

Palaeontological Assessment: Proposed Extension and Upgrade of Macassar Wastewater Treatment Plant Erven 703, 708 & 1205 and powerline (1:50 000 3418 BB Somerset West)



**Prepared for
ASHA Consulting (Pty) Ltd**

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Executive Summary

Dr Graham Avery (see Appendices 1, 2) was commissioned by Jayson Orton, ASHA Consulting (Pty) Ltd, on behalf of their client, to provide a desktop assessment of the palaeontological potential of the proposed extension and upgrade of the Macassar Waste-water Treatment Plant and Cable Route.

Proposed activity: Extension and upgrade of a Waste-water Treatment Plant and Construction of an Electrical Cable.

Location: 1:50 000: 3418 BB Somerset West: 34° 04' 34.4" S; 18° 45' 53.5" E (rough central point).

The proposed extension of the Macassar Waste-water Treatment Plant is located in a green category (moderate palaeontological sensitivity) landscape; the electrical cable is on Blue (low sensitivity) and white (unknown sensitivity) areas (SAHRIS nd). However underlying deposits, the Langebaan and Springfontyn Formations, in particular, would be categorized as red (very high palaeontological sensitivity). The surface cover sands are mainly loose 'white' Holocene Witzand Formation (Cw) sand that does not normally include palaeontological material; this formation is underlain by compact, greyish to pale orange Springfontyn Formation (Cs) sand and Langebaan Formation (Ll) aeolianites. Each of the deposits underlying the Witzand Formation is known to include rare, sparsely-distributed palaeontological material that, if encountered, would be of very high importance.

Excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover important fossil material that would enable observations to be made about our past biodiversity and natural and cultural environments.

Palaeontological remains are rare, protected by the South African National Heritage Resources Act of 1999 and, if encountered, must be recorded by an appropriately qualified specialist. Approval from Heritage Western Cape would be required to deal with any palaeontological occurrence encountered. A Work Plan should be applied for from Heritage Western Cape and a protocol for managing palaeontological eventualities during the extension and upgrade will need to be in place before any construction excavation takes place. This must include monitoring of excavations for ponds and other infrastructure, at least initially, by an appointed specialist who will determine the nature and timing of further monitoring.

Provided that the recommendations in this report are followed, there is no palaeontological reason why establishment of the proposed extension and upgrade of the Macassar Waste-water Treatment Plant and the electrical cable should not proceed, if appropriately managed/monitored.

Palaeontological Assessment: Proposed Extension and Upgrade of Macassar Waste-water Treatment Plant Erf 1205 and powerline (1:50 000 3418 BB Somerset West)

Introduction

Dr Graham Avery (see Appendices 1, 2) was commissioned by Jayson Orton, ASHA Consulting (Pty) Ltd, on behalf of their client to provide a desktop assessment on the palaeontological potential of the proposed extension and upgrade of the Macassar Waste-water Treatment Plant and associated underground powerline (Figures 1, 2 and 3). A full project description appears in the HIA to which this report is appended.

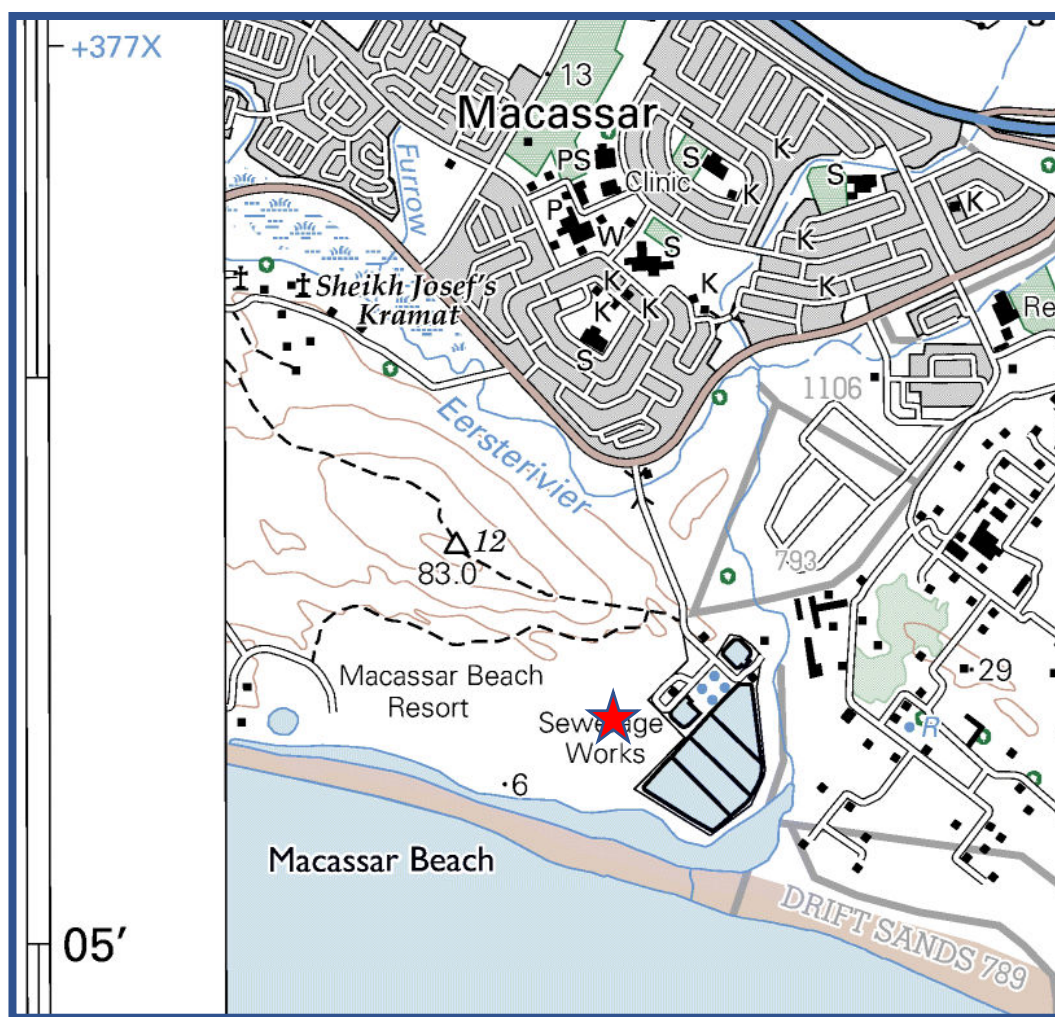


Figure 1. Location of the existing Macassar Waste-water Treatment Plant (starred) on 1:50 000: 3418 BB Somerset West: 34° 04' 34.4" S; 18° 45' 53.5" E.



