BIRDOSWALD

Excavations of a Roman fort on Hadrian's Wall and its successor settlements: 1987-92

Tony Wilmott

ENGLISH HERITAGE

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with
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and contributions by
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Preface and dedication

> Birdoswald, as the site of the old Roman camp of Amboglanna has acquired such a widespread reputation as to render almost superfluous any allusion to its many archaeological attractions. .... to the antiquary and lover of nature alike Birdoswald offers undoubted claims and attractions seldom to be met with
>
> (Walton and Lee 1901)

> It will be seen that Birdoswald is a site of exceptional interest; in the record of Wall research it is more important than Greatchesters or Housesteads or Chesters, and ..... its defences [are] the most impressive of all. In addition, the site may claim the most delightful view of all, down into the wooded Gorge of the Irthing, which a former Earl of Carlisle compared to the view from Troy
>
> (Birley 1961, 203)

These two quotations stress the beauty of the natural setting of Birdoswald, and the importance of the archaeology of the site. The first is from the details prepared by Messrs Walton and Lee, Estate Agents and Auctioneers of Walbrook in the City of London, when offering the Birdoswald Estate for sale in 1901, and the second the conclusion of the late Professor Eric Birley s description of the site in his *Research on Hadrian s Wall.*

Both the natural and the archaeological potential of the site were to the fore when the site was acquired by its present owners, Cumbria County Council, in 1984. A management plan for the site was compiled, which sought to explore both aspects for public enjoyment. To this end two developments began in 1987 and continued very successfully in parallel: the appointment of a site manager and the establishment of facilities for visitors, and the research excavations aimed at consolidation and display. These excavations, the first of any scale on the site since 1934, form the basis of this volume.

In utilising the site as a centre for visitors and education a long tradition of change in the use of the site is brought firmly into the present. Built in the second century as one of the string of forts on Hadrian s Wall, Birdoswald has been a determining feature in the local landscape for 16 centuries. In this exposed, upland environment the sheltering Roman walls have acted as a magnet for settlement, especially in the sheltered north-west corner where the present farmhouse (and visitor facilities) are sited, and where the principal part of the excavations took place during 1987–92.

The vast majority of the data reported in this volume are concerned with the three centuries of the occupation of the Roman fort, but, at Birdoswald, settlement in some form continued beyond the traditional end of the Romano-British period into the fifth, and possibly the sixth century. An archaeological gap follows, after which settlement resumed in the thirteenth century when an apparent tower house was built, utilising the Roman principal west gate as the entrance to the place. By the sixteenth century the gate had collapsed and the tower house was replaced by a Bastle house of typical border type. This was inhabited by members of the Tweddle family who were the victims, on three recorded occasions, of raids perpetrated by the reivers of Liddesdale. In more settled times the present farmhouse was built in stages; the oldest part dates to the later seventeenth century and this was added to in 1745 and again in 1858. The 1858 building work transformed the house into a gentleman's home with a mock medieval appearance, and antiquarian work done at the same time created an arcadian landscape where sheep grazed among the ruins of Roman walls and gates. A formal garden was separated from this landscape by means of a ha-ha made using the wall of a Roman building. This was the Birdoswald which existed until 1987, when the site entered upon its current phase of use. The recent work has been carried out with sensitivity and respect to the earlier works, seeking to enhance and explain the long history of the site rather than to replace it or, worse, to tell only a single chapter.

Archaeological and antiquarian interest in the site represents a continuing theme in its history. Since Reginald Bainbrigg described its 'great ruynes' in 1599, scholars have been drawn to the place and have made their mark upon it. Birdoswald was visited by all of the great Wall scholars, but active archaeological research began only in 1850, when Henry Glasford Potter began work at the request of the then proprietor, Henry Norman. The quality of Potter's publication was far in advance of much contemporary archaeological endeavour; the plates by John Storey were of extraordinary quality, and several are reproduced in this volume. During the 1890s, and the 1920s and '30s, excavations by Francis Haverfield, and by F G Simpson and Ian Richmond respectively laid the foundations, not only for the study of Birdoswald, but also for that of the Wall at large. These excavations, like those of Potter, are notable for their swift publication; published reports followed each season of work. These reports have been invaluable in the preparation of this volume, and it is the hope of the author and contributors that this work may be seen as a worthy successor to the earlier series.

In conclusion, and on a personal note, I wish to dedicate this volume to the memory of my father, Raymond Arthur Wilmott (1921–88), whose final illness prevented him ftom visiting the excavation.

Tony Wilmott, Portchester-*Portus Adurni*
July 24th 1995

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I would like to express thanks to all of those who worked on site during the six seasons including, in 1988, Troop 81, Boy Scouts of America, led by Mr Lee Goodnight. Site recording was largely in the hands of the supervisors: Sara Rushton (1987–91), Chris Place (1987), Mike and Hilary Graham (1987–8), Nick Hair (1988), Richard Annis (1989), Frances Blore (1989–90), and James Mumford (1992). In addition areas were run and recorded by Kit Watson (1987), Peter Redmayne (1988–9), Fred Coupland (1989, 1992), Simon Cox (1989), Samantha Williams (1989–90), and Adrian Gollop, Jane Gosling, John Johnson, Alison Kennett, Alan Rae, John Roberts, Matthew Robinson, and Andrew Sage (all 1990). A limited, but useful programme of metal detecting was carried out by Neil Marshall. Wendy Edwards volunteered in all six seasons, and supplied very welcome cake on occasions.

The site photographs in this report are the work of Greg McDonnell (1987–8), Mark Lake (1988–9), Adrian Gollop (1990), and the writer (1991–2). Onsite computing was undertaken by Cate Trend (1987), Angela Peirson (1988–9), Matthew Robinson (1989–90), and Moira Laidlaw (1990). Sheila Keyte worked on the database in all seasons, and subsequently on the site and research archives. Finds processing was the responsibility of Louise Hird (1987–90), Moira Laidlaw (1990), and Jacki Briggs (1992). Environmental processing and recording on site was the work of Shaun Doran (1988), Brian Leddington (1989), and Karen Izard (1990).

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The excavation could not have run so smoothly and successfully without the hard work, commitment, and dedication of Adam Slade (Site Manager) and his staff, who became firm friends of the excavation teams.

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from Birdoswald, and who did not blanch when the 'small amount of leather' turned out to be over 600 pieces including many soles complete with hobnails. The team (which included Glynis once the going got tough and the deadline loomed) undertook the Herculean task of X-raying all the bulk iron and remained cheerful. Jan would like to thank them for keeping her sane as she ploughed her way through 220 odd X-rays of the most corroded, fragmentary assemblage imaginable, and for supplying cups of tea to assist the process. Jan would also like to thank Quita Mould, Hilary Cool, and Angela Wardle for allowing her to parade various mystery items before them one wet night in Cardiff.

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Summary

The 1987–92 excavations at Birdoswald explored a long and complex stratified sequence with evidence for occupation from the second to the twentieth centuries. The work was mostly concentrated on the buildings on either side of the *via principalis*, adjacent to and including the *porta principalis sinistra*, though work was also carried out on the northern defences and the eastern wall at the *porta quintana dextra*.

The earliest human activity at Birdoswald is related to the construction of Hadrian's Wall in the early 120s AD. Pollen evidence shows that the site was densely wooded before the construction of the Wall, and that the clearance of trees was an aspect of Wall construction. The first phase on the site comprised the construction of the Turf Wall and turret 49b. This appears to have been associated with a construction camp on the end of the river promontory on which the fort stands. The turret and part of the Wall were demolished to make room for a fort, and a morass was drained and filled before construction began. It is probable that the first fort was built of turf and timber, and that it was associated with the Vallum, which was diverted around a fort here.

Later, the Vallum was probably levelled to make room for a larger stone fort, built with its *praetentura* projecting to the north of the Turf Wall. The start of construction of the stone fort was followed by a period of desertion before the completion of the defences, roads, and internal buildings. The decision to replace the Turf Wall with a stone wall abutting the north corners of the fort was accompanied by the blocking of the redundant *portae quintanae*. Excavated buildings representing this primary construction period include a store and also a basilica-like building, the latter so far unique in auxilliary forts and interpreted as a *basilica exercitatoria*.

These buildings were constructed by the garrison attested epigraphically for the late second and third centuries, and listed in the *Notitia Dignitatum* for the fourth century: the milliary, peditate *cohors* I *Aelia Dacorum*.

During the first half of the third century there is archaeological and epigraphic evidence for rebuilding and refurbishment in both of the *portae principales*, and on the defences in general. This work included rebuilding, in remarkably fine masonry, in the south tower of the *porta principalis sinistra*, and the eventual blocking of portals in the gates and access to corner and interval towers. Both the long narrow building fronting the *via principalis* and the ground floor of the *porta principalis sinistra* were used for ironworking during the later third century.

Towards the end of the century the fort was apparently deserted for a time. Consequently, buildings became dilapidated and the fort ditches silted up, causing the drainage system to fail.

On reoccupation in the early fourth century, these developments were rectified and active use of the fort began again. By 350 the use of the south *horreum* was changed, while its northern counterpart collapsed and was quarried for stone. The sub-floor of the north *horreum* was used for piecemeal dumping, and among the dumped material were Valentinianic coins and a characteristic late- or sub-Roman penannular brooch.

At some point in the late fourth or early fifth century the use of the south *horreum* was changed again, and included the provision of a hearth at its western end. High quality finds and a Theodosian coin were dropped around the hearth. This final reuse of the south *horreum* is associated with a small garrison, which evolved through the late-Roman and early post-Roman periods into a community akin to those inhabiting defended enclosures elsewhere in the north and west of Britain. The nature of reuse echoes the form of the halls built as the foci of such communities.

The eventual collapse of the *horreum* was followed first by the construction of a timber building on the robbed walls of the north *horreum*, including a relaid stone floor, and then by a second timber building, sited partly on the *via principalis* in order to emphasise its relationship with the *porta principalis sinistra*. These developments lasted possibly one century, and suggest that the site was deserted by *c* 520.

The site was reoccupied in the thirteenth century. A tower house was constructed adjacent to the surviving *porta principalis sinistra*, which finally collapsed in the fifteenth or sixteenth century, and an alternative entrance to the north-west corner of the fort built.

In the sixteenth century a bastle house was constructed as the focus of a farming settlement, utilising the standing Roman fabric. This settlement was attacked three times by the reivers of Liddesdale, but was also visited in 1599 by the first antiquary to write about the site. The bastle was replaced by a farmhouse sometime in the seventeenth century, and enlarged in 1745 and in 1858. During these centuries the site was frequently visited by those interested in its Roman past.

The acquisitions of the site by Henry Norman in the 1840s marked the beginning of scientific excavation, commencing in 1850. Norman also laid out the garden in front of the farmhouse, improved the house, and created the Birdoswald familiar to visitors before 1987, when the excavations reported here began.

Résumé

Les fouilles entreprises entre 1987 et 1992 sur le site de Birdoswald ont examiné une séquence stratifiée longue et complexe, et ont mis au jour des témoignages d'occupation couvrant la période qui va du second au vingtième siècle. Les travaux se sont surtout concentrés sur les bâtiments situés de chaque côté de la *via principalis*, ceux contigus à, et incluant, la *porta principalis sinistra*, bien qu'on ait aussi effectué des recherches sur les fortifications nord et sur le rempart est à la *porta quintina dextra*.

Les plus anciens signes d'activité humaine à Birdoswald remontent à la construction du mur d'Hadrien, au début des années 120 ap. J-.C. Des traces de pollen prouvent que le site était couvert d'une épaisse forêt avant la construction du mur, et que l'abattage des arbres a constitué un des aspects de la construction du mur. La construction du mur de terre et de la tourelle 49b appartiennent à la première phase d'occupation de ce site. Celle-ci semble avoir eu un lien avec un camp de bâtisseurs situé au-dessus de la rivière, au bout du promontoire sur lequel se trouve le fort. La tourelle et une partie du mur furent démolis pour faire place à une forteresse, et on draina puis combla un marais avant le début de la construction. La première forteresse fut probablement construite en terre et en bois et elle avait sans doute un rapport avec le Vallum qui fut détourné autour d'une forteresse à cet endroit.

Plus tard, le Vallum fut probablement nivellé pour donner de la place à une forteresse en pierre, plus grande, construite de telle manière que sa *praetentura* faisait saillie au nord du mur de terre. Après le début de la construction du fort en pierre, mais avant la fin de la construction des fortifications, des routes et des bâtiments intérieurs, le site fut abandonné pour un temps. La décision de remplacer le mur de terre par un mur de pierre attenant aux angles nord du fort s'accompagna de la condamnation des *portae quintanae* désormais redondantes. Parmi les bâtiments mis au jour qui datent de cette première période de construction on compte un entrepôt et aussi un bâtiment de type basilique; ce dernier est jusqu'à présent l'unique exemple retrouvé dans une forteresse auxiliaire et a été identifié comme étant une *basilica exercitatoria*.

D'après les inscriptions, ces bâtiments furent construits par la garnison en poste à la fin du second et au troisième siècle et figurent sur la liste du *Notitia Dignitatum* pour le quatrième siècle: la milliaire, *peditate cohors* I *Aelia Dacorum*.

Quant à la première moitié du troisième siècle on a retrouvé des témoignages archéologiques et épigraphiques de reconstruction et de remise en état dans les deux *portae principales*, et sur l'ensemble des fortifications. Ces travaux comprenaient la reconstruction, en maçonnerie extrèmement délicate, de la *porta principalis sinistra* dans la tour sud et éventuellement la condamnation des entrées dans les portes ainsi que de l'accès aux tours d'angle et intermédiaires. Aussi bien le long bâtiment étroit bordant la *via principalis* que le rez de chaussée de la *porta principalis sinistra* furent utlisés pour le travail du fer pendant la dernière partie du troisième siècle.

Vers la fin de ce siècle, le fort fut apparemment déserté pour un temps, ce qui eut comme conséquence la dégradation des bâtiments et le comblement des fossés du fort, ce qui empêcha le système de drainage de fonctionner.

Quand le fort fut réoccupé, au d'but du quatrième siècle, on remédia à ces problèmes et le fort repris son rôle et ses activités. A un moment quelconque avant 350 on modifia l'usage que l'on faisait de l'*horreum*, tandis que son pendant au nord s'effondrait et que les pierres en étaient utilisées comme pierres à bâtir. Le sous-sol de l'*horreum* du nord fut peu à peu utilisé comme dépôtoir et parmi les objets jetés on a trouvé des pièces de monnaie de Valentinien et une broche en forme d'anneau presque complet datant de la fin de la période romaine ou sub-romaine.

A un certain moment vers la fin du quatrième siècle ou au début du cinquième, l'usage de l'*horreum* du sud changea à nouveau et il fut doté d'un foyer à son extrémité ouest. On avait laissé tomber des trouvailles d'une grande qualité et une pièce de monnaie de Theodosius autour du foyer. La dernière réutlisation de l'*horreum* du sud est liée à une petite garnison, qui s'est transformée au cours de la fin de l'époque romaine et au début de l'époque post-romaine en une communauté proche des habitants des enceintes fortifiées trouvées ailleurs dans le nord et l'ouest de la Grande-Bretagne. La nature du nouvel usage rappelle la configuration des halles bâties comme point focal de telles communautés.

A la suite de l'effondrement final de l'*horreum*, on construisit d'abord un bâtiment en bois, sur les murs pillés de l'*horreum* du nord, qui comprenait un sol de pierre reconstitué, puis un second bâtiment en bois positionné en partie sur la *via principalis* de manière à mettre en évidence sa relation avec la *porta principalis sinistra*. Ces aménagements durèrent peut-être un siècle et donnent à penser que le site fut déserté avant 520.

Le site fut à nouveau occupé au treizième siècle. Une maison à tour fut construite à côté de la *porta principalis sinistra* qui restait et qui tomba finalement en ruines au quinzième ou au seizième siècle et une autre entrée fut construite pour donner accès à l'angle nord ouest de la forteresse.

Au seizième siècle une maison fortifiée fut construite, elle constituait le centre d'une communauté agricole, utilisant ce qui était resté debout des bâtiments romains. Cette occupation fut attaquée trois fois par des brigands de Liddesdale, mais elle reçut également

la visite d'un amateur d'antiquités à qui on doit le premier témoignage sur l'existence du site. La maison fortifiée fut remplacée par un bâtiment de ferme à un moment quelconque du dix-septième siècle, et agrandie en 1745 et en 1858. Au cours de ces deux siècles le site reçut fréquemment la visite de personnes qui s'intéressaienr à son passé romain.

L'acquisition du site par Henry Norman dans les années 1840 marqua le début des fouilles scientifiques qui commencèrent en 1850. Norman aménagea aussi le jardin devant la ferme, améliora la maison, et créa le Birdoswald que connurent les visiteurs jusqu'en 1987, date à laquelle commencèrent les fouilles qui font l'objet de ce compte-rendu.

Traduction: Annie Pritchard

Zusammenfassung

Die Ausgrabungen bei Birdoswald zwischen 1987 und 1982 erforschten eine lange, mehrschichtige Entwicklung, aus der hervorgeht, daß das Gelände vom zweiten bis zum zwanzigsten Jahrhundert besiedelt war. Die Arbeit konzentrierte sich überwiegend auf die Gebäude zu beiden Seiten der *via principalis* neben und einschließlich der *porta principalis sinistra*, obwohl auch die nördlichen Verteidigungsanlagen und der ösrliche Wall an der *porta quintana dextra* bearbeitet wurden.

Die ältesten Anzeichen menschlicher Aktivitär in Birdoswald stehen mit dem Bau des Hadrianswalls zu Beginn der 120er Jahre n.Chr. in Verbindung. Blütenstaub liefert den Beweis, daß dieses Gelände vor dem Bau des Walls dicht bewaldet war und daß die Abholzung einen Aspekt der Bauarbeiten darstellte. In der ersten Phase des Geländes wurden der Erdwall und Wachturm 49b gebaut, anscheinend im Zusammenhang mit einem Baulager am Ende des Flußvorgebirges, auf dem das Fort steht. Der Turm und ein Teil des Walles wurden abgetragen, um den Bau eines Forts zu ermöglichen; vor Beginn der Bauarbeiten wurde ein Sumpf entwässert und aufgeschüttet. Wahrscheinlich stand das erste, aus Erde und Holz gebaute Fort in Zusammenhang mit dem Vallum, das hier um eine Befestigung umgeleitet wurde.

Vermutlich wurde das Vallum später abgetragen, um für ein größeres, aus Steinen konstruiertes Fort Platz zu machen, dessen *praetentura* an der Nordseite des Erdwalls auskragte. Zwischen der Inangriffnahme des steinernen Forts und der Vollendung der Verteidigungsanlagen, Straßen und Gebäude im Inneren war das Gelände eine Zeitlang verlassen. Als Folge der Ersetzung des Erdwalls durch eine steinerne, an die Nordseite des Forts angrenzende Mauer wurden die nicht länger benötigten *portae quintanae* blockiert. Unter den Ausgegrabungen aus dieser ersten Bauepoche befinden sich ein Speicher und eine Art Basilika, vorderhand die einzige in diesen Hilfsbefestigungen; sie wird als *basilica exercitatoria* betrachtet.

Aus Inschriften geht hervor, daß diese Bauwerke am Ende des zweiten und im dritten Jahrhundert von einer Garnison errichtet wurden, die in der *Notitia Dignitarium* für das vierte Jahrhundert als die tausend Mann zählende Fußkohorte I *Aelia Dacorum* aufgeführt ist.

Laut Inschriften und archäologischen Funden wurden nicht nur die *portae principales*, sondern die Befestingungen im allgemeinen während der ersten Hälfte des dritten Jahrhunderts neu gebaut bzw. instand gesetzt. Diese Arbeiten umfaßten das besonders schöne Mauerwerk im neuen südlichen Wachturm der *porta principalis sinistra* sowie die Blockierung der Portale an den Toren und die Zugänge zu den Türmen an den Ecken und Zwischenräumen. Ende des dritten Jahrhunderts wurde sowohl das lange, schmale, an der *via principalis* liegende Gebäude und das Erdgeschoß der *porta principalis sinistra* für Eisenarbeiten verwendet.

Anscheinend wurde das Fort gegen Ende des Jahrhunderts vorübergehend verlassen; daher gerieten die Bauten in Verfall und die Graben verschlammten, folglich versagte das Abwassersystem.

Zu Beginn des vierten Jahrhunderts wurde diesen Schäden abgeholfen und das Fort wieder in Betrieb genommen. Bis 350 wurde das südliche *horreum* für andere Zwecke verwendet; das nördliche Gegenstück war eingestürzt und die Steine wurden abgetragen. Der Blindboden des nördlichen *horreums* diente als Deponie; unter den dort abgeladenen Gegenständen befanden sich Münzen aus der Zeit des Kaisers Valentinian und eine charakteristische spätrömische oder subrömische Spange.

Irgendwann im späten vierten oder frühen fünften Jahrhundert wurde das südliche *horreum* wieder für andere Zwecke benutzt; am westlichen Ende wurde ein Herd gebaut, in dessen unmittelbarem Umkreis wertvolle Funde, darunter eine Münze aus der Zeit des Kaisers Theodosius, gemacht wurden. Diese letzte Verwertung des südlichen *horreums* steht mit einer kleinen Garnison in Verbindung, die sich im Verlauf der spätrömischen und frühen nachrömischen Epochen zu einer Gemeinschaft entwickelte, denen vergleichbar, die im Norden und Westen Britanniens in verteidigten Einfriedungen lebten. Das Wesen der Wiederverwendung entspricht der Form der Hallen, die als Sammelpunkt dieser Gemeinschaften errichtet wurden.

Nachdem das *horreum* endgültig eingestürzt war, wurde zunächst über den geplünderten Mauern des nördlichen *horreums* ein Holzbau mit einem neuen Steinfußboden errichtet, und danach ein zweiter Holzbau, der teilweise an der *via principalis* lag, um die Beziehung zur *porta principalis sinistra* zu betonen.

Diese Entwicklungen nahmen ungefähr hundert Jahre in Anspruch, woraus man schließen darf, daß das Gelände *c* 520 verlassen war.

Im 13.Jahrhundert wurde das Gelände wieder besiedelt. Neben der noch vorhandenen *porta principalis sinistra* wurde ein Turmhaus errichtet; diese stürzte im 15. oder 16.Jahrhundert endgültig ein, weshalb an der nordöstlichen Ecke des Forts ein anderer Zugang gebaut wurde.

Im 16.Jahrhundert wurde unter Verwertung der vorhandenen römischen Strukturen ein festes Blockhaus als Sammelpunkt einer landwirtschaftlichen Siedlung erbaut. Räuber aus Liddesdale fielen dreimal in diese Siedlung ein, die allerdings auch im Jahr 1599 vom ersten Altertumsforscher aufgesucht wurde, der über das Gelände berichtete. Irgendwann im 17.Jahrhundert wurde das Blockhaus durch ein landwirtschaftliches Gebäude ersetzt, das in den Jahren 1745 und 1858 ausgebaut wurde. In diesen Jahrhunderten wurde das Gelände häufig von an seiner römischen Vergangenheit Interessierten aufgesucht.

Nach dem Ankauf des Geländes durch Henry Newman in den 1840er Jahren fanden 1850 die ersten wissenschaftlich fundierten Ausgrabungen statt. Norman legte auch den Garten vor dem von ihm verschönten Gebäude an und gestaltete so das Birdoswald, mit dem die Leute vertraut waren, die es vor 1987, dem Beginn der hier beschriebenen Ausgrabungen, besichtigten.

Übersetzung: Gerry Bramall

Glossary

compiled by Clare de Rouffignac and Tony Wilmott

(Sources: Courty *et al* 1989; Fleming *et al* 1972; Heron *et al* 1991; Holister and Porteous 1976; Jacomet 1987; Limbrey 1975; Lowe and Walker 1984; Moore and Webb 1978; Odum 1971; Pears 1985; Simmons and Tooley 1981; Stace 1991; Young 1981)

note: *italicised* terms in the definitions are also defined in this glossary

Ah Abbreviation for mixed mineral and organic soil horizons formed from *humose* materials

arris A sharp edge produced by the meeting of two surfaces

astragal A small moulding, circular in section, often decorated

biopores Small voids caused by animal activity or root action

cavetto A hollow moulding, with a quarter circle section

edaphic Vegetation community where topography, soil, water, fire, or other disturbance prevents further development to climatic climax vegetation (the self-perpetuating community of vegetation in equilibrium with the physical habitat)

entomophily A need for plants to be pollinated by insects

eutrophication The process of ageing of a land-locked body of water, accumulating nutrients, which results in abundant production of organic material

extrados The outer (top) curved face of an arch

fillet A narrow, flat, raised band; the upper most component of a cornice

Flandrian succession The sequence of changes in vegetation due to climatic conditions since the end of the last glacial stage 12,000 years ago

gley A periodically waterlogged soil which aquires characteristic mottling from the lack of oxygen and the presence of elements such as iron in a reduced state

hexaploid Plant having six sets of chromosomes

humose A mixture of mineral and organic materials which form the *A,h* soil horizons

hydroseral succession The progression of plant communities which occurs as a wet area changes over time to an infilled dry site

intrados The inner curve or underside of an arch (see *soffit*)

LFH Abbreviation for L (loose litter lying on the soil surface) F (organic residues undergoing decomposition and comminution by soil fauna and microorganisms) H (amorphous humus formed mainly of arthropod faecal pellets) which in vertical sequence form a *mor humus* horizon

lipid Class of chemical compound found in organic matter

lithology Soils and sediments

macromorphology Study of soils on a larger scale than *micromorphology*

micromorphology The study of undisturbed soils, loose sediments, and other materials at a microscopic scale

minerogenic Mineral-rich

mor humus Vertical sequence of litter, organic residues, and amorphous humus (see *LFH*)

non-occluded phosphorus A form of inorganic phosphorus usually associated with iron or aluminium

oligotrophic A water body which is poor in producing organic matter; the opposite of *eutrophication*

ombrotrophic Mire vegetation which depends entirely on rainfall for nutrient input

palaeosol Ancient soil

palynomorph Pollen grain

pedogenetic Soil formation processes

rachis Central axis of a cereal ear to which the grains are attached

redox Abbreviation for reduction-oxidation reaction

reiver (also reaver) A plunderer or raider along the Scottish-English border

ruderal Weed of cultivated ground

siraf A sieving and flotation system used to extract plant remains, bones, and artefacts from soil samples

soffit The underside of any architectural member

taxon (pl = taxa Group(s) of living organisms which are classified together using *taxonomy*

taxonomy The study of the classification, morphology, physiology, and ecology of all living organisms

till Deposits formed directly by ice or from glacier ice without the intervention of water, comprising a homogenous mix of sediment containing a mixture of mineral and rock types

The cutting of the first turf on July 28th 1987: (left to right) John Burnet (Head of Economic Development, Cumbria County Council), Tony Mills (BNFL), Andrew Saunders (Chief Inspector of Ancient Monuments, English Heritage)

1 Introduction

The site: topography and geology

Birdoswald is the eleventh fort from the east end of Hadrian's Wall . It lies 5.2 km (3.25 miles) from Carvoran and 11.2 km (7 miles) from Castlesteads, its nearest neighbours to the east and west respectively. From the north gate of the fort a road, the Maiden Way, runs to the Roman outpost fort of Bewcastle, 9.6 km (6 miles) to the north. The nearest modern settlement is the village of Gilsland which lies 2.8km (1.75 miles) to the east.

The fort is built on a high spur, which is contained to the south by a broad meander of the River Irthing. To the north of the site the ground also drops away into the well-named Midgeholme Moss, which occupies a natural drainage basin sealed to the east by fluvioglacial sands and gravels, and to the south by a glacial moraine (Trotter and Hollingworth 1932; Geological Survey of England and Wales, sheet 18, Brampton).

The site was clearly chosen for its strategic importance. The use of the highest point of the north bank of the Irthing as a route for the course of the Wall necessitated the provision of a crossing point over the Irthing at Willowford Bridge and this, together with the logic of fort spacing, in turn dictated the provision of a fort to guard the crossing. In the same way the North Tyne crossing was guarded by the fort at Chesters. The commanding aspect of the site must also have been a consideration; the site is notable for the sweeping views available in every direction. To the north west the hill-fort of Burnswark, which lies to the north of the Solway, may be discerned while on the eastern horizon rise the 'Nine Nicks of Thirlwall' and the central sector of Hadrian's Wall. To the south it is possible to look across the natural east-west route of the Irthing Gap (now occupied by the main road and rail connections between Newcastle and Carlisle) to Cold Fell at the northern end of the Pennine chain. To the north the land rises gently across Waterhead Common towards the Bewcastle Fells. The southward view (Pl 1) was compared to that from Troy by a nineteenth-century Earl of Carlisle:

> ...both have that series of steep conical hills, with rock enough for wildness and verdure enough for softness; both have that bright trail of a river creeping in and out with the most continuous indentations ....
>
> (from *Diary in Turkish and Greek waters*, quoted by Bruce (1885, 205)

The underlying geology of the spur consists of the Upper Border Group of Carboniferous sedimentary strata including crinoidal limestones, dark-blue shales, and grey-white micaceous sandstones, of which a (now outdated) subdivision is known as the Birdoswald Limestone Group (Turner 1971, 52). These rock types were all utilised as building materials on the site, and can be seen as exposures in the sides of the Irthing Gorge. It is probable that the river cliffs below Birdoswald fort were used as quarries during the Roman period as was the case a little further downstream at both Coombe Crag and Lanerton where Roman quarry inscriptions have been noted (Hodgson 1840, 440; RIB 1946–52; Collingwood 1930, 120; Hassall and Tomlin 1992, 316–7).

The upper drift geology consists of a thick deposit of pinkish boulder clay, the white weathered surface of which forms the natural subsoil of the site. Modern profiles developed over these clays comprise fine loamy mineral soils known as stagnogleys (Avery 1980; the Salop series after Kilgour 1985). These soils are typically subject to periodic wetness in their surface horizons, attributable to a combination of relatively high rainfall (900–1000mm per annum) and impermeable boulder clay at depth. Modern topsoils are only slightly organic and are moderately acid. Surface wetness precludes widespread cultivation and most areas are utilised as permanent grass, pasture, and rough grazing (McHugh forthcoming).

An important element of the microtopography of the spur is a dip of unknown extent which occupies the centre of the site chosen for Birdoswald fort. The impermeable qualities of the boulder clay allowed a small peat bog to develop in this dip. This bog, the so-called 'morass', was first identified during excavations in 1930 (Richmond 1931, 123).

Hadrian's Wall was carried across the river 0.65km east of the fort at Willowford Bridge. The course of the Irthing across its flood plain is subject to constant change, resulting in the 'continuous indentations' so admired by the romantic Earl. This is perhaps most noticeable at the Roman bridge itself, where the gradual movement of the river has been traced by Bidwell and Holbrook (1989, 50–52, fig 38). As the river turns southwards past Harrows Scar (Fig 1) it can be shown to have shifted steadily westwards, undercutting the limestone Scar itself and causing the loss of the part of Hadrian's Wall, which formerly ran down the Scar to meet the bridge. This erosion is graphically portrayed in a watercolour executed in 1848 by Henry Burdon Richardson (ibid, pl 6). The river now runs 72m west of the eastern abutment of the Roman bridge. Further east a stretch of Hadrian's Wall between turrets 48a and 48b (Willowford East and West) has also collapsed into the river due to the undercutting of the banks.

To the south of Harrows Scar the river turns westwards towards its confluence with the river Eden. Immediately to the south of Birdoswald the meander around the spur on which the fort is built appears to be undergoing the long process which will ultimately transform it into an oxbow lake (Fig 1, Pl 1).

This means that the spur is being eroded on both its eastern and western flanks. At least two, and possibly three, previous southern river banks are visible as more-or-less pronounced ridges in the field within the meander to the west of the spur, but the relative ages of these could not be determined without intensive sedimentological survey. It is not possible to assess the effect of erosion and deposition on the course of the river at this point. An early map, the 1603 survey plan of the Barony of Gilsland which was prepared for Lord William Howard of Naworth (Dept of Palaeography, University of Durham Library Special Collections, Howard of Naworth MSS C713/15), shows a less pronounced meander, though the lack of reference points for this part of the river makes this impossible to quantify. The same map was used successfully by Bidwell and Holbrook (ibid, fig 38) to gauge the shifting river course at Willowford Bridge. A comparison with the 1862 Ordnance Survey map, however, demonstrates that the eastern side of the meander has shifted approximately 20m to the west during the last century.

The erosion of the eastern side of the spur is sufficiently distant to pose no current threat to the surviving archaeology on its summit. The western flank is a different matter, as here there is a steep slope down to the river, and this is being continuously undercut. The resulting instability of the slope is, at the time of writing, causing the collapse of the top of the spur edge, and the possible attrition of important archaeological deposits. Since the excavation of 1933 the spur has been stable, and the renewed erosion now must be a cause for concern. The erosion of the spur is not merely the result of river movement but of water seepage into the underlying boulder clay, causing failure of the slope (Cumbria County Council 1987).

The Birdoswald sector of Hadrian's Wall

The stretch of Hadrian's Wall to the east and west of Birdoswald (Fig 1) has been one of the most productive of archaeological information as a result of works undertaken over more than a century. It is unique in that over a distance of only 6.5km (4 miles) every type of structure which formed part of the Wall system may be seen, and the various changes in the scheme for the Wall's construction may all be traced.

In the original plan a Stone Wall extended from Newcastle upon Tyne as far east as the Irthing valley, with the 50km (31 miles) from here to Bowness on Solway built in turf. The initial plan for the Stone Wall required a curtain wall 10 Roman feet (2.96m) thick, and the foundations for this Broad Wall were laid as far as the Irthing. To the east of the Irthing the final Stone Wall milecastle (48, Poltross Burn) and turrets (48a and b, Willowford East and West) are consolidated monuments in the guardianship of English Heritage. The milecastle was the subject of important excavations by Gibson and Simpson (1911) in 1909–10, while the two turrets were explored by Shaw (1926) during 1923. The milecastle and turrets were each provided with wing-walls of the same thickness as the Stone Wall foundation, which were intended to be bonded with the curtain wall. When the builders of the curtain wall reached the Irthing however, they were working to the Narrow Wall standard of 8 Roman feet (2.37m) or less which begins at the North Tyne crossing. This meant that the junction between the wing walls and the curtain wall were offset at points of reduction on the southern face of the Wall.

At the end of the Stone Wall lies the bridge over the Irthing at Willowford. Again built in advance of the curtain wall, this complex structure has been examined twice: by Shaw (1926) in 1924 and by Bidwell and Holbrook (1989) in 1984–5 in advance of reconsolidation. This monument too is in the guardianship of English Heritage. In its first form it is reconstructed as a simple stone bridge of three arches, which carried the curtain wall over the river. A tower was provided at each side (ibid, 66–70). A reconstruction drawing (ibid, pl 7) has shown the Turf Wall abutting the western tower of the bridge, although it is possible that this wall was not begun east of the top of Harrows Scar (ibid, 50), as it may have been unstable on the steep slope.

Perhaps the most complicated part of the entire Wall system is that which lies between milecastles 49 (Harrows Scar) and 51 (Wall Bowers). This is the only place known where the course of the Turf Wall diverges from that of its stone replacement for any distance. It is thus the only place where the Turf Wall may be examined in isolation and it is not surprising, therefore, that the Turf Wall was first identified in this sector. Its existence was predicted by Cadwallader Bates (1895), and proved by Haverfield at Appletree in 1895 (Haverfield 1897a, 187). The fact that it lay beneath the stone fort at Birdoswald was established in 1897 (Haverfield 1898a, 173). By the following year, Haverfield had traced the course of the Turf Wall in the Birdoswald sector from milecastle 49 to milecastle 51 (Haverfield 1899, 347–51, pl 1; Hodgson 1899), though it was not until 1934 that it was finally confirmed that the Turf Wall had extended from the Irthing to Bowness on Solway (Simpson, Richmond and McIntyre 1935, 217–8). The site of milecastle 50TW (High House) was identified in 1933 and excavated in 1934 (Simpson, Richmond and St Joseph 1935a). This important excavation determined the essential features of a Turf Wall milecastle, and allowed a reconstruction (ibid, figs 4, 6) which remains largely unchallenged. More importantly, a fragment of a wooden building inscription was found (Collingwood 1935; RIB 1935). This, though heavily restored, suggests that the Turf Wall was constructed during the reign of Hadrian, and under the governorship of Platorius Nepos (AD 122–5), the legate apparently charged by Hadrian with the task of building the Wall. The three Turf Wall turrets (49b, 50a, and 50bTW) in this area were also located during 1933, and all but the severely robbed 49b were excavated (Simpson, Richmond, and St Joseph 1935b). All were typical Turf Wall turrets of the type recognised in 1927 at turrets 51a (Piper Sike), 51b (Lea Hill) and, the best preserved, 52a (Banks East) (Simpson 1928, 382–3). The last-mentioned three turrets are consolidated and can be seen alongside the modern road. Whereas Stone Wall turrets were built with, and recessed into the Wall, turrets on the Turf Wall consisted of free-standing stone towers against which the turfwork was butted. Subsequently the stone replacement of the Turf Wall was also butted against these turrets, a relationship first noticed as early as 1857 by Bruce (1859) at turret 53a (Hare Hill).

A fort was clearly built at Birdoswald shortly after the Turf Wall. This is demonstrated by the fact that the Vallum, which followed the Turf Wall line was built to deviate around a fort on the site. Whether this was the present stone fort or an earlier turf-built predecessor will be discussed at length below. The line of the Vallum was originally traced together with the Turf Wall by Haverfield (1899, 347–51, pl 1), and in 1932 a primary Vallum crossing, the first of its type to be identified, was excavated to the south of the fort (Simpson and Richmond 1933, 246–52). The Vallum, the great earthwork which shadows the Wall to the south from coast to coast, usually consisted of a flat-bottomed ditch, 20 Roman feet (5.91m) wide and 10 (2.96m) deep flanked by two mounds, each 20 Roman feet (5.91m) wide, and each set back 30 Roman feet (8.87m) from the ditch edges. This is how the Vallum appears to the west of milecastle 50TW, where it remains visible in an exceptional state of preservation. To the east of the milecastle, for reasons which may be connected with the proximity of the Vallum to the Turf Wall, the north mound was omitted, and the upcast from the ditch disposed of in a double-size south mound. This state of affairs existed over the whole of wall-mile 50 between milecastles 49 and 50TW (Simpson and Richmond 1937a, 171–3). The situation at milecastle 50TW is further complicated by the fact that a primary causeway was provided across the Vallum at this point (ibid, 167–8).

The final element of the frontier works in this sector is the Stone Wall which replaced the Turf Wall from milecastle 49 (Harrows Scar) westwards. The stone milecastle 49 itself was partially excavated by Haverfield (1899, 352–3) in 1898, though the underlying Turf Wall milecastle was not recorded until 1953 (Richmond 1956a). It has long been accepted that the Stone Wall deviates from the line of its predecessor in order to meet the northern corners of the extant stone fort at Birdoswald. The deviation begins some 55m from the west side of the milecastle, where the Stone Wall strikes off the previous course at an angle of eight degrees. It meets the north-east corner of the fort and continues from the north west corner to meet the Turf Wall line again at milecastle 51 (Wall Bowers). In between lie the stone-built milecastle 50 (High House) and turrets 49b, 50a, and 50b. These installations were all excavated in 1911 (Simpson 1913), though turret 49b had previously been partially examined by Thomas Crawhall (Hodgson 1840, 207). The 1911 excavation suggested (Craster 1913; Newbold 1913) that the primary levels of the milecastle and turrets of the final phase of this highly complex series of developments had been occupied during the Hadrianic period. The Stone Wall milecastle 49 and turret 49b have also been consolidated.

Previous archaeological observations and work at Birdoswald

Early work on the fort at Birdoswald may be conveniently summarised in a chronological list similar to that prepared by Bidwell (1985, 1) for Vindolanda. Fuller references to the antiquarian visits and discoveries before 1831 and to casual finds, of which only the more important are listed here, may be found in the account by Birley (1961, 196–8). Also incorporated in the list are the principal events documented in the lifetime of the post-medieval farm. The locations of the principal excavations with their dates are shown in Figure 7.

1599: The site was visited by Reginald Bainbrigg, and the 'great ruynes thereof' described in an account sent to William Camden, who missed the site (Haverfield 1911, 365).

1603: The first reference to a Stonehouse at Birdoswald appeared in the *Gilsland survey* for Lord William Howard of Naworth (Graham 1934).

1732: The publication of Horsley's (1732) *Britannia Romana* included an account of the surviving remains at Birdoswald, described by Birley (1961, 197) as the best description of any Wall fort for over a century.

1745: The farmhouse was extended, the farmyard laid out, and farm buildings erected by Anthony and Margaret Bowman.

1821: Three altars found inside the fort included the dedication to Silvanus by the *Venatores Bannienses* (RIB 1905), confirming the Roman name of the site.

1831–33: The site proprietor, Thomas Crawhall, undertook excavations which were noted by Hodgson (1840, 207). These included work on the north-west angle of the fort where it was discovered that the Wall abutted the angle tower. A portion of the west wall (possibly that figured in a watercolour by Henry Richardson; Pl 2), the oven in the east tower of the *porta decumana* and Turret 49b to the west of the fort were also partially investigated.

1849: A little digging was done in the *porta quintana sinistra* by the participants in the first Pilgrimage under John Collingwood Bruce.

1850: Henry Norman, by now the owner of the site, together with the brothers Henry Glasford and W S Potter excavated both of the *portae quintanae* (Fig 40(1)) and a portion of the hypocaust of the bath-house of the *praetorium*. They may have been inspired to undertake this work by the Pilgrimage of the preceding year. The body of a statue of Fortuna, the head of which had been found the previous year (Pl 14; Coulston and Phillips 1987, 7–8; pl 15) was recovered (Potter 1855a) from the latter excavation, which was eventually backfilled under the supervision of the writer in December 1991.

1851: The Potters returned and excavated the *porta decumana* (Fig 2; Potter 1855b).

1852: The *porta principalis dextra* was discovered by James Boustead, a tenant farmer, while engaged in stone robbing. The Potters first reconnoitred and then excavated the gate (Figs 3, 140; Potter 1855c), discovering a third-century building inscription (RIB 1914) in the debris.

1858: The mock pele tower and gothic porch were added to the existing farmhouse by Norman, giving the building its present appearance (Fig 277).

1859: In levelling the broken ground in front of the farmhouse to form a garden, Norman (1860, 249) excavated the space between the south *horreum* (below, Building 197) and the adjacent building to the south. The buttressed *horreum* wall was utilised as part of the ha-ha around his garden (Fig 278).

Some excavations were also made 'at the expense of the Archaeological Institute' at its Carlisle meeting in 1859 (*Archaeol J* 1859). 'The remains of a tank or reservoir for supplying the station with water were found. Some arrangements for filtering the water by making it pass through a wall of charcoal, were noticed. ...... this cistern was fed by a spring on the west side of the station' (Bruce 1885, 203–4; Birley 1977, 161).

1895: Four seasons of excavation for the Cumberland Excavation Committee by F Haverfield (1897a; Hodgson 1897) began at Appletree, to the west of Birdoswald, where the Turf Wall was identified for the first time. This famous exposure has been further discussed by Whitworth (1992).

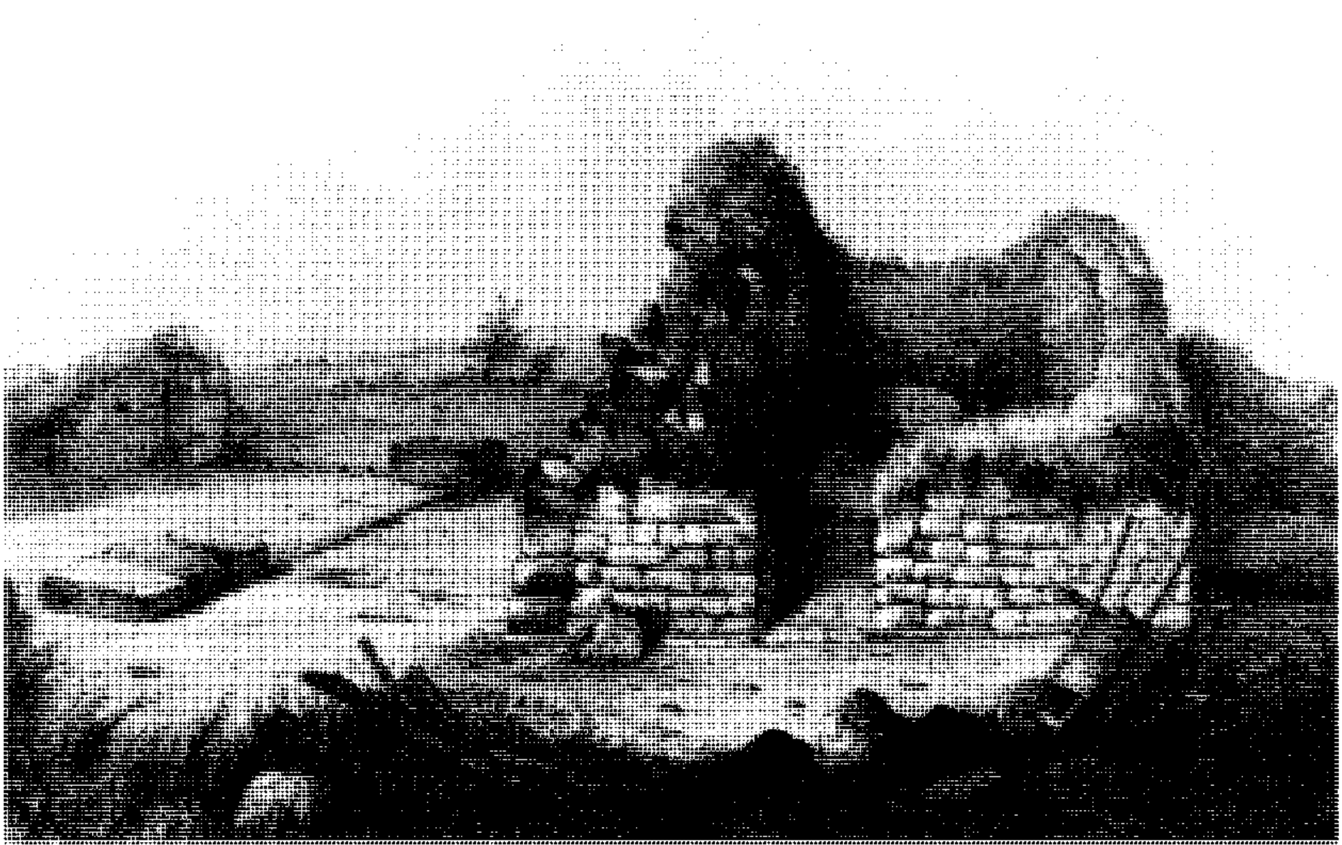

Fig 2 Engraving by John Storey of the porta decumana *during H Glasford Potter's 1851 excavation (reproduced by permission of the Society of Antiquaries of Newcastle upon Tyne)*

1896: The Vallum was located to the south of the fort, and the Turf Wall to the west (Haverfield 1897b; Hodgson 1897).

1897: The third season established firstly that the Vallum deviated southwards, apparently around the fort, and secondly that the Turf Wall underlay and therefore antedated the stone fort (Haverfield 1898a; Hodgson 1898). The plate by Mrs Hodgson (ibid, pl 1) demonstrated that the *porta principalis dextra* had become heavily silted up since the excavation of 1852.

1898: Excavation in Chapelfield, to the east of the fort, established the line of the Turf Wall and Vallum as far as Milecastle 49 (Harrows Scar) (Haverfield 1899; Hodgson 1899).

1920: A trial excavation at the north west angle of the fort demonstrated that a ditch ran under the reconstructed stone wall (F G Simpson Mss; Dr G Simpson personal communication). This was reported in a later publication (Simpson and Richmond 1934a, fig 2)

1927: F G Simpson (1928) decided to transfer his research work from Great Chesters to Birdoswald, thus beginning seven consecutive seasons of work, firstly by the Durham University Excavation Committee, and after 1930 by the revived Cumberland Excavation Committee. The east rampart and the Turf Wall ditch within the fort were trenched (Richmond 1929, 303).

1928: The relationship between the stone fort and Vallum ditches was established to the south west of the fort. An unfinished outer ditch was identified around the fort (Richmond 1929), and the existence of timber buildings to the south of the fort was established. The excavation of buildings north of the *via principalis* in the eastern *praetentura* was begun.

1929: Work concentrated on the buildings started the previous year (Richmond and Birley, 1930) resulting in the identification of a dated sequence of four Levels, which had considerable influence in the subsequent establishment of the idea of the four Wall Periods (Simpson 1930; Birley 1930c; Daniels 1989b, 10). Two important building inscriptions (RIB 1909, 1912) were also found. This sequence is fully examined below (Figs 4, 5, 6).

1930: The eastern defences were examined, leading to the recognition of a morass which had been drained. A ditch cutting the morass was excavated after the Vallum.

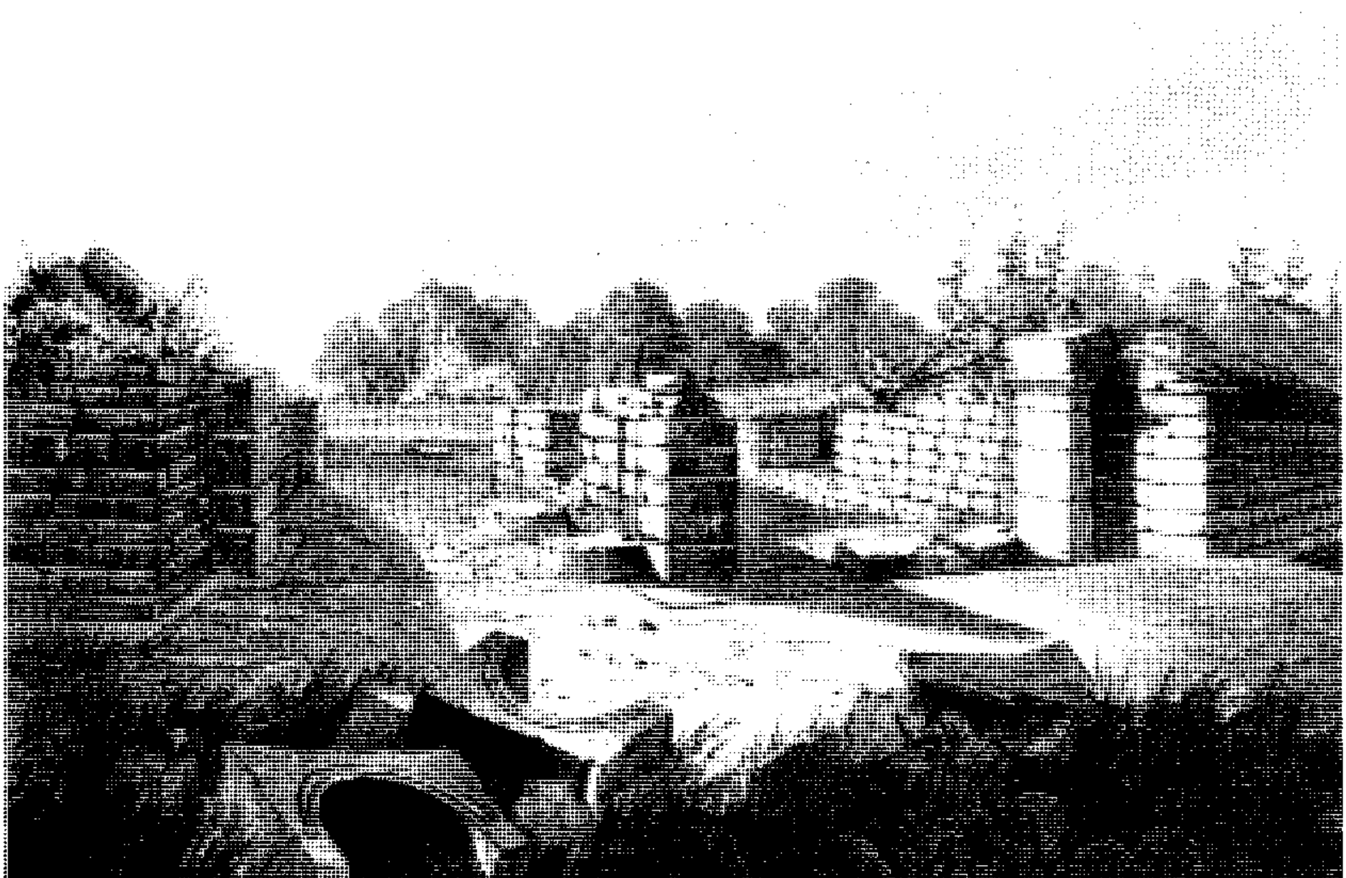

Fig 3 Engraving by John Storey of the porta principalis dextra *following the H Glasford Potter excavation of 1852 (reproduced by permission of the Society of Antiquaries of Newcastle upon Tyne)*

Fig 4 The offering to Fortuna at the beginning of the 1929 excavation, looking eastward towards the porta principalis dextra: *the group in the foreground (left to right: John Charlton, Eric Birley, [unknown], F G Simpson, [unknown], Kurt Stade, Mr Applebaum, R G Collingwood) are standing on the 'Level IV' floor, and the slabs on which the altar, Stade, Applebaum, and Collingwood are standing are the two inscriptions RIB 1909, 1912 (photograph taken by Sir Ian Richmond; reproduced by permission of Dr G Simpson)*

The junction of the *via quintana* and the *via decumana* was examined, with a sequence of buildings. A small hoard was found in the earliest floor. 'Rapid trenching' was also undertaken around the fort to establish an outline building plan (Richmond 1931).

1931: Trenches were cut from the *porta decumana* to the south-east angle tower and to the *porta quintana dextra*. Debris was found below Hadrianic levels, and the stone base for a turf rampart discovered below the stone fort defences (Fig 20; Simpson and Richmond 1932).

1932: Simpson and Richmond (1933) continued excavation on the spur to the south of the fort. A polygonal ditched enclosure was cut by the Vallum. The excavation of the Vallum revealed the original Vallum-crossing (Fig 21), the first such feature to be identified. The south-east rampart was explored, including a range of ovens, the early rampart-base and a building butting the front of the south-east angle tower. The basis of a system of three Phases (as distinct from the four Periods of 1929) was established for the southern area.
1933: The three Phases of the previous season were broadly confirmed (Simpson and Richmond 1934a). A rectangular enclosure stood within the polygonal ditches, and a 'native hearth' was found on the promontory. Work to the east of the *porta principalis dextra* established the relationship between the fort ditches and that of the Turf Wall (Fig 58).

1945: Excavation beneath the *principia* showed the site of the Turf Wall turret 49a (Soc Antiqs Newcastle upon Tyne 1946, 275).

1949: Aerial reconnaissance by J K St Joseph (1951, 55) showed the *principia* and two *horrea*. The flagstone floor of the south *horreum* was visible as squares of parched grass during the drought of 1949.

1949–52: Consolidation of the gates and curtain walls of the fort was carried out by the Ministry of Works into whose care they had been placed by Lord Henley, the then proprietor (in 1939). Work was carried out under the supervision of Mr Charles Anderson on the north west angle tower, the northern interval towers on the west and east sides of the fort and the *porta principalis dextra*. Archaeological recording was carried out and reported upon by J P Gillam (1950). The original

Fig 5 The 1929 excavation on its completion, from the same viewpoint as Figure 4 (reproduced by permission of Dr G Simpson)

records of the 1951–2 work are deposited with the site archive for 1987–92 in Tullie House Museum. During works on the east rampart a wrist purse containing a coin hoard was found (Richmond 1950a; 1954; Watson 1954).

1959–60: Ploughing by J Baxter led to the discovery of a cremation cemetery to the north west of the fort, in New Field. This was recorded by R Hogg (Wilmott 1993).

1979: A guide book, containing a summary history and description of the site was published by Howard (1979).

1984: The Birdoswald estate was conveyed to Cumbria County Council.

1987: A full earthwork survey of the Birdoswald area was undertaken by K Blood and D McKay of the Royal Commission on Historic Monuments (England) (Fig 280).

1987–91: Five seasons of excavation and consolidation work took place under the direction of the writer in the former gardens of the farmhouse, within the farmhouse, and in the north-west corner of the fort.

1992: Excavations took place under the direction of the writer on the east side of the fort. The *porta quintana dextra*, first excavated in 1850, was re-examined.

1993: A new visitor's centre was opened by HRH the Duchess of Kent.

1995: A guidebook and summary history based upon the results of the 1987–92 excavation was published by Cumbria County Council (Wilmott 1995).

The Excavations of 1929 and the Wall Periods

The results of all of the excavations listed above are discussed in this report as appropriate. Those of the 1929 excavations will be cited more frequently than the rest, however, and it seems fitting to discuss and critically assess them in some detail in this introductory chapter in order to avoid repetition later.

The academic aims of the work were clearly laid out by the excavators:

> The Durham University excavations of 1928 proved the Vallum, as well as the Turf Wall, to antedate the stone fort: and they began to indicate an earlier structure avoided by the Vallum. This earlier structure might be Hadrianic: in any case, it was imperative to distinguish accurately between its relics and the earliest relics of the stone fort. The latter were not yet to hand, but they could be expected to exist, exceptionally well defined, in the buildings overlying the peat-filled Ditch of the Turf Wall. For these buildings were necessarily later than the Turf Wall, and their lowest level should contain pottery that was not only early Hadrianic, but uncontaminated by sherds of an earlier occupation. It was therefore decided to secure all that this unique level could yield: and, in examining the levels above it to produce a dated and complete pottery classification for the stone fort
> (Richmond and Birley 1930, 169)

The objectives were thus to characterise the Hadrianic material culture of the earliest deposits of the stone fort, and to establish a dated stratigraphic sequence. The buildings selected for excavation were those to the north of the *via princpalis*, in the eastern *praetentura*: the structures which sealed the Turf Wall ditch and which lay in the field enclosed by the fort wall (Fig 7). The counterparts to these buildings on the western side of the *via praetoria*, which lay beneath the garden of Birdoswald farmhouse, were excavated in 1987–92 (Fig 8). The complexities of the buildings excavated during 1929 are clear from the photographs (Figs 4, 5) of the beginning and end of the excavation.

The 1929 excavations were enormously influential in Wall studies. Their importance lay in the fact that they were the first in any Wall fort to be undertaken with 'special regard to ... stratification', and this was the first occasion upon which a stratified sequence of buildings and artefacts was recovered from such a site. The dating derived from this work set a phasing framework not only for Birdoswald, but for the Wall as a whole. Building upon conclusions derived from Sir Edmund Craster's (1911) analysis of the coin evidence from milecastle 48 (Poltross Burn), the results of the excavations of 1929 formed the basis for the identification and dating of the four classic Wall Periods which were for many years the foundation for the chronology of Hadrian's Wall (Birley 1961, 263–5).

The building sequence above the Turf Wall Ditch was divided into stratigraphic 'Levels' I–IV (Fig 6; Richmond and Birley, 1930), and it was the interpretation and dating of these four Levels which led to the system of Wall Periods I–IV outlined first in an influential article by Birley (1930c). The evidence for the Wall Periods derived from a combination of stratigraphic, epigraphic, ceramic, and numismatic evidence and an attempt to fit these within the calendar of known historical events. In the interpretation of the evidence, however, there was a clear tendency to 'make inferences about military and political events from archaeological evidence, and also to use hypothetical interpretations of written evidence as a basis for dating structures and artefacts' (Gillam 1974, 1).

This was particularly evident in the use of the two inscriptions which were recovered, and in the assumption that episodes of rebuilding were the direct result of destruction by 'enemy action'.

In the following reconsideration, which embodies information from the two published reports (Richmond and Birley 1930; Richmond 1930a) an attempt will be made to review the results empirically, highlighting the split between evidence and interpretation. It should be stressed that to criticise original interpretations in the light of 60 years of progress in both archaeological method and frontier studies is by no means to denigrate the scholars who undertook the Birdoswald excavations from 1927–33: on the contrary, Wall studies could not have reached their present state without the foundations laid by the often inspired contributions of these individuals.

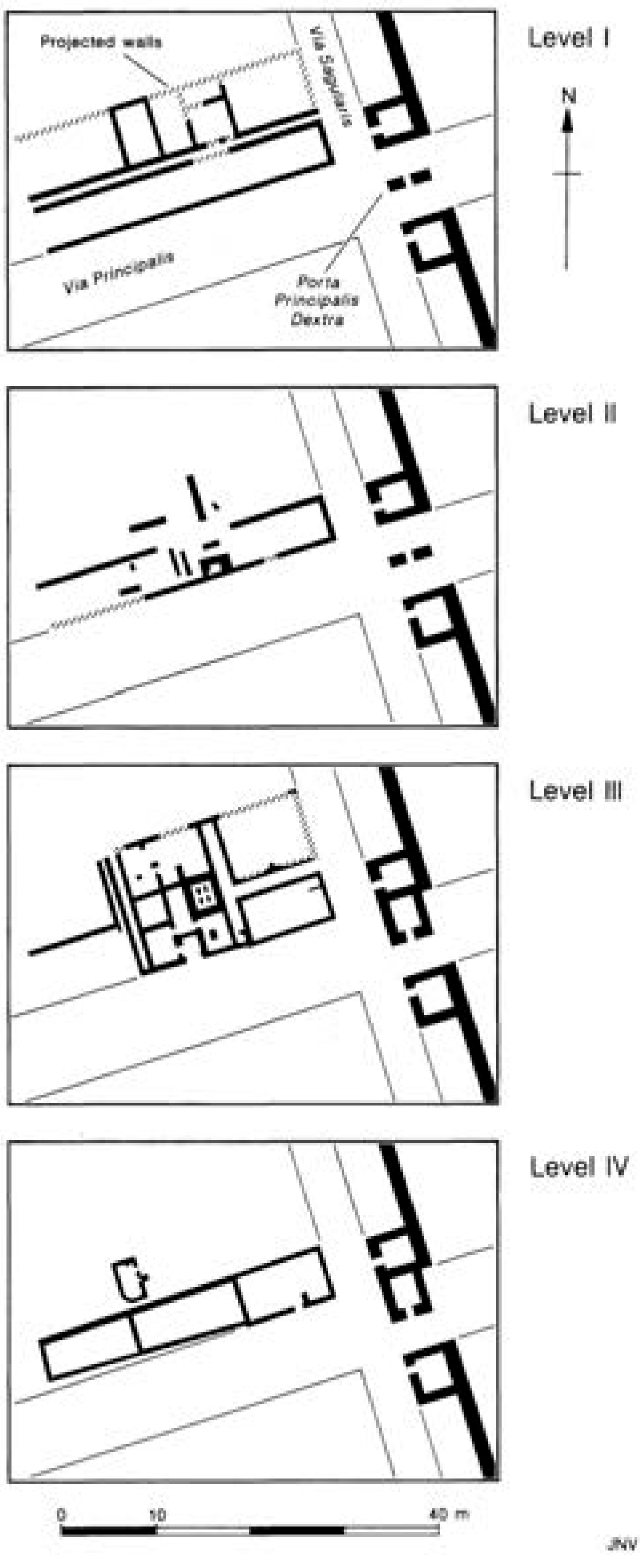

Fig 6 Phase plans of the building excavated during 1929 (extracted from Richmond and Birley 1930, fig 1)

As a building sequence dated purely from the finds which were stratigraphically associated with the four Levels, the 1929 results do not justify the close dating arrived at by the excavators. The conclusions on chronology were heavily influenced by the dates of two inscriptions (RIB 1909, 1912) found reused in a Level IV floor (Fig 4). Within the stratigraphic sequence the only contribution that these inscriptions make is that the later of the two provides a *terminus post quem* for the floor in which it was reused. The inscriptions are directly relevant to the histories of the buildings from which they were robbed and not that in which they were found, and their texts show clearly that they were quarried from other nearby buildings. Despite this it was assumed that they referred to site-wide works which might be represented in all of the fort buildings. The inscriptions are a different category of evidence to the archaeology: they are important as texts which illuminate the history of fort buildings, and should be cautiously used as such. They cannot be viewed as a part of the archaeological sequence. A reinterpretation in the light of this fact demonstrates a less certain and more flexible chronology than that published in 1930.

At the bottom of the sequence was the 'peat filling' of the Turf Wall ditch. Above this was a 'Level 0' which has been little commented upon. This consisted of 'sandy material and dirty clay, occupied for a short time before the floors [of the primary stone building] were laid.' It also incorporated a 'V'-shaped drain and carpenters chips'.

Level I consisted of two 'fine buildings' running parallel to the *via principalis*, divided by an alley (Fig 6). The eastern ends of the buildings terminated on the *via sagularis*, and, despite the fact that the western extent of the buildings was not determined, it was and is presumed that their western ends coincided with the *via praetoria* (Fig 7). The roadside building was 5.4m wide overall, and was not subdivided into rooms. The northern building measured 8.98m wide, and was divided into regularly-sized rooms averaging 4.5m in width. Coins of Trajan dated to 105–12 were found in the earliest layers of both these buildings, while the alley between the two structures, which was only 800mm wide, produced a large quantity of pottery, the so-called 'Alley deposit'. This deposit was at least partly sealed by floors of the following Level II, and it was dated not later than *c* 150 (Birley 1930a). The excavators had already presumed that the primary stone buildings were Hadrianic, and they overlay the Hadrianic ditch of the Turf Wall; the finds were seen as consistent with a Hadranic date, and therefore Level I (and by implication Level 0) was attributed to Wall Period I.

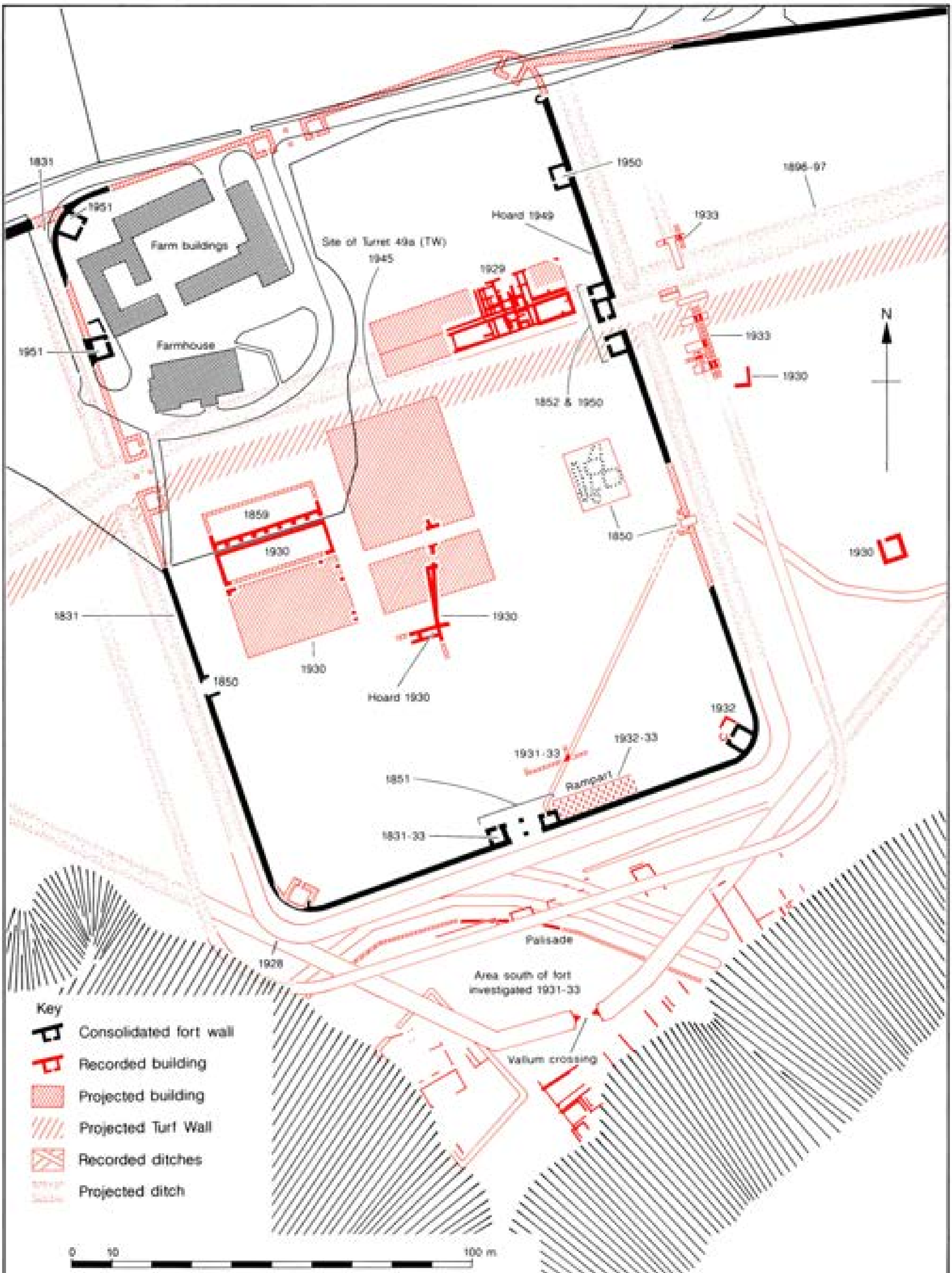

Fig 7 Plan of fort to show areas investigated before 1987 and structures recorded or projected

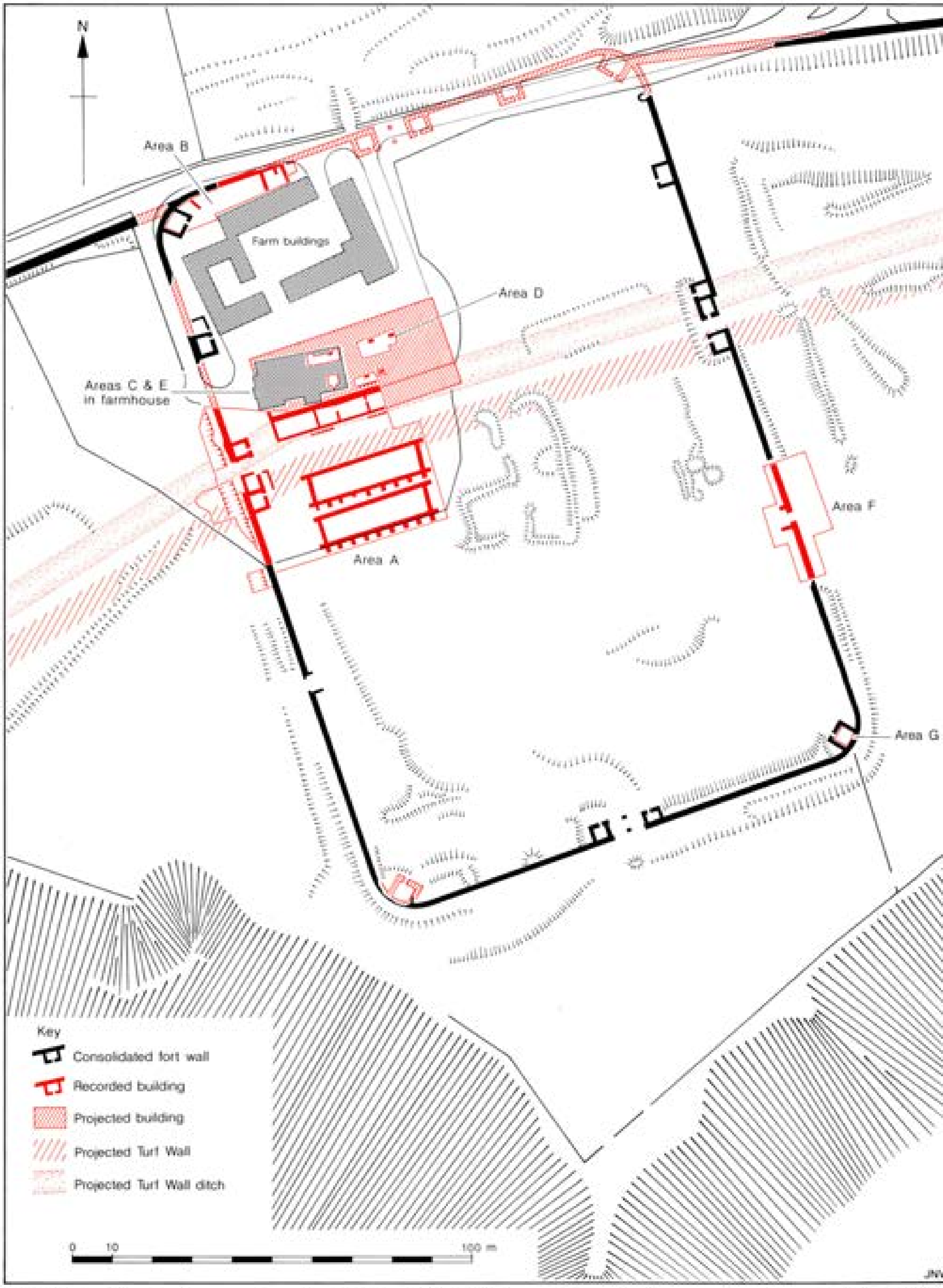

Fig 8 Plan of fort to show areas investigated during the 1987–92 excavations, significant earthworks recorded during 1987 (excluding ridge-and-furrow), and structures recorded or projected

Although the Alley deposit is undoubtedly an important group of material, several questions must hang over its interpretation. These are above all concerned with deposit formation, and the questions parallel the slightly-later Hadrianic-Antonine group found in an alley between two barracks in the fortress at York (Perrin 1995, 328–31). It is not known whether the pottery was a discrete single group, found at a particular point within the 38.20m-long alley, or whether it was evenly distributed within the fill of the alley along its length. It is not known whether the buildings were standing or demolished at the time of its deposition, or why the pottery was disposed of in that particular spot. Given the chronological homogeneity of the group, and the fact that it includes large sherds and almost complete vessels, it seems likely that it was deposited at one time rather than being a gradual accretion of primary refuse deriving from the buildings on each side of the alley. There is no record of stratigraphy within the alley deposit which might have resolved this point. John Dore has pointed out (personal communication) that the group contained small quantities of intrusive material up to the fourth century in date, but the excavators were content that some later-second-century material was present in the primary deposit (Birley 1930a, 181, 192). An important indicator of the date of the deposit is an almost complete Dragendorff Form 37 bowl of the Cerialis-Cinnamus group, dated by the excavator to 150–60. Pottery of this group found during the 1987–92 excavations is discussed in Chapter 11 and is considered to have a date range *c* 135–60: it is thought that it could have reached the site in the late Hadrianic or mid-Antonine period. The large quantities of pottery in the York alley are thought by Perrin (1995, 330–31) to be suggestive of deliberate clearance either before or after the Severan campaigns of 208–11. If such an explanation is invoked for the Birdoswald groups a context might be found in the disposal of stores before or after the Antonine advance into Scotland. There are, however, many contexts in which this deposit might be seen.

The subdivision of the first Wall Period into IA and IB was part of the original conception of the Wall Periods (Birley 1930c, 164–6), though no 'Level IB' or other evidence for this sub-period was found at Birdoswald in 1929, and the absence of such evidence was remarked upon by Simpson (1930). Wall Period IB was first identified by other evidence, largely from the Birdoswald sector of the Wall. It was identified by Simpson as a result of the discovery of flagstone floors overlying the original clay in turrets 49b, 50a, and 50b (Simpson 1913, 319, 327), and the presence of two phases of pivot holes in the gateways of milecastles such as 50 (High House), and 48 (Poltross Burn) (Birley 1930c, 174). This also occurs at milecastle 54 (Randylands), which appears to have been rebuilt in stone in the later Hadrianic period, or towards the end of Wall Period IA (Simpson, Richmond and MacIntyre 1934b, 145; Allason-Jones *et al* 1984, 233). Period IB had at first been associated with the supposed 'Brigantian revolt' of the mid-150s, but was subsequently reinterpreted by Birley (1930c, 174): 'the occupation in [Wall Period I] was historically continuous and IB was not the aftermath of destruction, but renovation work undertaken in the ordinary course of routine'. This interpretation was in part the result of the fact that there was not usually any rubble indicative of 'destruction' associated with these mid-second-century alterations.

Since Hartley's (1972) work on the samian ware from the Antonine Wall it has been clear that Hadrian's Wall was largely abandoned *c* 140 while the Antonine Wall was built and garrisoned. A brief abandonment and reoccupation of the Antonine Wall in the 150s was followed by its permanent abandonment *c* 163 (Breeze and Dobson 1987, 124–7). It is now largely accepted, for example at milecastle 54, that the original Hadrianic pivot stones were smashed on the removal of the gates when the milecastle and the Wall were abandoned under Antoninus Pius, and a new set installed when the fortlet was recommissioned after the final abandonment of the Antonine Wall (Allason-Jones *et al* 1984, 233). The end of Wall Period IA is thus dated to an abandonment in the 140s consequent on the reoccupation of Scotland, and the beginning of IB to the return to the Hadrianic frontier line in the early 160s.

Before 1929 the end of Wall Period IB was dated to *c* 180 (Gibson and Simpson 1911, 459). This was in part the result of the coin evidence from milecastle 48 (Craster 1911), though it was also influenced by the account by Cassius Dio of an invasion of the province which is now generally attributed to this year: 'The tribes in the island crossed the wall that separated them from the Roman forts, doing much damage and killing a general and the troops he had with him' (Cassius Dio lxxiii.8). This event was thought to have resulted in wholesale hostile destruction along the Wall, and rebuilding over masonry rubble was regarded as presumptive proof both of the scale of the disaster, and of the measures taken to rectify it. 'Level II' at Birdoswald was thought to have been part of this general rebuilding: 'the walls had to be rebuilt from their very foundations, indicating how great a disaster had befallen Hadrian's building' (Richmond, 1930a, 308). It was noted that many of the architectural fragments, including a capital, column bases, and chamfered string moulds, were used within the building to level up subsidence into the Turf Wall Ditch beneath.

The character of Level II is difficult to assess (Fig 6b), although the buildings of Level I were extensively rebuilt. It is possible that there was a change in function, as at least part of the alley between the buildings was sealed by a floor of this period (ibid). It was suggested that hearths and a mill found in the east end of the southern building might indicate use as a cookhouse (Richmond and Birley 1930, 172). In strictest terms the pottery from the alley deposit of Level I provides the archaeological *terminus post quem* for the beginning of Level II. As this deposit did not contain pottery later than *c* 150 (Birley 1930a) the construction work for Level II must have begun after this date, and this means that it is at least possible that Level II was built as early as Wall Period 1B.

The earlier of the two inscriptions found in 1929 (RIB 1909) records the building of a *horreum* between 205 and 208. Despite the fact that the inscription relates to a building other than that in which it was found, the excavators associated it with the archaeological evidence for rebuilding, and stated that the period to which Level II belonged 'opens with' the inscription (Richmond and Birley 1930, 174). Both the archaeological and epigraphic evidence were held to relate to Wall Period II. The rebuilding was presumed to have followed from the enemy destruction which ended Wall Period I, and the inscription was therefore held to date Level II. It was, however, felt that 205–8 was too late a reconstruction to have followed a destruction in 180. In order to account for this discrepancy, the suggestion was made that the Dio reference concerned a crossing of the Antonine Wall, and that the destruction on Hadrian's Wall was due to incursions into the province following a withdrawal of troops by Clodius Albinus in 196 in preparation for his struggle with Severus (Birley 1930c, 166–9). In fact no such incursions are historically attested; they were hypothesised in order to account for the *horreum* inscription (Daniels 1979, 362). Daniels (ibid; 1989b, 11) places the beginning of Wall Period II *c* 180, restoring the pre-1929 interpretation of Dio, that a crossing of Hadrian's Wall is meant. This is consistent with the dating of the withdrawal from the Antonine Wall. Enemy destruction, once thought ubiquitous, is now claimed only for the forts in the vicinity of Dere Street: Corbridge, Halton Chesters, and Rudchester (Frere 1978, 188; Breeze and Dobson 1987, 130). Certainly no evidence of hostile destruction was found at Birdoswald during 1987–92. Though the Level II rebuilding utilised reused stone, and a great deal of rubble appears to have been used to alleviate the problem of subsidence into the Turf Wall ditch, the presence of masonry rubble is no longer considered to be proof of enemy action (Breeze and Dobson 1972, 201).

The plan of the Level III building was entirely different to that of Level I (Fig 6c). It consisted of a square building with a small hypocaust in one room. Other rooms were interpreted as wash-houses and cook-houses. The building was again subject to subsidence, and alteration (Richmond and Birley 1930, 171). It was interpreted as married NCO quarters on the basis of the plan and, 'on the borderline between fact and conjecture, a woman's ring would hint at family life...' (Richmond 1930a, 308). The argument that male and female occupation may be inferred from archaeological objects, though occasionally still raised (Hingley 1989, 43–5), is questionable (Allason-Jones 1988, 220; 1995).

The interpretation of the transition between Levels II and III was marked by the same problem as that between Levels I and II. Again it was claimed (Richmond and Birley 1930, 176) that Level III 'opens with' an inscription, this time of the Tetrarchy (297 305; RIB 1912). The inscription states that the cohort 'restored the *praetorium,* which had become covered in earth and fallen into ruin, and the *principia* and bath-house (? or *ballistaria*)'. This was originally taken at face value as a clear statement of the condition of the *praetorium* which suggested that it had been disused for some time (Richmond 1930, 311), and it was postulated that the Level II building saw such disuse as befell the *praetorium*' (Richmond and Birley 1930, 172), though no direct evidence for such disuse was found. As Welsby (1982, 36) has pointed out these interim statements were made before the Wall Periods were formulated. Afterwards, it was claimed that a Wall destruction occurred, this time following the denudation of the Wall garrisons by Allectus in his defence against Constantius Chlorus (Birley 1930c, 169). The text of the inscription, with others of its type (for example RIB 1234 from High Rochester), even came to be thought of as deliberately euphemistic, concealing the humiliating fact of enemy destruction 'for military pride could not admit the disaster which had taken place, and instead ascribed the fall to the ravages of time' (Simpson 1964, 48). The discovery of a layer of soil over collapsed buildings at Halton Chesters, together with similar neglect at Rudchester allowed Gillam (1974) to claim that desertion and collapse could be seen which clearly demonstrated the phenomenon recorded on RIB 1912. He suggested that this took place after 270, invoking numismatic evidence, and a general lack of late-third-century pottery. This interpretation returned to the original dating of the end of Wall Period II which had been proposed after the excavation of milecastle 48 (Poltross Burn; Craster 1911). The text of RIB 1912 is not now seen as official euphemism, but as a statement of fact (Welsby 1980). Like the earlier inscription, however, it must be seen to stand alone as a document, and not as part of the 1929 structural sequence. In fact the pottery from Level II is not closely datable within the third century, and the latest coin sealed by Level III is as early as 218–22. It is therefore impossible to synchronise the initiation of Level III with the inscription, or indeed with Wall Period III; the rebuilding could have occurred at almost any time from *c* 230.

Level IV saw a further re-planning. Richmond (1930, 309) described a long and narrow half-timbered building with three internal divisions, which resembled the southern building on Level I but was slightly shorter. To its north-west was a small apsidal building. Both had burnt down, preserving traces of the larger's wattle-and-daub walls. Neither site had been used again but Richmond pointed out that this did not necessarily mean the whole fort had been abandoned.

The Level is dated by a *terminus post quem* from the latest coin contained in Level III, an issue of Valentinian I (364 75) found beneath a Level IV floor (Birley 1930c, 169). Inevitably, the construction of this building was seen as the result of the restoration of the frontier by Count Theodosius *c* 369 after the 'barbarian conspiracy' of 367, though again no evidence may be realistically held to demonstrate enemy destruction. Breeze and Dobson (1987, 225) have even argued that the Wall might have been circumvented by sea, and thus one of the safest places in the province during this crisis.

As to the destruction of the Level IV building it seems that it was in good structural condition when it was destroyed by fire after 375. Whether or not the garrison had been withdrawn by Magnus Maximus the results from the 1987–92 excavations clearly demonstrate that occupation continued after the burning. This apparently peaceful phase saw the remaining buildings gradually deteriorate and it seems certain that the fire identified at the end of the 1929 sequence was also the result of slow decay and not, as Richmond and Birley suggested (1930, 171), the consequence of looting by an unspecified enemy.

The results from the 1987–92 excavations clearly demonstrate the continued, and apparently peaceful, occupation of the fort beyond this date and also the gradual decay and dilapidation of the fort buildings. There can be little doubt that the end of the 1929 sequence was also the result of slow decay.

In no period was satisfactory evidence for enemy destruction cited other than the presence of rubble debris. The 1929 buildings were sited over the Turf Wall ditch, and would have been subject to subsidence. The buildings constructed over this ditch on the west side of the fort (Fig 8) were rebuilt at irregular intervals as a result of subsidence, and there is every reason to believe that the same was true of the 1929 structures.

The importance of the 1929 excavations at Birdoswald cannot be doubted. They were the first conscious stratigraphic excavations in any Wall fort, and the first to produce a sequence of stratified pottery and other finds. The excavators were fortunate enough to secure an excellent run of stratified coins with which to date a succession of buildings. This graphically demonstrated the potential for change within a fort occupied for three centuries. In addition the discovery of two major building inscriptions shed light on aspects of the history of the site and its garrisons, as well as more generally upon the later third-century administration of Roman Britain (Birley 1930b, 201). In these areas the 1929 work provides any later researcher with a valuable starting point in the exploration of the history of the site. On the negative side, it has been shown that the 1929 results cannot sustain the weight of interpretation which has been laid upon them. Not only is the history of Hadrian's Wall far more complicated than the scheme of Wall Periods suggested, but other buildings at Birdoswald have histories which do not relate to the 1929 sequence. Some buildings are more complex and some less. In this report, the 1929 sequence will be frequently cited, while bearing in mind the caveats and limitations listed above.

The name of the fort

The problem of the Roman name of Birdoswald has been frequently discussed as a result of an apparent contradiction between the archaeological evidence and the *Notitia Dignitatum*. In the *Notitia* the fort garrisoned by *cohors* I *Aelia Dacorum* is recorded as *Amboglanna*. This Dacian cohort is well attested at Birdoswald on a large number on inscriptions (RIB 1874–96, 1898, 1904, 1909, 1912, 1914, Wright 1961, 196), and consequently Birdoswald was identified as *Amboglanna* by Horsley (1732, 152, 478). *Amboglanna* was subsequently corrected by Haverfield (1918), to *Camboglanna,* which is how the name appears on the Rudge Cup and the Amiens *patera* (Heurgon 1951).

In 1821, an altar (RIB 1905) dedicated to Silvanus by the *Venatores Bannienses* was found inside the fort. This suggested that *Banna,* a name which appears on the Rudge Cup, the Amiens *patera* and also in the *Notitia,* was Birdoswald. Breeze and Dobson (1987, 272) have pointed out that, without the confusion engendered by the *Notitia* entry, the altar would have been quite sufficient to establish the identification of Birdoswald with *Banna.* The solution was found by Hassall (1976, 113) in his discussion of the British section of the *Notitia,* where it is proposed that there is a lacuna in an early version of the document. Hassall restores the text from:

> *Tribunus cohortis primae Aeliae Dacorum, Amboglanna*
> to:
> *Tribunus cohortis primae Aeliae Dacorum, [Banna Tribunus cohortis secundae Tungrorum], Amboglanna*

Camboglanna should thus be located at Castlesteads on the Cambeck, where *cohors* II *Tungrorum* is attested epigraphically (RIB 1981–3). This argument is described by Rivet and Smith (1979, 262) as 'not only acceptable, but, once demonstrated, obvious', and the identification has achieved general acceptance (eg Mann 1989, 75). The topographical relevance to Birdoswald of the name *Banna,* with its meaning of a spur or promontory is very clear.

Background to the present project

Until 1978 the site of Birdoswald had formed part of the Scaleby Castle Estate. On the death of the late Lord Henley, an agreement was made whereby the fort and surrounding farmland of the Birdoswald Estate was received by the Treasury in lieu of Capital Transfer Tax. In 1981 Cumbria County Council accepted the offer of a free conveyance of the property, which was finally acquired by the County in 1984.

The acquisition of the property was subject to a Management Agreement between the county and the

Secretary of State for the Environment, under which the county undertook to manage the land in ways which would maintain its landscape character, safeguard its archaeological and nature conservation features and promote public enjoyment. Some development of Birdoswald had also been suggested by the Hadrian's Wall Consultative Committee (1984, 7, 24) as part of a strategy encouraging visitors to use the sites to the west and east of the Wall as well as the much-visited central sector. A steering group, involving input from both English Heritage and the Countryside Commission was established, and under the aegis of this group a conservation, development, and management plan was drawn up (Cumbria County Council 1987). This document established the principles, policies, and detailed proposals whereby the aims of the Management Agreement could be met.

One of the conditions of the Agreement stated that 'the Council, in cooperation with English Heritage, will arrange to excavate, display, and interpret to the public the remainder of the...Fort as resources and research techniques permit'. The impetus for the present project came from the offer from British Nuclear Fuels plc (BNFL) to contribute the sum of £250,000 to enable such excavations to be undertaken. The Central Excavation Unit (now Central Archaeological Service, hereafter CAS) of English Heritage was contracted to carry out excavation work, and the writer was appointed to direct the project.

A research design drawn up for the project proposed that work should be concentrated in two areas. The main area (Area A; Figs 8, 9), the former garden of Birdoswald farmhouse was selected in view of its potential to meet research objectives, to facilitate the consolidation of the Roman fabric, and to provide the opportunity for the display to the public of a meaningful portion of the fort interior. As well as the major internal structures [one of which is certainly a granary], it also presents the opportunity to examine the adjacent rampart area and the west gate, which has not previously been investigated. In addition, the work will allow the examination of the Turf Wall, and establish whether the 'morass' located beneath the *principia* in earlier excavations extends westwards into this area.

A number of specific research aims were formulated for the work:

1. To provide information on the history and development of the site and the frontier system of which it forms a part through the investigation of the structures and deposits within the excavated area. In particular:

    a. to establish the character of any pre-fort activity in the area.

    b. to establish the original layout of the fort in the area.

    c. to achieve an understanding of the subsequent development and use of the fort, and in particular to provide evidence relating to the disrepair and possible abandonment in the later third century indicated by epigraphic evidence, and the character of the fourth century occupation.

2. To examine further the relationship between the Turf Wall and the fort.

3. To establish the extent of the 'morass' and demonstrate how the builders of the fort addressed the problems which it presented.

4. To exploit the potential of appropriate deposits on the site to provide information on the local environment throughout its history.

It was recognised that the morass provided the highest potential for the investigation of the pre-Roman environment, and also that the potential for the survival of well-preserved later horizons was arguably better in the area of the garden than elsewhere on the site, where the presence of ridge-and-furrow attests ploughing in the past (Fig 280). A subsidiary aim for Area A was to save and consolidate the exposed and crumbling Roman *horreum* wall which formed part of the ha-ha bounding the garden on its south side.

The second area, Area B was located on the north curtain wall of the fort adjacent to the north-west angle tower (Fig 8). This required work, as a drystone retaining wall beside the road was in a dangerous state and needed to be removed. The lowering of the level of the bank behind this wall was also desirable in order to improve traffic intervisibility on the road.

Work on Areas A and B began in June 1987 after a small turf cutting ceremony attended by all parties to the project (frontispiece). Area A was extended in each successive season except 1991. Area B was completed during 1989.

In 1990 the public toilet facilities in the farmhouse were renovated. In order to stabilise one of the interior walls of the farmhouse, sub-floor excavation was required and this was undertaken by the excavation staff. Areas C and E were excavated beneath the floors of the outshot at the back of the house and of the former dining room respectively (Figs 8, 9). Area D was situated in the garden to the immediate east of the house, and was examined as an evaluation exercise designed to establish whether the existing septic tank could be enlarged. This Area was excavated only as far as the top of the surviving structures and stratification.

During 1992 it was proposed by English Heritage to re-excavate the *porta quintana dextra* in order to consolidate its surviving remains. This gate was part of the defensive circuit which had been in English Heritage guardianship since 1939. The aim of the work was to complete the consolidation and display of the curtain wall and gates of the fort, and had been proposed by the County Council in a forward planning document (Cumbria County Council 1989). The opportunity was also taken to examine the upper levels of, and to consolidate the south-east angle tower of the fort. These sites were excavated during the summer of 1992. For the purposes of this report they are designated Areas F and G respectively (Fig 8).

Methodologies

Owing to the integrated approach adopted for this report the results of several areas of specialist study are combined in a series of small contributions, rather than discussed separately. For this reason the methodologies adopted for these studies are grouped below.

Excavation

The problem of accommodating the conflicting demands of research excavation, an inherently destructive process, and structural consolidation was anticipated in the project design:

> A consideration of great importance which must govern the conduct of the excavation is the need to reconcile the continuing preservation of features on the site with the need to understand their function and place within the development of the fort. In order to achieve a proper balance between the three-fold objectives of investigation, consolidation of structural features and display to the public, the research objectives of the excavation must be reconciled to the continuing preservation of particular structures, and thus problem oriented strategies must be devised. Total excavation is, therefore, not proposed as the fort, a monument in care, should remain a research resource retaining as much archaeological evidence as possible which is capable of re-examination.

Excavation methodologies were kept under constant review against these factors. The general philosophy of the work has been reviewed elsewhere (Wilmott 1991b) but may be summarised here. It was decided at an early stage that the display at Birdoswald should be aimed, not at duplication, but at complementing and expanding the story told elsewhere on the frontier. The themes emerged during the 1988 season when a decision was taken to display the site in the late-Roman and early post-Roman periods. Methods of consolidation and display were discussed with architects at this point, and a draft design was formulated. From this point, the only significant addition to normal excavation procedure was that whenever any stone structure or surface which was capable of consolidation was removed, all stones were numbered and retained for replacement. As suggested in the project design, problem-oriented strategies were developed in response to questions raised as the excavation progressed. Few parts of any area or building were totally excavated, and in Areas A and B some parts were more deeply examined than others. The positions of, and justifications for these deeper areas are discussed in the relevant sections of this report.

The excavations of 1987–91 in Areas A, B, C, D, and E were recorded under the CAS Site Code 420, and Areas F and G on the east side of the fort was excavated in 1992 under Site Code 473. The sites were recorded using the principles and techniques outlined in successive editions of the CAS recording manual (English Heritage 1985; 1992). All data was computerised using the 'Delilah' software package developed by the CAS, and the site was used as a testbed for this software in 1987.

The examination of the latest periods on the site was a major research priority of the work. For this reason it was decided to ensure that the latest deposits were examined particularly closely, concentrating particularly upon such deposits as might previously have been dismissed as the random results of the collapse and demolition of Roman stone buildings. In adopting this approach the Birdoswald project was very heavily influenced by the strategies pioneered by Philip Barker (1990b) at Wroxeter. In the first season (1987) Area A was laid out as a 30m square. Trenches were excavated on each side of this area to the bottom of the topsoil layer in order to establish the depth of the top of archaeological deposits. The turf and topsoil ranged from 25–340mm in depth and was removed partially by hand and partially by mechanical means. This revealed a mosaic of rubble and surfaces of varying concentrations, sizes, and texture which were then drawn in detail before stratigraphic excavation continued in plan. The same strategy was adopted in subsequent expansions of Area A.

Throughout the project the emphasis in recording was on the plans, and major sections (Sections 1 and 2; Figs 9, 25, 26) were recorded cumulatively. A suite of recording methods was used including, where appropriate, single-context planning. All deposits were planned, and rubble spreads were planned in close detail stone by stone, as much of the stratigraphy of the site consisted of rubble deposits which differed only subtly one from another. All standing building elevations were drawn.

Macrobotanical sample analysis

by J P Huntley

The integrated summaries of macrobotanical evidence for the *horrea*, the ditches, and an oven are based upon a full macrobotanical report (Huntley 1990), published in the *English Heritage Ancient Monuments Laboratory Report* series.

Bulk samples of between 6 and 25 litres of material were floated and wet-sieved over 500μm mesh in a siraf tank on site. Following drying the residues were sorted on site and at Fort Cumberland. Very few charred plant remains were recovered from these residues. The dried flots were retained for sorting in the University of Durham Biological Laboratory. This was carried out at magnifications of up to x40. Due to the large numbers of samples, the results of scanning during assessment and the limited available time it was decided to analyse all of the >1mm fraction of the flots and to scan the 0.5 1mm fraction.

Initially each sample was treated as a separate entity and coded thus for computer analysis. In order to bulk up very low numbers of seeds all samples from any single context were then amalgamated. In those cases where a large group of contexts were seen to have constituted a single depositional episode, for example the sub-floor dumping in the *horrea* (Buildings 197, 198), the contexts were bulked together, and these second amalgamations were likewise coded separately. Although somewhat complicated this method allows analysis at various levels of detail. The tables were all produced and manipulated using the PHYTOPAK suite of programs (Huntley *et al*, 1981).

All seeds and fruits were identified by comparison with modern reference material held in the laboratory. Nomenclature in species identification throughout the report follows Clapham, *et al* (1987). Where identification was imprecise and two or more species were possible a 'type' was used such that: *Ranunculus repens*-type includes *R. repens*, *R. acris*, and *R. bulbosus*, *Carex hostiana*-type includes *C. hostiana*, *C. flacca*, *C. panicea*, *C. binervis*, and *C. sylvatica*, and *Rumex obtusifolius*-type includes *R. obtusifolius*, *R. conglomeratus*, and *R. crispus*.

Summary tables (Tables 6–8 and 10) are presented in the main body of the text, listing numbers of seeds from samples. The number of contexts which are bulked together, and the numbers of samples from those contexts are given in each table. Appendix I lists the taxa represented and their common English names. All tables of carbonised data present the actual numbers of items counted and do not take into account the differing volumes of sediment floated. Given the low numbers of seeds and the relatively consistent amounts of sediment floated this is not considered significant.

In all of the tables the species names are prefixed with a letter. This refers to the broad ecological category to which that taxon may be attributed:

a: arable weeds	e: exotic	g: grassland
r: ruderal	t: wood/scrub	w: wet ground
h: heathland	x: broad or imprecisely identifiable	

Additional letters are used to distinguish parts of cereals:

s: cereal chaff   c: cereal grain

Pollen Analysis

by Patricia E J Wiltshire

The full palynological report (Wiltshire 1992) upon which the integrated summaries in this volume are based appears in the *English Heritage Ancient Monuments Laboratory Reports* series.

The aims of the palynological analysis were to investigate:

1. The nature of local vegetation before the Roman army became active in the area.

2. The nature of the local vegetation immediately before the construction of the Turf Wall.

3. The method of construction of the Turf Wall and rampart.

4. The origin of the organic material used in the Turf Wall construction.

5. The degree of similarity between the Turf Wall at Appletree and Birdoswald.

6. The nature of the hiatus horizon.

7. The vegetation which prevailed within the fort area before the building of the *horrea*.

Palaeosols and overlying turfs and sediments of the Turf Wall at Appletree and Birdoswald, and the rampart at Birdoswald, were sampled (by Maureen McHugh) by taking 500mm monoliths from exposed sections. A single 'morass' peat sample was obtained from beneath the granary walls. This peat sample was mixed and of unknown age but certainly predated the fort. Three sections of the hiatus horizon were sampled. HS1 was taken as a single mixed sample so that no temporal differentiation could be established. HS2 and HS4 were sampled in Kubiena boxes and may be regarded as duplicates; analysis was carried out on the lower and upper parts of the layer. Except for the morass peat, both palynological and soil micromorphological analyses were carried out on the same samples throughout.

The palynological evidence in this report is drawn from two horizons within any soil profile. The terminology used to describe these horizons are the LFH horizon or uppermost organic layer of a soil including the loose litter at the top and organic residues in various stages of decomposition (for definition see Limbrey 1975, 77–8; also known as mor-humus), which constitutes the putative ground-surface organic layer, and the Ah horizon, the humose mineral topsoil (ibid).

Standard preparation procedures were used (Moore *et al*, 1991). Fresh soil/sediment was measured for 2cm≥ volume displacement. Pollen preparations were stained with safranine and suspended in glycerol jelly. Preparations were examined with a Zeiss phase-contrast microscope at x 400 magnification and x 1000 magnification. Every attempt was made to count a minimum of 500 palynomorphs but this was not always possible due to low microfossil concentration.

Counts ranged from 113–850 but most were in the region of 500–600 palynomorphs.

Nomenclature follows that of Bennett *et al* (1994), Moore *et al* (1991), Punt and Clark (1984), Punt *et al* (1988), and Stace (1991). Cereal-type pollen refers to all grains of >40μm with a mean annulus diameter of 8–10μm (Anderson, 1979; Edwards, 1989).

The state of the pollen preservation did not allow identification to morphological group for Cereal-type, but *Secale* (rye) was absent from the pollen record. No attempt was made to differentiate between *Corylus* (hazel) and *Myrica* (sweet gale) pollen, and both are included in *Corylus avellana*-type (cf hazel); only hazel macrofossils were recorded from Birdoswald and it is assumed that the *Corylus avellana*-type pollen found was largely that of hazel.

In all pollen diagrams, palynomorphs were expressed as a percentage of the total land pollen and spores (TLP), excluding *Sphagnum*. *Sphagnum* was expressed as a percentage of *itself* plus TLP sum since they were deemed to be genuine components of communities contributing to the palynomorph influx.

Details of lithology are given in Figs 15, 16, and 17. Original pollen diagrams were produced by Tilia/Tilia*graph (Grimm 1991) and Apple Macintosh graphics programs. Palynomorph taxa included in the ecological groups in the summary diagrams are given in the tables in Appendix 3. Ecological groups were designated as follows and full data are presented in the tables in Appendix 3, where minor taxa (those achieving <1% TLP) are shown as (+).

woodland plants:	trees and shrubs; climbers; Pteropsida monolete indet; *Polypodium*.
grasses:	Poaceae.
moorland and bog:	Ericales; *Pteridium*; *Sphagnum*; *Cyperaceae*.
weeds and ruderals:	all other herbs.

It should be stressed that these categories are crude, and a number of taxa may occur in more than one category. A full tabulated quantification of taxa for each sample discussed appears in Appendix 3.

Midgeholme Moss data (Innes 1988; Lewis 1993) have been used to provide additional information regarding the regional vegetation at Birdoswald. Details of palynological methodology are to be found in their reports. A partial data set from Lewis (ibid) has been drawn in the form of summary diagrams (Fig 18), and has been reinterpreted in the light of more accurate radiocarbon calibration. The diagrams were divided into local pollen assemblage zones (LPAZ) for convenience of description. The zonation was achieved by reference to woodland clearance and regeneration phases, and also to marked changes in lithology, some of which corresponded closely to changes in the pollen spectra.

Microscopic fragments of charcoal were found in every sample although it was very sparse in some. No attempt was made to quantify the fragments and subjective description is given where necessary.

All the radiocarbon dates quoted for Midgeholme Moss peats were calibrated using data from Stuiver and Pearson (1986), Pearson and Stuiver (1986), Pearson *et al* (1986), and a bi-decadal weighted average of data from Linick *et al* (1985), Stuiver *et al* (1986) and Kromer *et al* (1986). Simple calibrated date ranges were calculated using the maximum intercept method of Stuiver and Reimer (1986), with end points rounded outwards to ten years (Mook 1986). The program OxCal (v2.17) was used for calculation (Bronk-Ramsay 1994; forthcoming). The chronology was interpreted using a mathematical model (Buck *et al* 1992; Gelfrand and Smith 1990) which included the radiocarbon evidence and relative dating information provided by stratigraphy. All dates are quoted at the 95% confidence limits unless otherwise specified.

Soil analysis

by Maureen McHugh

The full soils report (McHugh forthcoming) upon which the integrated summaries are based is to be published in the *English Heritage Ancient Monuments Laboratory Reports* series.

Undisturbed samples were taken for thin-section preparation and pollen analysis as well as bulked samples from each soil horizon or context as appropriate, for physical and chemical analyses. Soil thin sections were prepared following Murphy (1986) and were examined under plane and cross polarised light using a standard petrological microscope (Cox *et al* 1976). Soil micromorphological descriptions were made according to Bullock *et al* (1985).

Soil pH was determined in water and calcium chloride (Avery and Bascomb 1974), total carbon and nitrogen were determined using an induction furnace (Leco CS 125 carbon/sulphur analyser) and standard Kjeldhal digestion procedures (Hesse 1971) respectively. Particle size fractions were determined using standard procedures (Avery and Bascomb 1974) and results expressed as a cumulative gravimetric % of <2mm air dry mineral soil. Background chemical and physical analyses were all undertaken using three replicate sub-samples from each soil.

Total phosphorus (P) and available inorganic phosphorus (Ap) were extracted using a standard nitric acid/perchloric acid digestion procedure and the method of Olsen, respectively (Page *et al* 1982). Fractionation was achieved by sequential extraction (Chang and Jackson 1957; Syers *et al* 1972; Eidt 1977). In each instance total phosphorus in the extract was determined using a standard ascorbic acid colorimetric procedure (Page *et al* 1982).

The inositol phosphate (inositol P) fraction of both soil organic phosphorus and the lipid component of soil organic matter (not incorporated into soil humus) were also investigated. Inositol phosphates were extracted using wet chemical and anion exchange procedures (McKercher and Anderson 1968). Soil lipids were investigated using gas chromatography and gas chromatography/mass spectrometry following soil degradation by established procedures (Christie 1973, 17–23) modified by O'Donnell (personal communication).

Stonemasonry survey

by Peter Hill

The full survey reports on the stonemasonry (Hill 1991a, 1992) from which the integrated summaries are taken are contained within the site archive.

Full surveys of stonemasonry were made on an objective basis, in isolation from archaeological contexts and interpretations.

Many sites on the Wall have stones which were deeply, not to say roughly, worked and which have retained the tool marks and original appearance to a surprising extent. At Birdoswald, many of the stones have been carefully worked with fine tool marks on a stone which has suffered to a much greater extent from weathering, leading to many toolmarks having almost completely disappeared. Furthermore, in general no cleaning of stone was undertaken, and no partly-buried surfaces were further exposed. As a result of these two factors, while the tool might be discernible there is often no recognisable pattern of working and so the type of tool has been recorded without further detail. In references to tools 'blade' means either chisel, axe, or adze, and is used where it is not possible to discriminate. The width of the blade is given where this could be read. Broad 'chisel/blade' with no size given indicates the use of a blade in excess of about 30mm but where the exact size could not be determined.

Surfaces which have been heavily worked with a punch or are rockfaced were not normally measured but described by their visual appearance backed by a judgement based on the author's masonry skills. Where no comment is made on a particular aspect of a stone, this indicates that there is nothing useful to be said. Facing stones have been commented on in general terms; individual stones have been covered only where there is some value is so doing.

Measurements of all stones cited are given in the order length of face x depth into the wall x bed height. Voussoirs are thus recorded as distance from intrados to extrados x thickness of arch x bed height at intrados/bed height at extrados. All measurements are approximate as many stones are weathered or have damaged arrises.

The radius of the arches from which the several voussoirs have come has been calculated using the formula:

$$r = \frac{b \times q}{a - b}$$

where b is the bed height at the intrados, q is the distance from intrados to extrados, and a is the bed height at the extrados.

It should be noted that there may be uncertainty in measuring stones which were often worked with indistinct arrises and which have been subject to weathering and damage over the intervening years. This can have a noticeable effect on the likely radius of an arch when calculated form individual voussoirs. An indefinite depth of arch ring (perhaps the most likely as the extrados had only to abut comparatively rough walling stones) alters the calculated radius only by about the amount of the difference in measurement, but variations in measuring the bed heights are more significant.

At a number of points, reference is made to the 'average quality of Roman military work'; this somewhat indeterminate standard is based on observation and measurement both along the line of the Wall and at other contemporary sites elsewhere. The standard generally varies from mediocre to poor, and it is comparatively rare (for example) to find both ends of a moulded stone showing the same profile.

Terminology for types of masonry follow the definitions laid out by Hill (1981, 2–4). Two particular types were found at Birdoswald and will be referred to throughout the text. The definitions for these are as follows:

> **Coursed rubble**: The stones are squared up, more or less roughly according to the quality, to about the same height within each course, usually not above 250–300mm. The face may be left rough or dressed with a walling hammer or punch; the joints and beds will tend to be in excess of 15mm, and in elevation the corners of the stones tend to exhibit roundness rather than angularity. It is normal for the joints to be worked to a taper, as this increases the hold of the mortar and makes accuracy of working, and thus cost less important.
>
> **Ashlar**: This term is confined to masonry which meets the following criteria. The stones should have carefully worked beds and joints, finely jointed (generally under 6mm), and set in horizontal courses. Stones within each course should be of the same height, though successive courses may be of different heights. Where the centre of the face, however it is finished, intentionally projects beyond the wall line it should be bounded by a well chiselled margin some 20–25mm wide, worked straight and square to the beds to allow of accurate setting both to adjacent stones and to the general line of the wall. These drafts should twist in reasonably well, and ideally the stone should be perfectly rectangular in elevation.
>
> (Hill 1981, 2–4)

Reporting

The archive

The site research archive has been compiled according to the guidelines enshrined in the English Heritage document *Management of archaeological projects* (1991 edition, 39–41). The original archive is deposited with the finds in the Tullie House Museum, Castle Street, Carlisle with a microform copy in locations at the National Monuments Record, Kemble Drive, Swindon.

Report format

This report contains all of the evidence, analysis, and synthesis necessary to the understanding of the excavated archaeological sequences. It also embodies reassessments of earlier work on the site, and the results of survey and of documentary research. An integrated approach has been adopted in order to maintain a narrative which embodies all evidence relevant to each particular structure or period, presented in sequence. This approach, which is now achieving wide use (eg LeQuesne forthcoming, Buxton and Howard-Davies forthcoming), has proved particularly useful in the presentation of environmental evidence and the results of the survey of stonemasonry; types of evidence which are all too often placed in appendices, microfiche, or archives, often resulting in their being passed over by the reader in their entirety. The individual reports, of which the integrated specialist texts are summaries, exist either in the research archive or as parts of the *English Heritage Ancient Monuments Laboratory Report* series. For this reason it has not been considered appropriate to reproduce these reports in microfiche. The detail contained in the summary specialist reports is considered by the specialists to be the minimum which will allow their fellow workers, as well as archaeological readers to appreciate the nature of their evidence. Scientific evidence has thus been treated

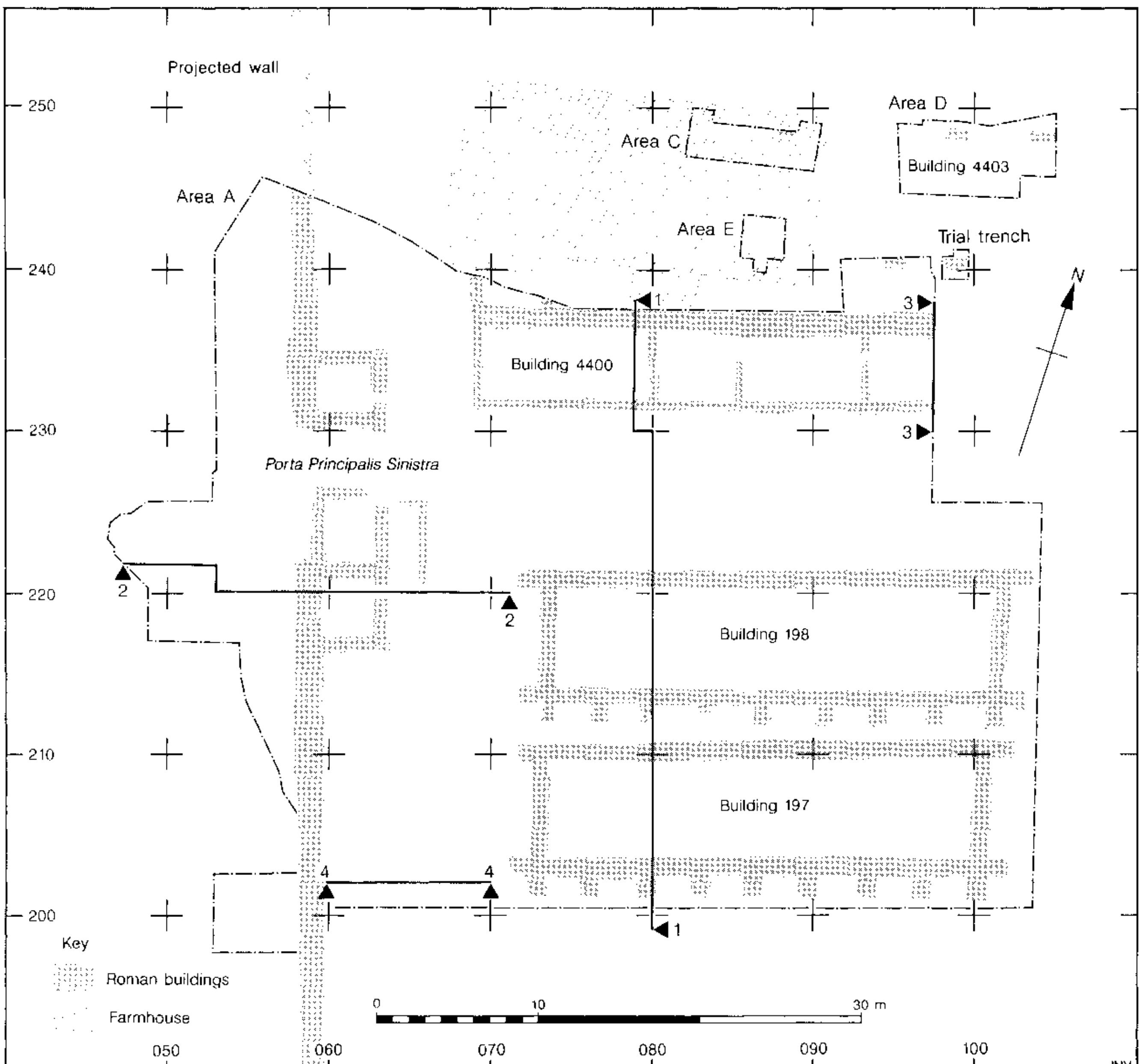

Fig 9 Plan of 1987–92 excavation Areas A, C, D, and E: the site grid and coordinates act as a key to the location of detailed plans in the report; the main published Sections 1–4 are also located

in exactly the same way as stratigraphic data, as a complex body of evidence of which sufficient needs to be presented to justify the conclusions drawn. Different text sizes have been used in order to condense some of the more detailed material.

The report is presented chronologically beginning in Chapter 2 with the pre-Roman environment, and ending in Chapter 14 with the medieval and post-medieval phases. Chapters 2–10 examine a continuous stratigraphic sequence from the pre-Roman to the sub-Roman periods and extensive discussions of the major Period divisions occur within these chapters. The small finds, pottery, and animal bone evidence from these periods is grouped in Chapters 11–13. Chapter 14 takes up the history of the site in the medieval period, which seems to begin at Birdoswald after a substantial chronological break in occupation. This chapter embodies the excavation, ceramic, standing building, field survey, and documentary evidence for the medieval to modern periods on the site. Chapter 15 gives a short summary of conclusions which ties together the various strands of discussion within the report.

Contexts, samples, and finds were allocated numbers within a single numerical sequence, as were groupings of contexts such as buildings. These numbers have been retained in the published report to facilitate cross reference to the archive.

In the structural texts, all illustrated contexts are discussed, though it has also been necessary to refer to contexts in the text which are not illustrated for purposes of archival cross-reference. Context numbers within Areas F and G which duplicate the series in Areas A–E are prefixed with the 1992 Site Code, as (eg) 473.189. The site grid to which all published plans of Areas A, C, D, and E are related is shown in Figure 9, and all plans incorporate coordinates which locate them on this grid. Figure 9 also locates the four principal published sections (1, ; 2, Fig 26; 3, Fig 22; 4, Fig 56). Plans of Areas B, F, and G may be located within the fort with reference to Figure 8. The key to published plans, sections, and elevations appears at Figure 10.

In the finds texts, and in the catalogues of architectural fragments integrated within the structural text, citation is by catalogue number followed by small find number, context number, and a short indication of context location, type, and Period. The pottery has been grouped into Analytical Groups which reflect closely stratigraphically identifiable episodes of deposition.

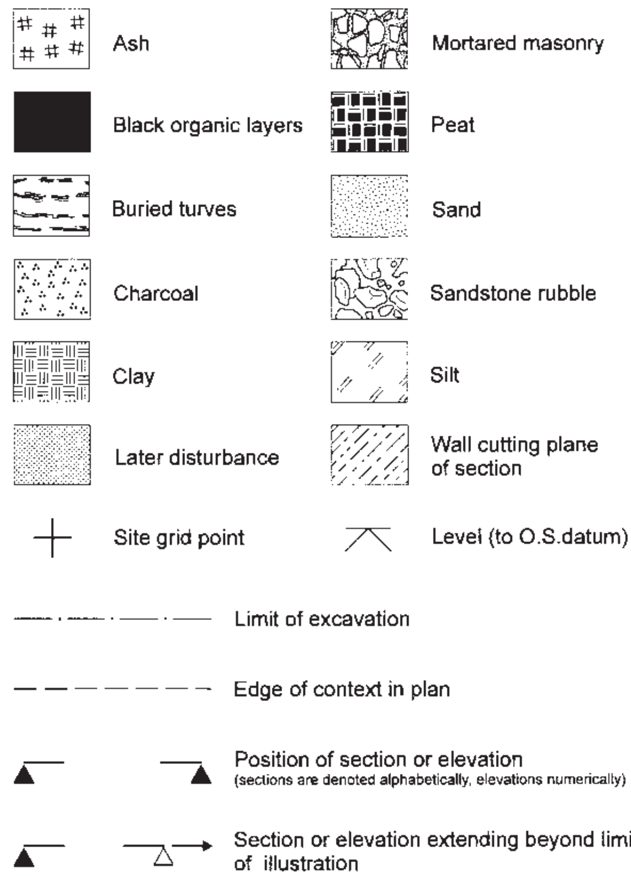

Fig 10 Key to plans and sections

Periodisation, phasing, and the land use diagram

It has become a commonplace, particularly in urban archaeology, that most simple schemes of periodisation are far too simplistic to be useful in the interpretation of deep and complex stratification. It is in the nature of human occupation of any site that within different areas and buildings, activities may have been more or less intensive, and change more or less rapid, within any given period. While one area might continue to be used in a certain manner, other parts of a site might simultaneously see a number of changes in use. Because of this it has not been possible to impose a rigid framework of cross-site periodisation or phasing for the Birdoswald excavations. A hierarchical system of period and phase designations has therefore been adopted. Such a system allows flexibility when judging the contemporaneity or otherwise of activities, and gives scope for the expression of uncertainty in the association of phases of activity in stratigraphically unconnected areas and buildings. The hierarchy may be defined as follows:

Periods 1–11

These are interpretive sub-divisions of the chronology of the site, derived from all analyses of phasing and dating evidence. As such they are the basic interpretive chronological units used within this report. Although based on analysis of the stratigraphic sequence in Areas A, C, D, and E, the comparison of dating evidence has allowed sequences in Areas B and F, and also those derived from previous excavation work on the site, cautiously to be drawn into the system of Periods.

Table 1 Relationship between Periods and Site Phases defined in Area A

periods	*site phases*	*description*	*dating*
1	1	Turf Wall and ditch	Hadrianic
	2	structures above Turf Wall ditch	
2a	3	beginning of stone fort defences	Hadrianic-Antonine
	4	hiatus horizon	
	5	completion of defences and primary stone buildings/occupation of stone fort	
3	6	second major structural phase	Severan
4a	7	blocking of *porta principalis sinistra* and attendant alterations/occupation and industrial activity	*c* 220–90
		Period ends with(?) brief desertion	
4b	8	re-excavation of fort ditches [?re]occupation	*c* 290–350
5	9	collapse and robbing in Building 198	post-AD 350–400+
	10	reuse of Building 197	
6	11	first timber building phase	5th–6th century
	12	second timber building phase	
		[no evidence]	
7	13	hollow-way and early medieval stone building	13th–16th centuries
8	14	bastle house	16th–17th centuries
9	15	existing farm, primary phase	mid-17th century–1745
10	16	existing farm, secondary phase	1745–1858
11	17	existing farm, final phase	1858–present

Site Phases 1–17

These are the clear divisions of the stratigraphic sequence which were recognised and defined during analysis of the complex stratigraphic sequence in Area A, the main area of excavation. Their identification is the result of stratigraphical analysis alone, and takes no account of dating evidence. The Site Phases formed the basic relative chronology with relation to which specialist finds analyses were undertaken. In a number of cases the Site Phases were subsequently grouped in order to demonstrate successive stages of single chronological Periods. The relationship between Periods and Site Phases is summarised in Table 1.

Building Phases

In most instances the histories of individual buildings could not be closely or directly related to the overall site phasing. A good example is that of the two *horrea*, Buildings 197 and 198. The high-standing walls of these buildings separated their internal stratification from that of Area A as a whole. The only stratigraphic links existed below the construction levels and above the demolition levels of these buildings. Internal phasing is thus designated as Building 197 Phases a–e and Building 198 Phases a–e.

This system becomes more complex in Building 4401 which is divided into Building 4401 Phases a–d. Activities in Phase b require further sub-division, and the Phase is thus subdivided once more into two subsidiary Working Phases designated b (i) and b (ii).

Ditch Phases

The western fort ditch was cut on six definable occasions. The six cuts are, like the buildings, given internal phase designations as Ditch Phases a–f. This is particularly important in the report on the leather from the ditches.

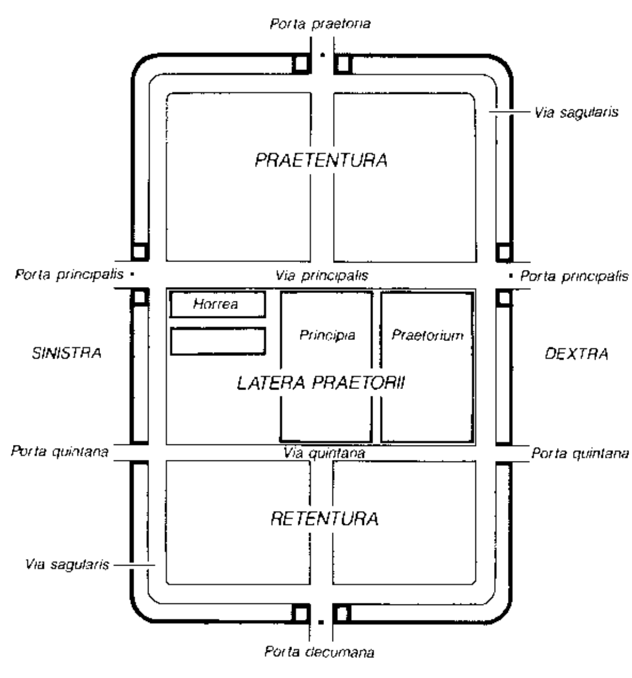

Fig 12 Key to the Latin terms for elements of the fort, which are used throughout this report

The land use diagram

The land use diagram at Figure 11 summarises the complexities of the site chronology. Such diagrams have recently become invaluable in the analysis of complex urban sites (Davies 1992; Steane 1993; Williams forthcoming). The diagram demonstrates the complexities of phasing, while showing the uncertainties involved in applying general phasing and periodisation across the whole site. Although the diagram is based on the Area A sequence, an attempt has been made to draw the results of the 1929 excavation into the site chronology. Also embodied in the diagram are the essential elements of dating evidence, namely the dates and reference numbers of coins, and the analytical pottery groups. The diagram is presented here as a convenient reference tool which summarises the entire sequence.

Terminology

Latin terminology is used throughout this report to describe fort areas, gates, roads, and buildings (Fig 12). These terms are more specific than many of their possible English counterparts, and are thus less cumbersome. The most important example of this here is the use of the word *horreum* rather than 'granary'. One of the problems which have bedevilled the study of the buildings conventionally termed 'granaries' has been the assumption that the buildings were solely for the storage of grain. This has led to the production of several works attempting to relate the capacity of *horrea,* assessed using a variety of criteria, to the size of garrison and to known data on military rations (Haverfield and Collingood, 1920, 140; Bulmer, 1969). That the buttressed buildings with raised floors familiar in Roman forts are the *horrea* to which epigraphic sources refer is not in doubt. They are not, however, necessarily exclusively grain stores. Rickman (1971, 1) and Milne (1985, 68), among others have pointed out that the word *horrea* was used to describe any kind of store building. Johnson (1989, 54) has preferred the expression 'store building' to 'granary' in his discussion of such buildings on Hadrian's Wall, whereas Daniels (1989a, 79) has used the cumbersome expression granary-storehouse'. While there is doubt on what to call these structures it seems sensible to use their original appellation. Although Rickman (1971, 1), is followed by Milne (1985, 68) in using the plural term *horrea* whether referring to buildings in the singular or the plural, in this report a single building will be termed a *horreum* following the usage attested in the inscription (RIB 1909) which refers to the construction of one of the Birdoswald buildings (... *horreum fecerunt* ...).

2 The pre-Roman environment

by Patricia E J Wiltshire, with contributions by Maureen McHugh and Tony Wilmott

Summary

The topographic and vegetational history of the Birdoswald spur, and the conditions that were encountered by the builders of the Turf Wall on their arrival in the area, were elucidated by the analysis of pollen and soil materials from specific samples. These samples were taken in a morass which occupied the centre of the later fort site, and from the buried ground surface below the Turf Wall and the north rampart of the stone fort, as well as from the fabric of the Turf Wall itself. The examination of such samples was a major aim of the research design.

In this chapter, the nature of the evidence for the vegetational history of the region is examined, and the potential of the Birdoswald data generally is discussed. The subsoil, and the natural gradients of the site are examined, together with the evidence for the natural morass. A summary description of the results from the samples is given, supplemented by samples from Appletree, 1.7 km to the west. Preliminary results from samples in Midgeholme Moss are also provided.

The natural levels show that the Turf Wall and subsequently the *via principalis* of the stone fort were laid out upon a natural ridge from which the ground dipped southwards to the morass and northwards to the Midgeholme Moss. The morass was truncated by Roman building activity, but provided evidence for a phase of dense woodland on the spur which can be tentatively dated (by comparison with Midgeholme Moss) to the Neolithic or late Mesolithic period.

Pollen from beneath the Turf Wall and stone fort rampart at Birdoswald demonstrates that the natural vegetation of the spur was dense alder carr, while a somewhat more open wooded landscape existed at Appletree and Midgeholme Moss. The most important pollen came from the ground surfaces upon which the Turf Wall was constructed, as this was undisturbed before turfs were piled upon it. At Birdoswald the wooded landscape persisted, and construction of the Turf Wall was so rapid that the clearance which must have attended the operation was not registered in the pollen record. The first substantial tree clearance must therefore have been associated with the construction work. At Appletree, however, clearance was earlier, and the vegetation in the area was predominantly open moorland. The conclusion that the builders of the Turf Wall were greeted by a very mixed landscape is discussed.

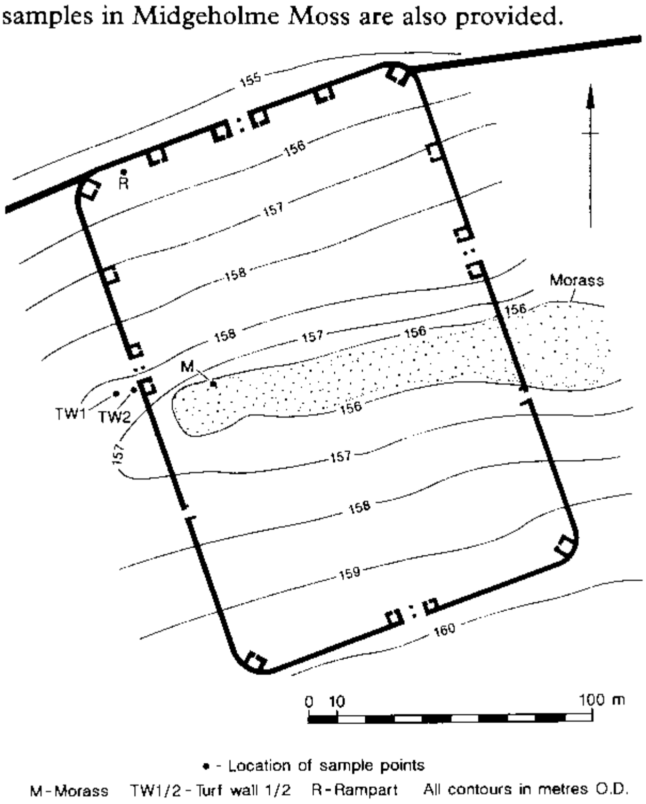

Fig 13 Plan to show the natural topography of the site, the location of the morass, and the locations of environmental samples; the contours are extrapolated from spot heights taken within the fort

Introduction

An important aspect of the 1987–92 excavation project was the recovery and analysis of environmental evidence, in particular of pollen and soil data relating to the earliest periods on the site. One of the research priorities set in the project design was the exploration of a natural morass (Fig 13), the existence of which had been established during excavations in 1930 (Richmond 1931, 123). The term 'morass' was used by Richmond to describe an area of organic peat of unknown depth and extent which occupied a natural hollow in the centre of the Birdoswald promontory. This morass was drained, and sealed by dumping in preparation for the earliest occupation of the site. Samples of peat from it were seen as having the potential to contribute significantly towards the understanding of the local pre-Roman environment. A further sampling priority was the Turf Wall which, as far as was known, was the earliest feature on the site. It was assumed that this Wall would seal an intact ground surface datable on archaeological and historical grounds to the 120s AD. It was considered that the remains of the Wall itself would comprise elements of the natural, contemporary, local ground surface which had been removed from context and piled up during Wall construction. It was known that the Turf Wall was partially demolished in order to insert the later stone fort, and the earthen dump rampart of the stone fort was expected to seal a ground surface, environmental data from which could be compared with results from beneath the Turf Wall. Any differences could probably be accounted for as evidence for activity which took place on the site in the short period between the construction of the Turf Wall, and that of the stone fort. It was hoped that this sampling programme would elucidate the impact that the sudden imposition of Hadrian's Wall had upon the landscape.

The nature of the vegetation in the landscape around Hadrian's Wall, and the impact of the Roman presence upon that landscape, has recently provided a focus of interest for palaeoecologists. There is considerable controversy regarding the timing of substantial woodland clearance, and, to date it has proved difficult to ascertain both the amount of woodland and the pattern of its distribution at the regional level (*sensu* Jacobson and Bradshaw 1981). The literature is reviewed by Tipping (forthcoming) who highlights the observation that in the overwhelming majority of sites so far analysed, extensive or complete clearance of woodland appears to be a late Iron Age phenomenon, the earliest in the region occurring at about 350 cal BC. Many extensive clearances have been dated to about 200–100 cal BC and, although timings are somewhat imprecise, dates within this range certainly do not lie in the early Iron Age radiocarbon 'plateau'. This means that they can be attributed to the later Iron Age with some confidence.

Nearly all the vegetation reconstruction in the region near Hadrian's Wall has been accomplished by palynological analysis of deep peat sequences from large ombrotrophic mires or oligotrophic valley mires (Barber *et al* 1993; 1994; Donaldson and Turner 1977; Dumayne, 1993a; 1993b; 1994b; Dumayne and Barber 1994; Innes 1988; Lewis 1993; Tipping 1995; forthcoming). Indeed, Midgeholme Moss, the focus of the studies carried out by Innes (ibid) and Lewis (ibid), is a valley mire about 100m north-north-west of Birdoswald. Their results have been used here to give some broad preliminary chronological comparisons. Palynological analysis of several peat sequences from Midgeholme Moss is currently in progress (Wiltshire, in prep) and Lewis's (1993) work was carried out as part of this more detailed study. Forthcoming data from these analyses should provide a clearer understanding of the regional landscape immediately prior to, during, and just after the building of the Wall and the fort at Birdoswald.

Timings of environmental changes recorded in these mire peats rely on radiocarbon dating. Since no securely-dated contexts are available in these systems, and because there is a lack of precision in radiocarbon dating, it is acutely difficult to differentiate between late Iron Age and Roman impacts on the landscape (Dumayne *et al* 1995). Radiocarbon chronologies are often very imprecise when calibrated at two standard deviations. There are problems of 'suck-in' and 'smear' effects (Baillie, 1991) where (a) imprecise dating can result in truly synchronous events being smeared over a long period of radiocarbon time and (b) a known event can 'suck in' environmental information which approximates to the date of the event, but which has been so loosely dated that correlation might be erroneous. This is exemplified by results from Midgeholme Moss where significant regional woodland clearance coincides with changes in lithology and radiocarbon dates, some of which span the late Iron Age through to Roman. Clearly, it is tempting to suggest that both changes in sedimentation and woodland structure were related to the building of the Wall and the fort; but this could be a 'suck in' situation, and it could be argued equally that the clearance had been initiated in the Iron Age. These difficulties can be overcome to some extent by high precision dating and 'wiggle matching' (Clymo *et al* 1990; Pilcher 1991a; 1991b; 1993), but the costs associated with the level of stratigraphic resolution required in these kinds of analysis are prohibitive.

Another approach to obtaining a more precise chronology in environmental reconstruction is to study fills from archaeological contexts with secure dating. Unlike large sites such as raised mires, which can have extremely wide pollen catchments and record vegetation change at the regional level, archaeological features reflect, in the main, the local environment. However, they do provide valuable information during occupation phases of a site. Tipping (forthcoming) discusses the work of Davies (1978) and Manning (1995) where ditch-fills from Vindolanda, dated to AD 80–92, the 120s and 160–80, were subjected to pollen analysis. Their results show that, with the exception of alder, birch and hazel, all arboreal taxa had been cleared by the last decade of the 1st century. He quotes that 'An open landscape with considerable area given over to pasture was present, but apparently with no cereal cultivation until the middle of the 2nd century AD'. It is not surprising that analysis of the ditch fills at Vindolanda suggests an open environment; this is what one would expect in the immediate vicinity of a settlement.

While not detracting from the value of the fills of archaeological features in environmental reconstruction, the problems associated with their complex taphonomy are well known (Greig 1982). In the absence of a wider sampling strategy, it might also be dangerous to make inferences about the broader landscape from sediments in features with potentially small pollen recruitment areas. Furthermore, the presence of cereal-type pollen grains in such sediments is not a reliable indicator for cereal cultivation *per se*. Other on-site activities such as the processing and storage of cereals which had been grown elsewhere could result in an input of cereal pollen into any archaeological feature.

Buried and intact ground surfaces are potentially less complicated by multifarious taphonomic processes than are pits and ditch fills. There may be problems associated with differential decay and movement of palynomorphs through a soil (Dimbleby 1985; Havinga 1984; Tipping and Carter 1994), but these will depend on many physico-chemical factors within the soil fabric. Decomposition of pollen and spores will depend, among other things, on the degree of aeration and hydrogen ion concentration in the soil matrix. Where pH and pF (water tension) are low (as in acid, wet soils) the soil matrix will have a very low redox potential, and oxygen can be limiting. Bioactivity in such deposits is generally severely diminished, and decomposition is inhibited (Anderson and McFayden 1976; Killham 1994; Swift *et al* 1979). Burial of an acid, damp soil by dump material or turfs can result in particularly low redox by virtue of compaction which destroys pore structure. This situation can create an environment highly conducive to good preservation of organic remains. Furthermore, the Experimental Earthworks Project has provided strong evidence that, where soil pH and bioactivity are low, burial of a ground surface by turfs inhibits either the upwards or downwards movement of palynomorphs from the original surface (Jewell and Dimbleby 1966; Evans and Limbrey 1974).

The integrity of a buried profile can be confirmed by soil micromorphology, while fine resolution pollen analysis throughout the profile can give valuable information about a site's vegetation at, and before, the time of burial. The level of extra-local and regional information preserved by the buried soil will vary according to the openness and exposure of the site. A model of soil sampling, accompanied by soil micromorphology, has been presented by Tipping and Carter (1994), and this provides a method for assessing the reliability of palynological data in buried soils. While Tipping and Carter's approach is to be recommended, the aims of the analysis of the old ground surfaces, and Wall and rampart turfs, at Birdoswald and Appletree were to gain information on (a) the local vegetation at the time of Wall building and (b) the local vegetation before the Roman presence. It was hoped that turfs within the Wall structure would provide additional information on local vegetation since it is likely that the Wall-builders collected them from areas a little removed from the construction site. Variation in pollen spectra within the turfs themselves might thus highlight any heterogeneity in the local and extra-local vegetation.

Stratigraphic definition and land-form

The basal pink, natural, boulder clay on the site was generally overlain by a deposit of pale-brown compact fine sandy loam with small or medium whitish pebbles, together with darker brown lenses and black or brown root stains (1707, 3906; Fig 27: 2528, 3795, 4283, 1985, 1911, 1944, 368; Fig 25). This was recognised everywhere on the site as the weathered top of the boulder clay, and the original natural ground surface (hereafter OGS). The survival of this deposit in any area was taken as being a sign that Roman truncation had not occurred to any significant extent. There was abundant evidence for trees having grown in this natural material. One tree-hole was excavated (4302) and others were identified in plan or in section (eg 1645; Fig 26). Where encountered, such features were sectioned in order to check that they were not of anthropogenic origin. The colour and textural variants to be found within the uppermost natural layers on the site could all be attributed to tree root disturbance.

The highest point at which this natural deposit survived was in Area E, and to the north of Area A where the average level was +157.90–95m OD. The slope to the south was relatively gradual. At the southern edge of Area A, both inside and outside the fort Wall, the level was +157.00m OD. This gradient reflects the drop into the dip in which lay the morass. Peat deposits up to 320mm in depth which marked the edge of the morass itself (1251=367; Fig 25), had developed over the OGS (1240=399) in this area. The downward slope to the north was more marked, and in Area B the untruncated surface lay at +155.49m OD giving a slope over twice as steep as that to the south. Though such gradients are not spectacular, the natural profile is of interest in demonstrating that the *via principalis* of the stone fort, and before that the line of the Turf Wall, occupied the crest of a low natural ridge, which formed the last high ground before the land fell away northwards to the Midgeholme Moss (Fig 1). The contours given in Figure 13 are approximations where they lie outside the excavated areas. They are based on indications of level given by earlier excavators and the Roman ground surfaces measurable at the five available fort gates.

The Birdoswald morass

'Rapid and widespread trenching' during 1930 had demonstrated that the morass extended across the centre of the fort (for approximate extent, see Fig 13), occupying a pronounced hollow, which extended beyond the fort ditch system to the east, and as far west as the south Wall of the southern *horreum*, Building 197 (Richmond 1930b, fig 1). This fact was confirmed by the discovery of peat beneath the buttresses of Building 197 at the southern edge of Area A (Fig 25). A sample was taken for analysis, though it was demonstrable that the morass peat had been heavily truncated by building and levelling during the Roman period. It should be noted that this was the only area of the morass which coincided with the excavated area, and it was not, thus, possible to explore the full potential of the morass peat for analysis.

A summary pie chart of the results from the single peat sample is given in Figure 14 (for specific tabulation, see Appendix 3, Table 39). The sample was probably mixed, so that it is impossible to fit it into a precise chronological framework. However, the truncation of the peat in the sample area suggests that the deposit was of considerably pre-Roman date.

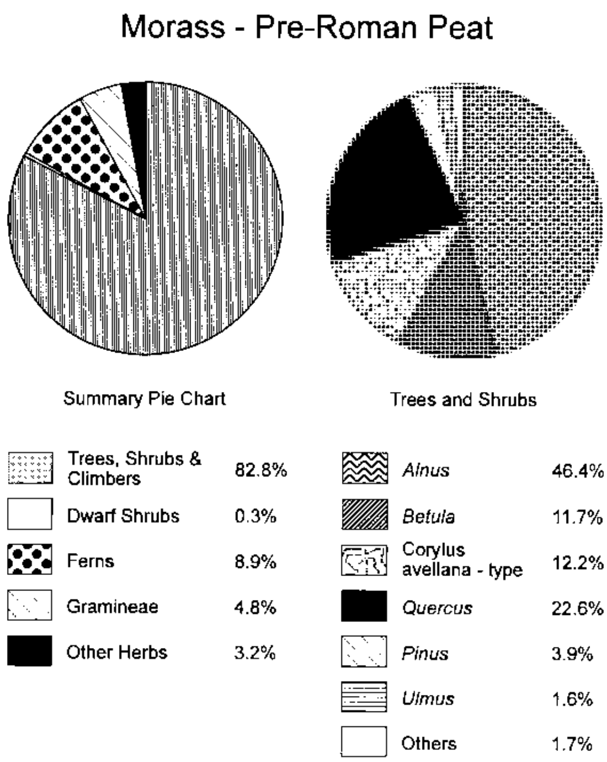

Fig 14 Pie chart for the morass sample showing relative proportions of pollen by ecological category, and of trees and shrubs by species

The morass peat accumulated in damp (but not waterlogged) woodland, dominated by *Alnus* (alder). *Corylus avellana* type (cf hazel), *Quercus* (oak) and *Betula* (birch) were abundant, and relatively high levels of *Pinus* (pine) and *Ulmus* (elm) were recorded. There was an understory of ferns and tall herbs such as *Filipendula* (meadowsweet), *Valeriana* (valerian), and *Urtica dioica* (nettle). The canopy was open enough to allow *Fraxinus* (ash) and shrubs to flower. Evidence for an open canopy is supported by the presence of *Hedera* (ivy) and *Lonicera* (honeysuckle). These climbers must have been growing very close by since, by virtue of their extreme entomophily, their pollen does not travel far from source. Their presence also adds weight to the contention that there were standing trees or stumps in the immediate locality since both plants require upright support and adequate light for flowering. Furthermore, both also grow well in acidic, moist soil and will not tolerate waterlogging (Grime *et al* 1988).

Open habitat taxa such as Ericales (heathers etc), Poaceae (grasses), and other herbs were relatively sparse, amounting to only 8.3% of the total pollen and spore sum. The presence of open habitat indicators would suggest a disturbed woodland, with areas of grassland (probably grazed) in the vicinity (see Table 39) although, if the palynomorph load were mixed because of crude sampling, the open habitat indicators could have been derived from younger peat. Nevertheless, there is overwhelming evidence that the site was dominated by damp, disturbed, acid woodland.

In terms of regional vegetation, the pollen diagram from Midgeholme Moss (Innes 1988) indicates that a similar woodland composition prevailed in prehistoric times; and it is possible that the truncated Morass peat records the vegetation of the spur during the Neolithic or late Mesolithic periods.

The Turf Wall samples from Birdoswald

The Turf Wall and its underlying buried soil horizons were sampled in two places. The first (TW1; contexts 1701/1746) lay to the west of the later stone fort ditch, the second (TW2; contexts 1707/4172) to the east, both outside the *porta principalis sinistra* (for location see Fig 13).

The approach adopted towards palynological analysis of this material was to take samples from the putative ground surface (LFH horizon) and from the mineral topsoil (Ah horizon). The LFH layer should give information regarding the pollen recruitment at the time the first turf was laid, and during an unspecified period before Wall construction. There could be no chronology for Ah samples except that they were likely to represent a period considerably before the Roman presence.

The constructional turfs of the Wall were sampled in the same way in order to ascertain their orientation and, as stated above, to gain information on the extra-local ground surface at the time of Wall building. Orientation of constructional turfs was confirmed by micromorphological analysis.

An important factor which must be borne in mind is that, whatever the nature of the vegetation dominating the ground surface at the time of burial, there must have been sufficient open ground, dominated by herbaceous taxa, to provide the turf for building of the Wall.

Sample TWl

A summary pollen diagram showing the major ecological groups and sample points is given in Figure 15. Full pollen percentages are listed in Appendix 3, Table 40, and Figure 298. Analysis was carried out at 40, 60, 70, 170, 205, 215, and 225mm. For ease of description these have been designated sub-samples 1–7 respectively.

The buried land surface and the first turf (sub-samples 5–7)

Sub-sample 7 may be considered to be the Ah horizon of the original land surface which was buried beneath the piled turfs of the wall. Sub-sample 6 might represent the LFH horizons of both the *in situ* ground surface and that of the first inverted turf, while sub-sample 5 is the Ah horizon of this turf from which sub-sample 6 was taken. The black band making up these putative contiguous palaeosurfaces was narrow and a single sample was obtained from its central part. It is conceivable, therefore, that it contained a mixture of two distinct pollen recruitments.

Soil analysis indicates that the soil had been superficially disturbed before burial, though this could have been merely as a result of trampling during the construction of the Turf Wall. Good pollen preservation within the soil matrix suggests that bioactivity was at a low level and soil analysis indicates that the profile was wet, though not permanently waterlogged. Evidence of the activity of oribatid mites and enchytraeid worm, soil micro-organisms associated with humus, and soils of acid and boreal woodland (Swift *et al* 1979),

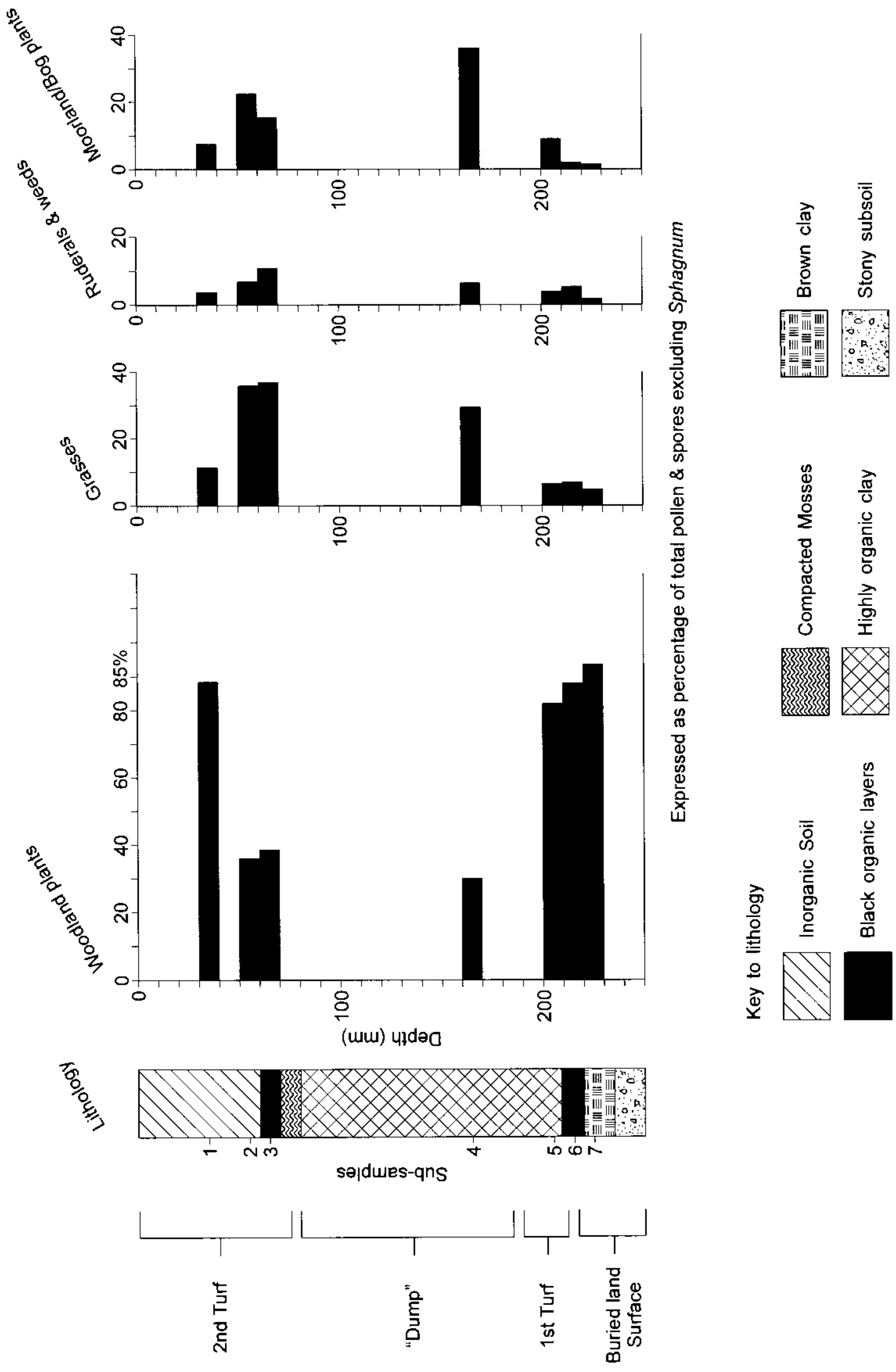

Fig 15 Summary pollen diagram for Turf Wall sample TW1

implies the availability of periodically-aerated microsites within the soil fabric. Soil analysis demonstrated a low pH throughout the soil profile.

The pollen from the Ah horizon at TW 1 (sub-sample 7) shows that well before the Wall was built, the local landscape was heavily wooded, dominated by dense alder carr with woodland taxa accounting for 92.5% of the pollen sum (Figs 15, 17). However, low levels of grasses, *Plantago lanceolata* (ribwort plantain), *Calluna* (ling), and *Pteridium* (bracken) suggest there was open, grazed moorland in the vicinity. The overall levels of phosphate in the soil are consistent with minimal human or animal interference, and the very low levels of microscopic charcoal also suggest low human impact.

As already suggested, the single sub-sample within the black band (sub-sample 6) might conceivably represent the actual ground surfaces of both turfs so that pollen spectra may have been mixed. When compared with the pollen spectra from the Ah horizon (sub-sample 7), the woodland component had been reduced by only 5%, but there were quite marked differences in its composition. Although it remained the dominant tree, alder was considerably reduced, as were hazel and oak. However, birch was relatively unaffected and contributed as much pollen as before, possibly even more. It is impossible to be certain as to the precise nature of the immediately local vegetation when construction of the wall started. However, Figure 15 shows the pollen assemblage to be dominated by woodland taxa with open habitat plants representing only 12.8% of the total pollen sum. This means that even if the inverted turf had been obtained from a less wooded area, trees were probably still dominant in its environs. Herbaceous plants such as bracken, grasses, and Cyperaceae (sedges) could easily have been components of the woodland understory, and their observed small increase could be as a result of a small reduction in the woodland canopy.

Sub-sample 5 is taken to represent the Ah horizon of the first inverted turf, and its pollen spectra reflect a more open terrain. Microscopic charcoal levels were very low, and alder, oak, and cf hazel had slightly lower percentages; but birch and ling were considerably higher than in sub-sample 6. It is possible, therefore, that the inverted turf was obtained a little distance away from the wall in an area dominated by more open woodland, possibly with birch being an important component. If this were the case, sub-sample 6 might indeed represent a mixed sample with the pollen record of the original land surface being 'diluted' by the pollen record of the inverted turf. In other words, the original land surface might have been even more densely tree-covered than sub-sample 6 might indicate.

Any changes in woodland composition between the Ah and LFH horizons of the *in situ* ground surface were probably the result of pre-Roman land use. When woodland canopy is opened up, birch can colonise open ground very rapidly (especially if it has been burned) and will flower within five years (Grime *et al* 1988; Harding, 1981). Also, it is frequently over-represented in the pollen record by virtue of the fact that it coppices readily by cutting or burning, and can flower prolifically as a result (Beckett and Beckett, 1979). Thus its increase in the pollen record is often more apparent than real, but usually indicates some degree of opening up of the tree canopy or soil disturbance.

An occupied, or intensively used, soil might become eutrophicated and aerated through disturbance, and this would lead to enhanced microbial decomposition of palynomorphs in the soil fabric. The pollen preservation in sub-sample 6 was good, which could indicate a lack of prolonged disturbance of the upper soil layer before Turf Wall construction. Soil analysis has suggested that the *in situ* LFH horizon might have been disrupted a little prior to the emplacement of the inverted turf. However, there is also strong evidence that the overlying turfs were obtained very locally so the view that the promontory was wooded is still tenable. The high levels of microscopic charcoal in the sample attest to human activity at Birdoswald immediately before and, obviously, during the building of the wall. Nevertheless, phosphate levels in the buried soil horizons were consistent with those usually characteristic of natural soils. This is further evidence to support the contention that there was minimal pre-Roman humus on the site.

Dump material (sub-sample 4)

It is very difficult to interpret the origin of sub-sample 4, since it was obtained from a relatively homogeneous, organic clay which might have been organic soil dumped on top of the first turf of the Wall. However, the deposit was certainly obtained from a much less wooded terrain than that of the spur. The high levels of moorland/bog plants, weeds, grasses, and low charcoal levels indicate that the dumped material might have been obtained from the periphery of Midgeholme Moss.

The upper turf (sub-samples 1, 2, and 3)

These sub-samples probably represent three horizons within a single inverted turf. All contained very low levels of microscopic charcoal. Sub-sample 3 consisted totally of unhumified remains of the following mosses: *Rhytidiadelphus squarrosus*, *Hypnum cupressiforme*, *Pleurozium schreberi*, and *Eurhynchicum* sp (nomenclature after Smith 1978). This sub-sample might thus represent the L layer (of the LFH horizon), sub-sample 2 the FH layers (of the LFH horizon), and sub-sample 1 the Ah of the inverted profile.

The mosses in sub-sample 3 all have fairly wide ecological tolerance ranges and are found in a variety of habitats, including moorland, acid grassland and woodland. The pollen contained within the moss band shows that the area from which the turf had been obtained was open and dominated by very weedy, probably grazed, grassland and ling. The similarity of sub-samples 2 and 3 is striking although ling levels were higher in sub-sample 2. Sub-sample 1 had a pollen assemblage dominated by woodland, with open habitat plants being less important. However, the woodland canopy was probably fairly open with grazed, weedy, grassland and ling in the vicinity. It would seem that the upper inverted turf had been obtained from the same area as the more minerogenic dump material (see sub-sample 4). Both the pollen and the soils evidence suggest that this upper turf had been obtained from the edge of Midgeholme Moss.

Sample TW2

A summary pollen diagram giving ecological groups with sample points appears in Figure 16. Full pollen percentages are listed in Appendix 3, Table 40, and Figure 298. Analysis was carried out at 80, 190, 200, 320, and 330 mm. For ease of description these have been designated sub-samples 1–5 respectively.

The buried land surface (sub-samples 4 and 5)

There were virtually no palynomorphs in sub-sample 5 and only exceedingly sparse and degraded pollen and spores in sub-sample 4. Soil analysis suggests that the *in situ* profile was truncated before emplacement of the first turf. From the palynological evidence it is difficult to differentiate between two possibilities: (a) a non-inverted turf (with its LFH and partial Ah horizons) could have been placed directly on a truncated profile so that sub-sample 5 represents the Ah of the emplaced turf or (b) sub-sample 5 could represent the Ag horizon of the buried land surface and sub-sample 4 is from the LFH horizon of an inverted turf. Soil analysis showed that the profile was subjected to a fluctuating water table but that gleying was much less intense than in TW1 (sub-sample 6) and, overall, the soil at TW2 was drier than at TW1.

A virtual lack of palynomorphs indicates that sub-sample 5 was obtained from a subsoil, and the paucity of pollen and spores in sub-sample 4 suggests that the LFH layer it represents was highly bioactive. Pollen is highly susceptible to auto-oxidation, microbial decomposition (Havinga, 1984), and ingestion by micro-and mesofauna. Thus, conditions in this layer were frequently, if not continuously, aerobic through much of its fabric; and soil analysis demonstrates that although still within the range of a 'non-anthropogenic' soil, phosphate levels were higher than in the TW1 profile. Only very sparse, highly-corroded, indeterminable pollen and spores were present but single grains of the following were recognised: birch, pine, oak, ling, *Pteropsida* monolete indet. (eg ferns such as *Dryopteris*), *Polypodium*, (polypody fern), bracken, sedges, grasses, *Melampyrum* (cow-wheat), ribwort plantain, and *Sphagnum* moss. Three grains of alder were found. This assemblage is similar to that of the *in situ* ground surface of TW1 (sub-sample 6) and tentatively points to disturbed woodland or a woodland edge environment. Abundant microscopic charcoal in these sub-samples may simply reflect activities associated with the construction of the Turf Wall.

