SURVEY AND SAMPLING AT THE CASTLE DYKES IRON AGE 'HENGE', WENSLEYDALE, NORTH YORKSHIRE

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with contributions by

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SUPPLEMENTARY MATERIAL

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APPENDIX SM1

SOIL MICROMORPHOLOGICAL ANALYSIS OF THE OLD LAND SURFACE AND OVERLYING BANK MATERIAL AT CASTLE DYKES

Charles French

Introduction

Two blocks were taken for micromorphological analysis (Bullock *et al* 1985; Courty *et al* 1989; Murphy 1986; Stoops 2003, 2010), one from the old land surface/buried soil beneath the bank (K1) and one from the bank overburden immediately above (K2). The descriptions are found below.

Observations in thin section

The thin section of the thin (*c* 7cm), possible old land surface/buried soil (K1) was dominated by poorly sorted stone fragments of various sizes and a calcitic, fine sandy clay loam between. Fine/very fine quartz sand, micritic calcium carbonate and dusty clay predominate, with minor irregular zones of amorphous sesquioxide impregnation, brown staining of much of the groundmass and highly humified organic matter fragments.

This soil horizon resembles a thin, truncated and rather poorly developed, lower A to B horizon of a brown earth type of soil developed on a calcitic substrate (Bridges 1978, 61). It has been subject to much oxidation of the organic component, some illuviation of dusty clays, and the secondary formation of fine calcium carbonate and iron oxides and hydroxides. The upper organic A horizon appears to be completely missing, suggesting soil truncation as part of the building of the monument. The large amount of fine to coarse limestone pebbles mainly derives from the weathering of the limestone bedrock, although some of it has probably been introduced as a consequence of the construction of the monument above.

The thin section taken from the bank make-up above (K2) was dominated by variable zones and sizes of coarse to fine limestone gravel with a calcitic fine sandy clay loam between, and some evident inter-leaving of organic matter (now humified) at the base of the bank/top of the old land surface, and/or ocasional infills of calcitic ash with micro-charcoal. The groundmass was a mix of very fine quartz sand, micritic calcium carbonate and dusty (silty) clay, with some secondary sesquioxide and brown humic staining in places throughout. There is a moderately well developed small blocky ped structure evident.

It is suggested that this sample is indicative of a mix of lower A and B soil horizon and weathered limestone bedrock material, essentially the soil from the immediate area, that has been thrown-up to make the henge bank. It has also received minor amounts of probably dumped hearth rake-out material. Once in place, this bank material has enjoyed longer term stability and some pedogenesis to produce a soil structure replicating what the pre-henge soil may have more closely resembled prior to its disturbance by the construction of the henge bank.

APPENDIX SM2

DATA TABLES

Table SM1. Description of the core through the bank.

Depth (cm)	***Description***
0–10	Dark brown (10YR 3/3) compact humic silt, stone-free, common fine fleshy and fibrous roots, weak small to medium crumb structure, abrupt boundary **Ah (topsoil under grass)**
10–22	Very dark greyish brown (10YR 3/2) compact massive stone-free silt with common fine fleshy roots, rare medium fibrous roots, clear boundary **A horizon (topsoil)**
22–48	Dark greyish brown (10YR 4/2) silt becoming greyer with depth, with few small to medium stones, few fine fleshy roots, weak medium blocky structure, sharp boundary **B horizon (brown earth soil)**
48–96	Dark greyish brown (10YR 4/2) to brown (10YR 4/3) compact silt loam matrix with yellowish brown (10YR 5/6) fine sandy inclusions, rare medium stones scattered throughout, rare small stones, mixed heterogeneous deposit **Upper bank material**
96–110	Large stone
110–128	Compact brown (10YR 4/3) silt loam, rare small stones present throughout, abrupt boundary **Upper bank material**
128–152	Dark greyish brown (10YR 4/2) silt with few stones, rare very fine ?charcoal flecks @ 164cm small flint/chert **Lower bank material**
152–165	Dark greyish brown to very dark grey (10YR 4/2 – 3/2) compact silt with some fine sand present, rare small stones, abrupt to sharp boundary, possibly redeposit Ah material **Lower bank material (?A horizon derived)** K2: 154-164cm (kubiena sample)
165–171	Compact (very) dark greyish brown (10YR 4/2 – 3/2) silt loam (weakly humic), many very small and small stones, weak incipient ?blocky structure, sharp boundary over sandstone bedrock **Azonal buried soil** K1: 164-171cm (kubiena sample)
	Sandstone bedrock **Parent material**