Figure 2. Google Earth view of the location for the proposed extension and upgrade of the Macassar Waste-water Treatment Plant and its boundary (green polygon).



Figure 3. Location, on the SAHRIS Palaeo-sensitivity Map, of the electrical cable route (yellow line) to the Macassar WWTP (yellow polygon).

- A. Areas of red, are of very high Palaeontological sensitivity reflecting Middle and Late Pleistocene Langebaan Formation palaeo-dune topography along the coast (SAHRIS nd; Roberts, Cawthra, and Musekiwa 2014; Roberts, Bateman, et al. 2009).**
- B. Similar features may be included in the green moderately-sensitive areas where Middle and Late Pleistocene Springfontyn Formation and Langebaan Formation sediments likely underlie the Holocene Witzand Formation cover sands and would be classified as palaeontologically very sensitive (requires a desktop study).**
- C. Blue areas are of low sensitivity (no palaeontological studies are required however a protocol for finds is required).**
- D. White areas are unknown (requires a minimum of a desktop study) see Figure 6.**

Method

A background desktop study of the proposed area was conducted by Dr G. Avery, archaeozoologist. The 1:250 000 geological series map and explanation sheet 3318 were consulted for information on the surface geology of the area (Geosciences 1990; Theron et al. 1992) (Figure 3). Reports, including the geo-technical Report (Human and Welland 2023), and other scientific publications were consulted. The site was not visited, since the surface has been covered by the archaeological survey and the areas of primary palaeontological concern, and Pleistocene archaeology, are sub-surface.

Results of the Study

A. Geology and lithology

Figure 4 shows the general surface lithology of the area (Geosciences 1990). The approximate location of the extension and upgrade is starred. The sediments at the locality are shown as

predominantly loose ‘white’ Holocene Witzand Formation (Cw, Cw/Cs) sand that is underlain by harder, light-grey to pale-orange, Springfontyn Formation (Cs) sand. Ridges of Langebaan Formation (Ll) aeolianite and calcrete outcrop. The Springfontyn and Langebaan formation sediments are known to include sparse fossils and Stone Age remains (Roberts, Bateman, et al. 2009; Roberts, Botha, et al. 2009; Roberts, Cawthra, and Musekiwa 2013). Such finds can only be exposed by erosion or digging and, although likely to be sparse, would be categorized as very important.

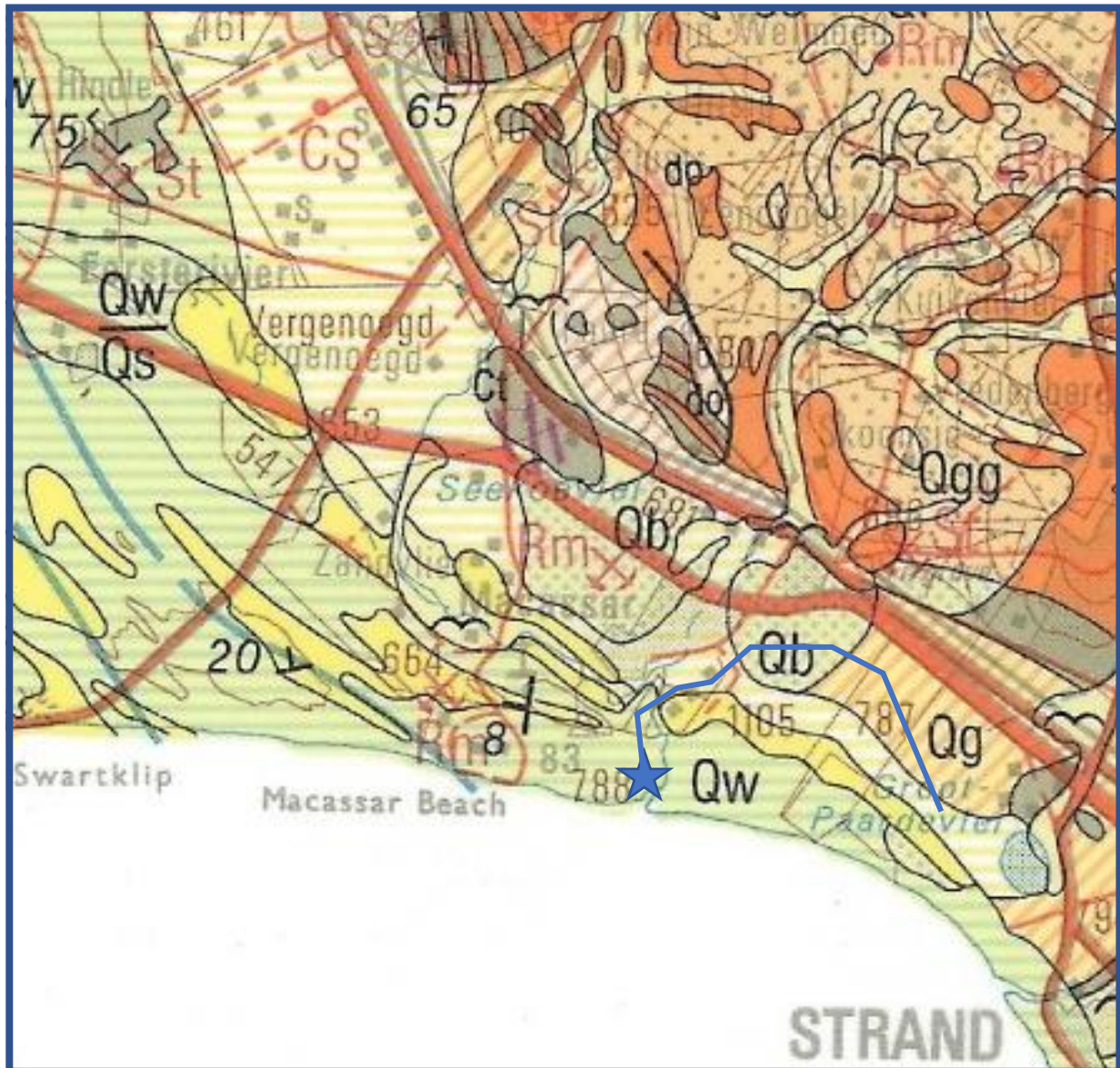


Figure 4. Surface geology in the Macassar area (Geosciences, 2010). The area is covered by a veneer of unconsolidated white Holocene sands (Qw-green stripes), which overlie light-grey to pale-orange Pleistocene Springfontyn Formation sandy soil (Cs-orange stripes). Ridges of limestone and calcrete parabolic Pleistocene dunes of the Langebaan Formation (Ll-solid yellow outcrops). Brackish calcareous soil (Qb) and loam and sandy loam soils (Qg), through which the cable will run, occur further inland and appear to overlie Springfontyn Formation sediments (QS), which are known to include ESA and MSA artefacts and fossils. The geotech borehole study shows that these aeolian sands are underlain by estuarine-derived sands. Underlying these sediments bed rock, between 7 and 18 m below ground level, is greywacke of the Tygerberg Formation, Malmesbury Group (Human and Welland 2023). Figure 5 shows the regional Sandveld Formations that are likely to underlie the project site -- Figure 9 provides greater detail of the coastal Sandveld sediments typical of the False Bay coast at Swartklip and is broadly applicable to the coastal area of the WWTW site.