The upper turf (sub-samples 2 and 3)

Sub-sample 3 represents the Ah horizon, and sub-sample 2 the LFH horizon, of a turf with its surface uppermost. The more minerogenic material between this turf and the ground surface appears to be the remnant of an intact mineral subsoil and so probably represents the subsoil of the turf itself.

Both sub-samples 2 and 3 have very low microscopic charcoal levels and are dominated by woodland taxa, but there are considerable differences in their pollen spectra.

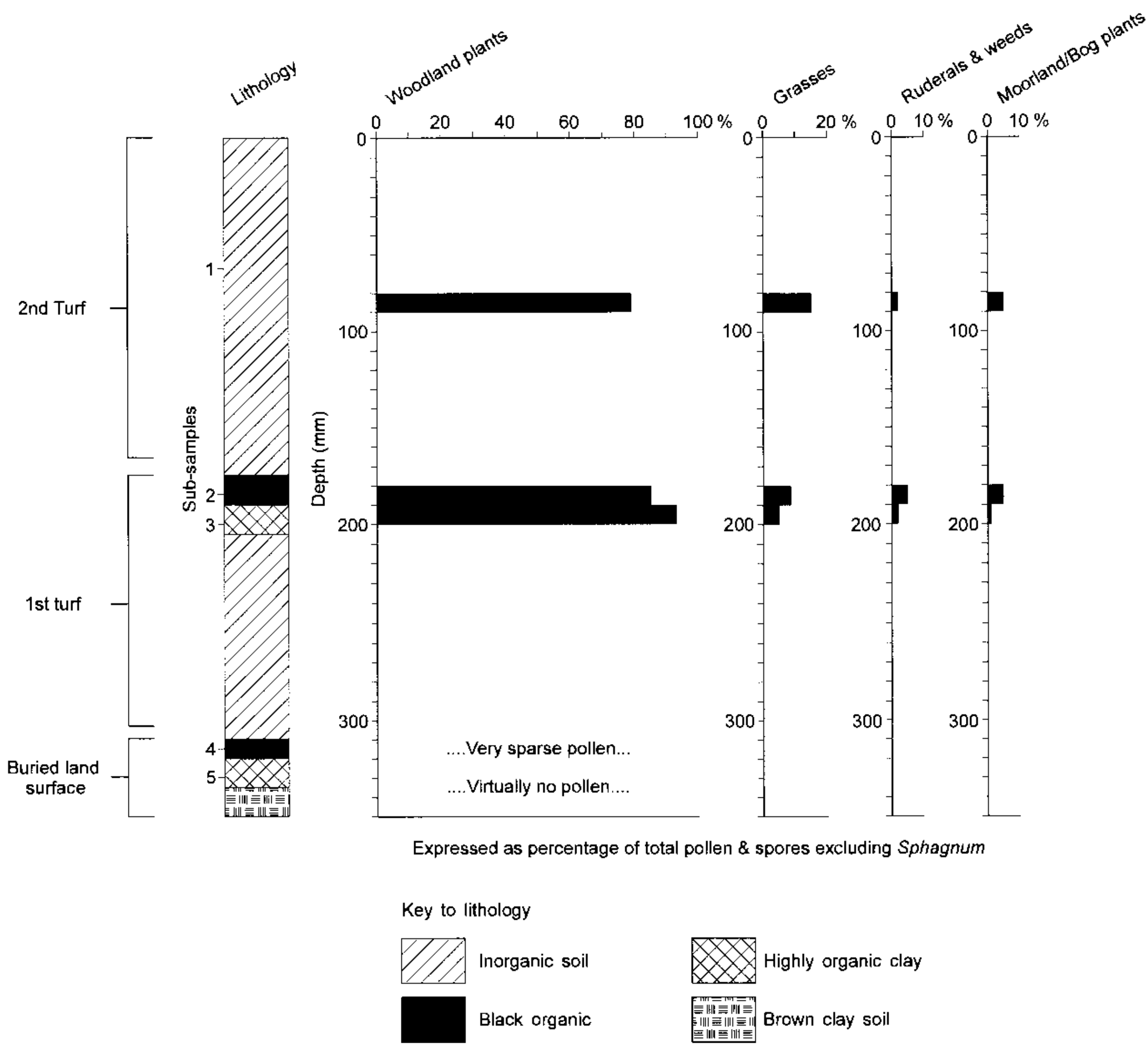

Fig 16 Summary pollen diagram for Turf Wall sample TW2

In sub-sample 3, alder and hazel were most abundant with open habitat plants such as ling, grasses, and *Sphagnum* moss being at a low level. Sub-sample 2 indicates an opening of the tree canopy with alder, oak, and particularly, hazel being reduced, and birch and open habitat indicators increasing.

This picture is very similar indeed to that shown by the original land surface and first inverted turf of TWl (sub-samples 5, 6, and 7). It would seem that the area from which the turf was obtained was woodland, but that by the time it was cut for Wall construction, the canopy had been reduced, allowing the pollen of more open habitats to become incorporated into the ground surface. Birch had either taken advantage of the openings or was better represented by virtue of its rapid flowering after coppicing. There is strong evidence to suppose that the turf of sub-samples 2 and 3 was obtained very locally, from the spur rather then from further afield.

Without carrying out very-detailed pollen analysis of the whole profile, it is impossible to tell the origin of the largely inorganic soil, which overlies this turf (sub-sample 1). But it may represent the subsoil of an overlying turf, though its pollen assemblage is exceedingly similar to that of sub-sample 2.

The Turf Wall samples from Appletree

During 1989 the traditional recutting of the Turf Wall section at Appletree (location, Fig 1), for the benefit of participants in the 11th Pilgrimage of Hadrian's Wall (Whitworth 1992), was undertaken by members of the excavation team. The opportunity was also taken to obtain a sample from this section, in order to secure comparative data from a nearby, though somewhat different, environment on the line of the Turf Wall.

A summary pollen diagram with major ecological groups and sampling points is given on Figure 17, and full pollen data are given in Appendix 3, Table 41, and Figure 299. Samples included both the organic and inorganic deposits in the areas of the three distinct, highly organic horizons. Analysis was carried out at depths of 25, 35, 45, 60, 140, 150, 160, 170, 225, 235, 255, and 275mm. For ease of description, these have been designated sub-samples 1–12 respectively.

The buried land surface (sub-samples 11 and 12)

Soil analysis confirmed that sub-samples 11 and 12 may be regarded as the LFH and Ah horizons respectively of the original buried soil. There was evidence of a low level of disturbance of the surface but the profile was considered to be intact. The Ah (sub-sample 12) shows that the local landscape had been dominated by mixed deciduous woodland and dominated by birch and alder, with oak and hazel being abundant. Figure 17 indicates the possibility that the catchment included a mosaic of woodland which depended on local edaphic conditions. A birch/alder carr probably covered the wetter ground while oak might have dominated the drier slopes towards the Irthing. Hazel could have been growing in either habitat.

The woodland seems to have supported a tall-herb community including meadowsweet and *Rumex* spp (docks), while the small amount of pollen of *Vaccinium*-type (cf bilberry) suggests that it might have been growing within drier oak/hazel woodland on local acid soils. The presence of ash and *Ilex* (holly) implies that the woodland had some degree of open canopy near to the pollen site. Areas of open (probably grazed) moorland are also evidenced by low levels of grasses, ribwort plantain, bracken, *Rumex acetosella* (sheep's sorrel), other ruderals and pasture herbs, and traces of ling and *Sphagnum*. However, these open habitat plants were represented at a low level, and it is clear that during this unspecified time before the building of the Wall, the immediate area was heavily wooded. Human presence in the area is indicated by sparse charcoal fragments, and the presence of cow-wheat is generally thought to indicate disturbed, burned woodland; but the immediate site seems to have been little affected by human hand. This is borne out by soil analysis where there was evidence of a prolonged period of soil stability, and phosphate levels were those characteristic of the pre-Roman background landscape, and/or pastoral husbandry.

Sub-sample 11 shows that the ground surface buried by the first foundation turf had been largely cleared, and the landscape in the pollen catchment was virtually treeless at the time of construction. Soil evidence has confirmed that the immediate site supported herbaceous plant cover. Figure 17 shows that all trees, shrubs, and ferns which were probably growing in the woodland (Pteropsida monolete indet and polypody fern), were dramatically affected. This means that clearance was wholesale and unselective. The increase in hazel relative to other arboreal taxa might simply indicate an enhanced flowering in the small numbers of plants left after clearance; this is hazel's natural response to coppicing or removal of competition. Disturbed soils are indicated by taxa such as *Papaver* (poppy) and Chenopodiaceae (eg orache), but there is overwhelming evidence that the site had quickly become dominated by wet moorland and bog. Soil analysis indicates that the soil was wet, with low redox potential, and minimal bioactivity. The *Sphagnum* percentage rose from a mere presence to 7.3%, and grasses, bracken, and ribwort plantain all increased. There was also a dramatic rise in the representation of ling from a mere presence in the Ah horizon to 60% in the LFH. While ling is an exceedingly prolific pollen producer and need not have been growing directly at the pollen site (Faegri and Iversen 1975), the heathers (*Erica* spp *sensu strictu*) and *Sphagnum* are thought not to be disseminated very far from source. But, even in the case of ling, most of its pollen is deposited very close to the plant, and its pollen representation in the modern pollen rain appears to be directly related to its percentage ground cover (Evans and Moore 1985). It seems that once tree cover was removed, moorland vegetation, which had already developed elsewhere in the catchment, spread rapidly into the site.

Micromorphological evidence indicates that before Wall construction, there were at least three separate episodes of burning, as well as some physical disturbance of the surface soil. Reflectance determinations of the LFH layer suggest a range of fire temperatures between 375° and 410° C and this has been interpreted as being consistent with a low-temperature, smouldering fire. However, experimental work has shown that these are the favoured ground-surface temperatures during fire management and maintenance of moorland vegetation for stock grazing today (see Gimingham 1972; Mallick and Gimingham 1985). Without further work, it is difficult to differentiate between burning associated with initial woodland removal and subsequent firing of the surface, and it is quite possible that what is being recorded here is Iron Age fire management of pastures. Soil evidence clearly indicates that burning was episodic and that fires were well separated temporally. This might fit well into the model for moorland and heathland management (Gimingham 1992).

It must be stressed that palynomorph preservation was good in both sub-samples 11 and 12 and this probably reflects the acid and wet nature of the original soil profile and the lack of bioactivity within its matrix. The site at Appletree seems to have been grazed moorland before Wall construction and this implies clearance by Iron Age peoples.

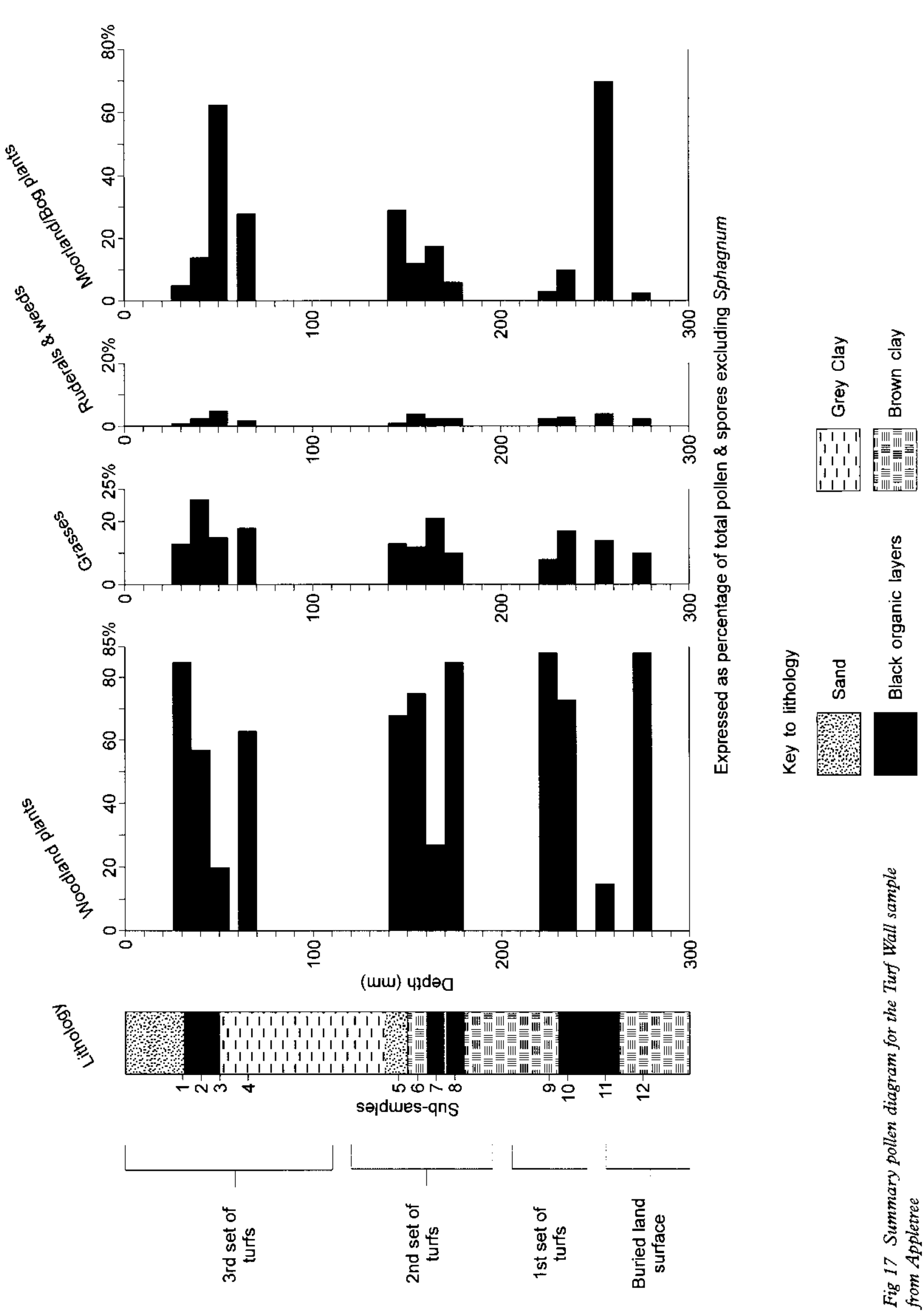

Fig 17 Summary pollen diagram for the Turf Wall sample from Appletree

The first turf (sub-samples 9 and 10)

Sub-sample 10 was from a black organic layer which merged into the material from which sub-sample 11 had been obtained. Sub-sample 9 was from the minerogenic material immediately above the black layer. Micromorphological analysis confirms that these sub-samples represent the L and H (of the LFH) horizons of the ground surface from which the turf had been obtained, and that the turf was inverted with the mineral Ah separate lying above.

Figures 17 and 299 show that the turf had been obtained from an area which had, at one time, been dominated by trees and shrubs, with levels of woodland plants reaching those of the Ah horizon of the original land surface. Indeed, the pollen spectra and microscopic charcoal levels of this Ah horizon (sub-sample 9) closely resemble those in the Ah of the buried soil (sub-sample 12). The two habitats must have been very similar, each supporting woodland but, nevertheless, with open, and possibly disturbed, areas nearby. Soil analysis has confirmed that the turfs of the Wall at Appletree have a local origin so it is not surprising that similar vegetation is reflected in the palynological sub-samples.

Sub-sample 10 shows that woodland plants diminished while open habitat taxa were more abundant. Grasses, ruderals, and other herbs indicating disturbance, and possibly grazing pressure, were more abundant. Ling and *Sphagnum* also increased by a small amount. This means that the woodland was being thinned, and pollen from outside was finding its way into the local soil. Charcoal fragments were much more abundant than in sub-sample 9, and evidence from soil analysis of repeated burning has already been discussed. It is interesting that alder, birch, and hazel declined while oak increased. This might mean that the damp, scrub vegetation on the site was being cleared away before oaks, which might have been growing on the drier slopes towards the Irthing. It might also mean that, although collected locally, the turf was obtained a little distance from the site, possibly towards the Irthing, since the buried ground surface (LFH) indicated a dramatic drop in oak rather than a rise. It is possible that the turfs are recording heterogeneity quite sensitively in the vegetation in the wider environs of the Wall before its construction.

It is quite clear that sub-sample 10 is not strictly comparable to sub-sample 11, and this may be interpreted in two ways. Most probably, the actual surface of the inverted turf may not have been sampled so that sub-sample 10 represents the lower part of the LFH horizon. If so, a relatively gradual change from wooded to unwooded conditions is demonstrated, and this may have been missed in the original land surface because of lack of sampling resolution. Secondly, the inverted turf might have been collected from some little distance away from the immediate site, from an area which had not been cleared too extensively. The inverted turf profile certainly contained pine which was absent from the *in situ* profile. Nevertheless, the very low levels of this tree indicate that it was not growing in the vicinity; the pollen had probably been derived from a considerable distance away.

The second set of turfs (sub-samples 5, 6, 7, and 8)

The lithology of the second set of turfs is rather complex, with a very fine lamina of inorganic material interleaved between the upper and lower parts of the black organic layer (Figs 17 and 299). However, all the material in this part of the Wall section was derived from a site (or sites) dominated by woodland with a fairly open canopy and with open, grazed moorland in its environs.

There are two possible interpretations of the pollen data for this part of the section. First, in spite of the presence of the interleaved sand, the black layer could have been formed from a single turf which had not been inverted. The sand layer could conceivably represent inwashed inorganic material during the *in situ* formation of the turf. The pattern of vegetation change in sub-samples 7 and 8 is very similar to that in the inverted turf (sub-samples 9 and 10) except for small differences in pollen percentages, notably in oak. Again, sub-samples 7 and 8 might represent a partially truncated LFH horizon. If so, the uppermost layer has been missed so that, although there was an increase in open habitat plants, very high levels of ling were not recorded (as would have been expected if the very surface of the turf had been analysed, and the turf had been obtained from the immediate vicinity (cf sub-sample 11).

Secondly, the lower part of the turf (sub-sample 8) could represent the lower part of an LFH horizon of turf obtained from an area very similar to that of the original pre-clearance ground surface. Sub-sample 7 could then be the LFH horizon of an inverted turf, while sub-sample 6 (taken from the minerogenic layer) might represent the Ah horizon of that inverted turf. In this scenario, the thin sand between the two black organic layers might represent inorganic materials which had been deposited between the faces of the lower turf (sub-sample 8) and the inverted turf before they had been placed in the Wall. The relationship of sub-sample 5 to sub-samples 6, 7, and 8 is also difficult to interpret but this sandy material was certainly obtained from a wooded area with open, possibly grazed, moorland nearby. Microscopic charcoal levels were high in sub-sample 7 (though nowhere as high as in sub-sample 11, the original ground surface), while they were low in sub-samples 5, 6, and 8. This indicates that there is a high probability of sub-sample 7 representing the upper part of a turf, but its relationship with sub-samples 6 and 8 is enigmatic in the absence of more data.

The third set of turfs (sub-samples 1, 2, 3, and 4)

Although the uppermost black layer appears to be a single horizon, again the pollen evidence may be interpreted in several ways. However, soil analysis indicates that sub-samples 1, 2, and 3 represent an intact and inverted turf profile. Sub-sample 4 has a broadly similar palynomorph assemblage to sub-sample 5 and both might have been derived from mixed, local topsoil and subsoil which were used to level the Wall during construction. Soil analysis certainly confirmed that this practice occurred at Appletree.

The inverted turf (sub-samples 1, 2, and 3) reflects a gradual demise of woodland plants and a reciprocal increase in moorland, open, weedy grassland, and disturbed soils. All trees and shrubs were affected so it seems there was a progressive and wholesale removal of woodland which allowed the establishment of moorland and grassland. The pollen spectra are so similar to those of the buried surface (sub-samples 12 and 11) that it is highly likely that this turf was stripped from the surface immediately adjacent to the Wall. The palynological evidence from these samples also strengthens the argument that Appletree was largely cleared of trees, and dominated by moist, degraded grassland at the time the first construction turf was laid.

Moorland plants, including *Sphagnum*, were represented in every sub-sample in the Appletree section, indicating nearby open, moor-dominated countryside even when Appletree itself was heavily wooded. This strongly suggests that woodland clearances were well under way in the area for some considerable time before the Romans arrived. The total lack of evidence of arable agriculture at Appletree might also suggest that these clearances were the result of exploitation of woodland resources, and extension of grazing lands.

Midgeholme Moss: a more regional picture of vegetation around Birdoswald

The results from soil and pollen analysis at Birdoswald and Appletree give a view of the environment immediately before the construction of the Turf Wall in 120 2 as well as a very useful glimpse of the ecological history of each site. Some enhancement of the data has proved possible by consideration of Innes's (1988) and Lewis's (1993) results from the Midgeholme Moss which provide broadly dated sequences for purposes of comparison.

The two studies involved sampling at different locations on the mire. Sediments worked on by Lewis were obtained from the eastern edge, about 50m to the east of the Roman road across the moss which was located by means of a rapid auger survey. Innes's (1988) study was based on sediments obtained from towards the centre of the mire, and his results probably reflect a wider regional history of the landscape (Jacobson and Bradshaw 1981). It is inevitable that there will be some variation in the results from the two sites because of pollen dispersal characteristics, but any large-scale impact on vegetation in the landscape should be recorded in both.

Innes (1988) showed that the Midgeholme Moss basin began accumulating sediment at about 10,000 years ago and that for much of its history it was an open lake. His results record the change from an open postglacial landscape to one dominated by mixed deciduous woodland as the Flandrian succession proceeded. The lake gradually filled-in through hydroseral succession, and this was accelerated in later prehistory by extensive woodland clearance. The removal of woodland was accompanied by marked changes in sedimentation; lake muds gave way to sediments containing considerable amounts of herbaceous detritus, and then to true peats, derived from herbaceous plants colonising and growing on the mire surface. Peat development is usually associated with significant alteration to local hydrology and this, in turn, has been shown to be related to woodland clearance and resultant surface run-off (Moore 1993).

The first major woodland clearance and a change in sedimentation in Innes's (1988) diagram coincides with a radiocarbon date of *220 cal BC–AD cal 120 (89% confidence) (OXA-2325; 2040±80BP)*. These dates cover a long period of time spanning the latter part of the Iron Age through to the period of the construction of Hadrian's Wall. It is tempting to infer that the observed changes were caused by Roman exploitation of local woodland resources during the initial phase of Wall building. However, this clearance was followed by a seemingly rapid and significant regeneration of trees and shrubs. Considering the enormous demand for wood likely to be generated by the building of the Wall, it is unlikely that such a substantial recovery would have been possible in the shorter term. It is more probable that this initial extensive clearance was due to Iron Age use of the region's woodlands, and/or to possible agricultural activity. A single cereal-type pollen grain was found in this clearance phase and this might suggest the proximity of crop fields. However, it must be noted that the site was still open water at this time, and it is possible that the cereal-type grain might, in fact, have been derived from the aquatic sweet grasses (*Glyceria* spp), plants well known to produce pollen in the cereal pollen size range (see Edwards 1989).

The recovery of woodland was followed by a very intensive clearance, and tree pollen percentages eventually fell as low as 10% of the pollen sum. Indeed, the area appears to have remained largely cleared thereafter although *Salix* (willow) seems to have spread over the site during the post-Roman period between AD cal 440–780.

Figure 18 shows the pattern of change in woodland, sedimentation, and concentration of palynomorphs in an area of the eastern edge of Midgeholme Moss from what was probably late Iron Age to Roman/post-Roman times. Lewis's (1993) full data show that this area of the basin had also supported open water, but that herbaceous, peat-forming communities had established on the surface by the late Iron Age.

Local Pollen Assemblage Zone (hereafter, LPAZ) MM1 (Fig 18) shows clearly that in later prehistory, the site was dominated by woodland (arboreal pollen exceeded 81%), while the palynomorph concentration index suggests that peat was accumulating slowly. However, the tree/shrub curve and the 'woodland cover' curve (*sensu* Heim, 1962) indicate that woodland was being systematically cleared. The woodland cover curve is based on the rather over-simplified contention that a value of 50% arboreal pollen is indicative of 50% woodland cover. A value of <50% arboreal pollen is taken to indicate clearance, while a value of >50% infers wooded conditions. While the limitations of this concept are accepted, it is very useful as an indicator of woodland change. A single cereal-type pollen grain found here again might have been derived from the sweet grasses.

In MM2, arboreal values were much reduced and eventually fell below 50% while peat growth was further enhanced; Figure 18 shows that all the major woody taxa were affected. Herbaceous plants such as grasses and sedges increased, probably because the opening up of the local woodland canopy was allowing extra-local pollen (possibly from elsewhere on the mire) to filter into the site. A radiocarbon date of *160–61 cal BC (81% confidence) (GU-5082; 2100±60BP)* towards the end of MM2 suggests strongly that this woodland clearance was made in the late Iron Age and was not related to the building of the Wall. Both Innes's (1988) and Lewis's (1993) results make it obvious that, even though significant clearances were being made, regional woodland cover was still quite extensive during this period.

Zone MM3 (Fig 18) shows that woodland recovered substantially after the Iron Age clearance, reaching values well above 50%, although this recovery was due largely to the increase of alder and hazel. Peat growth slowed as the woodland re-established, and the presence of humified wood fragments within the peat in the latter part of MM3 suggests that trees had spread across the mire surface at this location.

The zone line between MM3 and MM4 is drawn where there are marked changes in lithology, peat growth, and vegetation. This boundary coincides with a broad-ranging radiocarbon date of between *120 cal BC* and *140 cal AD* *(GU-5081; 1970±60BP)*. There was a marked drop in palynomorph concentration, indicating a relatively rapid peat growth and, in spite of trees actually growing on the pollen site, woodland clearance appears to have been in progress. All the major woody taxa declined and there was a very marked rise in sedge pollen, possibly derived from the mire surface as the local canopy became more open. This clearance was of greater extent than the one initiated before *260–61 cal B (81% confidence) (GU-5082; 2100±60BP)* and, in spite of the large range in the radiocarbon date, it is tempting

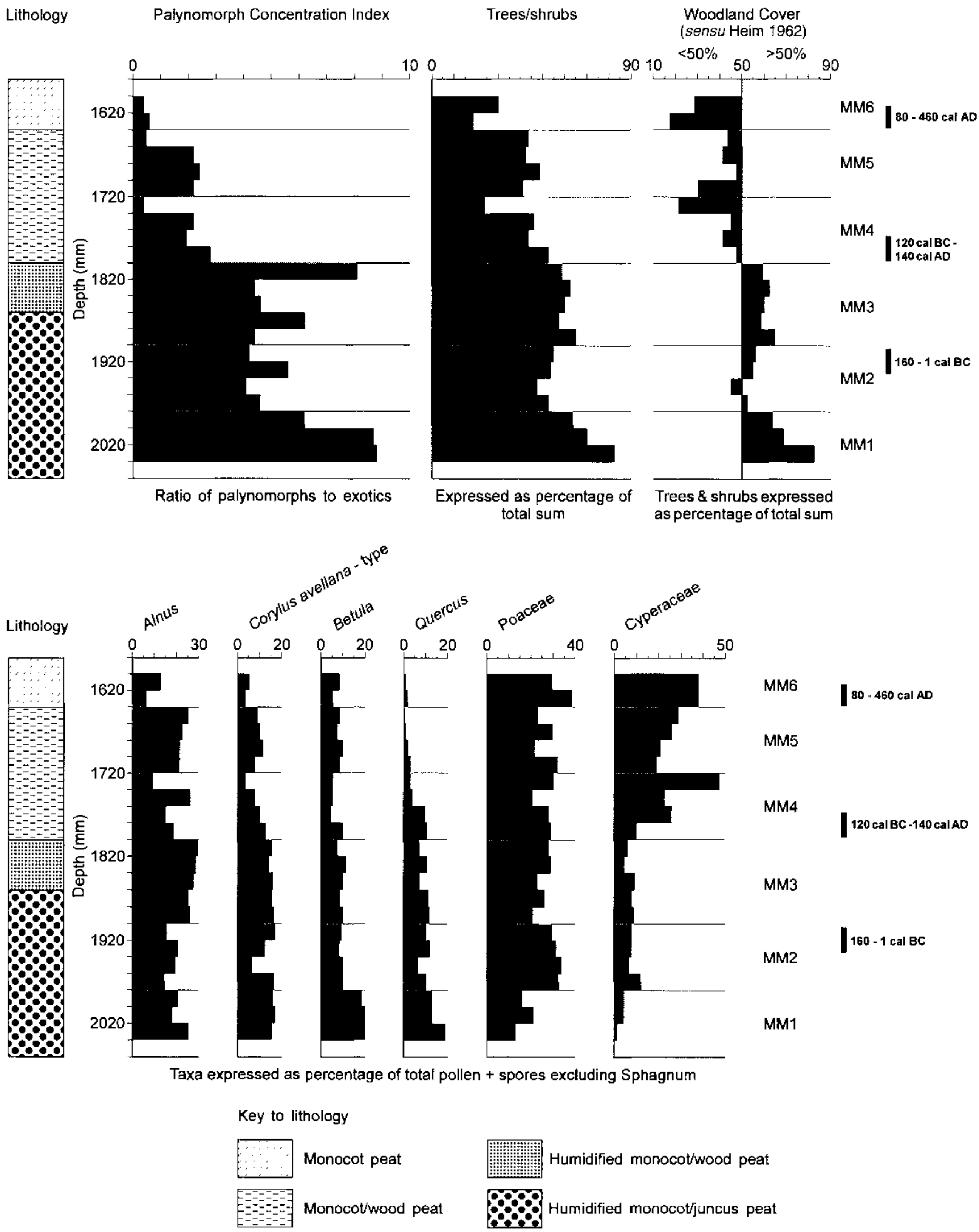

Fig 18 Midgeholme after Lewis

to suggest that it might be related to the Roman presence. The pattern of events certainly mirrors that found by Innes (1988) where there was an initial marked Iron Age clearance, a period of regeneration, and then an extensive and sustained reduction of woodland.

The clearance in MM4 was expansive and it is particularly notable that the decline of oak which occurred in this zone was sustained thereafter. Alder, hazel, and birch could all have been components of a marginal alder carr, and the pattern of their pollen curves could have been reflecting very local events at the site. However, oak is relatively intolerant of high water table (Grime *et al* 1988) and is unlikely to have been growing within the carr. Its demise thus reflects a wider woodland decline.

Zone MM5 records another phase of woodland recovery and a slowing of peat growth. It is interesting that alder, hazel, and birch all recover (though not to their former percentage representation) but that oak declined even further.

The beginning of zone MM6 coincides with a radiocarbon date of *cal AD 80–460 (94% confidence) (GU-5179; 1740±90BP)*, a marked drop in palynomorph concentration, and a change from wood peat to unhumified grass/sedge peat. There was also another dramatic reduction in woodland, and the absence of wood remains in the peat suggests that even trees and shrubs at the margin of the mire were now being removed. Alder, hazel, and birch were all affected but there seems to have been a very small increase in oak. However, this rise could be a statistical artefact and its representation remained well below 5% of the pollen sum. The radiocarbon date indicates strongly that the Romans were responsible for this onslaught on the region's trees and shrubs; and the removal of the very local woodland could possibly have been related to the building of the wooden road which ran very close to the west of the pollen site.

Innes's (1988) work suggests that the first major impact on native woodland near to Birdoswald was in the late Iron Age, that there was a substantial, though not complete recovery of trees, and then a very intensive and sustained removal of trees thereafter. It is likely that the more open landscape was created and maintained by Roman activity in the region. Lewis's (1993) work was carried out at a finer resolution and records more sensitively vegetation changes over a shorter period of time. Thus, episodes of clearance and regeneration might have been recorded which were missed by Innes's wider study. However, both show that before the late Iron Age clearance, the region was heavily wooded with arboreal pollen percentages being above 80% of the total pollen sum. Even at the greatest extent of this first extensive impact on the woodland, arboreal values were over 46% at the eastern margin, and about 50% overall in the region. In the subsequent regeneration, arboreal pollen reached values 65–70% and, even when the Roman impact was at its maximum, values of about 30% are recorded. Thus, a picture of a completely treeless landscape during the late Iron Age and the Roman occupation is hardly tenable.

Results and conclusions

The results of the pollen analyses for three archaeological sample sites (Turf Wall 1 at Birdoswald, the north rampart of the stone fort at the same site, and the Turf Wall at Appletree) are summarised in the pie charts at Figure 19, together with the results from two horizons within the Midgeholme Moss sequence. In the cases of the archaeological samples, the results from the ground beneath the Turf Wall and rampart are given, not those from the Wall fabric. These are divided to show the differences between the upper LFH horizon, the vegetated surface upon which the structures were built, and the Ah horizon which reflects earlier, but not much earlier, conditions upon the various sites. The sub-samples each have two charts, reflecting the amounts of tree and non-tree pollen, and then the proportions of the four main tree species, alder, birch, hazel, and oak.

The Ah horizons beneath the Turf Wall and the north wall rampart at Birdoswald are consistent, indeed almost identical, in showing an alder-dominated woodland environment for the site, with trees and shrubs accounting for over 92% of the pollen sum (Fig 19, A3 and B3). The pollen record of the sample from the truncated morass indicates that dense woodland, though varying in its components, had long been predominant on the spur (compare Fig 14). Before 160 cal BC, Midgeholme Moss was also very wooded, with arboreal taxa accounting for 81.8% of the pollen sum, and with virtually equal proportions of the four major arboreal taxa (Fig 19, C4). The Ah of the buried soil at Appletree (Fig 19, D3 and D4) indicates an environment remarkably similar to that of Midgeholme Moss both in terms of woodland cover and in proportions of alder, birch, hazel, and oak, and it would appear that the woodland was somewhat more disturbed and open here than at Birdoswald. Although heavily-wooded, it is likely that areas of open and probably grazed moorland existed in the vicinity. The comparisons between the respective Ah horizons are, however, imprecise, both because of the nature of the sampling, and the uncertainty that these are more than very broadly contemporary. Comparison with the Midgeholme Moss material must be regarded as highly tentative.

The LFH horizons at Birdoswald and Appletree are more reliable for comparison, as they have two advantages. Firstly, they are in an identical stratigraphic position: as the *in situ* ground surfaces upon which the Turf Wall was built both are sealed by the same stratigraphic structure despite being 1.7km apart. Secondly, they are unusually securely dated by archaeological means, as the Turf Wall was constructed in the early to mid-120s. The pollen from the LFH horizon of the ground surface sealed by the Turf Wall thus gives an absolutely sealed, dated snapshot of the vegetation of the immediate locality of any sample at the time when the Turf Wall builders arrived in the area. At Birdoswald (Fig 19, Bl) the local environment was wooded. Though the canopy was not as dense as that recorded in the Ah horizon, the proportion of tree pollen had reduced by only 5%, to 87.2%.

The main difference was that alder was now co-dominant with birch, which seems to have increased at the expense of hazel. As discussed earlier, this could indicate some level of disturbance, use, or even management in the woodland and the tendency of birch to flower profusely after coppicing. The fact that the ground beneath the Turf Wall was undisturbed, and that the pollen archive was so well preserved within the LFH horizon is evidence for the rapidity of clearance and construction by the Turf Wall builders, who

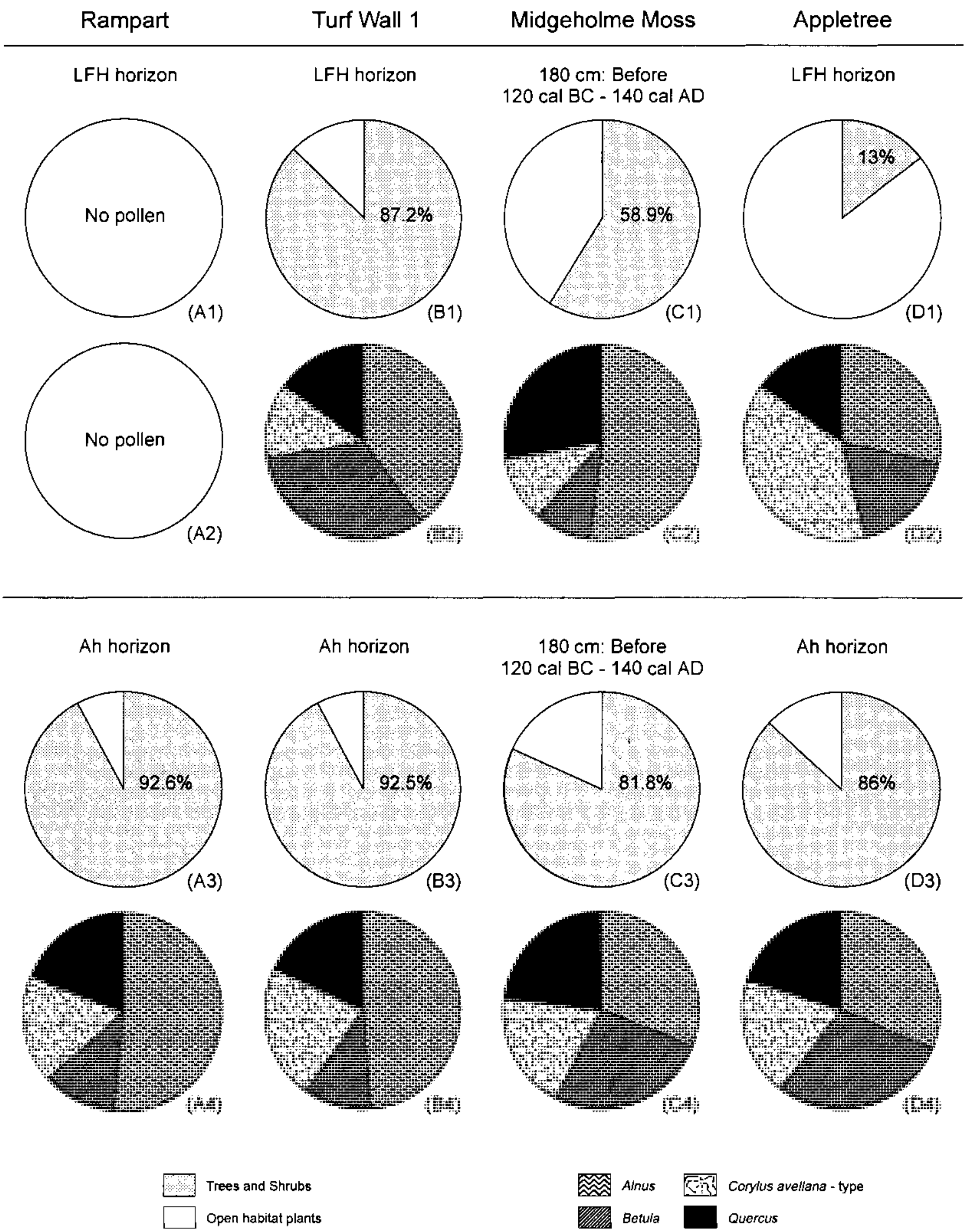

Fig 19 Pie charts for samples from the Turf Wall (TW1), the horizon beneath the Stone Fort rampart in Area B, Appletree, and Midgeholme Moss, comparing proportions of pollen by ecological category, and of trees and shrubs by species

allowed no time between operations to allow the pollen to decay or to become disturbed or diluted. This says much about the speed and efficiency of the builders once the decision to construct the Turf Wall had been taken.

Results from Midgeholme Moss (Fig 19, Cl and C2) show that during and before this period (dated at 120 cal BC–140 cal AD *at 95% confidence GU-5081 1970±60BP*) woodland cover in the area was in the region of 58.9%. Alder was the dominant tree but oak was also extremely important in the landscape. Because of a lack of precision in sampling and radiocarbon dating, correlation between these results and those from the archaeologically-dated buried LFH at Birdoswald is fraught with difficulty and can only provide tentative regional background suggesting a more open landscape than that on the spur.

The LFH horizon at Appletree reveals a very different immediate pre-Turf Wall environment from that at Birdoswald (Fig 19, Dl and D2). As has been discussed earlier, the Appletree area was dominated by open wet moorland with tree pollen down radically from 86% to 13%. Wholesale clearance had certainly taken place since the deposition of the pollen in the Ah horizon; three episodes of burning are reflected by the soils evidence, and these might reflect either primary woodland clearance or subsequent moorland management. It seems that on the removal of tree cover moorland vegetation, which had existed in the immediate area, colonised the Appletree site. Because of differential pollen production it is difficult to estimate the true proportions of the major woody taxa representing the remnants of the former woodland, although hazel had the highest pollen representation.

Until recently, there has been a relative paucity of pollen diagrams relating to the Iron Age and Romano-British periods for the landscape along Hadrian's Wall, and most information came from the regional work of Donaldson and Turner (1977), Davies and Turner (1979), Turner (1979), and Barber (1981). As already stated, however, this has become an area of increasing interest to researchers in more recent years (Barber *et al* 1993; 1994; Dumayne, 1993a; 1993b; 1994; Dumayne and Barber 1994; Tipping 1995; forthcoming). Recent work by Dumayne (1993a), on a series of moss site on the lines of Hadrian's Wall and the Antonine Wall, as well as the country in between, has been deliberately aimed at establishing dates of clearance, in order to assess the impact of the construction of large scale Roman frontier works upon the region. The principal value of this work has been to challenge the conclusion that the first major clearance took place during the Roman period. On the contrary, it is clear that the earliest increase in the pollen of grasses and consequent decline in woodland pollen occurred during the Iron Age, and that a relatively-open landscape existed before the Wall was built. Such evidence comes particularly from Walton and Glasson Mosses in Cumbria (Dumayne 1994). The results at Appletree are entirely consistent with this view, as are recent results from the excavation of the Turf Wall at Crosby on Eden (Bennett forthcoming b).

It is clear that the builders of Hadrian's Wall were greeted by a mixed pattern of land use. To the west and east, in the fertile river valleys, arable agriculture was taking place. This has been archaeologically demonstrated, mostly by the presence of ard marks in pre-Wall subsoils. Sites at the eastern end of the Wall include, *inter alia*, Wallsend (Daniels 1989a, 77; Bidwell and Watson 1989, 21 8), Stotts House, Walker (Jobey 1965, 80), west Newcastle (Harbottle *et al* 1988, 153), West Denton (Bennett forthcoming a), Throckley and Wallhouses (Bennett 1983a; 1983b), and Carrawburgh (Breeze 1972, 85). To the west, similar evidence has been found at Annentwell Street, Carlisle (Charlesworth 1979d) and Tarraby (Smith 1978, 35–6). In the central area a pastoral economy, and preferential clearance associated with grazing may have been partly responsible for the Iron Age open landscape at Appletree and Crosby, and the absence of any evidence for cultivation. A dense deciduous woodland continued to prevail at Birdoswald. The site, ideally suited to Roman military purposes, was less useful for grazing, as it was adjacent to a cliff edge, and the woodland harboured a small peat moss. This may explain why no clearance took place here prior to the construction of the Wall. Similar local topographical reasons might explain the evidence from Dumayne's (1994) survey of Fozy Moss. This site, 200m north of the Wall at Sewingshields, showed that major woodland clearance in the area was initiated *c* 125. Similarly at Bolton Fell Moss clearance did not occur before the Roman period (Dumayne 1994, 24).

Evidence for a varied pre-Wall landscape could be further inferred from the work of Simpson and Richmond (1935) at Garthside, where the use of clay instead of turf as a building material suggested to the excavators that an area of woodland might have existed here, and therefore that turf was not readily available. The Garthside work in 1934 is notable as the first occasion on which samples from the Turf Wall were analysed. One of these was from Appletree and, though there was no quantification, it is clear that the results acheived (ibid, 245) were broadly similar to those from the 1989 sample reported above. Impressed by this result, Simpson saw that, 'samples from the Turf Wall throughout Cumberland would enable us to reconstruct a detailed picture of the local flora in Roman days, a novel possibility beyond the dreams of older generations' (ibid). This remains true. The present authors see this chapter as only a first step upon the road envisaged by Simpson 60 years ago.

The study presented here must be considered to be preliminary. The lack of strict temporal controls for both the soil and turfs, and for the mire peat is tantalising. However, fine resolution palynological and micromorphological analyses of buried soils and turfs, coupled with detailed fine-resolution analysis, and adequate radiocarbon dating of adjacent mires would help establish the temporal relationship between the soils and sediments. Indeed such a study of the remains of the Turf Wall and adjacent mires stretching westwards would greatly enhance our knowledge of the landscape confronting the Roman Wall builders.

3 Occupation before the Stone Fort (Period 1)

Summary of evidence from early excavations

The excavations of the late nineteenth and early twentieth centuries created the framework for all later work at Birdoswald, and the annually published reports of these operations set out much of the detailed evidence for the periods of occupation before the stone fort was built. No full synthesis of these reports was published and interpretation constantly changed as season succeeded season and more discoveries were made. During the excavations those phases which were earlier than the construction of the stone fort were designated Phases I–III (Simpson and Richmond 1933; 1934a). In the following summary of the principal results of this work these numbers are placed in parentheses after each heading. The principal features are illustrated with excavation dates in Figure 7, and the relationship between the original phasing and that which will be suggested in the discussion of this Period is summarised in Table 2.

The possible signal tower

'A good building 20ft [6.096m] square with 3ft [960mm wide] walls standing 13 courses high' (Richmond 1931, 130) was found east of the south-east corner of the stone fort in 1930. Though water inundation prevented the full excavation of this building, it should probably be identified as a signal tower like those at Mains Rigg, Pike Hill, and Walltown, which have the same dimensions (Daniels 1978, 209, 220, 186). This building was not mentioned by Birley (1961) in his *Research on Hadrian's Wall*; he interpreted the rectangular timber enclosure on the promontory south of the later stone fort as a signal post (ibid, 143).

The promontory enclosure ditch and palisade (Simpson and Richmond 1934a, Phase I)

The earliest enclosures on the site comprised a pair of concentric ditches associated with a palisade trench which cut off the spur end to the south of the stone fort (Fig 7). The inner ditch was the best preserved. Its course described five changes of direction, which were mirrored by the palisade trench on the inner (south) side, and by the outer ditch. Both ditches were later cut by the ditch of the Vallum. On the eastern side the ditches terminated in butt ends against the river cliff, while the west end of the inner ditch was eroded by land falls, and the outer ditch was not traced westward of the ditch of the stone fort. This enclosure has been conventionally interpreted by Birley (1961, 143) and in successive editions of the Wall *Handbook* (most recently Daniels 1978, 204) as a pre-Roman native promontory fort. The evidence for this suggested date was the discovery of 'native' pottery in two locations: in an 'occupation' layer noted in the section of a pit, and also in a pit which was apparently associated with a hearth (Simpson and Richmond 1934a, 123). Neither of these features was stratigraphically associated with the ditches, so any connection between them was always tenuous. Subsequent re-evaluation of the 'native' sherds (Jobey 1979, 130) has shown them to be vessels in Housesteads Ware, a fabric with Frisian attributes which is found in early second-century contexts at Vindolanda, in third-century contexts at Housesteads (ibid), and also at Burgh by Sands (Greene 1986). This pottery is clearly representative of a Roman, and not a pre-Roman Iron Age, date.

Only brief mention is made in the excavation report of the finds from the ditches themselves (Simpson and Richmond 1933, 246). Additional evidence comes

Table 2 Summary of the sequence of events before the construction of the stone fort

1987–92 period and site phase	*activity*	*Simpson and Richmond Phase*	*dating*
Period 1	stone signal tower to SE of later Stone Fort (Fig 24a)		?Trajanic
Site Phase 1	construction of Turf Wall, Turret 49a	Phase III	early Hadrianic: Milecastle 50TW built under Nepos
	polygonal spur-end ditch and palisade containing rectangular enclosure (?construction camp) (Fig 24b)	Phase I	Trajanic/early Hadrianic pottery from rectangular enclosure
Site Phase 2	morass drained; turf and timber fort constructed on south-east stone rampart base	Phase II	rampart delimits dumping including Trajanic samian below Hadrianic levels
	timber structure beneath Building 198		
	Vallum constructed respecting turf and timber fort (Fig 24c)	Phase II	

from the classic report by McIntyre and Richmond (1934) on the Roman leather tents from the site. They record the context of the tent fragments as follows:

> In 1931 a section cut through the inner ditch of the early polygonal enclosure revealed in the black silt which filled the very bottom of the ditch, a compressed mass of leather. The position showed that this had been thrown into the ditch while the polygonal enclosure was still occupied, and that it had not come in as part of the later filling.
>
> (ibid, 68)

This evidence strongly suggests that the polygonal enclosure was a Roman structure; possibly the palisade and ditches of a temporary camp on the spur end. The polygonal enclosure contained a smaller enclosure formed by a ditch with an entrance in the north-west side. This shared the stratigraphic relationships of the polygonal enclosure in that it too was cut by the Vallum ditch. A small runnel containing window glass and pottery which 'is consistent with an early Hadrianic date but does not exclude the possibility of a Trajanic foundation' (Birley 1961, 143), divided the enclosure into two areas, the front of which was occupied by a cobbled 'forecourt'. The excavators accepted that the rectangular enclosure was in contemporary use with the polygonal enclosure (Simpson and Richmond 1934a, 120).

The Turf Wall, ditch, and Turret 49a (Simpson and Richmond 1933, Phase III)

The fact that the Turf Wall or, more specifically, the Turf Wall ditch, ran in an undeviating line beneath the stone fort was established by Haverfield (1898a, 181; Hodgson 1898, 207–9). In 1927 the material of the Wall was found to consist of peat blocks which retained traces of heather vegetation, prompting Simpson's belief (1928, 380) that the material was taken from Midgeholme Moss. The filling of the ditch was examined in 1928, within the walls of the later stone fort, and found to consist of 'blocks of peat, cut oblong, and pitched anyhow into the Ditch, which was 7 feet 10 inches [2.39m] deep by 27 feet 6 inches [8.36m] wide at the top'; though the drainage channel at the bottom of the ditch was filled with 'washed silt', there was no sign of vegetation growth in it. The excavators concluded that the case is conclusive for a filling of the Turf Wall Ditch soon after it had been cut' (Richmond 1929, 303 4).

The Turf Wall and the site of its robbed stone turret (49a) were identified in 1945 by Simpson and Richmond (Soc Antiqs Newcastle upon Tyne 1946, 275; Birley 1966a, 17) beneath the *principia* of the stone fort (Fig 17). All that remained of the turret was a gap in the Turf Wall and a scatter of mason's chippings (Richmond 1957, 179).

Evidence for an early fort (Simpson and Richmond 1933, Phase II)

The idea that there was actual occupation before the stone fort was constructed (as distinct from mere building activity associated with the Turf Wall) derives from a number of small pieces of evidence, which suggest the existence of a turf and timber fort considerably smaller than its stone successor.

The first indication that such occupation had occurred came in 1927, when a covered drain which predated the east wall and rampart of the stone fort was found (Richmond 1929, 303). A ditch found in 1930, which had not been dug until the Vallum was present, also apparently antedated the stone fort. The 1930 excavation established the existence of a deep dip or 'slack' in the centre of the fort, which was filled by the natural morass (Fig 13). This implied that 'occupation of the site on a large scale was impossible until this bog was levelled and drained' (Richmond 1930a, 4). The small ditch found in 1930 cut through:

> made ground tipped in on top of [the] morass. The extent of this morass was not discovered, but it continued north-westwards, well beyond the limits of the [stone fort] ditch system, and it yielded Roman rubbish, old shoes and scraps of pottery and also a drain. It thus became clear that the newly discovered ditch .... was not connected with the first occupation of the site. Before it was constructed, there was time to drain a morass, to deposit rubbish within it and to level it completely.
>
> (Richmond 1931, 123)

The relationships between these features allowed Richmond to conclude that 'at the south the Vallum was laid out first; at the north, a morass was first drained and then filled up, two distinct operations hinting at two distinct policies in the treatment of the site' (ibid, 124).

In 1931 'the south east area was examined by two cross trenches, from the Decuman [south] Gate to the east Quintan Gate, and from the centre of the first to the south-east angle-tower' (Simpson and Richmond 1932, 141). At the southern side of the interior of the fort, near the junction of the two trenches, and below 'Hadrianic levels' lay:

> unequal ground, now slopes and now shallow pits, yielding thick rubbish, including, in Samian, form 37, decorated by Trajanic *Butrio* ... also much leather, being shoes and a short sword scabbard. All this looked like spread rubbish rather than traces of habitation for which evidence only appeared further up the slope. The first sign was a long foundation, 11ft 6ins [3.51m] wide and kerbed to the north, but considerably destroyed by later builders...
>
> (ibid, 141 2)

In this context, after the 1929 work had taken place, 'Hadrianic levels' can be assumed to mean the earliest levels of the stone fort. The foundation was thought to include a curved corner slightly to the west of the place where the curve of the south-east corner of the stone fort began. In the following year it was further examined. The phrasing of the description of the feature in the published report can lead the reader to the conclusion that the interpretation of the foundation as the base to a turf rampart was discarded, disproved, or rejected. In fact a careful reading of the paragraphs shows that Simpson and Richmond (1933, 252–4) were absolutely certain that they had found such a rampart base, and it was only the corner of the feature whose existence they doubted. The foundation itself was interpreted as part of a fort associated with the Vallum, which was thought at the time to be earlier in date than the Turf Wall. Yellow clay overlying the foundation was actually the east edge of an oven, to make way for which the [early rampart] foundation had been dug away' (ibid). This was one of four ovens whose

> mouths encroached on the foundation making gashes in it where it had been deliberately dug away opposite to them. The kerb of the foundation lay too far beyond the oven mouths to have served as the back edge of a rampart associated with them

At the South Gate, behind the east guard tower

> the kerbing of the foundation had been removed, but the very distinctive pitching of sharp, freshly-quarried stones ran on until it approached the pathway leading to the guard-chamber doorway.

The original published plan is reproduced as Figure 20. The conclusion is definite, that the early straight foundation both predated the stone fort, and that 'its extant remains are the chance survivals of a thorough demolition'. The excavators conclude that, though there was no

> trace of the structure which the foundation carried ... yet a rampart foundation it assuredly is. Its type of kerbing proves that it is not a road, and its sharp pitching shows that it is not a wall foundation. Thus it must have carried an earthwork of some kind.
>
> (ibid, 252–4)

A curving drain and hearth located to the east of, and on line with the early foundation, but well to the west of the angle of the stone fort was originally identified as reflecting the corner of the early rampart (Simpson and Richmond 1932, 142), though this was subsequently rejected as an interpretation. There are two

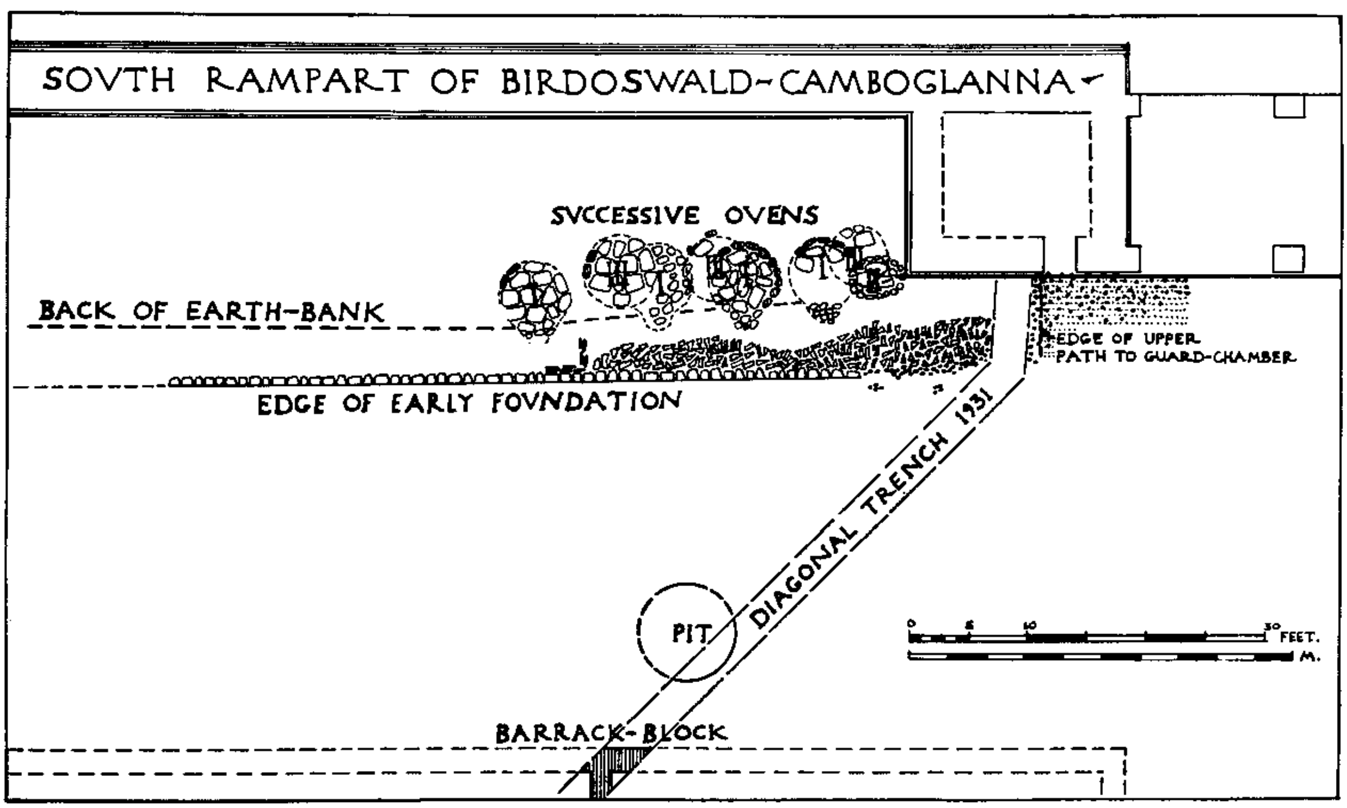

Fig 20 Published plan of excavated area on the south wall of the fort showing the early foundation beneath the stone fort rampart (reproduced by permission of the Cumberland and Westmorland Antiquarian and Archaeological Society)

possibilities: either the rampart did turn northwards at a similar point to the wall of the stone fort, or it ran on to the east beyond the line of the east wall of the fort.

In 1931 Simpson and Richmond (1932, 142–3) noted that the south rampart of the stone fort was built of 'rubbish representing an extensive pre-fort occupation'. The presence of pottery in the rampart backing of the stone fort was taken as

> presumptive proof of an occupation coming between the Vallum Fort and the stone fort. For had the latter immediately succeeded the former, the clean clay rampart of the former must have been used to form the new earth bank, whereas the material actually employed was occupation earth from elsewhere.
>
> (ibid)

The following year, when the clean clay upon the rampart base was found to be part of the later ovens, the idea of a phase between the rampart base and the stone fort was abandoned, and the excavators concluded that 'the systematic destruction of the [early] fort ... [is] ... sufficient to account for the debris in the south rampart' (Simpson and Richmond 1933, 262).

The Vallum (Simpson and Richmond, 1933, Phase II)

In 1896, Haverfield (1897b, 416) established that the Vallum appeared to skirt the stone fort to the south, although it grazed the fort's south-west corner. The precise layout of the Vallum was not, however, recovered until 1932 (Simpson and Richmond 1933, 247–52). During that year, the regular point-to-point course of the Vallum as it skirted a fort was traced, and it was demonstrated that a causeway had been provided across the Vallum as part of its primary conception. This causeway was formed not by back-filling the Vallum ditch, but by leaving a strip of undisturbed material in place, and revetting it with stone walling which was founded on substantial squared blocks at the base, all of which had lewis holes (Fig 21). These blocks were designed to carry the weight of an arch and gate over the causeway, and the first such gate to be found was discovered at Benwell the following year (Birley *et al* 1934). The Vallum causeway at Birdoswald was the first of its type to have been found at any fort.

Between milecastles 49 (Harrows Scar) and 50TW (High House), including the deviation at Birdoswald, the north mound of the Vallum was omitted, leaving a south mound of double size. This was particularly clear immediately west of milecastle 50TW, where the north mound resumed, and the south mound was reduced in width (Simpson and Richmond 1937a, 172–3).

In 1928 the relationship of the Vallum to the south-west corner of the fort was examined (Richmond 1929, 306–8). It was found that the inner ditch of the stone fort cut the deliberate filling of the Vallum ditch, and

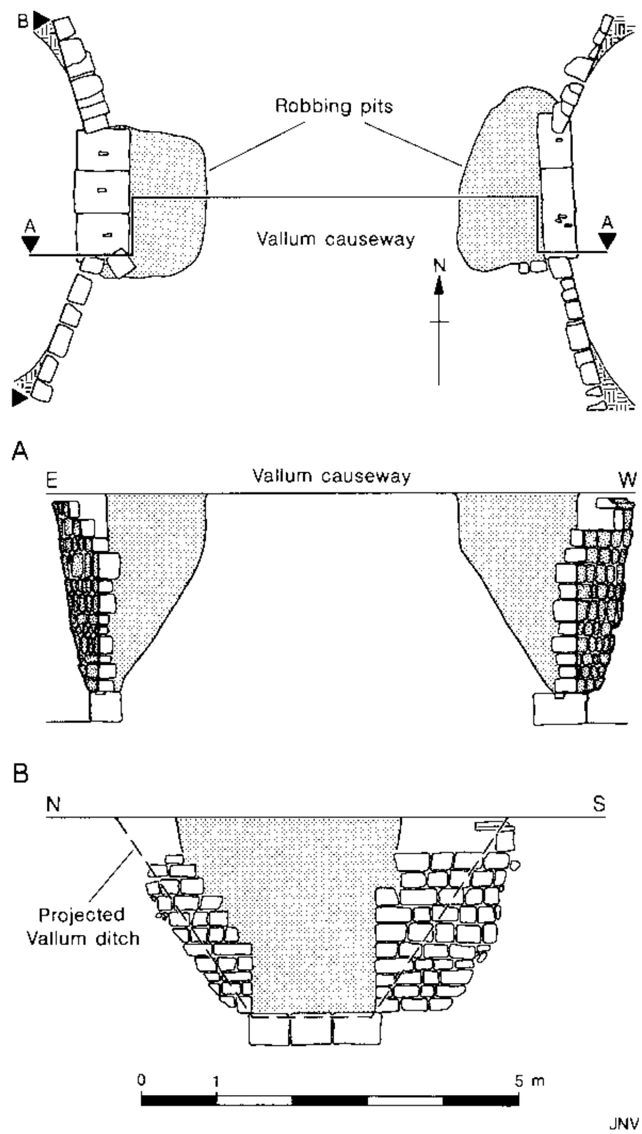

Fig 21 The Vallum causeway to the south of the fort, excavated and recorded in 1932 (after I A Richmond)

that the fill of the Vallum comprised blocks of peat below boulder clay, thought to be the mound material of the Vallum pitched back into the ditch. The fill of the stone fort ditch was very different from that of the Vallum ditch, consisting of silt overlain with masonry collapse. It was felt by the excavator that this ditch was primary to the stone fort and that it was open throughout the lifetime of the fort. A second ditch, apparently unfinished, lay outside the inner ditch, and was evidently a further element in a primary multiple ditch system for the stone fort. This outer ditch cut the filled Vallum ditch in two places (Fig 7). Richmond wrote:

> For the moment then we get the following facts. Very soon after the Vallum had been dug at Birdoswald, its mounds were removed, and the ditch was filled up level with the surface. Not all the mound content was put back into the ditch, but practically none was left on the ground ... the new [stone] Fort was now erected on the site.

> The ditch system of the Fort was dug right across the filled in Vallum Ditch in such a way as show ... that the two, [stone] Fort ditch and Vallum ditch in no way formed part of the same system.
> (Richmond 1929, 310)

He concluded that it had:

> thus become evident that the course of the Vallum had indeed nothing to do with the present Fort, since at the time the Fort was built, the Vallum was out of existence at Birdoswald, not long after it had first been projected.
> (ibid)

This conclusion was restated the following year, when the idea that the Vallum was associated with an earlier fort began to take root:

> The Durham University excavations of 1928 proved the Vallum, as well as the Turf Wall, to antedate the stone fort: and they began to indicate an earlier structure avoided by the Vallum.
> (Richmond and Birley 1930, 169)

The botanical evidence taken in 1928 demonstrated that the Vallum ditch was extremely short-lived, concluding that 'the Ditch could only have been open a year or two before the re-filling with the peat' (Blackburn, 1928, 308).

Swinbank and Gillam's later work (1950) on the pottery from the Vallum ditch appeared to confirm an early filling. The pottery was published as a securely-dated later Hadrianic group, suggesting a date for the Vallum filling in the late 120s or the 130s (ibid, 61), although the group (Gillam 1970, group 36) has subsequently been dated to 130–40 and, as Bidwell and Holbrook (1989, 78) correctly point out, could be as late as Antonine in date. An aspect of the eradication of the Vallum was the deliberate robbing of the causeway revetting walls, for which robbing pits were excavated through the causeway (Fig 21). As these pits were filled with the same material as the ditch, the robbing must have been simultaneous with the backfilling (Simpson and Richmond 1933, 250, fig 3).

Evidence from 1987-92

Period 1 was represented by two successive Site Phases (Table 1; Fig 11). Site Phase 1 represents the Turf Wall and its ditch, and Site Phase 2 comprises timber structures above the Turf Wall Ditch which were sealed by the earliest deposits of the stone fort.

The Turf Wall and its ditch (Site Phase 1)

The earliest human activity in Area A was represented by exposures of the structure of the Turf Wall and its ditch in those limited areas where these survived and were examined. Analysis of the underlying natural topography showed that the Wall was built on a natural ridge representing a high point from which the ground dipped northwards into Midgeholme Moss and southwards into the morass. On the eastern side of the later stone fort ditch the southern tail of the Turf Wall was located 6.7m to the south of the west gate (Pl 3). Within the stone fort the Turf Wall had been subject to thorough destruction. Immediately to the east of the *porta principalis sinistra*, frequent patches of hard brown organic material with traces of vegetated surfaces (4300) were recorded, representing surviving Turf Wall material still adhering to the natural ground surface from which the rest had been cleared or, possibly, elements of the original vegetated surface upon which the Turf Wall had been built (Crosby on Eden notwithstanding; Bennett forthcoming b).

The structure of the Turf Wall and the origins of the turf

by Tony Wilmott, Maureen McHugh, and Patricia E J Wiltshire

Outside the stone fort walls the structure of the Turf Wall was examined on both sides of the ditch to the south and west of the *porta principalis sinistra* (Fig 26). The Turf Wall (1707) covered the whole of the small area which was excavated to the west of the ditch complex. It was waterlogged, and therefore exceptionally well preserved. It was examined both microscopically (in samples TW1 and TW2; Fig 13) and macroscopically.

The analysis of sample TW1 confirmed the archaeological interpretation of the sequence of building. The surviving Turf Wall consisted of two separate inverted turfs, one above the other, both comprising the LFH and underlying Ah horizons. The absence of fine humose mineral soils similar to that of the Ah horizon of the buried soil profile, suggests that the turfs were not removed and inverted *in situ*, but that they came from elsewhere and were inverted upon an existing vegetated surface. The two vegetated surfaces were archaeologically observed as a 5mm deep layer of black, greasy material containing visible plant remains. As this black layer dried out during excavation it split and delaminated as it had been laid, separating the two vegetated surfaces. The inverted turf comprised 140mm of a black loamy, humified peat (38% organic matter). On top of this was a clayey, humose mineral soil, in turn overlain by a shallow peat and its associated mineral soil. This consisted of the Ah soil elements of two turfs placed back-to-back. The mineralogy of these soils suggests a broadly local origin for the laid turfs. The inclusion of the mineral subsoil and the vegetated surface in the case of the uppermost turf and a marked increase in intact tissue debris with depth in the lower turf suggests that both were derived from areas of shallow peat. Their high mineral content, the humified nature of much plant debris, the moderate pH of the lower turf and the evidence of the pollen suggest that both turfs were derived from a shallow soligenous mire close by or, less

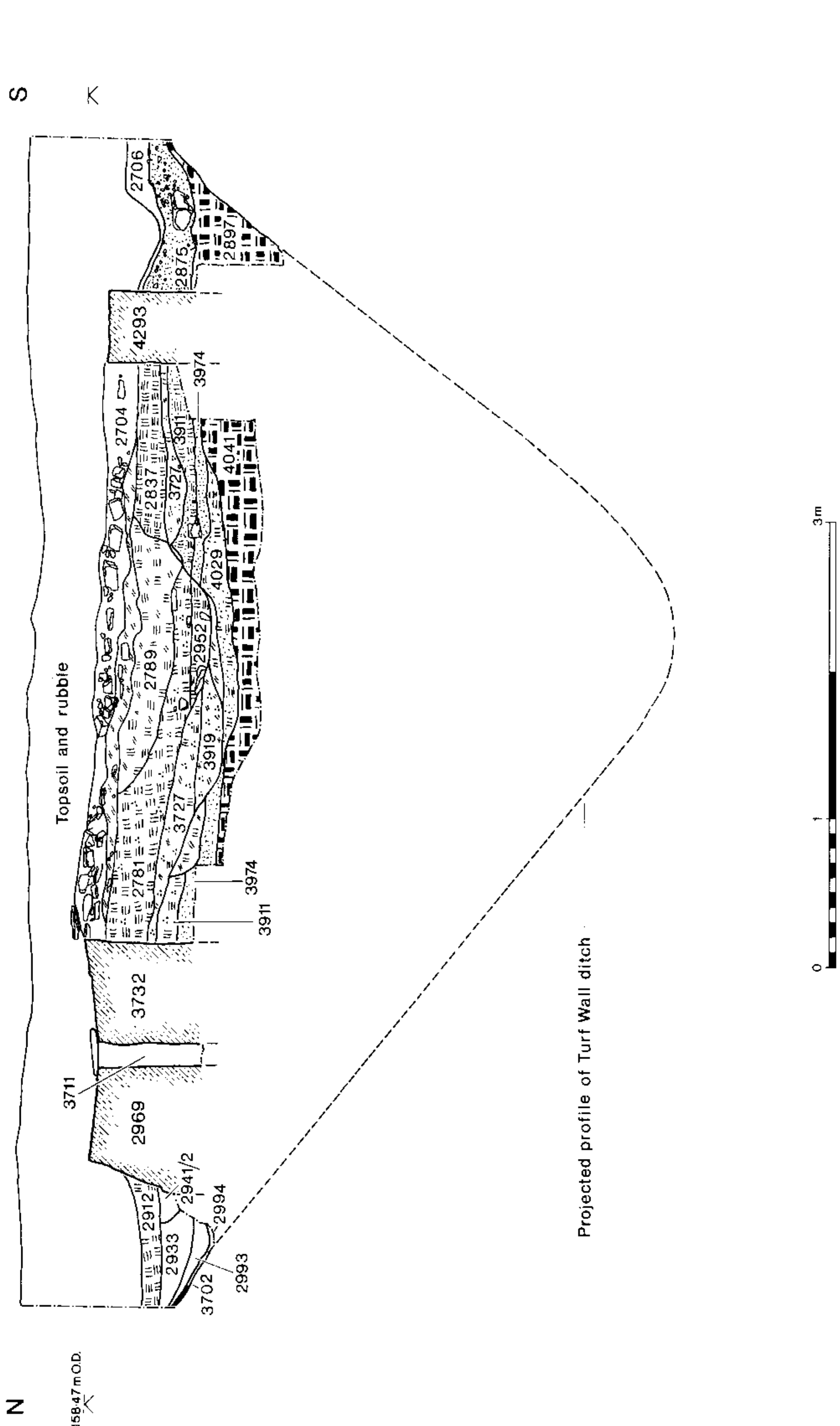

Fig 22 Section 3: north-south section across the line of the Turf Wall ditch to the west of Area A (for location see Fig 9)

probably, from the margins of the Midgeholme Moss. The vegetated surface of the upper turf consisted of a 3mm depth of plant remains, mosses being particularly visible. These mosses and their ecological significance are discussed above.

On the eastern side of the fort ditch (sample TW2) it was more difficult to assess archaeologically what elements of the Wall (4172) were present, although it appeared that mineral soil was dumped directly onto the buried land surface without an initial turf. A turf was placed on top of this with the surface uppermost. The turf above this was also not inverted. The loamy, humified peat soils were much more irregular, mineral rich, and stony than those at TW1 and lacked any distinct root mat or mineral subsoil. General mineralogical and particle size characteristics suggested that the turfs had a local origin, while their micromorphology indicated that they comprised intact peaty soils which although roughly cut, were placed over the *in situ* soil rather than dumped (McHugh forthcoming). Both turfs are thought to have accumulated in a near neutral, moist, mineralogenic environment which was rich in plant, microbial, and soil faunal detritus. Although there is evidence to suggest *in situ* tree or shrub growth, the upper turf at least was colonised by diverse non-woody plants, perhaps rushes and sedges, prior to its removal. It is thought that these turfs also developed on the moist and wooded margins of a nearby mire, though probably not the Midgeholme Moss (*contra* Simpson 1928, 380).

The Turf Wall Ditch

The backfilled Turf Wall Ditch was a far more readily identifiable feature within the walls of the stone fort than the obliterated Turf Wall. Though examined only in one small exposure on the east side of Area A, the presence of this feature below the later Building 4400 and the north tower of the *porta principalis sinistra* of the stone fort, was indicated by the subsidence it caused in the overlying buildings. This was apparent from the fact that, despite the thorough way in which the tower foundations were laid (Fig 28), efforts were later required to buttress it, and also from the constant rebuilds to which Building 4400 and its successors were subject.

The partial Turf Wall Ditch section at the east excavated end of Building 4400 (Section 3, Fig 22) shows a ditch 7.70m wide at the top, with a steady, even slope of 45 degrees or steeper. The projected depth of the ditch is 3.80m. In the south and north edges of the ditch the fill was a mixed clay and organic layer, within which a characteristic laminated pattern of redeposited turf was clearly visible (2897, 4041). Turfs could be seen in section, pitching into the ditch at a considerable angle.

As the walls of Building 4400 were to remain *in situ*, it was only possible to excavate a trial area 3m square below the floors of its eastern room (room v; [illegible]. The ditch was not completely emptied here, but was excavated down to what appeared to be the earliest layer of deliberate backfill (4041). This comprised a dark-brown, anaerobic clay loam. It had a high organic content and the black outline of individual turfs were clearly visible; it also contained fragments of brushwood. The results of this small examination would seem to confirm that the Turf Wall Ditch was deliberately backfilled with material from the demolished Turf Wall itself, echoing Richmond (1929, 303–4).

Pre-stone fort structures (Site Phase 2)

A number of features, mostly insubstantial, poorly preserved, or imperfectly understood, suggested that there was a phase of occupation, including construction, which predated the stone fort.

Outside the stone fort, overlying the south tail of the Turf Wall was a build-up of peat (4130, Pl 3) which may have partially accumulated before the construction of the stone fort.

The very earliest features beneath the west end of the north *horreum* (Building 198) were located in a rectangular trench only 2m wide. Due to the waterlogged conditions in this sondage recording was very difficult. The features consisted of a series of cuts, mostly recorded in section (Fig 23) and containing no finds. The main feature was a substantial north-south post-trench (1966). This was originally flat bottomed and steep sided, at least 1.30m in width. At the bottom was a slot (1967) at least 800mm in width (the western edge of the slot was not defined). Some difficulty was experienced in the excavation of this feature as the eastern side had slumped, causing an undercut profile. The fill of the slot (1973) was a layer of yellow crushed sandstone. There were two fills in the trench. Layer 1971 was apparently packed around timbers which were later deliberately withdrawn creating a void (1965) which was filled by a mixed organic clay-silt containing straw (1964). The profile of the bottom of this void suggests that two posts were placed side by side in the trench. If so the eastern post was placed less deeply than that built into the deep trench. The posts would originally have been around 250–400mm in width, and positioned 310mm apart. The overcut on the eastern side was probably made when the posts were extracted.

Stratification beneath Building 197 was sampled only in a 2m wide north-south section trench on the line of Section 1 (Fig 25) This showed that there was a considerable depth of stratification pre-dating the *horreum*, though there was no sign of any other stone building. The OGS (1240=399) lay at a steep slope from north to south. On the southern side a deposit of natural peat (1251=367) 320mm in depth overlay the clay. This was cut by a straight-edged feature (1248) filled with laminated silt, sand, and peat (1246) and sealed by a patch of organic peat (1243=1244). On the north side of the later wall (473), the stratigraphy was completely different. The natural clay was overlain by a series of deposits which appear to equate with 394 between the two *horrea*.

From the bottom, sequentially these were a brownish, sandy, mixed peaty clay (1238) overlain by disturbed, mixed peat containing a sand lens (1235). The sequences were cut by a further feature (1247=1252). A sandy primary silt (1237=1242) within this cut was succeeded by a mixed sand, clay, silt, and peat fill (1236=1241). It was not possible to establish whether these features comprised pits or linear features, or whether they were associated with timber structures.

Dating and finds

Dating and finds evidence for any element of the pre-stone fort Roman activity on the site have been rare in every excavation undertaken.

Apart from the signal tower, which produced no finds, the earliest feature on the site must be the Turf Wall, as no woodland clearance is attested in the pollen record beneath the turfs of the Wall. It has been concluded that construction was so swift that there was no time for the fact of tree clearance to appear in the pollen record before the bottom turfs of the Wall were laid. The only stratified finds from the Turf Wall and ditch were as follows:

Beneath the Turf Wall, Area A

Cornelian intaglio depicting an eagle flanked by maniple standards. A Trajanic analogy suggests a date for the intaglio (Fig 195, No 86).

Primary rampart of stone fort

A large volume of cultural material has been found at various times in the primary earthen rampart of the stone fort. The fact that the south rampart of the stone

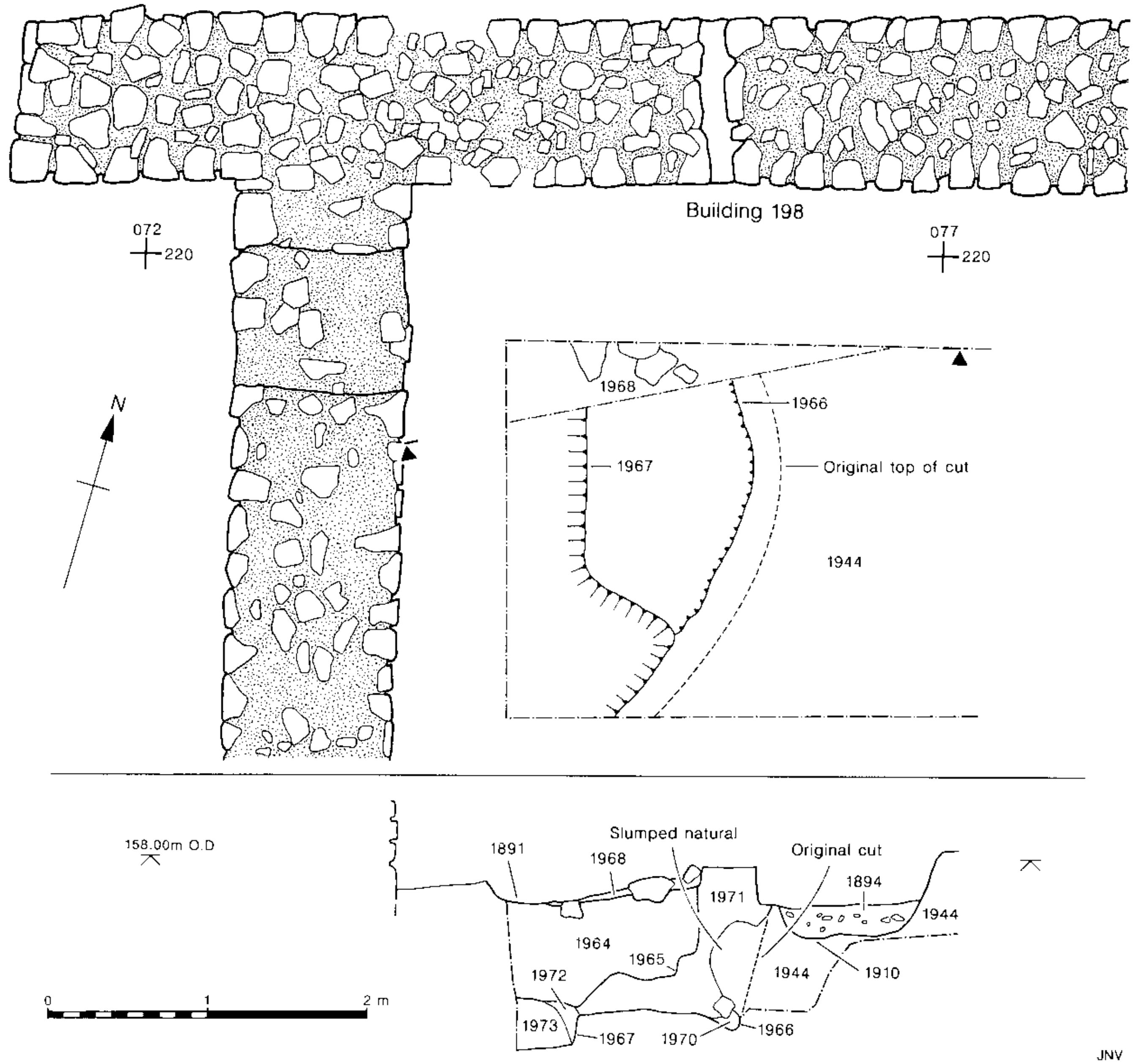

Fig 23 Plan and Section 8, showing early features beneath the west end of Building 198

fort was apparently composed of 'occupation earth from elsewhere' was noted by Simpson and Richmond (1932, 143), and during the work on Areas B and F, a similar conclusion was reached for the material in the north and east ramparts. Simpson and Richmond (1933, 262) suggested that this derived from the scraping up of earth for rampart building from inside an earlier fort. If this is so, then finds from the earlier occupation might be represented within the primary rampart of the stone fort, and it should be noted that the samian ware tends not to be early in date. Otherwise, the only evidence for the date of the early rampart base is the Trajanic samian found in spread rubbish which was associated with it.

The idea that the rampart finds relate to a pre-Stone Fort occupation should be treated with considerable caution, as the story of the construction of the stone fort is sufficiently complex to allow other interpretations; however, it is considered appropriate to list such finds here.

Pre-1987

South rampart
Two mortaria, stamped ANAUS (from 'black layer at base of rampart section west of the south-east angle tower'). He worked at Corbridge *c* 155/60–75, but also further south *c* 130 55/60.
Samian bowl (18/31), stamped BITVRIXF (Simpson and Richmond 1932, 142), a Lezoux potter. Hadrianic-Antonine (Simpson 1995, 286)
Samian bowl (37) with stamp of Moxsius of Les Martres-de-Veyre (Simpson and Richmond 1933, 262). Hadrianic–Antonine (Dickinson and Hartley 1988, 225, no 77; 1993, 212)

East rampart, north of porta principalis dextra
Hoard contained in arm purse (Fig 296; Richmond 1950a; 1954; Watson 1954). As Bennett (1990, 350) points out, this hoard was closed before the issue of Hadrian's second coinage from AD 125 onwards (RIC, 137).

1987–92

Area B: north rampart
Coins: No 7, Trajan, 101–2
No 21, Hadrian, 119
No 24, Hadrian, 118–38
Pottery: Analytical Group 1
Coarse wares (Fig 155), Nos 1–4, 6–11, 14–20
Samian ware (Fig 178), Nos 1–4, *c* 125–40
Samian stamps: Nos St8, *c* 110–25
St21 Hadrianic
St22, Hadrianic
Stamped sherd: St12, *c* 110–25
with graffito (Fig 251, No 7)
[...]MARTINIDIIC, *Martini dec(urionis)*

Finds: Button and loop fastener (No 11)
ceramic counter (No 41)
stylus (No 161)
curry comb frag (No 182)
catapult bolt head (No 262)
ferrule (No 267)
bone obj (No 294)

Area F: east rampart
Pottery: Analytical Group 1
Samian ware (Fig 178), Nos 5–8 *c* 125–45
Coarse wares (Fig 155), Nos 5, 12–13, 21–25
Finds: Trumpet brooch (No 55), bone object (No 296)

All of the stratified finds from the ramparts of the stone fort would fit an early to mid-Hadrianic date, and some, such as the pre-1987 samian stamps, could be later Hadrianic in date. Although there are similarities between Analytical Group 1 and the 1929 Alley deposit, a much smaller range of vessel forms was represented. This was especially noticeable in the BB1 assemblage which consisted entirely of cooking pots. Analytical Group 2, which, like the Alley deposit, reflects the primary occupation of the stone fort, contained a similar range of forms both to the Alley deposit, and to the material from the backfilling of the Vallum ditch.

The hoard of Hadrianic coins contained within an arm purse was found in 1949 in the stone fort rampart to the north of the *porta principalis dextra*. It has frequently been argued (for example by Richmond (1950a), Simpson (1964, 81) and Daniels (1978, 202)) that these coins were lost accidentally by a rampart builder. There is, however, an alternative explanation: it is possible that the purse was scraped up as part of the occupation material used to create the stone fort rampart. In a bronze purse the coins would not spill as they might in a less effective or durable container, such as a pot. The failure to notice even fairly large objects when moving very large volumes of earth is a very well-known archaeological phenomenon.

Discussion of Period 1

Subsequent syntheses of the work of Haverfield and of Simpson and Richmond, while acknowledging the crucial importance of their work in establishing the early sequence at Birdoswald, have deviated from the interpretations offered by the excavators. Though this has often been perfectly valid, resulting from the discoveries made in later work, some of the original conclusions which demand more serious consideration have been passed over. The 1987–92 excavations have necessitated a return to certain of these 'lost' conclusions and have altered others only subtly. It is now possible to suggest the sequence of events during the period before the construction of the stone fort. This is summarised in Table 2, and illustrated in outline in Figure 24.

At this point the previous excavators' preconceptions should be noted, as these formed so much of the basis for the strategies and interpretations of the 1930s

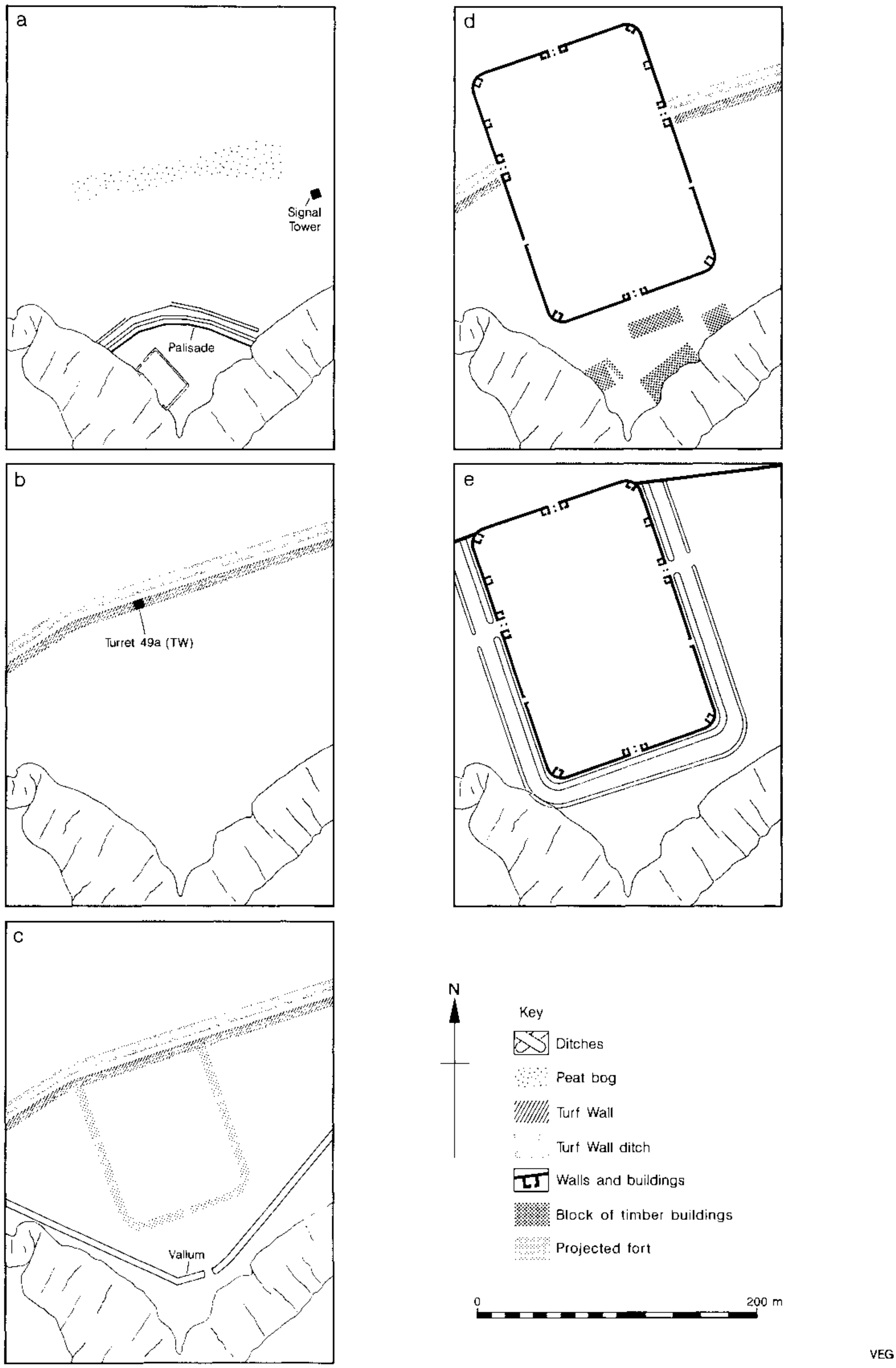

Fig 24 Summary plans of pre-Stone Fort phases

excavations. In 1927, Simpson believed the Vallum to be an early, pre-Turf Wall frontier with associated forts (Simpson and Shaw 1922, 376). Having undertaken work at Great Chesters he 'returned to Birdoswald on our original quest, that of an early fort presumed to exist somewhere between the Turf Wall line and the known deviation of the Vallum' (Simpson 1928, 383); if found, such a fort would have been interpreted as a 'Vallum fort'. Simpson and Richmond's (1933) preliminary sequence had the polygonal enclosure as their Phase I because of this hypothesis, and the Vallum, which cut this enclosure and was thought to be the earliest Roman feature on the site, as Phase II. The rampart base in the south-east corner of the fort was at first thought to be part of an early fort associated with the Vallum (ibid, 247) and was therefore also attributed to Phase II. The Turf Wall was then assigned to Phase III in the belief that it was secondary to the Vallum. This phasing, together with the present amendments is summarised in Table 2. It was finally accepted in 1935 that the Vallum post-dated the addition of forts to the mural line (Simpson, Richmond, and St Joseph 1936, 167–70), a fact which necessitates a revision of the excavators' phasing, while attempting to account for all of their observations.

The first building on the site was probably the square structure interpreted above as a possible signal tower. Situated to the south-east of the later stone fort, it has been proposed as a forward signalling post from the Stanegate (Wooliscroft 1989, 6; Bennett 1990, 67), though Breeze and Dobson (1987, 22–3) consider the evidence for the tower unsatisfactory. The fact that it is of similar size to other such signalling towers has already been noted, and has been emphasised by Bennett (1990, 67). The tower presently lies in something of a dip to the east of the stone fort, and in the present day landscape it would not be in the most advantageous signalling position. This is not necessarily an argument against the interpretation of the structure when the pre-Roman appearance of the site is considered. The spur was heavily wooded, though it is possible that the morass was relatively free of trees. The tower was built beyond the southern edge of the morass (Fig 24a) and it is possible that it stood on the edge of the woodland, and/ or that some limited tree clearance occurred around the building. Also the land form of the spur has changed drastically since Roman times. This is clear from the surviving height (1.30m) of the buried *porta quintana dextra* excavated in 1992 (Figs 41, 42) and also from the fact that the tower itself stood 13 courses high (Richmond 1931, 130) and yet was completely buried. It is, of course possible that the less than ideal position of the tower was dictated by the topography and vegetation.

Birley (1961, 143) interpreted the polygonal enclosure and the rectangular enclosure within it in terms of a 'native promontory fort within which a small Roman post had been inserted', thus acknowledging that the two were in contemporary use, a conclusion derived from the fact that both were cut by the ditch of the Vallum. The only evidence to support the 'native' interpretation of the polygonal enclosure was the pottery which was supposed pre-Roman. This is now identified as Housesteads Ware which is Roman in date. The association of this pottery with the promontory enclosures is in any case far from secure. It has been established by pollen analysis that tree clearance on the spur was minimal before the building of the Turf Wall. If the enclosure was pre-Roman it would have been bounded by the river cliff to the south, while to the immediate north lay woodland and the morass. The construction of this enclosure would have necessitated clearance on a scale which would almost certainly have been represented in the pollen record beneath the Turf Wall. On these grounds alone it is unlikely that the enclosure antedated the Turf Wall. The presence of Roman tent fragments in the very bottom silt of the polygonal enclosure ditches implies that the promontory was enclosed during the Roman period. If the tent fragments represented the dumping of rubbish and tidying after the enclosure was abandoned, their stratigraphic position would suggest a very short period of occupation. In view of these arguments it seems reasonable to suggest that the polygonal enclosure may have constituted a temporary tented camp, possibly established to house the builders of the earliest linear frontier, the Turf Wall. The builders of the Turf Wall would also have been responsible for the major work of tree clearance on the promontory, a task accomplished with such rapidity that there was no time for the clearance to register in the pollen record before the turfs of the Wall were laid. It may be that the position of the boundary of the proposed construction camp was in part dictated by the existence of the morass between the camp site and the line of the Turf Wall (Fig 24b).

Such camps are difficult to identify with any certainty (Welfare and Swan 1995, 23–4) even on the line of Hadrian's Wall, though there is a very good case to argue that this was the function of the Birdoswald camp. The irregular shape was devised to take full advantage of the shape of the promontory, showing the kind of pragmatism visible too in the design of the camp at Plumpton, Cumbria (ibid, 43–4). Today the area defined by the enclosure ditches is small, but the size of the promontory in the second century is not known. The fact of continuing riverine erosion of the spur suggests that it was more extensive in earlier times, extending much further southwards than today. The suggested camp would thus have been substantially larger than it now appears. It is feasible that the butt ends of the enclosure ditch on the east side were not the end of the enclosure against the cliff, but the northern side of an entrance up to which the cliff has encroached during almost two millennia of land slippage. The stratigraphic association between the rectangular enclosure and polygonal ditches on the spur has been stressed above; both features were apparently Roman, and both were cut by the Vallum ditch.

Though there is no structural evidence for buildings within this enclosure, the presence of a more permanent structure is suggested by the window glass. It is possible that the enclosure comprised a headquarters or officers quarters within the temporary camp.

The Turf Wall Ditch was described in 1929 (Richmond 1929, 303–4), and the Turf Wall examined in detail in 1927 and 1989. In addition, the Turf Wall section at Appletree (first excavated by Haverfield (1897a) in 1895, subsequently reopened for each Wall Pilgrimage and recorded by Bennett in 1979) was reopened in 1989 and recorded by Whitworth (1992). The observation by Mrs Hodgson (1897, 400) that the Turf Wall at Appletree was built with the bottom turf laid green side down on top of an *in situ* turf surface was confirmed at Birdoswald in the TW1 sample, but not in the sample taken at TW2. Even at Appletree, the classic Turf Wall section, no clear evidence for orderly 'brickwork' construction could be confirmed in 1989; instead a soil dump formed the base of the Wall and turfs were levelled with mineral soil. This should occasion little surprise, as it has long been apparent that the builders utilised whatever materials were to hand, and Breeze (1982, 76) has pointed out that 'Earth Wall' might be a better term. At High House, only the faces of the Wall were of laid turfs, with soil and turf fragments forming a core (Simpson 1928, Fig 1). Recent work at Crosby on Eden similarly revealed spreads of soil behind built turf revetments (Bennett forthcoming b). The pollen analysis reported in Chapter 2 has shown the wooded character of the promontory at Birdoswald immediately preceding the building of the Turf Wall, and it is possible that the only source of turf in the immediate locality was the relatively poor material on the fringes of the Midgeholme Moss and other local mires. Both soil and pollen analysis serve to demonstrate that building materials were brought from such locations. At Appletree by contrast turf was extensively used. Pollen here shows that trees had been cleared from the site some time before the Wall was built and that periodic burning had taken place. It seems that an open grazed landscape existed here, and that turf would therefore have been a readily available commodity. This use of turf extended from Appletree (in Wall mile 51) as far west as milecastle 53 (Banks Burn) and resumed at turret 54b (Howgill). At milecastle 54 (Randylands) and turrets 54a (Garthside), however, clay was used. This area of clay construction apparently coincided with a belt of scrubland within which useful turf could not be found (Richmond and Simpson 1935). At turret 54a (Garthside) a turf-built wall replaced the clay original, though even this included 'consolidated slime blocks' cut from a stream bed (Simpson *et al* 1934a, 140) at the base. It is possible to speculate that the clearance of scrub had allowed the regeneration of turf for the construction of the replacement Wall. The Garthside area is the only place other than the Birdoswald sector where the Turf and Stone walls diverge; this fact, and the fact that pollen clearly survives within the fabric of the Wall (Richmond and Simpson 1935), suggests that this area would be an ideal candidate for further environmental work of the sort carried out at Birdoswald.

The evidence found in 1945 (Soc Antiqs Newcastle upon Tyne 1946, 275) appeared to confirm the thesis of Simpson *et al* (1935, 236) that the Turf Wall was constructed complete with Turret 49a, the easternmost of the sequence of stone-built Turf Wall turrets. It thus appears that the Turf Wall and all of its associated features were completed at Birdoswald before any fort was planned. The completion of the construction of the Turf Wall in the Birdoswald sector is broadly dated by a fragment of oak building inscription, apparently bearing the names of Hadrian and the governor Platorius Nepos (122–*c* 126), which was found at milecastle 50TW (High House) (Collingwood 1935, 229–32; RIB 1935).

The cornelian intaglio (Fig 195, No 2336) found beneath the Turf Wall in Area A is an evocative piece; the subject matter is usually connected with legionary troops, and both context and content would indicate that it was dropped by one of the legionary builders of the Turf Wall.

It is logical to assume that the drainage of the morass took place after the construction of the Turf Wall, not least because an operation on this scale would have been attested in the pollen record had it occurred before. On the east side of the stone fort the morass was apparently eradicated by a process involving rubbish dumping, make-up deposits, and drainage (Richmond 1931, 123), reminiscent on a small scale of the drainage works undertaken, for example, in the upper Walbrook valley in London (Maloney 1990, 119). The sheer volume of labour involved in site preparation at Birdoswald cannot be overemphasised; the clearance of a large area of woodland followed by the drainage of a marsh would have involved huge effort. After the reclamation a small ditch was cut through the fill of the morass. This ditch is important, as it is recorded as respecting the Vallum ditch, yet antedating the stone fort. This implies that the construction of the Vallum and the filling and drainage of the morass were contemporary, or that the drainage was earlier than the Vallum. It would certainly seem that both operations occurred before the construction of the stone fort, the wall of which cut the small ditch.

Richmond's observation (1929, 310) that the course of the Vallum had 'nothing to do with the stone fort' was based on the fact that the primary multiple ditch system of the stone fort cut the deliberate backfill of the Vallum ditch. Though the inner ditch was open throughout the life of the fort and was recut on several occasions (Fig 26), the outer ditches were never even completed. It is therefore the relationship of these outer ditches to the filled Vallum ditch which are important in demonstrating this sequence. It seems that the Vallum was backfilled before the stone fort ditches were begun, and it follows from this that the stone fort was itself constructed after the Vallum ditch was backfilled.

The deviation in the course of the Vallum together with the causeway of unexcavated material provided across it demonstrate that a fort was in place or under construction when it was laid out. The discovery of the apparent early rampart base beneath the south-east defences of the stone fort was hailed with relief in 1932 as the long-sought 'Vallum Fort' (Simpson and Richmond 1933, 257), a fact which may explain why this crucial component in the archaeology of Birdoswald has been overlooked virtually since its unearthing. On the discovery of the Vallum crossing, the excavators immediately reinterpreted the rampart base as part of an early fort around which the Vallum was diverted. This remains the best explanation for these phenomena, though we should now see the fort represented by the rampart base as having been added to the Turf Wall (Fig 24c). This interpretation was actually postulated by Simpson, Richmond, and St Joseph (1936, 169) soon after the true relationship between the Vallum and the Turf Wall was established. Even then, however, the theory was by no means new; it had first been proposed by Haverfield, who stated that it was 'possible that a smaller earthen fort stood on the site ... and that the vallum was built when the Turf Wall and hypothetical earthen fort [were] built.' This he considered, with remarkable perception 'would explain to some extent the line of the vallum close to the fort, and in particular the strange manner in which it grazes the south-west corner of Birdoswald' (Haverfield, 1899, 182).

The only more recent writer to accept implicitly the idea of two successive forts at Birdoswald was Hind (1989, 3), who restated that the Vallum was diverted around the first fort, while the ditches of the slightly later (stone) fort impinged upon it.

The use of stone bases for turf or clay ramparts on Hadrian's Wall is now known from milecastles 53 (Banks Burn; Simpson and MacIntyre 1933, 270, fig 21) and 72 (Fauld Farm; Austen 1994, 45) as well as beneath the Turf Wall itself at Burgh by Sands (ibid, 39; Bennett (forthcoming b) suggests that a broad turf built foundation may exist at Crosby on Eden and at Appletree). At 3.51m (11ft 6ins) the Birdoswald rampart would be very narrow (Jones 1975, 70), suggesting that not all of it was revealed. A kerb is only recorded for its north side, and it may well have originally extended south of the stone fort wall. A more usual average for a turf or clay rampart would be 6.2m (20ft; ibid), and this is the rampart base width both at Burgh by Sands and milecastle 72.

The construction of turf and timber primary forts on the Turf Wall has long been accepted. It can be demonstrated at Bowness (Potter 1979, 322; Austen 1991b, 8) and Drumburgh (Simpson and Richmond 1952, 9–12). At Castlesteads a ditch and rampart off alignment with the stone fort (Richmond and Hodgson 1934, 163) at its south-east angle is interpreted as belonging to such a fort (Daniels 1978, 229). Recent work at Stanwix suggests that the proposed Birdoswald sequence may not be unique, as the minimum sequence proposed by Caruana (1989, 32) is startlingly similar to that now inferred for Birdoswald. The existing stone fort appears to have been Antonine (Dacre 1985, 68). The south-west corner of this fort extends beyond the point at which the Vallum was diverted, presumably to avoid a fort (Daniels 1989b, fig 9). The conclusion is that the Turf Wall was provided with a small, possibly timber, fort which the Vallum was laid out to skirt. Of the Turf Wall forts it is only at Birdoswald and Stanwix that the relationship between the Vallum and stone forts has been relatively closely examined, and in both cases anomalies exist pointing to the existence of forts respected by the Vallum which are not the later stone forts. This must represent an important potential line of inquiry in examining other forts in the Turf Wall series.

The very limited evidence might suggest that the morass was drained in order that an early fort could be constructed, and it seems possible that the drainage, and the construction of the fort and Vallum were broadly contemporaneous, rather than strictly sequential events. It seems likely that the decision to add a fort and the Vallum to the Turf Wall at Birdoswald did not occur long after the Turf Wall was built, as at milecastle 50TW it was found that the Vallum mounds were placed upon ground from which turf had already been stripped, presumably for the construction of the Turf Wall (Simpson and Richmond 1937a, 169). This suggests that the construction of the Vallum, and therefore of the fort, followed before any turf regeneration could occur.

The proposed early turf and timber fort at Birdoswald must, as Haverfield suggested, have been smaller than its stone successor. This is clear from the fact that despite the extensive recent work on the fort defences to the west and north, no further trace of the early rampart base has been found. This strongly suggests that the early fort is entirely contained within the stone structure. The lack of evidence may also be explained either by a thorough demolition of the rampart as suggested by Simpson and Richmond (1933, 252–4), or by the fort never having been completed. There is certainly room for the stone fort (176.78 x 121.92m) to contain an earlier establishment of the size of the Haltwhistle Burn fortlet (63.4 x 50.9m) as suggested by the excavators (Simpson and Richmond 1932, 142), or an establishment somewhat larger than the clay fort at Drumburgh (96.32 x 82.30m). Such a difference in size would further explain a fact which puzzled the original excavators: why the stone fort rampart did not incorporate that of its forerunner (ibid). A further difficulty with the proposed early fort is why no substantive trace of it was found in Area A. Here the only features which could, however tenuously, be associated with an early fort were the timber slot and post holes beneath Building 198 and the sequence noted in section beneath Building 197. The latter sequence in particular showed a large amount of activity which did not involve the erection of stone buildings. It may be significant that all of the potential early fort stratigraphy lay to the south of the Turf Wall, while all extensive excavations within the stone fort have taken place in the *praetentura*, to the north of, or on the line of this Wall. This might suggest that the early fort did not project to the north of the Turf Wall, but lay entirely behind it. Figure 24c gives an extremely tentative suggestion for an early fort plan, based on the largest establishment which might incorporate the known rampart, be skirted by the Vallum, and lie to the south of the Turf Wall. The suggested fort measures 103 x 85m (0.87ha).

The existence of 'spread rubbish' including Trajanic samian, which was sealed by Hadrianic levels and contained by the early rampart base strongly suggests that the early fort was occupied. It is possible that it was this kind of deposit which was redeposited during the construction of the primary rampart of the stone fort, and that this was the origin of at least some of the cultural material incorporated within the rampart.

The finds which might come from an early fort are all Hadrianic, but in general no refinement of this date is possible. However, the coinage in the arm purse hoard, found embodied in the Stone Fort rampart to the north of the *porta principalis dextra* (Fig 7) was closed before the issue of Hadrian's second coinage from 125 (Bennett 1990, 350). A further hoard found in the *retentura* of the stone fort in 1930 shares this date (Richmond 1931). The excavators record that this hoard was found in the earliest level encountered in the angle between the *via decumana* and *quintana*, and that it was 'pushed into the floor' of a building. This building was presumed to belong to the earliest phase of the stone fort (ibid, 124), but the context is not secure; it is possible either that this early level belonged to the earlier fort, or that the hoard was sealed by the floor of a later stone fort building.

Though its associations must remain obscure and its suggested context highly speculative, the rampart base to the south east cannot be ignored. It seems most likely to have formed part of a Turf Wall fort located entirely to the south of the Wall. No extensive excavations within the the *retentura* of the stone fort have been undertaken since the rampart was found, and it is here that the evidence, if any, lies. This must remain one of the most important aspects of the archaeology of Birdoswald remaining to be resolved by future researchers.

The botanical evidence suggests that the Vallum ditch was filled soon after its excavation, and the pottery from its filling (Swinbank and Gillam 1950, 61; Gillam 1970, group 36) suggests that it could have been out of commission by the late 120s. In seeking a context for a reused pivot block in Willowford Bridge 2, Bidwell and Holbrook (1989, 78) have suggested that the decommissioning of the Vallum was much later, and that that the botanical evidence for an early filling followed a scouring of the ditch and not its initial cutting. This they place as late as the return from the Antonine Wall *c* 163. The conventional view of a short-lived Vallum better fits the evidence from the site, however. It has already been argued that the Vallum was probably eradicated to allow for the construction of the stone fort. For reasons which will be examined below, it is necessary to place the construction of most of the stone fort, including halts in the work, into the Hadrianic period. It is therefore tentatively suggested that after an occupation of two or three years the early fort was taken down, the Vallum backfilled and a start made on the construction of a larger fort in stone.

4 The construction and primary occupation of the Stone Fort (Period 2)

Period 2 comprises Site Phases 3–5 (Table 1; Fig 11). These are stratigraphically defined as follows: Site Phase 3 represents the commencement of building on the fort defences, work on which ceased during Site Phase 4, when a site-wide soil horizon (hereafter the hiatus horizon) accumulated. After this hiatus Site Phase 5 represents the completion of the building work and the primary occupation of the buildings of the stone fort.

The evidence for the primary structural phases of the stone fort was remarkably consistent; analyses of the stratification, stonemasonry, artefacts, pollen, and soils gave a consistent story in all excavated areas. It seems certain that there was a major hiatus amounting to a complete cessation of work while construction was in progress. Although some buildings were occupied in Period 2, it is clear that others, notably the *horrea,* were not even begun until later.

The defences

The *porta principalis sinistra* and west curtain wall

The structural sequence of the *porta principalis sinistra* was examined only within the fully-excavated south portal of the gate (Figs 27, 30), along the curtain wall to the south of the gate, and inside the north tower.

Foundations

Despite the limited extent of excavation it was possible to extrapolate the plan of the entire foundation of the gate (Fig 27), and to examine the method of construction. In the deep section below the floors of the north tower the Turf Wall ditch had been backfilled with a regular and deliberate deposit of hardcore, comprising stone broken into roughly regular pieces up to 200mm (3872; Figs 27, 28). As this was left *in situ,* it was not possible to establish whether the foundations had been carefully laid into the ditch in offsets as had occurred at the *porta principalis dextra* (Fig 29; Gillam 1950b, 65). The rubble was levelled with a deposit of hard, red-brown sandy clay (3844) before construction took place.

No foundation cut for the curtain wall was apparent to the south of the gate, though one must have existed, as the foundation (3838; Fig 65) was two courses deeper than the top of the surviving Turf Wall. These two courses carried the foundation through the unstable Turf Wall material to the natural boulder clay beneath. The west curtain wall foundation was 1.87m in width, and the foundation raft for the gate (3838) was of one build with it. This raft was two courses deep and was constructed of large sandstone slabs quarried from thinly-bedded material and roughly dressed to size, laid

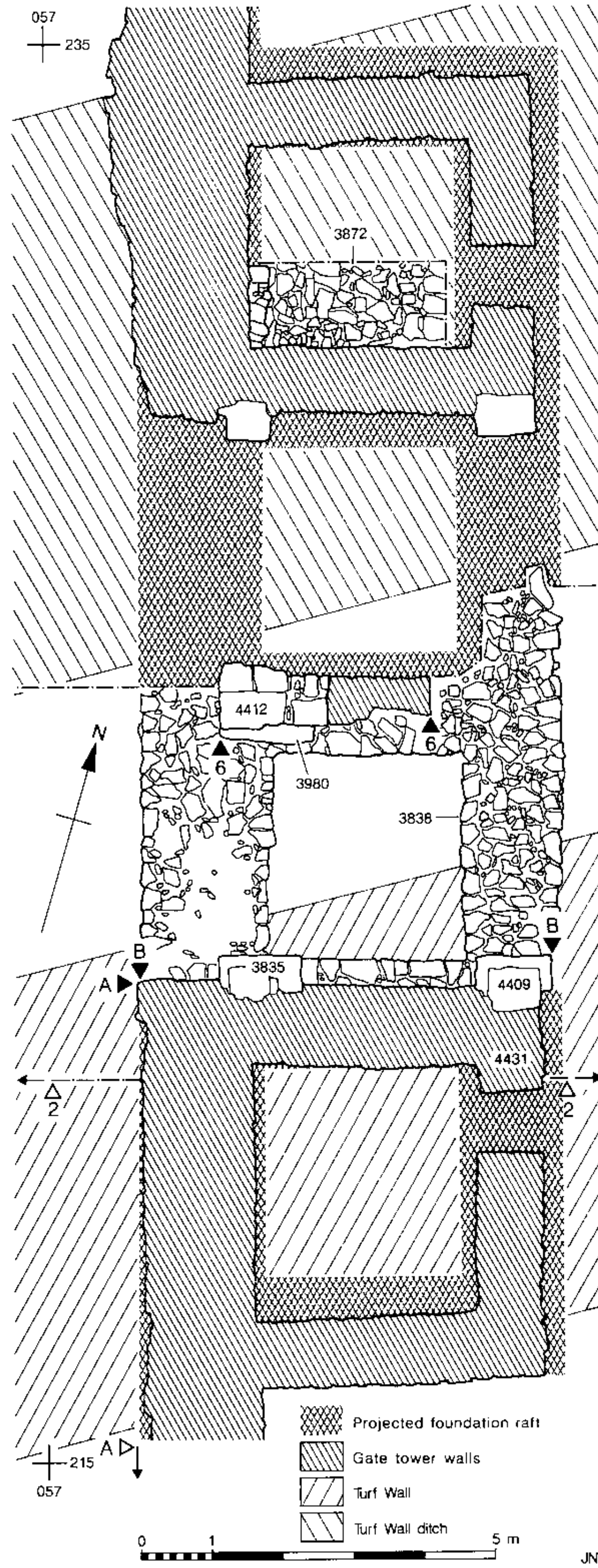

Fig 27 Foundation and structure plan of porta principalis sinistra, *showing position of underlying Turf Wall and ditch*

in hard, pebbly orange clay. The only place where a construction trench for this raft was identified was to the east of the east wall of the south tower (4431; Fig 27), where a small cut (4430) filled with clay and stones (4429) was identified (Fig 26). The foundation raft for the gate measured 18.50m long, and projected back 4.12m eastwards ftom the curtain wall foundation. The raft was not solid, but was laid out in a series of four hollow squares with an internal length of side of 2.85m, separated by stone rafts 1.42m wide. The two inner squares acted as the foundations to the portals, while the outer squares were laid out to support the flanking towers.

The superstructure and its phasing

by Peter Hill and Tony Wilmott

The detailed assessment of the structural phases of the gate has been greatly enhanced by the full analytical survey of the stonemasonry by Peter Hill (Hill 1991a), the results of which are summarised in the following description.

The first stage of construction was to lay out the six substantial foundation blocks (average sizes, 1.30 x 1.26 x 440mm) for the piers which were to support the arches of the double gate. The westernmost of the two foundation blocks for the western pier of the *spina* (3980) was placed in the centre of the central foundation raft. The blocks forming the pier bases for the northern and southern sides of the gate were then placed flanking the two centre squares of the raft, with their edges built on the inner edges of the squares (Fig 30). Though all of the piers except the eastern *spina* pier survived, only the south-west and south-east gate piers and the west *spina* pier were excavated to a level at which they could be properly examined.

The excavated foundation blocks were all of similar quality workmanship. That laid for the southwest pier (3835) had heavily-punched sides, worked approximately straight and square. The top bed was largely unweathered, and was carefully worked both with a punch in small neat pecks, and with a broad blade. Overall it was straight within 3mm, indicative of the care taken to provide a solid, flat foundation on which to build the pier. There was no pivot hole, the area normally occupied by one being cut to a recess a few millimetres deep, worked with a broad blade in a slightly radiating pattern. The top bed of the south-east block was later weathered and worn by sharpening.

The gate was set back 1.12m from the outer curtain wall face. The south side of the recess was provided with two large blocks (4415; Figs 31, 32) placed adjacent to and level with the foundation block of the south-west pier. These extended to the west edge of the foundation raft. Their dressing was

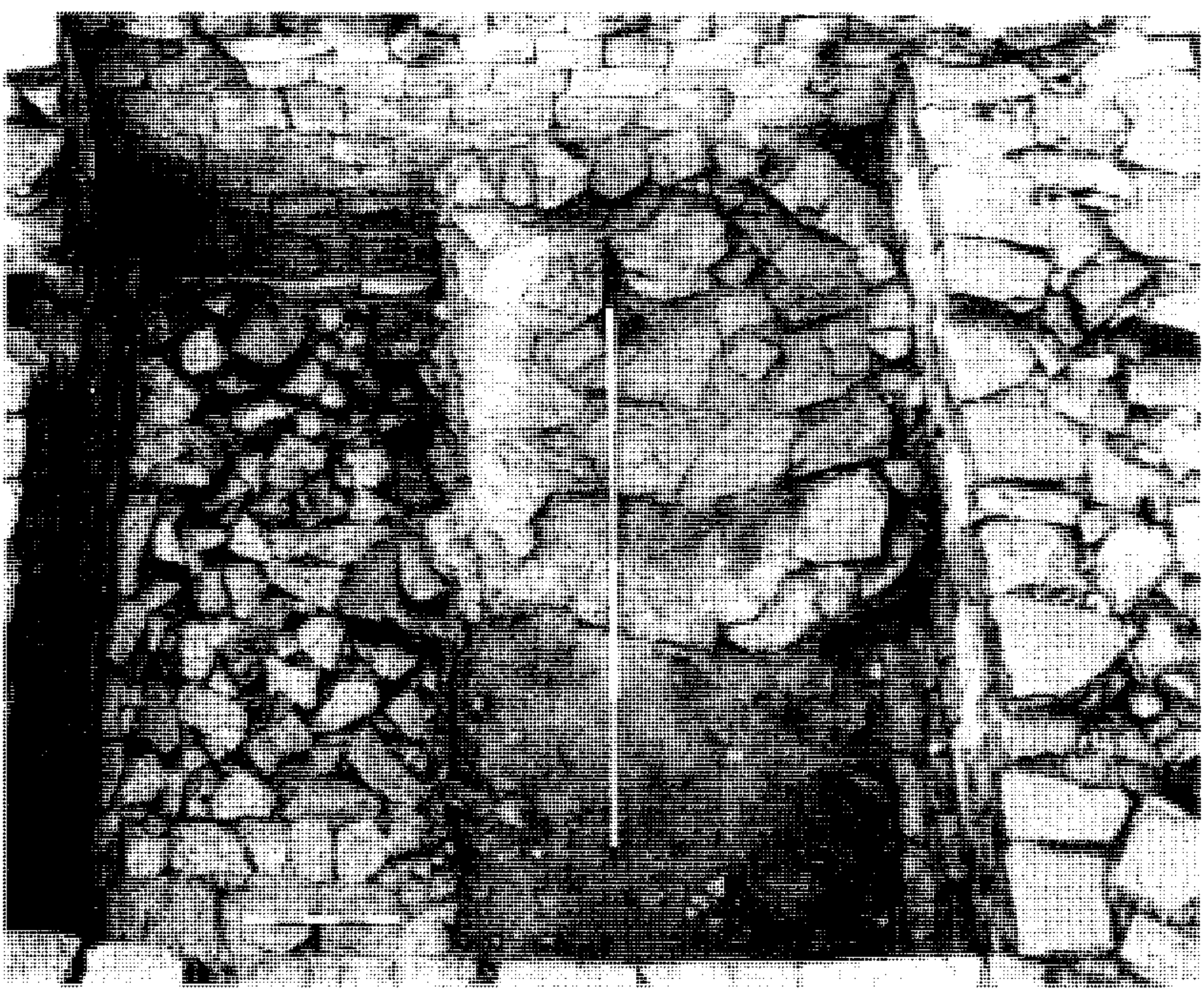

Fig 28 Half-sectioned interior of north tower of porta principalis sinistra *with rubble backfill of Turf Wall ditch (3872) in the lower portion*

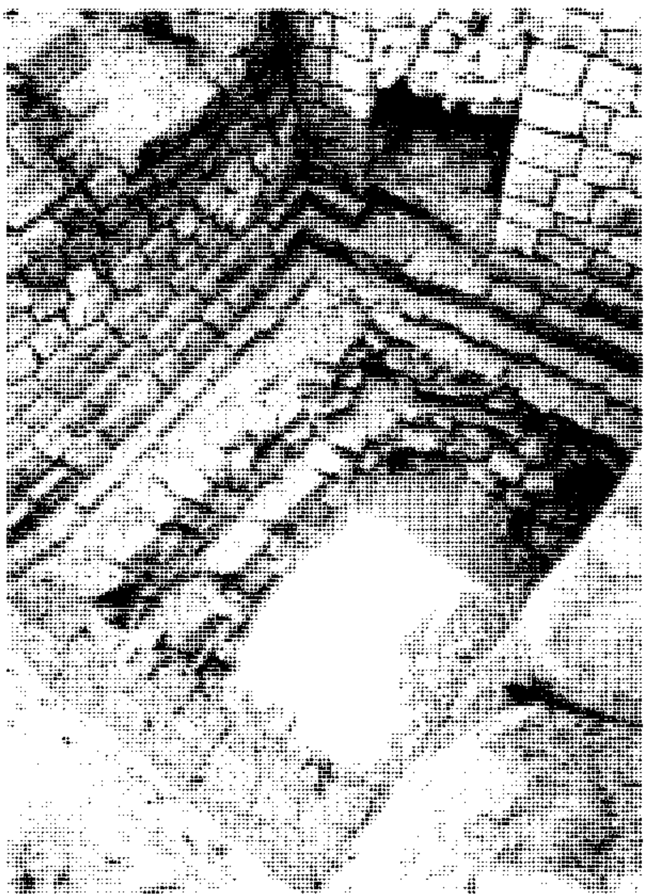

Fig 29 The foundations of the north tower of the porta principalis dextra *showing stepping down into the Turf Wall ditch (photograph by J P Gillam; reproduced by permission of RCHME and Brenda Heywood)*

not unlike the pier foundation blocks, although the heavily-punched sides were less neatly finished and the top beds noticeably rougher. The later use of the top bed of the western block as a sharpening stone does not altogether disguise the heavily-punched surface.

Two stones constituted the foundation for the *spina* (Figs 33, 34). The westernmost stone (3980) was almost a copy of that under the south-west pier, though its top bed was not quite as good, having been unevenly worked with a punch, with occasional blade marks. The eastern block, which carried the back of the pier of which it formed a part (4412), was of very much poorer quality, and is linked to a later phase of work.

The quality of the first courses of each pier suggested that they were contemporary with their foundation blocks, and all could be the product of the same directing mind. All were heavily punched in roughly-parallel diagonal furrows and featured adequate, if uneven, chiselled margins on the quoins, the appearance of which is of good workmanlike engineering rather than elegance (see especially the south-west pier, 3835; Fig 31).

After the piers had been built they were incorporated into the side passage walls of the gate. These walls of coursed rubble are 960mm wide and were built on the outer edges of the foundation rafts, such that the walls and piers together occupied the entire available foundation width (Fig 30). The two bottom courses of the south passage wall on its north side (4408; Fig 32) are each offset by 80mm. The uppermost of these offset courses was level with the top of the pier foundation blocks.

At a very early stage in the work there was a change in the quality of masonry. It is unclear to what point the passage walls had been built when this occurred, but it is possible to specify which pier stones had been laid: namely all of the foundation blocks except the eastern block under the west pier of the *spina*, a single course on each pier except the western *spina* pier and the second course of the north-east pier. The work on subsequent pier blocks was not so much less

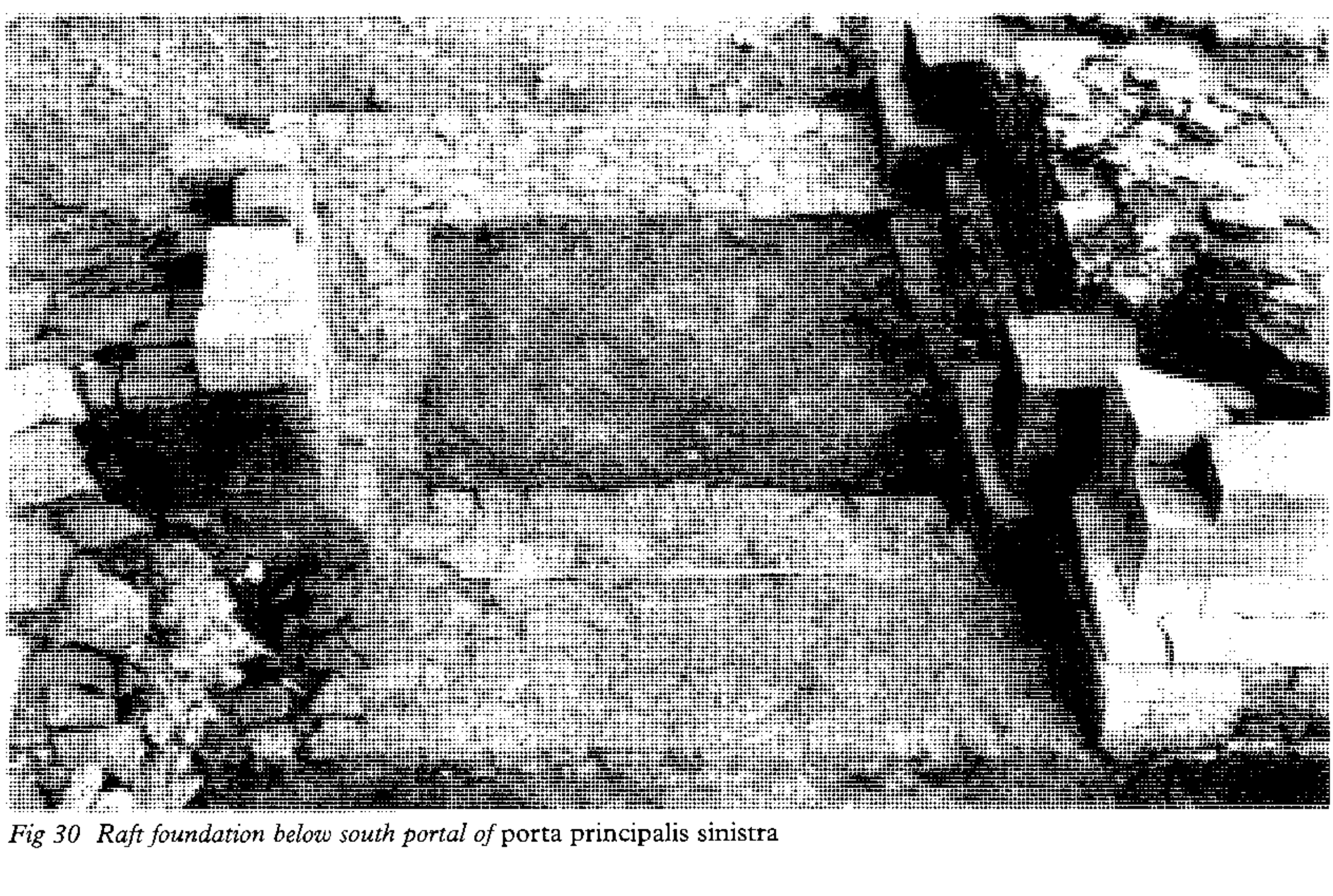

Fig 30 Raft foundation below south portal of porta principalis sinistra

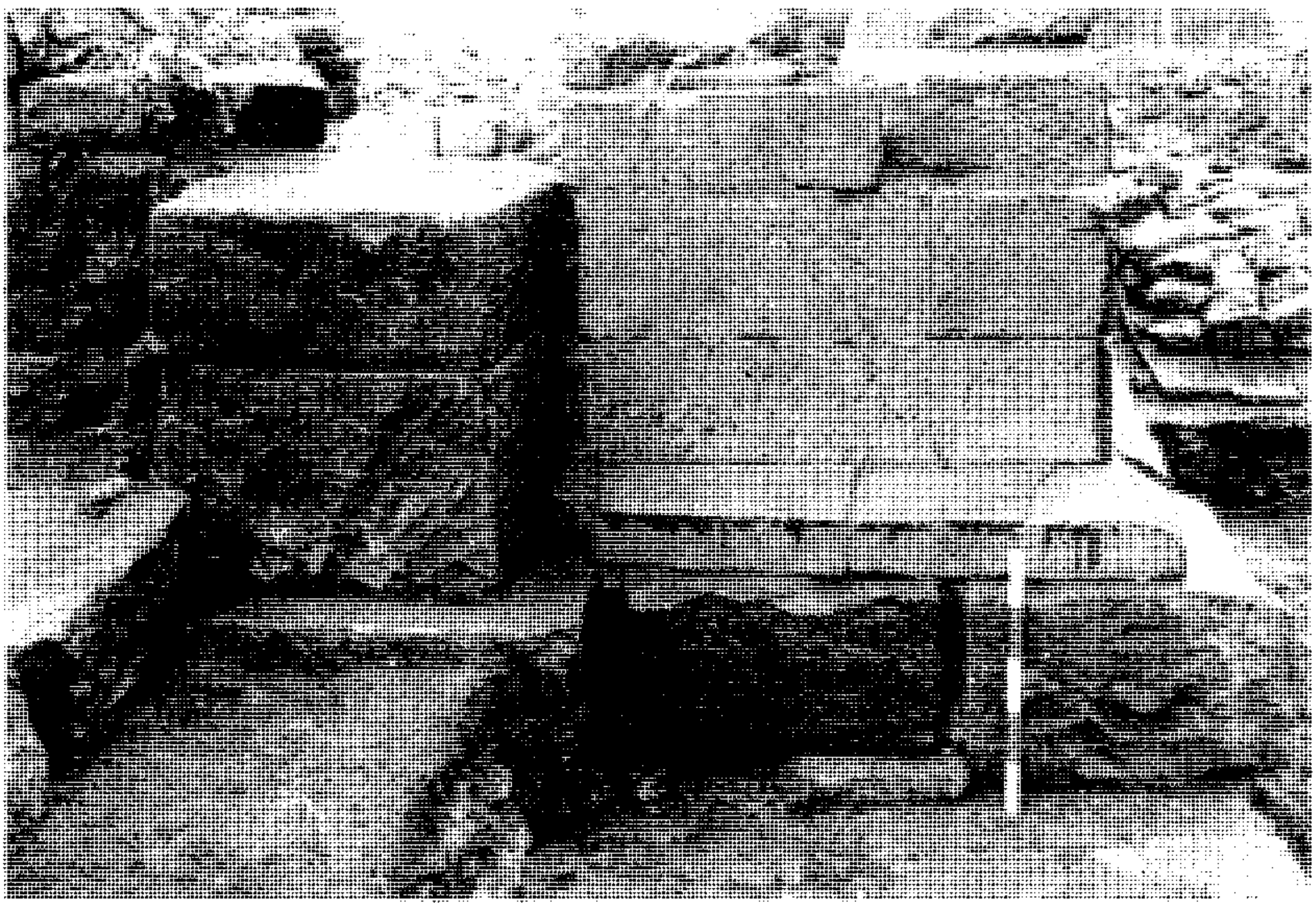

Fig 31 Southern return of gate recess: this shows the south-west pier (3835) standing on its large foundation block; the foundation block is abutted by two further primary foundation stones (4415); the ashlar above these stones (3834) represents a later rebuild

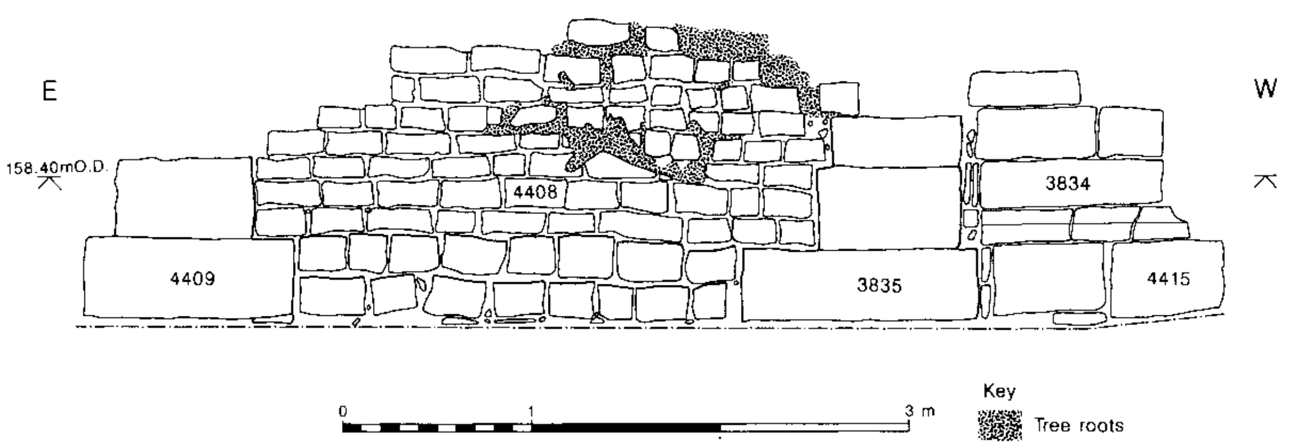

Fig 32 Elevation B, the south passage wall of the porta principalis sinistra *showing incorporated piers (located in Fig 27)*

well finished than the lower courses although this occurs, as less carefully worked. For example, on the first course of the south-west pier, the west face was finished with heavy work by a punch, but carried out with an eye to regularity; the second course has a less bold finish, but is more careless in execution. This difference was observed universally in the gate structure above the primary courses (Hill 1991a).

The eastern foundation block and the rest of the west pier of the *spina* (4412; Figs 33, 34) appear to represent a third type, following a second break in the work. This part of the gate structure is remarkable for the crudity of its execution and the lack of interest in its appearance. The eastern foundation block stone was particularly bad: the top bed was roughly punched off around the pivot hole while the remainder was more or less natural and irregular. There may have been an initial attempt to produce a fair finish on the west face of the first course, but this small effort was not sustained.

This second halt was confirmed by the stratigraphic evidence. Within the south portal a construction layer of coarse sandy silt, possibly representing decayed mortar, was located in the angle of the southern gate recess. This lay partially beneath the two foundation blocks of the south-west gate

Fig 33 The south face of the gate spina: *this shows the marked difference in quality between the westernmost foundation block (bottom left) and the remainder of the masonry work*

return, and partially banked against it. Over this and the foundation raft lay a roughly-metalled surface (3931; Figs 34, 103). This was sealed by a homogeneous layer of black or very dark grey silty loam with a small organic content. This deposit was an aspect of a major soil horizon (hereafter the 'hiatus horizon') representing an abandonment of work (3880). Both of these deposits were stratigraphically later than the foundation blocks of the gate piers, including the western block of the western *spina* pier but earlier than the poor eastern foundation block for the *spina* which was cut into them (Fig 34). The hiatus layer also sealed the foundation raft of the gate to the east of the east wall of the south tower (3738; Fig 26).

Like the eastern foundation block of the *spina*, the threshold (4268) of the south portal was laid above the black abandonment horizon (Figs 34, 35). The threshold was continuous, made up of four stones 600mm from front to back, with an upstand varying from 100–225mm wide and 50–70mm deep. All the surfaces were worked with a punch in a random but neat finish typical of Roman military works. The southern stone had a pivot hole 85mm in diameter in which the iron pivot survived. The underside of this stone, and the end 175mm of the upstand, were cut away so as to fit over the foundation block and into a check cut into the botrom course of the south-west pier to form an internal angle 170mm deep (Fig 36). It is reasonably certain that the upstand was initially worked straight through to the end and cut away in a second, but contemporary, operation. The pivot hole was within 25mm of the end of the stone, not an ideal thickness to resist the weight of the door although it seems to have worked.

The rather clumsy botching of the southern end of the threshold seems to be an attempt to compensate for a mistake in the calculation of the original foundation levels. It is possible that the downward slope to the south had not been adequately accounted for. The alternative favoured by Peter Hill is that this might have been necessitated by the subsidence

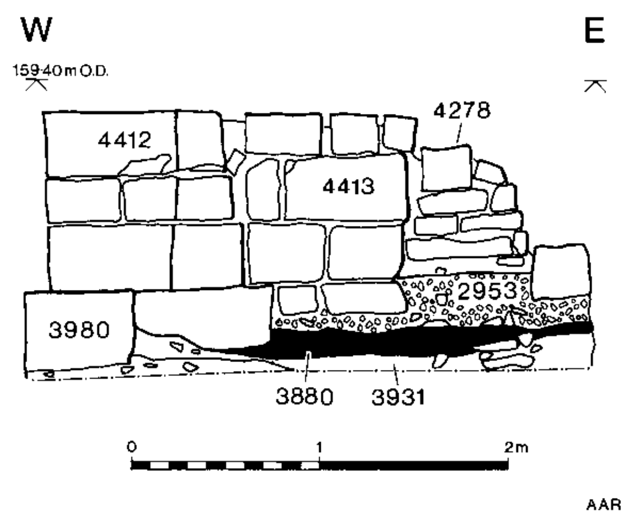

Fig 34 Section 6, including the south elevation of the gate spina *(located in Fig 27)*

of the south-west pier by around 100mm, though this would imply that the hiatus, as represented by the black soil and the change in the quality of the work, was of considerable duration.

Within the north tower of the gate the internal offset from the foundation was covered by a construction layer (3819) of clay and mason's chippings. These were sealed by a dark layer which respected the lower courses of the walls (3842), and which may represent the black hiatus soil within the tower.

The gate towers are of different sizes. The internal dimensions of the north tower are 3.08m x 2.98m, while those of the south tower are 3.08m x 3.54m. This was due to the way in which the prepared foundation raft was used.

Fig 35 The primary threshold of the porta principalis sinistra *lying above the black hiatus soil (upon which the scale is lying)*

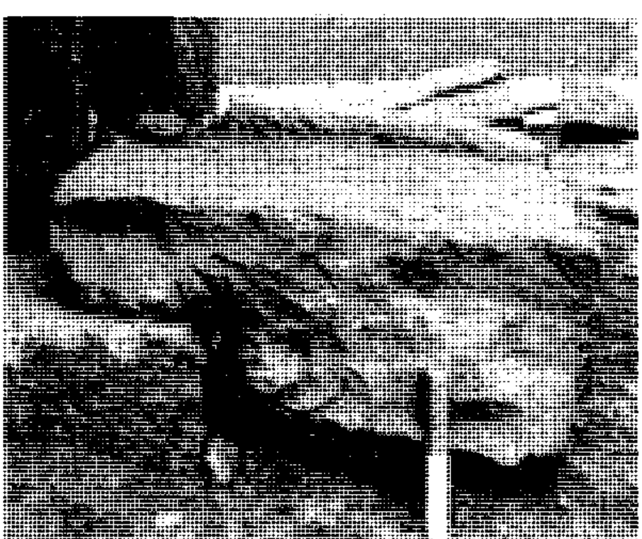

Fig 36 South stone of threshold showing the check cut in the pier, the truncated upstand, and the lap over the primary foundation block, and also a stub of an iron pivot

The north wall of the north tower was built on the inner (southern) edge of its raft and the south wall of the south tower on the outer (southern) edge of its raft. All of the tower walls are 960mm in width. The effect of this is clear from Figure 27. Though first interpreted by the writer (TW) as an error, the fact that the same difference occurs in the *porta principalis dextra* indicates that this was deliberate. Both towers contained a guardchamber at ground level, access to which was gained by way of a doorway in the east side of the tower. The doorways are 1.13m in width and are offset towards the gate portals.

The walls of the north gate-tower survived to a maximum of nine courses (1.48m) high above the foundation. The foundation of the south wall of the tower (4416) was offset on its inner face by 100mm. Directly above the offset was a second foundation course of longer, narrower blocks corresponding in level to the flat surface of the foundations in the carriageway (3838). Above this are two courses of of large blocks, each offset by 100mm. These are the internal counterparts to the external offsets noted on the south passage wall of the gate (4408; Fig 32). The remaining courses are of the standard type of mortared coursed rubble. This wall was bonded with the west curtain wall, but only the foundation and uppermost surviving (ninth) courses showed this; the intervening eight courses are all butted. There was no surviving bonded masonry above the foundation in the north-west corner of the tower, though the other two corners are properly bonded.

Within the north tower the black layer was sealed by a layer of sand and degraded stone, with many chippings and off-cut stone fragments (3802) representing the completion of the tower after the hiatus. The construction debris was levelled to the upper offset with a pure coarse sand (3801) which may have been used as the levelling for a floor of timber planks. This would explain the fact that there was no obvious resilient primary floor level.

Architectural fragments from the gate

edited from contributions from J C N Coulston, Peter Hill, A M Whitworth, and K Wilson

A variety of architectural fragments were found in the rubble deriving from the collapse of the *porta principalis sinistra*. These are described here as they are the sole evidence from which the form of the upper parts of the gate may be deduced. It is, of course, impossible to be certain how much of this material may have originated from the first construction of the gate and how much from rebuilds. That at least one major rebuild of the gate took place is clear from the standing masonry.

Cornice mouldings (Fig 37)

1. 3443; 3444; 3445; 3367, 316/rubble/Period 7–8.

Four pieces of a moulded cornice in local buff sandstone, with fillet, cavetto, and astrigal. These are of a consistent width (370–420mm) and height (225–35mm). Three were broken (3443, 350mm long; 3444, 570mm long, and 3445, 520mm long). The complete stone (3367, 790mm long) is here described. The top bed was worked with a punch but has since become weathered, probably due to exposure after collapse. The bottom bed is neatly punched with small pecks, straight with a range of 3mm; the first 25mm consists of a chiselled draft, suggesting that the wall which it stood on

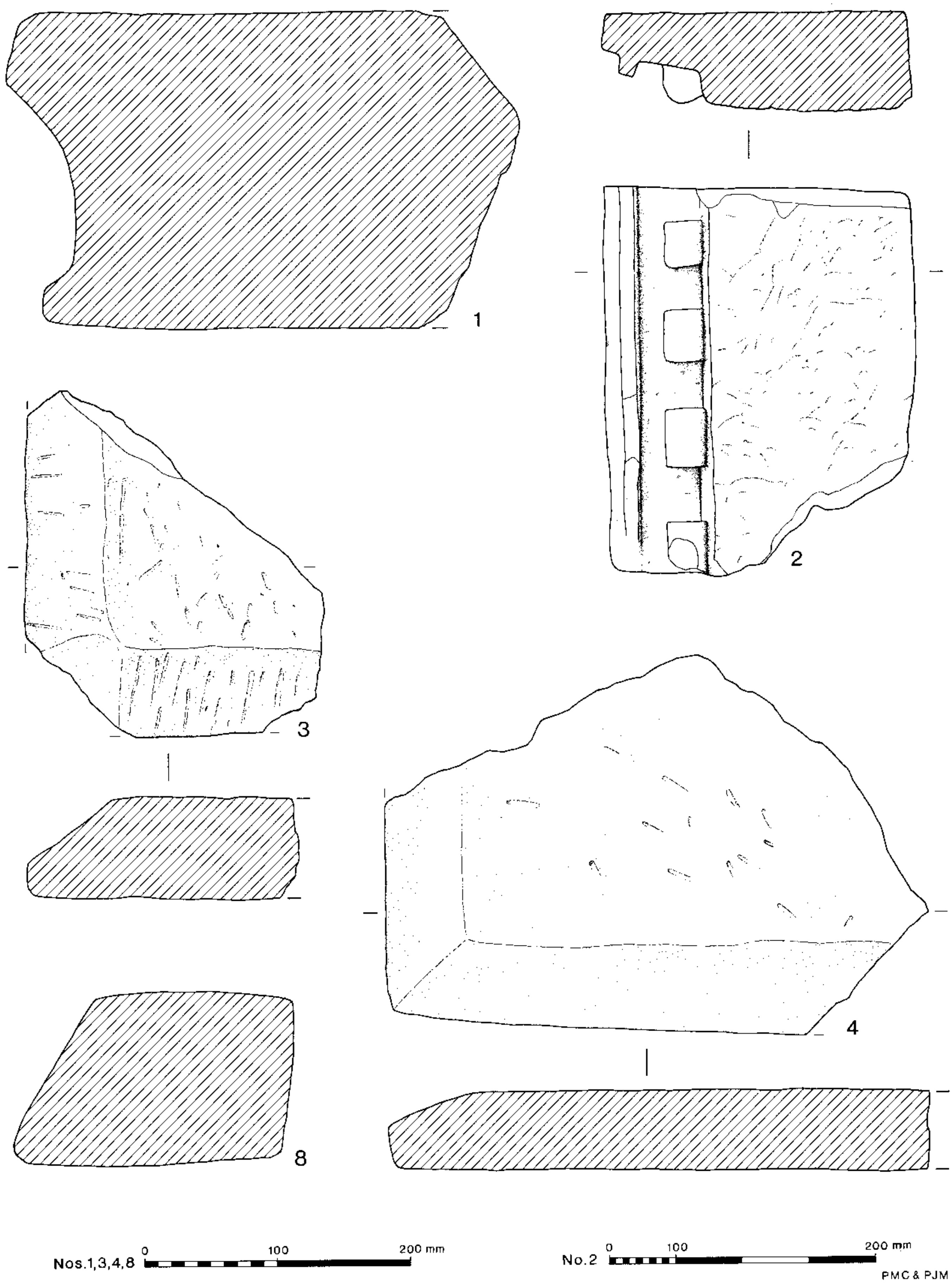

Fig 37 Architectural fragments from the porta principalis sinistra: *profile of cornice moulding (1), dentilled cornice block (2), merlon capstones (3, 4), and profile of string course moulding (8)*

was in line with the bottom of the cavetto, which is what one would expect. The joints are largely punched, with occasional use of a blade. On the face the fillet meets the top bed in a rough and inconstant quadrant, much weathered and/or worn. On the weathered fillet, both ends of which are missing, there are some punch marks with occasional chisel. It varies between 1mm round and 3mm hollow.

The upper part of the cavetto is worked with a 40–50mm blade driven along the axis at an angle indicating the work of a right handed mason. The tool marks are slightly curved, suggesting a chisel with a slight bull-nose. There are intrusive punch-marks, especially at the right-hand end. There is a marked but irregular junction between the upper curved part of the cavetto and the near vertical lower part. The latter is again worked with a blade approximately 35mm wide almost at right angles to the axis. The cavetto as a whole is straight from end to end, but undulates by up to 3mm. Against the astrigal is a draft cut with a 12mm chisel; the junction between cavetto and astrigal is sometimes very distinct and sometimes less so. The astrigal is missing at both ends and damaged towards the middle; what remains is weathered and battered to an extent which precludes measurement. It was worked in a series of chiselled drafts by a right handed mason. The drafts remain to give a sub-circular polygon.

The stones are above the standard normally set by the army, and set at a height would have looked very impressive. Although not as good as a first view suggests, the mason responsible was more skilled than the average legionary.

The stones were found laid out within a rubble context (316) contemporary with the robbing of the eastern *spina* pier of the gate during Periods 7–8. They lay virtually adjacent to the *spina*. It seems likely that they were laid aside as useless when the gate was finally robbed for building materials. The cornice may have been a decorative cap to the *spina* and/or gate piers. In such a position passing traffic would probably cause the considerable damage to the astrigal through minor collisions. An argument against this interpretation might be the fact that no returns appear on any of the stones. However, a very small length of moulding, 2.23m, is represented by the fragments recovered, whereas the total length would have been 8.90m if the moulding was used on both sides of the *spina*. If this was the original position of the cornice, it would not have been part of the original gate build, as its quality presents a stark contrast to the quality of the *spina* structure, and a continuous *spina* was in any case not part of the original plan for the gate. It could have been added as part of the Period 3 rebuild.

2. 820; 3383, 1338/rubble/Period 7–8.

Dentilled cornice block in local buff sandstone; height 140mm, width, 580mm. depth 460mm. Much of the left end of the piece is broken away except for the front portion. Otherwise the stone is largely complete. The frontal underside moulding has medial damage, and the stone is worn overall. The weathered top bed is worked with a punch, with sigus of a blade used towards the back left-hand side, used diagonally, as by a left-hander. The first 70mm of the bed appears to be worked more deeply and less evenly than the rest, but this effect could be the result of weathering, indicating that this stone was used on the exterior of the gate and had a wall above it, protecting the majority of the bed. The fillet is 50mm deep at both ends, a significant point. It is now weathered and damaged, with some punch marks showing. Below is a slight chamfer about 25mm wide at both ends.

The flat soffit has a series of four dentils. It is worked with the vigorous use of a punch between the drip and the dentils. The areas between the dentils were worked partly with a chisel and partly by scraping, leaving an undulating surface, largely devoid of toolmarks. The dentils vary in width (60–75mm), height, and curving profile. The bottom bed is heavily punched, and comparatively poor. The one remaining complete joint is unevenly worked, and is 4–5mm under square measured from the face of the drip, deteriorating towards the back.

The block would have formed an impressive decorative element when new, and the uneven working shown in the unequal dentils would not have been noticeable when fixed at a height. The variation in the dentils suggests execution by eye, without measuring. In contrast, unusual care was taken to match up the section dimensions of the ends of the block in order to create a uniform joint with other blocks in the scheme.

Two cornice fragments with single dentils were also recovered from contexts 204 and 241 (726). Though one of these was of different section to No 2, they may have formed part of a similar dentil series.

The dentilled pieces were found in the upper fill of the fort ditch (1338), in its latest phase, and had presumably fallen from some height. They are tantalising indications that the gate had been decoratively treated.

Merlon capstones (Fig 37)

A number of stones from the destruction of the *porta principalis sinistra* are interpreted as merlon capstones. Two of these (nos 3–4) retained one corner, and are illustrated. Such capstones are not a common find, though are now recognised more frequently (Bennett 1983a, n44; Crow 1988a, 151). Important examples come from milecastle 79 (Solway House), and the Peel Gap tower (Crow 1991, 61, fig 4), milecastle 39 (Castle Nick), Housesteads (Crow 1988a), turrets 7b (West Denton; Birley 1930c) and 51b (Lea Hill; Woodfield 1965, 171, 182), Cote How tower (16a) on the Cumberland Coast (Richmond 1956b, fig 1), as well as from South Shields (Bidwell *et al* 1988b, 174–5, fig 7.8; Bidwell and Speak 1994, 148, fig 5.5). They are generally rectangular, some 440mm wide with a chamfer and fillet provided to three sides. They were employed in pairs disposed back-to-back in order to cap wide merlons. In the following descriptions the top bed is as viewed with the chamfer uppermost. Weathering to this bed is taken as evidence suggestive of use as capstones, rather than as parts of a string course on the angle of a tower with the chamfer facing down (Hill and Dobson 1992, 32–3, figs 4a, 4b).

3. 3364, 1314/rubble/Period 7–8.

Broken slab, now approximately 250 x 220 x 75mm, of which one original corner remains. Two adjacent sides have a chamfered face with a 20mm vertical fillet at the base, all now much weathered. The 75mm long chamfer may have been worked with a broad blade or more likely with a punch in uneven vertical furrows. No tool marks remain on the fillet. The corner has been broken off, removing the mitre. The top bed was roughly worked with a punch, and the bottom bed is similar. There are tenuous indications that the bottom bed might have overhung the crenellation below by perhaps 25mm, and there is some weathering to the top bed.

4. 3426, 241/rubble/Period 7–8.

Broken slab, now 370 x 390 x 55mm, one original corner remains. Two adjacent sides have a chamfered face with a 25mm vertical fillet at the base. The stone is much weathered. The chamfer may have been worked with a blade, while the top and bottom faces are punch dressed.

A further two fragments of merlon cap featured the chamfer to two sides (3422, 3428). Eight fragments with a chamfer on a single side were also recovered (3365, 3369, 3405, 3406, 3419, 3424, 3425, 3427, 3429), but these might have originated from string courses.

Window heads (Figs 38, 39)

Evidence for two types of arched window heads was recovered from the gate area: one type was a simple arch constructed of five voussoirs and the other a bilithic construction of two half-arches. At the *porta principalis dextra*, four monolithic arched window heads were discovered, and were until recently displayed by the gate, though they have now been removed to store. These are also briefly considered here.

A number of window head types have been recorded on the Wall and at South Shields. At milecastle 39 (Castle Nick) a piece from of a trilithic segmented window head was recovered (Crow 1988a, 151, fig 6.3). Monolithic window heads are found at Housesteads (Budge 1903, nos 206–13; Bosanquet 1904, fig, p 267, nos 1–4, 6–10), Great Chesters (Bidwell *et al* 1988b, 211), Chesters, turret 44b (Mucklebank) (A Whitworth personal communication), and South Shields, where representations of voussoirs were either painted or incised on their faces (ibid, 171–4, fig 7.8 nos 1, 2; Bidwell and Speak 1994, 148, fig 5.4). Window voussoirs of the type found in some profusion around the *porta principalis sinistra* have been recognised among fallen stonework at the *porta decumana* at Birdoswald (Bennett 1988, 128) where they still lie at the time of writing, and also at Corbridge, Vindolanda (A Whitworth personal communication), and Melandra Castle (Conway 1906, 32).

5. One of four monolithic window heads from the *porta principalis dextra*.

A rectangular slab 680 x 830 x 400mm with a semi-circular window head, 660mm wide internally, cut out at one side. The whole is dressed with a punch, some faces being distinctly finer than others, particularly the front vertical face and the window soffit. In common with two other window heads, the front face has a simple hood/ archivolt moulding above the arch. The top horizontal face of the block features a lewis hole, and rebates were cut in each side of the top to key the piece into coursed rubble.

6. 3392, 1314/rubble/Period 7–8.

Lefr-hand half of a bilithic window head. When standing on its base the maximum height of the stone is 580mm, the width 660mm, and the section 240mm square. When paired, the stone would make a window of 660– 680mm internal width. The front face is worked with a chisel, and the reverse and soffit are punch dressed. The other faces are rough, near natural, and appropriate for bonding with coursed rubble. There are some mortar traces to the back face.

7. 3384–3388, 1314/ rubble/ Period 7–8.

Voussoir window head. Five of the more complete voussoirs were used to reconstruct experimentally the window head

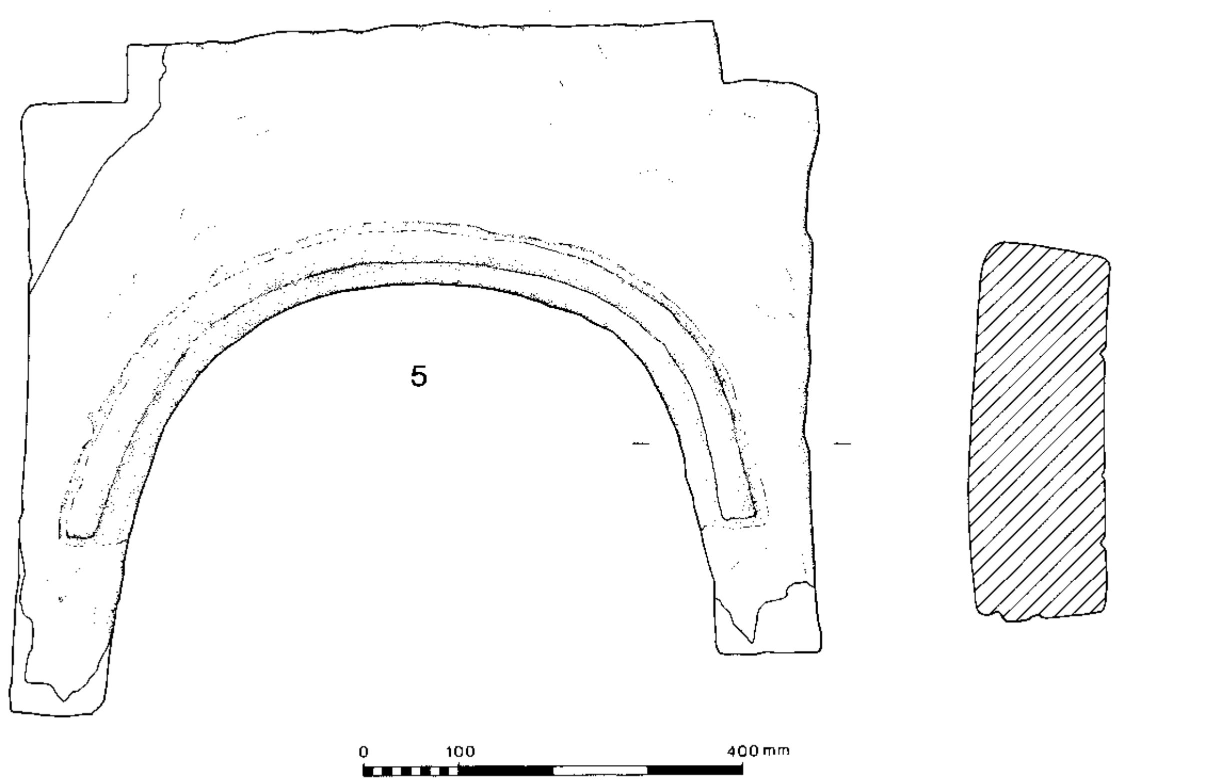

Fig 38 Monolithic window head from porta principalis dextra

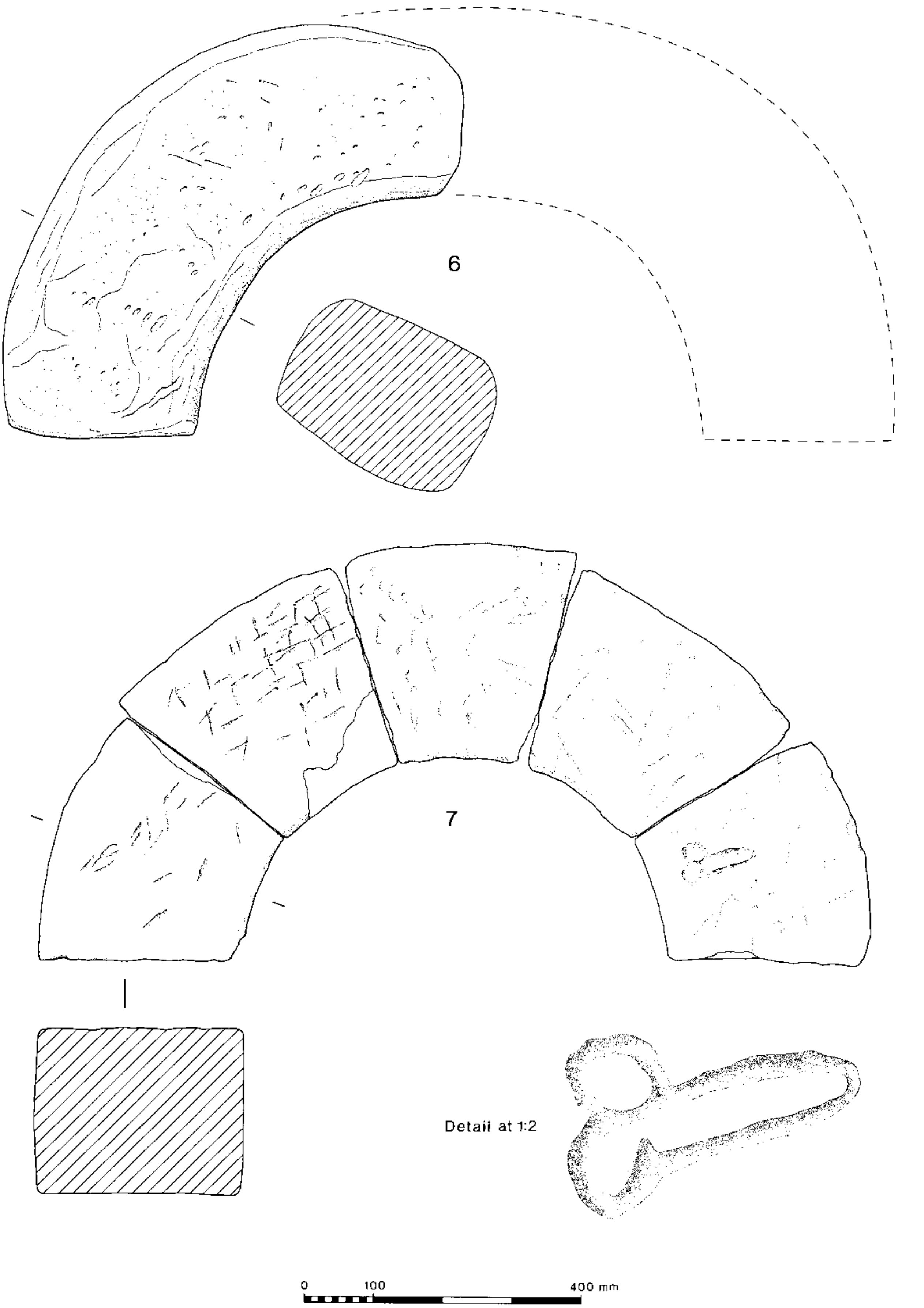

Fig 39 Half of bilithic window head (6), and window head reconstructed from five voussoirs (7) found in the rubble from the collapsed porta principalis sinistra

shown in Figure 39. Though it is demonstrable from the arch radii of the stones that they came from at least two different arches, the ease with which they could be used together demonstrates that there was considerable flexibility in the sizes of voussoirs. The arch gave an internal window width of 660mm.

