

Palaeontological Assessment Upgrade of Abalone Hatchery (3017AD Hondeklipbaai)

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Archaeozoology, Stone Age Archaeology and Quaternary Palaeontology

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Executive Summary

Graham Avery was commissioned by Ecosense cc (per Kozette Myburgh) on behalf of their client to conduct a desk top survey of the palaeontological potential of the proposed upgrade of the Existing abalone hatchery at Hondeklipbaai and alternative on Aristeia site.

Applicant: University of Stellenbosch
Proposed activity: Abalone Hatchery
Location: 30°19.061' S; 17°16.413' E (existing pilot project)
30°20.323' S; 17°16.724' E (Aristeia central point)

The proposed site is located in a palaeontologically-sensitive region with a hard rock base of gneiss, which outcrops along the coast. Any excavation for foundations and/or infrastructure that penetrates into underlying terrestrial and/or marine sediments, if preserved, may encounter fossils. Since such occurrences are sparse, fossil finds would be significant and would require careful recording and possible systematic excavation. Excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that would enable observations to be made about our past biodiversity and environments.

Existing Pilot Hatchery site

The existing site in the Town of Hondeklipbaai is disturbed and virtually on bedrock, which outcrops nearby. J. Orton notes that fill has been introduced. Furthermore, the 2 m to 3 m mid-Holocene high sea level is likely to have inundated and removed any earlier deposits. It is therefore unlikely that intact material other than possible mid-Holocene beach deposits will have survived.

Impact is likely to be minimal to zero and manageable.

Aristeia Site

This site is relatively undisturbed. The surface is covered by Holocene Witzand Formation aeolian sand (low dunes) and is sparsely vegetated. Given its proximity to the coast, it is unlikely that the sediments over bedrock reach any significant depth. The 2 m to 3 m mid-Holocene high sea level is likely to have inundated and removed any earlier deposits. It is very possible that intact mid-Holocene beach deposits will have survived. Orton mentions this in his HIA Report.

Impact is likely to be minimal and manageable.

Palaeontological remains are rare and, if encountered, must be recorded by an appropriately qualified person. Collaboration between the contractor and a suitably-qualified palaeontologist or archaeologist with palaeontological knowledge will be required prior to and during construction excavations so that palaeontological information and/or material can be recorded. Mitigation may extend beyond monitoring if warranted.

Provided that the recommendations of this assessment are complied with, there is no palaeontological reason why the proposed development should not proceed.

Location of the Proposed Sites

The proposed sites are on 1:50 000 topographical map 3017AD Hondeklipbaai), Namakwaland Magisterial District. Detail is shown on Figures 1, 2.



Figure1. Google Earth view showing Hondeklipbaai and the options.

