



DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

Archaeology, Palaeontology and Meteorites Committee  
Heritage Western Cape  
Protea Assurance Building  
Green Market Square  
Cape Town, 8000

December 22, 2018

RE:

CASE NUMBER 130701TS06, EXPIRATION DATE 23/02/2019  
ARCHAEOLOGICAL PERMIT: EXCAVATION COLLECTION AND ANALYSIS OF  
ARCHAEOLOGICAL MATERIALS FROM KNYSNA EASTERN HEADS CAVE 1 (KEH1),  
KNYSNA

To the Committee:

On behalf of my colleague Dr. Thalassa Matthews and myself, I am writing to request the renewal of our current archaeological permit for the site Knysna Eastern Heads Cave 1 (KEH1). KEH1 includes a deep archaeological sequence currently dated from > 46 ka through 19 ka, with a particularly dense occupation between 39 and 19 ka, and with artifacts consistent with late Middle Stone Age, early Later Stone Age, and the Robberg industry. Sites in this time range are very rare in the Western Cape, and KEH1 is unique in that it is the only such site to be located at the current coast, and on the edge of the now submerged Palaeo-Agulhas Plain. Thus, KEH1 significantly contributes to our understanding of forager activities in an extinct ecosystem during the environmentally highly variable period leading up to the Last Glacial Maximum. The site also contains a deep sequence (OSL dates pending), the edge of which we have just been able to delineate in August 2018, underlying our AMS radiocarbon-dated section. In addition, the site has a stratified overlying shell midden occupation, for which we now have some detailed stratigraphic information and charcoal samples for dating. KEH1 thus provides evidence of a remarkably long sequence of human occupation from the late Pleistocene through the Holocene.

Our current permit has allowed us to expand upon the archaeological and environmental samples of our initial pilot data, develop a more densely dated chronology using AMS radiocarbon methods, collect and process samples for OSL dating (dates pending), and investigate the horizontal arrangement of hearth features. Analyses of general archaeological and specialist samples are ongoing, and include lithic, faunal, microfaunal, micromorphology, phytolith, and other specialist studies. We have two significant publications in preparation, and have presented information on the site to colleagues and the public through seven invited lectures and eleven conference presentations in both the US and South Africa. We are also working together with a large interdisciplinary research team that is specifically focused on developing a better understanding of the extinct ecosystem of the Palaeo-Agulhas Plain – a project for which KEH-1 provides significant archaeological and environmental context.

The next stage of our research is specifically focused on the critical deep section of the excavation (> 46 ka). These deep KEH-1 units overlap temporally with the upper levels of key MSA sites along the southern coast, most notably – Klasies River, Pinnacle Point, and Klipdrift. Our recent excavations have reached the point at which we could begin to tie KEH-1 directly into the larger regional MSA record. In June and July of 2018, we were able to delineate the edge of the lower intact deposits,

much of which had been covered by a rockfall layer. With this new information, we are poised to access the deep levels of the site. This stage of the research is critical to our ultimate goal of understanding the significance of technological changes between the Middle and Later Stone Age, human responses to the drastically shifting environmental zones of the Late Pleistocene, and the larger regional changes in social networks.

We have secured funding in support of the upcoming field season and the resulting analytical requirements of the next two to three years. We anticipate being able to provide for the project with future grants. The project has also provided, and will continue to provide, training and work opportunities for South Africa students and professional archaeologists.

KEH1 is a significant archaeological locality and has the potential to greatly contribute to our understanding of Late Pleistocene societies of the Western Cape. We would like to renew our permit for excavation, collection, and analysis of archaeological materials from this site in order to fulfill this potential.

