

PALAEONTOLOGICAL SPECIALIST REPORT



In terms of Section 38(8) of the NHRA

Transnet Manganese Export Terminal (MET) Enclosed Stockyard and Conveyor, Coega.

Prepared by

Dewald Wilken
Pr.Sci.Nat

In Association with

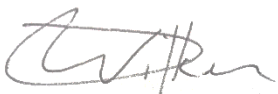
CEN

July 2023

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, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) 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 71 of GN No. R. 543.



Signed

Name
Dewald Wilken
Pr.Sci.Nat

Date
16 July 2023

EXECUTIVE SUMMARY

A PIA was undertaken in 2012/2013 and included in the Final EIA Report of September 2013 for the proposed Transnet Manganese Export Terminal. The Environmental Authorisation was issued in July 2014.

The ECPRHA indicated that the previous study was considered to be outdated and requested a 'walk down' for the palaeontology instead of a full PIA, for the proposed development of covered stockyard and covered conveyor from the stock yard to the berth at the Port of Ngqura. A "walk down" 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 site of the proposed development is underlain by Quaternary Sands (not fossiliferous) the Alexandria formation (highly Fossiliferous), the Kirkwood Formation (highly Fossiliferous), and possibly the Sundays River Formation (highly Fossiliferous). It is likely that fossils can be uncovered during construction. The development of the Manganese stockyard and conveyor may continue. It is recommended that a palaeontologist is available to monitor the site during bush clearing and any excavation on the Kirkwood or Alexandria Formation. The appointed palaeontologist MUST be informed at least 2 months prior to excavation, in order to prepare an application for a Fossil Collection Permit as it is highly likely this will be required.

If any fossil material is found during excavation on this site, the chance fossil find procedure at the end of this document should be followed.

Contents

1. Introduction	4
1.1 Background Information on Project	4
2. Methodology	4
2.1 Purpose of Palaeontological Monitoring.	4
2.2 Monitoring approach	5
3. Geological Context of The Study Area	6
3.1. Alexandria Formation	6
3.2. The Kirkwood Formation	6
3.3. The Sundays River Formation	7
4. Palaeontological Heritage Resources	7
4.1. Review of regional palaeontology	8
4.1.1 Alexandria Formation	8
4.1.2 Kirkwood Formation	8
4.1.3 The Sundays River Formation	9
5. Assessment of the Impact of the Development	9
6. Assumptions and Uncertainties	12
7. Conclusion And Recommendations	13
8. References	14
Appendix 1	15

1. Introduction

1.1 Background Information on Project

A proposal for an amendment application to construct a covered stockyard and conveyor system for the export of manganese in the Coega area was initiated by Transnet. A PIA was undertaken in 2012/2013 and included in the Final EIA Report of September 2013 for the proposed Transnet Manganese Export Terminal. The Environmental Authorisation was issued in July 2014. The ECPRHA indicated that the previous study was considered to be outdated and requested a 'walk down' for the palaeontology instead of a full PIA.

