PALAEONTOLOGICAL SPECIALIST STUDY

In terms of Section 38(8) of the NHRA

Palaeontological Assessments for the Development of Storage Facilities and Light Industrial Workshops on RE/139 Zandhoogte by Sapphire Ocean Investments, Mossel Bay Local Municipality, Garden Route District Municipality, Western Cape.

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4 June 2025

THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I, **Dewald Wilken**, as the appointed independent specialist hereby declare that I:

• act/ed as the independent specialist in this application;

• regard the information contained in this report as it relates to my specialist input/study to be true and correct, and

• do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;

• have and will not have no vested interest in the proposed activity proceeding;

• have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 (as amended) and any specific environmental management Act;

• am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;

• have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;

• have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;

• have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;

• have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not; and

• am aware that a false declaration is an offence in terms of regulation 14 of GN No. R. 326.

Signed

Name

Dewald Wilken Pr Sci Nat

Date
4 June 2025

EXECUTIVE SUMMARY

A Palaeontological Impact Assessment (PIA) was requested for the proposed development of storage facilities and light industrial workshops on RE/139 Zandhoogte by Sapphire Ocean Investments, Mossel Bay Local Municipality, Garden Route District Municipality, Western Cape. A palaeontological impact assessment was conducted to comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

The area is underlain by the Enon Formation of the Uitenhage Group. The Enon Formation is rated to have very high sensitivity. The Enon Formation has yielded disarticulated bone fragments, silicified wood, charcoal and two therapod teeth. However fossils in this formation are rare. As seen at the small quarry on site, the Enon Formation in this area is deeply weathered, this decreases the chance of finding fossil material even more.

For these reasons, the development on 139 Zandhoogte may continue with no limitations, on the condition that the Chance Fossil Find Procedure at the end of this document is followed, in the unlikely event that fossil material is found.

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1. Introduction

1.1 Background Information on Project

A palaeontological Impact assessment was requested for a proposed development of storage facilities and light industrial workshops on RE/139 Zandhoogte by Sapphire Ocean Investments, Mossel Bay Local Municipality, Garden Route District Municipality, Western Cape. A palaeontological impact assessment was conducted to comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA). The screening report for an environmental authorisation as required by the 2014 NEMA EIA regulations indicated the proposed site environmental sensitivity to be very high.

The area is located near the coast between the Klein Brak, and Groot Brak rivers as seen in Figure 1. The site is underlain by the Enon Formation of the Uitenhage Group and is Cretaceous to Tertiary in age.

Figure 1. Google Earth© satellite image of the study site, in relation to the Groot Brak – and Klein Brak rivers, where the development is proposed.

Figure 2. A more detailed photo of the area where development is proposed.