The voussoirs were worked entirely with a punch, the faces being straight within 3mm with a range of 4mm. Starting with the lefthand springer (3384), the approximate sizes of the voussoirs are as follows: 300 x 250 x 200/370mm, 300 x 215 x 210/360mm, 310 x 190 x 180/335mm, 280 x 250 x 190/370mm, and 300 x 250 x 195/330mm. The calculated radii of the several stones are 350mm, 410mm, 360mm, 275mm, and 410mm respectively.

The stone used as the right springer (3388) had a phallus pecked into its front surface. It points radially outwards with a conical tip and some indication of a glans. This was not necessarily carved at the time when the voussoir was dressed and the arch was constructed; being incised, the phallus could have been cut at any subsequent time. Phalli were carved at points of entry, such as doorways to buildings or rooms, or on gates and bridges (Coulston and Phillips 1988, nos 404–5, 448, 457; cf Keppie and Arnold 1984, nos 97–8), where they served an apotropaic function, warding off the evil eye and ensuring good luck (Turnbull 1978; Johns 1982, 62–75). Depicting a phallus on a window seems to be a logical extension of this custom.

Apart from the five voussoirs above there were a further 11 found in the gate area (619, 3374–79, 3395–7, 3417) giving a total recovered of 16. A comparison of the radii of the voussoirs was not effective in suggesting whether some of these were from the same windows. It is noteworthy that all of the Birdoswald window heads, whether monolithic, bilithic, or voussoir were designed to frame windows of a broadly similar width, around 660mm.

String courses (Fig 37)

Stones with a simple chamfer to one side, or to two adjacent sides were found in the vicinity of the gate. Chamfered stones are frequently found on the north side of Hadrian's Wall, and a complete 10m run of a fallen string course was found at Peel Gap (Crow 1991, 59–60). Such stones have been discussed by Crow (1988a, 149–50) and Bidwell *et al* (1988b, 175–6). These stones show no weathering on the top or bottom beds, but are weathered on the chamfer. They were built into the wall with the chamfer projecting (Hill and Dobson 1992, fig 4b), and were used at significant points, for example immediately below the parapet at wall walk level. Crow (ibid, fig 6.1) reconstructs a milecastle gateway with string courses of this type at each floor level of the tower. Two types of string course were found at the gate. One (No 8) was 120mm in thickness and had a simple steep chamfer with small or non-existent fillet. The second type (No 9) had a shallower chamfer and a more defined fillet, but was only 75mm thick. All of the stones were fragmentary.

8. 3372, 1314/rubble/Period 7–8.

A steeply-chamfered stone, 330 x 200 x 120mm. The chamfer is 100–110mm and the rough fillet about 15mm. The chamfer is very much weathered, the natural beds unweathered. Both joints remain, neatly worked with fine punch marks. A further eight stones of this type were recovered: 3390, 3399, 3401, 3402, 3404, 3416, 3418, and 3423.

9. 3369, 1314/rubble/Period 7–8.

315 x 255 x 75mm, broken at one end, with a 100mm chamfer and a 25mm vertical fillet. The bottom bed is natural, the top bed punched neatly but unevenly, with traces of mortar. Both beds appear unweathered. The fillet was worked straight with vertical chisel marks (One other stone of this type was recovered: 3373).

Diamond broaching

A large number of coursed-rubble walling stones around the gate were worked deeply and deliberately with a punch in reasonably carefully-set furrows laid out in a lozenge pattern: so-called diamond broaching. A broach is an alternative term for a punch. The purpose of this work, in which the lozenges may be between 10mm and 50mm across, is unclear apart from the idea that it is simply decorative. In many cases the face has first been worked over with a punch to give a reasonable surface before the laborious and often careful working of the lozenges. Its frequent use in the gate indicates that it must have been called for by some supervising authority. It is unlikely that it was used for mortar or plaster keying, as no render has been observed on the surface of any of the stones. Furthermore, it is frequently found on single stones in long lengths of curtain wall (A Whitworth personal communication), where it may simply be the work of legionaries bored with turning out hundreds of identical walling stones.

The west curtain wall

The coursed rubble curtain wall, which was 1.59m in width, was built at the western edge of the raft foundation (3838), leaving an offset of 280mm to the rear. The wall (4151; Fig 65) was constructed with a bottom course of larger blocks. This had a 80mm offset to the second course, which was offset to the wall face by a similar amount. This external double offset was identical to that of the north faces of the south passage wall and the north passage wall of the *porta principalis sinistra*. To the south of the excavation area a culvert through the fort wall (338) was built into the offset courses. This was capped by a larger stone within the third regular course (Fig 60).

The curtain wall, together with the walls of the gate passages and towers, was bonded with a pinkish, sandy, soft mortar, which survived mainly within the laid rubble core of the wall.

The *porta quintana dextra* and adjacent curtain wall (Area F)

The gate structure

by Peter Hill and Tony Wilmott

The earliest features defined during the excavation of Area F were those relating to the construction of the stone fort, specifically of the *porta quintana dextra*. During the excavation of this area in 1992 a further

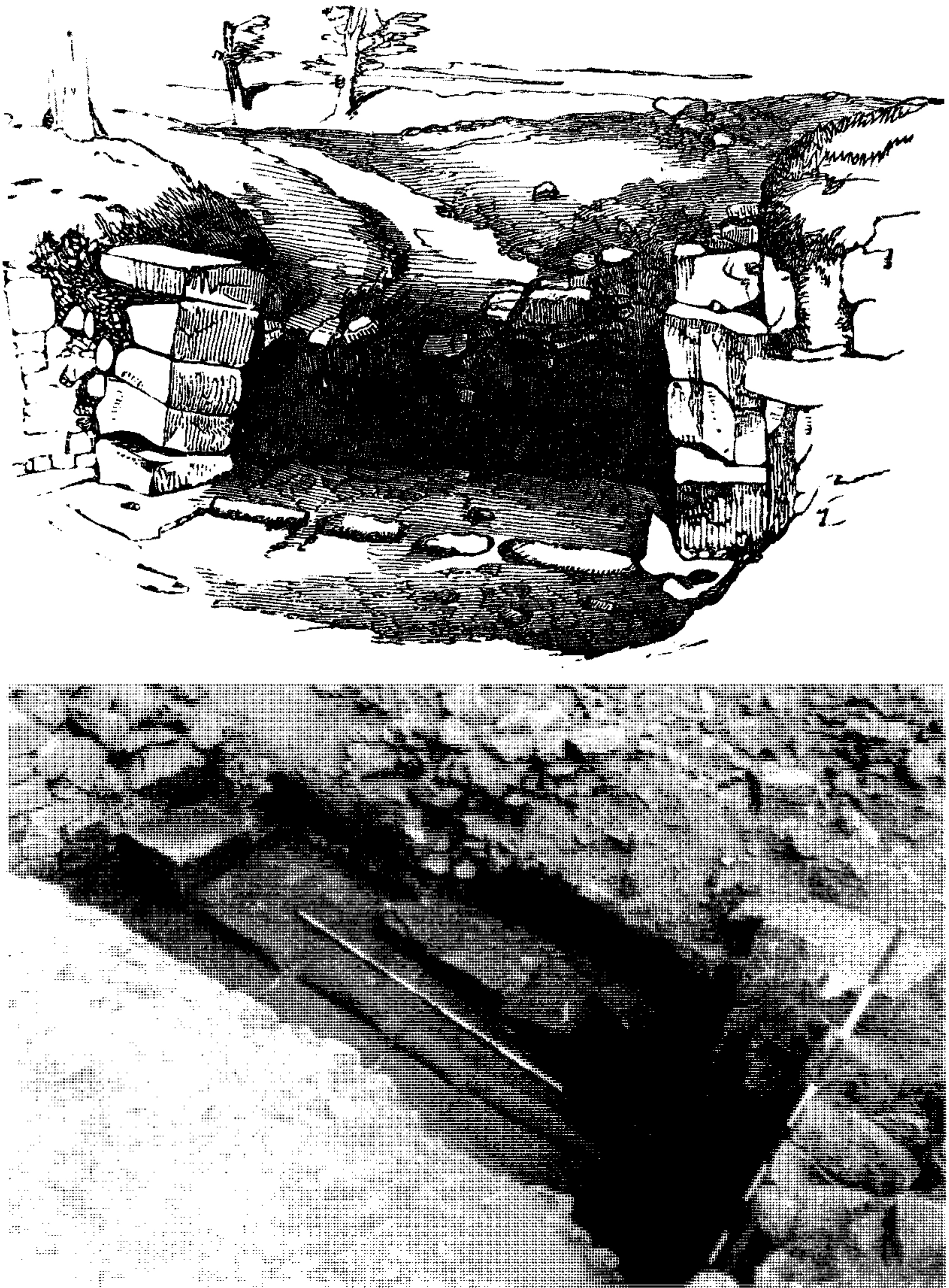

Fig 40 The porta quintana dextra *as recorded by Potter (1855a), top, and as recorded in 1992, bottom*

stonemasonry survey was undertaken by Peter Hill (Hill 1992: contained within the site research archive). This gate had been excavated by Potter in 1850, and drawn by John Storey. Comparison of the Storey engraving and the 1992 excavation photograph (Fig 40) shows that much of the north pier has been lost in the last century. As at the *porta principalis sinistra* three styles of masonry representing three separate building stages were recognised.

The foundation blocks under both piers appear to be of a similar standard both to each other and to the foundation blocks for the piers of the *porta principalis sinistra*. As at the *porta principalis sinistra* these blocks were built before the road surfaces were laid. The foundation of the north pier was visible only on the west side, where it projected 500mm from the passage wall offset. It was approximately horizontal, suggesting that the foundation may have consisted of two blocks and that the eastward lean of the pier may have been due to the subsidence of an eastern block, the junction of which may be hidden by the sill. The top bed was generally rather poor, and the western edge broken away, perhaps along a bedding plane. However, within 75mm of the rear of the pier, the surface improved markedly, carefully worked with a punch in small pecks; there was insufficient available for measurement, but it seems likely that the whole bed was originally produced to a good military engineering standard. There was a pivot hole 110mm diameter and 60mm deep, centred approximately 220mm from the passage wall. The southern pier foundation (473.064; Fig 41) measured 1.17m from its western edge to where it disappeared below the eastern baulk, and 0.46m from the northern edge to the southern. Again the top bed was worked with a small punch, though the north-east corner of the stone was roughly cut away with a punch to a depth of about 40mm over an area around 475 x 280mm. The pivot hole was centred in a similar position to that on the north side. There was some wear in the hole, indicating that the iron collar was rotating with the pivot rather than being held fast by lead caulking.

The northern pier (473.061; Fig 41) comprised a single block measuring 560 x 550 x 360mm. This was the only surviving stone of the full height pier recorded by Potter in 1850 (Fig 40). The pier originally stood 1.83m (6ft) high and consisted of five blocks. The remaining stone is less than ideal, but there is evidence of some care having been taken, and overall it may be considered to be of an acceptable Roman military engineering standard. The faces were worked with a punch in random pecks and furrows to give a reasonably clean but not very attractive face. There was a chiselled margin at the top of the south face, 20mm wide at best, sunk 5mm below the face, though it is clear that this was never continuous. There was also a well-defined chiselled margin on the east side which was probably square to the east face. The top bed was generally straight with undulations of up to 2mm. It was neatly, albeit randomly, worked with a punch, with some signs of a blade used against the faces. The stone was less good than the lower stone of the south-west pier of the *porta principalis sinistra* (3835) and was perhaps nearer in quality to the upper stone on that pier. The differences were not great, however, and this stone may relate to the first stonemasonry type defined at the *porta principalis sinistra* although the possibility that it belongs to the second phase should not be excluded.

The south pier (473.060; Figs 41, 42) stood 1.30m high, with four stones surviving. Five were recorded by Potter, to a height of 1.73m (5ft 8ins). The two lower stones are similar to each other, although less well finished than the north pier. One can again see these falling into either of the first two masonry types with the latter being slightly more likely. The two stones were similar in size to that on the north side, but varied in height, at 305mm and 260mm. Like the northern stone the blocks were worked relatively roughly with a punch to give a rather untidy, though acceptable appearance. The well defined chiselled margins were about straight, and the top beds were punched with fine pecks to a clean, near straight finish.

The two upper stones on this pier are distinctly different. These stones are 330mm and 355mm high. They are 850mm long from east to west, including a projection on the western (inner) face which was set back 250mm from the northern face, would have originally overhung the lower stones on the western side by 250–300mm. The east (outer) face of the fourth course was partly visible. There was a very rough margin along the top, about 50mm wide, worked with a punch rather than a chisel. The remainder was a bold rock face, very roughly reduced, possibly with a pitching tool at either side, with poor attempts at margins at the sides. The northern faces are little better than a shallow rock face worked mostly with a punch, occasionally with a 35mm blade. The return to the west face was relatively tidily worked with a punch in short furrows, straight from side to side. The north face of the projection was almost certainly partly worked with a pitching tool. The projections on these stones could never have formed a face as a continuation of the passage wall. They were well in advance of the line of the passage wall, and simply represent those parts of the stones left after clearance had been cut for the door. They will always have overhung the rear of the lower courses and the overhang would have been visible only when the door was closed. It is probable that the stones were prepared at the quarry to a standard size and, once bedded onto the existing courses, were regarded as finished and the passage wall built around them. The upper two stones of the pier certainly fit into a later stage than the lower pair, and, to judge by the lack of care taken, would fit well with the completion of the west *spina* pier of the *porta principalis sinistra* (4412); this is the the third masonry type which followed from the deposition of the black hiatus soil in Area A.

A large voussoir was embodied in the clay rampart which backed this gate after it was blocked. Enough stone was exposed to check the overall size, as follows: thickness (front to back of arch) 635mm, width between joints at extrados 406mm, at intrados 305mm, depth of arch ring at joints 533mm, depth of ring taken midway between joints, 560mm. The latter measurements should be identical, the difference represents inaccuracy in working. From these measurements it is possible to calculate the span of the arch from which the voussoir came, using the formula cited above. Taking the depth of the arch ring as 533mm gives a span of 3.20m, using the 560mm depth gives a span of 3.35m. The distance between the piers is 3.32m. It seems improbable that the voussoir came from anywhere but the arch over this gate. The extrados was largely natural with some help from a punch and perhaps a pitching tool. It is a rough unmeasurable surface suitable to abut coursed rubble. There are very few signs of tool marks on the west face apart from the occasional use of a blade; it is little better than a reasonably-straight natural face, which could well have formed the inner, largely unseen, face of the arch. The upper surface or joint was generally straight overall. The careless appearance of the voussoir would suggest that it belonged to the same masonry type as the upper stones of the south pier.

The passage walls to the gate tower (473.065, 473.066; Fig 41) faced the ends of north and south sections of curtain wall (473.073, 473.11; Fig 132). They were constructed of coursed rubble with tapered facing stones 160mm deep and from 470–190mm in length, and were bonded with a hard,

Fig 41 Section 9, within area F (the porta quintana dextra*) and location plan extracted from Figure 132 (NB All context numbers are prefixed with the designation 473 as eg 473.117)*

pinkish-white mortar with large gravel aggregate 2mm down. These survived at the highest to 1.35m high, a total of eight courses. The walls are offset by 60mm from the inner face of the bottom course.

The gate sill was made up of four pieces of buff sandstone consisting of a flat portion at road level on the west (inner) side, and a continuous upstand against which the doors were closed. In the upstand were three grooves such as might be worn by the passage of wheeled traffic; the intervals between the centres of the grooves are spaced (from the north) 760mm and 560mm. The two deepest and widest grooves lie in the northern half of the sill and are about 90mm below the top of the upstand. The southern groove is only some 40mm deep; the comparative shallowness of this groove may be in part, but not entirely, due to the wear on the upstand.

The sill poses interesting questions. A block of stone 100mm high would have been an ideal chock to stop a cartwheel; this would have been the effect of the unworn sill. There could be no question of the roadway inside the fort being laid level with the top of the sill, as this would have prevented the doors from closing. The use of a chamfered timber laid inside the sill as and when needed would ease the problem, but the wear on the flat part of the sill strongly indicates that this was not done. It is conceivable that the sill may have been cut away in appropriate places to allow for the easy passage of wheeled traffic, but no evidence of tool marks survives. Of course cartwheels are generally of large diameter, making the sill less of an obstacle than it would present

Fig 42 The south pier and robbed passage wall of the porta quintana dextra: *a gate voussoir can be seen at the west end of the passage wall; the tip lines in the rampart are clearly visible*

to a smaller wheel, but considerable effort would still have been needed to get a laden cart over the sill. The amount of wear might be invoked to suggest that the gate was in use for a considerable period of time, but it is difficult to be certain of this point. No quantifiable evidence is available to give the degree of wear to be expected from driving iron-tyred wheels over specific types of stone sill; it is probable, for instance, that the wetter the weather then the quicker the wear, as with a whetstone. At the Housesteads *porta praetoria* the upstand was 280mm, an impossible height for a laden cart to cross, and must have been cut away to allow the passage of wheeled traffic. Further research is clearly needed on this point, in view of the implications of using the depth of ruts to determine for how long a gate was in use; this is a suspect approach as the factor is the quantity of traffic, not passage of time. In this case the heavy wear on the top of the upstand, caused probably by foot traffic, is a more reliable indicator and suggests that during its life, however long or short this may have been, the gate was heavily used. The position of the ruts is also of interest, the two deepest lying only 760mm apart. The distance between the northern and southern ruts is 1.32m, near enough to the 1.42m found at Housesteads, but the northern groove is worn to twice the depth of the southern one. Perhaps we are dealing here with two gauges, the narrower of which represents the frequent passage of a hand cart. No tool marks were visible in any of the ruts.

The north-east corner of the foundation block to the south pier ran down in an irregular, worn, hollow chamfer. A similar hollow is found in the analogous position in the foundation to the east pier of the *porta decumana*. It is not in a position to have been caused by passing traffic, lying between 35 and 130mm from the face of the pier. It could have been caused by knife sharpening, but the stone would have been inconveniently close to ground level for this purpose. A ready explanation is that a sentry stood here, just outside the gate, perhaps habitually taking surreptitious support from the pier.

The gate sill was butted to east and west by road surfaces. To the west, inside the fort, this consisted of a compacted surface of orange-brown gravel (473.117), while to the east lay a slightly-worn surface of cobbles (473.116), mostly below 150mm. On analogy with the situation at the *porta principalis sinistra* it seems likely that this comprised the primary cobble foundation to a gravelled road outside the fort which was never laid down.

The curtain wall

The history of rebuilding of the curtain wall is considered below as it is not clear how much, if any, of the exposed wall was primary. The wall itself (473.005; 473.011) measured 1.60m thick, identical to the west and north curtain walls.

There is no reason to suppose that it was not constructed in the same typical coursed rubble walling stones as the rest of the fort curtain. The contemporary passage walls to the gate tower (473.065; 473.066) which faced the ends of, and are bonded with, the north and south sections of curtain wall were probably of the same construction as the curtain wall itself.

Blocking and rampart

The gate was blocked, probably soon after its construction. The gate tower was demolished and the fort rampart raised against the back of the blocking. The passage walls were demolished and robbed in steps (Figs 41, 42). The bottom two courses may have been kept intact in order to provide additional revetment to the rampart built behind the blocking of the gate.

Three stones of the east face and two of the west face of the blocking walls survived. These lay 1.60m apart, the same width as the fort wall. It seems likely that there was a rubble core between the two faces, and that this was removed by Potter (1855a, 67), who noted that the stones of the blocking wall were larger than those used in the *porta quintana sinistra.* Some 'appeared to have been taken from the upper part of the pillars of the gateway' and the workmanship is described as 'bad and coarse'.

The east face (473.067) was represented by three surviving sandstone blocks measuring 400 x 260 x 200mm. The west face (473.068) comprised two discontinuous sandstone blocks each 760 x 380 x 230mm in size. The wall faces were constructed directly upon the primary road surfaces already described.

The rampart (473.018=473.004=473.100) survived to a height of 1.42m. It was mainly comprised of orange-brown sandy clay, though it included narrow bands of light grey sand, ash, and charcoal. It was at least 5m wide, extending to the edge of excavation and beyond. The tip lines in this material ran from the wall top dropping westwards. It was clear that the rampart was dumped against the back of the blocking wall and the robbed passage walls. Part-way up the bank and 500mm west of the fort wall was a roughly-built clay-bonded wall (473.101; Fig 41), two to three courses high (450mm), 400mm wide, made of tabular sandstone pieces. This is interpreted as a small strengthening wall incorporated into the rampart to avoid slippage. Reference has already been made to the voussoir found incorporated in the rampart behind the gate. This demonstrates that the arch was thrown down when the gate was blocked and the tower dismantled, and it seems likely that Potter was correct in observing that stones from the tower were reused in the blocking.

It is possible that the primary fort ditch was now cut across the whole frontage of the gate. Certainly the road cobbles (473.116) were cut by a ditch edge (473.017) which did not respect the gate. This was cut from the level of the cobbles, and it is therefore unlikely that it was a late recut.

The North Wall (Area B)

In Area B the construction of the stone fort was examined in two deep cuttings: firstly in a section cut through the fort rampart at the western end of the area (Fig 43), and secondly within the interval tower excavated to the east of the area (Fig 126).

Fort wall and rampart construction

The north wall of the fort (202) survived to a height of seven courses of which three lay beneath an offset of 200mm on the south (internal) side. The wall, at a

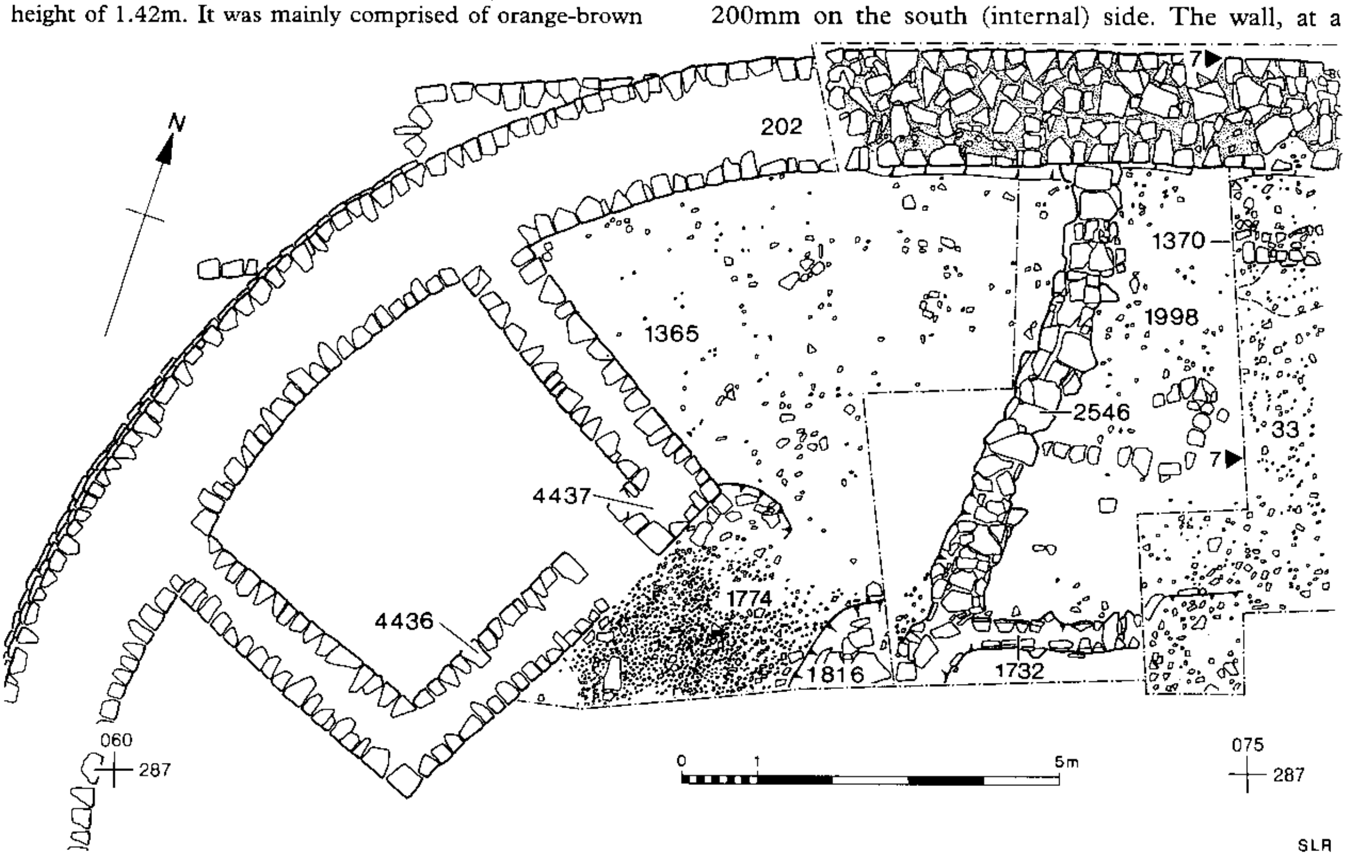

Fig 43 West end of Area B to show the area of deeper excavation through the rampart

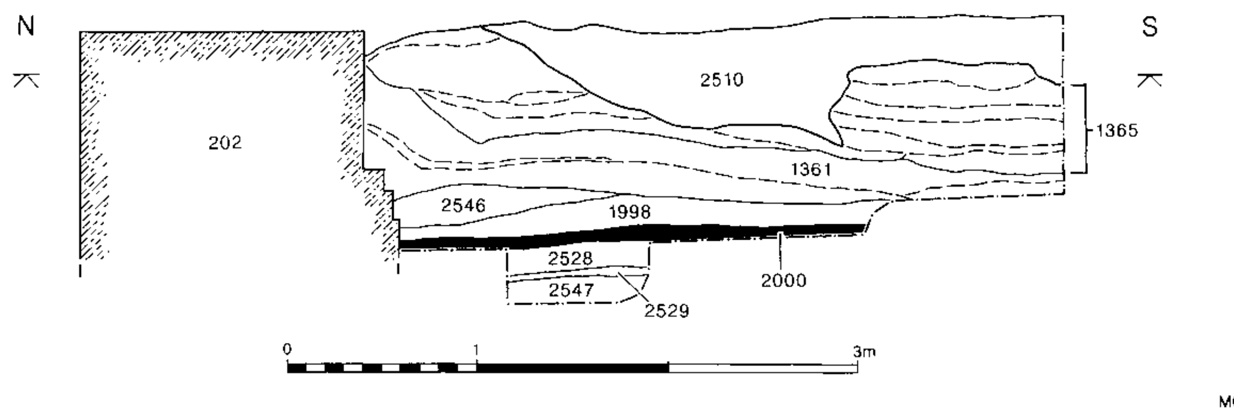

Fig 44 Section 7, the north wall rampart in Area B (located in Fig 43)

width of 1.60m, was constructed of well-laid coursed rubble with a core comprising large, roughly-dressed slabs up to 230mm thick. The core was coursed, suggesting that it had been laid course for course with the facing stones. The edge of a construction trench (2505) was located 600mm to the south of the wall. This was sealed by a black silty layer (2000; Fig 44) which spread well beyond the wall to the south.

Above 2000 lay a compacted deposit of sandstone chippings (1998), probably mason's chippings derived from the building of the wall. This was cut by a stone lined drain (2546; Figs 43, 45), 'V' shaped in profile, with flag-lined sides, and a flagstone cover. The drain led to a culvert which had been constructed as part of the fort wall. This was of identical

Fig 45 Drain 2546 leading to culvert in north wall of fort: the rampart section is visible to the left

construction to the culvert south of the *porta principalis sinistra* (compare Fig 57). The construction of the drain was thus anticipated by the construction of the wall and was part of the original conception of the fort layout.

The drain was sealed by the primary rampart (1365), an earth bank built up against the back of the curtain wall in a series of dumps laid successively as part of a single operation. These dumps varied enormously in colour, content, and texture, and had the appearance of occupation deposits scraped up and reused. To the west of the section lay two irregular walls (1370, 1371; Fig 126). These are no more than two courses high, and were entirely incorporated within the rampart material which they appear to have served to revet in the same manner as the primary rampart revetment walls behind the blocked *porta quintana dextra* (Fig 41).

Analysis of the soils from the rampart

by Maureen McHugh, Patricia E J Wiltshire, and Tony Wilmott

The subsoil beneath the rampart in Area B apparently remained undisturbed during the construction of the Stone Fort. The evidence for this is the fact that the *in situ* Ah horizon beneath the rampart was similar in morphology and pollen content to the undisturbed underlying Ah beneath the earlier Turf Wall (Chapter 2, Fig 19).

The rampart was sampled in two sub-samples, of which the lower represented an *in situ* 1A horizon. There was a substantial amount of microscopic charcoal present in this layer and palynomorphs had already completely disappeared (Wiltshire, 1993). Although the fading of palynomorphs could have been caused by persistent disturbance and consequent enhanced aeration of the soil matrix, the building of a curtain wall against which the rampart was raised would certainly have been disrupted the upper levels of the *in situ* soil. The subsample from the black band may derive from the LFH horizon of an inverted turf (PW), possibly placed as a foundation course to the rampart. Both palynological and soil analyses of this sample suggest that the foundation turf might have been taken from an area towards Midgeholme Moss (Wiltshire 1992, 16 (for full pollen data for the rampart sample see Appendix 3, Table 42 and Fig 300), McHugh forthcoming, 26).

Levels of phosphorus within the black band far exceed those documented in most cultivated, fertilised, and unmodified soils (Tiessen *et al*, 1983; Sharpley and Smith, 1989; Sharpley *et al*, 1987; Wild, 1988) and are greater than those documented in some midden soils by Pettry and Bense (1989). They massively exceed levels in the Turf Wall samples (Table 3). The anomalous distribution of phosphorus suggests that it was added to the black band and can be attributable to human or animal activity. Marked differences between the organic fill, the overlying mineral soil forming the rampart, and *in situ* A horizon suggest that post depositional contamination of phosphorus through percolation can be discounted. The levels of phosphorus indicate quite clearly that this material has been subject to intensive, though probably short-lived, additions of phosphorus. The distribution of forms present, particularly the predominance of inositol phosphate in the organic fraction, has been attributed to the addition of animal excreta to an otherwise unamended organic soil just prior to burial. Regardless of precise origin, phosphorus enhancement suggests activity on-site or in adjacent areas prior to the raising of the ramparts. It may have been caused by something as simple as the builders casually urinating against the wall. Though the analysis of phosphorus distributions was undertaken for the black band as a whole, it seems likely that the massive enhancement attested was derived from the *in situ* soil, with its other indications of disturbance, rather than from the rampart soil of the deposit.

The rampart above the black material is thought to comprise local soil which has been dumped rather than emplaced intact. Mineralogical and chemical characteristics suggest that it comprises mainly local mineral topsoil, though physical characteristics suggest an additional subsoil component. Intact laminations suggest that the soil may not have been completely disrupted, though the presence of local peaty inclusions and horizontally-oriented fine humified plant (mainly wood) debris indicate fairly substantial disturbance. Charcoal inclusions (absent in the *in situ* soil) are thought to reflect local activities at the time of rampart construction. The overlying deposits have not been examined in detail, though variations in terms of colour, texture, and organic matter content are thought to reflect distinct phases of construction and slight differences in origin. Some peaty inclusions share morphological similarities with the basal black band, and are thought to have a similar origin. The persistence of this stratigraphy indicates minimal post-burial disturbance.

Fig 46 North-west angle tower as excavated by Gillam in 1949, looking east: the broad raft foundation of the south-east wall is visible in the bottom right corner (photograph by J P Gillam; reproduced by permission of Brenda Swinbank and RCHME)

Table 3 Soil phosphorus in deposits associated with the Turf Wall, north rampart and hiatus soils (Mg Pq^{-1} over dry soil)

site	*Pt*	*Pi*	*Po*	*Po as % of Pt*
Appletree TW				
lower turf	453.1	95.8	357.2	78.8
upper turf	329.8	19.0	310.8	94.2
A	302.8	28.4	274.5	90.7
TW1				
lower turf	562.7	226.0	336.7	59.8
A	454.9	226.2	228.7	50.3
TW2				
lower turf	862.0	578.5	283.5	32.9
A	697.0	352.1	345.0	49.5
North Rampart				
organic dump	2541.6	2421.5	120.1	4.7
mineral dump	895.7	280.8	615.0	68.7
A	546.2	313.9	232.3	42.5
hiatus soils				
HS1	1216.6	846.7	369.2	30.4
HS2	3294.4	2090.1	1204.9	36.6
HS3	2741.2	1354.9	1386.7	80.6
HS4	4665.9	445.2	4220.7	90.5

key: *Pt* = total phosphorus

Pi = F1 (non-occluded Fe and Al associated phosphorus) + F2 (occluded Fe and Al associated phosphorus) + F3 (Ca associated phosphorus)

Po = organic phosphorus (Pt-Pi)

(Sequential extraction procedures yield the following inorganic phosphorus (P) fractions: non-occluded iron (Fe) and aluminium (Al) associated P (F1), occluded Fe and Al associated P (F2), and calcium (Ca) associated P (F3). The total extractable P (Pi) comprises F1+F2+F3, subtracted from the total P (Pt) provides an estimate of organic P (Po).

In non-anthropogenic soils (agricultural, pastoral, semi-natural, virgin), total Pt values usually lie within the range 140–700 ug P g^{-1} (Wild 1988), although values up to 1434 and 1558 ug P g^{-1} have been documented (Sharpley *et al* 1987; Tiessen *et al* 1984) suggesting a marked variation between soil environments. Within any given soil system, however, Pt provides a crude estimate of relative enrichment, which may be interpreted in terms of external inputs (human, animal, occupation) if background, or 'native', concentrations are known.

The forms and distribution of phosphorus within any given undisturbed system are closely related to continuing soil processes or pedogenesis (Walker and Syers 1976). The use of phosphorus as an indicator of function or usage in archaeological soils relies on the recognition of deviations from trends expected in a natural system. For example, high levels of F3 would not be expected in slightly acid soils; conversely, high levels of F1 and F2 are not usually predominant in calcareous soils, while high levels of both F3 and F1+F2 would not normally be expected in a single soil system. Eidt (1977) suggests that such parallel distributions can usually be linked with settlement or occupation.

Once added to the soil via natural processes or external agencies, phosphorus is gradually incorporated into the soil organic system. Po therefore tends to accumulate in 'virgin' soils over time, and is high in weathered or acid soils (Sharpley *et al* 1987), where it might comprise from 60–90% of Pt. The proportion of Po is dependant upon climate, soil type, vegetation, land use, drainage, organic matter content, microbial activity, pH, and soil texture. Thus while low levels of Po might sinply reflect intrinsic soil conditions, Po will also decline as a result of mineralization processes brought about by clearance, cultivation, drainage, etc.)

(For fuller table see McHugh forthcoming)

The primary interval towers

The north-west angle tower was excavated internally in 1949. A photograph (Fig 46) suggests that the tower was of one build with the fort walls. It stood 13 courses high, the bottom two of which had internal offsets. There is an apparent broad, flat foundation below these offsets similar to the rafts on which the *porta principalis sinistra* was constructed. Its walls are 920mm in thickness.

The interval tower to the east (Building 4419) was also bonded with the fort wall. Its side walls (4314, 4315; Fig 126) are 920mm wide. The south wall of the tower was robbed (4311), as was most of the east wall, but evidence survived to demonstrate internal dimensions for the building of 4.32 x 3.13m. The earliest floor was a compact deposit of pebbly hard sandy clay (1853).

The hiatus horizon (Site Phase 4)

Stratigraphic definition

The stratum discussed here was an extremely extensive layer which comprised a major identifiable horizon over the entire site. Its excavated extent is shown in Figure 47. The deposit formed a crucial stratigraphic separation between the two phases of stonemasonry at the *porta principalis sinistra*. Eastwards from this gate, it covered the entire excavated area beneath the later *via principalis* (3738=4063) and extended through the gate (3880), where it lay above the foundation raft and on the berm (3877). The deposit ranged from 20–130mm in thickness. It was level, with a top surface range of +157.74–157.91m OD. To the west of Area A, on the north side of the former Turf Wall ditch it (3804) lay at a level of +157.98m OD. The layer was defined at a very similar level of +157.97m OD in Area E (3781), and was tentatively identified in Area D.

Between the two later *horrea* and beneath Building 198 (1285, 2555) the stratum was defined as a very thin silty layer which sealed the post and trench features of Period 1. It appeared at the southern edge of Area A (1281; Fig 16) where it was sealed beneath the primary fort rampart. The ubiquity of this deposit is such that on all section drawings in this report (Figs 16, 25, 26, 34, 103) it appears as solid black shading. In all areas this layer immediately predated the construction of the earliest stone buildings and also the laying-out of roads. It was directly sealed by strata associated with these activities.

Analysis of hiatus soils

by Maureen McHugh, Patricia E J Wiltshire, and Tony Wilmott

This section summarises the specialist reports in this deposit. Full details can be found in McHugh (forthcoming) and Wiltshire (1992).

Sampling

The hiatus soils were sampled in four places (Fig 47). HS1 (3880) was taken from below the sills of the *porta principalis sinistra* and above the raft foundation. HS2 came from Section 2 (3738; Fig 25) to the north of the *horrea*. HS3 (3804) was taken from below the clay floor make-up of Building 4403 to the north-east of Area A, and the final sample, HS4, was an additional sample of context 3738 taken at random. All of the soils were well sealed; HS3 by the boulder clay levelling provided for the floors of Building 4403, and the other samples by the thick mixed clay and gravel of the *via principalis*.

Archaeologically HS1 was a visually-indistinguishable continuation of the hiatus soil deposits within the fort; however its position as a thin layer overlying the raft foundation of the *porta principalis sinistra* and adjacent to the gate structures rendered it less satisfactory for analysis than the remainder of the deposit. The analysis of this sample was therefore not continued beyond macromorphological examination.

Conditions of burial

The characteristics of the sealing road and floor make-up levels suggest that these were largely derived from weathered boulder clay. The predominant reddish brown colours and the limited extent of gley morphology within the till suggest that post-burial soil reduction (and by implication other soil processes also) has been limited, despite the presence of microcrystalline iron oxides within the buried soils. The rarity of biopores across the very sharp boundary between the hiatus deposit and the overlying strata indicates that root penetration and biological activity were minimal after the deposit was sealed. It may therefore be assumed that the results of analysis of the buried hiatus soils reflect conditions contemporary with their accumulation and before burial.

The pH values throughout, and levels of phosphorus within the buried hiatus soils, were very much higher than those from all other samples taken except for the lower organic material below the north rampart (Table 3). The raised pH may simply reflect soil pH at the time of burial with post-burial leaching and acidification limited by the slow permeability and high pH of the sealing material. Even assuming that pH has been enhanced through the percolation of calcium-rich solutions originating in mortars or refuse, the persistence of any phosphorus in solution seems unlikely given the expected residence time of soil water in the slowly-permeable sealing deposits and the affinity of soil clays, oxides, and carbonates for phosphorus. Assuming for a moment that iron-associated phosphorus was released for leaching as a result of reduction, at near neutral pH it would be immediately resorbed by calcium (or magnesium). Its subsequent activity would then be controlled by carbonates which are unaffected by reduction processes unless pH declines.

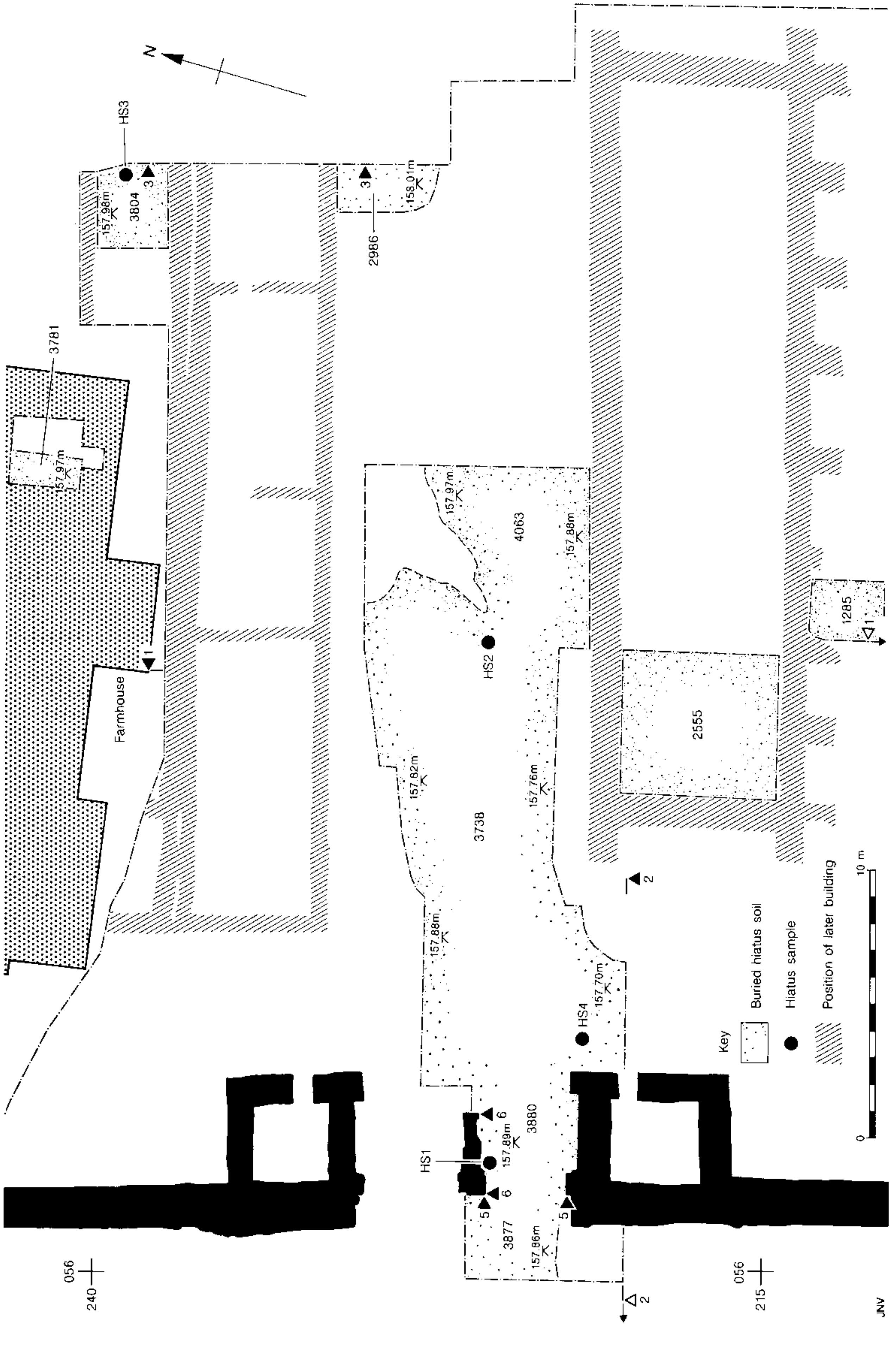

Fig 47 Plan to show areas where the hiatus soil was identified: the smaller figures represent levels expressed in metres above OD

The fate of organic phosphorus in any leachate is less certain, though the absence of organic coatings, stainings, or accumulations within the sealing materials suggests that organic matter mobility was, in any case, limited. Inositol phosphates are known to have a high affinity for calcium and soil clays or iron/aluminium in calcareous and acid soils respectively, while other forms of organic phosphorus would probably either mineralise rapidly at the surface (and adsorb through inorganic mechanisms) or accumulate within the occupation debris. In any case it seems highly unlikely that gradual post-burial contamination would give rise to such variability, not only in the overall levels of phosphorus, but also in the species present. Eidt (1977) suggests that phases of desertion in otherwise continuously-occupied sites can be defined by breaks in the vertical distribution of soil phosphorus. The dumping of relatively-fresh drift over these 'desertion' soils would provide a man-made hiatus in this process which seems likely to persist. It may therefore be concluded that levels of phosphorus within the buried soils also reflect the pre-burial environment.

Morphology

Broad physical similarities between the hiatus soil samples, and between these soils and their subsoils (Fig 48), suggest some degree of common *in situ* development, though in each case the sharpness of soil/subsoil boundaries suggests minimal faunal mixing at least during the later stages of soil development. Organic matter content, however, varied quite markedly between samples, while carbon/nitrogen ratios suggest a real variability in terms of organic matter composition (values in fresh plant and humified materials ranging from in excess of 20:1 to 8:1 respectively), with ratios in HS3 suggesting the predominance of unaltered plant or other organic material or the presence of charcoal. Pettry and Bense (1989) related erratic carbon/nitrogen ratios with discrete cultural components in midden soils, and it seems at least likely that variations here reflect real differences in terms of vegetation composition or site function. The pH was comparatively enhanced in each soil, though was highest in HS3 where values throughout exceed 7. High pH may reflect i) limited post-burial acidification mediated by the slow permeability and high pH of the sealing material, ii) the degree of sealing afforded by subsequent structures, or iii) post-burial soil modification as a result of prolonged occupation.

The physical characteristics of the subsoils are closely comparable suggesting a common local origin, though the subsoil of HS2 is only marginally gleyed suggesting that the profile was truncated prior to the development of the hiatus soil.

The hiatus soil samples exhibit a varied and complex micromorphology (McHugh forthcoming) which is not wholly consistent with the development of a contiguous humic topsoil in an undisturbed environment. Although they shared mineralogical similarities suggesting a degree of common *in situ* development, and while each was rich in fine organic fabrics and plant debris, the precise arrangement of soil constituents and the nature of the organic components varied quite markedly between soils. It should also be noted that there is little morphological evidence for the rapid burial of a vegetated surface.

Phosphorus distributions

With the exception of HS1, levels of phosphorus in the hiatus soils far exceeded those observed in the early, undisturbed, soils studied in association with the Turf Wall at Birdoswald and Appletree. They also exceeded levels documented in soils not affected by human activity (Wild 1988), cultivated, fertilised (Tiessen *et al* 1983; Sharpley and Smith, 1989), and midden soils (Pettry and Bense 1989). These levels must reflect intensive inputs by human or animal activity. In each instance, non-occluded phosphorus predominated in the inorganic fraction, levels of organic phosphorus exceeded those observed in virgin, cultivated, or midden

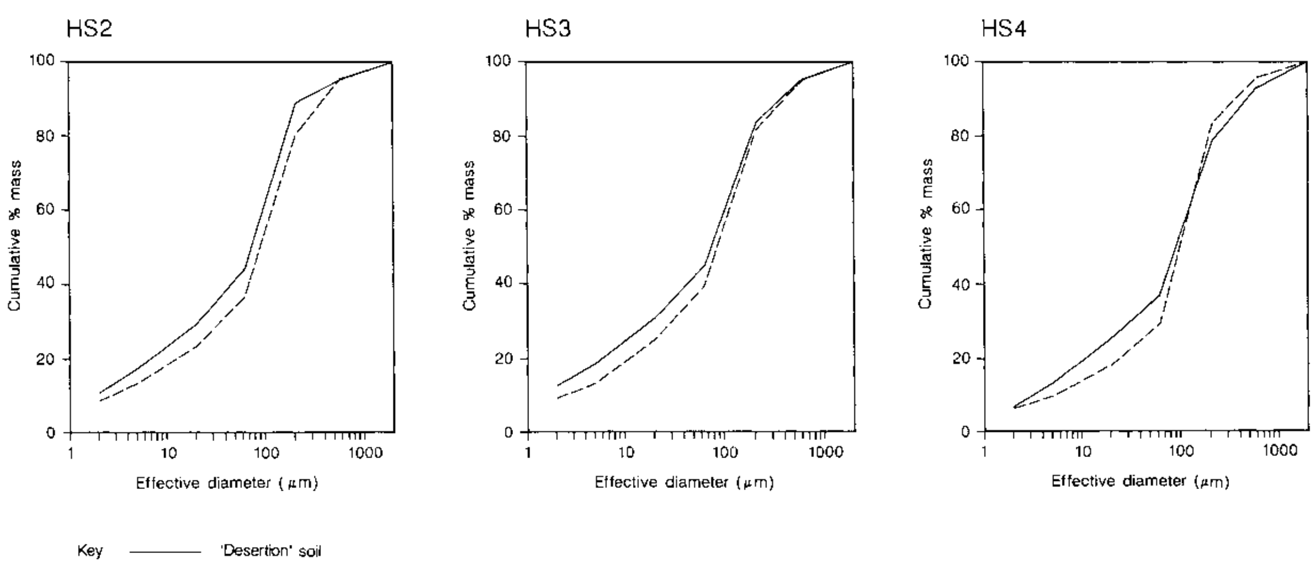

Fig 48 Soil particle size analysis

soils (Sharpley and Smith 1989; Pettry and Bense 1989), while levels of higher inositol phosphates exceed those observed in the non-anthropogenic Birdoswald soils.

The general distribution and levels of phosphorus within HS2 and HS3 are closely comparable (Table 3) with the exception of non-occluded phosphorus which is almost twice as great as in HS2. Using the simple interpretive scheme outlined in the caption to Table 3, the predominance of non-occluded forms at very high concentration in both soils suggests that enrichment though intensive, was probably short-lived. The very high levels of organic phosphorus in both soils (at least twice as much as in the Turf Wall soils) must be attributed to the addition of organic wastes, not subsequently released through mineralisation prior to burial, or to the incorporation of inorganic forms into the organic matter cycle. Though additions were short-lived in terms of the overall timetable of soil formation, they must have taken place sporadically throughout the period prior to burial.

It is interesting to note that levels of non-occluded and other inorganic forms of phosphorus in HS2 were closely comparable with those in the organic layers at the bottom of the north rampart. It may be significant that absolute levels of higher inositol phosphates were also similar, exceeding those in all of the other soils examined. Although organic matter and organic phosphorus contents vary between these two soils, close similarities in terms of lipid composition (the grouping accounts for 80% of the variance in principal components analysis of all Birdoswald soils) suggests a shared biochemical fingerprint reflecting a common plant or animal primary source. It seems at least possible that this may be attributed to the addition of a particular type of animal excrement. Differences in overall organic phosphorus content (it is ten times greater in HS2) might reflect the addition of another organic phosphorus source or simply the timescale of amendment with some of the phosphorus in HS2 held within complex humic substances as a result of incorporation into the soil organic cycle.

HS4, in contrast, was only marginally enriched in inorganic forms of phosphorus. This suggests that inputs of inorganic phosphorus via human/animal activity or organic matter mineralization were much less intensive than in HS2 and HS3. It is, however, massively enriched in organic phosphorus (comprising more than 90% of the total) with values exceeding those in all other soils suggesting the addition of phosphorus-rich organic materials which were not mineralised prior to burial or the incorporation of inorganic forms into the organic cycle as above. Comparison of the lipid composition of HS3 and HS4 suggests similarities in terms of plant or animal primary sources (the grouping accounts for 58% of the variance in the second principal component). Like HS2, this may also be due to the presence of animal dung. It seems likely that HS3 and HS4 shared to some extent a common phosphorus rich organic source material. It may be that differences between the overall levels of organic phosphorus in soils HS3 and HS4 (and to some extent HS2) reflect the timescale of amendment and thus mineralization processes, rather than any intrinsic functional differences, though this suggestion must remain speculative.

Site function

The general physical and chemical evidence suggests that the three soils (excluding the anomalous HS1) share some degree of common *in situ* development, yet the profiles differ quite significantly in terms of their subsoil morphology, their micromorphology, phosphorus distributions, and carbon/nitrogen ratios. The latter suggests a real variability in terms of organic matter composition, either in the degree of humification or the intrinsic nature of the organic materials present.

While this situation might be interpreted simply in terms of a natural variability in the soil environment, the close proximity of samples taken in a visually-inseparable archaeological deposit suggests that differences might reflect discrete areas of site use or at the very least a variability in vegetation composition. The pH values and soil phosphorus distributions tend to support this suggestion. The interpretation of soil phosphorus distributions in terms of site function is however constrained by the complexities of phosphorus transformations in soils, particularly in those affected by human occupation or animal housing.

It may be concluded nevertheless that the levels and overall distribution of phosphorus within the hiatus soils are consistent with intensive usage associated with human or animal activity. Massively raised levels of iron, and associated aluminium, and organic phosphorus at near neutral pH (organic phosphorus usually declines as pH rises and organic matter mineralises) confirm the presence of a disturbed soil system (Eidt, 1977; Harrison, 1987). Using the simple interpretive scheme proposed by Eidt (1977) the predominance of the non-occluded inorganic fraction in each soil suggests that the period of enrichment was shortlived.

Levels of organic phosphorus exceed those elsewhere on site (with the exception of the organic north rampart material), and can only be attributed to the addition of phosphorus enriched organic materials. Although some fresh plant materials are comparatively enriched in organic phosphorus (Harrison 1987, 176), the degree of humification noted in thin section suggests that animal or human wastes are the most likely source. While mineralization of this organic material would contribute significantly to the non-occluded inorganic pool, excreta are also intrinsically rich in inorganic phosphorus (ibid, 177). It is worth noting that values of organic phosphorus, and organic phosphorus as a percentage of total phosphorus in HS2 and HS3/4, lie within the range documented by Harrison (ibid) in horse/sheep and cattle stable manures respectively. This implied variability in function must however remain speculative since the proportion of organic phosphorus in excreta depends on the phosphorus status of grazed materials, microbial activity, the timescale of amendment, and many other complex factors (ibid, 109). Soil lipid composition however suggests that at least some of the organic phosphorus in HS2 may be attributed to the addition of a very specific organic material which shares a common source with organic phosphorus in the organic constituents of the north wall rampart. It is thought that lipid composition, inositol phosphate contents, and overall phosphorus distributions might reflect the addition of a particular type of animal excrement. Similarly, the lipid composition of HS3 and HS4 suggests a link in terms of primary organic input sources and thus tentative link in terms of function.

Soil phosphorus determinations therefore provide some evidence for a variability in site usage, though conclusions must remain tentative. It may however be concluded that the levels and the distribution of phosphorus in the hiatus soils undoubtedly reflect intensive human or animal occupation, the latter seeming most probable. The origin of these soils however remains problematic since their morphologies suggest that each has been subject to normal soil processes to some extent, while soil composition and the arrangement of soil constituents suggest intrinsic differences in terms of soil development (McHugh forthcoming).

The origin of the hiatus soils

The general evidence suggests a common local subsoil origin and indeed the subsoils at HS3 and HS4 are physically coherent and typically gleyed, a morphology which is consistent with an undisturbed *in situ* origin. Channel infillings within upper areas of subsoil HS4 are consistent with superficial (topsoil) disruption or burning, perhaps prior to the development of the hiatus soil. The subsoil at HS2 in contrast is loose, incoherent, and only marginally gleyed suggesting that the mineral soil profile has been truncated or that the subsoil comprises redeposited material. While this variability suggests differences in the intensity of early activities on site, it need not necessarily imply differences in terms of topsoil origin, and indeed relic root channels indicate quite clearly that each subsoil has supported plant growth.

HS2 and HS4 were rich in carbonised organic detritus, some of which may have been burned. Carbonised remains within soil 2 were particularly abundant within lower areas where the soil exhibited a marked stratification thought to indicate the deposition of burnt detritus rather than *in situ* development. Although it lacked any marked depositional features, irregular interlayering of degraded wood debris and organic/inorganic soil fabrics within lower areas of HS4 also suggests some type of depositional process, though clearly these differ from those acting in HS2. It may however be concluded that the morphologies of HS2 and HS4 are not consistent with the development of undisturbed humic topsoils *in situ*. HS3 in contrast is much poorer in carbonised debris, while organic components are more varied and less degraded with structured wood and non-woody remains and well-preserved microbial detritus scattered throughout. The abundance of relic biopores, the presence of faunal turbation features, and phytoliths and pollen grains within the topsoil, the association of tissue remains with relic voids in the subsoil and the micromorphology of soil/subsoil boundary combine to suggest normal soil development and a biologically-active soil system. It may be concluded that the overall morphology of HS3 and its subsoil are consistent with the development of humic topsoil *in situ*.

Palynological analysis

Pollen percentages are shown in Appendix 3, Table 43. The material provided for HS1 was a single mixed sample so that no spatial or temporal differentiation was possible. However, both HS2 and HS4 were presented in Kubiena boxes so that lower (earlier) and upper (later) deposits were analysed. Pollen preservation in all the samples was poor although accurate identification was possible.

HS1: Microscopic charcoal was present, but not abundant. The pollen spectra show the area to have been dominated by open, disturbed mixed, acid woodland with areas of weedy, possibly grazed moorland nearby. The condition of the pollen and the levels of phosphate suggest that the surface on which the layer accumulated was, or had been, occupied.

HS2, HS4: There were differences in the pollen spectra for the two locations but it is obvious that the two sets of samples reflect similar conditions and similar patterns of change through time. Both the earlier and later deposits contained microscopic charcoal, but at both locations, the later one contained very much higher levels. Both areas were dominated by damp, disturbed woodland; a wide variety of trees and shrubs were recorded, including willow, *Prunus* type (cf sloe) and *Crataegeus* type (cf hawthorn) all of which must have been growing very nearby or been brought into the site by human agency. However, the levels of bracken, *Sphagnum* moss, grasses Gramineae, ling, and ribwort plantain show that there were also areas of open, grazed moorland. In both the earlier and later deposits, HS2 recorded more open conditions and soil disturbance than HS4. It is intriguing, therefore, that much higher levels of phosphate were recorded from from HS4 than HS2.

When results are compared with those from the Turf Wall samples, the marked reduction in woodland, and an expansion of grasses, weeds, and moorland plants are striking. The lower parts of both HS2 and HS4 could conceivably represent a desertion phase of the site, but there is little doubt that during the deposition of the upper material, its environs were subject to considerable human impact. The degree of corrosion of the pollen and the presence of microscopic charcoal would suggest that people were active at the site during the deposition of the hiatus layer. However, the area of the fort was certainly dominated by woodland, and it is conceivable that pollen degradation could have been due to natural decomposition in a biologically-active soil. The presence of charcoal and disturbance indicators certainly point to some human activity, but not necessarily to occupation.

There is little doubt that human impact was greater during the latter phase of deposition of HS2 and HS4, and it is possible that what is recorded was the resumption or acceleration of Roman activity during building of the internal buildings. The very high charcoal and reduction of woodland taxa support this contention but, even here, if there had been very intense occupation of the soil surface (see the AO horizons of Turf Wall 2 and the north wall rampart) complete pollen degradation might have been expected. This did not occur in the hiatus layers. The site may not have been completely abandoned but these layers were deposited during a time when human activity was not as intense as when the Turf Wall and the rampart were built.

Layers HS2 and HS4 have so many similarities in their species composition and richness (see Appendix 2, table 4), and in their pattern of change, that they must be considered to be more or less contemporaneous. However, they appear to be rather different from HS1. It is strikingly obvious that there are major differences, not only in woodland composition, but also open habitat indicators and minor components. HS1 had higher levels of oak pollen and lower levels of alder, ferns, and ling. It also had a lower species richness for trees and shrubs. The two sets of spectra are quite distinct and, either there were very drastic changes in the vegetation over the short distance between the two sample sites, or the deposits are not contemporaneous. The only other possibility is that the pollen spectra represent partially-dumped material rather then a true picture of the vegetation at the site and, in this case, any comparison would be erroneous.

In summary, there was microscopic charcoal present, and corrosion and degradation of palynomorphs, in all the samples. This indicates that the upper ground surface was either subjected to a degree of disturbance, and/or that it supported a biologically active soil in which pollen was subjected to normal decomposition processes. The fact that it was possible to identify the microfossils would suggest that even if the soil were disturbed, there was certainly little evidence of intense occupation.

Conclusions

The analysis of the hiatus soils in Area A was of particular value, as it was clear that these soils were not subjected to extensive post-depositional disturbance due to their having been effectively sealed by the make-up layers of structures within the fort. The results, therefore, certainly, reflect the pre-burial environment; in this case the conditions obtaining on site after the first two stonemasonry phases in the *porta principalis sinistra*, but before the third, and before the primary gravel roads of the fort, which sealed the hiatus soils, were laid.

Given the evidence presented above, it seems likely that HS3 reflects the accumulation of an *in situ* humic soil. In the case of HS2, indications suggest that the subsoil horizon was truncated before soil development took place. For this sample point this is unsurprising as it is entirely consistent with the removal of the Turf Wall in preparation for the beginning of the construction

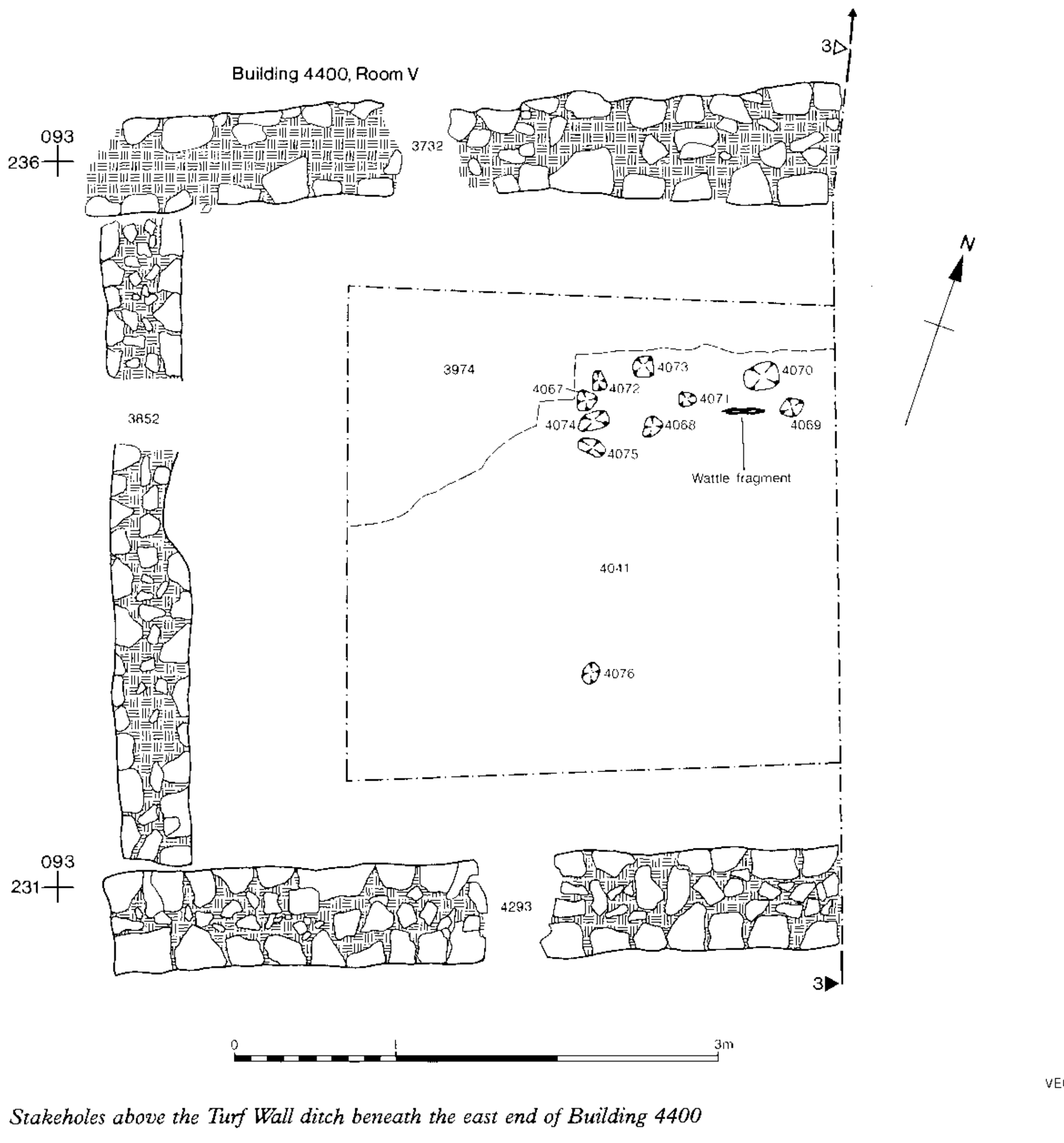

Fig 49 Stakeholes above the Turf Wall ditch beneath the east end of Building 4400

of the stone fort. By contrast HS3 lay on the north side of the Turf Wall ditch and HS4 on the berm between the ditch and the Wall itself; both areas which would not be affected by the removal of the Turf Wall, and where subsoil truncation would not necessarily be expected.

Following the primary intervention caused by the construction and demolition of the Turf Wall and the beginning of work on the stone fort, then a humic soil accumulated in formerly-disturbed areas. Although secondary scrub woodland may have invaded at this time, the early stages of soil accumulation included continued human activity on site, adding significant human waste to the newly-developing soils. A period of undisturbed plant growth and 'normal' soil development undoubtedly followed. The fort area may have been abandoned at this time, though subsoil morphology suggests that any period of abandonment was not prolonged. The abundance of carbonised plant debris within the samples suggests that the scrub may have been subsequently cleared through burning. The soil phosphorus evidence suggests that the site was then intensively utilised for animal housing/penning. The absence of a vegetated topsoil surface suggests that this intensive usage continued until just prior to burial beneath the roads and buildings of the stone fort.

HS1, though visually identical and consistent with the entire hiatus deposit, shows both morphological differences and differences in pollen content from the other samples. This is probably due to the fact of its accumulation over the laid stonework of the foundation to the *porta principalis sinistra*, which might prevent it undergoing the same natural soil processes as the rest of the deposit. The pollen content, however, suggests that there may have been an element of dumping.

Structures notionally associated with hiatus horizon

A small sample area was excavated in the centre of the eastern Room v of the later Building 4400 (Fig 49) in order to examine the upper fill of the Turf Wall ditch. The top of the deliberate backfill of the ditch (4041) was cut by a series of ten stakeholes up to 100mm deep (4067–4076), most of which were grouped along the northern edge of the filled ditch. Wood chips and a fragment of wattling were found on the surface of this layer, and these were probably associated with the stakeholes. Stakeholes 4067 and 4068 contained black, organic fills (4064,4065), the rest were filled by the overlying layer (4029, Fig 22).

The excavation of 1929 in the south-east *praetentura* revealed an early 'Level 0' beneath the Hadrianic stone buildings, but above the Turf Wall ditch. This consisted of a drain and 'carpenters chips' (Richmond and Birley, 1930). This deposit represents activity in the period between the filling of the Turf Wall ditch and the construction of Hadrianic stone buildings, and was found beneath the building immediately to the east of Building 4400; it almost certainly represents the same phenomenon as the structures beneath Building 4400 (Fig 11).

The primary buildings (Site Phase 5)

Two primary buildings were excavated to the north of the *via principalis*. Building 4400 and the south wall of Building 4403 were constructed over the Turf Wall ditch, which had been backfilled in preparation for their construction. The buildings, like the gate sills of the *porta principalis sinistra*, directly sealed the black hiatus deposit. The plans of these two buildings are shown in Figure 50, with a red interpretative overlay for Building 4403.

Building 4403: The basilica

Description

Preparation

Elements of this building were excavated in Areas A, C, D, and E, as well as in a trial trench and in a pipe trench excavated to the north of Area D (Fig 50). In the north-east extension to Area A the stratigraphy associated with the construction of the building was examined.

The black hiatus horizon and the Turf Wall ditch fill were sealed by make-up layers for the construction of the building. Above the upper fill (2994=4029, Fig 22) of the Turf Wall ditch lay a reddish-grey silty clay with some small to medium stone (2993, Fig 22). This appears to have been packed into the ditch at the same time as the deep rubble foundations of the south wall of the building (2969) were laid. The internal area of the building was then prepared by spreading a hard, compacted reddish brown clay, which ranged from 40 to 120mm in depth (2933). A second layer of hard compact red clay (2912) sealed two cuts (Fig 50). One of these (2941) was a construction trench for the superstructure of the south wall of the basilica. The other (2932) was a long, narrow, shallow cut 100mm deep and 2.17m long, 340mm wide with uneven edges and base. The upper clay layer (2912) was only distinguishable from the lower by the presence of these cuts, which seem to represent short-lived operations during the laying of the clay floor make-up. The whole deposit was then cut by the foundation trench (2908) 200mm deep and 1.26m wide in which the sleeper wall (2911) on which pier bases were constructed was laid. In Areas C, D, and E the clay make-up layer (1746, 4288, 3725) was defined at the same level (+158.13m OD) as in Area A, while in the small triangular area of the interior of the building excavated at its west end in Area A, a similar layer (3912) had a surface level only 100mm higher. The foundation trench (1658, 1987, 1994) for the northern sleeper wall (1743, 2503) was also cut through the clay preparation layer.

Sufficient evidence was obtained to demonstrate the following preparatory sequence for the construction of this building. The laying of substantial rubble footings into the edge of the Turf Wall ditch was done as part of the operation of filling the ditch and making up the ground for the south exterior wall of the building. While these clays were being laid, structural work was also begun. It seems likely that the clay was laid to provide a near finished level. The foundation sleeper walls for the load bearing piers were then cut into the clay. They would have been invisible in the final layout in which stone flooring was intended to abut the pier bases on all sides.

Structural Features

The southern exterior wall (2969) of the building was excavated in plan over a distance of 28.84m, and a northward return at its western end (4018) was also defined. A small portion of the north wall (4425) was revealed in the pipe trench.

In the north face of the south wall of the building a centurial inscription (Fig 250, No 4) was cut down and reused upside-down as a building block. The only likely original context for this stone is that it came from the fabric of the demolished Turf Wall turret 49a nearby. As there was a gap of only 160mm between the south wall of the basilica and the north wall of Building 4400 it was not possible to examine the southern face of this wall. It was only at the western and eastern excavated ends of the wall that its northern face was visible. These walls are 680mm wide and were built of clay-bonded coursed rubble.

The load-bearing elements of the building were the pier bases, which were constructed on sleeper walls consisring of a single course of faced, clay-bonded core. The southern of these foundations (2911) lay 2.85m to the north of the southern exterior wall, and the distance between the two

Fig 51 Westward view of the south aisle of Building 4403 within Area A, showing Piers 7S and 6S (beneath the far baulk) built upon a sleeper wall foundation

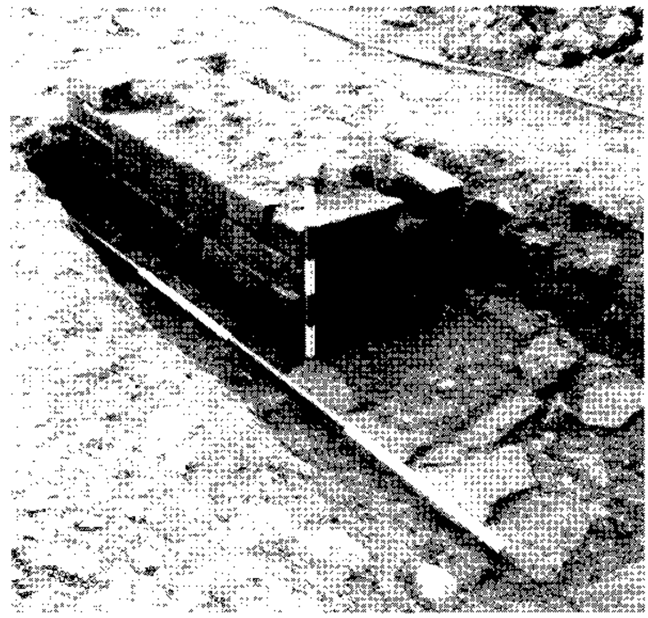

Fig 52 Pier 9N of Building 4403 in Area D

sleeper walls was 7.48m. The northern sleeper wall (1743, 2503, 2506) was located in Areas C and D. It is important to note that the load-bearing piers were built well to the north of the Turf Wall ditch, probably to avoid problems of future subsidence.

In Figure 50 the pier bases which were excavated, as well as those which are projected, are numbered from the west end of the building 1–9N (north) and 1–9S (south). In the following description these numbers are used with context numbers in parentheses. The piers are 2.36m apart where it was possible to measure between them, and they each measured 1.32m x 710mm in plan. The preservation of the piers varied from one course in the cases of 5N (1745), 8N (4284), 7S (1938=2909; Fig 51), and 8S (1935), to five courses in the case of 9N (2502; Fig 52).

After the piers were built the sleeper-wall construction trenches were back-filled around them with a variety of fills all of which contained a high proportion of small rubble.

Stonemasonry

by Peter Hill

When the survey of stonemasonry (Hill 1991a) was undertaken, only the piers in Area A were available for examination. However all piers were of identical construction and quality, so the following comments are applicable to all.

The piers consisted of facing stones set on a rectangular plan with the centre filled with small angular sandstone rubble and pinkish-brown mortar. The quoins were long stones with short returns, laid so that each face of the pier shows one long and one short quoin face. The long and short returns were reversed in successive courses.

Pier 7S (2909) was closely examined as a sample. The quoins were worked straight and square, apart from occasional variations due to an acceptable degree of carelessness rather than to lack of skill (a marked difference from the situation usually found in Roman military building, where accuracy so often appears to be the result of chance). The faces were worked first with a punch and were finished with a 75mm blade, which is only a little less than the bed height of the stones. None of the joint faces was visible, but on plan they do not look particularly neat or straight.

The top beds of the quoins were less consistent than the faces: that of the north-east quoin was worked with a punch, and although nearly straight from end to end, tapered away towards the back of the stone with a range of up to 6mm. The bed of the south-east quoin had a chiselled margin, the rest being worked with a punch, tapering up in places towards the back by up to 6mm. The south-west quoin is neatly worked with a punch, while the bed of the north-west quoin is dressed with a combination of a punch and a 25mm blade to give a straight surface with a range of up to 3mm.

Between the quoins on the south side of the pier, the stones were noticeably less well-finished in that they had more or less natural beds. The bed heights varied by up to 6mm, and the faces, although generally neat in appearance, tended to be rounded by 3–4mm. They were worked with both punch and blade, with intrusive punch marks on the finished face, and give the feeling of having been worked by less skilled men; the joints were quite unsquared. On the north side, the faces appeared even less good and seemed to be partly natural, partly worked with a punch, and not finished with a blade. The single stones completing the east and west sides have had even less work done on them than the rest.

The quoins can with some justification be regarded as ashlar faces, the remaining stones coming under the heading of good-quality coursed rubble. The interpretation which best fits the evidence is that the building which the piers were to support was of some importance and that appearance was more of a consideration than was often the case in military work. The quoins, assuming they continued in the same style in the upper courses, would have looked impressive with their unusually sharp arrises and smooth faces. It would seem that the quoins were worked by skilled men, while the rest of the stones were worked by less-skilled men, or alternatively that their finish was felt to be less important. The mortar joints now visible range in width from 10 to 25mm wide, and the bed joints are likely to have been at least 10mm wide, to judge by the uneven top beds. The importance originally given to the work was thus indicated by the the immediate visual appearance rather than by any technical superiority.

The south wall of the building, the only one visible, was built of small hammer-dressed coursed rubble, which was neat enough but not so good as the chiselled coursed rubble of the pier bases. Thin beds of stone seem to have been quarried for the building, giving natural beds with limited necessity for further work. The outer face may be slightly better than the inner, but there is little to choose between them.

Floor Levels

The importance of Area E is that it was the only place where a full profile of the floors of the building could be established.

The lowest of these (3724) was surfaced with large angular flagstones which were crushed in places. On the north side of the area this was overlain by a dark grey-brown clay patch (2890), but most of the area was covered by a floor packing of compacted gritty sand (2889), overlain by a dark red-brown clay with small pebbles and large angular stones surfacing and mixed into it (2888). To the west of the area was a patch of compacted crushed limestone with some large slabs, presumably survivors of an original floor (2883).

These layers were sealed by a floor level of 250mm thick greenish-brown crushed and compacted sandstone (2841) which was consistent over the area excavated. It was sealed on its south side by a layer of fine sandy gravel (2865, 2840) This may have been a consistent level, possibly laid to soften the hard crushed-limestone floor. This was capped by a further crushed-limestone surface at an average level of 158.37m. OD, varying from 20 to 100mm deep, but with a consistent compacted surface (2822).

Elsewhere floors were not well preserved. Over the construction trench between the piers 8N and 9N in Area D lay a surface of flagstones (4287), which was sealed by a further surface of compacted crushed sandstone (1908). A crushed-sandstone deposit was also found in Area C (1609, 1933).

In Area A, in the eastern area of the interior of the building, the only undisturbed surviving floor level was a deposit of greenish crushed sandstone (2824) which survived at a level of +158.17m OD in the north-east corner of the excavation. The crushed sandstone was probably the same deposit as the lowest similar floor level in Area E. At the south side of the area, the floors subsided into the Turf Wall ditch. The resulting hollows were filled and surfaced several times during the lifetime of the building. The top level of these was +158.26m OD.

In the south-west corner of the building in Area A a fragment of crushed sandstone floor (3786) survived at an average level of +158.36m OD, similar to the level of the top similar floor in Area E, to which it probably equates.

Building 4403 remained in use throughout the subsequent history of the fort with no alteration other than the occasional renewal of floors. There was no dating evidence for any of the floors, which could have been laid at any time during Periods 2a–5.

Dimensional Analysis

The dimensions of the building are problematical as so little of the structure was excavated. However, a plan can be reconstituted by mathematical means. There is one certain dimension: the overall width of 16.05m (external). The proportion of width to length for a basilica, according to Vitruvius (*De Architectura* V, 1.4), ought to be between 1:2 and 1:3, though he adds that these need not be adhered to if site conditions would make it difficult. The latter ratio would demand a length of 49.5m for the building. Measuring between the edge of the *via praetoria* at the probable eastern end of the building, and the *via sagularis* at the western end gives an available external length of 42.78m. The internal length of the building, given the wall width of 920mm, would thus be 40.94m.

The primary dividing wall at the western end of the south aisle provides us with an internal measurement of 3.48m for the end bays. By subtracting the width of two end bays of this size from the projected internal length of the building it is possible to arrive at the total length of the load-bearing piers and intercolumniations. In order to establish the number of intercolumniations and piers, a single pier length may be subtracted from the total, to represent the easternmost pier. The remaining length is then divided by the length of one intercolumniation plus one pier. The result gives the number of intercolumniations and should be close to an even number. To express this as an equation:

$$\frac{\text{internal lgth of bldg - (2x end bay wdth + pier lgth)}}{\text{(intercolumniation + pier length)}} = \text{number of intercolumn}$$

The calculation is as follows:

$$\frac{40.94 - (6.96 + 1.32)}{2.36 + 1.32} = \frac{32.66}{3.68} = 8.875$$

The result can be seen as giving nine intercolumniations plus the two 3.48m end bays, and there would thus have been two rows of ten piers. In this calculation it is assumed that the intercolumniations were equal. The fact that the result is not even suggests that they were not. The actual discrepancy is 460mm. It is not necessary to explain this small difference in terms of calculation or original survey error, as it can be explained by the excavated evidence. Of the intercolumniations established in excavation, only one, between piers 5S/N and 6S/N, is different, being 1.90m instead of the usual 2.36m: a difference of 460mm. It is significant that this difference, which renders the above calculation exactly correct, occurs in the centre of the building. The reconstruction of the excavated evidence at Figure 50 demonstrates that the spacing of the piers thus calculated ensures that the south-west dividing wall in the south aisle would have butted against the western end of Pier 1S. The plan at Figure 50 and the reconstruction drawings at Figures 61 and 100 assume that this mathematical analysis is correct.

Building 4400

by Sara Rushton

Building 4400 was a long, narrow building with a total width of 5.60m. It stretched from the *via sagularis* to beyond the eastern limit of excavation, presumably as far as the *via praetoria*. The western 30m were examined. Two phases of this building (a and b) were defined.

Phase a

At the east end of the building, the series of stakeholes were sealed by a layer of waterlogged, dark-grey sandy clay (4029=2994, Fig 22). This formed the upper fill of the Turf Wall ditch and appears, together with a thick layer of dark brown, gravelly, sandy silt (3893=3970=4027=4028) which survived patchily above it, to have been laid as levelling prior to the construction of the building. The walls of the building were constructed directly upon the surface of this levelling. Evidence for a foundation cut came only from the central area of the building, where a narrow foundation trench (4297) 150mm deep was provided for the south wall.

The walls of the building were constructed of clay-bonded coursed rubble. Peter Hill (1991a) comments that the walls of this building are markedly less well masoned than those of the contemporary Building 4403. Thin bedded stone was used, but there was less work on the faces. The walls are, on average, 700mm wide, and stood to a maximum six courses in height. Over the course of time all walls were badly affected by subsidence into the underlying Turf Wall ditch. The primary floor of this building, which survived very poorly, seems to have comprised small flagstones (4022, 4386), some well squared and others very irregular. The surface did not appear to be very worn.

Phase b

The flagstone floor of Building 4400 in Phase a was sealed by a layer of dark-brown, loose, sandy clay 30–150mm deep (3974; Fig 22) and a series of partition walls were built on top of this. The five rooms thus created (Fig 50) are numbered (i–v) from the western end of the building. The partition walls are all built of clay-bonded coursed rubble and averaged 0.50m wide. They survived up to a maximum of six courses in height, and all were affected by subsidence into the underlying Turf Wall ditch.

Room i

This room was excavated to the top of the earliest surfaces insofar as these survived. A flagstone floor (4396) was revealed at the eastern side of the room, and the western and central areas were covered by a thin layer of hard, pink clay containing finely-crushed roof tile (4387). These layers were sealed by a large, rectangular, raised platform (2.4 x 2.2 x 0.25m) of uniformly-burnt clay (4377) built on a raft of large rubble (a similar platform was also constructed in Room v). Associated with this were layers of dense charcoal (4395) and dark clay loam (4381, 4379) containing much roof tile. The north edge of the platform was sealed by a strip of clean clay and rubble (4376; Fig 25), which was banked up steeply against the inner face of the north wall. The platform was associated with a surface of worn, even, small flags and cobbles set in thick clay (4356, 4378).

Room ii

Room ii was 4.8m long. It was divided from Room i by a cross-wall (4296) which was butted against the north and south walls of the building. Peter Hill remarks that the east face of this wall had part of two courses made up of stones with vertical chiselling on the faces. Though not in themselves especially good, they were above the general run of adjacent walling stones and may have been reused from an earlier building, or from stockpiled material intended for another structure.

The full extent of the earliest layers in this room was not explored. The earliest recorded layers associated with these walls comprised a flagstone floor (4404) upon which was an extensive deposit of charcoal (4405). This was sealed by a number of small dumps of clay and silt.

Room iii

This room was divided from Room ii by a cross-wall (4290), which survived only at its southern end, having been robbed in antiquity. It was butted against the south wall of the building. The room was 3.80m long, and opened into Room iv by means of a doorway 0.98m wide cut through the south end of its east wall (2775). The interior surfaces at the east end of this room had again been extensively disturbed. The earliest recorded floor was a thick layer (150mm) of dark-brown, firm, silty clay (4160). A small oven (4237) was located centrally within the room. This oven measured 0.90 x 0.74m, it had a flagstone floor and walls up to two courses high bonded with clay which had been burnt red. The hard, compacted, burnt clay (4238) which filled the oven possibly represents its collapsed clay dome. Again subsequent deposits in this room consisted only of a series of small silty dumps.

Room iv

The entrance to this room from the *via principalis* was by means of a doorway 0.80m wide, which was cut through the south wall. The room was separated from Rooms iii and v by two cross-walls (2775, 3852) and was 3.20m wide. Nearly all of the stratification between these two walls had been destroyed by a succession of later walls in this area. For this reason only a sample area 1.8 x 1.8m was excavated between the angle of wall 3852 and the south wall of the building (4293). The stratification against the west wall of the room (2775) survived only in the doorway through this wall and in a narrow strip 0.25m wide against its east face.

The east wall (3852) was built directly on top of the preparatory make-up layer (3756). It had no foundations, and was butted against the north and south exterior walls of the building on the east side of the south doorway. A layer of large sub-angular flagstones (2999) covered the western portion of the sample area, and part of the south threshold. This floor was overlain by a series of small deposits, which were sealed by a dense cobbled surface (2977) which covered all of the sample area.

Room v

The eastern wall of this room lay outside the area of excavation. The make-up layer of rubble set in loose sandy clay loam (3974; Fig 22) covered all of the exposed interior of the room. It was cut by a long, narrow steep-sided cut (3954=3955), the purpose of which was unclear. A few large flagstones (3950) appear to represent the remains of a robbed floor. This floor was sealed by an extensive layer, 150mm deep, of black silty loam containing a high proportion of charcoal (3909=3910=3911). In the centre of the room a few fragmentary flagstones (3918) were laid above this layer.

There is a distinct similarity between this sequence and that in Room i. A similar clay platform was built in the north-west corner of the room, with low retaining walls supporting the south and east edges. This feature (Fig 53) covered an area of 3 x 3m. A substantial layer of compact, burnt clay (3848=3849=3870) sealed these stones and formed the base of the platform. Above this was a second layer of compact, reddish brown clay (3828=3843=3862), which made up the bulk of the platform. These clay dumps were retained by a wall of undressed stone (3846=3863=3861) standing one course high. Three large stones (3827) lay on the surface of the clay in the angle of the north-west corner (for the subsequent development of this feature see Fig 117). The surface associated with the platform in this phase was a hard clay floor containing some charcoal (3727; Figs 22, 50).

Unfinished building

The hiatus horizon (2555) beneath the later north *horreum*, Building 198, was cut by a vertical-sided trench 1.16m in width which ran north-south across the area (1910; Fig 54). Towards the south end of the trench on the western side was a projecting area 1.35m by 1m, and a similar projection was recognised 2.82m to the north. The lowest fill of this feature was a compact deposit of orange clay containing 40% large (250mm) irregularly-cut or water-worn stones (1968=1894).

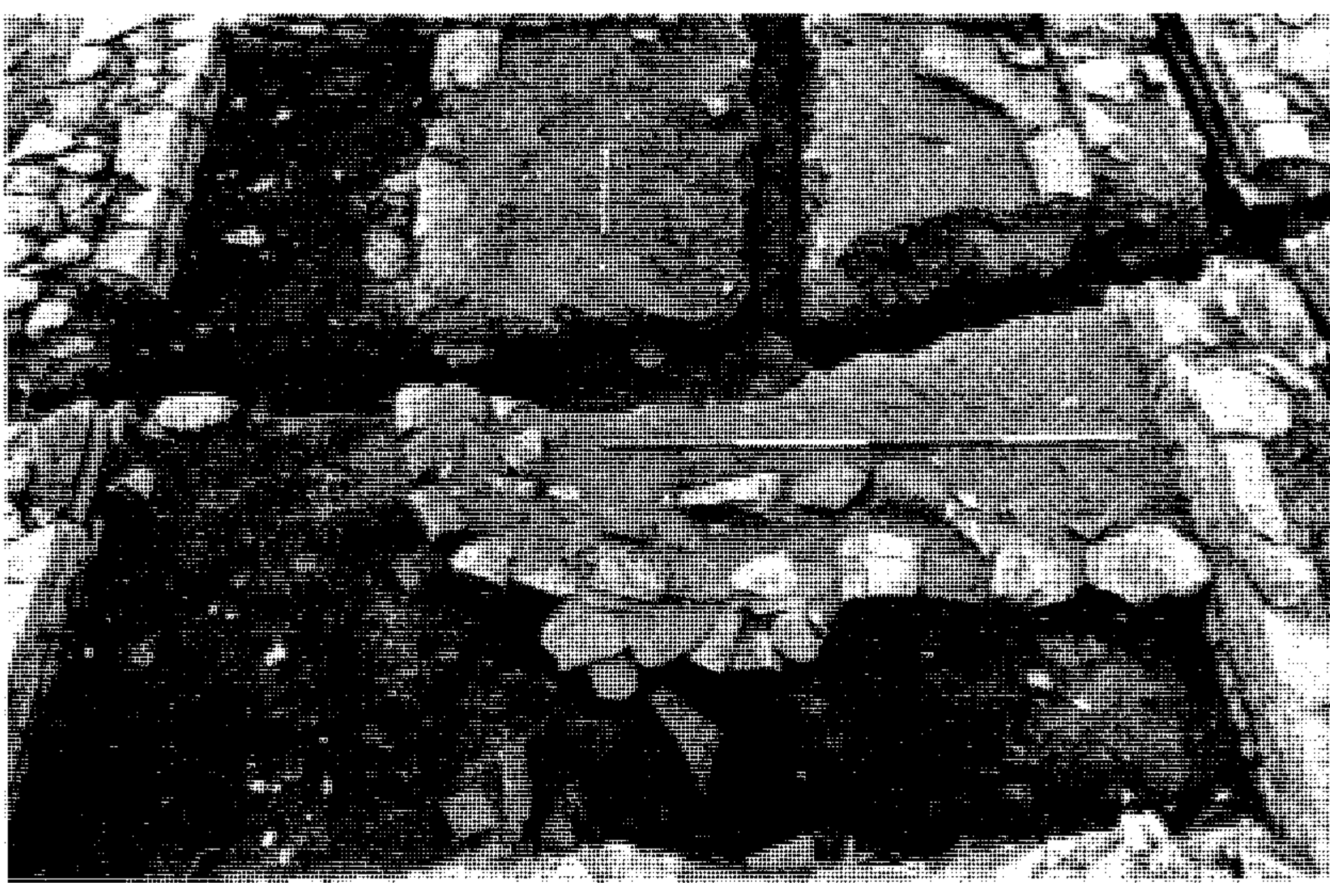

Fig 53 Stone revetted clay platform in Room v of Building 4400 from the east; the T-shaped channel is caused by the insertion of nineteenth-century drains

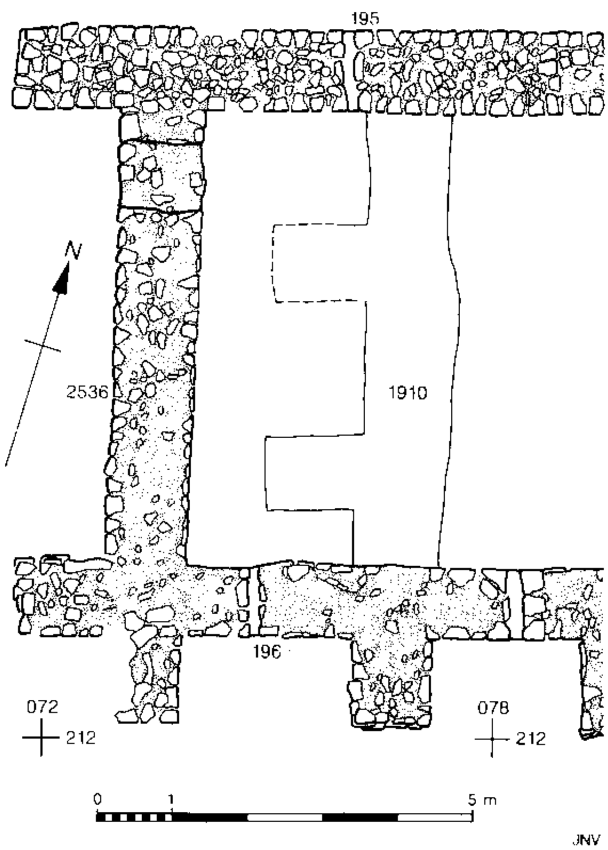

Fig 54 Excavation beneath the western end of Building 198: the Period 2a buttressed foundation for an unfinished building (1910) crosses the area from north to south

To the south of the trench the fill was a soft, layered, dark and light grey silt with frequent black and brown patches which had the appearance of redeposited turf. The main body of fill (1892) was of mixed orange and brown clay and silt.

The trench is interpreted as the foundation to a buttressed building, possibly a *horreum* with clay and cobble foundations partially laid. The prepared trench was apparently never built upon, but was backfilled with turf and other material, and sealed with gravels which resembled those used to form the primary roads.

Roads, drainage, and the fort ditch

It is logical to assume that the roads were laid out concurrently with the completion of the defences and the construction of the primary buildings. Though the gate sills of the *porta principalis sinistra* and the foundations of Buildings 4400 and 4403 were certainly in place before any road aggregates were laid, it is most likely that building and surfacing works proceeded side by side. The principal drains within the fort were constructed as free-standing parallel walls around which the gravel road aggregates were laid.

Within the fort

On the *via principalis* the black hiatus layer was sealed and levelled where necessary by a 180mm thick deposit of grey, compact clay. The drainage system was created at this stage. Two drains were excavated (Fig 55). One (4085), a vertical sided, flat bottomed cut, 350mm wide and 260mm deep, ran north-south to the east of the gate. This was lined and capped with sandstone flags. It discharged into another drain (3924) which lay to the south of the *via principalis* at its western junction with the *via sagularis*, beneath which it curved. This drain was partially destroyed by the later insertion of the north wall of Building 198. The walls of the drain comprised three uneven, clay-bonded courses of coursed rubble. The cover comprised similar sandstone flags those of which drain 4085 was constructed, and was laid level with the surface of the road.

A further Roman drain was revealed to the south of Area A (1233; Fig 56). The direction taken by drain 3924 suggests that it and 1233 may have been the same feature, and this interpretation is given in Figure 55. The outfall of these drains would almost certainly have been by way of the culvert in the west wall (338; Figs 57, 65) and thence across the berm into the fort ditch.

The discovery of this drain and culvert was the result of a drainage programme associated with the consolidation of the *horrea*, which involved draining groundwater from the fort into a pumping chamber located in the fort ditch. This began by identifying the lowest lying point at which a drain could be provided under the fort wall. The fact that this coincided with a drainage point which had been identified by the fort builders suggests that the modern ground profile, though consistently higher, does to some extent reflect that of the second century.

Section 4 (Fig 56) shows that the primary layer of the rampart against the west wall of the fort, consisting of hard, grey clay (428) which survived 620mm high at the wall, also directly sealed the hiatus horizon, though at the eastern edge the rampart material lapped over the road aggregate, suggesting that it was added afrer the road had been laid.

The preparatory road layer, a single course of heavy cobbles (4165, 4166) incorporated the capstones of drain 3924. The road agger and the surface laid over these cobbles consisted of a very compact orange gravelly clay, with over 90% of the matrix comprising gravel of fine-medium pebbles (3930=3854=1671=4013, 1271=1276). This comprised a uniform and consistent layer over the entire excavated area (Fig 55). In front of Building 4400, at the east end of the excavated area, this layer (2875; Fig 22) clearly post-dated the construction of the south wall of the building (4293), and also served to top-up the Turf Wall ditch.

The site of the later *horreum*, Building 198, was heavily truncated during the building's construction. However, some stratification survived for the period between the backfilling of the primary unfinished foundation trench of Period 2 (Fig 54), and the erection of the *horreum* in Period 3. A series of deposits were excavated within the west end of the building. These consisted almost entirely of orange-brown gravelly clay-silt (1890, 1843=1847) which strongly resembled the primary road aggregate (3930). The terracing of the *horrea* resulted in the denudation of these deposits to the east of Building 198, and within Building 197, but they strongly suggest that the site was left free of buildings, and provided with some hard surfacing during Period 2 after the idea of building had been abandoned. The north wall of Building 198 was built directly on top of these layers.

The primary *via principalis* was cut by a timber structure set up 3.40m to the east of the *porta principalis sinistra*. This structure consisted of a pair of postholes 0.54m in diameter and 0.12m deep (3897, 3914), linked by a slot 3.82m long

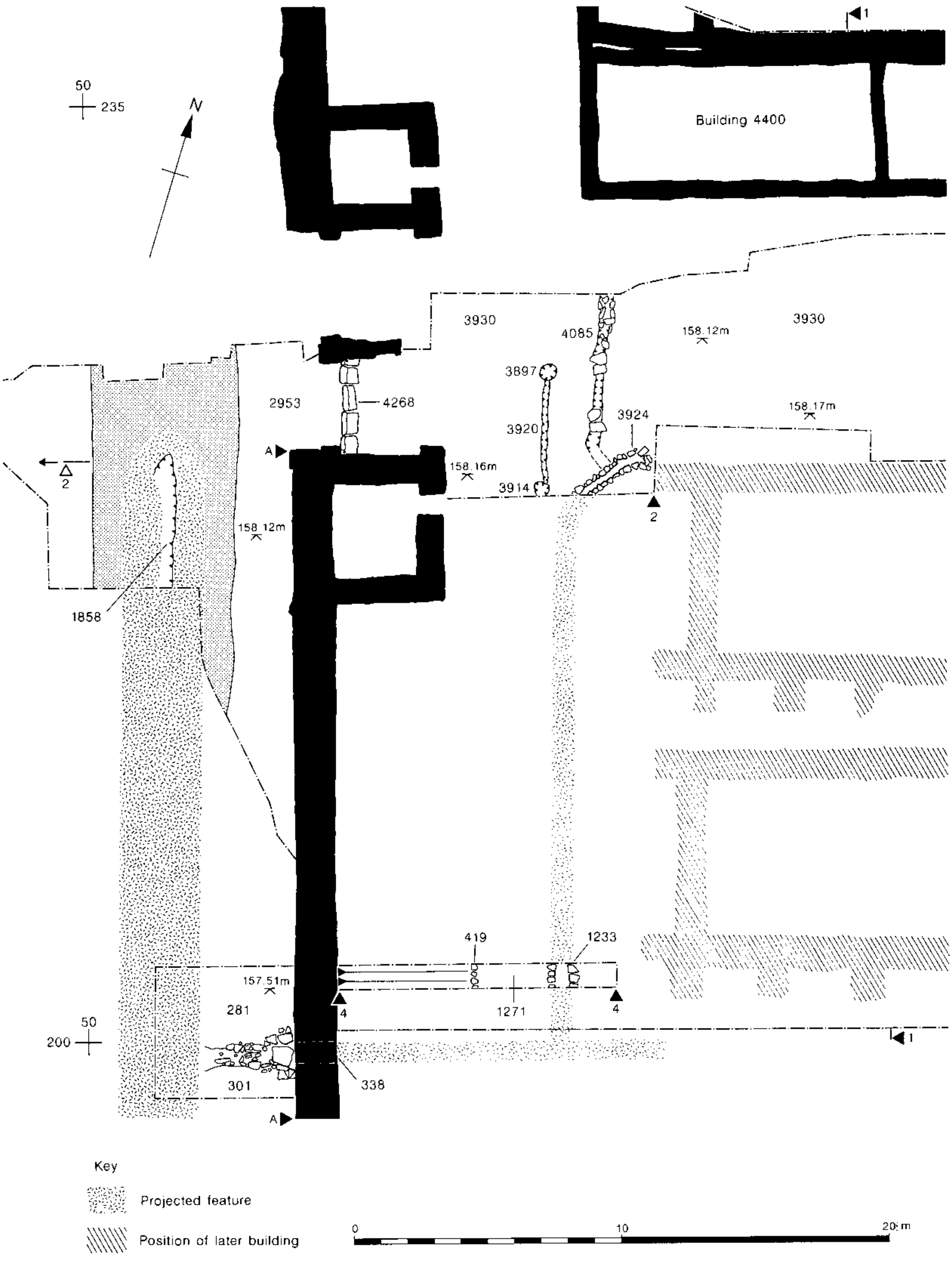

Fig 55 Drainage plan of the western side of Area A: the shaded area represents truncation from later ditch digging

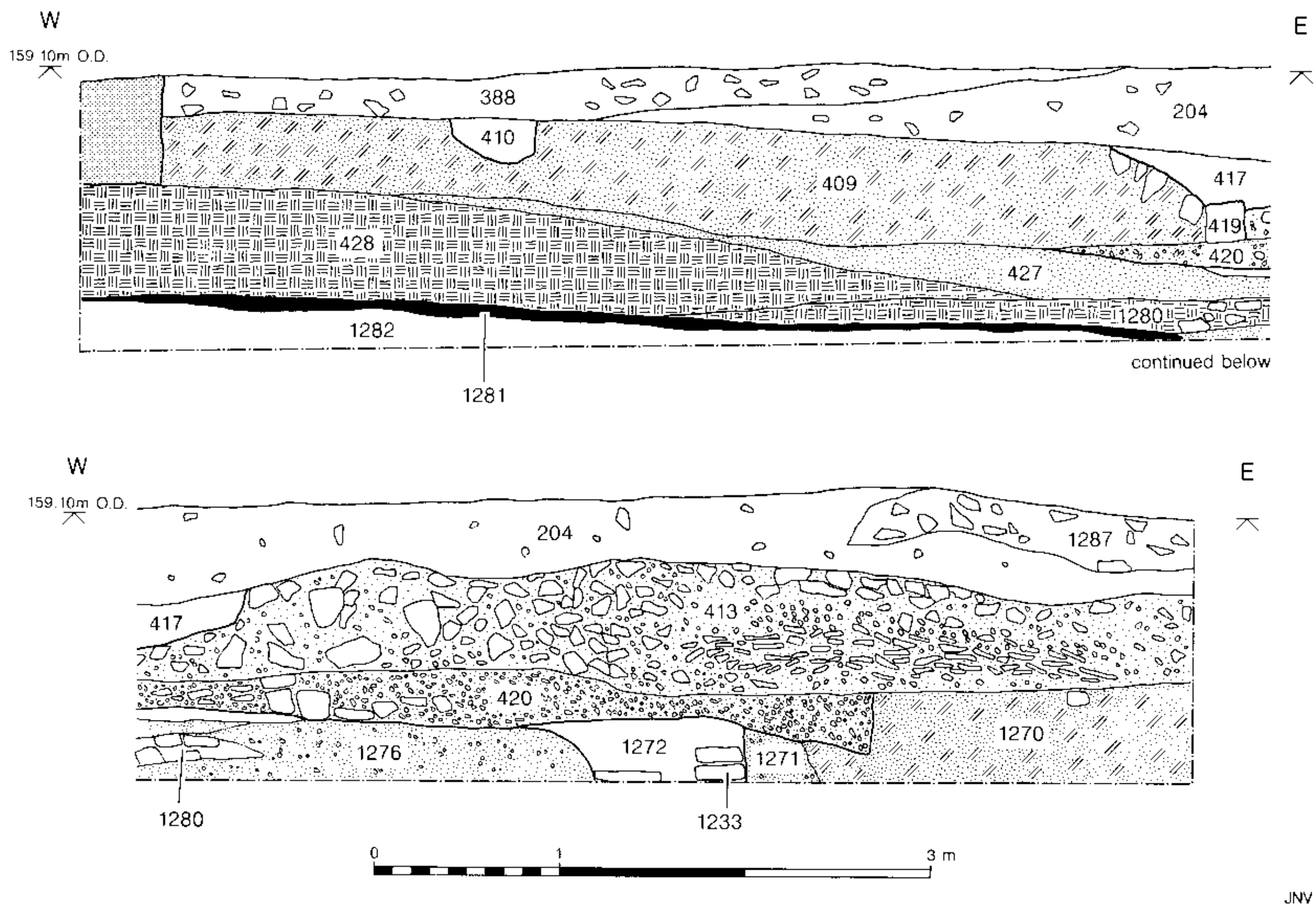

Fig 56 Section 4 (located in Fig 55)

(3920; Fig 55). The purpose of this structure, which would have obstructed traffic through the south portal of the gate, is unclear, though it is possible that it was associated with scaffolding for the upper works of the gate. The postholes and slot were sealed by two orange gravel resurfacings. The first of these (3925; Fig 26) was associated with a flagstone re-capping of drain 3924.

The final resurfacing of this Period consisted of a characteristic deposit of crushed greenish sandstone (3927=3936=4140=1945). This very thin and patchy horizon served as a stratigraphic link between several areas. It sealed a series of resurfacings in the south portal of the *porta principalis sinistra* and extended from the south side of Building 4400, through the gate onto the berm.

The berm and ditch

The same pattern of primary road deposits occurred to the west of the gate sills of the *porta principalis sinistra*, where a surface of large cobbles (3749) also underpinned the orange gravel road metalling (2953). During the laying down of these surfaces several short-lived postholes were cut (3817, 3821, 3832, 3830, 3720). The posts had been *in situ* when the gravel was laid, and are interpreted as scaffold holes for the construction of the upper works of the gate.

The constant recutting of ditches in later phases (Ditch Phases d–f), had largely removed the evidence for the ditches which respected the double portal gate, though the earliest ditch phases did survive as a group of three successive butt-ends (Ditch Phases a–c) in the bottom of their successors. The earliest butt-end (Ditch Phase a; 1858) would, if projected to the contemporary surface, have been approximately 3.48m wide and 1.64m in depth. It is important to note that the bottom of this butt-end lay 6.38m north of the excavated tail of the Turf Wall, and thus that Wall must have been removed before the ditch was dug.

The relationship between the ditch and the surfacing operation was apparent in the area of the culvert (338) in the curtain wall at the south end of the excavated berm (Fig 57). Here the peat build up against the Turf Wall (405, Pl 3) was overlain by a mixed layer of boulder clay with some peat (289=1267) which is interpreted as upcast from the earliest ditch. It was apparent that this early ditch was provided with a surfaced berm constituted in the same way as the road through the *porta principalis sinistra*. Above the upcast lay a road base of large pebbles (345) with orange gravel (281) above it. A drain (301) was provided from the culvert and this must have discharged into the primary ditch. It was constructed in a similar manner to the internal drains. The preparatory cut (343) was 800mm wide, and 320mm in depth, and was cut through the ditch upcast. It was lined with a row of upright timber stakes, cut square, and measuring 50–70mm in section. The stakes are 180–230mm apart and were joined by tightly-woven wattling (342). The drain was capped by flagstones (340) which were laid out level with the pebble base to the orange gravel road deposits (345). A large squared wooden post was driven into the berm adjacent to the drain. At the southern end of the berm, a layer of cobbling was deposited (4088=262), providing a compact and well drained surface. This was repaired at least once.

The two successive recuts (Ditch Phases b, c; 1857, 1844) of the ditch were undated. Though it seems likely that the second should be seen as an aspect of Period 3, it is probable that the ditch was recut at least once during Period 2. The primary drain (301) continued to function, and to discharge into the successive recuts of the ditch. This, together with the very poorly-draining clay subsoil, suggests that the ditches were constantly full of waste water, a factor which would aid rapid silting.

Dating and finds

The finds and dating evidence for this Period, divided by Site Phase, are as follows:

Site Phase 3

Fill of Turf Wall ditch: Area A

Coin: No 22, Hadrian, 119–21

Site Phase 4

The hiatus soils

Coin: No 17, Hadrian, 117

Fig 57 Drain 301 leading west across the berm into the fort ditch from the culvert (338) in the fort west wall

Site Phase 5

Building 4400 Phases a and b

Coin: No 20, Hadrian, 117–38

Pottery: Analytical Group 2
Coarse wares (Fig 156), Nos 26–45
Samian ware (Fig 178), Nos 9–14, *c* 125–50
Samian stamp No St2, *c* 130–50

This group is an extremely close parallel to the 1929 Alley group (Birley 1930a), with the bulk of both the coarse and samian wares dating to the late Hadrianic – early Antonine period.

Find: Copper alloy ring (234)

Building 4403

Inscription: graffito of stallion on west end of south wall of building (No 236, Fig 235)

Primary rampart of stone fort

Though a proportion of the material from the fort ramparts might be redeposited from earlier occupation, it might also derive from the beginning of the building of the fort, or from the hiatus soils. The contents of the rampart give a *terminus post quem* for the construction of the ramparts, and so are summarised again here.

Pre-1987

South rampart

2 mortaria, stamped ANAUS (from 'black layer at base of rampart section west of the south east angle tower'). He worked at Corbridge *c* 155/60–75, but also further south *c*130–55/60.

Samian bowl (18/31), stamped BITVRIXF (Simpson and Richmond 1932, 142), a Lezoux potter. Hadrianic-Antonine (Simpson 1995, 286)

Samian bowl (37) with stamp of Moxsius of Les Martres-de-Veyre (Simpson and Richmond 1933, 262). Hadrianic-Antonine (Dickinson and Hartley 1988, 225, no 77).

East rampart, north of porta principalis dextra

Hoard contained in arm purse (Fig 296; Richmond 1950a; 1954; Watson 1954). As Bennett (1990, 350) points out, this hoard was closed before the issue of Hadrian's second coinage from AD 125 onwards (RIC, 137).

1987–92

Area B: north rampart

Coins:
No 7, Trajan, 101–2
No 21, Hadrian, 119
No 24, Hadrian, 118–38

Pottery: Analytical Group 1

Coarse wares (Fig 156), Nos 1–4, 6–11, 14–20
Samian ware (Fig 178), Nos 1–4, *c* 125–40
Samian stamps, Nos St8, *c* 110–25
St21, Hadrianic
St22, Hadrianic
Stamped sherd St12, *c* 110–25
with graffito (Fig 251, No 7):
[...]MATINIDIIC, *Martini dec(urionis)*

Finds: Button and loop fastener (No 11), ceramic counter (No 141), stylus (No 161), curry comb frag (No 182), catapult bolt head (No 262), ferrule (No 267), bone obj (No 294).

Area F: east rampart

Pottery: Analytical Group 1

Coarse wares (Fig 155), Nos 5, 12–13, 21–5
Samian ware (Fig 178), Nos 5–8 *c* 125–45

Finds: Trumpet brooch (No 55), bone obj (No 296)

The finds from this Period are few in number and all appear to be the result of casual loss. Small personal possessions such as coins, brooches, counters, and the button and loop fastener could all have been dropped during building work for example. The ferrule, catapult bolt, and ?curry comb fragment might all be explained as pieces of broken equipment.

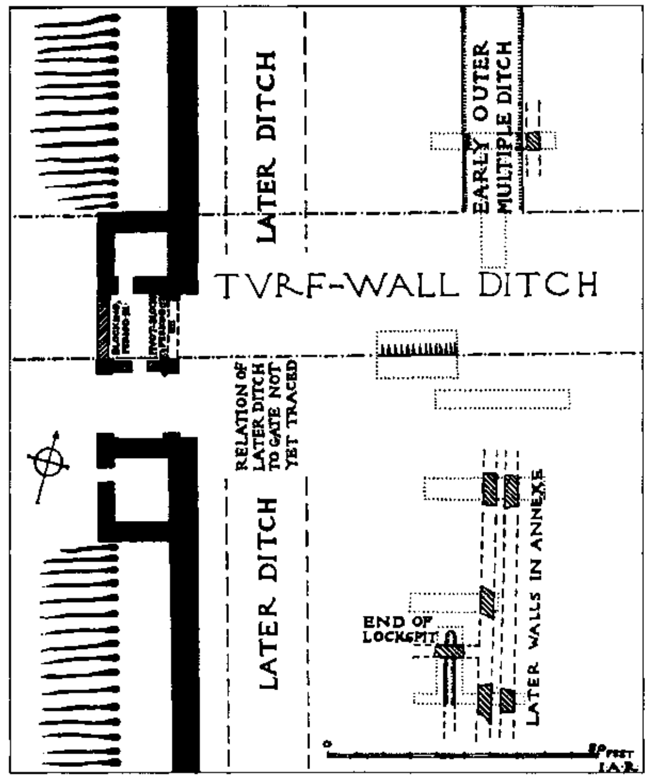

Fig 58 Richmond's original published plan of the Turf Wall and later ditches excavated in 1932 outside the porta principalis dextra *(reproduced by permission of the Cumberland and Westmorland Antiquarian and Archaeological Society)*

Evidence from early excavations

A series of timber buildings were found which overlay the backfilled Vallum ditch to the south of the fort (Simpson and Richmond 1933, 255–7; 1934a, 124–7; Fig 7). The northern group of buildings lay directly south of the stone fort. They were constructed in sleeper trenches and varied in size, but were built in a row, and were open to the south side. The excavators interpreted them as 'open ended sheds for carts or stores' (Simpson and Richmond 1933, 256). A similar row of buildings lay further south, towards the edge of the river cliff.

The importance of these buildings lies in the fact that they seem to represent a short-lived phase between the filling of the Vallum ditch and the excavation of the ditches of the stone fort which cut the sleeper trenches of the buildings. A multiple ditch system was intended, of which two ditches have been examined. The inner ditch was explored by Richmond (1928, 310), who was of the opinion that it was a primary stone fort ditch which had been open throughout the life of the fort. Excavation in Area A shows that the silting of this ditch was naturally rapid and that it was constantly recut until the mid-fourth century. Observations regarding this ditch are therefore of little relevance to the early period. The relevant element was the outer ditch, which remained unfinished throughout the life of the fort though it had been at least cut as a 'lockspit' or marking-out ditch. The stratigraphic relationships of this feature are extremely significant. It was ascertained that the northern group of timber buildings occupied a stratigraphic position after the Vallum ditch was filled, and 'were cut through by the outer multiple ditch of the stone fort and were therefore demolished before the stone fort was ready' (Simpson and Richmond 1934a, 126). If the Vallum was backfilled in preparation for the stone fort it seems likely that the buildings were indeed temporary in character and may be associated with the construction of the stone fort rather than the Turf Wall with which they were at first linked (Simpson and Richmond 1933, 257). A secondary phase of buildings constructed with stone-lined postholes overlay the southern sleeper trench group.

The two ditches were further examined outside the *porta principalis dextra* (Fig 58) in order to establish whether the stone fort was 'designed to fit the Turf Wall, with a praetentura projecting beyond it as at so many forts on the Wall' (Simpson and Richmond 1934a, 127). This led to the following conclusion.

> It was found that the outer multiple ditch, fully dug, ran straight into the Turf Wall ditch on the north as if contemporary with it, that is it was not cut in a mass of filling as if it were crossing that ditch when obliterated. On the berm of the Turf Wall there was no multiple ditch, and, coming from the south the multiple ditch was found as a well defined lockspit ending abruptly 50ft [30m] south of the middle of the gate. In short the outer

Table 4 Sequence of events during the construction of the stone fort

1987–92 period and site phase	*activity*	*Simpson and Richmond Phase*	*dating*
Period 2a	Vallum backfilled		late Hadrianic pottery from filling
	timber buildings on spur, possibly camp for stone fort construction	Phase III	buildings cut Vallum ditch filling, in turn cut by primary stone fort ditches
Site Phase 3	stone fort construction started	Level I	
Site Phase 4	hiatus in construction represented by change in masonry type and black soil horizon		
	timber structures above Turf Wall ditch and below Building 4400 (1987–92) and 1929 buildings	Level 0	
Site Phase 5	completion of defences, laying of roads; Buildings 4400, 4403 (1987–92), and 1929 buildings all constructed	Level I	
	fort ditch excavation and construction of fort defences		
	foundation laid for stone granary to be aligned N–S		
	Stone Wall built abutting N corners of fort; Milecastle 50SW constructed; *portae quintana* blocked and earth rampart completed		Hadrianic pottery found in rampart behind blocked *porta quintana dextra*; Hadrianic occupation in Milecastle 50SW

multiple ditch had been cut in association with the open Turf Wall Ditch, and had been intermitted so as to leave a gap for the wall to pass through and link up with the south tower of the stone fort's east gate. The wall then visualised, however, was hardly the Turf Wall, for in relation to the ditch the south tower is planned to suit a fifteen foot [9.03m] berm, and could not have been used with the Turf Wall unless the latter were modified. It would seem that the builders of the stone fort had already visualised the coming of the Stone Wall and had planned, as usual, to make use of the Turf Wall ditch, joining the Wall to the main lateral gate of their fort.

(ibid, 127)

Salway (1965, 97) has noted that any functional communication between the outer multiple ditch of the fort and the Turf Wall ditch would render the *porta principalis dextra* useless. It may be that the outer ditch was dug before the Turf Wall ditch was backfilled, but there can never have been any intention of leaving both open. It is thus probable that the digging of the outer ditch, and by extension the demolition of the 'sheds', must have occurred before the fort was in full working condition.

Discussion of Period 2: the stone fort in the second century

Building sequence

The building of the stone fort appears to have been a long drawn-out process, but the detail of how it was carried out is consistent. A summary of the main events is presented as Table 4.

It is argued above that Richmond (1929, 310) was correct in observing that the course of the Vallum had 'nothing to do with' the stone fort. This was based on the fact that the backfilled Vallum ditch was cut by the primary multiple ditch system of the fort. The Vallum appears to have respected the early fort and it seems likely that it was levelled in preparation for the construction of the extant stone fort. Material from the filling of the Vallum ditch would thus provide a *terminus post quem* for the initiation of construction on the stone fort. The pottery from the Vallum was first published as a well-dated Hadrianic group (Swinbank and Gillam 1950, 60), of the late 120s, though Gillam (1970, Group 36) later placed it in the range 130–40. Bidwell and Holbrook (1989, 78) have argued that a pivot stone found reused in Willowford Bridge 2 might have been taken from the gate of the Vallum crossing at Birdoswald, and rightly point out that the group of pottery from the Vallum filling 'could be as late as the Antonine period'. To suggest then that the botanical evidence might indicate that the ditch was silted soon after a recutting takes the evidence too far. There is no need to assume that the date of reuse of the pivot stone is identical with the date of demolition of the structure from which it came.

It has been repeatedly assumed that the Turf Wall abutted the principal gates of the stone fort 'like the Stone Wall at Chesters' (Daniels 1978, 204; Breeze and Dobson 1983; Fig 10; Johnson 1989, 56), and that the stone fort projected to the north of the Turf Wall. Although the *porta principalis sinistra* was built within the thickness of the Turf Wall, and it appeared at first that the stone fort and Turf Wall could not have functioned together, it is now clear that the traditional assumption was correct and that the stone fort was constructed astride the Turf Wall, and was designed to function with it as a projecting fort. It would have been surprising if this had not been the case, as the fort was designed with single portal *portae quintanae* in addition to the *portae principales* from the outset. Such subsidiary gates occur only on the projecting forts *per lineam valli* (Wallsend, Benwell, Rudchester, Halton Chesters, Chesters, Birdoswald), where they afford lateral communication to the south of the curtain wall. In the projecting forts the *portae principales* are situated to the north of the barrier. The relationship between the Turf Wall and the two *portae principales* is summarised in Figure 59. The projected line of the Turf Wall and its ditch in this plan is based upon the standard Wall width of 6.1m and berm of 1.83m (Daniels 1978, 19–20). The line of the Turf Wall to the west of the *porta principalis sinistra* (Fig 59a) is based upon the line established by Haverfield and assumes a straight course following the orientation of the Wall and ditch to the point where they appear as extant earthworks some 390m west of the gate. The southern tail of the Turf Wall (Pl 3) was found 6.7m south of the south portal of the gate. This is so close to the usual width of the Wall that the fort must have been deliberately planned such that the gate lay immediately to the north of the Wall. Turf Wall material was found within the excavated south portal of the gate because the gate was built within a bend in the line of the Wall. The north face of the Wall was not identified within the portal, and it is possible that some of the apparent Wall material which was found within the gate included material thrown down during the construction of the stone fort. It is noticeable that a bulge in the wall of the north tower of the gate, which was the result of a later near-collapse (Fig 121), lies directly above the projected north edge of the Turf Wall ditch: exactly where instability might be expected. At the *porta principalis dextra* (Fig 59b) the Turf Wall impinged slightly upon the gate, but a minor cutting back of the face of the Wall would have compensated for this. The Turf Wall was not identified at this gate (Fig 58) and it is possible that the position of the gate tower may be accounted for by a variation in the original width of the berm. It is also possible that the Turf Wall was considered temporary when the Stone Fort was built, and that Simpson and Richmond (1934a) were correct in their assertion that a stone replacement on the same line was anticipated by the builders of the fort.

The evidence of the stonemasonry is now relevant and is summarised in Table 5. The three masonry types described for the two excavated gates can also be identified in the other gates of the stone fort (Hill 1991a; 1992). The table summarises the results of the detailed survey. The first two masonry types are not very dissimilar, the second being merely less carefully finished than the first. There are a variety of possible explanations for this; perhaps they reflect seasonal working, or the circulation of building gangs with differing skills. If the latter, it might be argued that the task of dressing the foundation blocks was allocated to a more skilled team because of the importance of creating a sound foundation. It is clear from the table that none of the gates were completed by the builders of the two first masonry types. The third masonry type was a poor piece of work, radically different from corresponding work elsewhere in the gates, and cannot relate to the same building campaign as the first two. It was first defined (Hill 1991a) at the *porta principalis sinistra* where the eastern foundation block of the west *spina* pier, together with the pier itself, were of the very poor standard characteristic of this type. This is a crucial observation as the extensive black hiatus horizon stratigraphically post-dated the western foundation

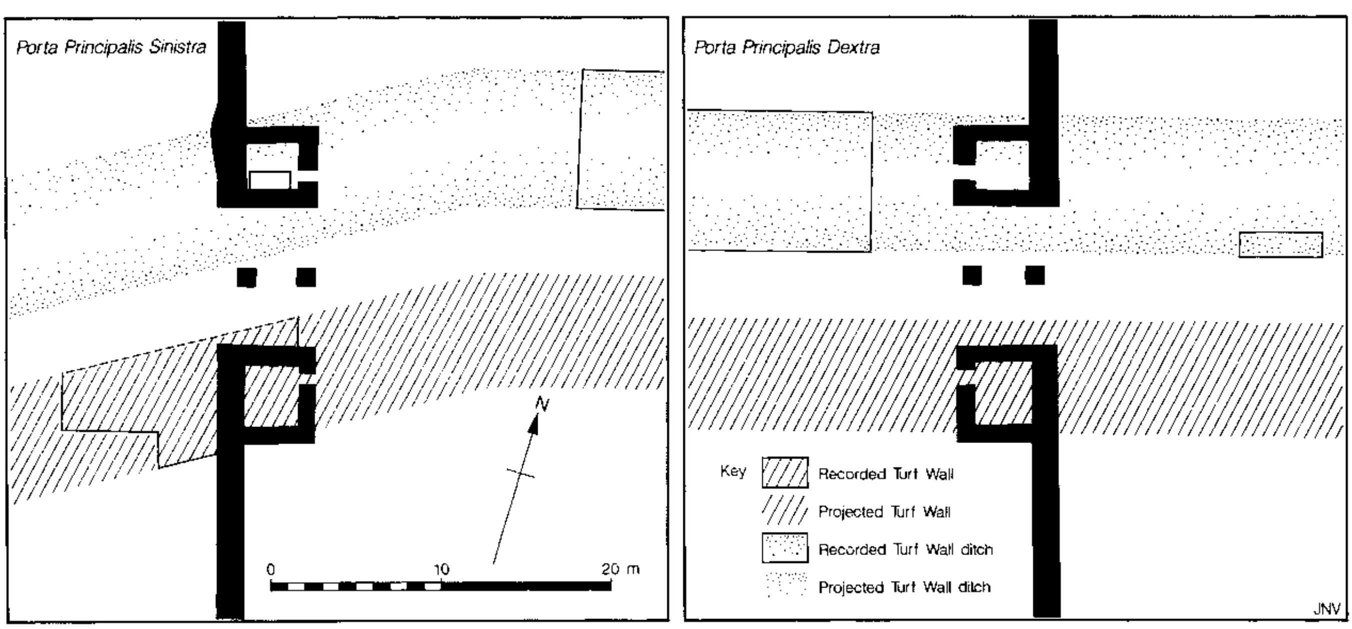

Fig 59 Outline plans showing the relationship between the Turf Wall and ditch and the portae principales

Table 5 Summary of stonemasonry phases recognised in the gates of the stone fort

	porta principalis sinistra	*porta principalis dextra*	*porta decumana*	*porta quintana sinistra*	*porta quintana dextra*
1	main pier foundation blocks and course 1 course 2 of NE pier W *spina* foundation block	all four main gate piers E *spina* pier	courses 1–3 of SW pier courses 1–2 of NW pier *spina* foundation	foundation blocks to W piers	
2	all four main piers completed	W *spina* pier	SE pier courses 4–5 of SW pier S *spina* pier		course 1 of N pier courses 1–2 of S pier
	[hiatus horizon in Area A divides phases of *porta principalis sinistra*]				
3	*spina* foundation completed E *spina* pier threshold	voussoir		W piers built	courses 3–4 of S pier voussoir

block (which was of the high standard set by the first masonry type), and antedated the eastern block. This clearly demonstrates that the gate was begun before the period of probable abandonment but remained unfinished until reoccupation. To extend this to all of the gates, it may be seen from Table 5 that before the hiatus horizon was deposited the *porta principalis sinistra* was completed except for its *spina*, the *porta principalis dextra* lacked its voussoirs alone, the *porta decumana* may have been completed (though no voussoirs survive from this gate), the *porta quintana dextra* lacked its south pier and the *porta quintana sinistra* had only its foundation blocks. There is no way of knowing how far work on the curtain wall of the fort had advanced; it is unlikely that the wall walk was reached anywhere, as its height was probably determined by that of the top of the gate arches, none of which (with the possible exception of the *porta decumana*) had been built. Excavation in Area A demonstrates that the internal streets, rampart, and buildings were not begun until after the break in work represented by the hiatus horizon.

The desirability of detailed chemical and micromorphological analysis of the single widespread stratum of the hiatus horizon was recognised during the excavation and the analysis has produced results of enormous value to the interpretation of the site. It might be noted that the specialists working on the soils and the stonemasonry did so in isolation, both from the stratigraphic analysis and one from the other, and reached their conclusions quite independently. The combined evidence from the analyses of the soils and stonemasonry contributes significantly towards a detailed enhancement of the complex story of the stone fort's construction.

The suggested sequence is as follows: the Vallum ditch was filled, and the Turf Wall together with an early fort, whether finished or not, were levelled within the limits of the stone fort. The Turf Wall ditch was filled, predominantly with material redeposited from the Turf Wall itself. The foundations for the gates and curtain wall of the stone fort were laid, and building was commenced by the workers who produced the quality of work shown in the first two stonemasonry types. Before any of the gates were completed an abrupt halt was made on the building operation. This was followed by a limited presence on site while a topsoil began to develop. A short abandonment of the shell of the partly-built fort allowed the growth of scrub which was subsequently cleared by burning. Whatever else then happened animals were present within the fort enclosure for some time before the hiatus soils were sealed. This may have involved the use of part of the fort as animal housing, or the use of the entire part-constructed fort enclosure as a corral. The flimsy timber structures situated over the Turf Wall ditch, identified both recently and in 1929 (Level 0), may synchronise with this phase; the micromorphological analysis of soils, admittedly in late Roman contexts at Deansway, Worcester, have similarly indicated animal penning in association with insubstantial timber buildings (Dalwood 1992, 4). The idea that these structures provided evidence for the occupation of an earlier fort has been considered, and rejected, as they would imply that such a fort projected, an idea for which there is no other substantive evidence. The close of the hiatus phase is marked by a resumption of work on the gates by the less skilled masons who produced the third type of stonemasonry.

The sequence of activity following the hiatus within the fort clearly reflects a concentrated burst of work aimed at the final commissioning of a fully-constructed stone fort. It has been demonstrated that this phase included the completion of the defensive circuit including all six gates, the construction of the basilican Building 4403, the two long, narrow buildings on the north frontage of the *via principalis*, and the barrack in the *praetentura* excavated in 1929. The rampart was raised behind the wall, and the streets and drains were laid out. It may be presumed that many other buildings were also constructed at this time. Not all of the work was undertaken with the same lack of care as characterised the completion of the gates; the ashlar faced quoins of the piers of Building 4403 indicate the presence of skilled masons, and it is possible that the contrast between the gates and these piers reflect some aspect of prioritisation during the construction process.

The rampart on the west side of the fort directly sealed the hiatus horizon, as did the adjacent *via sagularis*. This suggests that the rampart was constructed broadly at the same time as the street. Though the ramparts were partly constructed with redeposited occupation material, as noted elsewhere, much of the rampart was built of clay which was probably obtained from the excavation of the fort ditches. This suggests that the ditches were also excavated as part of this renewed building programme. It is tempting to associate the sleeper-beam structures on the spur to the south of the fort, which were cut by these ditches, with the pre-hiatus structural Site Phase 3 and the stratigraphically-later posthole buildings with the renewed building of Site Phase 5, though there is no clear evidence for this assertion. The excavators' interpretation of the buildings cut by the fort ditches as temporary structures for the fort builders is still the best explanation for their stratigraphic position between the filled Vallum ditch and the primary stone fort ditches. The later buildings, though it is possible that they were temporary in character, could just as easily represent buildings associated with an extramural *vicus*.

The defences

The excavation of the *portae principalis sinistra* and *quintana dextra* contributes little that is new to the study of stone fort gates. These structures have been the subject of intense recent study in preparation for the excellent if controversial gate reconstruction at South Shields (Bidwell *et al* 1988a, 1988b). The gateways of Hadrian's Wall have been the subject of specific surveys by Richmond and Child (1942), and by Bennett (1988). Birdoswald holds a place in the history of the study of Roman fort gates; the 1855 reconstruction drawing of the *porta decumana* by John Storey (Fig 60) is one of the earliest attempts at depicting the possible appearance of such a gate.

The *porta quintana dextra*, like its western fellow, appears to have been a straightforward tower-gate of the simple type used in stone milecastles (Crow 1988a, 145) and in the *portae quintanae* of all projecting forts on the Wall, of which the best preserved are visible at Chesters and Birdoswald. The gate would have consisted of a tower similar in dimensions to the interval towers on the fort wall. Unlike these towers, however, the bottom storey was occupied by a single portal arched gate. The floor above the arch was probably at the same level as the rampart walk, and it is likely that the tower was three storeys in height.

The layout of the foundation raft is perhaps the most unusual feature of the *porta principalis sinistra*; where gates were built over an earlier Wall ditch at Rudchester (Brewis 1925) and Halton Chesters (Simpson and Richmond 1937b) deep raft foundations have been encountered. The use of a raft comprising hollow squares, however, is so far unique *per lineam valli*; the more usual layout is for gate towers and *spinae* to be founded upon large level slabs laid over rubble and clay-packed trenches. It is possible that excavation below the primary road levels in other forts might reveal that rafting was a more common practice, although at South Shields (Bidwell *et al* 1988b, 161–2) it can be stated for certain that continuous rafts did not exist. The *porta praetoria* and *porta principalis sinistra* at the late Hadrianic or early Antonine fort of the *Classis Britannica* at Dover do, however, appear to have had raft foundations of similar type running across the portals (Philp 1981, 26–29), and Philp (ibid, 98) sees the construction of this fort as following on immediately from the fleet's involvement in the construction of Hadrian's Wall. This involvement is attested by the inscription found in one of the Benwell *horrea* (RIB 1340) and also by a centurial stone found near Birdoswald (RIB 1945).

A second distinctive feature of the gate is the larger size of the south tower. That this was intentional is demonstrated by the fact that the corresponding tower of the *porta principalis dextra* was similarly constructed: it is clearly not the case, as Bennett (1988, 125) has suggested while discussing the eastern gate, that the difference in size was due to a later rebuild. It is possible that the answer lies in the relationship between the south towers and the abutting Turf Wall, though the logic of this remains obscure.

The gates at Birdoswald are nearest in plan to those of Housesteads. At the latter site the walls of the flanking towers appeared to have been butted against the back of the curtain wall (Bennett, 1988, 120), though this observation may simply reflect the same badly-bonded masonry noted in the north tower of the Birdoswald *porta principalis sinistra*. The lack of any recess in the rear of the curtain wall within the tower occurs only at Birdoswald, Housesteads, and Benwell (ibid, 125). Another similarity with Housesteads is that the *spina* piers at both sites were originally planned as free-standing without a connecting wall, a pattern which also occurs at Wallsend and Great Chesters (ibid, 123). The usual interpretation of this plan is that the piers were connected by a lateral arch (Richmond and Child 1942, fig 9). Access through the provision of rear doorways to the towers rather than from portals is somewhat more unusual among Wall forts, and has otherwise been found only at Rudchester, although doors in a similar position exist at South Shields.

No roofing materials were found among the stonework which later collapsed from the gate. The presence of architectural stonework including merlon caps, string courses, cornices, and window heads in some quantity might suggest that had slates or tiles been used on the towers in their latest form, these too would have been recovered from the collapse deposits. This evidence is important in view of the fact that no such data were recovered from the other gates at Birdoswald, and similar demolition deposits have not survived on other fort sites (Bidwell *et al* 1988b, 194). At milecastle 27 (Lower Brunton) collapsed debris

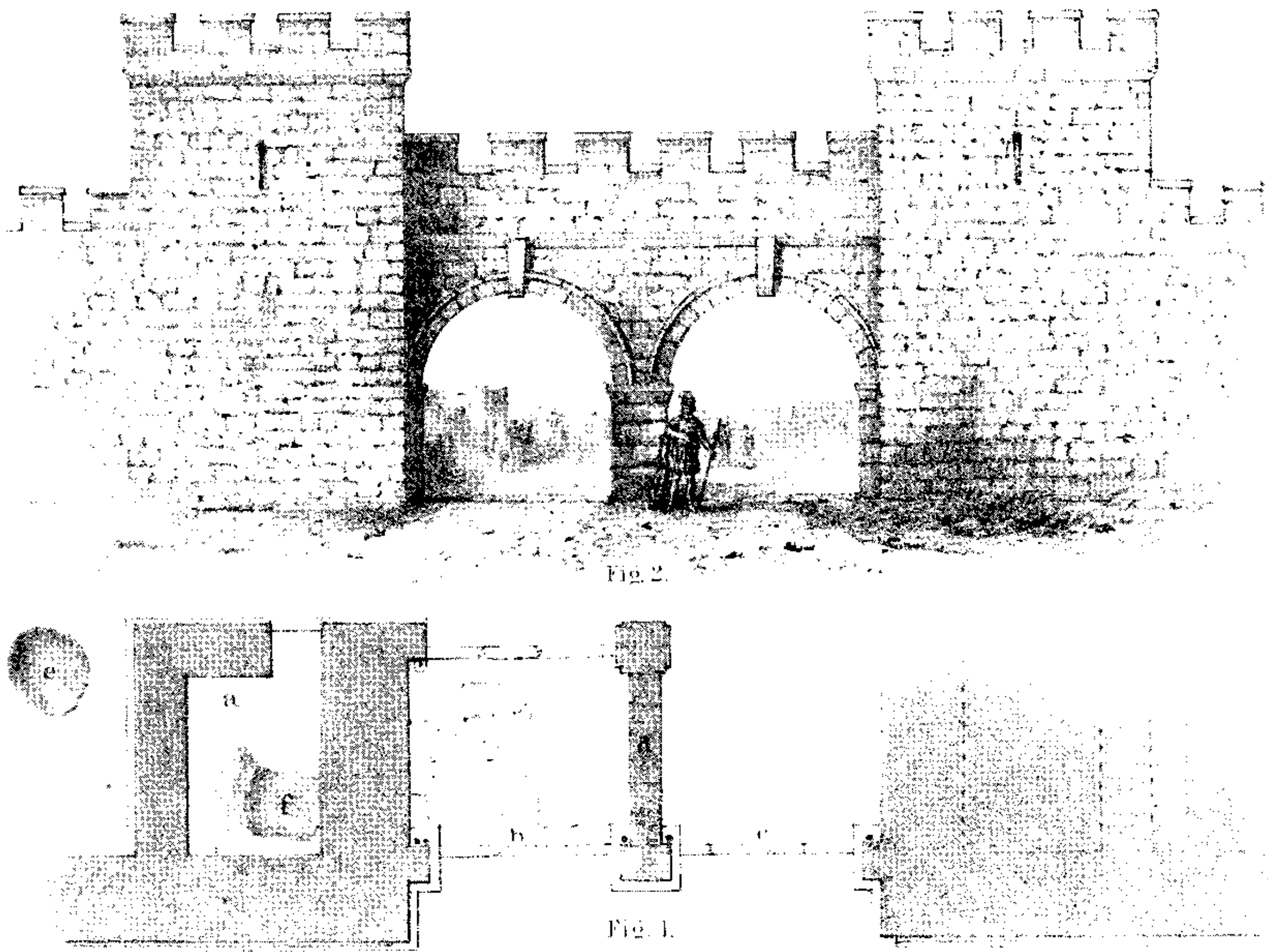

Fig 60 Reconstruction and plan of the porta decumana, *drawn by John Storey following the 1851 Potter excavation (reproduced by permission of the Society of Antiquaries of Newcastle upon Tyne)*

which included architectural fragments was found at the south gate. This also contained no tiles or slates (Gillam 1953, 171), and the resulting interpretation was that the turret roof was flat. The lack of roofing material in the debris from the north gate of milecastle 39 (Castle Nick) resulted in a similar conclusion (Crow 1988a, 151). At Birdoswald the lack of roofing material in the rubble from the gate may be an accident of survival. The stone fabric of the gate survived until the fourteenth century and the architectural fragments reported upon above were all from the debris which resulted from the medieval collapse of the gate. It is highly unlikely that any tiled or slated roof could have survived for this length of time; it may have collapsed or was dismantled and cleared away long before the structural collapse which produced the rubble layers.

The discovery of an iron pivot-stub in the southern pivot hole of the south portal of the *porta principalis sinistra* is of considerable interest. The gate leaf turned on tenons at the ends of vertical timbers, which were housed in pivot holes at the top and bottom of the gate. The method of hanging was to thrust the tenon into the upper hole and to slide the lower tenon into position. Iron plates used as bases for pivot holes, and iron collars and bindings for the curved uprights of the gates, are not uncommon finds (Bidwell *et al* 1988, 212–4; Manning 1988). The iron stub at Birdoswald suggests that the gate tenons were provided with an iron ferrule as well, whereas timber tenons have been found at Chesters (Clayton 1903, 106).

The gate may thus be reconstructed with few differences from the simulation at South Shields (Bidwell *et al*, fig 7.19). Using the evidence of the standing pier and voussoir of the *porta principalis dextra* at Birdoswald, Bennett (1988, 130) has calculated that the soffits of the arches of the double gate would have been 3.40m in height, and the length of the voussoirs would give an extrados height of 4.40m. Hill and Dobson (1992, 47–49, fig 6) point out the need for stone coursing of 300mm above the upper pivot stone of a gate (in this case a milecastle tower gate) in order to hold the pivot in position. They reconstruct a floor joist immediately above the extrados of the arch. Extrapolating this to the Birdoswald gate, and accepting

Bennett's suggestion (1988, 130) that the floor joists might have a scantling *c* 100mm, the first-floor level of the gate would have been at 4.50m above ground level.

Arches were provided above the portals on both sides, and the two piers of the *spina* may have been linked by a transverse arch (Richmond and Child 1942, fig 9). The rear gate arches can only have functioned to support a second storey or attic (Bidwell *et al* 1988, 189), and the flanking towers probably rose a further storey above this. The towers were entered at ground level by means of doors to the rear, though the upper storeys were probably accessed from the wall walk on top of the fort wall and may have had no direct communication with the ground floor. This is further suggested by the later treatment of the ground floor rooms. These were often completely filled by the installation of ovens which would exclude any stair or ladder access to the upper floors. Subsequently ground-floor tower doors tended to be blocked.

The problem of roofing on gates is a perennial one and possible reconstructions vary. Possibilities which have been suggested include the flat crenellated towers, and a similar platform above the arches reconstructed by Richmond and Child (ibid) at Housesteads and by Storey (Potter 1855c; Fig 160) at Birdoswald; roofed attic and towers are proposed by Crow (1989, fig p 10; 1995, fig 17) at Housesteads, while the compromise used in the reconstruction at South Shields has roofed towers flanking a flat platform with a crenellated parapet. The problems with the use of flat roofs in a climate such as that of Britain has been discussed by Bidwell *et al* (1988, 195–200), who demonstrate that the roofs of fort gates in the north-west provinces tended to be wholly or in part provided with gabled roofs. Hill and Dobson (1992, 41) describe flat roofs more strongly, as an 'abomination to be avoided wherever possible'; the flat roof of the tower on the farmhouse at Birdoswald, which was rotten and unsafe after less than 20 years, illuminates the problem further. Bennett (1983a, 44) expressed the view that Wall-turrets had probably been flat-roofed. Later he suggested (1988, 137) that low pyramidal or gabled roofs sheathed in lead and surrounded by a crenellated parapet might have been employed as they were in medieval fortifications and churches, though no evidence for this has ever been found. Crow (1995, 32) has also noted the possibility of a low gable within a parapet. A novel explanation for the combination of a lack of roofing material suitable to a pitched roof, and the presence of merlon caps among the collapsed debris from the gate, has recently been advanced by Hill and Dobson (1992, 43). They postulate a flat-topped tower with crenellated parapet surmounted by a thatched roof carried on four corner posts. This idea has the merit of accounting for all the evidence. The presence of merlon caps in the debris from the gate at Birdoswald suggests that there was an open crenellated platform on the gate. The author prefers the South Shields interpretation of a flat roof with crenellated parapet above the gates flanked by roofed towers, and this is reconstructed in Figure 100.

The chamfered string courses would be employed at parapet level, and also possibly at the floor levels of the towers. The dentilled cornice may have been positioned above the gate arches between the towers on the exterior face of the gate. An elaborate cornice from the *porta praetoria* at Housesteads is thus reconstructed by Crow (1995, fig 17) Shuttered windows, constructed in a variety of ways, would have been provided in the storey above the gate, and also in the upper storeys of the towers.

The height of the curtain wall to the wall walk would probably fall within the range 3 – 4.8m projected by Bidwell *et al* (1988b, 184), but appears more likely to have been at the higher end of this range. Most reconstructions, from John Storey's 1855 drawing of the *porta decumana* onwards, including the South Shields simulation, show the string course over the gate arches at the same height as the wall walk. The argument that the wall walk and the first floor of the gate were at the same level was advanced by Richmond and Child (1942, 146–7), and is supported by extant examples in other provinces (Bidwell *et al* 1988b, 182). The height of 4.5m suggested above for the first floor of the *porta principalis sinistra* would thus be the height of the wall walk. This is not dissimilar to the height of 4.2m projected for the south curtain at Housesteads from the angle of the surviving steps of a stairway in the rampart (Crow 1995, 30; for such calculations see also Hill and Dobson 1992, 46–7). The top of the wall may originally have been provided with a crenellated parapet, at the foot of which a chamfered string course would have embellished the exterior face.

The earthen rampart behind the stone wall was more than 5m in width, though its primary kerb was nowhere satisfactorily identified. The rampart at Housesteads varied between 5.8 and 6.5m wide (Crow 1995, 36). The Birdoswald rampart was at least 1.42m high, as it survives to this height behind the blocked *porta quintana sinistra*. It was built using a variety of materials, though clay, which may have come from the excavation of the fort ditches, was an important element in its construction on the east, south, and north sides. Peat from the morass was used on the west side (Simpson and Richmond 1933, 262), and on all sides where excavation has taken place, occupation debris was incorporated. However, the rampart was not merely a dump of earth; it was revetted by longitudinal lengths of rough walling, each two courses high, placed at different levels within. Such walls were found in the north and east ramparts, and would have served to consolidate and tie together the earth dumps, as did the upper layer of timber corduroy found in the rampart of the timber fort at Ribchester (Buxton and Howard-Davies forthcoming). It is possible that some at least of the fourth-century retaining walls in the north-east rampart at Housesteads (Crow 1989, 15–16) performed a similar function. The evidence for the emplacement of a turf at the base of the rampart against the north wall in Area B echoes the situation in the legionary fortresses of Chester and Gloucester, where one or more courses of turf appear to have been laid at the foot of the rampart in order to stabilise the ground (LeQuesne, forthcoming; Hurst 1986, 101).

The original form of the rampart is open to some debate, and there are a variety of theories. Richmond and Child (1942, 144, fig 2) saw the rampart top as comprising a flat wall walk 1.52m (5ft) wide at a level 1.6m below the wall walk, and further suggested that a ladder led from this platform to a centrally positioned door to the first floor of the gate towers. Bidwell *et al* (1988b, 208) favour a flat-topped rampart at the level of the wall walk, giving added width to the wall top which would have been only *c* 1m wide when a parapet wall 500–600mm thick was included. A full height rampart is also reconstructed by Crow (1989; 1995) for Housesteads. The evidence from Birdoswald can only suggest that the hard packed and partially metalled surface at 1.42m high would at some time have been the rampart top at the eastern side of the fort. It is too low to have been a lower wall walk of the kind suggested by Richmond and Child. It thus seems likely that the original primary rampart was higher than this, probably extending to the wall walk, and that it was truncated at a later date.

The provision of culverts in the wall serving drains from within the fort suggest that the fort drainage scheme was laid out at the same time as the walls were started and before the rampart was built against the back of the curtain wall.

The fort plan and the internal buildings

The primary fort plan is very little known (Figs 7, 8). Reasonably-complete building plans have emerged only from the present excavations and those of 1929. The known primary buildings lie immediately to the north of the *via principalis* in the *praetentura* of the fort. The fort buildings were arranged *per scamnum*, that is with their long axes parallel to the short axis of the fort.

The *praetentura*

Ranged with their long axes on the street frontage were a pair of long, narrow buildings without internal partitions, but with stone floors and, in one case a drain. There was no evidence for the function of these buildings which may have comprised stores or stabling. Two similar buildings were constructed in analogous positions at Wallsend (Daniels 1989a, fig 39), and identical buildings in the same position also occur in the mid-Antonine stone fort at South Shields (Bidwell and Speak 1994, fig 2.4, 17–18). Among continental forts, a long narrow building appears in the same position as Building 4400 in the fort of *ala* I *Tungrorum Frontoniana* at Aquincum in Pannonia (Németh 1991, 98, abb 1). Similar undivided buildings occur in the Flavian timber forts of Künzing (Schönberger 1975) and Pen Llystyn (Jarrett 1969, 102–3, fig 53). All of these forts are arranged *per scamnum*, and it is interesting that at the *per strigas* fort at Fendoch (Richmond and McIntyre 1939) similar buildings were constructed face to face across the *via praetoria*.

Behind the eastern building was a barrack block, divided into *contubernia* each of which measured on average 4.5m wide (Fig 6). This block is generally reconstructed (Richmond 1931, fig 1; Breeze and Dobson 1987, fig 1) as a standard infantry cohort barrack with ten *contubernia*. At the east end of the block a larger room seems to be part of a centurion's quarters. As this barrack was built back-to-back with the long narrow building on the street frontage, there was no space for the centurion's quarters to project. It is, however, possible that such a projection existed on the north side where the building was not excavated (Fig 6).

Behind the western street frontage structure (Building 4400) lay the basilican Building 4403 (Figs 50, 61) which is of considerable importance. The evidence from which Building 4403 has been reconstructed is directly comparable to that for the Hadrianic second basilica of London. As at Birdoswald, the identification of this building was the result of the accumulation of evidence from scattered small areas and of a rigorous reconstruction exercise (Marsden 1987). Of the 30 projected pier bases of the London basilica, only five (17%) have been actually discovered on the ground (ibid, 43, fig 30), while at Birdoswald there are six out of a projected total of 20 (33.3%). A further similarity in the state of preservation of the buildings at London and Birdoswald is that several piers had been totally robbed, leaving only the sleeper walls upon which they had originally been constructed. If there had been no surviving pier bases the identification of this building as a basilica would not have been possible.

A comparative discussion of this building is hardly possible, as it is so far unique in auxiliary forts (unless the similarly sized building in an analogous position in the Dacian fort of Buciumi is a parallel (Gudea 1979, 78; Chirila *et al*, 1972, and A Matei personal communication), though the lack of detail in the publication precludes any certainty). The comparanda for Building 4403 are to be found in the basilicas attached to fora in the towns of Roman Britain, where similar construction, albeit on a much larger scale, can be seen. The two successive basilicas of London (ibid) as well as those of Leicester, Wroxeter, Silchester, Caerwent, and Cirencester (Wacher, 1974, 42–47) include continuous sleeper wall foundations upon which piers were placed.

The epigraphic references to basilicas in British auxiliary forts were summarised by Richmond (1961) in context with the discovery of a building inscription from Reculver, Kent, referring to *aedem principiorum cum basilica*. The find-spot of this inscription, as well as

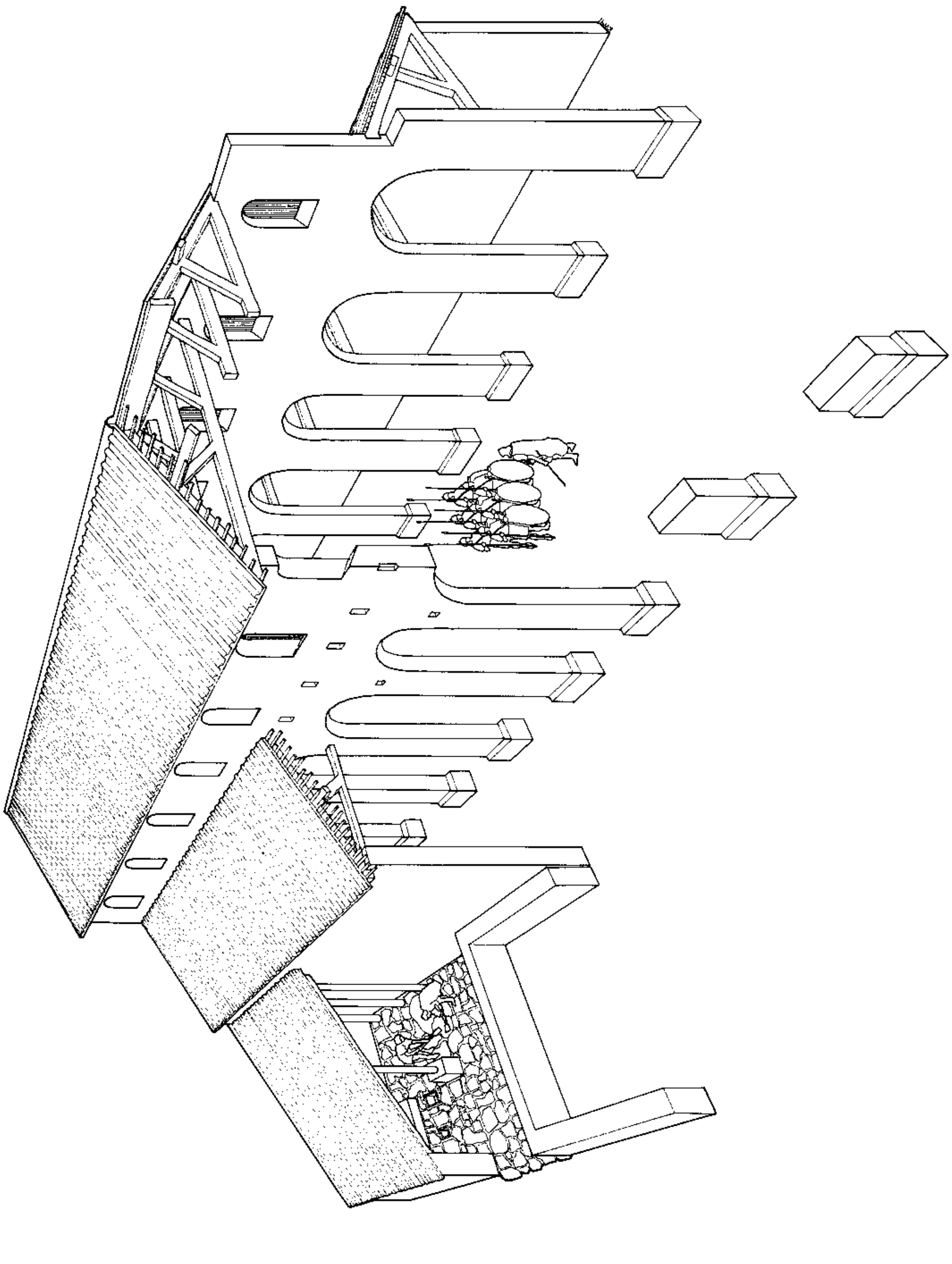

Fig 61 Perspective reconstruction of Building 4403 from the east end: the foreground piers are 8N and 8S; to the south of the building is shown Building 4400 in Building Phase 4401b (drawn by Kate Wilson)

the Latin (R S O Tomlin personal communication), indicate that it referred to the cross-hall of the *principia* and not to a separate basilica. This important find was the first evidence that the cross-hall was termed a basilica. The *balneum [et b]asilicam* repaired in Lancaster by the *ala Sebosiana* in the third quarter of the third century (RIB 605; Jones and Shotter 1988, 213) is cited by Richmond as referring to an exercise hall attached to the unit bath-house, and the same interpretation is given for the *balneum cum basilica* (RIB 1091) of *cohors* I *Lingonum* at Lanchester. The only other specific reference to such a building from British forts is the *basilica equestris exercitatoria* attested at Netherby (RIB 978). Richmond (1961, 226) gives two other examples of the use of the word alone in inscriptions from the auxiliary fort of Syene and the legionary fortress at Mainz, where the building was in the care of one C Lucilius Messor of *legio* XIII *Primigenia*, who acted as *cust[os] basil[icae]* (ILS 2414; Davies 1969, 75). The use of the term in these forts is ambiguous. It seems that the term *basilica* could be used for buildings with differing functions as long as they shared the plan which we still know as basilican; having a nave lit by a clerestory and flanked by aisles (Smith 1963, 1).