Sincerely,



Naomi Cleghorn, Ph.D.  
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Associate Professor of Anthropology  
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Associate Member  
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Nelson Mandela University  
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Cc:

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Natural History Department  
25 Queen Victoria Street  
Cape Town, 8001, South Africa

**REPORT OF ARCHAEOLOGICAL EXCAVATION  
HWC PERMIT CASE NUMBER 130701TS06  
KNYSNA EASTERN HEADS CAVE 1**

**JANUARY 2019**

**PERMIT HOLDERS**

Dr. Thalassa Matthews, IZIKO The South African Museum, Natural History Department, 25 Queen Victoria Street, Cape Town, 8001, South Africa

Dr. Naomi Cleghorn, University of Texas at Arlington, Dept. of Sociology and Anthropology, 601 S. Nedderman Dr., Suite 430, Arlington, Texas, 76019, USA

## INTRODUCTION

The archaeological site at **Knysna Eastern Heads Cave 1 (KEH 1)**, see Figure 1) was identified in 2012, and excavated under HWC permit 2237 beginning in December of 2013. This permit was renewed in 2016 and is currently valid through February 23<sup>rd</sup>, 2019. To date, a total of twenty-seven weeks of excavation have been completed – primarily in July and August each year of 2015 through 2018. The study of KEH 1 is a multidisciplinary project involving research scientists from South Africa, the United States, Canada, Brazil, Spain, and Australia. In addition, more than two dozen students from four countries, including South Africa, have participated in the associated research and fieldwork. The KEH-1 project is funded through grants from the U.S. National Science Foundation, the Leakey Foundation, the Templeton Foundation, the University of Texas at Arlington, the Hyde Family Foundation, and private U.S. donors. Initial results have been presented at conferences and workshops in the U.S. and South Africa, and peer review publication is in preparation.



Figure 1: Map showing the location of KEH 1 together with other MSA and LSA localities.



Figure 2: KEH 1 during July 2015 excavation

### OVERVIEW OF KEH 1

KEH 1 is a south-facing coastal cave located about 23 m above mean sea level on the south coast of South Africa, a short distance east of the Knysna Heads (Figure 2). The site is the highest of four adjacent caves and rockshelters cut by wave action and erosion into an escarpment of Table Mountain Sandstone. The visible interior of KEH 1 includes a single chamber, about 10 m wide by about 5 m high at the mouth, and about 20 m long from the mouth to the back wall. Sediments within the cave are at least 5 m thick and include dense archaeological accumulations. A steep active erosional slope of about 35° exposes the stratigraphic sequence of sediments across the western half of the cave mouth.

Our goal in excavating KEH 1 is to develop a high-resolution temporal sequence to understand human adaptation to Late Pleistocene environmental change along the southern coast. Initial AMS radiocarbon results from four charcoal samples date the excavated portion of the site between ~ 44 kya and ~ 19 kya (calibrated). This period (particularly between 45 and 25 kya) is relatively poorly documented in the archaeological record of the Western Cape. In fact, KEH 1 is the only such sequence from the current coast and therefore provides a unique window onto forager behavior on the now submerged Agulhas Bank.

## EXCAVATION OVERVIEW

Excavation at KEH 1 occurred between 2013 and 2018. The first two excavations (December 30<sup>th</sup>, 2013 to January 14<sup>th</sup>, 2014 and July 1<sup>st</sup> to July 7<sup>th</sup>, 2014) were short tests focused on developing a long sequence through the western section of the erosional face. The goal was to obtain initial dates, find distributions, general technological characteristics, and an understanding of the stratigraphic sequence. Our preliminary conclusions were that the tested portion of the sequence dated from ~44 kya to ~19 kya, sampling the poorly known period of the MSA/LSA transition, and thus the site merited more intensive investigation. For this reason, we conducted a larger excavation from July 13<sup>th</sup> to August 21<sup>st</sup>, 2015. The goals of the 2015 excavation were to connect sections of the long western sequence that we were unable to bridge in 2014, to develop a dense sequence of AMS dates, to undertake a micromorphology analysis of sediments, to increase lithic and faunal sample sizes, and to expand the excavation to the east to investigate the horizontal distribution of hearths and related features. Subsequent excavation seasons (2016 – 2018) allowed us to vertically expand our long section on the west side of the cave, greatly expand the horizontal extent of the excavation (a critical part of our analysis of the large number of hearth features), and build up find samples large enough to produce statistically significant results.