Table SM2. Description of core through the ditch.

Description
Very dark greyish brown (10YR 3/2) massive humic silt with common fine fleshy and fibrous roots, stone-free, main root penetration to 12cm (15cm). Lower part (A) grading into a dark brown (10YR 3/2) silt No structure observed throughout. 0–9cm = Ah; 9–19cm = A **Topsoil**
Very dark greyish brown (10YR 3/2) massive silt, stone-free excepting medium stone at 25–26cm. From 39cm gleyed with strong diffuse mottles of yellowish red (5YR 4/6) becoming brown (7.5YR 5/3) with depth, rare fine vertical roots, clear boundary **Tertiary fill**
Very dark grey (10YR 3/1) soft stilt, stone-free excepting stone at 66-67cm) massive and very soft with a fine sand inwash lens at 76–78cm, few-many fine charcoal flecks from 68cm (83cm), becoming common from 94cm, abrupt boundary @ 81cm charcoal @ 90cm crumb of pottery? or sandstone **Possible standstill/stabilisation zone**
Soft dark grey (10YR 3/5 to 4/1) stone-free silt. [at top of core 100-110cm very wet, malleable to sloppy deposits] waterlogged from 110cml, large stone at 100–115cm, abrupt boundary @ 133cm large roundwood frag (C14 & ident) **Secondary fill – waterlogged**
Soft dark grey (10YR 4/1) very moist silt becoming drier at base), rare medium stones, clear to gradual boundary **Secondary fill**
Firm very dark grey (10YR 3/1) dense slightly moist silt with rare small and medium stone pieces, becoming slightly more common towards the base, gradual boundary **Secondary fill**
Very dark grey firm silt to 210cm, below which is very wet dark grey (10YR 4/1) silt, occasional very small and medium stones throughout – probably waterlogged, clear boundary **Primary fill – waterlogged**
Very dense firm, stiff almost solid, very dark grey (10YR 3/1) silt loam, with common very small subangular stone grits, texturally a silt loam with definite fine sand grains. Stones are several geologies. **Natural deposit (?moraine)**
As above but with small and medium stones becoming denser towards base **Natural deposit (?moraine)**

Table SM3. Material recovered from sample processing.

Fill	*Depth (cm)*	*Sample wt (g)*	*>4mm (g)*	*>0.5mm (g)*	*?waterlogged flot*	*Charred flot*	*>2mm charcoal*	*Burnt bone*	*Bead*
Tertiary	23–33	432	124	4	-	-	-	-	-
	33–43	511	28	11	-	-	-	-	-
	43–53	575	0	5	-	-	-	-	-
	53–62	523	1	0	-	-	-	-	-
?stabilisation	62–72	556	44	28	-	-	-	-	-
	72–-82	541	13	16	-	5ml	@ 81cm	-	-
	82–92	532	84	17	-	15ml	✓	✓	✓
	92–101	538	59	15 C	-	-	✓	✓	-
Secondary - waterlogged	101–111	450	21	6 C	10ml	-	✓ 5ml twig	-	-
	111–121	242	6	5	20ml	-	✓ 5ml rw + twig	✓	-
	121–131	414	462	5	5ml	-	-	-	-
	131–141	393	0	0	30ml	-	-	-	-
	141–151	509	142	0	30ml	-	-	-	-
	151–161	550	265	4	5ml	-	-	-	-
Secondary	161–171	792	108	49	2ml	-	-	-	-
	171–184	958	159	97	<0.5ml	-	-	-	-
Secondary	184–199	1150	193	113	-	-	-	-	-
Primary	199–209	433	49	49	-	-	-	-	-
	209–219	560	27	11	35ml	-	-	-	-
	219–229	341	23	14	2ml	-	-	-	-
	229–242	511	58	17	-	-	-	-	-