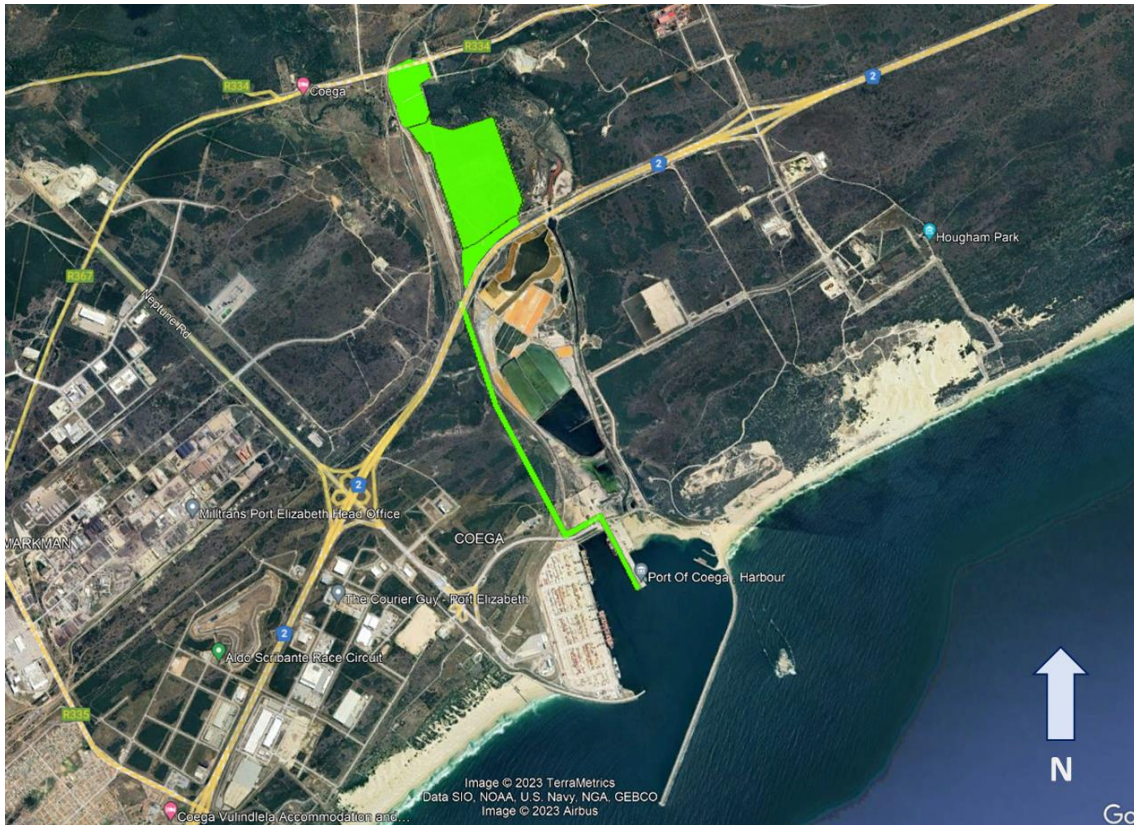


Figure 1 Google Earth© satellite image of the area where construction will be undertaken in Coega, marked in green.

2. Methodology

2.1 Purpose of Palaeontological Monitoring.

The proposed development area is underlain by fossiliferous sediments of the Alexandria Formation, the Kirkwood Formation and possibly the Sundays River Formation. According to the SAHRIS Fossil Heritage Browser, the Alexandria Formation is known to contain marine invertebrates like mollusks, echinoderms and trace fossils. This Formation is of high palaeontological significance. The Sundays River Formation is dated to the early Cretaceous and is known to contain rich marine invertebrate fauna (molluscs, echinoderms etc.), vertebrates (e.g. plesiosaurs), microfossils (foraminifera, ostracods) and trace fossils of very high palaeontological significance. It overlays the very high palaeontologically important Kirkwood Formation (145Ma), which is known for fossils of wood, cycads, ferns, freshwater bivalves, and vertebrates. See Figure 2.

Due to the high likelihood of the development intersecting and impacting the significant Alexandria Formation and the Kirkwood Formation, palaeontological monitoring is recommended during excavation. These recommendations were brought forward by John Almond in 2010. The purpose of the initial palaeontological heritage study was to satisfy the requirements of section 38(8), and

therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999) in terms of impacts to palaeontological resources. It contributed to the broader environmental assessment for the Coega area.

