SIAVH Project

The Knock Vitrified Fort, N. Ayrshire: Site survey and archaeological excavation of the southern ramparts.

Report

Executive Summary

Between August 2015 and May 2016 a series of geophysical surveys and a stratigraphic excavation were undertaken on the site of The Knock – an Iron Age vitrified hill fort in North Ayrshire, Scotland. The geophysical survey indicated that the summit of The Knock was comprised of a ringed structure that followed the contours of the topography on the summit of the hill along with numerous outcrops of igneous rock. The excavation of what is believed to be an Iron Age vitrified hill fort provided evidence of an outer facing rampart wall with rubble infilling. Burning could be identified at the site and subsequent collapse of the rampart had occurred. Vitrification of the hill fort, although previously indicated in the 1940's and 19th century, has been dismissed across the southern ramparts as no vitrified remains were identified, however vitrification of the northern ramparts cannot be totally ruled out as excavation was not undertaken here. The bedrock that is comprised of weathered basalt could have been mistaken for vitrified material.

Acknowledgements

Thank you to Mrs Valerie Campbell who allowed the survey and excavation to be undertaken on her land and for all her knowledge and advice during the project.

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1 Introduction

Hilltop defences composed of ditched and banked earthworks, and sometimes augmented with masonry walls, are a common feature of the Iron Age in Europe, but it remains unknown as to why and how the defences of many examples were deliberately vitrified by subjecting them to intense and prolonged heat (as tested by Brothwell et al., 1974, Armit and Ralston, 2005). Although examples exist in mainland Europe, Ireland and England, by far the highest concentration are in Scotland, and indeed until recently these were thought be an exclusively Scottish phenomenon.

1.1 Excavation background

Identification of a vitrified hillfort at The Knock, Largs was first recorded in the Roy Military Survey-Lowland map (1752-55) held by the Scottish Library[1] and later documented by Smith (1895). In 1942 an emergency land survey of ancient monuments in military training areas was commissioned by the RCAHMS (1942), with The Knock being a training area for WW2 military. Further publications that mention the site are most notably Childes and Graham (1943) in their classification of Scottish monuments by the Royal Commission, with Newall (1969) and Stevenson (1985) cataloguing it together with other pre-historic monuments across the Clyde estuary and the West of Scotland. At present dating has not been undertaken on the site and the chronology of the hill fort within the landscape has yet to be established. Although the majority of Scottish vitrified hill forts have been catalogued (Sanderson et al., 1985) there has been little investigation into the methodology employed in the vitrification of the Iron Age hill forts, the resources used, the effects the vitrification process had on the surrounding environment or the interaction required by the local community in amassing the vast amounts of fuel required in the vitrification of such a structure.

1.2 Aims and objectives

This study, conducted by staff at Universities of York and Stirling and in line with ScARF (Scottish Archaeological Research Framework) research goals (Alexander et al., 2012), proposed to elucidate the nature of Iron Age settlement and landscape. It was to be based on an archaeological investigation centred on The Knock vitrified Iron Age hill fort, located in Largs, Scotland. The research aimed to bring together the application of dating, microscopic observation and multi-elemental soil analysis techniques to prehistoric Iron Age hill forts.

It is proposed that understanding the methodology behind the formation of Iron Age vitrified hill forts would provide an insight into the relationship between resource management and community interactions, whilst also recognising the impact that vitrification had on the surrounding landscape and its inhabitants.

Therefore, the overall aim of the survey and excavation was to record geophysical data and provide a sequential interpretation of the rampart, the construction process and the methods employed

[1] (http://maps.nls.uk/geo/roy/#zoom=14&lat=55.8252&lon=-4.8771&layers=roy-lowlands) by Smith SMITH, J. 1895. *Prehistoric Man in Ayrshire: By John Smith*, Elliot Stock, 62, Paternoster Row, EC.,

1.2.1 Objectives:

- To assess the extent of the ramparts and their integrity and identify the best and least destructive locations for excavation; ascertaining the extent needed for the geophysical survey to achieve complete coverage of the rampart area.

- To undertake a geophysical survey of The Knock Iron Age vitrified hill fort within a 20 m grid system encompassing the ramparts of the hill fort.

- To fully excavate the outer face of the southern section of the ramparts within a 1.5 m by 4 m section, with excavation being undertaken until the bedrock (parent geological material) is exposed.

1.2.2 Specific plans:

- To obtain visual and geophysical reconnaissance survey by employing gradiometry to provide accurate data of the subsurface structure that may have been built within the hill fort enclosure. A metal marker pin was to be placed at the site so that a reference point could be obtained if future work will be carried out by other agencies. The survey site was to encompass twelve 20 m x 20 m grid squares.

- To undertake a focused stratigraphic excavation on the fortification across an exposed a section of the wall, approx. width of 1.5 m, depth 1 .5 m and approx. 4 m in length. This work will comprise of removal and replacement of turf by hand. Stratigraphic excavation of the rampart was to include all recorded contexts being photographed in order to determine the relationship between distinctive depositional events. Post-excavation plans were to included returning all material to the section and reinstating the wall with any vitrified material being placed in the centre and the soil/turf replaced in as near its original position as possible after excavation. To have a digital register of information, to be supplied to Historic Environment Scotland (post-excavation), that included all section locations, including GPS coordinates and plans.

- Undisturbed mineral samples were to be collected from the internal structure of the wall and the outer part of the rampart. Additionally, bulk soil samples would be obtained from the outer part of the rampart (Table 4). The soil samples were to undergo ground-breaking analysis through the combination of trace element analysis and soil micromorphology to identify burnt material that cannot be detected by standard archaeological excavation methods and also to identify variations in chemical composition that do not relate to parent material, but may be due to augmentation during burning.

- Organic samples were to be collected to determine the date of the rampart construction through the process of radiocarbon dating.

- To undertake post-excavation (for the first time) on samples collected from an Iron Age hill fort combining soil micromorphology and geochemistry to precisely define the conditions necessary for the vitrification process to occur at this site. Bulk soil samples were to be analysed using XRF (X-ray Fluorescence), whilst the undisturbed soil samples were to be impregnated with poly carbonate resin, made into 30 μm glass slides and analysed at a microscopic scale using soil micromorphology, as per Stoops (2003) and Bullock *et al* (1985).

- Obtained data from the excavation were to be logged into a data base for future investigation by other organisation and to be made available to Historic Scotland and the local community in Largs.

1.2.3 Research Questions:

A number of research questions, listed below, were considered during the survey, fieldwork and post-excavation analysis. In answering some/all of these questions the project aimed to address the overarching question of why the ramparts surrounding Iron Age hill forts were vitrified.

1. Can the geophysical survey of the site provide an enhanced understanding of the structure of the hill fort?
2. What resources were employed in the construction and subsequent vitrification of the hill fort?
3. What were the methods used in the construction of the fort and the material used in the firing of the fort that allowed the vitrification process to occur?
4. Did vitrification of the stone occur as a result of the initial construction techniques or was the process of vitrification a later occurrence once the fort had been occupied?
5. What were the implications of the hill fort vitrification on the surrounding landscape and its ecology?

2 Location, Area of Interest and Geology

2.1 Location

The Knock is located at NGR 2028 6286, just north of the town of Largs in North Ayrshire, Scotland (Figure 1). The site is a scheduled ancient monument (Canmore ID 41289, Site No. NS26SW 2).

