

## IV

### THE VALLUM AT WALLHOUSES, NORTHUMBERLAND; EXCAVATIONS IN 1980 AND 1981

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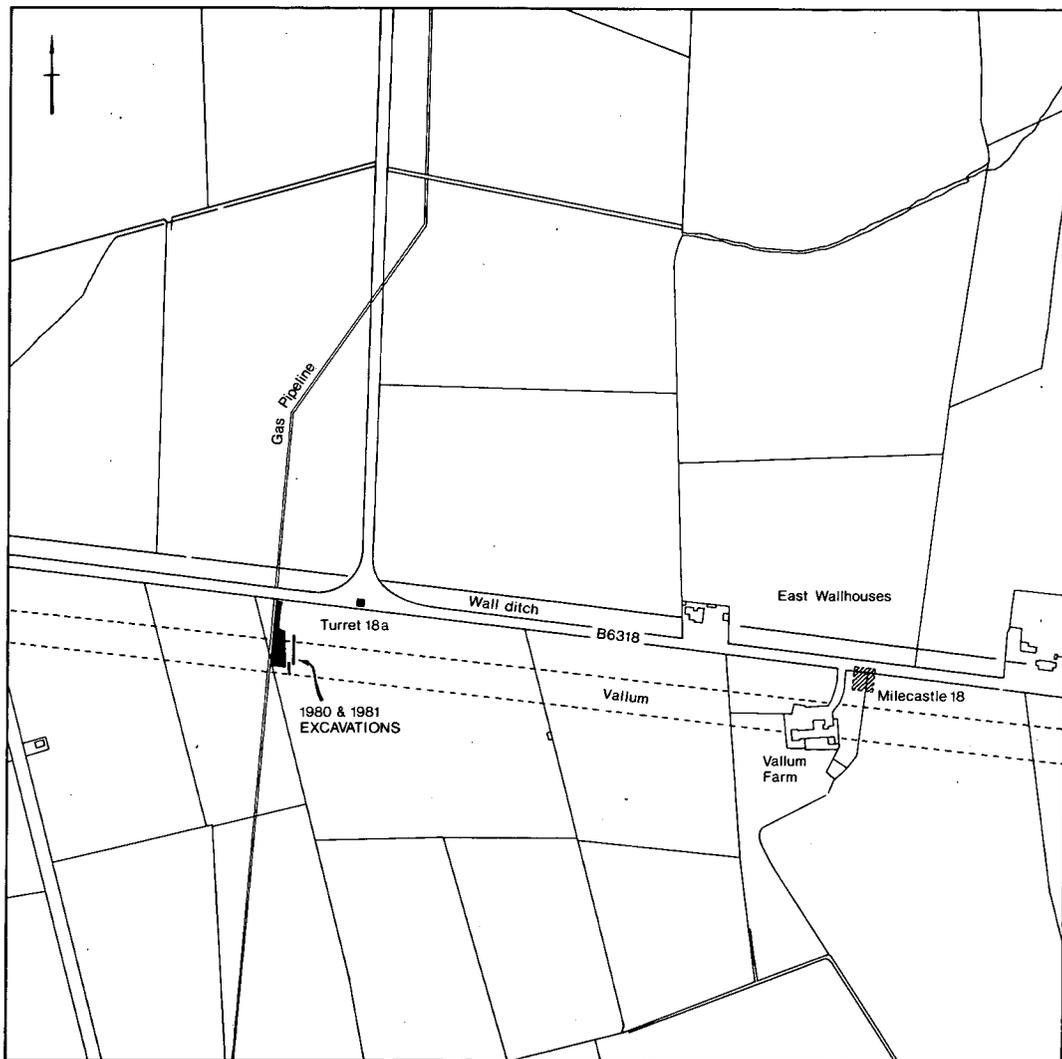
#### *Introduction* (figs 1 and 2)

THE ROUTE of a major gas pipeline crossed the Hadrianic frontier at NGR NZ 043 684, a few metres west of the known position of turret 18a.<sup>2</sup> This information became known in May 1980, and excavations were immediately arranged for June and July of that year, shortly before work was due to commence on the project. The pipe itself was thrust-bored beneath the Wall Ditch and Curtain, the latter here sealed by the Military Road, the B 6318, and open-cut to the south after this area was excavated. The 1980 work was carried out by the Central Excavation Unit of the Inspectorate of Ancient Monuments, with subsequent work in 1981 on the south mound of the Vallum by the British Gas Corporation's own archaeological staff: the 1981 work is included in this report by kind permission of the British Gas Corporation.

Fieldwork in 1980 had established that the designated route of the pipeline would intersect the Vallum complex at a point where a crossing existed (fig 2). The area between the Vallum and the Wall was blanketed by ridge and furrow, which lay on an axis parallel to these structures, and in view of this, and the limited time available for excavation, a trial trench (fig 2, Area A) was cut to the east of the threatened area to establish the relative positions of the Vallum mounds and ditch, and of the Military Way, and to determine the local stratigraphy and nature of the subsoil. Subsequently, the main site (fig 2, Area B), was mechanically stripped of topsoil, the machine also being used to remove the upper Vallum ditch fills in Area B as the trial trench had established that these were mostly deliberate, of perhaps comparatively recent date. In 1981 the south Vallum mound was sectioned by hand: for the purpose of this report, the 1981 section is designated Area C (fig. 2).

Finds and records from the excavation are marked with the Central Excavation Unit Site Code 189 for Areas A and B, and with the British Gas Corporations Site Code CBA 13 for Area C. The material from the site, and the original records, will be deposited in the Joint Museum of Antiquities, Newcastle upon Tyne, with copies of the records deposited in the National Monuments Record. This report is a synthesis of the results obtained in 1980 and 1981, and constitutes a Level IV publication:<sup>3</sup> a fuller, draft, report is deposited with the site records.

Our thanks must go to the Cattle Breeder and Embryo Services Ltd., the owners of the land, for permission to excavate, and to the British Gas Corporation for



WALLHOUSES 1980-81

Fig. 1. Site location, showing approximate route of 1981 gas pipeline.