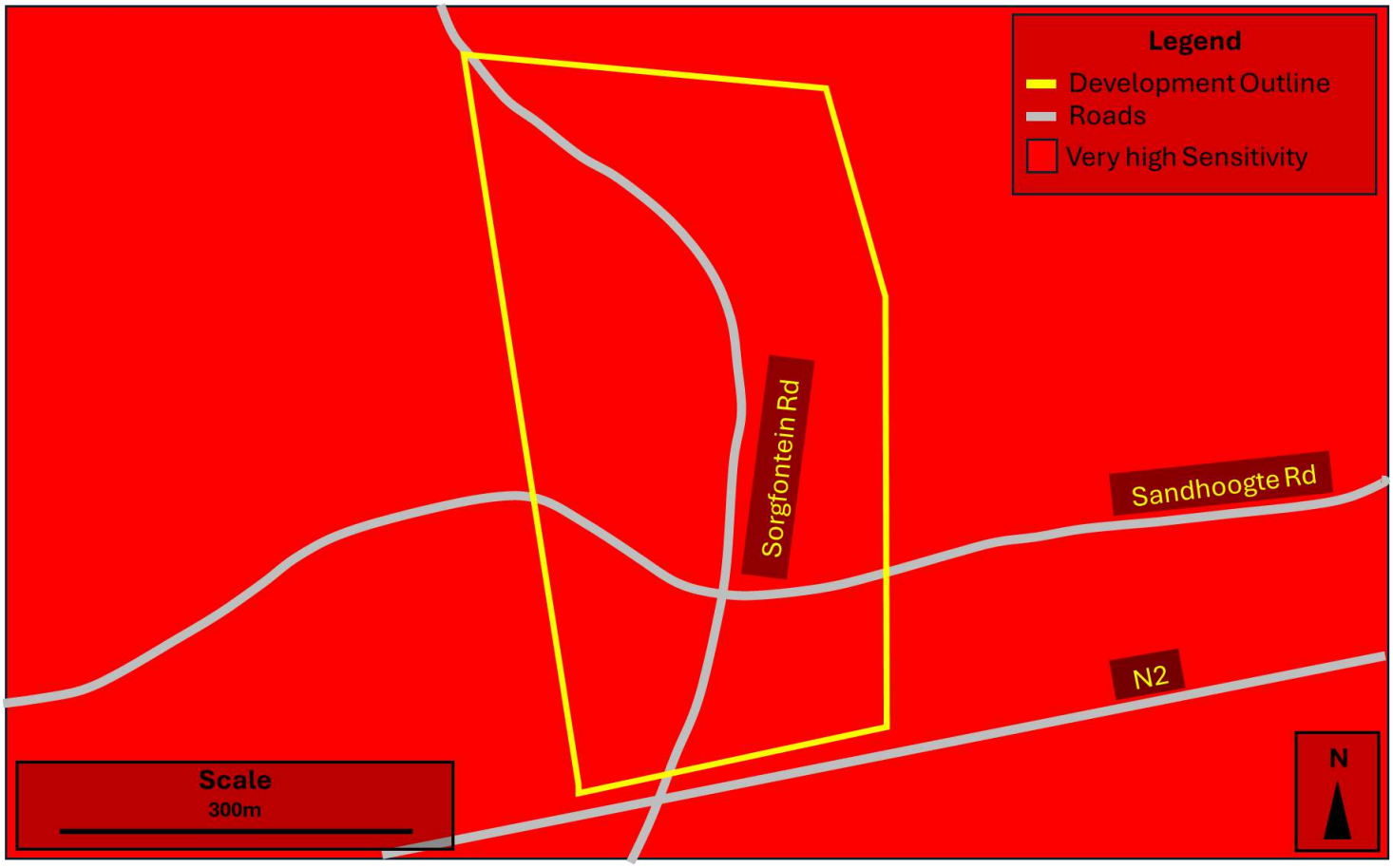

Figure 3. Palaeo-sensitivity Map adapted from SAHRIS.. Indicating very high fossil sensitivity underlying the study area in the Western Cape.

2. Study approach

This PIA report provides a record of the inferred palaeontological heritage resources within the study area. The identified resources have been assessed to evaluate their heritage significance in terms of the grading system outlined in Section 3 of the NHRA (Act 25 of 1999). Recommendations for specialist palaeontological mitigation are made where this is considered necessary. The report is based on (1) a review of the relevant scientific literature, including previous palaeontological impact assessments in the broader study region (*e.g.* Almond 2013). (2) published geological maps and accompanying sheet explanations (*e.g.* Toerien, D.K. (1984)).

3. Geological and Paleontological context of the study area

The following section will provide a basic review of the relevant geology and palaeontology in the study area, as summarised in Table 1.