Formation	Age and Lithologies	Fossil Potential
Witzand	Holocene and recently active calcareous dune fields and cordons (<~12 ka)	Rare sub-fossils of importance for historical faunal distribution. Mainly Later Stone Age archaeological sites.
Springfontyn	Pleistocene to Recent (Holocene) quartzose sand dunes, silts and peats (<~2 Ma)	Mineralized bones generally sparse, but can be prolific in some areas, e.g. Elandsfontein and part of Baard's Quarry. High significance
Langebaan	Late Quaternary aeolianites <~3 Ma	Mineralized bones moderately common. Local to high significance. Extends under sea. Local to high significance
Velddrif	Quaternary raised beaches and estuarine deposits <~1.2 Ma. Sea levels below ~15 m asl	Marine molluscs common and rare bones at or near the coast. High significance
<i>Marine erosion surfaces below ~15 m asl.</i>		
Old indet. sands		
Langebaan	Late Pliocene to mid- Quaternary aeolianites. <~3 Ma	Molluscs and sparse (can be patchy concentrations, e.g. Langebaanweg, bones of terrestrial and marine forms. Extends under sea. Local to high significance
Uyekraal -- Previously subsumed in the upper Varswater Fm	Mid-Pliocene marine deposits ~3 Ma. Sea-level max. ~35 m asl	Shell fossils common, local significance. Fossil bones very sparse, high significance
<i>Marine erosion surface to ~35 m asl</i>		
Old indet. sands		
Langebaan	Earlier Pliocene aeolianites <~3 Ma.	Fossil bones moderately common, local to high significance
Varswater – upper	Later early Pliocene regressive deposits of wider area. 5-4 Ma. Sea-level max. ~50-60 m asl	Fossil bone rare, high significance. Poorly known, fossil shells of high significance



Figure 5. Summary of Sandveld Formations likely to occur in the Macassar area. Modified from (Pether 2013; Pether, Roberts, and Ward 2000; Pether 2014; Roberts, Bateman, et al. 2009; Roberts, Botha, et al. 2009) and G Avery (pers. observation). Ma = Million years ago; ka = thousand years ago. Note: The base of the Holocene has been formalized at 11.8 ka; and chronology for the base of the Lower Pleistocene Boundary has been formally re-defined to an earlier date of 2.58 Ma (Gibbard et al. 2010) – deposits of the latter age and older are assumed to be beyond the reach of the proposed construction; The period of likely interest regarding the Macassar Waste-water Treatment Plant extension and upgrade is arrowed. The Uyekraal Formation is so far only known in the Saldanha region.

B. Palaeontological Potential

The Macassar extension Site

The site area is categorized green (of moderate palaeontological importance) (SAHRIS nd) (also see Figures 3, 6 and 7).

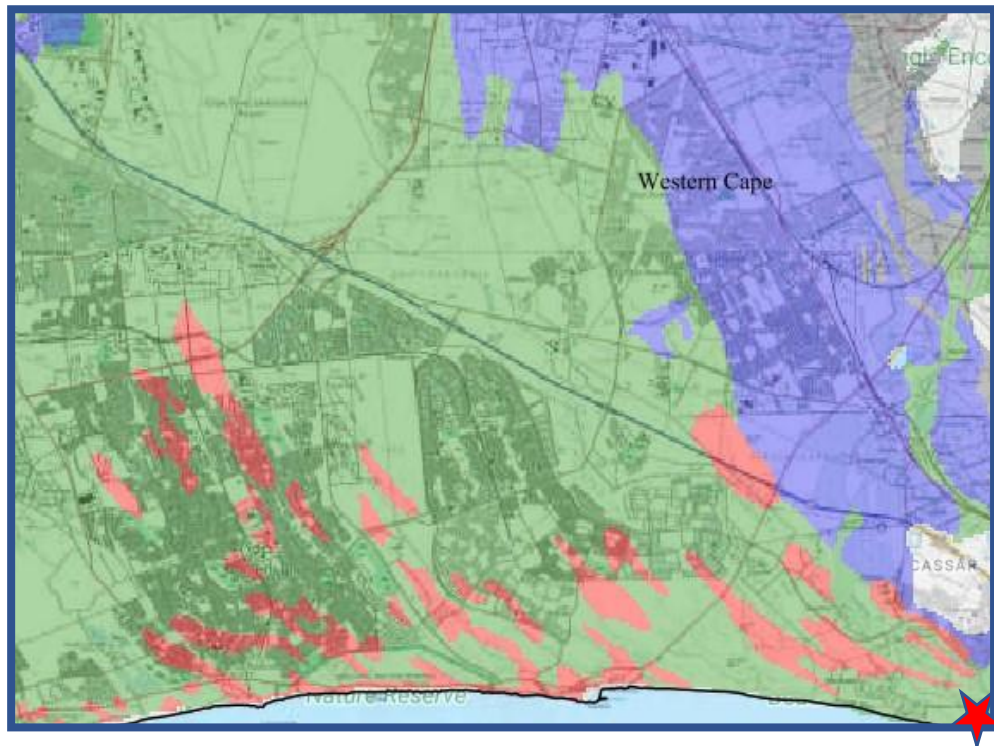


Figure 6. The Swartklip/Macassar coastal area. Patchy areas of red, are of very high Palaeontological sensitivity reflecting Middle and Late Pleistocene Langebaan Formation palaeo-dune topography along the coast (SAHRIS nd; Roberts, Cawthra, and Musekiwa 2014; Roberts, Cawthra, and Musekiwa 2013; Roberts, Bateman et al. 2009). Similar features may be included in the green moderately-sensitive areas where Middle and Late Pleistocene Springfontyn Formation and Langebaan Formation sediments likely underlie the Holocene Witzand Formation cover sands and would be classified as palaeontologically very sensitive.



