy Facility 3: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
- Klipkraal Wind Energy Facility 4: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
- Klipkraal Wind Energy Facility 5: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
- Klipkraal On-site Switching / Collector Substation and associated 132kV/400kV Power Line (part of a separate BA application).

The overall objective of the development is to generate electricity by means of renewable energy technology capturing wind energy to feed into the National Grid.

It is anticipated that the proposed Klipkraal WEF 1 will comprise sixty (60) wind turbines with a maximum total energy generation capacity of up to approximately 300MW. The electricity generated by the proposed WEF development will be fed into the national grid via a 132kV/400kV overhead power line. A Battery Energy Storage System (BESS) will be located next to the onsite 33/132kV substation. The storage capacity and type of technology would be determined at a later stage during the development phase, but most likely will comprise an array of containers, outdoor cabinets and/or storage tanks.

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 [GNR 982, 983, 984 and 985) 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. Specialist studies have been commissioned to assess and verify the project under the new Gazetted specialist protocols.

1.1 Terms of Reference

The objective of a Palaeontological Impact Assessment (PIA) is to determine the impact of the development on potential palaeontological material at the site.

According to the "SAHRA Archaeological, Palaeontological and Meteorite Unite (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the aims of the PIA are: 1) to **identify** the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint 2) to estimate the **palaeontological importance** of the formations 3) to determine the **impact** on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all applicable best practice recommendations, appropriate legislation and authority requirements;
- Submit a comprehensive overview of all appropriate legislation, guidelines;
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study,
- Description and location of the proposed development and provide geological and topographical maps

- Provide palaeontological and geological history of the affected area.
- Identification of sensitive areas to be avoided (providing shapefiles/kmls) in the proposed development;
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    a. **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
    b. **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity.
    c. Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.
- Fair assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (such as permits, licenses etc).

1.2 Specialist Credentials

This study has been conducted by Mrs. Elize Butler, palaeontologist of Banzai Environmental (Pty) Ltd. She has conducted approximately 400 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-nine years. She has experience in locating, collecting, and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.Please see Appendix B.

1.3 Assessment Methodology

The aim of a desktop study is to evaluate the possible risk to palaeontological heritage in the proposed development. This includes all trace fossils as well as all fossils in the proposed footprint. All possible information is consulted to compile a scoping report, and this includes the following: PalaeoMap of the South African Heritage Resources Information System (SAHRIS) (Almond *et al*, 2013; SAHRIS website), all Palaeontological Impact Assessment reports in the same area; aerial photos and Google Earth images, topographical and geological maps as well as scientific articles of specimens from the development area and Assemblage Zones.

2. ASSUMPTIONS AND LIMITATIONS

The focal point of geological maps is the geology of the area and the sheet explanations of the Geological Maps were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas is also used to provide information on the existence of fossils in an area which has not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies it is generally **assumed** that exposed fossil heritage is present within the footprint. A field-assessment has thus been conducted to improve the accuracy of the desktop assessment.

3. TECHNICAL DESCRIPTION

3.1 Project Location

Klipkraal WEF 1 is located 27km south-east of Fraserburg, within the Karoo Hoogland Municipality in the Northern Cape Province (**Figure 1-3**).

Klipkraal WEF 1 is located on the following farm portions:

- Remainder of the Farm Matjiesfontein No. 409 (RE/409)
- Remainder of the Farm Klipfontein No. 447 (RE/447)
- Portion 1 of the Farm Klipfontein No. 447 (1/447)