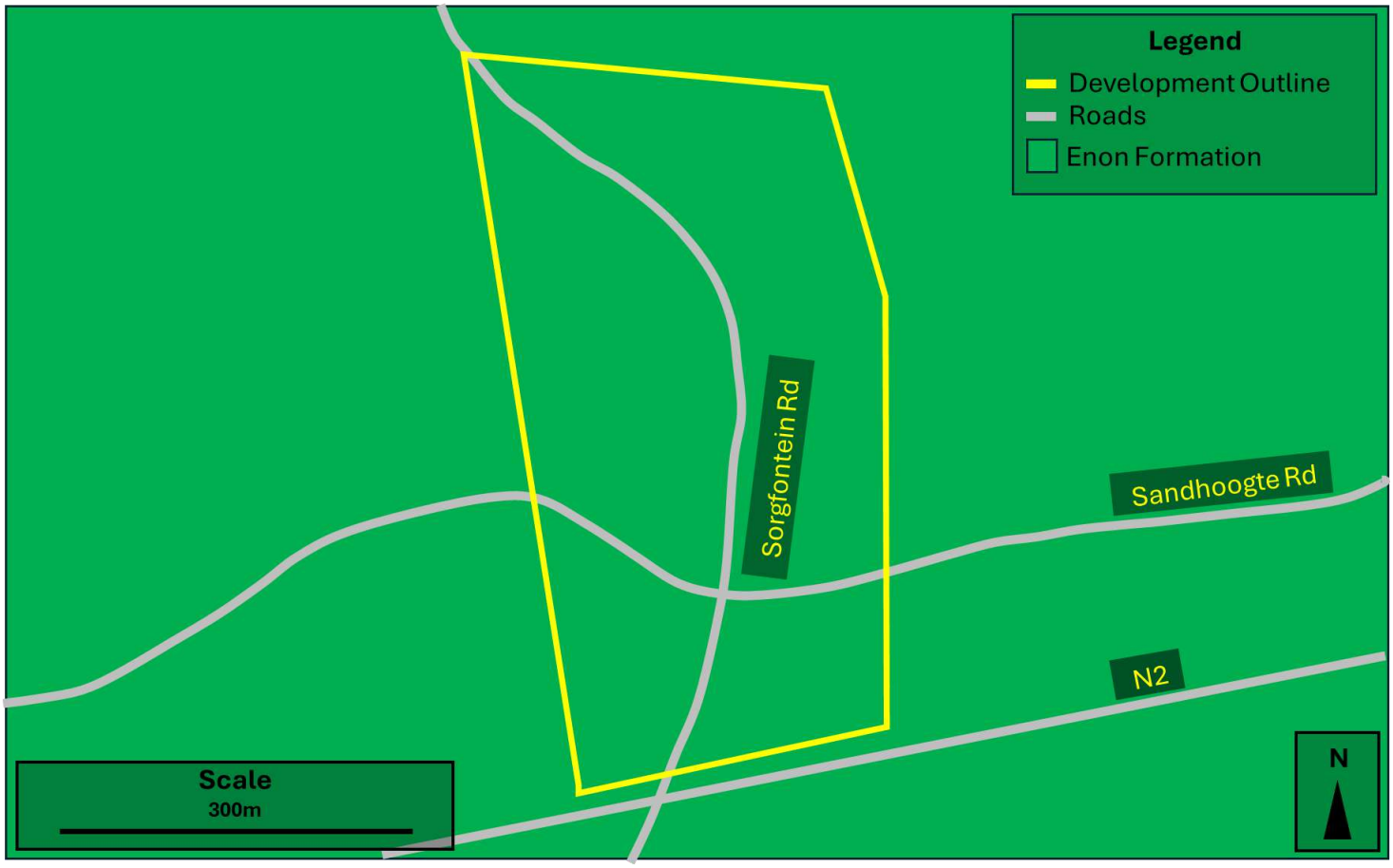

Figure 4. Geologic map of the study area in Mossel Bay Local Municipality, Garden Route District Municipality, Western Cape. *(Adapted from Toerien, (1984)).*

The Uitenhage Group is an onshore post-Karoo Mesozoic deposit. It was predominantly deposited in a basin formed by Horst and Graben structures which formed during the breakup of Gondwana. This basin also has faults cutting the horst as seen in Figure 5. Simplified block diagram of Algoa Basin showing the floor of the basin, with the Cretaceous and younger sediment removed. 1 - Coega Fault, 2 - Commando Kraal Fault, 3 - Coega Kop. Based on reflective seismic data from Soekor. After Shone 1976. Smaller deposits of the Uitenhage Group area are also found in Baviaanskloof, Georginda, Vlakteplaas, Oudtshoorn, Plettenberg Bay, Knysna, Herbertsdale-Mossel Bay, Heidelberg-Riversdale, Swellendam and Worcester-Robertson Basins, which are Graben and half-Graben rift basins (Muir et. al. 2017)

The Uitenhage Formation is divided into 3 formations. These are listed from oldest to youngest as the Sundays River Formation, the Kirkwood Formation, and the Enon Formation. For this study, only the Enon Formation is of importance.