The cross-hall of the *principia* at Birdoswald is clearly visible as an earthwork in the field beyond the excavation area, and there is no evidence for a primary internal bath-house. It therefore seems most likely that Building 4403 functioned as a *basilica exercitatoria*, or drill hall, of the kind described by Vegetius:

> Continual unceasing drill with missiles and loaded javelins was enforced to the extent that for winter use porticoes roofed with tiles or shingles ... were provided for the cavalry, and buildings like basilicas [*quaedam velut basilicae*] for the infantry. In these the troops were given their training in wet or windy weather.
>
> (*Epitoma Rei Militaris* II: 23, translation from Pitts and St Joseph 1985, 124)

Wet and windy weather is extremely frequent in the Birdoswald area, and covered space for practice would have been a necessity to maintain an effective force.

Several types of building have been identified as drill halls in the past. In his excavation of the fort at Brecon Gaer, Wheeler (1926, 42) suggested that the forehall attached to the front of the *principia* was probably a *basilica equestris exercitatoria* of the sort mentioned in the Netherby inscription. Webster (1985, 223) and Wilson (1980, 49, fn 25) have further assumed that the Netherby inscription refers to and identifies a forehall, though no such structure has been found there. There is now a considerable body of literature which identifies these forehalls as cavalry exercise facilities. Richmond (1950b, 24) noted that the addition of a forehall to the *principia* at Newstead 'synchronises as at Halton [Chesters] with the posting of cavalry to the fort'. It has been shown (Johnson 1983, 314 n 73) that of the 31 forehalls known, half are connected with cavalry units. All five British forehalls, at Newstead, Ribchester, Halton Chesters, Brecon Gaer, and Wallsend are in forts with cavalry or equitate garrisons. Of these, at least four, those at Brecon Gaer (Jarrett 1969, 51), Newstead, Halton Chesters (Richmond 1950b, 24), and Wallsend (Daniels, 1989a, 79), were apparently additions to the original fort plans, and these were built in what may have been the only free space in which such large structures could be sited within an otherwise fully-functioning fort. Schönberger (1969, 169) opined that forehalls were not for cavalry, but were 'roofed places where soldiers could fall in'.

The date of 222 for the Netherby inscription suggests that the *basilica*, specifically associated with cavalry, was an addition to the fort plan, and may therefore have been a forehall. However, the phrasing of RIB 978, that the building was completed having 'long since been begun from the ground' raises the possibility that it may have been an unfinished primary structure which was completed during the early third century, much as the Birdoswald *horrea* were built on a vacant plot at a similar time. This in turn may suggest that it more nearly resembled the Birdoswald basilica than the forehalls.

In legionary fortresses *basilicae exercitatoriae* have been claimed at Inchtuthil (*JRS* 1960, 213) and Caerleon (Davies 1974, 21; Jarrett 1967, 32; Boon 1972, 85). In their discussion of the Inchtuthil building Pitts and St Joseph (1985, 124–8) prefer an interpretation as a store and workshop, arguing that the hall was too small for cavalry practice, and that the internal division into nave and aisles would make weapon practice unlikely. Little is known of the supposed *basilica exercitatoria* at Caerleon apart from its plan. The building lies on the dextral side of the *praetorium*. The interpretation of the plan has been presented in two different forms by Boon (1972 and 1987). The outline plan at Figure 62 is taken from his 1987 version. This is strikingly similar to the Birdoswald building, with two small rooms occupying one end bay of each aisle. The Caerleon building was clearly considered important as it was a primary masonry structure (Boon 1987, 28–9). The dimensions of the Caerleon and Birdoswald structures may be compared as follows:

	Birdoswald	*Caerleon*
Aisle width	2.85m	4.70m
Nave width	7.48m	11.36m
Total internal width	14.60m	23.20m
Total internal length	48.88m	46.80m
End bay width	3.48m	5.90m
Intercolumniation	2.36m	2.50m
No of intercolumniations	9	9

Although the widths of the buildings are very different, their lengths are similar. This may be due to exigencies

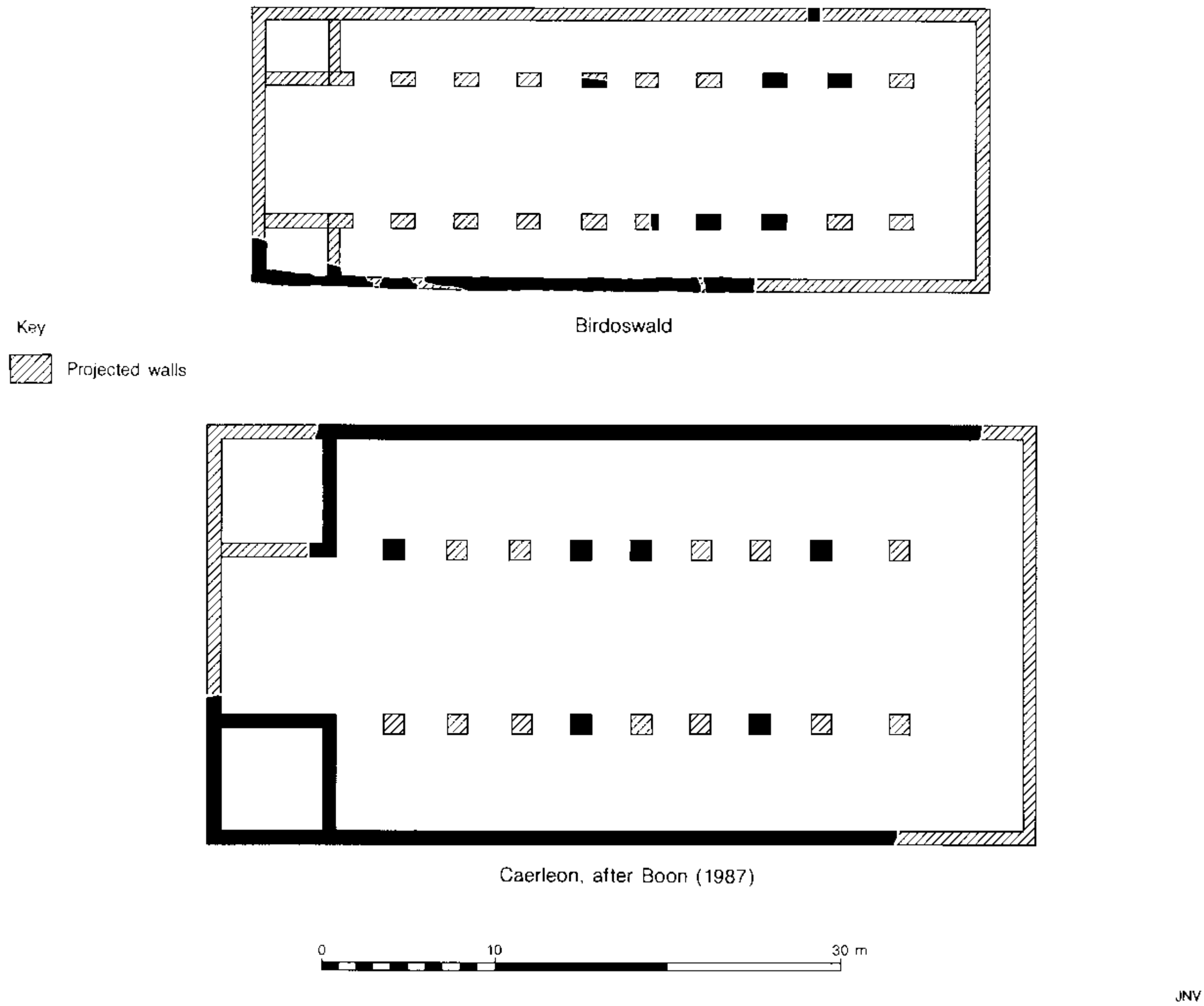

Fig 62 Comparative outline plans of basilicae exercitatoriae *at Birdoswald and Caerleon (scale 1:400)*

of space in fort planning, though it is also possible that the length of the building was dictated by its function. If missile practice, particularly with throwing spears or javelins as described by Vegetius, was undertaken under cover in this building the length would need to be well above the effective range of such weapons. Experiments carried out at South Shields (Bidwell *et al* 1988b, 181, fn 3) showed that 20–25m could be achieved by an untrained individual. The experience of the Ermine Street Guard suggests that it is unlikely that this would be much increased given the weight of the practice weapons (C Haines personal communication). The lengths of the buildings at Caerleon and Birdoswald could easily contain such a range with adequate margin for safety. The reconstruction drawing (Fig 55) shows that there would also have been room for small groups to move under cover within the building.

The *latera praetorii* and the *retentura*

The *principia* seems to have occupied the usual site in the centre of the fort (Fig 12). It might be assumed that this was a primary building, though no extensive excavation has ever been done. The plan of the *principia* is clearly visible as earthworks at the centre of the fort (Fig 8). The earthworks clearly mask a structure which survives exceptionally well. During excavations in 1930 Richmond reported that:

> It was impossible to bottom [the south wall of the *principia*] owing to water trouble. But we found the voussoirs of its arched entrance lying as they had fallen, and this part of the building, the whole range of principal rooms, 92ft [28.04m] long, the biggest on the Wall, is standing at least fifteen courses high, with a late repair visible in the height of the wall. The north wall of the building, on the other hand, running along the *via principalis*, is only five courses high, owing to the sharp rise on the north side of the 'slack'.
> (Richmond 1930b, 4–5)

The back wall of the building is thus constructed in the bottom of the dip in which the morass lay, and the *principia* must, as Richmond (1931, 127) remarked, be 'among the most remarkable in Britain'. To the east of the *principia* the *praetorium* is known only from the 1852 excavations in its bath-house by Potter (1855c).

The excavations of 1987–92 explored the *latera praetorii* to the west of the site of the *principia*. Here it is apparent that no substantial stone buildings were erected before the later second or early third century *horrea* which were built during Period 3. There were some small traces of activity, but the only Period 2 foundation discovered, for a buttressed building aligned north-south, was never used and was sealed by gravel surfacing. It seems that this area was not built on during Period 2 and remained an open area until the close of the second century.

Knowledge of other structures in the *latera praetorii* and the *retentura* derives exclusively from the 'rapid trenching' undertaken during 1930 (Richmond 1930, fig 1), and these structures are shown as 'projected' in Figure 7. Immediately behind the *principia* lay a 'ruined building of the first period' (ibid, 125) which occupied the space between the rear wall of the *principia* and the *via quintana*. The buildings on the west side of the *latera praetorii* are not dated. One long, narrow building occupied the space to the south of the southern *horreum* of Period 3, though some evidence was found to suggest that this building was not primary. A larger, undated, building lay between this and the *via quintana*. No function can be suggested for any of these buildings.

In the *retentura* a primary building which appeared to be a barrack was located on the south-west side of the junction between the *via quintana* and the *via decumana*. The hoard found in 1930 (Richmond 1931) was recovered within this building.

The primary garrison

No garrison for Birdoswald is known by name until the very end of the second century. Birley (1939) placed *cohors* I *Tungrorum* at Birdoswald during the Hadrianic period, an idea followed by others including Breeze and Dobson (1983, 246). This suggestion was based on the discovery of a tile stamp (RIB 2477) at Hare Hill, between milecastle 53 and turret 53b, and nearer to Castlesteads, the later garrison of *cohors* II *Tungrorum*, than to Birdoswald. This is very poor evidence; the portability of such objects is stressed below in connection with a tile stamp from Birdoswald itself, and it seems unlikely that this is relevant to the Birdoswald garrison (see also Roxan 1985, 97).

The only direct evidence for a second-century garrison is a graffito on a samian vessel (Fig 251, No 7) which marks it as the property of one Martinus, a *decurio*. This sherd was found within the rampart on the north wall of the fort. There is doubt as to whether finds from the primary rampart represent material scraped up from an early fort or material representing early phases of the stone fort, but whichever is the case the Martinus sherd indicates the presence of auxiliary cavalry at some point during the early phases of the history of Birdoswald. The discovery of a curry comb (Fig 218, No 182) in the primary rampart would further suggest the presence of horses.

The only data from which the garrison type might be deduced are the plan and dimensions of the fort itself. The actual accommodation for the Birdoswald garrison is unknown, save for a single barrack block, apparently of an infantry type, in the *praetentura*. The discovery of the basilica, Building 4403, complicates any attempt to assess how many barracks might have been contained in the fort as it might conventionally have been assumed that the site of this building would have been occupied by a pair of barracks (cf Daniels 1978, 203–4). The presence of the basilica thus greatly reduces the potential accommodation available. Any other unconventional buildings would further affect any attempt to estimate the number of barracks which might be present, and this exercise has consequently not been attempted.

It has frequently been attempted to relate fort dimensions to primary garrisons (Richmond 1955; Jarret 1969, 15–16; Hassall 1983, 105), and the validity of this approach has been examined by Bennett (1986). Though tentative size ranges for each unit type can be suggested, no strict rules were followed in the construction of forts and there are many variations. These can be attributed to a number of causes: differences in organisation between provinces, lack of standardisation in unit size, individual forts being constructed to suit the actual, rather than a theoretical, garrison size, and also, in the light of the Birdoswald evidence, the potential for variation in the range and type of buildings required by a garrison. To follow Bennett's analysis, at 2.145 ha, Birdoswald fits into his size group C (ibid, 711). By comparing the sizes of forts where the primary garrison types are known, Bennett shows that forts of this size were primarily occupied by *cohortes quingenariae*, both *peditatae* and *equitatae*, though there are also examples of *cohortes milliariae* of both types, as well as *alae quingenariae* in such forts (ibid, 710–2, figs 1–5). In other words, Birdoswald could have been built for any kind of unit other than an *ala milliaria*. The forts of Hadrian's Wall were built as a series at a particular time in order to house single auxiliary units, and attempts have been made to identify a pattern of fort size and garrison (Breeze and Dobson 1969, amended by Austen and Breeze 1979, 123–5). Of all the forts on the Wall Birdoswald at 2.145ha is closest in size to Housesteads at 2ha (thought to have been built for a *cohors milliaria peditata*; Breeze and Dobson 1987, 54) and Chesters at 2.35ha (known to have been built for an *ala quingenaria*; Austen and Breeze 1979). The value of this kind of exercise is very limited indeed (Wilmott forthcoming).

David Shotter (1995, 25) points out that the Hadrianic coinage from Birdoswald includes a proportionately large quantity of silver, which might imply the presence of the higher-paid auxiliary cavalry in the fort, and it is clearly possible that the *decurio* Martinus served in the stone fort. The apparent infantry barrack excavated in 1929 seems to argue for the presence of infantry, although there are similar barracks in the *ala* fort at Chesters. It has been argued above that the basilica was an infantry drill hall, as it seems too narrow for equestrian use.

Though a great deal more evidence is needed, it seems at least reasonable to suggest that the first garrison of the fort contained auxiliary cavalry, and was either an *ala quingenaria*, or, perhaps more likely, a *cohors equitata* whose size is unknown.

Subsequent development

It has already been noted that the stone fort was built to project to the north of the Turf Wall. The evidence for this is the *portae quintanae*, which were only provided in projecting forts. The fact that these gates were completed is demonstrated by the presence of the voussoir in the rampart behind the blocked *porta quintana dextra*. They were finished in masonry typical of the poor third phase, and were thus completed after the hiatus. This means that the fort was still intended to project when completed. It is logical to presume that the *portae quintanae* were blocked when the Turf Wall was replaced in stone in the Birdoswald sector. The new stone wall abutted the north corners of the fort, which thus no longer projected, and the *portae quintanae* became redundant (Breeze and Dobson 1972, 196). The blocking of the *portae quintanae* was thorough, involving the continuation of the earthen rampart across the blocked aperture. There is no direct evidence for the date of this operation. It is generally accepted that the replacement of the Turf Wall in the immediate area of Birdoswald took place in the very late Hadrianic period. This is based on the analysis of the phasing, coins, and pottery from the stone replacement of milecastle 50 (High House) which was excavated between 1909–12 (Simpson 1913, 297–397). Gillam (1970) dated the Wall Period IA pottery from milecastle 50 and turrets 50a and 50b to *c* 135–40 (ibid, groups 38, 39, 55), and Welsby (1985, 75) considers that the evidence for the late Hadrianic replacement of the Turf Wall up to milecastle 51 is still conclusive. This evidence is of crucial importance in the history of Birdoswald, as it provides an effective *terminus ante quem* for the sequence up to the blocking of the *portae quintanae*. It means that, given the accepted date of 122 for the beginning of the construction of the Wall, all of the archaeological events of Periods 1 and 2 must have taken place between 122 and *c*140. The Turf Wall and ditch were laid out, a turf and timber fort built, and probably used, and the Vallum constructed. These installations were then demolished, and a stone fort started, and then abandoned in a partly built state. Scrub was allowed to grow for a while and was then cleared, and the stone fort completed and occupied.

In a final change of plan the *portae quintanae* were blocked and a new stone Wall partly built. Though 18 years are more than adequate to accommodate all of these changes, Johnson (1987, 58) has pointed out the difficulties inherent in making deductions from such small groups of material as were present in milecastle 50, and raises the possibility that the rebuilding of the Turf Wall in stone between milecastles 49 and 51 might have followed the return from the Antonine Wall in the 160s. The only substantive change to the Hadrianic sequence thus far postulated which such a conclusion would make would be to suggest that the blocking of the *portae quintanae* took place during the 160s.

The Birdoswald sequence shows, perhaps better than any other sequence on the Wall, the size and complexity of the undertaking, and in the light of this extraordinary series of starts and checks and changes of plan we might wonder with C E Stevens (1966, 39) whether 'Hadrian, the staff, and the soldiery had not got tired of Hadrian's Wall by the time it was finished'.

The stratigraphic evidence in Area A suggests that the history of the stone fort after its construction, and before the alterations of Period 3, was a simple case of continued occupation. The only structural evidence is the division of Building 4400 (Phase b) and the resurfacing of the streets. The site of the later *horrea* remained vacant until Period 3.

There is no structural or stratigraphic evidence at all to indicate that the fort might have been abandoned during the occupation of the Antonine Wall, or indeed what effect the events of the later second century might have had on the garrison. Inferences can, however, be drawn. The fact that throughout Period 2 the excavated area of the fort was maintained in a clean condition, together with a failure to construct *horrea* within the fort, might suggest that the fort was maintained by a reduced garrison which did not require the storage facilities for a full strength establishment. The evidence of coins and samian ware adds some credence to this argument, though this derives from the examination of the total fort assemblages and not from stratified material, as there were no good stratified deposits for this period. As at other Wall forts (Shotter 1995, 25) there are fewer Hadrianic than either Trajanic or Antonine coins, a factor usually explained by the presence of predominantly Hadrianic coinage in the possession of troops withdrawn for service on the Antonine Wall. This is not as marked at Birdoswald as elsewhere, however, suggesting some continued occupation. The samian ware from the site might suggest reduced occupation through the period from 140–160. Most of the material comes from a single group of potters, the Cerialis-Cinnamus group (135–60), as does the latest piece from the 1929 Alley deposit. In theory these wares could have originated in a single consignment in either the late Hadrianic or mid-Antonine period, though the proportion of the products of this group within the Birdoswald assemblage is closer to that from Antonine Scotland than from Hadrian's Wall and its hinterland forts, a fact which strongly indicates occupation contemporary with that of the Antonine Wall. Thus the clean condition of the fort agrees with the evidence of coins and samian ware in suggesting that the fort was not totally abandoned during the Antonine period.

If there is no evidence from the excavated areas for an Antonine abandonment, there is similarly no evidence for reoccupation in the later second century. No building activity took place at this time, and the *horrea* were still not constructed. The evidence suggests, however that the site continued to be kept clean and maintained.

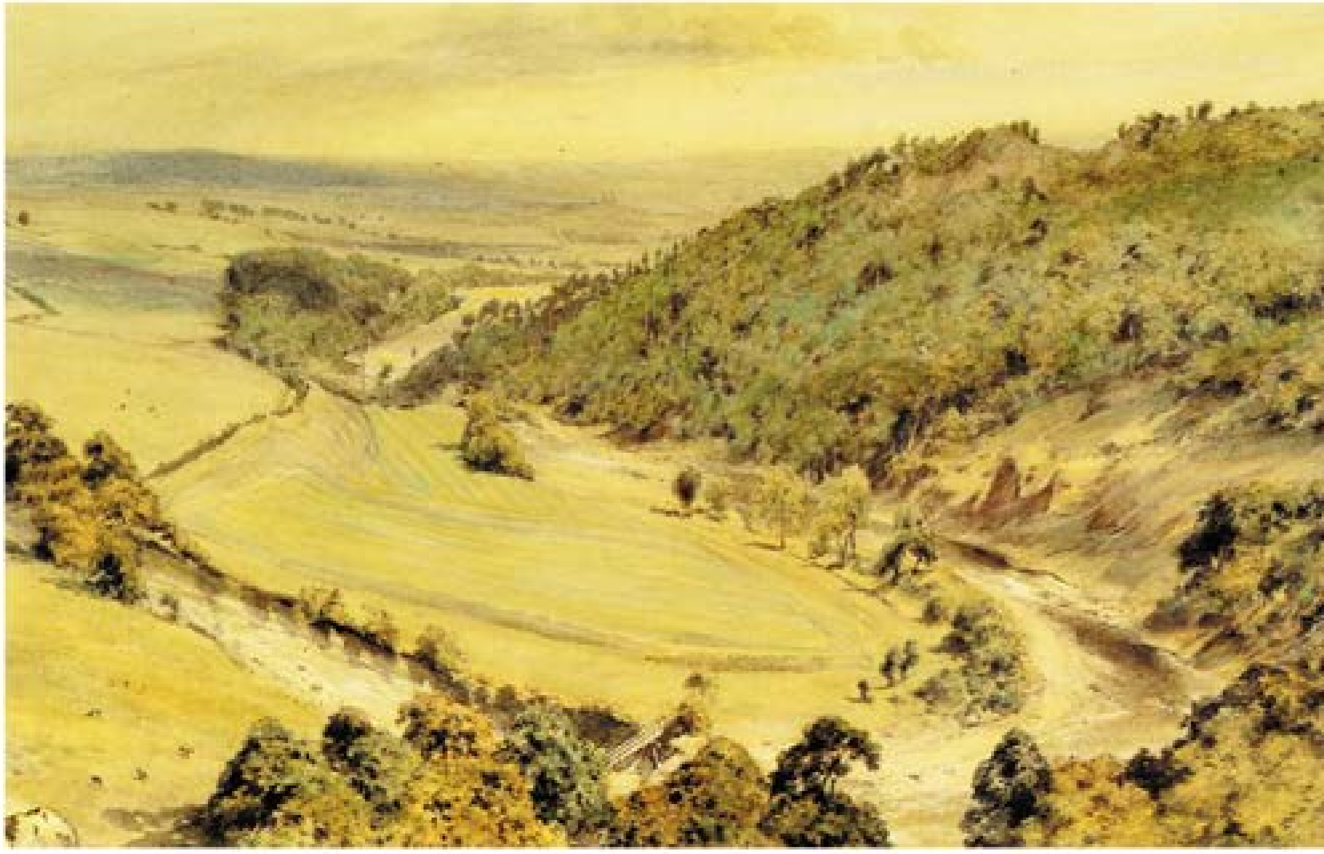

Plate 1 Watercolour by Henry Burdon Richardson of the meander of the river Irthing to the south of Birdoswald, viewed from the spur in 1849 (Reproduced by permission of Tyne and Wear Museums Service)

Plate 2 Watercolour by Henry Burdon Richardson of Birdoswald farm and the porta quintana sinistra *of the fort in 1850 (Reproduced by permission of Tyne and Wear Museums Service)*

Plate 3 The southern heel of the Turf Wall (4172) overlain by a deposit of peat (4130)

Plate 4 Building 197, the south horreum *from the west, showing the complexity of the final sub-floor arrangements*

Plate 5 Building 4401 from the east during Building Phase b showing drain, postholes, and stone boxes of both Working Phases

Plate 6 '... humo copertum et in labem conlapsum ... ? *Building 4401 from the east showing collapse and soil accumulation (3750, 3751) between the end of Phase b (ii) and the beginning of Phase c*

Plate 7 Building 4419 from the east, showing all excavated features

Plate 9 Building 200: members of the excavation staff mark the positions of the principal timber uprights

Plate 8 The western end of Building 198 in Period 6: the stone floor of Building 199 laid over the roof collapse of Building 198 can be seen. In the side walls of Building 198 are the postholes which form the structural elements of Building 199

Plate 10 The via sagularis *in Period 5, looking south: the imprint of two timber buildings are clearly visible*

Plate 11 Gold earring with glass bead in centre (No 77, Fig 191)

Plate 13 Bone pin with head decorated with applied gold foil (No 91, Fig 196)

Plate 14 Statue of Fortuna, ht 1.05m, w 0.475m, d 0.346m, excavated from the bath-house of the praetorium *in 1849–50 and now in Tullie House Museum (Tullie House)*

Plate 12 Intaglios from Birdoswald (Nos 86–9, Fig 195)

5 The second major construction phase (Period 3)

Period 3 was the second during which the construction of principal buildings took place: the *horrea* were built on the plot at the western end of the *latera praetorii* which hitherto had been devoid of stone buildings. At the *porta principalis sinistra* the south tower appears to have been demolished and rebuilt using fine ashlar masonry at the base. It was not possible to isolate aspects of the occupation sequences of Buildings 4400 or 4403 and to identify them with this Period, though some of the flooring operations discussed above for Building 4403, and some of the activity already noted for the subdivided Building 4400, may have actually belonged to Period 3. Some of the later road surfacings mentioned under Period 2b may also have been contemporary with the building operations of this Period, and it is highly likely that the last of the three ditch recuts (Ditch Phase c) which respected the dual portal *porta principalis sinistra* should be regarded in context with the alterations which now took place. Period 3 may be identified with Site Phase 6 (Table 1, Fig 11).

Rebuilding of the south tower of the *porta principalis sinistra*

Stratigraphy

During this period the outer face of the curtain wall immediately south of the west gate, and the return to the south-west pier, was rebuilt or re-faced without any apparent interference with the gate portal itself. The stratigraphic evidence for this consisted of a broad cut (3948; Fig 63) or scoop which removed the orange gravel surface (2953; Fig 55), both along the berm and in the southern 0.52m of the south portal of the gate. This scoop extended 9.60m north-south, and was 0.54m in depth at the north end, and 0.18m on the south (downhill) side. The extent of this scooped-out area coincided with a length of exceptionally fine masonry (3834) composed of substantial ashlar blocks on an ashlar plinth, which had been built into the fort wall, and the scoop is consequently interpreted as a foundation, or working cut made to aid its insertion. The scoop was filled with fine, ferruginous sand (3771; Fig 26), containing a large proportion of stone, of which much was large and angular and probably derived from the robbing away of the original facing stones of the curtain wall to insert the finer ashlar work. Above the fill of the construction scoop for the ashlar work lay a mass of rubble and brown sandy loam (3765).

Stonemasonry
by Peter Hill

A stone-by stone analysis of the inserted fine masonry (3834) was undertaken on site (Hill, 1991a), of which this forms a summary. An overall view of the masonry appears in Figure 64, while its drawn elevation appears as part of Figure 65 (Elevation A). The stones on this elevation are numbered within each course, and the courses are themselves numbered 1–4 from the bottom, with the plinth course below. In the description 1/3 denotes course 1, stone 3. P/2 is plinth course, stone 2 and so on.

The plinth

The chamfered plinth course was built with a greenish-blue fine-grained sandstone. It was 170mm high, and projected 80–115mm from the wall line. The chamfer was between 125 and 135mm long above a vertical fillet which varied in height from 100 to 115mm. Much of the chamfer had been used for sharpening tools or weapons, as later occupants of the fort took advantage of the fine grain and highly abrasive nature of the stone. This meant that it was often not measurable. The quoin was undersquare by 4mm.

The return to the gate pier (Figs 31, 32) was made up of two stones with a crude make-up piece

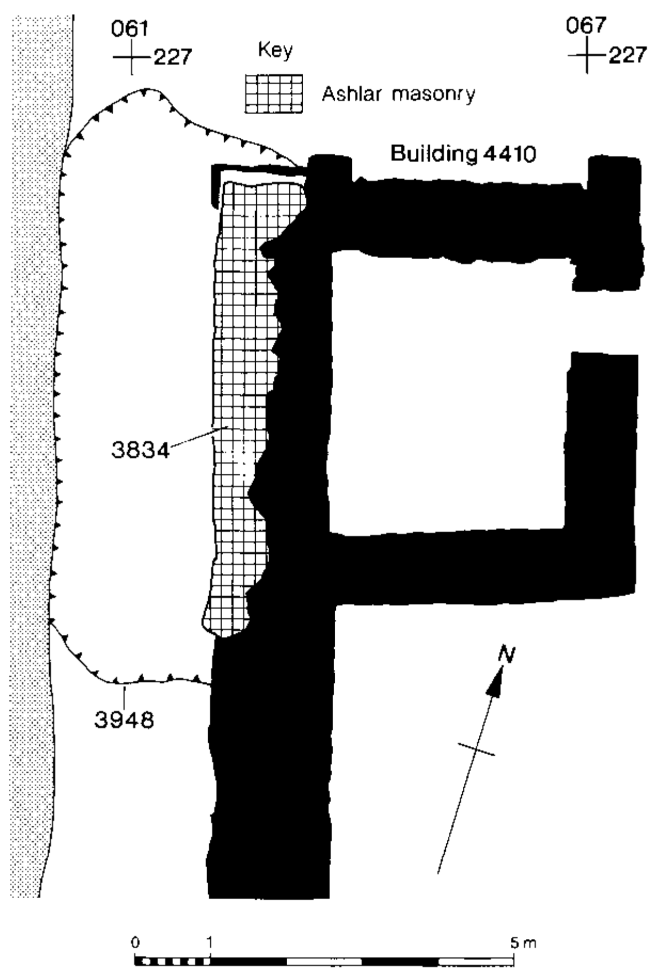

Fig 63 Plan of construction cut for fine ashlar masonry

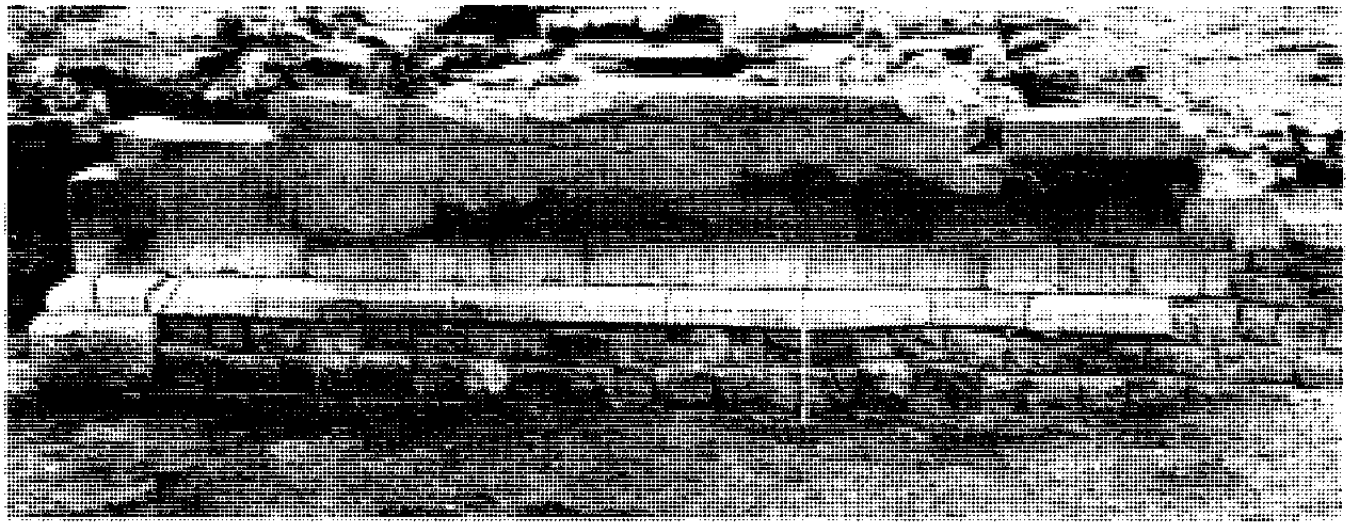

Fig 64 Overall view from west of block of fine ashlar (3834) facing the south tower of the porta principalis sinistra

approximately 75mm long against the pier, while the main run of the plinth on the curtain wall had eight stones. The fillets generally had broad tooling, some vertical and some at random angles with a few intrusive punch marks. The work of a left-handed mason could be distinguished. The fillets were generally worked straight with some undulations of up to 3mm. They normally had an unevenly chiselled margin on the ends and lower edge, which in the case of P/3 and P/4 were worked by a left-hander.

The chamfers seem originally to have been straight, but were so worn by sharpening that their original appearance was hard to judge. The quoin stone was so heavily worn on the top of the chamfer that up to one third of the fillet had been lost. On P/2 the chamfer was worked entirely with a punch in diagonal furrows from top right to bottom left; apart from some areas of wear it is approximately straight with a range of 4mm. On P/4 the chamfer was worked with a punch to give a small diamond broached finish, and P/5 had intermittent diamond broaching on the chamfer.

Generally speaking the plinth was worked by men with rather more skill than available to the average legionary but, in relation to the style of work apparently intended, they seem to have had little regard for the finish.

The ashlar

This is the only known example of true ashlar walling anywhere on the line of the Wall. The use of the term ashlar is an indication of its general appearance. In order to assess the quality of the work each of the 46 stones was examined and recorded in detail.

Almost all the stones in this wall were approximately rectangular in elevation with sharp arrises and angles, though there were some half a dozen noticeable exceptions. The faces were dressed to a plane surface, and joints were no more than 1mm wide. There are 11 snecked joints (detail, Fig 66), which, with one exception, cause a drop in course heights as they run from north to south with the slope of the ground. The quoin was 12mm oversquare. The stone was a buff sandstone, a little coarser than that of the plinth but still fine grained. Both stones were extremely abrasive and the dressing of the stone would have called for the constant attendance of a blacksmith to keep chisels in anything like good order. The face was given to shaling-off in thin layers, and as the stone does not seem to be face bedded this may indicate a poor resistance to weathering after having been buried. The indications are that this loss is post-excavation.

The first course quoin ran through to the pier (Fig 31). Much of the face was dressed with a 65–75mm blade over occasional signs of the initial work with a punch. Around the margins and over some areas of the face there were traces of work with a 25–30mm blade, probably by a left-hander. The margin on the quoin may have been later redressing by a right handed mason. The face varied between 3mm round and 3mm hollow but was generally straight overall with a range of under 1mm. Like the plinth, this quoin stone stopped short of the pier by some 75mm, the gap here being filled by two thin slabs of stone set on edge. The 300mm return to the west face had a number of more or less vertical furrows from a punch, partly removed by vertically-chiselled drafts, with a 30mm chisel. The chisel marks were at angles which alternated on successive drafts, as though left-and right-handed masons were working the drafts by turns; it is referred to hereafter as double diagonal. The reason for the use of this finish must have been for its decorative effect, while the reason for them being set vertically is probably because it is easier to work to a straight edge in short drafts across a long stone than to work from end to end, and as many of the faces on this wall are long ones, the short ones were presumably worked in the same way for the sake of the appearance. This suggests an unusual degree of concern for the finished work, albeit allied to some shortage of skill. The alteration between left- and right-handed angles would be an extremely tiresome one for the mason to produce, as the author (who

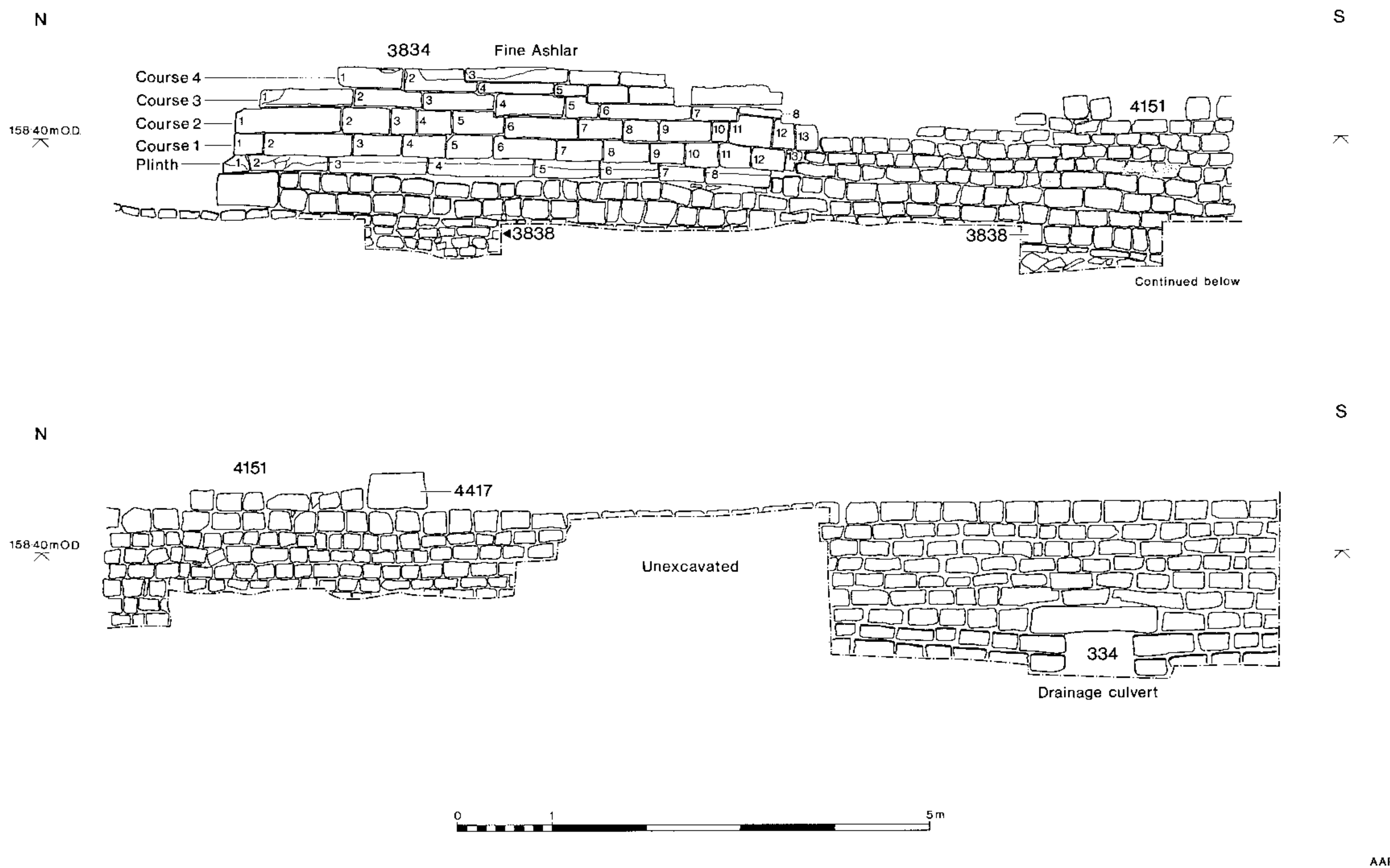

Fig 65 Elevation A, the west elevation of the fort curtain wall south of the porta principalis sinistra

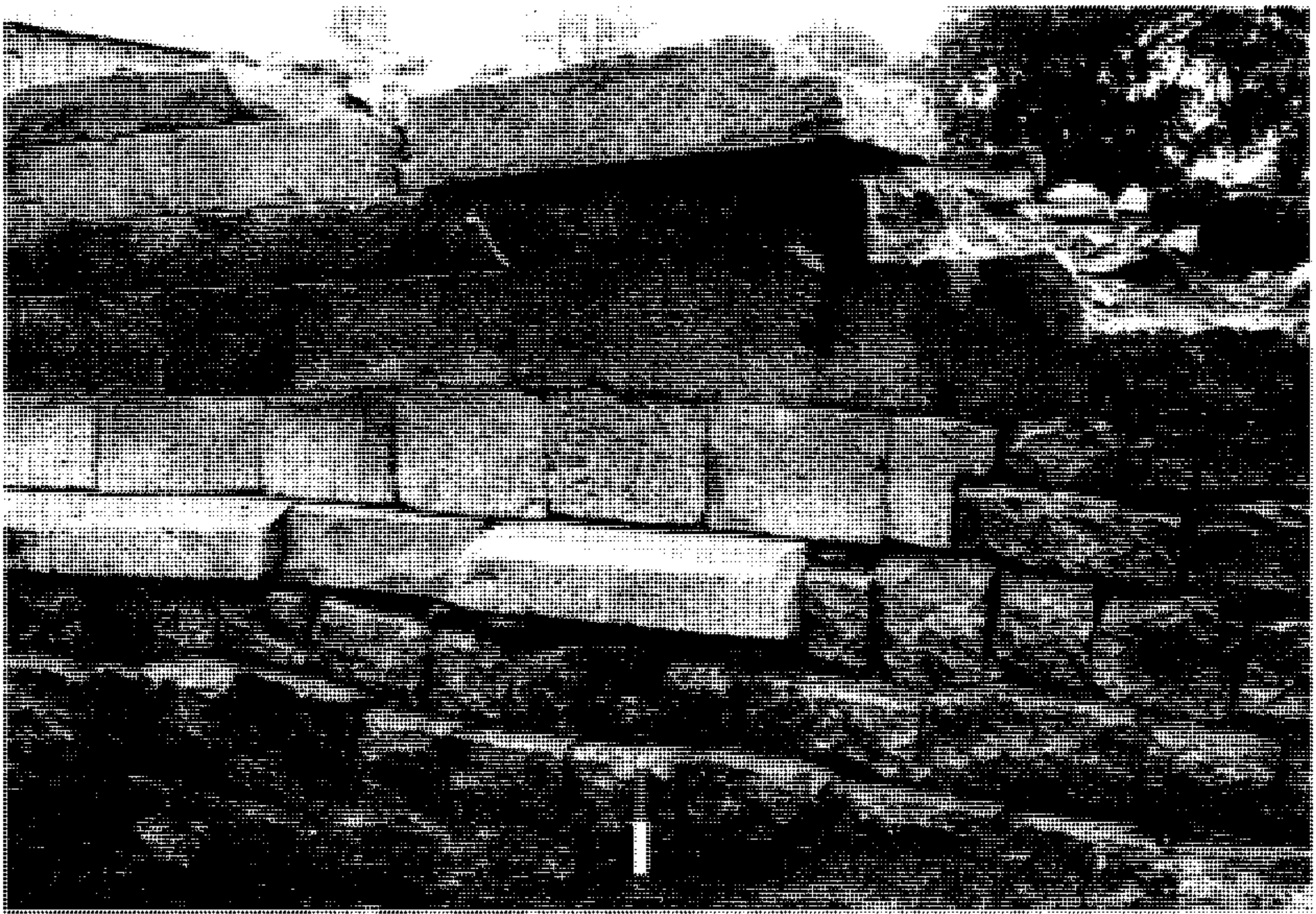

Fig 66 Detail of southern end of fine ashlar (3834, showing snecked joints and junction with coursed rubble of fort wall to south)

as a left-handed mason was made to produce a right-handed finish to match that of his colleagues' stones) can testify. The decorative effect here was nullified by the divergence from the parallel of the successive drafts and the unevenness of the chiselling, to say nothing of the punch marks. The face is between 2–4mm round with a range of 2mm. The two faces of this quoin differ markedly in their appearance and viewed in isolation might be thought to come from different stones.

On the second course, the single ashlar between the quoin and the pier (Fig 31) was finished with a broad blade, set vertically to the left-hand side and at more of an angle towards the right, from top right to bottom left. The top right-hand side showed many intrusive punch marks which spoiled the otherwise reasonable appearance. Overall the face was straight with a range of 6mm into the punch marks. On the left-hand side the stone overhung the course below by about 25mm and stopped short of the pier by some 50mm; this gap is now filled with small stones, earth, and tree roots. This lack of accuracy in otherwise well-fitting work may suggest that the stones of this ashlar wall were reused from elsewhere; this point is examined further at the end of this section.

The poorest finish on any stone was on 1/2. This was finished overall with the vertical double-diagonal chiselling typical of the work, but here over a surface heavily covered with punch marks. It measured a little better than it looked, varying between 3mm hollow and 2mm round, ignoring the punch marks, with a range of 5mm. Some stones, such as 1/9, had a faint chiselled margin on the sides and top, while 2/8 stood a little proud of the general wall line, with chiselled margins cutting back to the wall line in the form of chamfers.

Stone 3/8 was a thin slab (75mm high) worked with a punch in reasonably-neat vertical furrows with some vertical marks of a broad blade as a finish. Although reasonably carefully worked the difference in finish from that of the other stones may indicate that it was worked as an afterthought to fill a space resulting from the use of reused material. The back of the ashlar was revealed behind the quoin by removing the east face of the wall and the core (Fig 67). It can clearly be seen that the stone was quarried in slabs approximating to the finished bed height and the back roughly split off to the required size.

It was noted above that most of the snecked joints dropped from north to south; the single exception, 2/11 (Figs 65, 66), suggests but does not prove, that both ends of the ashlar were begun at the same time but that most of the stones were laid working from the quoin southwards.

The southern end of the ashlar presented some interesting features indicative of the manner and philosophy of the building (Fig 66). The first course

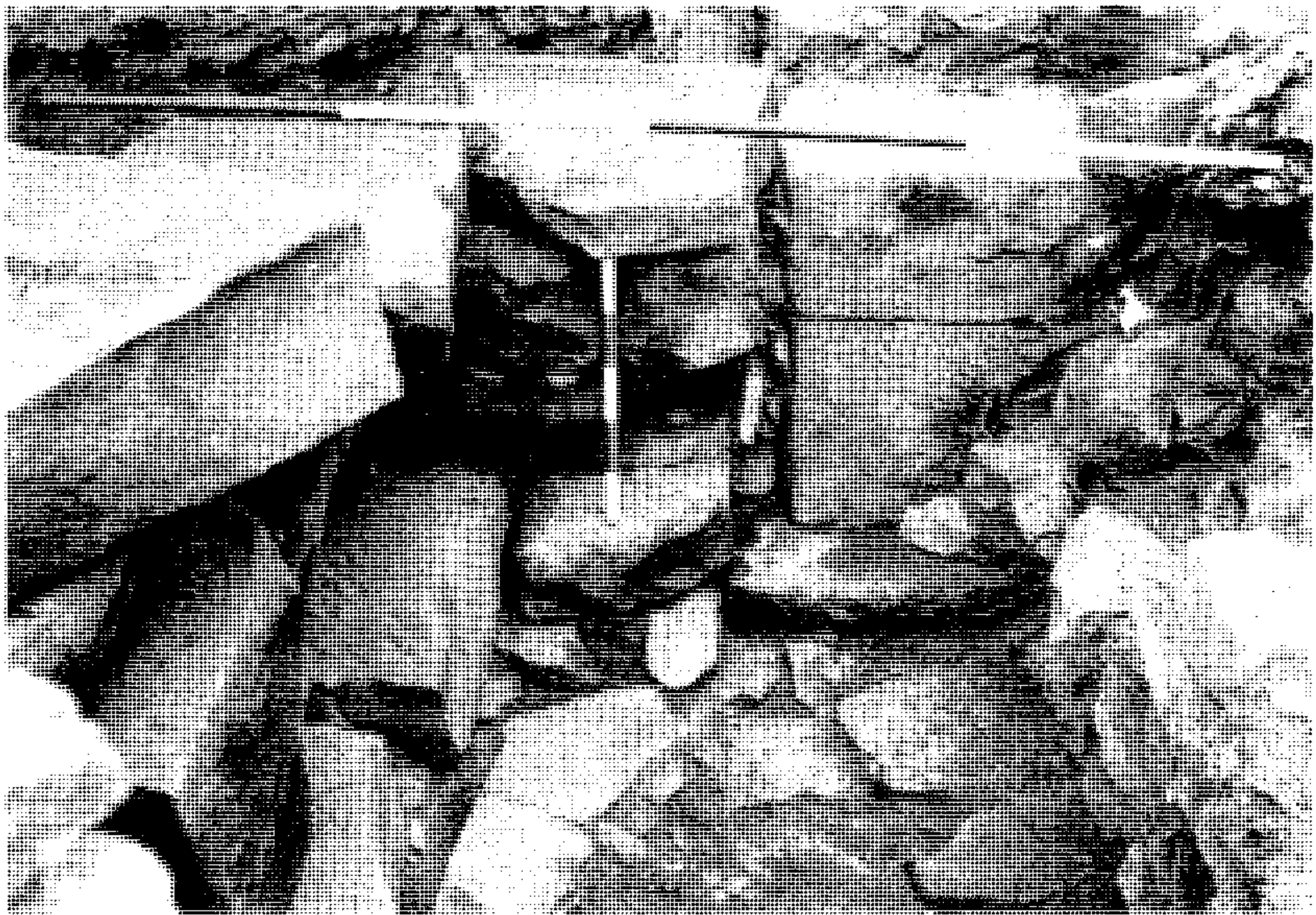

Fig 67 Rear of south-west pier of porta principalis sinistra *and abutting fine ashlar (3834) on removal of wall core*

tilted down slightly as the last two stones, 1/12 and 1/13, passed just beyond the end of the plinth and 1/13 was snecked over a coursed rubble, indicating that the latter was in position when the ashlar was built. The third stone from the end on the second course, 2/11, seems to have had its bottom bed cut at a slight angle to take account of the dip, and the right-hand joint of this stone and the left-hand of 2/12 have been cut at an angle to maintain a tight joint. Stone 2/12 was snecked to receive another ashlar, now missing; the manner in which this stone was cut away may indicate that the work was done as part of a secondary use rather than relating to a possible primary use elsewhere. The right-hand joint of this stone had been cut back at an angle to give a tight joint with the final stone 2/13, which sat awkwardly on a coursed rubble. The top bed of 2/13 had been cut back to near horizontal to align with the top bed of 2/12. All this suggests that if the stone was being reused, which is likely from the physical evidence, considerable care was being exercised to maintain the ashlar character so far as possible. The snecked joints are not of themselves evidence of reuse, as the feature occurs on other sites with reasonable frequency and seems to have been used as a means of accommodating stones of miscellaneous bed heights without going to the organisational trouble of calling for the right number of stones of a specific bed height.

The pressure spalling on the upper stones may have occurred when the masonry above began to fall outwards. The ashlar wall, with its wide beds and narrow joints, would be very stable whereas the coursed rubble elsewhere would have been less stable once the mortar began to decay and therefore more likely to fall. This indicates that the top course of ashlar now visible is all that was originally built, the wall being finished in coursed rubble. This is confirmed by the evidence of the small amount of corework which overlay the masonry (Fig 68).

It was noted above that the stone may have been reused. Certainly the unusual quality supports the suggestion but the distinctly untidy appearance of a number of stones militates against this. A possible origin might have been a monument or statue base which, if sufficiently important, might call for exceptional effort, but it would be difficult to explain the high incidence of blemishes. In such a primary use, the stone may well have been limewashed which would have given a better appearance, while not hiding all the deep holes, but in that case it would not have been necessary to produce a surface which was any more than tolerably flat; a claw finish would have been ideal and would have meant much less work than the double-diagonal chiselling which must have been intended to be seen. A thick coat of render would have given a uniform appearance, but could have been applied over stones worked with only half the care here exhibited.

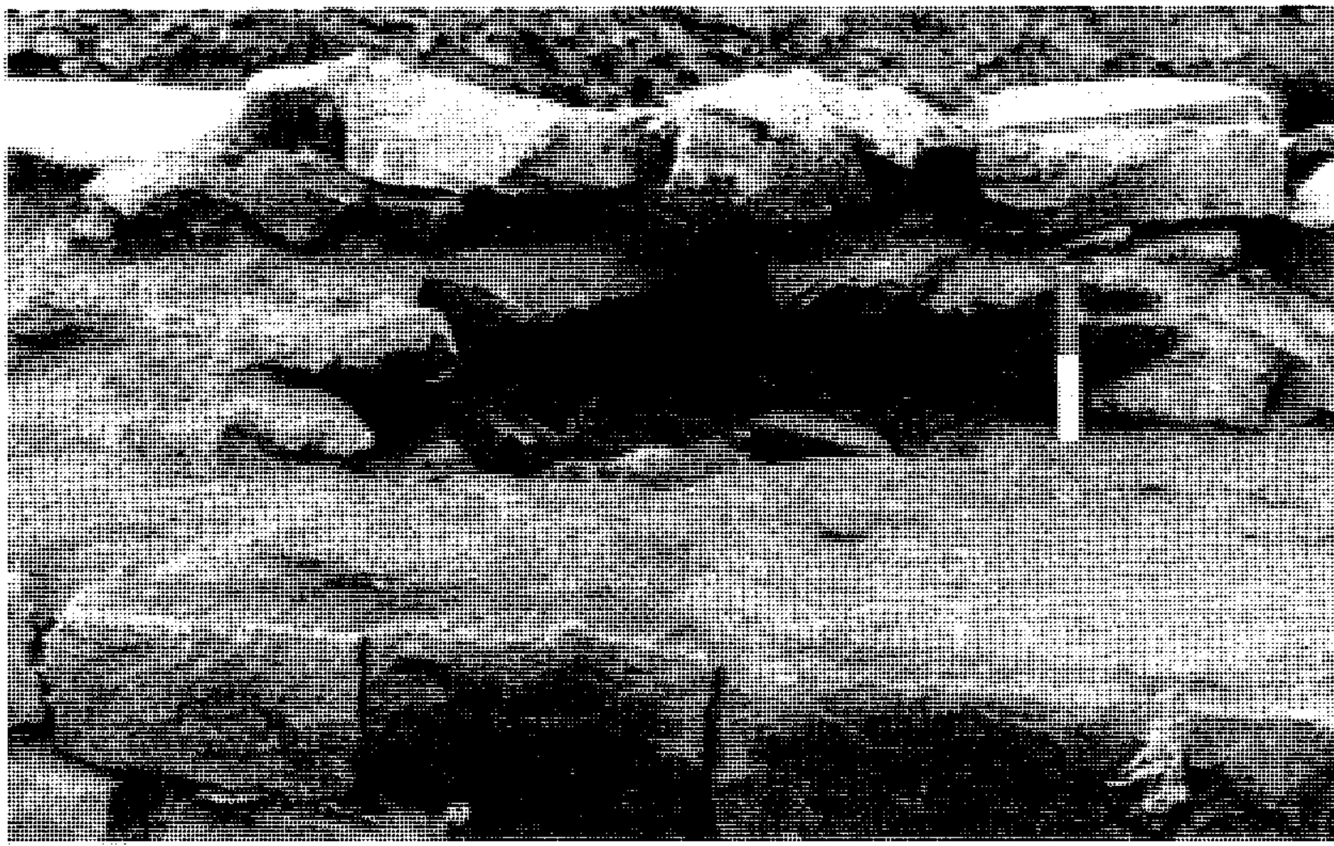

Fig 68 Core work and white mortar overlying the eastern tails of the large ashlar blocks from the east side of the wall: to the left of the scale the tails of two of the ashlars can be seen below the overlying white-mortared corework; the flat mortar in the foreground forms part of the same white mortar construction; beneath the ashlars the associated unmortared rubble core is visible

The uniformity on the bed heights of the plinth stones is worthy of remark, as the military masons were not normally excessively concerned with the regularity of moulded stones. Set against this is the typical variation in the respective sizes of chamfer and fillet, and the lack of neatness in working these as compared to the ashlar. This suggests that the plinth stones were originally used elsewhere, for a different purpose, in a position where regularity of bed height was of some concern, and then reworked to form a plinth.

The work done at the southern end to ensure that the stones fitted together with tight joints above and against existing work of lower quality, implies a continuation of the direction implicit in the other parts of the wall. Again, the gap between the ends of the return and the gate pier may imply reuse, but there would have been no visual problem if the quoin, and thus the line of the wall, had been set a few millimetres to the east to avoid the gap. The likely explanation, whether the stone were reused or not, is that the work was not accurately set out. The discrepancy between the two faces of the first course quoin may be an indication that the short return was not intended to be seen in an original position.

In summary, the ashlar wall and plinth are of a quality not seen in any other building on the line of the Wall, but they are far from being first class work. Some stones, particularly 2/1, are worked with a remarkable degree of care and skill, although this did not extend over the whole stone. Others, such as 1/2, while worked with similar techniques, are of very much poorer quality. The plinth, while of generally good appearance and worked with some skill, has some diamond broaching and other indications of a lack of consistent care about the finish. The material may have been reused but it is difficult to visualise an original use which could have called for skill well above the legionary average but which at the same time could have found acceptable the frequent disfiguring departures from the ideal.

Bonding, core, and superstructure

At the north end of the masonry, a sample portion of the wall core was removed (Fig 67). This clearly demonstrated the building sequence (Fig 26, Section 2). The courses below the plinth, and the coursed rubble over which the south end of the masonry was lapped, were bonded with the pinkish mortar typical of Period 2. This was also true of all but the top two courses of the surviving east (inside) face of the wall. In all of these areas the coursed and mortared core and the coursed rubble facings of the Period 2 curtain wall (4151; Fig 26) survived. Behind the fine work (3834), however, it was clear that the western face and most of the core had been removed. A small area of pink mortared core remained adhering to the lower courses of the east wall. The tower had, therefore, been dismantled to this point. The plinth was laid, using the bottom two courses of the Period 2 curtain as a foundation (Figs 64, 65), such that when the construction scoop was filled the bottom of the plinth would coincide with ground level. The ashlar was then built in courses, and the core laid between the ashlar face and the original inner face. The core was again coursed, but it was unmortared and comprised smaller stones, distinguishing it from the Period 2a core which it butted (Fig 26). As already noted, the surviving ashlar was complete, never having been built higher. The evidence for this was the occurrence on top of the uppermost course of a thick layer of very hard white lime mortar. This mortar retained several core stones (Fig 68), and the imprint of the tapering tails of standard coursed rubble stones on both the east and west faces. It is clear that the remainder of the rebuild comprised coursed rubble faces with a rubble core, the core, and joints above the ashlar being bonded with this very distinctive hard white mortar.

Buildings 197 and 198: the construction of the *horrea*

These two buildings, together with their internal phasing are discussed as Chapter 6. It is necessary here, however, to note the stratigraphic relationships which identify the structures as belonging to Period 3.

The *horrea*, Buildings 197 and 198 (Figs 68, 69), were long, narrow, rectangular buildings, measuring 28.38m x 8.26m, with walls 1.05m thick. The long walls continued beyond the short end walls for a distance of 1.12m, creating open end bays, and the overall length of building including end buttresses was 30.22m. The south walls of each *horreum* were provided with nine evenly spaced buttresses 1.12m long, and the same width as the walls. The core and facings of the walls of the buildings were bonded with a similar hard white mortar to that which capped the ashlar wall. The similarities in plan, construction, and layout of these two buildings leave no doubt that they were a deliberately planned pair, thus evidence for the phase of construction of one must apply to both buildings.

At the north-west corner of Building 198, it was established that the construction of the *horrea* postdated the layout of the roads and drainage system. The construction trench of the building (4305) cut the gravel of the primary Period 2 *via principalis*, and broke through the side of the curving drain (3924; Fig 55) which ran along the south side of this road. Stratigraphically the *horrea* could not have been later than Period 3, as the ventilation slots in the north wall of Building 198 were blocked by a drain which was built against this wall during Period 4a.

The stratigraphy associated with the construction of these buildings was sampled in limited areas, mainly confined to the line of the principal north–south section (Section 1; Fig 25) and the west end of Building 198. In the area immediately south of the *via principalis* some removal of surfaces had taken place to help in terracing the buildings into the natural slope. Within the west end of Building 198, some of the orange gravelly sand (1843; 1847) of the Period 2 surfacing survived, but between the two buildings the residual lower part of the overall black hiatus layer (1285; Fig 25) comprised the layer from which the *horrea* were constructed. The walls of Building 198 were built directly on this truncated surface without any foundation cut, while a foundation trench (393; Fig 25) 0.10m deep was provided for the north wall of Building 197 (1207). This reflects the fact that while Building 198 was built on the top of the natural slope, Building 197 was terraced into its side.

The south wall of Building 197 (18) was founded in a flat-bottomed foundation trench of which only the south edge was defined (369; Fig 25). This was sealed by a 0.14m deep deposit of mixed whitish clay, probably redeposited natural levelling. This was in turn cut by the construction trench (376) for the north wall of the building to the south (377). This suggests that this third building was also constructed as part of the same building operation.

Definition, dating, and finds

The association of the rebuilding of the *porta principalis sinistra* and the building of the *horrea* as aspects of a single Period rests on a number of stratigraphic factors which mean that neither operation can belong either to Period 2 or to Period 4a. At the gate the structural work replaced masonry of Period 2, and was clearly a rebuilding. The construction scoop for the ashlar was sealed by a deposit which was in turn overlain by the blocking of the south portal of the gate. This blocking is an aspect of the major works which define Period 4a. The *horrea* were a planned pair built at the same time in the same style. Though earlier deposits were truncated during the construction of these buildings it is clear that the northern Building 198 cut and destroyed a Period 2 drain. A drain was constructed as part of the works associated with the blocking of the gate, which initiated Period 4a. This drain blocked the ventilation slots in the north wall of Building 198. The *horrea* both contained reused stone from earlier buildings of some pretension (Fig 80), further indicating that they were not primary buildings, and there is some possibility that the ashlar at the gate was also reused. The final common factor was the use of a hard white lime-rich mortar as a bonding medium. Such mortar has long been recognised as typical of Severan rebuilding works (Simpson, Richmond, and McIntyre 1934, 142; Crow 1991, 55) and occurs throughout the length of the Wall. It is clearly visible in the unconsolidated section at Burtholme Beck in Wall-mile 54 to the west of Birdoswald. It should be noted, however that the recent discovery of mortar of this character in an

Antonine context at Willowford Bridge (Bidwell and Holbrook 1989, 81) suggests that it was not a purely Severan phenomenon. The use of similar hard white mortar in the east curtain wall of the fort in Area F is commented upon below.

The dating evidence for Period 3 was recovered from the fill of the scoop excavated for the insertion of the fine ashlar (3771) at the *porta principalis sinistra*:

Pottery: Analytical Group 4
  Coarse wares (Fig 158) Nos 50–52, *c* 180–240
  Samian ware Nos 18–24, *c* 180–240
Finds: Intaglio (Fig 195) No 87, *c* 208–12; glass
  armlet (No 11)

The evidence thus suggests that the rebuilding of the *porta principalis sinistra* took place in the earlier third century.

One of the two inscriptions recovered in 1929 (RIB 1909), which had been reused in a floor of the later fourth century, records the building of a *horreum* (*horreum fecerunt*) by *cohortes* I *Aelia Dacorum* and I *Thracum CR* under the tribune Aurelius Julianus and during the governorship of Alfenus Senecio (205–8). Though it is possible that other *horrea* might have been built in the fort during the early third century, it seems most likely that the inscription came from either Building 197 or 198. The building in which the inscription was reused lies close to the *horrea*, on the diametrically opposite side of the *via praetoria*/*via principalis* junction.

The evidence suggests that the building works of Period 3 are at least broadly contemporary, and took place in the early third century. If it is accepted that the inscription refers to one of the excavated *horrea*, this would date the construction of these buildings to 205–8. This would be a similar date to the manufacture of the intaglio associated with the ashlar. The ashlar would thus be later in date than the *horrea*, though possibly not a great deal later. It is probable that both major works were undertaken as part of a continuing programme of building work which appears to have taken place during the early third century, and this is discussed at length in Chapter 9.

6 The *horrea* (Periods 3–4b)

Description

The external dimensions and plans of the *horrea* have been mentioned briefly, in context with the stratigraphic evidence for their construction during Period 3. This chapter will consider the planning, layout, and complex structural histories of the two buildings, and will proceed to a reconsideration of their structural and functional aspects.

The excellent state of preservation of the *horrea*, with walls standing up to 2m high, combined with their longevity as standing buildings, meant that their internal phasing could not be related to the periods applied to the overall site. All that may be stated is that the sequence described began with the construction of the buildings in Period 3, and ended with the collapse of Building 198 in Period 5. During the intervening Periods both buildings underwent differing alterations which could not be related either with each other, or with the history of the site at large. These changes were mainly concerned with the morphology of the sub-floor supports. The sub-floor spaces remained open for ventilation purposes during most of the life of the buildings. Dating evidence, therefore, tends to relate to the latest periods, when these spaces were either silted up or deliberately backfilled with material containing datable finds. For this reason a relative sequence only may be constructed for each building on the basis of architectural relationships.

In the following discussion Building 197 (Pl 4) refers to the south *horreum* and Building 198 to the north. The history of each building is divided into Building Phases a–e. The foldout plans at Figures 69 and 70 form the keys to published elevation drawings which demonstrate points of phasing detail.

Planning and construction

As already noted the *horrea* were built on a site not previously occupied by completed stone buildings. The site slopes from north to south, and compensation had to be made for this. This was achieved by subtle variations in the construction of the lower walls of the two buildings, allowing them to share an identical appearance above floor level. The buildings were so similar in original construction that small differences are significant. Repetition is therefore avoided in the following descriptions by first describing individual components of the buildings. The survival of the buildings is such that economy of descriptive narrative may be achieved by the inclusion of a substantial number of illustrations, which convey the evidence better.

The long north wall of Building 198 was constructed on the south edge of the *via principalis* to align precisely with the south passage wall of the south portal of the *porta principalis sinistra*, and it would be logical to presume that this was the base-line used in the survey which laid out the buildings. The western end of the buildings were set back 1.34m to the east from the edge of the *via sagularis* as defined by the west walls of the earlier Buildings 4400 and 4403 to the north of the *via principalis* (Figs 8, 9).

The plans of the *horrea* were originally identical (Figs 69, 70). Each was a long, narrow, rectangular building measuring 28.38 x 8.26m (external dimensions), with the long walls extended 1.42m beyond the short end walls to flank the entrance area. These flanking walls could not have served as buttresses, but probably carried extensions of the roofs over the entrances at each end. The south walls were provided with nine evenly-spaced buttresses, each measuring 1.42m long x 1.12m wide. The two end buttresses were on line with the short end walls of the buildings. The overall length of the buildings, including the wall extensions at either end, was 30.18m. All exterior walls were 1.13m in thickness. The buildings were separated by an alley 2.42m wide (measured from wall-face to wall-face; the buttresses intruded into the alley).

Foundations

Foundation trenches were not apparent for any of the walls of Building 198, which seems to have been constructed directly upon levelled ground. In between the buildings the ground level had been truncated down to the black hiatus deposit of Period 2a (1285; Fig 25) at a level of 157.40m OD.

The north wall of Building 197 (1207) was constructed in a foundation trench (393; Fig 25) 100mm deep, filled with stones and clay (392). The south wall (18) was also provided with a shallow foundation trench (369) filled with clay and cobbles (370), as was the spinal sleeper-wall (1473; Fig 25). The buttresses on the south wall were entirely devoid of foundations, and were built directly upon the peat subsoil (367; Figs 25, 71). The foundations of the south wall lay at 156.50m; 390mm lower than those of the north wall. The backfilling of the foundation trenches was always from the outside of the building. They were, therefore, excavated such that the walls could be built against the inside edge of the prepared trench.

Exterior long walls (Elevations F, G, H, P: Figs 72, 73, 90)

The long walls of the buildings shared several features in common. The two south walls were each provided with nine buttresses. The coursing of these buttresses was the same as that of the main walls, with courses alternately bonded through above a butted first course. Between each pair of buttresses was a sub-floor ventilation slot. Ventilation slots were also provided at regular

Fig 71 Fifth bay from east of south wall (18) of Building 197: note the buttress built directly onto the peat subsoil

intervals along the unbuttressed north walls. At the bottom the walls were set back by means of an offset on the exterior face above the first two or three courses. At a uniform level on the north and south walls of each building lay a string course. This comprised narrow slabs (50mm deep), running twice as deeply into the core (350–400mm) as the normal facing stones (150–250mm). It marked the level at which the primary floor was laid, and an internal 120mm offset or scarcement was provided on the inside face of the wall upon which the ends of a boarded floor could be housed.

The north wall of Building 198 (195) was exposed in plan only except at its west end, where the south elevation was revealed. Seven courses of this wall survived, and the tops of eight ventilation slots were clearly revealed. Though this was the same number as in the south wall, the slots were not symmetrically opposed across the building. The south wall of the building (196) survived to a maximum height of nine courses, or 1.32m (Elevation F; Fig 72). The offset on the exterior face at the bottom of the wall lay at a level of 157.70m OD, above the third course, and was 80mm wide. The wall was buttressed. The ventilation slots were five courses deep (720mm), the bottom lying on the top of the second course. At the east end of the building the seventh course was narrower than the rest, but the ninth course was uniformly the bonding or string course, which lay at a level of 158.55m OD. Traces of a mortar edge on the top of the small surviving segment of this course marked the internal offset for the floor. The capstones of the ventilation slots were incorporated in the course below the string course. The south face of the fifth buttress from the east end survived to a height of eight courses, the top of which incorporated a chamfered plinth which set the face of the buttress back by the width of the chamfer (280mm). On the east corner of the fourth buttress from the east, and on the fourth course up, was a reused stone carved with the name IVLIVS in rustic capitals (Fig 250, No 2).

The north wall of Building 197 (1207) survived to a maximum height of 11 courses (Elevation G; Fig 72). The exterior offset, 120mm wide, was two courses from the bottom of the wall at a level of 157.78m OD, and the four-course deep ventilation slots bottomed on this offset. The third course was also offset. The capping course for the vents comprised the string course which lay at a level of 157.80m OD. The four surviving courses above the string course were offset by 0.12m on the inside to create a scarcement for the floor.

The south wall of Building 197 (18) survived to a maximum height of 14 courses or 2.00m (Fig 71,

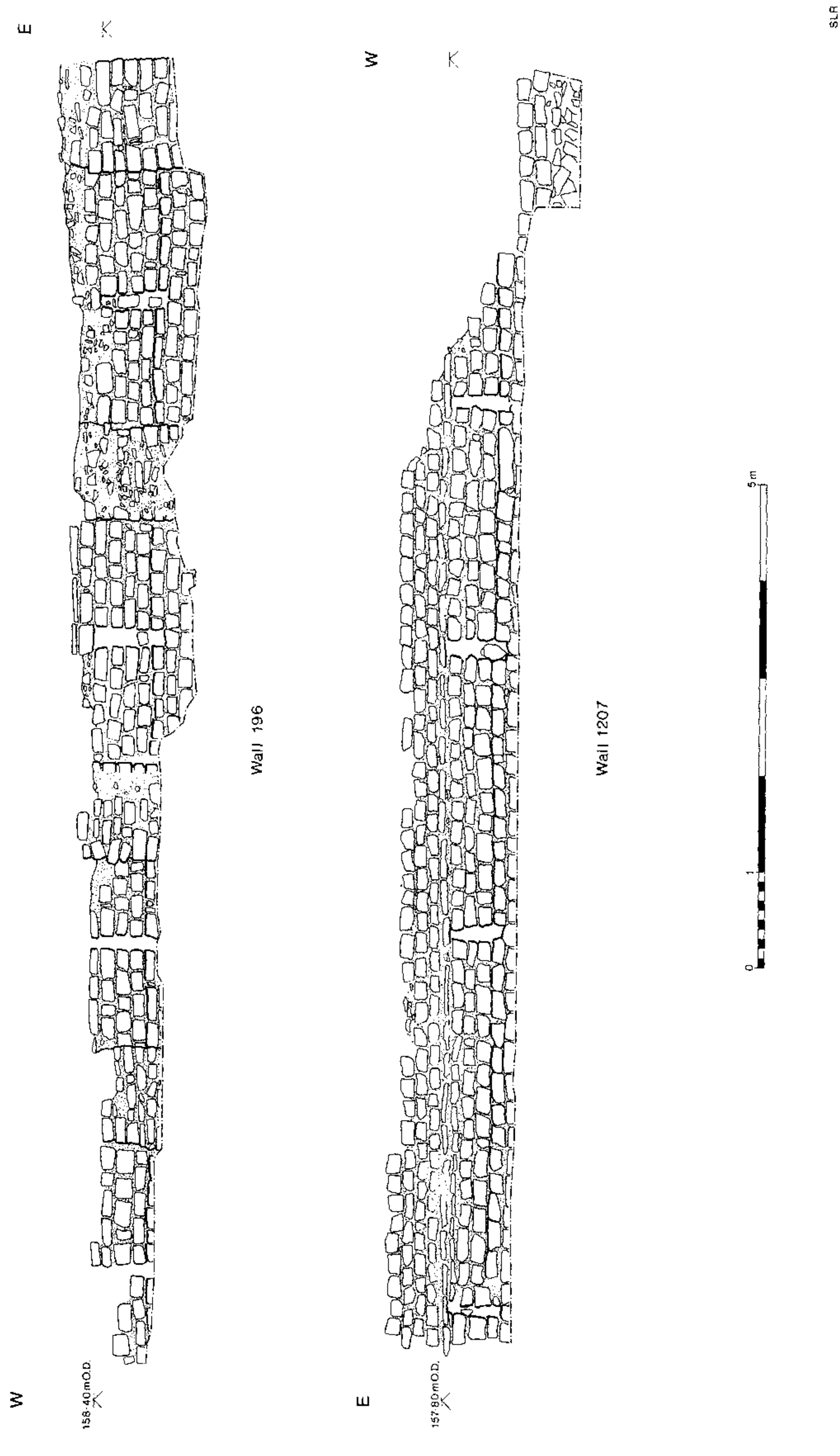

Fig 72 Elevations F (south face of south wall (196) Building 198) and G (north face of north wall (1207) Building 197) (for locations see Figs 69, 70)

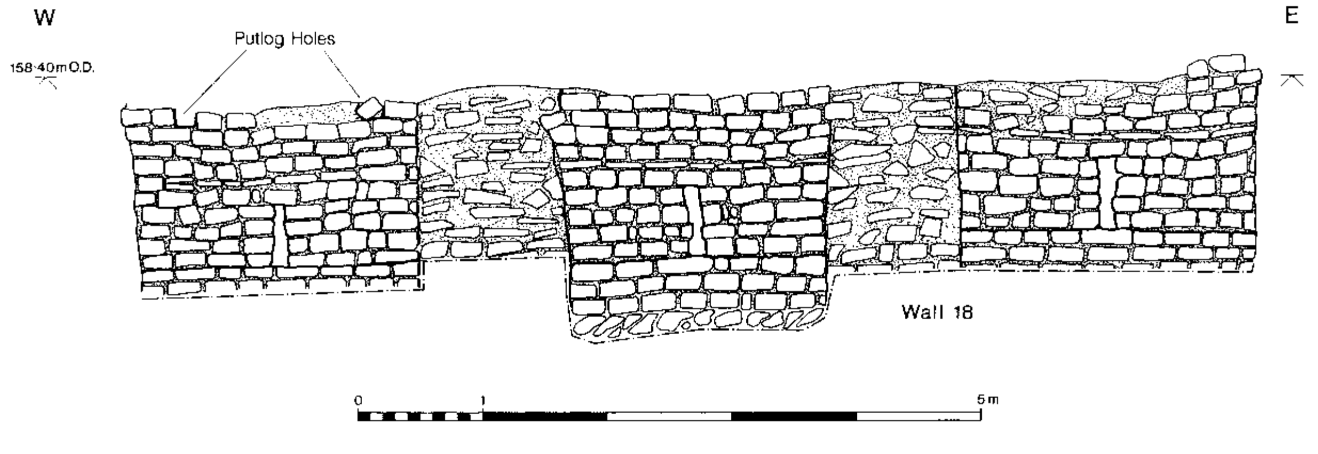

Fig 73 Elevation H (south face of south wall (18) Building 197) (for location see Fig 70)

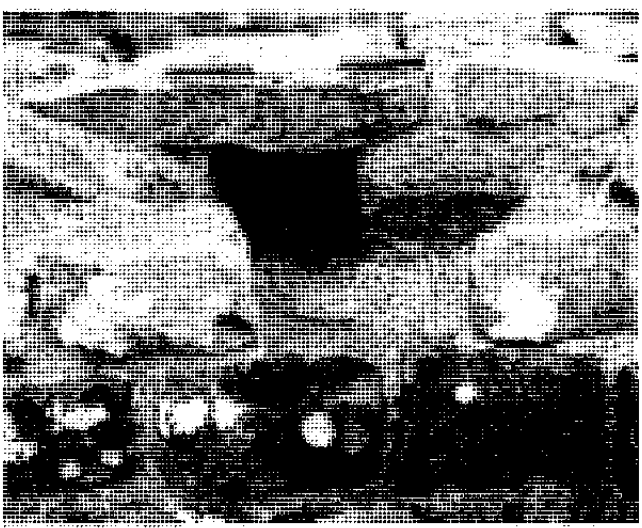

Fig 74 Putlog hole in south wall of Building 197 (18), photographed after consolidation in 1991

Elevation H; Fig 73), and the top course was level with the top course of the north wall (1207). The bottom three courses lay beneath an offset 120mm wide at a level of 157.00m OD. The wall was provided with buttresses, and between each pair of buttresses was a ventilation slot. These slots were four courses in height (620mm) and the bottom of the slots coincided with the top of the offset. The ninth course was a string course, which lay at 157.80m OD. On the inner face of the wall this string course marked the 120mm offset for the floor (Elevation P; Fig 90). In the top surviving course of the wall, was a series of putlog holes between 140 and 165mm square (Figs 74, 75). These were disposed above and flanking the ventilation slots, two being provided between each pair of buttresses. They ran through the full width of the wall and were later blocked. Outside the building to the south a series of sub-circular postholes (2541, 2543, 372, 374; Fig 75) 200mm in diameter and averaging 240mm deep lay in pairs between each buttress pair, opposing the putlogs. They were placed virtually on line with the ends of the buttresses. These features were the postholes for scaffolding uprights. The putlog holes accommodated cross members, allowing for the construction of the lowest of the timber platforms used in building the higher parts of the wall, a procedure described by Ling (1985, 23, fig 31). The first scaffolding lift was 2m

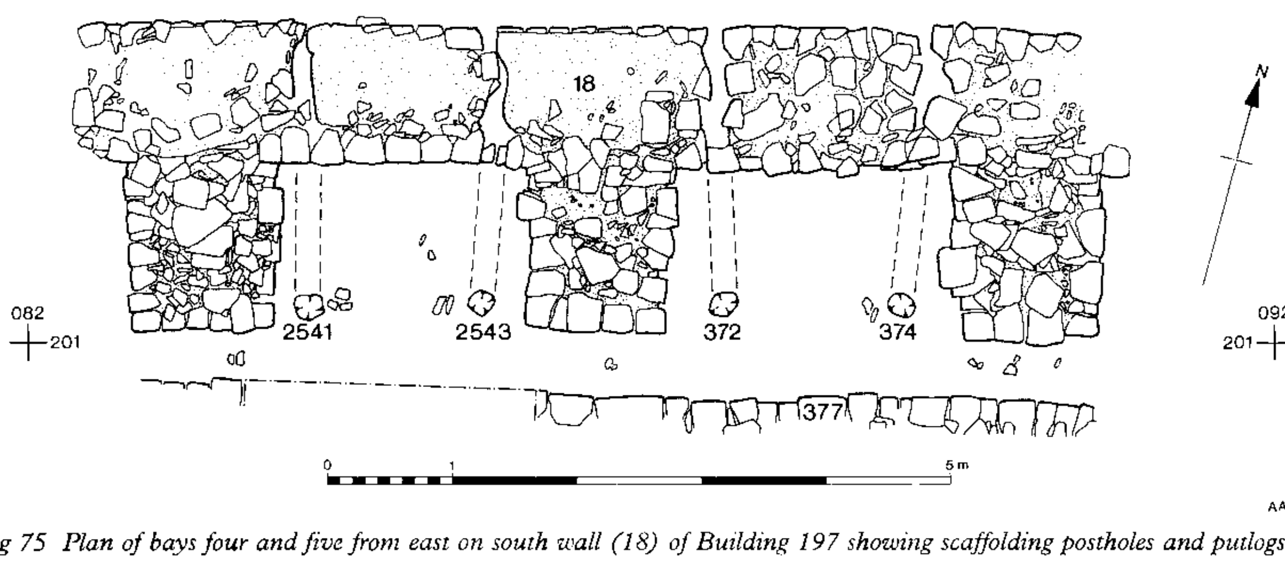

Fig 75 Plan of bays four and five from east on south wall (18) of Building 197 showing scaffolding postholes and putlogs

high. Though this is greater than would conveniently have been built by men standing at ground level, any disadvantage would have been offset by the fact that those working on the ground while work above progressed could stand and work beneath it with the minimum inconvenience. Lifts above this would probably have been 1–1.5m in height as on the Temple of Janus at Autun and elsewhere (ibid).

The coursing of the extensions to the long walls which flanked the entrances at the ends of the buildings was identical to the main run of these walls, including the string courses. On both ends of Building 197, plinth courses composed of crudely-worked stones with a steeply chamfered face were found on the projecting walls. These were provided in two positions: one on the inner face of the wall forming the course above the string course, and one on the butt end of the wall two courses below the string (Fig 76).

The different coursing of walls 195, 1207 and 18 represents a gradual compensation for the slope on which the *horrea* were built. As excavated, the tops of the south and north walls of Building 197 were level, though the south wall contained two more courses. Section 1 (Fig 25) shows that the south wall acted in part as a retaining wall to the slope. The necessity in the construction of the building appears to have been to ensure a level string course and floor scarcement while allowing plenty of space for ventilation beneath the floor on both the north (uphill) and south (downhill) sides of the building, without the method being visible to a casual inspection. A comparison of the elevations reveals the subtlety of the method used (Fig 75). The two additional courses in the south wall of Building 197, when compared with the north wall, were placed at different points in the wall: there were three courses rather than two below the offset at the foot of the ventilation slot, and an extra course was inserted between the top of the slot and the string course. In the south wall of Building 198, the internal floor scarcement is only 800mm higher than that on the adjacent north wall of Building 197. Two extra courses are gained in this wall by deepening the ventilation slot to five courses and inserting a course below the string course (Fig 77).

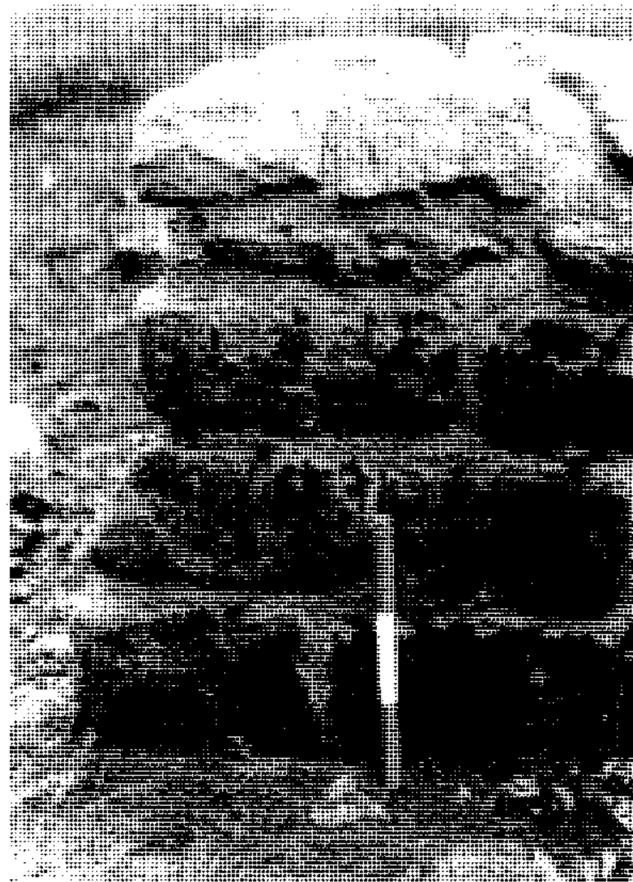

Fig 76 Wall extension at south-east corner of Building 197, photographed after consolidation in 1991

Short end walls and entrances

These features survived extremely well in Building 197. The east end wall of the building (1223) had seven excavated courses, but these did not include a string course (Elevation J; Fig 79). Two 'entrances'

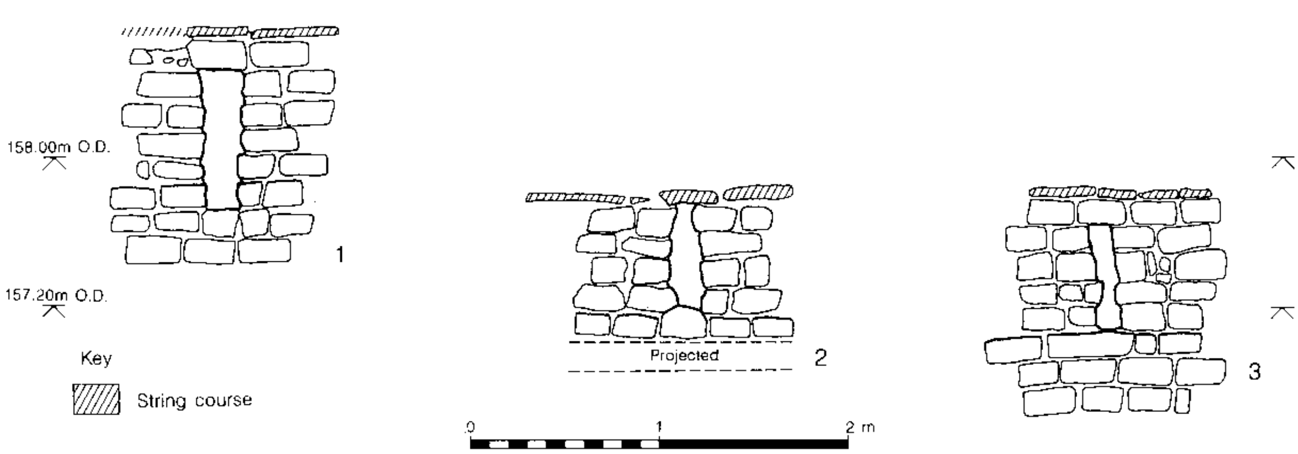

Fig 77 Schematic elevations showing slope compensation in the north (2) and south (3) walls of Building 197 and the south wall (1) of Building 198

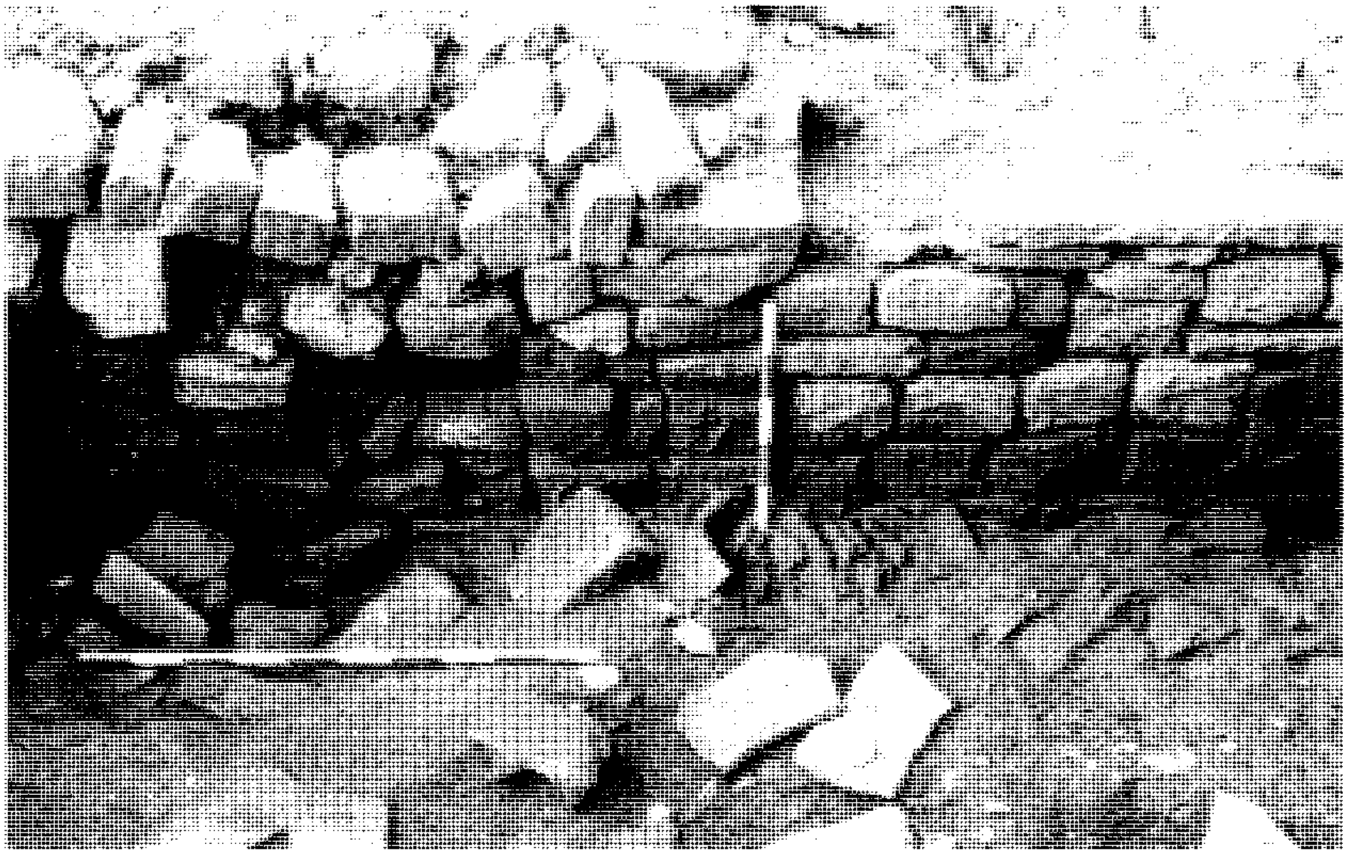

Fig 78 East end of Building 197 showing blocked sub-floor doorway

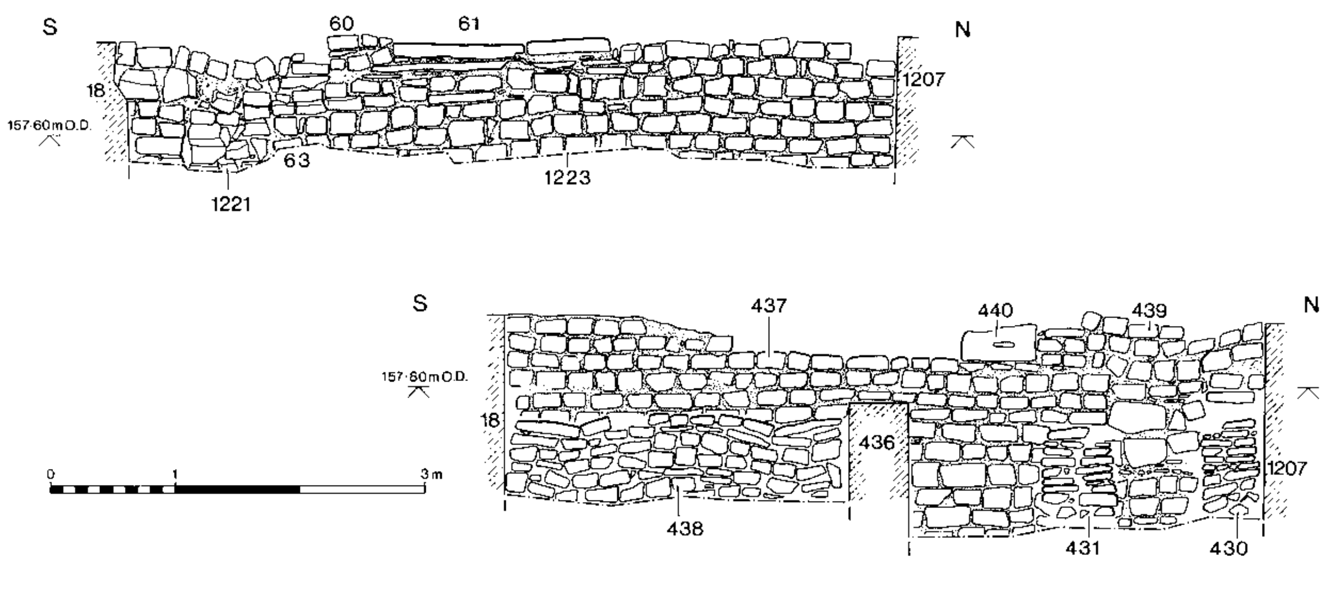

Fig 79 Elevation J: exterior elevation of east wall of Building 197; Elevation K: interior elevation of west wall of Building 197 (for location see Fig 70)

were provided, and both were apparently primary. To the south of the wall was a sub-floor aperture 780mm in width. This was later blocked on the outside with crudely-laid masonry (1221; Fig 78). On the inside of the wall, slots built in the thickness of the walls flanking this doorway may have retained the ends of timber lintels. The wall core was held up by corbelling the roof of the entrance with large slabs. The entrance was too unsafe and inaccessible to examine closely this corbelling. In the centre of the wall, at the same level as the string courses on the long walls, was a threshold (61) 1.82m wide. This was paved with two large slabs, one of which was a reused decorative panel (Fig 80). At each side of the threshold were pivot holes 80mm in

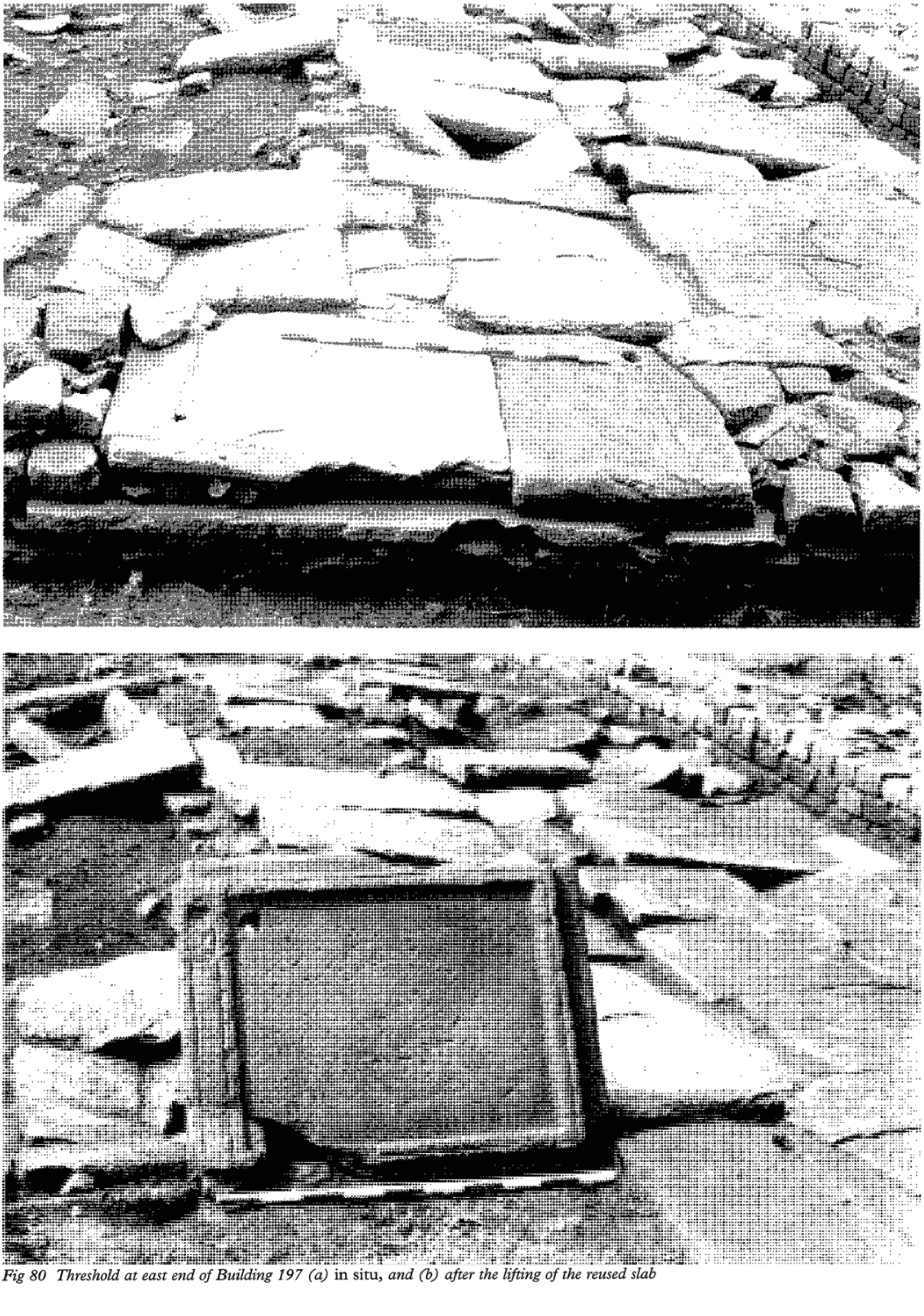

Fig 80 Threshold at east end of Building 197 (a) in situ, *and (b) after the lifting of the reused slab*

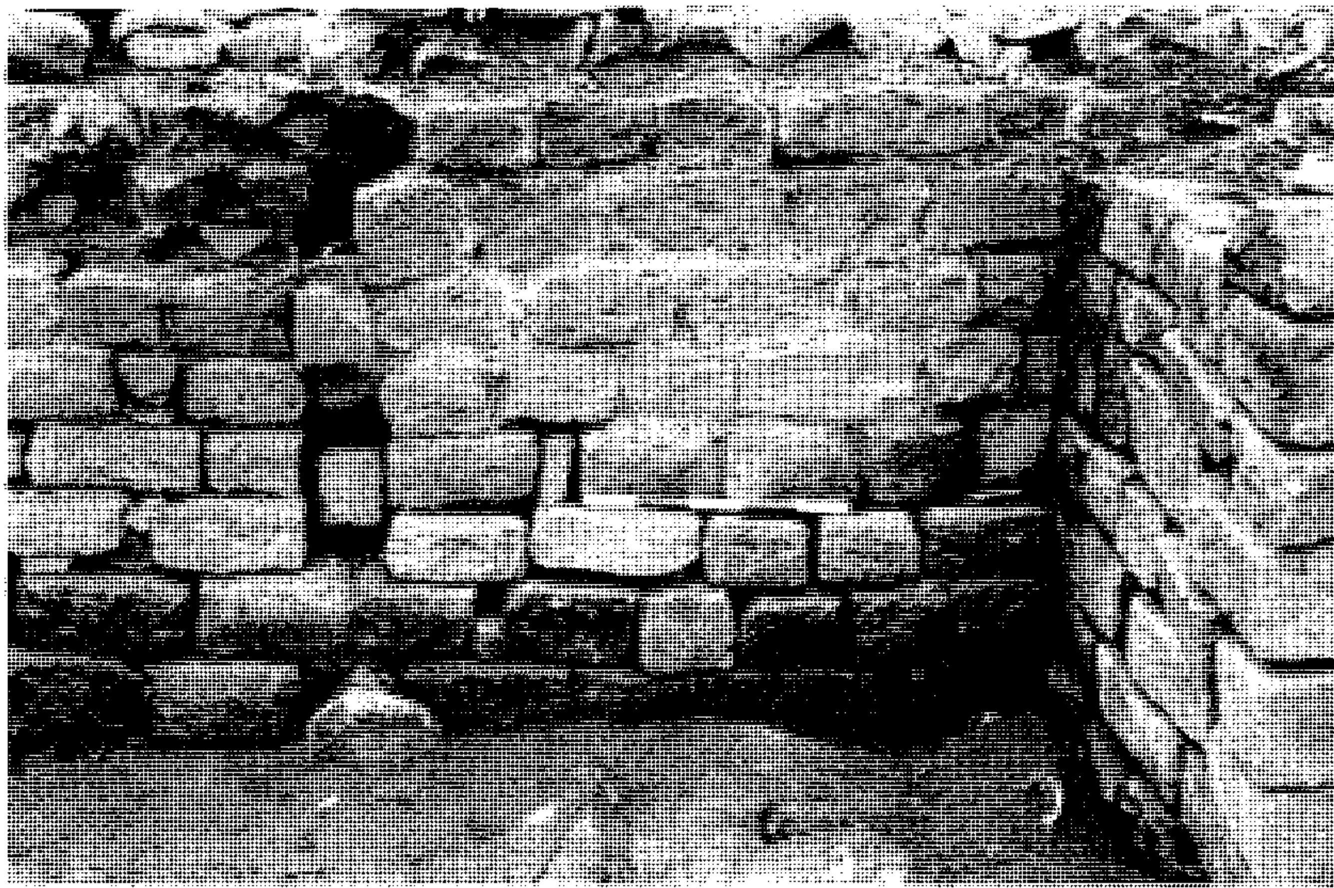

Fig 81 Surviving pointing on outside of south wall of Building 197 (18)

diameter with chases provided to facilitate the hanging of the double doors on their hinges (Bidwell *et al* 1988, 213). The doors opened outwards within the reveal of the exterior walls.

The western short wall of the building (437) (Elevation K; Fig 79) featured a sequence of entrances. To the north was a narrow door; its large threshold block was at the level of the scarcements on the long walls. It was 960mm wide, and had been blocked with masonry, well laid and butted against the side walls (439). It seems to have been succeeded by a broad central door 1.96m wide. This lay two courses above the level of the floor, and was probably inserted at a date when the road surface to the west had been appreciably raised. A stone set in puddled clay on the floor inside the entrance may represent the remains of a step. The north side of the door was marked by a pair of large stones (440). Wear patterns on these stones suggest that they had previously been used for sharpening, though they were in positions which precluded use for this purpose. The blocks had, therefore, been reused. They featured similar pivot holes and chases to those of the primary eastern threshold. The inner block of the pair featured a lewis hole on its internal face.

The primary entrance layout of Building 197 therefore included a broad entrance and a sub-floor door at the east end, and a narrow doorway in the north corner at the west end. Though the evidence from Building 198 did not include broad entrances, the evidence suggests that its entrances were planned in mirror image to its southern counterpart. In the west wall (2536), at the north corner, a sub-floor door (4423) survived, and in the opposite corner, a narrow threshold lay at scarcement level (4422; Fig 68).

Stonemasonry

by Peter Hill

The walls and buttresses of both north and south *horrea* were constructed mostly of typical small coursed rubble (Hill 1981, 3) with a 100–140mm bed height, Some stones were small, irregular, natural pieces. There were few signs of tool marks, most of the stones having apparently been dressed with a walling hammer, but some stones had either vertical or diagonal marks resulting from the use of a broad blade. Many of the stones had a split face, suggesting that they were either split from large slabs by the use of a heavy hammer, or that they were dressed with a pitching tool. All the joints visible for inspection were produced by splitting. In the north *horreum*, at the west end of the inner face of the north wall, was a small quoin stone reused as part of the run of the wall. It was carefully worked with mostly vertical broad tooling. The quoin was oversquare by between 6 and 10mm, and the top bed was worked with a punch to give a rather uneven surface. It did not form part of a ventilation slot, and seems to have been reused from a structure of the style of the piers of the earlier basilican Building 4403. The ventilation slots were formed with simple returns of the walling stones, the returns having occasional marks of a blade on a split face.

Mortaring

The walls were bonded with a hard, creamy-white lime mortar, containing 30% small aggregate, averaging 10mm down. The same material was used for the core as for the face pointing. Areas of this pointing survived in good condition (Fig 81). It was apparent that the pointing took little account of the preoccupation in modern consolidation of ensuring that the stones are not covered by mortar. On the contrary, mortar adhering to the stones demonstrated that the arrisses were well covered, and in some cases only a small portion of the centres of the stones would have been visible. The strong impression which emerged was that the builders required a virtually flush face to the walls, and that this was achieved by thick pointing which was deliberately spread well beyond the stone joints.

During the consolidation of Building 198 it was decided to experiment with a pointing technique to assess whether similar results to those observed in the Roman mortar would be obtained. A lime-rich mortar was prepared, and the easternmost bay of the south wall of the building was treated. The mortar was placed into the joints roughly, using a large trowel. A stiff-bristle brush was then used to point the wall. The work was done by a mason with experience in the use of this brush-pointing technique. The results of this exercise were extremely instructive; the thick mortar filled the joints, covering the arrisses of the stone and filling irregularities, such that a flush surface was created. The brush required constant wetting in order to work the mortar effectively, and to prevent the bristles from clogging. A side-effect of the brushing was that lime from the mortar was held in suspension in the mason's water-bucket. As the brush travelled over the stones a thin lime-wash was applied, which would have given the building a white appearance. The experiment was conducted as a contribution to the continuing debate on the treatment of the face of Hadrian's Wall, most recently summarised by Crow (1991, 59). Whitening of the Wall face has been variously interpreted as lime leaching from the mortar over time, or as whitewashing. One of the principal pieces of evidence for the latter is a part-whitewashed chamfered stone from Peel Gap (ibid, fig 3). Though the use of deliberate whitewashing in repeated coats has been found on the town walls at Colchester (Morgan, 1988) it is entirely possible that the 'whitewash' observed on the Birdoswald *horrea*, and on the Wall at large, is a serendipitous by-product of brush pointing. The whitening effect of this technique was known to the builders, and would probably have been considered desirable. It would certainly have been less time consuming to apply a lime-wash by brush-pointing as construction advanced and while the scaffolding was in place, than to paint the walls as an entirely separate operation.

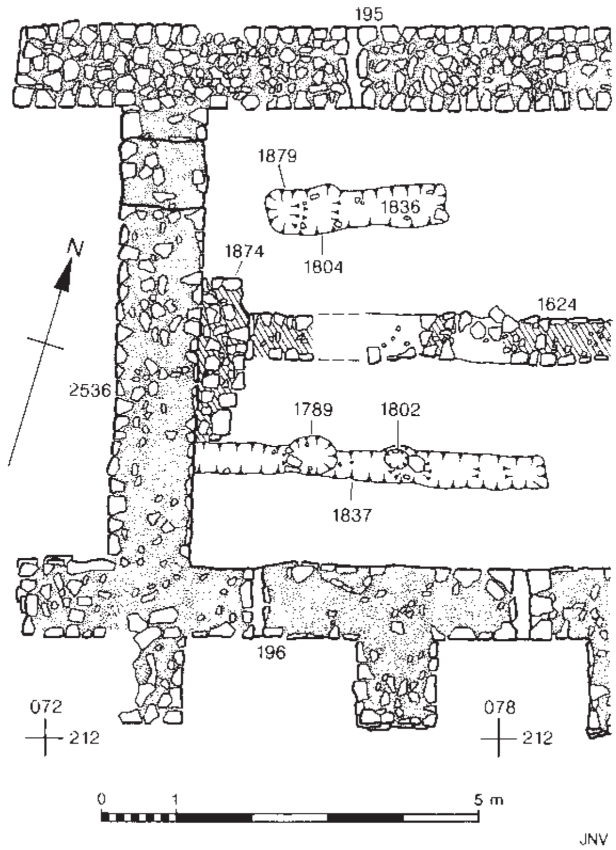

Fig 82 Primary floor supports at west end of Building 198

Primary sub-floor layout

The primary sub-floor plan was identical in both buildings, and consisted of three elements. The most evident of these were the single spinal sleeper-walls (Building 197; 436, 473, 493, 1211, 1212; Building 198; 1624; which were butted against the end walls of the buildings. They were founded as deeply as the exterior walls of the *horrea* in foundation trenches filled with compact clay, sandstone, and cobbles (473; Fig 25).

The floor supports associated with the spinal walls were sampled on the line of the section through Building 197 (Fig 25) and in the excavation of the west end of Building 198 (Fig 82). In the latter area single post-trenches were positioned equidistantly between the spinal wall and the exterior walls. The northern trench (1836) was straight sided, 700mm wide and 150mm deep with a concave base. It was filled and packed with silt containing large sandstone fragments and cobbles. In the western end of the slot were two postholes (1879, 1804) of similar size: 300mm in width and 700mm deep. The southern feature (1837) was similar in shape and fill, but was longer, as it was butted against the western stone wall (2536) of the

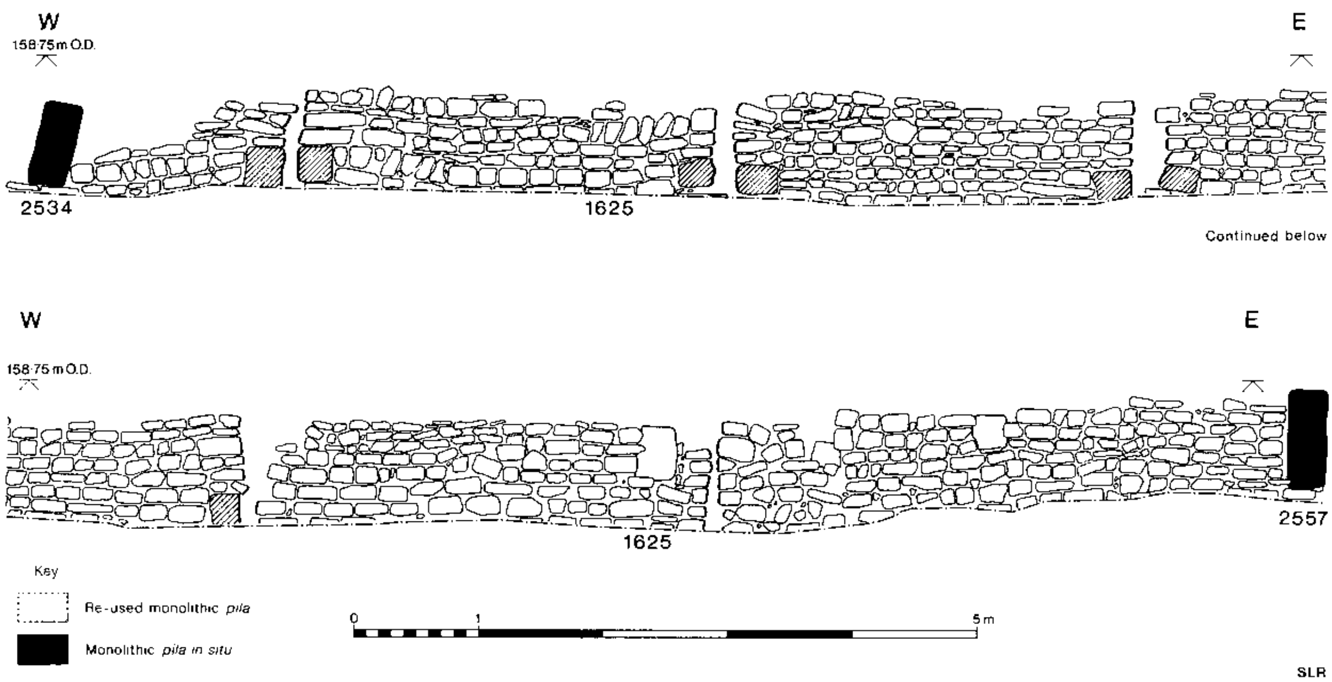

Fig 83 Elevation L (for location see Fig 69): south elevation of sleeper-wall 1625

horreum. Again two postholes (1789, 1802) lay within the trench. In Building 197 similar post trenches were observed in section (1249, 1250; Fig 25) and, to a limited extent, in plan (1229; Fig 93).

The primary sub-floor arrangements for both buildings, therefore, involved a spinal sleeper-wall with timber posts placed in prepared trenches forming equidistant rows between the sleeper and outside walls. Floor support against the long walls of the buildings was provided by the scarcement. In Building 197 the scarcements were at the same level as the thresholds of the primary broad entrance at the east end of the building, and the doorway at the west end. This suggests that timber floor planking was slung across the width of the building, resting on the scarcement and supported in the centre by the sleeper-wall and probably by means of joists fastened to the tops of low posts in the post trenches. It seems unlikely that joists were placed on the scarcements, as this would have carried the floor level above that of the thresholds, and thus necessitated the provision of steps.

Subsequent development of Building 198

Phase b

The second phase of floor treatment in Building 198 retained the spinal sleeper-wall and provided extra support on each side of it. The surviving features of Phases b and c are summarised in Figure 69. This was achieved by replacing the timber supports with stone. A mixture of stone supports were used, most commonly monolithic *pilae*. Six of these were found *in situ* (Figs 69, 83, 84), and a further 16 reused in later sleeper-walls (Figs 83, 85).

Fig 84 Secondary monolithic pila *(2558) built into sleeper-wall of Building 198*

At the west end of the building was a single monolithic *pila* (2560), which lay against the west wall of the *horreum* on the line of the southern primary timber slot. Along the south wall of the building were ranged a series of built *pilae* (1839, 1840, 1841, 1842). These survived to only a single course high. They measured 310mm square and on average lay 1.02m apart, though 1840 and 1841 were separated by half this distance. *Pila* 1840 was reinforced on its western side by an additional facing (1838).

It seems likely from the distribution of these *pilae* that the new floor was heavier than the original, and it is possible that the first stone floor was now installed. Built *pilae* were placed along the face of the south exterior walls, supplementing the original scarcements, while monolithic *pilae* were constructed against the

Fig 85 Recumbent reused monolithic pilae *flanking ventilation slot in sleeper-wall 1625, Building 198*

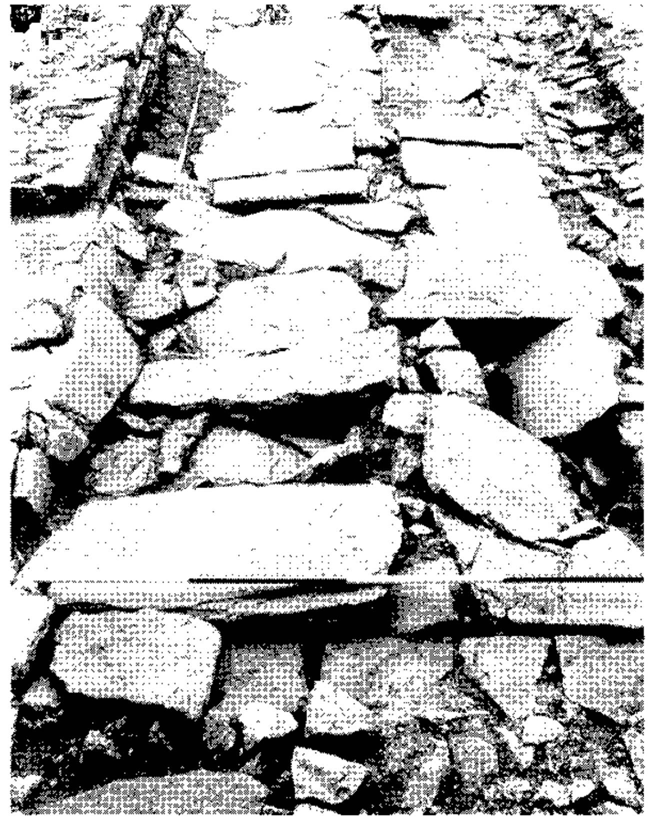

Fig 86 Surviving flagstone floor of Building 198 Phase c in south-east corner of building

north face of the spinal wall (2559), along the length of the earlier north (2558) and south (2560, 2534, 2557) timber slots, and apparently (2533) elsewhere as well. It was not possible to recover the original plan.

Phase c

This phase saw the insertion of longitudinal sleeper-walls flanking the primary spinal wall (Figs 25, 69). Two sleeper-walls 0.71m wide were laid against the exterior walls to north (1622) and south (1626). Between these and the primary spinal wall (1624) were two further walls (1623, 1625).

The sleeper-walls varied greatly in width. They were very sinuous and poorly constructed using rough, randomly selected and laid stone with orange clay bonding. All were pierced with ventilation slots. These slots were often flanked with recumbent, reused monolithic *pila* stones (Elevation L; Fig 83, Fig 85), and were relatively carefully built, a fact which attests to their importance. At the western end of the building a wall (1874) was built across the end of the spinal sleeper-wall to form a 'T' shape. As the sleeper-walls of this phase had originally extended to butt against the west

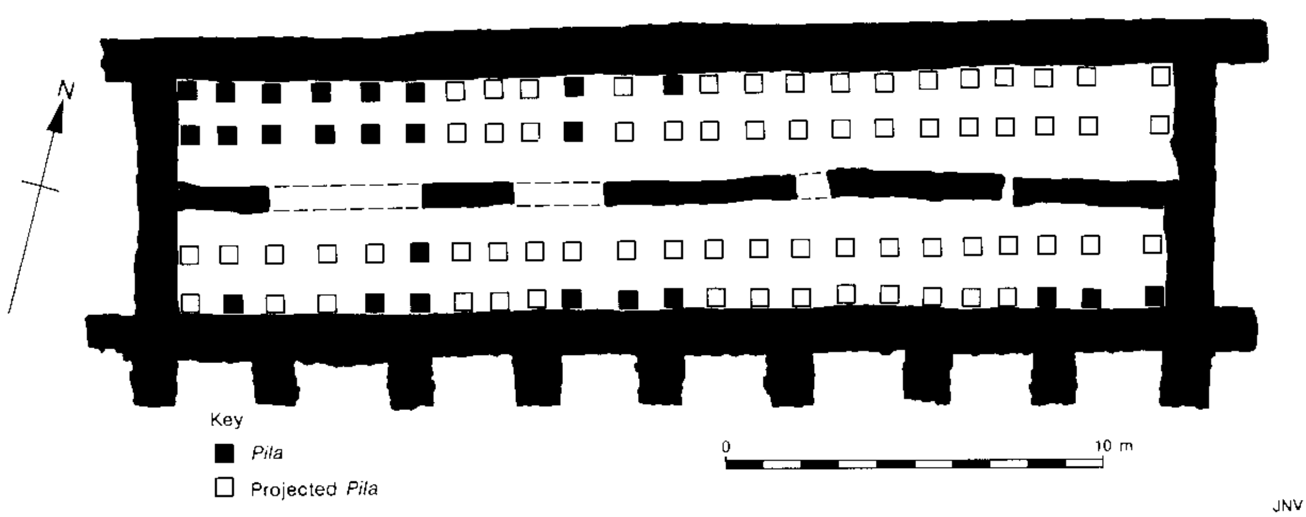

Fig 87 Plan of pilae *in Building 197 during Building Phase b*

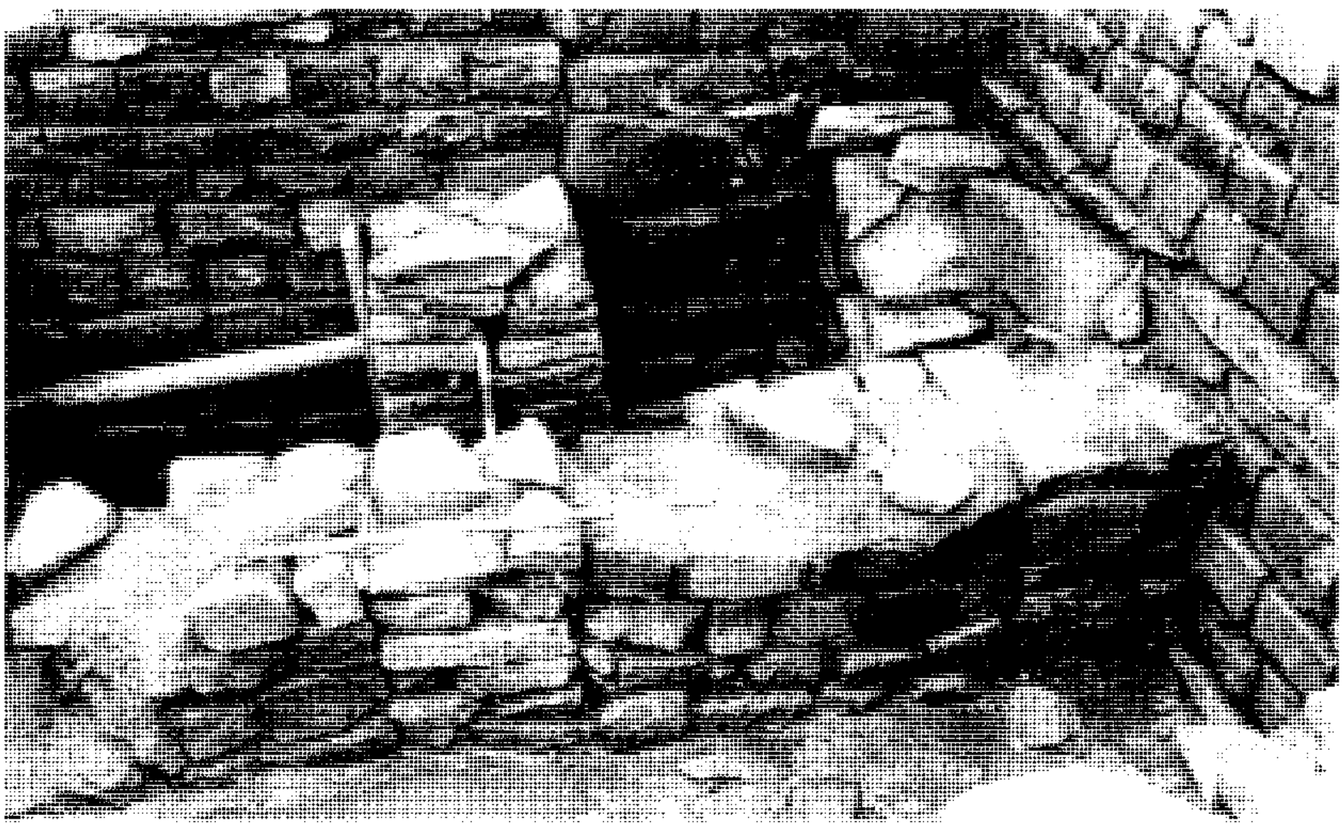

Fig 88 Detail of successive floor supports in north-west corner of Building 197: pilae 430 and 431 are against the west wall; in the foreground pilae *432 and 433 are built into a later sleeper-wall; the primary spinal sleeper-wall can be seen to the left*

wall of the building, this would have abutted the walls on each side of the spinal wall (1623, 1625). It was probably inserted as an additional support after the sleeper-walls were constructed. This was certainly true of the sleeper-wall (2561, 2562, 2563) built against the east wall of the building.

During the construction of these walls deposits of clay bonding material were spread in the interspaces between them. This seems to have been an incidental result of construction work rather than a deliberate attempt to seal the sub-floor.

This was the only phase for which evidence of the original raised flooring survived. This comprised substantial flagstones of a hard but fissile shale with very thin bedding planes (1375; Figs 86, 91). The ends of the flagstones were laid on the sleeper-walls. It was noticeable that the scarcement provided for the primary timber floor was also used for the stone floor, though settlement within the building combined with the weight of debris above the floor had later caused the flagstones to snap along the scarcement edge (Fig 86).

Phase d

This phase (Fig 91) was marked by the solid backfilling of the west end of the *horreum*. The sleeper-walls were robbed for a length of 5.40m, and left with the ragged ends shown in Figure 69. The interspaces between the sleeper-walls were blocked along the line to which they were removed with large cobbles, masonry, and flagstone fragments.

The sub-floor at the west end was filled with mixed dumps of material, firstly rubble, then stony silt and clay. The top layer (1516) comprised a fine compact loam.

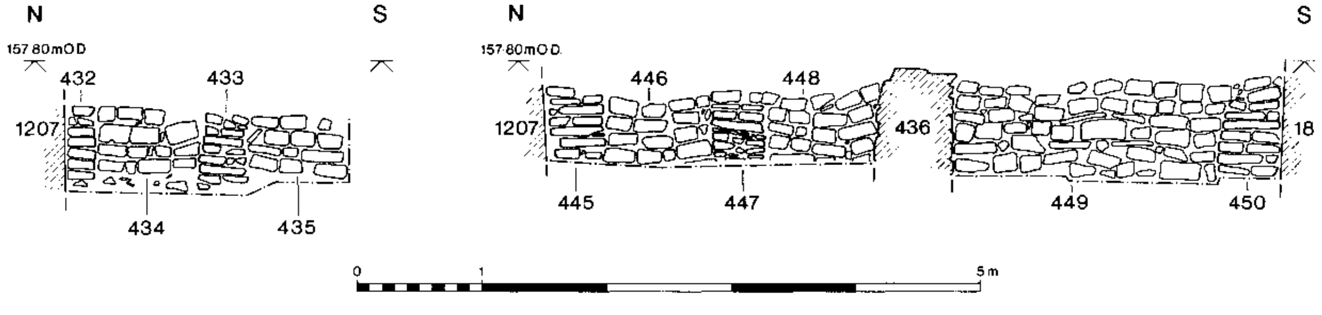

Fig 89 Elevations M and N (for location see Fig 70)

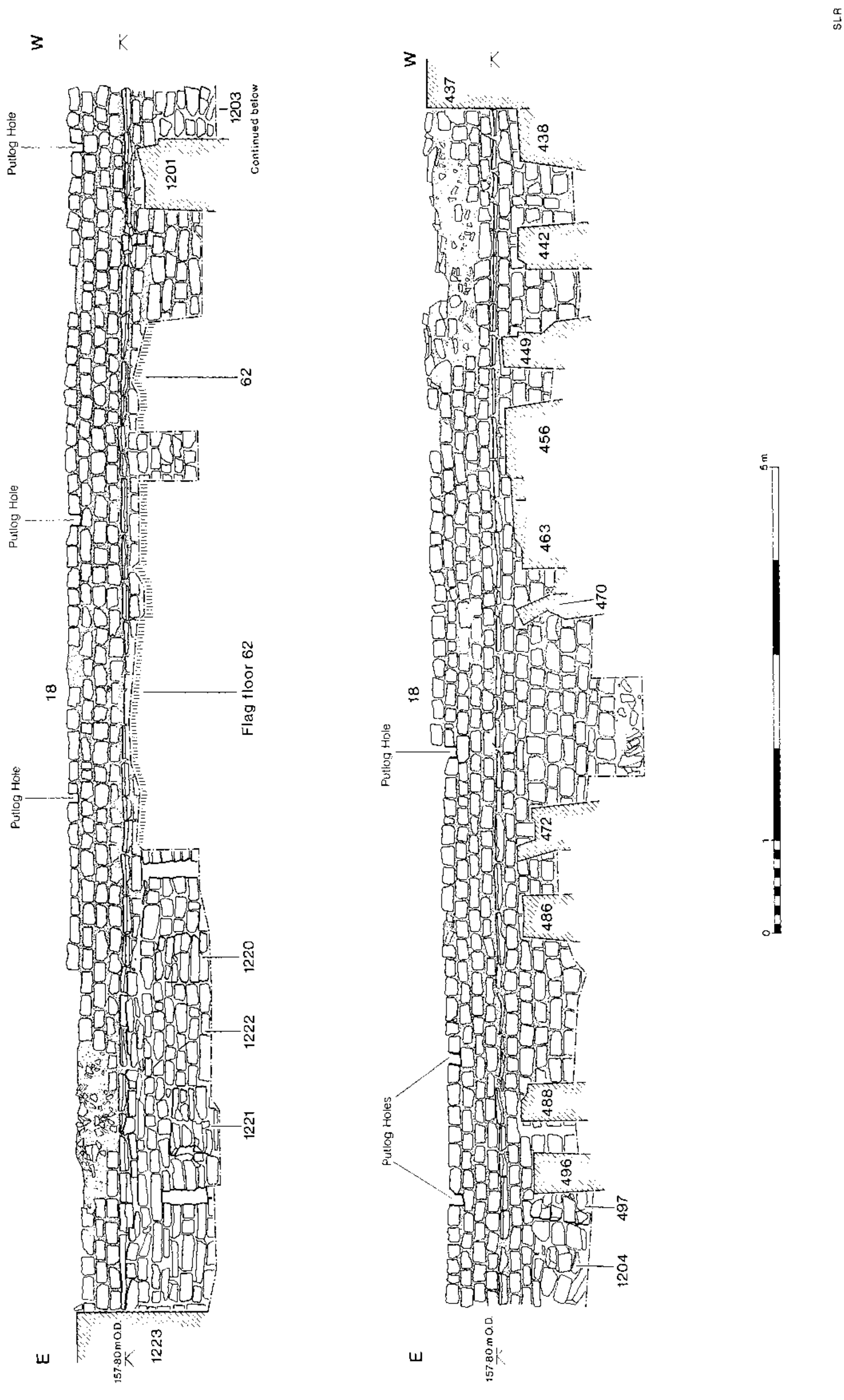

Fig 90 Elevation P (for location see Fig 70)

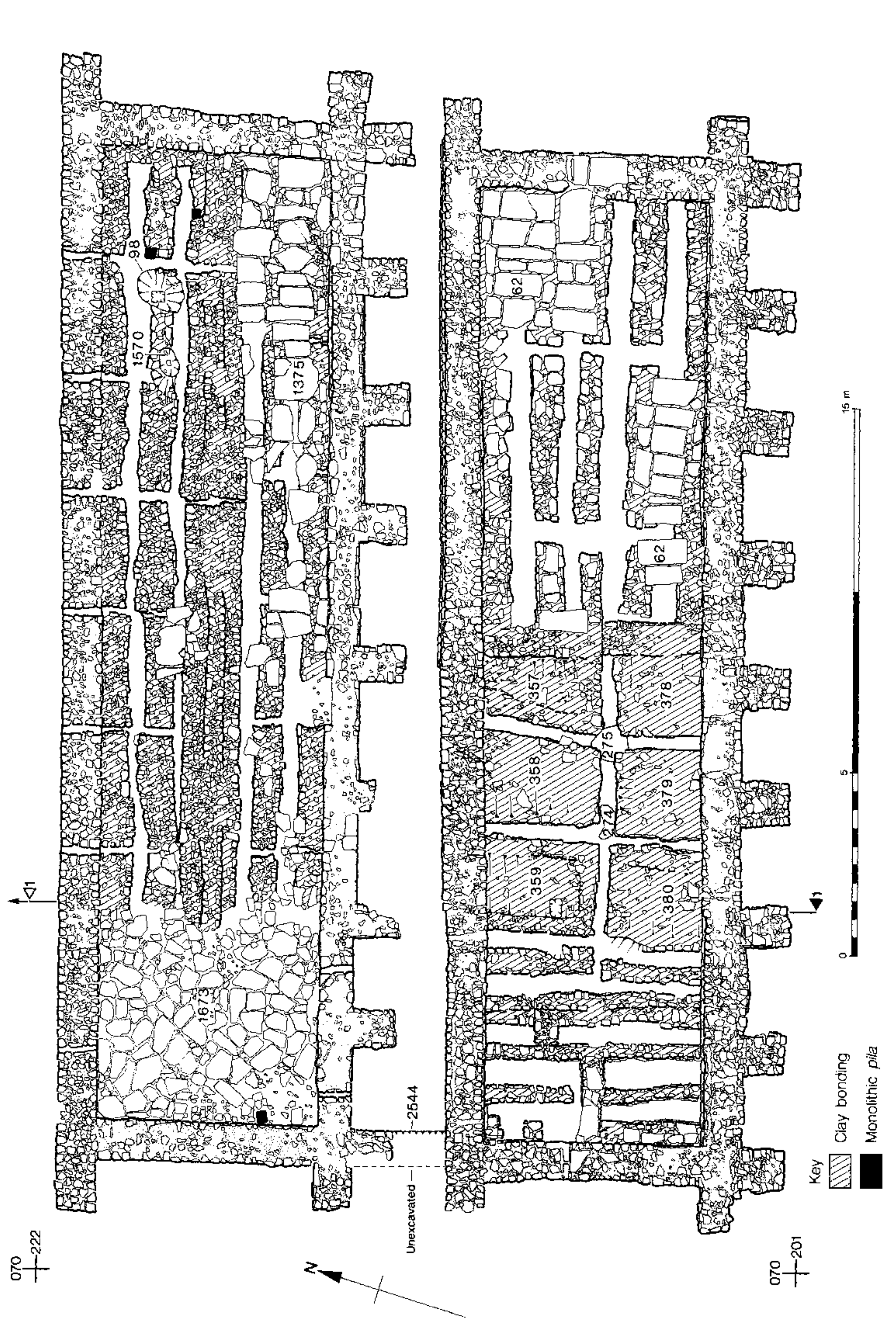

Fig 91 Plan of both horrea, *showing Building 198 Phase d and Building 197 Phase d*

This was sealed by a thin layer of pure white sand (1479) which had been laid as a bedding to the flagstone floor, much as sand is used today to bed paving slabs. The flags (1673; Fig 91) were close-set, though irregular, and suffered from subsidence on each side of the underlying spinal sleeper-wall.

It may have been at this point that the spinal sleeper-wall was widened to a width of 1.51m by the addition of new faces and core in-fill on each side (1627, 1628; Fig 25, 69). The only deposits overlying the solid floor were two small patches of burnt clay and charcoal (1427, 1429). It appears that at least one fire had been kindled in the building.

The appearance of the deposits beneath *in situ* flagstones suggests that there was some primary silting which took place beneath the raised floor. In the interspaces between the sleeper-walls, and beneath the surviving suspended flagstones was a deposit of very mixed silty clay containing charcoal flecks, fine sand, and yellow clay as well as a few pieces of masonry which had collapsed from the flanking sleeper-walls. This deposit (1607, 1660, 1630, 1587; Fig 25) cannot be regarded as a deliberate backfill.

Subsequent development of Building 197

Phase b

The second phase of floor treatment in this Building retained the spinal sleeper-wall and provided stone *pilae* on each side of it. Unlike the equivalent phase in Building 198, all of the *pilae* were built; there were no monolithic examples. Also unlike Building 198, the general plan of the layout of the *pilae* could be recovered (Fig 87).

There were four rows of *pilae*, built 750–870mm apart: two rows lay against the outer walls of the building, and two on the line of the primary post trenches. The building of the *pilae* was associated with a construction layer of gritty, mortary sand (1239; Fig 25) upon which they were built. This deposit sealed the earlier timber slots. Each *pila* consisted of nine courses of flat stones, each around 80mm thick. They measured 480mm square in plan, and up to 810mm in height. The two *pilae* against the west wall of the building in the north-west corner (430, 431; Figs 70, 88) survived in their original condition, while most others were incorporated into later sleeper-walls (432, 433, 445, 447, 450; Fig 89: 1203, 1220, 1221; Fig 90). In the centre of the Building the bases of a few *pilae* remained *in situ* (474, 475, 476, 477, 483, 484, 489, 498, 497, 1203; Fig 93).

Phase c

This phase is summarised in Figure 70. Clay-bonded sleeper-walls now superseded the *pilae* of the preceding phase. No discernible deposit was accumulated around the *pilae* and sealed by the sleeper-walls, so the previous phase need not have been long-lived.

The thickness of the sleeper-walls ranged from 0.48–0.56m. Some were newly built, others incorporated earlier *pilae* (434, 435, 446, 448, 449: Fig 88). The new sub-floor plan used lateral sleeper-walls at the west end of the building, and longitudinal walls to the east. The sub floor was thus divided into two unequal parts 15.86m long at the west end and 10.13m to the east.

West end: lateral sleeper-walls

The spinal sleeper-wall (436) was retained at the west end of the building for a distance of 2.3m. In this area the lateral sleeper-walls were butted against the exterior and spinal walls. At the end of the truncated spinal wall a continuous sleeper-wall (Elevation N; Fig 89), which incorporated three earlier *pilae*, was built across the building width. The next sleeper-wall to the west also included *pilae*, and was thickened on its western side by a new facing (452) which post-dated a subsidiary east-west wall (451). The fifth sleeper-wall at the western end of the building (438) extended only from the south wall of the building to the spinal wall.

Beyond this point most of the sleeper-walls were completely removed for later alterations to take place (for detail see Fig 93). However, 4.68m to the east of the easternmost complete north-south sleeper-wall lay remains of the original easternmost of these walls. The northern surviving segment (485), which survived only one course deep, butted the west sides of two *pilae* (483, 484) The incomplete southern part of the wall (490) butted at its end against a *pila* placed against the south wall of the building (489). The east side of this *pila* was also butted by a robbed section of the longitudinal wall against the south *horreum* wall (491).

East end: longitudinal sleeper-walls

To the east the situation was straightforward, and strongly resembled that of the equivalent phase in Building 198. The spinal sleeper-wall was retained, and was breached for ventilation at two points. Sleeper-walls were ranged on each side of the spinal wall: two along the line of the former *pilae* (1202=1208=1210, 495=1217=1215=1214), and two against the exterior walls (499=1204=1222). Slots made in the sleeper-walls coincided with and continued the ventilation slots in the exterior walls (Elevation P; Fig 90). Fewer *pilae* survived here than at the west end of the building, but three (1203, 1220, 1221) were incorporated in the southernmost sleeper-wall. A portion of the floor laid during this phase survived in the north-east corner of the building (62; Figs 70, 92).

Before Phase d was initiated, a uniform deposit was laid down in the spaces between the sleeper-walls. This dark grey-brown silt (1226, 1263, 1266, 1265, 1260, 1261, 1264, 355, 381, 354, 356, 352, 353) 120mm in depth may have been the result of material dropping

Fig 92 Longitudinal sleeper-walls and flagstone flooring at east end of Building 197

between the flagstones into the sub-floor below. Macrobotanical samples from this material were the most useful analysed.

Phase d

A radical alteration of the centre of the building now took place: the sleeper-walls were demolished, and replaced with a solid, though partially-ventilated floor. This was formed by inserting stone walled 'bunkers' filled with orange, slightly-sandy clay (357, 358, 359, 378, 379, 380; Fig 91). The detail of these alterations is summarised in Figure 93.

The demolition of earlier *pilae* and sleeper-walls was not complete, and their stumps frequently remained to be recorded (Fig 93). Among the walls removed was a considerable length of the spinal sleeper-wall (473=479). The 'bunkers' were constructed as six sub-rectangular stone-walled boxes, using the north and south walls of the building as one side. Those to the north were slightly larger than the southern examples, as their south walls overlay the former spinal sleeper-wall, and the north-eastern 'bunker' retained a segment of this wall as its south side (493). The ventilation channels between the 'bunkers' linked some of the vents in the side walls of the building. All of the walls of these 'bunkers' were constructed of irregular masonry, including small areas of herringbone work, bonded with similar clay to that filling the 'bunkers'.

Section 1 (Fig 25) demonstrates the operation. The spinal sleeper-wall of Phase a (473) was removed. The south wall of the northern 'bunker' (465) was founded on the ruin of this wall, while the north wall of the southern 'bunker' (471) was built against its southern side. When the walls had been built the 'bunkers' were filled with clay (359, 380), and a flagstone floor laid on top.

At the eastern end of this area, a substantial wall 0.89m thick (500=1201), 11.48m west of the eastern wall of the *horreum*, separated the central block from the longitudinal sleeper-walls at the east end of the building. No such division was constructed between the central area and the western lateral sleeper-walls.

Within the central channel between the bunkers there was a series of three stone-lined postholes (Fig 93). The eastern posthole (275) was 0.52m in diameter. It was stone-lined, and its bottom lay on a large flagstone. The next posthole west (274) was of similar dimensions. Both of these postholes were lined with large stones jammed firmly into the channel. The third posthole to the west (1269) was again of similar dimensions, but was cut into the top of a 'bunker' wall (471). The postholes lay in line, with their centres approximately 2.50m apart. They were ranged along the top of the former spinal sleeper-wall. It will be argued below that these postholes may have been the footings for supports to the floor of a second storey.

Phase e

This Phase constituted the final phase of use of Building 197. It was characterised by the backfilling of the entire sub-floor of the building and an apparent change of use. The phase is well-dated, and falls within Period 5. Because of the change of use and of the association of the phase with developments on the site of Building 198, the phase is considered with the rest of the Period in Chapter 10.

Stratification between and around the *horrea*

The foundation trench for Building 198 was sealed to the south by a compact clay-silt layer 0.18m deep, containing a high proportion of stone chippings (259; Fig 25). The presence of arbitrary, trampled deposits of clay and charcoal suggests that this layer existed for some time as a surface. There was no equivalent layer between the *horrea*.

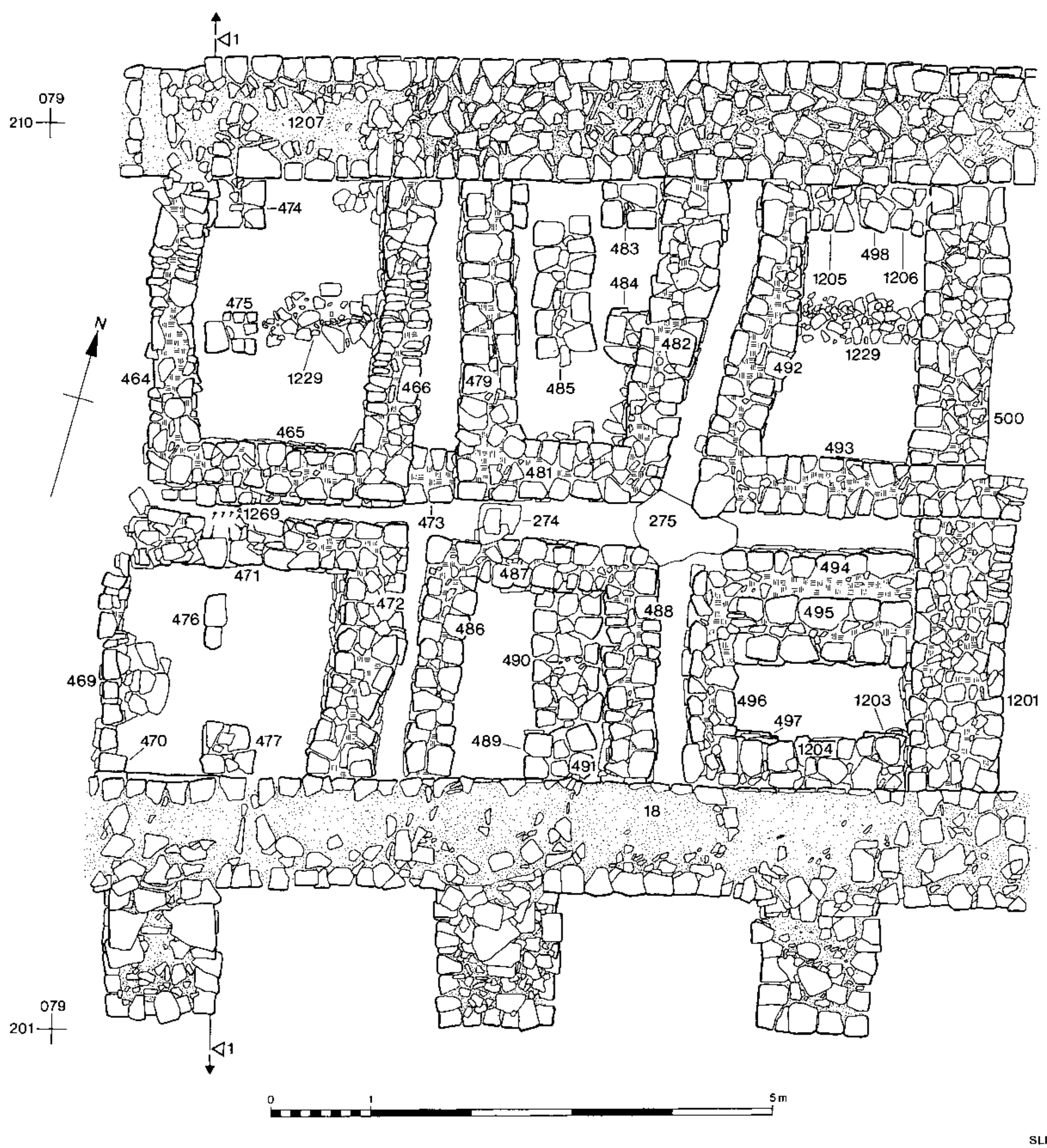

Fig 93 Detail of central portion of Building 197 to show alterations to sub-floor

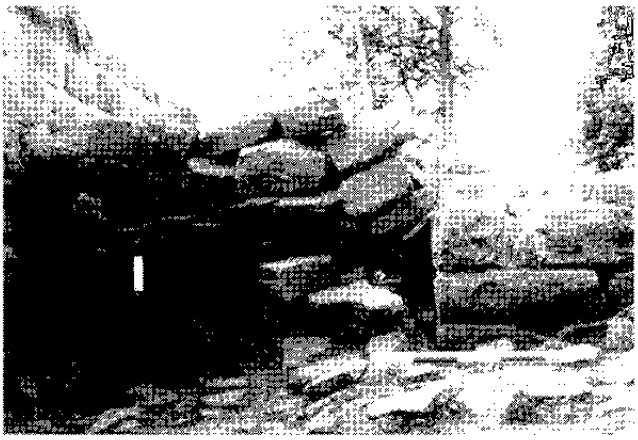

Fig 94 Wall 2544, blocking the west end of the alley between Buildings 197 and 198

Excavation did not in the main proceed below a consistent layer of gritty and stony sand, of which 60%+ comprised shattered and decayed red sandstone roofing slates of Type 1. The position of this deposit in the stratification of the *via principalis* is noted below. The layer occurred all around the buildings: to the south of Building 197 (248; Fig 25), between Buildings 197 and 198 (387), and on the *via principalis* to the north of Building 198 (1581, 2914, 2958). At the east end of Building 197 a well-constructed surface of flagstones (1255; Fig 69) was laid over this slate debris. A deposit of ashy clay (396) overlay these flags, and this seems to have been the latest Roman surface represented in this area.

The red slate debris is interpreted below as representing an episode of roof-stripping and replacement. Though it seems that most slate was cleared away after this operation, much remained to be incorporated into compacted walking surfaces. The alleys between the buildings may have ceased use after this, as the slate debris formed the last deliberate or compacted surfacing of the alleys, and they were sealed off by means of walls from the main north–south streets. Two of these walls survived (plan, Fig 91), one at the east end of the alley to the south of Building 197 (2545) and another, the best preserved (2544), at the west end of the alley between Buildings 197 and 198 (Fig 94). The latter retained the accumulating road surfaces of the *intervallum* road on its west side, preventing it from spilling into the alley. As the level of the top of the compacted slate debris surface was identical to that of the bottom of the sub-floor vents there is little doubt that the alleys were sealed off in order to prevent rising surfaces from blocking these vents.

Architectural stonework

edited from contributions by J C N Coulston, Peter Hill, A M Whitworth, and K Wilson

Architectural stonework found in the collapsed rubble from these buildings, and in their fabric, demonstrates both the incorporation of reused material and stonework prepared for the building itself. A selection of these are illustrated in Figures 95 and 96.

1. 61 895 Bld 197\Pha\threshold (Fig 95)

Screen panel: height 1060mm, width 860mm, depth 115mm, Local buff sandstone.

The piece is complete in two fragments except for the loss of the lower portion (approximately 50%) of the right-hand tongue, and the lower left corner. The back is heavily worn from pedestrian activity after the stone was reused, and a hole was cut into it to take a door pivot.

A recessed rectangular panel is surrounded on three sides by a double moulding, and bordered along its top by a triple moulding of a flat fillet between two rolls. The sides and bottom of the stone have projecting rectangular section tongues. A 20mm diameter hole has been cut in the top-right corner of the panel right through the stone. On the back there is a shallow, recessed channel running across the width of the piece.

The panel face has been worked first with a punch and then chiselled and smoothed off. Some of the deeper punch-holes remain randomly distributed across the surface, whilst chisel-marks appear around the edges of the panel. The hole was probably cut with punch and chisel, rather than with a drill because one one side is straight (Hill 1991a). The back is roughly point-dressed.

The piece was presumably designed to key into a pair of uprights and a bottom sill to form a screen. A panel of very similar dimensions is positioned in the rear range of the Vindolanda *principia*, and it is likely that the Birdoswald screen fulfilled a similar function.

This block was reused upside-down in the primary eastern broad threshold of Building 197 (Fig 80).

2. 385 3381, 3382 Bld 197\ Phe\collapse (Fig 96)

Rectangular block of fine-grained sandstone: in two fragments, originally measuring 740mm long by 210 x 185mm. The block has a moulding to one face consisting of a series of steps and half-round mouldings which step in from the corner diametrically opposite to a rebate measuring 500 x 700mm.

This block was recovered from the collapsed debris at the east end of Building 197, immediately in front of the primary broad entrance. It seems possible that it formed part of a moulded door jamb or lintel.

3. Stones with concave chamfer: the example illustrated in Figure 96 (3431) is one of four stones found in the alley between the two *horrea* which feature a concave chamfer. Three of these had the chamfer on a single face (3438, 3436), while the illustrated example had it on two adjacent faces (3431). All of these stones were roughly worked with a punch with some blade finishing. The average size was 240 x 230 x 150mm, and all had a fillet up to 45mm below the chamfer.

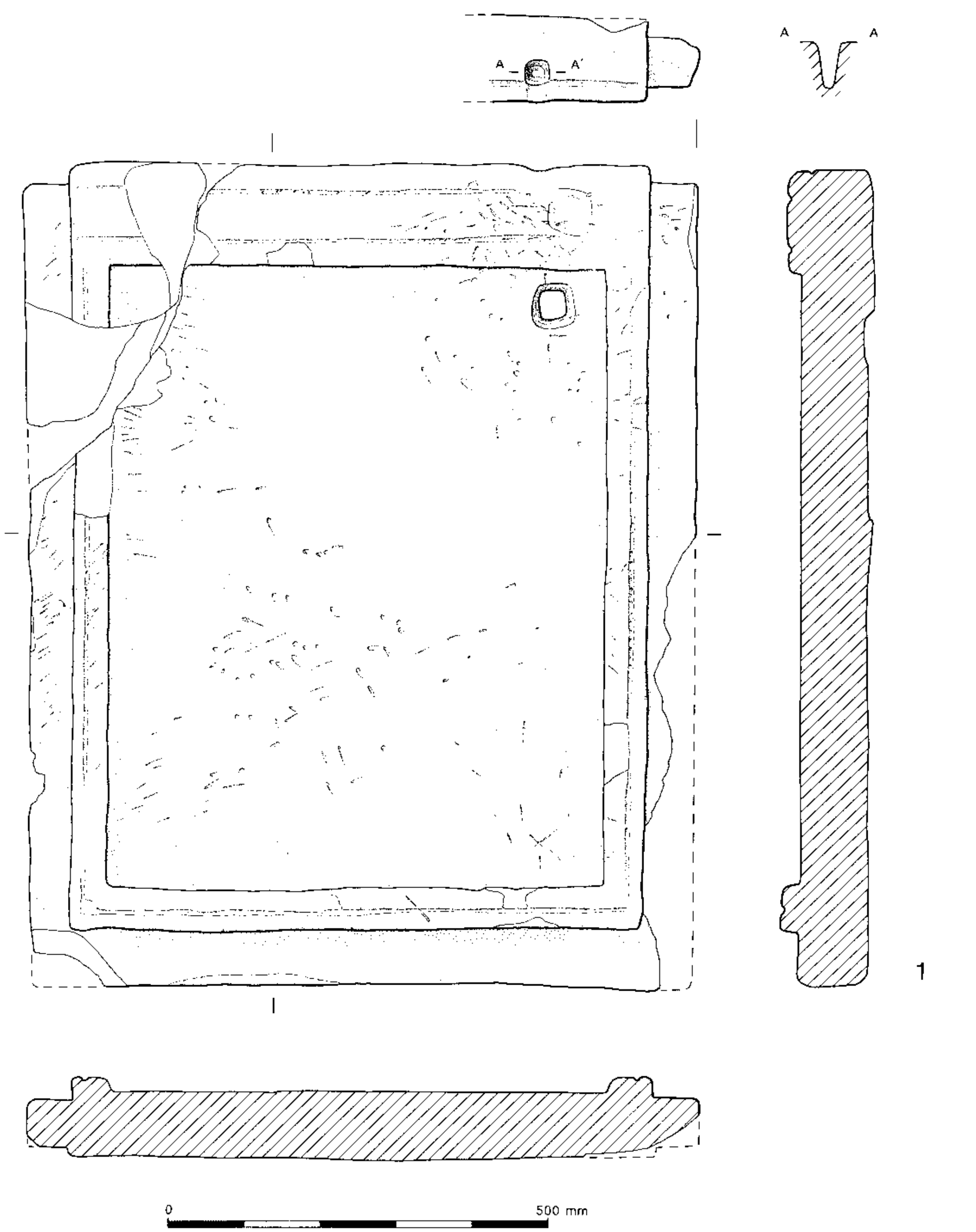

Fig 95 Reused stone panel from threshold of south horreum *(scale 1:8)*

One of these stones demonstrated the position in which they were used. This stone had traces of mortar on the top bed, which ended 20mm from the edge of the stone on which was the fillet. The last 20mm of the top bed was weathered. On the bottom bed mortar traces were found extending to the edge. It is clear that these stones formed a string course, probably at a high level in the wall of the *horrea*.

4. Chamfered stones: a large number of chamfered stones were recovered from the alley between the *horrea*, of which 26 were retained as bulk finds (profile, see Fig 96). These were similar to those which remained *in situ* on the buttresses. The average measurement was 280 x 220 x 170mm. All were heavily weathered, to the point at which the differentiation between chamfer and fillet was unmeasurable.

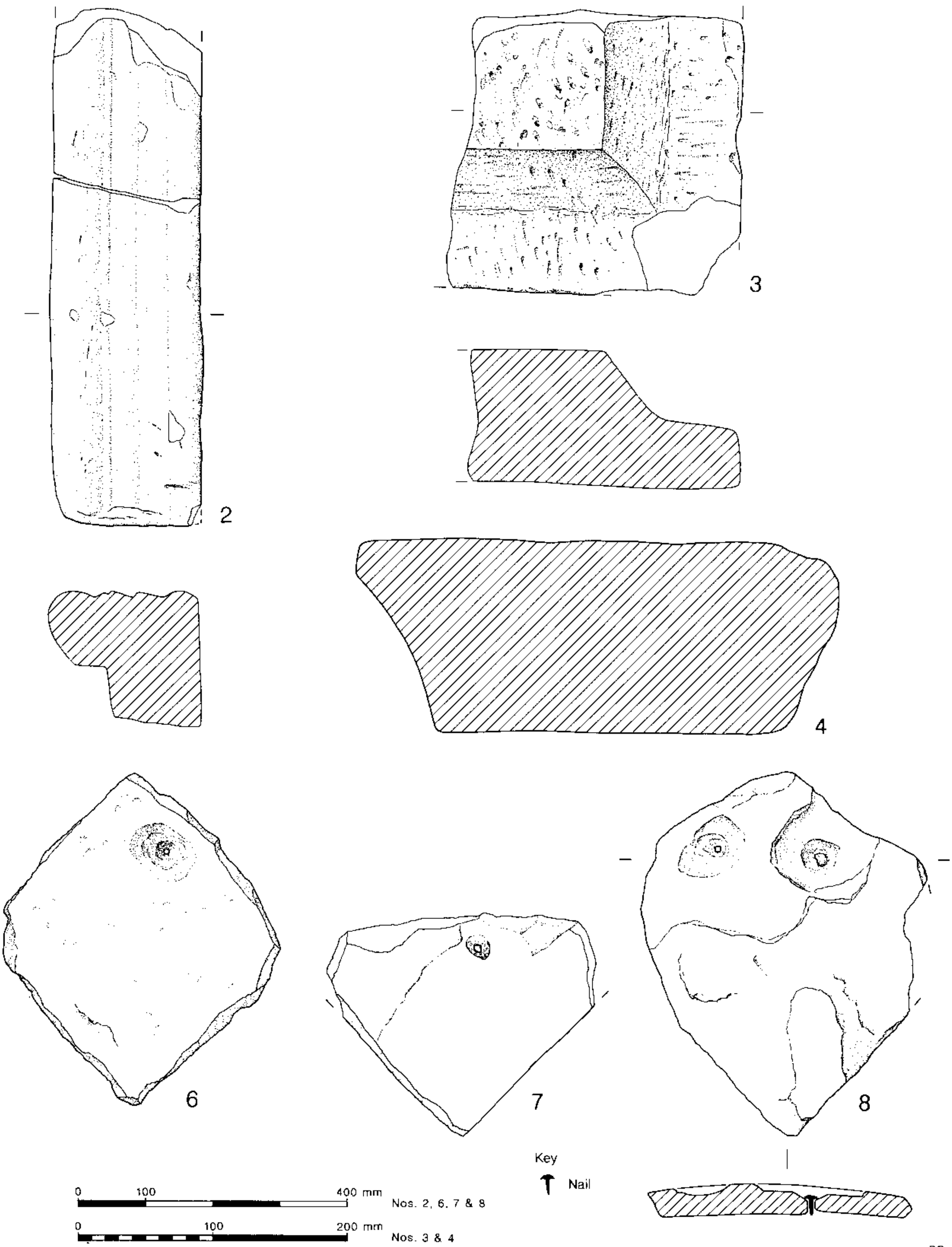

Fig 96 Reused stone from horrea *including door jamb (No 2, scale 1:8) and chamfered stones (Nos 3–4, scale 1:4); types of roofing slate from north* horreum *(Nos 5–7, scale 1:8)*

5. 1612, 3394

Voussoir: 170 x 290 x 210/365mm. Though superficially weathered, this voussoir showed signs of dressing to a reasonably high standard on all faces, having been worked firstly with a punch and finished with a broad blade. The arch from which this voussoir came had a radius of 223mm.