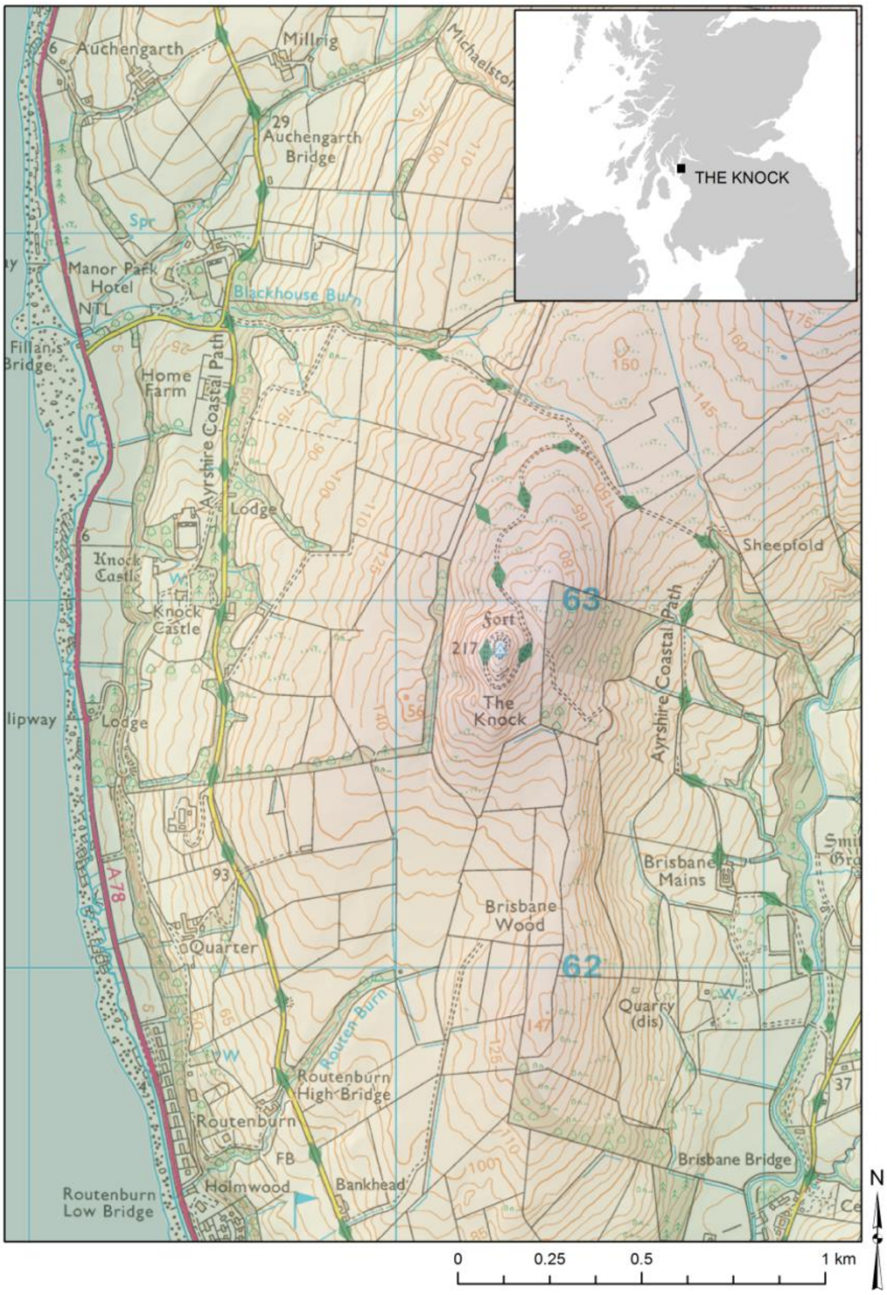
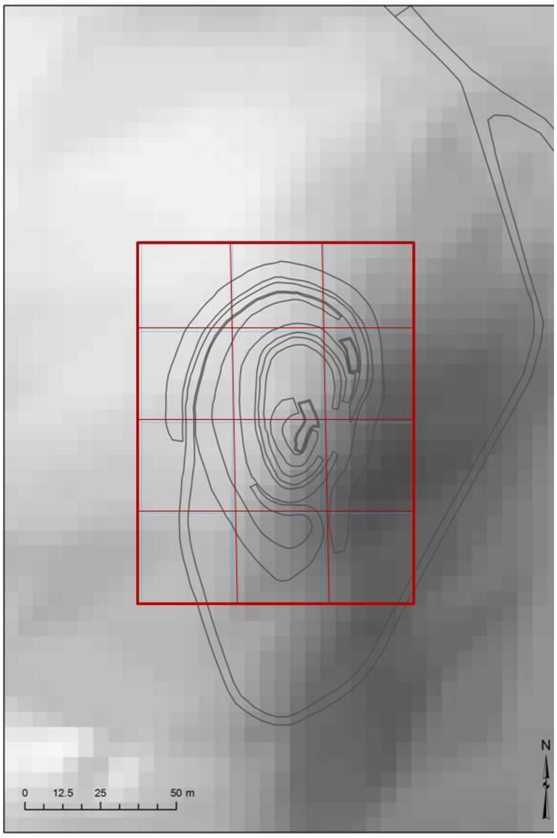


Figure 1: Location of The Knock Iron Age hill fort (Backdrop data Ordnance Survey 2015a and 2015b).

2.2 Area of interest

Figure 2 displays the areas that were assigned for the survey and also exhibits an oblique view of the ramparts at the summit of The Knock (looking south east).



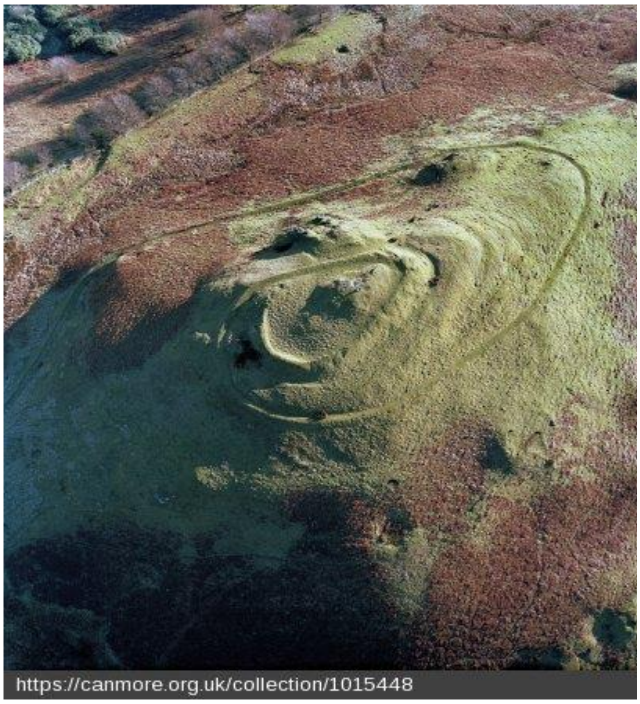


Figure 2: The twelve (20 m x 20 m) survey boxes across the summit of The Knock (left) and an oblique aerial view of the ramparts (right) facing south east (https://canmore.org.uk/collection/1015448).

2.3 Geology

The bedrock geology of the hillfort is comprised of two different types of basaltic rock, both part of the Clyde Plateau Subsuite (Figure 3). These rocks, due to their igneous nature, are highly magnetic, and as such, can be problematic for performing geophysical survey.

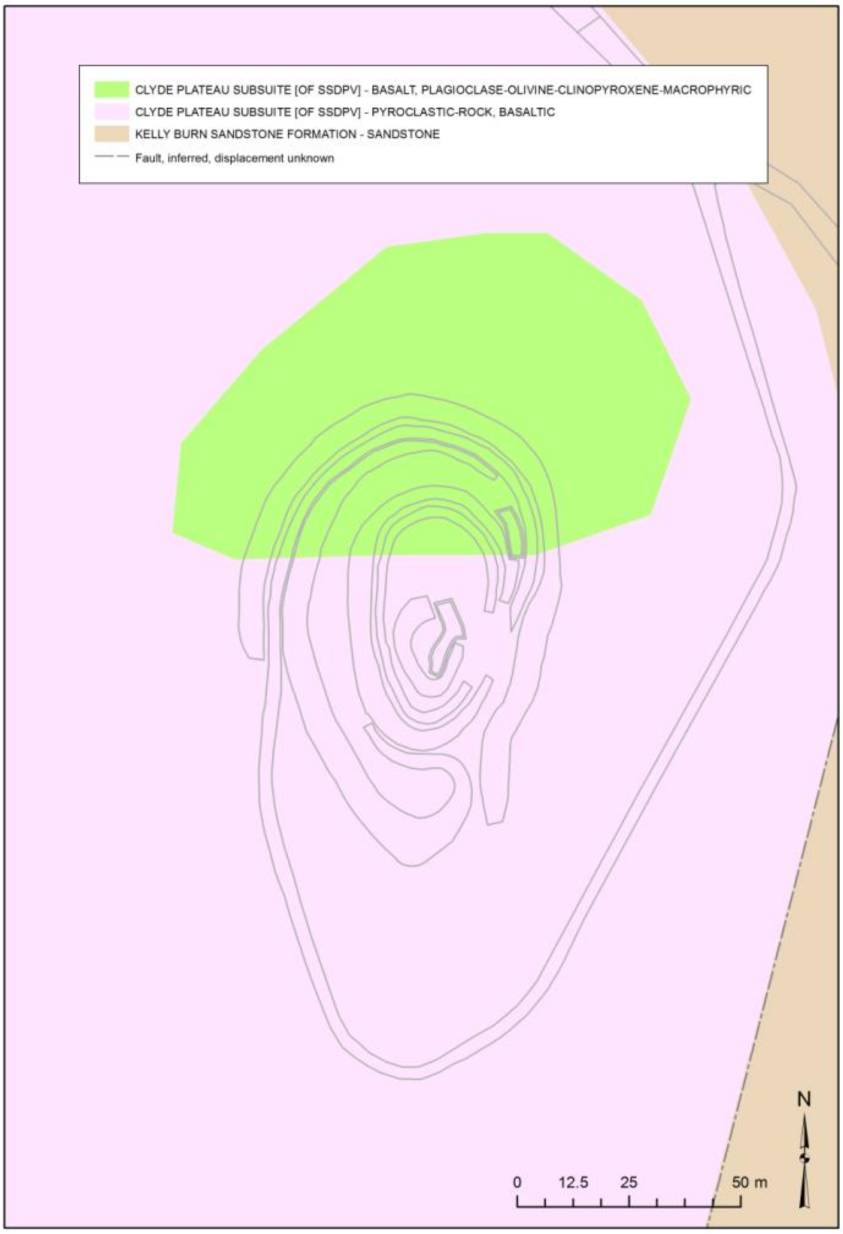


Figure 3: Bedrock geology and linear faults (British Geological Survey 2015; Backdrop data Ordnance Survey 2015c).