?Moraine	242–252	520	98	55	-	-	-	-	-
	252–260	715	101	46	-	-	-	-	-
	260–270	835	138	97	-	-	-	-	-
	270–280	666	110	76	-	-	-	-	-
	280–295	742	137	80	-	-	-	-	-

KEY: C = CHARCOAL; RW = ROUNDWOOD

Table SM4. Results of the pollen sampling.

Depth (cm)	Description
256	Pollen is sparse in this sample with Poaceae and *corylus* along with few *quercus*, *plantago* and Cyperaceae grains.
224	Poaceae, along with large amounts of *corylus*, *quercus* and *plantago*, dominate sample with moderate amounts of chenopodaceae, and smaller amounts of *salix*, Cyperaceae, *filipendula* and Lactuceae indicating a wooded environment with possible tree clearance. There are few algal spores and moderate amount of burnt matter present. The pollen grains in this sample did not take the safranine stain well.
208	Pollen again was very sparse with a few Poaceae along with 2 scabious and rumex grains counted.
196	Pollen sparse in this sample with only 148 grains of Poaceae and small amounts of *alnus*, *corylus*, Cyperaceae, *bidens*, *rumex*, *filipendula* and scabious counted. Small amount of burnt material were also present.
172	Poaceae along with high amounts of *corylus*, *quercus salix* and *plantago* dominate indicate a wooded environment with open spaces possibly clearing? Moderate amounts of cereal suggest local agriculture. Chenopodaceae and smaller amounts of *filipendula*, *rumex* and *ranunculus* as well as copious amounts of burnt material are also in evidence whist the VAM's indicate possible soil erosion occurring.
148	The dominance of Poaceae and *corylus* along with *alnus*, *salix* and *quercus* suggest a more arboreal environment with cereal amounts indicating probable local agricultural practices. The moderate amounts of *plantago*, *ranunculus*, *filipendula*, Lactuceae, *rumex*, Cyperaceae, *bidens* and Asteraceae indicate open spaces. There are few algal and fungal spores and burnt material present.
124	Poaceae and Lactuceae dominate this sample along with significant amounts of *cereal* suggesting the probability of agricultural practices in the vicinity. Substantial amounts of *salix*, *plantago*, *corylus*, *ranunculus* along with smaller amounts of Cyperaceae, *succisa pratensis*, Ericaceae, Asteraceae, *bidens*, *pteridium*, *betula*, *ulmus*, *pteropsida*, *polypodium*, and *sphagnum* are again in evidence giving the environment a more arboreal and possibly wetter aspect. A few algal spores as well as burnt material are also present.
92	Radiocarbon dated to 550– 403BC (84.6% probability). An open environment again is indicated with Poaceae and Lactuceae again dominant in this assemblage along with moderate amounts of *corylus*, *plantago ranunculus* and *salix* and smaller contributions from Ericaceae, *filipendula*, *bellis*, Asteraceae, Cyperaceae (sedge), *succisa pratensis*, *lycopodium* (clubmoss), *polypodium* and *pteropsida*. Small amounts of cereal are again in evidence. A few algae spores are present along with significant amounts of burnt and charred material.
80	The pollen accumulation at this depth again is indicative of an open environment although probably drier with fewer ferns present. Poaceae, Lactuceae and *plantago* dominate the assemblage along with moderate amounts of *pinus* (pine), *corylus*, *centaurea* (knapweed), *succisa pratensis* (devils bit scabious), *bidens and filipendula* (meadow sweet). Smaller amounts of Ericaceae, Chenopodaceae (goosefoot) and *carduus* (thistles) as well as *polypodium* (polypodies), *pteropsida* and *sphagnum* (mosses). Small amounts of cereal also present indicating the possibility of agricultural practices nearby. Fewer algae were present again suggesting a drier environment. Charcoal and burnt plant matter were present in the assemblage.
52	The pollen assemblage at this depth indicates an open damp environment with Poaceae and Pteropsida (grass and ferns) dominating supported by moderate amounts of Asteraceae (daisies), Ericaceae (heather), *bidens* (bur-marigolds), Lactuceae (dandelions) and *salix* (willow). Smaller amounts of *alnus* (alder), *corylus* (hazel), *quercus* (oak). Algae and fungal spores indicate the possibility of localised ponding whilst the VAM's (Vesicular-Arbuscular Mycorrhizae) can be found on eroding soil surfaces and so could be indicative of some soil erosion (van Geel 1979). There are also indications of burning in the vicinity with amounts of charcoal and charred plant material present in the pollen assemblage.