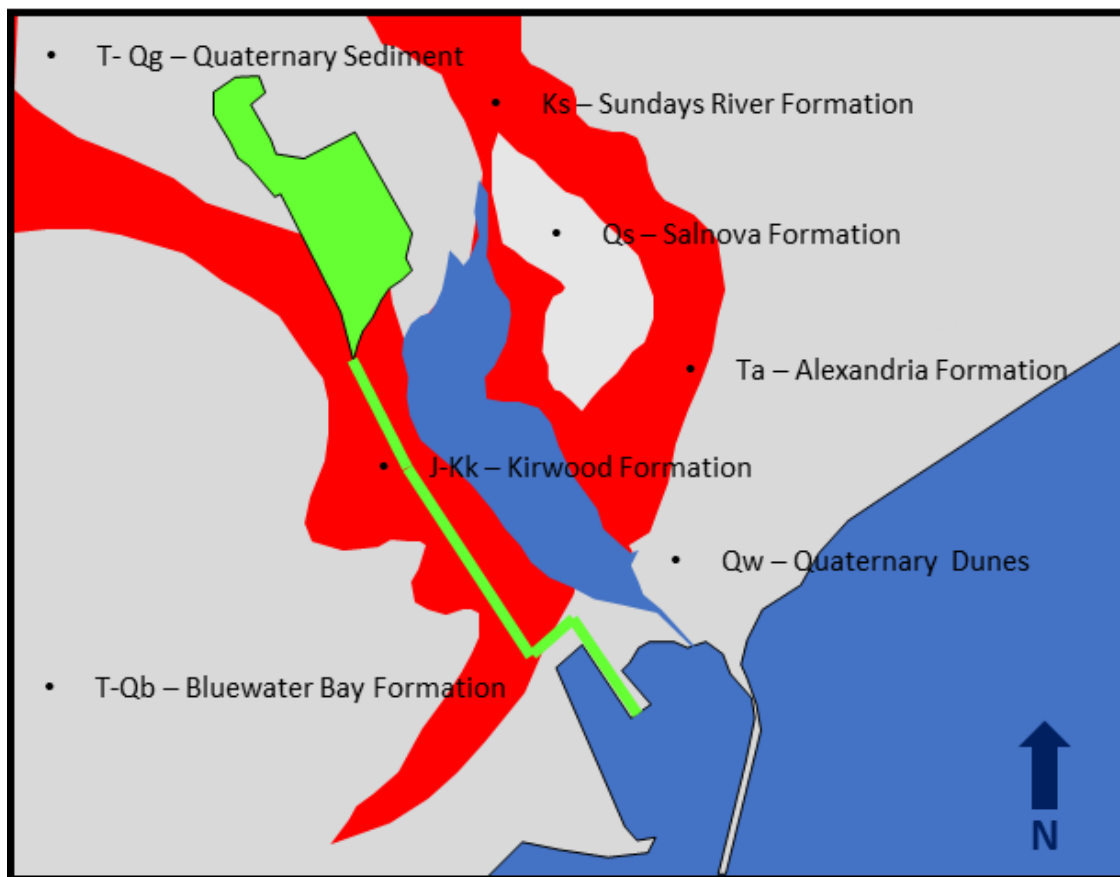


Figure 2 Palaeosensitivity Map. Indicating Very High fossil sensitivity underlying the study area.

2.2 Monitoring approach

The initial PIA report (Almond 2010) provided a record of the observed and inferred palaeontological heritage resources within the broader 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).

This 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 2010, Almond 2011, Almond 2012, Almond 2013, Almond 2014, Prevec 2016), (2) published geological maps and accompanying sheet explanations (e.g. Mountain 1974, Hill 1993), and (3) a palaeontological field study of the area on 12 July 2023.

3. Geological Context of The Study Area

The area under investigation consists of three Formations important for palaeontology (Kirkwood Formation, Sundays River Formation, Alexandria Formation) and Quaternary Sands as seen in Figure 3. The following section will discuss these Formations in more detail.