3 Geophysical Survey

3.1 Geophysical survey methodology

Three types of geophysical survey were carried out: fluxgate gradiometry, magnetic susceptibility and electrical resistance. All data was collected on the same 20m grid system, oriented north-south, which was laid out using a Leica Differential GPS (Figure 4). An area of approximately 3900m^2 was surveyed using the two magnetic techniques, whilst the electrical resistance was focussed on a small central area of 800m^2.

3.1.1 Fluxgate Gradiometry

Fluxgate Gradiometry was carried out using a Bartington Grad-601 with a sample resolution of 1m x 0.25m. On a standard archaeological site, the range would ordinarily be set to 100nT to allow for greater reading resolution (0.03nT), but due to the strong magnetic responses at The Knock, this was increased to 1000nT (accepting the subsequently coarser 0.1nT resolution) to allow the strong responses from the basalt bedrock and vitrification to be captured effectively without over-ranging.

Data was processed using standard workflows using Geoplot 3 Software (Table 1) and limited to 3 standard deviations around the mean using the clipping function.

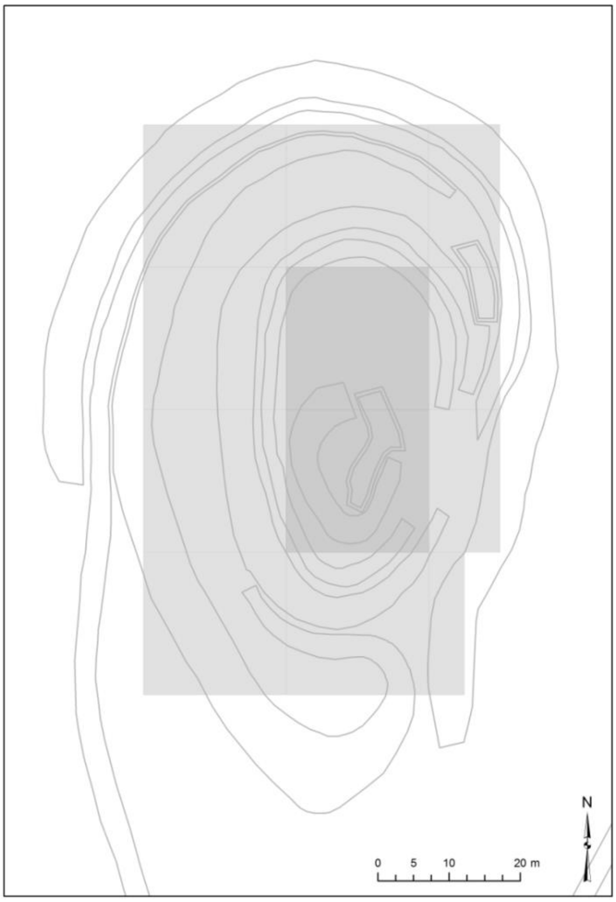


Figure 4: Location of the surveyed areas on the summit of The Knock. Pale grey shows the limits of the fluxgate gradiometry and magnetic susceptibility surveys, whilst the dark grey shows the small area covered by the electrical resistance (Backdrop data Ordnance Survey 2015c)

3.1.2 Magnetic Susceptibility

Magnetic Susceptibility was captured using a Bartington MS2 with field coil at the 1 SI setting. Samples were taken at 2.5m intervals on the same grid structure as above. The points were collected in Microsoft Excel, then imported into ArcGIS and interpolated using the Natural Neighbour function, to a resolution of 0.5m. No further processing or filtering was carried out.

Table 1: Processes applied to the geophysical data (after Geoscan Research, 2005)

Edge matching (resistance only)	This process removes grid edge discontinuities common in resistance surveys. It operates by comparing the mean edge difference between adjacent grids and subtracting this from one grid to achieve a smooth match.
Zero Mean Traverse (gradiometry only)	This process sets the background mean of each traverse within each grid to zero, thereby removing striping effects and edge discontinuities over the whole of the data set.
Clipping	Clipping improves data display and statistical calculations by removing outlying high or low values from strong ferrous responses.
Despike	Despiking locates and removes random spurious readings in resistance data, or iron spikes in gradiometry data, and replaces with the mean of surrounding pixels.
High Pass Filter (resistance only)	The high pass filter removes low frequency, large scale spatial detail, and is typically used to counteract the effects of geological changes across a site.
Low Pass Filter	This function removes high frequency, small-scale detail, and is generally used to smooth data or to enhance larger weak features.
Interpolation	Interpolation can be used to give a smoother appearance to the data and can improve the visibility of larger, weak archaeological features. However, it does this at the expense of increasing the number of data points and is purely a cosmetic change

3.1.3 Electrical resistance

Resistance survey was carried out with a Geoscan RM85 twin probe resistance meter. Samples were taken at a resolution of 1 x 0.5m on the same grid structure as before in a zig-zag traverse scheme. The gain was set to x1 to allow for the large range in the area. Data was processed using standard workflows in Geoplot 3 (see Table 1 above).

3.2 Geophysical survey results

3.2.1 Fluxgate gradiometry

Results for the fluxgate gradiometry showed a large range of responses from -1051.53 – 1131.61 nanoTesla (Figure 5). This was primarily due to the basaltic bedrock. Two areas of exposed bedrock – one on the eastern rampart (1), and one on the summit adjacent to the Ordnance Survey trig point (2), gave very high readings (+/- 600-1000 nT) due to the parent rock material. No significant difference in response was seen between the two similar underlying geology types, of which the hillfort is comprised. However, very high responses (+/- 800-900nT) were also noted along one of the northern ramparts (3). This area was turf-covered rather than exposed, and the high responses could be interpreted either as a rampart constructed of the basaltic bedrock, or of elevated magnetism of another building material due to vitrification.

Of interest was that fact that there is not a consistent magnetic response across all of the ramparts of the hillfort. Aside from the northernmost strong responses, the remainder of the ramparts show significantly less magnetism. The southern rampart (4) at -400 – -150nT is noticeably less responsive, and the eastern and western sides show almost no distinctive response.

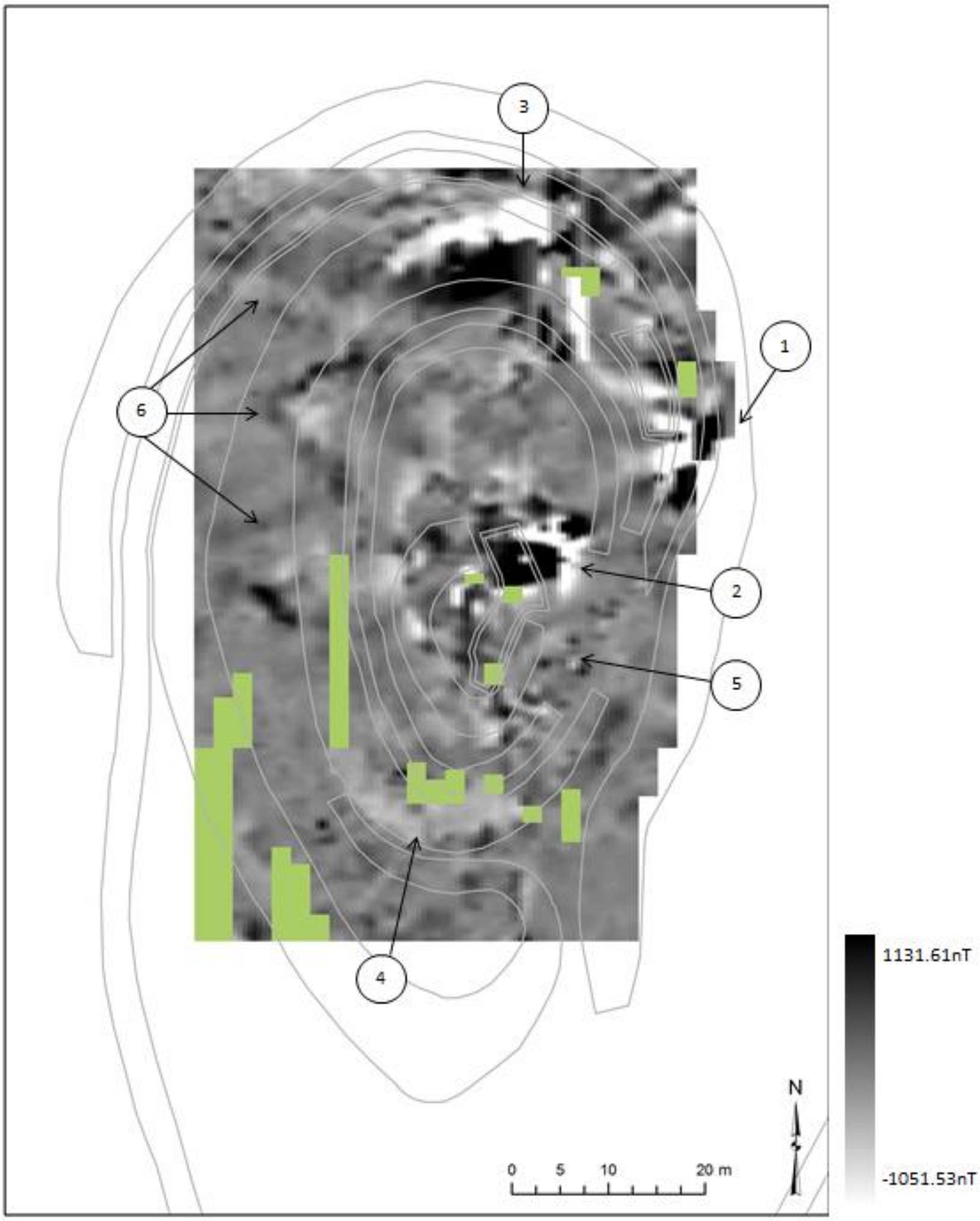


Figure 5: Plot of processed magnetometry results. The green areas were not surveyed due to the steepness of slope.