Table SM5. Charcoal identifications from Core 2.

Depth (cm)	**82–92**	**92–101**	**101–111**	**111–121**	**121–131**	**131–141**	**141–151**	**151–161**	**161–171**	**171–184**	**199–209**	**209–219**	**219–229**
AQUATICS & CLADOCERAN EPHYPPIA													
*Callitriche*sp. (water-starwort nutlet) P					1			1				2	
Lemna sp. (duckweed fruit) P												1	
Glyceria sp. (sweet-grass caryopsis) PM			2			3	39					2	
Cladoceran ephyppia (water-flea eggcases e.g. *Daphnia*)			++	+	++	+++	+++	+++	+++	+		+++	+++
WATERSIDE/ MARSH													
Juncus sp. (rush seed) MPw			+	+	+		+					+	
Carex sp. (sedge nutlet and calyx type A) MPw				11	2			1					
Carex sp. (sedge nutlet and calyx type B) MPw					2								
Carex sp. (lenticular sedge nutlet) MPw			1			2						1	
Carex sp. (trigonous sedge nutlet) MPw		5											
Indeterminate Cyperaceae MGw												2	
Sphagnum sp. (sphagnum moss leaf) M			+		+							+	
GRASSLAND													
Viola sp. (violet seed) GEWSH		1f		1f									
Cardamine pratensis L. (cuckooflower seed) Gwi								2	4			3	
Linum catharticum L. (fairy flax seed) Gi						1							
Ranunculus acris/bulbosus/repens (buttercup achene) DG			8	1	4	2	2					1	1
Plantago major L. (greater plantain seed) CGo			6		1	2	3	2				3	
Prunella vulgaris L. (selfheal nutlet) GDWoi					1	3	3						
Stachys sp.		1											

Carduus/Cirsium sp. (thistle achene) GDY					2	1	2					1	
Leontodon autumnalis L. (autumn hawkbit achene) Gi						1							
Poaceae (various grass caryopses) GD			11	2	7	3	13	22	5			14	5
HEATH													
Calluna vulgaris (L.) Hull (heather shoot tip) Emsp							1						
Erica sp./*Calluna vulgaris* (heather, ling capsules) EM							3						
Pteridium aquilinum L. (Kuhn) EGaSW							1					2	
SCRUB / CARR / WOODS													
Rubus sp. (bramble/raspberry seed) DHSW*		5	4	2				1					
Corylus avellana L. *(*hazelnut shell frag.) HSW	[1]	[1]											
cf. Alnus sp. (cf alder leaf frag in bud)												2f	
Salix sp. (willow bud scales)							2				cf.1		
NUTRIENT-ENRICHED & DISTURBED GROUND													
Polygonum aviculare (knotgrass achene) CD													
Atriplex patula/prostrata (orache seed) CDn		1e					1					4	
Stellaria media(L.) Vill. (common chickweed seed) Cno			11	2	2	15	12	14	12	1f		44	7
Chenopodiaceae			11e	2e	1e								
Brassica cf. nigra (cf. black mustard seed) *CD									1			2	1
Capsella bursa-pastoris (L.) Medik. (shepherd's purse seed) Co							4	20	18		3	26	11
Polygonum aviculare (knotgrass achene) CD			6	1	1	1	2					6	
Rumex sp. (dock achene) CDG			1			1		1				4	