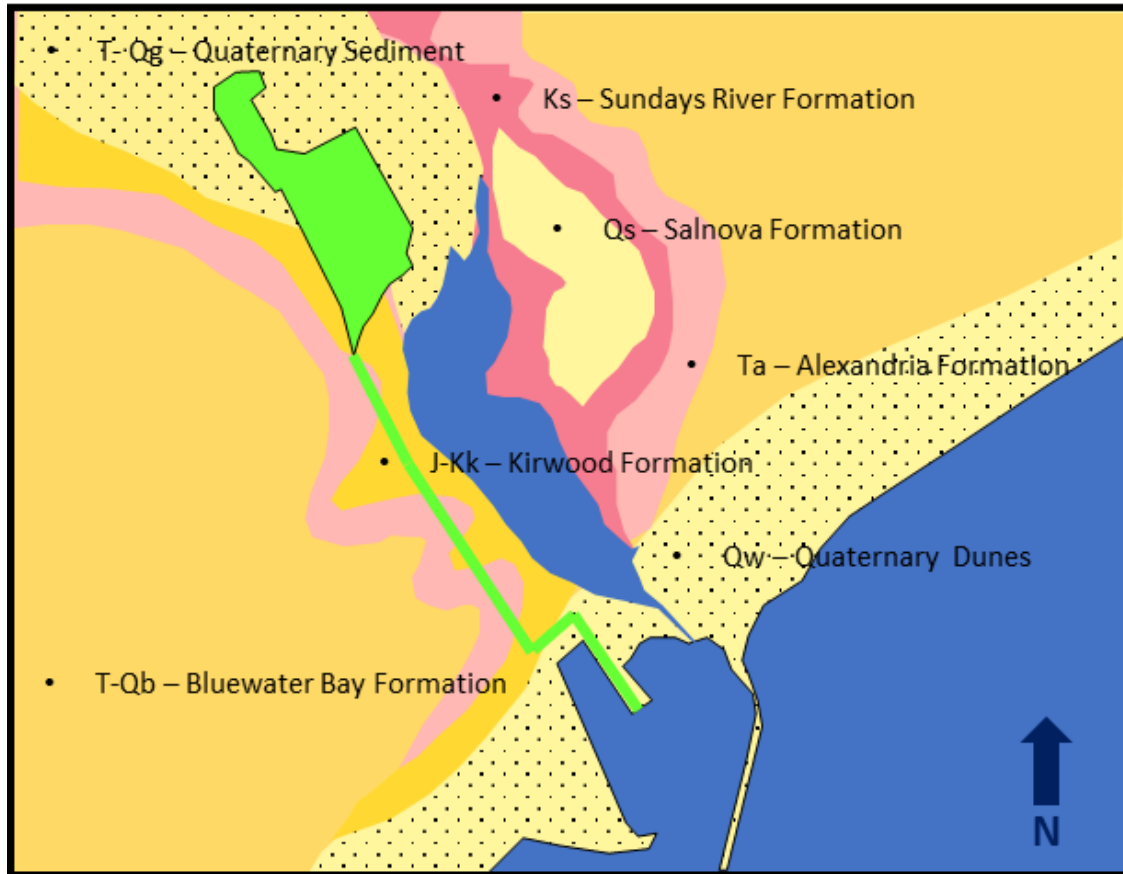


Figure 3 Extract from 1: 250 000 geological map sheet 3324 Port Elizabeth (Council for Geoscience, Pretoria) showing the area in the Eastern Cape Province.

3.1. Alexandria Formation

The Alexandria Formation formed due to a series of marine transgression/regression cycles during the middle Miocene (Le Roux, 1990b.), these transgressions/regressions also caused the formation of six plateaus inland (Ruddock, 1962). The Alexandria Formation dates to the late Miocene-Pliocene, and has an average thickness of about 13m, with a maximum thickness of 18m (Siesser and Dingle, 1981). The base of the Alexandria Formation consists mostly of oyster beds or basal conglomerates. These beds are overlain in turn by an interbedded mixture of thin conglomerates, pebbly coquina, and calcareous sandstones. Horizontal layers, planar cross beds, and trough cross bedding, are common in the upper sandy layers of the Formation (Le Roux, 1987a,b).

In the Bathurst area this formation has been lifted between 300 m and 400 m due to tectonic uplift (King, 1972; Partridge and Maud, 1987).

Fossil found in the formation include, Bivalves, Gastropods, corals, bryozoans, brachiopods, and echinoderm. Ophiomorpha is also known to be found, along with, more rarely, shark teeth.

3.2. The Kirkwood Formation

The Kirkwood Formation was shaped by fluvial sedimentation, with point-bar sand deposits, overbank mud accumulation, and subaerial exposure of the most recent sediments.

The Kirkwood Formation consists mostly of coarse- to medium- grained buff to olive coloured lithic sandstone (up to 2000m thick) and is often interbedded with thick grey-green siltstones and mud rock (often more than 30 m thick). These sandstones contain trough and planar crossbedding. The Kirkwood Formation is well known for its fossilised wood, that can range from smaller pieces to whole charred, silicified tree trunks as well as ferns, cycads, and conifers.

Fresh water bivalves, and vertebrate remains have also been recorded. The siltstones in this formation are colour-mottled which indicate sub areal exposure and/or root zone bioturbation. The mudrock is generally barren, although some plant and vertebrate remains have been found.

3.3. The Sundays River Formation

The Sundays Formation was formed in a shallow-marine depositional environment, that consisted of estuarine, lagoonal and shallow shelf settings.

The Sundays River Formation overlies (and in some areas grade laterally into) the Kirkwood Formation it can attain a thickness of almost 2000m, and consist of thin grey sandstones, siltstones and mudrock. The sandstones tend to be fine- to medium- grained litharenites.