Excavation procedures followed standards originally developed over more than a decade of excavation at the Pinnacle Point locality in Mossel Bay. Multiple total stations and a GPS base station and RTK rover system were used to map the topography in and around the cave. Control points established outside the cave linked the excavation grid to Universal Transverse Mercator (UTM) system, Zone 34 South, and ellipsoidal heights were converted to orthometric heights using the Trignet INTGEOID (SAGeoid2010) ellipsoidal conversion utility. The UTM grid was thus used as the 1m<sup>2</sup> excavation grid for KEH 1 (Figure 3). Thirteen permanent control points within the cave were used to establish total station orientation and three-dimensional position for all data. All archaeological data were collected and analyzed using ESRI ArcGIS and Microsoft ACCESS databases.

Using the natural erosional slope at the mouth of the cave, we were able to sample vertically through the area of interest without undercutting or disturbing a stratigraphically higher shell midden component. The 2 m by 0.5 m excavation area is parallel to the dip of the slope (cutting directly into this face), and exposed more than 2 m of vertical section in steps (Figure 4). In 2015, we opened a second excavation area east of the original section (see Figure 3). The eastern area provides more information about the spatial distribution of features within the upper part of the stratigraphy.

The site was excavated stratigraphically within quadrants of the grid. Stratigraphic Units (or SU, within a grid square) and Lots (within a quadrant of a square) were identified on the basis of sediment characteristics (e.g., color, texture, and natural inclusions) as well as find density. For particularly thick, homogenous portions of the deposit, stratigraphic control was retained by arbitrarily dividing units into 5 cm horizontal spits when archaeological finds were present, and 10 cm spits when sediments were sterile. The base of each SU was record by total station and photographically recorded in the section profile. High resolution photographs were taken mid-way through the excavation of each Lot.