This voussoir was found in the sub-floor of Building 198. It had fallen or been dropped on top of the silting in the bottom of the sub-floor which had accumulated before the flagstone floor was robbed out. Its stratigraphic position demonstrated that it was deposited after the floor had been robbed, but before the sub-floor was reused for dumping. It thus seems likely that the stone was robbed, or had collapsed from the building in which it was discovered.

Roofing

by Michael J Astill

A detailed study of the collapsed roofing material from Building 198 was undertaken to assess the structure, pitch, and weight of the roof.

Construction

The majority of the slates used were lozenge-shaped split sandstone slates with countersunk nail holes offset to one side (Fig 96, No 6). Half slates with the nail hole in the apex, were used for the bottom eaves course, while similar half slates with the nail hole in the flat edge (Fig 96, No 7) would have been used at the top of the roof. Slates with two nail holes (Fig 96, No 8) were apparently used on the roof verges as gable slates. At least one of the few slates with nails still present had the nail placed through the slate from the back, such that the head would not sit in the countersunk hole produced when making the nail hole. There were two basic sizes of whole slate: 510 x 410mm and 460 x 410m. Few stone roof slates have been published with illustrations, but those which have uniformly show offset nail holes (Holbrook and Bidwell 1991, 282–4; Clarke 1990, 164). The assemblage from Dalton Parlours, West Yorkshire also includes an example pierced from the back by a nail (ibid).

Though it is simple to assess the use of the top and eaves course slates the different positioning of nail and nail hole is less simple. A suggestion can, however, be made. If slates were all laid with the nail on the same side of the slate, the slates could swing to one side, pivoting on the nail. If, however they were laid with nails on alternating sides they would swing together, using the inertia of the swinging action to help lock the roof together. The use of a double-nailed tile on the verge, with the second nail stopping the tendency to swing would ensure that the edge of the roof was as strong. No alternative readily explains all of these features.

To estimate roof cover it is necessary to arrive at a figure for the roof pitch. Iron nails would be progressively weakened by rust and on a steep roof they could easily break, allowing the slate to fall. With a 35° pitch several problems would be overcome. Less than this might create problems from rain water running back under the slates and the pitch does not put undue stress on the single nail. If a nail did rust or break the weight of overlapping slates would hold the stone in place. With nails set on average 130–150mm from the head and 50mm from the edge of the slate, a nail 75mm long would be required. A side lap of approximately 75mm gives a gauge of 150mm, which in turn gives a head-lap of 200mm. These factors suggest that the roof was boarded out, and not lathed as Gentry suggests in her reconstruction.

Given a pitch of 35°, the dimensions of the *horreum* (28.38 x 8.26m) suggest a rafter length of 5m. With a gauge (in a lathed roof, the distance between the horizontal laths onto which slates are hung) of 150mm, and taking the average width of slate, a figure of 2,340 slates for each side of the roof is arrived at. With an average weight per slate of 9.5kg (21lbs), the weight of stone per side is 22 tons, and for the whole roof, 44 tons. The buildings have been reconstructed (Fig 100) with roofed porticoes over the entrances, supported by the end buttresses. This adds 306 slates per side to the above figure, giving a total of 5292 for the whole building, and a roof stone weight in excess of 49 tons. This estimate is twice that given by Gentry for tiles to roof the Corbridge Severan W *horreum* (28 tons), based on weights and dimensions of ceramic tiles from the Caerleon Museum, and on a very shallow roof pitch of 25 degrees (Gentry, 1976, 37–40). The dimensions of this building are similar to the Birdoswald *horrea*. A ceramic tile roof naturally would be lighter as tiles do not require overlapping, being purpose-shaped to butt and to be joined by imbrices. However, it should be noted that Pliny the Elder records the view that some people advised against the use of tiles, on the grounds that the grain would get hot (Pliny, *Naturalis Historia* XVIII.302). Gentry gives an estimate for roof trusses and other timberwork of 12 tons, which gives a total roof weight of 40 tons. We have not attempted to estimate the weight of timbers, as it is unlikely that these would be of standard weights and sizes. We can assume the use of nine trusses, one positioned over each buttress, and we must also assume some very substantial bracing to take the weight of stone. The implication that the roof was boarded out is also important. The only method by which boards could be obtained in the ancient world was by radially splitting a tree and dressing the board with an adze. Such boards are not only heavy, but vary so considerably in weight that no estimate is feasible. We can, however, postulate a much greater weight of timber than Gentry's 12 tons. Twenty tons is probably conservative, but even this would give a total roof weight approaching 70 tons. This may seem excessive, but it should be remembered that at

Birdoswald we have the advantage of analysing material from the *in situ* roof collapse of the *horreum* itself, and that these estimates must, therefore, be realistic.

Weathering

The area around the *horrea* was heavily spread with fragments of Type 1 stone slate made in soft red-brown sandstone. The position of this material suggested that it was the remnant of a wholesale stripping out of the roof prior to a full replacement. The old slates were simply allowed to fall shattered on the ground and were largely cleared up, though many became incorporated into road surfaces. Only one virtually complete slate was recovered. In order to establish whether the roof had been replaced due to damage caused by rainwater seepage experiments were carried out to test the slates for porosity. Slates were exposed to over eight hours of rainfall on two separate days. On the first day rain began with a light drizzle with heavy downpours over the following eight hours. On the second test the rain was fairly heavy from the start, with strong gusts of wind driving rain onto the slates. The slates were laid to a 35° pitch, and cloaked in such a way that only the area which would normally be exposed to the weather received any rain. This test was slightly flawed insofar as the slates would, under normal conditions, have other slates above, below, and beside them and run-off from these would increase saturation time. The slates were checked every 15 minutes, and the results are shown in the graph at Figure 97. This shows Type 1 slates to be very porous, and Type 2, though considerably more watertight, still allowed water to penetrate to the nail hole. Although this is bad, it is not nearly as disastrous as the Type 1 slate. If all, or even part of this batch of slates were as porous as the test examples, damp would penetrate to the boards supporting the slates, resulting in fungus growth and rot. In addition the expansion of water frozen in these slates would weaken or destroy them. The combination of weathering effects could, and apparently did cause sufficient damage to warrant at least one complete overhaul of the roof to the extent of reslating with a more suitable material.

This rain seepage would add considerably to the weight of the roof during the not infrequent wet weather. Another factor to be taken into consideration is the increase in weight which would be occasioned by heavy snowfalls. Snow would stay on a shallow pitched roof. It would need to be shovelled off manually when conditions allowed, or melt-water seepage would exacerbate existing problems.

Dating and finds

Dating evidence for the buildings was very sparse, as the nature and use of the buildings prevented the accumulation of deposits which would incorporate dating evidence. The arguments suggesting that the *horrea* were constructed *de novo* in the early third century

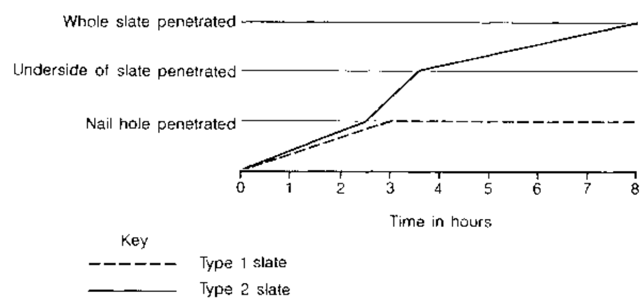

Fig 97 Graph to show porosity of horreum *roofing slate types*

have been cited above, and the presence of reused stonework in the construction of the buildings confirms that they were not primary structures. It will be demonstrated below that Building Phase e, the backfilling of the entire sub-floor of Building 197, and also the disuse of Building 198, took place in the mid-fourth century. The alterations described above, therefore, spanned a period of approximately 150 years.

The deposits used to create the solid floor at the west end of Building 198 (Phase d) contained a small group of material:

Pottery: Analytical Group 6
Coarse wares (Fig 160) Nos 57–68, *c* 190–260

Finds: Penannular brooch (No 70), bone and gold pin (No 91, Pl 13), awl (183), hilt segment (275)

A far smaller group came from the solid filling of the central area of Building 197 (Phase d):

Pottery: Analytical Group 5
Coarse wares (Fig 159) Nos 53–6, *c* 150–260

Finds: Glass bead (No 49)

Both of these operations may thus be dated to the mid-third century.

Discussion and reconstruction

Roman military *horrea* have been well served within the last 25 years by major surveys. Roman *horrea* generally were examined by Rickman (1971), and military *horrea* in Britain have been surveyed by Gentry (1976). A similar catalogue and discussion for Dacia has also recently appeared (Petculescu 1987). Despite much discussion, and a general feeling that *horrea* are now largely understood, the excavation of the Birdoswald pair necessitates a re-examination of the reconstruction of this class of building.

The most important feature of the Birdoswald *horrea* is their preservation. For surviving structural detail and height of walls they rival the best in Britain, at

Corbridge and Housesteads. Though such survival is certain to provide new information, especially when a pair of buildings can be totally excavated and compared, two of the surprising aspects of the Birdoswald *horrea* could be seen from the plan alone, namely the facts that only the southern sides of the buildings were buttressed and that they were disposed with their long axes parallel to the *via principalis*. The more usual layout would be perpendicular to this thoroughfare. Another surprise was the complexity of the constant changes which affected the sub-floors.

In the following discussion structural and functional features are considered individually. The final section is concerned with drawing these strands together to suggest alternative reconstructions for the Birdoswald pair.

Structural features

Layout and construction

The layout of the Birdoswald buildings, with their long axes along the *via principalis,* is paralleled in the unbuttressed *horrea* at Caernarvon (Gentry 1976, 11), at Castell Collen and at Templeborough (Fig 98). At the latter site the *horrea* are double, and buttressed on one side only.

The Birdoswald *horrea* fall well within the range of dimensions and proportion of this class of building in Britain (ibid, 41), though the walls, at 1.05m, are among the thickest. The clay and cobble-packed foundations are also typical (ibid, 7). The Period 2 unfinished foundation beneath the west end of Building 198 is particularly characteristic, with its projecting buttress foundation, though the arrangement in Building 197 as built, where the wall has a clay and cobble foundation while the buttresses are built on the ground surface, seems very odd.

Sub-floors and flooring

The primary sub-floor arrangements with a stone spinal sleeper-wall, timber posts placed between the sleeper and outside walls, and a floor-level scarcement are unusual. There was no sign of the joist sockets which can be seen in the walls at Housesteads, or slots like that in the long wall of the west *horreum* at Dover (Philp 198l, 111), and it has been suggested above that longitudinal joists may have been supported on the rows of posts inside the walls in order to supplement the scarcement ledges in supporting a timber floor. The joists and timber floor would probably have been nailed together. Though nails have been found between sleeper-walls in *horrea* at Gelligaer and Penydarren (Johnson 1983, 146), there were none at Birdoswald. and it may be that the original floor was dismantled.

There is no directly comparable layout in any British *horreum,* though spinal sleeper-walls are occasionally found. At Birdoswald the internal width of the *horrea* is 6.20m. In the north *horreum* at Ribchester (Fig 98) a single stone sleeper-wall ran up the centre of a *horreum* 5.49m wide, and the remains of a charred wood floor were found in this undated building (Gentry 1976, 89). At Old Church, Brampton (ibid, 86; Simpson and Richmond 1936) the (possibly) Hadrianic *horrea* were 6.10m in interior width. Here again stone sleeper-walls were provided in the centre only (Fig 98). It is possible that ancillary timber supports were provided at these sites, either being missed in excavation or leaving no discernible trace. The fact that at Castell Collen the (apparently primary) lateral sleeper-walls were found actually to block sub-floor ventilation slots, which were also filled with stone (Gentry 1976, 68), may indicate that there was an earlier and unrecognised phase of timber floor supports which respected the vents. Several Dacian sites provide parallels to this sort of sub-floor disposition. Spinal sleeper-walls alone were found in the second-to third-century *horreum* at Bologa, while Severan buildings at Buciumi and Jidava had floors supported on timber posts. None of these buildings were completely excavated (Petculescu 1987, 69–70). Two *horrea* in the Pannonian fort of Iza (Visy 1989, 56) have a series of stone piers ranged down the centre of the buildings, and a similar layout occurs at Hardknott (Fig 98) (Gentry 1976, 81). Rickman (1971, 241–2) cites Niederbieber and Weissenburg as two of several German sites where the floors of stone *horrea* are supported on timber uprights. Other combinations of stone and timber occur at Castleford, where a stone *horreum* is provided with lateral timber joists as floor supports (West Yorkshire Archaeology Service 1984, 25), and in the quasi-official civilian *horreum* at Kenchester (Wilmott and Rahtz 1985). The best potential parallel to Birdoswald, however, is at Pumpsaint (Jones and Little 1973, 11) where postholes have been found both against the interior wall, and parallel to the spinal stone sleeper-wall of a Trajanic *horreum.*

The second phase replaced the original timber floor-supports with stone *pilae,* both monolithic and constructed. Two rows of *pilae* were provided on each side of the spinal sleeper-wall, one of which was ranged against the exterior walls of the building. This was probably one aspect of a change from a timber to a stone floor. The *pilae* were provided to support the corners of flagstones in the manner familiar from the arrangement of the *tegulae bipedales* in hypocausts (Brodribb 1987, 90). *Pilae* ranged against the walls show that the scarcements were inadequate as supports for the edges of heavy flagstones. The scarcements were used to locate the flags, but the *pilae* supported them.

Birdoswald adds to a small number of British *horrea* using stone *pilae,* the others being Ribchester, Housesteads (Fig 98), Castlecary, (Gentry 1976, 10), South Shields (Dore and Gillam 1979, 29–32; Bidwell and Speak 1994, fig 2.4) and Dover (Philp 1981, 33). The latest of these is the Antonine building at Castlecary. There is no other known British example of

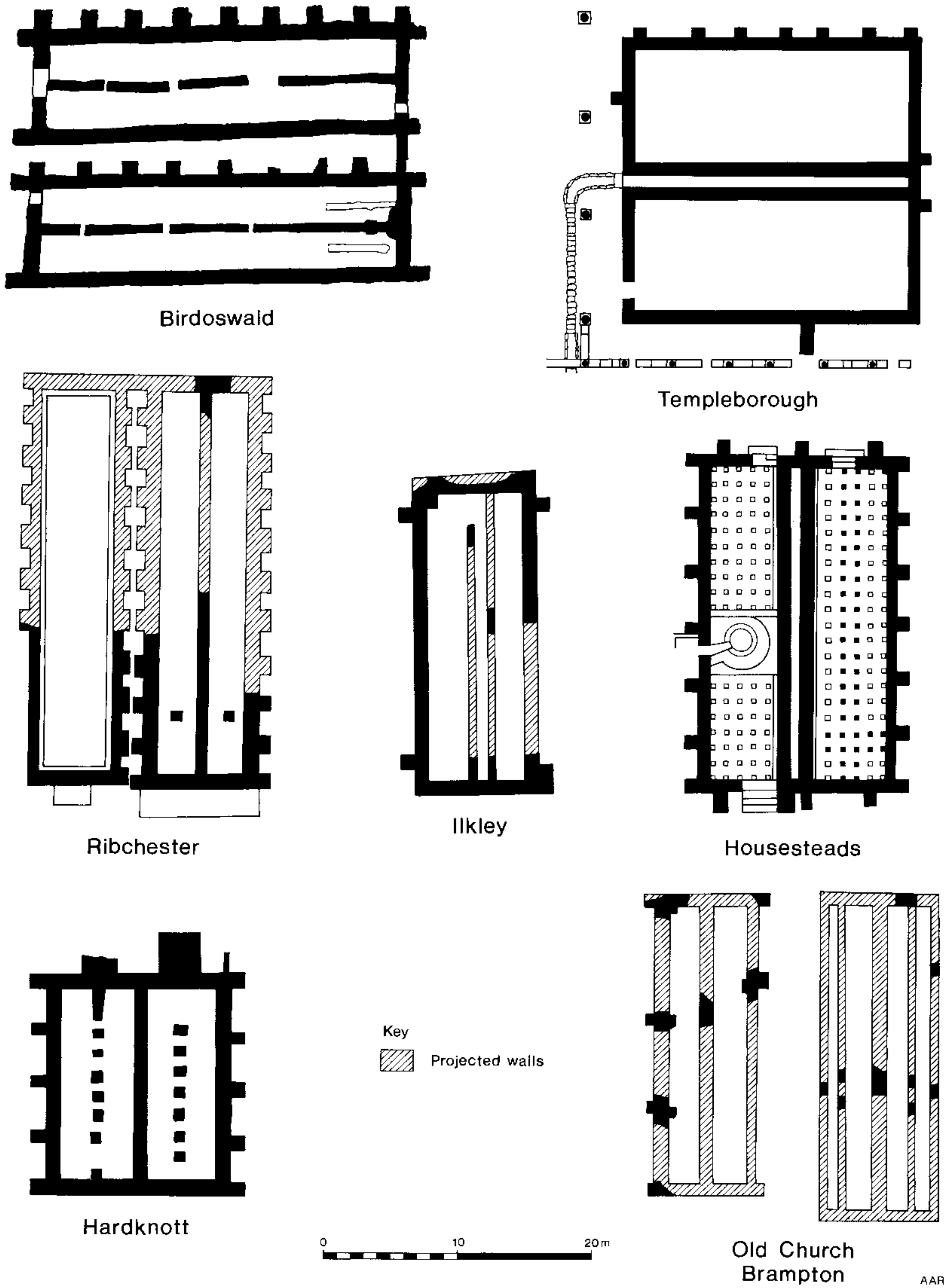

Fig 98 Comparative horreum *plans*

a sub-floor where *pilae* are definitely associated with a spinal sleeper-wall, though this might be the case at Ribchester. A parallel for the plan can, however, be found in one of the Severan *horrea* at Porolissum, Dacia (Petculescu 1987, 69).

Attempts have been made to place a chronology on sub-floor planning in British military *horrea*. Rickman (1971, 221–4) suggested that the transverse sleeper-walls were early, copying the system of timber joists used in many timber *horrea*, such as Fendoch. The above mentioned Castleford *horreum* might be considered as an intermediate step in such a sequence. Rickman's idea that transverse walls would later be abandoned in favour of other types of support was refined by Gentry, (1976, 10), who saw a sequence from Trajanic-Hadrianic transverse walls, to Hadrianic-Antonine *pilae*, and then to longitudinal walls. These, though present from the Hadrianic period, she sees as becoming the rule in the early third century. Petculescu (1987, 74) repeats these arguments for Micia in Dacia, where transverse sleepers are replaced by *pilae*, but from the mixed supports used in the two *horrea* at Porolissum concludes that the various methods were used indiscriminately. The evidence from Birdoswald shows a sequential development from timber floors and floor supports to stone *pilae* and flagstone floors, followed by sleeper-walls of both lateral and longitudinal type. The chronology of this development does not fit any of the proposed models, and at any rate should begin in the Severan period.

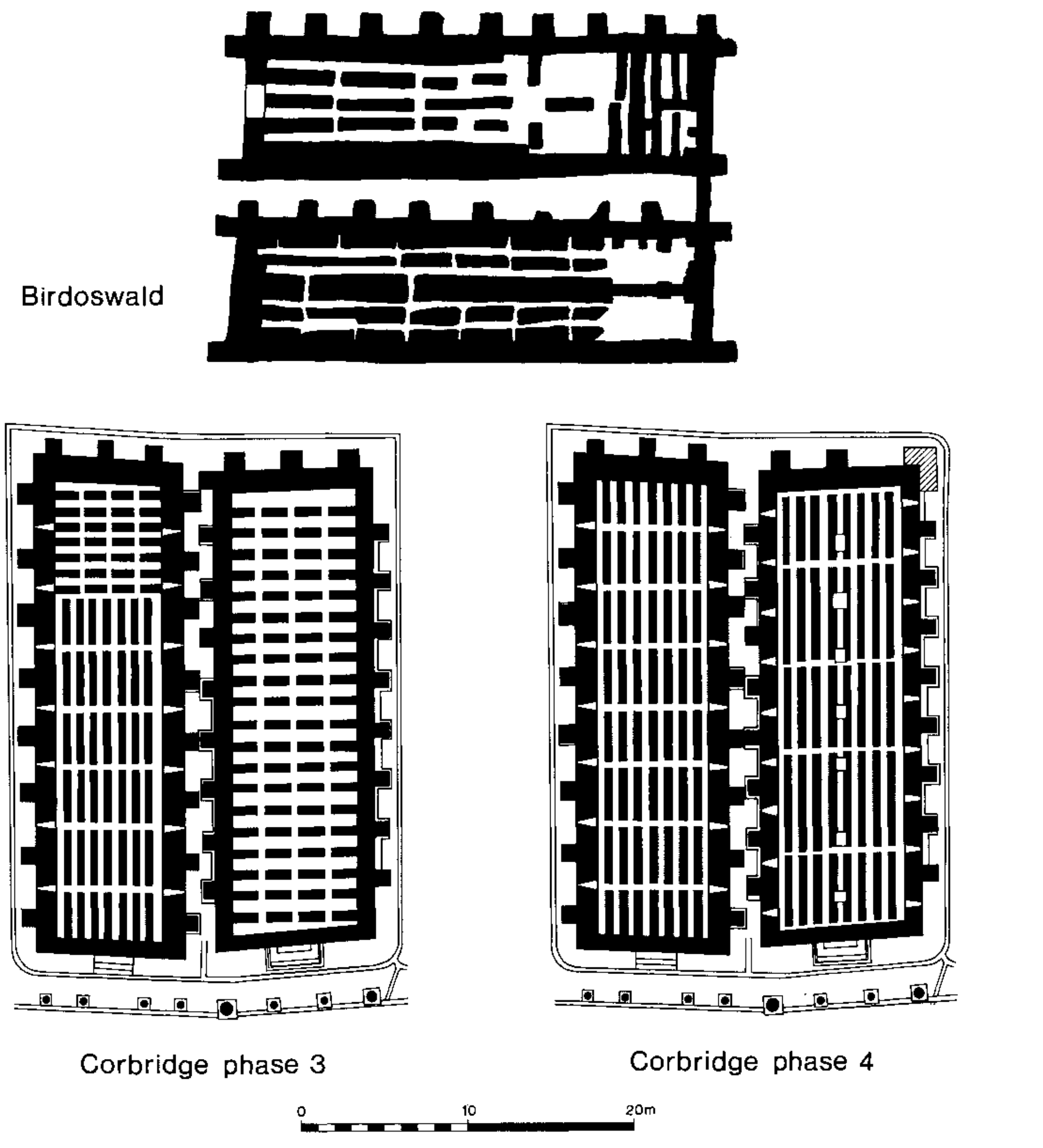

Fig 99 Comparative horreum *plans*

An indiscriminate use of the various methods, for whatever reason, seems more likely.

The sleeper-walls in the Birdoswald *horrea* incorporated the earlier *pilae*, a situation which may also have occurred at Housesteads (Crow 1995, 52, 82, fig 78). Building 198 was given five longitudinal sleeper-walls, broken at regular intervals to allow ventilation, while Building 197 had longitudinal walls at the east end and lateral walls at the west end. Longitudinal sleeper-walls are the commonest type of floor-support in British *horrea*. The bipartite treatment of Building 197 is paralleled at Corbridge, in the unbuttressed Site XI *horreum*, and in the late second-century west *horreum* (Fig 99) (Gentry 1976, 71–4), as well as at Halton Chesters in a Hadrianic *horreum* where traces of a timber floor were also found (Gillam 1961, 6).

As well as reflecting a desire to strengthen the floors, the deliberate zoning of solid and ventilated floors in both buildings during Building 197 Phase d and Building 198 Phase d must have some bearing on what was being stored. The use of solid floors in *horrea* is attested at several sites. At Bar Hill the east end of a building was paved at ground level (Gentry 1976, 58). This building may never have had a raised floor, while at Caersws, a ground-level flagged floor followed the removal of a raised predecessor (Gentry 1976, 66). Recent work at Benwell (Holbrook 1991, 43) has shown that in one part of the granary a solid floor lay at the same level as an area raised on transverse sleeper-walls. In the Wall forts sub-floor backfilling was a frequent occurrence. It seems to have happened at Housesteads (Gentry 1976, 82), though the story here seems more complex (Crow 1995, 82), and also at South Shields (Bidwell 1989, 89; Bidwell and Speak 1994, 43–4).

Entrances and Loading

There were many entrances to the Birdoswald *horrea*, and the primary scheme shows a different treatment for each end of the buildings. The evidence for these features is best for Building 197. Here the east end was provided with a broad, double door, with a threshold at the level of the raised floor. To the south of this lay a sub-floor access door. At the western end of the building a standard width single door was provided in the north corner. Building 198 was oriented the other way, with the sub-floor access at the west end, and the narrow door in the south-east corner.

At Corbridge (Richmond and Gillam 1950, 153), the western of the two Severan *horrea* had a small opening into the sub-floor in its south wall and alongside its loading entrance. This was situated in the exact relative position as the similar opening in Building 197 at Birdoswald. It originally had a wooden door frame and was later walled up. The excavators were of the opinion that the hole was to allow cleaners to enter and clean out the sub-floor. This seems unlikely: even children would find it hard to move around and turn in the spaces between the floor supports and they could easily get stuck. It seems far more likely that these apertures were provided to allow dogs or similar animals to deal with the rodents which would have been certain to infest these areas. Similar 'ferret-holes' can be seen at Hardknott (Gentry 1976, 81), and an offset small door in the south end of the east *horreum* at Templeborough may have served a similar function (Fig 98).

Ventilation

Birdoswald shows the normal pattern of sub-floor ventilation (ibid, 11), with narrow slots disposed between each buttress pair. For ventilation above ground level the usually accepted reconstruction would include louvred openings in the walls. This idea was suggested by Richmond and McIntyre (1939, 131–2) in their proposed reconstruction of the timber *horrea* at Fendoch. They suggested the use of 'bins 5 feet high at the back at least, with a wall rising 5 feet more above it, the upper space being occupied by carefully weather-proofed double louvres to give the abundant supply of fresh air which a building of this type would require.'

Bulmer (1969, 10) was responsible for extending the concept of louvred ventilation to stone-built *horrea*. His reconstruction, like Richmond's, assumed the use of bins in a single storey building, and the requirement for ventilation above the bins. His idea was that the buttresses were provided to support the weight of the roof, acting as piers between louvres. His evidence for louvres was entirely based upon Richmond's assumption of such features in his Fendoch reconstruction. Rickman (1971, 237) accepted the arguments for louvred wall ventilators in timber built *horrea*, but suggests that air and light would be provided to stone *horrea* by way of tall, narrow, splayed windows like those in civil *horrea* in Ostia and Trier (Eiden 1949). Crow (1995, fig 32) has implicitly accepted this idea in a reconstruction published as this volume was going to press. Manning (quoted by Morris 1979, 39) suggested closely spaced grilles rather than louvres in stone buildings, and an iron window grille was found in the excavation of stone-built *horrea* on the Thames waterfront in London (Milne 1985, 76).

In levelling the garden and creating a ha-ha, Norman (1860) discovered 'some arch stones' in the debris between the south wall of Building 197 and the next building to the south. His account of the stone he removed, including a mass of 'slates for roofing, many being perforated with nail holes' encourages the belief that this was intact collapsed debris; it is difficult to see his 'arch stones' as anything other than window head voussoirs. The single voussoir found in the sub-floor of the robbed Building 198 was the only such stone to be recovered from collapse deposits in the *horrea* during the recent excavations. It may, however, together with Norman's observation, be seen as tentative evidence for the arched splay windows of the type suggested by Rickman (1971, 237).

Evidence for a second storey

The evidence suggestive of two storeys in the Birdoswald *horrea* consists of the mode of construction of the primary spinal sleeper-walls of both buildings, and the later treatment of this wall in Building 197. These walls were as deeply founded as the exterior walls. The floor supports which they accompanied were timber joists on low posts, and scarcements only 120mm wide. Though a timber floor would have required central support, the well-constructed, deeply-founded spinal walls would have been excessive merely to take the load on the floor; further timber supports would have been quite adequate. The implication is that the spinal walls served another function, possibly as sleeper-walls for posts supporting the floor of a second storey or a loft. The span of the *horrea* would not require central supports to supplement the roof trusses. The provision, in Building Phase d, of postholes on the line of the partially-eradicated spinal sleeper-wall demonstrates the perceived importance of maintaining structural support on this line.

All reconstruction drawings of military *horrea* hitherto published show them as single-storey buildings. (Gentry 1976, fig 1; Wilson 1980, fig 24; Johnson 1983, fig 114; West Yorkshire Archaeology Service 1985, fig 12). Rickman (1971, 236) states that 'we are to think of them as one-storeyed buildings, as there is a complete lack of evidence for any arrangements for supporting or reaching a second storey'. Evidence that reconstructions of Roman buildings have, in the past, been somewhat timid is growing apace. Fallen two-storey walls have been found on a number of sites in Britain, notably at the villas of Littlecote, Wilts (Frere, 1983b, 328) and Redlands Farm, Northants (Keevil, 1991, 54). There is a further remarkable example from Oberndorf-Bockingen, Baden Württemburg (Klein 1995). The evidence for upper storeys was a major theme in a recent conference on Roman architecture in Britain (Johnson 1996). The reconstruction of upper storeys from evidence on the ground is naturally problematical, but such evidence does exist for a number of British stone-built *horrea*. Gentry (1976, 16–18) suggested that foundations placed alongside the long walls of buildings at Caerhun, Mumrills and Old Kilpatrick may have been the bases of external staircases leading to an upper storey. It is difficult to see the central piers added to the Severan east *horreum* at Corbridge (Fig 99) as anything other than provision for the addition of a second floor, or for ancillary support for a replaced upper storey. The excavators (Richmond and Gillam 1950, 157) were certainly of the view that this was the function of the piers, citing the two-storey *horrea* at Rome and Trier in support of their argument, and Rickman (1971, 236) also tentatively accepted the argument. The original Hadrianic layout of the *horreum* at Housesteads, a broad hall with a row of six central piers (Crow 1989, 17; 1995, 51), makes little sense as a single-storey structure: the proportions of the building imply height. It should be noted that in his reconstruction of the narrow Severan granaries at Housesteads, Crow (1995, fig 32) hypothesises a two-storey building.

It is relevant here to note the two stone-built, open-fronted *horrea* on the waterfront of Roman London. At 25 x 6m, these are virtually the same size as the Birdoswald buildings, and are reconstructed (Milne 1985, 72–3) with two storeys. In a reconstruction model (ibid, fig 42) the long sides of the buildings were provided with loading doors at first floor level.

Civil or commercial *horrea* are well attested in the Mediterranean world, and have survived to two storeys in height at Ostia and Rome (Rickman 1971). The only example of such *horrea* in the northern provinces is at Trier (Eiden 1949), where two storeys are evident in the surviving superstructure (ibid, Abb 8–10). These buildings occupied in excess of twice the floor area of the Birdoswald *horrea*, but the proportions of breadth to length were similar (Trier, 1:3.7; Birdoswald 1:3.4). The walls were not buttressed; instead, the long walls incorporated evenly-spaced piers supporting a double-storey, blank, relieving arcade (Eiden 1949, 80, Abb. 3). Within each arch was a narrow slit-window with a single, internal splay. The buildings were 18.95m wide, and were divided into three equal parts by rows of piers. The piers are reconstructed (Mylius 1949, 102–5, Abb. 16–17) as bases for timber supports taking the load of the upper floor, and also, by means of supports on the same line at first floor level, the wide roof trusses. Such additional support through such posts tying into the second storey and the roof beams would help to counter the lateral forces created by the weight of the roof.

Buttressing

Johnson (1989, 54) remarks of *horrea* that 'buttresses along the sides gave the building lateral strength, as well as providing for archaeologists of today a distinctive plan and the basis for endless arguments about what the superstructure looked like.' The question 'why buttresses?' has frequently been addressed and never very satisfactorily resolved. The question is inextricable from areas covered above, but it is so problematical that it certainly requires separate discussion.

The starting point for this discussion is that buttresses are so universally characteristic of military stone-built *horrea* that they must have had an important function. *Horrea* in Britain were generally heavily buttressed along their long walls, with closely-spaced buttresses paired across the width of the building. The nine buttresses 2.10m apart at Birdoswald are well within the standard range in British *horrea* (Gentry 1976, 55–6). In Germany *horrea* such as those at Weissenburg and Urspring generally seem to have had fewer buttresses, perhaps four per side, and these were, naturally, more widely spaced than in the British examples (Rickman 1971, 247–8). The same is true in some Dacian buildings, for example at Micia (Petculescu

1987, 74). The east *horreum* at Dover is more akin to these examples (Philp 1981, 111).

Bulmer (1969, 10) suggested that the buttresses were intended to support the weight of a roof, acting as piers between broad louvred openings. Louvres are not proven, but the idea that the buttresses strengthened walls which were pierced by some provision for ventilation retains some virtue. This certainly appears to have been the function of the blank arcade built into the walls of the Trier *horrea* (Eiden 1949, 80, Abb. 3). The problem at Birdoswald is why the *horrea* are buttressed only on one (the south) side. The only parallels in Britain are at Watercrook, Cumbria (Potter 1979, 147, fig 54), where the plan has been identified from parchmarks, and at Templeborough (Fig 98) There is another example in the Severan *horreum* at Bumbesti, Dacia (Petculescu 1987, 67). The villa of Köln-Mungersdorf near Cologne, however, has among its store buildings a structure measuring 27.40 x 11.75m, with a floor supported on stone blocks, and strongly buttressed on its western side only. Morris (1979 30) compares this third-century building to a 'typical ... military type' of *horreum*. Two buildings at Woodchester, Glos, including a large aisled building, also had buttresses confined to the east side, where the ground sloped sharply (Morris 1979, 33, 115, fig 41.g). The slope of the ground to the south may explain the buttresses on the south walls of the Birdoswald *horrea*. What is less apparent is why the buttresses had no foundations. If the ground slope was the only reason for buttresses the implication is that they would not have been thought necessary had the *horrea* been built on flat ground.

The buttresses have been explained by Johnson (1983, 155) as being designed to take the considerable weight of a roof. She points out that heavy roofs are found on other buildings within forts which do not require buttresses, but notes that such buildings had more load-bearing partitions, and would compose smaller continuously-roofed areas. The assertion has frequently been made that buttresses were required to support the lateral thrust exerted upon the walls by grain stored either loose or in bins (Rickman, 1971, 153). In the silo type of *horrea* found on villa sites at Kenchester (Wilmott and Rahtz, 1985, 71), and Gorhambury (Neal *et al*, 1990, 48), loose storage may have occurred. Certainly in the more substantially-constructed building at Kenchester the 1.5m thick walls and three pairs of opposed buttresses can only be explained as being intended to counter the thrust of either loose grain, or, perhaps more likely, of sacks piled to a great height. They would certainly not be required to support the light, tiled, pyramidal roof of a building with external dimensions of only 5.5 x 7.6m. These tower *horrea* come nearest to a type of building described by Pliny (*Naturalis Historia* XVIII.301), and may even be the only type of building which we are entitled to regard *sensu strictu* as granaries with no alternative, or complementary, storage function.

This discussion has not come closer to an understanding of the problem of the buttresses, and it may be that they were provided to address a combination of factors. However, the most cogent explanation would still seem to lie in the support of massive roof weight. Crow (1995, 51) has recently added the suggestion that the buttresses simply supported the weight of broad eaves which were designed to cast rain water away from the base of the wall, helping to ensure that the building remained dry.

Functional considerations

At this point it is appropriate to move away from the archaeologically-demonstrable features of the *horrea*, and to examine their function, that of storage.

It is unnecessary here to enumerate the conditions required for the storage of grain. These, together with the classical references, are discussed elsewhere by Gentry (1976, 1–6) and Morris (1979, 30). Suffice it to say that low temperatures, good ventilation, and defence from infestation and damp are the primary needs. These were ensured by thick stone walls, raised floors, and adequate ventilation beneath and above floor level. Philp (1981, 11) further suggests that the long, narrow shape of the buildings was intended to provide wall space for cooling.

Calculations made by Gentry (1976, 35–6) show that the thrust of grain stored to a height of 3m could easily be resisted by the buttressed walls of the Corbridge *horrea*. Much of the past work on *horrea* has assumed that grain was stored loose in bins, an idea which began with Haverfield and Collingwood (1920, 137) and was refined by Richmond and McIntyre (1939) and Bulmer (1969). Bins (*laci*) are mentioned by Columella (*De Rerum Natura* I.vi.13), but only to separate different kinds of produce in a single building. Gentry (1976, 18–20) does not totally reject the idea, though suggests that for the practical purposes of distribution, sacks would be more convenient (cf Manning 1975b, 115). Her suggestion (ibid, 25–6) that sacks were stacked to a height of 2.5m has been followed by Bidwell and Speak (1994, 29). Earlier writers have assumed that distribution within forts was carried out by individual dole; it would have been more efficient, however, to distribute sacks, perhaps to each *contubernium* or some other sub-unit of the garrison. An interesting reflection on this is provided by a recently-discovered writing tablet from Carlisle which records amounts of wheat and barley, measured in *modii* distributed to the individual *turmae* of an *ala* (I Caruana personal communication). This document strongly suggests sack distribution.

No evidence that bins were used has been found in any excavated *horreum*. Those assumed for timber *horrea* would have vanished with the rest of the superstructure, and there is no evidence whatever for bins in stone-built *horrea*. The stresses on bins would have been similar to those on the exterior walls. If it is argued that these stresses necessitated thick walls and buttresses, it is not reasonable to imagine the bins as free-standing and self-supporting: they would have had to be keyed into the stone floor and walls. The fact that floors were raised makes their survival rare, and the survival of walls above floor level is equally uncommon. It is, however, inconceivable that if such bins were used in the *horrea* at Birdoswald no evidence would survive. In the primary thresholds in Building 197 there were deeply-marked provisions for the installation of timber door furniture, and on the exterior walls there were putlogs for timber scaffolding. In spite of the fact that much of the floor of this building was relaid, sufficient flagging was found in its original position in both *horrea* to confirm that no provision had been made to slot timber bins into these floors. This is also true of Corbridge, as noted by Gentry (1976, 18). Walling above the level of the raised floor can be seen at both Corbridge and Housesteads as well as at Birdoswald. In none of these walls can any trace of timber fittings appropriate to the construction of bins be seen. Gentry (1976, fig 1) reconstructs a *horreum* without bins, and these features, which were never more than theoretical, should, perhaps, finally be rejected as unlikely and disproved.

If sacks were used for the storage of grain, their stacking must been organised in some way within the *horrea*. The problem of spontaneous combustion of grain must have been well known, and may have prompted Pliny's warning against the overheating caused by the use of ceramic tiles on *horreum* roofs. Overheating could cause spontaneous combustion by pyrophoric action (Kingsley 1960, 43; Astill 1996). A manual on fire prevention (National Fire Protection Association, 1948, 436) recommends that sacked material should be piled in tiers with intervening alleys. The mass should also be elevated several inches above the floor.

Gentry (1976, 23–8, table 2) estimates a theoretical annual requirement for a *cohors milliaria peditata* at 534.8 cu m of stored grain. She goes on to tabulate the capacities of fort *horrea* based on stacking of the building to a height of 2m. The equivalent statistic at Birdoswald is as follows:

internal area per *horreum* = 26.12 x 6m = 156.72 sq m
internal area of 2 *horrea* = 156.2 x 2 = 313.44 sq m
cc when grain is stacked to 2m height = 313.44 x 2 = 626.88 cu m

Quite how meaningful such a statistic can be is debatable as it is based on a whole series of imponderables. It does, however, give a rule of thumb by which varying dimensions of building can be compared. For what it is worth, the capacities for the forts of *cohortes milliariae peditatae* range from 522.2 cu m at Housesteads to 637.8 cu m at Templeborough, so Birdoswald falls well within the upper limit of the range. This demonstrates that fort granaries were able to supply the garrison for a year.

Gentry gives another statistic, namely the proportion of the area of the fort which is covered by the *horreum* floor. For Birdoswald again:

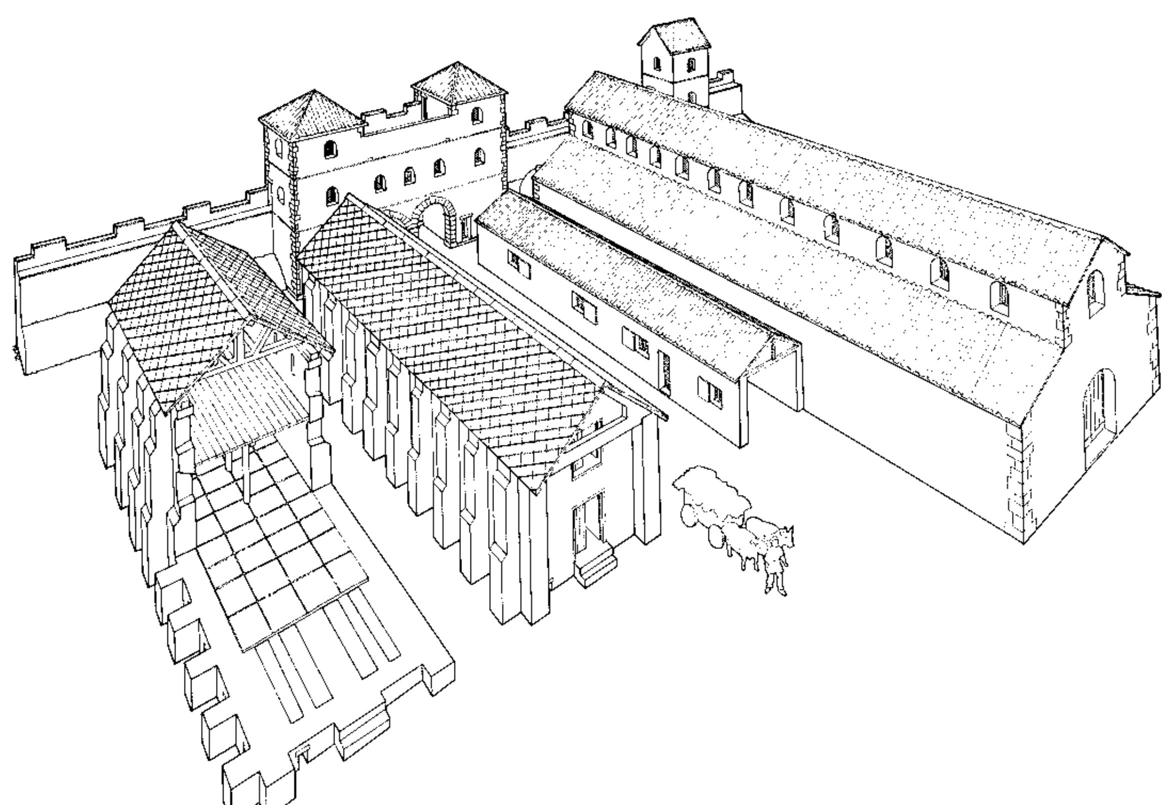

Fig 100 Reconstruction drawing of Area A during Period 3

internal area of fort = 122 x 183m = 22,326 sq m
internal area of 2 *horrea* = 313.44 sq m
Proportion of fort area occupied by *horreum* floor space = 1.4%

Although 1.4–1.6% is shown in Gentry's table as usual for a *cohors milliaria*, similar proportions occur for other classes of unit. Given the difficulties inherent in assessing fort type and unit size this kind of statistic is probably not very useful.

Reconstruction

In reconstructing the *horrea*, all of the above considerations have been taken into account. In common with all archaeological reconstructions the suggestions put forward here, while based on the evidence, are interim ideas advanced to stimulate discussion. The height of the buildings is the starting point from which other conclusions must flow, and in Figure 100 the *horrea* are shown as two-storey buildings. The walls at 1.13m thick are entirely capable of supporting a second storey, as would walls of considerably less thickness; the tower walls in the *porta principalis sinistra* were 960mm thick. The buildings were narrow enough to allow roof trusses to span the width of the building without ancillary support. For a roof as heavy as calculated for these buildings a fairly large number of trusses might be expected. The deep foundations of the spinal sleeper-walls are in puzzling contrast to the lack of foundations provided for the external buttresses. Logic suggests that it was the sleeper-wall, and not the buttresses, which was expected to carry a substantial weight. The emphasis placed on maintaining support along this axis evidenced by the postholes of Building 197, Phase d, further confirms an important function for the spinal wall. It is difficult to see what this might be other than to support the weight which was carried on an upper floor. The primary timber lower floor required support in the centre and a further two rows of supporting timbers in addition to the scarcement ledges on the wall line. A single central support supplementing similar scarcement ledges at first-floor level could be seen as a minimum requirement for a laden top storey. It is suggested, therefore, that timber supports were placed along the line of the spinal sleeper-wall, with their bases placed on a continuous timber floor formed of boards slung across the width of the building. It is possible that a further tier of supports placed directly above those on the ground floor might have provided additional support to the roof. This would not have been essential at Birdoswald, but is reconstructed by Mylius (1949, 102–5, Abb 16–17) for the civil *horrea* at Trier, and is a logical suggestion for the function of the central piers in the primary, broad, single *horreum* at Housesteads.

The existence of a second storey combined with the need to maintain wall thickness at eaves level to support the roof trusses may explain the thickness of the walls at ground level, where they were 1.25m thick. The ground floor scarcement reduced them to 1.13m. A similar scarcement at first-floor level would reduce them still further, to around 1m thick. It is possible that additional support might have been given to the floorboards in the upper storey, resulting in a much broader scarcement; this would reduce the wall width further, possibly to something approaching the width of the gate tower walls.

To suggest that the *horrea* were two storeys in height is to contradict most other reconstructions of military stone-built *horrea* (though now see Crow 1995, fig 32), in particular the Bulmer model, in which the use of buttresses as roof supports ranged between open, louvred wall panels was suggested. In the proposed reconstruction of the Birdoswald *horrea*, ventilation by means of arched, single-splay windows of the type found in the standing fabric at Trier is suggested from the evidence of the 'arch stones' found by Norman and the voussoir from Building 198. If the voussoir was from such a window, then these were not mere slits; the width of the window, based on the radius of the voussoir, would be 446mm. The internal splay of such windows might have weakened an area of wall, as seems to have been recognised at Trier, where piers built as part of the run of the exterior walls supported blank relieving arcades which contained the splay windows (Eiden 1949, 80, abb 3). It is tentatively suggested that a function of the buttresses might have been, as suggested by Bulmer (1969, 10) and Johnson (1983, 155), to support a heavy roof on a structure whose walls were weakened by the removal of walling in order to provide apertures for ventilation. It was suggested independently to the writer that the buttresses may have supported an engaged blank arcade at eaves level (B Walters personal communication). This does not, however, explain the single buttressed walls at Birdoswald, or the poor foundations for these buttresses. Though this would partly have been due to an appreciation of the need for buttressing of walls built on the downhill slope, it is also possible that exigencies of space were in part responsible. It must be remembered that the *horrea* were not primary buildings, and their planning would be dependent on the building plot available for their construction. The similarity between the proportion of the fort area occupied by *horrea* in milliary forts suggests that a set floor area was required, and it is possible that this floor area could only be achieved by omitting two rows of buttresses and utilising the space which they would have taken up.

In his reconstruction of the tower *horreum* at the villa of Gorhambury, Neal (*et al*, 1990, fig 61) postulates a second-storey loading-jetty at the front of the building, supported by two piers for which foundations were found. He further suggests a jib for the suspension of a pulley in the gable, serving a first floor loading bay of the kind seen in modern warehouses. A recent reconstruction painting of the waterfront of *Londinium* (Marsden 1994, cover) shows a similar jib mounted on a warehouse for use in conjunction with a second storey loading door. It has already been suggested that the purpose of the extensions of the long side walls at each end of the buildings was to support an extension of the roof over a covered bay at each end of the *horreum* buildings, possibly to facilitate loading. Such lifting gear as that reconstructed for Gorhambury and London would be a logical addition to the building. In the absence of any evidence for stairs it might be considered an essential aid to loading and unloading the upper storey, which might have been reached by means of ladders.

Macrobotanical evidence from the *horrea*

by J P Huntley

Building 197

All three of the discontinuous sections of the sub-floor were sampled. In the area of longitudinal sleeper-walls at the east of the building a layer of dark-grey, silty loam (235, 237) was sampled. This was the bottom layer associated with the building. It predated the addition of sleeper-walls to the plan of the building, and is interpreted as material which had fallen through the interstices of the flagstones from a suspended floor. Grain samples from this deposit almost certainly represent stored material. Ten sub-samples were analysed (Table 6).

Hordeum (Barley) was the predominant cereal grain. *Triticum* (wheat) was also present (Tables 6 and 7) and at least some of the grains had the characteristic blunt and rounded shape, with steep embryo, of *T aestivum* (bread wheat). The brittle rachis recovered possibly belongs to *T spelta* (spelt) as do some of the hexaploid grains. *Carex* sp (sedges) and *Bromus* sp (brome grass) were the most common wet ground and weed seeds recovered.

In the deliberate backfill deposited between the sleeper-walls in Period 5, there were large numbers of barley rachis internodes, indicating the presence on-site of whole ears of grain and, by implication, relatively local production. Barley is free-threshing in that the grain is easily removed from the ear and it is most likely to be transported any distance as threshed grain. This is in comparison with spelt whose ears need to be parched before the grain will fall free. Spelt is regularly transported in the form of spikelets, thus removing some of the coarse chaff, leaving final threshing to be carried out at the site of use.

Interestingly, two species of the classical cereal weeds were represented in this group of samples. *Centaurea cyanus* (cornflower) and *Valerianella dentata* (narrow-fruited cornsalad) are both rare plants today in Britain but are traditionally associated with cereal crops. Their seeds are somewhat smaller than cereal grain, particularly the *V dentata*, and would therefore be expected to have been removed during processing if grain had been imported from afar. Greig (forthcoming) has suggested that cornflower macrofossil records may indicate importation of cereal during the Roman period since the species only rarely occurs in samples from this date. However, pollen records of cornflower (Godwin, 1975) from Britain indicate that the plant has been present in these islands for the last 6000 years or so.

Table 6 Building 197: macrobotanical material from the primary storage deposits at the east end of the building (derived from 10 samples from 2 contexts)

taxon	*number*
c*Avena* sp grain	2
cCerealia undiff	12
c*Hordeum* sp hulled	21
c*Hordeum* sp indet	11
c*Triticum* sp(p) (hexaploid)	4
c*Triticum aestivum* grain	2
s*Triticum* sp(p) brittle rachis internode	1
c*Triticum* sp(p) grain	8
gGramineae 2–4mm	1
g*Rumex acetosa*	1
r*Galium aparine*	4
r*Rumex obtusifolius*-type	1
t*Corylus avellana* nut frag	1
w*Carex* sp(p) (trigonous)	9
x*Bromus* sp(p) grain	3
xGramineae undiff	1
x*Polygonum* sp(p)	1

key to ecological categories and parts of cereals: **(for tables 6, 7, and 8)**

a = arable weeds
e = exotic
g = grassland
h = heathland
r = ruderal
t = wood/scrub
w = wet ground
x = broad or imprecisely identifiable

s = cereal chaff
c = cereal grain

At the western end, in the area of lateral sleeper-walls, Two samples from the primary deliberate backfill produced one unidentifiable cereal grain, ling, and *Corylus avellana* (hazelnut) fragments. In the secondary backfill the cereal grains were poorly preserved with more than half unidentifiable. A selection of weeds were represented but predominantly indicate wet ground and ruderal vegetation rather than classical weeds of cereal fields. No chaff was recovered.

Samples from the central area came from the filling of the channels between the solid filled portions. Fourteen samples were analysed. Though three of these contained no identifiable seeds, the remainder produced barley, some wheat, and a few grains of *Avena* sp (oats). Chaff from both wheat and barley were recovered. Three of the glume bases of wheat were clearly attributable to spelt with their strong secondary venation.

Table 7 presents the amalgamated data from all sub-samples within the above groups. The table clearly shows that more barley grains were recovered than any other cereal and that wheat was the next most common. Small amounts of oats, which may have been growing as weeds among the other cereals, were also present. No oat chaff, which is the only material by which cultivated and wild species may be distinguished, was found. The barley was mainly hulled although one grain with the transverse wrinkles characteristic of a naked variety was recovered. A few grains with twisted embryos were present indicating that at least some was the 6–row *H vulgare*. This is the type predominantly grown in northern Britain until the medieval period.

As might have been expected, the primary deposits at the eastern end of the building were the richest in numbers of seeds. It seems likely that much of the material in the deliberate backfills originated with stored material. The fact that the majority of seeds were cereal grains indicates that we are most likely to be looking at material that was being stored in the *horreum*.

Building 198

The main sequence of samples in this building was taken from the later gradual backfilling of the interspaces between the sleeper-walls during Period 5 (Table 8). Though it is probable that some primary storage component was represented in these samples, it is probable that this component is diluted by the content of secondary dumped deposits.

Twenty six samples analysed from lower contexts contained similar assemblages. Wheat, either indeterminable or hexaploid, was common although one sample contained more barley. Weed seeds were not common; those present predominantly indicated a mixed type of cultivation and were not from the classical cornfield weeds. The glumes bases suggest that the wheat was probably spelt; however bread wheat grains were also recovered. The occasional *Secale* (rye) and oat grain was found as well as moderate numbers of indeterminable cereal grains.

The upper fills were loose and friable, allowing possible contamination. A total of 32 samples from four contexts were analysed. Indeterminable cereals were the most common with numbers of wheat almost equal. Barley was moderately common.

This building produced less securely sealed samples than did Building 197. This may account for the moderate numbers of poorly preserved cereal grains. Wheat was most common with moderate amounts of barley also present (Table 8). The oats may again have been from grain deliberately grown as a crop or from weeds; the lack of chaff precludes further interpretation. Weed seeds were moderately abundant although never dominant. Species characteristic of waste ground and broad cultivation are more common than those characteristic of arable fields alone.

Table 7 Building 197: summary table of non-primary macrobotanical data; this is derived from the Period 5 backfill of the sub-floor

taxon	*numbers*				
(numbers of contexts	2	11	10	2	14)
(numbers of samples	2	24	14	12	16)
	1W	2W	C	1E	2E
a*Centaurea cyanus*	–	–	–	–	1
a*Polygonum aviculare*	–	–	1	–	–
a*Polygonum periscaria*	–	1	–	–	3
a*Valerianella dentata*	–	–	–	–	2
c*Avena* sp grain	–	7	2	2	5
c*Hordeum* sp hulled	–	9	11	21	30
c*Hordeum* sp indet	–	5	4	11	5
c*Hordeum* sp naked	–	1	–	–	–
c*Hordeum* sp straight hulled	–	–	–	–	–
c*Hordeum* sp twisted	–	1	–	–	–
c*Hordeum* sp twisted naked	–	1	–	–	–
c*Triticum* sp(p) (hexaploid)	–	–	1	4	–
c*Triticum aestivum* grain	–	1	–	2	–
c*Triticum* sp(p) grain	–	10	7	8	8
cCerealia undiff	1	30	7	12	10
gGramineae 2–4mm	–	–	–	1	1
g*Plantago lanceolata*	–	2	–	2	–
g*Rumex acetosa*	–	–	–	1	–
h*Calluna vulgaris* twigs	9	–	–	–	–
r*Galium aparine*	–	–	–	4	1
r*Rumex acetosella*	–	2	–	–	–
r*Rumex obtusifolius*-type	–	2	1	1	2
r*Vicia sativa*	–	1	–	–	–
s*Hordeum* sp rachis internode	–	–	1	–	18
s*Triticum* sp(p) brittle rachis internode	–	–		1	1
s*Triticum* sp(p) floret scar	–	–	1	–	–
s*Triticum* sp(p) glume base	–	–	1	–	–
s*Triticum spelta* glume	–	–	3	–	4
s*Triticum* sp(p) spikelet fork	–	–	–	–	1
t*Corylus avellana* nut frag	1	2	–	1	–
w*Carex* sp(p) (lenticular)	–	1	2	–	–
w*Carex* sp(p) (trigonous)	–	6	8	9	2
w*Eleocharis* sp(p)	–	–	1	–	–
w*Eriophorum lat/angustifolium*	–	2	1	–	–
w*Ranunculus flammula*	–	1	–	–	–
x*Bromus* sp(p) grain	–	5	3	3	12
xGramineae <2mm	–	–	1	–	–
xGramineae undiff	–	–	–	1	–
x*Polygonum* sp(p)	–	–	–	1	–

key:
1W = lower backfill, west end
2W = upper backfill, west end
C = backfill, central area
1E = lower backfill, east end
2E = upper backfill, east end

Conclusions

The charred seeds were mainly from cereals and associated weeds. Wheat was the most common cereal recovered from the site as a whole (34.4% of cereal grains). Three categories of wheat were defined: bread wheat (*T aestivum*, 3.9%), hexaploid wheat (*T aestivum* and/or *T. spelta*, 27.4%), and indeterminable wheat (68.7%). Wheat chaff (straw and ear fragments) were present in low numbers and allowed some determination to species. Thirty six of the 38 glume bases recovered were clearly from spelt with their strong secondary venation. Six brittle rachis fragments were found and

Table 8 Building 198: summary of macrobotanical data from the Period 5 backfill of the sub-floor (derived from 66 samples from 34 contexts)

taxon	*number*
a*Agrostemma githago*	1
a*Centaurea cyanus*	3
a*Fallopia convolvulus*	1
a*Polygonum lapathifolium*	3
a*Polygonum periscaria*	51
a*Spergula arvensis*	1
a*Stellaria media*	1
c*Avena* sp grain	30
cCerealia undiff	260
c*Hordeum* sp hulled	59
c*Hordeum* sp indet	114
c*Secale cereale* grain	5
c*Triticum* sp(p) (hexaploid)	76
c*Triticum aestivum* grain	3
c*Triticum* sp(p) grain	167
gGramineae 2–4mm	1
g*Plantago lanceolata*	2
g*Rumex acetosa*	3
decumbens	3
r*Chenopodiaceae* undiff	5
r*Conium maculatum*	2
r*Galium aparine*	13
r*Plantago major*	1
r*Raphanus raphanistrum* pod frag	1
r*Rumex acetosella*	7
r*Rumex obtusifolius*-type	36
r*Veronica hederifolia*	2
r*Vicia sativa*	1
sCulm nodes	6
s*Hordeum* sp 6-row rachis internode	1
s*Hordeum* sp rachis internode	1
s*Triticum* sp(p) brittle rachis internode	3
s*Triticum spelta* glume	28
t*Corylus avellana* nut frag	14
t*Rosa* sp	1
t*Rosa* sp thorn	1
w*Carex* sp(p) (lenticular)	3
w*Carex* sp(p) (trigonous)	6
w*Carex hostiana*-type	1
w*Eleocharis* sp(p)	7
w*Ranunculus flammula*	3
x*Arrhenatherum elatius* tuber	2
x*Bromus* sp(p) grain	19
xGramineae <2mm	2
xLabiatae undiff	2
xLegume <4mm	1
xLegume >4mm	1
x*Ranunculus repens*-type	2
x*Stachys* sp	1

these may also have been from spelt – a species which breaks into spikelets upon threshing rather than releasing free grain as bread wheat does. The rachises in bread wheat remain largely as single units. The relatively low numbers of chaff fragments indicate that the material identified is probably cleaned grain ready for immediate use. Differential preservation due to charring may be the cause of the absence of chaff.

In spite of possible preservational problems there is strong evidence that both bread wheat and spelt were being used at Birdoswald although their overall relative proportions are not known. The source of the wheat also remains unknown. It is rather unlikely that it was being grown in the immediate area given the altitude and high rainfall. It is possible that it was being brought in from a supply fort such as that at South Shields whose *horrea* contained large amounts of both species (van der Veen 1988). It is assumed that the wheat was being used almost solely for human consumption. Barley was the next most common cereal (29.1%).

Although wheat growing may have been extremely marginal in the area at this time when the climate was, perhaps, only slightly warmer than that of today (Lamb 1977) barley production is more likely. Barley plants will tolerate wetter conditions than wheat although they do not grow on such heavy, clay soils. They will also ripen in shorter summers. If barley could be grown locally and if other supply routes were cut for any reason then it could have become a normal food. It does make tasty bread and takes little more effort to remove the glumes from it than from those of spelt. It could also have been fermented to produce beer, although none of the grains recovered here showed any evidence of having sprouted during a malting process. The other major use for barley was as horse feed although horse owners today dispute its use since it often causes animals to become bloated. A hard-working cavalry or draught horse may well have had a more active and efficient digestive system than modern animals. Although the fort was an infantry garrison, some horses would doubtless have been present and it is therefore possible that some of the barley was used as feed.

Oats formed 4.8% of the cereal grains. There was no oat chaff at all and therefore it is not possible to determine whether they were cultivated or not. In view of their low proportions it is suggested that they were weeds among the other crops. The same may be said of the seven grains of rye which were found. It is interesting to speculate whether the rye indicates that some of the grain was being imported from the Continent along with its weed seeds.

Arable weeds accounted for 4.4% of the total carbonised seeds. Classical arable weeds were rare, though cornflower and *Agrostemma githago* (corncockle) were found in Building 197. These species do, however, prefer lighter, more sandy soils than those generally found around Birdoswald today. Various *Polygonum* (knotweeds) also grow in cultivated fields but are not necessarily associated with cereals. Any weeds growing among the cereals are likely to have been harvested with them and hence their seeds would be mixed with the cereal grain. Although subsequent sieving and processing aims to remove all such weed seeds some inevitably remain and these would become carbonised with the grain.

An explanation for the representation of grassland, wetland, and ruderal species is not always obvious. Ruderal vegetation was represented by 5.8% of the seeds. This vegetation is generally found on disturbed ground such as along track and field edges and in odd corners or abandoned/fallow ground. At least some of the taxa, such as *Veronica hederaefolia* (ivy leaved speedwell) and *Galium aparine* (common cleavers) could have grown among crops, and some would also have been at home in grassland, for example *Vicia sativa* (common vetch) and *Rumex acetosella* (sheeps sorrel). As with much vegetation there is a continuum from newly-colonised open soil to established grassland with a dense cover of plants. Ruderals growing around the site may be accidentally caught up with the cereals and become burnt, and the same may be true for grassland species. Some of these may also have been growing among the cereals. Wet-ground taxa are more problematic again particularly when they reach values of more than 20%. In all of the earlier Building 197 groups the wet species are common. This may reflect wet conditions around the fort and it is possible that the *horrea* were also used to store hay or flooring material.

Grassland (2.3%) species such as ribwort plantain and common sorrel indicate communities similar to those present today. Though these may have been cut as hay there are no seeds characteristic of traditional herb-rich hay meadows, for example *Rhinanthus minor* (yellow rattle). Their absence may be due to the nature of preservation, however; these species are in evidence from deposits at Housesteads (Clapham 1988).

The small number of seeds is disappointing given the potential of the material and the effort expended on its recovery. It is clear that the catastrophic fires needed to preserve large amounts of grain did not occur. Charring may have been the result of limited episodes of spontaneous combustion, or even of fumigation (Carruthers personal communication). The seeds provide an impoverished comparison with, for example, the South Shields *horrea* (van der Veen 1988).

Primary storage deposits in Building 197 show the presence of wheat, but barley was predominant. The backfill beneath the floor of the building also contains a larger proportion of barley. Though this material was of mixed origin the possibility must be considered that it partially represents stored material. The presence of large amounts of barley chaff in the building might indicate a locally produced crop which was being threshed, or at least partially processed within the fort. This observation is valid whether the chaff derived from stored material or from the sub-floor dumps which were deposited during the later fourth century.

For Building 198 the data are less secure, but showed wheat as more common than barley. Although this may partly reflect the different provenances it is also possible that there was some differentiation between cereal storage in the two buildings.

7 Area A during Periods 4a–5

The blocking of the *porta principalis sinistra* and subsequent industrial activity (Period 4a: Site Phase 7):

Period 4a begins with a number of major alterations to the roads, buildings, and drainage of the fort. These were undertaken simultaneously with the blocking of the south portal of the gate, and are summarised in Figure 101. The works ushered in a phase of industrial activity during which the ground floor rooms of the *porta principalis sinistra* and the buildings on the north frontage of the *via principalis* were used for metalworking. The Period ends with the apparent total silting of the fort ditch, and the ending of the industrial use of these buildings.

Works associated with the blocking of the *porta principalis sinistra*

The gate

The western arch of the south portal of the gate was blocked with a poorly-constructed wall (4212) of coursed rubble with a core of small stones (Figs 102, 103). It was bonded with yellow clay, and stood to a height of nine courses. The blocking of the portal was not contemporary with the insertion of the fine ashlar during Period 3. The fill of the construction cut for the ashlar (3771) had been sealed by a layer of stony soil (3765; Fig 103) which was in turn cut by a shallow construction trench (1827) for the blocking wall. This only survived at the southern side of the portal. The eastern arch of the portal was blocked with a similar wall (4235), which survived to a height of three courses (400mm).

The *spina* of the gate had comprised a pair of piers which were possibly linked by a transverse arch. The space between these piers was blocked with walling (4413; Figs 33, 34), though a doorway was retained linking the north portal with its blocked counterpart. This doorway was itself blocked later during Period 4a (blocking 4278; Figs 34, 105).

Simultaneously with these alterations, a further wall two courses high (4159) with a loose, unbonded core was erected 1.80m to the east of the east blocking wall. The northern return of this wall was aligned with the *spina* of the gate. It is suggested that this was the sill wall of a lean-to annexe built to extend the rooms formed by the blocked portal and south guardchamber (Fig 105). There was one resurfacing of the *via sagularis*, perhaps associated with this lean-to, which comprised a thin (60mm) layer of ferruginated orange-red gravel (3925/3922), iron panning within the material being deposited through the action of water on the iron oxide contained with the gravel.

Ditch Phase d

In order to maintain the defensive appearance of the *porta principalis sinistra*, the fort ditch was recut and extended northwards. The new ditch (1708; Figs 26, 101, 118) was butted against the causeway which allowed access through the north portal, and was dug through the accumulated road surfaces which had served the south portal. The ditch was V-shaped, with the western edge cut at almost exactly 45°. It was approximately 4.20m wide, and was 1.65m in depth from its top surviving edge. It terminated in a rounded butt end.

This Period also saw the laying of new surfaces upon the berm (Fig 26). The main surface consisted of irregular pieces of sandstone and river pebbles in a sandy, yellowish-brown matrix (1912), contained within a kerb (1913) formed of irregular shaped and sized sandstone blocks and cobbles. A number of other patchy surfaces seem to have been contemporary with these.

The internal buildings

No alterations to the *horrea* (Buildings 197 and 198) or the basilica (Building 4403) could be identified with this Period, though Building 4400 was totally remodelled. As originally constructed, Building 4400 had been a long, narrow, freestanding building with a single gabled roof running east-west. Its southern long side formed the frontage of the *via principalis* during Periods 2–3, and the building was subdivided into several rooms (i-v; Fig 50) during Period 2. These room divisions were now to form the basis of the subdivision of Building 4400; Room i at the western end of the building was detached to become Building 4401, while Rooms ii-v became Building 4402.

The remodelling of the structure was done with the minimum of demolition. The only part of Building 4400 which was definitely dismantled was a stretch of the south wall (4293) measuring 4m long. This comprised the eastern 3m of the wall within Room i and the western 1m in Room ii (Fig 50). The wall which had divided Rooms i and ii (4296) now became the western exterior wall of Building 4402. It was thickened and strengthened by the addition of a new facing on its outside (western) face (4332; Figs 101, 111). Strengthening was not the only alteration needed to turn this partition wall into a gable end; it had originally been butted against the north and south walls of Building 4400, and now required bonding at the corners. Though evidence for this operation had been removed during the robbing of the north-west corner, it survived at the south-west corner. It seems that the small section of the south wall of the building to be dismantled was removed in order that this alteration could be accomplished. The stratification associated with this is shown in Section 7 (Fig 104). The south wall (4293)

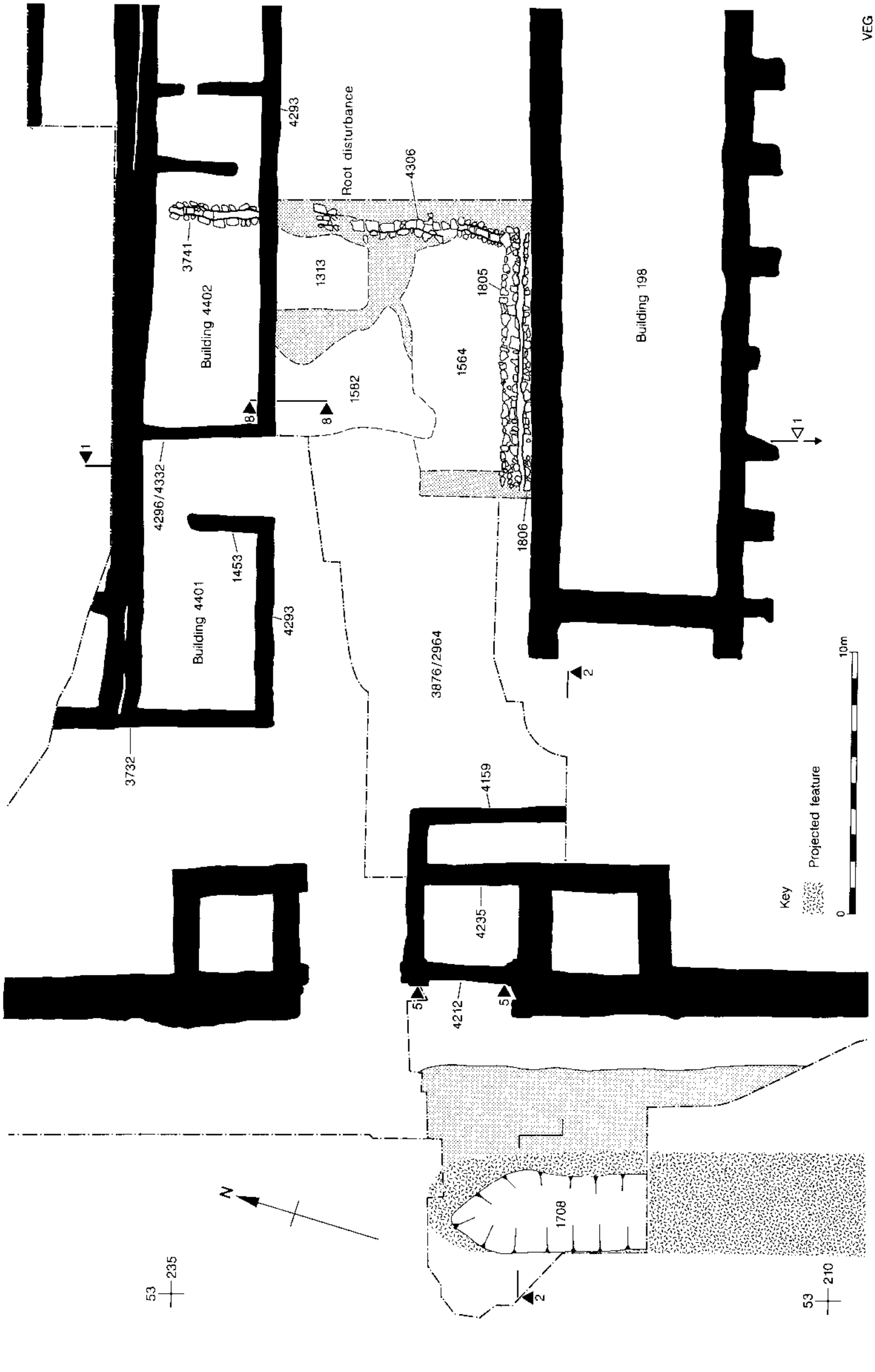

Fig 101 Summary plan of alterations associated with the blocking of the south portal of the porta principalis sinistra *in Period 4a*

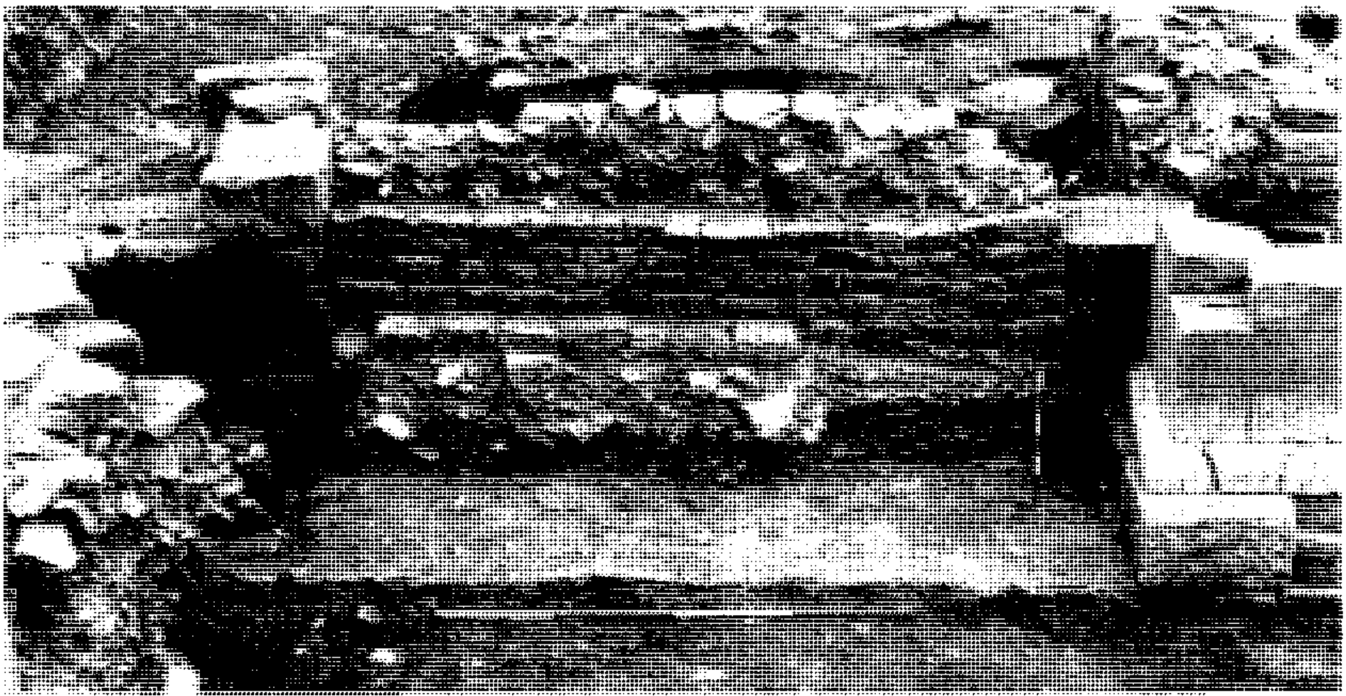

Fig 102 South portal of porta principalis sinistra *with blocking wall (4212) in place: the level from which the portal was blocked can be compared with the build up of surfaces in the north portal to the left of the picture*

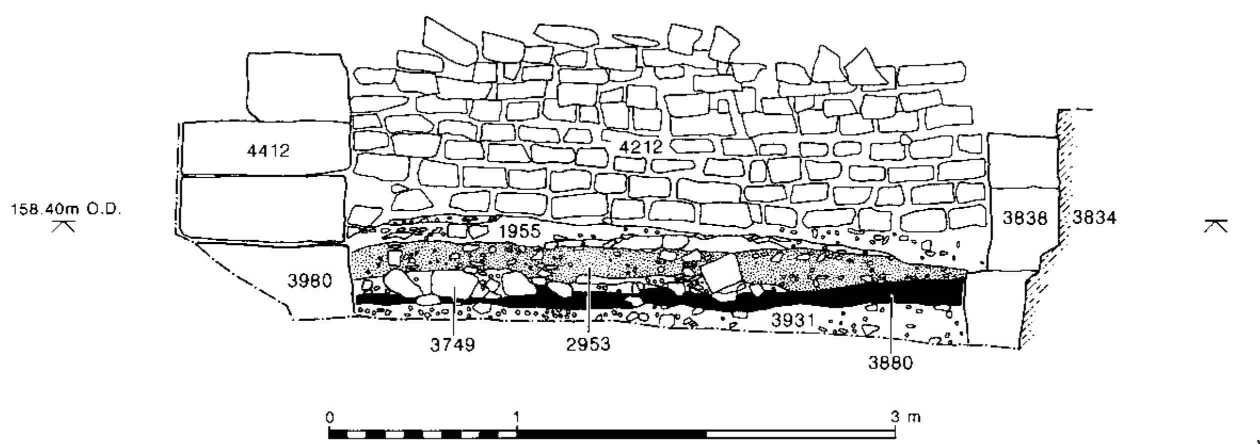

Fig 103 Section 5 (for location see Fig 101) showing the western blocking wall of the south portal of the porta principalis sinistra *and the stratigraphy beneath the blocking*

was robbed to one course below ground level. A robber trench (1584) which cut through the primary *via principalis* road surface (1808) was defined on the southern side of the wall. A new road surface which was laid as part of the alterations of Period 4a (1582) sealed the fill of the robber trench (1583). Elsewhere this surface was butted against the south wall of Building 4402, and this had probably been the case in this area as well. Here, however, the surface was later cut by a further robber trench (4418) which removed the south-west corner of Building 4402. It seems reasonable, therefore, to suggest that the first robber trench (1584) functioned both as a robbing trench and also as a construction trench for a remodelled, bonded south-west corner to Building 4402. This wall was respected by the Period 4a surface (1582), and was itself later robbed.

At the eastern end of the former Room i lay a thick, dense layer of rubble, ceramic roof tile and debris (4335). This may represent debris from the partial demolition of the south wall, dumped to level up the acute subsidence in this area. Built directly on top of the loam (4357) which sealed this debris were the thickening (4332) of the west wall of Building 4402, and the new eastern wall of Building 4401. This wall (4353; Figs 101, 111) was 540mm wide, and was built of clay-bonded coursed rubble which survived only one course high. Subsidence had caused it to buckle, giving a false appearance of poor construction. The surviving wall course was butted against the reused south wall of the building (4329), though this relationship may be illusory. The walls met at the western end of the gap created by the partial removal of the south wall. Given that some effort was taken to provide a

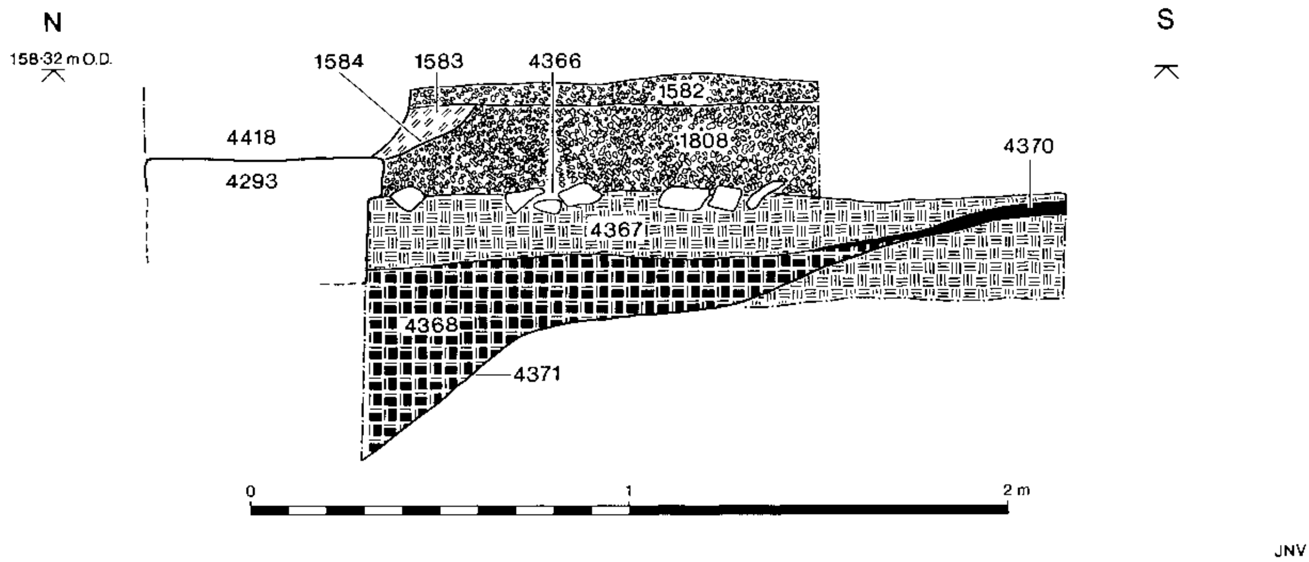

Fig 104 Section 7 (for location see Figs 51, 101, 114): shows the stratification associated with the Period 4a remodelling of Building 4400

bonded corner for the gable wall of Building 4402, the same was probably true of Building 4401, and the walls may have been bonded at a higher level. It has been shown above how deceptive apparent butting relationships between walls can be if only bottom courses survive.

Building 4401 was 7.5m long. A doorway with a paved threshold of broken roof tile and small flags (4360) was situated at the north end of its east wall. This gave access to the eastern portion of the former Room i which now formed an open yard between Buildings 4401 and 4402 (Figs 101, 111).

The internal arrangements of Building 4402 included the insertion of a stone-lined drain (3741) comprising two parallel lines of facing stones up to two courses high, running north–south for a length of 3.6m and forming a channel with an internal width of 2.2m and a depth of up to 310mm. Though the drain was interrupted by the insertion of a later wall, there is no doubt that it discharged through the south wall of the building which must have been remodelled at this point. Drain 4306 which ran southwards across the *via principalis* was a contemporary continuation of this feature.

Roads and drainage

The drain which ran from Building 4402 across the *via principalis* (3741, 4306; Fig 101) provided a vital stratigraphic link between the remodelling of Building 4402 and the contemporary road works which were associated with the blocking of the gate. Where it ran across the road the drain consisted of a layer of flagstones forming a base, with a single course of facing stones on each side, giving it a depth of 160mm, and an internal width of 230mm. It was very disturbed, having been robbed at a late date on its eastern side. The drain also appeared to be free-standing on its western side where robbing, ploughing, erosion, and the growth of a monkey-puzzle tree had taken their toll on its associated surfaces. Thus the drain was recorded over most of its length as perched on top of the primary orange gravel (1808) of the *via principalis*. At the southern end, however, where it could be shown that the drain was of one build with, and joined to, a roadside drain along the north wall of Building 198, some associated stratification was present.

The roadside drain with which 4306 communicated was clearly a secondary feature, as its south wall blocked the ventilation slots in the north wall (195) of the north *horreum*, Building 198. The construction of this drain was probably made necessary as a result of the fact that after the *horreum* was built the southward tending drain at its west end (3924) would no longer have been functioning. In order to insert the drain a broad cut (3853; Fig 25) was made through the primary road surface (1671/3854). This cut ran roughly diagonally east-west, along the *via principalis*, and was 150mm in depth at its northern edge, sloping gradually to 230mm at the south side. It was cut through the primary gravel road to the top of the clay beneath (3783), and the northern edge was 3.45m north of the *horreum* wall. Two parallel walls were then constructed on top of a 50mm deep layer of cobbles and gravel (1604), which probably acted as a soakaway. The south wall of the drain (1806) was a single-leaf wall 380mm wide, faced on the north side with a clay-bonded core packed between the face and the *horreum* wall. The north wall (1805) was faced on both sides, 610mm in width, with a thick clay and rubble core. The walls were very roughly coursed, using some facing stone, but mostly large rubble.

After the drains were built, the construction cut was backfilled in order to bring the road to a consistent level. The fill was a very compact, dark-brown matrix

Fig 105 The former south portal and tower of the porta principalis sinistra *with an annexe to the east*

of sand and gravel containing 60% large cobbles and 10% small-medium pebbles (1564/2964/1582/3876/1313; Figs 25, 101). This acted both as backfill for the construction trench and, with its compacted surface, as a new road metalling. The layer had an average level of +158.30m OD, as did the top of drain 4306. To the west, in the area of the *porta principalis sinistra*, this layer continued through the north portal, but butted against the west stone sill wall (4159) behind the blocked south portal. The surface was thus contemporary with the use of this wall. This was also the road surface (as 1582) which respected the south wall of Building 4402 (4418) and sealed the fill of the robbing and construction trench (1583) at the south-west corner of this building (Fig 104). These road deposits thus provided the stratigraphic link between the refurbishments which took place at the beginning of Period 4a.

The industrial phase

The *porta principalis sinistra*

After the south portal of the gate was blocked, it became possible to divide its subsequent development into three discrete areas. The largest of these was that of the south tower and portal together with an annexe attached to the east of both (Fig 105). The other two areas consisted of the open north portal, and the north tower which was turned over to industrial use (Fig 108).

South of the open portal (Fig 105)

The south guardchamber

The only layer revealed in plan within the ground floor guardchamber of the south tower was its latest floor: a surface of cracked and uneven sandstone flags, heavily disturbed by tree-root action (1702). During the partial demolition of the west wall of the tower (in order to examine the the rear of the Period 3 ashlar), it was apparent that a further flagstone floor lay beneath this, and that there was a make-up layer (4279) between these floors. The lower flagstone floor lay 780mm above the primary floor level of the guardchamber. A small deposit of yellowish-red silty clay (1703) in the south-east corner of the room may have comprised a hearth. The only other internal feature of the room was the presence of two pots (1688, 1689) set into the floor, one on each side of the doorway in the north-east corner. To the south was a complete BB1 pot which had been repaired with a lead rivet (Fig 106), while to the north was half of a greyware vessel, which had been cut from top to bottom and laid on its side (Nos 244, 245). The original doorway into the room was retained, and it seems that access to the guardchamber was gained from the annexe to the east.

Fig 106 BB1 pot (1688) embedded in the floor of the south tower of the porta principalis sinistra

The blocked south portal

The south portal was blocked off to the west by a high-standing blocking wall which survived to the full 1.08m height of the *spina* (4212; Figs 102, 103). To the east it was blocked by a wall (4235) of poorer construction, which survived only three courses high (Fig 105). Within the portal a floor of sandstone blocks and slabs, some of which appeared reused, was laid to form a rough paving (4247). The room was entered by means of a doorway through the *spina* wall which was later blocked (4278; Figs 33, 34, 105). Though there may have been additional access from the annexe no threshold was apparent in the eastern blocking wall.

The annexe

At the same time as the blocking walls were constructed, a further poorly-constructed wall of one course (4159; Fig 105) was erected 1.80m to the east of the east blocking wall. Though the area in front of the guardchamber was excavated only up to the line of Section 2 (Fig 26), the wall clearly originally extended across the front of the south tower as well as the portal. At its northern end the return of this wall was aligned with the *spina* of the gate.

Within the annexe were a series of features. The southern half of the building was floored with a compact layer of close-set smooth pebbles (4163). This was defined to the north and east by a timber slot (4154) 100mm deep and 200mm wide, which turned southwards against the east wall of the building. The east-west stretch of the slot lay immediately to the south of an apparent threshold in the annexe wall 4159. It was interrupted by a gap 250mm in width, at the south side of which was a small deep posthole,

Fig 107 Surfaces of the two most coherent working phases within the blocked south portal

possibly for the suspension of a door. Outside this partition, to the north of the threshold lay a pair of small stakeholes (4156).

The annexe appears to have been a short-lived structure. The end of its active period of use was marked by a stony brown soil accumulation (4139; Fig 26), which may have constituted an abandonment phase in this area. It was also marked by the robbing of the annexe wall by a pit 1.00m in diameter and 520mm deep (4157; Figs 26, 105).

Working deposits in the blocked portal

After the demise of the annexe a great many small deposits accumulated within the portal, probably representing a short period of very intense activity. The deposits were difficult to interpret due to intensive tree-root disturbance within the portal. Only two of the more comprehensible working phases are illustrated (Fig 107).

In the earliest phase an extensive and thick layer of compact clay (4214) formed a horseshoe around a hollow in the south-west corner of the room. On analogy with similar structures elsewhere on the site it seems most likely that this was a hearth, probably originally equipped with stone walls. This contained a layer of dark grey and black, carbon-rich silt (4200), overlapped on its southern edge by a gritty, silty black deposit containing a considerable quantity of flake hammer-scale and fragments of coal (4197). Further small deposits of burnt silt and clay were deposited before the doorway through the *spina* was blocked (4278; Fig 105). The fact that the door was blocked suggests that access was now provided from the east. Had the western blocking wall or the north wall of the south tower been pierced with doorways this would have been apparent from the surviving fabric. The worn state of the top surviving stones of the east blocking wall of the portal (4235) suggests either that the wall was levelled, and that the portal now became an open-sided structure, or that it had always been open to the annexe.

A layer of yellow-brown silty clay was now dumped against the west and north walls of the room (4177), and a rectangular pit (4125) 250mm in depth and measuring 1.10 x 900mm was set centrally in the floor of the room. This was filled with laminated material composed of black carbon alternating with dark red-brown layers including flakes of iron hammer-scale (4124) of the type formed during the shaping of wrought iron (McDonnell 1991). The pit was overlain by a number of small dumps of coal and ash (4120), silt and clay (4122). Several of these layers were rich in flake hammer-scale, and the final layer (4078; Fig 107) in the dumping sequence was a crunchy industrial waste deposit 200mm deep, comprising flake hammer-scale, carbon, and small pieces of coal. This deposit covered the entire southern and central area of the room.

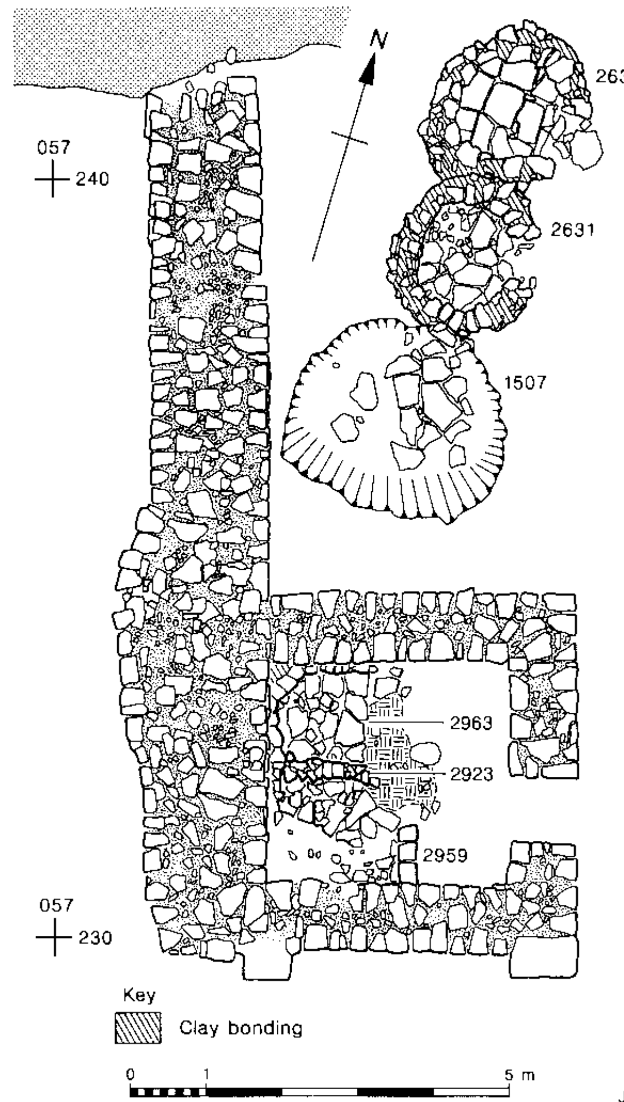

Fig 108 North tower of porta principalis sinistra, *showing hearth, and ovens set in the rampart to the north*

The waste layers appear to have initiated a new working phase which was less disparate than the last, though still difficult to comprehend. It was associated with the use of a stone hearth or oven (4054) 600mm in diameter of which a single course survived at a height of 100mm. All of the upper surfaces of the oven were blackened, though there was no heat reddening on the flat bottom stones, or on the side blocks. The side walls were set to slope inwards, suggesting that they were made to hold a clay dome. Herringbone-set slabs (4056) were added to a stone surface in the south-east corner of the room (4102) to make a floor associated with the use of the hearth. A laminated series of deposits of yellow clay alternating with black carbon (4055) were built up during the life of the hearth, and were presumably generated by its use. Almost in the entrance to the portal was a 100mm deep semicircular cut (4040), and on the northern side a small group of three stakeholes (4038) was located to the south of a 250mm square posthole 150mm deep (4043). Like the previous phase this ended with a deposit of industrial waste: a 100mm thick deposit of silt which was 90% carbon, granular coal, and flake and spheroidal hammer-scale (4025) spread over the northern side of the room.

The phase associated with the small oven was followed by one which had a stone box (3996) as its focus. This was 450mm square, and was built of edge-set flat stones embedded in the ground. It was open on the west side and had a flagstone base. It contained nothing. This feature was associated with a succession of dumps of yellow clay and carbon debris, though these now partially overlay the eastern blocking wall (4235). The stone box continued uncovered and probably in use during the deposition of a series of soil dumps (3985, 3973), culminating in a floor surface of flat flagstones set in grey-brown silt (3952).

This floor overlay the eastern blocking wall of the portal to merge with the latest flagged road surface (2843) of the *via sagularis*. A total of 460mm of deposits had accumulated between the first flagstone floor (4247) of the blocked portal and this final surface.

The north guardchamber

Like the south portal of the gate, the north guardchamber was utilised for industrial activity (Fig 108). The evidence for this took the form of a hearth (2963), associated with a large number of waste and working deposits, most of which comprised small dumps and lenses of soil, clay (most of which was partially fired), and black industrial debris which included charcoal, mineral coal, and hammer-scale (the micro slags generated during smithing). On examining these deposits *in situ*, Dr J McDonnell noted that:

> the layers of charcoal, coal, hammer-scale, and soil probably built up quickly, since no attempt seems to have been made to clean back to a floor level during the use of the hearth. The hearth must have been occasionally cleaned out onto the floor and then reused. This could be interpreted as a very short-lived ironworking activity.
> (McDonnell 1991)

Though the debris layers were individually recorded and planned they will, therefore, be treated here in short summary only.

Before the beginning of the industrial phase, there were a number of attempts to make-up the floor with deposits of clay and sand. It is possible that there was an early hearth represented by a clay and cobble core (2995), though the fact that these deposits were only

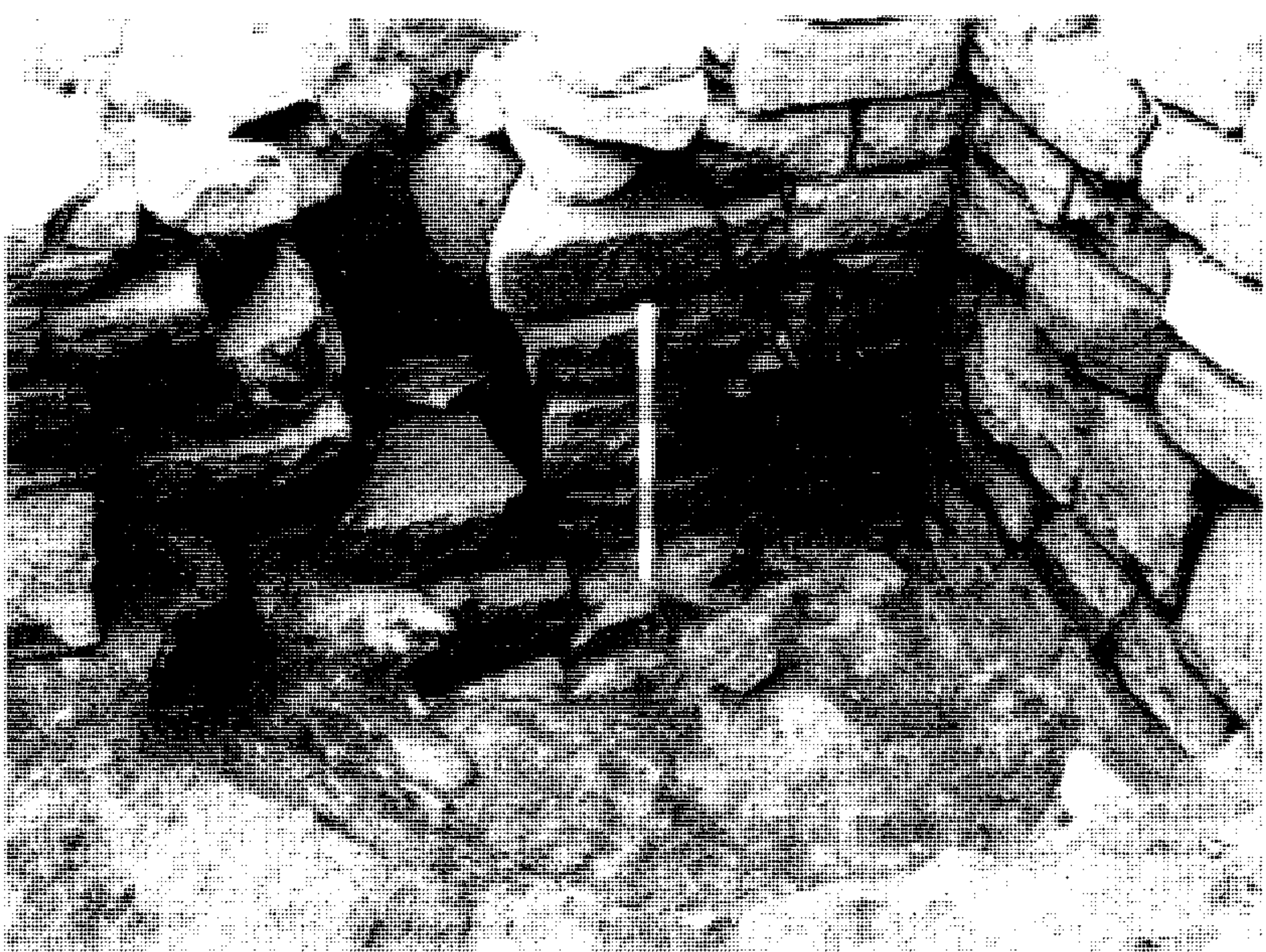

Fig 109 Flue in south wall of north tower of porta principalis sinistra

half-sectioned within the tower (Fig 28) meant that they could not be readily interpreted.

The large hearth built on top of these deposits (2963; Figs 28, 108) comprised an area of paving stones, irregular in shape, and probably reused, set in slightly-sandy reddish clay. One course of walling remained around the upper rim of the feature. The hearth covered the whole of the western half of the tower floor. It seems likely that the construction of the hearth was contemporary with the piercing of an opening in the south wall of the room at ground level, which gave into a flue within the thickness of the wall (Fig 109), presumably allowing either ventilation or a through draught for the fires inside.

The first deposit on the hearth may represent the latest working deposit of a period when the hearth was kept clean. This (2962) was a thin skim of black silt, 50% of which was carbon. After this was deposited, a single-course dividing wall bonded with clay (2923) was laid down the centre of the hearth.

Above the dividing wall were a number of laminated working deposits consisting of carbon and clay. A small length of wall comprising four squared blocks (2959), including a reused altar base, was built along the eastern edge of the hearth after these were deposited. This wall had the effect of dividing the hearth from the eastern part of the tower. The working deposit associated with the divided hearth covered the whole of the floor except the hearth itself. This was a black layer containing both spheroidal and flake hammer-scale, coal, and charcoal. It had a sharp crunchy texture (2900).

For most of the remainder of the life of the hearth, there was a sharp division between the sparse deposits on the hearth itself and the thick layers of black industrial debris (2881, 2882) to the west which probably reflected rake-back from work on the hearth. The treading of black material into road surfaces outside the chamber was also attested (2885), though the ghost of a stone doorsill is suggested by the fact that the internal and external layers seemed to stop on each side of a separating element.

Shortly after working debris had begun to spill over from the floors onto the hearth it may have been replaced. The evidence for this is a circular clay ridge between 300mm and 30–40mm high and 1.00m in diameter. This working phase is marked by a number of cuts into the robbed hearth including, on the south side, a sub-circular posthole (1698), and in the south-west corner of the room a substantial pit (1699), 1.14m x 860mm x 380mm deep. Both these cuts were filled and sealed by a thick layer of black silt (1690) containing charcoal, coal, and the spheroidal hammer-scale which is characteristic of fire welding (McDonnell 1991).

At this point the interior of the room became choked with debris, again including large quantities of hammer-scale, coal, charcoal, and some lumps and fragments of smithing slag (1748, 1666, 1657, 1332). J McDonnell (ibid) notes that 90% of the hammer-scale in these deposits was spheroidal, the rest flake. At the end of this phase, or possibly at the beginning of Period 4b, it seems that the doorway to the tower was walled up. No further accumulation of surfaces took place, and a large block measuring 700 x 350 x 250mm was laid in the entrance. This stone had some signs of bar-cramp slots on its short sides, though these had been worn away by subsequent wear. It appears to have seen multiple reuse.

The rampart ovens

To the north of the *porta principalis sinistra*, in the rampart west of the *via sagularis*, lay a clamp of three ovens. (Figs 108, 110). These were exposed but not excavated, and the structures were left *in situ* and consolidated.

The southernmost of these features was almost totally robbed. All that remained was the flagstone base (2711) in the bottom of a robbing hole (1507). The two more complete ovens (2631, 2630) were of identical construction. First a shallow pit, 250mm deep was excavated. This was lined at the bottom with well-laid, rectangular flagstones. The walls were built of irregular stones, including both reused facing stones and roofing slates. Two courses survived, the second

Fig 110 Range of ovens set in the fort rampart to the north of the porta principalis sinistra

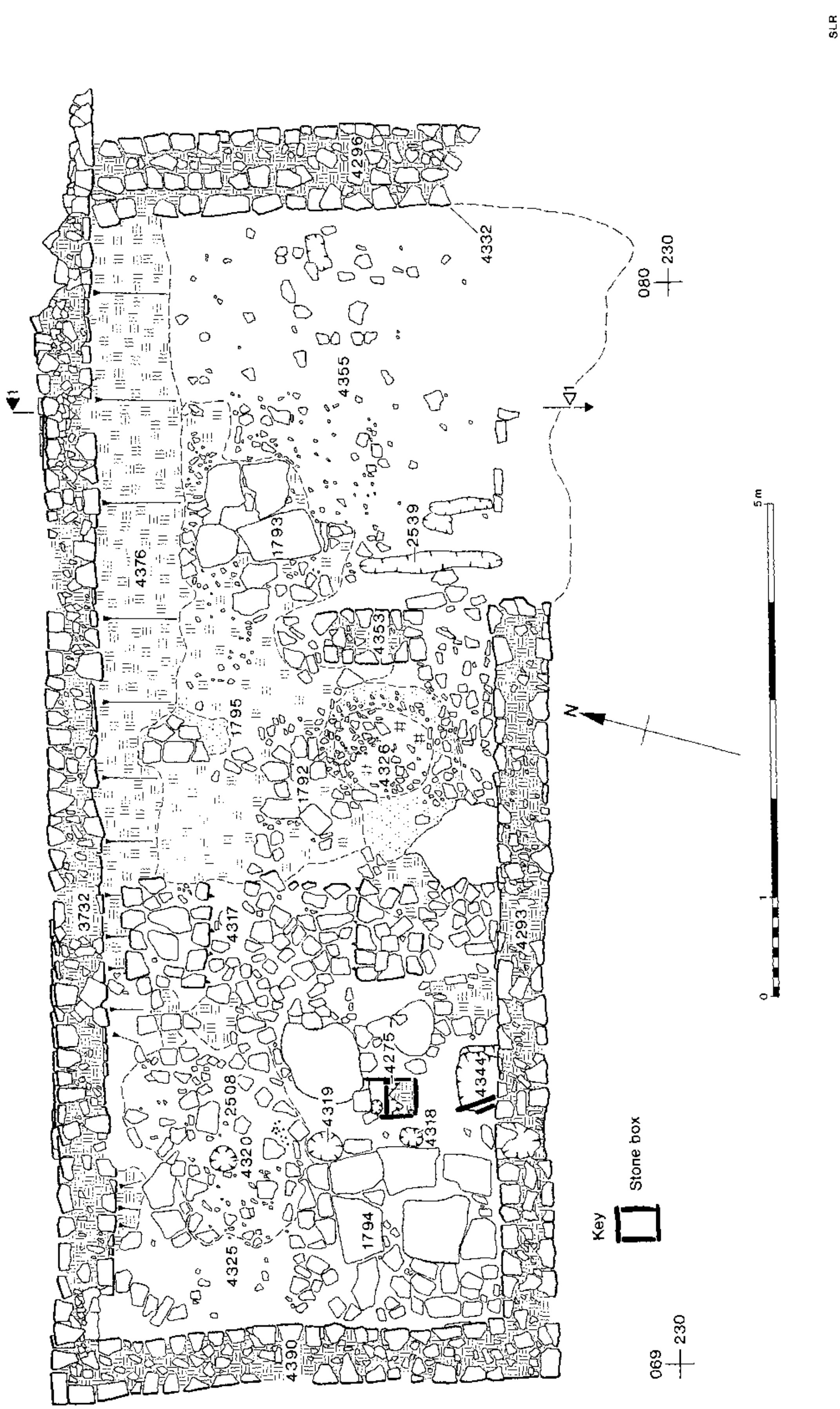

Fig 111 Plan of Building 4401, Phase a

battered over the lower course to give the start of the beehive shape of the oven superstructures. The walls were bonded with a silty clay which was burned to a red colour. Continual use had broken and crazed the flagstones in the bottom of the oven.

Both ovens contained patches of black carbon-rich ash, representing firing residue (2606, 2654). The remnant charcoal from this deposit was examined by J P Huntley (1991, 27). It included ling, pine, oak, and a fine grained wood from either birch, alder, hazel, or a mixture. Oak is not a very common wood in the area, and the deposit may represent the burning of offcuts from building, or material reclaimed from structures which could not otherwise have been reused. The other woods were probably from locally-growing trees and scrub, though pine is rare in the area today. The ling may have been used for kindling as it burns rapidly and would not produce a sustained heat. The single wheat grain may have derived from cooking.

In the northern oven was a patch of burnt clay (2653) which probably consisted of part of the wall bonding. Above this, a flat layer of carefully laid flat stones (2623) may have constituted a reflooring. This in turn was sealed by a layer, 50mm deep, of burnt clay with charcoal inclusions (2604), which formed the main fill of the oven and which probably comprised part of a collapsed clay dome or superstructure. An exactly similar layer sealed oven 2631 (2605).

Building 4401

by Sara Rushton

Phase a

This phase (Fig 111) represents the period of use of Building 4401 immediately following its remodelling as a free-standing unit as part of the works associated with the blocking of the south portal of the *porta principalis sinistra* during Period 4a (Fig 101).

The building was used for industrial purposes, and distinct zones of use were apparent within the building and immediately to the east. The earliest interior surfaces consisted of a number of elements. A layer of light red clay (4334) covered the east end of the building and contained a hearth setting (4326) which was inserted in the angle between the south (4293) and east (4353) walls. This hearth comprised rough cobbling and clay, burnt to a depth of 100mm. In the centre of the room were two slightly-raised, rectangular, parallel areas of laid stone, the lower area between which was paved with similar irregular blocks (4317). To the west this surface was heavily disturbed by later cuts. The central stones had a lot of fine charcoal on and between them. The surface appeared to have been patched at some stage with slightly smaller, more angular stone. Contemporary with this in the south-west corner of the room was a flagged area (1794).

The stone surfaces in the south-west corner were cut by a series of three stone lined boxes which were set into the floor. These were constructed by digging pits into which four stone slabs were laid on edge in a square. The pit was backfilled around the box thus formed, usually with clay. The earliest box (4352; not on plan) was almost entirely destroyed by later activity. It had been filled with silty charcoal and industrial waste (4340), which was sealed by a fresh base of sticky clean clay (4324), into which fine charcoal had become ingrained. The feature which succeeded this was a second box measuring 540 x 460 mm, lined with a packing of hard clay (4338) against which the laminated sandstone lining (4275) was placed. The lower fill comprised dark, gritty charcoal and industrial waste (4337). This box was altered at the end of the Phase by the insertion of a second clay base (4336), and an internal sandstone slab, which divided the box into two segments. The northern segment was 340mm deep, the southern only 170mm in depth. Cut into the clay base of the box were three small stakeholes and two triangular cuts (4276). The southern segment had two fills, (4138, 4132), both of which contained charcoal and iron. North of the division the lower fill (4180) was silty clay containing charcoal, above this was a looser fill (4173) containing charcoal, iron, and bronze.

Another box lay immediately to the south. There was some evidence that this too was of two Phases as the east edge of the cut (4344) had been recut, and there was a double thickness of stone lining (4351), separated by a thin layer of fill on the west side. The lower fill of this box was a dark charcoal rich silt (4343).

Between Building 4401 and the west wall (4296) of Building 4402, a thick (250mm) layer of sandy loam (4355) accumulated. This was the earliest layer to seal the demolished portion of the south wall of Building 4400, and also overlay the latest Period 2 crushed greenish sandstone road surface (3927). It was cut by an eavesdrip gully (2539), which ran parallel to the east wall (4353) at a distance of 200mm. At the north end of this wall over the centre of the Turf Wall ditch, the subsidence which subsequently bedevilled this building had begun, necessitating levelling with clay (4374). Above this a softer red clay loam (1795) was laid as bedding for a flagstone floor (1792, 1793) which appears to have originally covered a large area in the north-east corner of the building, through the doorway and into the area to the east. This floor respected the stone surfaces in the centre of the building (4317), and also the hearth (4326). To the east of the building, apparently after some of the flags were robbed, clay 1795 was sealed by an extensive layer (4234) containing a quantity of moderately large and very corroded pieces of iron.

Within the building layers of mixed, dirty clay loam (4325, 2508) built up against the east edge of flags 1794 and overlay the north-west edge of 4317, forming a level surface. These were cut by three postholes (4318, 4319, 4320) on a north–south alignment.

Phase b

Demolition and continued activity

During the activity associated with the use of the stone boxes the building was reconstructed. The north and west walls (3732, 4390) were demolished down to their sixth course, as was the western 3.60m of the south wall (4293). This did not, however, stop the activity associated with stone boxes which was apparently carried on in the open for a short time (Pl 5).

Two boxes were set into the partially demolished south wall (Fig 112), and sealed by its replacement. The westernmost (4274) measured 450 x 450 x 350mm, and was constructed in the same way as its predecessors. It too was filled with dark silt (4148) containing a high percentage of charcoal, fragments of bronze, iron, and wood. Cut into the clay bottom of the box were two small stakeholes and a long irregular cut (4277), and running diagonally across the south-east corner was a clay ledge 90mm high. Only the north and west sides of the second box (3990) survived. It had internal dimensions of 450 x 300 x 200mm and was filled with compact black loam (3851) containing charcoal and fragments of bronze. Box 4274 was surrounded by a wide clay platform which covered the levelled part of the south and west walls (1963). The clay was very clean along the top of the west wall, but mixed and dirty along the top of the south wall, possibly indicating that it was used as a working surface in conjunction with the box. Box 3990 was sealed by a plug of hard yellowish red clay (2950, 2869).

Rebuilding

The free-standing, gabled Building 4401 of Phase a was replaced by a pentice structure with an open east end which utilised the south wall of the Building 4403 as its north wall (Fig 113, reconstruction, Fig 61). The original north wall was sealed with clay (4239), and a series of three equidistant (4345, 4347, 4349) postholes were cut into its top. These were probably to support roof timbers associated with the lean-to construction. The building was thus widened to 4.60m.

The rebuilt west wall (4143) was 5.8m long. It oversailed the former north wall (4732) to abut the south wall of Building 4403 (2969). At its south end it was bonded with a return (4080, 2866), which ran eastwards for a length of 3.6m, using the former clay platform (1963) as a foundation. To the east the earlier narrow south wall (4329) was bonded with this new return and continued in use. The rebuilt walls consisted of clay-bonded, rather poor coursed rubble, and were of irregular width (720–900mm). They survived to a maximum of two courses high. The bottom course of the rebuild was made up of very large, irregularly-shaped stones.

To the east of the building, set almost centrally, was a rectangular pier base measuring 1m x 400mm (4223)

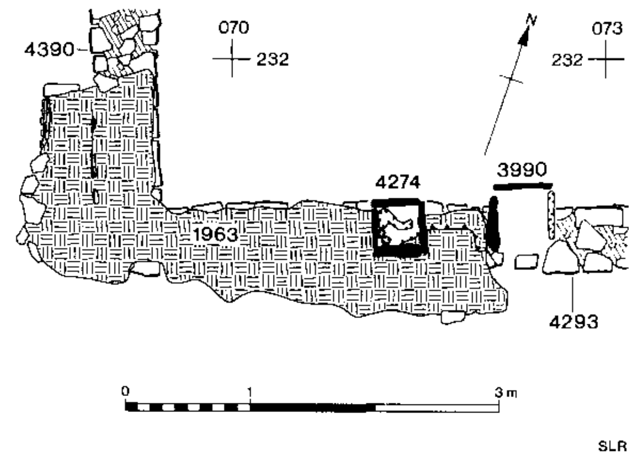

Fig 112 Plan of stone boxes set in clay platform during the rebuilding of Building 4401, Phase b

made of neatly dressed sandstone blocks, two courses high. At least one of the stones in this structure was of the type used in the quoins of the piers of Building 4403. This had the appearance of a structural element, possibly supporting the roof at the open end of the building, an interpretation which is reconstructed in Figure 61.

Phase b (i)

In the south-west corner of the building, another stone box (3995), measuring 420 x 420 x 200mm, was set into the earlier flagged floor (Fig 113). The original base was replaced with flat stones. In the gaps between the sides and base of the box in opposite corners, two stakeholes (4005) were inserted. The top of the box lay virtually flush with the surrounding surface and its fill (3891) consisted of fine charcoal and also contained fragments of iron and bronze.

To the north of the box lay a feature (4142) interpreted tentatively as a drying kiln. This was inserted through the west wall of the building. Outside the building was an L-shaped channel 1.2m long, the eastern side of which was formed by the outer face of the west wall (Figs 113, 114). The channel was embodied in a new road surface comprising fine orange-brown gravel (4141) which was laid to the west of the building. Inside the building the structure was extensively robbed, though it seems that it terminated in a shallow trough at its eastern end.

In the centre of the building a stone box (4009) with internal dimensions of 520 x 520 x 290mm was constructed in a pit (4026) packed with clean clay, which cut a layer of charcoal (4119) which had sealed box 4275 in the previous Phase. There were two fills to this box both of which (4007, 4008) contained a high proportion of charcoal, coal, iron, and bronze. Immediately south of this lay a rectangular cut (3999) which had housed a stone box which was robbed and replaced during the following working phase (Phase b (ii)). In the base of the box were two small stakeholes.

Fig 113 Plan of Building 4401, Phase b (i)

Fig 114 West end of Building 4401, Phase b (i) from the west

To the south and east of the pier base (4223) lay an extensive layer of pink clay (4127) which contained burnt patches and flecks of bright-red burnt clay and charcoal. As the building was open to the east these layers represent an exterior surface. Incorporated in this was a sub-square stone hard standing (4135). Integral with the clay layer (4127) there was later a shallow square feature 1.6 x 1.6m with an upstanding lip (110mm) of very burnt clay running along the eastern edge (4129). To the east of these deposits, within the open area between Buildings 4401 and 4402, lay an extensive layer of pink clay loam (4175) which contained burnt patches (4176) and flecks of bright red burnt clay and charcoal. These layers may represent an exterior surface on which a different or ancillary type of industrial activity took place in the open.

Phase b (ii)

During this Phase (Fig 115) the 'pier' (4223) went out of use, and was covered by a deposit of burnt clay (4052) above which was built a drain (3945). This consisted of two parallel lines of roughly dressed stone running north-south for a length of 1.6m, forming a channel with an internal width of 200mm. The southern end of this drain (2871) was pierced through the south wall of the building at the point of reduction between the rebuild (4080, 2866) and the original wall (4329). It was contemporary with the laying of a major road surface 2929/2924/3885/3886 on the *via principalis* and *intervallum* road. Drain 3945 seemed to mark a division in use within the building. The stone boxes and drains were confined to the west, and areas of burning and possible hard standing to the east.

A layer of mixed hard clay (3979) covered a large part of the western end of the building. It sealed the earlier stone boxes and appeared to be the working surface associated with a later set. There were two boxes associated with this later phase of activity: 3994 was a well-preserved example with internal dimensions of 220 x 340 x 250mm (Fig 116). The lower fill of this box (3798) contained the usual charcoal flecked throughout with bronze, and the upper fill contained a small crucible (Fig 174, No 251).

A number of fragmentary surviving features at the west end of the building attest to the wholesale later removal of surfaces belonging to this Phase. The final stone box (4000) survived only as a tiny portion of its north-east corner, including part of the flagged base. This box sat much higher than 3994, was certainly stratigraphically later and may represent a phase of activity which was almost totally removed by truncation. Context 3884 was a band of clay loam which lay against part of the inside face of south wall 4080. The northern edge of this layer was sharp and vertical, indicating that it was the remnant of a deposit that had been cut through and mostly removed. If an intermediate phase was scooped away almost in its

Fig 115 Plan of Building 4401, Phase b (ii)

Fig 116 Stone box 3994 with remnant of box 4000

entirety, then the construction of a drain (3850) in the position of the former drying kiln (4142) may be a phase later than is apparent from the surviving stratigraphy.

A drain 150mm wide pierced the west wall of the building (3850). It survived in a more or less complete state and consisted of two parallel lines of roughly-faced stone standing two courses high at most. It pierced the west wall and ran roughly westwards over the road surface where it was later robbed. The drop in height of 3850 as it crossed the west wall into the interior of the building (from 158.43m OD to 158.25m OD) clearly indicates that it was running into the building rather than out of it. This is also substantiated by the thick deposits of greenish silt (3772) found only in the interior section of the feature. Drain 3850 may have replaced 3945, as it lay on top of the road surface with which 3945 was built (3886/3885). Drain 3945 was remodelled and shortened by the insertion of a blocking stone, and rubble to the south of this (4128) may represent its destruction.

The east edge of drain 3945 was sealed by a patchy layer of very hard, clean pink clay (3881). This was cut by a linear slot (4207) which terminated at the southern end in a circular posthole (4206), and it is possible that a further longitudinal slot ran from this posthole eastwards. To the south of this, 3944 was cut by a number of shallow, circular postholes, most of which had charcoal-rich fills (3762, 4230, 4231, 1420, 4229), and a long, shallow cut (4227) filled with clean pink clay (4228). These features may represent timber supports to the open side of the building.

In the far north-east corner of the building an extensive burnt layer (4162) made up predominantly of charcoal may have been associated with this phase, though it could equally have belonged to the preceding phase of the building.

When Building 4401 Phase b came to an end, the west and south walls of the building were again demolished, or simply collapsed, down to the bottom one or two visible courses. The interface between Building 4401 Phase b and Building 4401 Phase c is very clearly marked by layers of rubble and soil (3750, 3751; Pl 6, Fig 122) containing charcoal and clay as well as roof tile, and two fragments of string course moulding similar to those used in the *porta principalis sinistra*. These deposits covered the entire interior area of Building 4401, and were completely different in character from those which marked earlier interfaces between phases in Buildings 4400 and 4401. Between Phases a and b of Building 4400, an even and consistent make-up layer was deposited upon which to build the inserted partition cross-walls. Between Building 4400 Phase b and Building 4401 Phase a, the minimum of demolition took place in order completely to remodel the building, and the deposits deriving from the demolition were either used to make-up subsided areas, or were apparently removed. Between Building 4401 Phases a and b, activity continued during rebuilding, as attested by the construction of stone boxes, apparently in the open. The interface between Building 4401 Phases b and c seems more to reflect a period of disuse or desertion for the building.

Building 4402

by Sara Rushton

Phase a

This Phase (Fig 117) marks the primary use of the building as remodelled in Period 4a (Fig 101). As the internal subdivisions of the building were basically the same as the rooms of Building 4400, from which Building 4402 was remodelled, the same room numbers (compare Figs 50 and 117) have been retained for the following description.

Room ii/iii

The partition wall (4290; Fig 10) between the former Rooms ii and iii was robbed in order to form one long room, measuring 9.4 x 4.2m. The south-east corner of the room was now occupied by a rectangular area of compact, even cobbling (4098) covering an area 2.8 x 2.3m. This cobbled platform was defined on the northern

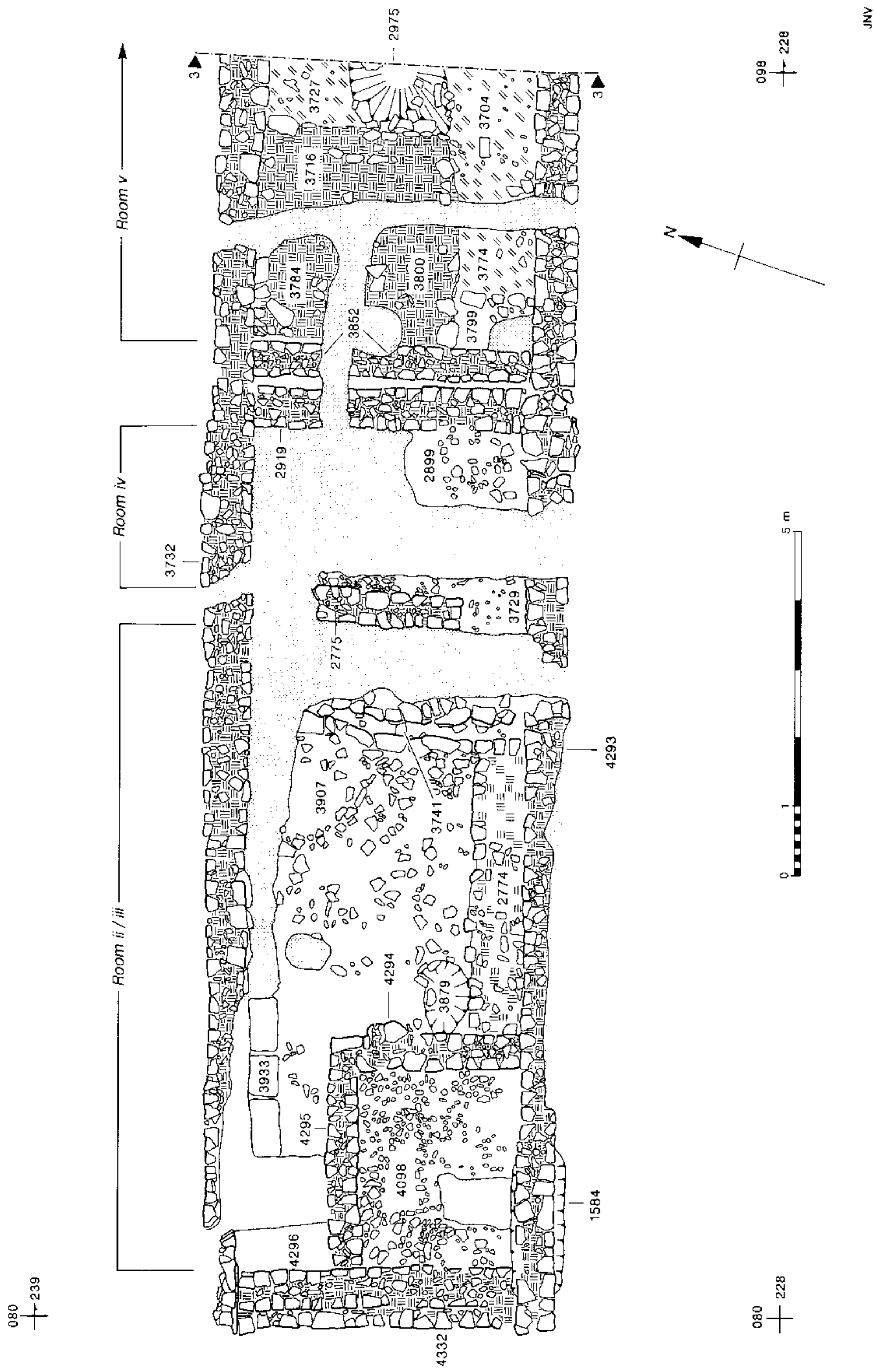

Fig 117 Plan of Building 4402, Phase a

and eastern sides by low walls, four courses high and 450mm in width (4294, 4295). The surface of this platform saw long use, and was repaired several times.

At the east end of the room was a stone-lined drain (3741) comprising two parallel rows of facing stones two courses high, running north-south for a length of 3.6m. They formed a channel with an internal width of 2.2m and a depth of up to 310mm. This drain ran across the entire width of the building and crossed the exterior south wall (4293) to join the drain (4306) which ran across the *via principalis* (Fig 101). This drain was contemporary with the major alterations of Period 4a. Butting against the drain and the eastern wall of the cobbled platform (4294), and longitudinally against the south wall of the building (4293) was a wide band of mixed brown clay retained on its north side by a single-leaf wall (2744) which survived up to three courses high. This feature was 4m long and may have functioned as a work bench for some industrial purpose.

At the same time as these features were built, three large, reused impost stones (3933) were laid end to end, flat side uppermost, against the inside face of the north wall (3732), covering a length of 2.3m. They probably functioned as a buttress to support the north wall against subsidence caused by the underlying Turf Wall ditch.

The earliest layers associated with this series of stone structures comprise small layers and dumps rather than one consistent surface. These were sealed by a layer of hard, dark greyish-brown silty clay loam containing many stones (3963), which covered most of the interior of the room apart from a small strip in the north-east corner. Further small patches and dumps in this surface were sealed by a second extensive layer (3907). This was a thick layer of compact reddish-brown sandy clay containing stones, charcoal, tile fragments, and lenses of burnt clay. It covered a large part of the interior of the room, but avoided the areas around the drain (3741) and stone and clay 'bench' (2774). This surface was cut by a shallow pit (3879), and was again sealed by small mixed dumps and patches, many of which included burnt clay, ash, and charcoal.

Room iv

The threshold in the south wall of this room (Fig 50) was blocked with a segment of poorly-built wall (2920). A cobbled surface (2899/3729) covered most of the small area of this room available for examination. A new east wall for this room (2919) was built directly on top of these cobbles. It butted the north wall (3732) of the building and the threshold blocking wall (2920); it had no foundation but was a well-built wall 650mm wide, clay bonded with a rubble core. Assuming that wall 2775, which was stratigraphically isolated, was the partition between Room ii/iii and Room iv, the room would have measured 2.5 x 4.2m.

A number of repairs were effected to the cobbled floor (2899/3729). The most likely reason for the construction of an additional wall between Rooms iv and v is as a lateral buttress to minimise the effects of subsidence.

Room v

The large, raised clay platform set in the angle between the north and west walls of the building during the initial subdivision of Building 4400 during Period 2b (Figs 50, 53) was sealed with a third thick layer of burnt clay (3800/3716/3784) which formed a smooth and fairly level surface. This was retained by additional stones added to the low walls (3806, 3799). Three small pieces of flagstone were laid on the north edge of the surface (3715), which was cut to the south west by three small stakeholes filled with dark, loose silt (3743, 3745, 3747).

The surface associated with the clay platform in this phase was a layer of dark clay silt (3704/3774) containing ash, charcoal, and some burnt clay. It was cut by a large pit (2975). The pit was 1m in diameter and 350mm deep. It was in exactly the same position as an earlier pit (3939) and may have been a re-cut of this feature. A small semi-circular cut, possibly a posthole (2974), lay in the north-west corner of the pit. Both features were filled with dark reddish-brown, sticky clay (2952; Fig 22). These features were followed in this Phase by a number of small dumps of clay and stone, most of which may be interpreted as partial floor resurfacings.

Discussion of the industrial buildings and deposits

It seems that a major phase of metalworking, which consisted predominantly of ironworking, took place within the ground floor rooms of the *porta principalis sinistra* and in Building 4401. The deposits associated with these phases were examined *in situ* by J McDonnell, who also examined the slags and other residues. His report (McDonnell 1991) is drawn upon for the purpose of this discussion.

The structures produced very little of the industrial waste such as iron slag which might have been expected from a working site. It was however, a noticeable feature of the 1987–92 excavations that general rubbish of any kind was conspicuous by its absence. It seems that waste was disposed of in areas beyond the limits of these excavations and it is possible that the nearby cliff edge offered a convenient place for rubbish disposal. As a consequence of the scarcity of diagnostic debris, the interpretation of the buildings and features as industrial must rely on their form and also most importantly on the evidence of the soil samples.

It has already been noted that the deep and complex deposits to the east of the hearth in the north guardchamber were probably accumulated swiftly and represented a short-lived period of ironworking. Unlike Building 4401 there is no evidence from the guardchamber for truncation and the wholesale removal of accumulated deposits, though this might have taken place. Such periodic thorough cleaning would extend the possible working period of the hearth. During the working of the subdivided hearth (assuming that both halves were worked together) there would have been a need for two bellows, two anvils, and at least two smiths. There would have been little working space available, and therefore large scale working could not have taken place. The soil samples from the chamber contained a great deal of hammer-scale, of which 90% was spheroidal, the rest flake. This is unusual since it is believed that spheroidal hammer-scale was generated during fire welding and flake during shaping and forming, thus flake should predominate in a general smithy (Table 9).

It is probable that the excavated deposits represent the last working of the hearth. After this the chamber was allowed to become filled with debris, mostly consisting of small fragments of slag, hammer-scale, charcoal, and coal, and was not finally cleared out. The door was subsequently blocked.

In the blocked southern portal of the gate the earliest deposits of coal and hammer-scale were associated with what appeared to be the remains of the clay core of an oven. This appears to have been robbed, though industrial waste continued to be deposited into a pit. It is possible that a phase of working was truncated before the initiation of the next phase, which centred on a small hearth, and ended with a widespread deposit of coal, charcoal, and hammer-scale. The following phase was centred on a stone box, and included some industrial layers, but disturbance by later tree roots made it impossible to characterise or interpret this phase.

The deposits in Building 4401 Phases a–b suggest that it should be identified as a workshop or *fabrica*. In this building it seems that disturbance of the floor levels was constant, though consistent horizons of truncation (as defined by Yule 1993) were generally not satisfactorily identified. The most persuasive argument for such a horizon comes from Building 4401, Phase b (ii) (Fig 115) where it seems likely that a whole working phase at the west end of the building, including stone boxes, was removed prior to the construction of a drain (3850). Given major episodes of truncation of this kind, and the possibility that such episodes might have occurred and left no clear archaeological trace, it must concluded that that the recorded archaeology does not include the entire sequence of working within the building, and the sub-phases within Phase b are merely the most cohesive phases within a sequence of continuing deposition and truncation. It is thus difficult to reach coherent conclusions on the nature of activity within the building.

Though there was no sign of any hearths, the presence of hammer-scale (Table 9) and the partial firing of clay floors and layers indicate that the heating and working of iron was being practised in the building. An important indicator as to the kind of work carried out would be provided if some conclusion could be reached on the function of the ubiquitous stone boxes which were constructed throughout the working life of the building in Period 4a. Stone boxes have been found in several turrets on the Wall, including 7b (Denton) and 35a (Sewingshields Crag). At turret 51b (Lea Hill) a clay-lined stone box was associated with coal and a large hearth (Woodfield 1965, 174, 183). In no case has any explanation for these boxes been suggested. At the villa of Dalton Parlours, West Yorkshire, an unenclosed stone box was found. Here the packing around the box as well as the fill contained slag, coal, and hammer-scale. It was suggested that the flat stones which formed the sides of the box were actually packing for an anvil base formed from a squared timber (Wrathmell and Nicholson 1990, 71–72). At Norton, Cleveland (Hayes, 1988, 89, pl 26), a similar box was found, and compared with those found in Romano-British rural settlements in Yorkshire and Northumberland. This example was interpreted by Swan (1984, 47) as a container for the storage of clay

Table 9 Summary table of metalworking waste from sampled contexts of Periods 4a and 4b

structure	*context*	*hammer-scale*	*SS*	*HB*
porta principalis sinistra				
north tower	1657	*sf		
	1666	*sf		
	1668	*sf	frags	
	1690	*s		
	1697	*s	500g	
	2793	*		
	2796	*		
	2799	*		
	2800	*		
	2803	*		
	2804	*		
	2806	*		
	2844	*		
	2900	*		
	2970	*		
	3755	*		
blocked portal	3851	*		
	3964	*		
	4120	*f		
	4122	*f		
	4124	*f		
	4125	*sf		
	4178	*f		
Building 4401 Phase a	4026	*		
	4051	*		
	4119	*		
Building 4401 Phase b (ii)	2628	*sf		*
	2823	*f		
	3772	*		
	3812	*		
	3899	*		
	3909	*		
ditch Phase d	1605	*sf		

abbreviations:
SS = smithing slag
HB = hearth bottoms
s = spheroidal hammer-scale
f = flake hammer-scale

for the use of a potter. They appear not to be uncommon on pottery kiln sites, occurring also at Mancetter, Whitehill Farm, and in the Nene Valley (ibid). Such simple containers would, it may be suspected, have been liable to a great many uses, but it is in association with evidence for metalworking that they are relevant here. At turret 51b the box was clay-lined and thus watertight, and it seems likely that it served as a quenching box of the kind used by a smith working at the anvil both to quench his work during the case-hardening and tempering process, and to cool down his tongs. Furnaces were often raised, and anvils would be placed on a block (Manning 1976); it is possible that neither would leave any archaeological trace other than the hammer-scale and semi-fired clay resulting from their use. Several of the stone boxes at Birdoswald were either built in clay-lined pits or retained traces of clay lining, and these might have functioned as quenching boxes. The boxes were generally at least part-filled with industrial waste and were frequently replaced, possibly as a result of leakage. One stone box in Building 4401, Phase b (i), was better made than the rest. It was set in an area of flagging in the south-west corner of the building (3995; Fig 113), and was provided with a flagstone cap. The box was filled with fine charcoal. After examining this box, J McDonnell (1991) suggested that it might have been used as a carburising pit, used to raise the carbon content of iron to produce steel. A piece of hot iron would be placed into a pit filled with charcoal, causing some carbon to become alloyed with the surface of the iron.

In Building 4402, workshop activities may also have been practiced, though this did not apparently involve metalworking. Rooms ii/iii and v had apparently specialised layouts. Room ii/iii featured a raised cobbled platform in the south-west corner, and on the eastern side of the room a drain ran across the *via principalis* to discharge into a roadside drain. Between these two features against the south wall was a stone-fronted raised area which may have functioned as a workbench. This layout suggests a process: something may have been kept or stored on the platform, worked with on the bench, and waste liquid poured away down the drain. It is not possible to go beyond this and suggest what sort of work was undertaken, however. The clay platform in Room v also may have had some specific function, but it is again impossible to suggest what this may have been.

It seems that Buildings 4401 and 4402 were both *fabricae* with specialist functions during Period 4a. It seems probable that the remodelling at the beginning of the Period was deliberately to provide separate buildings for different crafts. The ironworking of Building 4401 may have been detached from the rest of the building in order to minimise a potential fire hazard.

Fabricae have been identified in a number of auxiliary forts. Perhaps the most similar to Building 4401 is the *fabrica* at Cramond (Rae and Rae, 1974, 181–3). This building (Block B) was similarly located on the north side of the *via principalis*, in the *praetentura*, but adjacent to the *porta principalis dextra*. The floor of the first phase, which appeared to be Antonine in date, contained three stone boxes associated with a hearth, a kiln, and two tanks, and was strewn with tiny pieces of bronze and lead scrap. Every element of the arrangements in Building 4401 was present, with the addition of the tanks, but the phase was disturbed, and no associated walls were found. At Crawford a building next to the *porta praetoria* containing slag and crucible fragments was identified as a workshop (Maxwell 1972, 177, building IX). The closest parallel to the Birdoswald building on Hadrian's Wall is at Benwell (Simpson and Richmond 1941, 21–22) where deposits of 'mud, dust, coal, and a high proportion of ... smithy scale from heated iron' was found in association with a hearth in a long narrow building laid out parallel to the defences in the *latera praetorii*, between the *porta principalis* and *porta quintana sinistra*. At Caerleon, a room used for black-smithing contained ash, slag, and hammer-scale, several bowl furnaces and three tile-lined 'tanks' of similar dimensions to the Birdoswald boxes, which were apparently lined on only three sides (Frere 1984, 269, fig 2).

The roads

On the south side of the *via principalis* the only major horizon of Period 4a after the surfacing associated with the blocking of the *porta principalis sinistra* was a deposit of red-brown gritty, friable silt which formed the matrix for a mass of broken, crushed, and decayed red sandstone tile (1581/2914, 2958; Fig 25) of Type 1. This material was mainly concentrated around the north and west sides of Building 198, though it was identical to and is associated with similar deposits lying between and to the south of the *horrea* (387, 241; Fig 25). To the south of the excavated area of the *via sagularis* an identical deposit was recorded in section (1270; Fig 56) beneath later road deposits at the west end of Building 197.

It seems likely that these red roof-slate deposits derive from a wholesale stripping-out of the roofs of the *horrea* prior to re-roofing with the better quality Type 2 slate. Though most of the roofing was clearly tidied up from around the buildings, a substantial amount remained to be crushed and compacted, forming resilient road and alley surfaces all round both buildings, and surfacing the south side of the *via principalis*.

During the first rebuilding of Building 4401 (Phase b) a road surface was laid to the west of the building. This consisted of fine orange-brown gravel similar to the primary roads, but could not be readily identified with any surface on the *via principalis* (4141; Fig 113). The surface was associated with the use of a kiln (4142) which pierced the wall of the structure. During the later life of this rebuild (Building 4401 Phase b (ii)), the road around the building was again resurfaced, (3886/3885/2929/2924; Fig 115) with compacted gravel containing large, worn, sandstone pebbles.

Table 10 Summary of macrobotanical data (including fills and other materials) from the fort ditches

ditch phase *context number* *context type*	*c* *1605* *total fill*	*c* *1796* *lower fill*	*e* *1760* *total fill*	*f* *1755* *btm fill*	*f* *1499* *mid fill*	*f* *1496* *top fill*
xcoarse sand/gravel	–	3	–	–	2	–
xsilt and clay	–	1	–	3	3	–
xclinker/industrial waste	–	1	1	–	–	–
xamorphous organic material	–	4	1	–	1	2
xpeat/coarse organic	–	5	3	3	1	3
xmonocot fragments	5	5	1	1	–	–
xwood fragments	–	2	2	1	–	2
xcharcoal fragments	–	2	1	1	2	1
xbryophyte fragments	–	3	1	1	1	–
cbran fragments	–	1	1	1	1	–
xlegume flower	1	1	–	1	1	–
xtree bud	1	1	–	1	1	–
xfly puparia	–	–	–	1	1	–
xinsect fragments	–	1	–	–	–	–
a*Agrostemma githago*	–	–	1	–	2	–
a*Aphanes arvensis*	–	–	–	1	–	–
a*Galeopsis tetrahit*	–	1	–	–	–	0 1
a*Stellaria media*	–	2	–	1	–	–
a*Urtica urens*	1	2	*	+	+	1
c*Avena periderm*	–	–	–	2	–	–
cCerealia/large gramineae	1	2	2	5	–	–
c*Hordeum* indet	–	+	–	2	3	–
c*Hordeum* periderm	–	–	–	1	–	–
c*Triticum* undiff	–	1	–	6	*	–
c*Triticum/Secale* periderm	–	–	1	1	–	–
g*Bellis perennis*	–	–	–	–	1	–
g*Leontodon autumnalis/hisp*	–	–	1	–	–	–
g*Linum catharticum*	1	1	–	–	–	–
g*Rhinanthus minor* agg	–	2	–	–	–	–
g*Rumex acetosa*	–	2	1	3	–	+
h*Calluna vulgaris* flowers	1	–	–	–	–	–
h*Calluna vulgaris* shoots/twigs	1	–	–	1	–	–
h*Calluna vulgaris* twigs	–	1	–	1	–	–
h*Pteridium aquilinum* frond fr	–	–	–	**	–	–
r*Fallopia convolvulus*	–	2	–	–	–	–
r*Heracleum sphondylium*	–	–	1	–	–	–
r*Hyoscyamus niger*	–	–	–	–	–	+
r*Polygonum aviculare*	–	1	1	3	–	1
r*Polygonum lapath/persicaria*	–	–	–	2	*	–
r*Polygonum lapathifolium*	–	1	1	1	1	1
r*Polygonum persicaria*	–	4	4	2	2	1
r*Rumex acetosella*	–	2	1	1	–	1
r*Rumex obtusifolius*-type	–	2	–	–	–	–
r*Sonchus asper*	–	2	2	1	2	1
r*Urtica dioica*	1	3	4	+	–	*
s*Hordeum* rachis internode	–	–	–	1	–	–
s*Triticum* glume base	–	1	–	+	1	–
s*Triticum* spelta glume	–	1	–	1	–	–
t*Alnus glutinosa*	–	–	–	2	–	–
t*Betula* tree catkin scale	–	–	–	1	–	–
t*Corylus avellana* nut fragment	–	2	–	1	1	–
t*Prunella vulgaris*	–	1	1	–	–	–
t*Rosa* thorn	–	–	–	–	–	1
t*Rosa* sp(p)	–	–	–	–	1	–
t*Rubus fruticosus*	–	2	–	–	–	+
w*Carex* (lenticular)	1	2	4	+	2	2
w*Carex* (trigonous)	–	4	2	2	2	5
w*Carex hostiana*-type	–	3	2	2	2	1
w*Eleocharis palustris*	–	3	–	–	–	–
w*Montia fontana* ssp(p) chondr	–	–	–	1	–	–
w*Ranunculus sceleratus*	–	–	–	3	–	4
w*Sphagnum* sp(p)	3	1	–	+	–	–
w*Stellaria graminea*	–	1	–	–	–	–
x*Ajuga reptans*	–	–	–	–	–	1
xChenopodiaceae undiff	1	–	–	–	–	–
x*Cirsium* sp(p)	2	–	2	–	–	–
xGramineae <2mm	3	+	+	–	–	–
x*Juncus* sp(p)	–	1	4	–	–	–
x*Lamium* undiff	–	4	–	–	–	1
x*Luzula* sp(p)	–	–	–	1	–	1
x*Potentilla* sp(p)	2	4	1	–	–	*
x*Ranunculus repens*-type	–	+	+	4	–	+
x*Veronica* sp(p)	–	1	–	–	–	–
total numbers of taxa	*25*	*69*	*41*	*53*	*37*	*36*

key to ecological categories and parts of cereals:
a = arable weeds e = exotic g = grassland h = heathland r = ruderal t = wood/scrub
w = wet ground x = broad or imprecisely identifiable s = cereal chaff c = cereal grain

Ditch Phase d: the silting of the Period 4a ditch

The Ditch Phase d (1708; Figs 101, 26, 118), the excavation of which had been an aspect of the blocking of the south portal of the *porta principalis sinistra*, appears to have silted rapidly. The fill of the ditch was initially thought to have been a single layer (1605), but weathering in section showed the deposit to be divided into three distinct silts. The lowest of these (1796; Fig 26) was a very dark-brown clay silt which was compact, peaty, and organic. It contained frequent light grey-brown lenses of sandy silt, apparently representing single waterlogging episodes during deposition. The fill above this (1771) was a dark-grey silty clay with extremely frequent laminations of interleaved pure sand. This deposit had an extremely waterlain appearance. The upper fill was a dark greyish-brown sandy-silt (1709; Fig 26) with light grey gritty lenses and patches of heavily ferruginated sand, varying from light yellow to dark orange in colour. It seems certain that the ditch had been totally silted up before the next recut was made. Though the presence of waterlain and laminated sands and silts demonstrates that natural silting took place, the more organic deposits clearly reflect deliberate dumping. The ditch produced 98 leather objects, and a large quantity of animal bone neither of which are likely to have entered the ditch by accident. Flake hammer-scale recovered from sampling the fills of this ditch implies that the ditch was open and in use during the intensive industrial activity carried out within the structures of the *porta principalis sinistra*. This was the only Ditch Phase from which hammer-scale was recovered.

The waterlain sandy character of the upper fills of the ditch was similar to a series of sand deposits on the berm. The Period 4a surfaces both on the berm and in front of the blocked portal were entirely sealed by a layer of light pinkish-grey, loose gritty sand with cobbles and small pebbles (1862, Fig 26), which appeared to have been washed up against the plinth course of the fine ashlar (3834). It is possible that all of these deposits reflect a problem with waterlogging to the south of the gate, and constant episodes of flooding both in and over the edges of the ditch.

The macrobotanical evidence for the upper ditch fills (Table 10; Huntley 1991, 24) is significant. The relatively large quantities of monocotyledon fragments recovered from samples could be accounted for in several different ways. However, given that the ditch was totally silted before recutting and that waterlain material occurs over the berm as well as the ditch, the most likely explanation is that the backfilled ditch and berm were thoroughly vegetated over with sedges and similar plants, suggesting a period of abandonment, though the presence of the eggs of water fleas *Daphnia* in large numbers demonstrates that there was still some water in the ditch at this point.

Definition, dating, and finds

Period 4a began with the blocking of the south portal of the *porta principalis sinistra*. This act was only part of a major reworking of the western end of the *via principalis* which involved the resurfacing, drainage works, and the remodelling of Building 4400 to form the two Buildings 4401 and 4402. There are two reasons why this operation cannot be regarded as part of the Period 3 works. Firstly, the roadside drain on the south side of the *via principalis* was built to block the ventilation slots in the north wall of the *horreum* Building 198. If the two had been built together either the drain would have been altered or the slots would not have been constructed. Secondly a deposit which sealed the construction cut for the fine ashlar at the gate was itself cut by the construction trench for the western blocking wall of the south portal.

The dating evidence and finds from Period 4a are as follows:

porta principalis sinistra: blocking of portal:
Coin: No 30, Antoninus Pius (138–61)

porta principalis sinistra: blocked portal:
Coins: No 23, Hadrian (117–38)
No 78, BR. Victorinus (270–84)
Finds: Copper alloy armlet (No 1), brooch spring (No 62), ring key (No 80), handle (No 174), punch (No 178), stud (No 209), spearhead (No 265)

porta principalis sinistra: north tower:
Finds: Enamel disc brooch (No 65), patera handle (No 125), knife handle (No 173), studs (Nos 206–8), iron ring (No 223), copper alloy ring (No 233)

porta principalis sinistra: south tower:
Coins: No 38 Marcus Aurelius (168–71)
No 61 Philip II (244–9)
Finds: Iron ring frag (No 81), knife (No 171)

Ditch Phase d:
Pottery: Analytical Group 7 (Fig 161, Nos 69–73)
Finds: Copper alloy fitting (No 193), joiner's dog (No 217), shield binding (No 277)
Leather: 36 shoe fragments, 19 tentage fragments, 33 waste pieces, 10 scrap frags (Table 25)

Building 4401 Phase a:
Finds: Milling stone (No 134), bone die (No 156), handle (No 175), iron punch (No 177), stud (No 211), ?toilet object (No 291)

Building 4401 Phase b(i):
Coins: No 19 Hadrian (117–38)
No 40 Faustina II (161–75)
Finds: Glass bead (No 32), iron bell (No 247)

Building 4401 Phase b(ii):
Coin: No 83 BR. Tetricus I (270–84)
Finds: Parallelepiped die (No 157), fitting (No 192), strap (No 239), crucible (No 293)

Building 4402 Phase a:
Coins: No 31 Antoninus Pius (138–61)
No 39 Marcus Aurelius (161–80)
Finds: Milling stone (No 134)

via sagularis:
Pottery: Analytical Group 8 (Fig 162, Nos 74–9)
Finds: Enamel stud (No 202)

via principalis:
Finds: Triple bow 'P'-shaped brooch (No 59)

The dating for these changes was extraordinarily sparse. Given the broadly Severan date for the alterations of Period 3, the pottery from the road surfaces was all residual, consisting of late second-to early third-century material. The only coin (No 30) from a feature at the beginning of the Period was found in the fill of the construction trench for the western blocking wall of the south portal. The coin was also residual, dating to 138–61. The entire operation, therefore, shares the same early third-century *terminus post quem* as Period 3, but is clearly later in the stratigraphic sequence. The 'P' shaped brooch (No 59) from the surfacing of the *via principalis* at the beginning of this Period dates to the second or third century.

The occupation of the site immediately after the alterations which initiated Period 4a is characterised by the industrial activity, including ironworking, which took place in Building 4401 and within the *porta principalis sinistra*. The silting and dumping in the Period 4a ditch (1708) incorporated some flake hammer-scale suggesting that the ditch was open during the period when ironworking was occurring. It is noticeable that samples from no other ditch fills produced hammer-scale.

The pottery from this Period tends to be fragmentary and very limited in quantity. Building 4401 Phase b (ii) was associated a road surface (3886) which produced 360g of pottery (Analytical Group 8) including material dating to the mid-third century, but the fragmentary nature of this assemblage, and its inclusion in a road surface, suggests residuality. More useful is a barbarous radiate coin (No 83) of Tetricus I (270–84) found in one of the latest working deposits of this phase of Building 4401. This suggests a date in the second and third quarters of the third century for the ironworking phase. The ironworking within Building 4401 and the adjacent *porta principalis sinistra* were contemporary operations, and it is therefore significant that the only coin found in the gate structures was another barbarous radiate, this time of Victorinus (270–84; No 78) from the last silt deposit in the blocked south portal before the laying of the final flagstone floor (3965).

The sparse pottery from the Ditch Phase d (Analytical Group 7) was largely residual material of the later second and early third century. The shoe leather was slightly more informative. A shoe of Style 4 from this ditch is of a type in use as late as the third century on the northern frontier, but which is more common in the second century. A single example of a shoe of one piece construction was found. This type became increasingly popular during the third century, and is strongly represented among the late third-and fourth-century leather assemblages from subsequent recuts of the fort ditch.

The ditch is unlikely to have been recut (Ditch Phase e) until some time after it was filled. This is demonstrated by the presence of waterlain sands in the top of the ditch and over the berm, and also by the macrobotanical evidence which indicates that the ditch was finally vegetated over with sedges and water plants while water fleas bred in the residual pools. This suggests a long period during which the defensive ditch was not maintained.

The end of Building 4401 Phase b was marked by layers of rubble and soil which cannot entirely be explained away by demolition prior to rebuilding, and appear to be the product of collapse and possibly abandonment of this site for a short time. The only diagnostic sherd from these deposits was a flanged bowl in BB1 with intersecting arc decoration of the mid to late third century (cf Gillam 1976, no 44). It is at least possible that this dereliction and the flooding and growth over the fort ditch were contemporary.

Period 4a, therefore, begins with the remodelling of Building 4400 and the creation of Buildings 4401 and 4402 at an unspecifiable date in the earlier third century. During the Period, Building 4401 required rebuilding, after which an intensive ironworking activity took place both in this building and in the *porta principalis sinistra*. Small quantities of debris from this industry were deposited in the fort ditch. The period ended after *c* 270–84, as coins of this date were the latest finds associated with the ironworking. The coin found in Building 4401 gives the *terminus post quem* for the dereliction of that structure. This may be seen in context with the failure to scour out the fort ditch as representative of a period of limited maintenance in this area of the fort.

Site development during Periods 4b–5

Period 4b comprises Site Phase 8; the continued, or possibly the resumed, occupation of Area A after the apparent dereliction at the end of Period 4a. The west ditch, which had become totally silted, was drastically recut and bridged by a road serving the open northern portal of the *porta principalis sinistra*. The berm and the western side of the ditch were surfaced. Inside the fort, Building 4401 was rebuilt and new roads were again laid. There was no sign of any industrial activity during this Period.

Period 5 was only definitely identified within the *horrea*, Buildings 197 and 198, and is described in Chapter 10. It is assumed that some of the changes which took place at the *porta principalis sinistra*, on the *via principalis*, and within Buildings 4401 and 4402 were contemporary with the Period 5 developments in the *horrea*, though the stratigraphy within the rest of Area A does not allow for the differentiation of this Period.

The west defences and *porta principalis sinistra*

These Periods in the area of the western defences are best understood by reference to the general plan at Figure 118. The alterations undertaken to the defences in Area A are described here as part of the general chronological and stratigraphic account of Area A. The excavation of other parts of the defences in Areas B and F, and elsewhere on the circuit during previous excavation campaigns means that a more general discussion of defensive changes appears in Chapter 9.

Ditch Phase e: bridge-culvert, berm, and roads

The unmaintained ditch was succeeded by a major operation which involved structural work and road laying as well as a total recut of the fort ditch. The recut ditch (Ditch Phase e: 1809, 404; Figs 118, 26) was originally 1.43m deep and 2.46m wide. Unlike the earlier ditches, which had terminated in butt ends against the road through the gate, this ditch cut through all road surfaces west of the *porta principalis sinistra*, and was continuous. Access was provided to the unblocked north portal of the gate by means of a stone bridge-culvert. This (1927; Figs 119, 120) was constructed with stone piers built into the ditch edges leaving a vertical-sided aperture 1.24m high and 0.42m in width. The south face of the bridge-culvert shows that it was built using large, roughly dressed stones at the bottom, and above this, five courses of masonry, including reused stones of various shapes and sizes. A 0.14m offset existed below the third course on the west side, and the fourth on the east side of the structure. Inside the bridge-culvert, the sides were lined with regular coursed rubble. The roof was constructed using large, heavy slabs. The only one whose dimensions could be recorded was 1.42m wide and 1.67m long, with a thickness of 180mm. Each slab had a lewis hole in its underside, suggesting that they had been reused.