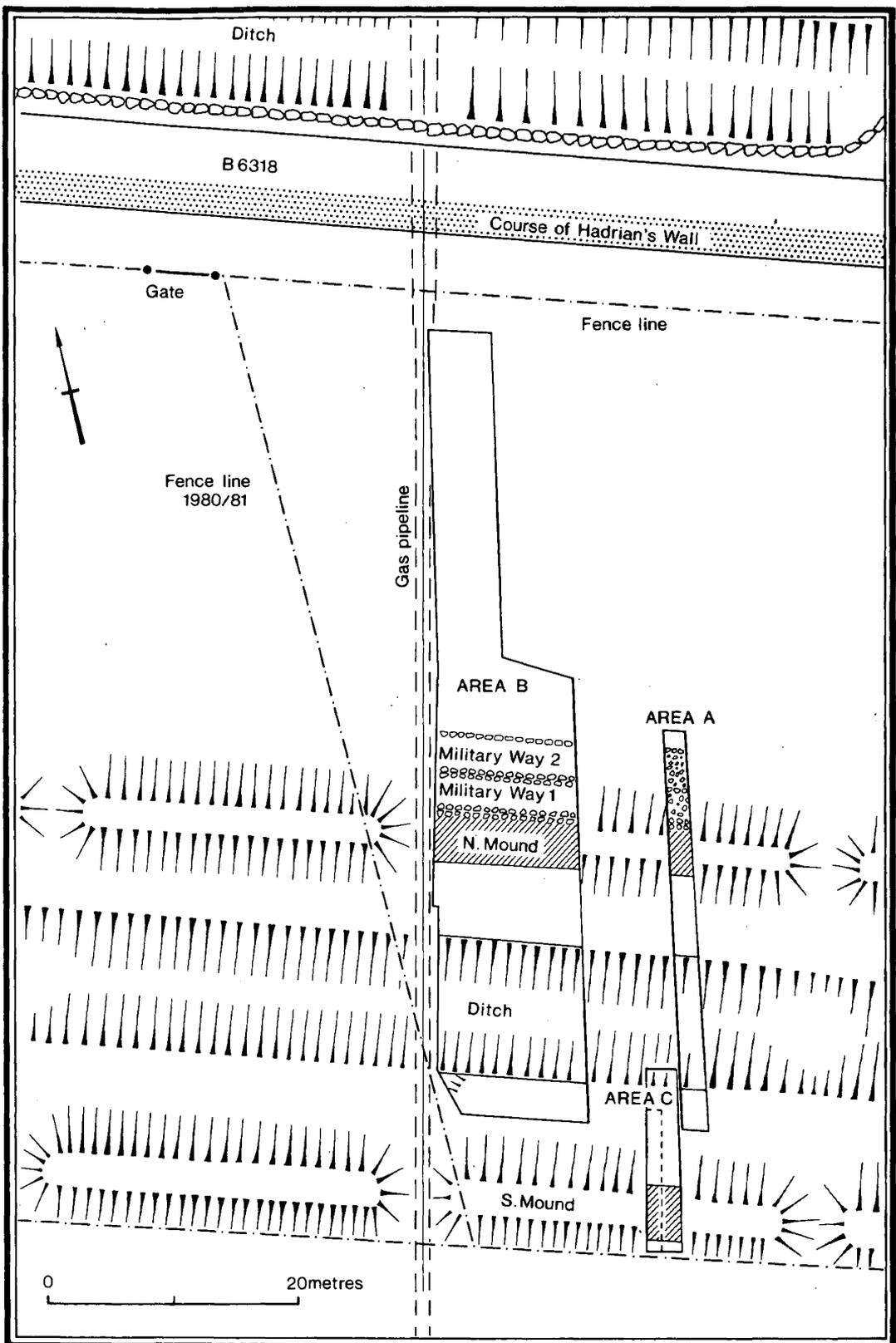


Fig. 2. General plan of the 1980 and 1981 excavations. Land drains not shown.

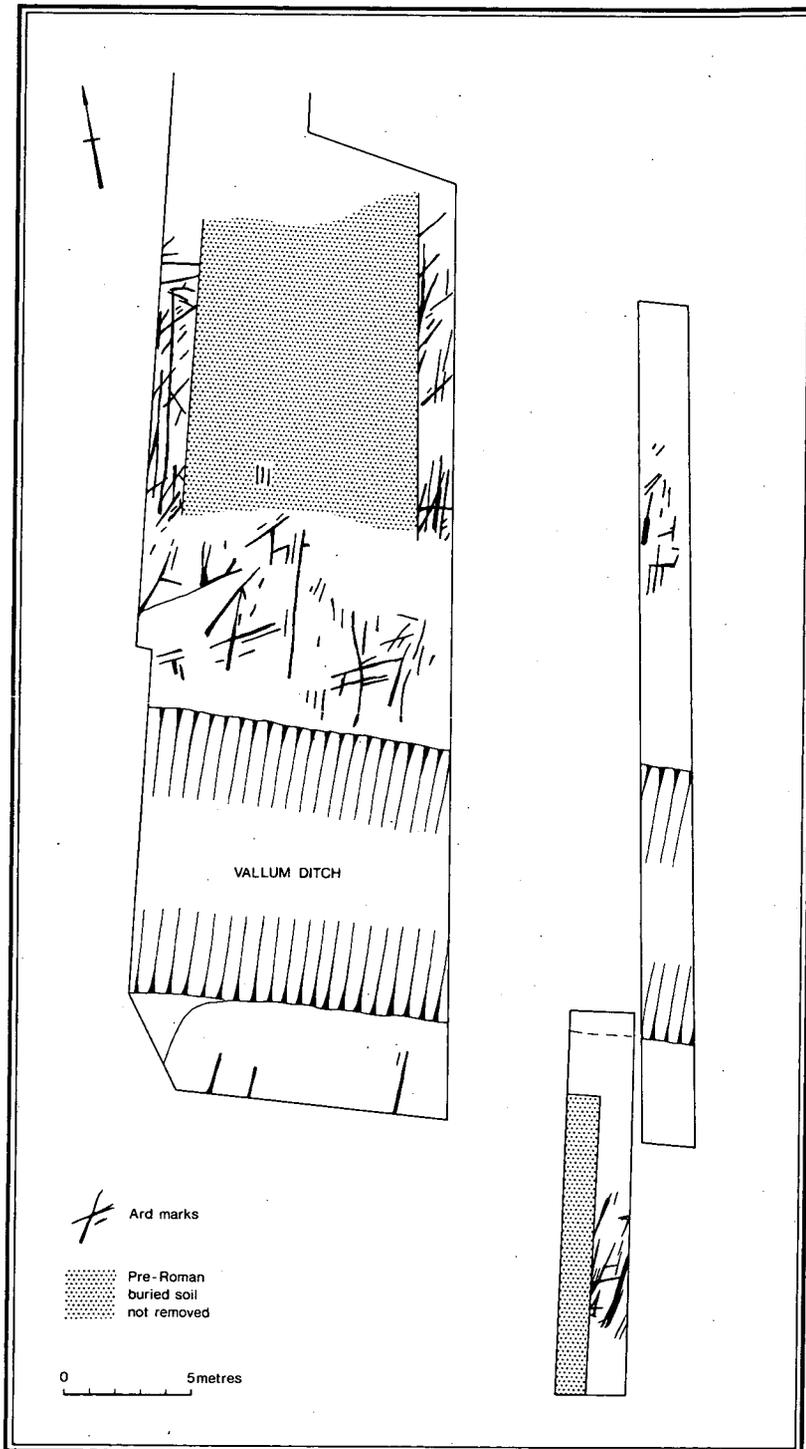


Fig. 3. The pre-Vallum ard-marks. Modern land drains and other pre-Vallum features, not shown.

their support and assistance with the work. In particular a debt is owed to David Storey, manager of Wallhouses Farm for his understanding and forbearance, and Phil Catherall, British Gas Corporation Archaeological Adviser, for his liaison work. John Gater, of the B.G.C., carried out a helpful geophysical survey across the whole site and the area north of the B 6318. Amongst the staff and volunteers a special mention must be made of Nic Appleton, Abbi Borrow, Fran Challoner, Andrew Herne, Tony Holmes, Robin Melia, Alex Miller and Myra Tolan. We would also like to thank Dr. G. Wainwright (Inspectorate of Ancient Monuments) for arranging the excavation; Dr. Helen Keeley (Ancient Monuments Laboratory), Dr. Brenda Heywood (York Minster Archaeology Office), Nick Balaam (C.E.U.) and Robert Young (Lampeter University) for their specialist advice; Christine Yendley, for assistance with preparation of the report; Keith McBarron for the published drawings; and Charles Daniels (Newcastle University) for his help and advice throughout the excavation and publication work. Use of the facilities and libraries of the Archaeology