3017AD HONDEKLIPBAAI

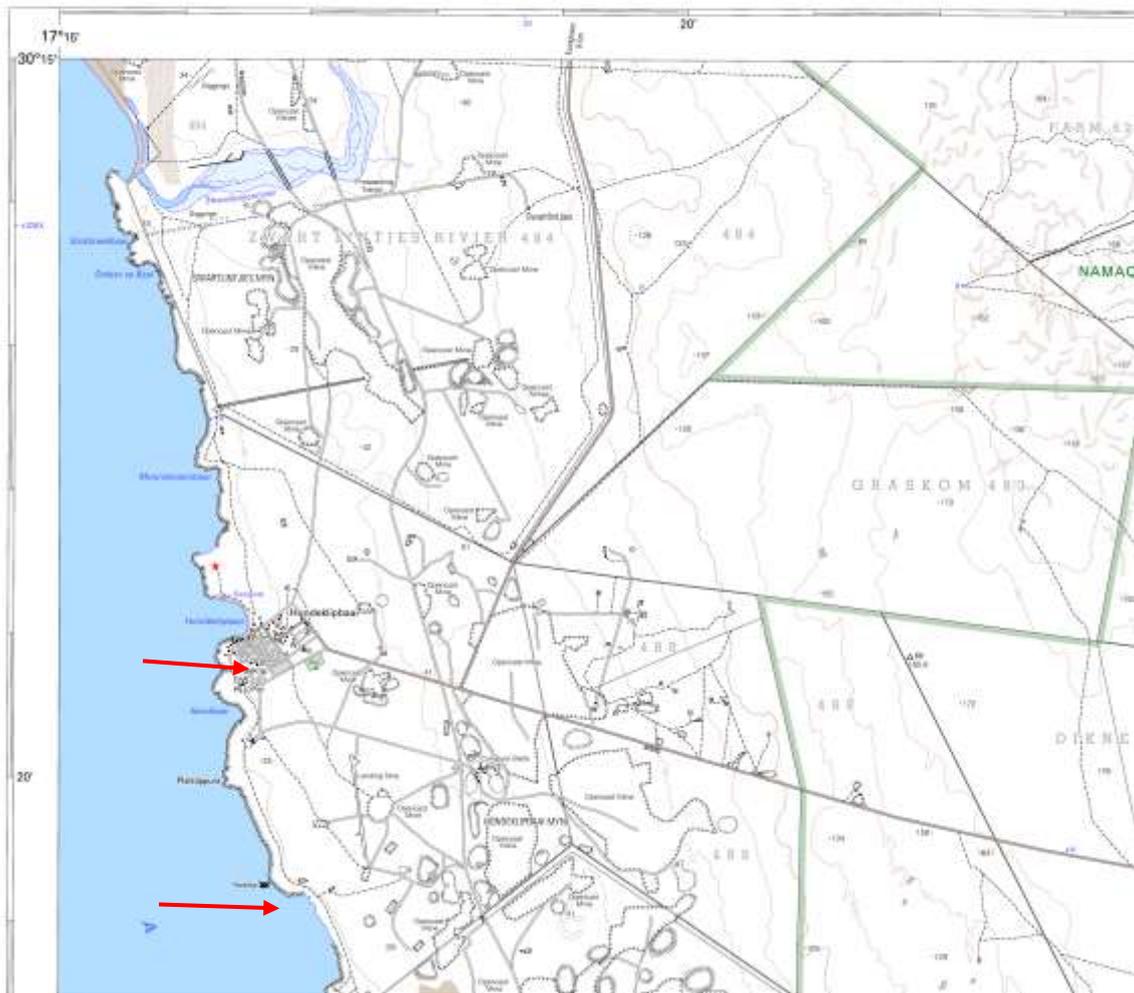


Figure 2. Location of Hondeklipbaai and proposed site areas (arrowed).

Method

As requested, a desk top study of the proposed Hondeklipbaai site area was conducted by Dr G. Avery Archaeozoologist (Figures 1, 2). The 1:250 00 Geological Series 3017 Garies map and geological sources were consulted for background information (Figures 3 and 4). Literature, including the unpublished dissertation of Pether (1994), was consulted (Figure 5).

The focus here has been to illustrate the potential of sub-surface sediments through the geological context and observations in the general vicinity.

Results of the Study

Geology and lithology

The geology of the area is shown on Figure 3 (Nm = gneiss; Qh = pale-red to red dune sand; Tgr = semi-consolidated red sandy soil; Qsc = heavy metal sand; Qsd = loamy brown sand; Qsw = stabilized white to pale-red plume sand with remobilized plume sand) and Figures 4 (De Beer 2010) and 5 (Pether 1994). Bedrock is Garies subgroup gneiss, which is especially

evident as outcrops on the coast and around the existing hatchery. Mid-Pliocene to Lower Pleistocene) marine and terrestrial sediments of the 50 m and 30 m Packages occur locally further inland. Holocene aeolian cover sand occurs at the coast. Beach deposits laid down by the mid-Holocene 2 m to 3 m high sea level occur. Such deposits may underlie the Aristeia site. Deeper deposits, such as those excavated during mining operations, are unlikely to be significant this close to the coast.