A potential inner rampart, just south of the summit (5), is possibly shown by a curvilinear response of speckled high and low responses in the +/- 300-400 nT range.

Aside from the ramparts and exposed bedrock, the only other obvious features were a series of zig-zag and linear low and high responses (+ 400-500 nT for the high, and -100-200nT for the low). These were located primarily on the western side of the hill fort. It is unclear what these could represent as they do not align with any existing earthworks, and so given their strong responses, could indicate geological formations.

3.2.2 Magnetic susceptibility

Results for the magnetic susceptibility were very similar to those from the fluxgate gradiometry, albeit at a lower resolution. Results gave extremely high ferromagnetic readings, ranging from 6 - 3843 SI[2], with the very highest readings corresponding to those areas of exposed bedrock (areas 1 and 2 on Figures 4 and 5), expanding outwards for a larger area than the gradiometry, until the outer edge lines up with the limit of area 5. The northern rampart (3) does not show with the same strong readings, and instead a more concentrated area further in is visible, with readings in the seventh octile. The southern rampart (4, Figure 5) did not show up in the same way as in the gradiometry. Whilst there is an area of elevated magnetic susceptibility in the highest octile, this was a discrete rounded area that did not conform in shape to the curvilinear rampart structure. The linear and zig zag features (6) of the gradiometry are potentially in evidence in Figure 6, but a more detailed survey might elucidate these further. Additionally, two linear features appear to correspond with the rampart structure at the south-east of the hill fort. Faint responses in the gradiometry may parallel these strongly susceptible features, but they are not clear.

[2] SI units for magnetic susceptibility are measured in (m=mass) $m.^{3}.kg^{-1}$

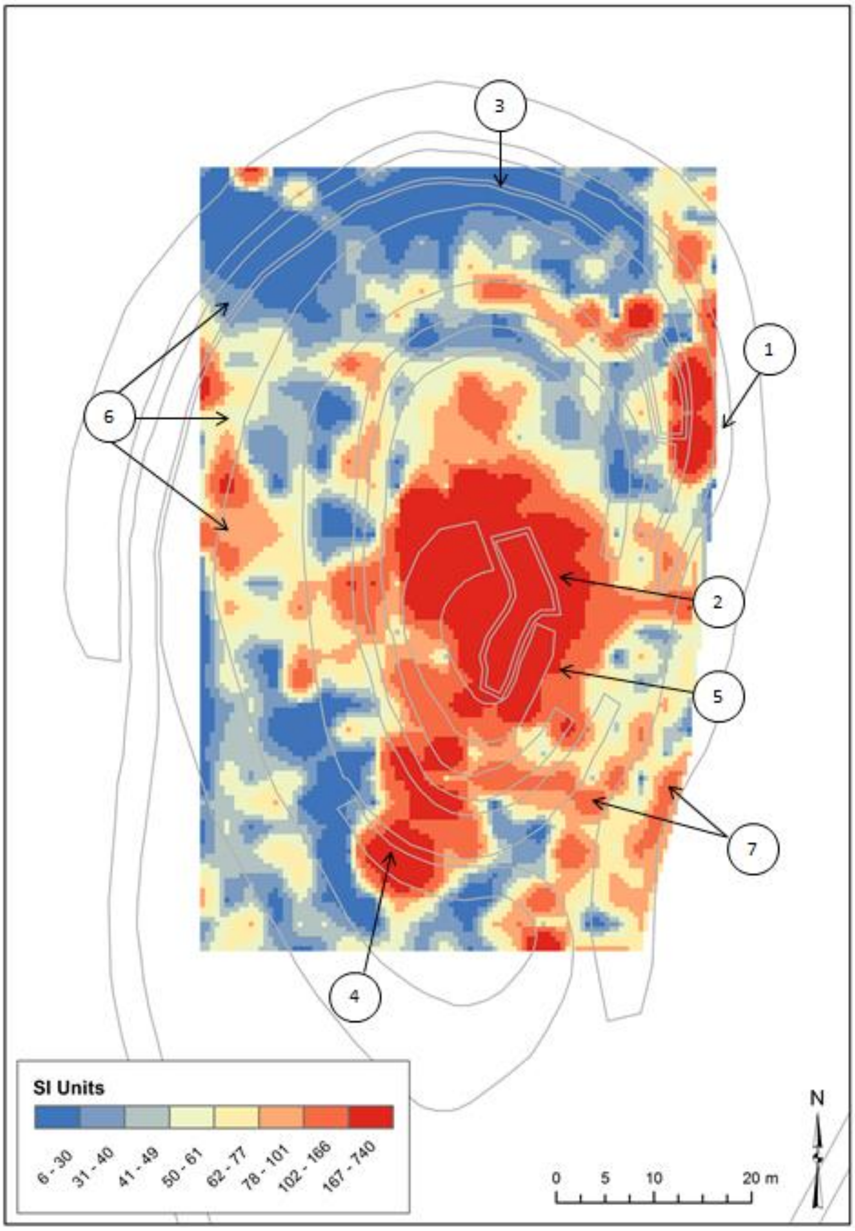


Figure 6: Magnetic Susceptibility results shown in categories based on octiles

3.2.3 Electrical resistance

The electrical resistance results did not add much to the overall survey (Figure 7). However, some features were noted. Firstly the correspondence with the southern rampart was particularly strong, with the highest resistance results coming from this area. Similar, but less strong results were obtained from the inner part of the north summit. The low resistance results on the summit of the hill fort are possibly related to the predominance of moss in this area. Even areas of exposed bedrock were giving low readings, most probably due to this vegetative cover, which retains more moisture than the surrounding grass. The only potential archaeological traces visible in these results were some potential rectilinear features: one in the northern part of the summit (1), and three to the east (2).