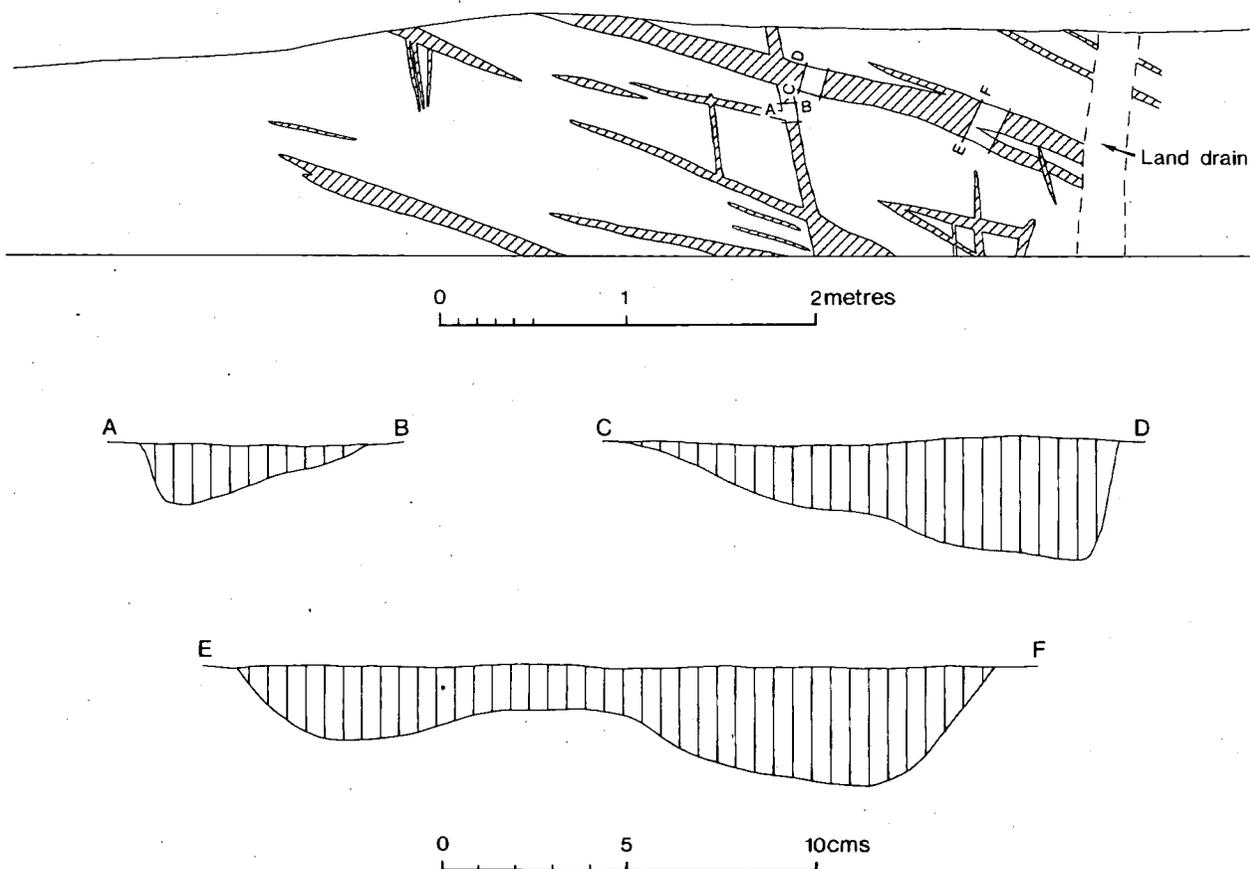


Fig. 4. Ard-marks in Area C, plan and profiles.

Departments of both Durham and Newcastle Universities is also gratefully acknowledged.

#### THE EXCAVATIONS

##### *Pre-Vallum Features* (figs. 3 and 4)

Removal of the Vallum mounds and road surfaces in all areas revealed a buried soil horizon, in places up to 8" (21 cm) thick (in accordance with standard practice of reports on the Hadrianic frontier, imperial measurements are favoured, with their metric equivalents in brackets). When this soil was removed, a number of features were revealed in the surface of the natural boulder clay. The majority of these (fig. 3) consisted of short linear grooves, often intersecting at 60–70 degrees, but occasionally at right angles. A number of the marks were sectioned, of which a representative selection from Area C is shown in fig. 4, and all proved to be of a V- or shallow U-shape, often with one side steeper than the other. Careful excavation established that the marks also existed on the Vallum berms and in other areas (fig. 3), but as these had not been protected by overlying, Roman, deposits, they were neither as well preserved nor as numerous. The marks represent cultivation of the site, with an ard, before the Vallum was constructed.

Other pre-Vallum features, not shown on fig. 3, consisted of irregular gullies and depressions. Most of these could be explained as natural in origin, but two parallel gullies beneath the Vallum south mound may be artificial, perhaps connected with the construction of the Vallum mound (see below).

##### *The Vallum* (figs. 5–9)

The mounds were constructed on top of a possibly truncated buried soil (fig. 6: 1–3, contexts 21 and 222; fig. 6, 4, context 14), there being no evidence for turf or any other soil surface horizon. Detailed examination of this soil, by Dr. Helen Keeley, showed that it had been cultivated, and fragments of charcoal were distributed throughout: none of these were of a suitable size for either identification or for carbon dating.

The north mound was revetted on the south side by what appeared to be the degraded remains of a turf stack (fig. 6: 1–3, context 22). This identification is based on section morphology, and visual analysis, there being no opportunity to check this scientifically. The stepped profile of the turf stack was preserved where it was overlain by the mound core (fig. 6, 1 and 3) or by other surface deposits (fig. 6, 1 and 2). It was not possible to establish the size of the turf blocks used for this revetment.<sup>4</sup> The north revetment was of drystone walling throughout (fig. 6, 1 and 2, context 24), using large, locally derived, sandstone slabs, but in places this was backed by a turf stack (e.g., fig. 6, 1, context 236; fig. 10). Mixed clays formed the main material of the mound core (fig. 6, 1–3, context 23; 4, context 8), but there were also some spreads of loam and larger deposits of what appeared to be degraded turf blocks, these presumably representing debris from the construction of the turf stack (e.g. fig. 6, 1 and 2, contexts 240, 242, 243, 235). The north mound generally survived to a height of 20" (50 cm) above the buried soil, but in the area of the crossing had been reduced to 16" (40 cm).