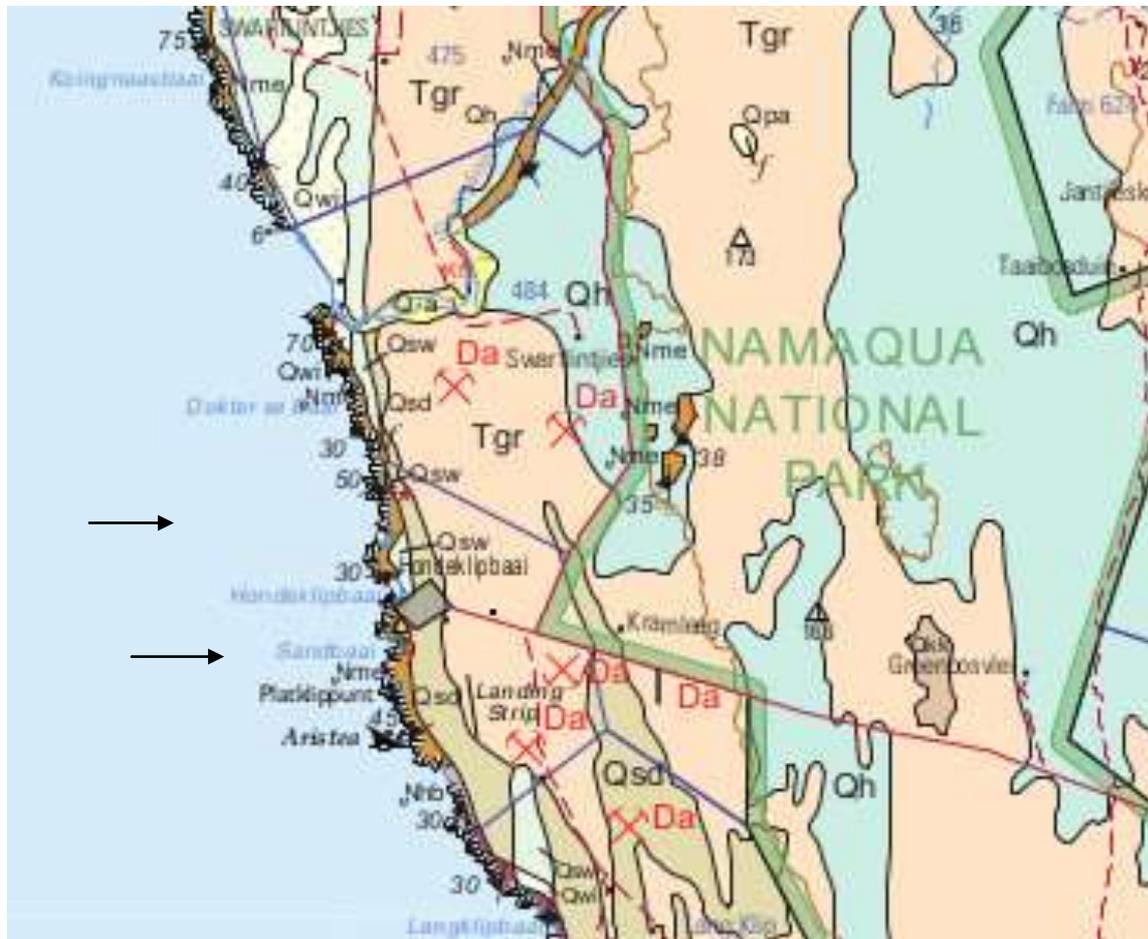


Figure 3. Surface geology excerpted from 1:250 000 Geological Series 3017 Garies. The approximate locations of the sites are arrowed.

The regional stratigraphic sequence is shown on Figure 4.

TABLE 10.1 – LITHOSTRATIGRAPHY OF THE CENOZOIC WEST COAST GROUP ON 3017 GARIES.