Figure 7. The Macassar Waste-water Treatment plant and extension area fall within a green, moderately palaeontologically sensitive area (SAHRIS n.d.). However, Middle and Late Pleistocene Springfontyn deposits underlie the Holocene Witzand cover sands. Springfontyn

deposits are known to include very important palaeontological remains. The red area to the north east indicates very high palaeontologically sensitive areas that here coincide with the Langebaan Formation parabolic dune ridges. None are mapped within the extension area. Nevertheless, it appears that Springfontyn and Langebaan Formation aeolianites and calcrete deposits exposed on the near coast surfaces (Figure 6) are likely to extend into the Macassar area under the Witzand cover sands.

The Extension site and portions of the electrical cable route lie on the eastern extent of the False Bay Dune Plume Roberts, Cawthra and Musekiwa (2014) (Figure 8).

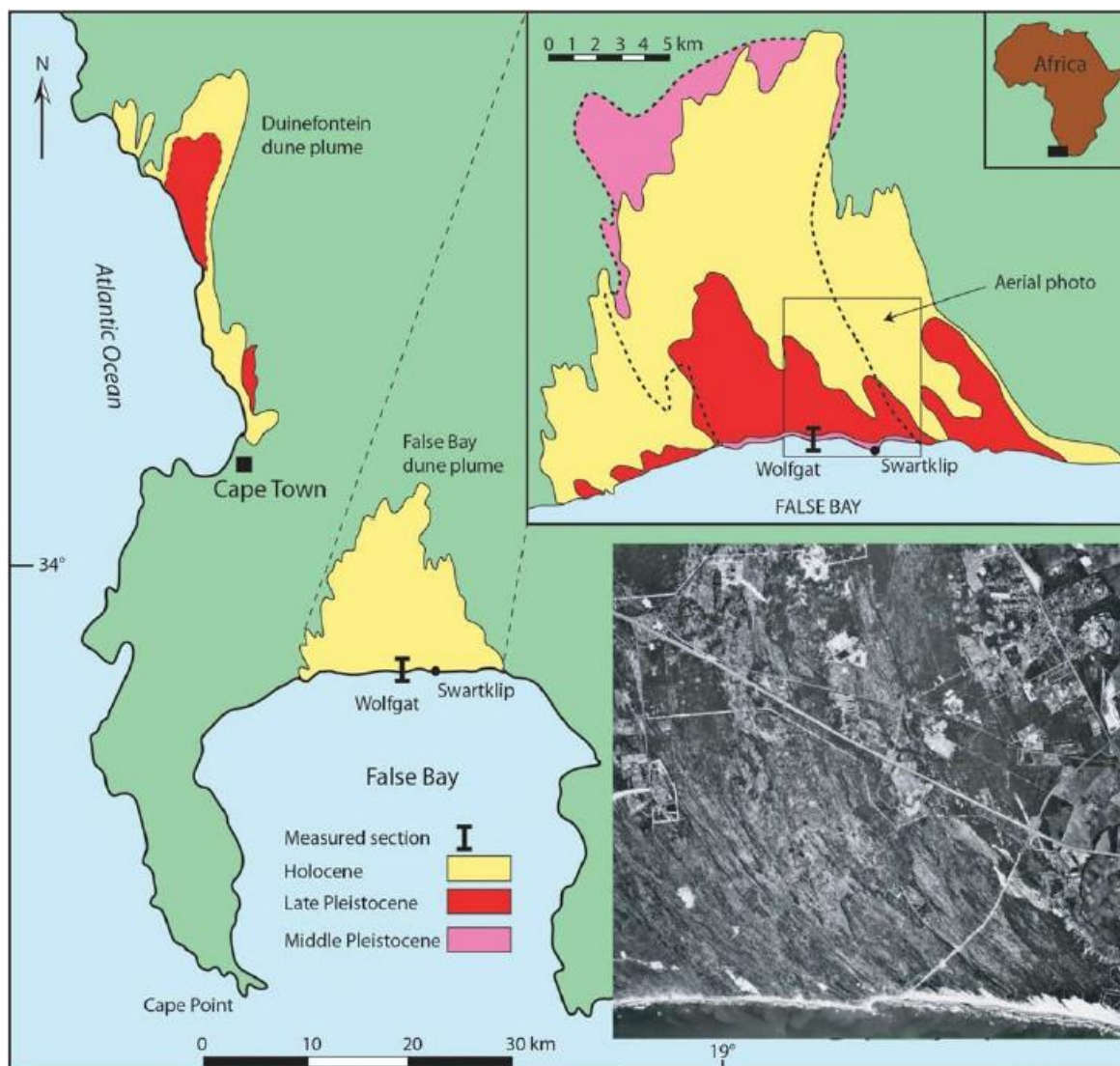


Figure 8. The False Bay Dune Plume, Pleistocene elements of which may extend close to and under the Macassar area (Roberts, Cawthra and Musekiwa (2014, figure 4).

Essentially, the Holocene Witzand Formation aeolian cover sands (dated from the present to 11.8 ka), which do not normally include palaeontological material, are underlain by elements of the Springfontyn and Langebaan Formations (Figure 3). Dates presented in Figure 5 (estimates for periods covered) and 7 (more accurate for False Bay area, by Optically Stimulated Luminescence (OSL) indicate sediments ranging from the Middle to Late Pleistocene, which are known to include sparse fossiliferous sediments, palaeo land surfaces, with bones and ichnofossils (trace fossils, such as burrows and tracks, and stone artefacts and peats). Notably, they also include intrusive bone accumulations introduced later in crevices or old burrows in the Langebaan Formation calcretes when used by brown hyaenas as dens (Roberts, Bateman, et al. 2009; Klein 1975). The stratigraphic complexity of the region is illustrated (Figure 9) by the lack of vertical consistency of the available dates, which, however, is more likely the effect of lateral variation over an extensive area, deflation and intrusion of younger remains into and/or contiguous with older deposits of the Langebaan Formation aeolianites.

Thus, sparsely distributed occurrences of palaeontological material can be expected within each of the Pleistocene deposits between about 130 ka and 230 ka indicated in Figure 9 and, possibly, earlier and/or more recently. Similar deposits are likely to be encountered under the Macassar extension and upgrade area. Since they would only be exposed during construction excavations, monitoring by an appropriately-qualified specialist will be required at that time.