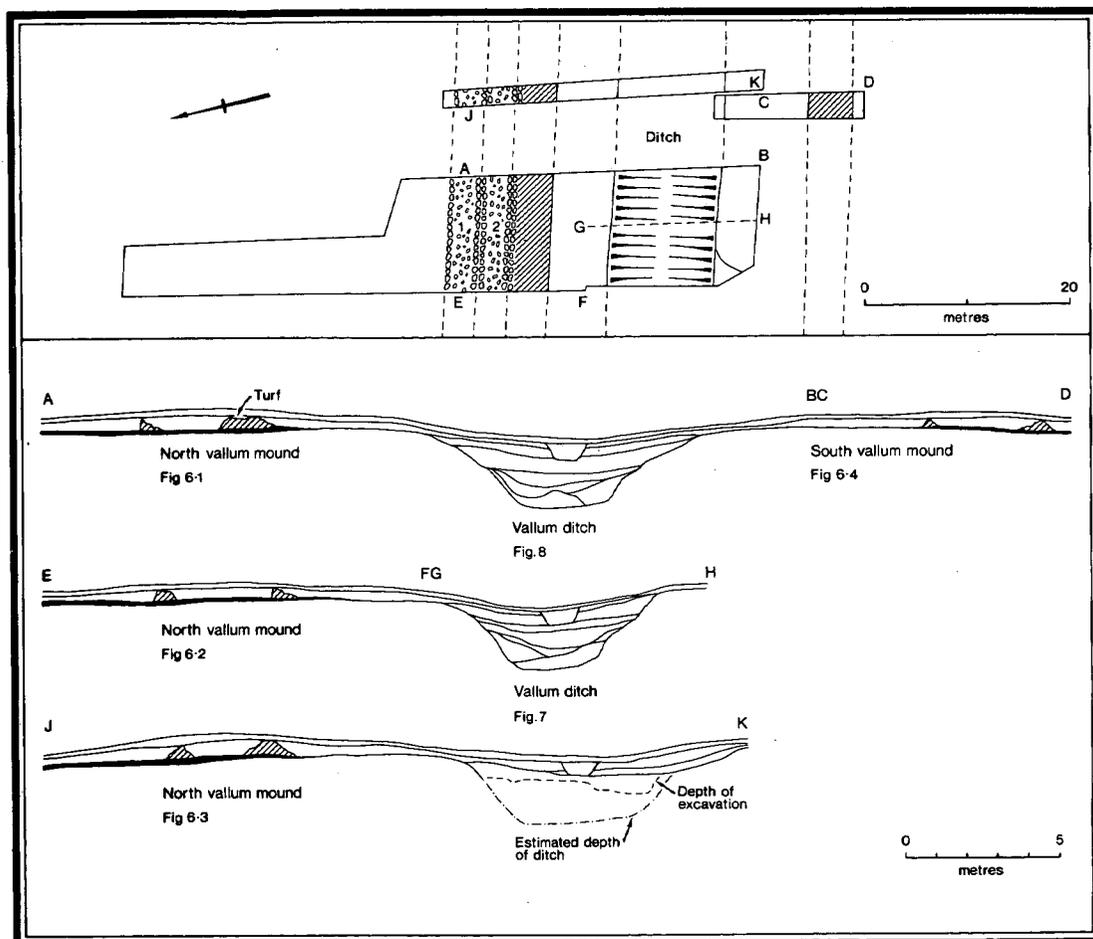
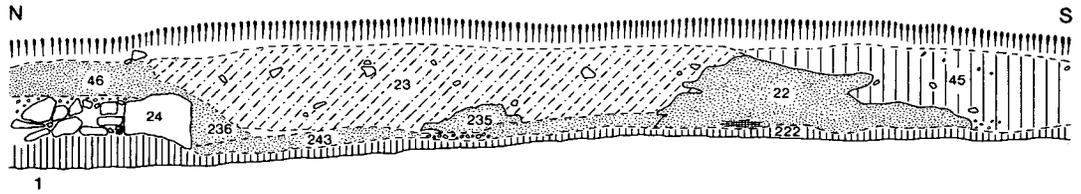


Fig. 5. Profiles through Vallum mounds and the ditch: revetments shown diagrammatically for ease of comparison, and sections "reversed" where necessary to achieve a constant west-facing section.

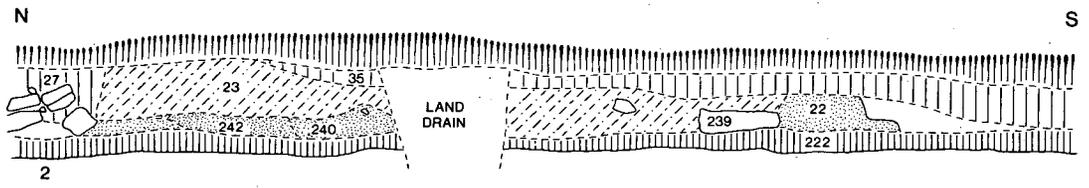
Its overall width varied slightly from 14 ft (4.30 m; 14.4 Roman Feet) to 14' 3" (4.40 m; 14.6 R ft).

A berm of between 21' 7" (6.60 m; 22.2 R ft) and 25 ft (7.60 m; 25.75 R ft) separated the north mound from the north edge of the Vallum Ditch. (Fig. 5)

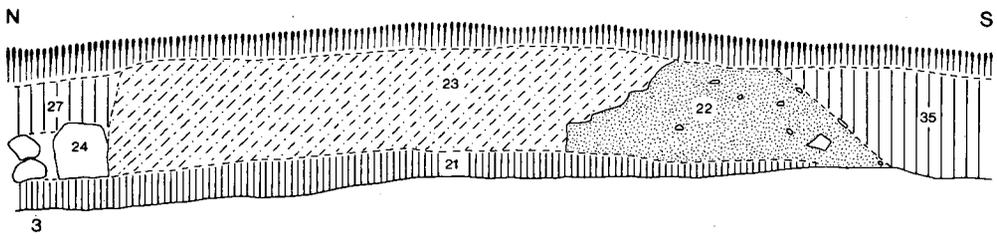
The Vallum ditch (figs. 7 and 8) averaged 26' 3" (8 m; 27 R ft) wide, and was a maximum of 8' 3" (2.50 m; 8.50 R ft) deep from the present ground surface, 7' 6" (2.30 m; 7.72 R ft) from the surface of the undisturbed boulder clay. In its original form it was evidently intended to have a flat bottom, 9' 2" (2.80 m; 9.4 R ft) to 12' 2" (3.70 m; 12.5 R ft) wide, with near vertical sides for the first few feet, before



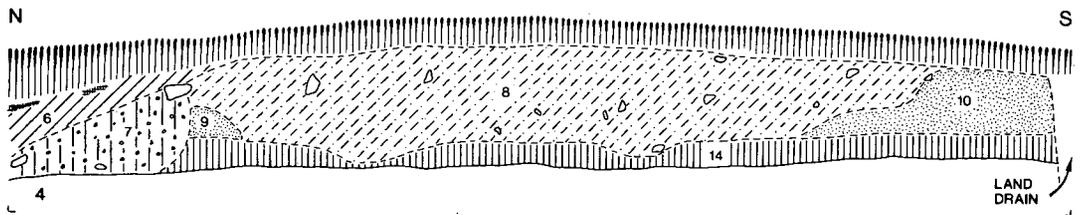
0 3  
IMPERIAL FEET



0 1  
METRE



0 3  
ROMAN FEET



LAND DRAIN

Fig. 6. Sections through Vallum mounds. Location as in fig. 5, and sections 2 and 3 shown "mirror-image" for ease of comparison and to give all sections a west-facing aspect.

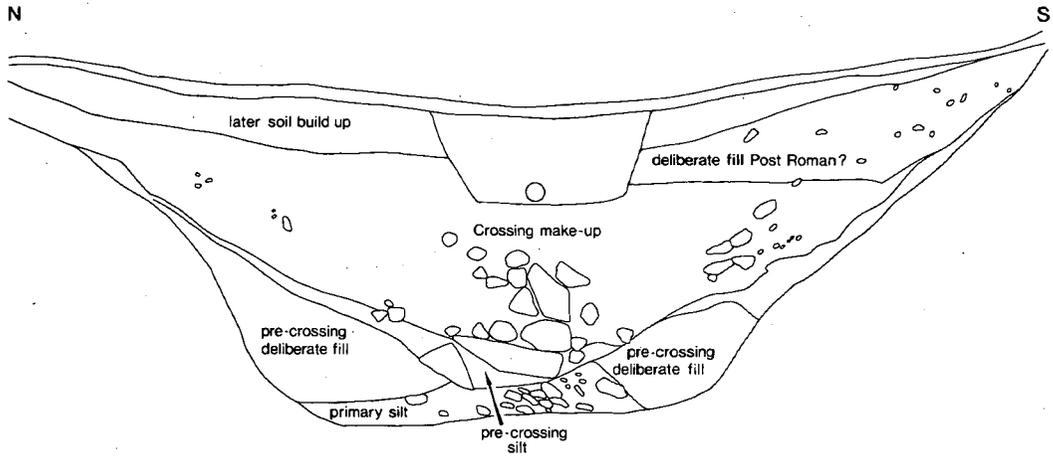
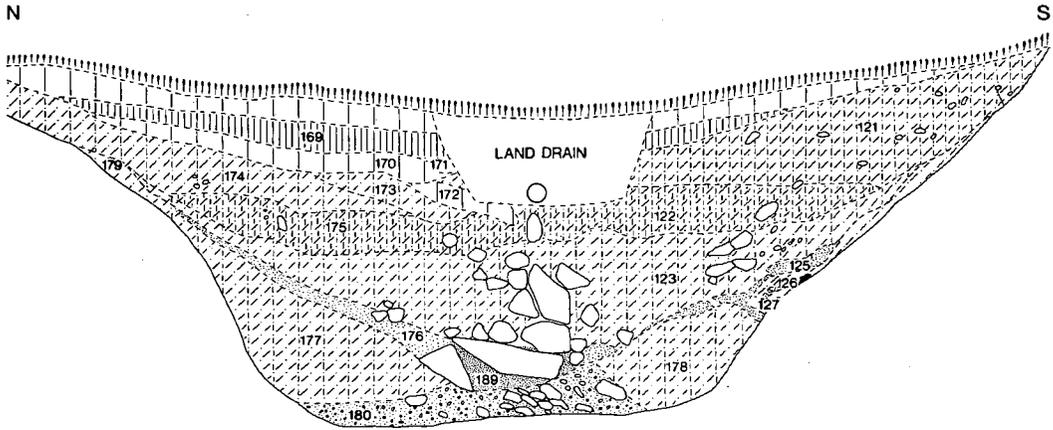