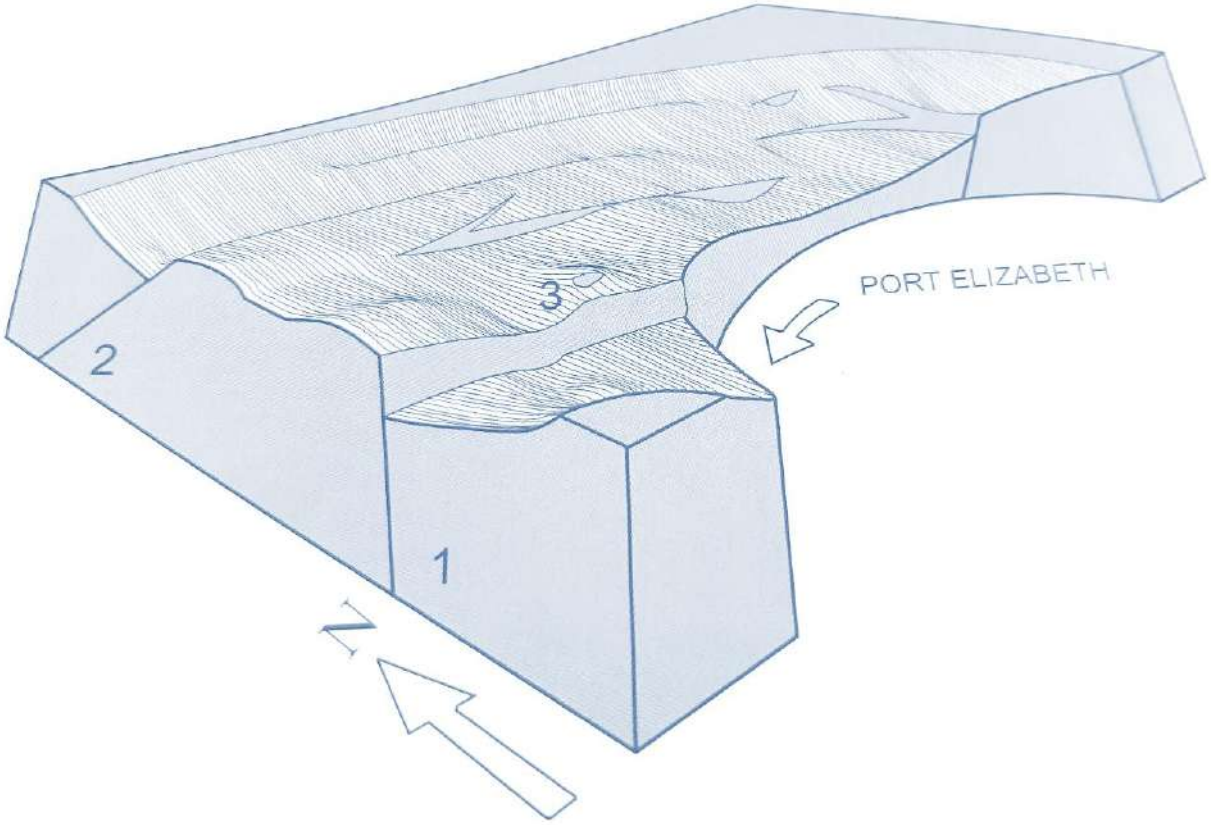

Figure 5. Simplified block diagram of Algoa Basin showing the floor of the basin, with the Cretaceous and younger sediment removed. 1 - Coega Fault, 2 - Commando Kraal Fault, 3 - Coega Kop. Based on reflective seismic data from Soekor. After Shone 1976.

Table 1 Summery of the geology relavant to this project.

Symbol	Group	Formation	Lithology	Palaeontology
Je/Ke	Uitenhage	Enon	Conglomerate, subordinate sandstone, mudstone	Silicified wood, charcoal fragments, abraded bone fragments, two theropod dinosaur teeth

3.1. Enon Formation (Very High Sensitivity)

The Enon Formation formed during the breakup of Gondwana during a time of intense erosion of the rocks that constitute the Cape Fold Belt (Gresse et al. 1992).

The most characteristic feature of the Enon Formation are the conglomerates. The conglomerates consist of large, sub-rounded to rounded clasts of sheared or unsheared quartzite and sometimes slate, shale, and charcoal. Quartzite clasts are generally more rounded whereas the slate and shale clasts are angular. These conglomerate beds are interbedded with subordinate sandstone lenses ranging from white, yellow, red, and green in colour, claystone, and rare mudstone units.
Up to 70% of pebbles in the conglomerate show a preferred imbrication. These pebbles are tightly packed together with a silty/sandy matrix. A red limonitic cement binds these pebbles into a hardened cohesive mass. These conglomerate clasts are often covered in limonite, giving then a red to yellow colour. Loading has caused pebbles to crack, or form indents due to pressure solution at pebble – to – pebble contacts.

Weathering of the conglomerate matrix and cement has caused pebbles to loosen and fall out, forming caves and honeycombing of exposed cliff areas. The silty sandstone lenses in the conglomerate can be about a meter thick and does not have a large lateral extent (but are more extensive in the Gamtoos Basin). These sandstones are often infiltrated with limonite giving them a reddish colour.

Although some disarticulated bone fragments and pieces of charred fossil wood had been found, a precise date on the Enon Formation could not be determined. The contact with the overlying Kirkwood Formation is seen as inter-tonguing and gradational, with sandstone in the Kirkwood formation looking very similar to that of the Enon Formation, and thin conglomerates being found within the Kirkwood Formation.