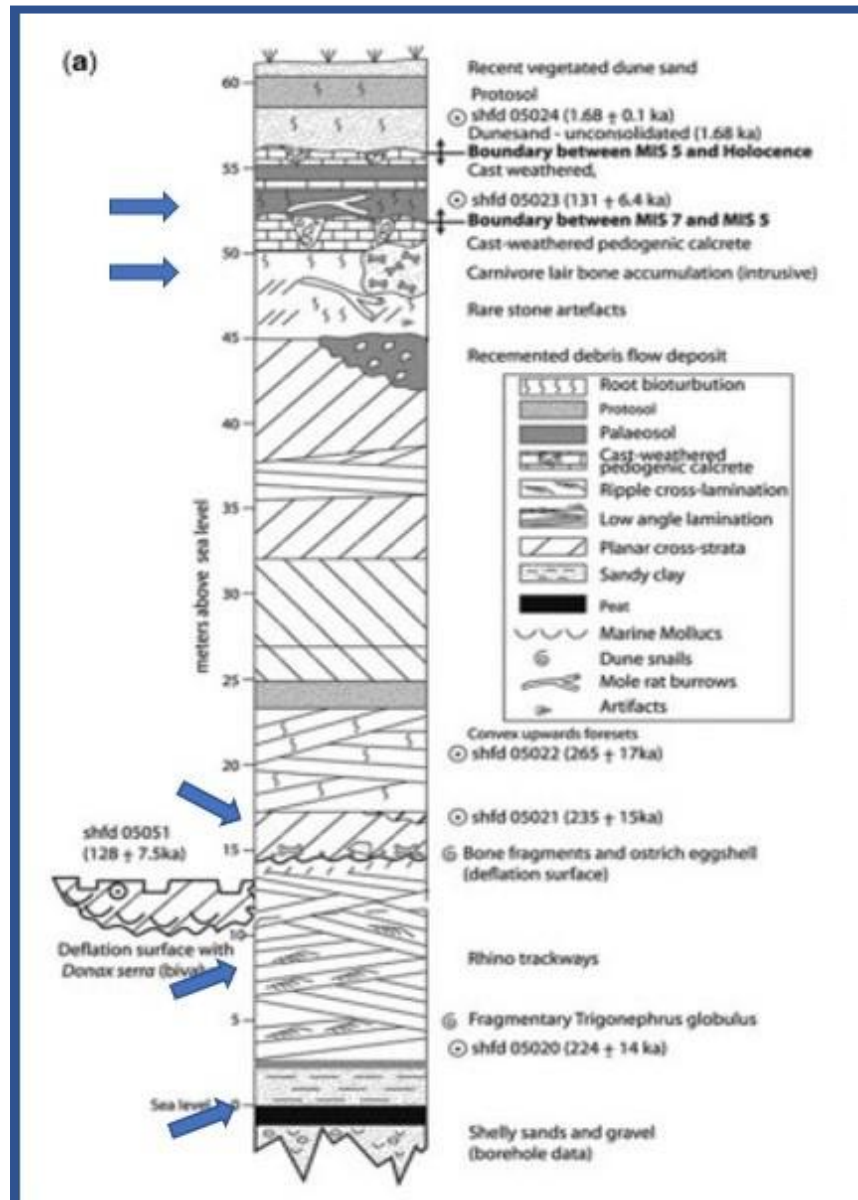


Figure 9. Generalized Late Quaternary aeolian stratigraphy of False Bay (after Roberts et al 2009, fig. 6). Note that heights above sea level will vary laterally, although the general composition may be relatively consistent. Arrows indicate sedimentary periods when fossil bones, hyaena accumulations, ichnofossils (burrows, tracks, root castes, peat and/or stone artefacts occur). Subtidal peat deposits are exposed periodically and reflect a time(s) when sea level was lower and the coastal plain, with wetland areas, extended some distance from its current position (see reconstruction Figure 10).

Witzand Formation

Holocene <11.8 ka (ka = thousand years ago).

Palaeontological material is not normally found in these loose sediments. Nevertheless, sub-fossil bones and other remains may contribute to knowledge of the recent historical distribution records of species, including people present during this period. Later Stone Age burials may be encountered. If so, established heritage protocols must be complied with.

Springfontyn Formation

Lower, Middle and Late Pleistocene ~2 Ma to 11.8 ka.

Palaeontological remains and ESA and MSA artefacts occur within the Springfontyn Formation compact sand and in the intercalated calcrete, which is underlain by earlier Langebaan Formation hard and soft calcretes that formed at different times (Figure 4).

The ancient land surface(s) with Middle Stone Age (MSA) artefacts exposed in the cliffs along the Swartklip coast and with ostrich eggshell and MSA stone artefacts on the boundary between the Witzand Formation sands that are mined (e.g. at Omega) some 3 km west of Macassar (Avery 1980, are in the Springfontyn Formation and may well extend to the Macassar area. Such land surfaces provide observations on spatial land use by MSA people and other species. A complete cranium of a rhinoceros, from the interface between the mined sand and on the eroded surface of the Langebaan Formation calcrete on the Omega site, is in Iziko South African Museum and rhinoceros trackways (trace fossils) between 2 and 10 m a.s.l. are noted by Roberts et al. (2014) (Figure 4). All such sites should be categorized as being of very high palaeontological sensitivity areas, but, being sub-surface, may not necessarily be reflected on the SAHRIS map. While the calcretes, *per se*, have high palaeontological potential, occurrences are very small. Rare large accumulations, such as the Swartklip brown hyaena den (~3500 identifiable bones of 27 species), which was intrusive into fissures or tunnels in the much older Langebaan Formation calcretes provide a remarkable insight into the local biosphere during the last glacial (Ice Age) between at least 40 ka to 110 ka (Klein, 1986) or even ~150 ka during the previous glacial (Brooks *et al.*, in litt.) (Figure 5, 9).