Urtica dioica L. (stinging nettle achene) CDn	19	121	157	19	62	27	19	23	1	1	3	45	7
U. urens L. (small nettle achene) CDn					1								
Cerastium sp. (mouse-ear seed) CD								11	20			15	3
Persicaria lapathifolia (L.) Gray (pale persicaria achene) CDw							1						
Persicaria maculosa (redshank achene) Cdo								1					
Torilis japonica (Houtt.) DC (upright hedge-parsley mericarp) GHWon			1									1	
Galeopsis tetrahit L. (common hemp-nettle nutlet) ADWod			cf.1f									4	
Plantago major L. (greater plantain seed) CGo													
Sonchus asper (L.) Hill (prickly sow-thistle achene) CDY								2	1			22	2
Lapsana communis L. (nipplewort achene) CDHSW		1			2				1			1	
CULTIVATED CROPS													
Hordeum vulgare (hulled barley grain)		[1]											
TOTAL PLANT MACROFOSSILS [ ] =charred; no brackets = waterlogged	[1] 19	[2] 135	210	41	89	62	108	101	63	2	7	208	37
CHARCOAL	5ml	10 ml	+	5ml	+	+	+			+		3ml	

no brackets = waterlogged plant remains; [ ] = charred plant remains; e = seed embryo and cotyledons only, i.e. no seed coat; f = fragment; + = occasional; ++ = several; +++ = frequent.

Table SM6. Insect remains from Castle Dykes Henge, Core 2.

Nomenclature follows Duff (2012). Ecological codes for beetles (Coleoptera) and bugs (Hemiptera) are shown in square brackets as follows: d – damp ground/waterside, oa – outdoor taxa unable to live and breed within buildings or in accumulations of decomposing organic material; ob – probable outdoor taxa; p – strongly plant-associated taxa, rf – foul decomposers, rt – eurytopic decomposers, sf – facultative synanthropes, st – typical synanthropes, u – uncoded, w –aquatics

Depth (cm)	***Insects taxa picked out of plant macrofossil samples***
219–229	*Aphodius* sp. (medium-sized) [ob-rf]; *Notaris* ?*acridulus* (Linnaeus) [oa-p-d]; indeterminate Coleoptera fragments; Coleoptera sp. larval fragment; Acarina sp. (mites)
209–219	Diptera (fly) fragment; Hymenoptera ?Aculeata; Carabidae sp. indeterminate [oa]; *Helophorus* sp. (large) [oa-w]; *Cercyon haemorrhoidalis* (Fabricius) [rf-sf]; Aleocharinae sp. [u]; *Gyrohypnus fracticornis* (Müller) [rt-st]; *Aphodius* sp. (large, 2 individuals) [ob-rf]; Cantharidae sp. [ob]; Chrysomelinae sp. (bluish-green) [oa-p]; *Phyllotreta* sp. (striped) [oa-p]; *Longitarsus* sp. [oa-p]; indeterminate Coleoptera spp. sclerites and leg segments; insect larval fragments
161–171	*Helophorus* sp. (small, 2 individuals) [oa-w]; Silphidae sp. [u]; *Olophrum* sp. [oa]; Aleocharinae sp. [u]; indeterminate Coleoptera leg sements; Acarina sp. (mites)
151–161	*Trioza urticae* (Linnaeus) nymph [oa-p]; *Megasternum concinnum* (Marsham) [rt]; *Gyrohypnus fracticornis* (Müller) [rt-st]; Coleoptera spp. underside and leg segments; insect larval fragments; Acarina sp. (mites)
141–151	*Agabus bipustulatus* (Linnaeus) [oa-w]; indeterminate Dytiscidae sp. [oa-w]; *Helophorus* sp. [oa-w]; *Hydrobius fuscipes* (Linnaeus) [oa-w]; *Tachyporus* sp. [u]; Aleocharinae sp. (2 individuals); indeterminate Coleoptera sp(p). leg segments
131–141	Diptera (fly) puparia, several; Hymenoptera Parasitica; *Helophorus* sp. (medium-large) [oa-w]; *Tachinus rufipes* (Linnaeus) [u]; Staphylininae sp. [u]; *Aphodius* sp. (2 individuals) [ob-rf]; indeterminate Coleoptera spp. leg segments; Acarina sp. (mite)

