SPHS fieldwork award 2015 report

A report on geochemical and archaeomagnetic applications as part of the Knossos-Gypsades project.

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Introduction

The Knossos-Gypsades Project completed its second season of excavation this year. The site is located on the Gypsades Hill, to the south of the palace complex, and comprises five trenches (figure 1). The project intends to investigate domestic units within a localised suburb of the Bronze Age urban environment. The methods of the investigation combine an intensive and systematic programme of environmental and geochemical/geoarchaeological sampling. These include the recovery of macro/microscopic residues which can assist with the reconstruction of past diet, cultivation practices and the organisation of domestic space (Hatzaki. 2014. 2).

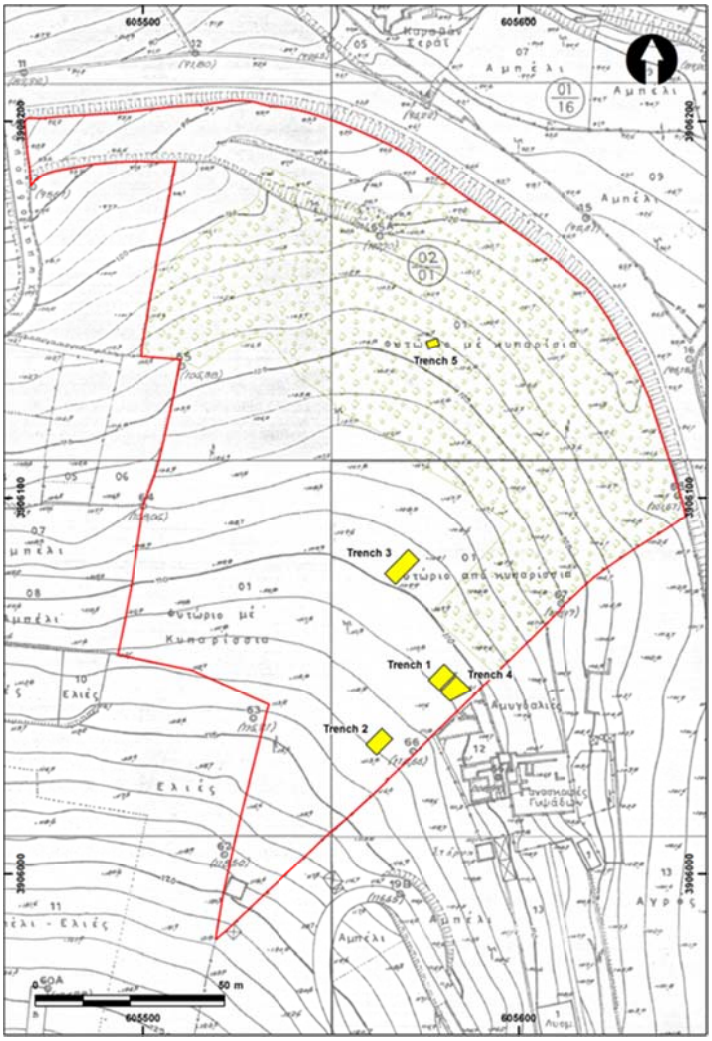

Figure 1. The Gypsades Hill study area (outlined in red)

My involvement in the project last year was brief as I could not attend for the full duration of the season for reasons of financial constraints. This year I was granted a bursary from the British School at Athens which enabled me to maintain a presence on the project for the entire season. This

permitted me to commit to a complete schedule of research which focused on geochemical and archaeomagnetic signals from domestic and extramural contexts.

As part of my involvement in the project, I supervised the recording and collection of samples from two spaces in Trench 1 and two cut features within Trench 3 (figure 1). The two spaces in Trench 1 were numbered Space 103 and 107 and were Late Minoan and Middle Minoan respectively (figure 2). Trench 3 contained two features which are considered as being outside of the confines of any structural edifice (figure 3). The work I was conducting in these areas was linked to the geoarchaeological component of the project. As part of this, I was expected to use geochemical and archaeomagnetic techniques on the sediments within the spaces and features. Up until my involvement with this project I had not undertaken any geochemical analysis and had only used archaeomagnetic techniques in a classroom environment.