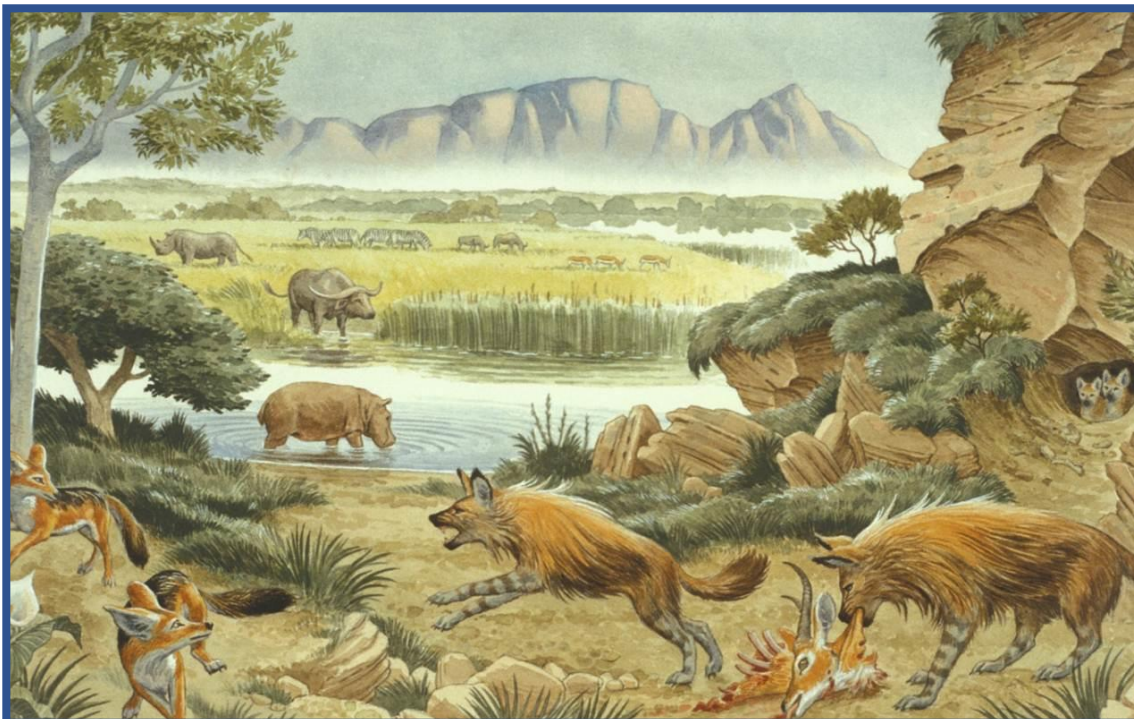


Figure 10. Reconstruction of False Bay, during a lowered sea level, based on information gained from the study of the bones from the brown hyaena den at Swartklip. Extinct long-horned buffalo, extinct Cape zebra and species historically not occurring in the western Cape, like white

rhino, hippo, springbok and southern reedbuck, were present in the the exposed bay (reconstruction by Cedric Hunter, copyright, Iziko Museums of South Africa).

Further afield, along the west coast, Springfontyn Formation deposits with Late Acheulian (ESA) artefacts and fossil bones, dated to 330 ka and underlying a Langebaan Formation calcrete dated to 160 ka, occur around palaeo wetlands at Duinefontein (Koeberg Nature Reserve) (Cruz-Urbe et al. 2003; Klein et al. 1999; Sampson 2003). Similarly, Springfontyn Formation sediments at Elandsfontein, near Hopefield, have yielded species-rich Middle Pleistocene bone accumulations, Late Acheulian (ESA) artifacts and an ancient hominid in a wetland context dated to between 700 ka and 400 ka (Klein et al. 2007; Klein 1978; Klein and Cruz-Urbe 1991).

Unless excavations during the extension and upgrade reach lower levels, the altitude of the Macassar site makes it unlikely that Late Pleistocene marine deposits, such as the 125 ka to 75 ka marine Velddrif Formation shell deposit at Mnandi Beach (Kensley 1985) will be encountered.

Although in much older deposits, it should be noted that fossil whale bones were recovered during the excavation of additional ponds at the Potsdam Waste-water Plant along the Diep River (GA, personal observation).

Langebaan Formation

Middle and Late Pleistocene; >700 000 to 11.8 ka.

Palaeosols, land surfaces, intrusive remains. Calcrete fissures or tunnels in the Langebaan Formation include intrusive (younger) Springfontyn Formation fossil hyaena den accumulations, the example at Swartklip numbering over 3 thousand bones, being exceptionally large and very important (Klein 1975).

For the most part, however, fossils are rare in the Langebaan Formation and most occurrences are most likely to be sparsely distributed and numerically small. All would be of very high palaeontological significance, however, if encountered, due to their scarcity (Almond and Pether, 2008).

Intrusions of Springfontyn fossil material into Langebaan Formation deposits

Features of Springfontyn age are intercalated with Langebaan Formation aeolianites and calcretes. Some, like the Swartklip brown Hyaena den accumulation formed intrusively in fissures and tunnels in the calcretes.

The ancient land surface(s) with Middle Stone Age (MSA) artefacts exposed in the cliffs along the Swartklip coast and with ostrich eggshell and MSA stone artefacts on the boundary between the Witzand Formation sands that are mined (Omega) some 3 km west of Macassar, and Springfontyn Formation sediments may well extend to the Macassar area. Rhinoceros trackways (trace fossils) have been recorded (Figure 7) and the undated peaty reed bed deposit at the base of the figure is periodically exposed intertidally around Strandfontein after storms and yielded the maxillary of an extinct Cape zebra (in the Quaternary collection of Iziko South African Museum).

River cobbles and Gravels

Lower Pleistocene ≥ 1.3 Ma (Million years ago)

Early Stone Age (ESA) artefacts are associated or contiguous with and assumed to be younger than the gravels of the Eerste rivier terraces, which occur widely in the Stellenbosch area; some may have been on palaeo land surfaces (Seddon 1967; Seddon 1966; Péringuey 1911; Deacon and Deacon 1999). It is not known whether such occurrences occur along the Eerste River section of the Macassar site, but gravel and cobbles are recorded in the lowermost sediments (Human and Welland 2023). Nevertheless, it is probably unlikely that the extension and upgrade construction will reach the depths at which these sediments are reported. Moreover, it seems possible that the occurrence of these gravel features may be related to the opening of a wider and deeper estuary during a higher sea level rather than the riverine terraces further inland.

The calcretes are unlikely to have high palaeontological potential, unless a feature, like a fissure or burrow with intrusive bone infill is encountered—small pockets of bone can occur, for instance, where bone accumulators like hyaenas, Jackals or porcupines used pre-existing fissures/burrows of other

animals. Their potential would be to provide records of past animal distributions and contexts in the area.

Essentially, therefore, the palaeontological potential of the proposed extension is moderate to very high, and can be realized provided that construction excavations are appropriately managed through monitoring by a suitably-qualified person.

C. The Electrical Cable Route

Much of what is reported above, especially the Springfontyn Formation may occur in the blue and white areas of the SAHRIS map, which the cable route traverses (Figure 11); and the green area is covered in the section of the WWTW site.



Figure 11. Location, on the SAHRIS Palaeo-sensitivity Map, of the electrical cable (yellow line) to the Macassar WWTW (yellow polygon).