Fig. 7. West section through Vallum ditch and crossing, with interpretation. Shown "mirror-image" for ease of comparison with fig. 8. Location as in fig. 5.

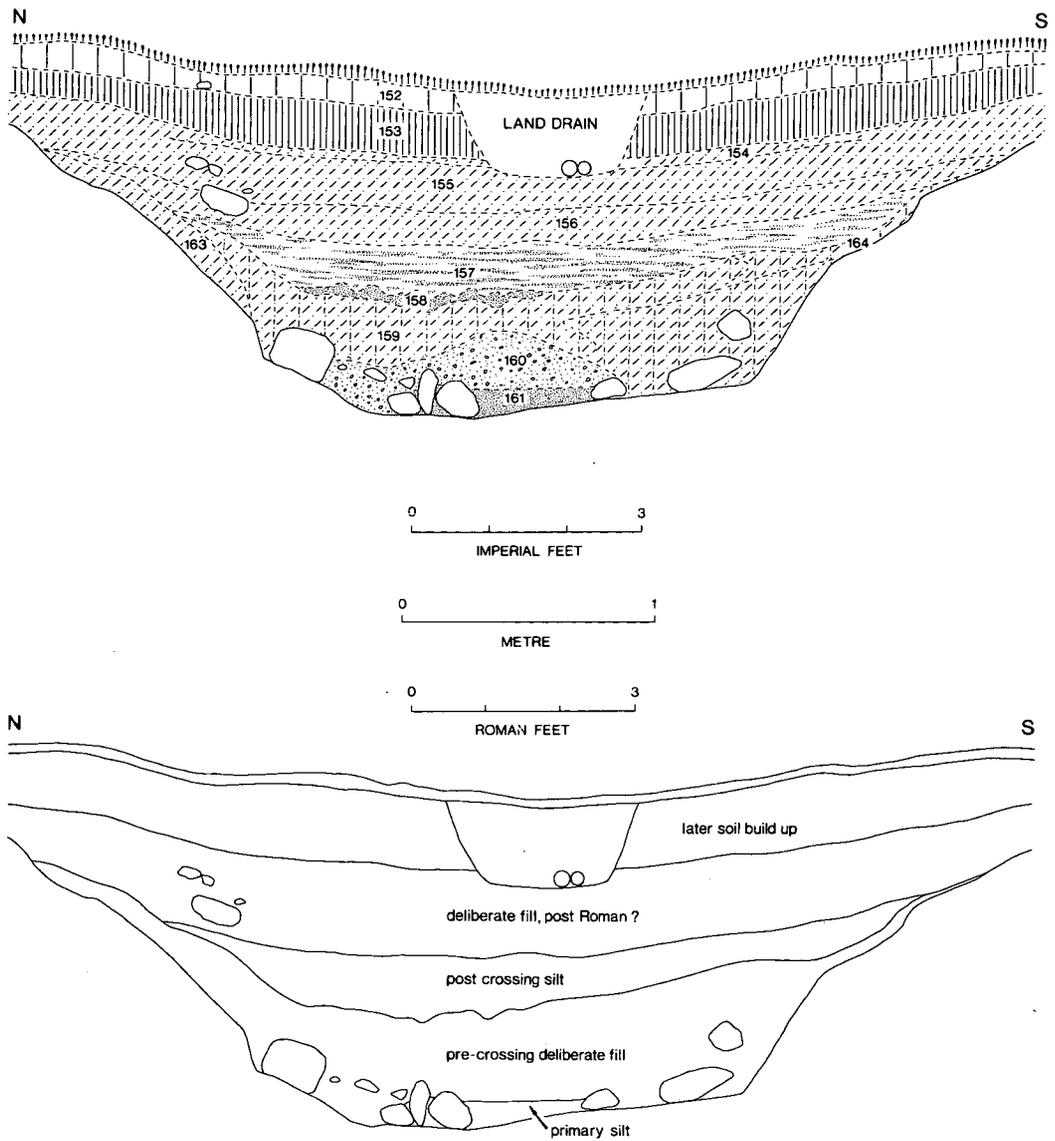


Fig. 8. East section through Vallum ditch, with interpretation. Location as in fig. 5.

taking a more gradual gradient to the surface. The ditch filling indicated six main phases. A deposit conventionally interpreted as primary silt had accumulated in the bottom of the ditch (fig. 7, context 180; fig. 8, context 161); this consisted of organic silt, with some stone blocks, and coarse sand and gravel. Over this deposit were a series of fills, consisting of dark grey clay loam, with large stone blocks, interpreted as a deliberate fill (fig. 7, contexts 177 and 178; fig. 8, contexts 159, 160, 163, and 164). A layer of organic silt had formed over this (fig. 7, contexts 125/126/127, 176 and 189), before further deliberate filling had taken place, this being represented only in the western part of the ditch section. This secondary deliberate filling was composed of mixed soils and clays (fig. 7, 122/175, 170-174), and formed the basis for a crossing over the Vallum ditch at this point. The crossing was surfaced by a spread of small cobbles, which only extended halfway across its length, and extended southwards into a hollow that had formed at the junction of the crossing and south lip of the Vallum ditch. Only the eastern edge of the crossing make-up was examined, and this proved to be gradually stepped down, meeting the secondary silting at a point 9 m from the west section edge. The uppermost level of the crossing was 8' 3" (2.50 m) wide, the hollow leading onto it 7' 3" (2.20 m) wide at the junction with the Vallum ditch, where it was a maximum of 6" (15 cm) deep; it extended back onto the south berm for a minimum distance of 11' 6" (3.50 m).

East of the crossing silting had evidently continued uninterrupted, a thick layer of banded silt and organic layers continuing to form over the pre-crossing silt (fig. 8, contexts 157 and 158). This was sealed by the final deliberate filling, consisting of spreads of clay and loam, containing some small and medium sized stones (fig. 7, context 121; fig. 8, 155 and 156), over which was a later soil build-up and the present cultivated soil horizons.

The south berm was about 23' 3" (7.10 m; 24 R ft) wide, and was 'cut' by the hollow way leading onto the Vallum crossing.