On the west side of the ditch, a north-south gravelled road (1643; Fig 26) was laid along its edge. The phasing of this road is demonstrated by the fact that it sealed the top fill (1709; Fig 26) of the Ditch Phase d, and was cut by the latest of the ditch sequence (Ditch Phase f: 1722; Figs 26, 118). The western side of the road was revetted by a stone drain 450mm wide and 130mm deep which was roughly built with facing stones and reused roofing slates (1644). It retained to the west a road surface comprising compact dark red-orange sandy gravel (1643). This road material was later resurfaced with an orange-brown deposit comprising compacted gravel with some large pebbles and

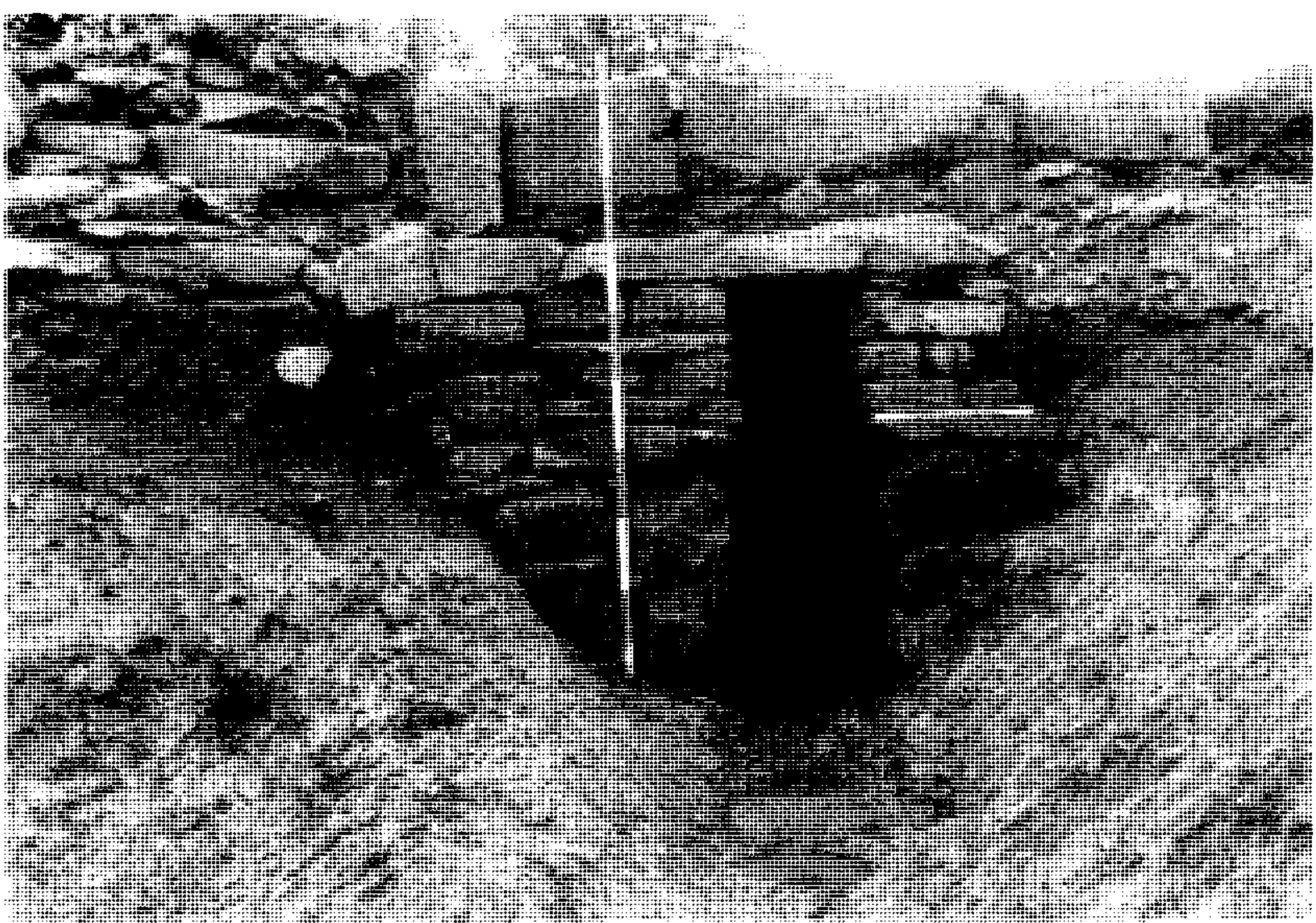

Fig 119 Stone bridge-culvert (1927) spanning ditch 1809, and carrying road through the north portal of the porta principalis sinistra

worn stones (1578/1641; Figs 26, 118). This straddled the drain, leaving it in the centre of the roadway.

The uppermost road level (1578/1641) was identical to a metalling layer (1787/261) which lay on the berm at a similar level, and which was retained by a stone kerb (1930). Though the deposits comprising the road above the bridge-culvert were not fully excavated, a trace of this kerb turning westwards across the ditch was noted during consolidation work, and a continuation of the gravel road (1787; Fig 120) was recorded in section. The evidence suggests that the whole area of roads and paths outside the *porta principalis sinistra* was resurfaced as one operation. It seems likely that the path on the west side of the ditch was revetted with a similar kerb to that which revetted the berm. The main east–west road seems also to have been retained by a kerb as it crossed the bridge-culvert. Thus the ditch was contained on three sides by paths, with stone kerbs preventing gravel from falling into the ditch.

It seems that at least the lowest levels of Ditch Phase e silted up quite swiftly. The lowest black silty fill (1821) contained some fragments of roof slate, cobbles, and pebbles washed from the berm, animal bone, and 165 pieces of leather. This shows that dumping was also a factor in the filling of this ditch. The overlying silt (1760, 1469) was similar, but more sandy.

Macrobotanical evidence ftom the upper silting (Table 10; Huntley 1991, 25) showed that the main body of fill (1760) was a heterogeneous mixture of minerals, wood, fine organic material, clinker, charcoal, and bryophytes (liverworts, hornworts, and mosses). Seeds were moderate in numbers and represented a variety of taxa. Grassland plants were commonly represented but there were also considerable numbers of seeds from the annual nettle (*Urtica urens*). This species grows in open situations and is a weed of moderately nutrient-rich soils. The uppermost fill (1469) was more organic with little mineral material. It contained more seeds from species characteristic of ruderal or waste situations with few representatives of grassland or open, weedy conditions. The nettle seeds, which were common, were from the stinging nettle (*Urtica dioica*). There were moderate numbers of henbane (*Hyoscyamus niger*) seeds; this is a powerful drug plant although it does also grow as a ruderal and it may be that this is the role it played here. It also contained a few seeds from lesser spearwort (*Ranunculus sceleratus*), which is an aquatic plant common in and by slow streams and muddy ponds. It prefers mineral-rich substrates.

The ditch was not totally filled before its final recut, but it was clearly used as a dumping ground, and the rich organic mix represented by the finds of leather and animal bone would have allowed conditions for vegetation such as nettles and spearwort to thrive.

Ditch Phase f: the final ditch re-cut

South of *porta principalis sinistra*

The final re-cut of the fort ditch (Ditch Phase f: 1772; Figs 26, 118) cut the fill of the Ditch Phase e on its east side, and the last surface of the path on the west side of the ditch (1641). The recut itself was 4.68m wide at the top and 1.51m deep: broader and shallower than any of its predecessors. It would seem that the road surfacings on each side of the ditch remained intact and continued in use while this ditch was in service. The recut involved the creation of a butt end, and the maintenance of the flow from the bridge-culvert by means of a small leat (4427; Fig 118, red overlay). By the time the re-cut took place, the bridge-culvert was silted, though it never silted completely; a void 0.36m in depth was always present at the top allowing stalactite growth, and during the excavation it was noted that groundwater was still finding its way southwards by means of this route.

The lowest fill of the ditch (1500/1755; Fig 26) was a deposit of sticky, brown, peaty clay containing no

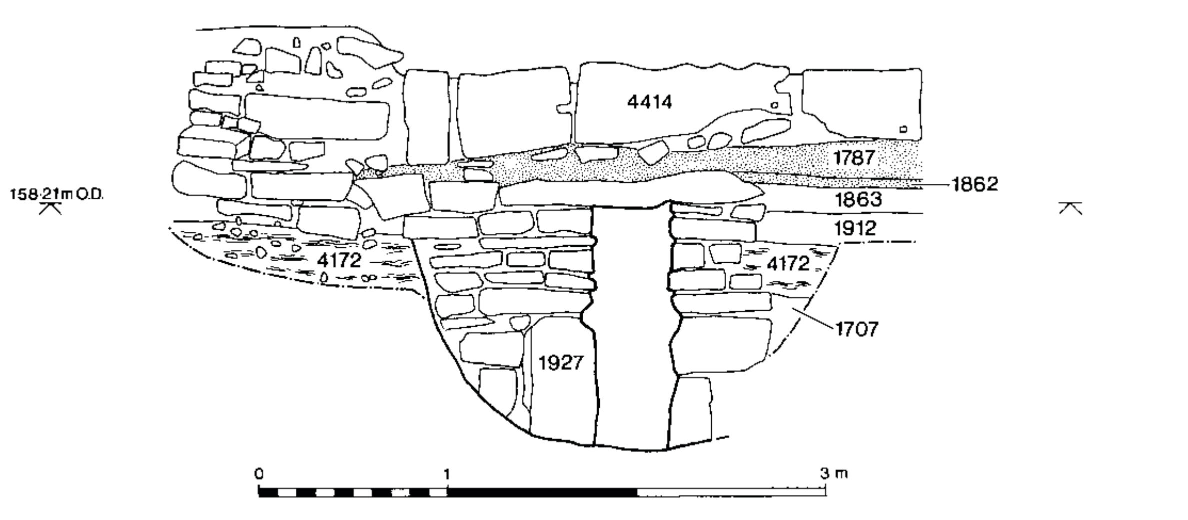

Fig 120 Section 10 (for location see Fig 116) showing elevation of bridge-culvert and kerb of overlying causeway

stone, but much animal bone and 286 pieces of leather refuse. As in earlier phases this was the result of organic tipping into the butt end of the ditch. The disuse phase of the ditch was then marked by the accumulation of deposits of loose, light greyish-brown sand, very lensed and variable in colour and texture, with a waterlain and laminated appearance (1769/1728/1485). This material also constituted the upper silt of the bridge-culvert and leat.

The lower fill (1755) contained moderate amounts of mineral material but also large amounts of bracken-frond fragments (Huntley 1991, 25; Table 10). Otherwise the organic material was fairly well humified and also well mixed with large amounts of silt and clay. *Daphnia* eggs were again present, as were seeds of the water crowfoot, indicating at least some open water. Besides the usual mix of grassland and ruderal taxa, cereal debris was more important here than in the earlier ditch samples analysed. Moderate numbers of wheat glumes (one of which was clearly spelt) and one barley rachis internode were seen. In addition, whole skins (periderms) of oats and barley and fragments of wheat/rye and barley bran were recovered. It is likely that the sample examined represents rubbish being thrown into the ditch, and this would be consistent with the presence of bone and leather. It is suggested that both faecal material and soiled bedding is probably represented but it is more difficult to suggest whether this is human, animal, or a mixture. By comparison with sites such as Carlisle it could be that animal bedding/dung is indicated given the lack of seeds from exotic taxa such as figs and coriander which are almost invariably present in faecal material from Carlisle (Huntley, 1990). However, the almost total lack of figs from Birdoswald as a whole may indicate that such luxuries were never consumed in any quantity on the site, if at all.

North of *porta principalis sinistra*

To the north of the north portal of the gate a limited excavation was undertaken into the upper levels of the Ditch Phase f (4428). The evidence for a similar sequence to that on the south side of the causeway was immediately apparent, though it was also clear that the very latest levels had had a somewhat different history. Before the final ditch silted up, it was partially backfilled on its western edge by the insertion of a clay platform. The lower portion of this was a pink clay make-up deposit (2753) containing well compacted rubble and pebbles. Over this was laid a further compact layer of pebbly clay (1751; Fig 118). This clay formed a wide, even clay shelf or platform up to 0.40m deep, which covered the berm and extended its width by 1.50m. Beyond the edge of the shelf the clay edge sloped away at a 45° angle to form the edge of a narrowed ditch.

The clay shelf was apparently the foundation to a structure which, owing to fluctuating edges of excavation,

Fig 121 Section of slumping wall north of porta principalis sinistra, *showing the surviving face of the late buttress (1634) inserted to support it*

was not fully recognised until virtually destroyed, and was therefore reconstructed through the site records. The shelf coincided with an area of the west wall of the fort which was bulging to the west, and which must, when standing, have been in imminent danger of collapse (Fig 121). It can be no coincidence that this was in the spot where the fort wall overlay the north edge of the earlier east-west ditch of the Turf Wall. The clay shelf formed the foundation for a buttress which had been built to prevent this collapse. The material of the buttress itself was found first in 1988, where a line of facing stones was found to be constructed face-to-face with the collapsing wall (1634; Figs 118, 121). This survived three courses deep next to the wall, and its effectiveness was shown upon its removal, when three courses of the facing of the curtain wall collapsed. On the edge of the clay platform lay three parallel lines of facing stones which were clearly the western edge of the buttress (1635; Fig 118). Among the stones was an extensive deposit of white, crumbly mortar (1483) which was clearly the bonding matrix of the buttress.

The ditch subsequently filled and silted to the west of the shelf, the silting pattern being extremely similar to that of the connecting southern ditch butt end. First there was a peaty organic fill (1850/1755), then two waterlain, laminated sand deposits (1849/1742; 1749/1728).

As the silting of the ditch continued, new, patchy cobbled surfaces were added to the berm, culminating in the construction of a rough, unbonded wall of stones and large cobbles (1474, Fig 118). This wall may have been intended to reinforce the buttress, but it also cut off access along the berm to the north from

Fig 122 Plan of Building 4401, Phase c

the west gate. On its south side the wall retained the last surface of the road which ran westwards from the *porta principalis sinistra*.

The north gate portal and the Military Way

The coast-to-coast road along the Wall which is now known as the Military Way was built in the mid-second century (Breeze and Dobson 1987, 128), and ran through the *portae principales* of the fort. Before and immediately after the blocking of the south portal of the *porta principalis sinistra* this road had comprised a gravel surface running between the butt ends of an open ditch (1708). When the continuous Ditch Phase e (1809) was cut, the Military Way was carried over it on the bridge-culvert, which was surfaced with gravel and cobbling, provided with a kerb on the ditch sides. The final form of the Military Way was rather grander. The kerb and cobbling were sealed by a paving of large flagstones (400, 118). When these were laid, new gate furniture was also installed. On each side of the gate pivot blocks were positioned, while, somewhat off-centre in the middle of the gate, a doorstop 520 x 380mm in plan and 387mm high was inserted into the paving. On each side of the doorstop were sills, each 360mm wide, and raised 170mm above the paving level. Both of these sills were very worn by wheeled traffic. It can be demonstrated that this wear took place over a long period, as this gate portal was still in use during the middle ages.

The paving of the Military Way was supplemented on the north side by an even, worn cobbled surface made of large, sandstone fragments and cobbles, all of which were heavily worn (1757; Fig 118). This was the surface revetted to the north by the rough wall 1474. The revetting wall had its counterpart in a kerb built on the south side of the road (4414; Figs 118, 119, 120). This comprised a run of eight heavy, reused stone blocks. It seems likely that these blocks had seen multiple reuse, but the ultimate origin of at least three of the stones, which had characteristic bar cramp slots cut into them, was probably Willowford Bridge (Fig 136).

The internal buildings

by Sara Rushton

No changes attributable with certainty to these periods were discerned in the basilica (Building 4403) or the *horrea* (Buildings 197, 198).

Building 4401

Phase c

The beginning of this Phase appears to mark a complete change in the function of the building, which was no longer used for industrial purposes. It appears to have remained open to the west as in previous Phases, but the fact that every surface east of the line shown in Figures 122 and 123 in this and subsequent Phases have been completely robbed away (truncation horizon, 4281) makes this conclusion uncertain.

The demolished west and south walls of the building were again rebuilt. No part of this rebuild survived, and its existence is deduced from the sequence of surfaces outside and inside the building. The position of the inferred wall is represented as context 3816 (Fig 122). The western edge of the levelled Building 4401, Phase b west wall, was sealed by a sequence of two exterior road surfaces (3839; 3823), which were in turn cut by the foundation trench (3825) for the west wall associated with Building 4401 Phase d (2955; Fig 123). The principal interior surface of Building 4401, Phase c was an extensive but patchy flagged surface (3705/2937/2996/3908) part of which overlay the central section of the Phase b west wall, forming a threshold (3908) 1.9m wide. This threshold was also sealed by the Building Phase d wall. The implication of this evidence is that the exterior surfaces had built up against the edge of the same wall through which the threshold lay, and that this wall must have been completely removed prior to Phase d.

Inside the building one of the threshold flags had broken its back over the inside edge of the wall. This was probably as a result of subsidence which had caused the flagging in the interior to sink. This subsidence was particularly noticeable in the north-west corner, where the flagstones tipped sharply. A contemporary bank of clean, burnt clay (3707) lay against the north wall.

The two road surfaces which respected Building 4401 Phase c were identical with two major resurfacings of the *via principalis*.

Phase d

As indicated above, this Phase opens with a rebuild of the west and south walls of the building (Fig 123). The rebuilt west wall (2955) was 0.5m wide. It was apparently bonded with the south wall which survived only as a stub. The south wall of the building in this Phase should be visualised as a multi-phase patchwork: the west end and bonded corner were the Phase d new construction, with the Phase c wall (3816) continuing to its junction with the primary wall (4329) of Building 4400. The Phase d rebuild was poorly constructed, made of very rough coursed rubble, bonded with clay, and with virtually no core. The foundation trench for this wall (3825) is mentioned above as part of the evidence for the Phase c rebuild.

Interior surfaces of this Phase survived chiefly on the north-west side of the building, where their subsidence protected them from the later removal of surfaces. On this side the remains of two clay dumps (2939, 2935) and a fragmentary flagstone floor (2934) survived. The latter was sealed by a black, compacted

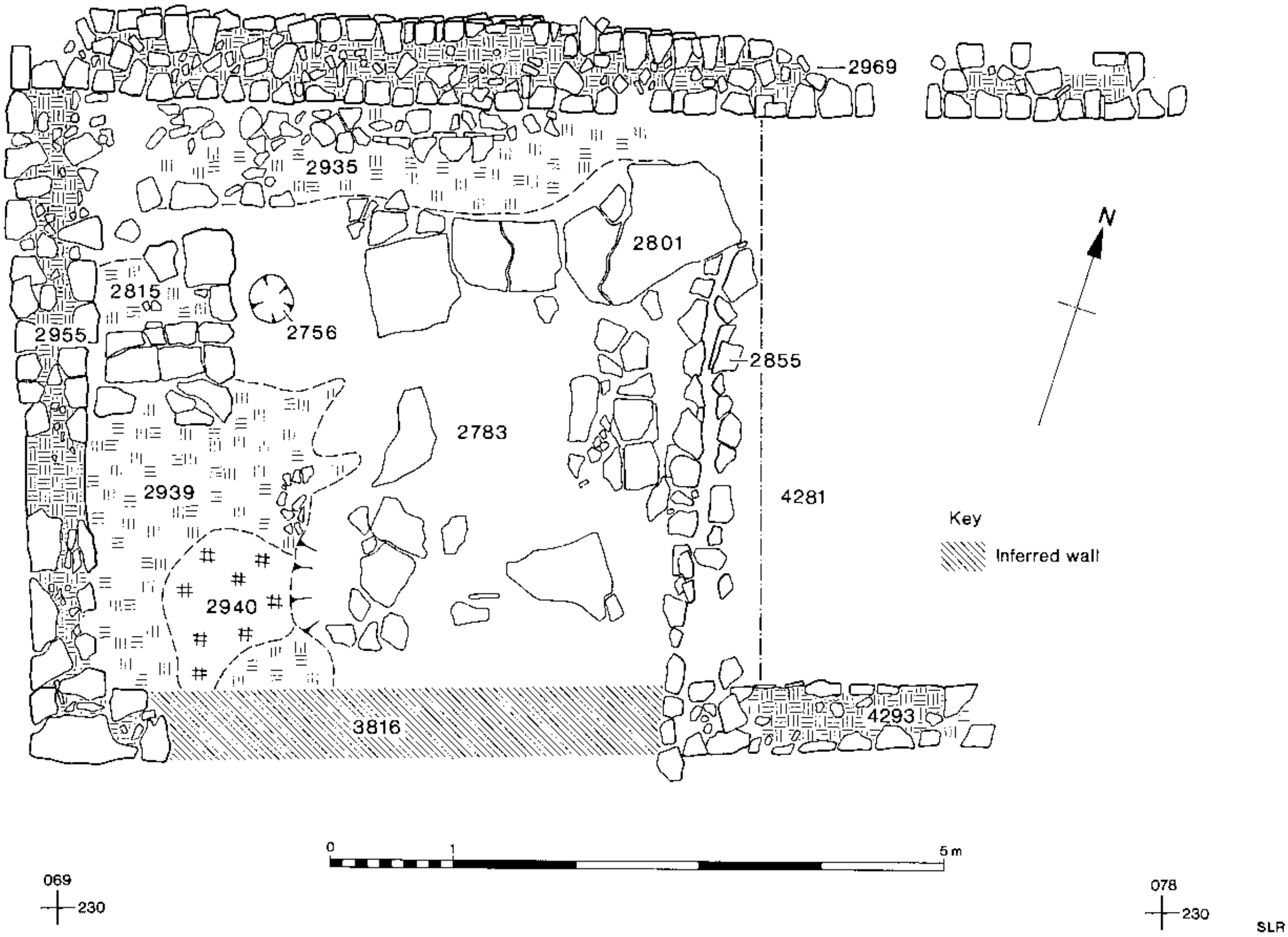

Fig 123 Plan of Building 4401, Phase d

layer of silty clay and charcoal (2894), 30–40mm thick and spread throughout the central area of the building. It had a vertical cut edge on the north side, and may have been a substantial burnt layer which had been spaded away for the insertion of a later floor. Above this a hard, laminated surface *c* 60 mm deep (2818), made of many interleaving lenses of charcoal, blackish-grey clay loam and burnt red clay, was overlain by a layer (2833) associated with the use of a drain (2855). This comprised two parallel lines of unworked sandstone 4.4m long and 0.10m wide, which ran north-south across almost the entire width of the building. It crossed the south wall but there was no trace of it in any surviving road surface outside the building. Though this looked like a drain, its poor construction would have made it far from watertight.

The final flagged floor (2801) only survived intact along the northern edge of the building. All of the flags had broken their backs over the edge of the demolished primary north wall and tipped into the subsidence in the centre of the building. A contemporary rectangular structure (2815) formed of dressed sandstone set in hard red clay around a very burnt flagstone was possibly a hearth.

Building 4402, Phase b (Fig 124)

Rooms ii/iii

The main interior surface associated with this Phase was a rather patchy layer of large flagstones (3829), which only survived in the central and northern areas of the interior. Because the surface was so badly disturbed it is not really clear whether the cobble platform, drain, and 'workbench' of the preceding Phase were still functioning.

Slightly overlying the east edge of flagstones 3829, but almost entirely confined to the area where there were no flags, were two fairly extensive loamy layers (3768, 3758), which may represent a surface used in conjunction with the flags.

Room iv

A layer of dark-brown mottled-clay loam (2989/2857) had accumulated over the cobbles (2872/2884) associated with wall 2919 in the previous phase. Above this was built a further new east wall (2856). This wall was built adjacent to and to the west of the two earlier walls thus reducing slightly the internal dimensions of the building.

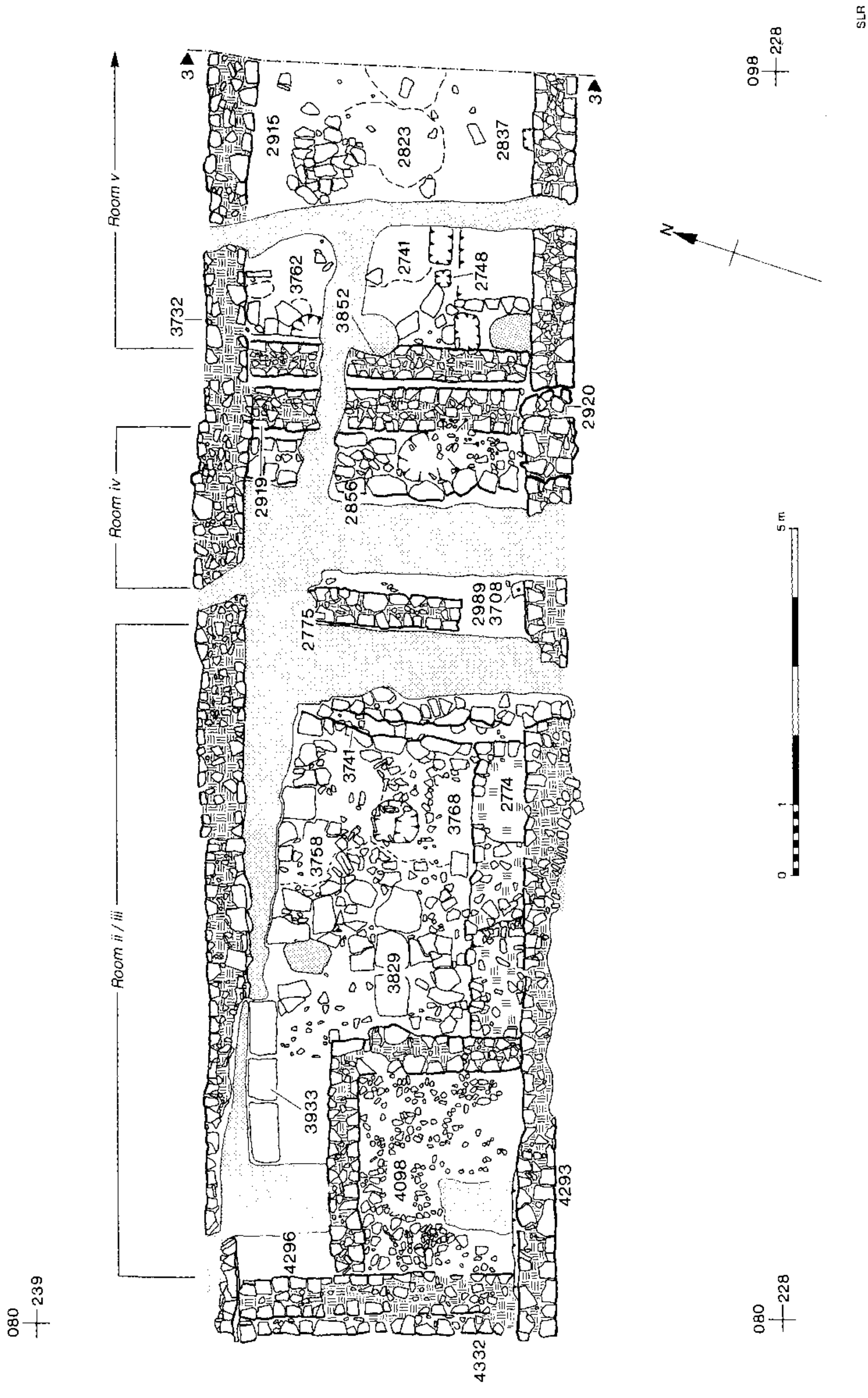

Fig 124 Plan of Building 4402, Phase b

The north end butted against north wall 4164; here the wall was 0.55m wide and was fairly well constructed of dressed stone with a narrow core of clay bonded rubble. This northern segment only survived for a length of 0.7m. To the south the remainder of the wall was much wider (0.9m) and was of poorer construction. The southernmost two metres of the west face was constructed of large unfaced stones, and the east face had been completely robbed.

The doorway into Room ii/iii, which had been retained since the subdivision of Building 4400 was provided with a pivot stone (3708).

Room v

A thick layer of compact, mixed, dark-brown clay (3762/3737/2816/2781/2837; Fig 22) sealed the platform and layers of Building Phase a. Two small areas of flagstones (3760, 2915) were set into this surface. On the western side of the room, running west–east, lay a shallow, sub-square cut (2748) and a long rectangular cut (0.4 x 0.35 x 0.12m), which may have been intended to hold a timber partition. A small stakehole (2747) lay between them. This floor was subject to subsidence, and a subsidence void was later filled with clay (2789; Fig 22).

The roads and drainage

During these Periods at least three major episodes of resurfacing took place on the *via principalis*, some of which could be related to developments in Building 4401. The first of these consisted of closely-packed, compacted small, rounded, pebbles. This layer (2887/3839) provided a stratigraphic link between the area around Building 4401 and the main *via principalis* (Building 4401 Phase c; Fig 122), as it was identical with the first of the road surfaces which respected the totally-robbed south and east walls of the Building in Phase c.

Overlying 3839, against the north-west corner of Building 4401, was a small patch of hard yellowish-brown clay (3841), overlain by the second major road resurfacing (3823; Fig 22: 1558/2773; Fig 25: 2727; Fig 26: 2573/2614), which consisted of well laid and worn surfaces of cobbles and gravel in varying concentrations. This deposit covered the entire excavated area of the *via principalis*. The average level of these surfaces was 158.40–160m, the level varying by gradual undulations. On the *via sagularis* the surface (2614/2573) was compact to the south and less cohesive at its junction with the *via principalis*. It was examined thoroughly in front of the *porta principalis sinistra*, where the layer comprised 90% of small-medium rounded pebbles in a dark yellowish-brown friable silt (2773/1558/2727), providing a very hard and compact surface. Immediately in front of the gate, however, the surface was made finer by the use of a layer of closely-set and packed square or rectangular flags, resembling

Fig 125 Periods 4b–5 drain associated with the second major resurfacing of the via principalis

setts (2886/2538). This may have been a deliberate attempt to make the *via principalis*, as a part of the Military Way, appear more impressive.

Adjacent to the blocked portal, and running through the north portal was a drain. This cut away the north end of the east wall of the former annexe to Building 4410, and bifurcated in front of the *spina*. The drain (3923; Fig 125) was built of a single course of stone incorporated within the overall surface, including a reused tombstone (Fig 234, No 282).

Overlying this surface, and slightly overlying the eastern blocking wall of the south portal of the *porta principalis sinistra*, were two patchy layers of red burnt clay (2879) and gritty, charcoal silt (2880). This demonstrated that the blocked portal was open to the fort interior.

It has already been noted that the final gable wall of Building 4401 Phase d, was built on top of the deposits of this resurfacing.

The third and final major resurfacing involved the placing of large flagstones, varying in size and shape (2843; Fig 25: 2930), in the area to the immediate east of the *porta principalis sinistra*. This surface was later extensively robbed.

Levels and stratigraphy make it fairly certain that this flagged surface was identical with the latest extensive surfaces associated with Building 4401 Phase d, and the final rebuild of its west gable wall. There were two external surfaces associated with this phase. A well-laid cobble surface (2967/2870) was built up against the latest west wall (2955) and sealed its construction trench. This surface survived in a strip 2.2m wide, having been protected from erosion by overlying medieval foundations (1629) by the Period 7 hollow-way (2599) immediately to the west. Later exterior surfaces associated with Building 4401 in this final phase were also preserved by virtue of their position beneath the stones of the Period 7 building. These comprised a long series of small resurfacings and patches of silt and metalling.

Definition, dating, and finds

This Period opens with a flurry of activity which is most marked in Building 4401 and in the fort ditch. The *terminus post quem* for the beginning of the Period is identical to that for the end of Period 4a, and relies similarly on the barbarous radiate coins of Tetricus I and Victorinus (270–84), which were found in the latest industrial deposits of Building 4401 Phase b(ii) and the *porta principalis sinistra* respectively.

The dating evidence and finds from Period 4b are as follows:

Ditch Phase e:
Pottery: Analytical Group 9 (Fig 163, Nos 80–101)
Finds: Pin beater (No 110), wooden bowl (No 123)
Leather: 96 shoe fragments, 2 tentage fragments, 58 waste pieces, 9 scrap frags (Table 25)

Ditch Phase f:
Coins: No 121 Theodora (337–40)
Pottery: Analytical Group 10 (Fig 164, Nos 102–26)
Finds: Glass armlet (No 12), bone pin (No 95), spindle whorl (No 115), wooden bowl (No 124), 'D' buckle (No 225), copper alloy rings (Nos 226, 229), spearhead (No 264)
Leather: 15 shoe fragments, 13 tentage fragments, 93 waste pieces, 28 scrap frags (Table 25)

West berm:
Finds: Glass bead (No 18), ceramic counter (No 152), copper alloy ring (No 231), buckle from *lorica segmentata* (No 254)

Building 4401 Phase c:
Coin: No 2 Vespasian (75)
Finds: Iron fitting (No 195), iron ring (No 222), copper alloy strap (No 244), belt plate (No 252)

Building 4401 Phase d:
Pottery: Analytical Group 11 (Fig 165, Nos 127–32)
Finds: Glass bead (No 26), jet/shale bead (No 53), die (No 158)

Building 4402 Phase b
Coins: No 1 Republic (87BC)
No 13 Trajan (98–117)
Finds: Copper alloy ring (No 238)

via principalis*: first major resurfacing*
Coins: No 12 Trajan (98–117)
No 14 Trajan (98–117)
No 26 Hadrian (117–38)
No 35 Faustina (posthumous issue by Antoninus Pius) (141–61)
No 100 Constantine II (321–2)
Finds: reused moulded panel (No 163), lock pin (No 201)

via principalis*: second major resurfacing (drain lining)*
Coins: No 51 Septimius Severus (210–11)
No 70 Tetricus I (270–4)
No 73 BR. Claudius II (270–84)
No 74 BR. Claudius II (270–84)
No 84 BR. Tetricus I (270–84)
No 86 BR. Tetricus I (270–84)
No 89 BR. Tetricus II (270–84)
No 106 Constantine II (324–5)
Finds: Tombstone frag (No 282)

via principalis*: third major resurfacing*
Coins: No 63 Gallienus (260–8)
No 90 BR. Tetricus II (270–84)
Pottery: Analytical Group 16 (Fig 170, Nos 227–32)
Finds: Toilet spoon (No 104), tankard handle (No 126), milling stone (No 136), ceramic counter (No 151), lead weight (No 158), copper alloy rings (Nos 225, 228)

Building 4401 was rebuilt (Phase c), but was no longer used for industrial purposes. Though the walls of this building did not survive, the road surfaces which had respected them did. The first of these represents a major road resurfacing which may have been an early aspect of the Period. The coin (No 100) found in the metalling provides a *terminus post quem* of 321–2 for both the first and second major resurfacings of the *via principalis*, both of which respected the walls of Building 4401 Phase c. Both of these resurfacings covered the entire area excavated within the fort. The final resurfacing of the *via principalis* also shares this *terminus post quem*, but is related to the final rebuild of Building 4401, Phase d. Pottery associated with this building phase was uniformly early fourth century in date (Analytical Group 11).

Outside the fort walls the ditch was recut (Ditch Phase e). This time, however, it did not end in a butt end but was cut across the entire frontage of the *porta principalis sinistra* and bridged by the bridge-culvert which carried the Military Way through the north portal of the gate. At the same time paths were laid branching southwards from the Military Way on both the berm, and the west side of the ditch. Dumping continued in the ditch, and the leather included shoe types which could run into the later third century. The pottery from the ditch is of third-and early fourth-century date (Analytical Group 9), when BB1 was still a major source of supply, and the Mancetter-Hartshill industry supplied most of the mortaria. The first appearance of Huntcliff and Crambeck wares occurs in this ditch and also in smaller, fragmentary assemblages from deposits of Period 4b.

The ditch was not allowed to silt up completely before being recut for the sixth and final time (Ditch Phase f), although it is clear that a substantial amount of organic material was dumped in it and that it was partly overgrown, largely with nettles. The final ditch recut to the south of the *porta principalis sinistra* was a butt-ended feature, slightly to the west of the bridge-culvert, with which it was connected by means of a leat. To the north of the gate the collapsing fort curtain wall was strengthened by the addition of a buttress. The date of the filling of the final ditch recut is crucial to the history of the site as a whole. It contained a large group of leather, including broad-toed sandals of the later third century and shoes of one-piece construction of the late third and early fourth centuries. The pottery comprises earlier fourth century material; Huntcliff ware makes up less than 2% of the assemblage, and grey Crambeck almost 5%. There was no later fourth-century material, and Mancetter-Hartshill, Nene Valley, and Dales types were still important in the assemblage (Analytical Group 10). The only coin from the ditch complex was recovered from the sandy natural silting in the very top of the ditch (1485=1728) which also formed the upper silting of the bridge-culvert. This was an issue dating to 337–40 (No 122), and gives a *terminus post quem* for the upper silting of the ditch.

Period 4b closes with the beginning of Period 5, the beginning of which is dated by the sub-floor backfilling of Building 197 *c* 350.

8 The development of the defences outside Area A

One of the most important aspects of Area A was the way in which the defences of the fort could be considered stratigraphically in context with the roads and buildings. In the smaller Areas B, F, and G (Fig 8) the defences were examined independently of the interior of the fort, rather as they had been in earlier excavations by Potter (1855a; b; c), Simpson and Richmond (1933; 1934a), and Gillam (1950). The development of the defences in these areas are described in this chapter, though the discussion will draw on evidence already cited from Area A and on earlier work in order to furnish as full an account as possible of the development of the defensive circuit as a whole. Although no published account of the 1951–52 excavations by J P Gillam has appeared, the original records do survive (Gillam 1952), enabling some outline of the sequence to be presented. Thanks are due to Brenda Heywood, who participated in the work, for supplying photographs through the RCHME, some of which are published here for the first time.

Area B

Area B (Fig 126) extended from the north-west angle tower of the fort to the entrance into the rear courtyard of the farm (Fig 8), which since 1993 has been the main entrance to the site for visitors. The central 9m long part of this area was left unexcavated below the upper layers of the fort rampart, but the western and eastern ends were examined in detail. At the eastern end lay a rampart building (Building 4419), which was converted from a primary interval tower. The phasing of this building is demonstrated in the simplified block plan which supplements the detailed plan in Figure 126, and is illustrated in Plate 7.

Building 4419

Phase a: the primary interval tower

The primary interval tower was built at the central point along the north wall of the fort between the *porta praetoria* and the north-west angle. Its north side was formed by the north wall of the fort (202) with which the side walls (4314, 4315) were bonded. The side walls were each 920mm thick. Though the south and east walls of the tower were robbed (robber trench: 4311), sufficient survived to show that the original dimensions of the tower were 4.32m x 3.13m (Figs 126; Pl 7).

Only one floor level, a compact deposit of hard, pebbly, sandy clay (1853) was installed before the construction of two ovens on the west side of the building (1463, 1739). These ovens were built as a pair over a clay core which was revetted by walling on its east side. They measured 1.12m in internal width and 1.54m long. They were approximately horseshoe-shaped, and their flues faced due east. The walls were built of large flat stones bonded with clay, which was reddened, and partially fired by heat from working the ovens. They survived to a height of four courses, which were slightly battered inwards, and were floored with close-set flags.

In the main body of the tower the primary floor was covered by a layer of soft black sandy silt containing fragments of fired clay (1851: Fig 126), probably representing firing debris and rake-back deposits from the ovens. This layer was the earliest of a series of such deposits laid down within the tower. Late in this sequence the northern oven (1739) was backfilled with clay. This clay was partially overlain by further charcoal and ash deposits on the tower floor, which demonstrated that the southern oven was still being fired.

Phase b: the rampart building

The interval tower was subsequently converted into a rampart building which probably functioned as a bakehouse. This involved an almost complete demolition of the tower followed by rebuilding. Part of the east wall (4314) was left as a stub projecting 900mm from the inner face of the north fort wall with which it was bonded. This may have been necessary in order to retain the integrity of the fort wall. The western wall (4315) was retained as far as its eastward return and the southern wall was completely removed, leaving a robber trench (4311) which contained a variety of clay fills, deposited in order to level up the floor for a larger building. The walls of the extended building were narrower than the primary walls at 820mm wide. A new wall (1682) was built along the face of the north wall of the fort, creating a longitudinal butt joint. This wall was also butted against the two residual wall stubs and cut through the backfilled northern oven (1739). This wall was continued by a further stretch (4309) which abutted the east side of the east wall stub (4314), returning southwards after 2.40m. The southward return was built in a foundation trench (415) which was cut through the primary rampart of the fort (403, 416, 425, 426). The west wall of the enlarged interval tower (4310) was again narrower than that of the original. It was however bonded over the primary wall in steps rising from south to north, and the stub of the original eastward return was left projecting (Fig 127) giving a very careless-looking finish.

The earliest internal layers were patchy deposits of mortar which may have been associated with the rebuilding. Above these lay a sandy clay floor (1467=1683). A new, well-constructed horseshoe shaped oven (1372) was built into the north-east corner of the extended room, utilising the original wall stub (4314) as part of its western side. The flue faced southwards. Like the other ovens it was built with four courses of flat stones bonded with red clay, the clay

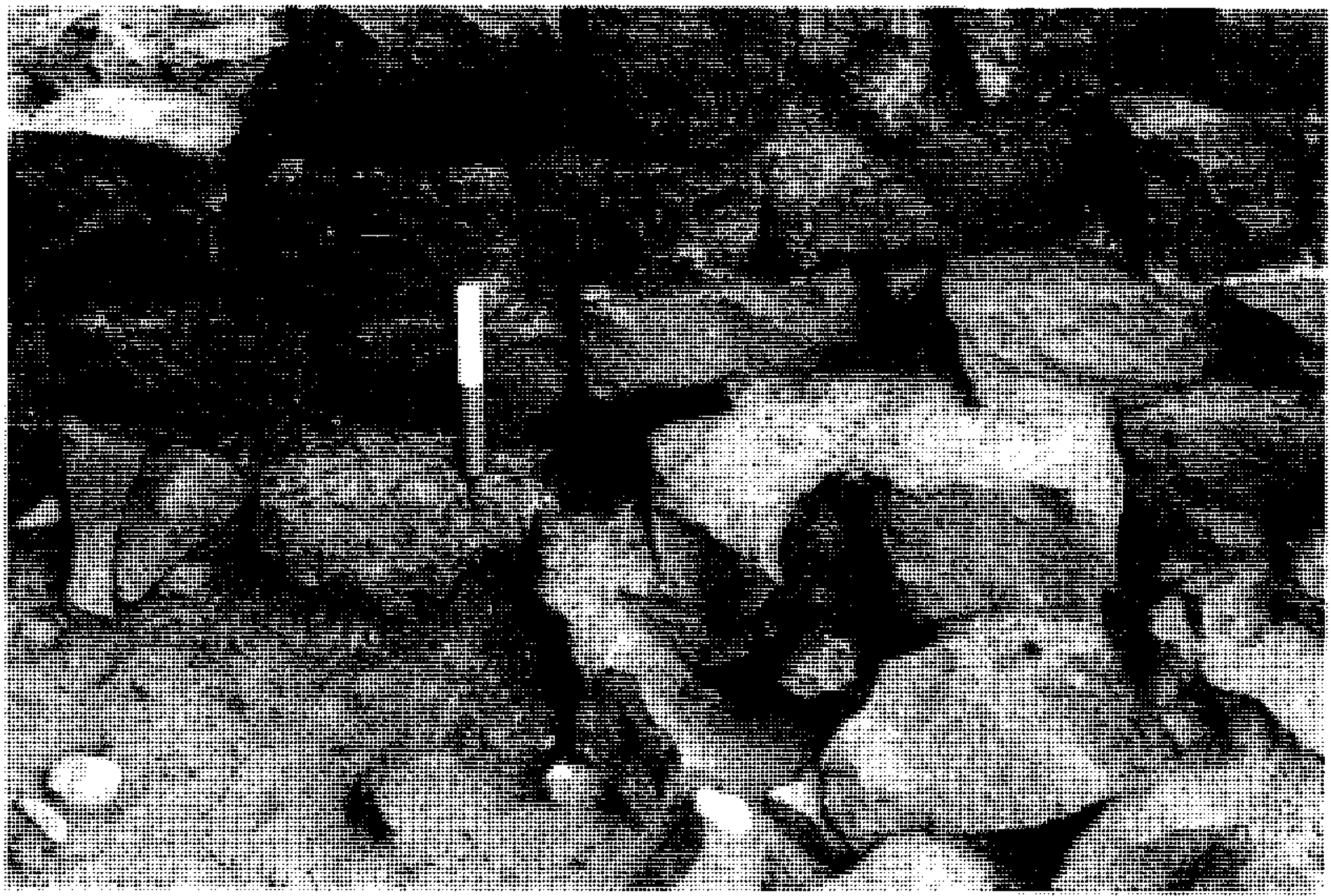

Fig 127 Internal (eastern) face of the western wall of Building 4419 in Phase b: to the right is the broader primary wall (4315) at its junction with the robbed south wall of the primary interval tower; to the west, the narrower secondary wall is bonded over the stepped end of its predecessor

bonding having been fired during the use of the oven. The stones of the walls were set on a slight internal batter, narrowing the diameter of the oven for the provision of a clay dome. The firing of the oven may be represented by a dump of black charcoal to the south (1413).

The remodelled building continued in use during the accumulation of interleaved floors and charcoal layers derived from the firing of the two active ovens (1372, 1463), though there was no way of judging what length of time might have been represented by this accumulation. Ultimately the ovens went out of use. The western oven (1463) contained a large amount of fired clay which probably derived from its dome. In the eastern oven (1372) the absence of dome material suggested that it may have been dismantled before the building went out of use. The collapsed layers within this oven and within the walls of the building at large (366, 386, 1324, 1373) contained ceramic roof tile, all broken into small fragments measuring around 50 x 50mm. The matrix within which this tile was contained was very sandy and contained a high proportion of mortar, and the entire deposit seems to represent the remains of a collapsed tile roof together with the mortar used to secure it. This deposit is the largest single deposit of ceramic roof tile from the site, and Building 4419 Phase b is the only structure for which a tile roof may be confidently inferred.

Fig 128 Stratification and blocking in the doorway of the north-west angle tower as revealed in the 1951 excavation (imperial 6ft scales) (reproduced by permission of Brenda Heywood)

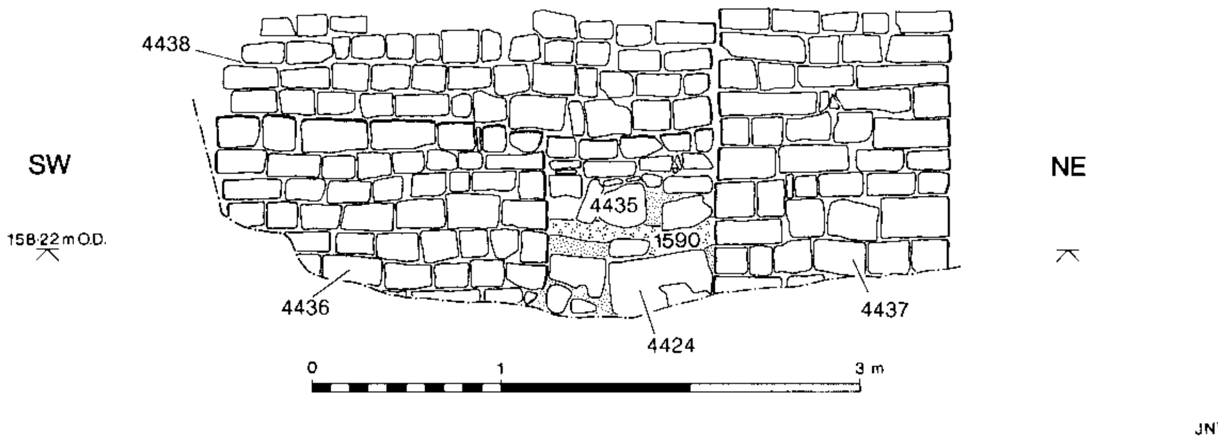

Fig 129 Elevation E: Exterior elevation of the south-east wall of the north-west angle tower

The north-west angle tower and its associated rampart, drainage, and road sequence

The north-west angle tower

During the excavations of 1952, the original clay and cobble floor was found on the south-east side of the tower (Fig 46). The north-eastern corner was occupied by two large ovens (4434), which were retained and consolidated. These ovens were found with the masonry forming the springers for the domed superstructure, although these collapsed before a photographic record could be made (Gillam 1952). The firing of the ovens produced charcoal and ash deposits which were removed during excavation within the tower, but were preserved in the entrance to the building beneath the later wall which blocked the doorway.

The lower three courses of the blocking wall to the tower door were irregular, and were constructed of a variety of shapes and sizes of stone (4424: Fig 129; Gillam 1952, sketch section). Figure 128 shows that some effort was apparently made to face these courses on the inside of the tower, though this effort was not sustained. The coursing above this (4438) indicates that a rebuilding took place, though whether this was contemporary with the blocking of the doorway is far from clear. Although the top four courses of stonework (4438) which ran across the doorway butted against

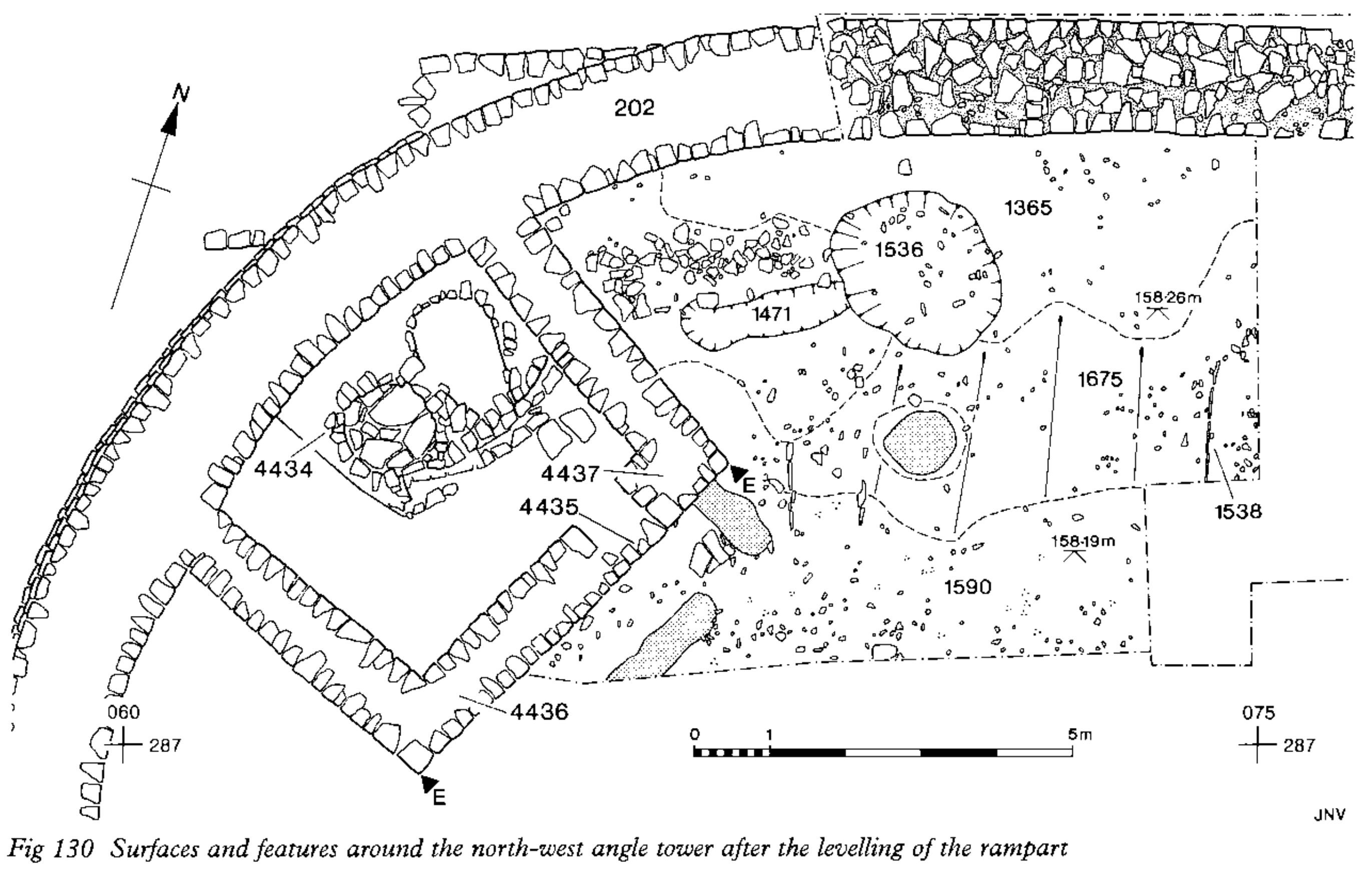

Fig 130 Surfaces and features around the north-west angle tower after the levelling of the rampart

the north-east jamb (4437), they clearly oversailed the bottom six courses of the south-eastern jamb (4436), and were continuous across the south-east face of the tower (Fig 129). Had the door been merely blocked, the blocking stonework would have butted both sides of the original aperture. The effect seen here could not have been achieved unless the tower had been dismantled to this level and then rebuilt.

Associated levels

The primary layout of the area to the east of the angle tower (Fig 43) included the earthen rampart (1365) built up against the north wall of the fort (202), with a stone-lined drain running beneath it to a culvert which carried water northwards into the fort ditch (Fig 45). Within the area excavated there was no sign of the primary southern edge of the rampart, or the way in which the rampart related to the angle tower. In the south-west corner of the trench, however, a small area of primary orange-brown road metalling (1781) was defined immediately to the south-east of the doorway from the interval tower which the road had clearly served.

After the road surface had been patched at least twice, a very compact surface (1774: Fig 44) was laid. The layer consisted of fragments of sandstone and sand, apparently representing broken-down sandstone flags, and it seems that this layer was part of a flagged road surface. During the period of use of this surface, the drain beneath the rampart (2546) appears to have silted up or collapsed, as it was replaced by a new drain (1732: Fig 43). This originated on the south side of the excavation area, at the southern end of the original drain. It was diverted eastwards to run along the foot of the rampart, probably in order to avoid the necessity of digging through the large volume of rampart material to repair its predecessor. The drain itself was V-shaped in section, 300mm deep, and lined and capped with flat sandstone slabs (1852). The fills of the drain (1733, 1734) comprised laminated silts which had a waterlain appearance. Before this second drain silted up, a number of alterations and repairs took place. The road was resurfaced with two successive layers of pebbles and cobbles (1773). Immediately over the drain itself, a cut through these surfaces (1676) was filled with sandstone slabs (1677), which were probably intended to strengthen the top of the drain, preventing collapse. This was only temporarily successful, and the drain was later replaced by a soakaway (1816).

Until this point in the history of the area it may be assumed that the rampart stood to its full original height, and it seems likely that the rampart was now lowered. The soakaway and road surfaces were sealed by a loose cobbled surface (1593) which overlay the south side of the lowered rampart. At the same time a large dump (2510: Fig 43) of clay-silt was laid down to level the reduced rampart and to fill a longitudinal cut which had been made in its top. The gradual raising of the *intervallum* road, and the lowering of the rampart now meant that both were at a similar level of +158.19–158.26m OD (Fig 130). This was also the level of the top of two stones which had been placed in

Fig 131 Building 4420 from the east

the bottom of the doorway into the angle tower (4424: Fig 129), possibly as a doorstep. A number of features were cut into the rampart top at this stage. A sub-circular pit 2m in diameter and 400mm deep (1536: Fig 130) is, by analogy with Area A, most likely to be a robbed-out oven. A slot 2.11m long, 430mm wide and 15mm deep was cut by this feature. A number of lines of thin flat stones (1538) may have been incorporated into the earlier rampart and exposed by its denudation; there was no sign of their having been inserted from this level.

It was at this point also that the ovens appear to have been built in the angle tower. Black soil with a considerable charcoal content (1590: Figs 129, 130; Gillam 1952, sketch section) was found beneath the blocking wall in the doorway of the tower and trampled into the cobbled surface of this phase (1593). The doorway into the angle tower was blocked after a substantial build-up of charcoal had accumulated, and surfaces outside the angle tower were not removed during the working of the ovens.

Subsequently, a layer of dark-brown sandy clay loam (1465) was used finally to level off the rampart and *intervallum* road. On top of a second layer of loamy soil (1414=1409) lay a number of small structures, mostly comprising two or three aligned stones, but having no clear stratigraphical or structural associations. The final development was a building constructed in the angle between the angle tower and the north wall (Building 4420: Figs 126, 131). The south wall of this structure (88) was not contemporary with its eastern counterpart (48). The latter was a clay-bonded wall of five courses with a bonded return which had been partially demolished. The west end was sealed by the compact sandy clay floor of the building (1321) upon which the south wall (88) was built. Irregular masonry at the west end of this wall abutting the angle tower may have been a blocked door. Further soil and stone layers (1302, 33, 1306) accumulated around this structure. At the east end of the rampart area was a long irregular pit (307: Fig 126) which was filled with a deposit of smooth clay (51). This fill was surrounded by a number of stakeholes (87=155) filled with soft silt. The function of this feature was not established.

Alterations to the east curtain wall in Area F

The construction and subsequent blocking of the *porta quintana dextra* during Period 2a has already been described and discussed. A number of further alterations to the wall occurred subsequently, the evidence for which takes two forms: firstly there is the stretch of standing curtain wall between the two gates on the east side of the fort. This was consolidated in the 1950s and has long exhibited a complex series of renovations. Secondly comes the evidence from the excavations of 1992. As well as the exposure of the curtain wall on each side of the former *porta quintana dextra*, the excavation revealed a wide scatter of fallen rubble lying to the east of the wall, among which could be discerned six distinct collapsed courses. Part of the wall had collapsed intact, and the analysis of the fallen material therefore demonstrates the final appearance of the much-altered curtain wall. The drawings essential to the understanding of this section are Figure 132, which shows the collapsed wall as excavated, and Figure 133, which gives a reconstruction of this wall raised back into place, together with the standing and consolidated wall running northwards to the *porta principalis dextra*.

The standing curtain wall

by Peter Hill

The overwhelming majority of the wall is built in coursed rubble. There is evidence of a number of rebuilds which are indicated by vertical offsets and visible changes in the character of the masonry (Fig 133).

Immediately adjacent to the *porta principalis sinistra*, in the seventh course, is a run of ten stones which are noticeably larger than the average. The third and fourth from the north have a small check cut into their top right and left corners respectively giving them something of the appearance of the stones of the gate piers of the *porta quintana dextra*, though the checks are too small to have accommodated the edge of a pivoted door, and the overall sizes (approximately 610 x 430mm and 590 x 430mm) are rather too small for the outer gateway of a fort. The seventh stone (610 x 290mm) has a lewis hole in the face.

The stones to the south of these are typical coursed rubble, the lower three or four visible courses being rather longer than usual, the upper courses are roughly square. At a rebuilding break 16.35m to the south of the *porta principalis*, a bonding course about 65mm high appears, centred 965mm above the offset course. which is itself 250mm above present ground level. This construction continues to the south for a distance of 7.6m to the next rebuilding break where the offset is set one course higher and the bonding course disappears entirely. This stretch of walling is 11.9m long and extends into the northern end of Area F (071). This southern section was bonded with a coarse, hard, yellow-white mortar which was also used in the core of the wall. Due to consolidation no original mortar was visible in the other areas of the standing wall. The chronological relationships between most of these rebuilds are far from apparent from the extant fabric.

The excavated curtain wall

by Tony Wilmott and Peter Hill

Because the excavation was not continued below the level of the *in situ* wall collapse, very little of the lower coursing was exposed. It was, however, apparent that this consisted of conventional coursed rubble. It seems possible that these courses (071) consisted of an area of primary wall. This idea is based on the similarity of both coursing and mortar to the primary passage walls of the *porta quintana dextra* (Figs 42, 43).

The most obvious element of the rebuilding of the wall was the use of large, reused sandstone blocks. These all featured such details as bar-cramp holes, crowbar holes, lewis holes, and dowel holes. As the cramp holes did not relate on adjacent stones, it is clear that the blocks were reused from another structure. The blocks were given individual context numbers and a selection are illustrated (Fig 136) and described below.

Courses 1–3 north of the former *porta quintana*

To the north of the former gate were three courses of large, reused blocks (Courses 1–3: Figs 132, 133). Course 1 remained *in situ* on the wall, Course 2 had rolled forwards in collapse to rest on its outer face. The three surviving stones of Course 3 had completely rolled over in collapse such that the stones rested on their original upper faces. The reason for the survival of so few stones of this course was that the collapsed material had subsequently been mined for building stone. The position of the two southernmost blocks of Course 2 (048, 047) in this area is significant. It was clear that they had rolled further to the east than the rest of this course, but they were just as clearly part of a continuous run of blocks. When restored to their original position (Fig 133) the southernmost block (047) would have capped the north pier of the former gate (061), and extended into the gate aperture. The Storey engraving of the gate (Potter 1855a, 66: Fig 40a) shows that the pier survived five courses high, indicating that Course 2 must have lain above the pier, in a similar position to the original arch impost cap which was the only stone on the pier missing in 1850.

It is possible to calculate the original height of the wall and this rebuild from the surviving evidence. The west face of the wall, which comprised conventional coursed rubble, survived to a height of 1.81m to the top bed of the twelfth course. If raised back into the perpendicular, the top bed of Course 1 of rebuild 072 would be level with this twelfth course, also at a height of 1.81m. Given the height of 360mm for the stones of Course 1, it seems probable that nine courses of primary coursed rubble (1.45m) lay beneath it. As recorded by Potter (1855, 67), the northern gate pier was 1.83m (6ft) in height to the top bed of the uppermost stone. It thus seems that the top stone of the pier was butted by the northernmost block of Course 1 (since robbed), with Course 2 then riding over both the pier and Course 1, to tie the wall across the top of the former gate portal. Course 2 was also 360mm thick, and Course 3 was 320mm thick taking the wall height to 2.49m (allowing joints 10mm thick between courses).

Fig 134 Collapsed walling to the north of the porta quintana dextra

Courses 1–4 south of the former *porta quintana dextra*

To the south of the gate the coursing was somewhat different (Figs 132, 134). The back wall face again stood to a height of 1.81m (12 courses). It is logical to assume that the top bed of the fifth and topmost course of the south gate pier (060) was of the same height as its northern counterpart, and this is reported by Potter (ibid). In this area the reused stones were of more variable size than those on the northern side, many being thinner. A stone of Course 1 which survived *in situ* close to the pier (110: Fig 133) consisted of a block 360mm thick on top of which was an 80mm thick string course bedded on a 70mm pad of hard white mortar. The extra 150mm provided by the string course and mortar pad was required to make up for the fact that this reused block was not of sufficient thickness, unlike the adjacent stone (058: Figs 132, 133). Further to the south the construction of Course 1 was similar to that to the north of the former gate. With or without the string course, Course 1 clearly levelled the wall to the top of the uppermost pier stone of the gate. Course 2 was 280mm thick, and Courses 3 and 4 were each 240mm. On this side of the gate the stones of Course 4 were similar reused blocks to Courses 1–3; as will become clear this was not the case elsewhere. To the top of Course 4 the wall height can be calculated as 2.60m.

Courses 4–7

Though Course 4 to the south of the gate appears to have comprised reused stones with similar clamp holes to those in courses 1–3, this was not uniformly the case. To the north of the gate the three surviving stones of Course 3 had rolled forward carrying the course above with them (Fig 132). This course appeared patchily as an almost continuous string course running through the rubble collapse, and as such gave the first indication that an intact panel of collapse existed. The course consisted of thin-bedded sandstone slabs varying in thickness from 130mm to a maximum of 250mm. The stones were varied in geological type, the quality of their dressing (though most were in their natural state apart, perhaps from rough trimming with a hammer), and also in size and shape. They had been selected simply as slabs with no other criteria evident. There are signs that when a single stone was of insufficient thickness, two had been used to make up the course to its required level. General wall height including this course (or courses) would have reached around 2.72m.

Course 5 is the strangest and most important course, as its stones had been carefully selected for their decorative quality. These were small, water-worn, limestone boulders comprising white fossilised coral (Fig 135). The blocks were virtually free of tool marks although, as they are soft enough to be scratched with a fingernail, any marks may have been weathered away. On a single stone, to the east of the north pier of the gate, was the trace of a 25mm 5–toothed claw. There is no doubt as to the source of these stones; the river Irthing below the spur on which the fort stands contains huge numbers of them. This soft stone would not have readily withstood the climate in the Birdoswald area, and must have been utilised because of its virtually pure white colour. It formed, therefore, a decorative white band 26mm broad, designed to contrast with the grey sandstone of the rest of the wall.

Fig 135 Detail of wall collapse to the north of the porta quintana dextra *showing part of the run of white limestone boulders of course 5*

Courses 6 and 7 consisted of thin natural slabs, some of which were water worn. They measured 140mm and 100mm thick respectively, and bring the total projected height of the wall as represented by its fallen courses to 3.30m. To the east of Course 7 the rubble petered out completely, with no trace that the collapse had ever extended beyond this point.

The reused blocks

by Peter Hill

Each of the reused blocks were individually examined and reported on. Those illustrated in Figure 136 and described here are a representative selection of the types.

These stones are typical of Roman military engineering of the utilitarian kind, the holes provided for hooked iron bar-cramps demonstrating that in their original use they had to resist considerable lateral pressure. The only likely source for such stones is the

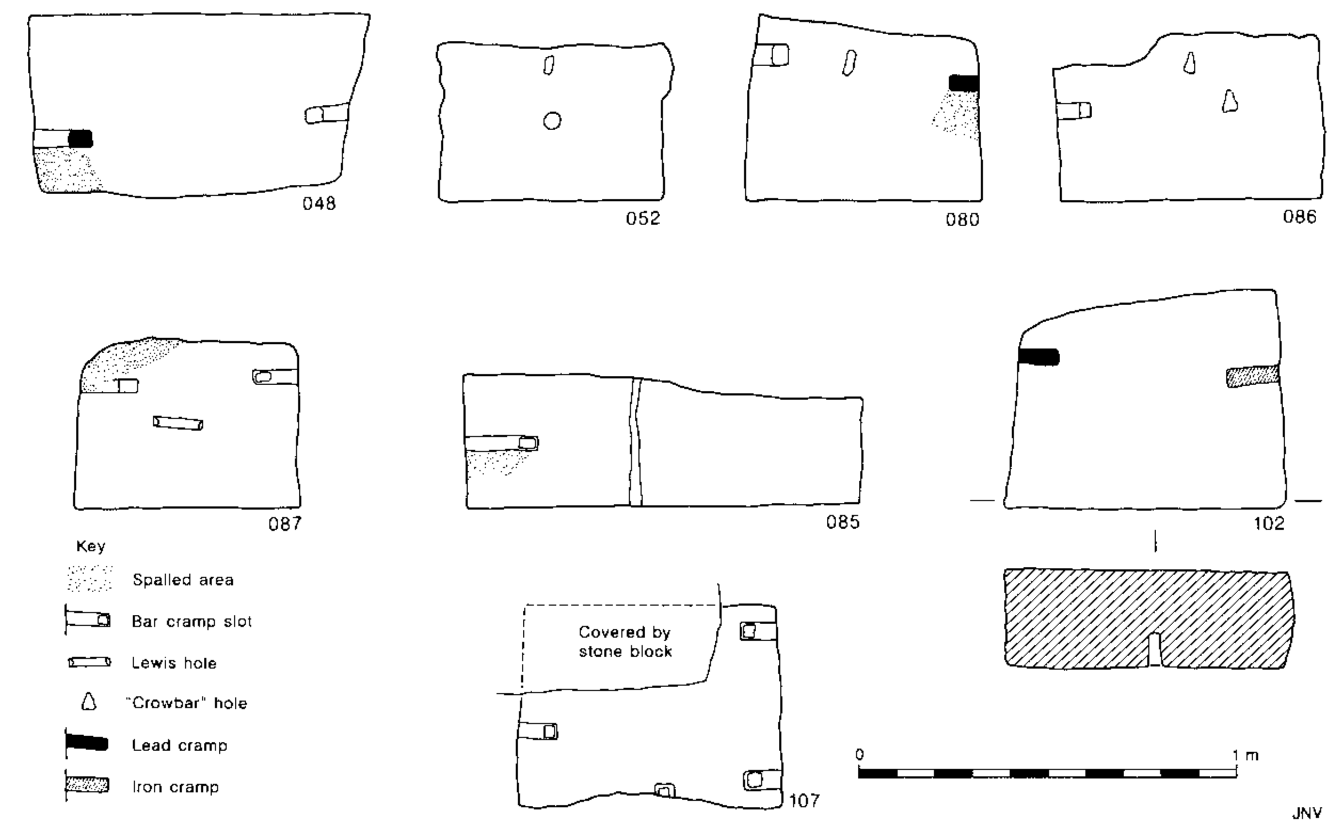

Fig 136 Reused blocks from the collapsed curtain wall in Area F

bridge over the Irthing at Willowford. All of the features of stones found in this and other bridges on Hadrian's Wall are present in the reused material. These have been extensively discussed elsewhere (Bidwell and Holbrook 1989), obviating full discussion here, but include crowbar slots (ibid, 119), lewis holes (ibid, 119–21), and circular holes to take wooden dowels (ibid, 128–31). The most prevalent feature of the stones, however are the above-mentioned bar-cramp slots. All of the cramp slots are of the type used in Bridges 1a and 2 at Willowford (ibid, 127–8; fig 88 type h; figs 48, 57, 64). Three similar blocks were found reused in the south kerb of the latest road through the *porta principalis sinistra* in Period 4b (Figs 119, 120).

048. The uppermost face (to the east), had a cramp hole in each end, the lefthand side having lead still in it; both had been broken away to remove the cramps. The lefthand half was worked with a punch, fairly roughly, generally straight with occasional projections. The right-hand, which was a little lower, was also worked with a punch; part of this half was also worked over with a 50–60mm blade. The stone dropped away towards the right-hand joint. The right-hand half looked rather worn as if open to the elements, traffic, or water, whereas the lefthand side was unworn. The division was not at right angles but ran from top right to bottom left. The lefthand joint was worked partly with a punch, and partly with a 50–60mm blade. All edges had an indistinct margin. The right-hand joint was similar to the lefthand, except that the centre, roughly punched, was sunk a little below margins which were clearly worked with a 50mm blade. The joint tapered with the stone widening towards the west. The weathered west face was all worked with a punch, with possible cleaning with a blade in places. The face was largely buried, but was clearly rounded although apparently quite cleanly worked.

052. The east face, top, and joints, were all very roughly punched as if to serve in a buried foundation. The top bed, which curved up to the right, had a sub-circular dowel hole in the centre, 30mm in diameter and approximately 40mm deep, cut with a punch. Also in the top bed, in the centre towards the back, was a small slot as for a crowbar.

080. This was tipped forward, concealing the face and leaving the top bed vertical. The top bed had two cramp holes, one at the top left running to the back, the other at the bottom right running to the joint. The lower lefthand part of the surface was neatly worked with a broad blade; the rest of the surface was worked with a punch in rough pecks and furrows. The back (now upper) quarter of the bed has been lost. What could be seen of the right-hand joint was worked with a punch with a range of at least 5–6mm. The lefthand joint had a faint chiselled margin against the back, the remainder was worked with a punch. It seems to have been deliberately worked hollow by 4–5mm. The back was roughly worked with a punch, and was very uneven except at the lefthand side where there was a 50mm wide chiselled margin; the reason for this above average margin in this position is quite obscure. In each end of the top bed were bar-cramp slots, one of which retained lead, though some attempt had been made to remove it. Also in the top bed was a small crowbar slot.

085. The right-hand end of the face was lost. The rest was roughly worked with a punch: there was some attempt at a margin on the lefthand side. There has been considerable damage to the arrises, but they were originally probably quite good within the limitations of the dressing. The top bed was quite neatly punched in small random pecks and furrows. It was between square and 3mm undersquare to the face. The right-hand joint was very poor, punched roughly, and partly fractured. The margin at the front was straight, but this seems to be more by accident than design. The lefthand joint was largely hidden, but the front had a 50–65mm margin worked with a ?broad blade. The top edge seems rough punched up to 10mm hollow, range 5–6mm. The back was natural. At one end of the top bed was a bar-cramp slot.

086. The face was worked with a punch in short furrows and small pecks, and odd deeper holes, with a hint of a chiselled margin against the top bed. The arrises were good, if now a little rounded. The top bed was overall about straight, worked with punch, and was not particularly good. There are two shallow slots set towards the back and roughly in the centre, with a lateral offset of 25mm and about 100mm apart; they were neither the beginning of quarry wedge slots, nor of lewis holes, but were possibly cut to take the toe of a crowbar for adjusting the position of the stone above. There was also a bar-cramp slot in the end of the stone.

087. The face was worked with a punch in long uneven furrows angled from top right to bottom left, especially over the lower right-hand area, with what may have been a chiselled margin against the top bed. It was about square to the top bed, but was never a good piece of work. The top bed undulated and was probably worked largely with a fine punch, generally smoothed as if worn by traffic or water, with small signs of a blade around the back margin. The lefthand third of the bed was broken off, around one of two bar-cramp holes, and a lewis hole was also provided in the top bed. The right-hand joint, where visible, was punched, with a rough chiselled margin at front and back worked with a 50mm blade. The lefthand joint also had a 50mm chiselled margin at the front, the remainder worked with a punch. Overall the joints were roughly square to the face. The back was natural, with some help from a punch in places.

102. The back was natural. The top bed was punched in short furrows, with occasional work with a ?50mm blade. There are signs of spalling which may have occurred during working. There were bar-cramp slots in each end of the top bed, both retaining lead and one retaining iron as well. The front half was less good than the back, where blade marks appear with punch marks. The front half was all worked with a punch, right up to and into the west face, and short furrows run through the arris; it seems likely that the back half formed a bed joint and was cleaned up, the front part was visible and was left relatively rough. The half-buried face was all worked with a punch, and had perhaps suffered wear since working. So far as can be seen, it was oversquare to the top bed by 20mm. The right-hand joint was partly broken away; the small part left visible was worked over with a punch. A slot in the underside of this stone appeared to be a cut-down dowel hole. It is possible that this was its second reuse.

107. The back was a very uneven natural face. The top bed was worked with a punch, mostly in pecks with a few short furrows. Bar-cramp holes at front and back run to the right-hand joint and one to the lefthand joint in the centre. Towards the buried face, the stone suddenly rose 5–6mm, to give a band 75mm wide worked with a broad blade after a punch. This may indicate that the upper course was set back by 75mm in its original position. There is a cramp hole to the back in centre of this bed. The right-hand joint, worked with a punch, is straight towards the face; there are signs of a blade towards the back. Of the lefthand joint only a broken corner is visible.

The collapse of the wall

The collapse of the wall seems to have been somewhat violent: Course 5 lay about 4m from the face of the wall at the north end of the excavation, but rather less than this opposite the former gate. The collapse appears to have centred at the gate, which would have been the weakest point due to the four butt-joints against the two gate piers lying close together in the lower courses of the wall. As might be expected under such circumstances the collapsed courses are close together in front of the gate. The collapse in the centre would have brought down the wall at ever increasing speed as it spread sideways, flinging the upper courses away from the wall line. The fanning out of the courses as a result of this can be seen from Figure 132. The courses of reused material were, however, too heavy to yield to these forces, and they therefore rolled down the slope provided by the revetting bank.

The east rampart

The clay rampart behind the former *porta quintana dextra* survived to a height of 1.42m (for the construction of this rampart see Chapter 8). It is probable that the rampart was originally higher than this, and that the hard-packed pebbly surfacing (004, 010, 018: Fig 132) at this level followed a truncation of the primary rampart. On top of the surfaced rampart was a small length of wall (056). This was 2.25m long and 0.70m wide, and was positioned 1.13m from the fort wall (011) with which it was parallel, on the south side of the former gate. The wall was three courses high, well constructed with an 80mm offset on the west side of the bottom course. No bonding material was apparent. The southern end of the wall was neatly squared off, and clearly had never had a return, the northern end was cut away by the excavation trench of 1850. At 400mm from the south end of the wall, in the second course, was a neat socket 150mm square. This suggests a timber spanning the gap between the two walls. It strongly suggests that wall 056 was part of a stair from the top of the reduced rampart to the wall top. Such a stair would have ascended to the north. The wall was later extended southwards for 1.07m by a two course wall of inferior construction (012). This wall terminated at the south end with a return towards the fort curtain wall. It seems possible that it represents a remodelling of the proposed stair, both lengthening it and changing its direction of ascent.

Bank east of the curtain wall

A final feature to consider is a bank comprising a variety of dumps which was built up against the face of the blocked *porta quintana dextra* (049: Figs 42, 132). This was deliberately placed up against the wall with its top somewhat lower than the centre of Course 1. It seems to have been deposited in an attempt to shore up the foot of the wall to prevent collapse, and its deposition on top of an unexcavated rubble deposit suggests that this followed on from a partial collapse of the wall, possibly the collapse which resulted in the rebuild represented by fallen Courses 4–7. Limited examination of the coursed rubble beneath the large reused blocks of Courses 1–3 shows the reason for the instability: these courses had begun to buckle under the weight of the reused blocks which they were unable to support. As Bruce (1867, 256) had previously noted 'the lower gateway has been injured by the yielding of its foundations'. The bank was an attempt to bolster this foundation, but it was the presence of the bank against the wall which caused the rolling effect discerned in the collapse of Courses 3, 4, and in places Course 2.

Area G: the south-east angle tower

Excavation within this tower was limited to tidying up previous work. An early excavation trench of unknown date (035) had penetrated to the uppermost surviving resilient floor (119). This consisted of hard packed clay and cobbles. On this floor an oven (036), 2.20m in diameter had been constructed. Little survived of this structure: only its flag floor and elements of a single course of clay bonded stone superstructure remained. The oven was situated in the south-west corner of the tower, immediately opposite the door at the western end of the north-east wall (Figs 137, 138). The oven was sealed by a deliberate dump of gritty silty clay including some decayed ash (033). This apparently represents the disuse of the tower.

Inside the tower, against the south, east, and north-west walls, several thin slabs of stone, between 50 and 75mm thick, were set on end in the floor. They were vertical or near-vertical, and were probably not fallen or stacked, but deliberately so placed as a facing to the wall. Their purpose is not clear. On the inner face of the north-west wall was an offset of 50mm, interrupted 915mm from the north corner by a hole which could have been a socket for a timber. The seating was dressed to a flat bed and face. The offset would have been 8–9 courses, perhaps a metre, above the Hadrianic floor level and the purpose both of the offset and the socket is unclear, though a possible function for the socket would be as part of the support for a staircase.

The area around the tower was excavated during 1932, and showed some complexity in its development (Figs 138, 139; Simpson and Richmond 1933, 259–62; figs 11–16). A small building, whose walls cut through the primary rampart material, was constructed against the north-east wall of the angle tower. This building had only a north-western and a north-eastern wall, as the end against the angle tower door was left open. The open side lay against a kerb and drain on the side of a path leading to the tower door; the building

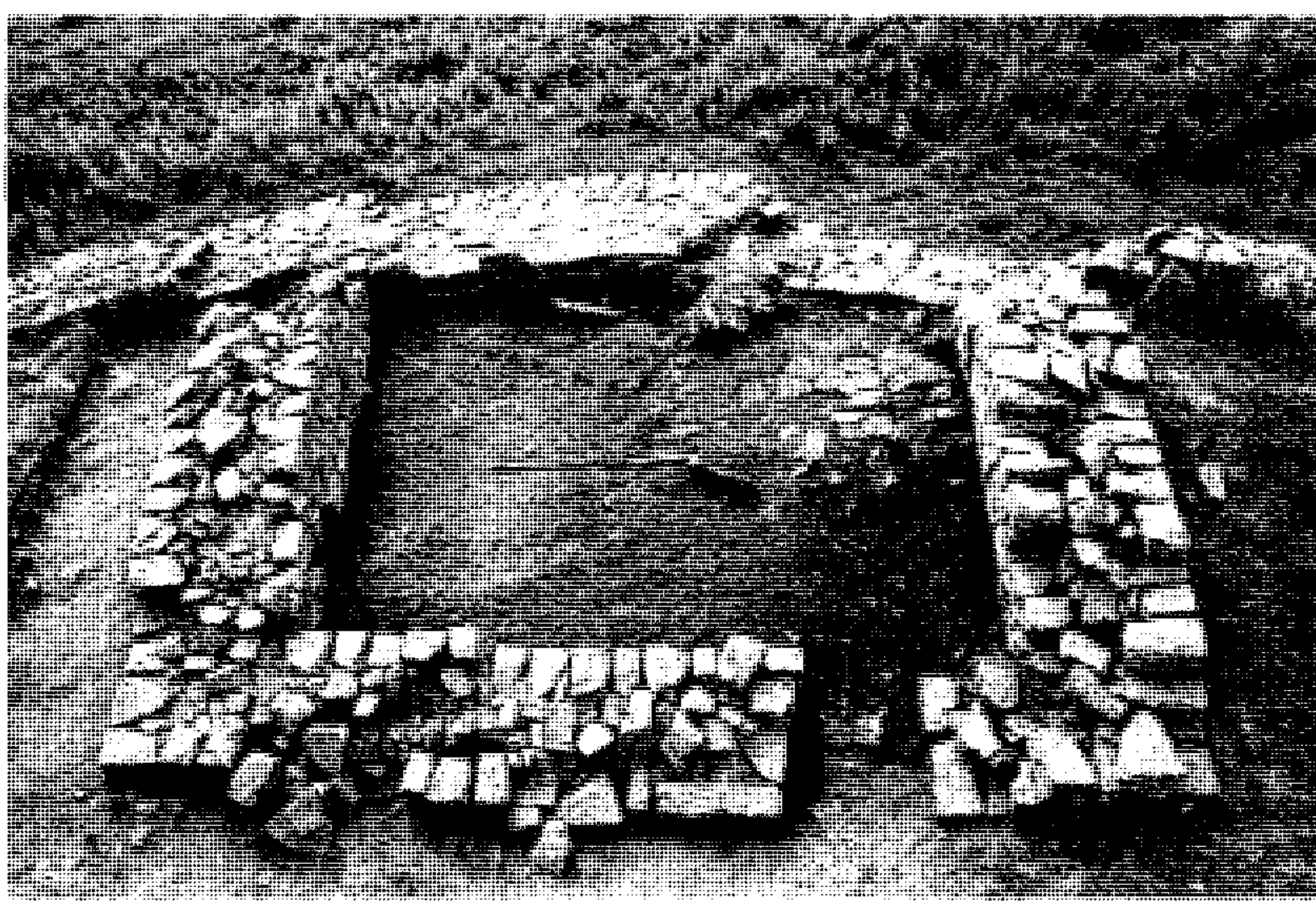

Fig 137 The south-east angle tower as excavated in 1992

was clearly contemporary with the active use of the angle tower. Both structures were respected by a cobbled surface, and both the building and the paving were associated with Antonine pottery. At the north-west side of the cobbling lay an oven (ibid, fig 14), the base of which contained a gold earring (Fig 191). A stone-built oven was subsequently built in front of the door to the angle tower which must now have fallen into disuse. Presumably this oven is broadly contemporary with the deposition of dumped deposits within the tower, though there is no sign that the tower door was ever blocked (Fig 139; ibid, figs 11, 12, and 14).

Evidence from early excavations

Work on the defensive circuit undertaken before 1987 is best summarised by means of a list of structures in descending order of prominence. Thus gates will be noted first, followed by interval and angle towers, and finally by the curtain wall and rampart.

The *porta principalis dextra*

This gate (Figs 3, 140) was first examined by Potter (1855c) in 1852 after its discovery during stone robbing by the tenant farmer James Boustead. Further excavation in advance of consolidation was undertaken by Gillam (1950; 1952, 64–8) almost a century later in 1949–52.

Potter (1855c, 142) noted that the blocking of the north portal lay at a higher level than the original gate floor. A second, higher, pair of pivot stones were provided in both portals. A dedication stone of 219 (RIB 1914) was found outside the south tower. Gillam (1950, 65; 1952, sketch section) recorded a stratigraphic sequence beginning with offsets going down into the Turf Wall ditch (Fig 29). Black silty material overlain by 'white lime' provided the base for a primary stone floor at upper offset level. This was overlain across part of the tower by laminated burnt material, probably associated with a structure first interpreted as

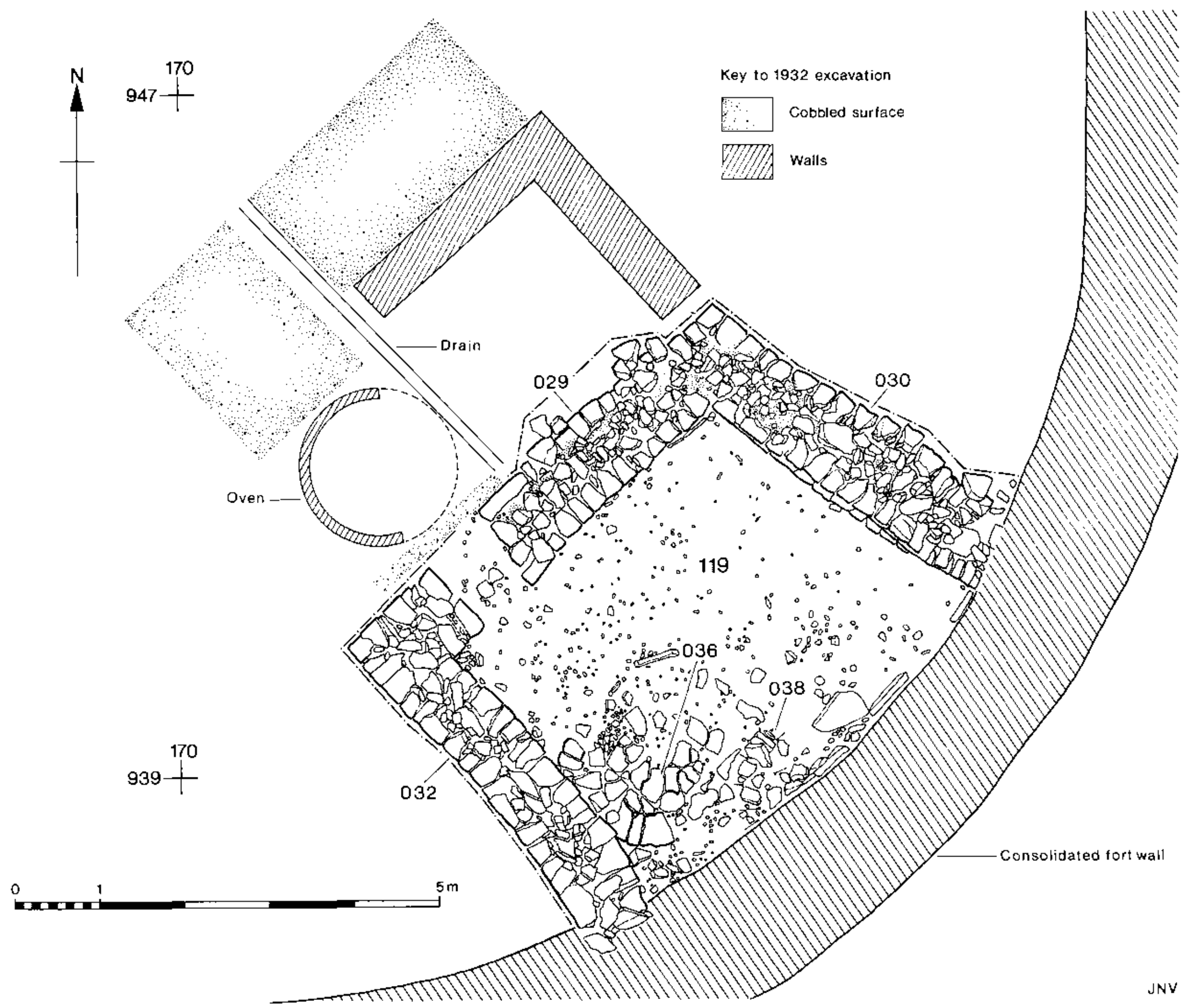

Fig 138 Plan of the south-east angle tower, incorporating the results of the 1932 excavations to the west of the tower (Fig 139)

Fig 139 The 1932 excavations to the west of the south-east angle tower (reproduced by permission of Dr G Simpson)

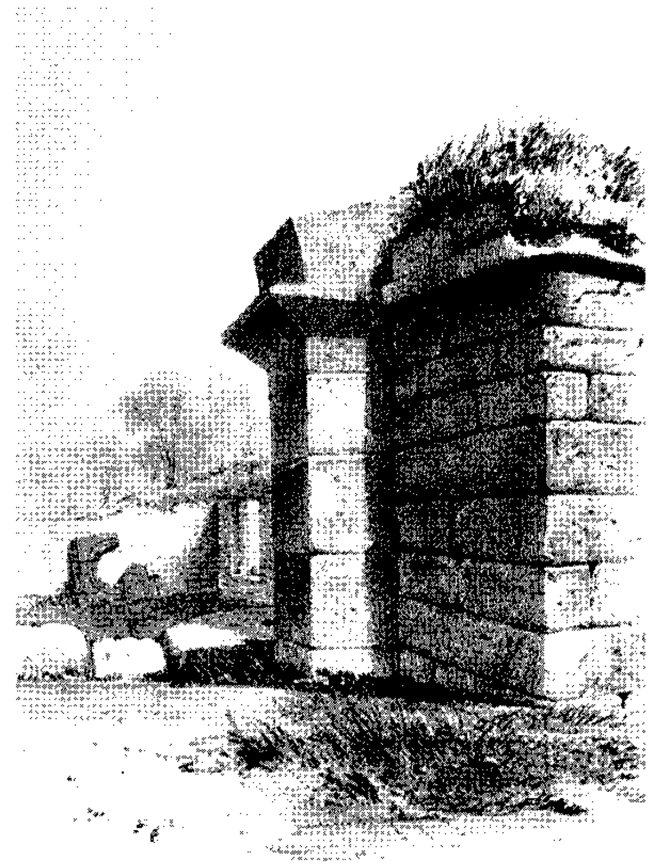

Fig 140 Engraving by John Storey of the north impost of the porta principalis dextra: *note in background the monolithic window head illustrated at Figure 38 and see also Figure 3 (reproduced by permission of the Society of Antiquaries of Newcastle upon Tyne)*

a tile kiln built on the hypocaust principle, which occupied the eastern two-thirds of the room. It was supported by two masonry buttresses held together with clay which contained a group of late second-century pottery (Gillam 1952, ref AA). Gillam later opined (personal communication cited by Welsby 1982, 36) that a bread oven or hypocausted room had been built in the ruined tower. The evidence for the ruinous nature of the tower is the fact that the reddening of the stones of the north wall of the tower stopped abruptly, close to the top of the surviving portion (Gillam 1950, 66; 1952, drawn elevation). Whether the tower was ruinous when the kiln or oven was in use, or whether it was subsequently dismantled, it is certain that rebuilding took place. This is demonstrated by the sharp boundary above the reddened stones observed by Gillam, and also by the fact that the blocking of the original west door of the tower was partially rebuilt with continuous coursed masonry crossing the aperture of the door, in exactly the same fashion as the blocking of the door into the north-west angle tower (Fig 129). When this blocking took place a new door was opened in the south wall of the tower, giving access from the blocked portal.

The kiln or hypocaust was subsequently buried by a layer of clay, thought to have been the kiln superstructure, which sealed late third-century pottery (Gillam 1952, ref AC). A new flagged floor was then laid 910mm above the original floor, sealing the kiln, and a doorway at the same level was inserted through the south wall of the tower. Pottery of the early fourth century was found among these flags. Daniels (1978, 201) sees this as being contemporary with the blocking of the south portal of the gate.

The survey of stonemasonry (Hill 1991a) revealed that the top two blocks on the west *spina* pier were reused. A curvilinear shape is incised on the north face of the top block at the east end of the east gate *spina*. John Coulston writes that the right portion of the work is obscure, but an asymmetrically-executed pelta facing upwards is a possible interpretation. Curving decorative motifs on window arches from Housesteads provide a partial parallel (eg Coulston and Phillips 1988, nos 417, 420, 433). Peter Hill notes that the north arch springer was fractured in such a way as to suggest, but no more, that the arch may have collapsed downwards rather than to front or back. The reason for this may have been that one of the voussoirs weathered so badly that it failed, or the stone was lost from the haunches of the arch while the crown was still heavily loaded. The latter may have occurred if stone had been robbed from the wall at one side of the arch while much of the tower was still standing. Failure of the arch was not due to movement of the piers for they now stand reasonably plumb, and they are so depicted in the Storey engraving (Fig 140), suggesting that no post-excavation correction of these piers took place during consolidation.

The *porta decumana*

The only excavations on this gate were those by Potter (1855b; Figs 2, 60), following preliminary work in 1831 by Crawhall (Hodgson 1840, 207). Crawhall cleared out part of the ditch, and while doing so appears to have found the full complement of voussoirs of one of the gate arches (Potter 1855b, 74). The east portal may have been blocked soon after erection, as the sill stones showed no signs of wear (ibid, 71). The blocking wall here was of 'superior workmanship ... great pains had been taken in building the wall, and nothing indicating hurry or want of time could be perceived' (ibid). The western portal, however, was blocked with a wall of 'very bad workmanship. Some of the stones were very large and set on edge; one of these was six feet long [1.83m], four feet broad [1.22m], and only five or six inches [127 or 152mm] in thickness' (ibid).

The east tower contained a pair of ovens against its south wall, while the west tower was 'reconstructed, following complete demolition, in large and irregular masonry in the style of the late fourth century' (Daniels, 1978, 201). In fact the east wall of the west tower was thickened, while the use of unusually large blocks of stone in the west passage wall is probably due to later repair and reconstruction of the gate. The engraving by Storey (Fig 60) shows an oven in the rampart to the west of the west tower.

The north-west interval tower

This tower lay between the north-west angle and the *porta principalis sinistra*. Its western wall was robbed to ground level. Inside the tower the original clay floor was found. Most of a globular amphora had been sunk into this floor (Gillam 1952, ref AV). A second, flagstone, floor sealed the primary surface. The east door of the tower was blocked (Gillam 1950, 68), and the blocking may still be seen.

The north-east interval tower

This lay in an analogous position to the north-west tower on the east side of the fort. It was again provided with a kiln or oven on its northern side, which was subsequently dismantled, and a flagged floor was laid over it. In its final phase the east (fort) wall was thickened to a width of 3.35m. This was interpreted as the conversion of the tower into a ballista platform, the western and southern walls having been demolished (Gillam 1950, 67–8). The small quantity of pottery recovered (Gillam 1952, refs AI, AP, AR, AS) allowed the four phases to be dated in accordance with the four Wall Periods.

The curtain wall and rampart

A unique situation was observed on the west wall of the fort by Hodgson (1840, 207). During stone robbing in 1831 the top course of the outer face was found to be 'joined together on the upper bed with dovetail iron cramps, each 11 inches [279mm] long'.

A sketch in his notebook demonstrates the accuracy of this description. The stones no longer survive, though there is one stone (4417: Fig 65) to the south of the *porta principalis sinistra* which is recessed on the top for a cramp, and a stone at the *porta quintana sinistra* which has the same bar cramp holes, and the same pattern of reuse as the reused stones at the *porta quintana dextra*. This was probably also taken from Willowford Bridge 2.

Exploration of the east and south ramparts showed some complexity (Simpson and Richmond 1933, 260–1). To the north of the south-east angle tower, the rampart was cut away to form a 'cooking shelf'. Upon this shelf lay the firing debris from the oven which blocked the door to the angle tower. The shelf was steeply revetted with stone at the back in order to retain a broad rampart walk. This had also been noted 22m south of the *porta quintana dextra* where an oven was found upon the shelf, and also at the gate itself in the trench dug from the *porta decumana* (Richmond and Simpson 1932, 141). The evidence for the shelf must lie to the west of Area F as, surprisingly, no trace of the earlier trench was encountered in this excavation. The shelf continued along the south rampart. The result of this appears to have been that the fort wall was backed by a rampart 4m in width, revetted on the west side by a vertical stone wall below which was a shelf 3.4m wide which appears also to have been revetted at its foot with a battered stone wall of five courses (Fig 139). It is possible that these alterations were contemporary with the lowering of the rampart in Area F.

On the eastern side, these rampart alterations were embodied in a new earth bank, the front of which was

> 'not the standard fort wall, but a new wall whose foundation and one course remained at this point only, perched high on the mound of ruins formed by the collapse of the fort wall.'
>
> (Simpson and Richmond 1933, 260–61)

This was the latest phase of the defences, though no evidence for dating was published. A similar narrow wall, only 800mm in width, is visible at the unexcavated south-west angle of the fort. This rebuild is interpreted as late Roman work, though its successor appears to be part of a medieval farm building (Daniels 1978, 201).

The defences: discussion

The continual maintenance of the defensive circuit would have been an important priority at all times in the fort's life, and the way in which the defensive structures and rampart changed through time would be influenced by the scale and nature of the fort's occupation as well as by functional and organisational considerations. The volume of archaeological work undertaken on the defences at Birdoswald over a period of a century and a half has served to point up their complexity, but the more work that is done the less possible it seems to establish a coherent story. Perhaps coherence in the study of the material remains of what must have been a largely *ad hoc* continuing labour is rather too much to expect. Hitherto the individual elements of the defences have been considered in isolation. In this discussion an attempt will be made to treat them as a whole.

The structural complexities of the primary construction of the defences have already been considered, and even as early as Period 2 changes in plan had left the circuit altered. The earliest completed plan was based on the four, main, double portal gates. All four angles were provided with towers, and on the north wall interval towers lay between the *porta praetoria* and the two angle towers. Interval towers were also provided between the northern angles and the *portae principales*. No interval towers appear to have been provided south of the *via principalis*, and the volume of excavation on the southern and eastern sides would probably have revealed them if they had existed. It is noteworthy that interval towers were provided only on those parts of the walled circuit which projected to the north of the Turf Wall when the fort and this Wall worked together. The *portae quintanae* provided towers on the east and west sides, but these gates became redundant when the Stone Wall was built up to the north corners of the fort. The towers were demolished and the gate portals blocked.

After the changes of Period 2, the alterations to the defences are either not closely datable, or not datable at all outside Area A. Though many of the gates and towers had similar structural histories it cannot be demonstrated that these were chronologically associated, and this should not be assumed.

Definite rebuilding is attested at both *portae principales* at about the same time. The *porta principalis sinistra* was rebuilt using fine masonry during the early third century, while rebuilding *c* 219 is attested epigraphically (RIB 1914) for the *porta principalis dextra*, though no part of the fabric of this gate may be related with confidence to the inscription.

Though one portal of each gate was blocked, these were the north portal in the *porta principalis dextra* and the south portal in its western counterpart. Furthermore the *porta principalis dextra* had a pair of replacement pivot stones laid in the portal before it was blocked, while the *porta principalis sinistra* was blocked after the use of its primary pivots. It is thus possible that the blocking took place at different times, or that it was contemporary, and the portal of one gate had required the replacement of pivot holes at some time when the other did not. All that may really be inferred is that the structural histories of the gates were different in detail.

At the *porta decumana* both portals were blocked, though not at the same time. Potter (1855b, 70–71) was probably correct in his belief that the east portal was blocked first, as the gate sill was very little worn. The latest fort ditch was not interfered with at the south gate, but was continuous across the blocked portals. This also occurred in the west gate at Great Chesters, and at the west gate of Housesteads, where the Military Way was cut by two banks and ditches (Crow 1995, 89). At Birdoswald, Richmond did not identify recuts to the fort ditch, several of which, having different relationships to the gate portals, were identified at the *porta principalis sinistra*. It seems likely that this continuous ditch was a late recut which post dated the blocking of both portals.

Little has been added to our knowledge of the blocking of fort gates on Hadrian's Wall since the summary prepared by Breeze and Dobson (1972, 194–7). Most gates were excavated in the nineteenth century, and so the dates of such blocking are generally little known. The sequence of blocking at Birdoswald is now better understood than most through the modern excavation of two of the six gates. The two *portae quintanae* were completed and then blocked after a very short period of use towards the end of the reign of Hadrian, during Period 2. Though it has been demonstrated that these gates saw a short life, the sill of the *porta quintana dextra* was very worn. This casts considerable doubt on the use of wear patterns to assess how long a gate may have been open. Such wear is the result of the volume of traffic, and intensive use over a short period will produce the same patterns as occasional use over a long time. The sill of the south portal of the *porta principalis sinistra* was very litrle worn despite being blocked a century after it was built, and this says much about the volume of traffic, particularly wheeled traffic, along the Military Way during the later second and early third centuries. It seems likely that the blocking of the portal of the *porta principalis dextra* was also a third-century operation, though the two phase blocking of the *porta decumana* is entirely undated.

All three principal gates which have been examined have shown signs of rebuilding and of the use of ovens, furnaces, or kilns in the ground floors of their towers. In the *porta decumana* there were ovens in both towers (Potter 1855b), and there is some indication that an almost complete rebuilding, which required demolition to a low level, took place after the ovens were installed. The use of the *porta principalis sinistra* for ironworking both in the north tower and, to a lesser degree in the blocked portal was a characteristic of the third century, and this could be associated with the ironworking carried out in the adjacent Building 4401 (Period 4a). There was no evidence in the surviving fabric that any rebuilding took place in this gate after the early third century. The addition of an annexe to the rear of the south tower and blocked south portal of this gate is paralleled at South Shields (Dore and Gillam 1979, 19; Bidwell and Speak 1994, 118, fig 4.11). The *porta principalis dextra* seems to have experienced some industrial use in its north tower, as evidenced by the base of an oven, kiln, or hypocaust. If the collapsed material sealing the remains of this feature was its collapsed roof, then the third-century pottery found beneath would tend to indicate that the use of this feature was contemporary with the ironworking in the *porta principalis sinistra*. This was followed by rebuilding, possibly in the early fourth century, though this date is very tentative (Welsby 1982, 37; Daniels 1978, 201). This rebuilding, like that in the *porta decumana*, involved an almost total demolition of the gate. Though the blocking of the door to the north portal belongs to this phase, the reused masonry on the west *spina* pier could belong to the earlier rebuild.

The interval and angle towers were almost all equipped with ovens. The north-west and south-east angle towers each contained ovens, as did the western interval tower on the north wall and the north-east interval tower. So prevalent is the use of the bases of interval and angle towers for the housing of ovens (for example at Housesteads, Simpson 1976, 126, 138; Crow 1995, 36–7) or even latrines as at Vindolanda (Bidwell 1985, 50–52), that Bidwell *et al* (1988a, 190, fn 5) have suggested that there was never any access to these chambers from the upper storeys of the towers. Under these circumstances the tops of the towers would have been entered through doors at rampart walk level, like the Severan towers at York, where no ground-floor doors were provided. At Caerleon Boon (1972, 38) notes that the bases of the stone interval towers were not much used and were used as 'rubbish holes' until they were dismantled and blocked off during the mid-second century, when bakehouses were built behind them. All of the towers at Birdoswald for which evidence is available, except for the south-east angle tower, had their doorways blocked after a bakehouse phase. Though these blockings are mostly undated, it appears that the door of the north-west angle tower was walled up in the early mid-third century (Gillam 1952).

Rampart buildings tended to be added to forts from the late second century onwards. They served a variety of functions and were constructed and demolished as they were needed (Welsby 1982, 29–30). In the case of Birdoswald only one such structure has been excavated, the bakehouse, Building 4419, Phase b, in Area B. This building is of interest as it clearly demonstrates a development of the fort interval tower. The tower begins as an integral part of the fort defences. After some time, the bottom storey is used as a bakehouse, and finally the bakehouse function becomes more important than the tower. The whole structure is remodelled as a low rampart building containing more floor space for working. The ovens within this building, like those in the north-west angle tower, are particularly well preserved. The ovens in the north-west angle tower survived to a height of four courses above oven floor level. It is known that the springer stones for the domes on these structures survived when excavated.

Ovens in the ramparts of forts have been recorded on many sites over a long period. Two of the most thorough accounts of these structures were published almost simultaneously by Bruton (1911, 20–21) for Castleshaw, and by Gibson and Simpson (1911, 433) for milecastle 48 (Poltross Burn). At Birrens a row of four ovens, which were rebuilt at least once, lay on a prepared platform of clay and gravel set within the tail of the rampart (Christison 1896, 101). A similar shelf was found at Pen Llystyn (Hogg 1968, 123) where a screen may have been provided behind a set of three ovens which were raised on a clay and gravel platform in a 3m wide space between the rampart base and the edge of the *intervallum* road. At Fendoch and Inchtuthil (Abercromby 1902, 209) rampart ovens appear to have been primary features, as do bakehouses at Housesteads (Crow 1995, 36). At Fendoch, the positions of the ovens, which were set into the rampart at the ends of barracks, suggested to the excavators that an oven was built for each century and that the *contubernia* cooked in rotation (Richmond and McIntyre 1939, 137). Other evidence in the form of inscribed millstones and bread stamps have also suggested that cooking was organised on century and *contubernium* lines (Johnson 1983, 198): evidence for the distribution of foodstuffs to unit subdivisions (centuries, *turmae*) is discussed with relation to the *horrea*.

The way in which the ovens were used was first published by Bruton:

> a dome shaped oven covered the flag floor and a fire of wood would be lighted on this floor and allowed to burn until the oven was thoroughly heated. The charcoal would then be removed, the floor cleaned, and the food placed into the heated chamber.
>
> (Bruton 1911, 21)

Each firing would thus have left a substantial amount of ash raked out of the oven before cooking, and ashes are a ubiquitous feature of all ovens excavated. After an oven has been in use for a long period the ash deposits might be quite substantial; at Malton ashes extended 3.65m back from the oven flues (Corder 1930, 16). The heat would severely damage the oven bases, but at Fendoch the excavators noted that domes might be renewed several times before the flagstone floors were rendered too broken and uneven to be of use (Richmond and McIntyre 1939, 137). A common feature of rampart ovens, found for example at Castleshaw and Fendoch (Richmond and McIntyre 1939, 137), is the use of stone hobs. No evidence for this practice was found at Birdoswald.

The constant refurbishment of the curtain wall of the fort is graphically displayed on the eastern side of the circuit, where several rebuilds are visible. The use of blocks from Willowford Bridge in one of these rebuilds is of considerable importance, not least in allowing a date for the rebuild to be inferred. All of the reused blocks excavated had features similar to the stones from Bridge 2 at Willowford, which was apparently replaced in the early third century (Bidwell and Holbrook 1989, 139–40). Willowford is the only logical source for these blocks, though the question remains as to why the stone from the original wall was not simply reused. A further question is posed by Hodgson's description of a portion of wall whose stones were actually joined by dovetail iron cramps. This portion of wall has entirely disappeared, but is unlike any surviving part of the fort wall. The fact that the blocks remained joined suggests that these stones were in their primary position, though the reason for such construction is far from apparent.

The evidence for the final form of the fort curtain wall in Area F is extraordinary. The fact that the entire wall had collapsed makes it possible to be certain that the wall was relatively low, and was provided with neither a parapet nor a wall walk. This has implications for the history of the *porta principalis dextra*, the original access to which was probably at wall walk level. The height of the latest wall suggests either that alternative access to the gate was provided, or that the wall was not maintained at a uniform height. The decorative white limestone band at the top of the wall is something which could never have been predicted. Though it is impossible to say whether this feature was universal in the rebuilding of the wall, similar stones were found concentrated around the western curtain wall of the fort in Area A. Unfortunately all of the developments in Area F are undated, and it is therefore not certain whether the bank built up against the front of the wall as a buttress was constructed before or after the final rebuild. As a strengthening technique this seems rather crude, though it is identical to a late-Roman device used to prop up the east wall at Vindolanda (Bidwell 1985, 49, pl III).

The final rebuild of the curtain wall in Area F maintained the breadth of the original. Elsewhere evidence was found of a further phase, in which the wall was drastically narrowed. Both north and west of the south-east angle tower, Simpson and Richmond (1933, 260–1) found that the final reconstruction of the defences consisted of an earth bank which overlay the collapsed curtain wall. This bank was revetted by a narrow stone wall built on the outer side. A similar wall survives near the south-west angle. A narrow wall built on the outer edge of the broad curtain wall might also be inferred in Area B, where a medieval wall (12), which had clearly butted an existing wall, overlay the southern half of the curtain wall (Fig 262). It is possible that similar evidence in Area F was lost during Potter's excavations. In its final phase, therefore, at least part of the defensive circuit of the fort consisted of an earthen bank revetted by a narrow wall. An exactly similar situation has been recorded on the north wall at Housesteads (Crow 1989), and at Vindolanda, Bidwell (1985, 46) cites evidence suggestive of a late earth refortification, though this is less satisfactory. At Housesteads the excavator suggests that the bank might be dated to the late fourth or early fifth century, while at Vindolanda it is cautiously postulated that the bank might represent a sub-Roman refortification. Either of these alternatives is clearly possible for all three sites where this phenomenon has been observed.

9 Birdoswald in the third and early fourth centuries: discussion

An attempt to write the history of these centuries at Birdoswald requires the marshalling of a considerable quantity of structural, dating, and epigraphic evidence. At the heart of the matter, however, lie the stratigraphic sequences established within the fort during the excavations of 1929 and in Area A of the current campaign.

Cohors I *Aelia Dacorum* and the Birdoswald garrison

Cohors I *Aelia Dacorum* seems originally to have been raised after the conquest of Dacia by Trajan, and transferred immediately to Britain. The cohort worked on the building of the Vallum, as attested by a building stone recording the century of Aelius Dida of *cohors* I *Dacorum* (RIB 1365). Their first known garrison was at Bewcastle where they are again attested simply as *cohors* I *Dacorum* (RIB 991). The editors of RIB suggest that the Bewcastle inscription is Hadrianic because *Aelia* is omitted. It has been suggested that units may have received such honorifics when milliary status was granted (Maxfield 1981, 234), and it is thus possible that the unit was upgraded after being posted to Britain. If, however, the fort at Bewcastle was built for this cohort (Austen 1991b, 43–4), then the size of the fort suggests that the unit already had a milliary establishment. It is possible that the title *Aelia* was granted late in the reign of Hadrian or early in that of Antoninus Pius, at the same time as the same honour was accorded to *cohors* I *Hispanorum* (Jarrett and Stephens 1987, 62). The only diploma (CIL xvi, 93) to record the cohort dates to 146, and gives the style I *Aelia Dacorum*. This diploma does not give a milliary symbol either for this cohort or for others which are known to have been of this strength such as *cohors* I *Fida Vardullorum*. However, this does not mean that these units were not milliary; Birley (1966b, 61) points out that only in diplomas where some units are referred to specifically as milliary should the absence of such a reference be considered significant. (A newly discovered diploma does give the full title (M Roxan personal communication).)

The only epigraphic source to accord the cohort its full style, *coh(ortis) mil(liaria)* I *Ael(ia) Dacor(um)* is from Lambaesis in Africa (Numidia). This gives the career of the equestrian officer Ti Claudius Proculus Cornelianus, who served his *militia secunda* as *tribunus* of the cohort, probably during the reign of Antoninus Pius (Pflaum 1955, 126; 1961, 367, no 164 bis; AE 1956, no 123).

The cohort is recorded at Birdoswald on a remarkable series of inscriptions (RIB 1872, 1874–94, 1896, 1898, 1904, 1909, 1912, 1914, 1918; Wright 1969, 194). These are bracketed in date by the building inscription found during 1929 (Birley 1930b), recording the construction of a *horreum* in 205–8 (RIB 1909) and an altar dated by the imperial honorific *Probiana* to 276–82 (Wright 1961, 194). Most of the inscriptions are altars dedicated to *Iupiter Optimus Maximus* (hereafter IOM), and it has been suggested (Davies 1969, 79) that they originate from a ceremonial burial deposit on the parade ground. The group seems to be a dispersed example of this kind of deposit, which has been found *in situ* at Maryport (RIB 815–837; Wenham 1939; Jarrett and Stephens 1987). The Maryport altars were buried at different times and a number are unweathered (ibid, 28). It has been suggested that the altars were dedicated at the *votorum nuncupatio* on 3rd January each year. Honourable burial (ibid, 21) would either take place on the dedication of the new altar, or at a periodical *lustrum* (Davies 1968, 79). The Birdoswald parade ground may have lain between the Wall and the river on the east side of the fort (Bidwell and Holbrook 1989, 85, 95), and the clearance of the area in order to accommodate this facility may account for the complete eradication of the Turf Wall. Many altars were found either reused in the fort or further afield, but five were found at Willowford (RIB 1876, 1887, 1889, 1890, 1896), and one at Underheugh (RIB 1891). Two of these altars, one (RIB 1880) found in the cliff above Underheugh, and the other ploughed up 'nearer to milecastle 49 than to Birdoswald fort' (Wright 1961, 193), may have been found in their original positions (Daniels 1978, 198).

The earliest inscription of the *cohors* I *Aelia Dacorum* IOM series may be RIB 1884; an altar which was rediscovered in 1990 (Tomlin 1991, 309). This records a *tribunus* called Domitius Honoratus. Tomlin (ibid) suggests that if this was L. Domitius Honoratus, prefect of Egypt under Severus Alexander, his tribunate would have been around the reign of Septimius Severus. If so, there is evidence for two Severan *tribuni*, the other being Aurelius Julianus who built the *horreum* between 205 and 208. During Julianus' tribunate at Birdoswald his infant son, Aurelius Concordius, died at the age of one year and five days and was buried in the fort cemetery (RIB 1919; Wilmott 1993).

Subsequent altars can be dated by the imperial honorific titles granted to the unit, and one (RIB 1875) by reference to a consulship. These are tabulated in Table 11. In addition to the altars a building inscription from the *porta principalis dextra* (RIB 1914) records the cohort working during Modius Julius' governorship of *Britannia Inferior* (219) under the *tribunus* Claudius Menander.

All but one of the datable inscriptions recording the name of the cohort give *tribuni* as commanding officers, and the names of 17 such officers are now known (RIB; Pflaum 1955, 126; Wright 1961, 194; Wright and Hassall 1974, 463; Tomlin 1991, 309). The latest datable inscription from the site (RIB 1912), a building dedication of 297–305 (which does not name the cohort), gives one Flavius Martinus, a centurion, as the

Table 11 Details of dated IOM altars from Birdoswald

RIB/ ref	*commanders*	*honorific/dating*	*date*
1892		ANTONINIANA	213–222
1896	Flavius Maximianus	MAXIMINIANA	235–238
1875	Aurelius Faustus	cos Perpetuus [+Cornelianus]	237
1893		GORDIANA	238–244
1886	Probius Augendus	POSTUMIANA	259–268
1883	Marcius Gallicus	POSTUMIANA	259–268
1882	Marcius Gallicus		?259–268
1885	Pomponius Desideratus	TETRICIANORUM	270–273
Wright 1961, 194	Aurelius Verinus	PROBIANA	276–282

praepositus in temporary command. Three other centurions in such positions are listed on the *cohors* I *Aelia Dacorum* altars: Aurelius Saturninus (RIB 1876), Julius Marcellinus of *legio* II *Augusta* (RIB 1880), and L Vereius Fortunatus of *legio* VI *Victrix Pia Fidelis* (RIB 1907). Marcellinus' appointment affords one of two known examples of centurions from *Britannia Superior* being employed in the northern province (Holder 1982, 70). During the reign of Maximinus Thrax (235–8), the cohort was under the command of a former *evocatus* of the *cohors* I *Praetorianorum*, Flavius Maximianus (RIB 1896). Command of an auxiliary unit for a praetorian is by no means unprecedented, and three such commanders were stationed at various times at Bewcastle (Austen 1991, 47). Such postings were an alternative to promotion to the position of legionary centurion (Breeze 1974, 251–4). The precise date of 237 for RIB 1875 demonstrates that the *tribunus* Aurelius Faustus was probably Maximianus' direct successor, and that the former praetorian thus commanded in 235–6. Two names from the reign of Postumus (259–68) are known: the *tribuni* Probius Augendus and Marcius Gallicus.

Cohors I *Aelia Dacorum* did not use a milliary symbol on any of its surviving inscriptions at Birdoswald. The Cornelianus inscription at Lambaesis clearly demonstrates that the cohort was milliary during the reign of Hadrian, and milliary status is implied by the fact that the unit commanders at Birdoswald were predominantly *tribuni*, but it still seems peculiar that among so many inscriptions the full title is never given. It is possible that the unit was operating at less than full strength, possibly with a detached vexillation, throughout the third century. Birley (1966, 61) lists four known milliary cohorts which were split in this way. An example of this is *cohors* I *Tungrorum* which is cited as *milliaria* in the British diploma of 103, but not in those of 122 and 124, in which several other cohorts are listed as milliary. The reason for this was that a *cohors* I *Tungrorum milliaria vexillatio* was serving in Noricum, and was listed among quingenary cohorts in a Hadrianic diploma for that province. By 158 the vexillation had rejoined its parent unit, which was again recorded as milliary on the diploma of that year (but see now Novwen 1996). The same kind of split is attested for *cohors* II *Tungrorum* (Birley 1935). An inscription from Carrawburgh of II *Tungrorum* which lacks a milliary symbol has been published by Davies (1968) as the first evidence other than the diplomas to reflect this practice, and other examples have been cited (Davies 1977, 8), including *cohors* I *Hispanorum* at Maryport, commanded by *tribuni* from 123 to 130 and by *praefecti* thereafter (Jarrett and Stephens 1987, 61–2). If I *Aelia Dacorum* was a half-cohort of this kind it does not necessarily mean that it would have a quingenary strength. Davies suggests (ibid, 109 n 17) that *cohors* XX *Palmyrenorum* at Dura Europos may have been a cohort which had lost a vexillation which never returned. The files of the unit demonstrate that its remaining six centuries and five *turmae* mustered a thousand or more men, suggesting that the size of the centuries and *turmae*, and not their number, was increased to make up the deficiency.

The fact that *tribuni* were still in command might be due to the fact that the cohort had been milliary, and the status of the commander remained the same as it traditionally had been. This might not be as odd as it seems, as commanders of quingenary cohorts were often referred to as *tribunus* during the third century (Davies 1977, 16). The author is grateful to Margaret Roxan for pointing out that *cohors* I *Vangionum*, named as milliary on several diplomas, is also given on inscriptions from Risingham (RIB 1215, 1216, and 1217) without a milliary symbol, but with *tribuni* in command. At Benwell, however, the same cohort is commanded by a *praefectus* when not at full strength. At High Rochester *cohors* I *Fida Vardullorum* occasionally omits the milliary symbol (RIB 1271 and 1285). It seems likely, as Margaret Roxan suggests (personal communication), that the symbol could be omitted simply because the status of the unit was well enough known and established, and in other words that the cohort retained its milliary status, whether it was retained at full strength or not.

The final reference to *cohors* I *Aelia Dacorum* is in the *Notitia Dignitatum* (Hassall 1976, 113). Though the date of the British section of this document is in doubt (Welsby 1982, 129–45), a consensus would view it as dating from the later fourth century (Holder 1982, 19).

Two other units are recorded from the site. The *horreum* inscription (RIB 1909) records *cohors* I

Thracum Civium Romanum assisting I *Aelia Dacorum* with the building. There is no evidence as to whether this quingenary cohort was brigaded with I *Aelia Dacorum* in garrison, or whether it was simply assisting with the building (Breeze and Dobson 1987, 256). The latter option seems most likely: the building inscription cites the Dacian cohort first, and is flanked by the devices of the palm and Dacian *falx* (Coulston 1981), which appear on another inscription of I *Aelia Dacorum* alone. These symbols appear to have been the devices of I *Aelia Dacorum*, and their presence on the *horreum* inscription would seem to suggest the Dacians as the senior partners in the enterprise and the 'home unit'. Secondly, among all of the parade ground altar series, beginning very soon after the building of the *horreum*, no further mention is made of the Thracians, though no alternative third-century garrison for this unit has been discovered (Holder 1982, 121–2). The other unit associated with the fort are the *Venatores Bannienses* (RIB 1905). These are now accepted as an irregular unit of third-century date (Breeze and Dobson 1987, 258; Holder 1982, 126), rather than as a group of hunters from the cohort as the editors of RIB suggested. The use of the fort name as part of the unit title, similar to the *exploratores Bremenienses* and *Habitancenses* at High Rochester and Risingham respectively, and also the *cuneus Frisionum Aballavensium* at Burgh by Sands, suggests that this unit was specific to Birdoswald.

Early third-century building history

Epigraphic evidence alone demonstrates that a major building programme was undertaken between *c* 198 and 219. The construction of a *horreum* during the governorship of Alfenus Senecio (205–8; RIB 1909) has already been mentioned and associated with the Period 3 construction *de novo* of the two *horrea*, Buildings 197 and 198. An inscription (RIB 1914) found during the 1852 excavation of the *porta principalis dextra* (Potter 1855, 146–8) commemorates rebuilding at the gate under the governor Modius Julius (219), and is probably one of a pair, the other referring to the emperor Elagabalus and his titles (Daniels 1978, 202). Such a second inscription would probably have suffered defacement or removal after Elagabalus' *damnatio memoriae* (222). This rebuilding may be associated with the reused material visible in the *spina* of the gate and in the east face of the curtain wall immediately to the south. It might also account for the secondary road and set of pivot stones found within both carriageways (Gillam 1950, 66) Two further inscriptions record building work during this period; RIB 1910 is a fragmentary dedication slab from a building constructed under Severus (198–209), while RIB 1911, an altar of the reign of Caracalla (212–17), also records building.

Construction work attested archaeologically in various parts of the fort may be allocated to this early second-century building phase. The construction of the *horrea*, and the rebuilding of the south tower of the *porta principalis sinistra* using fine ashlar stone have been associated as aspects of Period 3 in Area A. The association is in part through the use of hard white mortar, long recognised as a feature of Severan rebuilding on the Wall (Simpson *et al* 1934, 142; Crow 1991, 55), in both structures. The rebuilding of the gate tower is archaeologically dated by a small group of late second- early third-century pottery, and, more particularly, by an unworn intaglio, probably manufactured *c* 208–12. On the east curtain wall of the fort in Area F the rebuilding of the wall on the site of the former *porta quintana dextra* with large reused stone blocks may also be attributed to this period. The first piece of evidence is the use of hard white mortar of a similar type to that found in Area A; the second and more persuasive relates to the source of the blocks. It is argued above that the blocks were reused from the demolition of Bridge 2 at Willowford, as the stones and the type of bar-cramp provision were identical to the blocks used in that structure. The blocks would have become available as a result of the replacement of the Wall bridge with a road bridge (Bridge 3) designed to carry the Military Way (Bidwell and Holbrook 1989, 96). They could have been reused at any time after the bridge's replacement, which may in fact have been Severan (ibid, 138–40).

The evidence for a Severan date for Level II in the 1929 excavations is less satisfactory. The only coins giving a *terminus post quem* for the Level are Trajanic, though the pottery (Birley 1930a) from the alley which also predates Level II includes types dating to *c* 150. In terms of the 1987–92 Periods, this rebuilding could have taken place either late in Period 2 or in Period 3. Like the *horrea*, the *porta principalis sinistra* and the eastern curtain wall, the Level II rebuilding contains reused stonework. A building behind the *principia*, built on the *via quintana* and out of alignment with the rest of the fort buildings, was excavated during 1930 (Richmond 1931, 30). This was dated to the early third century by analogy with the 1929 building, but could have been erected at any time after the blocking of the *portae quintanae* during Period 2.

The evidence of RIB 1909 demonstrates that the *horrea* are Severan in date. The evidence for the dates of the rest of the early third-century building work is less specific and much of it may have been undertaken somewhat later than the reign of Severus as part of a rebuilding programme extending across the first quarter of the third century. This is consistent with the suggestion made by Gillam and Mann (1970, 44) that the majority of early third-century works on the Wall were carried out under Caracalla (212–17) following the end of the Scottish campaigns. It also suggests that a repair programme which had been begun under Severus was resumed under Caracalla (Jarrett and Mann 1970, 205). It has already been noted that building work during this reign is epigraphically attested at Birdoswald (RIB 1911). The period from 205–19 seems to have seen large-scale works on the fort defences, including the rebuilding of both *portae principales*, the eastern in 219. It seems logical to see the rebuilding of the east curtain wall using stone from Willowford Bridge as following on quickly from the rebuilding of the bridge, possibly during the governorship of Senecio. If this was the case the rebuilding of the *porta principalis dextra* would have constituted a second phase of work on this side of the fort undertaken some 14 years later.

Construction and repair works in the fort continued during the reigns of Severus, Caracalla, and Elagabalus. Though a recommissioning might seem to be implied by the scale of the works, this took a long time and appears, as Daniels (1979, 363) and Jones (1981, 394) have suggested, to have been a continual process throughout these reigns.

It is clear that repairs which occasionally involved substantial works continued through the mid-third century, and a further dated inscription (RIB 1922) records a building 'built from ground level' in the consulship of Maximinus and Africanus (236). The dated altars (RIB 1896, 1875) would suggest that this work was undertaken under the command of the ex-praetorian Flavius Maximianus (235–6) or his apparent successor, the *tribunus* Aurelius Faustus (237).

In Area A Period 4a saw the blocking of the south portal of the *porta principalis sinistra*, the laying of new drains, and resurfacing of the *via principalis*, together with the division of Building 4400 into Buildings 4401 and 4402. Though this work can be shown stratigraphically to have post-dated the early third-century rebuilding, there is no indication whatever to show how long after this it took place. No secondary pivot stones were provided within this portal. In the blocked north portal of the *porta principalis dextra*, however, a secondary set of pivot stones was associated with a resurfacing of the road in this area. This might suggest that the eastern gate was blocked at a later date than the western, or simply that maintenance was carried out at the eastern, but not the western, gate.

Desertion in the late third century?

The possibility that the fort might have been deserted during the later third century was raised by the discovery of an inscription (RIB 1912) during 1929 (Birley 1930b). The importance accorded to this dedication is such that it merits quotation in full:

> [D(ominis)] n(ostris) Dioc[letiano] et M[axim]iano
> Inuictis Aug(ustis) et / Constantio et Maximiano/ n(obilissimis) C(aesaribus) sub u(iro) p(erfectissimo) Aur(elio) Arpagio pr(aeside) / praetor(ium) quod erat humo copert(um) / et in labe(m) conl(apsum) et princ(ipia) et bal(neum)[*or* (listaria)] rest(ituit) / curant(e) Fl(auio) Martino cent(urione) p(rae)p(osito) c(ohors) [....
>
> *For our lords Diocletian and Maximian, Invincible, both Augusti, and for Constantius and Maximianus, most noble Caesars, under His Perfection Aurelius Arpagius, the governor, the .... Cohort restored the commandant's house, which had been covered in earth and fallen into ruin, and the headquarters building and the bath-house [or* ballistaria*], under the charge of Flavius Martinus, centurion in command.*

The inscription is dated to 297–305, and is the only Tetrarchic inscription from the Wall other than a virtually illegible specimen from Housesteads (Crow 1995, 77). It was originally accepted at face value (Richmond 1930a, 311) as implying a long period of disuse for the *praetorium*. Birley (1930b, 201) reckoned that the inscription dated Wall Period III, which had previously been dated to *c* 270 (Gibson and Simpson 1911, 460). The idea subsequently developed that the Wall was denuded of troops in order to aid Allectus against Constantius Chlorus, and that this resulted in a full-scale invasion from the north, crossing the Wall (Richmond 1963, 61; Frere 1978, 382); the inscription would then reflect rebuilding after this invasion. Finally, the inscription became regarded as deliberately euphemistic, concealing the fact of enemy destruction (Simpson 1964, 48–50). It has since been accepted (Welsby 1980) as a simple statement of the condition of the fort when rebuilding took place (for similar texts see now Thomas and Witschel 1992). Daniels (1978, 205) interpreted the inscription as a 'literal admission of the decay and collapse after the fort garrison had been withdrawn by Carausius or a little earlier' (possibly beginning around 270 (Daniels 1979, 363)), considering it likely that this withdrawal took place in order to find troops to build and garrison the Saxon Shore forts (ibid; Daniels 1980; Welsby 1982, 57). One other inscription has been invoked in connection with this argument: the latest IOM altar dates to 276–82, demonstrating that the cohort was in garrison and going about its regular observances at some time during these years. If the fort was deserted it would therefore have been during or after the reign of Probus. The date of RIB 1912 gives a maximum possible period for desertion of 29 years (276–305).

The Tetrarchic inscription (RIB 1912) is undoubtedly an important document for Birdoswald. It does, however, lie firmly in the sphere of historical evidence. None of the buildings to which it specifically refers have been excavated, and it is, therefore, not directly relevant to any of the excavated sequences in the fort (*pace* Millett 1981). If it has a strictly archaeological function it is as a datable object which provides a *terminus post quem* for the floor in which it was found. The archaeological evidence for the period in question requires separate evaluation before the implications of RIB 1912 are considered alongside it.

In Area A there is evidence for change taking place in the latter part of the third century, at the end of Period 4a. The intensive ironworking activity in Building 4401 ceased abruptly after Building 4401 Phase b, and the building was rebuilt. The layers of rubble and soil which lay between the end of industrial activity and the rebuilding do not appear consistent with a deliberate demolition prior to reconstruction, and it could be argued that they are more redolent of collapse and a brief desertion. The *terminus post quem* for this collapse is provided by a radiate copy of a coin of Tetricus I (dated to 271–84) which was found in one of the latest working deposits. In the *porta principalis sinistra* too, the latest working deposit was associated with another radiate copy of a coin of the Gallic Empire, this time of Victorinus, and similarly dated to 271–84. A complete change of use followed in both of these buildings. The ditch which had been cut during Period 3 was notionally associated with the ironworking phases of the structures at the west end of the *via principalis* by the fact that it was the only ditch phase which contained hammer-scale. The ditch contained pottery and leather of the late second and early to mid-third century but nothing of the later third or fourth centuries. It was allowed to silt up completely, and the resulting flooding carried silts and sands over the berm to wash against the curtain wall. At the same time, the macrobotanical evidence demonstrates that sedges and water plants choked the ditch, while water-fleas bred, possibly in residual pools of water.

Evidence from 1929 does not help in the assessment of this period. As already noted, the *terminus post quem* for the construction of the Level III building resides with a coin of Elagabalus (218–22), and the latest coin before the Level IV reconstruction is an issue of Valentinian I (364–75). There were residual coins of Tetricus, Victorinus, Gallienus, and Claudius II in this group. It might be noted that no suggestion of a soil layer in between Levels II and III was advanced by the excavators. The excavation of the *porta principalis dextra* suggested that the north tower was in a ruined state, or at least was dismantled in preparation for rebuilding after the collapse of an oven or hypocaust which contained later third-century pottery.

A change in the later third century is certainly attested archaeologically. Most significant, perhaps is the failure to maintain the ditch on the west side of the fort. This was the fourth archaeologically-attested recut of the ditch, and in subsequent periods it was recut at least a further twice. Substantial efforts were made to ensure the free flow of water around the fort when the bridge-culvert was built during Period 4b. It should be remembered that the drains within the fort were designed to discharge into the ditch; the failure to maintain the fort ditch to a point where the berm was flooding thus implies that the drains within the fort were backing-up. The dating for this is very vague: all that can be stated is that this state of affairs occurred during the second half of the third century, that the earlier phase of ditch fill was contemporary with nearby ironworking, and that the situation was probably not remedied much before the century came to a close.

The second important factor is the abrupt cessation of widespread industrial activity in Building 4401 and in the various elements of the *porta principalis sinistra*. This was followed by the collapse of Building 4401 and the appearance of loamy soil among the collapsed stonework (Pl 6). Building 4401 was inherently unstable due to the underlying ditch of the Turf Wall. It had already been rebuilt twice, and was to be rebuilt a further two times. In other phases of rebuilding most of the demolition debris was cleared up or levelled. This means that it is impossible to compare the formation of this deposit with other episodes of collapse or demolition. The very abrupt change in use in combination with this deposit might, however, suggest that the building was not reconstructed for some while. The *terminus post quem* of 271–84 for the end of the ironworking in Building 4401 is also the *terminus post quem* for rebuilding.

There is no reason to believe that the *horrea*, Building 4403, and the 1929 building were not fully functional during this period. The structural evidence which might indicate desertion is thus the ending of the practice of ironworking, and the collapse or demolition of a notoriously unstable building during the period from *c* 275. The building was rebuilt at an unknown date within the late third or early fourth century. In addition, the silting and choking of the fort ditch, leading to flooding, and perhaps to problems in the fort drainage system, would indicate a period when maintenance did not take place.

Though archaeological evidence which has been interpreted as attesting to desertion in Wall forts during the later third century is widespread (conveniently summarised in Welsby 1982, 35–42), it can never be taken as proof that any fort was completely deserted. At Rudchester (Gillam *et al* 1973, 82), a collapsed wall of 'Wall Period II' was overlain by 'a layer of humus'. Similarly at Halton Chesters collapsed buildings were sealed by a layer of earth. Though rebuilding occurred, an 85–100 year gap was postulated by the excavator (Gillam 1961). Gillam (1974, 14) saw in this an archaeological illustration of the phenomenon recorded at Birdoswald in RIB 1912. Summarising the evidence, Welsby (1982, 57) suggested that 10 out of 15 forts of the Wall system show signs of total or partial desertion, with the possibility that Birdoswald, Rudchester, and Halton Chesters were totally deserted. Following Gillam (1974, 14), Welsby also proposed South Shields as a fort which was deserted during the late third century; more recent work (Dore and Gillam 1979, 68–70; Bidwell 1989, 85) has, however, disproved this. Humic deposits over buildings demolished in the later third century at Wallsend (Daniels 1979, 363) are not now seen in context with desertion (Daniels 1989). Taking the example of the completely-excavated fort at Wallsend, Johnson (1989, 109) has rightly pointed out that small-scale excavation in different parts of the fort 'might have come up with any number of varying stories about abandonment or continuity'.

The relatively small scale of excavations at Birdoswald, and the fact that none of the buildings whose refurbishment is recorded in RIB 1912 have been studied, make any attempt at placing the inscription into context fraught with difficulty. Welsby (1982, 36), while noting that it was not proof that the whole fort was abandoned, nevertheless accepted that the evidence from Birdoswald, together with Halton Chesters and Rudchester 'does imply that these sites were totally abandoned by the army in the later third century' (ibid, 57). Though Welsby (1980, 91) finds it difficult to accept that a fort continued in use when its *principia* was in a state of disrepair, Donaldson (1990, 209) has rightly stressed that the inscription marks out the *praetorium* as the building which was in the worst state. There is no indication of the scope of the works undertaken on the *principia*, and it cannot be assumed on the strength of the inscription that the building was not in use, or at least serviceable, during the period immediately before its renovation.

The apparent complete dilapidation of the commander's residence requires explanation. It has been argued (Wilkes 1966, 125; Breeze and Dobson 1987, 213) that the *praetorium* might not have been used for a while if the status of the commanding officer had been that of a centurion *praepositus* for a number of years. Such a commander would not require as large a household as a member of the equestrian order from which officers had traditionally been drawn. This argument has been invoked in connection with the reduced *praetorium* at Bewcastle with its succession of ex-praetorian commanders (Austen 1991, 47), and also for the late garrisons at Housesteads (Charlesworth 1975, 28). Recent geophysical work at Lanchester has revealed possible *horrea* built over the south side of the *praetorium* (Casey *et al* 1992, 79) again suggesting that the building was not serving its original function. The succession of commanders at Birdoswald does not seem to support this idea, however, as there does not appear to have been a string of socially inferior officers. The former praetorian Flavius Maximianus (235–6) was succeeded by the *tribunus* Aurelius Faustus by 237, and during 259–68 the *tribuni* Probius Augendus and Marcius Gallicus commanded. Pomponius Desideratus was *tribunus* in the early 270s, while the commander under Probus (276–82), Aurelius Verinus, was also of this rank. Welsby (1980, 91) pointed out the important fact that the rebuilding attested by RIB 1912 was itself undertaken by a centurion *praepositus*. It is possible that by the reign of Probus the use of the title *tribunus* did not mean that the officer was necessarily from an equestrian background; the supply of commanding officers of the traditional type seems to have ended during the third century (Wilkes 1966, 123), and *tribuni* were probably promoted from the ranks during and after the crisis of the middle of this century. If, however, the title retained its earlier significance, then the fort was still commanded by officers for whom a fully-functioning *praetorium* was necessary. In this case it would be unlikely that the *praetorium* would have been allowed to reach the advanced stage of decrepitude apparently attested by the inscription unless the fort really had been abandoned for a time. Another alternative is simply that the *praetorium* was not as badly damaged as the inscription makes out. Although it is singled out for special mention, a recent survey of similar inscriptions (Thomas and Witschel 1992) points out that rebuilding inscriptions may be used to exaggerate repair, or to downplay extensive rebuilding (ibid, 174) depending on the motives of the builders.

Among the finds from Birdoswald there is an almost complete absence of coins of the 'British Empire' of Carausius and Allectus (287–296). From 147 closely dateable coins derived from the excavations of 1987–92, and 50 from 1929 (Richmond 1930, 173–5) there is only a single issue of Allectus (No 95). This follows a period when the coinage of the Gallic Empire and its derived copies was relatively common (Coin Nos 65–94). A lack of coins of this period frequently occurs on the Wall forts; Shiel (1977) has contrasted this with major sites in the hinterland of the Wall, for example South Shields and Corbridge, where such coins are found in some number. In his report on the coins from Bewcastle, Casey (1991, 40) argues that the circulation of coins of the Gallic Empire and their derived barbarous radiate copies would have ended with the minting of the plentiful Carausian coinage, as there is no evidence for the inclusion of barbarous radiates in any number in Carausian hoards. Shotter (1995, 24) has suggested that the lack of such coins supports a short break in activity at Birdoswald in the last quarter of the third century. The general paucity of coins of Carausius and Allectus on Wall forts has led to the belief that the frontier was lightly held by a much reduced garrison (Shiel 1977, 77), possibly by small caretaker garrisons who may have remained while most of the troops left. The idea that substantial withdrawals during these reigns were made to help in the construction of the forts of the Saxon Shore has already been mentioned.

Vindolanda presents several interesting parallels with Birdoswald. Here too the latest inscription (RIB 1710) accords the cohort (probably *cohors* IIII *Gallorum*) the style *Probiana*, suggesting that life was carrying on, much as it had throughout the third century, as late as 276–82. At Vindolanda the evidence of coinage suggests that the *vicus* was largely abandoned by *c* 270 and never rebuilt (Bidwell 1985, 91). A lack of coinage of Carausius and Allectus at Vindolanda has led Casey (1985, 105) cautiously to postulate a short late third-century break in occupation in the fort as well, though he stresses that such a conclusion is not tenable on coin evidence alone. No evidence to indicate a break has been found during recent excavations in the fort. Like Building 4401 at Birdoswald, Period 5 in the Vindolanda barracks has a *terminus post quem c* 275, and would not have begun much if at all later than 300. This was a straightforward rebuilding and it could just as easily have taken place under Probus as after Allectus (Bidwell 1985, 69).

It is possible to advance a model for the late third century at Birdoswald based on the limited evidence available. It seems reasonable to suggest that the fort continued as a fully functional military establishment until the last quarter of the third century. This is indicated by the historical evidence of the IOM altar sequence reflecting the practice of 'official' religion proceeding with no significant break from the reign of Caracalla to that of Probus. Jones (1981, 399, 410) invoked the inferior work on the Tetrician altar (RIB 1885) as symptomatic of a decline in military standards on the frontier, but the script used on the *Probiana* inscription, of which Jones seems to have been unaware, is of reasonable quality. Both these inscriptions can be regarded as representing the 'old order' (Welsby 1982, 57). The traditional military order is also represented by the succession of *tribuni* as unit commanders up to this point, whether or not these were equestrian officers of the old school. This evidence suggests the maintenance of standards in the fort. It may well be that while the traditional military ceremonies and outlook continued, the requirements of the army in terms of facilities and accommodation altered. These would only be apparent from archaeology, and changes to fort layouts at Wallsend and elsewhere may bear witness to this. We may agree with Jones (1981, 411) that the army was not the same as that of Severus or Caracalla by the later third century, but not that the official life of the fort was necessarily in decline (ibid, 408).

The evidence which seems most pertinent to the problem of desertion relates to the silting of the fort ditch. The earlier and later history of the maintenance of the ditch suggests that it silted rapidly, and thus required constant recutting. The episode during which it flooded is exceptional. The effect of this flooding upon the drainage system in the fort may only be imagined, but it is likely to have been considerable. It does not seem possible that this would have been allowed if the fort was extensively occupied. A period of desertion is thus suggested. Although this need not have been of long duration, it might also account for the lack of coins of the 'British Empire'. The 10–20 year absence envisaged by Daniels (1980, 189–91) seems a reasonable estimate. The site of the *praetorium* is in the lowest-lying part of the fort, and lies on the natural morass which was drained before the construction of the first fort. The present ground level is some 1.6m above the Roman level, but the area still floods, and is the only part of the fort currently growing marsh grasses. A breakdown in the drainage system would influence this area first and most seriously, though the rear wall of the *principia* would also be affected. It may be this factor which provides the context for RIB 1912: the instability of the ground and the presence of standing water might weaken the structure and cause structural damage. Flooding would carry in silt, and it would not take very long to fulfil the letter of the description. It is unnecessary to interpret the inscription as meaning that the *praetorium* had completely disappeared and become sealed by a layer of soil, though this interpretation is invited by the hyperbole of the text. It has been argued that rebuilding inscriptions need say nothing about the real circumstances of a buildings condition, unless an absolute cause is referred to (Thomas and Witschel 1992, 148). It may be that '*humo copertum*' is actually an oblique reference to such a cause.

Flooding might also have adversely affected the rear wall of the *principia*. At the same time Building 4401, with its weak lean-to structure and its tendency to subside, may have collapsed.

The early fourth century

The restoration of the ditches and fort drainage followed the flooding attested in Period 4a and marked the beginning of Period 4b. The evidence shows a determined effort being made to ensure that drainage was maintained. The ditch was cut across the line of the *via principalis* and was bridged to allow access into the fort. Late third-century pottery found in Hadrian's Wall to the west of the fort suggests that the curtain wall was also undergoing maintenance at this time (Breeze and Dobson 1987, 213). Whether any provision was made to conduct the ditch under the Wall at the north corners of the fort is not known. Building 4401, Phase c, was rebuilt on top of the collapsed debris of Phase b(ii) but was no longer used for industry. The resurfacing of the roads in the fort occurred after the reconstruction of Building 4401, and the first of these resurfacings contained a coin of Constantine II (321–2).

It seems likely that the restoration of the ditches and drainage was synchronous with that of the buildings recorded in RIB 1912. The inscription, dated to 297–305, is generally interpreted as reflecting a major work of renovation under the Tetrarchy after the recapture of the province from Allectus by Constantius Chlorus. Perhaps the most frustrating aspect of this inscription is the fact that the name of the cohort responsible for the rebuilding is missing, though the entry in the *Notitia Dignitatum* would suggest that *cohors* I *Aelia Dacorum* were still present, or that they returned after a period of absence.

The restoration of the main administrative buildings of the fort, Building 4401, and the fort ditch suggests that the fort was to be reoccupied in much the same way as previously, but evidence from elsewhere would suggest that the unit which now occupied the fort might have been very different in character to the second- and third-century cohort. Barrack accommodation had been reduced by this time if not before; the construction of an apparent officer's house on the site excavated in 1929 (Level III) effectively removed an entire barrack which would originally have accommodated a full century. It has been suggested (Daniels 1980) that Birdoswald may have contained the so-called chalet style (Wilkes 1966, 130) of barrack block. The evidence for this is sparse, consisting of Horsely's (1733, 152) description of 'rows of houses, or barracks' standing 32 inches apart', and also on the somewhat ambiguous statement by Richmond (1930, 141) that occupation of the fort was heaviest 'after Constantius I, whose short barracks divided by drainage alleys resembled those of 1929'. Chalets have been found in a number of forts on the Wall and elsewhere, notably at Housesteads and Wallsend (Daniels 1980), and have been interpreted as accommodation for family units, with each chalet housing a single soldier and his dependants. This would imply a substantial reduction in the size of the garrison, and Daniels (ibid, 190) has estimated a complement as low as 80–100 for *cohors* I *Tungrorum* at Housesteads. Very small units existed in the east under the Tetrarchy (Duncan-Jones 1978, 548), including a nominal *cohors quingenaria* only 164 strong. Whether or not chalets were present at Birdoswald, and whether or not Daniels' interpretation is valid, we do not know what date these putative alterations took place. The scale of reconstruction in the early fourth century, however, seems to suggest a more active establishment, and drastic change in the unit's strength may not have occurred until somewhat later, possibly during the army reforms of Constantine when the garrisons of the Wall were classed as immobile frontier troops, or *limitanei*.

As in earlier periods, the evidence from Area A indicates that the fort continued to be used, maintained, and kept clean. The fort ditch silted up again, and continued to be used for the disposal of refuse, particularly leather and animal bones. It was recut for a final time at some point in the first half of the fourth century. Road surfaces continued to be laid, and Building 4401 was rebuilt, also for the final time. The *horrea* and the basilica appear to have continued in use. The defences were maintained, and the north tower of the *porta principalis sinistra* was buttressed and strengthened. It is probable that many other repairs to the walled circuit were also undertaken at this time, probably including the final rebuild of the east wall with its decorative stone band.

A major change in the life of the fort occurred in the middle of the fourth century. This marks the beginning of Period 5, and is described in the next chapter.

10 The late and sub-Roman periods

Period 5

This period represents the late-Roman transition between the Roman occupation of Period 4, and Period 6 which may be described as 'non-Roman' in character. It comprises Site Phases 9 and 10. Period 5 was defined within a stratigraphical continuum within and immediately around the northern *horreum*, Building 198, where a sequence of collapse, robbing, and dumping took place. Building 197 saw a change in use, but remained intact during this period.

The reuse of Building 197 (Phase e; Site Phase 10)

The structural history of Building 197, Phases a–d covers Periods 3–4b, and is described in Chapter 6. The change in use which characterises Building 197, Phase e, also defines the beginning of Site Phase 10 and of Period 5.

Preparation

During Phase d (Fig 91) Building 197 had a solid-floored central area with a ventilated sub-floor at each end. In preparation for the Phase e change of use the remainder of the sub-floor was backfilled, and the building was provided with a solid floor throughout.

First the flagstone floor was raised and all sub-floor apertures were blocked. A thorough job was made of walling up the sub-floor access door in the east wall of the building (1221: Elevation J, Fig 79; Fig 78), but the ventilation slots in the long walls had small facing stones tightly and unevenly wedged into them, and many of these subsequently fell out. All spaces beneath the floor were entirely backfilled at both ends of the building, as were the ventilation channels in the already solid-floored central area. The material used to fill the sub-floor was layered: the lower deposits comprised a dark, grey-brown gritty silty clay, and the upper fill a reddish-brown clay loam. Approximately 70% of these dumps consisted of stone, including building stones, broken flags, and roofing slates (Fig 141). When excavated, this material was broken down into a large group of numbered contexts in order adequately to locate finds and samples, though it became clear during analysis that the material was the result of a single dumping operation. Finds from the dumps have been analysed as a single group in accordance with this fact.

The character of the relaid floor (62; Figs 142a, 143) varied. In the north-east corner the flags were laid neatly to the edge of the building, while over the southernmost interspace between the longitudinal sleeper-walls at the east end of the building, the flags bridged the gap, but were patched along the wall edge with smaller rubble stones. The spinal postholes in the centre of the building were sealed by the floor, possibly

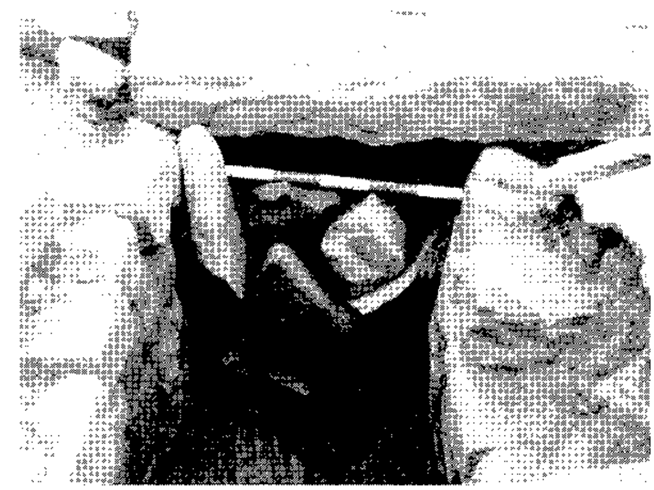

Fig 141 Section of rubble and soil backfill beneath the relaid floor of Building 197

indicating that the floor of a second storey was no longer maintained. In the centre of the building the flagstones were thin (average 80mm thick), having originally been used over a solid floor; at the ends, however the flags were extremely substantial, measuring up to 200mm thick. These were clearly the original flagstones which had previously been suspended over the ventilated sub-floor, where their strength and thickness would have been required for the storage of heavy goods.

Deposits upon relaid floor

At some point after the floor was relaid, archaeological deposits began to accumulate upon it. The earliest consisted of thin layers of fine dark silt (157, 158). These were concentrated at the west end of the building and, getting thinner as they spread out across the flagstones to the east. These were overlain by a black, friable clay silt containing small pebbles (165, 166, 175, 104, 84; Fig 142b). This material appeared to contain a great many flat-laid roofing and walling stones, and on the south side of the building it was sealed by a surface of reused stone roofing slate (119). This, together with other small patches of contiguous flat stones, may indicate that a deliberate resurfacing of the floor with stone took place. Some subsidence and breaking of floor slabs took place before this, and it is possible that this new flooring was laid to compensate for this. Above this a further succession of thin layers of black and dark-grey silt (189, 190, 118, 159, 121, 115, 182, 81, 187, 127; Fig 142b) seem to have been formed by the same continuing process as the earlier deposits in this sequence.

At the western end of the building, two sub-circular arrangements of flat stones, some of which were very slightly reddened by fire, were found. These features were disturbed by later collapse, but have previously

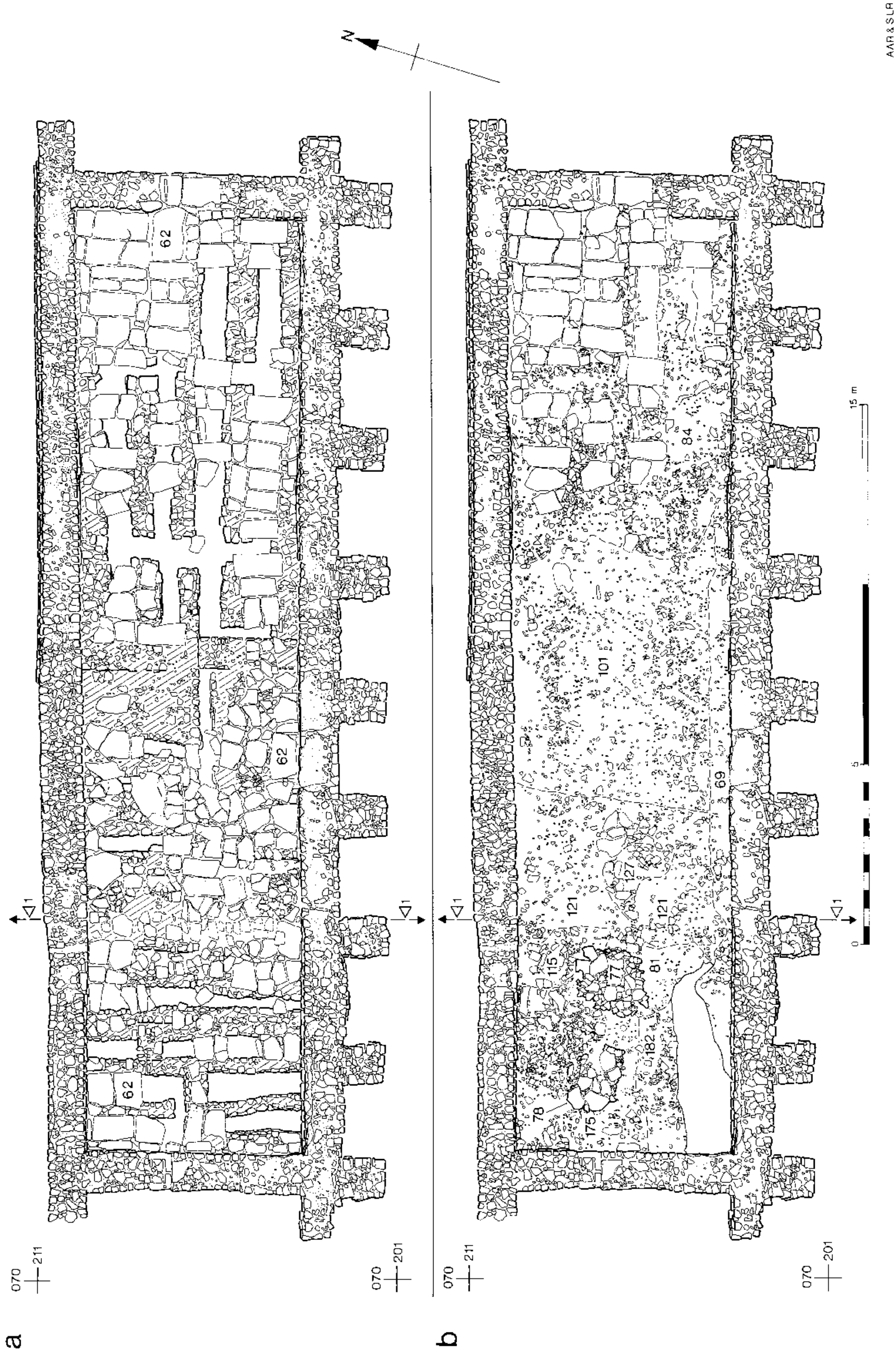

Fig 142 Plans of Building 197 during Period 5: (a) the relaid floor, (b) deposits above the floor

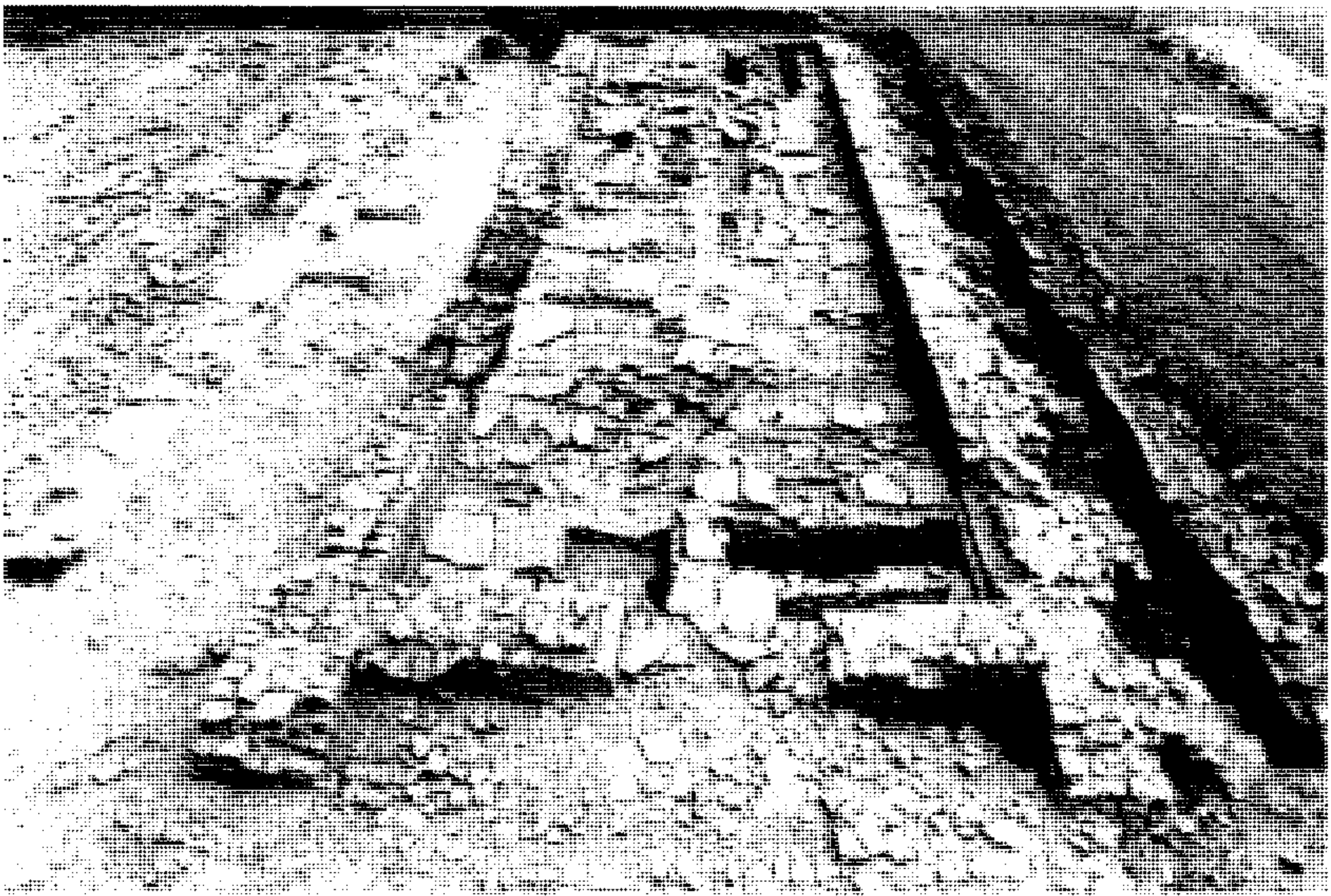

Fig 143 Period 5 relaid floor in Building 197

been interpreted (Wilmott 1989a) as hearths from which later burnt deposits (103, 104) may have derived. The principal associated surface was a compacted dark-brown and black layer containing many charcoal flecks and small stones (101). Other layers (174, 176) appear to be counterparts of this deposit.

Above these layers was a compact deposit including flat stones and reused roofing slates (68, 69, 183). This deposit appears to continue a process whereby black silty layers were deposited and occasionally sealed with surfaces of flat stones. This was the last such deposit, however, and was covered by a thick layer of soil and building rubble which seems to have been the product of the final decay or collapse of Building 197 (7).