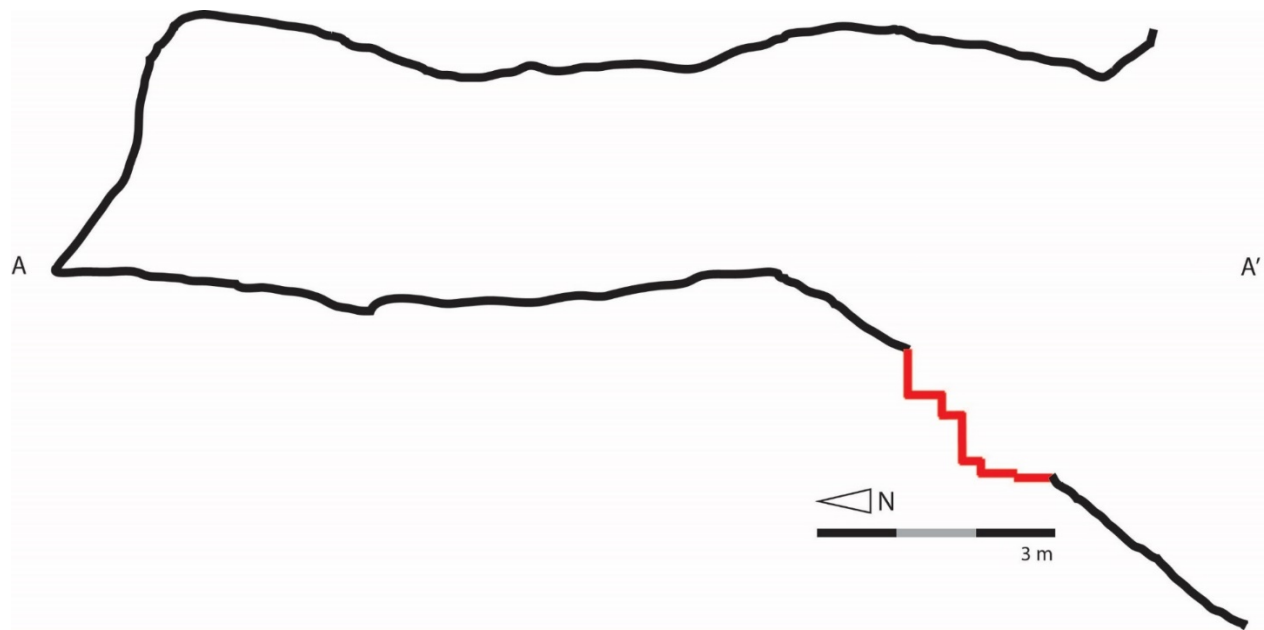


Figure 4: Profile of cave interior and area of excavation (in red) along the west wall of the deep section shown in Figure 3.

All finds (without size limit) were recorded *in situ* using a total station and were then collected in barcode-labeled bags. All sediments were wet sieved using graduated screens (10mm, 3mm, and 1.5mm sieve sizes), and a 1 L sample from each SU was processed by floatation to sample for macrobotanical remains. Finds recovered by sieve are currently being sorted at the Diaz Museum in Mossel Bay. Small sediment samples of ~100g were collected from each Lot in order to retain an archive of sediment characteristics. In addition to artifacts and faunal specimens, collected finds included charcoal (which is well-preserved at the site) and small samples of sediment from hearth areas retained for phytolith analysis.

### STRATIGRAPHY

There are three distinct accumulation components within the cave (visible in the erosional slope): an upper shell midden (a shell-supported matrix), a rock fall layer, and an underlying deposit that includes anthropogenic material. Table 1 presents a hierarchical overview of the major depositional units within the cave. The dense shell midden (hereafter, the Upper Component) is between 1.5 and 2 meters deep, and forms the modern floor of the cave chamber. In the interior chamber of the cave, five scooped-out circular features, 1.5 to 2 m in diameter and about 30 cm deep appear to be old excavations into the Upper Component. The process that produced these features is not clear, but is more likely to be biogenic than geogenic. The rings are too large to be drip-related and we observed that the cave ceiling is relatively dry even during periods of high humidity. Therefore, we speculate that these features may be anthropogenic excavations, and related to occupation of the cave or to 19th century antiquarian activities (pers. comm. Judy Sealy and Tim Maggs, August 10th, 2015). A modern campfire structure within the cave attests to the continued use of this site by Knysna residents.

In the deposit underlying the shell midden, we have excavated four major stratigraphic aggregates (*sensu* Karkanas et al. 2015) dated by AMS on charcoal and shell. From the base of the



excavation, these are the Dark Brown Spally (DBS) dating from > 46 ka to ~34 ka, the Dark Shelly (DS) dating from ~32 ka to ~29 ka, the Dense Hearth Aggregate (DHA) dating from ~26 ka to ~22 ka, and the Orange-Brown Sandy (OBS) dating to ~19 ka. Several of these dates are taken from within units, thus gaps between units do not necessarily indicate hiatuses. In 2017 and 2018, we connected these underlying units to the upper component (shell midden), in the process exposing at least one additional stratigraphic aggregate (mostly sterile). Dates for this upper sequence are still pending.