I was also tasked with the comprehensive recording of sediments, sections, and plans. I carried out the descriptions under the direction of Project Director Gianna Ayala who helped me develop defined and complex descriptions of sediments.

I have firstly included a background which explores the importance of analysing household units and the role in which analytical geochemical and archaeomagnetic techniques can offer. This is followed by an explanation of the location of the spaces and features, a methodology, results and conclusions.

Background

The status of Knossos, as the earliest example of urbanism in Europe, presents an opportunity to understand more about the mechanisms which contributed towards the development of urban society (Bennet. *et. al.* 2006. 103). The household represents one of the most fundamental socioeconomic entities which archaeologists and anthropologists can interrogate. Detailed archaeological studies of houses can inform an enquiry of significant aspects of human behaviour such as division of labour, gender relations and social inequality (Fernandez. *et.al*. 2002. 488). Traditional forms of analysis have focused on material culture studies and actual structural remains to provide evidence regarding events which were on-going in and around the household (Driessen & Langohr. 2013 .6). Recent excavations and experimental work around the world have used Chemical and archaeomagnetic signals to determine nuanced aspects of daily life such as food and craft preparation as well as storage practices (Rondelli. *et.al*. 2014. 491).

Location of spaces and features

Space 103 extended from under the eastern baulk (figure 2). Approximately four fifths of the space was exposed, displaying 2m x 2m of observable internal structure. Given the contrary alignment of the excavated buildings to the trench, Space 103 was bisected diagonally. The excavation reached a depth of 0.51m through what was recorded as a single homogenous *contextual* fill and recorded in 7 arbitrary units.