Virtually nothing is known about the palaeontological content of the blue and white areas, which include sandy soils, which may include ESA artefacts and overlie Malmesbury base rocks, which have not yet yielded fossils or artefacts sub-surface, other than the possibility that ESA artefacts may occur at or near the Eerste River -- this is supported by Heritage studies on the AECI property near Paardevlei, Somerset West (Orton 2021; Halkett and Hart 1996), which adjoins the Denel Swartklip property and through which part of the cable will pass (Figure 11). ESA, MSA and LSA (Later Stone Age) artefacts are reported on the surface. The former two cultural groupings were located in the northern portion near the Lourens River and towards the Helderberg, whereas the LSA sites were mostly in areas behind the coastal fore dunes. Palaeontologically, Velddrif Formation fossil shells, deposited during a higher sea level, were found upstream of the Lourens River estuary, but too close to the present coast to be relevant with respect to the cable route.

It is probable that Stone Age material will be encountered on the surface during a foot survey or sub-surface during the construction. The existence of pans and wetlands may have been a draw for people and animals and may have been a resource for stone raw material, like silcrete within the soils, which might be exposed during excavation of trenches, as found during the development of Blue Downs ERF 1897 (GA personal observation, Avery (2022 b)).

Conclusions

The Water Treatment Plant

1. Palaeontological remains in the Langebaan and Springfontyn Formations are often sparsely distributed and rare but, if encountered, provide very important additions to the paucity of information currently recorded for the periods represented in the Macassar area.
2. While there is no direct evidence of palaeontological material in the sediments underlying the Macassar Waste-water Treatment Plant and proposed extension area, it is reasonable to use information from adjacent areas as a framework within which to assess the possibility that fossil material could be encountered during any excavations that penetrate below the Witzand Formation.
3. Since it is shown above that there is a clear probability that important palaeontological material could be encountered in the deposits underlying the Macassar site, a protocol, e.g., Avery (2022a) and the HWC Protocol for Chance Finds: (https://www.hwc.org.za/sites/default/files/3_11%20Protocol%20Fossil%20Finds%20Final%20June%202016.pdf) for recovering any palaeontological material encountered during the extension and upgrade must be developed by an appropriately-qualified palaeontological specialist, who will monitor construction excavations. The frequency of visits would be worked out with the contractor to minimize time spent on site.
4. The extension and upgrade of the Macassar Waste-water Treatment Plant can be managed so that it will not impact significantly on palaeontological remains; in the event of fossils, or artefacts, being encountered, a management plan will be in place to recover material, which would be deposited in a recognized repository.

The Electrical Cable Route

1. Springfontyn Formation deposits underlie the cable route; they are known to include palaeontological and artefactual remains, which are often sparsely distributed and rare. But, if encountered, they would provide very important additions to the paucity of information currently recorded for the periods represented in the Macassar area.
2. There is direct evidence that older archaeological and/or palaeontological material may occur in the sediments underlying the Cable Route, based on information from adjacent areas through which the cable route will pass.
3. Since it is shown above that there is a clear probability that important palaeontological material could be encountered in the deposits underlying the Cable Route, a protocol, e.g., Avery (2022a) and the HWC Protocol for Chance Finds for recovering any palaeontological material encountered during the construction of the electrical cable must be included in the EMPr (see attached) and an appropriately-qualified palaeontological specialist, who will monitor construction excavations. The frequency of visits would be worked out with the contractor to minimize time spent on site.
4. The construction of the Macassar Waste-water Treatment Plant cable route can be managed so that it will not impact significantly on palaeontological remains; in the event of fossils being encountered, a management plan will be in place to recover material, which would be deposited in a recognized repository.

Impact Assessment.

Project phase	Construction			
Impact	Destruction of palaeontological resources			
Description of impact	Destruction of and damage to palaeontological materials during earthmoving activities			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	- Monitoring of construction excavations, and - Removal of any fossil materials discovered during construction.			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	Extremely high	Natural and/ or social functions and/ or processes are severely altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	High	The resource is irreparably damaged and is not represented elsewhere
Significance	Moderate - negative		Negligible - negative	
Comment on significance	Fossils are known from the nearby sand mines but they can be very patchily distributed underground. Impacts are nonetheless probable. Individual fossils can have high cultural significance for their scientific value and the overall impact significance of moderate negative seems appropriate. Rescue of fossils will dramatically reduce the impact and negligible negative is again appropriate.			
Cumulative impacts	Cumulative impacts are expected to be of low significance.			

Provided that the recommendations herein are adhered to the proposed extension and upgrade of the Macassar Waste-water Treatment Plant can be allowed to proceed from a palaeontological perspective, provided that an appropriate monitoring and management system is in place.

Recommendations

1. In terms of The South African National Heritage Resources Act 25 of 1999, amendments and regulations (www.sahra.org.za), all archaeological and palaeontological remains are protected and may only be disturbed or removed by an appropriately-qualified person in possession of a relevant permit.
2. Monitoring of construction excavations at the waste water area and along the cable route must take place. A protocol to ensure recovery of any artefacts and/or fossils, and possible further mitigation must be included in the project Environmental Management Program (EMPr).

3. Application to Heritage Western Cape for a Workplan approval, before construction is initiated, is advisable, since this would enable removal of any palaeo-material to be made with minimal delay.
4. Any heritage material encountered during the course of construction must be retained and will be deposited in the Quaternary collection of Iziko South African Museum.
5. Palaeontological awareness training is a useful way to stimulate worker interest and facilitate their recognition and reporting of fossil material if encountered. . This could be in the form of an illustrated online (Zoom or other digital format) lecture showing examples of what the artefacts and fossils might look like and explaining why they are important elements of our heritage.
6. Funds must be available to cover the costs of monitoring and any fieldwork arising from this.

Palaeontological Points for the EMPr

Should anything of an archaeological and/or palaeontological nature be encountered on site the Conservation/Supervising Officer must be notified. Established protocols (see the Fossil Chance Finds Protocol) would 'kick in' and this must be carefully explained to workers during the Environmental Education Programme. The author of this report can assist with training in the basic recognition and value of palaeontological material.

Heritage Permits Required

All fossils are protected by law. The primary heritage legislation that needs to be considered is The National Heritage Resources Act 25 of 1999, amendments and regulations (www.sahra.org.za). All heritage material, including human remains, is included.

Clearance in terms of the National Heritage Resources Act of 1999 will be required before the project can proceed.

A Work Plan approval for the disturbance and removal of any palaeo material encountered will be required from Heritage Western Cape (HWC); potential delays could be minimized by submitting an application for a Workplan before construction is initiated.