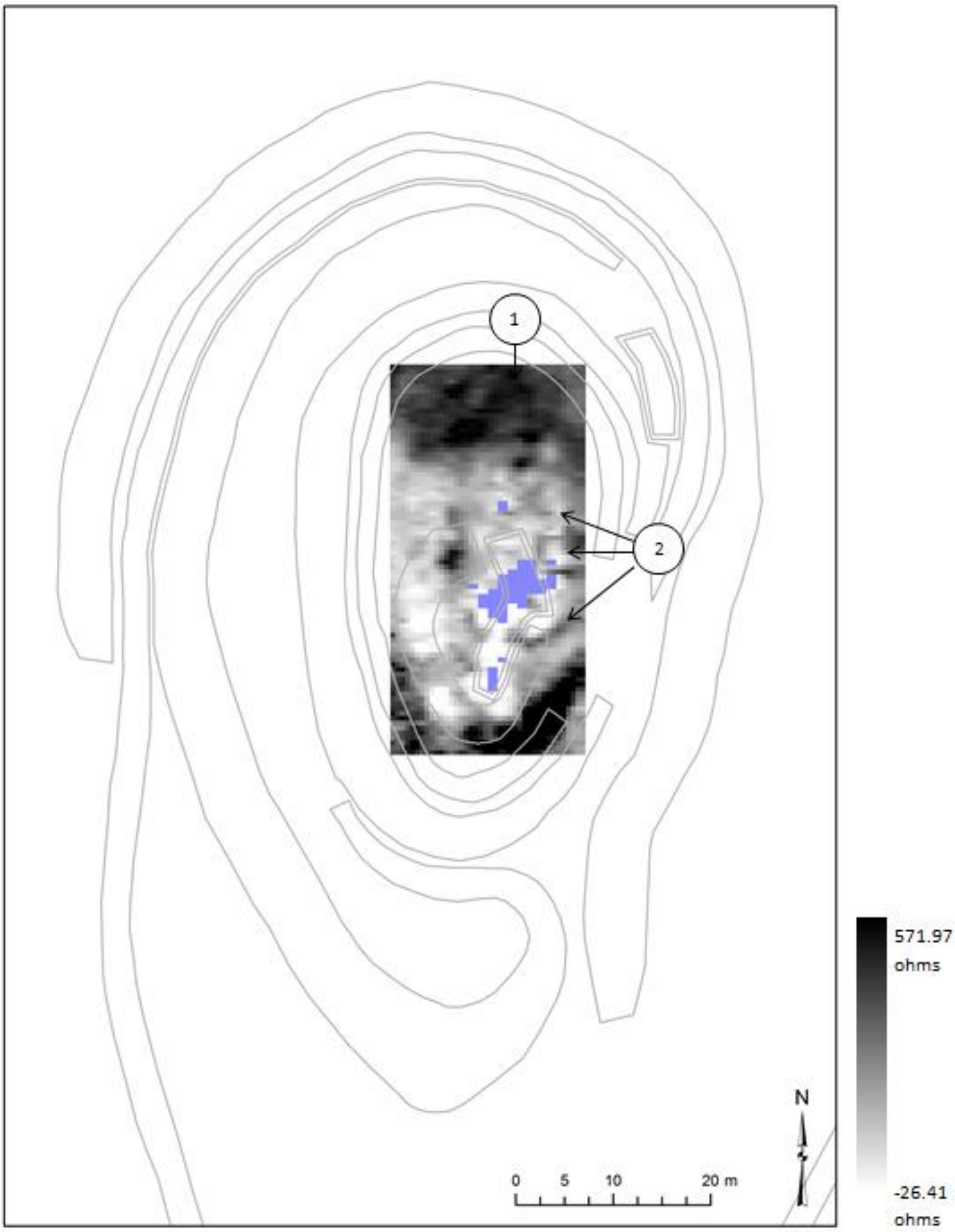


Figure 7: Electrical resistance results

4 Excavation

4.1 Excavation Methodology

The excavations on the Knock hillfort were conducted on the southern ramparts of the hillfort located at NS 2028 6286 (55°49'30.9"N 4°52'13.6"W), with Section A sitting at the base of the suspected rampart and Sections B and C based above and along the rampart (Figure 8). The excavation trenches were de-turfed by hand and stored face side down so that it could be reinstated after back filling of the excavation trenches. The spoil from the trenches was stored on tarpaulins away from the excavation trenches. All archaeological features and deposits were excavated using shovels and trowels. The excavation trench was excavated in three sections due to the topography and the location of the ramparts in relation to this. The lower Section A adjacent to the exposed basaltic geology was excavated in the first instance and recorded. The upper area section B was then excavated and extended to take in section C. Part of the rubble that had collapsed from the rampart was removed to ascertain the depth of the rampart and the construction method and then the rubble was reinstated. A topographical survey of the excavated sites was undertaken using mapping-grade GPS (Trimble Geo7x handheld unit) (Figure 9).

The archaeological investigation was undertaken using single context recording (Appendix: Table 3) in conjunction with scale plan and section drawings (multi-context) together with digital photography. All artefacts were treated as small finds and were recorded in 3 dimensions (X, Y and Z coordinates) using the hand held mapping-grade GPS (Trimble).

Trenches A, B and C were fully reinstated by hand and the turf repositioned over the trenches.

4.2 Results of the Excavation

The results of the site investigation are summarised below, with section locations displayed in Figure 9.

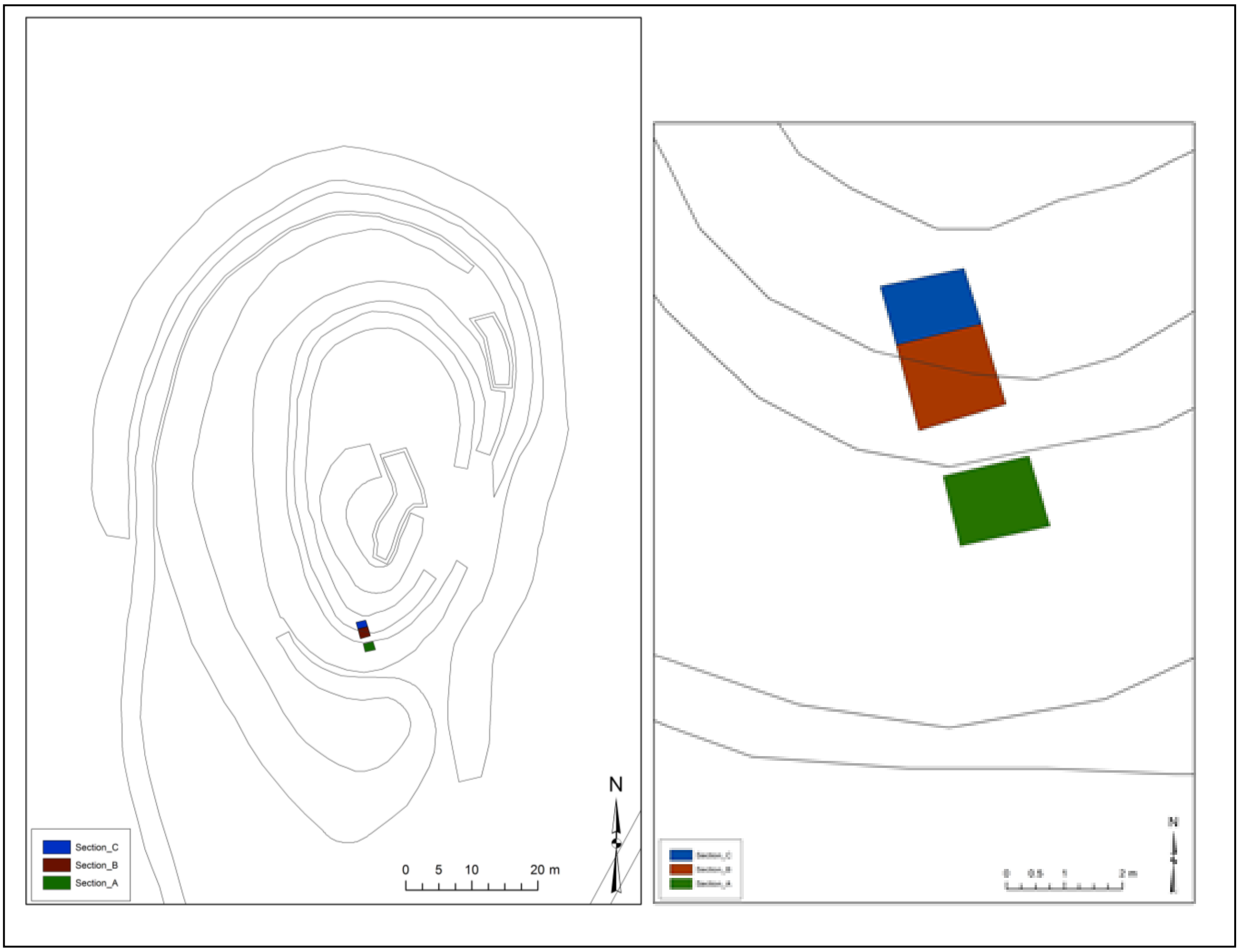


Figure 8: Location of excavations at scale 1:500 (left) and 1:10 (left) showing the placement of the excavation sections, Section A (green), Section B (brown) and Section C (blue) (Section B_C), coordinates for the sections are displayed in Table 2

Table 2: Coordinates for the sections excavated on the southern ramparts of the Knock hillfort in May 2016, ad displayed in Figure 12 above.

Section	Latitude	Longitude	Height MSL
Section A			
PT001A (Top-Left)	55.825189150	-4.870607186	214.199
PT002A (Top Right)	55.825192792	-4.870583841	214.199
PT003A (Bottom-right)	55.825182726	-4.870577360	213.532
PT004A (Bottom-Left)	55.825179860	-4.870602931	213.983
Section B			
PT001B (Top-Left)	55.825208943	-4.870621465	214.98
PT002B (Top Right)	55.825213706	-4.870598692	215.119
PT003C (Bottom-right)	55.825203401	-4.870594613	215.038
PT004B (Bottom-Left)	55.825195569	-4.870614134	215.072
Section C			
PT001C (Top-Left)	55.825218104	-4.870626591	215.67
PT002C (Top Right)	55.825220733	-4.870606562	215.542

Section A was used to determine the relationship of the southern rampart to the bedrock, while sections B and C were used to identify the location of the rampart, its relationship to the bedrock and the extent of collapse that had occurred on the outer wall of the south facing rampart. A detailed section drawing of Section A is illustrated in Figure 10 and 9 Section B_C in Figure 10. All stratigraphic units and archaeological features were given their own event/context number and are recorded in the context register and displayed in the appendix,

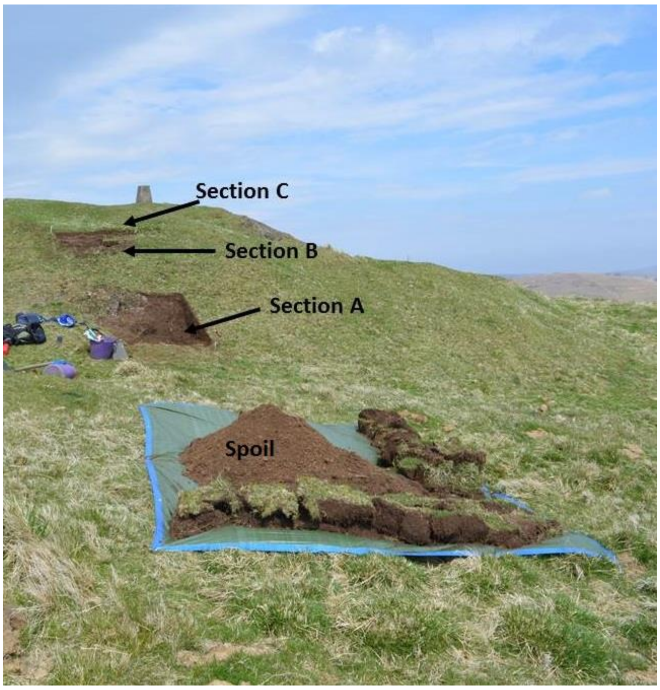


Figure 9: Location of the excavated sections (A, B and C) in relation to the summit of The Knock

4.2.1 Section A

The visible weathered, igneous basaltic rock face was evident above Section A (Figure 10) the dimensions of which were: 1.5 m x 1 m x 1 m. The section showed several stratigraphic units as illustrated in the section drawing (Figure 13) and had identifiable soil horizons. It was evident that there had been tumble accumulation in event 115 against the exposed bedrock (104) and below event 114. This indicated that the soil development had occurred after the collapse of the southern rampart and that the area was possibly devoid of soil and turf during the lifetime of the hill fort.