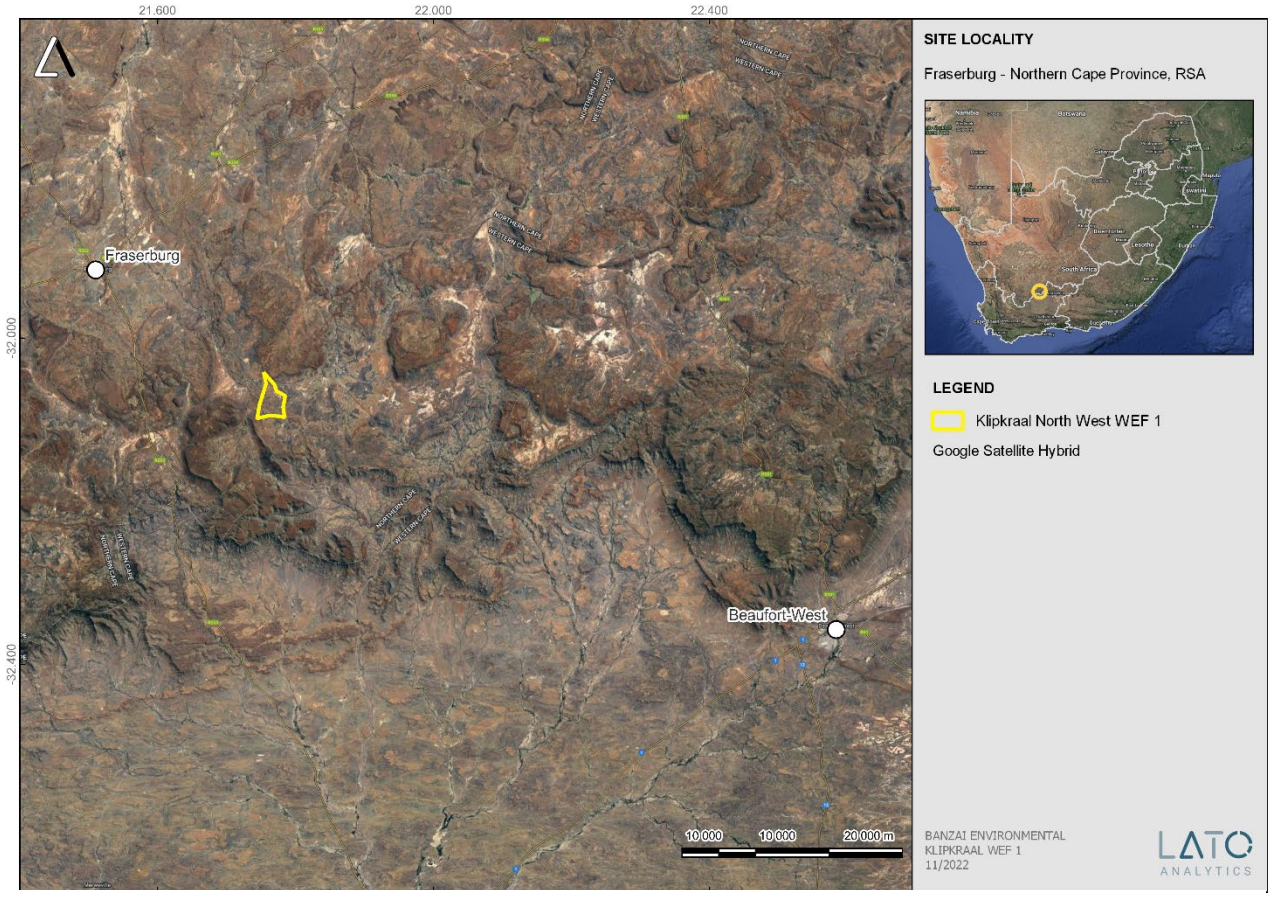


***Figure 1**: Regional setting of the proposed Klipkraal 1 WEF*

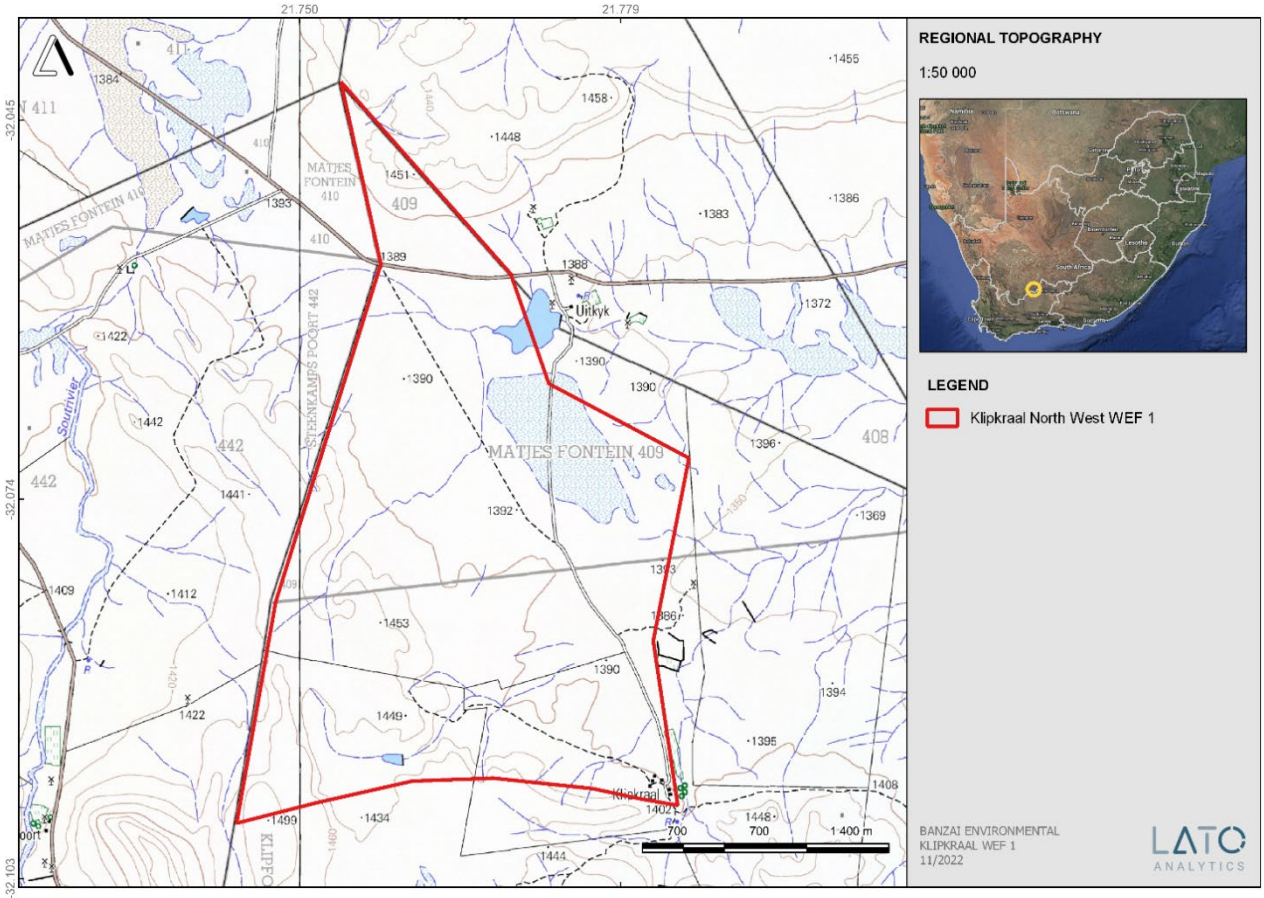


***Figure 2**:Locality Map of Klipkraal 1 WEF [1:50 000 3221BB]*

***Figure 3**: General view over the proposed Klipkraal WEF 1 development.*

3.2 Project Description

It is anticipated that the proposed Klipkraal WEF 1 will comprise sixty (60) wind turbines with a maximum total energy generation capacity of up to approximately 300MW. The electricity generated by the proposed WEF development will be fed into the national grid via a 132kV overhead power line. The location of the BESS and substation will be confirmed during the EIA phase. The storage capacity and type of technology would be determined at a later stage during the development phase, but most likely will comprise an array of containers, outdoor cabinets and/or storage tanks.

3.2.1 Wind Farm Components

The proposed wind farm projects which form part of the larger Klipkraal WEF will each include the following components:

Wind Turbines

Wind Energy Facility	Capacity	No. of turbines
1	300MW	60
2	300MW	60
3	300MW	60
4	300MW	60
5	300MW	60

- Approximately 60 turbines per wind farm, with a maximum export capacity of up to approximately 300MW for each wind farm.
- Each wind turbine will have a maximum hub height of up to approximately 200m;
- Each wind turbine will have a maximum rotor diameter of up to approximately 200m;
- Permanent compacted hardstanding areas / platforms (also known as crane pads) of approximately
- 100m x 100m (total footprint of approx. 410 000m2) per wind turbine during construction and for on- going maintenance purposes for the lifetime of the proposed wind farm projects. This will however, depend on the physical size of the wind turbine;
  Each wind turbine will consist of a foundation (i.e. foundation rings) which may vary in depth, from approximately 3m and up to 10m or greater, depending on the physical size of each wind turbine. It should be noted that the foundation can be up to as much as approximately 700m^3

3.2.2 Electrical Transformers

- Electrical transformers will be constructed near the foot of each respective wind turbine in order to step up the voltage to 66kV.
- The typical footprint of the electrical transformers is up to approximately 10m x 10m but can be up to 20m x 20m at certain locations

3.2.3 Step-up/Collector Substations

- New 11-66/132-400kV step-up / collector substations, each occupying an area of up to approximately 2ha, for each wind farm being proposed [i.e., one (1) substation per phase].
- The proposed substations will include an Eskom portion and an Independent Power Producer (IPP) portion, hence the substations have been included in each respective wind farm EIA and in the grid connection infrastructure BA (substations, switching stations and power lines) to allow for handover to Eskom.
- Following construction, the substations will be owned and managed by Eskom. The current applicant will retain control of the medium voltage components (i.e., 33kV components) of the substations, while the high voltage components (i.e., 400kV components) of these substations will likely be ceded to Eskom shortly after the completion of construction.

3.2.4 Main Transmission Substations (MTS)

- Two (2) new 132/400kV Main Transmission Substations (MTS) are being proposed, occupying an area of up to approximately 120ha each.
- Each proposed MTS will include an Eskom portion and an IPP portion. However, a separate substation has also been included in each respective wind farm EIA and in the grid connection infrastructure BA to allow for handover to Eskom.
- Following construction, the substations will be owned and managed by Eskom. The current applicant will retain control of the 132-400kV and lower voltage components of each MTS, while the 132/400kV voltage components of each MTS will likely be ceded to Eskom shortly after the completion of construction.

3.2.5 Electrical Infrastructure

- The wind turbines will be connected to the proposed substations via medium voltage (i.e., 33kV) cables.
- These cables will be buried along access roads wherever technically feasible, however, the cables can also be overhead (if required);
- Each WEF will then connect to the MTS via a 400KV line.

3.2.6 Battery Energy Storage Systems (BESS)

- A Battery Energy Storage System (BESS) will be constructed for each respective wind farm [i.e., one (1) BESS per phase] and will be located next to the 33-66/132-400kV step-up / collector substations which form part of the respective wind farms, or in between the wind turbines.
- It is anticipated that the type of technology will be either Lithium Ion or Sodium-Sulphur (or as determined prior to construction).
- These batteries are not considered hazardous goods as they will be storing 'energy'.
- The size, storage capacity and type of technology will be determined / confirmed prior to construction.

3.2.7 Roads

- Internal roads with a width of up to approximately 15m will provide access to each wind turb ne.
- Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.
- Existing site roads may also be upgraded using temporary concrete stones in order to accommodate for the heavy loads.
- Turns will have a radius of up to 50m for abnormal loads (especially turbine blades) to access the various wind turbine positions.

3.2.8 Site Access

- The proposed wind farm application sites will be accessed via existing gravel roads from the R353 Regional Route.

3.2.9 Temporary Staging Areas

Temporary staging areas will be required for each wind farm and will be located both at the foot of each wind turbine and at the storage facility (i.e., turbine development area) to allow for working requirements.

- One (1) temporary staging area per wind turbine / range of wind turbines will be required for each wind farm (i.e., for each phase).
- Temporary staging areas will cover an area of up to approximately 100m x 100m (10 000m2 / 1ha) each.

3.2.10 Temporary Construction Camps

Temporary construction camps will be required during the construction phase. One (1) temporary construction camp per wind farm is being proposed [i.e., one (1) per phase].

- This area will be used as a permanent maintenance area during the operational phase. One (1) permanent Maintenance Area will be required per wind farm [i.e., one (1) per phase].

- Each combined Temporary Construction Camp / Permanent Maintenance Area will cover an area of up to approximately 2.25ha.
- A cement batching plant as well as a chemical storage area will fall within each Temporary Construction Camp and Permanent Maintenance Area.
- Each Temporary Construction Camp and Permanent Maintenance Area will be strategically placed around the proposed wind farm sites and will avoid all high sensitivity and/or 'no-go' areas.

3.2.11 Offices, Accommodation, a Visitors' Centre and Operation & Maintenance (O&M) Buildings

Offices (including ablution facilities), Accommodation (including ablution facilities), a Visitors' Centre and Operation & Maintenance (O&M) buildings will be required and will occupy areas of up to approximately 100m x 100m (i.e., 1ha).

- Each wind farm (i.e., each phase) will have its own O&M building and Office, however, the Accommodation and Visitors' Centre will be centralised locations which will be shared between certain wind farm projects (i.e., shared between certain phases which will be confirmed at a later stage).

3.2.12 Septic Tank and Soak-Away Systems

- Each wind farm will consist of septic tank and soak-away systems.
- This will be required for construction as well as long term use.
- Septic tanks and soak-away systems will be placed 100m or more from water resource (which includes boreholes).

3.2.13 Wind Measuring Lattice Masts

- Two (2) wind measuring lattice masts (approximately 120m in height) have already been strategically placed within the wind farm application sites in order to collect data on wind conditions.
- Two (2) additional wind measuring lattice masts may be installed within the wind farm application sites. This will be confirmed at a later stage, prior to the respective application forms being submitted.

3.2.14 Fencing

- Fencing will be required and will surround each respective wind farm.
- A maximum height of 3m for the fencing is proposed. The area which the fencing will cover will be confirmed during the detailed design phase, prior to construction commencing. The type of fencing to be used will be either palisade or diamond/clear view/mesh.
- Fences will however be constructed according to specifications recommended by the Ecologist and Avifauna specialist (as per the EMPr).

3.2.15 Temporary Infrastructure to Obtain Water from Available Local Sources

- Temporary infrastructure to obtain water from available local sources will be required. Water may also be obtained from onsite boreholes and from the town of Fraserburg.
- New or existing boreholes, including a potential temporary above ground pipeline (approximately 50cm in diameter) for each wind farm, to feed water to the sites are being proposed.
- Water will potentially be stored in temporary water storage tanks.

3.2.16 Temporary Containers

- Temporary containers of up to approximately 80m3 will be required for the storage of fuel on-site during the construction phase of each wind farm.
- As mentioned, a chemical storage area will fall within the Temporary Construction Camp and permanent Maintenance Area.

3.3 Layout Alternatives

3.3.1 *Wind Energy Facility*

Design and layout alternatives will be considered and assessed as part of the EIA. These include alternatives for the Substation locations and also for the construction / laydown area.