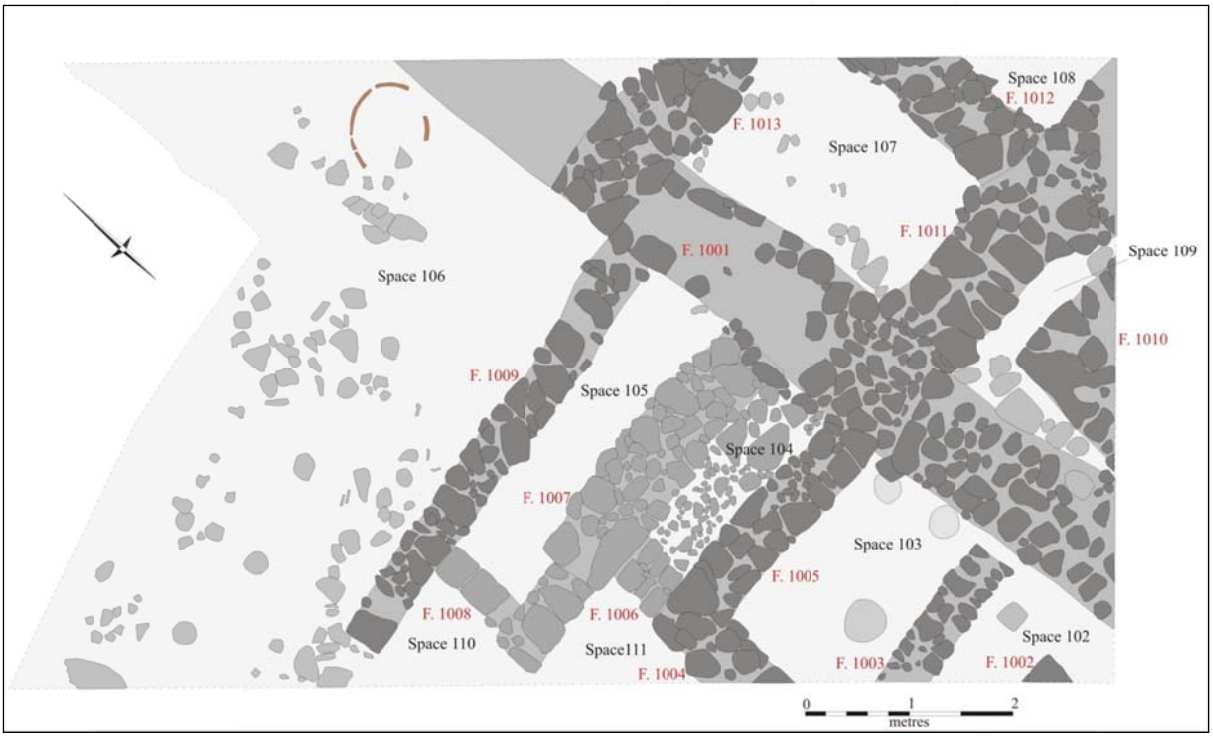

Figure 2. Plan of Trench 1

Space 107 was located towards the western limit of Trench 1 (figure 2). A 2.1m portion of the space was exposed from under the western baulk. The space was bisected diagonally in a similar fashion to Space 103. A depth of 0.54m was reached when the excavation ceased. This space is not considered as being completely excavated and further fill is expected to be removed in future excavations. The space fill was excavated in nine arbitrary layers although only one single homogenous *contextual* unit was observed.

Trench 3 was located 25m to the north-east of Hood's excavation (figures 1 and 3. The trench, which measured 4x8m, was oriented north-easterly. A sequence of activity which ranged from Late Minoan I to the Hellenic periods was identified throughout the course of the excavation. The partial remains of Roman and Hellenic buildings were revealed towards the centre of the trench, with Late Minoan I artefacts occurring in dense clusters within discrete features. The south-west section was selected for analysis as it demonstrated a well attested sequence with features believed to be associated with maddening practices.

