

**Assessment of soils and sediments from Cawthorn Camps, North Yorkshire**

by

Maria-Raimonda Usai

**Summary**

*Soils and sediments from an excavation at Cawthorn Camps were assessed. Materials from a Roman rampart were compared with local natural soils through field and macro-morphological observations. Similarities were found between a light coloured layer previously interpreted as 'mineralized turf' and horizons from local soils, suggesting the hypothesis that the light coloured horizon was the result of bleaching of podzol-like materials employed for the rampart construction. Since some discrepancies were observed in the profile sequences, and considering that some typical podzol features can only be interpreted with microscopic examinations, it is recommended that macro- and micromorphological analysis are carried out to test the above hypothesis and to obtain more information on the dynamics of profile formation.*

*Observations of undisturbed samples from a section of a turf wall suggested that a core of horizontally arranged turf blocks was covered by a more chaotic and disorderly mass of turf material. Micromorphological analysis of samples from the core and covering material of the wall is recommended in order to check the above interpretation.*

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Environmental Archaeology Unit  
Department of Biology  
University of York  
PO Box 373  
York YO10 5YW  
Telephone: 01904 433847  
Fax: 01904 433850  
E-mail: mru2@york.ac.uk

Prepared for:  
Peter Wilson  
Centre for Archaeology  
Fort Cumberland  
Fort Cumberland Road  
Eastney  
Portsmouth PO4 9LD

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### Introduction

Excavations at Cawthorn Camps were carried out during the September 1999 by English Heritage Centre for Archaeology, under the direction of Pete Wilson. The site is located on the Tabular Hills in North Yorkshire. Previous excavations were carried out in the 20s by I. A. Richmond, who interpreted the earthworks as representing four Roman camps (labelled A, B, C and D). Later, works by G. Lee, conservation officer of the North York Moors National Park, suggested a more complex series of events including Roman and post-Roman occupation.

The archaeological aims of the project included characterizing pre-Roman occupation of the site, understanding and dating the Roman and post-Roman use of the site. The excavation comprised three main trenches designated 1, 2 and 3.

#### *Trench 1*

Trench 1 was located within earthwork feature B, which had been interpreted as a post-Roman annex to Fort A. The excavation of Trench 1 revealed part of two turf walls at either ends of a feature interpreted as a structure inside the annex.

#### *Trench 2*

Trench 2 transected the eastern boundary of earthwork A, which has been interpreted as

a Roman fort, surrounded by a rampart with a palisade. Trench 2 was cut into a trench previously excavated by Richmond and revealed a context defined by Richmond as 'mineralized turf' at the base of the rampart.

#### *Trench 3*

This trench was located between earthworks A and C, attempting to test for the presence of pre-Roman features.

### Aims

The main aims of the geoarchaeological work are:

- Understanding and recording, with standard terminology, the general soil and sediment features of the area, with particular reference to waterlogging, type of soils profiles, stratigraphy.
- Interpreting the origin and nature of the features (including also the 'mineralized turf' and the over- and under-lying horizons) at the base of the rampart of Fort A.
- Contributing to the interpretation of the turf wall of the feature in Annexe B, for example by defining which part of the outcrop of turf materials constituted the actual wall, which parts of the outcrop could rather represent some protective cover added to the wall at some stage, and which other parts could possibly represent

weathering or erosion materials derived from the wall.

- Interpreting the nature of the contexts of Trench 3.

## Methods

The site was visited before and during the archaeological excavation.

Local natural soils were observed and partly described. An attempt was made to define a reference soil profile for the site, to be employed as a control for interpretation of the site stratigraphy and, particularly, of some of the materials of Trenches 1 and 2.

Loose samples, Kubiena boxes, or other undisturbed samples of selected sediments and soils were collected from the trenches, and field description of selected features (including context boundary type, waterlogging patterns, horizon definition, depth) was carried for the profiles sampled. The samples collected are listed in Table 1 in the Appendix.