3.3.2 No-*go Alternative*

The 'no-go' alternative is the option of not undertaking the proposed WEF project. Hence, if the 'no-go' option is implemented, there would be no development. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report.

4. LEGAL REQUIREMENT AND GUIDELINES

National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **"all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**".

The identification, evaluation and assessment of any cultural heritage site, artefact or finds in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA) Act 107 of 1998
- National Heritage Resources Act (NHRA) Act 25 of 1999
- Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified.

The next section in each Act is directly applicable to the identification, assessment, and evaluation of cultural heritage resources.

GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impacts Assessment (EIA) – Regulation 23
- Environmental Scoping Report (ESR) – Regulation 21
- Environmental Management Programme (EMPr) – Regulations 19 and 23

National Heritage Resources Act (NHRA) Act 25 of 1999

- Protection of Heritage Resources – Sections 34 to 36
- Heritage Resources Management – Section 38

The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) "…*identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*".

In agreement with legislative requirements, EIA rating standards as well as SAHRA policies the following comprehensive and legally compatible PIA report have been compiled.

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Impact assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length.
- the construction of a bridge or similar structure exceeding 50 m in length.
- any development or other activity which will change the character of a site—
- (Exceeding 5 000 m^2 in extent; or
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m² in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

The proposed Klipkraal WEF 1 is depicted on the 1: 250 000 Sutherland 3220 (1983) (Council of Geoscience, Pretoria) (**Figure 4**). This map indicates that the north-east portion as well as a small portion in the development is underlain by Jurassic Dolerite (Jd, red) while the rest of the footprint is underlain by the Teekloof Formation (Pte; green) of the Adelaide Subgroup (Beaufort Group).

The PalaeoMap of the South African Heritage Resources Information System (**Figure 5**) indicates that the Palaeontological Sensitivity of the Jurassic Dolerite is Zero as it is igneous in origin and thus unfossiliferous while that of the Adelaide Subgroup is Very High (Almond and Pether, 2009; Almond *et al*., 2013). Large areas in the development are underlain by white and indicates that this areas have not been allocated so a specific Palaeontological Sensitivity.

Updated Geology (Council of Geosciences, Pretoria; **Figure 6, Table 1**) refines the geology of the 1983 Geological Map and indicates that the north-eastern portion is underlain by Jurassic dolerite, the largest portion of the development is underlain by the Middleton Formation with the south western portion underlain by the Balfour Formation. Both the Middleton and Balfour Formations forms part of Adelaide Subgroup (Beaufort Group).

The Jurassic dolerite present in the development form part of the Karoo Igneous Province is one of the worlds classic continental flood basalt (CFB) provinces. This Suite was formed approximately 183 million years ago and consists of intrusive and extrusive rocks that occur over a large area (Duncan et al, 2006). Generally, the flood basalts do not contribute to prominent volcanic structures but instead are formed by successive eruptions from a set of fissures that form sub-horizontal lava flows (sills and dikes) varying in thickness. This lava caps the landscape on which they erupted. As the Karoo is an old flood basalt province it is today preserved as erosional fragments of a more extensive lava cap that covered much of southern Africa in the geological past. It is estimated that the Karoo lava outcrop currently covered at least 140 000 km^2 while it was larger in the past [~2 000 000 km^2 (Cox 1970, 1972)]. The Karoo Igneous Province can be divided into the Lebombo and the Drakensberg Groups. This Igneous Province contains a large volume of flood basalts as well as silicic volcanic rocks. These units consist of hyodacite and rhyolitic magma and crops out along the Lebombo monocline. Individual units span up to 60 km and sometimes show massive pyroclastic structures and are thus classified as rheoignimbrites. The basal lavas lie conformably on the Clarens Formation but in specific localities, sandstone erosion occurred before the volcanic eruptions took place. Lock *et al* (1974) described evidence in the Eastern Cape that in the early stages of volcanism magma interacted with ground water to produce volcaniclastic deposits as well as phreatic and phreatomagmatic diatremes. Eales *et al* (1984) also found evidence of aqueous environments during early volcanism by the existence of pillow lavas and associated hyaloclastite breccias and thin lenses of fluviatile sandstones interbedded with the lowermost magmas.

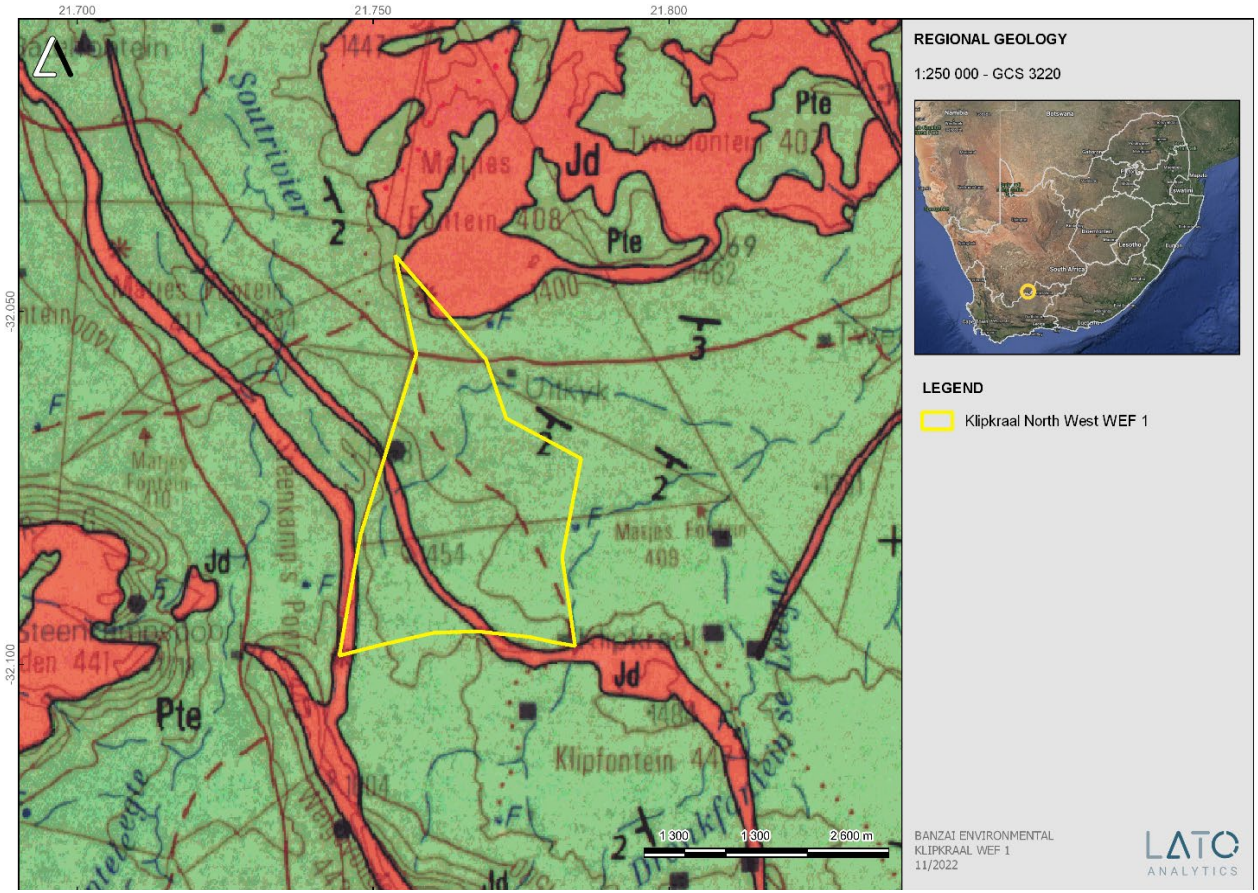
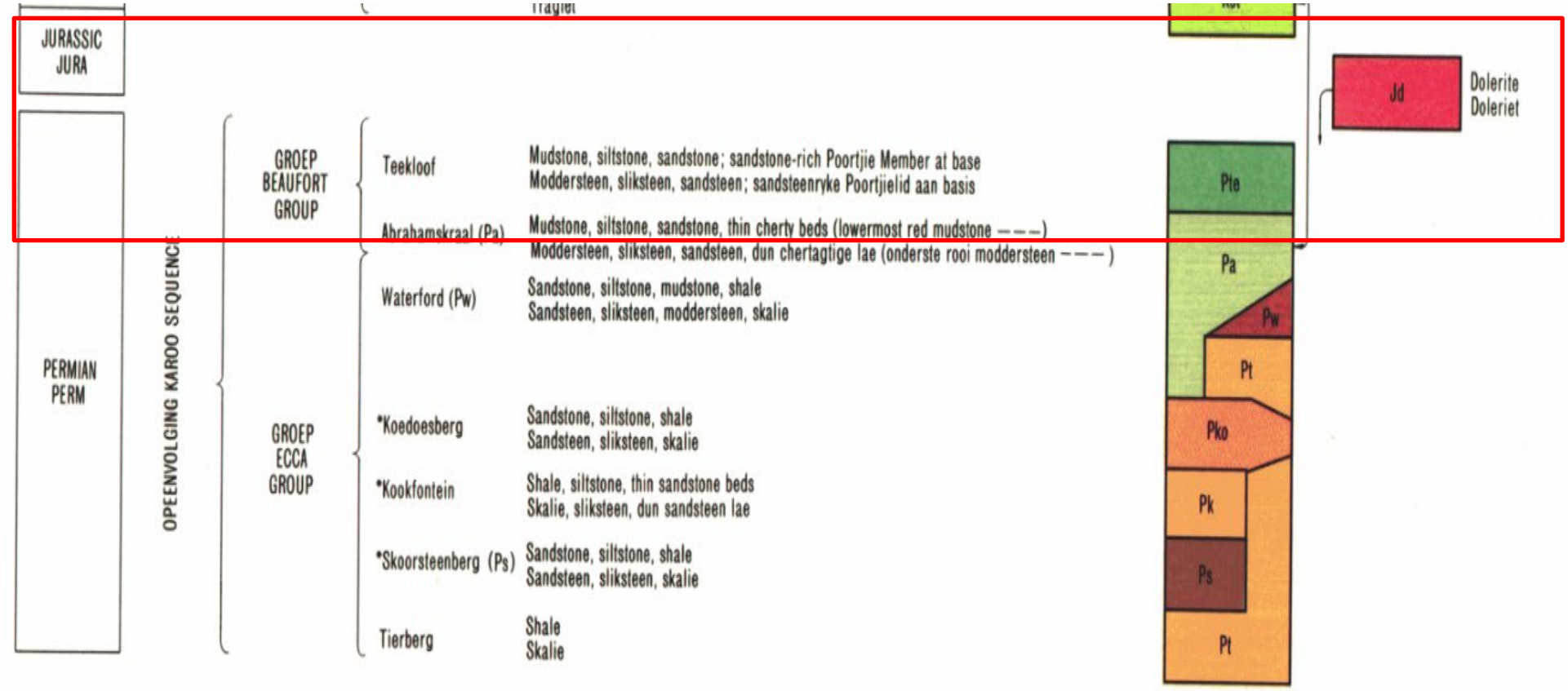