More than 30k finds plotted by total station during excavation have been identified to type (i.e., ~ 69% of all plotted finds excavated). There is a clear trend from very low density of finds in the Dark Brown Spally (> 46 ka to ~34 ka), a jump in density in the Dark Shelly (by 32 ka), and peak density in the Dense Hearth Aggregate (~26 ka to ~22 ka). The initial increase in density in the Dark Shelly is largely driven by an influx of shell fragments (Fig.2). Preliminary analysis of these by A. Jerardino demonstrates they are marine, and largely rocky intertidal in origin. Shell taphonomy and species suggests the coast was probably within 5 km of the site (Jerardino, pers. comm.), and certainly within a daily foraging radius of 10km. By contrast, terrestrial fauna and lithics drive the great increase in find density in the Dense Hearth Aggregate. Terrestrial fauna and lithics are also significant components in the Orange-Brown Sandy (~19 ka), although overall find density falls precipitously. A small carnivore microfauna midden (identified by T. Matthews) in the Orange-Brown Sandy also attests to the lower intensity of site use during this period.

In addition to the density of individual finds, features such as hearths are a proxy for intensity of site use. To date, about 50 individual hearth features have been identified within the 0.46 m<sup>3</sup> of the excavated Dense Hearth Aggregate level. These hearths are densely stacked and occur horizontally across the full 3.5 m extent of the excavation. Most of the hearths are very well preserved, with distinct ash, carbonized, and sometimes rubified components, and many preserve a clear circular bowl shape. They vary from ~0.3 to 1 m in diameter. There are no identifiable hearths known from the Dark Shelly, although the matrix suggests they were present (X. Villagran, pers. comm.). There is one hearth currently known in the lowest unit – the Dark Brown Spally.

Table 1: Summary stratigraphic scheme of KEH 1

Site Components	Aggregates	Subaggregates
Upper Component (UC)	Shell midden	
	Brown Sandy Clay	
Rock fall		
Lower Component (LC)	Orange Brown Sandy (OBS)	OBS-1 OBS-2
	Dense Hearth Aggregate (DHA)	DHA-Upper DHA-Lower
	Dark Shelly (DS)	
	Dark Brown Spally (DBS)	DBS-Upper DBS-Lower



Figure 5. Current extent of excavation. Photo date: July 11, 2018



Figure 6. Current extent of excavation, showing long section along west wall. Photo date: July 11, 2018



Figure 7. Site excavation. Photo date: June 20, 2018



Figure 8. End of season sand bag barrier. Photo date: July 13, 2018

## **Previous and ongoing analyses and SAHRA export permits**

### *AMS dating:*

Nineteen charcoal and one identified shell sample have been exported for AMS radiocarbon dating at multiple labs (including Oxford University, University of Georgia, and BETA Analytic). Sixteen of these samples successfully produced dates. SAHRA permits 1279, 2298, and 2525 apply. This analysis is destructive.

### *OSL dating:*

A total of 12 OSL samples have been exported to the University of Wollongong for OSL analysis. A thirteenth OSL sample is awaiting export and has a permit. SAHRA export permits 2703 and 2801 apply. This procedure is destructive to sediment samples.

### *Micromorphology:*

Analysis and preparation of samples is ongoing for 11 micromorphology samples. SAHRA export permits 2211 and 2448 apply. This sampling is destructive, but samples are to be returned to the KEH-1 collection upon completion of analysis.

### *Other analyses:*

In addition, fauna, microfauna, lithics, mineral pigments, ostrich eggshell, shell, and phytolith analysis is currently ongoing within South Africa at the Diaz Museum in Mossel Bay, Izikiko in Cape Town (microfauna), and at the University of Witwatersrand (phytolith).

## **Conservation Plan**

The excavation area of KEH-1 is located on a 35° erosional slope at the mouth of the cave. Prior to our work at KEH-1, we observed signs of active erosion on this slope and on the access path to the cave, probably as a result of public use of the cave (it is well known locally). Each season of excavation (typically 6 to 8 weeks per year), we have worked to stabilize the erosional slope without impeding access to the cave, or affecting the perspective from the interior of the cave. We have used more than 500 military grade sandbags filled with clean builders sand to stabilize and protect all surfaces, including the access path to the site. At the end of each season, we fill in and cover the full extent of the excavation area with a minimum of two layers of sandbags. In the deeper parts of the excavation, sandbags are used to fill and stabilize walls, and fill to grade with the slope. We inspect our sandbags yearly, and replace those that have degraded. We have observed that the outer layer of sandbags tends to harden to a cement-like structure, protecting the underlying bags. These protected bags have largely been well-preserved for the duration of the time we have been digging at the site. We plan to continue this process of stabilization over the long term. The MAPCRM archaeological firm (based in Mossel Bay) has agreed to assist me in checking the site annually and making any necessary repairs in the years following the completion of excavation.