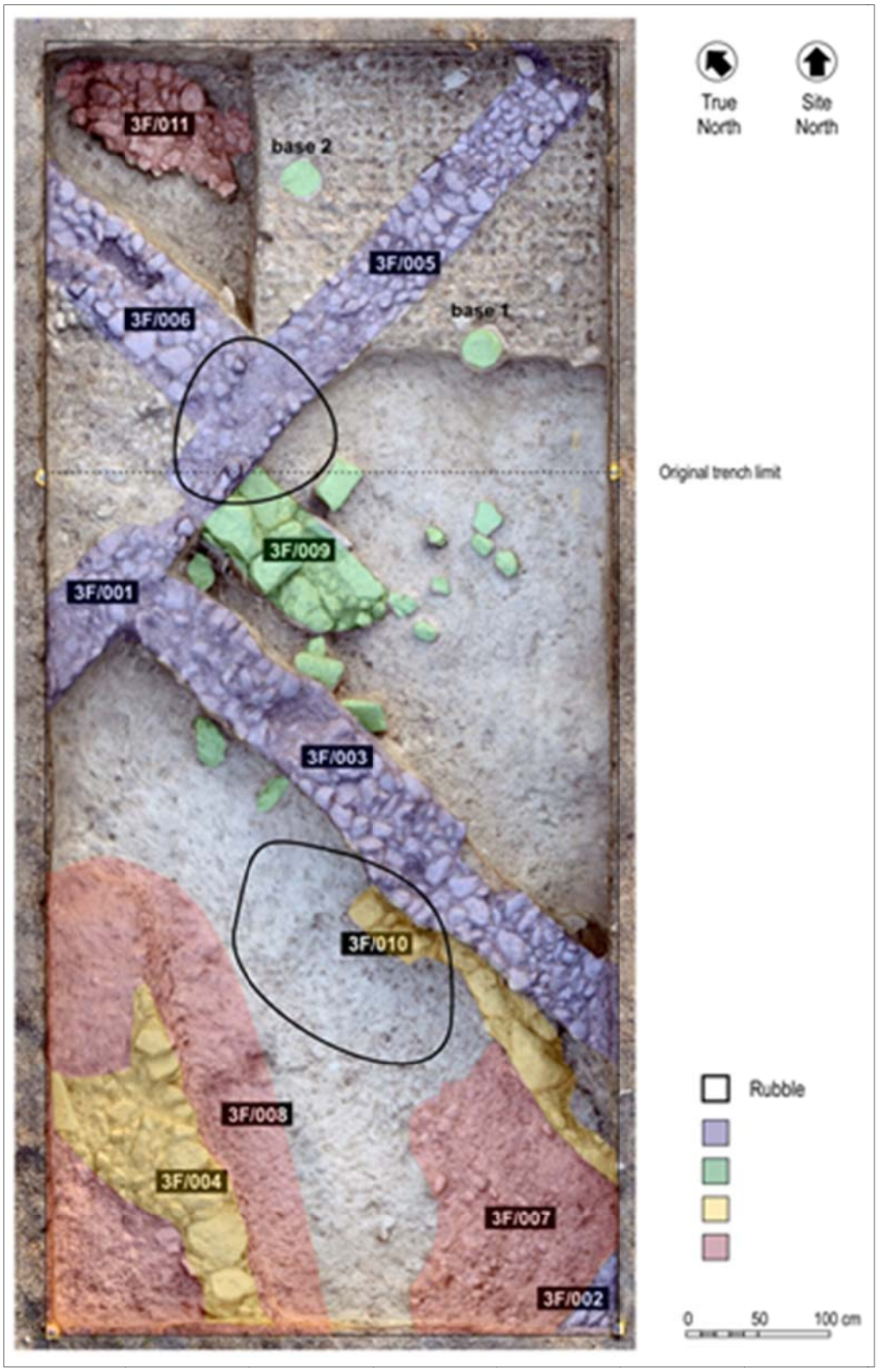

Figure 3. Photogrammetric plan of Trench 3

Methodology

The analytical techniques used throughout the project were dictated by requirements stipulated by articles in the project permits. Project permits were granted by the Ephorate of Prehistoric and Classical Antiquities (EPKA) on several conditions including the proviso that no samples or *in-situ* structural remains be destroyed or removed from the site or stated facilities without prior consent

(Hatzaki. 2015. 1). A consequence of the agreed provision determined that certain analytical techniques were restricted. This constraint was largely due to the destructive nature of certain processes and the practicability of transporting varieties of instrumentation to the processing facility. Portable equipment which could be transported to the Knossos facility and suited the research aims of the project included portable X-ray florescence (pXRF), bench-top and hand-held variants of magnetic susceptibility meter and hydrometers for particle size analysis.

Magnetic susceptibility readings were taken in Spaces 103, 107 and Trench 3. Vertical transects at pertinent locations along the baulk sections were taken at 50mm intervals. Bulk samples which were recovered from inside the spaces were sub-sampled in the laboratory facility and analysed with a pXRF tracer. My role extended to assessing and interpreting the data in order to assist with the design of future effective field methodologies.

Geochemical and archaeomagnetic applications

Geoprospection techniques such as magnetic susceptibility can identify depositional events which have gone unnoticed due to their subtle visual and textual appearance. For example, fire events are commonly discovered in the form of burnt reddened or blackened artefacts and sediments (Weston. 2002. 207). The discolouration of a clay based sediment is only likely to transform to red or black hues in temperatures between 700° to 1200° within 2 to 8 hours of increasing heat or in oxygen reducing conditions respectively. Materials which have been heat affected but are not exposed to the specific conditions which regulate colour change may not be recognised as being pyrogenically altered (Ionescu. 2011. 70). Techniques such as magnetic susceptibility can identify heat affected sediments which may not display the visual characteristics.