***Figure 4**:Extract of the 1:250 000 Sutherland 3220 (1983) Geological map (Council of Geoscience, Pretoria) indicating that the development is underlain by the Teekloof Formation (Pte; green) of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup, while the most north-eastern margin as well as an area in the development is underlain by Jurassic dolerite (Jd, red).*

Table 1:Legend of the 1:250 000 Sutherland 3220 (1983) Geological map (Council of Geoscience, Pretoria).



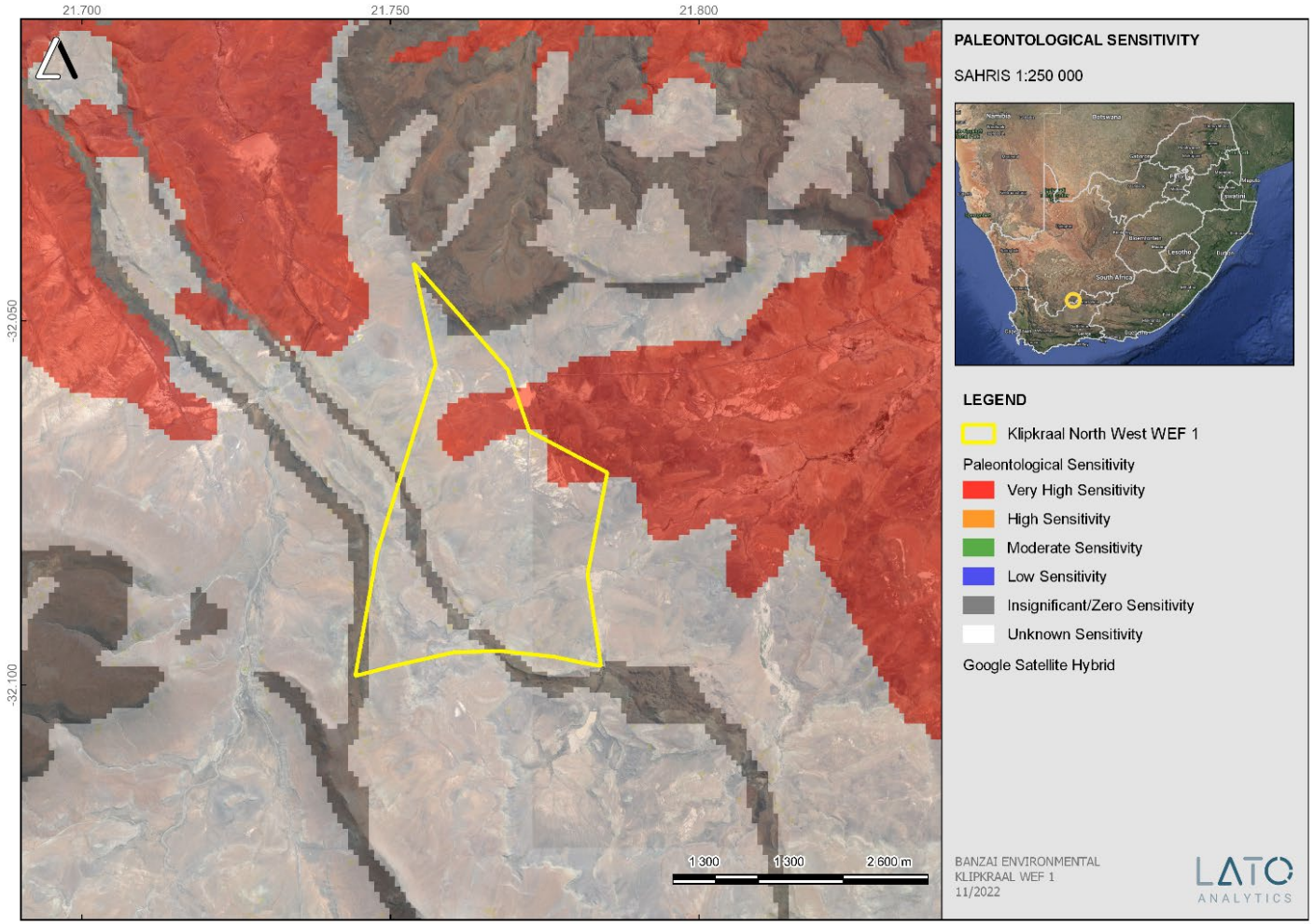


***Figure 5**:* Extract of the 1: 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed Klipkraal WEF 1 development.

Table 2:Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website)

Colour	Sensitivity	Required Action
RED	**VERY HIGH**	**field assessment and protocol for finds is required**
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	**INSIGNIFICANT/ZERO**	**no palaeontological studies are required**
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

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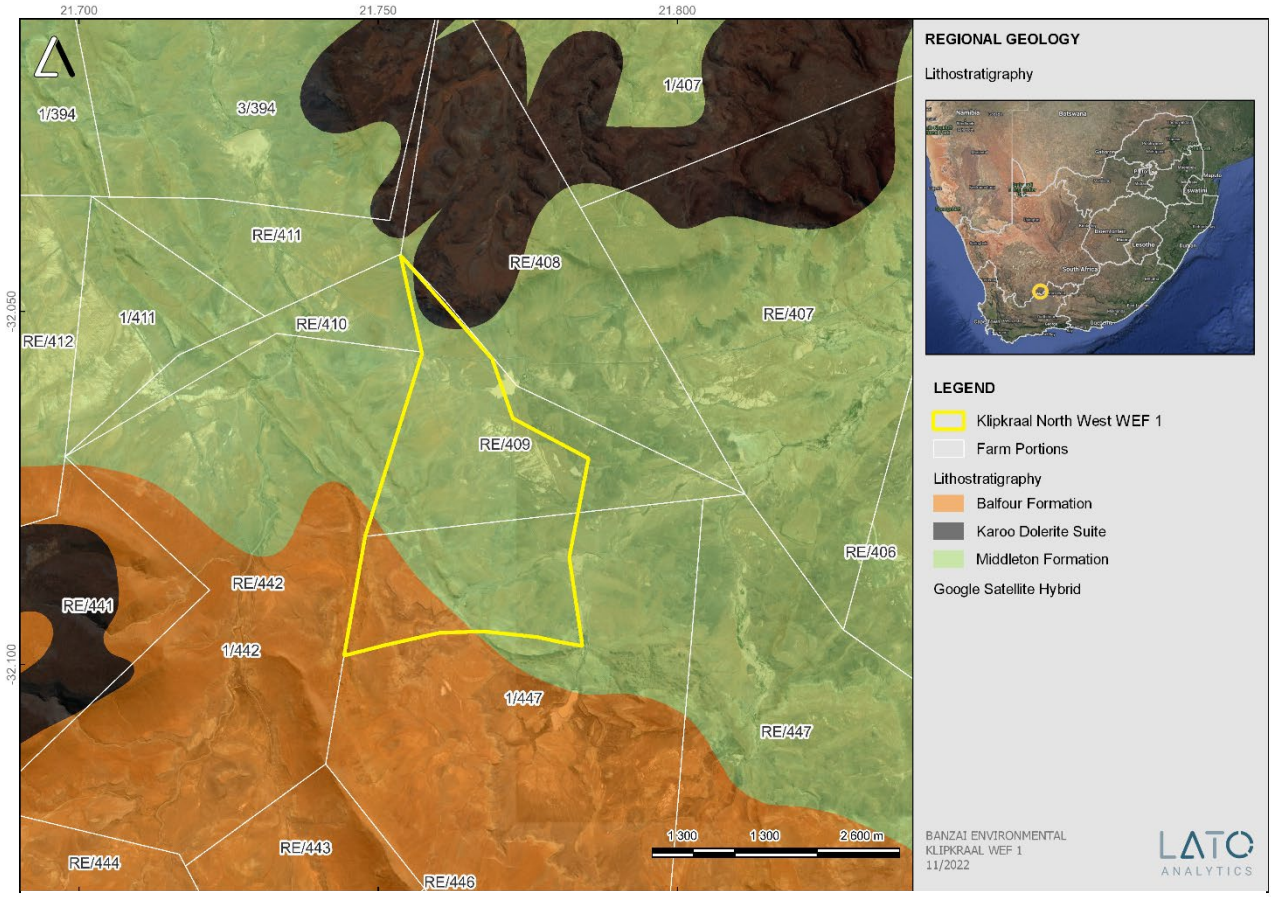