## FUNDING OBTAINED FOR PAST & CONTINUING RESEARCH

- 2018 – 2022 Hyde Foundation Grant
- 2015 – 2017 “Long Term Human Response to Sea Level Change”  
National Science Foundation Grant, Cleghorn, N. (P.I.)
- 2014 – 2016 “Investigating a rare Early Later Stone Age site at Knysna, South Africa”  
Cleghorn, N. (P.I.) Leakey Foundation Grant
- 2013 – 2017 “The Evolutionary Foundations of Human Uniqueness”  
Templeton Foundation Grant to Institute of Human Origins (ASU),  
Cleghorn, N. (Senior Researcher)
- 2013 – 2014 “The origin of modern human behavior and cognition in coastal Southern Africa”  
UTA Research Enhancement Program Grant, Cleghorn, N. (P.I.)

## PRESENTATIONS ON KEH-1 RESEARCH

- 2018 Keller, H.M., Cleghorn, N.E., Hodgkins, J., 2018. The Fauna of KEH-1 (South Africa) A Middle and Later Stone Age site: A Pilot Study. Presented at the Annual Meeting of the Society for American Archaeology, Washington, D.C., April 12, 2018.
- 2018 Cleghorn, N., Keller, H.M., McGrath, J.R., Shelton, C., Watson, S., Schoville, B.J., Peart, D., Bickerton, N., Esteban, I. Assessing the development of societal complexity at the Middle to Later Stone Age transition in the context of the Economic Defensibility Model: Evidence from Knysna, coastal South Africa. Presented at the Annual Meeting of the Paleoanthropology Society, Austin, Texas., April 10, 2018.
- 2018 Cleghorn, N.E., Life’s a Beach! The emergence and persistence of coastal foraging in early modern human evolution. Invited Presentation in the Center for Anatomical Sciences, University of North Texas Health Sciences Center, April 20, 2018.
- 2018 Marean, C.W., Cleghorn, N.E., From Pinnacle Point to Knysna: Building a High Resolution Sequence of Modern Human Origins. Invited presentation at the Hessequa Society, Still Bay, South Africa, March 8, 2018.
- 2017 Cleghorn, N. Sea level change and human resilience on the south coast of Africa. Invited presentation at the Arlington Technology Association lecture series. May 4th, 2017.
- 2017 Cleghorn, N., Villagran, X., Schoville, B., Peart, D., and Keller, H. Hearth Features at Knysna Eastern Heads Cave 1, Southern Coast of South Africa. Poster presented at the 82nd Annual Meeting of the Society for American Archaeology, Vanouver, B.C., March 31, 2017.
- 2017 Sender, R., Peart, D., Keller, H., and Cleghorn, N. Ostrich Eggshell Taphonomy and Distribution at Knysna Eastern Heads Cave. Poster presented at the 82nd Annual Meeting of the Society for American Archaeology, Vanouver, B.C., March 31, 2017.
- 2016 Peart, D., Watson, S., Keller, H. and Cleghorn, N. Variation in Site Use through Time: Find distribution at Knysna Eastern Heads Cave 1, (Western Cape, South Africa), from Marine Isotope Stage 3 through the Last Glacial Maximum. Abstract submitted for the 81st Annual Meeting of the Society for American Archaeology, Orlando, April 6 – 10, 2016.