AGE		LITHOLOGY AND FAUNAL CONTENT		DEPOSITIONAL ENVIRONMENT		LITHOSTRATIGRAPHIC UNIT	
QUATERNARY	Holocene	Alluvium		Fluvial			
		Quartz scree		Colluvial			
		Heavy-mineral sands		Beach			
		White shelley sand		Beach and plume		Witzand	
		Light-brown loamy sand		Interdune		Swartduine Formation*	
	Pleistocene	Unconsolidated, but stabilised white to pale-red sand. In places reworked into active dunes.		Aeolian dune plume, reworked plume		Swartlintjies Formation*	
		Cobble and boulder conglomerate, grit, extant cold-water molluscan fauna, heavy-mineral sands, calcrete	Unconsolidated pale-red sand	Marine (storm-beach, beach, upper-shoreface and lower-shoreface) deposits	Aeolian	Curlew Strand Formation*	Hardeviel Formation
		Unconsolidated red sand		Aeolian, derived from earlier deposits		Koekenaap Formation	
		Calcareous and gypsiferous reddish granitic soil, intermittent calcrete horizons, dorbank		Colluvium, hill wash, fluvial, aeolian		Panvlei Formation*	
		Semiconsolidated red clayey sand, rare aeolian cross-bedding.		Aeolian		Graauw Duinen Formation*	
NEOGENE	Pliocene	Marine sand, cobble and boulder conglomerate, grit, phosphorite pellets, heavy-mineral sands. Extinct warm-water molluscan fauna.		Marine (storm-beach, beach, upper-shoreface and lower-shoreface) deposits		Alexander Bay Formation	
						Hondeklip Bay Member* (30-m Package)	
	Miocene					Avontuur Member* (50-m Package)	
PALAEOGENE	Oligocene	Calcifed and silicified gravel and sandstone		Fluvial		Koingnaas Formation*	
		Silicified angular conglomerate and sandstone		Scree and hill-wash deposits		De Toren Formation*	

Figure 4. The regional lithostratigraphy figured in De Beer (2010) * indicates names not at that time accepted by SACS.