***Figure 6**:Updated geology (compiled by the Council of Geosciences, Pretoria) indicates that the north-eastern portion of the development is underlain by Jurassic dolerite, the central portion is underlain by the Middleton Formation while the south-western portion is underlain by the Balfour Formation of the Beaufort Group (Karoo Supergroup.*

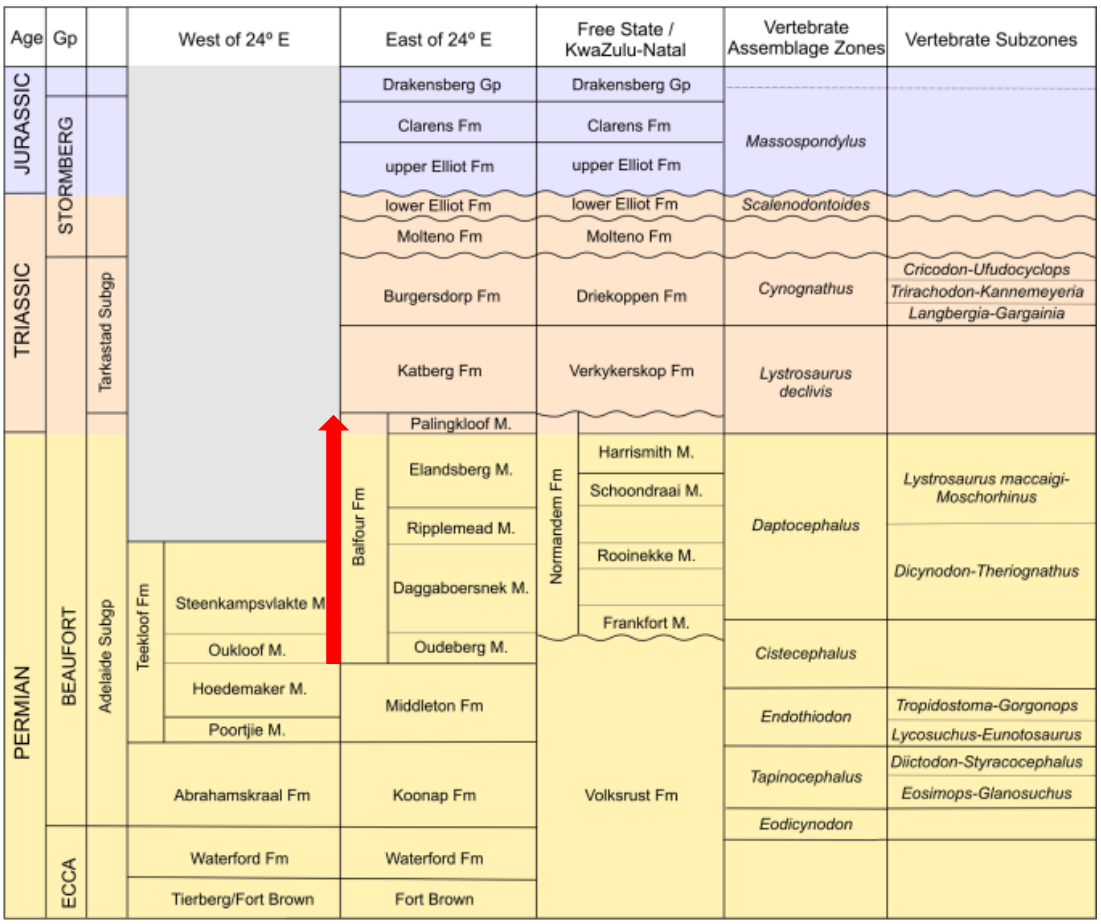

***Figure 7**: Vertebrate biozonation range chart for the Main Karoo Basin of South Africa.*

Solid lines indicate known ranges, dotted lines indicate suspected but not confirmed ranges, single dot represents the stratigraphic position of the taxa that have only been recovered from a single bed.

Wavy lines indicate unconformities. (PLYCSR=Pelycosauria and MAMMFMES+Mammaliaformes. Gp=group, Subgp-Supbroup, Fm=Formation, M=Member. The proposed cemetery development is indication by the blue arrow

The Adelaide Subgroup is approximately 5 000 m thick in the southeast, but this decreases to about 800m in the centre of the basin which decreases to about 100 to 200m in the north. The Koonop Formation is about 1 300 m, Middleton 1 600 m and the Balfour Formation approximately 200 m thick. The Abrahamskraal Formation is about 2 500 m thick and the Teekloof Formation 1 000 m.

The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium-grained, grey lithofeldspathic sandstones. In the northern Normandien formation the basin consists of course to very coarse sandstones and granulostones. Coarsening–upward cycles are present in the lower part of the Normandien Formation while the mudrocks and sandstone units usually form fining-upward cycles. These cycles are positioned on erosion surfaces which is overlain by a thin intraformational mud-pellet conglomerate and vary in thickness

from a few meters to tens of meters. Singular sandstone units could vary from 6m to 60m in the south thinning northwards.

Thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and-fill features. The sandstones are characterized internally by horizontal lamination together with parting lineation and less frequent trough crossbedding as well as current ripple lamination. The bases of the sandstone units are extensive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units.

The mudrocks of the Adelaide Subgroup usually have massive and blocky weathering apart from in the Normandien and Daggaboersnek Member. Sometimes desiccation cracks and impressions of raindrops are present. In the mudstones of the Beaufort Group calcareous nodules and concretions occur throughout.

The Lower Adelaide Subgroup consists of the following formations:

Abrahamskraal/Koonap Formation: Transitional brackish lacustrine to fluvial. Greenish-grey sandstones grading upwards into fine-grained siltstones and mudstones.

Middleton Formation: Semi-arid climate supported a lush flora and fauna that thrived along meander belts and semi-permanent lakes. Cyclic deposits of lenticular sandstone bodies grading into greenish-grey mudstone. The thickest formation in this succession, constituting 37% of the Beaufort Group and 47% of the Adelaide Subgroup. The formation has lenses of red mudstone which are likely to have been deposited in a sub-aerial fluvial environment. The Middleton Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup) is biostratigraphically subdivided in the *Cistecephalus* and *Endothiodon* Assemblage Zones (**Figure 7**; Smith and Botha, 2020). Vertebrate fossils known from the Middleton Formation include amphibians, anapsids and therapsids (Smith et al 2020). Anapsid fossil diversity declines in the Middleton Formation, while therapsid taxa (e.g., *Dicynodontia* and *Gorgonopsia*) show diversification in the *Cistecephalus* and Endothiodon AZs (Rubidge 2005; Smith et al 2020). The *Cistecephalus* AZ is characterized by the presence of numerous dicynodont species e.g. *Diictodon, Pristerodon, Cistecephalus, Aulacephalodon* and *Oudenodon*. Plant fossils are also present in this formation and comprise of Glossopteris and Schizoneura. The *Eodicynodon* and *Tapinocephalus* Assemblage Zones are present in the Kroonap Formation. The *Eodicynodon* AZ is characterised by *Eodicynodon* and *Tapinocaninus* fossils. The *Tapinocephaus* AZ has a rich diversity of Therapids, dinocephalia, while fish, amphibia and plant fossils are also present.

The flood plains of the Beaufort Group (Karoo Supergroup) are internationally renowned for the early diversification of land vertebrates and provide the worlds' most complete transition from early "reptiles" to mammals. The Beaufort Group is subdivided into a series of biostratigraphic units based on its faunal content (Kitching1977, 1978; Keyser *et al*, 1977, Rubidge 1995, Smith *et al,* 2020; Viglietti 2020)). The portion if the proposed development is underlain by the Balfour Formation which is divided in the *Daptocephalus* (DAZ)

which in turn is divided in the upper (younger) *Lystrosaurus maccaigi - Moschorhinus* and lower (older) *Dicynodon-Theriognathus Subzones* (Figure 5) (Viglietti, 2020).

The *Daptocephalus* Assemblage Zone (AZ) expands into the lower Palingkloof of the Upper Balfour Formation. This Zone is characterized by the occurrence of the two therapsids namely *Dicynodon* and *Theriognathus*. The *Daptocephalus* Assemblage Zone of the Beaufort Group shows the greatest vertebrate diversity and includes numerous well-preserved genera and species of dicynodonts, biarmosuchians, gorgonopsian, therocephalian and cynodont therapsid Synapsida. Captorhinid Reptilia are also present while eosuchian Reptilia, Amphibia and Pisces are rarer in occurrence. Trace fossils of vertebrates and invertebrates as well as *Glossopteris* flora plants have also been described.

The lower Palingkloof Member is of special importance as it precedes the Permo-Triassic Extinction Event which destroyed the vertebrate fauna and extinguished the diverse glossopterid plants. The lower *Lystrosaurus* declivis AZ forms part of the Katberg Formation. Fauna and flora from this assemblage zone is rare as few genera survived the Permo-Triassic Extinction Event. The *Lystrosaurus* declivis AZ is characterized by the dicynodont, *Lystrosaurus*, and captorhinid reptile, *Procolophon,* biarmosuchian and gorgonopsian Therapsida did not survive into the *Lystrosaurus* Assemblage Zone although the therocephalian and cynodont Therapsida are present in moderate quantities. Captorhinid Reptilia is reduced, but this interval is characterised by a unique diversity of oversize amphibians while fossil fish, millipedes and diverse trace fossils have also been recorded.