Disuse and robbing in Building 198 (Site Phase 9)

In the alley between the two *horrea* the surface of crushed and broken red sandstone roof slate (387; Fig 25), which derived from a wholesale stripping and replacement of the roofs of the buildings, was apparently kept clean for some time. It was directly overlain by a thick layer of yellow-brown sandy loam and mortar (312; Fig 25) containing approximately 60% buff sandstone roof-slate (Type 1). Most of the sandy component of this deposit was probably derived from mortar used in the construction of the roof. The fallen slates lay at an angle of approximately 30°, pitching from north to south (Figs 25, 144). It is clear that these slates had fallen into the alley from the north and must, therefore, have slid with some force from the roof of Building 198. The deposit extended along the alley from its eastern end as far as the space between the seventh and eighth buttress, and was piled up against the south wall of Building 198. This deposit is clearly representative of a major roof collapse. The force with which the mass of material appears to have fallen precludes deliberate dismantlement.

Above the collapsed roofing was a rebuilding or strengthening of the seventh buttress from the east end of the building (1286; Figs 25, 144). This comprised a 1.68m wide rebuild, faced on both sides, but without apparent bonding or core. Three courses survived, to a height of 0.46m. The rebuilt buttress was on line with the rough blocking of the interspaces of the gaps between the sleeper-walls of Building 198 which was installed during Phase d, when the western end of the building was provided with a solid floor. This buttress was the only evidence for rebuilding of any kind after the roof collapsed. It has been suggested above that there may have been a partition separating the western, solid floored, part of the building from the larger, eastern ventilated part. Such a partition would have lain on the line of the reinforced buttress. The pattern of roof collapse in the alley changed at the point where the buttress was reinforced; to the east, the alley was filled

Fig 144 The alley between the horrea *on the line of section 1 (Fig 25: a layer of collapsed roof slates (4421) and overlying robbing rubble (102) are shown in section, with the primary collapse deposit* in situ *in the alley (312); the pitching of the collapsed slate from north (right) to south is clear. The rebuilt buttress (1286) lies stratigraphically between the two roof collapse layers)*

by the primary collapse deposit (312) which was homogeneous, without any internal variation in colour or matrix. This deposit was less deep towards the west, where the buttress was built on top of it, and gave out completely 1.23m to the west of the buttress. The rebuilt buttress stratigraphically separated this primary body of roof collapse from a second similar layer (4421; Figs 25, 144). This deposit was deepest at the west end of the alley. It was concentrated in the area to the west and in the immediate vicinity of the rebuilt buttress. Again pitched roofing slates formed a substantial component of the deposit.

The stratigraphy of collapse in the alley suggests two phases for the collapse of the roof of Building 198. The primary collapse (312) seems to have occurred to the east of the solid-floored portion of the building. It may be that a partition wall dividing this area from the remainder of the building served to strengthen the roof, preventing catastrophic collapse. If so, the western end of the building may have been retained in use for some time with its roof repaired and reinforced by the reconstruction of the buttress at its south-eastern corner.

The lifetime of an attenuated building cannot be estimated, but it too seems to have ended with the collapse of the roof. Though the second deposit of roofing slates (4421) in the alley were probably deposited as part of this collapse, most of the roofing fell directly onto the floor of the building (Fig 145). The flagstones were covered with a thick (0.15m) deposit of Type 1 buff sandstone roof slate (1394; Fig 145). The edge of the collapse lay on the line of the projected partition wall and the rebuilt buttress. Although no surviving wall existed, the slates lay at an angle of repose suggesting that they may have originally fallen against a standing wall on this line.

To the east, the hollow-floored area of the building was certainly abandoned and it appears that most of the flagstone floor was robbed away. The sub-floor deposits associated with the use of the *horreum* were now sealed by dumped backfill. The lower fill of the interspaces between the sleeper-walls (1519, 1520, 1521, 1522; Fig 25) was a dark-brown mixed clay-silt with patches of charcoal, clay, stone, and gravel. It is important to note that this material did not extend very far beneath the few surviving flagstones of the *horreum* phases, and the very mixed upper fill of the interspaces (1403, 1416, 1417, 1418; Fig 25) was mutually exclusive with the presence of surviving flagstones. The material in the sub-floor beneath the flagstones was a fine silt without stones, and where flagstones survived voids existed beneath them. It seems clear that the filling of the sub-floor of Building 198 is a different phenomenon to that of Building 197. In Building 197 the sub-floor was deliberately filled, using a large quantity of stone in order to create a solid floor. In Building 198, it was clear that no deliberate policy of this kind had been employed. In particular, there was a comparative absence of stone.

The fills between the sleeper-walls of Building 198 varied greatly in colour, texture, and coarse components, and it seems likely that they accumulated partly as a result of natural silting, and partly from *ad hoc* dumping after the removal of the flagstone floor.

It seems likely that the partial robbing of Building 198 to ground level took place at the same time as the robbing of the floor. It is possible that the robbing was aided by the use of shear-legs placed in two postholes. These holes (1570, 98; Fig. 91) were roughly circular in plan, with a diameter of 1.00m. They were cut with their eastern sides vertical and the western on a gentle slope, 0.80m deep, with a square post-socket 0.40m square at the bottom. Between the *horrea* the material above the second roof collapse (4421), a thick layer of loose gritty and mortary material containing much facing stone and roof-tile rubble (102; Fig 25) may represent the by-products of this robbing.

Dating and finds

More dating evidence in the form of coins, ceramics, and other finds were found in features of Period 5 than in those of any other single period.

Building 197: Backfilling of sub-floor

Coins: No 4, Domitian (81–96)
No 25, Hadrian (117–38)
No 55, (illegible) (31BC–AD235)
No 76, Postumus (270–84)
No 81, Tetricus I (270–84)
No 96, Licinius (312–3)
No 101, Fausta (324–5)
No 105, Crispus (324–5)
No 111, Constantine I (332–3)
No 112, Constantius II (332–3)
No 114, Constantine I (332)
No 116, Constantine I (332)
No 122, Theodora (337–40)
No 123, Constantius II (337–40)
No 127, Constans (347–8)
No 128, Constans (347–8)
No 133, Urbs Roma (341–6)
No 134, Urbs Roma (341–6)
No 135, Constantinopolis (341–6)
No 138, Constans (341–6)
No 166, (illegible)
No 172, (illegible)
No 174, (illegible)

Pottery: Analytical Group 13 (Fig 167, Nos 150–82)

Finds: Glass beads (Nos 39–42), copper alloy earring (No 75), copper alloy finger rings (Nos 78, 79), intaglio (No 89), bone pins (Nos 92, 94), toilet spoon (No 103), ?nail cleaner (No 107), spoon (No 127), knife (No 169), dividers (No 180), ring with split pin (No 219), iron ring (No 250), lead belt plate (No 252), *lorica hamata* fitting (No 258), bone pommel (No 276), statuette fragment (No 278).

The good-sized group of 23 coins contains just three issues dated before 235. There is then a steady run of 17 *aes* from 270 to 348, when the group stops abruptly. The pottery from the group covers a wide date range. The high percentage of BB1, most of which is

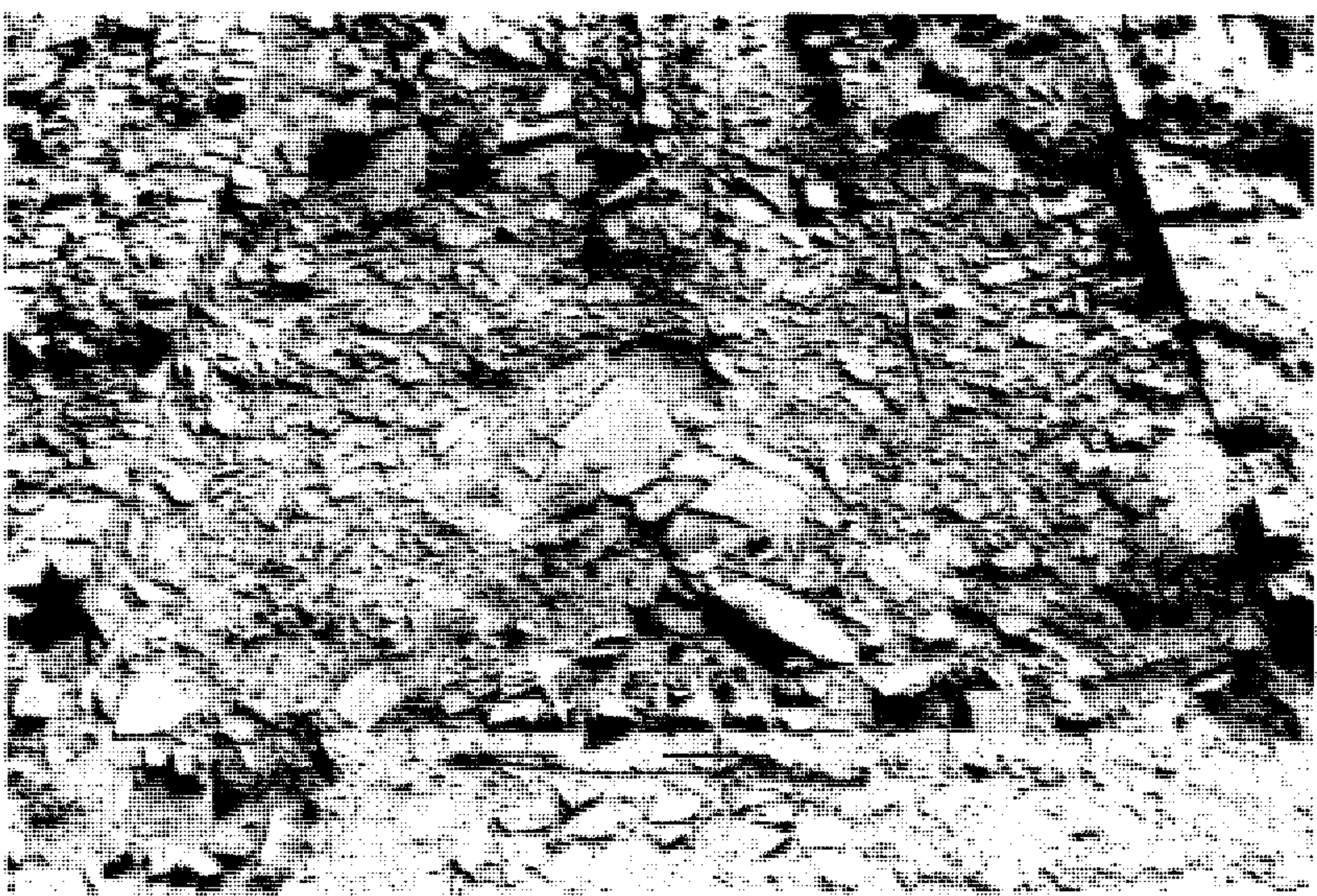

Fig 145 Collapsed roofing at western end of Building 198: the nail holes in many slates are clearly visible

residual, is consistent with the residual coins, and indicates the redeposited nature of some of the material used to fill the sub-floor. Despite the residual component within the pottery assemblage, it would conventionally have been dated to rather later than the cut-off point suggested by the coins. The basis for the dating would have been the relative proportions of the two jar types in Huntcliff ware, Gillam 161 (conventionally 300–370) and Gillam 163 (conventionally 360–400). In the Building 197 group, the supposedly later type exceeds the earlier by 118% to 93% rim percentages. The lack of ambiguity in the coin evidence clearly suggests that a re-evaluation of the dates of the Gillam 163 jar is required, and that it is appearing in some quantity 10–20 years before its conventional start date.

Roof collapse at west end of Building 198
Coin: No 143 Constantius II (350–3)

Backfilling of robbed sub-floor of Building 198
Coins: No 45, Commodus (189)
No 54, Elagabalus (218–22)
No 69, Tetricus I (270–74)
No 117, House of Constantine (330–35)
No 125, Constans (337–40)
No 141, Constans (348–50)
No 143, Constantius II (350–53)
No 146, House of Constantine (354–64)
No 147, House of Constantine (354–64)
No 150, Valentinian I (364–75)
No 151, Gratian (367–75)
No 155, Valens (367–78)
No 158, House of Valentinian (364–78)
No 169, (illegible) (275–84)

Pottery: Analytical Group 15 (Fig 169), Nos 210–26.

Finds: Copper alloy armlet (No 4), bone armlet (No 10), five glass beads (Nos 28, 36, 37, 46, 49), jet bead (No 52), four copper alloy penannular brooches (Nos 69, 71–3), iron penannular brooch (No 74), bone pin (No 90), fork (No 106), cosmetic pallet (No 108), jet/shale spindle whorl (No 121), ceramic spindle whorls (No 114, 118) and counters (Nos 142–50), stone counters (Nos 153, 154), lead weight (No 159), knife (No 168), whetstone (No 185), square buckle (No 188), 'D'-shaped buckle (No 189), brooch pin (No 191), stud (No 204), copper alloy ring (No 227), belt plates (Nos 249, 250), catapult bolt head (No 260), bone pommel (No 271).

This group of 12 coins is smaller and contrasts with the group from the backfilling of the floor of Building 197. It opens with two late second- to early third-century *denarii*. There are just three coins dated between 270–340, which comprised the major component (70%) of the former group. The majority of this group post-dates 348, which was the final date for the previous group. There is a strong run of issues from *Fel Temp Reparatio* (348–50) to the House of Valentinian (364–78). This group is almost complementary to that from the south *horreum*. The pottery shows less variety and less residuality than the groups in Building 197, possibly reflecting the fact that it developed entirely during the late fourth century with no reworking. This in turn suggests that the finds represent objects in use during the later fourth century.

Deposits over the relaid floor of Building 197
Coins: No 50, illegible (41–192)
No 52, Julia Domna (196–211)
No 53, Elagabalus (218–22)
No 56, Julia Mamea (222–35)
No 110, House of Constantine (324–5)
No 113, Urbs Roma (332–3)
No 161, House of Theodosius (388–95)
No 171, Illegible (341–95)

Pottery: Analytical Group 14 (Fig 169), Nos 183–209.

Finds: Jet/shale armlet (No 5), glass beads (Nos 21, 45), gold earring (No 77), glass finger ring (No 85), bone pin (No 93), toilet spoon (No 102), ceramic spindle whorl (No 111) and counters (Nos 139, 146), moulded stone (?reused as flooring: No 164), chisel (No 179), key (No 197), iron bar (No 236).

The backfilling of the sub-floor of the south *horreum*, Building 197, and the re-laying of its stone floor, are dated by pottery and coins found in the backfill which was sealed against contamination by the flagstones of the relaid floor. It is seldom that such a substantial group of material is found quite so unambiguously sealed as this one, and it is in this that the importance of the assemblage lies. The usefulness of the group is further enhanced by the fact that the contexts constituting the backfill were removed from the site wholesale and intensively metal-detected, making it certain that no numismatic evidence was missed. The importance of the *terminus post quem* of 348 for the relaying of the floor, which is provided by the two latest coins (issues of Constans; Nos 127, 128), can hardly be overstated as the coins from these deposits are almost complementary with the group of 13 identifiable coins from the subsequent piecemeal dumping in the sub-floor of the adjacent, demolished Building 198. The latter group includes four of the *Fel Temp Reparatio* issues of 348–64 (Brickstock 1987, 118) which are not represented in Building 197, and four Valentinianic issues of 364–78. Of the remainder, three overlap with the Building 197 run from 270–348, and two are long residual. The implication of this is to fix the date of the backfill in Building 197 very closely to the middle years of the fourth century (*c* 350), before the *Fel Temp Reparatio* coinage was in common use, as it seems certain that later coins would have been found beneath the flagstones had they been in circulation when the floor was relaid.

The collapse of the roof at the west end of Building 198 was dated to after 350–53 by a coin found between the flags of the floor and the collapsed roofing material. The coin serves as a *terminus post quem* for the latest phase of roof collapse in Building 198. Its virtual contemporaneity with the terminal date for coinage beneath the floors of Building 197 may be significant.

Building 198 was apparently extensively robbed for building material during the period immediately following the roof collapse, and this robbing included the removal of the flagstones from the floor. Subsequently the former sub-floor appears to have become a dumping ground. The fact that the coins from these deposits form a natural progression from those from Building 197 has already been noted. The latest are issues of the House of Valentinian (364–78) and of Valens (367–78). A further significant find from the Building 198 dumps is a small penannular brooch of a type which is now postulated by Margaret Snape (1992, 158) as a characteristic sub-Roman type, on the basis of numismatic and stratigraphic associations at Birdoswald and elsewhere, notably South Shields and Piercebridge (No 73).

The pottery assemblage from these dumps differed significantly from that from the sub-floor backfill of Building 197 and the earliest deposits overlying the relaid floor in this building. In particular the range of material is less than in the Building 197 assemblage. The final deposits within Building 197, associated with the last of the episodes of apparent floor patching (68), contained a group of material very similar in composition to the Building 198 dumping. It is this consideration which places both the reuse of Building 197 and the robbing and dumping in the derelict Building 198 into a clearly-defined Site Phase 10. The pottery assemblages provide a *terminus post quem* up to 400+, but other finds were more useful. The latest deposits in the reused Building 197 were associated with the two large hearths, around which were dropped *inter alia* a gold earring (No 77), a glass finger ring (No 85), and a Theodosian coin dating to 388–95 (No 161). The evidence recorded by Henry Norman (1860) suggests that the roof of Building 197 had collapsed, hence the large numbers of roof-slates which he cleared from within the building while levelling for his garden. The collapse removed by Norman would have sealed the Theodosian coin of 388–95 which was the latest datable object from the material overlying the relaid floor of the building. This coin thus provides the *terminus post quem* for the collapse of Building 197 and the end of Period 5 (Site Phase 10). A coin dated by Kent (1951, 9) to after 389 was the latest found above the floor of the Level IV phase of the 1929 building.

It is possible cautiously to postulate a connection between the events on Site A with those in the 1929 building. Though there is no absolute certainty that the Severan inscription (RIB 1909) recording the building of a *horreum* relates to the excavated *horrea*, it has been argued above that this was the case. The inscription was found in a floor of Level IV (Richmond *et al* 1930, 170–1) which had a *terminus post quem* after 364–75 for its construction, based on a sealed coin of Valentinian I (Richmond *et al* 1930, 174). If the *horreum* inscription was robbed from the excavated *horrea*, a convincing amplification of the sequence is suggested. Building slabs such as this would usually have been placed in prominent positions, and would be available for reuse only after demolition or drastic rebuilding. The inscription refers to the building of one *horreum*, and it is probable that, as at Corbridge (RIB 1147, 1148), both buildings were adorned with such slabs. The presence of the Theodosian coin within Building 197 shows that it was intact later than its northern counterpart, and therefore that the slab is likely to have been taken from Building 198. The *terminus post quem* for the reuse of the inscription is provided by a coin of the same date as the latest found within the dumping in the sub-floor backfill of Building 198. It is noticeable that the rebuilt 1929 building was one of the closest to the quarry provided by the derelict Building 198, lying as it does immediately across the *via praetoria*.

The dating evidence for Period 5 (Site Phases 9–10) is unambiguous. The sub-floor of Building 197 was backfilled with mixed material and the floor relaid *c* 350. The major portion of the roof of Building 198 probably fell in at around the same time. For a while the west end of the building stood alone, but this too collapsed after 353 and the whole building was exploited as a quarry to repair and rebuild other fort buildings, of which one was probably the 1929 Level IV building in the south-east *praetentura*. Building 197 continued in use during this phase, and occupation refuse was deposited as and when necessary in the former sub-floor of Building 198. During this phase the range of pottery available to the inhabitants apparently decreased markedly. Period 5 closed with the collapse of the roof of Building 197 after 388–95. How long after this date the building might have remained in a usable condition cannot be estimated, but it is salutary to note that the solid construction of civil *horrea* meant that they often survived to be reused with other functions. Greenhalgh (1989, 103) cites those at Arezzo, used as housing by 876. In 895 the *horrea* at Trier, were reused as the '*monasterium s. Mariae vocatum Orrea*' (Eiden 1949, 73–4). It seems unlikely, however, that these remained as roofed structures, and their urban locations would mean that reuse of standing fabric was more likely than at Birdoswald.

Period 6

Period 6 includes Site Phases 11 and 12. These phases are characterised by the erection of timber structures over the remains of Building 198, and upon the *via principalis* and the *via sagularis*. Although there was no stratigraphic connection between the Period 6 structures and Building 197, it is possible that the reuse of this building continued during Period 6.

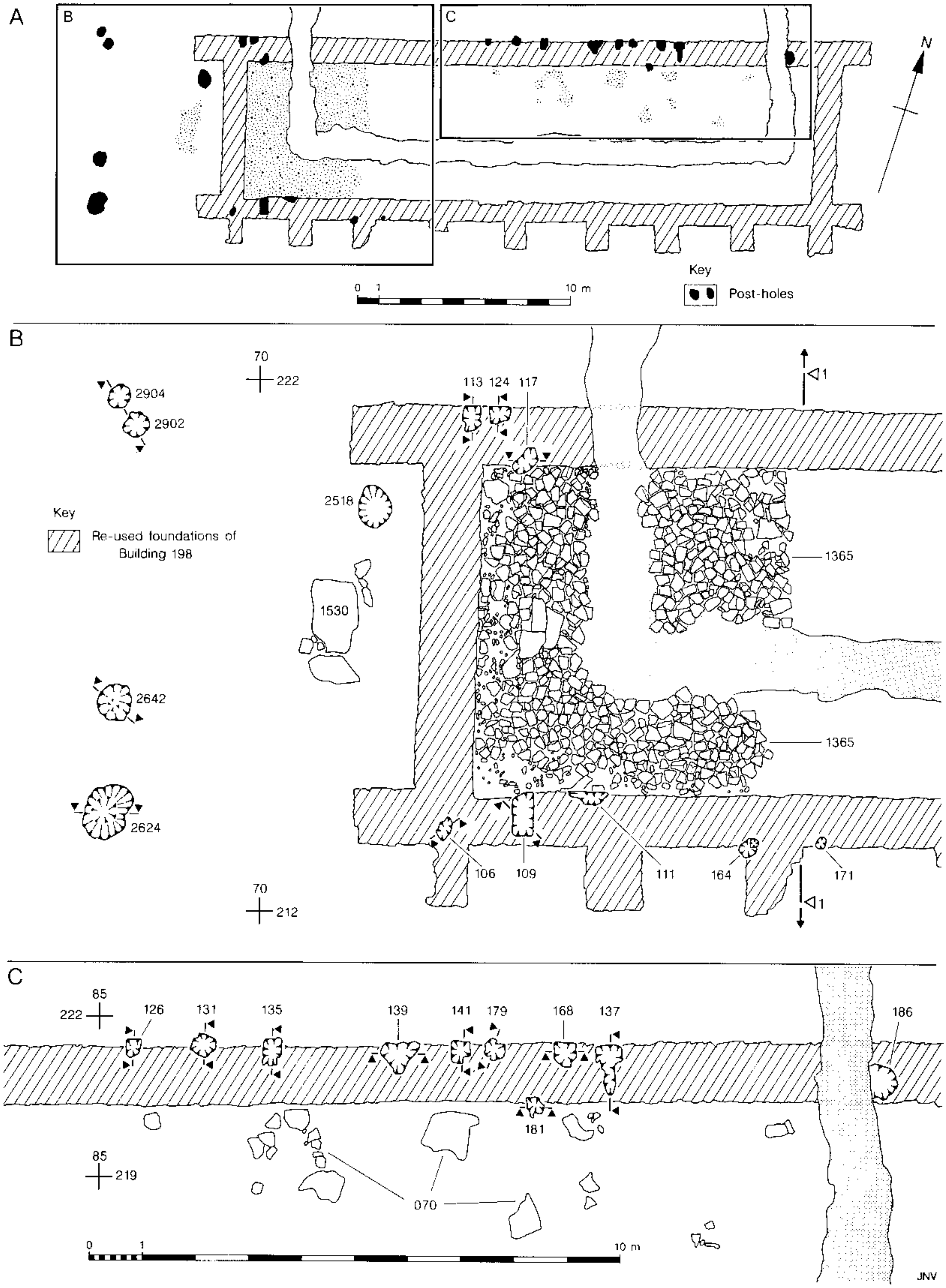

Fig 146 Plan of Building 199 showing locations of postholes cut into the walls of the former horreum, *Building 198*

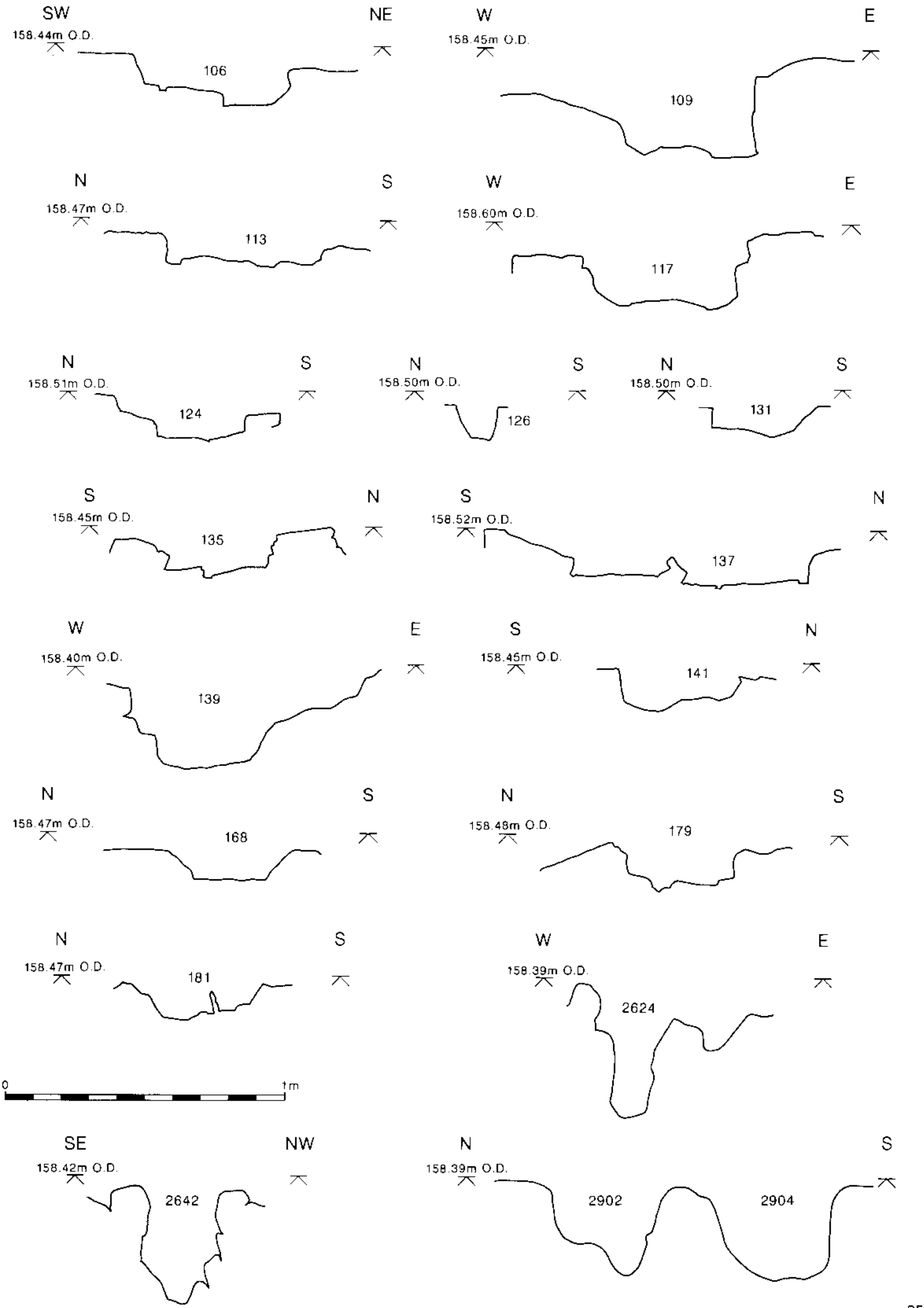

Fig 147 Profiles of postholes of Building 199

The first timber building phase (Site Phase 11)

In Site Phase 11 two buildings were found. Building 199 occupied the site of the former *horreum*, Building 198, and the eastern side of the *via sagularis*. Building 4426 was built on the west side of the *via sagularis*, against the fort wall. Both buildings were built using more or less ground-fast posts, and both seem to have reused elements of standing masonry walls in their construction.

Building 199

The robbing of the walls of the north *horreum*, Building 198, was followed by the construction of a major timber building, Building 199, on the same site. The building was post-built. Most of the posts were placed in shallow postholes located in the tops of the exterior walls of the former *horreum* (Figs 146, 147, and 148). Five postholes were found cut into the top surviving course of the south wall of Building 198 (106, 109, 111, 164, and 171), and 14 were cut into the north wall (113, 124, 117, 181, 126, 131, 135, 137, 139, 141, 168, 179, 181, and 186). Four of the latter (141, 168, 186, and 137) were also cut into a small ridge of silt (169) which had accumulated against the north wall of the *horreum* and overlay the latest surface of the *via principalis* (2707). These holes varied in size and shape, but were consistently 130mm in depth.

At the western end of the building deeper postholes were cut into the latest surface of the *via sagularis* (2904, 2902, 2642, and 2624). These postholes formed a continuation of the lines of those cut into the robbed *horreum* walls. They were more substantial in size than those in the wall top and were of a fairly consistent size. All were sub-circular in shape and averaged 0.40m in diameter and 0.27m in depth. In two of these postholes (2624, 2642) stone packing survived, leaving post pipes 220mm square and 240 x 180mm respectively.

The flooring of this building was of stone. The level eastern end of the building appears to have been floored over the debris accumulated in the sleeper-wall interspaces with a surface of fissile micaceous shale (70, 1530), while at the west end of the *horreum*, the undulating surface of fallen roofing was levelled up by the use of a layer of facing stones laid like crazy paving (Pl 8: 1363, 2530) within a matrix of silt (1376, 1311) which appears to have worked down between the stones. This layer too was overlain by patchy survivals of the fissile shale floor, which spread beyond the western wall of the former *horreum* (1530).

It seems clear that the western wall of Building 199 comprised the western group of postholes (2902, 2904, 2624, and 2642), and the easternmost extent is represented by posthole 186. The building would thus have measured 31.60m long and 8m in width. Many postholes in the south wall of the proposed building are missing. This may be because the *horreum* wall stood higher here than elsewhere; it is possible that other

Fig 148 Posthole (113) of Building 199 (see Fig 146)

postholes existed at a higher level, or even that a standing stone wall was utilised in the construction of Building 199. Certainly this section of wall survived to a higher level than the remainder of Building 198.

When this building went out of use, a rubble layer (71, 85) appears to have been deposited on top of the floor at the western end of the building.

Building 4426

The evidence for this building consisted of a line of four postholes which ran southwards from the south-east corner of the *porta principalis sinistra*. All were stone packed, and may be listed from north to south as follows: (Fig 149)

2626: stone-packed posthole with three large packing stones, measuring 0.40 x 0.27 x 0.10m.

1515: Posthole 0.32m diameter 0.31m deep. Featured a post pipe 240 x 180 mm, surrounded by packing of sandstone fragments.

1513: Amorphous posthole 0.30m diameter, 0.14m deep, located in the south side of a shallow scooped post-pit. The posthole showed in plan as a good, stone-lined feature. Its shallow depth may have been due to later truncation.

2639: Truncated stone-packed posthole 0.40m diameter, 0.12m deep.

These four postholes were irregularly spaced, but probably supported a lean-to structure against the west wall of the fort, using the south wall of the south tower of the *porta principalis sinistra* as its north wall.

The second timber building phase (Site Phase 12)

Site Phase 12 was defined beneath the medieval deposits of Site Phase 13 to the west of Area A, but directly below rubble and topsoil deposits over the rest of the area. The identification of this phase relied upon the recognition of the traces of three timber buildings, all of which were surface-built, within a complex sequence of stratified rubble. The buildings were constructed upon Roman road surfaces, demolished buildings, and rubble spreads, and were sealed by rubble deposits, medieval buildings, and soil accumulations. The methodology employed for the latest deposits was of enormous importance in the recognition of these buildings. When Area A was begun in 1987, the turf, topsoil, and loose rubble were removed and the underlying surface cleaned. This revealed a stone spread made up of overlapping layers of collapsed stone, rubble, laid surfaces, and wall tops of varying periods and functions. These surfaces were then drawn in detail, and the recognition of anomalies, usually differences in colour, angularity, composition, and compaction resulted from close observation by the draughtspeople. The interpretation of small, and seemingly unconnected, anomalies on the ground was greatly facilitated by the existence of the tower of Birdoswald farmhouse, which afforded an ideal platform from which these anomalies could be studied for long periods during their excavation. This overhead view allowed the gradual appreciation of the pattern formed by the Site Phase 12 features, and their interpretation as buildings. As Barker (1990, 219) found at Wroxeter, the subtleties of the surfaces could best be appreciated by observing them from a variety of viewpoints while moving around them, though they were notoriously difficult to capture on a still photograph from a single viewpoint.

Rahtz *et al* (1992, 13) record a similar sequence of work undertaken on the difficult site of Cadbury Congresbury, where 'long and agonising discussions [took place] between director and site supervisor about which stones should be removed in attempting to define features more closely, or in dissecting their component parts'. This is a description which could equally be applied to the excavation process at Birdoswald. It was not possible to rush excavation, particularly on the *via sagularis*. As more of the area was exposed it became more possible to recognise the sequence, but the deposits associated with the buildings were not excavated until it could be absolutely certain that the *via sagularis* area was in phase. Excavation continued on more simple areas, such as the *horrea* while the problems in this area were carefully examined. One rubble stratum was particularly intractable, and was left for three seasons before the team was confident enough to tackle it. The scrupulous care taken in the dissection of these deposits has resulted in the understanding of a coherent structural and stratigraphic phase in the early post-Roman history of the site.

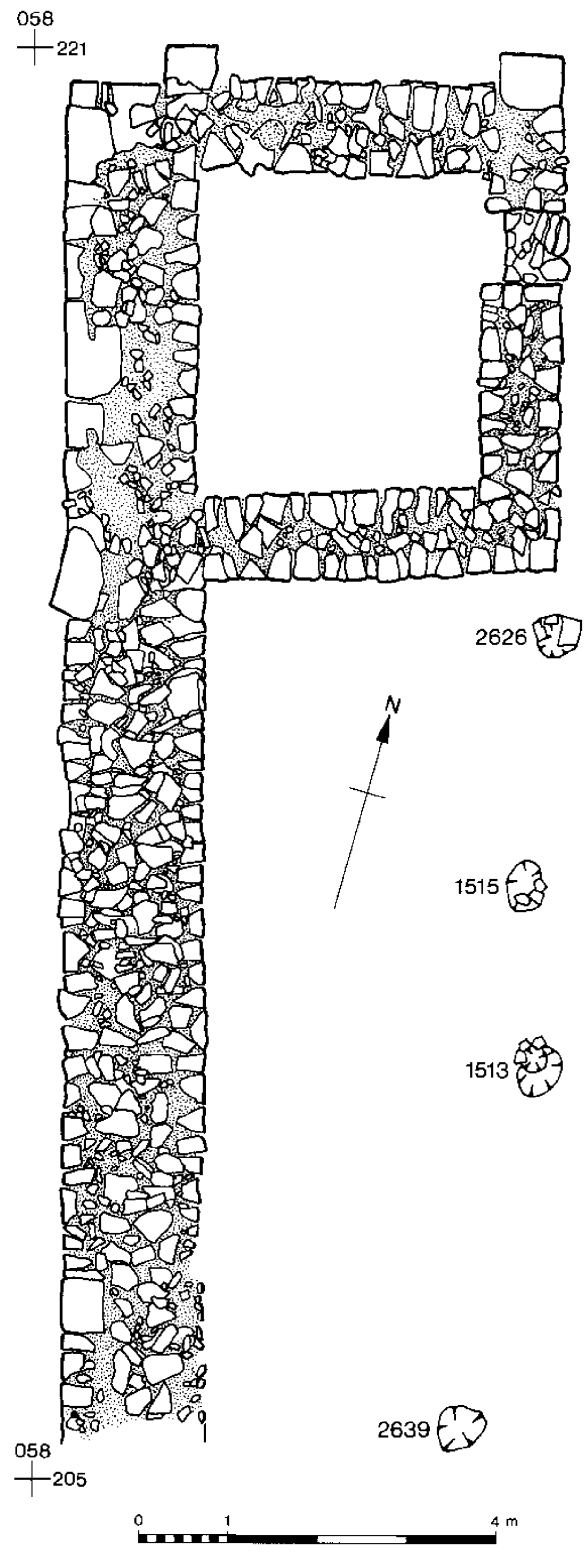

Fig 149 Plan of postholes, Building 4426

Building 200

This building is illustrated in Figures 150, 151, and Pl 9. In Pl 9, members of the site staff are shown standing upon the principal post positions. Without these figures as markers the building would be visible, but not immediately obvious. Figure 150 is a plan of the surface upon which Building 200 stood. The surface is rendered in grey, with the slight features which constitute the evidence for the building highlighted in black.

The first feature to be noticed as part of this building was a longitudinal east-west slot (39) 23.00m long, 1.30m at its maximum width, and 0.39m deep. It was steep-sided and flat-bottomed, and it was noticeable that at its east end, flagstones associated with the original *horreum* phase had been trimmed to allow the insertion of this feature. At its western end the slot turned at right angles towards the north, running for 2.91m before meeting the former north wall of the *horreum*. The slot cut through the north wall of the *horreum*, and continued for a further 3.90m as a shallow (30mm) flat bottomed impression in the rubble to the north of the *horreum*. This western wall line, photographed from a low level and looking southwards, is shown in Figure 151. At the south end of the western slot lay a flagstone post-pad made of a single stone, irregular in shape and crushed into six pieces. The centre of the stone was dished to a depth of 50mm (143). This pad lay at the end of a row of similar pads which formed an east-west line (143, 145, 146, 147, 148, 153, 55; Fig 150). The easternmost of these pads (55) lay at the end of a return of the slot (39) which, though less clear, mirrored the return at the western end.

At the end of the 1987 season of excavation it appeared that Building 200 was of a mixed construction. It seemed that the southern, eastern, and western walls were founded in broad slots (39) and that the northern wall was built around a series of large posts constructed on post-pads. As this did not seem a likely reconstruction, it was decided to examine the slot (39) very much more rigorously during the following season. In order to obtain the most objective results, a highly skilled excavator (S Rushton), who was unaware of the current thoughts regarding the building, was assigned to the task of cleaning and scrutinising the slot thoroughly. She was instructed to observe the smallest variations in the shape of the slot, and particularly the form of its flat bottom. When this task was completed, it became clear that obvious variations existed within the slot. These consisted of rounded, flattened, and slightly-concave areas which had been cleared of stone. There was some evidence that clay and flat stones had been laid over the underlying stone in order to level these features. When these anomalies were recorded and planned (2565, 2566, 2572, 2571, 2567, 2568, 2569, and 2570; Fig 150), it was evident that they formed a parallel line of pads which were paired with the stone pads already identified. It thus became apparent that Building 200 was constructed around two rows of paired posts. The posts on the former *via principalis* which formed the north wall of the building were placed directly upon an existing hard surface. On the former Building 198, the slot appears to have been excavated in order to find solid ground on which to build the south wall. The builders found and reused the central sleeper-wall of Building 198 as the foundation. There must have been a compelling reason to construct this building in such an inconvenient way, and such a reason can be inferred from the spatial relationship between Building 200 and the *porta principalis sinistra*.

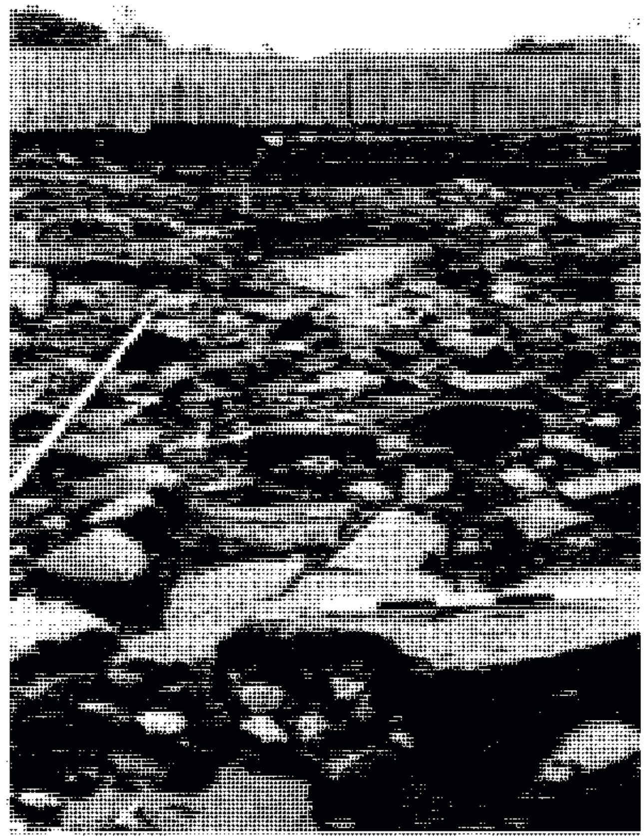

Fig 151 West end wall of Building 200 from the north

There are five pairs of principal post-pads (Fig 150). Though their centres are difficult to identify, and the measurements between them too uneven to allow accurate measurement of the building's dimensions, it would appear that the two posts at the west end (143, 2565) were intended to lie *c* 3m west of the next pair (145, 2566). There was then a long gap of *c* 9m before the next (148, 2567). Within this gap in the south wall was a pair of smaller post-pads (146, 147), and to the north, a counterpart to 147 (2571). As far as post-pad 148 there was a southern edge of an associated slot. From that pad eastwards both sides of a very shallow slot continuing 39 was visible. The next pair (153, 2568) lay *c* 6m to the west. The final pair was *c* 3m further east (55, 2569), with a small intermediate pair (151, 2570).

Internal arrangements appear to have been represented by a partially-metalled floor in the area to the north of the *horreum* (149). This surface ended on the line of the north wall of the building, and its edge can be clearly seen in Pl 9. There was an apparent partition on the line of the second pair of pads from the west. This was represented by a cut through the top course of the *horreum* wall paralleling the cuts provided for the end walls of the building (4395).

The fill (38) of the slot (39) was a soft black silt with occasional small pebbles.

Buildings 4298 and 4299

These buildings were far less clear than Building 200. They occupied the whole of the excavated area of the *via sagularis* (Fig 152, Pl 10). Like Building 200, an oblique view ftom above was necessary to identify them. The most obvious evidence that buildings were constructed on the surface of the *via sagularis* was a slot 30mm deep and up to 500mm wide, which appeared to run from the open portal of the *porta principalis sinistra* to the southern limit of excavation. To the west of this slot the surfaces of the road were worn or covered with silt, while to the east a resilient surface, possibly a footpath, lay between the slot and the walls of the *horrea*.

During excavation the slot was resolved into two discontinuous, but aligned slots (2613, 2615; Fig 152). The southern slot had a westward return (2616) at its northern end, and these two slots defined the northern and eastern wall line of Building 4299. Though the southern end of the building was truncated, it was clear that it had been in excess of 14m long. A very faint slot was defined on the western side of the building, but the clearest indication of the position of the west wall was a widespread silt deposit (2601) which was contained by the building, and ended to the west in a straight line. The width of the building, measured between the slot on the eastern side (2615) and the edge of this silt, was 7.30m.

Slot 2613 had a barely-discernible westward return, which appeared to meet the south-east corner of the south tower of the *porta principalis sinistra* (Fig 152). To the north, slot 2613 became very much shallower and an additional stratigraphic factor became important in identifying its line. A layer of dark grey-brown pebbly loam (2681) had accumulated against the edge of the western wall slot of Building 200. To the east this layer stopped abruptly at the line of the slot (2613). It had clearly built up when both Buildings 200 and 4298 were standing. A further exterior surface outside this building and contemporary with it (2673) also built up to the north (2673), and it is the fact that the medieval features of Period 7 were cut through this surface which demonstrates that the buildings of Site Phase 12 do not belong to this later period.

The bottom of the wall slot for Building 4298 was also defined by the fact that its base had been compacted to form a narrow and sharply-defined surface of compacted silt. The north wall of the building was defined by the westwards return of this deposit, which was visible on top of the underlying road surface rather than by a clear continuation of the cut slot.

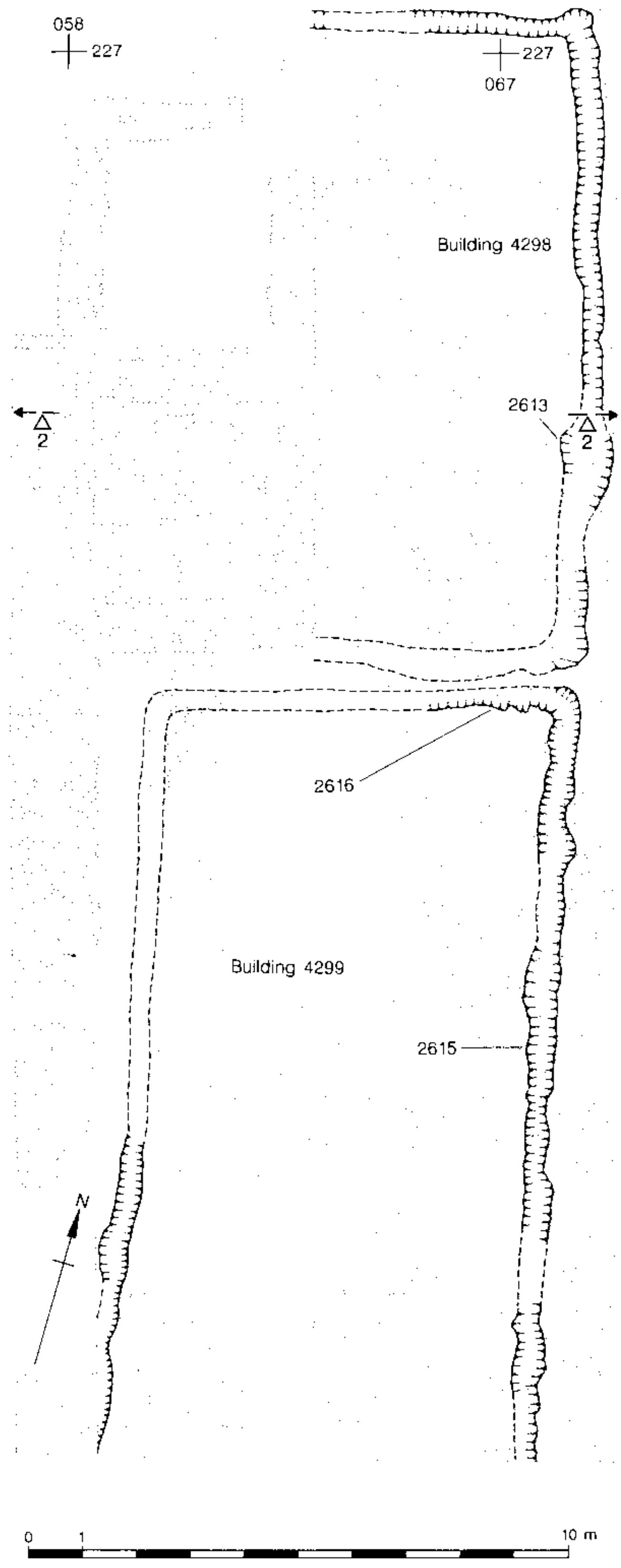

Fig 152 Plan of Buildings 4298 and 4299

Building 4298 measured 11.13 x 5.10m. The west wall of the structure may have lain against the combined south portal blocking and south tower of the *porta principalis sinistra*, or it may have been a lean-to structure. A compact red-brown silt accumulation inside the building suggested that it was not intended as living accommodation.

The *porta principalis sinistra*

The timber structures in the gate are only notionally assigned to this phase. There is no stratigraphic connection to suggest that they do not belong to Period 5 or to Site Phase 11 in Period 6. They are not, however, part of the medieval settlement of Period 7.

The structure consists of a pair of large postholes which flanked the paved causeway (400) through the open north portal. The postholes were situated outside the gate, on the western side of the arch (Fig 153), in contrast to the pivot holes provided for the inward opening gates on the inside of the arch. The postholes were of two phases. On the northern side of the gate, the earlier posthole (1759; Fig 153) was cut hard up into the corner of the gate pier and the wall to the north of the portal The cut was sub-rectangular, 0.50m long, and 0.35m wide. It was substantial, with a depth of 0.70m. The grey silt fill, or partial fill (1758) of the first posthole was cut by a further hole (1829). This was 1.07m long and 0.80m deep and the sides were almost vertical. The fill contained a number of large packing stones. On the southern side, the earlier posthole (1457) was an oval shaped cut with an almost vertical western edge, which continued to the full depth of the post-pipe within. Like the northern cut, this was partially filled with a greyish-brown silt (1458) before being recut (1442). Again like the northern posthole, this latest fill contained packing stones.

Dating evidence and structural chronologies

Several coins were found in surfaces associated with the second phase of timber buildings in Period 6.

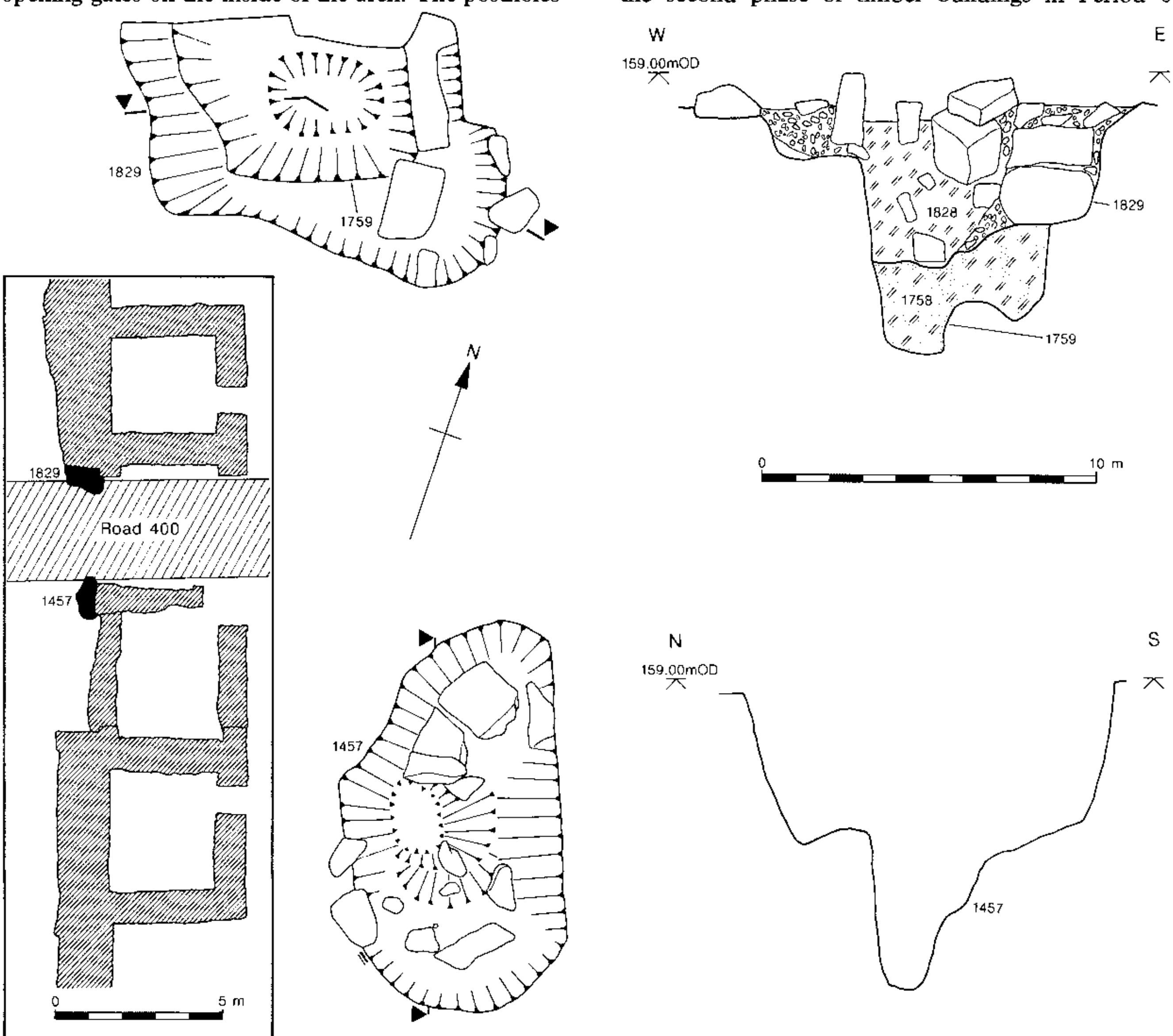

Fig 153 Plan of postholes which replace door sockets in the north portal of the porta principalis sinistra

Though all must be considered residual, it is of interest to note that they run up to the end of the coin sequence as attested elsewhere. These are:

No 60, Maximinus I (235–8)
No 119, House of Constantine (330–35)
No 131, Constantine II/Constans (347–8)
No 132, Constantine II/Constans (347–8)
No 137, Urbs Roma/Constantinopolis (341–6)
No 156, Valens (364–78)

There was also fragment of a gold earring (No 76) associated with this phase.

The construction of the timber Building 199 marks the beginning of Period 6, and of Site Phase 11. Little direct dating evidence relates to Period 6 in either of its constituent Site Phases (11 and 12). It is certain that the construction of Building 199 took place after 367–78, the date of the latest coin from the dumps in Building 198 over which Building 199 was constructed. For some time the continuously occupied Building 197 had been the only building standing on the site of the *horrea*, while the site of Building 198 was utilised for dumping. It is possible, therefore, that Building 199 was also the sole building on the *horrea* site, and was the functional replacement of Building 197, possibly built after Building 197 had lost its roof. If so the *terminus post quem* for the construction of Building 199 is advanced a decade, to 388–95, which is the date of the latest coin within Building 197.

A stratigraphical and structural sequence which continues beyond the date at which the latest Roman coins and pottery occur must, perforce, run at least into the fifth century, and it is clear that Period 6 represents occupation of this type and date. The lack of conventional dating evidence requires that other factors be invoked in order to give a best estimate as to the possible duration of the Period.

Such sequences as found at Birdoswald are as yet rare in Britain. The closest to have been examined comes from the excavations between 1966 and 1990, directed by Philip Barker in the Baths Basilica at Wroxeter, Shropshire, and published at a similar time to the present volume (Barker *et al* 1997; I am grateful for pre-publication sight of the concluding Chapter 7). At Wroxeter, as at Birdoswald, there are no finds which must be fifth rather than fourth century in date, even though there is a sequence of structural phases post-dating the appearance of the latest Roman material. A *terminus post quem* for the final reflooring of the basilica is given by a coin dated 367–75 (Phase W; ibid, chapter 7). The end of occupation is given a *terminus ante quem* by a carbon 14 date of Cal AD 600–790 (Birm 1045, 1340 ±60 BP) from a skeleton which was buried after the end of the timber building sequence (ibid, chapter 7; White, 1990). In between these dates came first a 'building yard' phase (Phase X), producing a remnant magnetic date *c* 500–550 (ibid, chapter 7). This was followed by the final demolition of the basilica (Phase Y), and the construction, occupation, and abandonment of a range of very substantial timber buildings on prepared platforms of rubble (the 'great rebuilding', Phase Z; ibid, chapter 7), the dates of which are thought to be *c* 530/580 to *c* 650–700. These buildings had no ground-fast members, and Barker (1985, 114) has recognised the potential of such buildings to last anything from 25 years to a century, favouring a point midway between the two, and thus constructing a possible chronology for a sequence of three buildings. Much of the dating within phases is reliant on an assessment of the length of time buildings might have survived, or pathways been worn (Barker *et al* 1997, chapter 7; Barker 1985, 114–15; 1990b, 226).

The vestigial character of the archaeological evidence for the Period 6 buildings at Birdoswald is only relative; traces are substantial compared to the Wroxeter buildings or to those of a similar date recently published from Canterbury (Blockley *et al* 1995, 204–7). Like at Wroxeter, however, the evidence should not be taken to indicate structures of a vestigial character. Building 200, the main edifice of Site Phase 12, was a large, well prepared, framed building. Its principal members were surface-built on pads, preventing the ground level rot which is a problem of ground-fast timbers. Properly maintained such a building could have lasted a very long time indeed. Many aisled barns, for example, provide instances of medieval timber-framed buildings, constructed on pads, which have survived in usable form to the present. Building 199 was not so well planned and constructed, but it too was surface built, using earlier stone walls as foundations.

A minimum chronology for Period 6 might begin directly with the suggested *terminus post quem* of 388–95 for the construction of Building 199, and would allocate 25 years life to the buildings of Site Phases 11–12, terminating the sequence *c* 445. A longer chronology would consider that Site Phase 11, with its *terminus post quem* of 388–95, need not begin until 420. Adding a century for the lifetime of each of Site Phases 11 and 12 would provide a terminal date *c* 620. Any variant on this is possible. In particular, Building 197 may have lasted considerably beyond 420. The evidence for its use, including the collapse of floor slabs and the episodes of reflooring would seem to indicate a long life. An average may be taken assuming a life for Building 197 beyond the deposition of the Theodosian coin, and a start to Site Phase 11 *c* 420. An estimate of 50 years life for each building would mean that Building 200 would be constructed *c* 470, and the site abandoned *c* 520. The following discussions will be based on this average chronology, showing occasional bias to the longer option, though the writer is aware that both shorter and longer chronologies must, given the nature of the evidence, be considered valid.

An Anglo-Saxon brooch from Birdoswald?

In his second edition of *The Roman Wall*, J Collingwood Bruce (1853, 251, pl.3) illustrated a sixth-century small-long brooch of Leeds' (1945) trefoil-headed type among Roman objects from Birdoswald (see Appendix 2, Fig 297, No 5). These were part of the Crawhall collection which consisted in part of objects found during the excavations undertaken by Thomas Crawhall, then the site-owner, during the 1830s. The find-spot of this brooch is included on Hope-Taylor's (1977, fig 114) map of the Tyne-Forth province *c* 575–603. The provenance of the object was questioned by Cowen (1965, 13) on two grounds. Firstly, he considered that the brooch was an unlikely find at Birdoswald, being well outside the area of distribution of such objects as it was then known. Secondly, Crawhall had owned a pair of Bronze Age antiquities from Handcross, Sussex. These, Cowen argued, had probably been purchased on the market while Crawhall was visiting the south, and Cowen considered that a similar purchase or gift from outside the Wall area was a more likely source for the small-long brooch. It should, however, be noted that Cowen (ibid, 12–13) was satisfied that the Roman objects were all from Birdoswald (albeit with a single object from Benwell). Cowen argued that Bruce's carelessness with provenances (ibid, 15) resulted in the misattribution of the brooch to Birdoswald. This seems a little harsh, though it is true that he misattributed the objects from Handcross to Birdoswald in his *Catalogue of Antiquities at Alnwick Castle*. This mistake was demonstrably caused by a lapse of memory of the 75-year-old Bruce, some 28 years after his first publication of the small-long brooch (ibid, 14, 17–18). The idea that Bruce was wrong in attributing the brooch to Birdoswald has been accepted by Miket, first in his publication (Miket and Pocock 1976, 74) of a cemetery at Darlington which provided, at the time, the northernmost example of the type in the shape of two of Leeds' (1945) cross-potent types. The subsequent discovery of small-long brooches still further north, at Hylton, Sunderland (Miket 1982) and Cleadon, Tyne and Wear (Miket 1984), however, prompted Miket (1982) to open 'once again the possibility of additional discoveries of this kind of brooch in Bernicia'. The most recent example found is a trefoil-headed brooch like the putative Birdoswald example from Norton, Cleveland (Sherlock and Welch 1992, 40). An example from West Heslerton, found with an early Saxon cruciform brooch and a Roman knee brooch, is also cited by Sherlock and Welch (ibid).

The known distribution of these brooches is spreading northwards, and (if the provenance of two supposedly from Corbridge (Miket 1985) is correct) westwards. Newman (1985, 162) has pointed out the natural route for settlers, trade, or 'influence' from the east provided by the Tyne–Irthing gap. It would now be less surprising for an object such as this brooch to have been carried to Birdoswald along this route. The general date range of these brooches is from the late fifth century through the early to mid-sixth (ibid); a date which overlaps with the average chronology for the final period at Birdoswald.

Though the false provenance argument has now been advanced in a number of sources (eg by Cramp 1991, 9) since 1968, this author feels that the argument against a Birdoswald provenance is far from proven, and that the possibility that the brooch was from the site, as Bruce stated, should remain open.

Periods 5 and 6: discussion

Periods 5 and 6 at Birdoswald provide some of the first and best evidence for the latest Roman and earliest post-Roman periods on the northern frontier. The extremely good dating evidence for Period 5 provides the *terminus post quem* for the beginning of Period 6, which, it is argued above, represents a long post-Roman occupation. The two periods provide archaeological evidence for radical change on the frontier in terms of the use of space and of buildings, and of the building technologies used. These can only reflect great social and organisational changes. Because of the lack of firm evidence for the immediate post-Roman period in the frontier zone, this discussion will inevitably be wide-ranging, drawing on evidence from later periods, and from both inside and outside the former Roman province, in an attempt to make some preliminary assessment of the context in which the developments at Birdoswald may be seen.

The patterns of building within these three site phases follow a sequence of which elements may be seen on other sites. In Period 5, buildings were selectively reused or demolished, Site Phase 11 (Period 6) then saw elements of stone buildings adapted by the addition of timber structures, while in Site Phase 12 the stone structures were ignored, and new timber buildings were erected.

Period 5: reuse and demolition

In or around 350, it seems that the inhabitants of the fort no longer required the large *horrea* which had been in use since the late second century. In one of these buildings, Building 197, the sub-floor was backfilled and the building used for other purposes, culminating in a period of 'domestic' use. Unlike earlier phases of this building, no effort appears to have been made to maintain an upper storey. There may have been a phase of use between the relaying of the floor, and the occupation, which resulted in the accumulation of silt and floors of fragmentary stone, but with the filling of the ventilated floor it seems virtually certain that the building ceased to function as a military granary. At around the same time the roof of the north *horreum* collapsed. Far from this being replaced, the debris was not cleared, and the building was utilised as a quarry.

The floor slabs were removed, probably for use elsewhere, and the former sub-floor was used for casual dumping. The building excavated in 1929 continued to be maintained as a 'rough shack' (Simpson and Richmond 1933, 262), probably directly at the expense of Building 198.

The implications of these observations are considerable. Firstly it should be restated that the archaeological dating for these events is, very unusually, unambiguous. It is clear from the finds from both *horrea* that coin loss on the site as a whole continued throughout the fourth century. The backfilling of the sub-floor in Building 197 took place before the common circulation of *Fel Temp Reparatio* coinage, commencing *c* 350, and the collapse and robbing of Building 198 and the dumping which followed occurred immediately thereafter. The *horrea* were the storehouses for the garrison's food, and as long as a large garrison existed and bulk supply networks were in place, the *horrea* would be needed. The fact that the *horrea* were no longer required suggests that neither of these elements were present after the middle of the fourth century. It is, of course, possible that there were further *horrea* elsewhere in the fort, but the observation remains valid; however many *horrea* existed, the storage capacity of the buildings in the *latera praetorii* was no longer required.

The pattern of development during this Period is strikingly similar to that summarised by Tainter (1988, 21), in his description of the use of architecture following social and economic collapse:

> Little new construction [is undertaken], and that which is attempted concentrates on adapting existing buildings ..., public space [will be] turned to private. People may reside in upper storey rooms as lower ones deteriorate. Monuments are often mined as easy sources of building materials. When a building starts to collapse the residents simply move to another ... Palaces and centralised storage facilities may be abandoned, along with centralised redistribution of goods and foodstuffs.

Similar patterns occur on a variety of sites in Britain, both urban and rural. At Wroxeter the baths basilica was refloored, and then elements of the building were dismantled. An annexe was partially dismantled and turned into a builders yard, where the stockpiling of materials for use elsewhere (White, 1990, 5; Barker *et al* 1997, chapter 7) may have occurred. This sequence took place during the period *c* 410–500/550. A similar situation can be adduced at Exeter where a new floor was laid in the basilica in or after the reign of Valens (365–78). After the demolition of the basilica the products of demolition were removed wholesale, possibly for reuse elsewhere, before the area was given over to an organised cemetery by the mid-fifth century (Bidwell 1979, 108–13). In Canterbury the shells of former public buildings were occupied by timber structures in the late fourth century (Blockley 1980; Blockley *et al* 1995, 259). At a villa near Kenchester, Herefords, the main house was shunned by a late fourth-century hollow way which headed to a more easily-maintained farm building (Wilmott and Rahtz 1985, 90).

It would be possible to quote many other examples of the way in which areas of towns and rural settlements experienced declining standards during the later fourth century, though only at Binchester, Birdoswald, Wallsend, and South Shields is it possible to observe the phenomenon in any detail among the northern forts. At Wallsend the late fourth-century *praetentura* was almost devoid of buildings, and the demolished hospital was replaced with a series of small timber buildings (Daniels 1989, 83; fig 42) which fronted onto the *via quintana*. At South Shields a granary was provided with a solid floor in the mid-fourth century and was subsequently demolished and robbed. After this the fort road gravels were quarried in the vicinity of the granary (Bidwell and Speak 1994, 45). Presumably these materials were taken in order to maintain some other, more active area in the fort. Binchester has a long stratigraphic sequence within the *praetorium* bath-house, which is terminated by a *terminus ante quem* from a burial associated with a mid-sixth-century brooch (Ferris and Jones 1996, 58).

At Birdoswald it is not necessary to look far for the cause of the symptoms so aptly epitomised by Tainter: this must lie in a drastic reduction in the numbers and effectiveness of the garrison. The lack of any information on the nature and size of the early fourth-century garrison has been noted above, but the evidence of the chalet type barracks on several forts on the Wall has been held to suggest that already the garrison was considerably smaller than in the second and third centuries. Garrison sizes in the east were certainly small, and Duncan-Jones (1978, 553) cites evidence for *cohortes* only 50 or 100 strong as early as the reign of Diocletian; the *ala Hiberorum* appears to have been 116 sttong, and *cohors* XI *Chamavorum* numbered 164. In 411 Synesius of Cyrene records that the largest unit in Cyrenaica contained just 40 soldiers (Tomlin 1979, 265). James (1984, 166) cites examples of late forts on the Rhine and Danube *limes* for which units are named in the *Notitia*, but which would have been incapable of accommodating anything like the second-century strength of these units. At Eining, for example, the fort of *cohors* III *Brittonum* was reduced to 10% of the size of the former auxiliary fort.

The attenuated garrisons of *limitanei* were static, and legal marriages led to the acquisition of stable lifestyles, families, and roots (Johnson 1989, 110). By the third century at the latest, local recruitment in Britain was supplying the normal needs of the auxiliary units in the island (Dobson and Mann 1973, 201) and ethnically and culturally these units would have had much in common with the inhabitants of the surrounding areas within the frontier zone. By 313 soldiering had become a compulsory hereditary occupation (Tainter 1988, 144), and up to 372 the sons of soldiers drew rations (Holder 1982, 102). The *limitanei* received pay and supplies, and they should not be thought of as soldier-farmers, or as a peasant militia, though it is generally thought that such troops were poorly paid and supplied (Jones 1964, 649–53). There is no evidence for the working of land by soldiers in their own interest, even in the eastern Empire, until 443 (in *NTh* 24, 1, 4; for discussion see Isaac 1988, 145–6). Given the small numbers of troops proposed above, the provisioning of the soldiers and their sons would not require anything like the resources of the second or third century (cf James 1984, 173). Such limited demand might mean that it was possible to supply the fort entirely from local resources (Casey 1992, 74), as had probably been customary for a long period (Manning 1975a; Jones and Walker 1983 191).

The critical question in Period 5 is the nature of the reuse of Building 197. The reflooring *c* 350 would have allowed many different uses, and there is no evidence until the silt deposits and resurfacing of the floor began. A phase where the interior of the building was kept clear of such deposits could have lasted for a long time. The accumulation of silt on the floor appears to have begun with the construction of the hearths, and the reflooring seems to have followed the failure of a number of the paving slabs which were laid over the backfilled sub-floor. Without the evidence of the finds, it might be concluded that this phase was industrial or of low status, simply because of the nature of the floor deposits, but the quality of the finds suggests the contrary. There are no signs that the hearths were industrial, as there was no slag or hammer-scale within the building, and the finds were all domestic. There can be little doubt that these deposits represent a gradual *in situ* accumulation; this is demonstrated by the marked variation within Analytical Group 14 between the pottery assemblage in the early deposits and that in the latest layer (69), which is much less varied. This may reflect a gradual attrition of pottery supplies taking place over time. An important point in the distribution of the finds is that those which might be regarded as high in status, namely the gold earring and the glass finger ring, as well as the silver Theodosian coin, were all found in the immediate vicinity of the hearths.

It has been noted above that there was no sign of the maintenance of an upper storey in Building 197 during Period 5, and there is no evidence for internal partitioning either. An undivided building of the size of 197 might not be suitable for ordinary domestic occupation; at the very least it would be impossible to heat adequately. If it was not a store, and not for permanent domestic occupation, it might have been used for specific, occasional, purposes of either a secular or a religious character. There is no evidence for religious use (though this would be almost impossible to identify), and it is possible to conclude that the building was used for secular occasions.

It is possible that a garrison of the size adduced above would all be able to assemble in Building 197. The position of the hearth, together with the high-status nature of the finds around it, might indicate that this was the place set aside for the use of the commander. In plan, the long narrow building with a hearth at one end is highly reminiscent of the halls of the post-Roman British and Anglo-Saxon periods; but conversely, the *horreum* was probably the only building within the fort whose shape and size would lend itself to such gatherings. The only alternatives might be the basilica, Building 4403, or the cross-hall of the *principia*. The basilica would have probably been too large for a depleted garrison, while the *principia* might either have been too specialised in its plan, which was designed for the military system of the second century, or previously altered to serve other functions; the *principia* forecourt at South Shields, for example, appears to have been partially transformed into a Christian church by the end of the fourth century (Bidwell and Speak 1994, 103–4).

The deposits overlying the floor of Building 197 probably date to the very end of the fourth and the early fifth centuries, and a terminal date *c* 420 is suggested above for this occupation. In any case the reuse of Building 197 probably outlasted the traditional end date of Roman Britain of *c* 410, and there is a total lack of knowledge concerning the nature of any occupation of forts and the status of their inhabitants beyond this date. This broader question is further addressed below.

Period 6 (Site Phase 11): adaptation

Site Phase 11 illustrates an intermediate period both technically and chronologically between the reuse of existing stone buildings in their entirety during Period 5 and the construction of completely-new timber buildings later in Period 6, during Site Phase 12. Buildings 199 and 4426 utilised elements of standing or ruinous Roman stone buildings in their construction. Building 4426 was apparently built as a lean-to structure, the north and west walls of which were formed by the west wall of the fort and the southern wall of the south tower of the *porta principalis sinistra*. Building 199 may have incorporated the standing south wall of Building 198, in which case it would have been partly stone and partly timber built, with a roof plate supported at a constant level by both elements. The irregularity of the excavated postholes would be the result of the practical problems of the building process (Charles 1982, 101).

Buildings combining parts of ruinous stone structures with timber additions are known from a number of other sites. At the temple at Uley, Gloucestershire, the collapse of part of the temple in the late fourth century was followed by the clearance of debris, and the modification and reuse of the surviving portions of the stone building, including an added timber-framed element (Woodward and Leach 1993, 56, 316). At Rivenhall, Essex (Rodwell and Rodwell 1986, 63), a late or sub-Roman timber structure in the form of a projecting wing was apparently added to the villa frontage, its construction similar to that of the sixth-century Wroxeter timber buildings (but see Millett 1987, 437). The use of one earlier wall to build a lean-to or pentice structure, as appears to have been the case with Building 4426, is perhaps the easiest way of reusing existing fabric. This approach is exemplified in the sixth-century Wroxeter complex (Barker 1981, fig 5; White 1990, 6; fig 13).

Period 6 (Site Phase 12) : rebuilding

Site Phase 12 saw the final stage in the development from wholly stone to wholly timber construction; it also marked a point at which the lines of Roman buildings ceased to influence the form of the timber built settlement. During Site Phase 11 it was probably the survival of parts of the walls of Building 198 which dictated the position of Building 199, but Building 200 seems to have been freely planned, with its position chosen purely because of its relationship with the *via principalis* and *porta principalis sinistra*. Building 200 was similar in width to Buildings 198 and 199 and was surface built; it would therefore have been a logical course to utilise the robbed walls of Building 198 as foundations. The movement of the frontage of Building 200 to the north can only be explained in terms of a desired relationship with the gate, and this spatial consideration attests to the perceived importance of the building. Ever since the south portal of the gate was blocked in the mid-third century during Period 4a, the area of the *via principalis* between the frontage of Building 198 and the open north portal of the gate had been dead ground. Building 200 utilised this space. The north wall was deliberately aligned with the gate *spina* and was therefore constructed on the resilient surface of the *via principalis*. The emphasis on establishing this relationship with the gate gave rise to the variations in the foundations described above, though the width of the building was probably influenced by the fortuitous position of the spinal sleeper wall of Building 198 which was used as the foundation for the south wall.

By covering the dead ground in front of the former *horrea*, the builders of Building 200 ensured that it was the first structure which would have been seen by anyone entering the *porta principalis sinistra* from the west. Buildings 4298 and 4299 were erected in a position of less importance, directly against the fort wall. All these relationships stress the importance of Building 200 in the settlement of Site Phase 12, and suggest that it was the principal building. Buildings 4298 and 4299 can thus be interpreted as service structures.

The insertion of the postholes flanking the open portal of the *porta principalis sinistra* at Birdoswald is paralleled by an exactly similar phenomenon in the latest phase of the south-west gate at South Shields (Bidwell and Speak 1993, 127, fig 4.15). Unlike Birdoswald, the postholes at South Shields are the culmination of a long sequence of activity at this gate. The *terminus post quem* for this was a coin of 388–402 which was found in the top layer of road metalling on a revetted causeway through the outer fort ditch. A subsequent ditch was cut through this causeway, isolating the gate. After a period of natural silting, this ditch was partly filled with rubble from the gate, including architectural fragments (ibid, 45). Late alterations to a fort gate are also seen at Housesteads, where a timber slot was cut into the face of the *spina* of the east gate (Crow 1995, 91). At South Shields the postholes are seen as representing a rebuild of the collapsed arch of the gate in timber. Such an interpretation is inadmissible for Birdoswald, where the collapsed rubble of the gate seals pottery of the thirteenth to fourteenth centuries, demonstrating that the gate survived until the medieval period. At Birdoswald the postholes in the gate portal are part of the latest phases of the Roman and sub-Roman sequence, and were installed when the gate arches were still standing. Philip Barker has suggested an interpretation for these features; during the Roman period the fort gates always opened inwards, closing against the central door-stop block from within. Though acceptable in secure times, inward opening gates would be vulnerable to attack if this was anticipated. It is suggested that the postholes were part of the provision of outward opening gates, probably provided as part of an operation intended to put the fort into a more defensive posture.

Though Building 200 was founded on post-pads and Buildings 4298 and 4299 were built on sills, all three were surface-built, a fact which explains the difficulty experienced in recognising and excavating them. There is an increasing body of evidence for the existence of fully-framed, surface-built structures in Roman Britain. First-century buildings in Chelmsford, Essex, were constructed on sills laid directly on the ground (Drury 1975, 165) in the same manner as Birdoswald Buildings 4298 and 4299. Rodwell and Rodwell (1986, 56) further note that surface building on prelaid gravel floors are frequently found in Essex. A substantial aisled building at Rivenhall was built on surface-laid pads, and the weight of the timber superstructure had pushed these pads into the underlying floor (Rodwell and Rodwell 1986, 56), very much as the padstones on the north side of Birdoswald Building 200 had been crushed. At Wanborough, Wilts (Anderson and Wacher 1980, 119–21), a building is interpreted as having been attached to floors whose joists were supported on sarsen boulders placed upon the ground, while other buildings were constructed with sleeper beams placed directly upon the ground. Wacher (1971, 174) considers that the latest buildings at Catterick are fifth century in date. Again these were timber structures 'with posts or sleeper beams supported on large boulders and blocks of stone'. In the

Walbrook valley in London timber buildings were keyed into timber floors (Grimes 1968, 96; Wilmott 1991, 28). The use of base-plates and uprights has recently been recorded at Cannon Street and elsewhere in London (Goodburn 1991, 200, fig 2). Neither of these techniques would have left adequately interpretable archaeological traces had the timbers not survived in the waterlogged ground. The sixth-century buildings already cited from Wroxeter were surface-built on prepared platforms of rubble (Barker 1981), features not discovered at Birdoswald, and included both base-plate (Barker 1975, 109) and post construction (Barker 1977, 258). Recent excavations at Dod, Borders, have revealed three phases of rectangular buildings following a complex sequence of roundhouses. Like the Wroxeter structures these were recognised as rafts of compacted rubble and are interpreted as the stances for framed buildings of sill-beam construction (Smith 1982; Smith forthcoming).

A widespread and characteristic tradition of timber building of the sixth to eighth centuries (hereafter referred to as EMB: Early Medieval Building) has been identified on a number of type-sites where particularly well-preserved building remains have been discovered (James *et al* 1984), most notably at Cowdery's Down, Hants (Millett 1983), and Yeavering, Northumberland (Hope-Taylor 1977). The features of these buildings include earth-fast uprights with walls of continuous wattling or planking. Important diagnostic features are the presence of external raking timbers which acted as buttresses, opposed axial doors in the long sides, and the use of a simple double square planning module. One end of these buildings is frequently partitioned off. The buildings were framed, and combinations of crucks and end-gable posts have been suggested for the superstructure (James *et al* 1984, figs 7–8). In addition to Yeavering further buildings of this type have been identified within the frontier area at Sprouston, Roxburghshire, Doon Hill, Lothian (Reynolds 1980, 49), Thirlings (Webster and Cherry 1975, 226) and Milfield, Northumberland (Hope-Taylor 1977, 15) and in the eighth-century Northumbrian settlement at Whithorn, Galloway (Hill 1990a; 1990b). This distribution effectively brackets Birdoswald to east and west. The style is certainly later than the Birdoswald buildings, however, and is limited to those areas where Anglo-Saxon settlement had taken place (James *et al* 1984, fig 1). It is thought to result from a fusion of elements derived from Romano-British and Anglo-Saxon timber building techniques. Large-scale Anglian penetration into Cumbria did not occur until the mid-seventh century (Newman 1984, 156) by which time the excavated sequence at Birdoswald, assessed even on the maximum chronology above, was long over. It is not therefore surprising that Building 200 does not belong to the EMB tradition. It is, however, valid to consider Building 200 as the kind of Romano-British forebear of EMB noted by James *et al* (1984, 203). It shares two relevant features, namely a framed structure and opposed doorways in the long sides, though these are positioned towards one end rather than axially.

Two of the northern sites which feature the developed EMB style have earlier phases including somewhat differently constructed buildings which have been proposed as post-Roman and pre-Anglian in date. These are Yeavering, Northumberland, and Doon Hill, Lothian. The rectangular structures of Phase I at Yeavering were constructed with ground-fast posts, and were interpreted by the excavator as 'post Roman and pre-Germanic ... and non-Germanic' (Hope-Taylor 1977, 212). Hope-Taylor (ibid, 277) dates these buildings to the period after 250 and before 500. Scull (1991) has reconsidered this phase in the light of the evidence now available, however, and demonstrates that neither the cultural affinities nor the proposed date of these structures are secure, and that the Phase I structures could be Anglian and therefore mid- to late sixth century in date. The earlier of two substantial buildings at Doon Hill (Doon Hill A) had abraded samian and Roman ironwork in the fills of its post-holes, thus settling a dispute about its possible prehistoric date (Reynolds 1980; Selkirk 1980; Hope-Taylor 1980). Doon Hill A measured 23 x 10.8m. It was planned as an open hall with a tapering bay at either end. The overlying Doon Hill B was a fully fledged 'Yeavering Style' EMB structure, and Doon Hill A is considered to have been its fifth to sixth-century British predecessor. The recent report on the early medieval phases at Cadbury Castle, Somerset (Alcock 1995), has compared the well known fifth-century hall building found at that site with Doon Hill A, drawing together a number of similarities in plan (ibid, 134–7).

Major timber buildings of fifth- to sixth-century date are very little known in Britain (Reynolds 1980). The only other structures which are demonstrably contemporary with those at Birdoswald are the Wroxeter surface-built structures which have been cited as parallels to Building 200 in structural terms, and the timber hall at Cadbury Castle, Somerset (Alcock 1995, 110–11, 171). The major building at Wroxeter, however, is similar to a Roman winged-corridor villa in plan (Barker 1981, 16; White 1990, 7). The simple rectangular plan of Building 200 recalls those of the fifth- to sixth-century hall buildings at Cadbury Castle and Doon Hill A, though these differ structurally in that ground-fast posts are used. This is also true of a more local building: a rectangular hall at Kirkconnel, Dumfries (Clough and Laing 1969, 134–36), which has been ascribed to the sixth to seventh century by the presence of a single bead of this date.

The most useful comparanda to Building 200 at Birdoswald are the halls of the post-Roman, British population of northern and western Britain at South Cadbury and at Doon Hill. The successive Doon Hill buildings are generally interpreted as timber halls which would have been the residence of a royal official, noble, or chieftain, taken over as a royal lodging during progresses (Ritchie and Breeze 1990, 30; Alcock 1988, 24), and at Cadbury Castle the analogous building was the principal structure of its phase, interpreted as 'the feasting hall of whatever noble warrior lived at Cadbury with his war-band' (Alcock 1987, 182).

A comparison of the dimensions of these buildings, given the prominence which is attached to them in Dark Age studies (Alcock 1987, 243–4), is interesting:

Birdoswald, Building 200:	23m x 8.6m (max external)
Doon Hill A:	23m x 10.8m
South Cadbury:	19m x 10m
Kirkconnel:	16m x 6m (approx)

It is clear from this short list that Building 200 can hold its own in size with the largest and most-important fifth- to sixth-century British buildings thus far recorded, and its similarity in size to Doon Hill A is remarkable.

Although an attempt has been made to reconstruct Buildings 200, 4298, and 4299 in Figure 154, this is to demonstrate the position and relative size (compare Fig 100) of the timber buildings, rather than to attempt a detailed reconstruction. Though buildings which share the broad characteristics of the plan of Building 200 have been cited above, none have the same mode of construction. The structural elements comprise five pairs of pads upon which would have stood trusses which divided the building into four bays. The irregularity of the pads and uncertainty as to their centres make a notional estimate of intended dimensions the best way of quoting the size of the building's bays. The eastern and western bays are of equal size, the pads measuring a notional 3m centre-to-centre. The second bay from the west is three times wider (9m), but includes two smaller pairs of pads, interpreted as the footings for opposed door-frames. The final bay is *c* 6m wide. If these measurements reflect the builder's intentions, it is possible that the size of the building between the centres of the end posts was some 21m. If post centres are taken to assess the possible width of the building a figure somewhat over 7m is reached. It is thus possible that a 1:3 ratio of width to length was required.

Figure 154 reconstructs Building 200 as a cruck-built structure, though other alternatives are clearly possible. Addyman (1981) rightly points out that the existence of padstones, laid to support the feet of the principal uprights of a building, is evidence for the positions of these uprights and not their nature. He notes that such stones are likely in many cases to be the only evidence for cruck construction. A problem in the interpretation of Building 200 is that some of the pads are out-of-line. This problem is solved, assuming the presence of cruck-frames, as these are independent of the walls. Cruck-frames may therefore be of differing span within the same building, as long as the centre points between each pair of principal posts forms a straight line for the ridge (Green 1982, 87–8).

The use of crucks in Roman Britain has been claimed in a mid-fourth-century building at Godmanchester, Cambs (ibid, 96–7; fig 4.7), and at Latimer, Bucks (Branigan 1968). Here a building of

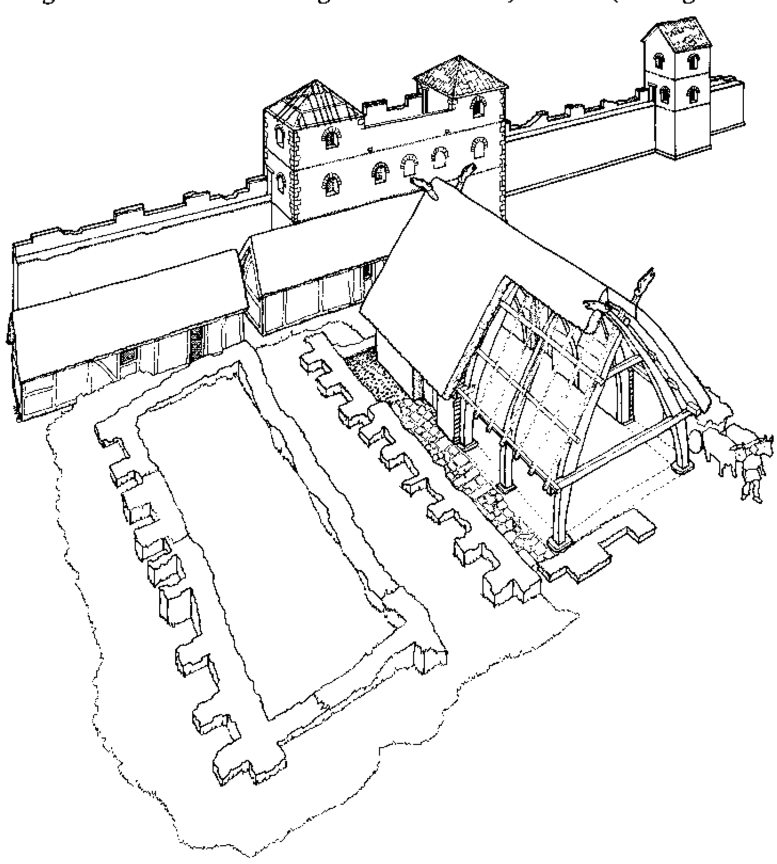

Fig 154 Reconstruction drawing of Area A in Period 6, showing Buildings 200, 4298, and 4299

the late fourth or early fifth century had the postholes which represented the cruck-feet lying within the lines of the timber walls (Smith 1964, 137). This controversial reconstruction has been criticised by Addyman (1981). Crucks have been suggested as part of the reconstruction of buildings of the EMB tradition (James *et al* 1984 193) of sixth- to seventh-century date at Cowdery's Down, Hants, where Smith's (1981, 8) cruck apex type F1, which supports a lintel and king-post, is reconstructed (James *et al* 1984, Figs 7, 8). An alternative to cruck-framing would be to propose that the building had a ridge supported upon gable posts. As the centre of the building is marked by the line of the former north wall of Building 198, central ridge supports could have been placed upon this wall and would not necessarily leave any archaeological trace.

In the absence of roofing or walling materials which might be associated with Building 200 it may be assumed that these were natural and biodegradable. The roof was probably thatched, but the walls are a more difficult problem. At 1.30m wide the trench representing the south wall of Building 200 was too broad for a sleeper beam, and there is no evidence for any supports for wall panels. Both of these factors suggest that the walls were of earth. Earthen walls tend to be wide, and Clifton-Taylor (1987) quotes widths of 2–4 ft (0.61–1.22m). Such a walling medium would also be ideal for use in association with crucks, and this type of structure was used in a house of *c* 1700 at Great Orton in Cumbria (Mercer 1985, 145). The soft dark silt which filled the trench would appear to back up this idea, and it is suggested that turf might have been the medium employed.

Birdoswald and the frontier zone in the fifth century

It is suggested above that the reuse of Building 197 during Period 5 might well have lasted until 420 or later. The average chronology used for this discussion assumes a 50-year life for each Site Phase within Period 6. If the construction of Building 199 took place *c* 420, therefore, Building 200 would have been erected *c* 470, and the end of the Period would be *c* 520. This period includes and follows the accepted end date for Roman Britain. Millett's (1990, 212–30) model for this period suggests that, after the attack on the province of 408, and the failure of the military to deal with it, the provincial elite took upon themselves their own defence. Though this situation was legitimised by the rescript of Honorius in 410, it sprang from a tax revolt and the deliberate rejection of centralised Roman government in 409. Millett attributes this revolt to 'those paying taxes for a defence and administration which no longer served their needs' (ibid, 228, but Dark (1994, 55–70) offers a different explanation with a broadly similar result: the end of 'aspects of elite culture'). If centralised authority was rejected, the army, as a branch of that authority, would no longer be supplied by it. As Holder (1982, 103) points out, the only difference after *c* 409 would have been that soldiers were no longer paid or supplied. The small populations of the frontier troops and their families would still be in residence, however, and it is probable that in Periods 5 and 6 at Birdoswald we are seeing structural aspects of their response to the situation. Percival (1976, 176), discussing Gallic villas in this period, says that 'survival ... would have meant evolution into something else, and if we are seeking evidence for survival it is this something else that we must look for'. The timber buildings of Period 6 are, compared to the occupation of the Roman fort, certainly 'something else'.

In the absence of evidence for the post-Roman period on the frontier, Breeze and Dobson (1976, 232) concluded their account of Hadrian's Wall in the third and fourth centuries by saying that 'We must accept that the soldiers of the Wall returned to the soil from which they sprang.'

This statement emphasises the complete lack of evidence for what happened to the Hadrian's Wall garrisons at the beginning of the fifth century. It also encapsulates a belief that the *limitanei* and their dependants, most of whom would have sprung from the local soil (in that they were locally recruited), simply drifted away to resume the agricultural lifestyle which had prevailed in the area from the Iron Age and throughout the entire Roman 'interlude' into the sub-Roman period. In this scenario the forts, which had been 'limited islands within a rural sea' (Jones and Walker 1983, 191), especially in the north west, would have lost their importance and relevance, and would therefore have been deserted.

Birdoswald was demonstrably not deserted, probably for as much as a century after the accepted end date for Roman Britain. As Birdoswald has produced the first substantial archaeological evidence for such continuity, it is not possible to assess how typical this was for forts in the north in general or on Hadrian's Wall in particular.

A prerequisite for survival and continuity would certainly be the potential of the local area to provide food. Birdoswald, like other forts on the western flank of Hadrian's Wall, lies in an area where cultivation is possible; the Irthing valley is a very fertile area (Higham 1992, 76) and arable cultivation has taken place in the immediate vicinity of the fort until recent years (J Baxter personal communication). Isaac (1988 139–47) notes the lack of evidence for the oft-repeated idea that the *limitanei* were soldier-farmers, arguing that they were always first and foremost troops, who were paid and supplied by authority. It has already been argued, following Manning (1975a), that supply to forts had probably been levied compulsorily from the local population for some time. When central authority failed it is possible that such a relationship continued. However, as Casey (1992, 74) suggests, the old regime of official coercion might have given way to a symbiosis in which a local community supplied a residual garrison in return for the assurance of security in case of trouble. If the relationship between the *limitanei* and the local populace was in any way similar to that demonstrated in the Abinnaeus archive, relating to the commander of *ala* V *Praelectorum Dionisiada* in Egypt, then we might conclude that the garrison had long been an integrated part of local society (Tomlin 1989, 234), possibly involving at least some element of the military as landowners (though not workers on the land) in the district, a pattern known from the eastern empire (though only from the fifth century; Isaac 1988, 144), and recently adduced for the west (Whittaker 1993, 282–5). In such a case coercion might not have been necessary.

Environmental evidence shows that reforestation was not the immediate result of the changes of the early fifth century. Regional pollen diagrams from the north east indicate that the mainly pastoral agricultural economy persisted for the duration of the fifth and probably the sixth centuries (Clack 1982, 388–93; Casey 1992, 72), and work at Dod, Borders, may demonstrate a similar pattern (Innes and Shennan 1991, 32). The pollen sample from Fellend Moss on the line of the Wall itself shows an end to the clearance phase in ad 620 ±40 (AD 600–680; Davies and Turner 1979, 786–90). Patricia Wiltshire's continuing work on the pollen from the Midgeholme Moss will be of the first importance in establishing whether a similar pattern obtained in the immediate vicinity of Birdoswald. It is suggestive that the terminal date of *c* 520 for Period 6, judged on the basis of the average chronology quoted above, coincides with the beginning of reforestation attested at several moss sites, for example at Steng Moss, Northumberland (*c* 480–530; Turner 1979), and Hallowell Moss, County Durham (*c* 550; Donaldson and Turner 1977).

It seems probable that the events of the early fifth century had little effect upon the *limitanei* of the Wall (Casey 1992, 73). There is no evidence, for example, that they were withdrawn by Constantine III in 406, and the evidence for continued occupation at Birdoswald would seem to confirm this. During the early fifth century it would appear that the principal threat to the north of the diocese of Britain was from the Picts and Scots, but it is possible that attacks from these peoples were carried by sea, circumventing not only the Wall, as they may have done in 367 (Breeze and Dobson 1987, 225), but also the emergent British kingdoms of the Scottish Lowlands, and attacking the more prosperous south (Casey 1979; Mann 1977). If this was the case, the Birdoswald area might have been left in relative peace. The threat from the north might have come simply from small raids on the scale of guerrilla operations or banditry as elsewhere in the empire (Whittaker 1993, 279–81); however, given the generally troubled conditions of the period, the fact that a defended place was inhabited by an armed community might have been of major importance in allowing that community to survive.

Evidence for early post-Roman occupation in forts of the other north-west provinces is as rare as in Britain. The only possible example known to this writer is at Alzey, where timber-built long buildings are succeeded by stone structures in phase 3 of a sequence which begins with the construction of the fort under Valentinian. The excavator interprets this as a mid-fifth-century military reoccupation (Oldenstein 1986, 350–1). Holder (1982, 103) has compared Britain to other provinces, such as Spain and Noricum, where no combined effort was made against invaders by populations or garrisons, concluding that 'with no concerted effort in time of trouble individual units would have been destroyed ... [or] faded away over a period of time'. Esmonde-Cleary (1989, 142) cites the account in the *Vita Sancti Severini* of the *limitanei* of Noricum Ripense in 452: pay had ceased, troops sent to get pay had been killed by barbarians, and consequently only a few very small formations were left. He suggests the same pattern for the British northern frontier. The situation in Noricum is represented by Pauli (1981, 50) in terms of a 'decimated populace [dwelling] in congested quarters in the forts', presumably having taken refuge there. These attitudes rely on the *limitanei* maintaining a 'Roman' and 'military' role, and the double assumption firstly that this would make them automatic victims of barbarian assault and secondly that there were 'barbarians' around who were bent on aggression. There is another model for the response of such units which is provided by Procopius and cited by Casey (1992, 73), in which:

> Roman soldiers ... stationed on the frontiers of Gaul to serve as guards gave themselves, together with their military standards, and the land which they had been guarding for the Romans, to the *Aborychi* and the Germans; and they handed down to their offspring all the customs of their fathers ... For even at the present day they are clearly recognised as belonging to the legions to which they were assigned in ancient times, and they carry their own standards when they enter battle ... And they preserve the dress of the Romans in every particular, even as regarding their shoes.
>
> (Procopius, *Goth* v.12.17)

Liebeschuetz (1993, 267) has argued that, though barbarian federates came to be the determining factor in battle during the late fourth and fifth centuries, the regular units of the *Notitia* did not disappear. They may have survived, possibly in considerable numbers in the Merovingian and Gothic periods. Bachrach (1972, 14–15, 33–4) similarly suggests that the remnants of Roman military organisation, particularly garrison troops, were significant military factors in Merovingian Gaul. This may be seen in context with James's (1988, 83–4) comment that the key to Frankish success was their acceptance by Gallo-Romans as the legitimate heirs of Rome.

Just from these few historical sources it is clear that there was a patchwork of responses to the crisis of the fifth century in the West and it cannot be expected that the response of *limitanei* in one province, or in one locality, would necessarily mirror that of another. Unlike the frontiers of north west Europe cited above, however, Hadrian's Wall was not overrun quickly either by Pictish or Anglian incomers. This is clearly demonstrated by the successful existence in the north and west of the former diocese of British polities which did not fall under Anglian control until the sixth century (Dark 1994, 217–58). This unique factor is much underestimated. Unlike most of the western provinces there is no impediment to the survival in some form of late Roman military units. If such units survived in Gaul, how much more likely is their survival on Hadrian's Wall.

The fifth-century inhabitants of Birdoswald would have had a number of advantages which might have enabled a natural and continual evolution in the settlement to take place; they were in an area where cultivation was possible and in an inland position and thus sheltered from seaborne attacks. They inhabited a fortified place, had (at least in the early fifth century) a military tradition and were armed. The site was fortunately situated, in the area where Brittonic survival was strongest in the north.

In order to arrive at a hypothesis as to the nature of the fifth-century settlement at Birdoswald it will be useful briefly to review the types of contemporary settlement known elsewhere in Britain. The recent publication of the York Minster excavations (Phillips and Heywood 1995) has offered a number of alternative models for the development of the basilica of the Roman fortress of York (Carver 1995, 189–90; 194–5). In the preferred Model B, the basilica is seen as operating as a market hall or farm, supplying services such as smithing and meat distribution, while, in an adjacent barrack, the centurions quarters continue as the high status residential structure into which it had been converted in the later fourth century (ibid, 187). The opposing social interpretations of the York evidence are cited as '... self sufficiency within a run-down, ruralised town, [whose] citizens, relieved of hierarchy and taxation, have contrived some centralised amenities' or as an 'attempt to claim status, exact tribute and exercise authority in a traditional seat of military government' (ibid, 195). The settlement at Wroxeter has been cited as a structural parallel to Birdoswald above. On this site the influence of the Roman civilian province is clear in that the principal building was akin to a Roman winged-corridor house in plan (Barker *et al* 1997, chapter 7; White, 1990, 7). This is not in itself evidence for the continuation of an urban function at Wroxeter; on the contrary it appears to have been the residence of a powerful Romanised figure, perhaps a *tyrannus* who may have succeeded to the reins of Roman power over a small area. Millett (1990, 222) sees the Wroxeter buildings as evidence for the survival of a central person after the demise of the economic functions of the central place which he occupied. In Millett's (ibid, 228) persuasive model for the end of Roman Britain the inhabitant of the Wroxeter building might have been a powerful individual who took control of the administration of the local area, possibly based upon the Roman (and pre-Roman) unit of the *civitas Cornoviorum*. Barker *et al* (1997, chapter 7), however, do see a continuing urban function for Wroxeter, though this might still be based around the power of a local magnate, who might be secular or ecclesiastical.

An interesting aspect of the Wroxeter sequence is the way in which the major timber rebuilding follows a period during which Roman buildings were robbed and cleared. It is possible that they succeeded to a phase of adaptation. In a similar way the mid-fifth-century timber basilica at Uley, set within a perimeter bank with complex entrances (Woodward and Leach 1993, 318-20), appears to have succeeded a phase wherein the ruins of the preceding stone-built pagan temple were reused and adapted by the addition of timber elements. Dark (1995, 176) cites the unpublished work of Ellis (1984) which demonstrates a consistent pattern of sub-Roman architecture in Europe and the east, in which the reuse of old foundations for new walls and the construction of simpler structures on or adjacent to Roman period buildings are symptomatic. This is closely reminiscent of the progress at Birdoswald from the reuse and adaptation of Roman stone structures to a full scale and confident rebuilding in the medium of timber. This type of sequence, from reuse to adaptation to reconstruction, might usefully be sought elsewhere.

Given the defensible nature of the site at Birdoswald it is, perhaps, fortified or defended fifth-century places in other parts of Britain which should be considered as potential parallels. These are few in the south and east of the former diocese, though little is known of the status of defended towns, but in the west there is increasing evidence. This has previously been invoked in connection with late fortification in a northern fort; in his report on the late fourth- or fifth-century rampart at Vindolanda, Bidwell (1985, 46) tenuously suggests that this might be seen in context with the refortification of western Iron Age hillforts in the fifth to sixth centuries (Fowler 1970; Burrow 1981, 100). More recently Crow (1995, 92–3) made a similar comparison with the replacement of the north wall and an interval tower at Housesteads with an earth bank and a timber tower.

Throughout the north and west of post-Roman Britain, enclosed and fortified sites existed from the fifth to the eighth century. A recent list of such places (Alcock 1988b, 23, appendix) shows that they could have a varied structural and occupational style and history. There were refortified sites and sites enclosed *de novo*, they could be walled in stone, embanked, or palisaded, and were frequently sited upon hill tops, cliffs, or promontories. Other natural defences such as marshland or open water were also utilised. Alcock (ibid, 27) lists some of the reasons for the construction of such forts: they were secure refuges, and bases from which territory could be controlled. They might serve a residential and domestic role, and could be sited in a place chosen for its symbolic value. Fortified sites such as the reoccupied hillforts of the south-west did not involve continuity of settlement (Burrow 1981, 155). Their status might be interpreted as either the defensible dwellings of local rulers and their following (*llys*), or places of refuge (*burh*). The best known sites are Cadbury Castle and Cadbury-Congresbury, both in Somerset, both of which are now fully published (Alcock 1995; Rahtz *et al* 1992). At Cadbury-Congresbury, the initial settlement was made by people who maintained a latest Romano-British material culture, though this is seen by the excavators as very residual, even archaic (Rahtz *et al* 1992, 221–2, 249). The refortification, and the use of fifth-century imported pottery with which it is associated, are interpreted by the excavators as reflecting high status (ibid, 249), and it is suggested that this phase, the *floruit* of the settlement, belongs to the late fifth or early sixth century. Imported pottery also forms the basis for a similar date for the refortification of Cadbury Castle and the construction of the hall building cited above as a parallel to Birdoswald Building 200 (Alcock 1995, 110–11). Both of these fortifications are thought to be the centres of local rulers: Burrow's (1981, 155) *llys* model. Rahtz *et al* (1992, 249) invoke Millett's ideas in suggesting that Cadbury-Congresbury might also have been the seat of a *tyrannus*, or local post-Roman petty ruler. The development here is different from Wroxeter, however, in that there is no continuity of place or of the appearance of Romanisation. The site might represent a later phenomenon; between the early fifth century and the latter part of the century when Cadbury-Congresbury was refortified, there might have been much change and restructuring among local power groups (ibid). Rahtz (1982) has argued that at Cadbury-Congresbury the evidence suggests a re-emergence of the attributes of pre-Roman society in which older centres of power are reused. Alcock (1995, 172) believes that the refortification of Cadbury Castle and the construction there of a timber hall, which is interpreted as the feasting hall of a noble warrior with his war band (Alcock 1987, 182), required a strong political and organisational power, probably provided by a petty king (Alcock 1995, 171–2).

The landscape of this period to the north of the Wall is as difficult to characterise as the south, though considerable attention has been paid to fortified sites (eg Alcock 1987, 234–54; 1988a). It has been argued that many Anglian strongholds of southern Scotland had pre-Anglian origins (ibid, 4). Enclosed places for which there is evidence of occupation between the fifth and eighth centuries include both palisaded settlements such as Doon Hill, Kirk Hill, and possibly Yeavering, and, further north, stone-walled forts built in upland areas, such as Burghead and Craig Phadraig, both of which were built or refortified in the fifth century or later. An interesting example of post-Roman fortification in southern Scotland is the use of diamond broached stones (Curle 1905, 225, fig 2) among the materials used to build the fortifications of the hillfort at Ruberslaw, Roxburgh. These reused Roman stones are geologically alien to the fort, and there was no necessity to import building stone from elsewhere. The nearest Roman place was Cappuck, 11.4km distant. Alcock (1987, 197; 1995, 140) sees this kind of reuse, also found at South Cadbury, as a vicarious attempt to 'partake symbolically of the famed military prowess of the Empire'. If this interpretation of this phenomenon is correct it demonstrates a respect for *Romanitas* in the frontier area which seems to have persisted as late as the sixth century and beyond. The construction of the remarkable Building E, a copy of a Roman theatre, in Yeavering Phase II is eloquent testimony that 'the ruling class at Yeavering was in some degree concerned, at an early stage, to emulate, to conserve, or to revive the remains of Romano-British tradition' (Hope-Taylor 1977, 268). The same motivation is ascribed by Fernie (1983, 177) as inspiring the effort taken to rob stone for the construction of churches such as Escomb, built out of stone taken from the fort at Binchester (Ferris and Jones 1991,109), some 3km distant, to which we may add those at Hexham (Greenhalgh 1989, 130) and Corbridge. Reuse in these cases, however, was probably prompted by more prosaic motives connected with the availability of stone.

Although fortified places have been identified, the internal arrangements of such places are very little known. Since Scull (1991) demonstrated that the first phase at Yeavering was probably of Anglian date (*contra* Hope-Taylor 1977), the only convincing large pre-Anglian building plan known from the North is the hall of Doon Hill A which is cited above as a possible parallel to Birdoswald Building 200. Like the hall at Cadbury Castle, this is interpreted as a royal or noble hall (Alcock 1988a, 18). Cramp (1983, 274) *inter alia* has suggested that the changed conditions of the post-Roman period brought about a revival of old heroic traditions, and that this was reflected among both the British population and the Anglian incomers in the construction of a similar type of structure: the hall. 'The picture of the aristocratic warrior society presented by the *Goddoddin* and *Beowulf* is similar in the feasting and fellowship of the royal retinue and guests in a kings hall' (ibid).

Though these phenomena are often seen as implying the re-assertion of Celtic social custom by the later fifth century, Dark (1994, 178–81) has suggested that all of the elements of sub-Roman 'heroic' society were in fact present in Roman Britain. The concept of kingship was not alien in the late Roman world. The post-Roman hall is paralleled by late-Roman aisled buildings, and occasions were marked by feasts. Panegyrics were common, and late Roman aristocrats had bands of retainers. In arguing that these factors are consistent with the continuity of *Romanitas*, Dark has effectively reconciled the concept of sub-Roman survival with the apparent phenomenon of recrudescent Celticism.

It is difficult to imagine a place which more adequately fits the desirable conditions for a post-Roman fortification than Birdoswald; it is a walled enclosure situated upon a cliff-girt river promontory, and as a location symbolic of the continuance of *Romanitas* its status as a former Roman fort would be hard to better. It seems likely that by Period 6, which the average chronology would place in the later fifth century, there may not have been much difference in status between Birdoswald and the reoccupied hillforts of Cadbury Castle and Cadbury-Congresbury. It may be that Period 6 at Birdoswald was just one of a mosaic of enclosed and fortified places which acted as centres in the fifth-century British polities of the north and west. It has been suggested that the reused Building 197 might have been a place in which the whole garrison might have been able to gather. If this was not a hall in the sense in which that term is understood for Cadbury Castle, its plan is very suggestive of one. It is long and narrow, with a hearth at one end around which high-status objects have been found. Buildings 199 and 200 make most sense as the functional successors of this building, and it has been seen that the best parallels for contemporary buildings of the size and plan of Building 200 are the timber halls which reflect the development of a heroic society with both Celtic and Roman antecedents, in the fifth century and later. The deliberate repositioning of this building with relation to the *porta principalis sinistra* was done to emphasise its importance; the gate was now to be thought of as the entrance to the compound in which this building stood It is possible to invoke in this context the 'echo' of *Romanitas* seen in the gate structure of Phase 11 at Cadbury Castle (Alcock 1995, 170) and to speculate whether there was an attempt here to imitate the appearance of the northern forts which remained in occupation. Buildings 4298 and 4299, crammed in between the defences and Building 200, make most sense as service buildings.

Birdoswald is distinct from other excavated defended places of this period in the fact that it saw continuous use from the Roman period, and was probably still occupied by the descendants of the *limitanei* by the late fifth century. It has been assumed above that the garrison throughout the later fourth century was of small size. When official supply failed, *c* 409, it has been suggested that the remaining garrison might have continued to exact the customary tax levy for their maintenance from the local agricultural populace, in exchange for armed protection. This could, of course, have been more or less coercive, and might result in the control of a tract of territory by the inhabitants of the fort. Higham (1992, 217) notes that the communities of the Roman north quickly responded to the challenge of the fifth century by establishing a military capacity based around tribal kingdoms headed by warrior kings who drew their war bands 'from the same social groups within local tribal societies which had previously staffed the Roman *limitatenses*'. If this was the case the earliest military capability would be represented by the *limitanei* themselves; troops who shared the ethnic and cultural background of the people around, but who were the hereditary possessors of Roman military tradition. Such troops might enter into allegiance to a tribal leader or, if securely located, might themselves become a self-sustaining community based around a hereditary commander. It is possible that by this time the leader was the recipient of personal oaths of allegiance in the manner of the late Roman *bucellarii* (Liebeschuetz 1986, 1993), an institution which Whittaker (1993, 295) has seen as a key to the transition from the late Empire to the early-medieval German kingdoms. Such a community might explain the fact recorded by Gildas, and commented upon by Dark (1994, 198), that sub-Roman kings fought in formation and employed Roman tactics. As groups or individuals began to take over local power in the civilian areas of the provinces of Britain, establishing quasi-independent units (Millett 1990, 228), so might the local garrisons of northern forts establish *territoria* on a smaller scale, based upon the zone from which supplies had customarily been drawn. It is this latter model which is suggested for Birdoswald. The *limitanei* of *Banna* would not have the problem of legitimacy which might have been a problem to the inhabitants of Cadbury-Congresbury (Rahtz *et al*, 149); they would be (literally as well as metaphorically) the standard bearers of residual *Romanitas*. This status might well set them apart from other groupings, even though they may have shared the same social structure, based around the hall of a 'head-man'. In this way forts like Birdoswald may have become local power centres with the potential to become 'part of the jigsaw that formed itself into the developing Northumbrian kingdom' (Johnson 1989, 112).

The Birdoswald settlement may be regarded as successful only up to a point. Economically it was probably based upon the local exchange of goods and services rather than on subsistence. It appears never to have developed either an industrial capacity of the sort recorded (for example) at Dinas Powys or Mote of Mark (Alcock 1987, 89, 241), or the capacity for long-distance trade in such goods as imported pottery or glass like both Cadbury Castle (Alcock 1995, 82–90) and Cadbury-Congresbury (Rahtz *et al* 1992, 249). It seems likely that the settlement failed before the mid-sixth century, when such developments appear to be more common.

In contrast with the south, where new fortifications were built or where pre-Roman ones were reused, the Roman north was amply supplied with defended places: the forts which continued in occupation until the fourth century and beyond. It may be here that the key to the sub-Roman period in the north should be sought. Alcock (1987, 252) has said that:

> The role which the late Roman forts may have played in determining the geography of power in the Dark Ages is one of the great unexplored problems of the transition from Roman to Dark Age England, Scotland, and Wales.

It may be that some indication of the answer to this problem is now emerging. The idea that Roman forts persisted as centres is not new. The important Roman fort of Old Carlisle was called *Palmcastre* in medieval times (Wade-Evans 1949). A gloss in texts of Nennius (*Historia Brittonum* xlv; Wilson 1904) describes the refuge of the North British leader Outigern (Alcock 1987, 245) as '*Guasmoric*, near *Lugubalia* [Carlisle], the city to wit in English is called *Palmcastre*'. Collingwood (1928, 110–11) noted this, and Birley (1951, 39) went so far as to say that it:

> will encourage us to suspect that [the fort] survived for many a long year after the 'departure of the Romans' as a centre of sub-Roman civilization in Cumbria.

Archaeological evidence from a number of fort sites now suggests that they actively outlasted the fourth century. At Brecon Gaer in Wales Casey (1971, 91–101) found a non-Roman dry-stone wall around the fort which might represent refortification, while at *Segontium* (Caernarvon) numismatic evidence (Casey 1979, 76–7) suggests occupation beyond 395, and two fifth-century penannular brooches were also found there (Kilbride-Jones 1980). In North Britain a fifth-century date was adduced for the excavation at Malton of a large ditch through the buildings of the *vicus*, near the south-east gate (Corder 1930), and at Piercebridge the ditch was recut after the date of the latest coins (402; Casey 1992, 71). Binchester is a good example of probable continuity, as butchery and blacksmithing took place within the former bathhouse, after the deposition of latest Roman material and before two episodes of stone robbing, the second of which was probably connected with the seventh-century construction of the church at Escomb (Ferris and Jones 1991, 105–9).

On the line of the Wall itself the evidence for continued use is sparse. At Vindolanda Bidwell (1985, 46) has demonstrated that a refurbishment of the defences took place during the late fourth or early fifth century. This may have involved the deliberate piling of soil to a height of 3m against the wall to prevent collapse. This probably took place when the occupants no longer possessed the skill or resources to maintain the walls. This is redolent of the evidence of late embanked fortification at Birdoswald (Simpson and Richmond 1933, 261), and Casey (1992, 70) suggests that the apparent glacis defence at Vindolanda may have been surmounted by a palisade or wall.

The well-known *Brigomaglos* tombstone (RIB 1722), with its lettering dating to *c* 500 (Jackson 1982, 62), was found in 1878 'a short distance north east of Chesterholm fort' (Birley 1982). This stone recalls the *Cunorix* tombstone from Wroxeter (Barker 1981, 18) dated to 400+, and a possible Class I inscribed stone from Castlesteads (RIB 2331). In addition to this a sixth-century Anglian penannular brooch (Miket 1978) was found at Vindolanda 'above the doorsill of the Diocletianic south gate' (Birley 1970, 136). This gate was held by the excavator to continue in use until the Theodosian period, and a bone scatter outside the gate to extend 'well into the fifth century' (ibid, 104–5). At Chesters a brooch of identical type to the Vindolanda example was overlooked until published by Miket (1978). The third phase of the north curtain wall at Housesteads collapsed, apparently late in the fourth century. It was then replaced by an earth rampart, the *terminus post quem* of which was provided by pottery of 350+ from the preceding collapse (Crow 1988, 72). The excavator considered that this might date to 'the close of the fourth or perhaps the early fifth century', but it must be possible that it was even later than this. There is no evidence as to how long it may have lasted in use. Adjacent to the north wall an apsidal structure found in 1898 may have been a late and/or sub-Roman church. The building lies close to a water tank, part of which was used as a long cist grave. The idea that this might reflect the continuance of Christianity into the sub-Roman period is intriguing (Crow 1995, 95–6).

In the immediate hinterland of the Wall fifth-century occupation appears to have occurred at both South Shields and Carlisle. At Carlisle the comment in the *Vita Sancti Cuthberti* (v) that Cuthbert saw an operational Roman fountain in the seventh century is frequently cited as evidence for continuity. Ian Caruana has speculated (personal communication) that the 'fountain' may have been some more mundane form of water supply or disposal, which is possible given the laying of a water pipe in *Verulamium* as late as the mid- to late-fifth century (Frere 1983, 226). Large-scale excavation has largely failed to find evidence of the period, but the discovery of a *solidus* of Valentinian II early within the flooring sequence of a townhouse in Scotch Street demonstrates one location where occupation must have continued well into the fifth century (Keevil *et al* 1989). Much of the evidence from South Shields has been cited above (Bidwell and Speak 1994). The postholes in the gate here were the culmination of a long sequence of activity for which the *terminus post quem* is a coin of 388–402 which was found in the top layer of road metalling on the revetted causeway through the outer fort ditch. A subsequent ditch was cut through this causeway cutting off direct access. After a period of natural silting, this ditch was partly filled with rubble from the gate, including architectural fragments (ibid, 45). The installation of the postholes followed this, and subsequently an inhumation cemetery was located outside the gate.

South Shields was the first site on which an immediate sub-Roman penannular brooch type (Snape 1992) was identified, of which there is also an example from Birdoswald (Fig 190, No 73). Johnson (1989, 115) cites the tradition that Oswin, King of Deira was born at South Shields. The date of his murder (651) would imply that his family was living at the fort site in the later sixth century.

There is some sixth-century Anglo-Saxon evidence from the Wall zone in addition to the brooches from Chesters and Vindolanda. The possibility that an early sixth-century brooch came from Birdoswald is discussed above. In addition to this an early pair of cruciform brooches, dating to a little before 500 (Hope-Taylor 1977, 303) accompanied by several beads came from Site XI at *Corstopitum* (Corbridge) (Knowles and Forster 1909, 406–8), while a cruciform brooch from Benwell was found outside the fort together with a glass vessel (Brewis 1936). Both of these finds probably constitute burial assemblages.

Dark (1992) has invoked the post Roman evidence from the Wall as the basis for a thesis that the Wall system was refortified during the sub-Roman period, possibly *via* a power structure descended from the command of the *Dux Britanniarum* based in York. It is now possible to argue that the evidence from York itself (Phillips and Heywood 1995; Carver 1995) cannot be held to support its survival as an administrative centre whose writ might run as far as Hadrian's Wall. While agreeing that the evidence from the Wall forts, particularly the refurbishment of defences at Housesteads, Birdoswald, and Vindolanda, the Birdoswald hall buildings and the inscribed stones from Vindolanda and (possibly) Castlesteads, points to the development of high-status secular occupation (Dark 1992, 115), this writer diverges from Dark's conclusion that these sites represent a deliberate reoccupation of the Wall. Dark's thesis seems to depend upon a prior desertion of the Wall followed by renewed occupation. The Birdoswald evidence suggests that continuity and evolution is the case. Dark finds it unlikely that 'so many ... residual communities living near each other would develop high-status attributes' (ibid, 116), though Alcock (1988a, 5) has suggested that the two power centres of Doon Hill and Dunbar which lay only 3.5km apart were in contemporary use during the seventh century.

More seriously, the evidence which Dark uses spans the fifth and sixth centuries, a period during which local power groups must have been subject to change and fluidity (*pace* Cadbury-Congresbury; Rahtz *et al* 1992, 249). It is possible that the inhabitants of sites on the Wall ceased to cooperate, or even became mutually hostile. Tainter (1988, 20) points out that after the collapse of complex administrative structures 'groups that had formerly been economic and political partners [may] now become strangers, or even threatening competitors'. It may be that different sites had greater or less success at different times, that status fluctuated, and that some sites may have failed earlier than others.

The suggestion that Wall forts were occupied beyond the beginning of the fifth century does not mean that the occupation of various sites was both contemporary, and of similar status at the same time, an argument which is implicit in Dark's interpretation of these phenomena.

Dark (1992) suggests that the sixth-century Anglian material from Corbridge and Benwell, and also the brooches from Vindolanda and Chesters (to which might be added the small-long brooch which may come from Birdoswald), might be evidence for the employment of mercenaries or *foederati*. He also invokes three barbed spearheads of a type found in a fourth- or fifth-century deposit at Nydam in Denmark which have been found on the line of the Wall at Housesteads and Carvoran as well as at South Shields (Swanton 1973, type A1). Cowen (1948), Swanton (1974, 5) and Bishop and Coulston (1993, 160) have viewed these spearheads as of later Roman date, Swanton in particular attributing these apparently ethnic weapons with the Germanic units of the frontier zone in the third and fourth centuries. Swanton would further associate the Housesteads example with the *cuneus Frisionum* attested by two inscriptions at this site (Swanton 1974, 5; RIB 1593, 1594). This unit was styled 'Severus Alexander's' and was therefore in garrison in the second quarter of the third century. Swanton's association of an ethnic weapon with the *cuneus Frisionum* is of interest when seen in context with Housesteads Ware, a form of pottery with Frisian analogues (Jobey 1976, 138), and other apparent indicators of ethnicity relating to this unit (Crow 1995, 61–2). Although similar spearheads (Swanton 1973, type A2) have been found in Saxon graves in the south it cannot convincingly be argued, as Dark (1992, 112, n 11) has, that the A1 spearheads are of sub-Roman date. These spearheads fall into a similar category to the late Roman military metalwork which has been found in some cemeteries in the south and has been interpreted as the equipment of mercenaries (Hawkes and Dunning 1961), though they are actually typical of late Roman army and civil officials (Tomlin 1976). It is true that the early Anglian material does predate widespread acculturation in the Wall zone, and its place in the development of the area is difficult to assess. The sites at which it has been found, however, are some of the most likely to have been viable survivors from the late fourth to the early fifth century, and may have attracted Anglian settlement or 'contact' at an earlier time.

The evidence for the post-Roman period on the Wall constitutes a limited corpus which represents a long period. At Birdoswald and South Shields there are similarities in the identical recasting of a gate and the presence of a possible fifth-century brooch type (Snape 1992). In addition to this at Birdoswald are the halls and the refortification of the defences in revetted bank form. Such refurbishment also occurs at Housesteads and Vindolanda. At Housesteads it may be associated with a late church and burial, and at

Vindolanda with a late fifth- to early sixth-century epitaph. On all of these sites continuity of settlement may be inferred, though the duration of such continuity is not known.

The case of Housesteads and Vindolanda is suggestive. If the idea of competition between former Wall forts is accepted, it might be that Vindolanda, in its more low lying and sheltered, but defensible position might possess the natural advantages to outlast its more bleakly situated neighbour. Crow (1995, 94) has suggested another idea: the two communities might have combined, and perhaps reoccupied the hillfort of Barcombe overlooking Vindolanda, which may retain the name *Vercovicium*, formerly applied to Housesteads. The presence of possible early sixth-century settlement in the form of burials at Benwell and Corbridge, and of chance finds at Chesters, Vindolanda, and maybe Birdoswald, might reflect some element of early acculturation in the more successful of the Wall's successor settlements.

It is not reasonable to view the fifth century on the Wall, or indeed anywhere else entirely from a 'sub-Roman' or a 'pre-Anglian' viewpoint, a point stressed by Faull (1984, 49; also see Arnold 1982, 452) in her discussion of settlement and society in the fifth-century north-east. She refers to the fifth as a 'lost' century in the north. Whatever this century in the former Roman frontier zone was like, it was different both from the Romanised fourth century from which it developed, and from the Germanic-influenced sixth and seventh centuries into which it evolved, but it seems that at Birdoswald and other sites we are beginning to see a possible model for this evolution.

A remaining tantalising indication at Birdoswald is an eighth-century gilded-bronze pin (Fig 297, No 6; Cramp 1964), the context for which is completely unknown.

Postscript: King Arthur and Saint Patrick

Now that early post-Roman occupation has been demonstrated at Birdoswald it is necessary briefly to examine the long-held theory connecting Birdoswald with the legendary King Arthur, and the more recent association of the site with St Patrick.

An Arthurian connection with Birdoswald has been an oft-revived chimera since Crawford (1935, 291) suggested that the name of *Camlann*, Arthur's last battle, was derived from *Camboglanna* (see esp Brown 1961). Whatever the philological merits of this derivation, the connection should have been ended in 1976 when Hassall finally established the identification of *Camboglanna* with Castlesteads and *Banna* with Birdoswald. Unfortunately, the dramatic and romantic setting of Birdoswald-*Banna*, together with its imposing surviving remains, lends itself to Arthurian visions far more than the landscape of Castlesteads-*Camboglanna*, where no visible ruins survive. This, together with the tendency of speculative Arthurian literature to perpetuate itself rather than to examine new evidence, has meant that years after Hassall's conclusion, the old Birdoswald = *Camboglanna* = *Camlann* story is still being repeated (eg Wood 1981, 58–9; Brewer and Frankl 1985, 127). The present excavation was plagued by press references to this story. The *Cumbria Gazette* (1987a, 1987b) even claimed that the excavation was launched in order to search for Arthur's grave. Keys (1987) linked the Arthur story with the excavated sub-Roman buildings, while a more traditional line, completely ignoring the evidence of place-names and of archaeology, was taken by Carruthers (1990). The most serious example has been a study by Goodrich (1986), who has claimed to identify the *loci* associated with Arthur. This book contains many inaccuracies concerning Hadrian's Wall and Roman Britain, including the following:

> King Arthur's Camlann would have been fought at the large, westernmost [sic] fortress on Hadrian's Wall, the one now called Birdoswald. On road maps such as 'Carlisle and the Solway', published by John Bartholomew and Sons, Ltd, Edinburgh, it is called Birdoswald and CAMBOGLANNA ROMAN FORT ... this extensively fortified hill fort [sic] of the Romans ...
> (Goodrich 1986, 265)

This fallacy is perpetuated in spite of the fact that Rivet and Smith (1979), in whose book full discussion of the place names can be found, are cited by Goodrich (1986, 92–4) in support of other points.

The acceptance of an identification of Birdoswald with *Banna* has brought to the site an association with another sub-Roman luminary, namely St Patrick. The idea of Patrick as a northerner, together with the idea that *Banna* was identifiable with Patrick's birthplace was suggested when *Banna* was thought to have been Bewcastle (Cunliffe-Shaw 1963, 17). This idea has migrated to Birdoswald along with the name (Thomas 1989, 125–6). St Patrick himself (*Confessio*) describes his birthplace '*...qui fuit vico Bannavem Taburniae*'. This name is reconstructed by Thomas (ibid) as *vicus Banna venta berniae*. The first two words are unambiguous, but serious doubt attends the second half. The complex problem of *venta* as a place name element is summarised by Rivet and Smith (1979, 26–4). The final element in the name is, Thomas suggests, derived from a Celtic *bern* or mountain pass. This he places at Greenhead. Though the valley of the river South Tyne certainly runs to the south of Greenhead, and the Tipalt Burn cuts a valley through the village, neither exactly qualifies as a mountain pass. Attention should perhaps be focused upon Ravenglass, *Glannaventa*, which is not only on the Irish Sea, facilitating Patrick's capture by pirates, but also at the end of the Roman road from Ambleside which traverses the pass of Hardknott.

11 The Roman ceramics

Introduction

The ceramic assemblage from the 1987–92 excavations at Birdoswald is, perhaps surprisingly, small and of poor quality. In general the groups were small, and in all excavated areas the amounts recovered were less than might have been expected. Even the fills of the fort ditches, which produced rich assemblages of leather and animal bone, contained very little pottery. An explanation for this could be that the excavations took place in parts of the fort where pottery was not widely used or dumped. The *horrea*, the basilica, and the storage and industrial buildings represented by Buildings 4400, 4401, and 4402, are not the kinds of areas in which large-scale pottery usage might be expected. The contrast between the groups from the present excavation and the large, well-known Birdoswald Alley deposit (Birley 1930a) excavated in 1929 is very marked, though the latter group is invaluable for comparison with the earlier material reported on here.

The pottery is published in a series of Analytical Groups. Though some of these are single contexts, most comprise several contexts which have been grouped, as together they represent closely-identifiable episodes of deposition. Thus the backfill beneath the floor of Building 197 during Period 5 is a single depositional episode though consisting of a relatively large number of contexts. Similarly the fills of the successive fort ditches, the filling of the robbed sub-floor of Building 198, the occupation material from the reuse of Building 197 and the material contained within the Stone Fort primary rampart, which may be residual from an earlier phase, are all treated as groups. Given the paucity of pottery found in each context, it is only by a controlled conflation of contexts that useful analytical groups could be assembled. Relatively few groups contained more than the 50 sherds regarded here as a minimum number for meaningful quantification and analysis.

The chapter is presented in two main sections. The first of these deals with the coarse wares. This section catalogues the Analytical Groups first, followed by sherds of intrinsic interest. In the Analytical Groups all of the sherds which can be illustrated appear in Figures 155–71. All other catalogued sherds are illustrated in Figures 172–6. The second section comprises the samian ware. In this section the Analytical Groups are catalogued first, and then intrinsically-important sherds which appear residually. These are catalogued by Period and Site Phase. Illustrated sherds are identified in the catalogue by means of an asterisk (*), and appear in Figures 178–9.

The coarse pottery

by Louise Hird (amended by J R Perrin to incorporate material from Areas F and G)

Methodology

The pottery analysis leading to the publication of this report has been recorded on *pro forma* work sheets which form the archive on this work (Young 1980, 5). The production of a vessel type series has not been attempted. It was felt to be more useful to publish illustrations of all forms in the significant groups only, though this effectively means that almost every vessel form represented on the site has a sample illustration. There are, in fact, very few types present that have not been recorded from other sites on Hadrian's Wall in contexts which were much more useful.

A Fabric Series has been produced, in order to avoid constant repetition in the pottery catalogue. Classification of fabric has been based on macroscopic observation. Unusual forms, or other comments on each fabric, are noted with the fabric description.

Fabric quantification has been based on both sherd count and weight, and quantification tables (Tables 12 and 13) have been produced for the Analytical Groups illustrated.

The total weight of coarse pottery was 277.747kg, made up of 12,952 sherds. Coarse and fine wares accounted for 172.097kg (11,557 sherds), amphorae 86.87kg (873 sherds) and mortaria 26.46kg (522 sherds). Out of the total, 183.897kg (8822 sherds) (66.2%) were well stratified.

Pottery supply to Birdoswald

A few comments on the sources of supply of pottery to Birdoswald are appropriate here, but are, of necessity, fairly tentative because of the limited quantities of material present.

Many of the traded wares which one might expect from Hadrian's Wall and other sites in North Britain (Gillam 1973) are present: for example Lower Nene Valley Ware, 'Rhenish' ware, Dales ware, BB1 and BB2, Derbyshire ware, and Severn Valley ware. However, these are not found in sufficient quantity to discuss in detail the relative importance of sources at different times, except perhaps for the fourth century.

Early wares such as Rustic ware (Fabric 28) of unknown origin are present in the Period 1 levels (Analytical Group 1) and may be residual at this time. Much of the pottery is made up of grey (Fabric 11) and oxidised (Fabric 12) wares of unknown, but presumably local manufacture. Dorset BB1 is present, and makes up about 12% by weight of the Period 1 assemblage.

BB1 continues to be present in considerable quantities (Tables 11, 12) throughout the occupation of the site.

Table 12 Coarse pottery quantification: fabrics shown as a proportion of Analytical groups on the basis of weight

fabric / *analytical group*	*1*	*2*	*3*	*4*	*5*	*6*	*7a*	*7b*	*8*	*10*	*11*
1	11.2	–	–	–	–	–	–	–	–	–	49.5
2	27.2	0.2	–	–	–	–	–	–	–	–	42.0
3	56.5	–	–	–	–	8.7	–	–	–	–	30.4
4	37.4	2.8	–	–	–	0.9	–	–	–	–	31.7
5	58.6	21.2	4.0	4.0	–	3.0	2.0	–	–	–	7.0
6	13.7	12.9	–	–	–	3.9	–	–	–	–	53.9
7	16.3	–	–	10.0	–	16.3	–	–	–	–	37.4
8	26.3	1.2	5.6	8.3	4.3	2.6	0.1	0.1	–	–	39.7
9	16.6	–	1.0	4.5	–	2.3	0.1	–	1.9	–	54.6
10	2.7	13.8	–	–	–	–	–	–	–	–	63.9
11	41.6	3.6	0.7	–	–	9.5	–	0.7	–	–	36.5
12	31.7	10.0	2.8	–	–	4.1	0.2	–	–	–	29.1
13	54.9	0.5	20.3	3.2	1.0	2.9	1.6	1.0	–	0.6	9.0
14	49.0	0.3	25.9	10.3	0.7	2.0	0.7	1.0	–	0.4	6.6
14(context 68)	5.6	–	61.0	21.1	0.5	2.8	0.5	–	–	1.9	5.6
15	28.9	–	29.5	4.7	–	–	2.3	1.5	–	–	26.9
16	46.6	–	4.5	24.0	–	1.5	–	–	–	–	6.0
17	5.3	0.5	–	–	–	–	–	–	–	80.4	12.6
fabric / *analytical group*	*12*	*13*	*14*	*15*	*16*	*19*	*20*	*22*	*23*	*24*	*25*
1	30.7	–	–	–	–	–	–	–	–	–	0.9
2	26.6	0.6	–	–	–	–	–	–	–	–	1.5
3	4.3	–	–	–	–	–	–	–	–	–	–
4	27.1	–	–	–	–	–	–	–	–	–	–
5	–	–	–	–	–	–	–	–	–	–	–
6	8.8	–	–	–	–	–	5.0	–	1.2	–	–
7	20.0	–	–	–	–	–	–	–	–	–	–
8	4.4	–	–	–	–	1.1	–	–	–	–	–
9	7.9	–	9.1	–	–	–	0.51	–	1.5	0.41	–
10	19.4	–	–	–	–	–	–	–	–	–	–
11	3.6	–	–	–	–	–	–	–	–	–	–
12	6.5	13.5	–	–	0.9	1.1	–	–	–	–	–
13	3.6	0.1	0.06	0.06	0.5	–	–	0.5	0.2	–	–
14	1.6	0.2	0.6	0.6	–	–	–	–	–	–	–
14(context 68)	–	–	–	–	0.9	–	–	–	–	–	–
15	3.2	–	–	–	–	1.7	–	–	–	–	–
16	–	–	–	–	–	–	–	–	–	–	–
17	–	–	–	–	–	–	–	–	–	0.5	–
fabric / *analytical group*	*28*	*34*	*35*	*36*	*37*	*38*	*40*	*41*	*42*	*actual weight (grams)*	
1	2.8	–	–	–	–	–	–	–	–	2970	
2	–	–	–	–	–	1.5	–	–	0.2	2570	
3	–	–	–	–	–	–	–	–	–	115	
4	–	–	–	–	–	–	–	–	–	535	
5	–	–	–	–	–	–	–	–	–	495	
6	–	–	–	0.3	–	–	–	–	–	1465	
7	1.0	–	–	–	–	–	–	–	–	950	
8	–	6.0	–	–	–	–	–	–	–	5145	
9	–	–	–	–	–	–	–	–	–	4810	
10	–	–	–	–	–	–	–	–	–	360	
11	–	–	–	–	–	–	2.9	0.7	–	685	
12	–	–	–	–	–	–	–	–	–	2300	
13	–	–	–	–	–	–	–	–	–	7570	
14	–	–	–	–	–	–	–	–	–	5035	
14(context 68)	–	–	–	–	–	–	–	–	–	1065	
15	–	–	–	–	1.2	–	–	–	–	1710	
16	–	–	17.3	–	–	–	–	–	–	665	
17	–	–	–	–	–	–	–	–	–	2062	

There is a single sherd of BB2 in Period 2, and rough-cast wares (Fabrics 25 and 38) of German and Gaulish origin also appear in this Period, while Period 2b-3 deposits contain Lower Nene Valley colour-coated ware (Fabric 6) of late second- or early third-century date and mortaria of Carlisle area manufacture.

The pottery from Period 3 contexts included BB1 of late second- and early third-century date and BB2 of later type (dish type Gillam 313). It has long been accepted that the western end of Hadrian's Wall received a small amount of later BB2, but Birdoswald has also produced examples of the earlier types (see

Table 13 Coarse pottery quantification: fabrics shown as a proportion of Analytical groups on the basis of sherd count

fabric / *analytical group*	*1*	*2*	*3*	*4*	*5*	*6*	*7a*	*7b*	*8*	*10*	*11*
1	15.4	–	–	–	–	–	–	–	–	–	48.0
2	27.1	0.7	–	–	–	–	–	–	–	–	45.7
3	25.0	–	–	–	–	12.5	–	–	–	–	50.0
4	29.1	1.8	–	–	–	1.8	–	–	–	–	27.3
5	53.8	20.5	5.1	2.6	–	5.1	7.7	–	–	–	5.1
6	14.5	19.5	–	–	–	3.1	–	–	–	–	61.6
7	19.6	–	–	5.8	–	9.8	–	–	–	–	45.0
8	25.2	1.1	4.4	3.7	2.6	5.2	0.37	0.37	–	–	40.4
9	22.0	–	1.5	2.6	–	5.6	0.51	–	3.1	–	45.6
10	1.8	10.7	–	–	–	–	–	–	–	–	58.9
11	36.0	1.0	1.0	–	–	7.2	–	1.0	–	–	43.3
12	35.9	6.7	1.7	–	–	3.4	0.6	–	–	–	30.3
13	45.5	0.5	16.5	3.4	1.2	4.3	4.8	6.1	–	0.3	10.6
14	55.1	0.2	15.9	6.5	0.2	4.3	1.3	2.9	–	0.2	7.6
14 (context 68)	13.1	–	52.4	9.8	1.6	6.5	1.6	–	–	1.6	11.5
15	10.7	–	33.0	1.9	–	–	21.3	3.9	–	–	20.4
16	45.3	–	3.8	20.7	–	5.7	–	–	–	–	5.7
17	5.9	1.7?	–	–	–	0.8	–	–	–	–	81.3

fabric / *analytical group*	*12*	*13*	*14*	*15*	*16*	*19*	*20*	*22*	*23*	*24*	*25*
1	30.0	–	–	–	–	–	1.0	–	–	–	2.7
2	15.9	0.7	–	–	–	–	–	–	–	–	7.3
3	12.5	–	–	–	–	–	–	–	–	–	–
4	40.0	–	–	–	–	–	–	–	–	–	–
5	–	–	–	–	–	–	–	–	–	–	–
6	8.6	–	–	–	–	–	1.4	–	0.5	–	–
7	17.6	–	–	–	–	–	–	–	–	–	–
8	11.5	–	–	–	–	0.37	–	–	–	–	–
9	11.3	–	5.6	–	–	–	1.0	–	0.51	0.51	–
10	28.6	–	–	–	–	–	–	–	–	–	–
11	5.1	–	–	–	–	–	–	–	–	–	–
12	9.0	11.02	–	–	0.6	0.6	–	–	–	–	–
13	4.7	0.2	0.2	0.2	0.4	–	–	0.7	0.2	–	–
14	3.1	0.2	0.2	2.0	–	–	–	–	–	–	–
14 (context 68)	–	–	–	–	1.6	–	–	–	–	–	–
15	6.8	–	–	–	1.0	–	–	–	–	–	–
16	–	–	–	–	–	–	–	–	–	–	–
17	7.6	–	–	–	–	–	–	0.8?	–	0.8	–

fabric / *analytical group*	*28*	*34*	*35*	*36*	*37*	*38*	*40*	*41*	*42*	*sherd count*
1	1.8	–	–	–	–	–	–	–	–	110
2	–	–	–	–	–	2.0	–	–	0.7	151
3	–	–	–	–	–	–	–	–	–	8
4	–	–	–	–	–	–	–	–	–	55
5	–	–	–	–	–	–	–	–	–	39
6	–	–	–	0.6	–	–	–	–	–	161
7	1.9	–	–	–	–	–	–	–	–	51
8	–	4.8	–	–	–	–	–	–	–	270
9	–	–	–	–	–	–	–	–	–	195
10	–	–	–	–	–	–	–	–	–	56
11	–	–	–	–	–	–	4.1	1.0	–	97
12	–	–	–	–	–	–	–	–	–	178
13	–	–	–	–	–	–	–	–	–	556
14	–	–	–	–	–	–	–	–	–	446
14 (context 68)	–	–	–	–	–	–	–	–	–	61
15	–	–	–	–	1.0	–	–	–	–	103
16	–	–	18.9	–	–	–	–	–	–	53
17	–	–	–	–	–	0.8	–	–	–	118

Fabric 2 description below). The excavations have also produced two jar types in Fabric 23 which are associated with BB2, coming as they do from the same source in the Thames estuary (Bidwell 1985, 178). One of these types (Gillam 151) had not previously been found this far west (see Fabric 23 description below). The Period 3–4b assemblages mainly comprised of BB1 and BB2, but also produced Crambeck (Fabric 4) and Huntcliff (Fabric 3) wares.

The pottery from Period 5 is dominated by the East Yorkshire wares, Crambeck and Huntcliff being the most important. The sealed deposit from Building 197

(Analytical Group 13, below) contains a coin sequence ending in 348 and provides sound evidence that the later and more developed forms of Crambeck (Corder and Birley 1937, Type 8) and Huntcliff (Gillam 163) must have appeared on the market at least 20 years earlier than previously believed. This fact will have a major effect on the future use of these types as dating evidence for the later fourth century and should lead to a complete rethink of the accepted mid- to late fourth-century chronology, with previously accepted beliefs, sequences, and events being open to re-interpretation.

Supplies of mortaria appear to have largely followed the pattern encountered at other sites in the north-west, for example Carlisle, where, during the second century, much material was supplied from the area of Carlisle and Old Penrith. In the third and fourth century Mancetter-Hartshill supplies predominated, with a few vessels arriving from the Lower Lower Nene Valley. In the later fourth century supplies are almost exclusively of Crambeck manufacture.

Fabric series

1 *Black Burnished Ware, Category 1* (BB1) (Williams 1977). The only unusual vessels in BB1 are fragments of two jugs, Nos 57 and 246. No 57 is similar to Gillam 161, No 246 rather less so. Although jugs in BB1 are not common on Hadrian's Wall they have been found on sites in the vicinity, eg at Vindolanda and South Shields. Wallace and Webster (1989, 88) suggest a broad date of mid-first to late second century for the form in general. The two from Birdoswald are from Analytical Group 6 (No 57), and in a context with a BB1 bowl of the late second century (No 246).

2 *Black Burnished Ware, Category 2* (BB2) (Williams 1977). Contrary to the statement by Williams (1977, 209) that early BB2 does not appear in the Western Sector of Hadrian's Wall, there are early types among the material from Birdoswald, and also from the Lanes, Carlisle (Hird forthcoming). From Birdoswald there is one example of Gillam 222 and several examples of Gillam and Mann 22. As these all came from unstratified contexts or contexts where they are obviously residual they are unillustrated. During Period 4b there would appear to be a point at which BB2 supplies to the site predominated over those of BB1. Analytical Group 10 is contemporary with Working Phase b (ii) in Building 4401, and in this small group there is almost five times more BB2 than BB1. Analytical Group 6, which relates to Building Phase d, and which is probably somewhat earlier, contains virtually equal proportions of the two wares.

3 *Huntcliff ware* (Corder and Birley 1937). Dark grey or black, soapy-textured fabric with white calcite grit inclusions in fabric, or voids, depending on soil conditions.

4 *Crambeck Grey ware* (Evans 1989, 55).

5 *Crambeck Parchment ware* (ibid, 55).

6 *Lower Nene Valley colour-coated ware* (Howe *et al* 1981).

7 *'Rhenish' ware.*

a) Self-coloured, pink fabric with glossy black slip. Central Gaul.

b) Fabric has grey/orange/grey sandwich core with glossy black slip. Trier (Greene 1978, 18).

8 *Dales type ware* (Loughlin 1977). Hard, rough, grey fabric with sand glint in surfaces. See comment under Fabric 19.

9 *?Dales type ware.* Open-textured, dark-grey fabric with orangey surface. May have been calcite-gritted.

10 Hard, dense, dark grey fabric with lighter-grey core and sand inclusions in fabric.

11 Unidentified grey wares. Certainly the products of more than one source.

12 Unidentified oxidised wares. Certainly the product of more than one source.

13 Oxidised, sandy, orange fabric with cream slip. Possibly the product of more than one source.

14 *Dales type ware* (Loughlin 1977). Very hard, light/mid-grey fabric with large inclusions of mica and sand. See comment under Fabric 19.

15 Fine-textured, charcoal grey fabric with lighter grey/brown core beneath polished, dark-grey surface.

16 *Dales type ware* (Loughlin 1977). Very hard, grey fabric with lighter grey band beneath dark surface. Sand inclusions are frequent and make the surface pimply. See comment under Fabric 19.

17 Micaceous, hard, mid-grey fabric with reddish-pink surfaces and inner and outer layers.

18 Hard, white fabric with pinkish-beige slipped surfaces and purplish inner surface.

19 *Dales ware* (Loughlin 1977). Grey, shell-gritted fabric (See also Dales types, Fabrics 8, 14, and 16). As at Vindolanda (Bidwell 1985, 177), Dales ware played only a minor part in the supply of pottery to the site. The Dales ware at Birdoswald is concentrated in the area of Building 198, both in contexts associated with its collapse and with the backfill, Analytical Group 15 (No 224), which extends into the late fourth century or

beyond. There is a concentration of Dales types in the early to mid-fourth-century fill of the final fort ditch, Analytical Group 9, in a variety of fabrics (Fabrics 8 and 14), Nos 110–13.

20 *Severn Valley ware* (Webster 1976). Sandy, orange fabric with visible mica in surfaces and possibly a grey core.

21 Sandy, oxidised fabric. Hard, fabric with brownish-grey outer surface.

22 Hard, white fabric with no visible inclusions.

23 *Gillam 151* (Bidwell 1985, 177). Hard, grey fabric with quartz sand inclusions and rather rough surface. Nos 178, 67 and 115, 244. In his report on the pottery from Vindolanda Bidwell (1985, 178) states that Vindolanda is the most westerly find spot for Gillam 151. This is no longer the case as several examples are present at Birdoswald. The Birdoswald material does, however, support the evidence from other sites that the type occurs in conjunction with BB2. No 67 comes from a context associated with the reflagging of the west end of Building 198 in which BB2 figures significantly (Analytical Group 6), and No 178 is residual in Analytical Group 13. There are also a couple of examples of the jar with the curved, everted rim in the same fabric, notably No 244, from the south tower of the *porta principalis sinistra.*

24 *Derbyshire ware* (Gillam 1939). Hard, orange fabric, charged with copious quartz grit which gives a very pimply surface.

25 *North Gaulish Fabric 1* (Anderson 1980, 28).

26 Sandy, oxidised, orange fabric with fairly fine texture and large inclusions (up to 3mm) of red material.

27 Fine-textured, pinkish-orange fabric with thin red wash.

28 *Rustic ware* (Thompson 1958). Very hard, mid-grey fabric with metallic outer surface and rustic decoration.

29 Sandy, oxidised, orange fabric with rough-cast decoration. Wilderspool/Carlisle area (Hartley and Webster 1973, 77–103). Carlisle mortaria made by potters originally from Wilderspool are attested at Birdoswald from previous excavations.

30 ?*Oxfordshire red colour-coated ware* (Young 1977, 123–84). Fairly fine textured, pinkish-orange fabric with red inclusions and reddish-brown slip.

31 Slightly micaceous, hard, fine-textured, pink fabric with fairly frequent red grit inclusions.

32 Not used

33 Hard, fine-textured, cream fabric with red/brown painted dot decoration.

34 Very hard, fine-textured, white fabric with grey metallic-slipped surfaces.

35 Micaceous, pink-buff fabric with blue-grey core and trace of cream slip.

36 Very hard, fine-textured, pale-grey fabric with stamped decoration.

37 *Oxfordshire red colour-coated ware* (Young 1977, 123–84). Orange fabric, slightly micaceous with deep orange slip and trace of cream paint/barbotine. Rouletted decoration.

38 Hard, white fabric with rough-cast decoration and orange or orange/brown colour-coat. Rhineland (Anderson *et al* 1982, 229–38

39 Very hard, fine-textured, orange-brown fabric with purplish-brown slip externally and rouletted decoration. Colchester? (Hull 1963, 91).

40 Fine-textured, pink fabric with creamy coloured surfaces and black painted decoration.

41 Fine, white fabric with orange, mica-dusted surface.

42 Self-coloured, creamy-buff fabric. Sandy in texture.

Mortarium fabrics

50 *Mancetter-Hartshill* (Hartley 1990, 244, fabric 624). Hard, white 'pipeclay' fabric. Mixed grit.

51 *Mancetter-Hartshill* (Hartley 1990, 244, fabric 624). As Fabric 50 but with red grit.

52 *Crambeck Parchment mortaria* (Evans 1989, 55). Sandy, creamy-white fabric with ironstone or slag trituration grit.

53 Fairly soft, yellowish-pinkish-buff fabric with mixed trituration grit, largely red but also grey and white.

54 North-western, probably Carlisle area. Self-coloured, sandy, orange fabric. Quartz sand inclusions. Mixed grit with mica. (Hartley 1990, 242, fabric 609).

55 North-western, probably Carlisle area. Sandy, orange fabric with cream slip. Mixed trituration grit, largely quartz with mica. (Hartley 1990, 241; fabric 603).

56 *Crambeck Parchment mortaria.* As Fabric 52 but finer.

57 North-western, Carlisle area. As Fabric 54 but with red slip over rim, white trituration grit. (Hartley 1990, 241; fabric 609).

58 Sandy, creamy-pink fabric with blue-grey core and ironstone grit. Trace of cream slip.

59 *Lower Nene Valley* (Howe *et al* 1981). Hard, creamy-white fabric with ironstone trituration grit and yellowish-pink surface wash.

60 Creamy-greyish-white, fine-textured fabric with pinkish outer layer and surface. Small red inclusions.

61 Self-coloured, creamy-yellow fabric with copious quartz grit inclusions. Lower Germany (Hartley 1990, 243, fabric 614).

62 Granular-textured, cream fabric with pinkish-yellow outer layer and surfaces. Large soft, white grit inclusion in fabric.

63 Fine-textured, slightly granular, yellowish-brown fabric with pinkish core. Mixed translucent trituration grit.

64 Hard, sandy, grey fabric with orange layer beneath surface which has a thick, cream slip. Red and quartz trituration grit survives as well as voids.

65 Hard, granular-textured, greyish-cream fabric with pinkish cream fabric and pinkish-grey wash on surfaces and red trituration grit. Lincoln? (Hartley 1990, 243, fabric 616).

66 Self-coloured, slightly granular-textured, yellowish-cream fabric.

67 *Oxfordshire red colour-coated mortaria* (Young 1977, 127). Sandy, fine-textured, orange-brown fabric with translucent pink and white trituration grit.

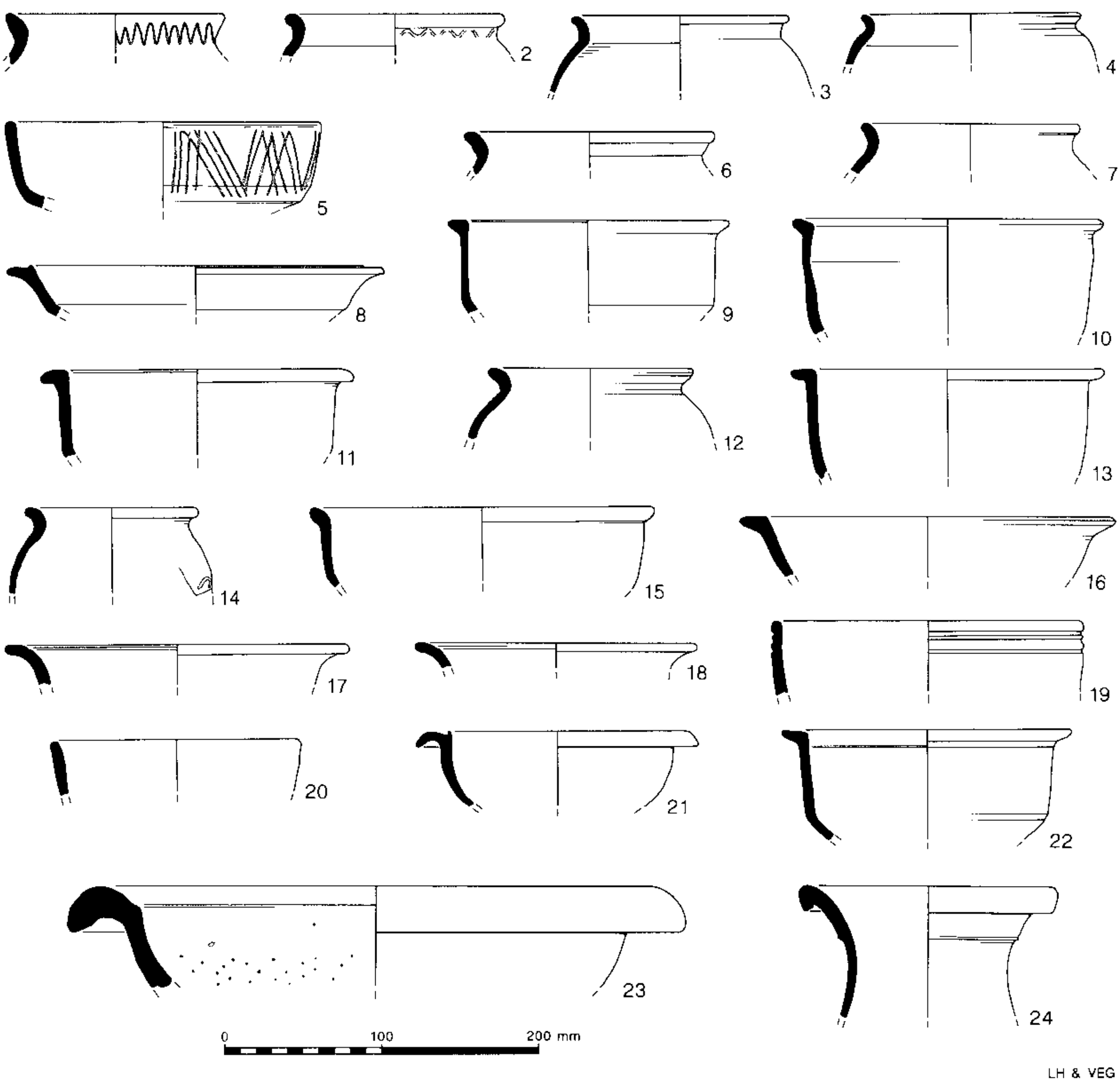

Fig 155 Roman coarse pottery: Analytical Group 1 (scale 1:4)

68 Hard, fine-textured, grey fabric with quartz sand inclusions and larger quartz trituration grit.

69 *Oxfordshire whiteware mortaria* (Young 1977, 56–79). Granular-textured, greyish-cream fabric with translucent pink and white grit.

70 Hard, granular-textured, white-pale grey fabric with mixed size trituration grit of quartz, up to 8mm.

71 Hard, sandy orange fabric with pink surfaces and small, mixed trituration grit.

72 North-western. Carlisle/Old Penrith area. Very hard, fine-textured, red fabric with quartz sand inclusions. May have greyish outer surface. (Hartley 1990, 242, fabric 610).

73 North-western. Carlisle/Old Penrith area. Very hard, fine-textured, orange fabric with few inclusions. Trituration grit is quartz with small amounts of mica in fabric and trituration grit. (Hartley 1990, 242, fabric 606)

74 As fabric 72 but with cream slip. Small, mixed trituration grit.

Amphora fabrics

100 Very sandy, self-coloured buff fabric. May be flaky. Peacock and Williams (1986) Class 25.

101 Very sandy, pinkish-buff fabric with cream slip or surface. Peacock and Williams (1986) Class 25.

102 Hard, relatively fine-textured, slightly micaceous, orangey-buff fabric.

103 Fine-textured, slightly micaceous, creamy-white/pink fabric.

104 Fine-textured, micaceous, orange fabric possibly with cream-buff outer surface. Peacock and Williams (1986) Class 27.

105 Fairly fine-textured, but still sandy, self-coloured orange fabric.

106 Fine-textured, sandy, thin, buff fabric, slightly micaceous.

107 Granular-textured, fine-cream fabric. Gaulish?

Catalogue

The Analytical Groups

Period 1

Analytical Group 1 (Fig 155)

Group of pottery from contexts predating the construction of the Stone Fort, or embodied in the rampart of the stone fort, possibly as material residual from an earlier occupation. These comprise:

a) The Turf Wall ditch fill (Contexts 4029 and 4041).

b) The fills of cuts beneath Building 198 (Contexts 1964, 1971, 1973, and 1995).

c) Pottery contained within the rampart of the stone fort comprising material from pre-stone fort occupation scraped up for use here. (North Wall, Area B: Contexts 403, 412, 416, 425, 426, 1365, 1977,1978, 1998, and 2658).

East Wall, Area F: (1992 excavation) Context 473.18 The Period 1 assemblage was made up of 2.97kg (110 sherds) of coarse wares. Only cooking pots were present in BB1, unlike the Birdoswald Alley deposit (Birley 1930a) and Vallum ditch filling (Swinbank and Gillam 1951), both of which had a greater variety of forms. Birley comments that of the cooking pots from the Alley about one tenth had the decorative wavy line on the neck. In our group, admittedly very small, two out of three have the wavy line.