The south mound was similarly constructed directly on top of the buried soil horizon, with no clear evidence of the existence of a turf surface, although a thin brown staining was noticed at the interface of the buried soil and the mound core. Two 'gullies', perhaps cart-ruts, were noticed in the surface of the buried soil horizon, about 4' 9" (1.40 m) apart, centre to centre. (Fig. 9, contexts 11 and 12). On the north side of the Vallum mound there was a deep cut (fig. 6, 4, and fig. 9, context 7) which might represent the robbing of a stone revetment, but the south revetment survived, laminations in the general matrix suggesting that this had been formed from turf blocks (fig. 6, 4, and fig. 9, context 10): soil identical to this survived behind the cut into the north revetment (figs. 6, 4 and fig. 9, context 9), suggesting that whatever form the north revetment had originally taken, it had been backed with a turf stack. Between the two revetments was a dump of mixed clays, with some small pebbles and sandstone pieces (fig. 6, 4, and fig. 9, context 8). At its best the south mound survived for a height of 21" (50 cm) above the buried soil surface, and its minimum width was 11' 9" (3.60 m; 12.2 R ft). Two parallel bands of burnt daub were found to run along both edges of the mound, the southernmost (fig. 9, context 5) badly disturbed by ploughing, but that to the north surviving with two distinct edges, forming a spread 28" (70 cm) wide (fig. 9,

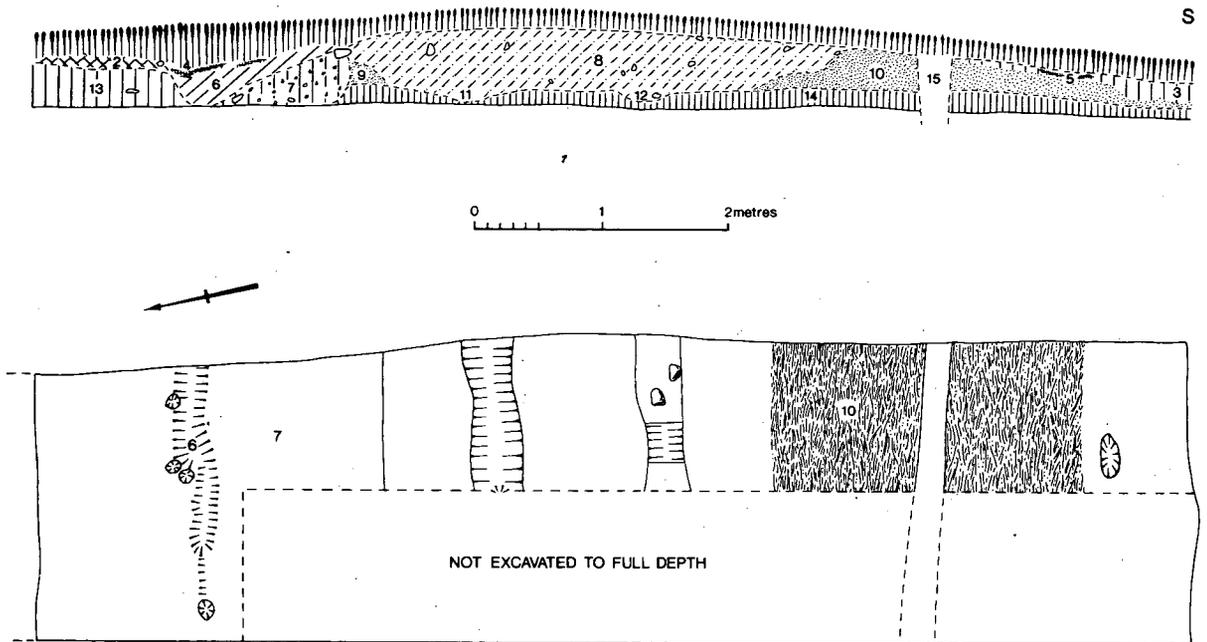


Fig. 9. Section and plan of Area C. The plan is after removal of mound core material, to show the parallel gullies beneath this, and after removal of the two spreads of burnt “daub”.

4). On excavation the northern spread proved very thin, (2 cm) deep, and after its removal four circular depressions were observed, each about 4" (10 cm) diameter and 2" (5 cm) deep (fig 9). In the section a deeper trench was apparent, as is indicated in fig. 9 by context 6, but no firm edges could be proved for this during the actual excavation. None of these features could be positively identified, but they might just represent a burnt wattle-and-daub fence.

#### *The Military Way* (fig. 10).

Contiguous with the north revetment of the north mound was a linear spread of small, medium and large sandstone slabs, set in a loamy soil (fig. 10, context 51). This spread was 10 ft (3.05 m; 10.3 R ft) wide, and evidently represented the primary phase of the Military Way. Its southern edge was partially sealed by collapsed walling and core material from the north Vallum mound (fig. 6, 1, 46; this is not shown on fig. 10 for convenience, except at the east end where it is represented by context 50). North of this primary Military Way was a replacement roadway, surviving as a 10 ft (3.05 m; 10.3 R ft) wide mass of packed small and large sandstone pieces, with a well preserved kerb to the south (fig. 10). Both road surfaces were sealed by later soil accumulations (e.g., fig. 6, 2 and 3, 27).

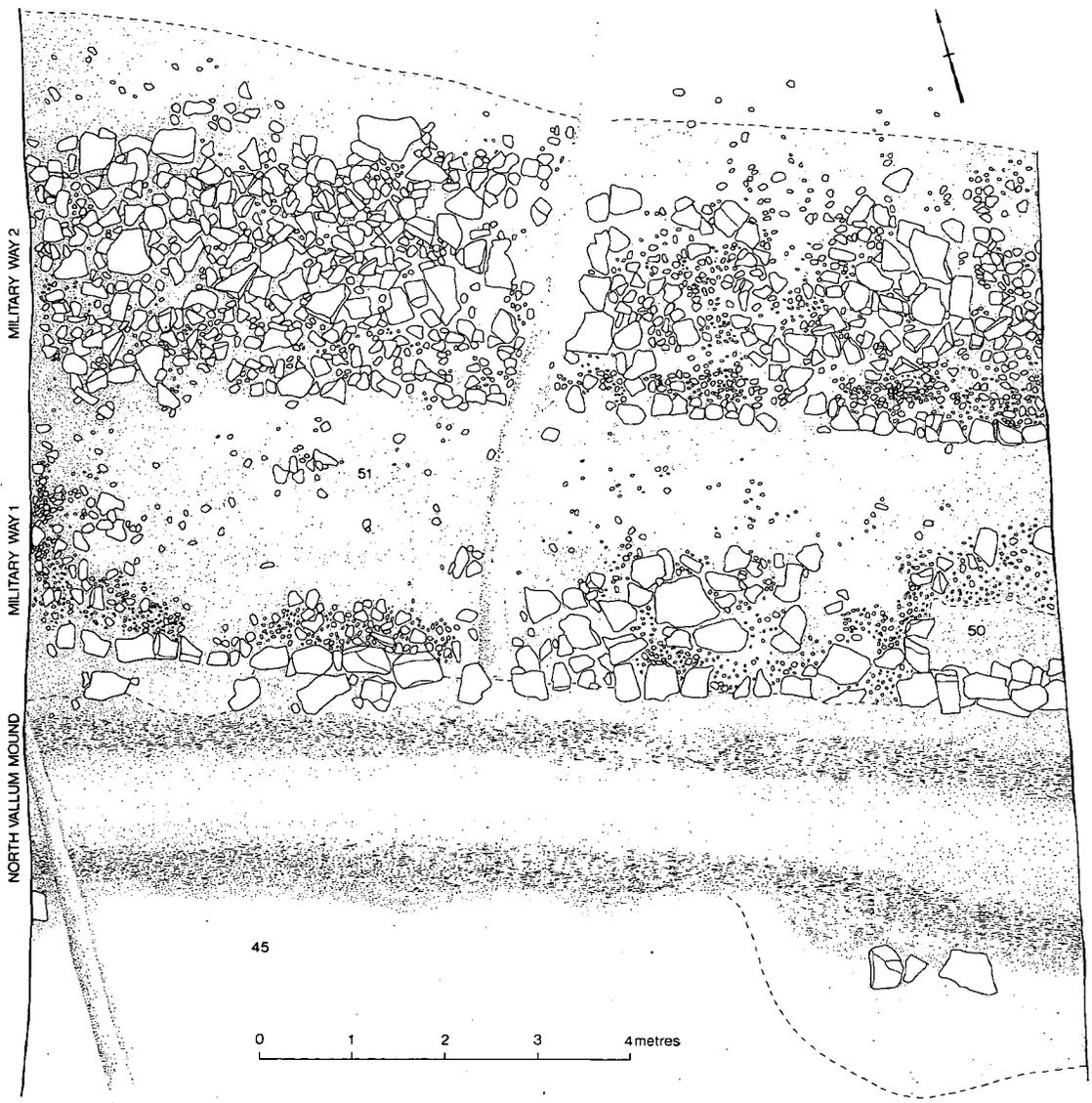


Fig. 10. Plan of north Vallum mound and Military Ways 1 and 2.