These sandstones often contain an abundance of shell fragments and calcium carbonate cement. The sandstones contain trough and planar crossbedding, the interbedded sandstone and mudrock show flaser and lenticular bedding. Wave ripples and load structures are a common feature.

The Sundays River Formation has a high fossil content, ranging from coquinoid sandstones containing cemented invertebrate fossils, plant material, vertebrate fossils (a near complete Plesiosaur), microfossils (forams, ostracods) and Ammonoids. The ammonoids have enabled researchers to date the Sundays River Formation to Valanginian in age (~135 Ma – Early Cretaceous).

3.4. Quaternary Sands

The Quaternary Sands in the area are relatively recent deposits. These sediments have been reworked over the last 2 Ma. From a palaeontological standpoint these sediments are of low concern

4. Palaeontological Heritage Resources

The area under development is underlain by alluvial deposits of low palaeontological sensitivity and sediments of very high palaeontological sensitivity according to the SAHRIS Palaeosensitivity Map (Figure 2 and Figure 3). The low sensitivity alluvial deposits overlay sediments of the Alexandria Formation, Sundays River Formation and the Kirkwood Formation of very high palaeontological sensitivity. According to the SAHRIS Fossil Heritage Browser, the Sundays River Formation is dated to the early Cretaceous and is known to contain rich marine invertebrate fauna (molluscs, echinoderms *etc.*), vertebrates (*e.g.*, plesiosaurs), microfossils (foraminiferans, ostracods) and trace fossils of high palaeontological significance. The Alexandria Formation contains marine fossils, and trace fossils. The Kirkwood Formation is well known for its dinosaur and plant fossils. As it is likely that the proposed development would intersect with the significant Kirkwood Formation and the Alexandria Formation and possibly the Sundays River Formation the following section

will discuss the palaeontology of these Formations.

4.1. Review of regional palaeontology

4.1.1 Alexandria Formation

Fossil found in the formation include Bivalves, Gastropods, corals, bryozoans, brachiopods, and echinoderm. Ophiomorpha is also known to be found, along with, more rarely, shark teeth.

4.1.2 Kirkwood Formation

The Kirkwood Formation is of high importance for palaeontology. It is one of the few fossil bearing beds of the Early Cretaceous and might fill a gap in the terrestrial Mesozoic fossil record. It is very well known for the “Wood Beds” containing large amounts of fossil flora such as conifers, cycads and ferns. It has provided evidence of four taxonomically distinct groups of sauropod as seen in Figure 4

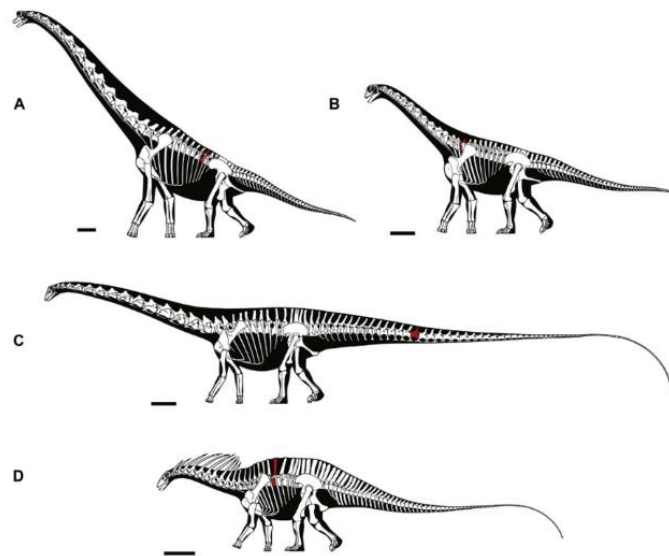


Figure 4 Sauropod diversity present within the Kirkwood Formation. A - after Giraffatitan; B - after Camarasaurus, C - after Diplodocus; and D – after Amargasaurus

The Kirkwood Formation has yielded Theropod, (most likely incertae sedis as seen in Figure 5), Ornithopod, frogs, turtles, Sphenodontids, crocodiles and some mammalian bones.