Event 115 contained several large pieces of charcoal that were collected from within and below the Tumble event, their location suggesting they had come from the collapse of the southern rampart.

Figure 10: Section A, below the south east facing rampart with the visible basaltic rock face above

4.2.2 Section B_C

Section B (left) and C (right) (Figure 11) were initially opened up as individual section to ascertain the location of the external area of the south ramparts. These sections were then extended and merged, becoming Section B_C. Removal of the turf and the soils making up the A-Horizon (Figure 13) revealed the soil horizon B1 (105), with event 106 below this containing a high frequency of gravels, pebbles and stones thought to have derived from collapse of the rampart (Phase 2). Below this event was 112, identified as a burning event, with a high frequency of charred organic remains, ash and burned gravels - the latter showed no visible vitrification - comprising of local red sandstone. Event 108 was again characteristic of B2-Horizon and contained sand, pebbles and stone suggesting that this was also derived from a collapse event (Phase 1). This overlaid the outer rampart (113) that was built directly onto the highly weathered basaltic bedrock (104) (Figure 14). The rampart had large sandstone facing blocks with an in-fill behind it of smaller stones, pebbles and gravels and within this there were some large pieces of charcoal. The charcoal was sampled (sample 19 and 20, as indicated in the sample register in the appendix) for further C14 dating due to the secure location of the event.

Undisturbed soil samples and bulk soil samples were collected from Section B_C for further micro-analysis of the soil for micro-artefacts and trace element difference, as seen in Figure 14In the appendix

Figure 11: Section B and C (Section B_C)with the photograph facing west, and displaying the outer part of the southern rampart and basaltic bedrock Section B to the left and Section C to the right.

5 Discussion

The geophysical survey of the site provided further clarification on the existing evidence of the ramparts, indicating that they were constructed to exploit the curvature of the hills topography, with both the fluxgate gradiometry and magnetic susceptibility displaying comparable results. The magnetic susceptibility exhibited high readings particularly in the areas of exposed igneous basaltic bedrock; however the southern area of the hill fort did display high levels with little exposed bedrock. This could be due to the development of exposed soil/sediment where the turf has been removed/degraded due to sheep and cattle grazing.

The Electrical resistance survey provided few results; however the southern part of the ramparts did produce, as already alluded to, the highest resistance results. There was a reduction in the vegetative cover in this location, which would have skewed the survey results. This survey being typically affected by increased vegetative cover.

The excavation of the site identified the outer rampart of the hill fort and that its construction had been undertaken using the local red sandstone. The stones used in construction of the outer rampart had been placed directly on the igneous basaltic bedrock and it was evident that larger stones were place on the outer part of the wall and the smaller stones, pebbles and gravels had been placed behind the facing stones. The utilisation of red sandstone suggests that it had been transported to the summit. An area of sandstone geology north of the hill was identified that had evidence of a quarry pit, discussed below (Section 4 and 7).

There is evidence to suggest that there were two phases of rampart collapse Phase one was of the collapse the outer rampart wall and tumble of stone, pebble and gravels down the hill. This initial stage was due to a fire event based on evidence of charcoal in the rubble in Section A and Section B_C. Further collapse occurred after another fire event, which was identified through the deposition of ash, burned organic remains and burned pebbles and gravels in Section B_C.

Based on current evidence from the excavation it is indicated that while burning occurred, it appears that the hill fort was not vitrified as initially thought by Childes and Graham (1943), at least in those areas tested. There is no indication that the burning across the southern section of the ramparts was intense enough to cause the vitrification of stones. There is a high level of exposed basaltic bedrock across The Knock and this material could have been mistaken for vitrified material due to the high level of weathering it displays (Figure 15).

5.1.1 Samples

Undisturbed soil samples were collected from Section B_C for analysis using soil micromorphology; the samples are displayed in Figure 14. Corresponding bulk soil samples were also collected for analysis by pXRF (portable X-ray florescence) to identify difference in soil trace element composition. Several charcoal samples were collected with the most significant being two large pieces of charcoal from under the outer facing wall of the southern rampart within a secure location, this sample will be analysed using C14 dating to determine the date of construction for the hill fort This analysis is on-going. For further sample information consult the sample register (Table 4).

5.1.2 Artefacts

One single artefact was identified from the fort; the sample being collected from between events 108 and 113, the artefact is believed to be a smoothing stone (Figure 17). The stone is at present undergoing microscopic use wear analysis by Dr Aimee Little at the University of York, Department of Archaeology BioArch facility to determine what activities the stone was employed to carry out.

6 Conclusions

Returning to the original research questions:

1. The use of a range of survey techniques (fluxgate gradiometry, magnetic susceptibility and electrical resistance) has improved our knowledge of the site in various scales and has helped determine the position of the ramparts in relation to the igneous bedrock. The survey has provided evidence that the fort appears to have exploited the contours of the hill top topography and that there is an indication of heating of the rampart, particularly in the southern rampart area of the site. Furthermore, the survey of

the site has provided a clearer picture of the vegetation cover and the possible processes of soil erosion that are occurring possibly due to the grazing of livestock on the monument.

2. The excavation of the ramparts indicates that although The Knock is an igneous intrusion into the local red sandstone, with the sandstone located in the low lying areas below the summit, the ramparts have been built of the sandstone. This shows that the material for the construction of the fort has been purposely carried up the hill. There was little evidence of vitrification in the southern rampart, there was evidence of external burning on pebbles and gravels but the intensity of the burning required to vitrify the stone had not occurred in this location. It must be noted that the area that provided the highest survey readings (using fluxgate gradiometry and magnetic susceptibility), the northern ramparts, have not be excavated due to permissions granted for excavation at the site.
3. There was no evidence pertaining to the methodology used in the burning of the fort but it was evident that the construction of the outer wall and some of the internal pebbles and stone had been placed directly onto the basalt bedrock.
4. Due to the evidence of burning we can conclude that the burning of the fort happened after the construction and Phase one collapse of the ramparts, with this event being the possible reason for the Phase two collapse, see Section 4.2.2.
5. The ecological effects of the fort construction have not as yet been identified, however the changes to the landscape will be addressed in future investigations (see Section 7).

7 Future investigations

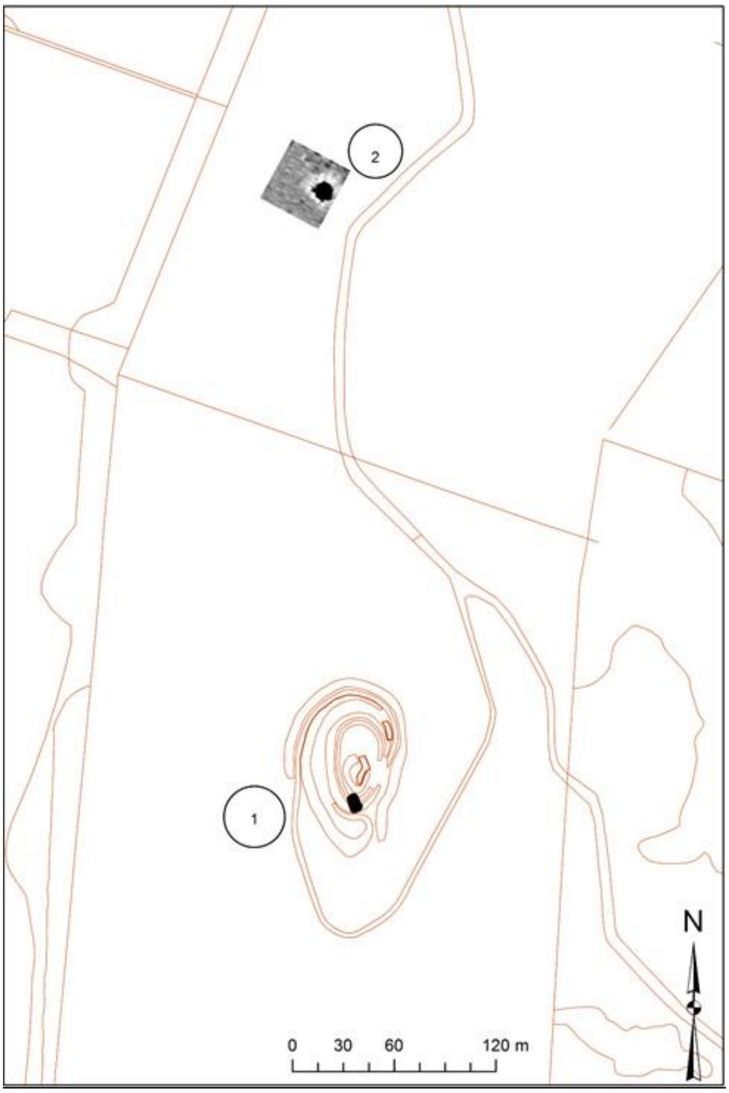


Figure 12: Location of excavations and surveys conducted in May 2016 at a scale of 1:2,500. Excavations were conducted at the southern ramparts of the hillfort (1) while geophysical surveys were conducted north of the base of the hill (2).