## Discussion

Although there are no large-scale soil maps published for the local soils at Cawthorn (only very small-scale soil associations maps which are not suitable for large-scale interpretations), some large-scale maps of soils in the surroundings describe two main soil associations: the first one includes iron stagnopodzols (of the Hambleton series) and typical brown earths (of the Firby series) both over loamy skeletal or coarse loamy sandstone or grit, under forest or moorland; and another association including typical

brown earths (Firby series), humus-iron stagnopodzols (Maw series) and ironpan stagnopodzols (Hambleton series), all over coarse loamy or loamy skeletal sandstone or grit, under pasture, forest and arable land (Carroll and Bendelow, 1981).

Soil uncovered in the three trenches at Cawthorn Camps corresponded, at least in some of the horizons exposed, to the humus-iron stagnopodzols of the Maw series and the ironpan stagnopodzols or iron podzols of the Hambleton series. No soils of the Firby series were observed (though it is possible that they were present in some parts of the Camps. The main basic soil profiles of the site are (see glossary in the Appendix of this document):

### 1) *Strongly acidic iron stagnopodzols over sandstone or grit, under moorland or forest (Hambleton series):*

Oh and/or	Black amorphous peat with weak
Ah horizon:	subangular blocky structure
Eag horizon	Brown or greyish brown sandy or silty loam, very stony (with angular sandstone fragments), weak subangular blocky structure; very porous. Moderately weak consistence.
Bfe horizon:	Iron pan, often only weakly developed.
Bs horizon:	Brown or yellowish brown sandy silt loam, very stony (with angular sandstone fragments); weak subangular blocky structure; moderately porous; in cases weakly cemented. Moderately weak consistence.

BC and/or	Yellowish brown or brownish
Cu horizon	yellow sandy silt loam; very stony (with angular sandstone fragments); massive. Moderately weak consistence.
2R horizon	Sandstone

2) *Strongly acidic humus-ironpan stagnopodzol over sandstone or grit, under forest or moorland (Maw series)*

Oh horizon	Black amorphous peat. Often flaggy sandstones at the surface.
(Ah horizon)	(Black and thin, not always present)
Eag horizon	Grey or pinkish grey loamy sand or sandy silt loam; slightly or moderately stony (with subangular or angular sandstones); weak or moderate subangular blocky structure; very porous. Consistence: moderately or very weak.
Bfe horizon	Dark reddish brown ironpan
Bs horizon	Reddish yellow sandy silt or sandy loam; slightly or moderately stony (with subangular or angular sandstones); weak subangular block structure. Consistency: moderately weak.
C or 2R horizon:	Shattered sandstone or massive bedrock.

Profiles of type (1) were represented in Trench 3, though in some parts of the same trench, colours were redder as in soil type (2). Trench 3 did not seem to contain any anthropogenic features, as also confirmed by

the archaeological interpretation. Thus, the soils of Trench 3 seemed suitable for representing a control profile of natural soils in the area. Samples of horizons O, E, B and C were collected in plastic bags. It is recommended that a detailed description of the samples is carried out following a standard terminology (for example Hodgson, 1973).

The wide transect across the rampart of Trench 2 contained, at the base of the rampart, a pale, bleached, sandy linear context (the context defined by Richmond as mineralized turf), overlying a clear red ironpan. The upper surface of this pale sandy layer was characterized by the presence of light coloured iron nodules, non-hardened and much thinner than the lower iron pan. Beneath this, a Bs and a C horizon followed. The upper part of the soil profile, however, was not present and there was no organic-rich horizon above the pale layer. Instead, the pale layer was overlain by a context similar to the underlying C horizon, overlain in turn by another pale sandy context. Here, however, the pale sandy context was not underlain by an iron pan: only lighter-coloured ferruginous nodules marked both the upper and lower boundary of the context.

A hypothesis for the interpretation of the sequence of Trench 2 is that the lower pale horizon represents the Eag horizon (from which many minerals have been removed, rather than a 'mineralized' layer as described by Richmond) horizon of an *in situ* buried podzol profile consisting of Eag, Bfe, Bs and C horizons (Figure 1). The profile, however, seemed truncated, as shown by the absence of the upper soil horizons (Oh), and was deliberately covered with materials obtained from the lower stony horizons (probably the

C horizons) and E horizons of soils in the vicinity. It is not clear whether a continuous sequence E-C was transported as a whole in the rampart, or whether it was firstly fragmented in two layers (an E horizon- and a C horizon-derived layer), though the second hypothesis could be more likely because of the absence of an iron pan below the pale transported layer.