no brackets = waterlogged plant remains; [ ] = charred plant remains; e = seed embryo and cotyledons only, i.e. no seed coat; f = fragment; + = occasional; ++ = several; +++ = frequent.

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Table SM7. Sample descriptions of charred and waterlogged plant macrofossils and invertebrate remains from Core 2. The following descriptions start from the base of the ditch, moving upwards. Fill descriptions and groupings are taken from the geoarchaeology report above.

Depth (cm)	***Description***
Primary fill	
209–219	This 10cm soil sample produced the highest concentration of waterlogged plant remains and the most diverse assemblage, and also the greatest numbers of identifiable invertebrate remains. Plant and invertebrate remains were well-preserved, suggesting that the sediments had probably remained permanently waterlogged since deposition. The presence of three aquatic plant species indicates that water stood in the ditch for most, if not all, of the year although it may not have been deep. Water-starwort (*Callitriche* sp.) is a pioneer species that usually gets crowded out once aquatic vegetation becomes well-established. Sweet-grass (*Glyceria* sp.) grows in mud or shallow to deep water (depending on the species) and duckweed (*Lemna* sp.) floats on ponds and ditches, becoming abundant in eutrophic waters. Cladoceran ephippia were frequent. A single *Helophorus* water beetle was noted; members of this genus are attracted to many types of water bodies even if small or temporary. Small numbers of remains from waterside taxa, including rushes (*Juncus* sp.), sedges (*Carex* sp.) and sphagnum moss (*Sphagnum* sp.), probably represent vegetation growing along the margins of the ditch. Fragments of wood and twigs were present, as were a few large fragments of charcoal. A small fragment of *Prunus* sp./Maloideae charcoal was submitted for radiocarbon dating. A radiocarbon date of c.562-419 cal BC (66.8% probability) was returned, giving the surprising result that the henge appears to be Iron Age in date. The only other evidence of shrubs or trees were two fragments of leaf that appeared to be alder leaves (cf. *Alnus* sp.) folded as if they were emerging from buds. Two fragments of bracken frond (*Pteridium aquilinum*) were also recovered; this plant can grow in woodlands or open rough grassland. All of the remaining seventeen taxa were either grassland herbs or plants of disturbed habitats. Interestingly, plants of both infertile soils and nutrient-enriched soils were represented, suggesting either that some of the remains had been brought in to the area from elsewhere, or possibly that one side of the ditch had been nutrient-enriched and the other had remained impoverished. Plants of nutrient-poor soils include cuckoo flower (*Cardamine pratensis*), mouse-ear and bracken. Plants showing a preference for nutrient-rich soils were more abundant, especially common chickweed and stinging nettles. A mainly open grassland environment is indicated with some nutrient enriched areas (possibly from livestock) and aquatic vegetation in the ditch. Terrestrial beetles noted included leaf beetles associated with Brassicacae and grassy habitats (*Phyllotreta* and *Longitarsus*), and a large *Aphodius* dung beetle again hinting at the possible presence of grazing animals. There was also a possible synanthropic element: *Cercyon haemorrhoidalis* is associated with dung deposited in the open and foul occupation waste, while *Gyrohypnus fracticornis* is typically found in man-made habitats where there is decomposing plant litter, although it can also be found in natural situations.
199–242	Moderate numbers of waterlogged plant remains were present in this 10cm sample, including frequent cladoceran ephippia (drought-resistant resting egg cases of *Daphnia*), an occasional buttercup achene (*Ranunculus acris/bulbosus/repens*) and grass seeds (various Poaceae). Cladoceran ephippia were frequent in many of the lower ditch samples indicating that water stood in the ditch for at least part of the year. They can be numerous in nutrient-enriched water bodies. Occasional fragments of poorly preserved wood, leaves and moss were present indicating the presence of at least some woodland or scrub in the vicinity. Wet conditions and semi-aquatic grasses, perhaps including sweet-grass (*Glyceria* sp.), were suggested by the weevil *Notaris ?acridulus.* A few weeds of nutrient-enriched soils were also present, including common chickweed seeds (*Stellaria media*) and stinging nettle achenes (*Urtica dioica*). Other common weeds of cultivated and disturbed soils include shepherd's purse (*Capsella bursa-pastoris*), mouse-ear (*Cerastium* sp.) and prickly sow-thistle (*Sonchus asper*). As a whole, the assemblage indicates that the local vegetation was grassy and open with some areas of disturbance and nutrient-enrichment either resulting from human or animal activities. The few identifiable insect remains provided a degree of support to this interpretation since they included fragmented sclerites of a scarabaeid dung beetle (*Aphodius*) primarily associated with herbivore dung. All of the plant species in this sample were present in much greater quantities in the sample above, 209–19cm (also 10cm deep), in addition to a much wider range of taxa, so it is possible that sample 219–29cm was taken from the base of the ditch containing primarily clean soil eroded from the ditch faces soon after it was excavated.