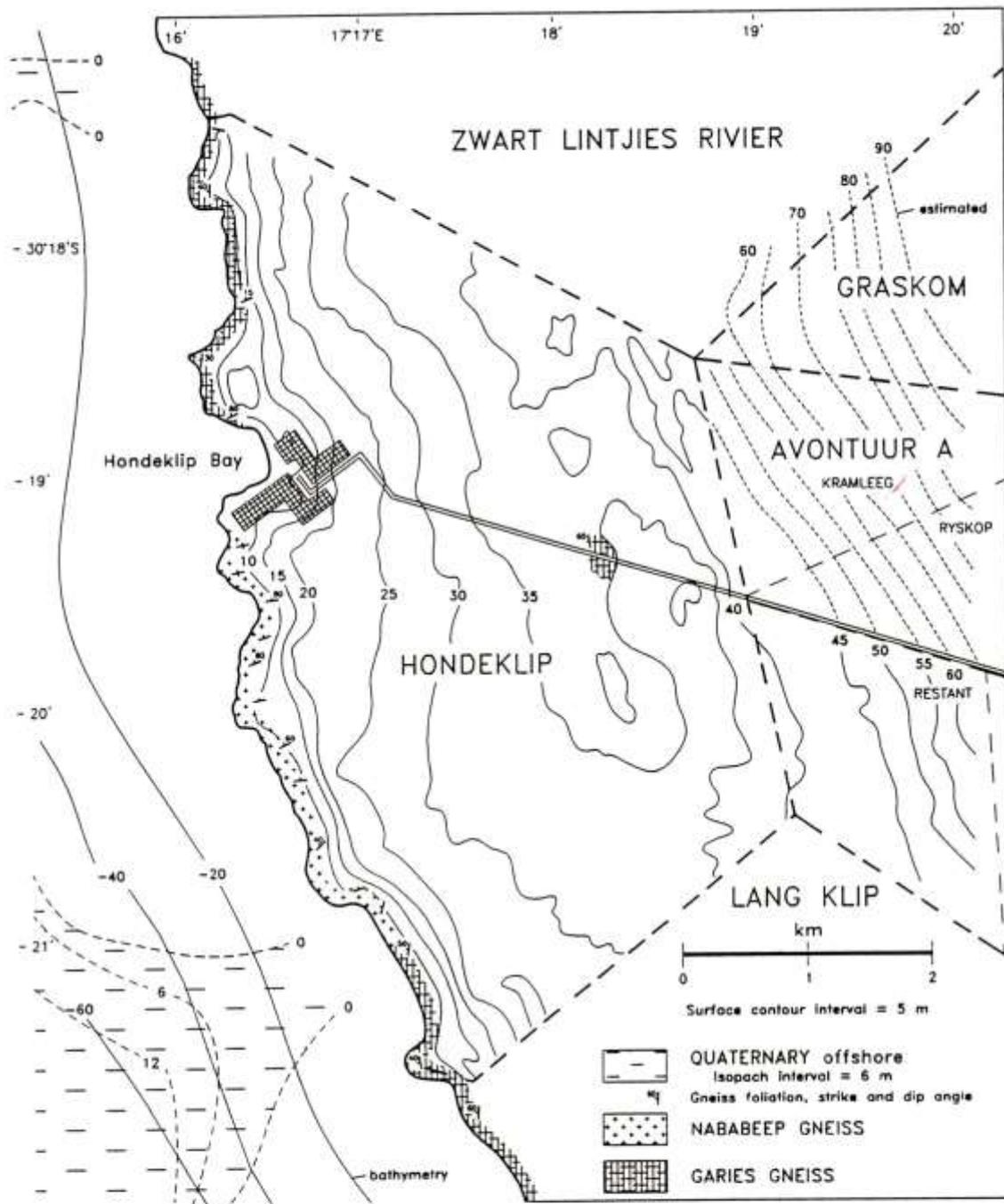


Figure 4.2 The study area. Surface topography and geology of the exposed gneissic bedrock, offshore bathymetry and offshore sediment thickness. Topography courtesy of the Trans Hex Group Ltd. Bedrock geology from Jack (1980). Offshore data from O'Shea (1971).

Figure 5. Figure from Pether (1994) showing proximity of two types of gneiss to the shore and the proposed sites. The contours support the contention that little depth of sediment is likely to exist between the surface and bedrock.

Description of proposed sites

Existing Pilot Hatchery site

The existing site in the Town of Hondeklipbaai is disturbed and virtually on bedrock, which outcrops nearby. J. Orton notes that fill has been introduced. Furthermore, the 2 m to 3 m mid-Holocene high sea level is likely to have inundated and may have removed any earlier deposits. It is therefore unlikely that intact material other than possible mid-Holocene beach deposits will have survived.

Aristea Site

This site is relatively undisturbed. The surface is covered by Holocene Witzand Formation aeolian sand (low dunes) and is sparsely vegetated. Given its proximity to the coast, it is unlikely that the sediments over bedrock reach any significant depth. The 2 m to 3 m mid-Holocene high sea level is likely to have inundated and removed any earlier deposits. It is very possible that intact mid-Holocene beach deposits will have survived. Orton mentions this in his HIA Report.

Palaeontological Potential

The Hondeklipbaai sites are situated in a palaeontologically sensitive and important area of the west coast (Roberts, et al. 2009; Pether 1994).

"The exposures in diamond mines on the Namaqualand west coast of South Africa provide a rare opportunity to examine a record that is normally inaccessible beneath a thick cover of aeolian sands" (Pether 1994).

Iziko South African Museum's Cenozoic Palaeontology section holds marine vertebrates, molluscs and invertebrate trace fossils (burrows) and terrestrial vertebrate fossils from the Hondeklipbaai area in its collection (Carrington and Kensley 1969; Kensley and Pether 1986; Pether 1994).

Thus, excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that enable observations otherwise impossible to be made.

No reference to surface palaeontological material specifically on the Hondeklipbaai sites was found, although fossils have been recorded further inland (Carrington and Kensley 1969; Kensley and Pether 1986; Pether 1994; Orton and Webley 2012). Since the proposed Hondeklipbaai hatchery site has been disturbed, its palaeontological potential may be minimal, although it is not possible to exclude the possibility that fossils may occur there. It is possible that fossils or sub-fossils of interest could be encountered during any excavation that cuts into any underlying sediments that have been preserved.