Contexts which are extraneous to the domestic unit are also of specific interest to the project. Practices such as middening can provide valuable data which can be used to reconstruct activities which contributed to the deposits (Oonk. 2008. 35). Chemical traces of elements such as phosphate and trace metals can indicate what materials have contributed to the deposit and therefore what activities have been undertaken locally. Deposits which derive from middening are rare in the Knossos environs and have received little attention (Hatzaki. 2011. 250). It remains unknown if the absence of such deposits is a result of misidentification or a genuine reflection of depositional practice.

Results

- Space 103

The ceramic assemblage which was recovered from the excavation of Space 103 was Late Minoan II, suggests a backfilling in the Late Minoan II. Other finds from within Space 103 include sealstones and a figure of eight stone pendant. Comments from the primary excavators suggest that little trample could be observed and a single depositional episode had been used to fill the room (Hatzaki. 2014. 6) (figure 4). Evidence from the magnetic susceptibility survey indicates that there is in fact a separate unit which contains a higher clay fraction which has not been observed in the recording of the room fill.

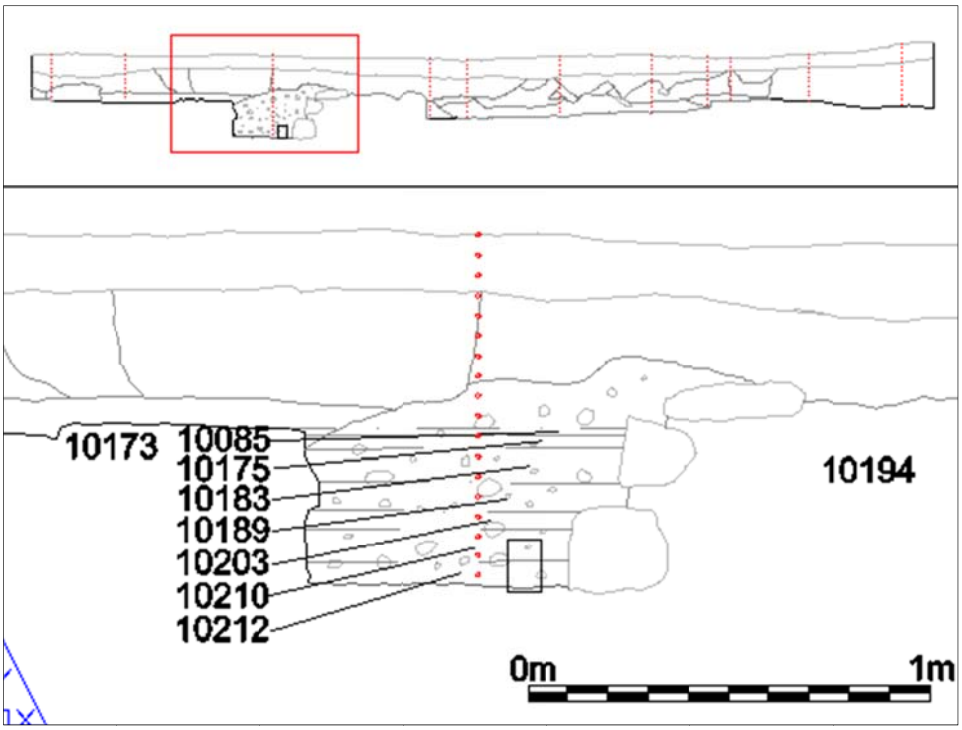

Figure 4. South-west facing section of room 103 demonstrating arbitrary units (red box in upper illustration panel denotes the focus of the lower illustration panel).

The pXRF survey identified the appearance of phosphate in unit 10210 which is particularly interesting. Comparative statistical analysis has revealed a likely hood that the phosphate is likely to represent the addition of organic material such as mineralised phosphates, degraded bone or ash by human or faunal agency.