## CONCLUSIONS

The discovery that the area had been cultivated in the pre-Roman period is a useful addition to the growing and extensive record of prehistoric agriculture in north England. Several sites along Hadrian's Wall have produced such evidence, and it is becoming quite clear that the Tyne-Solway isthmus was not a barren landscape before the arrival of the Romans.<sup>5</sup> It has been argued that most, if not all, of these areas of cultivation belong to the later Neolithic or earlier Bronze Age,<sup>6</sup> although a later Iron Age context has been advanced;<sup>7</sup> it is quite possible, of course, that the observed traces represent more than one phase of activity, and in the absence of accurate dating methods for these indications, other than that the Hadrianic frontier complex provides a *terminus ante quem* of c. A.D. 122, it would be unwise to be dogmatic in assigning them to any particular period.<sup>8</sup> The Wallhouses and marks are morphologically analogous to other marks on the line of the Hadrianic frontier, and such features are discussed in detail elsewhere.<sup>9</sup> It need merely be added here, that the Wallhouses marks give no indication of field boundaries, and that the two main alignments present indicate probably a minimum of two ploughing operations.

It is not possible to be certain about what happened immediately before the Vallum was constructed. The absence of an identifiable turf horizon beneath the Vallum mounds does not necessarily indicate that the area had been freshly tilled before the mounds were built, for the turf would probably have been stripped throughout the area to provide material for the mound revetments. It should be noted, however, that a distinct "turf" horizon is unlikely to survive in soils such as these, while it would make sense for the Wall builders to minimize their labour by following a route already cleared of woodland, if not actually being cultivated at the time the Roman surveyors arrived: analysis of a soil monolith taken from beneath the Vallum mound revealed no evidence, in the form of pollen, for the vegetational history of the area before the Romans arrived, but such heavy clays, as exist in the Wallhouses area, would naturally have supported heavy woodland.

The 1980 and 1981 excavations were amongst the most extensive to be carried out on the Vallum, and have added significantly to our knowledge of this structure. Until the research programme of Dr. Brenda Heywood for the Durham University Archaeology Committee, resulting in the preparation of her seminal—but unfortunately unpublished—thesis on the Vallum in 1954,<sup>10</sup> it was possible to talk of a "standard" Vallum profile, illustrations and descriptions of which have appeared in relatively recent literature.<sup>11</sup> The "standard" profile consisted of a ditch, 20 Roman feet across, and 10 Roman feet deep, with steep sides and a flat bottom 8 Roman feet wide. On either side of this was a berm, 30 Roman feet wide, defined by mounds, each 20 Roman feet wide. The whole complex was designed to be 120 Roman feet wide, from berm to berm, equivalent to one *actus*. Dr. Heywood has demonstrated, however, that this design was modified by the surveyors on the spot to suit local conditions,<sup>12</sup> and she has presented a number of instances where the Vallum varies from the accepted "standard". Indeed, "the only standard features (of the Vallum) were a flat-bottomed ditch, north and south berms and mounds, and an overall measurement of approxi-

mately 120 (Roman) feet across".<sup>13</sup> As constructed, the Vallum at Wallhouses conforms to these broad specifications, the total width of the complex being about 93 Roman feet (28 m; 92 ft), with berms of around 26 Roman feet, mounds, revetted with turf and stone, of about 15 Roman feet in width, and a ditch, 27 Roman feet across, with steep sides and a flat bottom, about 8 Roman feet deep, 11 Roman feet wide. The Vallum mounds were in part revetted with turf stacks, but dry-stone walling had also been used, particularly for the north revetment of the north mound. Where dry-stone walling did exist, this appeared to be primary rather than secondary, as it was seemingly backed by a diminished turf stack (e.g. fig. 6, 1, context 236).<sup>14</sup> There was no evidence on either berm of the "patrol track" attested at other sites.<sup>15</sup>

The systematic breaching of the Vallum mounds, and the construction of crossings over the Vallum ditch, is conventionally dated to the Antonine period, these actions being seen as a response to the decision to abandon the Hadrianic frontier line for a frontier further north.<sup>16</sup> It is not actually known if the Vallum was breached throughout its entire length, the process certainly being incomplete in places, but the relentless rigidity of the military mind is clearly apparent in the way that the Vallum has been levelled at intervals of between 44 and 53 yards (40.2 to 48.5 m) throughout most of its entire length. In the Wallhouses area, surface examination of this excellently preserved section of the Vallum indicates that both mounds were regularly breached at intervals of about 40–45 yards (36.5–41.1 m), with crossings laid over the Ditch opposite the breaches (e.g., fig. 2). Work on the break in the north mound in 1980 indicated that not all the material had been removed, up to 16" (40 cm) of the mound remaining above the buried soil horizon. Surface examination of the other breaks revealed that these too had not been entirely cleared to ground level, and similar incidences have been noted elsewhere.<sup>17</sup> It has been suggested that the breaks were intended to be about 20 Roman feet (5.90 m; 19' 5") wide,<sup>18</sup> despite the evidence that some are much wider. The breaks at Wallhouses are of the order of 20' 6" to 25' 9" Roman feet (6.10–7.60 m; 20–25 feet) wide.

It is generally assumed, with good reason, that the material from the breaks was used to form the crossings over the Vallum ditch. This certainly seems to have been the case at Wallhouses. Only half the crossing make-up could be examined in Area B, although the entire upper surface was available for examination. It is suggested that the total width of the crossing base was approximately 59' (18 m; 61 R ft) wide, leaving open lengths of ditch, about 75' (23 m; 77 R ft) long, between each crossing. The surface of the crossing was only 8' 3" (2.50 m; 8.5 R ft) wide, and the provision of some metalling indicates that passage onto the crossing was intended/expected, although whether this metalling was Roman or not could not be proved. At whatever date the crossing was metalling, it is surprising that the metalling only extended over the southern half of the crossing, and the only signs of wear noted were at the junction of the crossing and the south berm, where a hollow had formed. The reason for this set of circumstances eludes adequate explanation.

Limited silting had occurred before there was some deliberate infill, this being followed by some silting before the crossing was laid, supporting the general arguments concerning the short period which elapsed between digging of the Vallum ditch and

the construction of the crossings (figs. 7 and 8). East of the crossing, however, layers of organic silt clearly indicate that a pool of water had formed here between two adjacent crossings, and the depth of deposits noted might well indicate that this pool had existed for some time. Analysis of pollen from both pre- and post-crossing layers indicate a local environment of predominantly open country, with little woodland and perhaps some cereal cultivation (see below).

It is not known when the final deliberate filling of the Vallum ditch took place, and it would be unwise to suggest an appropriate historical period. It is considered to be, however, a post-Roman event, perhaps comparatively recently, when the field here was cultivated according to the ridge-and-furrow method.