In addition, small pockets of bone can occur, for instance, where bone accumulators like hyaenas, Jackals or porcupines used holes/burrows dug by aardvarks; older and younger younger sediments, too, may contain ancient wetland deposits and/or more-recent fossils. In addition to fossil bones and molluscs, there is the potential for encountering macro-plant remains and pollens of considerable age in wetland deposits. Thus, foundations excavated into sediments on the Hondeklipbaai sites may intersect fossil-bearing deposits. If so, there

is the potential to provide opportunities for observations not otherwise accessible to researchers.

Such probabilities could be better assessed if location of sub-surface infrastructure (e.g. foundations and/or septic tanks, and geotechnical information and details of the depth to which any excavations will extend, were available. They would greatly assist in assessing estimating whether and where monitoring may be necessary during construction.

Although not near the proposed sites, Orton and Webley (2012) note that they found a Middle Stone Age occurrence near Kleinzee with bones. The presence of mineralized bones of this period points to earlier human and/or hyaena activity in the region. Boegoeberg to the north revealed a Pleistocene hyaena den (Klein et al. 1999) and a similar occurrence has been located near Brand se Baai to the south. Information available suggests, however, that such occurrences are unlikely to be encountered in the proposed localities.

Essentially the deeper the cover and underlying sediments, the higher the possibility that fossil remains may be found. The possibility exists that beach deposits of the mid-Holocene high sea level may exist under the surface of the Aristeia site – indeed, Orton notes the possible existence thereof in his HIA Report.

Comments

Based on its geology and regional finds in Iziko Museums of South Africa collections, the Hondeklipbaai sites may have palaeontological potential. The likelihood of this is small on the proposed sites, however, although the possible occurrence of remnants of the mid-Holocene high sea level beach is noted. Nevertheless, with limited information available on the recorded occurrence of fossils on the proposed sites, good communication with contractors and on-site monitoring during excavations will be required to minimise any potential loss.

More systematic mitigation may be required if the context of any fossil material encountered warrants more than just recording and collection.

Conclusion

While no direct fossil evidence was found for the Hondeklipbaai sites, this does not mean that potential is lacking. Excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that enables observations to be made on geology, past sea levels, climates, environments and biodiversity, that would otherwise be impossible.

Palaeontological remains are often rare and, if encountered, must be recorded by an appropriately qualified person. As examples of potential, the richness of the globally important Langebaanweg (West Coast Fossil Park) fossil landscape (Hendey 1981) and the Swartklip hyaena accumulation (Klein 1975) and their important contributions to knowledge should not be lost sight of.

The Aristeia site may hold palaeontological material in mid-Holocene beach deposits and underlying sediments.

Given the known palaeontological potential of the area, mitigationary action, beyond simple recording and recovery during monitoring, including the possibility of systematic excavations, while unlikely, may be necessary.

Provided that the recommendations in this report are followed, current information indicates that the proposed development will not impact significantly on palaeontological remains. Appropriately conducted the development may provide opportunities to access rare fossil material and to better understand the local geological sequence.

Impacts

Existing Pilot Hatchery site:

Impact is likely to be minimal, to zero and manageable.

Aristea Site:

Impact is likely to be minimal and manageable.

Provided that the recommendations herein are adhered to the proposed development can be allowed to proceed from the palaeontological perspective.

Recommendations

Bulk earth works and excavation for foundations/infrastructure should be monitored by a palaeontologist or archaeologist with appropriate palaeontological knowledge. The frequency of this to be worked out *a priori* with the contractor to minimize time spent on site.

If possible, geotechnical information together with the proposed locations and depths of excavations for foundations and/or infrastructure should be provided prior to the commencement of construction. This may enable a better estimation of the time(s) when monitoring would be necessary.

Protocols for dealing with palaeontological/palynological (fossil pollens) monitoring and possible further mitigation must be included in the Environmental Management Plan (EMP).

Should remnants of the mid-Holocene beach be encountered, an appropriate sample, for faunal identification and one radiocarbon date (^{14}C), must be recovered. Any material recovered will be lodged in the collections of Iziko South African Museum.

Funds must be available *a priori* to cover costs of fieldwork and one date should the need arise.