This formation originated in a high energy alluvial fan and low sinuosity river systems (McMillan et all 1997).
Fossils preservation in the formation is poor, with only some disarticulated bone fragments, silicified wood, charcoal and two therapod teeth being found in the Formation.

4. Assessment of the Impact of Development

Figure 6 indicates some of the photos taken from site, the dots in green indicate photos that show the landscape and the lush vegetation in the area, and the dots in blue indicate areas where exposed Enon Formation was found. Figure 7 to Figure 10 show the site and vegetation cover from various angles. Figure 11 to Figure *15* show exposed Enon Formation, in a small quarry on site, and in the drainage ditches next to the road. The sediment under the surface is a made up of weathered red soil and pebbles derived from the Enon Formation, with no fossil material spotted in these cuttings. The area is very well covered in lush vegetation.

Figure 6. Position of photos taken during fieldwork, blue dots indicate where exposed soil was found, green dots were vegetation covers the area. note only relevant photos added to this document.

Figure 7 View from the southern side of the site, note lush vegetation cover.

Figure 8 The view from the center of site towards the northeast, note lush vegetation cover

Figure 9. The view from northeast of the site, note lush vegetation cover

Figure 10. The view from the center towards north east of the site, note lush vegetation cover

Figure 11. Red soil and pebbles weathered from the Enon Formation.

Figure 12. Typical red soil covering the Enon Formation.

Figure 13. a cutting of about 2.m high, showing a red sandy top soil derived from the Enon Formation with no fossil material.

Figure 14. Exposure of the Enon Formation in a drainage ditch next to the road, with no fossil material found.

Figure 15.the drainage ditch next to the road, exposing some weathered Enon Formation.

The area is underlain by the Enon Formation of the Uitenhage Group. The Enon Formation is rated to have very high sensitivity. The Enon Formation has yielded disarticulated bone fragments, silicified wood, charcoal and two therapod teeth. However, fossils in this formation are rare. It is unlikely but possible that this area could contain valuable fossil material.

Table 2. Impact Assessment Criteria pre and post Mitigation

	Pre-Mitigation		**Post-Mitigation**	
Criteria	**Category**	**Explanation**	**Category**	**Explanation**
Overall Nature	***Slightly Negative***	Fossil find is Possible	**Slightly Negative**	Fossil find is Possible
Type	***Direct***	The development will directly impact these resources	***Direct***	The development will directly impact these resources
Extent	***Site***	Impact is limited to the site footprint	***Site***	Impact is limited to the site footprint
Duration	***Short term***	Only during Construction	***Short term***	Only during Construction
Severity	***Negative***	Fossil find is Possible	***Negative***	Fossil find is Possible
Reversibility	***Completely reversable***	If Fossil Find procedure is followed in case of fossil find.	***Completely reversable***	If Fossil Find procedure is followed in case of fossil find.
Irreplaceable Loss	***Resources may be partially destroyed.***	Fossil find is Possible. Impact will remain negligible if the Chance Fossil Find Procedure is followed in the case of any fossil finds.	***Resources may be partially destroyed.***	Fossil find is Possible. Impact will remain negligible if the Chance Fossil Find Procedure is followed in the case of any fossil finds.
Probability	***Unlikely***	Fossil find is Possible	***Unlikely***	Fossil find is Possible
Mitigation Potential	***High***	If the Chance Fossil Find Procedure is followed in the case of any fossil finds.	***High***	If the Chance Fossil Find Procedure is followed in the case of any fossil finds.
Impact Significance	***Negligible***	Fossil find is Possible	***Negligible***	Fossil find is Possible
Overall significance	***Low***		***Low***	

Table 3. Assessment criteria on the NO GO option.

	No Go	
Criteria	**Category**	**Explanation**
Overall Nature	***Negative***	No fossils will be found if no excavation is done.
Type	***Direct***	No fossils will be found if no excavation is done.
Extent	***Site***	Impact will be site specific.
Duration	***Very long term***	No fossils will be found if no excavation is done, and any fossils will eventually weather and be lost.
Severity	***Low***	No fossils will be found if no excavation is done. However, no fossils will be lost.
Reversibility	***Completely reversable***	Impact is reversable if the excavation is done, and the chance fossil find procedures are followed in case of any finds.
Irreplaceable Loss	***Low***	No fossils will be found if no excavation is done.
Probability	***definite***	Fossil find is highly unlikely
Mitigation Potential	***High***	Impact is reversable if the excavation is done, and the chance fossil find procedures are followed in case of any finds.
Impact Significance	***High***	No development negates the possibility of finding Fossils.