Beaufort Group Formations (**Figure 7**) represented in the development footprint is the *Endothiodon*, *Cistecephalus* en *Daptocephalus* Assemblage Zones of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). These Assemblage Zones include gorgonopsians, therocephalian and cynodont (Therapsid) predators as well as herbivorous dicynodonts. Tetrapod groups are well represented in the Lower Bedford Group exposures. Trace fossils include invertebrate trace fossils as well as vertebrate burrows. Plant remains include those of vascular plants.

5.1 Additional Information Consulted

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- A Google Earth map with polygons of the proposed development was obtained from SiVEST.
- 1:250 000 Sutherland 3220 (1983) Geological map (Council of Geoscience, Pretoria).

6. SITE VISIT

A site-specific field survey of the development footprint was conducted on foot and vehicle on 24-26 September 2021. The following photographs of the site was taken. Several fossiliferous sites were identified during the site visit.

***Figure 8**:Typical ephemeral stream with coarse grained unconsolidated superficial sediments on the bedrock surface*

***Figure 9**:Hills and mountains with sparsely vegetated sandy soils in the foreground.*

***Figure 10**:Sandy soil with dry dam in the study area*

***Figure 11**:Fossil fragment*

GPS -32.080000 21.771944

***Figure 12**: Skull and weathered skeleton of Dicynodont*

GPS -32.079444 21.772778

Figure 13: Second skull in centre of photograph (red), while above skull is in lower right corner (yellow).

***Figure 14**:Fairly well-preserved tetrapod skeleton found in loose nodule*

GPS -32.079444 21.772500

Fragmented vertebrate skull and skeleton
-32.080336, 21.774499

7. SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

7.1 Planning / Pre construction

Table 3: Rating of impacts -Planning Phase

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	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Planning Phase																				
Loss of Fossil Heritage	No Impact.										**No Impact**									

7.2 Construction

Table 4: Rating of impacts – Construction Phase

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	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction/ Decommissioning Phase																				
Loss of Fossil Heritage	Damage, disturbance, destruction or	2	4	4	4	4	4	72	-	Very High	**Palaeontological Walkdown is recommended**	2	4	4	4	4	2	34	-	Medium

	sealing-in of legally-protected, scientifically valuable fossil heritage at or beneath the ground surface within the road footprint, mainly due to ground clearance and excavations										**during the EIA phase.** Medium. Most recorded fossil sites can be effectively mitigated by a professional palaeontologist in the pre-construction phase (recording / collection). Newly exposed fossils can be mitigated through a Chance Fossil Finds Procedure. However, residual impacts following mitigation may be locally high, given the unavoidable difficulties of identifying and sampling fossils from on-going										

											construction phase excavations and site clearance									

7.3 Operation

Table 5: Rating of impacts -Operational Phase

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	TOTAL	STATUS (+OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+OR -)	S
		Operation Phase																		
Loss of Fossil Heritage	No Impact										**No Impact**									

7.4 No go Impact

Table 6: Rating of impacts- No Go

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	TOTAL	STATUS (+OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+OR -)	S
No-Go																				

Loss of Fossil Heritage	N/A										N/A									

7.5 Cumulative Impacts

WEF's in the Klipkraal development area (35 km range) will have a Zero to Very High Palaeontological Sensitivity. However, it is important to note that the quality of preservation of these different sites will most probably vary and it is thus difficult to allocate a Cumulative Sensitivity to the projects. If all the mitigation measures are carried out, a conservative estimate of the Cumulative impacts on fossil Heritage will vary between Low and Medium.

7.6 Overall Impact Rating

The significance of the impact occurring will be negative very high before mitigation and negative medium after mitigation. Post mitigation the overall significance will be medium.

8. COMPARATIVE ASSESSMENT OF ALTERNATIVES

As the alternatives will have the same geology as the rest of the WEF development there is no difference in the preference of the alternatives from a Palaeontological point of view.

8.1 No-Go Alternative

Consideration must be given to the 'no-go' option in the BA process. The "no-go" option assumes that the site remains in its current state, i.e., there is no construction of the power line and associated infrastructure in the proposed project area and the status quo would proceed.

9. CONCLUSION and Summary

9.1 Summary of Findings

The 3220 Sutherland Geological Map (Council of Geosciences, Pretoria) indicates that a small portion of the proposed Klipkraal WEF 1 is underlain by the Jurassic Dolerite while the rest of the footprint is underlain by the Adelaide Subgroup (Beaufort Group). The PalaeoMap of the South African Heritage Resources Information System) indicates that the Palaeontological Sensitivity of the Jurassic Dolerite is Zero as it is igneous in origin and thus unfossiliferous while that of the Adelaide Subgroup is Very High (Almond and Pether, 2009; Almond *et al*., 2013). Large areas of the development on the PalaeoMap are underlain by white and indicates that these areas have not been allocated so a specific Palaeontological Sensitivity. The updated Geology (Council of Geosciences, Pretoria); refines the geology of the 1983 Geological Map and indicates that the north-eastern portion is underlain by Jurassic dolerite, the largest portion of the development is underlain by the Middleton Formation with the south western portion underlain by the Balfour Formation. Both the Middleton and Balfour Formations forms part of Adelaide Subgroup (Beaufort Group).

In the last few decades extensive research and collecting have been conducted by palaeontologists in this part of the basin and the Fraserburg area was found to be highly fossiliferous. A two day-site-specific field survey of the development footprint was conducted on foot 24-26 September 2021. Various fossiliferous sites, where fossils were found to be well-preserved, has been identified in the development footprint.

As the site visit was conducted in 2021 the layout of the WEF was not yet known. The specific layout of the Klipkraal WEF 1 development was thus not investigated in detail. It is thus recommended that a Palaeontological Walkdown of the development is conducted pre-construction once the final design details are available. The appointed Palaeontologist will also have to include a Chance Find Protocol for the Klipkraal WEF 1 development and training of accountable supervisory personnel by a qualified palaeontologist in the recognition of fossil heritage is necessary.

9.2 Conclusion and Impact Statement

The significance of the impact occurring will be negative very high before mitigation. The pre-construction Palaeontological walkdown will lower the Significance of the Impact to a Medium level.

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Appendix A: Impact Assessment Methodology

1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e., site, local, national or global), whereas intensity is defined by the severity of the impact e.g., the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).

1.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 1: Rating of impacts criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		

1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.**		

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

APPENDIX B

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION:	Palaeontologist
YEARS' EXPERIENCE:	30 years in Palaeontology
EDUCATION:	B.Sc Botany and Zoology, 1988 University of the Orange Free State
	B. Sc (Hons) Zoology, 1991 University of the Orange Free State
	Management Course, 1991 University of the Orange Free State
	M. Sc. *Cum laude* (Zoology), 2009 University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

MEMBERSHIP

Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

Part time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part time laboratory assistant	Department of Virology University of the Free State Zoology 1992
Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–2022

TECHNICAL REPORTS

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APPENDIX C: SITE SENSITIVITY VERIFICATION

CONTENTS

1 INTRODUCTION

Aura Development Company (Pty) Ltd (hereafter referred to as 'Aura') are proposing to develop up to seven (7) wind farms and associated infrastructure [including substations and Battery Energy Storage Systems (BESS)] on a number of properties, majority being adjacent, near the towns of Beaufort West and Fraserburg in the Northern Cape Province of South Africa. The proposed wind farm projects will have maximum export capacities of up to approximately 200 megawatts (MW) respectively. The proposed wind farms make up a larger wind energy facility (WEF) (with associated BESS) which will be referred to as the Klipkraal WEF, consisting of up to seven (7) phases, with a combined generation capacity of up to approximately 1 400 MW, as follows:

The proposed wind farms make up a larger wind energy facility (WEF) (with associated BESS) which will be referred to as the Klipkraal WEF, consisting of up to five (5) phases, with a combined generation capacity of up to approximately 1 500 MW, as follows:

• Klipkraal Wind Energy Facility 1: up to 300MW + BESS (**this application**)
• Klipkraal Wind Energy Facility 2: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
• Klipkraal Wind Energy Facility 3: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
• Klipkraal Wind Energy Facility 4: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
• Klipkraal Wind Energy Facility 5: up to 300MW + BESS (part of a separate EIA process which forms part of separate application)
• Klipkraal On-site Switching / Collector Substation and associated 132kV/400kV Power Line (part of a separate BA application).

The overall objective of the development is to generate electricity by means of renewable energy technology capturing wind energy to feed into the National Grid.

It is anticipated that the proposed Klipkraal WEF 1 will comprise sixty (60) wind turbines with a maximum total energy generation capacity of up to approximately 300MW. The electricity generated by the proposed WEF development will be fed into the national grid via a 132kV/400kV overhead power line. A Battery Energy Storage System (BESS) will be located next to the onsite 33/132kV substation. The storage capacity and type of technology would be determined at a later stage during the development phase, but most likely will comprise an array of containers, outdoor cabinets and/or storage tanks.

Klipkraal WEF 1 is located 27km south-east of Fraserburg, within the Karoo Hoogland Municipality in the Northern Cape Province (**Figure S1-S3**).