During the excavation season 2016 further geophysical survey was undertaken to determine the anomalies identified to the low lying land to the north of the hill fort (Figure 12). Fluxgate gradiometry, already employed on the summit of the fort, was carried out and the results of the survey are displayed in Figure 16. The results indicate that the anomaly was one of the many quarry pits across the area below The Knock; the pits are due to the quarrying of sandstone, typically used to construct the ramparts of the hill fort.

Further analysis of the sediments that have accumulated in these pits will be undertaken in season 2017/18 so that palaeobotanical investigation in the form of pollen analysis can be undertaken to determine changes in the vegetation of the area after the construction of the fort to the present day.

8 References

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8.2 Cartographic references

British Geological Survey (2015) 1:50 000 Geology [SHAPE geospatial data], Scale 1:50000, Tiles: sc029e,sc030w, Updated: 1 October 2013, BGS, Using: EDINA Geology Digimap Service, <http://digimap.edina.ac.uk>, Downloaded: 2015-08-05 09:38:04.334

Geoscan Research. 2005. Geoplot Instruction Manual.

Ordnance Survey (2015a) 1:25 000 Scale Colour Raster [TIFF geospatial data], Scale 1:25000, Tiles: ns15,ns16,ns25,ns26, Updated: 15 May 2015, Ordnance Survey (GB), Using: EDINA Digimap Ordnance Survey Service, <http://digimap.edina.ac.uk>, Downloaded: 2015-09-08 13:45:59.9

Ordnance Survey (2015b) OS Terrain 5 DTM [ASC geospatial data], Scale 1:10000, Tiles: ns16se,ns26sw, Updated: 16 December 2014, Ordnance Survey (GB), Using: EDINA Digimap Ordnance Survey Service, <http://digimap.edina.ac.uk>, Downloaded: 2015-04-22 14:34:54.059

Ordnance Survey (2015c) Topography [FileGeoDatabase geospatial data], Scale 1:1250, Tiles: GB, Updated: 18 December 2014, Ordnance Survey (GB), Using: EDINA Digimap Ordnance Survey Service, <http://digimap.edina.ac.uk>, Downloaded: 2015-04-22 14:34:54.

9 Appendix

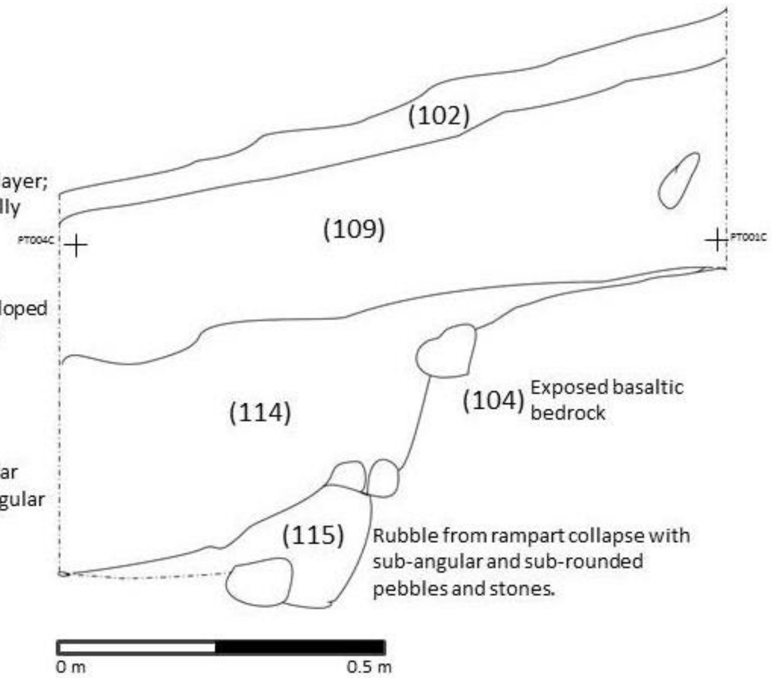
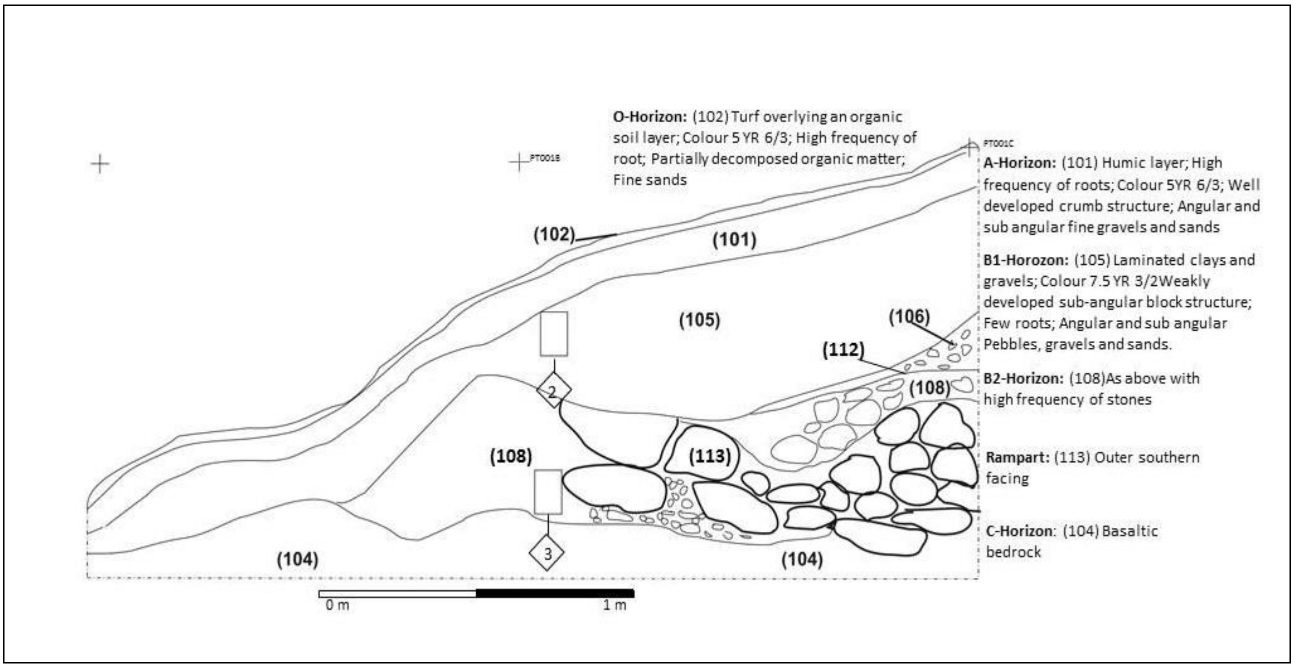


Figure 13: Section A section drawing showing the exposed basaltic bedrock and the rubble that has tumbled from the rampart (Scale 1:20)	**The Knock, Largs, N. Ayrshire Section A, Drawing 1**



O-Horizon: (102) Turf overlying an organic soil layer; Colour 5 YR 6/3; High frequency of root; Partially decomposed organic matter; Fine sands
PT001B
PT001C
A-Horizon: (101) Humic layer; High frequency of roots; Colour 5YR 6/3; Well developed crumb structure; Angular and sub angular fine gravels and sands
B1-Horozon: (105) Laminated clays and gravels; Colour 7.5 YR 3/2Weakly developed sub-angular block structure; Few roots; Angular and sub angular Pebbles, gravels and sands.
B2-Horizon: (108)As above with high frequency of stones
Rampart: (113) Outer southern facing
C-Horizon: (104) Basaltic bedrock
(102)
(101)
(105)
(106)
(112)
(108)
(113)
(108)
(104)
(104)
2
3
0 m
1 m