5. Assumptions and Uncertainties

“The key assumptions for these scoping studies are that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing. When ground-truthing is done work is often hampered by sediment and vegetation cover. There is also an inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologist carrying out fieldwork in RSA. Most development study areas have never been surveyed by a palaeontologist.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and without supporting field assessments may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by weathering or are buried beneath a thick mantle of un-fossiliferous “drift” (soil, alluvium etc.).” Groenewald (2016)

It is important to note that field assessments are often hampered by vegetation and thick sediment cover, and it is often the case that fossil material is only uncovered and discovered during excavation.

6. Conclusion and Recommendations

The area is underlain by the Enon Formation of the Uitenhage Group. The Enon Formation is rated to have very high sensitivity. The Enon Formation has yielded disarticulated bone fragments, silicified wood, charcoal and two therapod teeth. However fossils in this formation are rare. As seen at the small quarry on site, the Enon Formation in this area is deeply weathered, this decreases the chance of finding fossil material even more.
For these reasons, the development of storage facilities and light industrial workshops on RE/139 Zandhoogte may continue with no limitations, on the condition that the Chance Fossil Find Procedure at the end of this document is followed, in the unlikely event that fossil material is found.

Should important new fossil remains be found the finder should alert Heritage Western Cape; hwc.hwc@westerncape.gov.za as soon as possible. This is so that appropriate action can be taken in good time by a professional palaeontologist at the developer's expense. Palaeontological mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, taphonomy). The palaeontologist concerned with mitigation work will need a valid fossil collection permit from ECPHRA and any material collected would have to be curated in an approved depository (*e.g.* museum or university collection). All palaeontological specialist work should conform to international best practice for palaeontological fieldwork and the study (*e.g.* data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies recently developed by SAHRA (2013). These recommendations are summarised in tabular form in Appendix 1 (Chance Fossil Finds Procedure) and should be incorporated into the Environmental Management Programme (EMPr) for the proposed development.

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Appendix 1

Chance Fossil Finds Procedure

(Adopted from the HWC Chance Fossils Finds Procedure: June 2016)

Introduction

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

Training

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

Actions to be taken

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material. Once a workman notices possible fossil material, he/she should report this to the ECO or site agent.

Procedure to follow if it is likely that the material identified is a fossil:

- The ECO or site agent must ensure that all work ceases immediately in the vicinity of the area where the fossil or fossils have been found;
- The ECO or site agent must inform SAHRA of the find immediately. This information must include photographs of the findings and GPS co-ordinates;
- The ECO or site agent must compile a Preliminary Report and fill in the attached Fossil Discoveries: Preliminary Record Form within 24 hours without removing the fossil from its original position. The Preliminary Report records basic information about the find including:
    - The date
    - A description of the discovery
    - A description of the fossil and its context (e.g. position and depth of find)
    - Where and how the find has been stored
    - Photographs to accompany the preliminary report (the more the better):
    - A scale must be used
    - Photos of location from several angles
    - Photos of vertical section should be provided
    - Digital images of hole showing vertical section (side);
    - Digital images of fossil or fossils.

Upon receipt of this Preliminary Report, SAHRA will inform the ECO or site agent whether a rescue excavation or rescue collection by a palaeontologist is necessary.

- Exposed finds must be stabilised where they are unstable and the site capped, e.g., with a plastic sheet or sandbags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation.
- If the find cannot be stabilised, the fossil may be collected with extreme care by the ECO or the site agent and put aside and protected until SAHRA advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove all the fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until SAHRA has indicated, in writing, that it is appropriate to proceed.

FOSSIL DISCOVERIES: PRELIMINARY RECORDING FORM		
Name of project:		
Name of fossil location:		
Date of discovery:		
Description of situation in which the fossil was found:		
Description of context in which the fossil was found:		
Description and condition of fossil identified:		
GPS coordinates:	Lat:	Long:
If no co-ordinates available then please describe the location:		
Time of discovery:		
Depth of find in hole		
Photographs (tick as appropriate and indicate number of the photograph)	Digital image of vertical section (side)	
	Fossil from different angles	
	Wider context of the find	
Wider context of the find. Temporary storage (where it is located and how it is conserved)		
Person identifying the fossil Name:		
Contact:		
Recorder Name:		
Contact:		
Photographer Name:		
Contact:		