Palaeontological Points for EMP

- The requested test excavation by archaeologist (Aristea Site) will provide an opportunity to assess the sub-surface palaeontological potential of the site. This should include testing to establish whether mid-Holocene high sea level beach material is present.
- All fossils are protected by law. Should anything of a palaeontological/palynological nature be found on site by the Contractor (or any other party), e.g. bones not previously visible, work is to be stopped in that area immediately, and the OM / Principal Agent notified. Failure to do so will result in a penalty and this must be

carefully explained to workers during the Environmental Education Programme undertaken by the OM.

- The OM will advise on demarcation of this area and notify a relevant specialist (palaeontologist/archaeologist with appropriate experience) to view material and ascertain whether further study of the area is required.
- Should a specialist confirm a genuine fossil or sub-fossil and recommend further study of the area, work in the applicable area is to cease until further notice. SAHRA is to be informed immediately by the OM.
- Should any human remains be disturbed, exposed or uncovered during excavation, these shall immediately be reported the South African Police Service and, if suspected that the remains are older than 60 years, the SAHRA (tel 021 462 4502).
- The removal of discovered palaeontological remains, by a contracted specialist shall be at the Developer's expense. This will include the contingency to date one beach sample, if found.

Heritage Permits Required

The primary heritage legislation that needs to be considered is The South African Heritage Resources Act 25 of 1999 and regulations (details at www.sahra.org.za). All heritage material, including human burials, is included.

Clearance in terms of the National Heritage Act of 1999 will be required before the development can proceed. Locally, a permit will be required from the South African Heritage Resources Agency (SAHRA) and/or the relevant Provincial Heritage Agency for the Northern Cape; in the event of a burial being exposed; potential delays could be minimized by obtaining this before construction is initiated.

If human remains are encountered, the South African Heritage resources Agency (SAHRA) must also be contacted immediately; no bones may be further moved until an archaeologist or appropriately-qualified palaeontologist has assessed them and permission of SAHRA is granted. SAHRA must be contacted immediately through the appointed archaeologist and laid down procedures, including notification of the SAPS, must be followed.

References

Carrington, A.J. & Kensley, B.F.

1969 Pleistocene molluscs from the Namaqualand coast. *Annals of the South African Museum* 52(9): 189-223.

De Beer, C.H.

2010 The geology of the Garis Area. Explanation: Sheet 3017 Garies Scale: 1:250 000. Council for Geosciences.

Hendey, Q.B.

1981 Palaeoecology of the Late Tertiary fossil occurrence in 'E' Quarry, Langebaanweg, South Africa, and a reinterpretation of their geological context. *Annals of the South African Museum* 84(1):1-104.

Kensley , B.F. & Pether, J.

1986 Later Tertiary and Early Quaternary fossil Mollusca of the Hondeklip area, Cape Province, South Africa. *Annals of the South African Museum* 97(6): 141-225.

Klein, R. G.

1975 Paleoanthropological implications of the nonarchaeological bone assemblage from Swartklip I, South-Western Cape Province, South Africa. *Quaternary Research* 5: 275-288.

Klein, R. G., K. Cruz-Uribe, et al.

1999 Paleoenvironmental and Human Behavioral Implications of the Boegoeberg 1 Late Pleistocene Hyena Den, Northern Cape Province, South Africa. *Journal of Archaeological Science* 52(3): 393-403.

Orton, J. & Webley, L.

2012 Heritage impact assessment for the proposed Project Blue Wind ENergy Facility, Kleinzee, Namakwa Magisterial District, Northern Cape. Unpublished report prepared for Savannah Environmental (Pty) Ltd. Diep River: ACO Associates cc.

Pether, J.

1994 The Sedimentology, Palaeontology and Stratigraphy of Coastal-Plain Deposits at Hondeklip Bay, Namaqualand, South Africa. Unpublished MSc Thesis, Dept of Geology, University of Cape Town.

Roberts, D.L., et al.

2009 Coastal Cenozoic deposits. In *Geology of South Africa*. M.R. Johnson, C.R. Anhaeusser, and R.J. Thomas, eds. Pp. 605-628. Cape Town: Geological Society of South Africa & Council for Geoscience.



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