Work elsewhere has shown that the laying of the Military Way post-dates the crossings and the slighting of the Vallum mounds.<sup>19</sup> Its construction is conventionally dated to the later second century, the third century milestones associated with it (e.g. RIB 2298, dated to A.D. 213) merely reflecting the third century and later fashion for erecting milestones, as a cursory examination in the relevant section of RIB will show. The original Military Way at Wallhouses was about 10' (3.05 m) wide, with a kerb of large stones on the south running contiguous with the north Vallum mound. A similar kerb had once existed on the north edge, but there is now no trace of this, it probably having been removed and re-used in the second Military Way along with much of the original metalling.

At an unknown date, but presumably within the Roman period, the north revetment of the north Vallum mound had collapsed outwards sealing the southern half of the primary Military Way. This incident prompted the re-alignment of the Military Way to the north, the south kerb of the second road running probably along what had been the north edge of the primary road. The secondary Military Way was also 10' (3.05 m) wide, with a prominent kerb surviving on the south edge: there was no trace of the north kerb, this probably having been lost through later agricultural activity, it seemingly having coincided with one of the overlying furrows of the later ridge-and-furrow system. The body of the secondary road was composed of sandstone pieces of all sizes. It remains only to note that Wallhouses would appear to be the only place where the Military Way was replaced within the Roman period, although post-medieval "roads" are known to overlie it elsewhere.<sup>20</sup>

#### POLLEN ANALYSIS, by Nicholas Balaam<sup>21</sup>

Samples for pollen analysis were taken from the buried soil beneath the north Vallum mound and from organic rich deposits in the Vallum ditch. The samples from the buried soil proved to be devoid of pollen. However, not surprisingly, the waterlogged layers in the Vallum ditch were quite rich in preserved pollen. Samples from these layers were analysed for their pollen content according to standard methods.<sup>22</sup>

The layers sampled within the ditch represented a period of slow silting-up dating to a period after the construction of the Vallum crossing, an event dated to c. A.D. 140 (fig. 8, context 157). In addition, a sample was also taken from the earliest silting level, at the bottom of the ditch (fig. 8, context 161).

There is no significant difference between the pollen spectra of the earliest silting and the various samples of the post-A.D. 140 silting. It can therefore be assumed that in the *immediate* area of the ditch there was little vegetational change in the period between the original excavation of the ditch and the laying down of the post-crossing silts.

The pollen spectra from all levels examined showed similar characteristics. They represent predominantly open country with only a small amount of woodland (principally alder). The presence of Coryloid pollen in small quantities probably represents hazel scrub, but this cannot have been of great significance in the area.

Cultivation in the vicinity of the site is attested by small quantities of cereal type pollen and the presence of pollen of weeds such as *Artemisia*. In addition, evidence of cultivation marks beneath the buried soil sealed by the Vallum mounds indicates arable practices at some time before the construction of the Vallum. In view of the poor preservation of pollen in the soils of this site, it is unlikely that the pollen present in the earliest ditch silting is derived from cultivation in a period much in advance of the Roman occupation, and it could represent cultivation after the Vallum was built, and before the crossings were laid.

In addition to the pollen samples studied, one sample, originally thought to be waterlogged leather, was also examined. Microscopical examination of the sample showed it to be the remains of a small puffball, identified as *Bovista nigrescens* Pers. ex Pers. Puffballs from Vindolanda have been recorded recently, but it is not thought that the Wallhouses puffball represents anything other than a chance occurrence.<sup>23</sup>

#### NOTES

<sup>1</sup> The 1980 excavation was directed by J. B., and supervised by D. B. and A. K., of the Central Excavation Unit, Department of the Environment, The Castle, Carlisle. The work in 1981 was carried out by R. T. Communications concerning this report should be sent to J. B.

<sup>2</sup> Turret 18a was located and partially examined in 1931. See E. Birley, P. Brewis and F. G. Simpson, "Excavations on Hadrian's Wall between Heddon-on-the-Wall and North Tyne in 1931", *A.A.*<sup>4</sup>, ix (1932), 255-259, especially 258, and P. Brewis, "Conjectural Construction of Turret 18a on Hadrian's Wall", *A.A.*<sup>4</sup>, ix (1932), 198-204.

<sup>3</sup> (S. S. Frere, ed) *Principles of Publication in Rescue Archaeology* (1975), 14.

<sup>4</sup> The fourth century writer Vegetius recommends that standard turfs of 12" x 18" x 6" be used for turf revetments: see 111, 8.

<sup>5</sup> A summary of the available evidence is included in this volume: see J. Bennett, "The Examination of Turret 10a, and the Wall and Vallum at Throckley, Tyne and Wear, 1980", *supra* pp. 27-60, especially J. Bennett, *et al.*, "Appendix: The Pre-

Wall Buried Soil and Ard-marks", pp. 51-58.

<sup>6</sup> E.g., P. J. Fowler, "Wildscape to Landscape", in R. Mercer (ed) *Farming Practice in British Prehistory* (1981), 9-54.

<sup>7</sup> E.g., J. P. Gillam, R. M. Harrison and T. G. Newman, "Interim Report on Excavations at the Roman Fort of Rudchester", *A.A.*<sup>5</sup>, i, (1973), 81-85, especially 85.

<sup>8</sup> Pollen analysis has suggested that there was major clearance throughout north-east England immediately before the Roman period, and some of these marks may well belong to that phase in the landscape: see J. Turner, "The Environment of North-east England during Roman Times", *J. Archaeol Sci* vi (1979), 285-290. It is unfortunate, however, that the soils where ard-marks, etc., have been found on the Wall are rarely suitable for this form of analysis, with the attendant possibilities of radiometric dating.

<sup>9</sup> *Supra*, J. Bennett *et al.*, pp. 51-58.

<sup>10</sup> B. Swinbank (now Dr. Heywood), *The Vallum Reconsidered* (Thesis presented for the degree of Doctor of Philosophy in the University of Durham,

1954. Unpublished, available for consultation in the Reading Room, after prior arrangement with the Librarian, Department of Archaeology, University of Durham).

<sup>11</sup> E.g., C. M. Daniels (ed) *Handbook to the Roman Wall* (13th Ed., 1978), 30–33.

<sup>12</sup> B. Heywood, "The Vallum – its problems restated", in M. G. Jarrett and B. Dobson (eds), *Britain and Rome* (1965), 85–94.

<sup>13</sup> Heywood, *op. cit.*, 85

<sup>14</sup> I am grateful to Dr. Heywood for pointing out to me that a secondary stone revetment existed at Milecastle 23.

<sup>15</sup> Heywood, *op. cit.*, 89–90, with further references.

<sup>16</sup> Heywood, *op. cit.*, 90–91.

<sup>17</sup> F. G. Simpson and R. C. Shaw, "The Purpose

and Date of the Vallum and its Crossings", *C.W.*<sup>2</sup>, xxii (1922), 353–433, especially 405 and fig. 5.

<sup>18</sup> Simpson and Shaw, *op. cit.*, 405.

<sup>19</sup> Simpson and Shaw, *op. cit.*, 417–418.

<sup>20</sup> E.g., at Cawfields, F. G. Simpson (ed by G. Simpson) *Watermills and Military Works on Hadrian's Wall* (1976), 116–119.

<sup>21</sup> Central Excavation Unit, Inspectorate of Ancient Monuments, Fortress House, 23, Savile Row, London.

<sup>22</sup> G. W. Dimbleby, "Soil Pollen Analysis", *J. Soil Science*, xii (1961), 1–11. A full report of the Wallhouses pollen is deposited with the site records.

<sup>23</sup> R. Watling and M. R. D. Seaward, "Some Observations on Puffballs from British Archaeological Sites", *J. Archaeol Sci* iii (1973), 165–172.