References

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Declaration

I have no financial or interest other than palaeontological or archaeological in the proposed development and will derive no benefits other than fair remuneration for consulting services provided



Dr Graham Avery MRSSAf

26 March 2024

Curator in Natural History Collections Department (retired)

Archaeozoologist

Emeritus Research Associate: Iziko Museums, Research and Exhibitions Department

Professional Member Association of Southern African Professional Archaeologists #008 – Principle Investigator: archaeozoology, coastal, shell middens, Stone Age.

Member: Palaeontological Society of South Africa.

25 San Bernardo, 18 De Lorentz Street, Gardens, Cape Town 8001.

Appendix 1 (Qualifications and Accreditation)

- MA (UCT, 1976) and PhD (UCT, 1990), each in archaeology/archaeozoology and have worked extensively in the Quaternary palaeontological field, focusing on the south-western coast of South Africa, in both research and commercial contexts. I have conducted research on a variety of Early, Middle and Later Stone Age and palaeontological sites and published the findings.
- I am accredited with the Association of Southern African Professional Archaeologists (ASAPA) Cultural Resource Management (CRM) section (Member #008, 1998) as Principal Investigator: Stone Age, Shell Middens, Middle Pleistocene studies and archaeozoology and a member of the Palaeontological Society of South Africa.

Appendix 2 Abbreviated Curriculum Vitae: Graham Avery

Contact Details

Address: 25 San Bernardo
18 De Lorentz Street
Upper Gardens
Cape Town 8001

Business Details

Graham Avery (Sole Proprietor): Archaeozoology, Stone Age Archaeology and Quaternary Palaeontology.

Telephone: N/A

Cell: +27 83 441 0028

Email: dravery97@gmail.com

Professional Qualifications

PhD (archaeology) 1990. Archaeological and palaeoenvironmental interpretation of avian remains from archaeological sites. University of Cape Town.

MA (archaeology) 1976. Systematic Investigation of Coastal Shell Middens in the South Western Cape. University of Cape Town.

BA (Archaeology, Social Anthropology, African History, History and Geography) 1969 University of Cape Town.

Current Positions

- ❑ Emeritus Research Associate, Research and Exhibitions Department, Cenozoic Palaeontology, Iziko South African Museum (July 2020–).

Positions Held

- ❑ Research Associate, Cenozoic Palaeontology, Iziko South African Museum (July 2012–2020).
- ❑ Retired 31 January 2012.
- ❑ Archaeozoologist, Curator of Quaternary Collections, Cenozoic Studies Section, Natural History Department, Iziko South African Museum (2002–January 2012). [Transferred to Natural History Collections Department when Iziko came into being].
- ❑ Head of Human Sciences Division, South African Museum (1993–2002).
- ❑ Head of Archaeology Department, South African Museum (1990–1993).
- ❑ Acting Head of Archaeology Department, South African Museum (1985–1990).
- ❑ Researcher, Archaeology Department, South African Museum (1980–2002).
- ❑ Manager: Archaeological Data Recording Centre, South African Museum (1974–1979).
- ❑ Environmental Archaeologist, South African Museum (1970–1973).
- ❑ Manager (temporary): Archaeological Data Recording Centre, South African Museum (1969).

Research Publications (not included here)

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APPENDIX 3 – Palaeontological chance finds procedure

https://www.hwc.org.za/sites/default/files/3_11%20Protocol%20Fossil%20Finds%20Final%20June%202016.pdf

HWC PROCEDURE: CHANCE FINDS OF PALAEONTOLOGICAL MATERIAL

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:

- i 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;
- ii The ECO or site agent must **inform HWC of the find immediately**. This information must include photographs of the findings and GPS co-ordinates;
- iii The ECO or site agent must compile a **Preliminary Report and fill in the Fossil Discoveries: HWC 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.
- iv Upon receipt of this **Preliminary Report**, HWC will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.
- v **Exposed finds must be stabilized where they are unstable and the site capped, e.g. with a plastic sheet or sand bags**. This protection should allow for the later excavation of the finds with due scientific care and diligence. HWC can advise on the most appropriate method for stabilization.
- vi If the find cannot be stabilized, **the fossil may be collect with extreme care** by the ECO or the site agent and put aside and protected until HWC 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 the all 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 HWC has indicated, in writing, that it is appropriate to proceed.

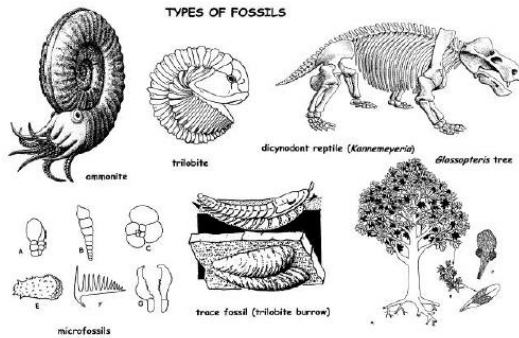
FOSSIL DISCOVERIES: HWC PRELIMINARY RECORDING FORM

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	
Temporary storage (where it is located and how it is conserved)		
Person identifying the fossil	Name: Contact:	
Recorder:	Name: Contact:	
Photographer	Name: Contact:	

Palaeontology: what is a fossil?

Fossils are the traces of ancient life (animal, plant or microbial) preserved within rocks and come in two forms:

- Body fossils preserve parts, casts or impressions of the original tissues of an organism (e.g. bones, teeth, wood, pollen grains); and
- Trace fossils such as trackways and burrows record ancient animal behaviour.



**How to report chance fossil finds:
What should I do if I find a fossil during
construction/mining?**

If you think you have identified a fossil:

Immediately inform the ECO or Site Agent.
He/she will then contact HWC and write a report
and if necessary operations will stop in that
specific area until the fossil is recovered

Heritage Western Cape
ceoheritage@westerncape.gov.za
 021 483 5959
www.hwc.org.za
 iLifa le...
 Erfenis Wes-Kaap
 Heritage Western Cape

Types of palaeontological finding - What does a fossil look like

Fossils vary in size, from fossilised tree trunks and dinosaur bones down to very small. Finds can be **individual fossils** (one isolated wood log or bone) or **clusters and beds**. Teeth, animal or plant remains, trace fossils in close proximity or bones resembling a bed of fossils is a layer with many fossil remains.

Below there is a list of few examples of fossils which may be identified during excavation in the Western Cape.

Image	Description	Image
	Leaves	
	Fossil wood	
	The remains of fish and marine life (e.g. teeth, scales, starfish)	
	Stromatolites	
	Animal footprints	

Images provided by Dr John Almond
 Text by HWC's Archaeology, Palaeontology & Meteorites Committee