- Space 107

Evidence from the single fill of Space 107 suggests a Middle Minoan IIIA abandonment and backfilling event. In addition to the ceramic artefacts, occasional ground stones were also identified (figure 5). No consistent changes in the compositional matrix of the sediment were observed by the primary excavators (Hatzaki. 2014. 6). Two peaks in values of magnetic susceptibility were observable at 0.5m in depth. The two peaks occur at similar vertical intervals. The values are closely connected and may indicate another previously unidentified layer. The large size of the peak does suggest that the result of this peak is a result of burning. It could therefore be argued that there are three space fills rather than a single context, one above the burnt layer, the burnt layer itself and one below.

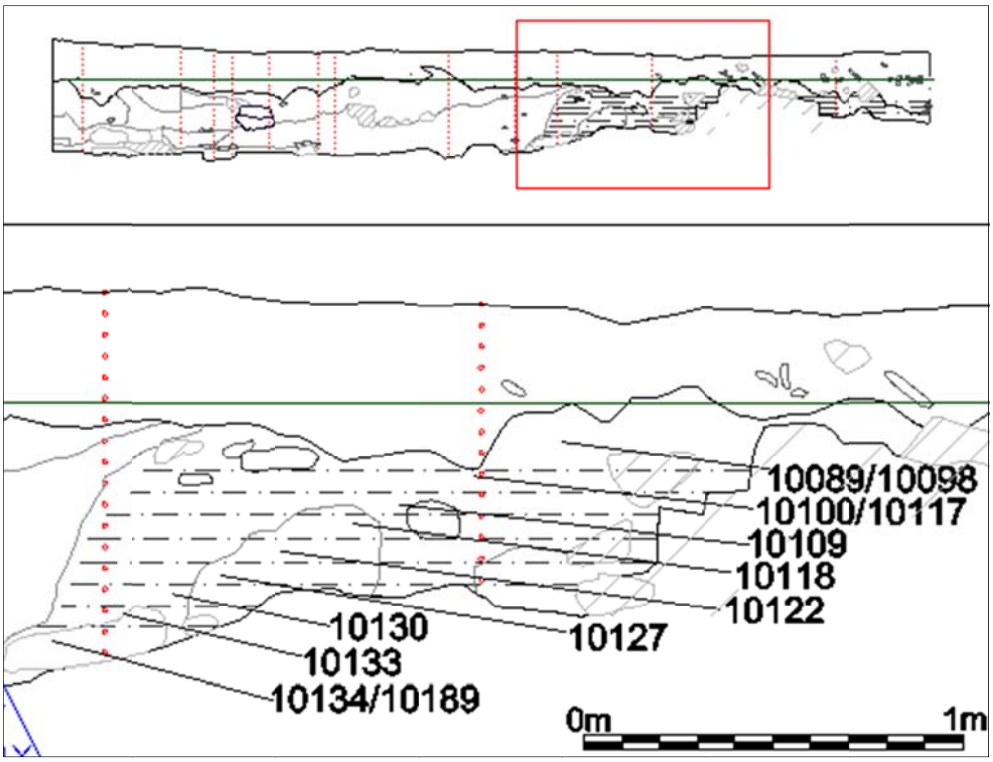

Figure 5. North-east facing section of room 107 demonstrating arbitrary unit (red box in upper illustration panel denotes the focus of the lower illustration panel).

The presence of phosphate in unit 10122 was the only isolated occurrence of an anthropogenic indicator throughout the fill. The high content of clay, calcium and iron is ideal for the preservation and fixing of phosphate. The quantity of phosphate present in Unit 10122 is particularly low, only scoring *p*= 2.1. The phosphate may derive from ash, bone or mineralised phosphates.