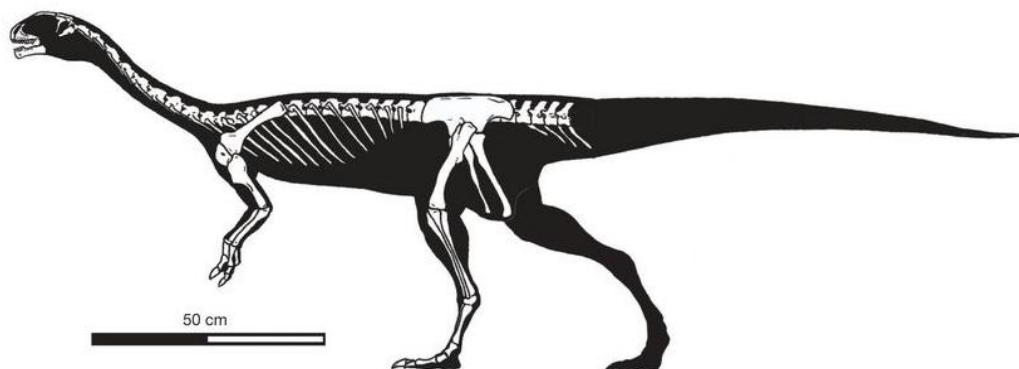


Figure 5 Incertae sedis

4.1.3 The Sundays River Formation

The Sundays River Formation is a shallow marine deposit, ranging from estuarine, lagoonal, and shallow shelf deposits. The fossils found in this Formation include foraminifera, ostracods, bivalves, brachiopods, gastropods, ammonoids, crustaceans, echinoderms, plant material and vertebrate fossils. A near complete fossil of the plesiosaur *Leptocleidus capensis* was recovered in 1911 (see Figure 6).

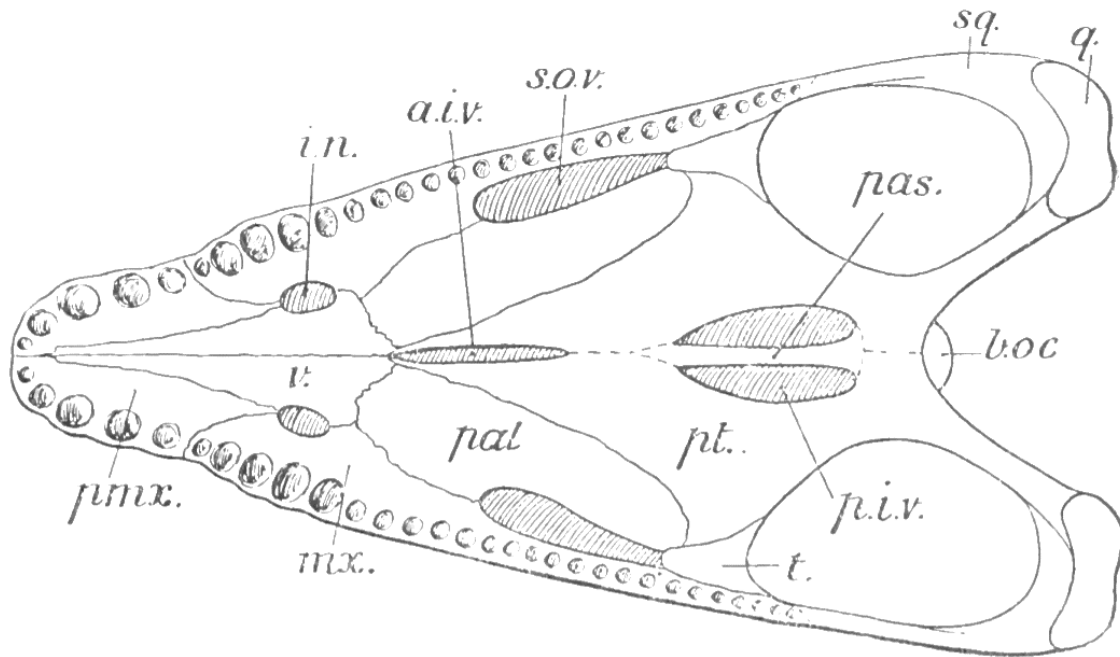


FIG. 1.

1. Diagrammatic view of the palate of *Plesiosaurus capensis*. $\frac{1}{3}$ nat. size.
a.i.v., anterior interpterygoid vacuity; *b.oc.*, basi-occipital; *i.n.*, internal narial openings; *mx.*, maxilla; *pal.*, palatine; *pas.*, parasphenoid; *p.i.v.*, posterior inter-ptyergoid vacuity; *pmx.*, premaxilla; *pt.*, pterygoid; *q.*, quadrate; *s.o.v.*, sub-orbital vacuity; *t.*, transpalatine bone; *v.*, vomer.