- 2015 Cleghorn, N. The Future of the Knysna Archaeology Project. Paper presented at the meeting of the Paleoscape II Workshop, The California Academy of Sciences, San Francisco, April 19th, 2015.
- 2015 Cleghorn, N., Matthews, T., & Shelton, C. The Blind Spot: An Early Later Stone Age perspective on the Agulhas Bank from Knysna Eastern Heads Cave 1, South Africa. Paper presented at the 80th Annual Meeting of the Society for American Archaeology, San Francisco, April 18th.
- 2015 Cleghorn, N. Shifting shorelines and changing landscapes: human strategies in the Late Pleistocene on the southern coast of South Africa. Invited Colloquium Presentation in the UTA Department of Earth and Environmental Sciences, Geosciences Program. March 19<sup>th</sup>, 2015.
- 2014 Cleghorn, N. New Stone Age Localities in Knysna, Western Cape, South Africa. Paper presented at the Paleoscape II workshop, Nelson Mandela University, George, South Africa. July 5th- 11th.
- 2014 Cleghorn, N. & Shelton, C. A new Stone Age site near the Knysna Eastern Heads, Western Cape, South Africa Paper presented at the 79th annual meeting of the Society for American Archaeology, Austin, TX, April 23 – 27.
- 2014 Cleghorn, N., Wilkins, J., Shelton, C., Schoville, B., Richardson, L., & Phillips, L. New Stone Age localities near the Knysna Heads, Western Cape, South Africa. Poster presented at the 23rd Annual Meetings of the Paleoanthropology Society, Calgary, Alberta, Canada, April 8-9. Poster available on-line at: <http://www.paleoanthro.org/meetings/2014/>
- 2014 Cleghorn, N. New Stone Age Localities in Knysna, Western Cape, South Africa. Invited presentation for the SACP4 archaeological project, Pinnacle Point, South Africa, May 21<sup>st</sup>, 2014.
- 2014 Cleghorn, N. The Origin of the Human Mind and the Stone Age of South Africa. Invited Presentation to the Tarrant County Archaeological Society. March 13<sup>th</sup>, 2014.

#### REFERENCES CITED

- Karkanias, Panagiotis, Kyle S. Brown, Erich C. Fisher, Zenobia Jacobs, and Curtis W. Marean  
 2015 Interpreting human behavior from depositional rates and combustion features through the study of sedimentary microfacies at site Pinnacle Point 5-6, South Africa. *Journal of Human Evolution* 85:1–21. DOI:10.1016/j.jhevol.2015.04.006.



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## Re: Update

### Woodbourne Resort [w48@mweb.co.za]

**Sent:** Tuesday, June 18, 2013 7:03 AM

**To:** Cleghorn, Naomi

Dear Dr Cleghorn.

Thank you for your e-mail. As we discussed in my telephone call I confirm that I will permit you and your assistants at your own risk access to the cave situated on my property (KEH1) via Coney Glen along the shore, to map the site and do test excavations and to proceed with the test excavation permit.

Best wishes.  
Jean Duthie

----- Original Message -----  
 From: "Cleghorn, Naomi" <cleghorn@uta.edu>  
 To: "Woodbourne Resort" <w48@mweb.co.za>  
 Sent: Saturday, June 15, 2013 10:37 PM  
 Subject: Update

Dear Mrs. Duthie,

Today (Saturday), my assistants and I spent most of the day mapping the topography of the sea cave and the immediate surroundings. We did this using laser survey equipment and a GPS receiver. It was a very successful session, although we will need at least one or two more days out there to really finish our initial 3D model of the cave. We will probably not be able to return for one or two weeks to do this. A group of fishermen came out while we were there, but didn't seem interested in what we were doing there. Please let me know if you would like photos of our work - I'd be happy to send some, but don't want to clog up your email.

Did you receive my previous email regarding our access to the site? If at you have a chance, could you please send me an email confirming your permission for us to proceed with the test excavation permit?

Thank you so much for letting us visit the site.

Dr. Naomi Cleghorn

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