Klipkraal WEF 1 is located on the following farm portions:

- Remainder of the Farm Matjiesfontein No. 409 (RE/409)
- Remainder of the Farm Klipfontein No. 447 (RE/447)
- Portion 1 of the Farm Klipfontein No. 447 (1/447)

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***Figure S1**: Regional setting of the proposed Klipkraal 1 WEF*

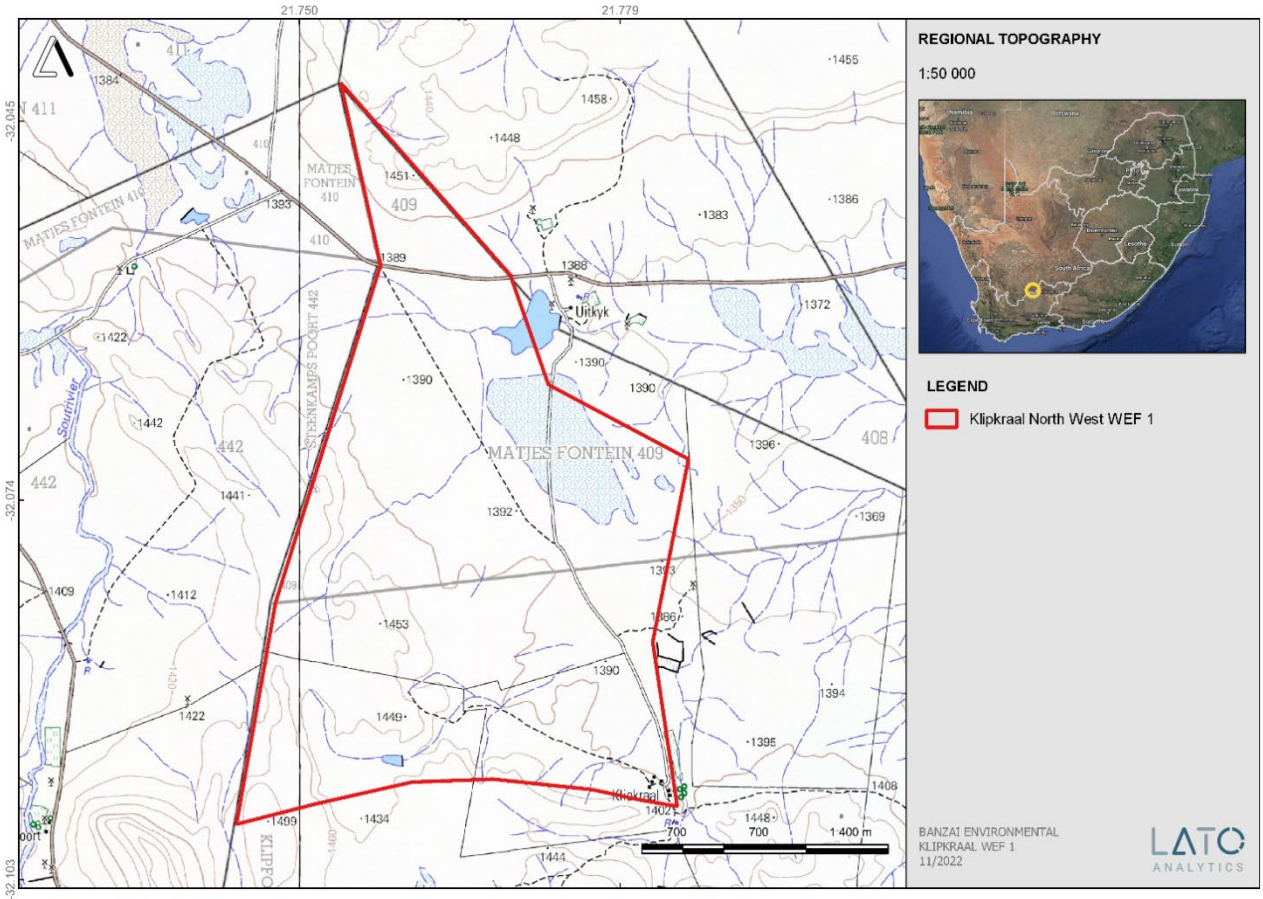


***Figure S2**: Locality Map of Klipkraal 1 WEF [1:50 000 3221BB]*

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations [4 December 2014, Government Notice (GN) R982, R983, R984 and R985, as amended], various aspects of the proposed developments may have an impact on the environment and are considered to be listed activities. These activities require authorisation from the National Competent Authority (CA), namely the Department of Forestry, Fisheries and the Environment (DFFE), prior to the commencement thereof. Further to this as per GN R. 2313 : **Adoptions of the standard for the development and expansion of powerlines and substation with identified geographical areas and the exclusion of this infrastructure from the requirements to obtain Environmental Authorisation** , the Standard was adopted in terms of section 24(10)(a) of the Act for the purpose of excluding the activities contemplated in paragraph 5.1 and 5.2 of the Schedule from the requirement to obtain environmental authorisation prior to commencement. In terms of the procedural requirement set out in the standard, screening tool reports have been undertaken for the grid corridor and associated infrastructure and site sensitivity verifications have been undertaken by the relevant specialists in accordance with the sensitivity themes. As per 6.1. of the GNR .2313, "Where any part of the infrastructure occurs on an area for which the environmental sensitivity for any environmental theme is identified as being very high or high by the national web based environmental screening tool and confirmed to be such through the application of the procedures

set out in the Standard", the site sensitivity verifications have been performed as per the procedural requirements set out.

In accordance with GN 320 and GN 1150 (20 March 2020)[1] of the NEMA EIA Regulations of 2014 (as amended), prior to commencing with a specialist assessment, a site sensitivity verification must be undertaken to confirm the current land use and environmental sensitivity of the proposed project areas as identified by the National Web-Based Environmental Screening Tool (i.e., Screening Tool). Elize Butler, as palaeontology specialist, have been commissioned to verify the sensitivity of the project sites under these specialist protocols.

[1] GN 320 (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

2 SITE SENSITIVITY VERIFICATION METHODOLOGY

The following information sources were consulted to compile this report:
The Palaeontology Sensitivity Verification was undertaken by the following methodology:

- The site sensitivity is established through the National Environmental Web-Based Screening Tool
- The Site is mapped on the relevant Geological Map to determine the underlying geology of the development
- Then the site is mapped on the South African Heritage Resources Information System (SAHRIS) PalaeoMap, and the Sensitivity of the proposed development established.
- Other information is obtained by using satellite imagery and
- Palaeontological Impact Assessments and Desktop Assessments of projects in the same area are studied.
- A site investigation was conducted for this project

3 OUTCOME OF SITE SENSITIVITY VERIFICATION

The proposed Klipkraal WEF 1 is depicted on the 1: 250 000 Sutherland 3220 (1983) (Council of Geoscience, Pretoria) (**Figure S3**). This map indicates that the north-east portion as well as a small portion in the development is underlain by Jurassic Dolerite (Jd, red) while the rest of the footprint is underlain by the Teekloof Formation (Pte; green) of the Adelaide Subgroup (Beaufort Group).