- Trench 3

Fatures 3F/008 and 3F/012were the foci of Trench 3. These have been interpreted as middening pits and a single homogenous deposit of unknown function respectively (figure 6). Finds from 3F/008 include stone vase fragments, animal bones, sea shells, pumice and obsidian tools. The assemblage of finds has lead Project Director Eleni Hatzaki to draw parallels between the finds from this pit and a suspected midden excavated at the Little Palace. The single fill of 3F/008 was excavated in five arbitrary spits. The magnetic susceptibility demonstrated low values followed by a particularly high peak at 0.5m in arbitrary unit (30039). The peak could be a result of the deposition of burnt material or, as only a single transect has been undertaken, the possibility exists that a ceramic sherd has generated this anomalously high reading. Interestingly, no Phosphate was identified in the fill of the suspected midden, F3/008. The absence of phosphate suggests that the midden did not contain any animal or plant remains which contained any fleshy matter. The single occurrence of phosphate in 3F/012 is represented in low quantities. The presence of phosphate in Unit 30070 could represent an organo-chemical rich unit or a single occurrence of an animal of plant which has degraded.

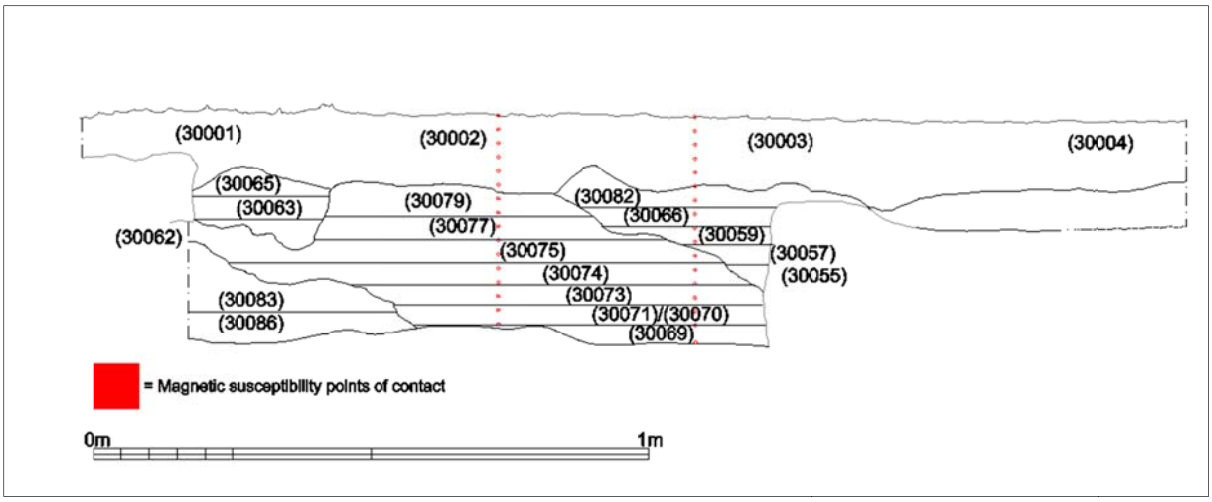

Figure 6. North-north-easterly facing section of Trench 3 demonstrating arbitrary units.

Conclusion

The analysis is in the early stages but it is already apparent that the analytical geoarchaeological techniques have identified deposit sequences which would have otherwise gone un-noticed. It is clear that in future excavations a higher transect density of magnetic susceptibility may be required for a more informed resolution. The only anthropogenic indicator which was revealed during the pXRF survey was phosphate and this was in small quantities. The results from the pXRF were disappointing as they did not provide enough interpretable data. It may not therefore be an appropriate tool for identifying middening practices. The results could be improved by applying the technique across floors and surfaces rather than from bulk samples.

Funding from the BSA provided me with financial assistance to attend a full season of excavation. I not only furthered my field training throughout the excavation, but was also exposed to an array of scientific field techniques such as magnetic susceptibility and pXRF. Many of these techniques cannot be taught or explained in a fully appreciable way in a classroom environment and I consider it a privilege to have had the opportunity to be involved with this aspect of the project. In addition to the analytical aspects, I also undertook supervision of staff on a high level research excavation. I expect the addition of this to my C.V will help my future career prospects a great deal.

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