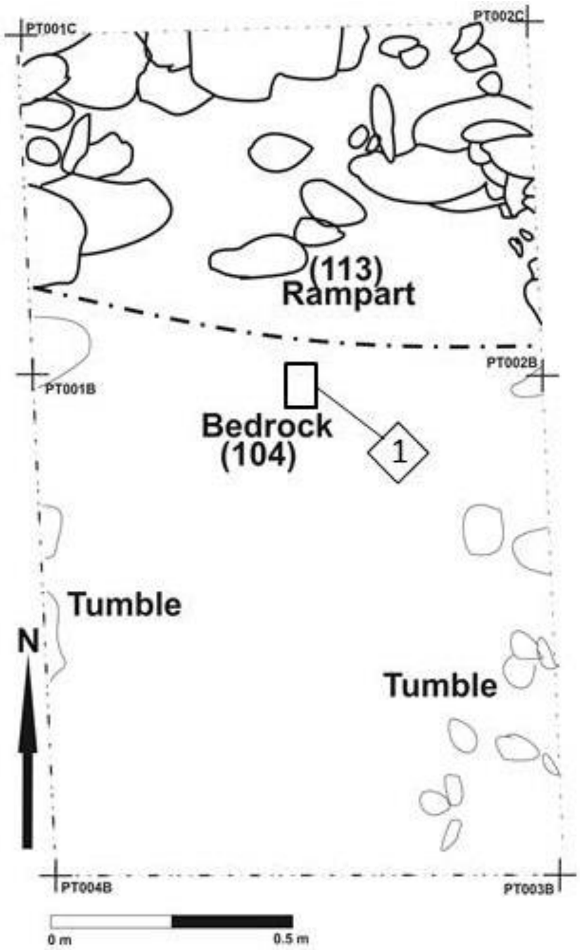


Figure 14: Plan and Section B_C drawings displaying the outer part of the southern rampart and the rumble that has tumbled from the rampart during collapse (Scale 1:10)	**The Knock, Largs, N. Ayrshire Section B_C Drawing 2 & Plan 3**

Figure 15: Degraded basalt below the southern rampart exposed due to sheep and cattle grazing on the left and, weathered basalt that may have been identified initially as vitrified rampart

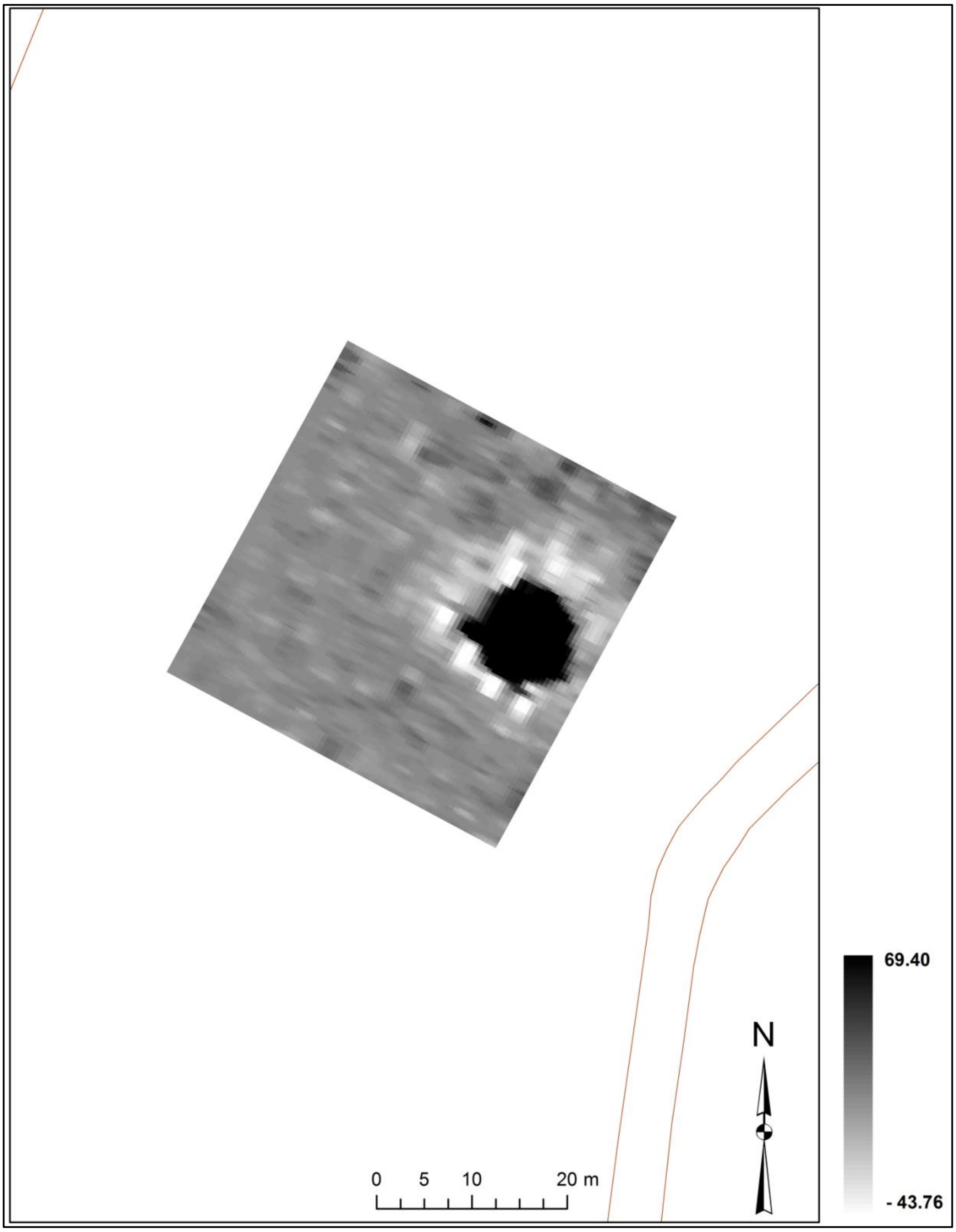


Figure 16: Results of the processed magnetometry results at a scale of 1:500

Figure 17: Smoothing stone, discovered in Section B_C, event 113.

Table 3: Excavation context register

Context No:	Description	Section No:	Drawing No:	Date
101	A-Horizon below turf and O-Horizon in Section B_C	B_C	2	8/5/16
102	A-Horizon below turf and O-Horizon in section A	A	1	8/5/16
103	B-Horizon below event 102 in Section A	A	1	8/5/16
104	Exposed geology (Weathered basaltic bedrock) above Section A and B_C	A	1 and 3	8/5/16
105	B1-Horizon in Section B_C overlying the tumbled rampart (108) and below (101)	B_C	2	8/5/16
106	Tumble event below (105) containing small gravels and pebbles			9/5/16
107	A-Horizon as event (101)	B_C		9/5/16
108	B2-Horizon and tumble rampart below (112) and above (113)	B_C	2	9/5/16
109	A-Horizon as event (101)	A	1	10/5/16
110	Continuation of (112)	B_C		11/5/16
111	Continuation of (112)	B_C		11/5/16
112	Burnt layer containing as and burned sandstone below (106 and above (108)	B_C	2	11/5/16
113	Outer facing southern rampart comprising of large sandstone blocks	B_C	2 and 3	14/5/16
114	B-Horizon below (109) and above (115)	A	1	14/5/16
115	Rumble from rampart tumble derived from Section B_C and below (114)	A	1	14/5/16

Table 4: Sample register

Sample No:	Context No:	Description	Section No:	Date
1	101	Charcoal sample from event 101 below turf	B_C	8/5/16
2	109	Charcoal samples	A	8/5/16
3	109	As above	A	8/5/16
4	105	Charcoal sample in B1-Horizon	B_C	9/5/16
5	115	Charcoal within Rubble of tumbled rampart	A	9/5/16
6	114	Charcoal from the B-Horizon	A	9/5/16
7	101	Coal sample from the A-Horizon	B_C	9/5/16
8	108	Charcoal sample adjacent to (113) the outer rampart wall	B_C	9/5/16
9	108	Bone found adjacent to 113	B_C	11/5/16
10	108	Wood species sample for identification of burning fuel adjacent to outer rampart wall	B_C	11/5/16
11	108	Wood species sample for identification of burning fuel adjacent to outer rampart wall	B_C	11/5/16
12	108	Kubiena sample 1 from (112)	B_C	12/5/16
13	108	Bulk soil sample to correspond to sample 12 from (112)	B_C	12/5/16
14	108	Wood species sample for identification of burning fuel	B_C	12/5/16
15	113	Stone smoothing pebble	B_C	13/5/16
16	105	Kubiena sample 2	B_C	14/5/16
17	108	Kubiena sample 3	B_C	14/5/16
18	112	Bone from the ash and burned lay (112) but bone shows no sign of burning	B_C	12/5/16
19	113	C14 dating sample collected from (113)	B_C	13/5/16
20	113	C14 dating sample collected from (113)	B_C	14/5/16

21	112	Bone from the ash and burned lay (112) but bone shows no sign of burning	B_C	13/5/16
22	105	Bulk soil sample to correspond to sample 16	B_C	14/5/16
23	108	Bulk soil sample to correspond to sample 17	B_C	14/5/16