Figure 6 *Leptocleidus capensis* (initially *Plesiosaurus capensis*) as described by Andrews C. W. 1911

5. Assessment of the Impact of the Development

The site of the proposed development is underlain by the Alexandria Formation, Kirkwood Formation, and possibly the Sundays River Formation. These Formations are highly sensitive formations from a palaeontological perspective.

Table 1. Impact Assessment Criteria

	Pre-Mitigation		Post-Mitigation	
Criteria	Category	Explanation	Category	Explanation
Overall Nature	Positive	Excavation might lead to the discovery of fossil material	Positive	If Fossil material is found it could expand our knowledge and National Heritage.
Type	Direct	The development will directly impact these resources	Direct	The development will directly impact these resources
Extent	Site	Impact is limited to the areas where excavation is done on site.	Site	Impact is limited to the areas where excavation is done on site.
Duration	Very short term	The Palaeontology will only be impacted during excavation	Very short term	The Palaeontology will only be impacted during excavation
Severity	Low	If a palaeontologist is on site during excavation	Low	If a palaeontologist is on site during excavation
Reversibility	Partly reversable	If fossil find procedures are followed.	Completely reversable	If fossil find procedures are followed.
Irreplaceable Loss	Resources will not be lost.	If fossil find procedures are followed.	Resources will not be lost.	If fossil find procedures are followed.
Probability	Likely	Fossil find is possible.	Likely	Fossil find is possible.
Mitigation Potential	High	If fossil find procedures are followed.	High	If fossil find procedures are followed.
Impact Significance	Negligible	If fossil find procedures are followed.	Negligible	If fossil find procedures are followed.

Table 2. Assessment criteria on the NO GO option.

	No Go	
Criteria	Category	Explanation
Overall Nature	<i>Negative</i>	Any fossil material will remain undiscovered.
Type	<i>Direct</i>	No excavation would lead to zero fossil material found
Extent	<i>Site</i>	No fossil material will be discovered on site.
Duration	<i>Very long term</i>	With time any fossils material not removed and curated will weathered and be lost to time.
Severity	<i>Low</i>	Fossils on this site is unlikely but possible.
Reversibility	<i>Completely reversable</i>	If fossils are uncovered and curated.
Irreplaceable Loss	<i>Resources cannot be replaced.</i>	If fossil material is not removed, they will be permanently lost to time
Probability	<i>Likely</i>	Fossil find is possible
Mitigation Potential	<i>High</i>	If Fossil material is removed and curated
Impact Significance	<i>High</i>	No development negates the possibility of finding Fossils.

6. Assumptions and Uncertainties

Based on the palaeontological record and the geology of the area, it is assumed that fossil finds are likely in the Alexandria Formation, Sundays River Formation, and the Kirkwood Formation. During the “Walk down” some signs of fossil bearing sediment was seen, this indicates a higher chance of finding fossils during excavation, and bush clearing.

The key assumption for this scoping study is 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. Even with ground truthing the geology could still be obscured by thick sediment cover. There is also an inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologists carrying out fieldwork in RSA. Most development study areas have never been surveyed by a palaeontologist.

7. Conclusion And Recommendations

The site of the proposed development is underlain by the Alexandria Formation, the Kirkwood Formation and possibly the Sundays River Formation. These Formations are known to be very sensitive, and highly fossiliferous.

The proposed development may proceed on the condition that a palaeontologist is present to monitor during bush clearing and any major excavation in the area. The appointed palaeontologist MUST be informed at least 2 months prior to excavation, in order to prepare an application for a Fossil Collection Permit as it is highly likely this will be required. In the case of any fossil finds the chance fossil find procedure at the end of this document must be followed.

Should important new fossil remains be found, the finder should alert ECPHRA (i.e. The Eastern Cape Provincial Heritage Resources Authority. Contact details: Ms. Ayanda MaMncwabe Mama 74 Alexander Road, King Williams Town 5600; ayanda.mncwabe-mama@ecsrac.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 of 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 summarized in tabular form in Appendix 1 (Chance Fossil Finds Procedure) and should be incorporated into the Environmental Management Program (EMPr) for the proposed development.

8. References

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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 or not 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:		