[1] GN 320 (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

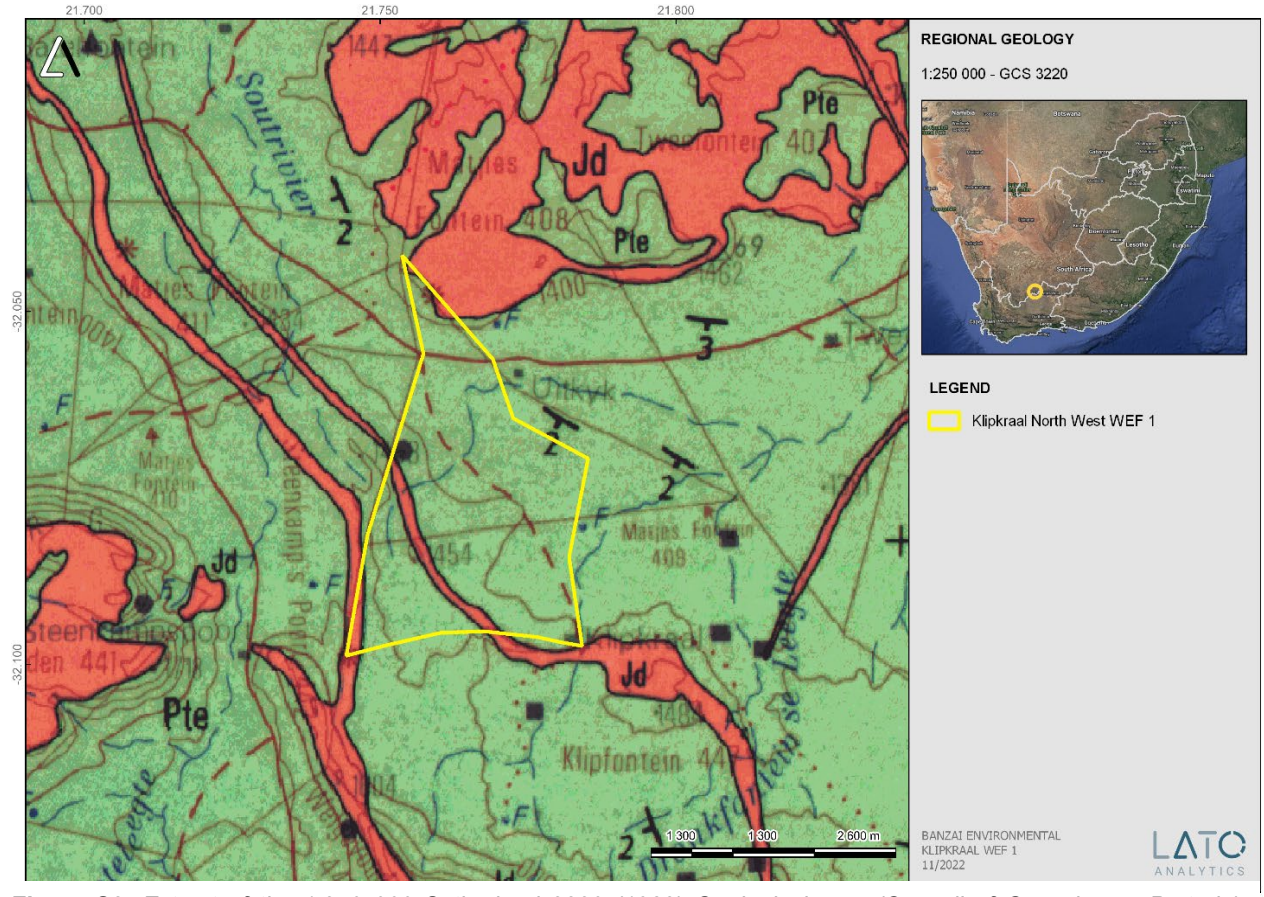


Figure S3: *Extract of the 1:250 000 Sutherland 3220 (1983) Geological map (Council of Geoscience, Pretoria) indicating that the development is underlain by the Teekloof Formation (Pte; green) of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup, while the most north-eastern margin as well as an area in the development is underlain by Jurassic dolerite (Jd, red).*

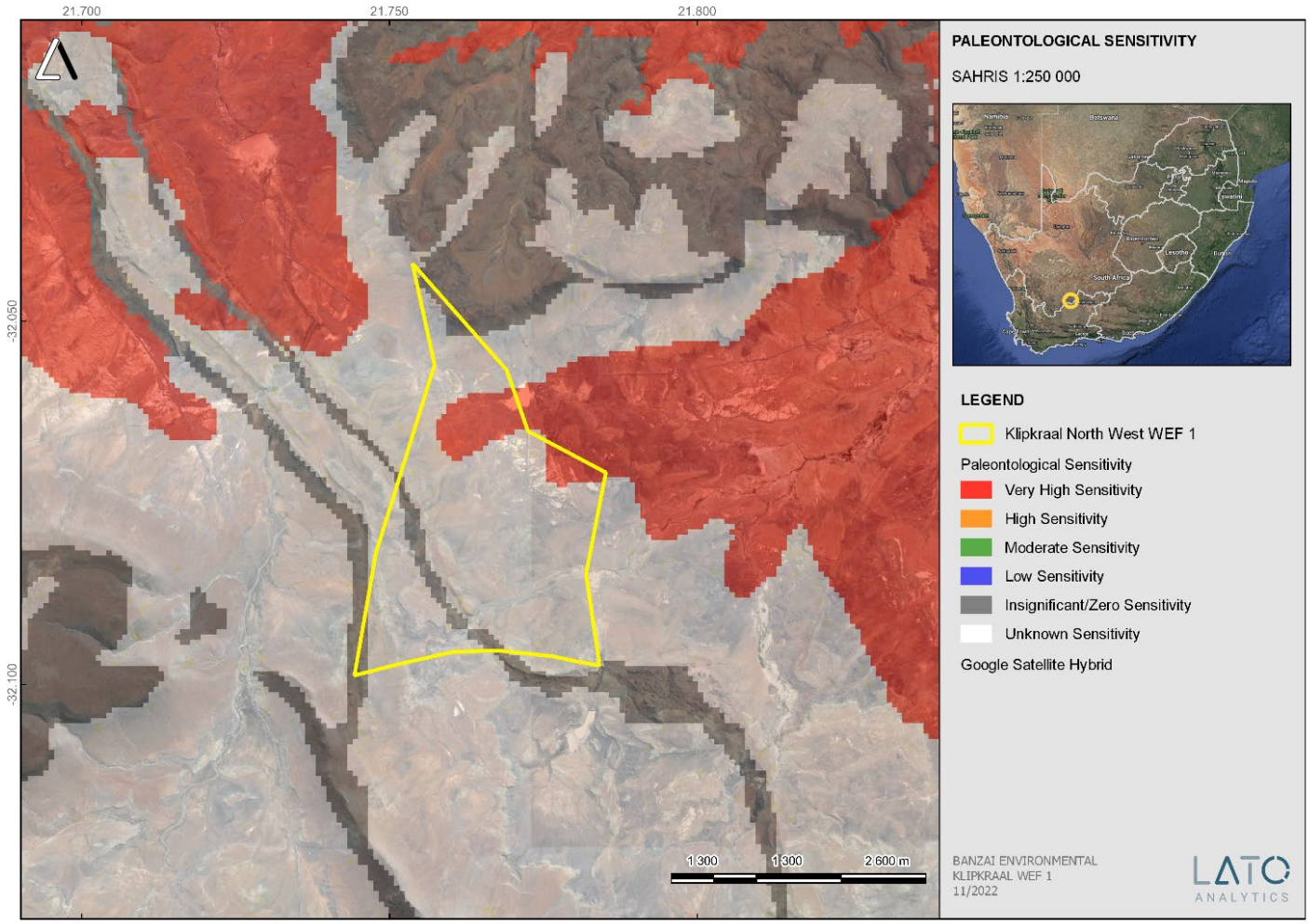


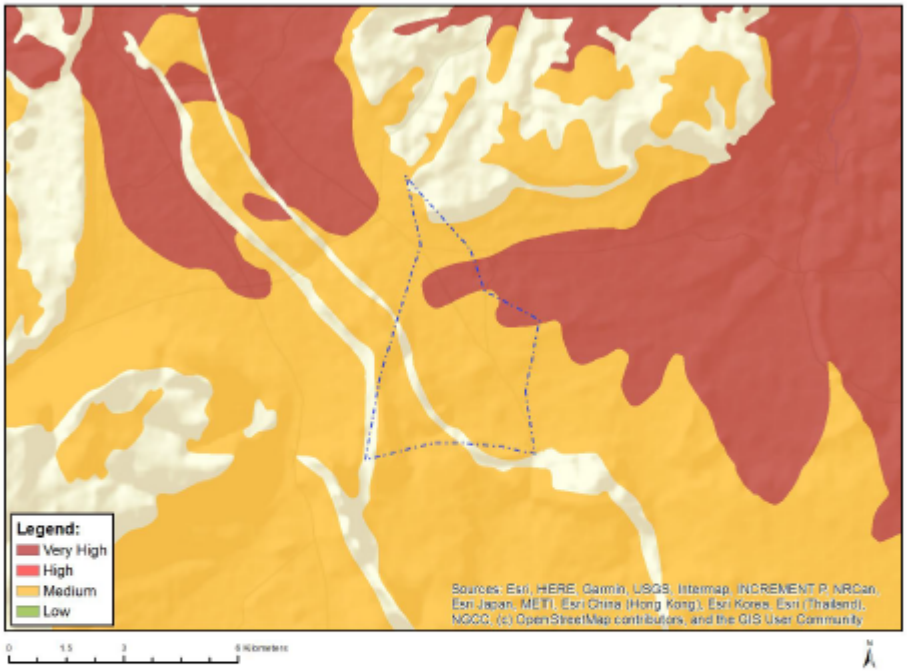
Figure S4: *Extract of the 1: 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed Klipkraal WEF 1 development.*

The SAHRIS Palaeomap indicates that the Palaeontological Sensitivity of the proposed development is underlain by sediments with a Zero to Very High (red) Palaeontological Sensitivity.

Table S1: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website).		
Colour	**Sensitivity**	**Required Action**
RED	**VERY HIGH**	**field assessment and protocol for finds is required**
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	**INSIGNIFICANT/ZERO**	**no palaeontological studies are required**
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

The PalaeoMap of the South African Heritage Resources Information System (**Figure S4, Table S1**) indicates that the Palaeontological Sensitivity of the Jurassic Dolerite is Zero as it is igneous in origin and thus unfossiliferous while that of the Adelaide Subgroup is Very High (Almond and Pether, 2009; Almond *et al*., 2013). Large areas in the development are underlain by white that indicates that these areas have not been allocated so a specific Palaeontological Sensitivity.

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Features with a Medium paleontological sensitivity
Very High	Features with a Very High paleontological sensitivity

***Figure S3**: Palaeontological Sensitivity of the Klipkraal WEF 1 generated by the National Environmental Web-bases Screening Tool*.

The National Environmental Web-based Screening Tool indicates that the Palaeontological Sensitivity of the development is Very High (dark red) to Medium (orange).

4 CONCLUSION

The Site Sensitivities of the proposed Klipkraal WEF 1 has been verified and it was found that:

The SAHRIS Palaeosensitivity map indicates that the Palaeontological Sensitivity of the development is Very High to unknown.

And

The National Environmental Web-based Screening Tool indicates that the Palaeontological Sensitivity of the development is Very High (dark red) to Medium (orange).

These maps indicate that the proposed WEF development is highly Sensitive from a Palaeontological point of view. A site investigation in the spring of 2021 uncovered various fossiliferous sites, where fossils were found to be well-preserved. This classification is thus confirmed to be accurate (National Environmental Web-bases Screening Tool and SAHRIS) as far as the impact of the Klipkraal WEF 1 is concerned, based on actual conditions recorded on the ground during the site visit in the spring of 2022.