The presence of iron nodules and accumulations both in the upper and lower pale E horizons may suggest that iron mottling was occurring during profile formation, but has also continued after burial. If the latter is the case, this would confirm a continuation of an oxidizing and acidic micro-environment throughout the rampart during the time since its construction.

The above interpretation, however, needs to be confirmed through a detailed macro-morphological description of the samples collected and through micro-morphological analysis. Loose samples in plastic bags, and undisturbed samples in Kubiena boxes or undisturbed soil lumps, were collected from the contexts mentioned above.

The turf wall of Trench 1 was characterized by an irregular morphology. The 'core' of the wall seemed regularly layered with different turf layers sub-parallel to each other and to ground surface. The outer part of the wall outcrop, however, was covered by a seemingly irregularly arranged mass of turf. One of the archaeological interpretations was that the core was the real wall, whilst the outer layer could be the result of wall degradation with time or a cover of material deliberately put into place either for protecting the wall or for other reasons. Two undisturbed samples (in Kubiena boxes)

were collected for micromorphological analysis for investigating and describing the structure of the core and covering layers.

### Recommendations

Macromorphological analysis is recommended for samples 611, 612, 634, 618, 635, 617, 616, 636, 620, and micromorphological analysis is recommended for samples 639, 640, 633, 610, 610b, 616 bis, and (Table 1).

Costs and time required for the analysis are indicated in Table 2.

### References

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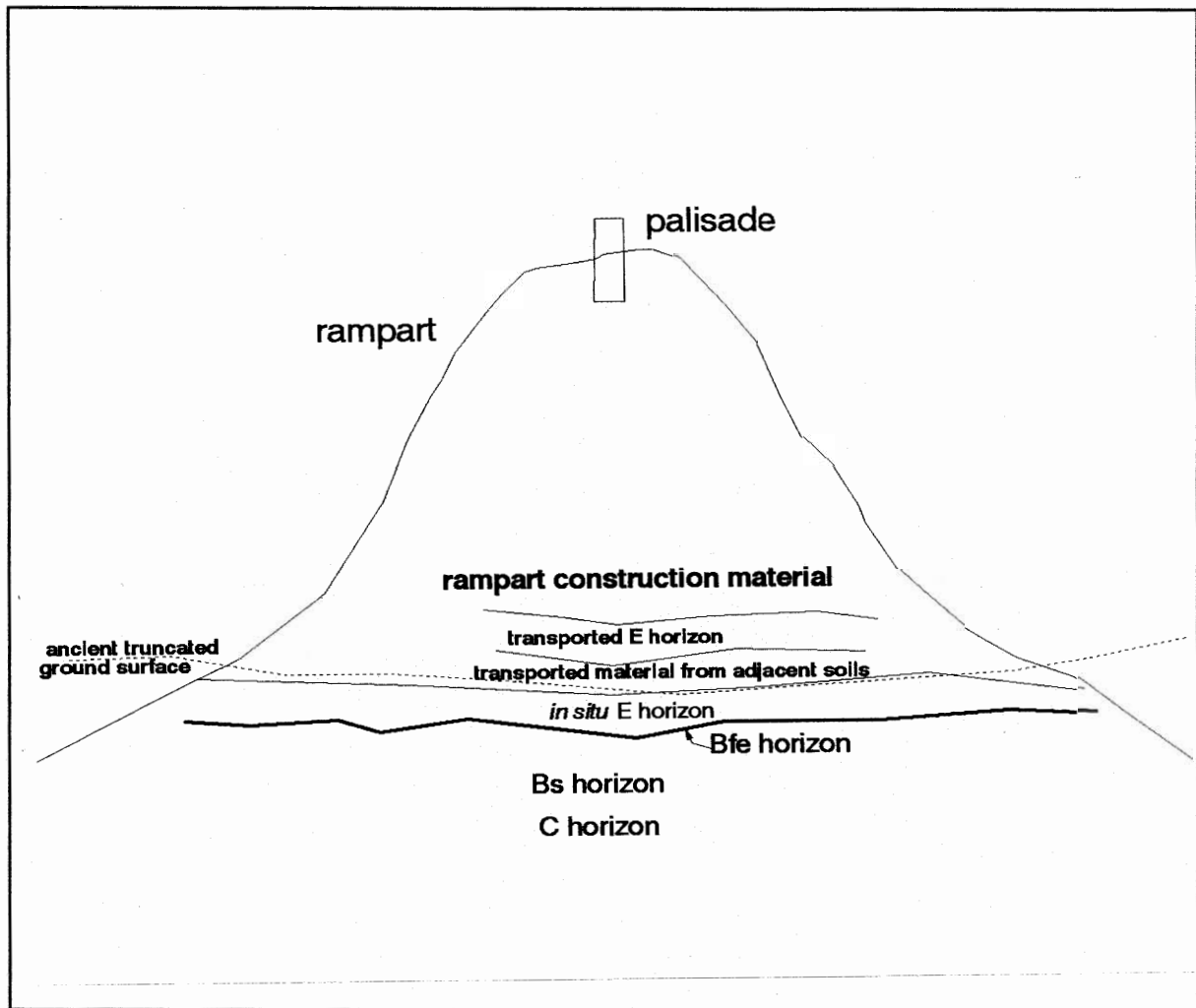