Secondary Fill	
199–209 & 171–184	Only 9 waterlogged plant remains were recovered from the two samples amounting to 23cm of deposit. A possible willow bud scale (cf. *Salix* sp.) and occasional weeds of disturbed, nutrient-enriched soils (common chickweed, shepherd's purse, stinging nettle) were the only taxa represented. It is likely that these deposits accumulated at a time when the climate was drier and/or warmer, as the conditions for preserving plant material by waterlogging were clearly not met. An alternative suggestion could be that clean material from the ditch sides had eroded into the ditch, but this is unlikely to account for such a thick deposit containing scarce plant remains without being clearly observed during sampling.
161–171 & 151–161	Although all of the next 7 samples could be discussed together, there are a few specific differences that can be pointed out by dividing the group into three sections. The lower deposits of the secondary fill (20cm) contain frequent ephippia and two *Helophorus* water beetles, but only one aquatic plant taxon (water-starwort) and few waterside/marsh taxa (traces of rush and sedge). It is possible that climatic conditions were too variable for aquatic plants to become established, although the ditch was obviously damp enough for organic remains to become preserved. Alternatively, the levels of activity could have risen to a level that meant vegetation was not left to flower and seed, either due to grazing by livestock or cutting for use as building materials, fodder, tinder or other domestic purposes. Specific taxa in these two samples were also present in the primary deposit but not in later samples, including cuckoo flower, black mustard seed (*Brassica* cf. *nigra*), mouse-ear and prickly sow-thistle. Shepherd's purse could probably also be added to this group as only four seeds were found in the layer above (141–51cm) while a total of 78 seeds were found in five samples below this sample. Apart from cuckoo flower which is a perennial herb of damp grassy places, these taxa commonly grow as weeds of disturbed ground and cultivated soils. A nymph of *Trioza urticae* (a jumping plant louse (Homoptera: Psylloidea)) suggests that nettles (*Urtica*) grew within or close to the ditch.
141–151, 131–141 & 121–131	It is not clear why there appears to be a change in particular taxa at around 151cm, as the plant taxa that replace those mentioned above are not specific enough in their habitat preferences to indicate recognisable vegetation or environmental change. Plant taxa that dominate this period of ditch infilling are sweet-grass in the ditch itself, with small amounts of sedges and rushes representing vegetation growing along the damp margins. Ephippia are still frequent so the ditch continued to hold water although it may have been shallow, as sweet-grass is often found dominating shallow, muddy ditches. Aquatic beetles were rather better represented than they were lower in the sequence consisting of two species of *Helophorus*, *Hydrobius fuscipes*, *Agabus bipustulatus* (all found in a wide variety of water bodies) and an indeterminate diving beetle (Dytiscidae). Buttercups, greater plantain, thistles and grasses dominate the grassland habitat group, as in sample 209–19cm, with a new grassland herb, self-heal (*Prunella vulgaris*) becoming established. Self-heal is widely distributed in grassy areas and rough ground and is more frequent on infertile soils. The presence of thistle achenes in all three samples could indicate that fairly high numbers of livestock were grazing nearby, reducing the fertility in places but also creating areas of high nutrient status, as indicated by the high counts for chickweed and stinging nettle seeds. Trampling and long periods of grazing favour