Figure 1. Hypothesis for the rampart make-up

Table 1. Geoarchaeological samples collected

Sample	CAS Sample No	Context	Notes	Recommendations
639			Kubiena box. Turf wall edge. Trench 1.	Thin section recommended.
640			Kubiena box. Turf wall layered core. Trench 1	Thin section recommended.
633			Kubiena box. Trench 2. E/Bfe/Bs	Thin section recommended.
610			Kubiena box. Time gap/Fe pan/B. Trench 1 (W-facing).	Thin section recommended.
610b			Undisturbed lump. Time gap/Fe pan/B. Trench 1 (W-facing)	Thin section recommended.
619			Kubiena box. B under 610. Trench 1 (W-facing).	Thin section non recommended.
616bis			Undisturbed lump. Boundary A/E with Fe pan. Trench 3.	Thin section recommended.
611		140	Plastic bag	Macro-morphology. No thin section.
612		117	Plastic bag. Turf bank	Macro-morphology. No thin section.
634			Plastic bag. Loose pieces of E horizon with parts of Fe pan. Trench 2.	Macro-morphology. No thin section.
618			Plastic bag. Bs horizon.	Macro-morphology. No thin section.
635			Plastic bag. Bs horizon under E horizon with pieces of Fe pan. BS/Bfe. Trench 2.	Macro-morphology. No thin section.
617			Plastic bag. E horizon.	Macro-morphology. No thin section.
616	645		Plastic bag. A horizon. Trench 3.	Macro-morphology. No thin section.
636			Plastic bag. Bs/C. Trench 2.	Macro-morphology. No thin section.
620	269?		Sample was collected by CAS and marked: 616 (645) with the wording: "whole mineralize turf collected for Raymonda"	Macro-morphology. No thin section.

Table 2. Costs and resources.

<b>Task</b>	<b>Number of samples</b>	<b>Time required (days)</b>	<b>Cost (£)</b>
Sample selection, preparation and packing for thin section laboratory	6	1.5	
Thin section preparation (by the thin section laboratory of the University of Stirling) @ £ 80+VAT per section	6		480
Micromorphological analysis	6	5	
Macromorphological analysis	9	4	
Analysis of results	15	1.5	
Interpretation and report writing		3	
Total time required		15	
Total cost			480



## *Appendix*

### *Glossary*

O horizons	Peaty horizons accumulated under wet conditions; Oh horizons have an organic fraction mainly amorphous.
A horizons	Surface horizons containing both mineral and humified organic matter.
E horizons	Leached ('eluvial') horizons with from which silicate and/or sesquioxides and/or organic matter have been removed.
Ea horizons	As above and bleached, pale coloured.
Eag	As Ea, but also gleyed (with reddish orange ferruginous mottles).
Bfe horizons	Iron pans
Bs horizons	Coloured horizons enriched in sesquioxides In the form of coatings around sand and silt grains
Bh horizons	Dark horizons with humus deposition between and lining sand and silt grains
BC horizons	Transitional between B and C
C horizons	Weakly consolidated or unconsolidated horizon retaining the characteristics of its parent rock
Cu horizon	Unconsolidated C horizon
R horizon	Bedrock