plants such as greater plantain, thistles and nettles. Some support for the presence of grazing animals came from two *Aphodius* dung beetles (131–41cm). The most notable change seen in this period is the presence of a few Ericaceous plant fragments in sample 141–51cm, including a shoot tip of heather (*Calluna vulgaris*) and a fruiting shoot tip of heather/ling (*Erica* sp./*Calluna vulgaris*). A fragment of bracken pinnule is also likely to have come from heathland. No other samples produced heathland remains and this was the point at which Ericaceae pollen first made an appearance (148cm; see pollen report below). Further comparisons with the pollen evidence are presented below. It is uncertain whether heathland was developing on the poor, acidic soils or whether the small amounts of material were brought down from the moors for bedding, fodder, building materials, fuel etc.
111–121 & 101–111	The lower of these two samples contained infrequent waterlogged plant remains but several large fragments of charcoal (see above). Although some sweet-grass was present in the upper sample and uncharred plant remains were frequent in this sample, it is likely that waterlogging became periodic rather than continuous around this point in the profile. Tough-coated seeds such as bramble (*Rubus* sect. *Glandulosus*) were mainly found in the upper samples (92–101cm, 101–11cm, 111–21cm) due to either scrub beginning to colonise the area or because drier conditions in the upper fills destroyed less-robust plant remains. Chenopodiaceae (including fat hen and orache), further indicators of nutrient-enriched soils, were only present in the three upper samples of the waterlogged secondary fill, though the state of preservation was poor even in these tough-coated seeds. Sedge nutlets were a little more frequent, again perhaps because the seed coats were robust enough to withstand periodic drying out. Nettle seeds were particularly frequent in some of the upper samples demonstrating that nutrient-enrichment was still taking place in the locality. A radiocarbon date carried out on a fragment of hazel roundwood from core 2 demonstrated that sample 111–21cm accumulated probably in the 6th–5th centuries cal BC (see above - SUERC-62831).

Possible stabilisation/standstill zone	
92–101 & 82–92	A second radiocarbon date carried out on hazel roundwood at 82–92cm also returned an Iron Age date (above – SUERC-62832). The fine, virtually stoneless silts in the upper part of the ditch fill indicated a very gradual accumulation of silt during this period, suggesting that few changes to the landscape in the area around the sampling point were carried out. Sample 92–101cm produced a single charred grain of hulled barley (*Hordeum vulgare*), the only plant macrofossil evidence for cereal consumption and possibly cultivation recovered from core 2. However, pollen evidence for cereal cultivation was found at 80cm, 92cm, 124cm, 148cm and 172cm, most notably at 124cm. This could relate to cultivation occurring in the locality or to crop processing activities taking place nearby. This topic is discussed further below. Two small charred hazelnut shell (*Corylus avellana*) fragments were recovered from the top two samples, providing evidence for the consumption of gathered foods. Single small fragments of charred hazelnut shell were also present in the two samples demonstrating use of local wild food resources. Although waterlogged plant remains were scarce and limited to just a few species in these upper samples stinging nettle seeds were still frequent. Because of the low diversity and obvious loss of material due to drying out it is not possible to interpret these assemblages in terms of environmental changes.

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