Like the Alley, our group contained only a small amount of Rustic ware (No 14), which is residual in a group of this date. Also present in the Alley and this group is rough-cast ware, Fabric 25. There are four fragments of mortaria in Fabrics 54 and 55 (not illustrated), and a stamped mortarium (264) all probably made in the Carlisle area. All but one of the amphora fragments present were of South Spanish Dressel 20, Peacock and Williams (1986) Class 25. The other was from a Gauloise 4 amphora, Peacock and Williams (1986) Class 27. The samian ware included decorated pieces (Nos 1–8), stamped vessels (St 8, St12, St21, St22) and plain ware.

cat no	*context*	*description*	
1	1365	Fabric 1	Gillam (1976) 1. Early to mid-second century
2	403	Fabric 1	Gillam (1976) 1
3	1365	Fabric 1	Gillam (1976) 1
4	1365	Fabric 1	Gillam (1976) 30. Early to mid-second century
5	473.18	Fabric 1	Gillam (1976) 75
6	1365	Fabric 11	
7	412	Fabric 11	
8	403	Fabric 11	
9	412/416	Fabric 11	
10	1365	Fabric 11	
11	425	Fabric 11	
12	473.18	Fabric 11	
13	473.18	Fabric 11	
14	1365	Fabric 28	Rustic ware. *c* 80–120
15	416	Fabric 12	
16	1365	Fabric 12	
17	1365	Fabric 12	

18	1365	Fabric 12
19	1365	Fabric 12
20	1365	Fabric 12
21	473.18	Fabric 12
22	473.18	Fabric 12
23	473.18	Possibly of South Wales or Holt manufacture
24	473.18	Probably Fabric 20
25	473.18	Base of a beaker with rough-cast surface; fine reddish-yellow fabric with a grey core; greenish, metallic colour-coat. Possibly of Colchester origin. (not illustrated)

Period 2

Analytical Group 2 (Fig 156)

Contexts 4137, 4335, 4348, 4355, 4356, 4357, 4375, 4376, 4379, 4381, and 4382
The best pottery group relating to the primary occupation Period of the stone fort was derived from the occupation deposits of Building 4400 Phase a, the undivided building, and Phase b, after the subdivision of the building into a number of rooms.

This group is very similar in composition to the group from the Birdoswald Alley (Birley 1930a). Nine of the 20 vessels illustrated are exactly paralleled in the published material from the Alley. The importance of this cannot be overstated. The Alley lay to the north of the counterpart to Building 4400 on the east side of the *via praetoria,* and it is clear that the Alley assemblage represents the same period on the 1929 site as is represented by Period 2 in Area A.

The group contained no mortaria. Unillustrated is one fragment of BB2. The latest vessel is a BB1 dish, Gillam 329, from context 4137, which dates to the late second century. The bulk of the coarse wares are mid-second century, ie late Hadrianic–early Antonine, in date. The samian ware included both decorated (Nos 9–14) and plain forms, one with a stamp (St 2).

cat no	*context*	*description*	
26	4356	Fabric 1	Gillam (1976) 2. Mid-second century. (cf Birley 1930a, fig 14, no 18)
27	4335	Fabric 1	Gillam (1976) 1. Early to mid-second century. (cf Birley 1930a, fig 14, no 18b)
28	4375	Fabric 1	Gillam (1976) 30. Early to mid-second century
29	4335	Fabric 1	Gillam (1976) 31. Mid-second century. (cf Birley 1930a, fig 15, nos 32–5)
30	4375	Fabric 1	Gillam (1976) 61. Mid-second century. (cf Birley 1930a, fig 74)

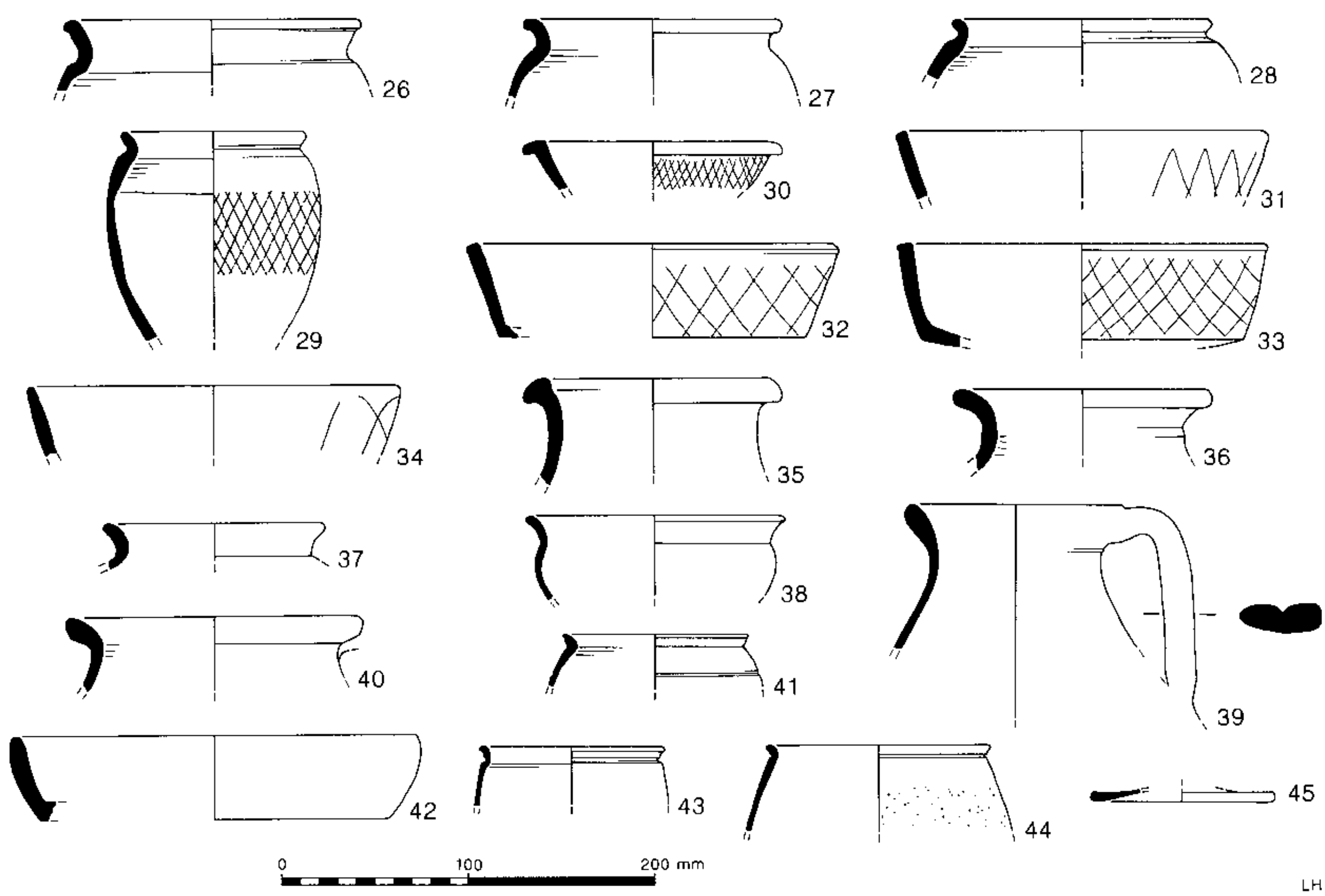

Fig 156 Roman coarse pottery: Analytical Group 2 (scale 1:4)

31	4356	Fabric 1	Gillam (1976) 75. Early to mid-second century. (cf Birley 1930a, fig 16, no 83)
32	4375	Fabric 1	Gillam (1976) 75. See No 31
33	4379	Fabric 1	Gillam (1976) 76. Mid- to late second century
34	4137	Fabric 1	Gillam 329. 190–340
35	4355	Fabric 11	
36	4335	Fabric 11	
37	4335	Fabric 11	
38	4335	Fabric 11	
39	4335/4355	Fabric 12	
40	4335	Fabric 12	
41	4335/4356	Fabric 12	Possibly rough-cast
42	4356	Fabric 12	(cf Birley 1930a, fig 16, no 82)
43	4335	Fabric 25	Gaulish. *c* 80–130/5 (cf Birley 1930a, fig 14, no 28)
44	4356	Fabric 38	Imported rough-cast beaker from the ?Rhineland
45	4335	Fabric 42	Amphora stopper

Periods 2–3

Analytical Group 3 (Fig 157)

Contexts 1845, 1846, 1848, and 4130
The fills of the primary fort ditch and its two recuts (Ditch Phases a–c), which respected the double-carriageway *porta principalis sinistra*, span Periods 2–3, ending with the initiation of Period 4a, when the south portal of the gate was blocked, and the ditch recut to respect the single carriageway (Ditch Phase d). The fill deposits were very heavily truncated by the later ditch recuts (Ditch Phases d–f), and therefore the pottery assemblage is very small.

This is a group comprising 115g of coarse wares, 40g of mortaria, 135g of amphorae, together with a few sherds of decorated samian ware (Nos 15–17). The latest vessel is a Lower Nene Valley beaker of the late second or early third century. The BB1 bowl and the mortarium are both of early to mid-second-century date.

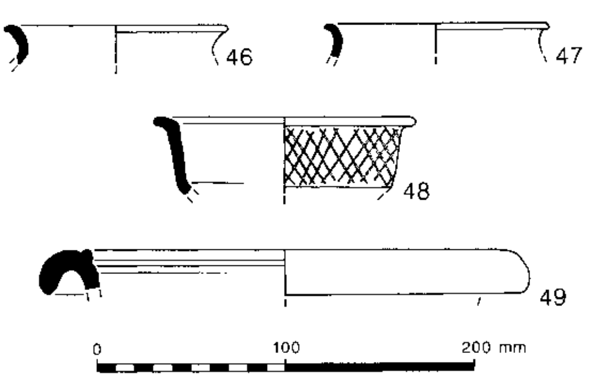

Fig 157 Roman coarse pottery: Analytical Group 3 (scale 1:4)

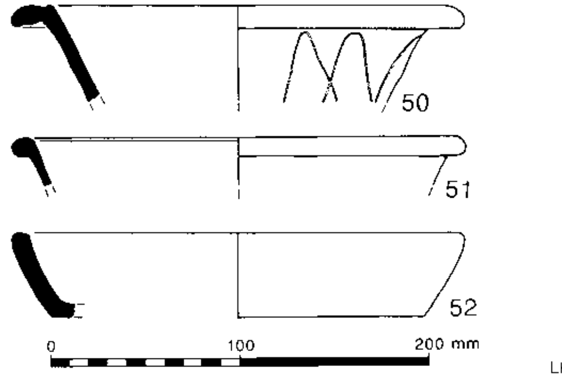

Fig 158 Roman coarse pottery: Analytical Group 4 (scale 1:4)

cat no	*context*	*description*	
46	1846	Fabric 11	
47	1846	Fabric 6	Howe *et al* (1981) 40. Later second to early third century
48	1848	Fabric 1	Gillam (1976) 34. Early to mid-second century
49	1846	Fabric 55	Hartley (1990, fig 186.17). Carlisle area, *c* 130–65

Period 3

Analytical Group 4 (Fig 158)

Context 3771
Despite the major structural changes which took place during this Period, only one very small group of 335g could be said with certainty to belong to Period 3. This was the fill of the construction trench for the insertion of the ashlar masonry on the west curtain wall of the fort. The group also contained sherds of plain and decorated samian ware including some of East Gaulish origin dating to the late second to early third century (Nos 18–24). A significant associated small find is a little-worn apparently Severan intaglio (No 87, Fig 195, Pl 12).

cat no	*context*	*description*	
50	3771	Fabric 1	Gillam (1976) 42. Late second to early third century
51	3771	Fabric 2	Gillam 313. 180–240
52	3771	Fabric 11	

Periods 3–4b

Analytical Group 5 (Fig 159)

Contexts 352, 353, 354, 355, 356, and 381
Building 197 was built during Period 3, and its use as a *horreum* continued until the sub-floor was backfilled

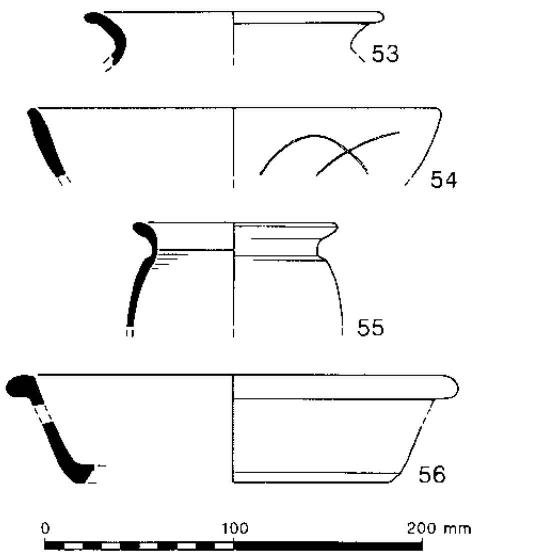

Fig 159 Roman coarse pottery: Analytical Group 5 (scale 1:4)

during Period 5. This event has a proposed numismatic *terminus ante quem c* 350. Preceding this, in Building 197, Phase d, a portion of the sub-floor was filled in order to create a central solid-floored area. Building 197, Phase c, to which the group catalogued here belongs, was the final phase during which the building had a completely open sub-floor.

This group produced only 495g of coarse wares, of which over 50% was BB1, mostly plain dishes of Gillam 329. Approximately 20% was BB2, dating to the late second or early third centuries. There were both cooking pots and a dish. These contexts also produced early fourth-century material: two sherds of Huntcliff ware (Fabric 3) and one sherd of Crambeck Grey ware (Fabric 4). One sherd of mortarium, of probable Rhineland origin, and two sherds of South Spanish amphora completed the group.

cat no	*context*	*description*	
53	381	Fabric 1	Gillam (1976) 10. Late third century
54	381	Fabric 4	Gillam 329. 190–340. There were four other examples of this type.
55	381	Fabric 2	Gillam 139. 150–250
56	356	Fabric 2	Gillam 313. 180–240

Analytical Group 6 (Fig 160)

Contexts 1516 and 1650
An area of the west end of Building 198 was provided with a solid floor in Building 198, Phase d. The pottery from the backfill of the sub-floor in preparation for this reflooring is of third-century date. In this group BB2 and BB1 are virtually even at 13.06% and 13.90% by weight respectively. Severn Valley ware (unillustrated) made up 5% of this group

cat no	*context*	*description*	
57	1650	Fabric 1	Jug Gillam 61. 170–200. Probably a pinched-neck jug of Wallace and Webster (1989) type A
58	1650	Fabric 1	Gillam (1976) 8. Mid-third century
59	1650	Fabric 2	Gillam 139. 150–250
60	1516	Fabric 2	Gillam 313. 180–240
61	1516	Fabric 2	Gillam 313
62	1516	Fabric 6	Unusual rim for scale-patterned beaker. Late second century
63	1650	Fabric 11	Second century?
64	1516	Fabric 11	
65	1516	Fabric 11	
66	1516	Fabric 11	

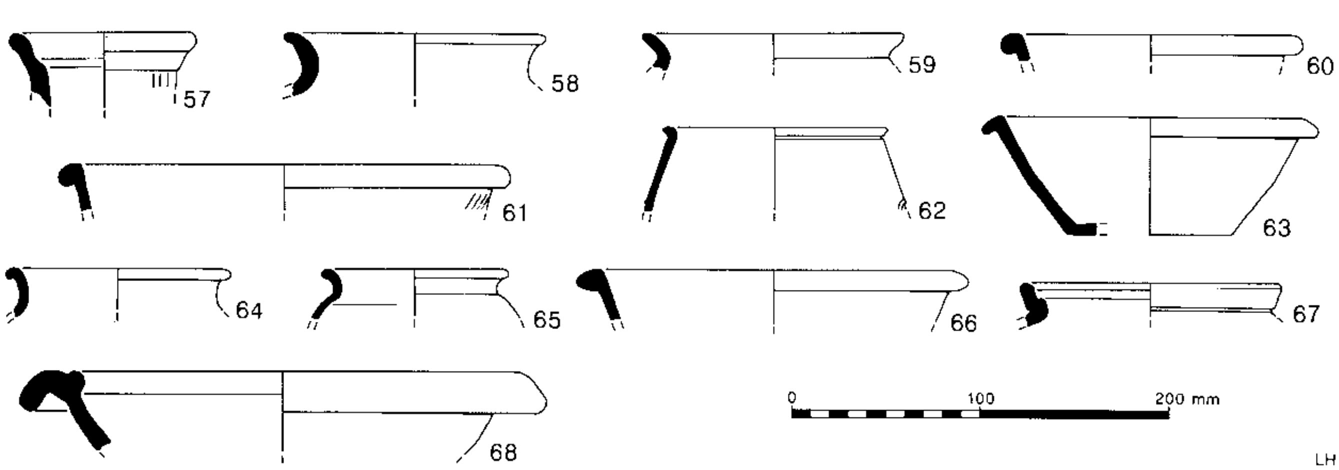

Fig 160 Roman coarse pottery: Analytical Group 6 (scale 1:4)

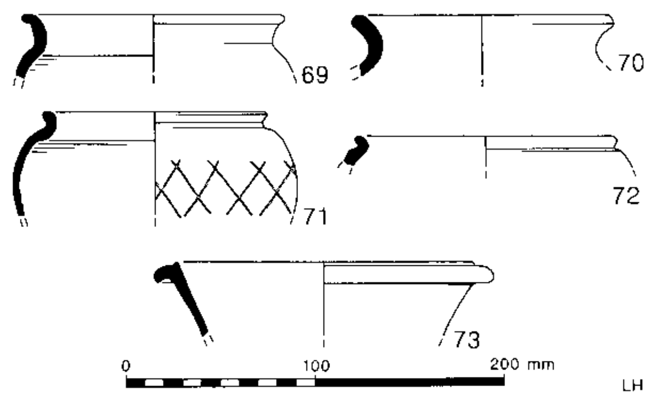

Fig 161 Roman coarse pottery: Analytical Group 7 (scale 1:4)

67	1516	Fabric 23	Gillam 151. 190–260
68	1516	Fabric 50	Mancetter-Hartshill. (Hartley 1990, fig 192.71) *c* 180–260

Period 4a

Analytical Group 7 (Fig 161)

Contexts 1605, 1709, 1771, and 1796
This group represents the filling of the first fort ditch to be excavated to respect the single portal gate created by the blocking of the south portal of the *porta principalis sinistra* in Period 4a (Ditch Phase d). The two joining sherds of a Crambeck bowl, Corder and Birley (1937) Type 1b, dated to the late fourth century (not illustrated) may be intrusive as may be No 73, reflecting the difficulty experienced on site in separating the fill of this ditch from that of later recuts.

cat no	*context*	*description*	
69	1605	Fabric 1	Gillam (1976) 1. Early to mid-second century
70	1605	Fabric 11	
71	1605	Fabric 11	
72	1796	Fabric 11	
73	1605	Fabric 4	Corder and Birley (1937) Type 1. Fourth century

Analytical Group 8 (Fig 162)

Context 3886
Within Building 4401, which was constructed in Period 4a, pottery was scarce and, when found, scrappy. The road make-up 3886 was contemporary with Building 4401, Phase b (ii). Pottery in this context gives a useful *terminus post quem* for Building 4401, Phase c.

The context produced a small group of 360g which dates to the late second or early third century. This appears to be a period when the supply of BB2 to Birdoswald overshadowed that of BB1. This context produced 13.8% BB2 to only 2.7% BB1.

cat no	*context*	*description*	
74	3886	Fabric 2	Gillam 139. 150–250
75	3886	Fabric 2	Gillam 313. 180–240
76	3886	Fabric 11	
77	3886	Fabric 11	
78	3886	Fabric 11	
79	3886	Fabric 11	

Period 4b

Analytical Group 9 (Fig 163)

Contexts 217, 1496, 1760, and 1821
This group comprised the fill deposits of Ditch Phase e, the ditch recut associated with the construction of the bridge-culvert outside the *porta principalis sinistra*. These deposits contain material of the third and fourth centuries. The bowl, Corder and Birley (1937) Type 10 (No 94), is the only vessel of late fourth-century date, and is probably intrusive. The majority of the material is of the late third or earlier fourth century, when BB1 was still a major supplier (26%) and Mancetter-Hartshill a major supplier of mortaria (67%).

cat no	*context*	*description*	
80	1760	Fabric 1	Gillam (1976) 10. Late third century
81	1760	Fabric 1	Gillam (1976) 10

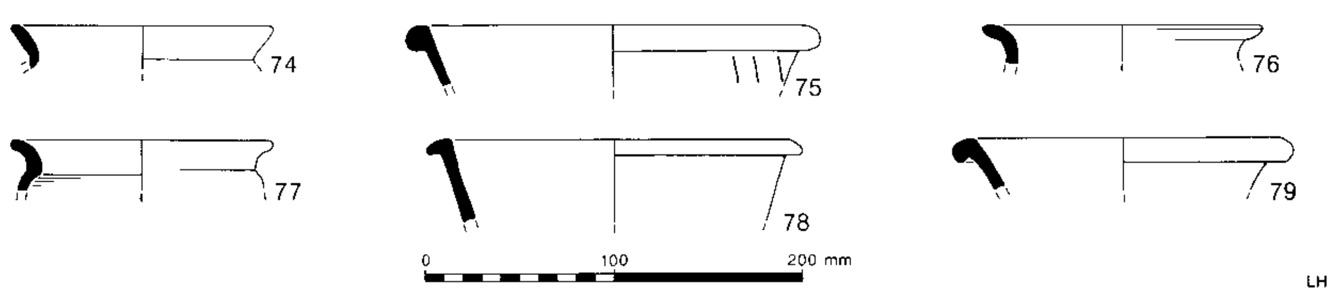

Fig 162 Roman coarse pottery: Analytical Group 8 (scale 1:4)

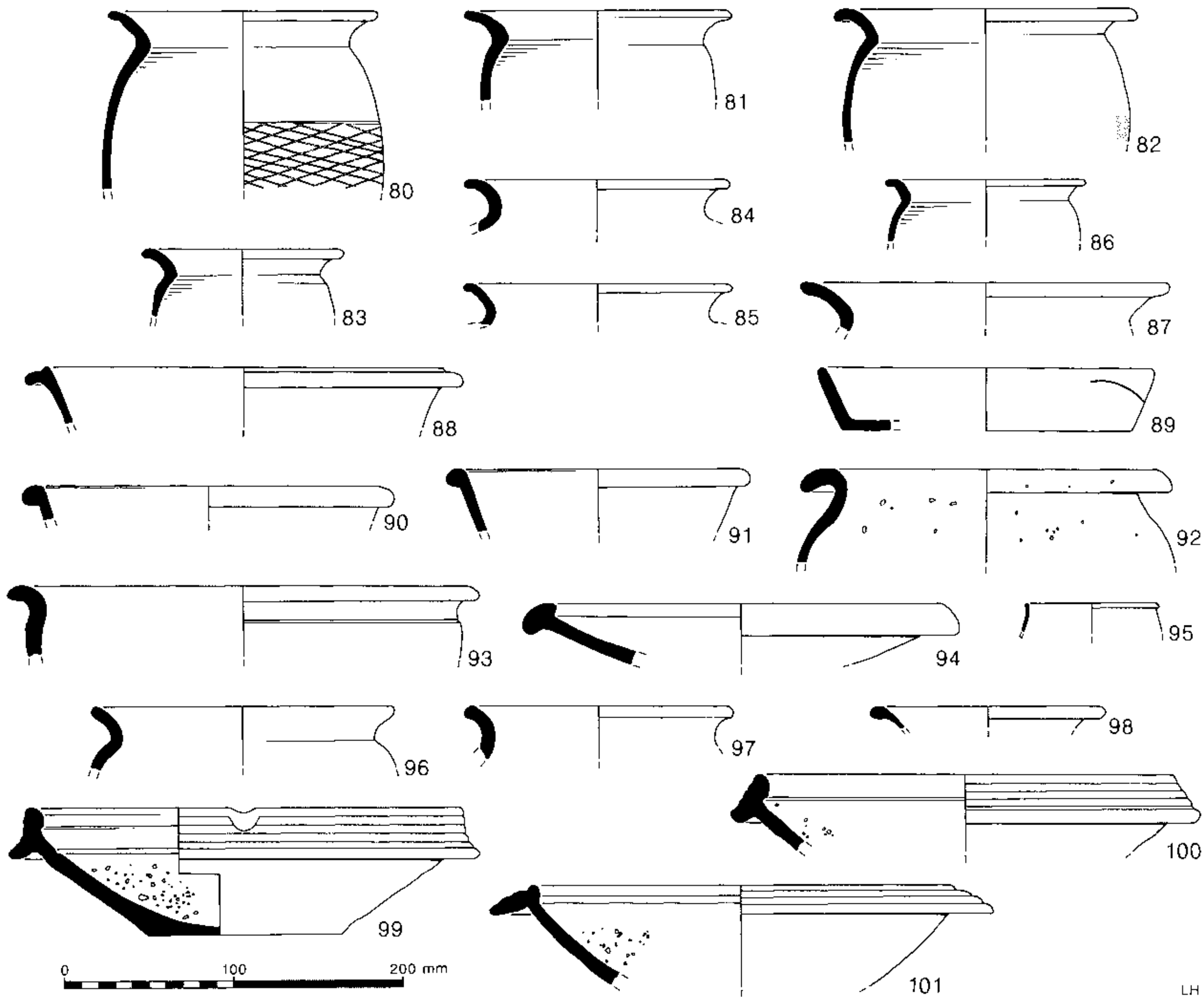

Fig 163 Roman coarse pottery: Analytical Group 9 (scale 1:4)

82	1760	Fabric 1	Gillam (1976) 12. Early fourth century
83	1821	Fabric 1	Gillam (1976) 8. Mid-third century
84	217	Fabric 1	Gillam (1976) 8
85	1496	Fabric 1	
86	1496	Fabric 1	Gillam (1976) 18. Late third century
87	217	Fabric 1	Gillam (1976) 10. Late third century
88	1496	Fabric 1	Gillam (1976) 43. Early to mid-third century
89	1496	Fabric 1	Gillam 329. 190–340
90	217	Fabric 2	Gillam 313. 180–240
91	1496	Fabric 2	Gillam 313
92	1496	Fabric 3	Gillam 161. 300–370
93	1496	Fabric 4	Corder and Birley (1937) Type 4. Fourth century
94	1496	Fabric 5	Corder and Birley (1937) Type 10. Later fourth century
95	217	Fabric 7b	Gillam 46. 220–260
96	217	Fabric 11	
97	1496	Fabric 11	
98	1496	Fabric 11	
99	1760	Fabric 50	Mancetter-Hartshill. Gillam 282. 230–340
100	1760	Fabric 50	Gillam 282
101	1760	Fabric 59	

Analytical Group 10 (Fig 164)

Contexts 1500, 1728, 1742, 1755, 4059, and 4060
The filling of the final recut of the ditch, Ditch Phase f, contained earlier fourth-century material. Huntcliff ware (Fabric 3) makes up less than 2% of the pottery and Crambeck Grey ware almost 5%. There is no late fourth-century material. Mancetter-Hartshill was still supplying over 60% of the mortaria, and the Lower Nene Valley almost 20%. Dales types (Nos 110–13) are significant in this group, making up over 10% if the coarse wares. Comparison with Analytical Group 13, which is independently dated *c* 350, but which

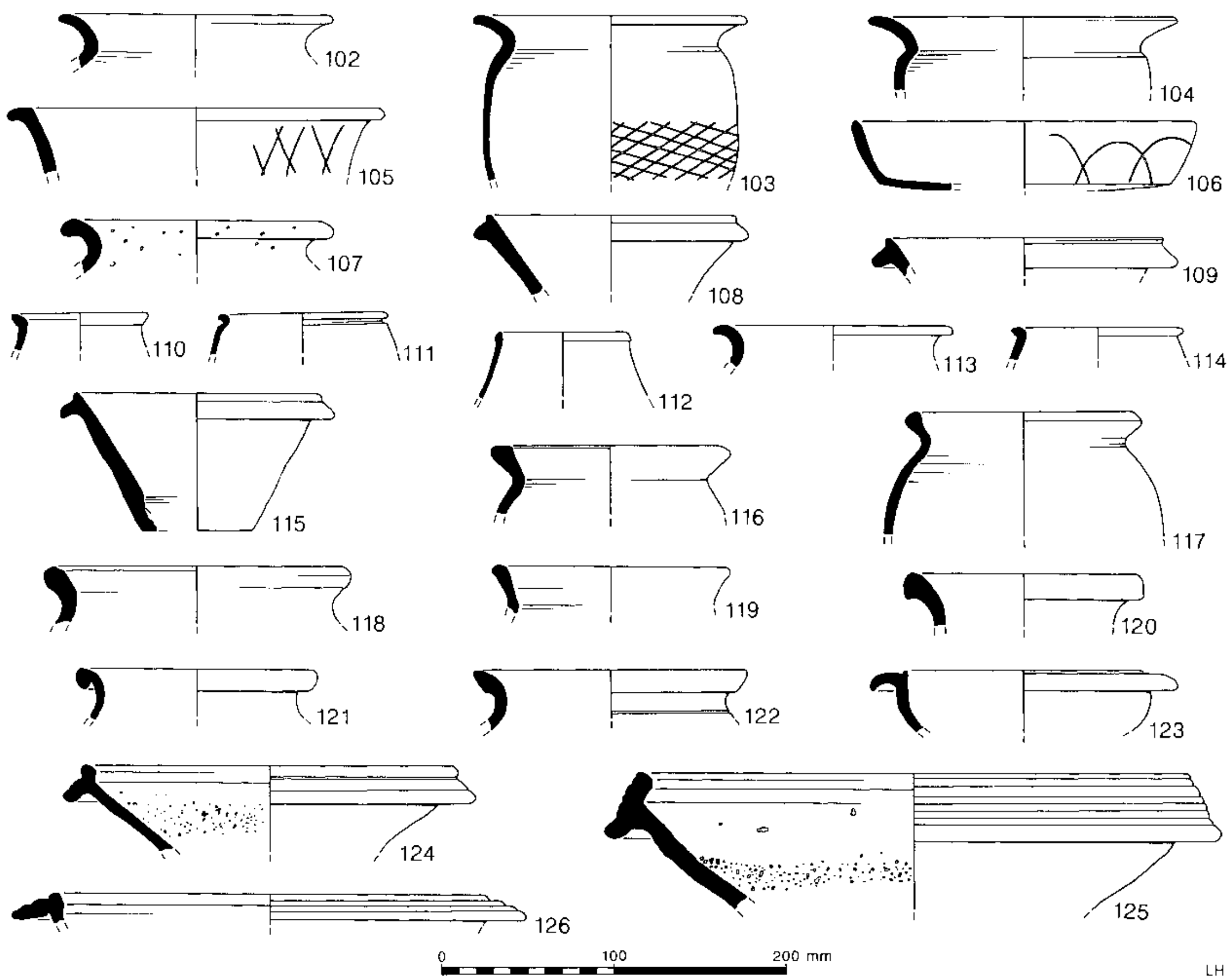

Fig 164 Roman coarse pottery: Analytical Group 10 (scale 1:4)

contains a significant amount of Huntcliff ware and of Crambeck mortaria, suggests that the ditch was filled before the mid-fourth century.

cat no	*context*	*description*	
102	1742	Fabric 1	Gillam (1976) 10. Late third century
103	1500	Fabric 1	Gillam (1976) 12. Early fourth century
104	1500	Fabric 1	Gillam (1976) 12
105	1500	Fabric 1	Gillam (1976) 57. Early to mid-second century.
106	1500	Fabric 1	Gillam 329. 190–340.There were two other vessels of the same form.
107	1742	Fabric 3	Gillam 161. 300–370
108	1742	Fabric 4	Corder and Birley (1937) Type 1. Fourth century
109	1742	Fabric 4	Corder and Birley (1937) Type 1
110	1742	Fabric 6	Howe *et al* (1981) 54–57. Fourth century
111	1500	Fabric 6	Gillam 87–89. First half of the third century
112	1755	Fabric 6	Howe *et al* (1981) 52. Fourth century
113	1500	Fabric 11	
114	1500	Fabric 11	
115	1500	Fabric 11	Fourth century
116	1742	Fabric 8	Dales type
117	1742	Fabric 8	Dales type
118	1742	Fabric 14	Dales type
119	1742	Fabric 14	Dales type
120	1755	Fabric 20	Severn Valley ware. Webster (1976) Type 4. Second to fourth century
121	1500	Same fabric as Gillam 151	
122	1496/1760	Fabric 34	
123	1500	Fabric 12	Fourth century?
124	1500	Fabric 50	Mancetter-Hartshill. Gillam 283. 250–350
125	1742	Fabric 50	Mancetter-Hartshill. Gillam 282. 230–340
126	1500	Fabric 59	Lower Nene Valley

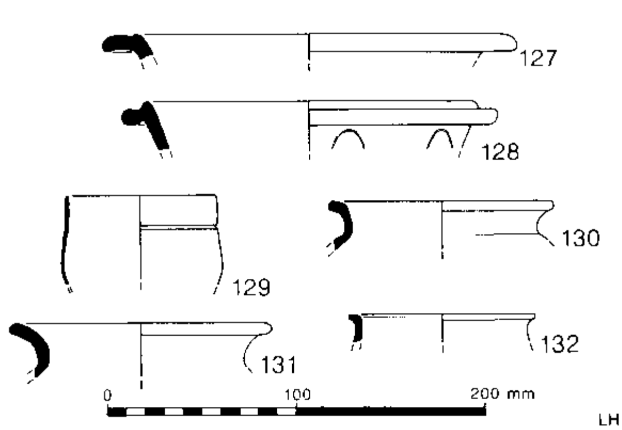

Fig 165 Roman coarse pottery: Analytical Group 11 (scale 1:4)

Analytical Group 11 (Fig 165)

Context 2628
This represents the latest occupation deposits found within Building 4401 during Phase d. It is a small group of probable early fourth-century date.

cat no	*context*	*description*	
127	2628	Fabric 1	Gillam (1976) 42. Late second to early third century
128	2628	Fabric 1	Gillam (1976) 47. Early fourth century
129	2628	Fabric 6	Howe *et al* (1981) 44. Later second century?
130	2628	Fabric 11	
131	2628	Fabric 11	
132	2628	Fabric 41	

Analytical Group 12 (Fig 166)

Contexts 33 and 1326
This group is from the final material added to the rampart on the north wall of the fort in Area B. The latest pottery in this group is Huntcliff ware (Fabric 3) of which there is one fragment (unillustrated) of a jar of Gillam 161, 300–370, and a bowl in BB1 (No 137) of the late third or early fourth century. The remainder of the material is of earlier date and consequently is residual.

cat no	*context*	*description*	
133	1326	Fabric 1	Gillam (1976) 1. Early to mid-second century
134	1326	Fabric 1	Gillam (1976) 61. Mid-second century but the intersecting arc decoration should suggest a slightly later date
135	1326	Fabric 1	Gillam (1976) 63. Mid- to late second century
136	1326	Fabric 1	Gillam (1976) 76. Mid- to late second century
137	33	Fabric 1	Gillam (1976) 46. Late third to early fourth century
138	33	Fabric 2	Gillam 139. 150–250
139	1326	Fabric 2	Gillam 313. 180–240
140	33	Fabric 2	Gillam 313
141	1326	Fabric 2	Gillam 313

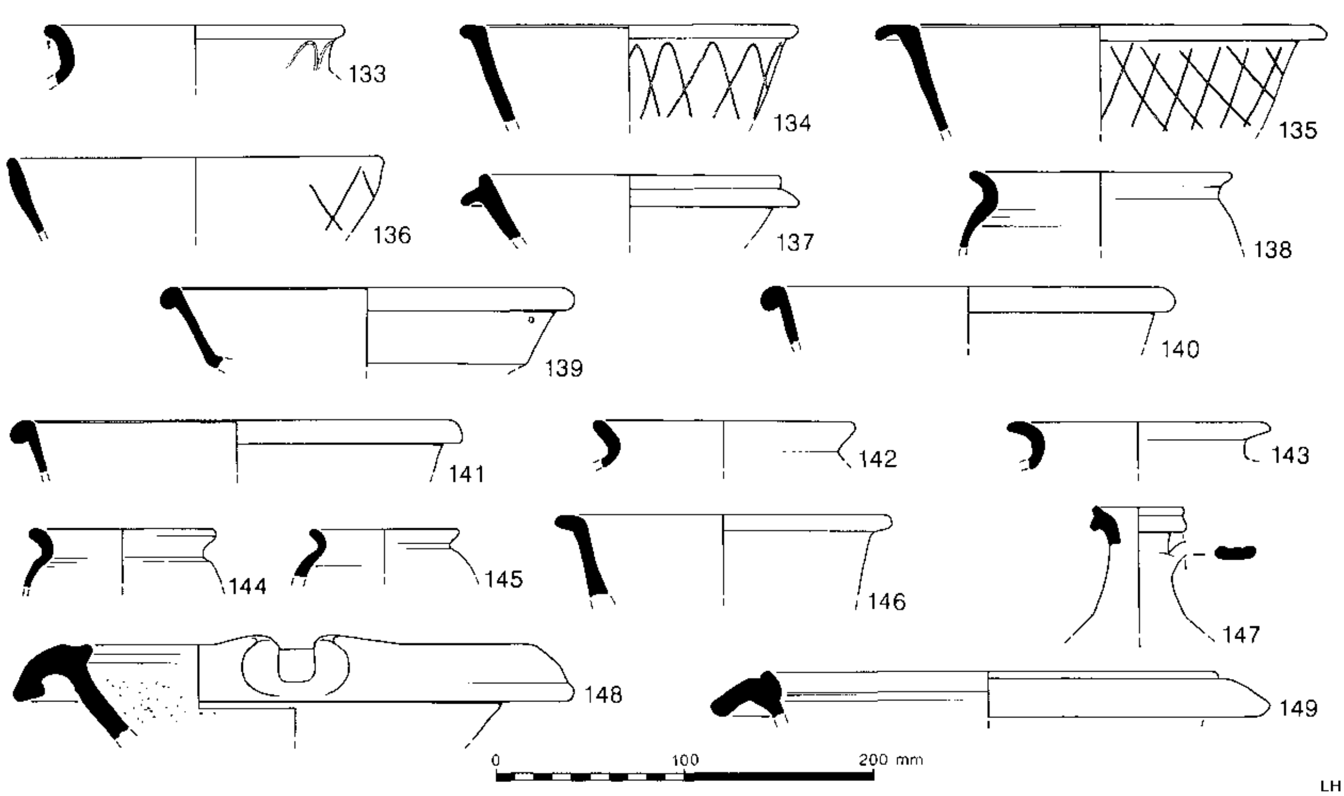

Fig 166 Roman coarse pottery: Analytical Group 12 (scale 1:4)

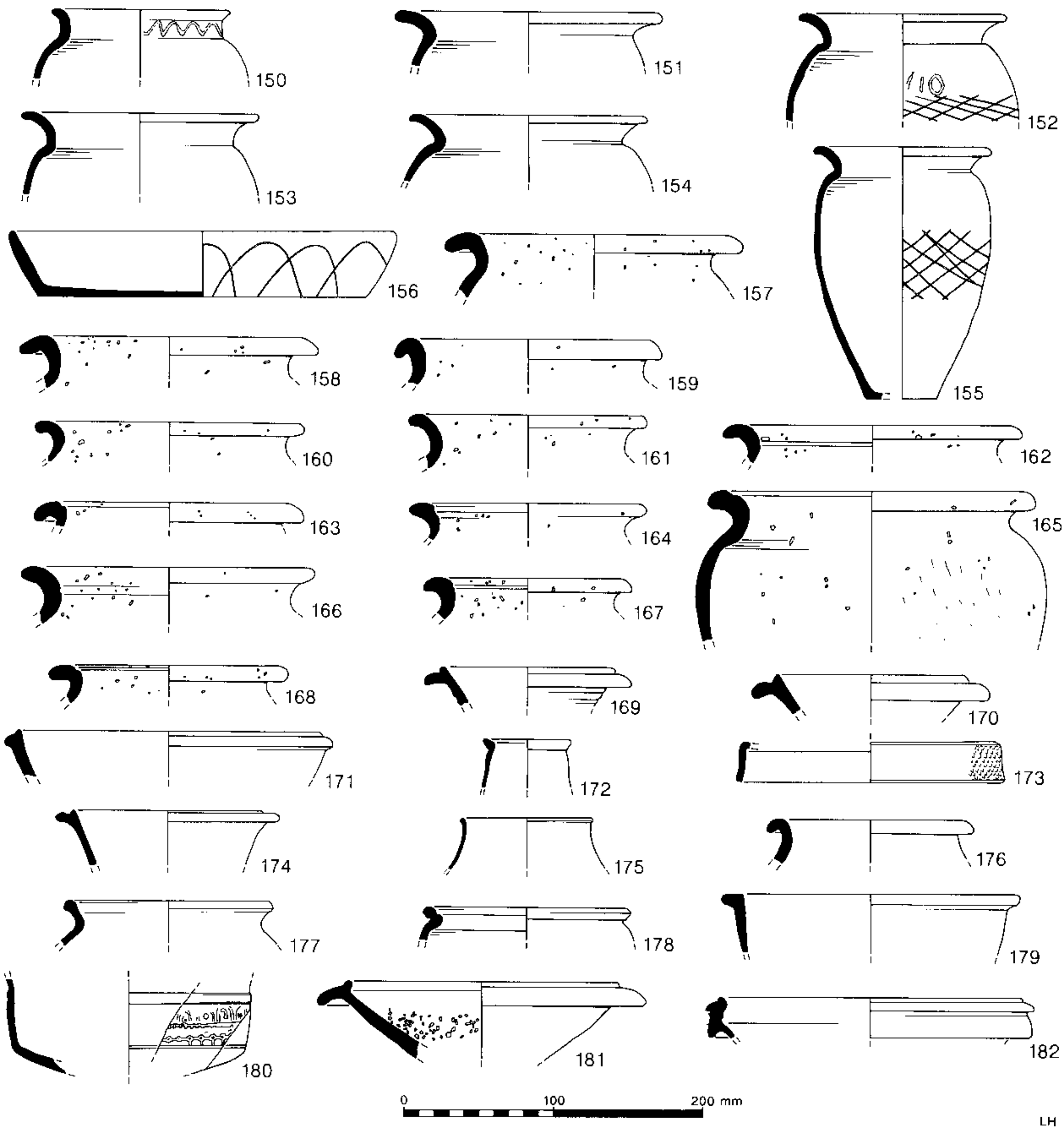

Fig 167 Roman coarse pottery: Analytical Group 13 (scale 1:4)

142	33	Fabric 11	
143	1326	Fabric 11	
144	1326	Fabric 11	
145	33	Fabric 11	
146	1326	Fabric 11	Second century?
146	33	Fabric 13	Gillam 17. 180–360
148	33	Fabric 57	Hartley (1990, Fig 187.27). From a Rhaetian workshop in the Carlisle area. *c* 160–200
149	1326	Fabric 50	Mancetter-Hartshill. Late second to early third century

Period 5 (Site Phase 9)

Analytical Group 13 (Fig 167)

Contexts 83, 94, 95, 96, 142, 160, 161, 172, 173, 191, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 264, 268, 271, 272, 277, 278, 290, 291, 292, 293, 294, 295, 298, 299, 303, 304, 305, 306, 308, 311, 313, 314, 326, 327, 328, 331, 332, 336, and 1213

This group derives from the backfilling of the sub-floor of the south *horreum*, Building 197, prior to the relaying of the flagstone floor. Unlike other Analytical Groups this has good independent dating evidence which contradicts what would have previously been the standard interpretation of the dating for the pottery assemblage.

The 23 coins from this group (see report by Davies, this volume) include 17 *aes* dating from 270 to 348, after which there is an abrupt halt. That later coins were used in some numbers on the site is demonstrated by the fact that the 12 coins from the deposit represented by Analytical Group 15 contained seven coins later than 348. The two coin groups are almost complementary, and there is little doubt that coins from later than 348 would have been present in Analytical Group 13 had they been in circulation at the time of deposition. It is unlikely, therefore, that this backfill was deposited much after *c* 350. It should be reiterated and re-emphasised here that this group could not have been more securely sealed than by the heavy flagstones of the *horreum* floor. It is also unquestionable that the coins and pottery recovered here had been in contemporary use.

Fourth-century groups of this quality are very rare on the northern frontier, and the chronological importance of such independently dated groups has recently been emphasised (Fulford and Huddleston 1991, 43). It should, therefore, be regarded as a benchmark group for the mid-fourth century.

Without the coins, the group would previously have been dated to the later fourth century, largely on the basis of the relative proportions of jars in Huntcliff ware (Fabric 3). Gillam 163 jars exceed Gillam 161 by 118% to 93% (rim percentages). Gillam 163, however, is conventionally dated (Gillam 1970, 18) to 360–400, while Gillam 161 is considered to have a date range of 300–370. A Lower Nene Valley flanged bowl, No 174, is also usually dated to the later fourth century.

The high percentage of BB1, 54%, is unusual for an assemblage of this date. Large numbers of plain dishes, Gillam 329, and cooking pots are represented though none are obviously good fourth century types. This might suggest that much of the assemblage was probably residual, though the absence of such cooking-pot types could be the result of other factors. A degree of redeposition is indicated, however, which is consistent with the occurrence of later third-century coins in the deposit.

It is clear that this group is later in date than the final ditch fill, Analytical Group 9. The latter group contained 1.03% Huntcliff ware and there is 20.27% in Analytical Group 13. This is also supported by the mortaria statistics. Mancetter-Hartshill mortaria make up only 10% of mortaria from the present group, while Crambeck products account for 70%. In Analytical Group 9, 66% of the mortaria were Mancetter-Hartshill and Crambeck was not represented.

In view of the close dating of this group it is clear that several well known types must now be considered to have been in production by an earlier date than hitherto thought. The types concerned are represented below with their conventional dating in parentheses. These are:

Huntcliff ware (Fabric 3) Gillam 163 (360–400)

Lower Nene Valley colour-coated ware (Fabric 6) Gillam 230 (360–400)

Crambeck Parchment mortaria (Fabric 52) Corder and Birley (1937) Type 8. (Later fourth century)

(Fabric 10) Gillam 164 (380–400)

cat no	*context*	*description*	
150	336	Fabric 1	Gillam (1976) 3. Mid- to late second century
151	161/172/173/	Fabric 1	Gillam (1976) 10 Late third century
152	305	Fabric 1	Gillam (1976) 8. Mid-third century
153	237	Fabric 1	Gillam (1976) 8.
154	237	Fabric 1	Gillam (1976) 8.
155	235	Fabric 1	Gillam (1976) 12/13. Early fourth century
156	314/327	Fabric 1	Gillam 329. 190–340 Graffito
157	173	Fabric 3	Gillam 161. 300–370
158	94	Fabric 3	Gillam 161
159	237	Fabric 3	Gillam 161
160	237	Fabric 3	Gillam 161
161	237	Fabric 3	Gillam 161
162	235	Fabric 3	Gillam 163. (360–400)
163	237	Fabric 3	Gillam 163
164	272	Fabric 3	Gillam 163
165	172	Fabric 3	Gillam 163
166	94	Fabric 3	Gillam 163
167	•234	Fabric 3	Gillam 163
168	234	Fabric 3	Gillam 163
169	173	Fabric 4	Corder and Birley (1937) Type 1. Fourth century
170	327	Fabric 4	Corder and Birley (1937) Type 1
171	95	Fabric 4	Corder and Birley (1937) Type 1a. Fourth century
172	237	Fabric 6	Howe *et al* (1981) 57. Fourth century
173	236	Fabric 6	Gillam 341. 180–230
174	236	Fabric 6	Gillam 230. 360–400
175	237	Fabric 7a	Gillam 46. 220–60
176	290	Fabric 10	Gillam 164. 380–400
177	278	Fabric 16	Dales type
178	237	Fabric 23	Gillam 151. 190–260. In use by 223–5 at Vindolanda
179	294	Fabric 12	A second century form. Residual
180	336	Fabric 12	Crudely decorated in imitation of samian
181	173	Fabric 52	Corder and Birley (1937 Type 6. Fourth century

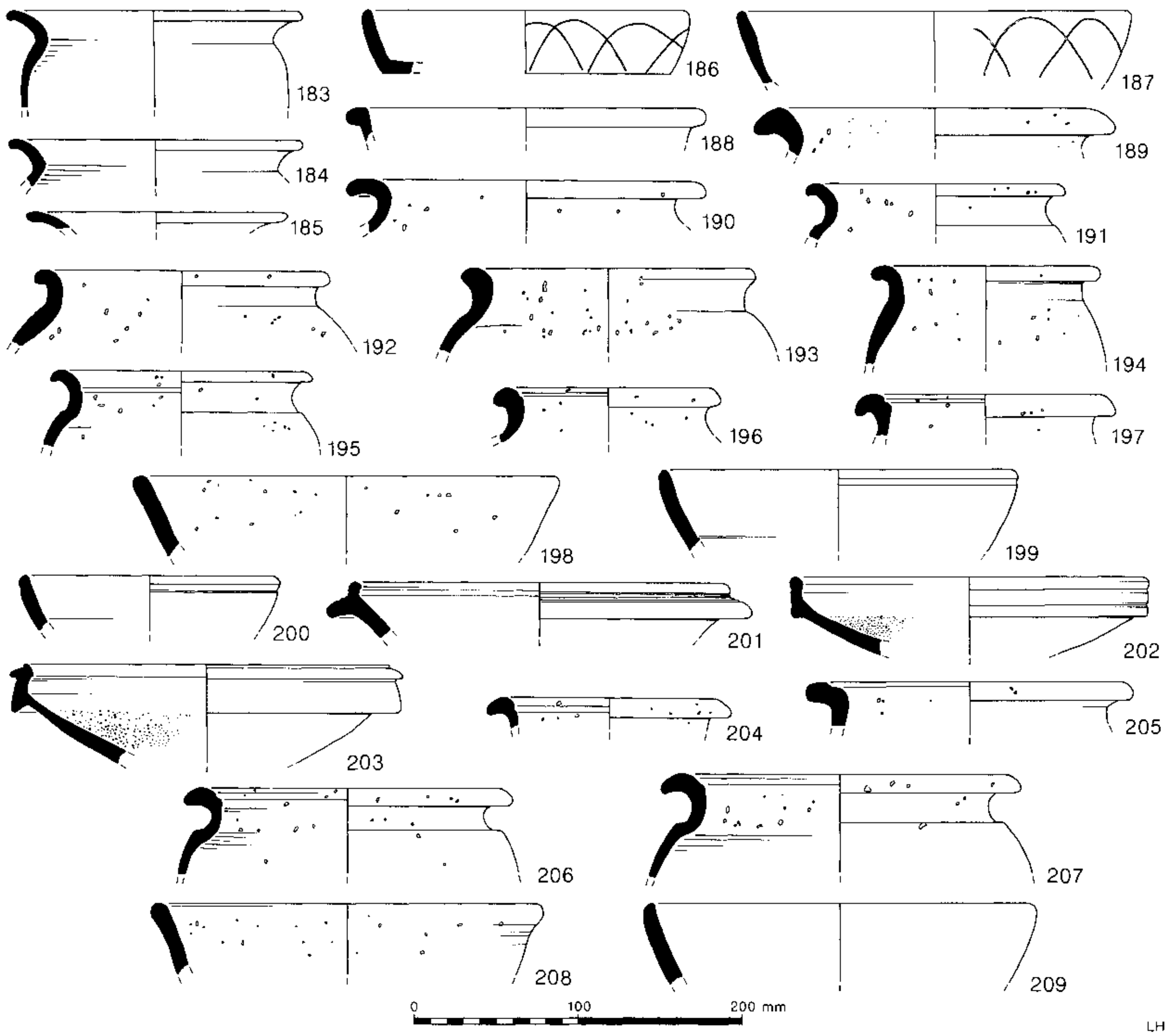

Fig 168 Roman coarse pottery: Analytical Group 14 (scale 1:4)

182	173	Fabric 52	Corder and Birley (1937) Type 8. Later fourth century

Period 5 (Site Phase 10)

Analytical Group 14 (Fig 168)

Contexts 68, 69, 84, 101, 107, 157, 158, 165, and 166 This group consists of the material accumulated above the flagstone floor of Building 197, which sealed Analytical Group 13. It has a *terminus post quem c* 350 derived from the coins beneath the floor.

If context 68 is excluded from the analysis of this group, it equates very closely with that from the back-fill beneath the flagged floor, Analytical Group 13. The proportions of the different wares are very close and the same fabrics are present, except for Fabrics 22 and 23. It may be more significant that the mortaria from this group are all Crambeck products, the residual element of local and Mancetter-Hartshill products having dropped out by the later part of the fourth century.

cat no	*context*	*description*	
183	84	Fabric 1	Gillam (1976) 10. Late third century
184	69	Fabric 1	Gillam (1976) 10
185	69	Fabric 1	Gillam (1976) 14. Mid-fourth century
186	84	Fabric 1	Gillam 329. 190–340
187	69	Fabric 1	Gillam 329
188	84	Fabric 2	Gillam 313. 180–240
189	84	Fabric 3	Gillam 161. 300–370
190	101	Fabric 3	Gillam 161
191	101	Fabric 3	Gillam 161

192	101	Fabric 3	Gillam 161
193	68/101	Fabric 3	Gillam 161
194	84	Fabric 3	Gillam 161
195	84	Fabric 3	Gillam 163. (360–400)
196	101	Fabric 3	Gillam 163
197	101	Fabric 3	Gillam 163
198	101	Fabric 3	Gillam 332. 340–400
199	101	Fabric 4	Corder and Birley (1937) Type 2a. Fourth century
200	101	Fabric 4	Corder and Birley (1937) Type 2a
201	101	Fabric 52	Corder and Birley (1937) Type 6. Fourth century
202	101	Fabric 52	Corder and Birley (1937) Type 9. Fourth century
203	68/101	Fabric 56	Corder and Birley (1937) Type 8. Later fourth century

Context 68 contrasts quite markedly with the stratigraphically earlier elements of this group listed above. BB1 has dropped to 5.6% by weight and is entirely residual at this time. Huntcliff ware (Fabric 3) is now about 61% of the coarse wares with the proportions of Gillam 161 to Gillam 163 being 29% to 83% (rim percentages). Crambeck Grey ware is now 21% of the material. The range of fabrics has dropped from 13 to 9 indicating the dominance of the Yorkshire potteries at this time. This context produced the latest coin found at Birdoswald, dated 388–95.

cat no	*context*	*description*	
204	68	Fabric 3	Gillam 163. (360–400)
205	68	Fabric 3	Gillam 163
206	68	Fabric 3	Gillam 163
207	68	Fabric 3	Gillam 163
208	68	Fabric 3	Gillam 332. 340–400
209	68	Fabric 4	Corder and Birley (1937) Type 2. Fourth century

Analytical Group 15 (Fig 169)

Contexts 1519, 1520, 1521, and 1522
This group consists of the 1.71kg of pottery from the gradual backfilling of the sub-floor of Building 198. There is less variety of fabric and less residuality in the group than is found in Analytical Group 13. This perhaps reflects the fact that the group developed naturally in the later fourth century and did not include material redeposited from elsewhere. This is demonstrated by the numismatic evidence (Davies this volume, chapter 12, Coins). Out of 12 coins from the group, seven post-date 348. The coins may be considered as complementary to the group associated with Analytical Group 13 which stop abruptly in 348.

The proportion of BB1 is 28%, compared to 54% in Analytical Group 13, and the proportion of Huntcliff ware is greater at 29% as compared with 20% in the earlier group, although there is only one sherd of Gillam 163 and no Crambeck Parchment ware (Fabric 5) other than mortaria.

There were only four sherds of mortaria, three of Mancetter-Hartshill and one of Crambeck. The Crambeck sherd (unillustrated) is probably from a Corder and Birley (1937) Type 8.

cat no	*context*	*description*
210	1522	Fabric 1
211	1522	Fabric 1

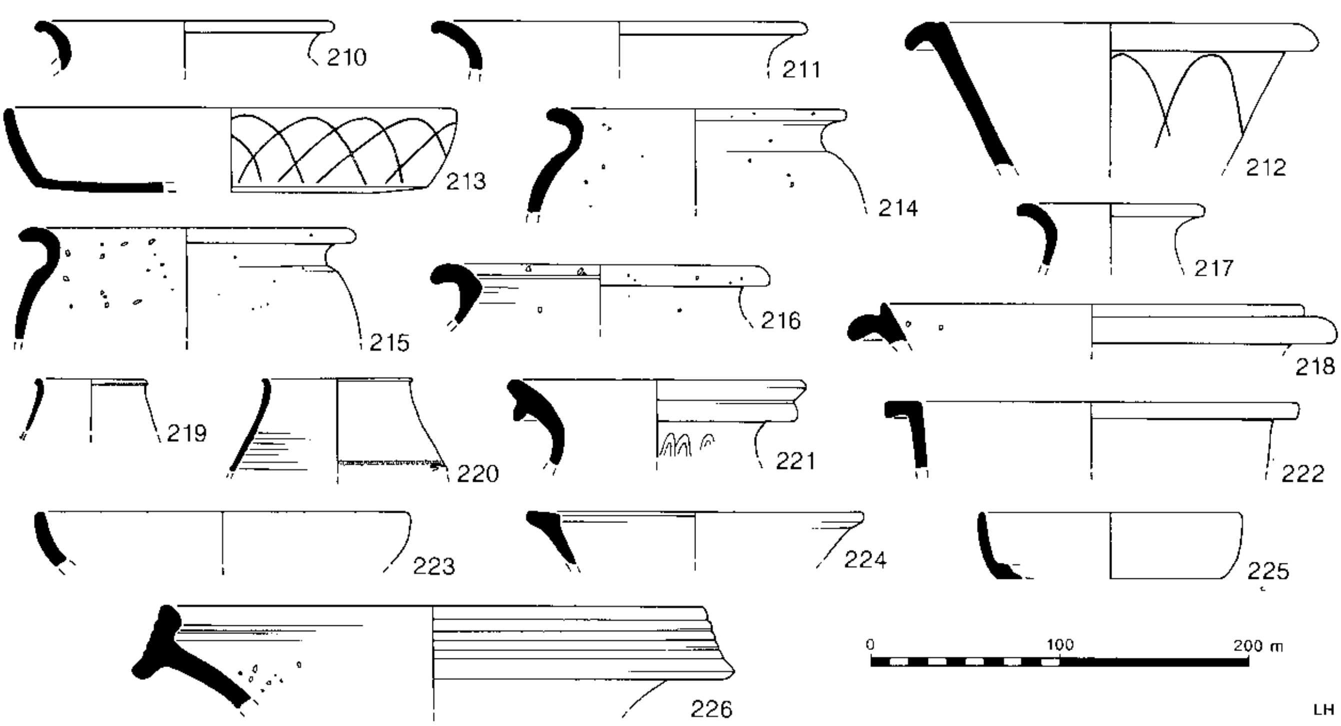

Fig 169 Roman coarse pottery: Analytical Group 15 (scale 1:4)

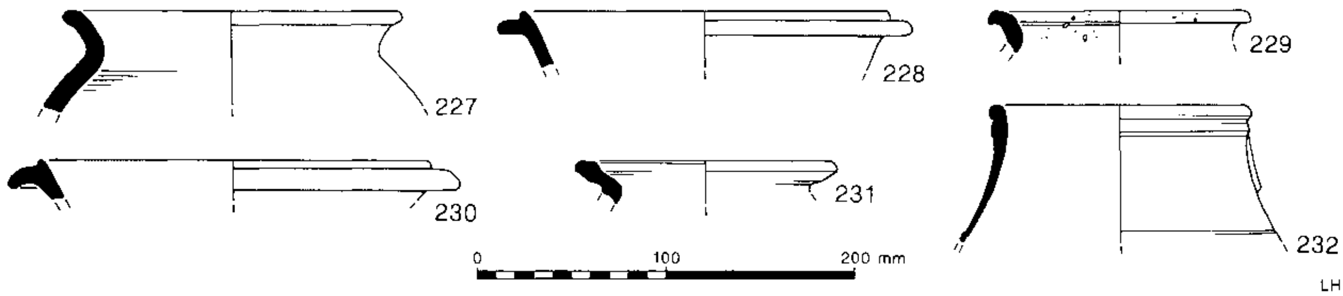

Fig 170 Roman coarse pottery: Analytical Group 16 (scale 1:4)

212	1520	Fabric 1	Gillam (1976) 42. Late second to early third century
213	1519	Fabric 1	Gillam 329. 190–340
214	1519	Fabric 3	Gillam 161. 300–370
215	1520	Fabric 3	Gillam 161
216	1521	Fabric 3	Gillam 163. (360–400)
217	1522	Fabric 4	Corder and Birley (1937) Type 3; two holes drilled in fragment. Fourth century
218	1520	Fabric 4	Corder and Birley (1937) Type 1. Fourth century
219	1520	Fabric 7a	Gillam 46. 220–260
220	1522	Fabric 7a	Gillam 48. 200–250
221	1522	Fabric 11	Probably an East Yorkshire product
222	1519	Fabric 11	Late first to early second century
223	1519	Fabric 12	Gillam 325. 90–130
224	1522	Fabric 19	Gillam 157. Dales ware 280–340
225	1520	Fabric 37	Oxford product. Young (1977) Type C94.1. 300–400+
226	1520	Fabric 50	Mancetter-Hartshill. Gillam 282. 230–340

Analytical Group 16 (Fig 170)

Context 1506

The latest large-scale Roman resurfacing of the *via principalis* produced only a small amount of pottery, 665g, the latest of which dates to the late fourth century.

cat no	*context*	*description*	
227	1506	Fabric 1	
228	1506	Fabric 1	Gillam (1976) 46. Late third to early fourth century
229	1506	Fabric 3	Gillam 163. (360–400)
230	1506	Fabric 4	Corder and Birley (1937) Type 1 Fourth century
231	1506	Fabric 11	Dales type
232	1506	Fabric 35	Jar with appliqué handle

Period unknown: Area G

Analytical Group 17 (Fig 171)

Contexts 473.27 and 473.33

This group comes from the dumped material overlying the ovens in the south-east angle tower of the fort, excavated as Area G in 1992.

cat no	*context*	*description*
233	473.33	Fabric 1
234	473.33	cf Fabric 1 but with dark grey core and pinkish-grey surfaces; possibly a local BB1 imitation.
235	473.33	Probably Fabric 2 but with dark grey surfaces, a red-brown core edge and inferior burnishing. Slightly reminiscent of vessels with mixed BB1/BB2 characteristics noted at York (Perrin 1981, 55; 1990, fig.122, 1353), though most of these had burnished lattice decoration.
236	473.27, 33	Fabric 11. The groove at the base of the neck may have been unintentional and the result of over-trimming of the shoulder.
237	473.33	Fabric 11. Form and faceted burnishing imitating BB1 vessels.
238	473.33	Fabric 11. Faceted burnishing on internal and external base; the latter also shows traces of a burnished loop decoration. Both of these would appear to be in imitation of the decoration commonly found on BB1 vessels.
239	473.33	Reddish-yellow fabric with lightly-burnished surfaces. Could be Fabric 12 but the form is similar to vessels of apparent North African type possibly manufactured at York. Examples have been noted at a number of military sites in Northern Britain, including Carlisle (Swan 1992, 22–6, Appendix 3 and fig 3).

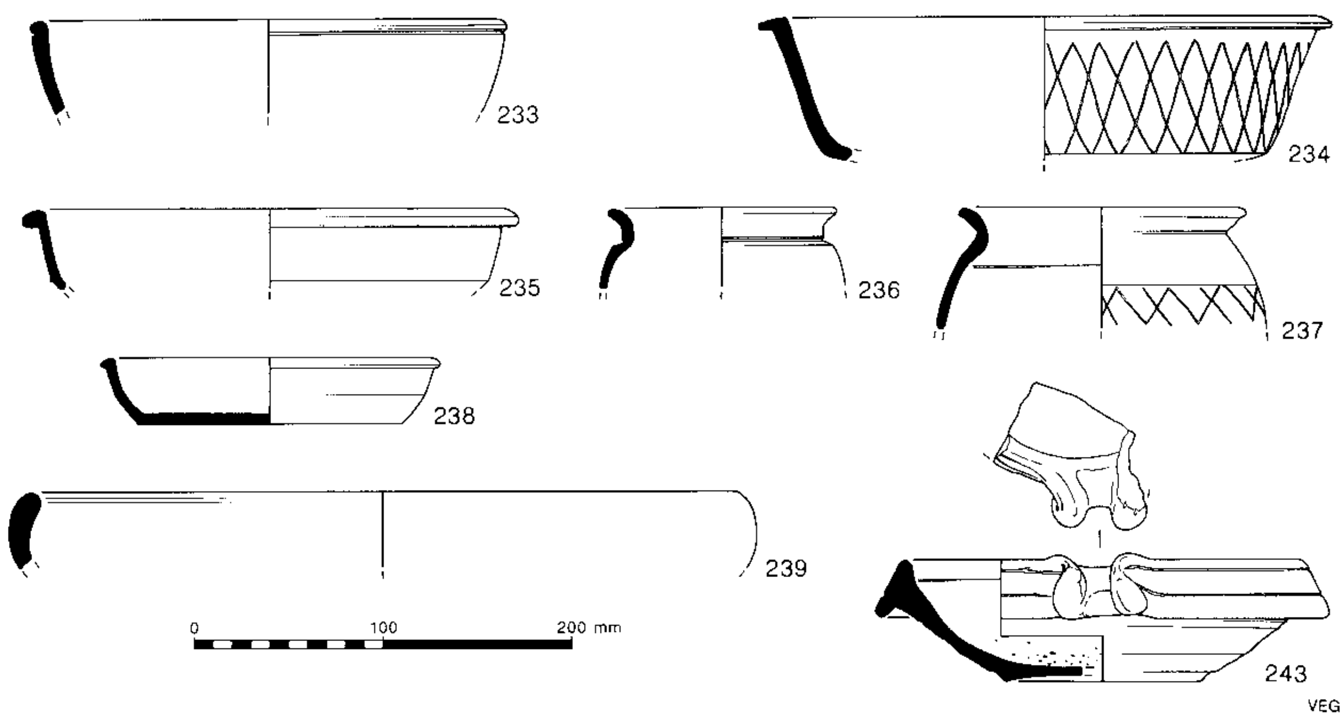

Fig 171 Roman coarse pottery: Analytical Group 17 (scale 1:4)

240	473.33	Beaker rim, Lower Rhineland colour-coated ware. Later type of cornice rim with splayed top edge.
241	473.33	Fabric 24. Jar rim
242	473.33	Fabric 6. Beaker sherd
243	473.33	Very hard dark orange-brown fabric. The vessel is self-coloured except for a red-brown slip, used in Rhaetian style, on the collar only, apart from a few splashes further down the external surface.

No 243 also has moderate to fairly frequent, ill-sorted and irregularly dispersed, quartz inclusions with rare opaque dark grey material.

The trituration grit is mixed quartz and red-brown sandstone with rare greyish-white rock, ? sandstone.

The lower two-thirds of the exterior, including the underside of the base which has almost been modelled into a footring, have been deliberately trimmed and burnished up to the 'sight-line' of the flange. The vessel is well-worn.

Hammerheads divided into three zones were made from *c* 150 but probably only became common sometime in the period 180–210. They were most common in the first half of the third century but probably continued to be made in dwindling numbers afterwards. Hammerheads with Rhaetian-style slip are uncommon because the practice of using it had died out before the hammerhead became a common form. This hammerhead form originated in the Mancetter-Hartshill potteries and the spout on this vessel is identical with spouts used there in *c* 150–80. A similar date is, therefore, likely for this vessel. A close parallel, even to a basically similar spout, is published from Carlisle (McCarthy 1990, fig 187, 34), though the fabric is wrongly assigned in the report (not 613, Mancetter-Hartshill (ibid, 251) or 623, Crambeck (ibid, 204), possibly 604). A Carlisle origin is likely for both vessels.

(JRP notes) Another similar vessel occurred at Ribchester (Edwards and Webster 1985, fig. 19, 238) though the date assigned to it in the report (*c* 100/50) does not fit with either that given for the context or the comments on the next vessel, also a sub-Rhaetian mortarium. The later Wilderspool Rhaetian mortaria included similar vessels (Hartley and Webster 1973, fig. 12, 122, 124).

Miscellaneous (Figs 172–176)

cat no	*context*	*description*
244	1688	Fabric 23. Same fabric as Gillam 151. (cf Bidwell 1985, fig 70, no 120)
245	1689	Fabric 1. An East Yorkshire product?
246	4127	Fabric 1. BB1 jug
247	1918	Fabric 39. Possibly a Colchester product (cf Hull 1963, fig 54 no 2). For similar subject matter on a vessel from Great Chesterford, Cambs, see Johns (1982, fig 78) and Webster (1989, 9, fig 2.16).

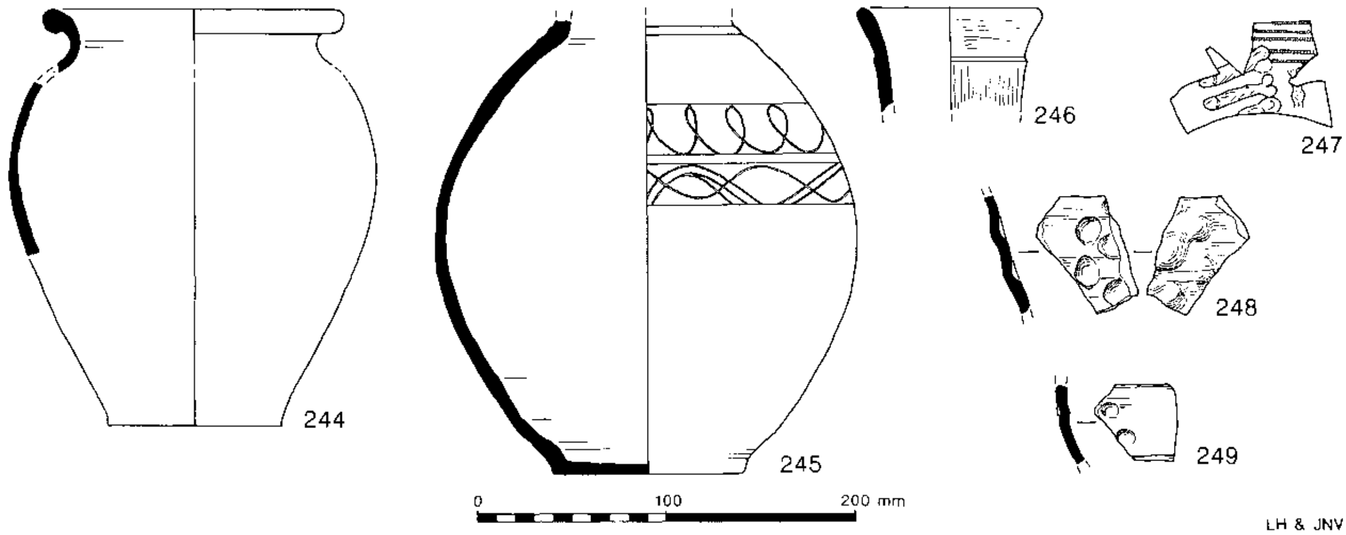

Fig 172 Roman coarse pottery: Miscellaneous (scale 1:4)

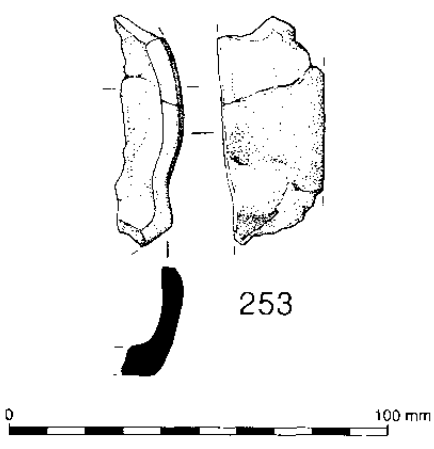

Fig 173 Ceramic lamp (scale 1:2)

248 473.7 Fabric 12? Fragment of pot with plain bosses pushed out by finger from the inside of the vessel. The effect is reminiscent of decoration associated with face or head pots, but on these the bosses are always decorated.

249 363 Sandy fabric with abundant pink, grey, and translucent quartz inclusions with some ironstone. Essentially buff-cream in colour but has a pink/buff/pink sandwich core and pink/reddish-yellow surfaces. External surface has also been covered with a red slip. Decorated with two dimples, possibly part of a ?repeating triangular motif in a zone(s?) separated by grooves. Could be part of a bowl or jar. The fabric is probably not local, and is not dissimilar to that of Verulamium, Oxfordshire, or the Upper Nene. It could conceivably be an import.

250 1465: 963 Lamp, Oxidised fabric, ?local, possibly Fabric 27. Traces of burnt oil along rim and extending a little way down both internal and external surfaces. Mr D Bailey of the British Museum comments on this form: an open lamp of Loeschcke (1919) Type XI with an unusual angular wick-rest. The type itself was in use from Augustan to Antonine times and other examples are known from Britain (Bailey 1988, 155–6).

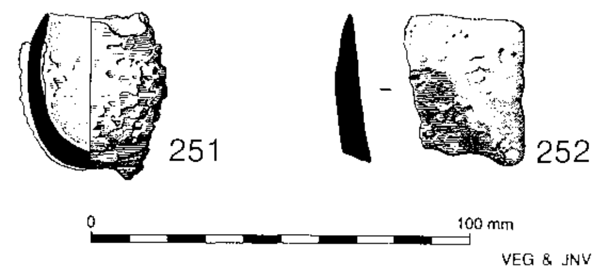

Fig 174 Crucibles (scale 1:2)

Crucibles (Fig 174)

cat no context description

251 3792 Crucible. Not enough residue remains to identify metal involved.

252 473.33 Crucible fragment. Not enough residue remains to identify metal involved.

Waster

253 2924 A fragment of a pottery waster, which unfortunately, having been badly encrusted, disintegrated into many pieces during washing. (Not illustrated)

Amphora Stamps (Fig 175)

cat no context description

254 1500 Fabric 100 Callender (1965) 922. L Q S. *c* 80–130

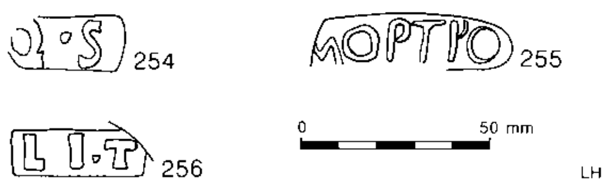

Fig 175 Amphora stamps (scale 1:2)

255 1409 Fabric 100 Unidentified
256 3791 Fabric 101 Callender (1965) 878. 150–98

Stamped mortaria (Fig 176)
by K F Hartley

257 3901
Fabric 55. Two joining sherds of a mortarium in hard, orange-brown fabric (2.5YR 6/6) with redder core (2.5YR 5/8) and very thin cream slip. Inclusions: moderate, mostly small quartz and opaque black, with some much larger black ?slag and rare pale sandstone. Trituration grit consists of quartz, clusters of quartz grains and sandstone. The partially impressed stamp is from a die which probably gives AVSTN/MAN when completely impressed.

258 4222
Fabric 55. (2.5YR 5/8), generally similar to No 257 but not quite so hard; some widely dispersed quartz and fewer black (?slag) inclusions. No trituration grit survives. The broken stamp is from the same die as No 257.

Nos 257 and 258 are two different mortaria with stamps from the same die of Austinus. In the lower line MAN is for *manu*, 'by the hand [of Austinus]'; similar abbreviations are commonly used in samian stamps but are extremely rare in mortarium stamps. Another

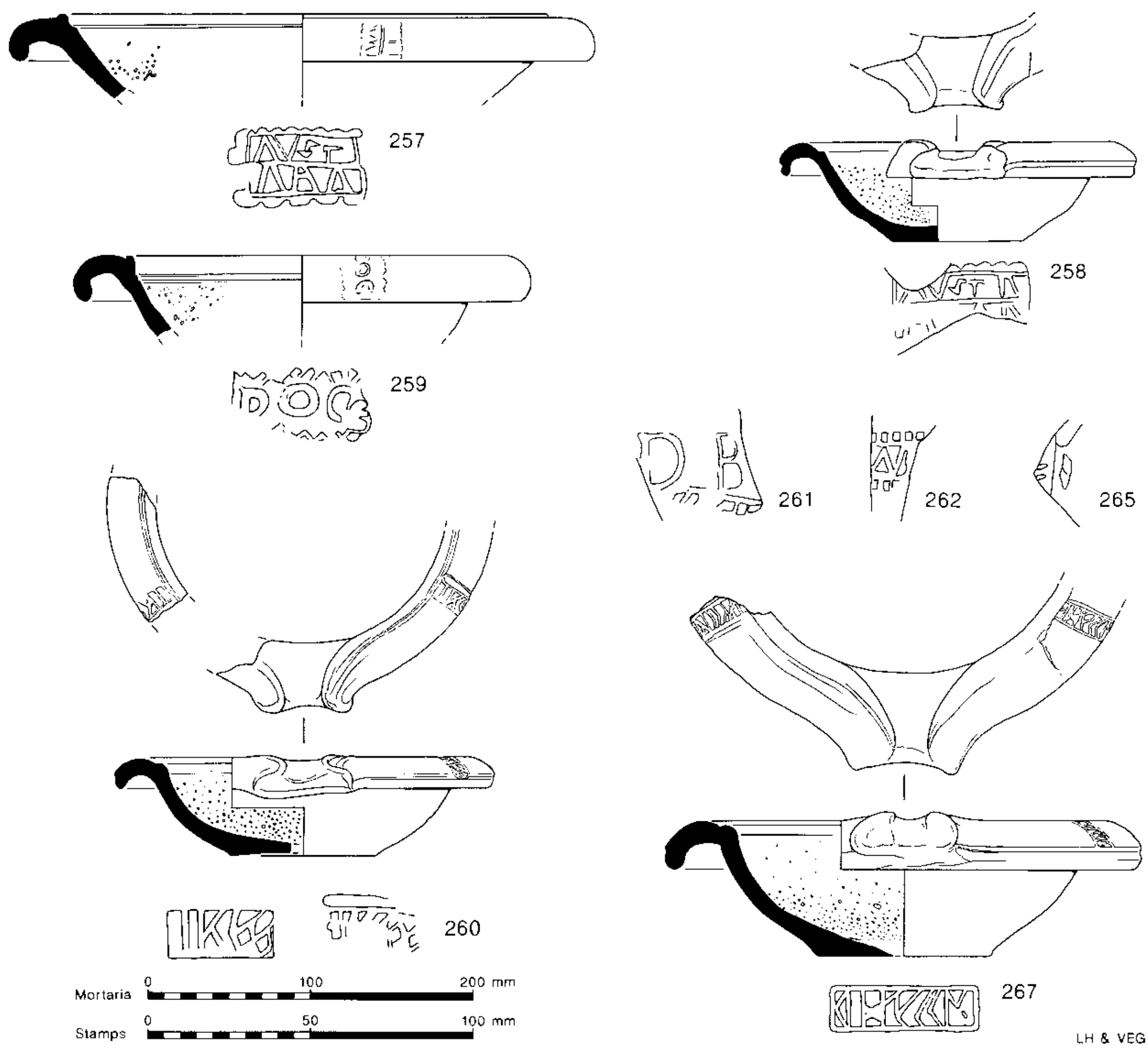

Fig 176 Stamped mortaria (scale: mortaria 1:4, stamps 1:2)

mortarium of his has already been recorded from Birdoswald, in the Vallum filling (Swinbank and Gillam 1951, fig 1, no 8). His work and its distribution have much in common with that of Doceilis or Docelis, except that more of his mortaria (up to 20) are from sites in Scotland. Austinus undoubtedly began stamping mortaria in the potteries at Wilderspool, Cheshire, but the Birdoswald examples and probably most of his products can be attributed to the Carlisle area. There is, however, a sufficient quantity of his work in Scotland to strongly indicate some activity there in the latest part of his career. His activity at Wilderspool was probably within the period 115–35, while that in the Carlisle region and Scotland is probably within the period 130–65.

259 1593/348
Fabric 71. Two joining sherds from a self-coloured mortarium in hard, orange-brown fabric (2.5YR 6/8), paler at the surface and with brown-buff core (7.5YR 7/6). Inclusions: moderate, ill-sorted quartz, opaque red-brown and rare black material. Trituration grit: quartz, red-brown sandstone and rare flakes of *galena*.

The incompletely impressed stamp reads DOCI with I barring the opening of the C. Doceilis or Docelis probably worked for a short period at Wilderspool before moving to the Carlisle area, where his main production is certain to be located (see the Lanes, Carlisle, forthcoming for discussion of his name). Two of his stamps have already been noted from Birdoswald. Over sixty of his stamps are known from sites mainly in north-west England, with 12 of these on 8–11 mortaria found in Scotland. A likely date-range for his production is 120–55.

260 3910
Fabric 74. Fragments making up an almost complete mortarium in extremely hard, dense, and technically overfired fabric, though there is no reason to doubt that the vessel was in use. The fabric is mostly black with chocolate-brown core but the surface is sufficiently orange-brown to suggest that this was the intended colour; there is no evidence of any slip. Inclusions: moderate, very ill-sorted, quartz. Much of the trituration grit has fallen out possibly during firing, the rest is composed of quartz with some sandstone.

Potter's stamps survive to both sides of the spout; both are incompletely impressed but preserve one end of the stamp, and the retrograde reading]IRN is possible, using the border to complete the N. One other unpublished stamp from the same die is recorded from Kirkby Thore. Fairly local production may be assumed, perhaps in the valley of the River Petteril where mortaria of the same type were almost certainly made at Scalesceugh. The two mortaria are of similar type, and production of this form in this area would best fit a date within the period *c* 110–40.

261 204
Fabric 54. Fragment with incomplete rim-section from a self-coloured mortarium in hard, very fine-textured, deep orange-brown fabric (2.5YR 6/8), with some ill-sorted quartz, black (?slag) inclusions and rare flecks of *galena*. No trituration survives. The incompletely impressed stamp, placed slightly diagonally on the flange, preserves].B from the lower line of a stamp, which when complete reads D.I.S./L.D.B. Two other mortaria of his have been noted from Birdoswald (not published). DIS/LDB began to stamp mortaria when working in the potteries at Wilderspool and probably moved later to the Carlisle area. His distribution suggests that approximately half, or almost half, of his activity was at Wilderspool before going to the Carlisle area. His period of production was primarily Hadrianic and no stamp of his has been found in Scotland. (For further details see Smith 1978, 46, no 75; Hartley and Webster 1973, fig 8, F93, 98.)

262 388
Fabric 55. Mortarium fragment with incomplete rim-section in pinkish-brown fabric (2.5YR 6/6), orange-brown at the surface, with slight traces of a thin cream slip. Inclusions: very moderate, ill-sorted and randomly dispersed, quartz and red-brown sandstone with rare flakes of mica. No trituration survives. The fragmentary stamp has been recorded only once before, from Castle Street, Carlisle (Taylor 1991, fig 304, no 17). On both occasions the die was impressed twice close together but the name of the potter is unclear. His work can be attributed to the north-west, probably in the Carlisle area and his forms suggest an Antonine date.

263 388
Flange fragment in self-coloured, softish, orange-brown fabric (2.5YR 5/8), with very moderate quartz and few ?slag inclusions. The poorly impressed and abraded stamp cannot be identified but the stamp is a narrow one. Production in the north-west is probable and a date around the mid-second century likely.

264 204
Fragment with incomplete rim-section in hard, orange-brown fabric with thin blackish core and moderate quartz, and a few blackish inclusions. The trituration grit included quartz and red-brown sandstone. The fragmentary stamp, probably in two lines, has not been identified. The rim-profile is similar to No 256, and similar origin and date are probable.

265 1301
A flange fragment in hard, fine-textured cream fabric. Inclusions: very moderate, small quartz, light brown and black material, and one very large piece of ?diorite. No trituration grit survives. The fragmentary stamp preserves only part of the border and fragments of two to three letters. The fabric and form clearly point to

manufacture in the Mancetter-Hartshill potteries within the period 130–70.

266 unstrat
A third of a well-worn mortarium in a very pale, brownish fabric with thick light-grey core merging into the surface colour. Cream slip. Inclusions: moderate quartz and red-brown sandstone. Trituration grit: fairly frequent, large to small-sized white quartz and brown sandstone with occasional fragments of tile. One almost complete stamp and a fragment from the second survive, from a die of Anaus who worked mainly at Corbridge, probably within the period *c* 155/60–75. His distribution would fit earlier activity further south, perhaps at Binchester *c* 130–55/60. The Birdoswald mortarium is undoubtedly in Corbridge fabric.

267 473/18
Self-coloured, hard, bright orangey-brown fabric. Inclusions: random, very ill-sorted, fairly frequent, mostly quartz with rare red-brown sandstone. Trituration: quartz and sandstone, some light-coloured.

There are a few unusual fine concentric grooves on the inside. The stamps surviving to both sides of the spout may be illegible rather than illiterate, but they are clearly recognisable. No other stamp from the same die is known. Mortaria with rounded flange and distal bead and in basically similar fabric are found at Birdoswald (see No 260), Milecastles 48, 50, and 65, but also at High Crosby on the Stanegate. A date within the period 110–40 is certain. Although they do not have identical readings to the stamps on this mortarium, stamps associated with some of the above mortaria have enough similarity to suggest that they might have been made in the same workshop. The pottery producing all of them is likely to have been in the Carlisle region.

The Samian ware

Decorated samian and potters' stamps by Brenda Dickinson
Plain ware identifications by J Mills

Summary

Sherds of at least 117 decorated samian bowls were recovered, three with potters' stamps, and there were a further 23 stamped plain ware vessels. The bar chart (Fig 177), representing average annual loss, was produced by dividing the number of identified potters' stamps and assigned decorated bowls from given date ranges by the number of years in each range. The total of 112 vessels on which the bar chart is based is a rather small sample which should be treated with care, particularly as the evidence of the plain ware has not been examined by the present writer. The bulk of the samian is residual but there is some which gives evidence of activity on the site before and during the construction of the stone fort.

The percentages of decorated ware and potters' stamps by source are:

South Gaulish	0.6%
Central Gaulish (Les M-de-V)	1.1%
(Lezoux)	87.6%
East Gaulish	10.6%

B R Hartley's (1972) paper on the Antonine occupations of Scotland has been used as the basis of statistical comparison for the Hadrianic and Antonine periods, and while it must be remembered that excavations on Hadrian's Wall in the intervening years have produced much new material and that at some sites the Hadrianic levels have been more thoroughly explored than ever before, the picture does not seem to have been radically changed by any of the new finds seen by the present writer.

There was clear evidence of Hadrianic activity on the site and, as often on the Wall, a small amount of pre-Hadrianic material was present. This consisted of three decorated bowls from La Graufesenque, all in the style of Mercator i or an associate, and belonging to the period *c* 85–110. One decorated bowl and two stamped dishes, all of Trajanic date, came from Les Martres-de-Veyre. The Hadrianic Lezoux material parallels the Alley group (Birley 1930a) to some extent, with bowls by Acaunissa, Criciro, and the Quintilianus and Sacer groups.

The samian from Site Phase 3 provides a *terminus post quem* of *c* 125 for the beginning of the construction of the defences of the stone fort. From this time larger quantities of discarded samian began to accumulate, reaching a peak *c* 135–40. With one probable and one possible exception, from Les Martres-de-Veyre and Chemery-Faulquemont/Mittelbronn respectively, all the pre-Antonine samian was from Lezoux. It was dominated by the work of the Sacer i-Attianus ii group, which accounted for 14% of the Hadrianic and Antonine material and, to a lesser extent, by X-6, who produced 5%. In this

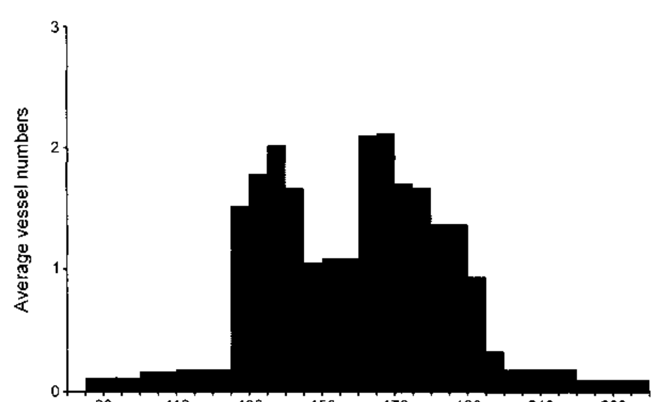

Fig 177 Average loss of decorated and stamped samian

respect Birdoswald is typical of Hadrian's Wall assemblages in general (Hartley 1972, 32, table IV).

The evidence of the decorated and stamped samian could be taken to suggest continued, though reduced, occupation of the site between 140 and 160. Unfortunately most of it was the work of one group of potters and could in theory have reached the site in a single consignment, either in the late-Hadrianic or the mid-Antonine period. The Cerialis-Cinnamus group (ibid, 34) has been given a range *c* 135–60 or later, the later date being assigned on the evidence of small quantities of its wares found in Wall Period IB contexts on Hadrian's Wall. However, the 11% of Hadrianic and Antonine decorated ware supplied by the Cerialis-Cinnamus group in this collection is closer to the proportion from Antonine Scotland (15.6%) than to the 3.4% from both Hadrian's Wall and its hinterland forts (ibid, 33, table V). There was very little early-Antonine decorated ware by other potters, but it is worth noting that seven of the potters whose stamps occur on plain ware are represented in Antonine Scotland, though not always by the same dies. At this point it must be stressed again that the quantity of material under discussion is relatively small. It remains to say that the samian evidence for a reduced occupation, rather than complete abandonment of the fort in the early-Antonine period, is inconclusive, but it would not necessarily rule out some occupation.

The material from Site Phase 5 gives a *terminus post quem* of *c* 130 for the completion of the defences and primary building construction.

The range of the samian from Site Phase 6, excluding the Hadrianic material, was from *c* 150 to the middle of the third century, but it contained nothing which is necessarily earlier than *c* 160. The later decorated ware was dominated by the work of Paternus v (Rogers's Paternus II) and his associates, which accounted for 25% of the Hadrianic and Antonine material. It is noticeable that he and most of the potters in his group are not represented at all in Antonine Scotland, except at Newstead (ibid, 33, table V). Conversely, only 4% of the Hadrianic and Antonine decorated samian in the present collection (three bowls) and 6% or so of the published bowls from the excavations of 1929–32 (Detsicas 1962, 31–50) were in the developed style of Cinnamus ii. His wares are admittedly commoner in Antonine Scotland than on Hadrian's Wall, but the average proportion at Wall forts is in the order of 20% (Hartley 1972, 32, table IV).The significance of this discrepancy is not immediately apparent, but it should be noted that the Antonine decorated ware from the recent excavations was rather heavily weighted towards potters who probably did not start work before *c* 160.

The scope of the samian extended into the third century, but some of the East Gaulish material was contemporary with the mid- and late-Antonine Lezoux ware. For instance, the Rheinzabern bowls of Cerialis v and Ianus ii are by potters who started work at Heiligenberg. They are certainly Antonine, but in Britain will not be earlier than *c* 160. The Argonne bowl is also Antonine.

The East Gaulish assemblage consisted largely of Rheinzabern ware and though there was some Trier and Argonne material, both are better represented elsewhere in the area, at, for instance, Carlisle (Dickinson and Hartley 1971) and Birrens (Wild 1975, 144, 172, 174).

One of the earlier East Gaulish pieces is a bowl of the Satto-Saturninus firm; decorated wares from its moulds were produced at more than one factory in East Gaul, though only one of the two largest, Chemery-Faulquemont or Mittelbronn, is likely to have exported to Britain. Its products are not common here, but some sort of small-scale trade seems to have been established in the area of Hadrian's Wall, to judge by sherds found at Carrawburgh, Stanwix, Wallsend and Birrens, and also at Carlisle and Ilkley. The East Gaulish assemblage based on sherd count comprises:

Rheinzabern	75.00%
Argonne	8.30%
Trier	6.25%
Satto-Saturninus ware	2.00%
East Gaulish, unspecified	8.30%

It is difficult to decide from this collection whether the samian was delivered to the site from the east or the west end of the Wall. The evidence would rest on the supply of East Gaulish ware and there is not enough of this to make a reliable assessment possible.

Catalogue

In the catalogue, illustrated sherds are marked with an asterisk (*).

The Analytical Groups

Analytical Group 1 Figs 178, 179

a) The Turf Wall ditch fill (Contexts 4029 and 4041).

b) The fills of cuts beneath Building 198 (Contexts 1964, 1971, 1973, and 1995).

c) Pottery contained within the rampart of the stone fort comprising material from pre-stone fort occupation scraped up for use here. (North Wall, Area B: Contexts 403, 412, 416, 425, 426, 1365, 1977, 1978, 1998, and 2658).

East Wall, Area F: (1992 excavation) Context 473.18

Decorated wares

1 1365
Form 37 rim, Central Gaulish. The ovolo (Rogers B76) was used by Arcanus and Geminus iii. *c* 125–40.

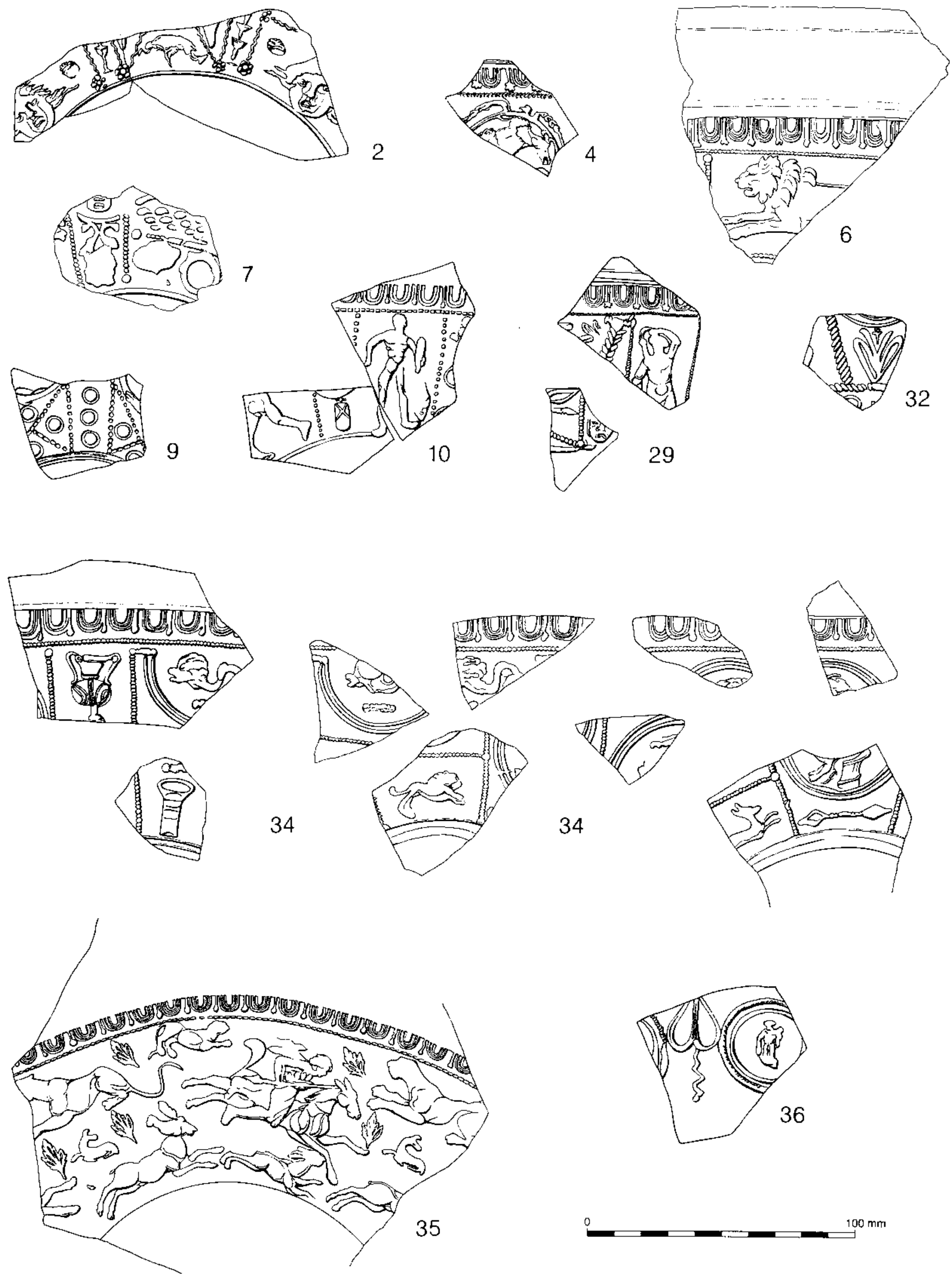

Fig 178 Decorated samian (scale 1:2)

Fig 179 Decorated samian (scale 1:2)

2* 1365; 416
Form 37, Central Gaulish. A panelled bowl, with: [1] a mask, with trailing hair, and a cup (Rogers U62). [2] A tier of cups (Rogers Q50). [3] A saltire with an acanthus in the bottom part (Rogers K13?). [4] = 2. 5) = 1. The wavy-line borders are Rogers A24 and the beaded rosettes are Rogers C280. The tier of cups, borders, rosettes, and perhaps the mask, though without the trailing hair, are on a stamped bowl of Igocatus (X-4) from Colchester (S & S 1990, pl 171, 2). This potter worked at Les Martres-de-Veyre, but the bowl is in Lezoux fabric. The transference of moulds from one production centre to another is not unusual and does not necessarily imply that the potter himself moved. The fabric of the Birdoswald piece suggests Hadrianic date.

3 416
Form 37, Central Gaulish. The ovolo (Rogers B29) was used at Les Martres-de-Veyre by Igocatus (X-4), but the bowl is in Lezoux fabric and is presumably Hadrianic. Cf 2 above to which this may belong.

4* 425
Form 37, Central Gaulish. The rosette-tongued ovolo (Rogers B24) and large vine-scroll (Rogers M2) were both used by the Large S potter, who worked in the Hadrianic period, almost certainly at Lezoux. *c* 125–40.

5 473.18; 473.22
Form 37 (3 sherds) Central Gaulish, Hadrianic.

6 473.18
Form 37, Central Gaulish, in the style of Arcanus or Geminus iii. *c* 125–45.

7 473.18
Form 37 (2 sherds), Central Gaulish, in the style of Sacer i or an associate. *c* 125–45.

8 473.22
Form 30, Central Gaulish. Hadrianic or Antonine.

Plain wares

Contexts 403, 412, 412/416, 416, 425, 426, and 1365 (also 1365 with a joining sherd in 1675 (Site Phase 13))

22 CG (LM) sherds from forms 15/17R or 18/31R (1), 18/31 (15), 18/31? (1), 27 (2), 33 (1), uncertain (2) of Trajanic or Trajanic/Hadrianic date. These include stamps St8 and St12.

22 CG (L) sherds from forms 15/17V (4), 18/31 (7), 18/31R (4), 18/31 or 31 (1), 31 (2), a cup (1) and uncertain (3). These include stamps 21 and 22. The date ranges are: Hadrianic, Hadrianic-early Antonine, Hadrianic-Antonine, Antonine, first half of second century, and second century.

Context 473.18
1 CG Form Curle 11 (2 sherds), Hadrianic.
1 SG Form 18 or 18/31, late C1 or early C2.
1 CG (LM) Form 15/17 (2 sherds, overfired and slightly burnt), Trajanic.

Stamps (see below)

St8	*c* 110–25
St12	*c* 110–25
St21	Hadrianic
St22	Hadrianic

Analytical Group 2

Contexts 2912, 3930, 4137, 4335, 4348, 4355, 4356, 4357, 4375, 4376, 4379, 4381, and 4382

Decorated wares

9* 3930
Form 37, Central Gaulish. This is in a style of X-6 which is associated with a cursive signature Catull[, (retr), on a bowl from Lezoux (S & S 1990, pl 171, 8). The arrangement of the decoration is closely paralleled on a bowl from Corbridge (S & S 1958, pl 74, 1) and it has the same beads, rings, and festoons. The strong ridge between two slighter ridges which closes the decoration was presumably made by a template and is one of the diagnostic features of this style (and cf ibid, 10–11). *c* 125–50.

10* 3930
Form 37, Central Gaulish. The single-bordered ovolo and borders of well separated beads are on a bowl from the Castleford *vicus* with a mould-stamp of Sacroticus. This potter's stamps are on plain ware from a pottery shop on the same site, which was destroyed by fire in the 140s (Hartley & Dickinson, forthcoming). There are also parallels in the work of Curmillus, who used the ovolo, the Perseus, or Hercules figure, D.450 = 0.7B2 and the pedestal, Rogers P8O (information from Mr George Rogers). The other figure is a Cupid or athlete. There is clearly some connection between the two potters, but it is not possible to say which of them made this bowl. *c* 130–50.

11 4356
Form 37, Central Gaulish. Two sherds from a bowl with a band of rings between bead-rows across the middle of a panel. The adjacent panel may contain a scarf-dancer to right. The lack of junction-masks on the borders and the beads themselves recall the Catull-style of X-6. *c* 125–50.

12 4376
Form 37, Central Gaulish. A heavily abraded sherd, with ovolo, Rogers B15(?), and a wavy line below. A saltire has an acanthus at the top (one of the series

Rogers KI6–35), a festoon symmetrically arranged across the middle and dividers (tiers of cups?), topped by masks, as side borders. The adjacent panel contains a figure to right. There are no close parallels for individual details, but the decoration as a whole is characteristic of the Hadrianic period.

13 3930
Form 37, Central Gaulish. Hadrianic or early-Antonine.

14 2912
Form 30 or 37 footring, Central Gaulish. Hadrianic.

Plain wares

1 CG (LM) sherd of uncertain form of Trajanic–Hadrianic date.

5 CG (L) sherds from forms 18/31 (1), 18/31R (2), 33 (1) and uncertain (1). The date ranges are: Trajanic–Hadrianic, Hadrianic, first half of second century and Hadrianic-Antonine.

Stamp (see below)

St2 *c* 130–50

Analytical Group 3

Contexts 1845, 1846, 1848, and 4130

Decorated wares

15 1848
Form 37, Central Gaulish, in the style of the Sacer i group. *c* 125–45.

16 1848
Form 37, Central Gaulish, in the style of Attianus ii. *c* 125–45.

17 1848
Form 37, Central Gaulish, in the style of Tittius or X-6. *c* 125–50.

Analytical Group 4

Context 3771

Decorated wares

18 3771
Form 37, in the style of Drusus i (X-3) of Les Martres-de-Veyre, with double festoon, his characteristic anchor (Rogers G395) and a basal wreath of chevrons (Rogers G366), with a dotted border above (Rogers A4). *c* 100–20.

19 3771
Form 37, Central Gaulish. Hadrianic or early Antonine. (3771:307,309, joining an unnumbered sherd).

20 3771
Form 37, Central Gaulish. Hadrianic or early Antonine.

21 3771
Form 37, East Gaulish, Rheinzabern ware. The scheme of decoration is unclear, but a double medallion (perhaps Ricken-Fischer 1963, K56), roundel (ibid, O131) and leaf (ibid, 99) are involved. The ovolo (ibid, E1) is on a stamped mould of Cerialis v from Rheinzabern (Ricken 1948, Taf 62, 12), the roundel on a stamped bowl (ibid, Taf 42, 1). Cf ibid, taf 42, 2 for a medallion which may be the same as on the Birdoswald bowl. *c* 160–80.

22 3771
Form 37, East Gaulish. A squirrel (Ricken-Fischer 1963, T129 = O.2141) and leaf (ibid, 48) are both on a Rheinzabern bowl in the style of B F Atto (Ricken 1948, Taf 40, 20). *c* 180–240.

23 3771
Form 37 base, Central Gaulish. Antonine.

24 3771
Form 30 or 37 rim, Central Gaulish. Antonine.

Plain wares

8 CG (L) sherds from forms 18/31 (1), 18/31R (2), 18/31R? (1), 33 (1), 35/36 (1) and uncertain (2). The date ranges are: Hadrianic-Antonine and C2. (1845, 1846, 1848, 4130)

Residual decorated sherds of intrinsic interest

Site Phases 6–8

25 4191
Form 37, Central Gaulish. A sherd from a freestyle bowl in the style of Cinnamus ii, with a horse (D.905 = O.1904) and bear (D.817 = O.1609). For the horse see Karnitsch 1959, Taf 77, 3 (Wels) and for the bear, S & S 1958, pl 163, 66 (London). Both bowls have his large label stamp CINNAMI, retr. The Birdoswald sherd may have been roughly trimmed for use as a counter. *c* 150–80.

26 4191
Form 37, Central Gaulish. A bowl by Paternus v (Rogers's Paternus II), or an associate. The decoration includes a ring-tongued ovolo (Rogers B105), a horizontal beaded border (Rogers A2) and a rosette (Rogers C194?), perhaps at the top of a vertical border. *c* 160–95.

27 4208
Form 37, Central Gaulish. The surviving panels include: [1] a satyr (D.311 = O.610). [2] A small, double medallion. A beaded rosette at the bottom of a vertical wavy-line border is probably Rogers C281. The bowl is by a member of the Quintilianus i group, probably Paterclus ii. The satyr and rosette are on a signed bowl from Silchester (S & S 1958, pl 72, 33). The medallion and wavy-line border are on two bowls in his style from London (ibid, 34–5). *c* 125–40.

28 1542
Form 37, Central Gaulish, with scroll decoration. The ovolo (Rogers B185 = B205) has been largely removed by the finishing of the rim, so that only the bottom part survives. The beads below the ovolo and a vine leaf (Rogers H58) are on a stamped bowl of Attianus ii from London (S & S 1958, pl 85, 6) and on a bowl from the Castleford *vicus* with a cursive signature of Drusus ii. A bird in the scroll, looking back to the right, may also be on the Attianus bowl. *c* 125–45.

29* 1679
Form 37, Central Gaulish. The surviving panels contain: [1A] a leafy festoon (Rogers F8), containing partly-impressed acanthi (Rogers K2?); [1B] a saltire with trifid motifs (Rogers G76?) at the sides. [2] An Apollo (D.54 = O.91), on a mask. The rosette-tongued ovolo (Rogers B17 variant?) is on a bowl from London (BM M500) in the style of Drusus ii. The Apollo and trifid motif, and probably the ovolo and mask, are on a bowl in the style of Sacer i from South Shields (S & S 1990, pl 170, 1). *c* 125–45.

30 1583
Form 37, East Gaulish. A small bowl, with the lower concavity of a winding scroll containing a Cupid (Ricken-Fischer 1963, M111a) and a leaf. Rheinzabern ware of the late second or first half of the third century.

31 1709
Form 37. The fabric and glaze would fit the South Gaulish range, but the ovolo (Fölzer 1913, Taf 32, 944), in a zone at the bottom of the decoration, is on two bowls from Trier (ibid, Taf 22, 14, 36). It was used by apparently later potters in the Werkstatt 11 group (Haalebos 1974, 56). Late Antonine?

32* 1783
Form 37, Central Gaulish. The decoration is divided by heavily corded borders or columns. The plant is not known to Rogers, but is generally similar to ones used in the Hadrianic and early Antonine periods, such as G3 and G20.

33 1382
Form 37, Central Gaulish, with the main ovolo of the Cerialis ii–Cinnamus ii group (Rogers B144) and a warrior (O.177A). The figure-type is rare for the group, but is on a bowl from Cambridge by one of its members. *c* 135–65.

34* 1382, 1787, 3989, 4025, 4078, 4099, and 4108
Form 37, Central Gaulish, in the style of Clemens iii of Lezoux. The ovolo is Rogers B103 and the panels contain: [1] a double medallion. [2A] A *cantharus* (Rogers T5); [2B?] A *cantharus* (Rogers T29). [3A] A double festoon with a dolphin to left (O.2394A); [3B] A leaping stag (D.860 = O.1732). [4] A double medallion with a seated Cupid (D.259 = O.443B), over a double-ended motif with lozenges (Rogers U30). Another panel with a dolphin at the top has a lion to right (probably O.1403A, with the front paw broken) at the bottom and is followed by a panel with a double medallion. A stamped, unprovenanced bowl of Clemens in the museum at Vienne is from the same mould (information from Mr G. B. Rogers). The ovolo, festoon, and dolphin are on another stamped bowl, from Apt (S & S 1990, pl 174, 3). *c* 160–90.

35* 1771
Form 37, Central Gaulish. Freestyle decoration, with ovolo Rogers B109, with a row of rectangular beads below. The figure-types are a horse and rider (D.158 = O.249), leopards to right and left (D.799 = O.1518 & O.1562(?), respectively), stag to right (D.852 = O.1720), kneeling stag to left (D.879 = O.1752a) and goat (O.1842?). The leaf is Rogers H151. This, like many small bowls, cannot be assigned to any one potter. Some of the figure-types were used by Sacer i and his associates, but the ovolo and leaf are more reminiscent of Butrio. A Hadrianic or early-Antonine date is not in doubt, however. *c* 125–45.

36* 2655
Form 37, Centtal Gaulish. A small bowl with medallions with chevron outer borders, one containing a tiny figure (Hercules with a club?) and a leaf-tendril (Rogers J48). The leaf and tendril are on a stamped mould of Banuus from the Terre-Franche kilns at Vichy, but there are no other parallels there. Small Central Gaulish bowls tend not to be clearly assignable to particular potters, but there is no doubt that this falls within the range *c* 160–200.

37* 2860, 2890, 2891, and 2898
Form 37, East Gaulish (Rheinzabern). Scroll decoration, with vine-leaf (Ricken-Fischer 1963, P6I), bunches of grapes (ibid, P164a), bird (ibid, T250), and ovolo (ibid, E23). There are close parallels with bowls with the B F-Attoni stamp (Ricken 1948, Taf 36) and the closest is on a stamped mould (ibid, Taf 36, 11), which has the ovolo, leaf, and grapes. This has a cursive signature]acomi or]rcomi below the decoration, but it was not necessarily inscribed before the mould was fired. Bowls of Respectus (ibid, Taf 110) also have similar decoration. *c* 180–220.

38 3707
Form 37, Central Gaulish, with Paternus v's large label stamp, [PTERN]FE retr. in the decoration. One panel, with a border of rhomboidal beads, contains a tripod (Rogers Q16). See S & S 1958, pl 105, 16 (Watercrook) for all the details and St14, below, for the stamp. *c* 160–95.

39* 4025
Form 37, Central Gaulish. A bowl in the style of Paternus v, with the ovolo which he normally used on small bowls like this (Rogers B106). The panels contain: [1] A medallion with beaded outer border (Rogers E18) and seated Cupid (D.261 = O.444). [2A] A sphinx (D.497 = O.857, with the broken tail replaced freehand), in a single medallion; [2B] rosette with fourteen petals (Rogers C242), in a single medallion. [3] A draped figure (D.505 = O.929). The ovolo, decoration of panel 2, and the medallion are on a stamped bowl from Aix-en-Othe (Habert 1893, no. 1031). *c* 160–95.

40* 217
Form 37, heavily burnt, East Gaulish. No precise parallel has been found for the triple-bordered ovolo, with plain tongue curving to the right, but the small pendant leaves are on an unprovenanced bowl in Reims Museum, in a style suggesting origin at one of the Argonne factories. Second half of the second century.

41 1821
Form 37, East Gaulish, in the style of Cerialis v of Rheinzabern. A corded scroll contains a leaf (Ricken-Fischer 1963, P83) and a bunch of grapes (ibid, 164). Cf Ricken 1948, Taf 52, 5 for the scroll and grapes, 7 for the leaf. *c* 160–80.

42* 1755
Form 37, slightly burnt. East Gaulish(?), with a double-bordered ovolo with striated tongue on the left, probably tapering at the tip, a border of well-spaced, square beads and a medallion or arcade of coarse chevrons. The plain band above the ovolo is chamfered just below the lip. The fabric and glaze suggest Trier as the source, though no parallels have been found for the decoration. Almost certainly Antonine.

Site Phase 10

43* 84, 268, 277, 299, and 323
Small fragments, none joining, of a Central Gaulish jar of form 54, decorated with figure-types and motifs in appliqué and tendrils and dots *en barbotine*. The decoration includes a draped figure, an urn and two sizes of leaf. No precise parallels have been found for the individual details, but the leaves are of the same general type as Déchelette 1904, 234, 156–7 and the urn, though much smaller, is not dissimilar to 155. Cf ibid, 171, for a jar with the same style of decoration. Second half of the second century.

44* 237
Form 37, Central Gaulish. The double-bordered ovolo with straight tongue has a zig-zag border (Rogers A26) below it. A panel has a double medallion containing a leaf (Rogers H18). The leaf is only attested for Do(v)eccus i, but the rest of the decoration does not fit his style. A date *c* 160–200 is not in doubt, however.

Site Phase 11

45* 360
Form 37, South Gaulish. The basal wreath of S-shaped gadroons was occasionally used at La Graufesenque by Mercator i and some of his contemporaries. The 'baton' placed diagonally in the zone above (Knorr 1919, Taf 57, 20) is also known for him. *c* 85–110.

Site Phase 13

46 260 and 1338
Form 37, Central Gaulish. An ovolo replacement of masks was used at Lezoux by Potters P-12 and P-13 (information from Mr George Rogers). Hadrianic.

Area B unphased

47* 1675 and 1594
Form 37, Central Gaulish. A freestyle bowl in the style of Austrus, with ovolo Rogers BI8, a lioness or leopardess (D.793 = O.1537), doe (a smaller variant of O.1814), goat (O.1849A), tree (Rogers N14), leaf tendril (Rogers J143), large acanthus (Rogers K5), and small acanthus (not illustrated by Rogers). The ovolo, leaf, goat, and lioness/leopardess are on a stamped bowl of Austrus from Exeter and the larger acanthus is on a bowl in his style in the Oswald-Plicque Collection, probably from Lezoux (Nottingham University Museum). Austrus had moved to the East Gaulish factory of Blickweiler before the abandonment of the Saalburg Erdkastell, *c* 139. He used most of the details at both factories, but the small acanthus apparently only at Lezoux. The fabric, too, would fit Lezoux better than Blickweiler. *c* 125–35.

48* 1327
Form 37, Central Gaulish. A panelled bowl, with a chevron, a trifid motif, perhaps acting as the tail-fin of a sea-creature and another, blurred motif. The ovolo (Rogers B231) originated at Les Martres-de-Veyre under Trajan, and was used at Lezoux in the Hadrianic and Antonine periods, occasionally by Sacer, but particularly by Cinnamus ii. The chevrons occur on unstamped bowls with his ovolo 3, from Colchester (Calver Coll.) and Worcester, but neither quite in his

usual style, and on one from Margidunum with the Cerialis-Cinnamus ovolo (Oswald 1948, pl 42, 6). The bead-row above the ovolo is reminiscent of Les Martres ware, but this is in Lezoux fabric. The absence of a border below the ovolo is unparalleled in Cinnamus's work and the link with him is likely to be through the Sacer group, one of whose potters almost certainly made this bowl. Hadrianic.

Building 198, Phase d

49* 1585
Form 37, South Gaulish. A bowl in the style of Mercator i with a saltire panel with a trifid motif in the bottom (Knorr 1919, Taf 57, 12), the same motif in a basal wreath and partly impressed grass-tufts in an adjacent panel (ibid), 13). Cf Taf 57B and F for stamped bowls of Mercator from Nijmegen and Vindonissa, which between them have all the details. *c* 85–110.

50 1650
Form 37, East Gaulish. A decorative medallion (Ricken-Fischer 1963, K48) contains a small seven-beaded rosette (ibid, O43) and an adjacent, narrow panel with a vertical series of trifid motifs (ibid, P127). The panels are divided by a corded border (ibid, O242) with a larger beaded rosette at the top (ibid, O42). The decoration is exactly matched on a stamped bowl of Ianus ii from Rheinzabern (Ricken 1948, Taf 4, 12F). *c* 160–90.

Site Phase 18 (modern contexts)

51 409
Form 37, East Gaulish, in the Satto/Saturninus style. Moulds by this firm were used, but not necessarily made, at several East Gaulish factories. This is likely to have come from one of the larger ones, either Chemery-Faulquemont or Mittelbronn. Cf Fölzer 1913, Taf 3, 11 for a stamped bowl of Satto from Rheinzabern (an import), which has a scroll with the same leaves (ibid, Taf 27, 272). It is not easy to date the Birdoswald piece; the Satto/Saturninus partnership is normally assumed to date from the late first or early second century (Lutz 1971, 73–4), but vessels from Carrawburgh and Ilkley are thought to belong to the later second century (Hartley 1967, 10, 7). All that can be said is that the thin wall of the bowl suggests that it is probably pre-Antonine.

52 1331
Form 37, Central Gaulish. A winding scroll contains a vine leaf (Rogers H51) in the upper concavity and a lion attacking a boar (D.778 = O.1491) and leaf-tips in the lower concavity. The figure-type was often used by the Cerialis ii–Cinnamus ii group and is on a bowl from Carlisle, probably by Cerialis (May 1917, pl 6, 8). The leaf is less common for the group, but is on a bowl from Corbridge, also probably by him. *c* 135–65.

53* 1523
Form 37, Central Gaulish. The ovolo (Rogers B109) has a wavy line below it. A winding scroll has a vine-leaf (Rogers H35), small curving leaf (Rogers K37) and six(?)-petalled rosette (Rogers C123?). An astragalus (Rogers R61) binds the scroll. This is almost certainly by a potter in the Paternus v group, but the ovolo poses a problem, as it is not attested for any member of the group. The closest parallels occur on bowls by Laxtucissa, who used the astragalus, rosette and, probably, the leaf, but the bowl cannot confidently be assigned to him. *c* 145–75.

54* 1609
Form 37, Central Gaulish. Both surviving panels contain the distinctive 'buds' of the Cerialis ii–Cinnamus ii group (Rogers J178, partly impressed), as on a signed bowl of Cerialis from Amiens (Simpson & Rogers 1969, 8, 14). One panel has a panther (D.799 = O.1518) in a chevron festoon (Rogers F41), over a kilted figure (D.103 = O.177) and an astragalus (Rogers R14). The two figure-types are on a bowl from Lezoux(?) with the group's commonest ovolo (Simpson & Rogers 1969, 8, 19). *c* 135–65.

55 1
Form 37, South Gaulish. One panel has a saltire with a trifid motif in the bottom (Knorr 1919, Taf 57, 10). By Mercator i or a contemporary. *c* 85–110.

56 204
Form 37, Central Gaulish, with a mould-stamp of Paternus v (see stamp No 13) and a ring-tongued ovolo (Rogers B105) with beads below. *c* 160–95.

57* 473.33
Form 37, Central Gaulish. A bowl in the style of Servus iv (Rogers Servus II), with ovolo (Rogers B153), dancer, and Apollo (smaller variants of D.216 = O. 353 and D. 56 = O. 93, respectively) and a leaf (Rogers J11?). The zig-zag border is Rogers A26. The Apollo, one of Servus' commonest figure-types is on a stamped bowl from Silchester (S & S 1958, pl 131.7) and occurs on a bowl in his style from Bewcastle, together with the ovolo, dancer, and borders. The leaf and medallion are not known for him. *c* 160–200.

58 473.33
Form 30 or 37 rim, Central Gaulish. Antonine.

59 473.33
Form 37 (4 sherds), Central Gaulish. Antonine.

The potters' stamps

Each entry gives: potter (i, ii, etc, where homonyms are involved), die number, form, reading of the stamp, published example, pottery of origin, date, excavation number.

(a), (b), and (c) indicate:

(a) Stamp attested at the pottery in question.
(b) Potter, but not the particular stamp, attested at the pottery in question.
(c) Assigned to the pottery on the evidence of fabric, distribution and, or, form.

Ligatured letters are underlined.

St1 204
Albucius ii 3a form 33 ALBVCI OF Lezoux (b). The range of forms on which this stamp appears includes 27, which seems to have gone out of use at Lezoux *c* 160, and 79R, which was first made there *c* 160–70. *c* 150–80.

St2 4356
Ambitotus la form 18/31 AMBITOTVMA (Habert 1893, no 53) Lezoux (a). A stamp also used on forms 18/31R and 27. There are nine examples from a pottery shop at Castleford, destroyed by fire in the 140s. *c* 130–50.

St3 237
Andegenus 3a form 33 ANDEGE[NI.F] Lezoux (b). There is no site dating for this stamp but an example which may be on form 80 gives a hint of mid- to late Antonine activity. Other stamps of Andegenus have been noted in an early-Antonine pit at Alcester and in the Second Fire deposits at Verulamium (after150). His range of forms includes 18/31, 18/31R, 27, and 79. *c* 150–80.

St4 1326
Borillus i 2a form 31 [B]ORILLI.OFFIC (Durand-Lefebvre 1963, no. 153) Lezoux (a). Borillus's wide range of forms includes 18/31, 18/31R, 27, 31, 31R, 79, and 80, indicating activity both before and after *c* 160. This particular stamp has been noted on forms 18/31R and 79, and at Balmuildy, Camelon (2), Mumrills, and Old Penrith. *c* 150–80.

St5 210
Borillus i 5d form 18/31 or 31 [BORILLI]OF Lezoux (a).The balance of earlier and later forms stamped with this die is slightly in favour of the latter. There is no site dating for the stamp. *c* 155–80.

St6 1372
Celsus ii 2a flat base [C]ELSI M Lezoux (a). The occurrence of this stamp at Bainbridge, Old Penrith, and Stanwix and on forms 3IR and 79R suggests mid- to late Antonine date. *c* 160–90.

St7 1465
Cinnamus ii 5b Form 37 [CI]NNA[MI] retr. (S & S 1958, pl 169 Lezoux (a). This stamp, the commoner of Cinnamus's large label stamps, has been noted many times on Hadrian's Wall, at northern forts in its system reoccupied *c* 160 and in Antonine Scotland, but it is more common in Scotland. *c* 150–80.

St8 1365
Dagomarus 4c form 15/17R or 18/31R [DA]GOMARVS*F (Habert 1893, no. 444) Les Martres-de-Veyre (a). Some of Dagomarus's dies were used at both Les Martres and Lezoux, but 4c seems to have been used only at the former, to judge by the associated fabrics. The stamp occurs at Catterick and, probably, on Hadrian's Wall (Chesters Museum). *c* 110–25.

St9 204
Errumocito Incomplete 1 form 31 ERR\[Rheinzabern (a). There is no site dating for any of this potter's dies, but his use of one on a standard form 32 suggests a late second- or early third-century range.

St10 1406
Luppa ii 1a form 33 LVPPAF (Dannell 1971, no 50) Lezoux (a) This stamp has been noted in the Rhineland, which received very little Central Gaulish samian after the middle of the second century. There are also examples from Camelon (2) and Corbridge. The die was used to stamp forms 18/31, 18/31R, 27, and 33. *c* 130–55.

St11 1327
Mattius ii 4b form 33 MATTIM Lezoux (a). Mattius ii's stamps occur at Corbridge and in Antonine Scotland (Camelon and Mumrills). His forms include 18/31, 18/31R, 27, 38, and 79/80, suggesting a range *c* 140–70.

St12 1365
Paterclus ii 10a form 18/31 [-ATERCL]OSFE (Durand-Lefebvre 1963, no. 561) Les Martres-de-Veyre (a). This comes from the final version of a die which was modified twice as it became damaged. Stamps from this, the final version, occur in the London Second Fire groups (4) and at Corbridge (2), Chesterholm, and Nether Denton. Paterclus ii's output at Les Martres seems to have been entirely Trajanic *c* 110–25.

Graffito incised externally midway between base and wall carination (No 7).

St13–4 204, 3707
Paternus v 7a Form 37 (2) CP] [P]ATERNFE retr;]FE retr. (S&S 1958, pl 169) Lezoux (a). This large label stamp is common on bowls from Hadrian's Wall and northern forts reoccupied *c* 160, but has not yet been noted from any Scottish fort with a normal Antonine occupation. *c* 160–95.

St15 1552
Priscus iii 4d 33 PRISC I M Lezoux (a). The die from which this comes was used to stamp both plain ware

and moulds for decorated bowls. One of the latter, from Lezoux, also carries a stamp of the mid- to late-Antonine potter, Clemens iii. The plain ware includes a dish of form 31, in the group of late-Antonine samian recovered of Pudding Pan Rock, Kent. *c* 160–90.

St16 1566
Quintus iv 2a form QV[INTI] (Hull 1958, 123, 23) Lezoux (a). This stamp of the earlier Lezoux Quintus was used mainly on cups, including form 27, which seems not to have been made at Lezoux after the mid-Antonine period. It has been noted at Newstead and a stamp from one of his other dies occurs at Camelon. *c* 140–60.

St17 336
Reditus 3a form 18/31 or 31 [REDI]TI M (*ORL* B73, p. 50, 103) Lezoux (a). Reditus's stamps appear both at the Saalburg Erdkastell (before 139) and in a group of burnt samian from Tac (Hungary), dated *c* 170. This particular stamp occurs in the Rhineland, which scarcely received Central Gaulish samian afrer *c* 150, and at Camelon. It was used on forms 18/31 and 10/31R. *c* 135–60.

St18 1326
Saturninus ii 8a form 31 SAT[VRNINI] (Dickinson 1986, 195, 3.186 Lezoux (a). There are many examples of this stamp in the group of late-Antonine samian recovered off Pudding Pan Rock. It was used on forms 3IR and 79R. *c* 160–200.

St19 2644
Verinus 5c form 31 [V]IIRNVZ (Dickinson 1986, 196, 3.220) Rheinzabern (a). There is no site dating for the stamp, but its use on some of the later Rheinzabern forms (eg Ludowici Tb, Tg, RSa, and RSc) suggests activity in the late second or first half of the third century.

St20 216
A 12-petalled rosette on form Curle 15 or 23, Central Gaulish. Antonine.

St21 426
CAT[on a Central Gaulish dish, with a rather flattened quarter-round moulding at the internal junction of base and wall, and external fluting at the same point and possibly externally at the lip. There is an internal offset below the lip, as on form 15/17. This dish is a variant of the Antonine form 15/31, but the footring, the depth of the wall and the height of the kick are more reminiscent of form 18/31. For a similar, though earlier, dish, cf Stanfield 1929, fig 14, 66. Hadrianic.

St22 1365
]DIQVAF on form 18/31, Central Gaulish. Hadrianic.

St23 204
O[or]0 on form 27, Central Gaulish. Hadrianic.

St24 353
SA[on form 33, Central Gaulish. Antonine.

St25 1489
IV....I or VI .... I on form 31, Central Gaulish. Antonine.

St26 1
V[(?) on form 31, East Gaulish (Argonne). Antonine.

St27 4139
Borillus i 5b form 33 [BORI] IOF (Curle 1911, 232, 17) Lezoux (a). There are many vessels bearing this stamp from Antonine forts in Scotland and it is noted in the late Antonine Aquincum hoard, but it was sometimes used on forms which went out of production at Lezoux *c* 160, such as 18/31R and 27. *c* 150–80

St28 97
Rottalus 1a form 33 RO[TT LIM] (Dickinson 1986, 3.176) Lezoux (a). A stamp noted from the Brougham cemetery, where the bulk of the samian is late 2nd century, and also from Benwell and Chesters. It was used on forms which did not evolve fully before *c* 160, such as 79, 79R, 80, and Ludowici Tg. *c* 160–200.

St29 1650
Saturninus ii 8c form 31 SATVR[NINI] Lezoux (a). Stamps of this potter have been noted from Hadrian's Wall and hinterland forts, and in the group of late Antonine samian recovered off Pudding Pan Rock. His range of forms includes 31R and 79R. *c* 160–200.

St30 1
Sosimius 1a form 33 [SOSI]MIIM Lezoux (c). So far, all the examples of this stamp recorded by the present writer are on cups of form 33, many of them clearly of mid-to-late Antonine date. Some have been noted from Bainbridge, Binchester, and Malton. *c* 160–90.

St31 215
Stabilis i 2a concave dish [ST B]I ISFEC+ (Ludowici 1927, 230c) Rheinzabern (a). There is no site dating for Stabilis i, but his use of forms 31R and 32 suggests a range from the late second to the middle of the third century.

St32 1459
Verecundus iii 1a (probably) form 31R V[ERECVNDI] (Dickinson 1986, 3.218) Lezoux (a). Verecundus iii's stamps occur at sites in northern Britain founded, or re-occupied, *c* 160. This particular one is known from Chesters, Malton, and South Shields and was used on forms 31R and 79. *c* 160–90.

St33 337
CE[(?) on form 31, Central Gaulish. Antonine.

St34 1394
M[(?) on form 31, Central Gaulish. Antonine.

St35 4127
]LV[on form 18/31R or 31R, Central Gaulish. Antonine.

St36 291
]RCI[on form 31, Central Gaulish. Mid-to-late Antonine.

St37 249
Form 31 with illegible stamp, East Gaulish (Rheinzabern). Late C2 or first half of C3.

Ceramic building material

Stamped tile (Fig 180)

by Ian Caruana

260 727: Tegula fragment with partial flange. The lower part of an **E** and **G** survive making identification as a legionary stamp certain. On the right side the impression becomes very faint so that the border has disappeared and the end of the **G** is visible only as a variation in the texture of the clay. The shape of the **G** and the overall size and proportions are characteristic of a known die of *legio* XX. Unfortunately this part of the die is not well preserved on the other stamps from this die and it is just conceivable, but unlikely, that a new die is represented by this stamp.

The die is one of a group from all four second-century legions whose use is confined to Cumbria and whose products are never found in the region of the legions' main bases. This is the seventh example of this stamp to have been found. A fragment on a brick was found at the tilery at Scalesceugh in 1914 (Hope and May 1917, 197 no 3). There is an unstratified example on a *tegula* from the *vicus* at Old Penrith (Caruana 1991, 112 no 30, fig 49) and four examples from Carlisle. Three came the 1981–84 excavations of the fort at Annetwell Street (Caruana & Hird forthcoming, table 118 nos 24–6) and one from the 1989 excavation on the Tullie House extension site (unpublished).

The Carlisle stamps give the only clues to dating. The tile from the Tullie House site came from a second-phase context in the second stone fort which suggests a deposition date not very far into the third century. Two from the 1981–84 excavations are from slightly earlier dated contexts. Both come from the same room of the barrack block, one from the primary phase and one from the second phase. The latter was reused structurally as rubble and must, therefore, have derived from an earlier phase when in use as a roofing tile. The dating of the construction of the second stone-period fort at Carlisle is not yet very precise but the evidence suggests that this die was certainly in use by the last quarter of the second century and probably by *c* 165.

Having said this it would be rash to assume that this necessarily dates the use of this die. There are stylistic similarities between this and another die of *legio* XX (*JRS*, 1954, 109, no 32) and one of *legio* IX (Wright

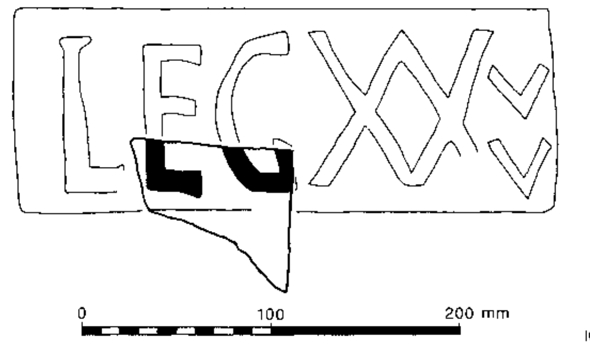

Fig 180 Tile stamp (scale 1:4)

1978, Types 3/5 – which are actually the same die). Detachments of both legions may have worked together or in some way the same influences were at work on their die-cutters. Further similarities can be seen in some incuse forms of *legio* II (EE ix 1268b; Boon 1984, 14, fig 5) and *legio* XX (EE ix 1271c). If the similarities are not coincidental the dating of the die used for the Birdoswald tile could be Trajanic or earlier, assuming that *legio* IX dies ceased to be used for stamping tiles after the legion left the province. Tiles were easily reused being good-quality roofing material and this factor can obscure their dating.

A further question that needs to be addressed in relation to the Birdoswald tile stamp is the mechanism by which bricks and tiles were supplied to forts. Examination of the tile collections in Carlisle Museum suggested to the author that those forts for which any quantity of material was available, primarily those excavated by Potter (1976) and Carlisle itself, each had different sources of supply. This was based essentially on flange and corner forms of *tegulae*; no stamped material was found in Potter's excavations. The distribution of legionary stamped tiles in Cumbria is centred on Scalesceugh and Carlisle – presumably production centre and destination. Strays at Stanwix and Old Penrith should cause little surprise, being the nearest forts to the main find spots.

A find at Birdoswald is more surprising since there was a known tilery (Brampton Old Church) much closer to the fort than either Carlisle or Scalesceugh. This tilery continued to operate until *c* 125 (Hogg 1965, 163) though arguably it was much better placed to serve Castlesteads than Birdoswald if it served any site on Hadrian's Wall. No stamped material was found at Brampton.

Another item of evidence to consider is a rather odd stamp, possibly of COH I TUN[G, (EE ix 1279), from the Hare Hill sector of Hadrian's Wall between Birdoswald and Castlesteads, which also seems to represent a different production source. *Cohors* II *Tungrorum* was the Castlesteads garrison but the numeral on the tile was certainly I not II. *Cohors* I *Tungrorum* was at Housesteads and on this reading the tile is more likely to be a 'carry'. (It should be noted that the reading of the unit name is also uncertain: the first letters read more like IV than TV and third is broken). However, it is certain that either there was a local source of production of tiles with its own die-stamps or this is an example of a stamped tile being moved some distance.

The Birdoswald stamp is an isolated find but something can be inferred from its discovery. The *horrea* were largely roofed with stone slates and ceramic tile was not common on the site. The excavations were large enough in scale for the absence of other stamped material to be significant and we have to conclude that tile stamping was not normal at Birdoswald's tilery (if, indeed, one existed). Moreover, since the die-stamp has a distribution centred quite closely on Carlisle there is a strong case for its production being intended for Carlisle and, possibly, some immediately adjacent forts.

The Birdoswald tile, therefore, joins a small group of isolated stamps found outside their normal or expected range. In this should be included an isolated IMP stamp from Housesteads (*Britannia* vii, 1976, 390 No.58) perhaps also derived from Carlisle and the COH I TVN[stamp mentioned above. One explanation of this drift of stamped tiles may be given by a phenomenon noted in Carlisle. On sites where *tegulae* were being used for roofing buildings the stamps, along with the tiles themselves, were highly fragmented. The best-preserved stamps were on isolated tiles, often substantially intact, in areas of the town where there was no evidence for tiled roofs and from a tile-covered grave from Botchergate. In one example the flange of a *tegula* had been carefully removed, again indicating that it had not been taken for its original purpose. The reason for tile salvage has not been worked out but it does show that intact or nearly whole roof tiles were being removed from derelict military buildings in the late Roman, or post-Roman period, for purposes remote from their original function. The Birdoswald tile may fall into the same category.

If this is the case it seems that two mechanisms for the distribution of tiles can be observed. Initially, individual forts were supplied by their own kilns in a highly-devolved system, possibly of intermittent production, in which transport costs were minimised. Later, perhaps as a result of the complete cessation of tile production, tiles were redistributed by a form of salvage from centralised sources – abandoned buildings. By this stage bulky reused tile appears to have become sufficiently valuable to be worth carrying individually, or in small numbers, over longer distances. A similar process, though probably on a larger scale, has been noticed for stamps of the *Classis Britannica* (Peacock 1977b, 245).

Other tile

Tile was recovered from Building 4419, the rampart building on the north wall, and from Room v of Building 4402, phase b. It was also found residually in small quantities in post-Roman contexts. All tile was found in small fragments, and it was not possible to reconstruct the sizes and types of tile used. The sample was not useful for analysis, and a basic quantification of tile by weight per context only was carried out.

12 The small finds

By Jan Summerfield
with contributions by Lindsay Allason-Jones, Justine Bayley, J C N Coulston, John Davies, Glynis Edwards, Martin Henig, Glenys Lloyd-Morgan, Quita Mould, Jennifer Price and Sally Cottam, Ian Riddler and R S O Tomlin

Introduction

During the six seasons of excavations at Birdoswald, a total of *c* 3000 small finds was recovered, with a wide range of materials represented, including gold and silver, and a large assemblage of leather. Over 600 objects are described in the following catalogue and full details of all the objects are given in the archive deposited in Tullie House Museum, Carlisle, together with the objects themselves. The majority of the stratified finds came from either dumps associated with the reuse of Buildings 197 and 198 or, in the case of the leather, the fort ditches. Much of the material was found residually in later contexts or in contexts of unknown date.

The area excavated would appear to have been kept scrupulously clean during most of the fort's life. While rubbish pits would not be expected inside the fort walls, the incidence of casual loss does seem to have been remarkably low. In the industrial buildings of Period 4a (Buildings 4401 and 4402, and the *porta principalis sinistra*) the only refuse which could be associated with industrial activity was hammer-scale. Larger lumps of slag were virtually entirely absent. Even in the fort ditches the disposal of materials was very selective. While animal bone and leather were well represented, pottery was noticeably absent in any quantity. It seems highly likely that much of the fort's refuse was dumped over the river cliff to the south. In the mid-fourth century (Period 5) some rubbish was incorporated in the deliberate backfill between the sleeper-walls of the south *horreum* (Building 197) in preparation for laying a solid floor, and during the later fourth century piecemeal dumping took place in the former sub-floor of the north *horreum* (Building 198).

Methods

All the finds were recorded using the system laid down in the CEU Recording Manual (1986) and a single numbering sequence was used for all archaeological records, whether of contexts or objects. The small finds were recorded by context and where appropriate, by three dimensional coordinates, and the information was entered onto individual object record sheets. The bulk finds, which included the glass and all the unidentifiable iron objects and nails, were recorded by context and the information entered onto bulk finds recording sheets. The information was computerised using the CEU Delilah database.

The site was a working farm until 1984 and in the early seasons of excavation large quantities of ironwork were found in the topsoil. These objects were treated as bulk finds due to the sheer quantity of material (over 30 standard CEU boxes). This material was scanned after X-radiography and all identifiable items were given a small find number. Some of the ironwork has been used by the Institute of Archaeology Conservation Department for testing conservation treatments.

Conservation of the finds
by Glynis Edwards

The conservation of the small finds from the site was carried out by the staff at the Ancient Monuments Laboratory between 1987–94. This report details the different approaches to the conservation of each material type.

A strategy of investigative conservation was defined at the outset and was applied to all the material from this site, nothing being cleaned totally for display purposes. All the material was packed in stable storage with silica gel, and sealed polythene boxes were used to maintain a micro-climate for the metalwork.

A total of over 700 laboratory numbers were issued for the bulk ironwork, and over 220 standard X-ray plates were used. Some of the bags of material were so large that they extended over more than one plate, the largest needing eight. From this scan 48 artefacts were selected for further investigation along with 21 from the 105 recorded small finds. Selected areas of these artefacts were investigated using hand tools and airbrasive equipment. This was always carried out under magnification to ensure that details were not removed.

The copper alloy presented less of a problem with 72 items from a total of just over 260 (excluding the coins) being selected for investigation. This was again carried out under magnification using hand tools such as scalpels and vibrotools for removal of soil and corrosion. The condition of a group of enamels was investigated more closely (Watts AML report No 21/94). Radiography was not necessary for the investigation of all this material and a total of only 19 objects including some of the coins was radiographed.

The coins formed an important part of the assemblage and early in the project they were prepared for the numismatist. Of the total of just over 180 coins, 42 needed no work or only a small amount of soil had to be removed. As with the copper alloy, cleaning was by hand tools, with the vibrotool used to remove hard

Table 14 Small finds arranged by function and material

	copper	*iron*	*glass*	*stone*	*wood*	*bone*	*ceramic*	*jet*	*lead*
pin beater	–	–	–	–	–	1	–	–	–
spindlewhorl	–	–	–	–	–	–	8	2	–
vessels	1	–	–	–	2	–	–	–	–
handles	1	1	–	–	1	2	–	–	–
spoon	2	–	–	–	–	–	–	–	–
querns	–	–	–	43	–	–	–	–	–
weight	–	–	–	–	–	–	–	–	2
styli	–	2	–	–	–	–	–	–	–
knives	–	4	–	–	–	–	–	–	–
punch	–	3	–	–	–	–	–	–	–
chisel	–	1	–	–	–	–	–	–	–
dividers	–	1	–	–	–	–	–	–	–
saw	–	1	–	–	–	–	–	–	–
awl	–	2	–	–	–	–	–	–	–
whetstone	–	–	–	19	–	–	–	–	–
ox goad	–	1	–	–	–	–	–	–	–
keys	–	3	–	–	–	–	–	–	–
lockbolt	2	–	–	–	–	–	–	–	–
lock pin	1	–	–	–	–	–	–	–	–
studs (2 bell)	10	1	–	–	–	–	–	–	1
double spike look	–	1	–	–	–	–	–	–	–
joiner's dog	–	1	–	–	–	–	–	–	–
split pin	–	2	–	–	–	–	–	–	–
rings	11	4	–	–	–	–	–	–	–
straps/bar	–	4	–	–	–	–	–	–	–

Table 15 Small finds arranged by functional group

military		*domestic*		*personalia*		*tools*	
belt plate	4	pin beater	1	armlets	10	punch	3
buckle	4	spindlewhorl	10	beads	3	chisel	1
lorica fittings	2	vessels	3	brooches	19	dividers	1
misc military	7	handles	5	earrings	3	saw blade	1
catapult bolt head	3	spoons	2	finger rings	8	awl	2
spearhead	4	querns	43	*intaglii*	4	whetstone	19
pilum	1	weights	2	pins	10	ox goad	1
knobbed ferrule	1	*styli*	2	tweezers	1		
slingshot	3	knives	3	toilet spoon	3	*structural*	
		keys	3	fork	1	double spike loop	1
		lockbolts	2	misc toilet	1	joiner's dog	1
		lock pins	1	pallets	2	split pin	2
		studs	12 (incl 2 bell shaped)			straps/bar	4

areas of corrosion. Some chemical removal of corrosion was necessary for 12 objects, mainly the silver coins. Both formic acid and ammonium thiosulphate were used with the necessary washing afterwards and five of the coins also needed some consolidation of friable edges, an acrylic resin being used for this purpose.

The leather formed another large group of material (over 150 bags), which had been well-packed on site with adhering soil in polythene bags with the air gently removed, and then stored in sealed polythene boxes. This was stored for two years in a cold room and then the material was batch treated. Soil was gently removed and then material with no iron was soaked briefly in the di-sodium salt of EDTA to remove any iron salts from the ground water that had penetrated the material. After this the material was rinsed for two days and then soaked for two days in glycerol which acts as a lubricant. It was then frozen in a domestic deep freezer before being transferred to a large freeze drier where the water was sublimed off as ice under a vacuum. The drying process took from two to four days depending on the thickness of the material. All the hobnailed soles were X-radiographed to reveal the nailing pattern.

The wooden bowls have not yet been treated but are being kept in cold storage. As with the leather they will be freeze dried, but a polyethylene glycol will be used as a pretreatment.

Other materials found did not need any conservation treatment other than packaging in the correct environment. In particular, the jet and shale was all in a dry condition and had not shown any signs of cracking, and the gold artefacts and a silver pin (not published) looked as good as new. The original treatment cards, the X-radiographs, and a conservation report will be deposited in the museum as part of the archive.

Table 16 Objects of personal adornment arranged by function and material

	copper	*jet*	*bone*	*glass*	*iron*	*gold*	*stone*
armlet frag	4	5	1	–	–	–	–
beads	–	3	–	–	–	–	–
brooches	18	–	–	–	1	–	–
earrings	1	–	–	–	–	2	–
finger rings	4	3	–	1	–	–	–
intaglii	–	–	–	1	–	–	4
pins	4	–	6 (5)	(1)	–	–	–
tweezers	1	–	–	–	–	–	–
toilet spoons	3	–	–	–	–	–	–
fork	1	–	–	–	–	–	–
?toilet	1	–	–	–	–	–	–
buckles/pins	1	–	–	–	1	–	–
pallets	–	–	–	–	–	–	1

Small finds catalogue

The catalogue is arranged by function and broadly follows the categories defined by Crummy (1983, 5), though not all categories are represented at Birdoswald and there are, therefore, gaps in the numbering. Objects of intrinsic merit have been illustrated to provide a representative selection of the range of types recovered. Illustrated pieces are referred to by their catalogue number. In the text the catalogue number is followed by the small find number, the context number, the phase description, and a Figure number. Minimal references are given to specialist works with similar artefacts and no attempt has been made to list all known parallels.

All the catalogue entries are by Jan Summerfield, with the exception of the glass (Sally Cottam and Dr Jennifer Price), the coins (Dr John Davies), the leather (Quita Mould), the stone items (Dr Jon C N Coulston), the intaglios (Dr Martin Henig), and the inscribed objects (Dr R S O Tomlin). Other contributors included Dr Glenys Lloyd-Morgan (pipeclay figurines), Ian Riddler (the parallelepiped die No 157), and Lindsay Allason-Jones (the gold earring No 77). The contributions of these specialists are acknowledged in the text by placing their initials at the end of the relevant catalogue entry.

Category 1: personal adornment

Armlets

copper alloy

1. 2341 3965 PPS/Blocked portal/Period 4a
Incomplete. Rectangular section. With alternate notches on the upper and lower edges. Much of the original surface is missing.
Height 3mm; thickness 1mm.

2. 920 1473 Area A/Period 7–8
Incomplete. Rectangular section. The decoration consists of groups of transverse grooves with plain panels in between.
Height 3mm; thickness 1mm.

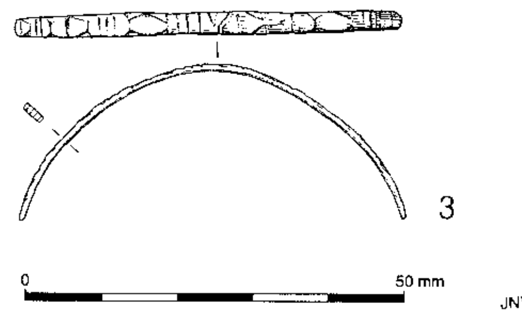

Fig 181 Copper alloy armlet (scale 1:1)

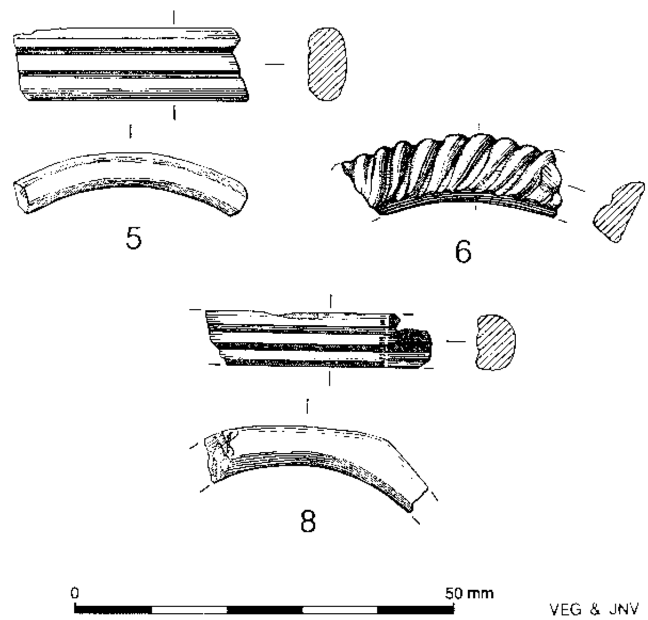

Fig 182 Jet/shale armlets (scale 1:1)

3. 788 101 Bld 197/Phe/Floor Layer/Period 5 (Fig 181)
Incomplete. Rectangular section. Decorated with continuous transverse grooves which are irregularly spaced. Fourth century.
Height 3mm; thickness 1mm.

4. 2072 1521 Bld 198/Phe/Dump/Period 5
Incomplete. Cable type with two strands of oval section.
Total thickness 3mm.

jet/shale

5. 573 69 Bld 197/Phe/floor layer/Period 5 (Fig 182)
Incomplete. Rectangular section. Decorated with two latitudinal grooves.
Height 7mm; thickness 3mm.

6. 854 1388 Area A/Period 7–8 (Fig 182)
Incomplete. D-sectioned but split. Cable type decorated with diagonal grooves on the outer face.

7. 2019 1559 Bld 4406/Period 7
Incomplete. D-section. Plain.
Height 4mm; thickness 5mm.

8. 894 1443 Area A/Period 7–9 (Fig 182)
Incomplete. Rectangular section. The inside is round and the outside is octagonal with two parallel latitudinal grooves. Parallels date from the late second to early fourth century (Hagen 1937, Type B23; Lawson 1976, 254, fig 5, no 44; Crummy 1983, 37, fig 38, no 1568 with grooves running around the circumference).
Height 5mm; thickness 4mm.

9. 2037 1577 Area A/Period 7–10
Incomplete. Rectangular section. See Cat No 8.
Height 5mm; thickness 4mm.

bone

Bone armlets are late Roman in origin, made from single thin strips of bone with an average width of 5mm and thickness 2mm, and with an ovoid rectangular section bent into a circular shape of *c* 70mm in diameter (MacGregor 1985 112). The ends are fastened by a variety of techniques. Lankhills (Clarke 1979, 313–14) produced 42 examples with three basic types: the Birdoswald example is of the second type, Type B, with plain terminals joined with a plain cylindrical sheath and held in place by iron rivets, one for each terminal. Discolouration of the bone suggests that at Lankhills the sleeves could be made of either copper alloy or iron. At Lankhills six of the less-decorated examples of Type B were buried before 350 and there were none in graves after 370. Many bone armlets are known from the Continent including several published by Keller (1971, 106–7) who suggested that they were more common in the Danube frontier regions than further north-west and argued that they were predominately made in the middle and late fourth century. These suggestions must now be revised in the light of the evidence from Britain. Only two examples from Lankhills were decorated and the rest were plain. Other examples are known from around the county: Catterick (Hildyard 1958, 224–65), Lydney Park (Bathurst 1879, 35), and Gloucester (Hassell and Rhodes 1974, 15–100).

10. 906 1403 Bld 198/Phe/Dump/Period 5 (Fig 183)
Incomplete. Oval section. One finished end which is pierced.
Height 4mm; thickness 3mm.

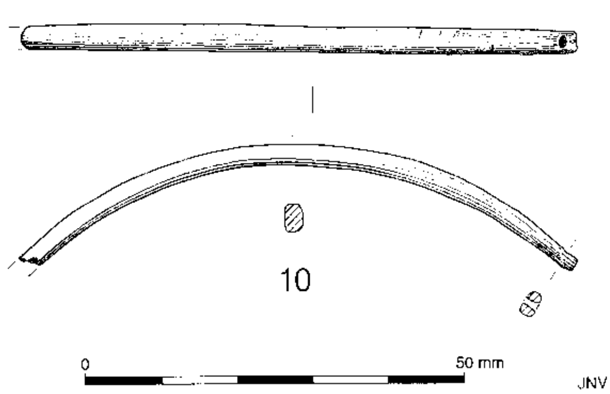

Fig 183 Bone armlet (scale 1:1)

glass

There were two fragments from Romano-British glass bangles (Nos 11 and 12). Plano-convex glass bangles, either plain or decorated with twisted cords or trails, are almost exclusively found in Britain during the later first and early second centuries. They have been found in many areas of the country, within the province and beyond, but are particularly common in the north. In a study of glass bangles from Great Britain, Kilbride-Jones (1938) defined three main groups, and later research, including a recent study of bangles from east Yorkshire (Price 1988), has retained this classification.

No 11 is a Type 2 blue/green bangle with a central right hand twisted cord of opaque blue and white. The very small internal diameter suggests that the bangle was either worn by a child, or that it had a different function (Price 1988, 354). The broken ends of the fragment have received a considerable amount of wear, suggesting that the piece continued in some form of use after breakage. Very many similar blue/green bangles are known from northern Britain including examples from the Agricolan supply base at Corbridge (Charlesworth 1979, 59, no 16, fig 20), from Housesteads and Chesters (Kilbride-Jones 1938, 374), South Shields (Allason-Jones and Miket 1984, 283, 4.60) and Newstead (Kilbride-Jones 1938, 374, fig 3, nos 2, 4, 11, 15).

The opaque white fragment, No 12, comes from a Type 3A bangle (Price 1988, 349). Many examples are known from military and native sites in northern Britain, including Vindolanda (Price 1985, 214, no 84, fig 78), South Shields (Allason-Jones and Miket 1984, 283–4, nos 4.62–4), and Stanwick (Price 1988, 364, no 68). About 100 fragments were found at Traprain Law, Lothian, where Kilbride-Jones suggests a manufacturing centre (Kilbride-Jones 1938, 394).

11. 2390 4088 West berm/Period 2b-3 (Fig 184)
Fragment of armlet. Plano-convex section. Blue/green.

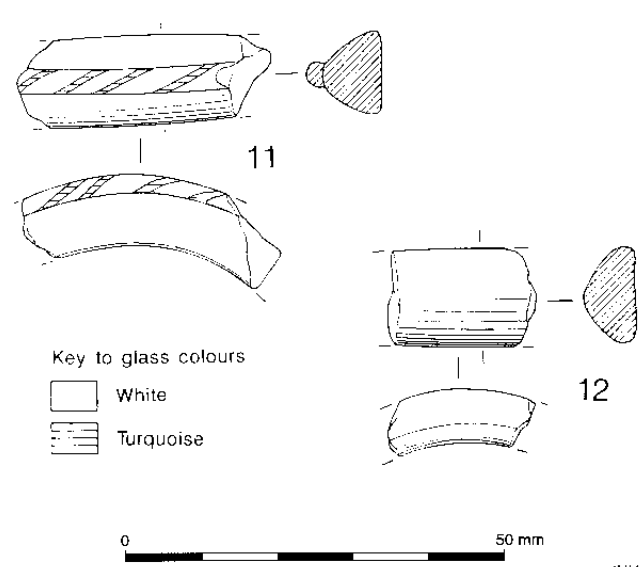

Fig 184 Glass armlets (scale 1:1)

Central horizontal cord with one opaque blue and two opaque white threads twisted right-hand. Elongated bubbles. Surfaces worn. Edges reworked.
Height 9.5–10mm; width 12mm; internal diameter 52mm; length 35mm.

12. 944 1500 West ditch/Period 4b (Fig 184)
Fragment of armlet. Triangular cross-section, rounded apex. Opaque white. Inner surface pitted. Apex worn.
Height 7.5mm; width 12.8mm; internal diameter *c* 60mm; length 21mm.

[JP/SC]

Beads

glass

Thirty-eight beads were recovered during excavations. These came from a number of areas of the site, and there was no particular concentration of finds.

There were two blue/green annular beads (Nos 14 and 15). These beads are quite common in Roman Britain and are a long-lived type, often made in plain blue/green glass but also known in a variety of other colours (Guido 1978, 66 iia, 140–3). Similar beads are known from a Hadrianic or earlier context at Cannon Street, London (Harden 1979b, 22, no 53, fig 12), from a Flavian context at Fishbourne (Price and Cottam forthcoming, no 171), and ftom a late fourth-century context at Frocester Court Villa (Price 1979, 46, no 58).

Four beads (Nos 16, 17, 18, and 19) have been formed ftom long rods divided into segments (Guido 1978, 91–4, fig 37, nos 1–3). No 17, which has three segments, is the most unusual bead from Birdoswald. It is made in colourless glass with an inner lining of gold leaf. In his detailed study of gold-leaf beads, Boon (1977, 193–4) suggests that the gold leaf was wrapped around a tube of colourless glass, which was subsequently coated with a further layer of colourless glass. Boon states that gold-leaf beads appear to originate during the Ptolemaic period in Egypt, although the only known centre of manufacture was on Rhodes (ibid, 194–5). During the Roman period these beads had a wide distribution throughout the Empire and beyond the northern frontier (ibid, 197). They are difficult to date closely, but Boon suggests a general date from the later second to fourth centuries (ibid, 200). In Roman Britain 26 gold-leaf glass beads were found in a drain deposit dated 160–230 in the legionary bath-house at Caerleon (Brewer 1986, 151–2), and 44 came from a post-170 cremation at Baldock (Boon 1977, 197–8). Examples already known from the Hadrian's Wall area include 24 from Coventina's Well, Carrawburgh (Allason-Jones and McKay 1985, 37, no 127), and from Vindolanda and Chesters (Guido 1978, 206).

The three other segmented beads (Nos 16, 18, and 19) are dark-green, blue, and turquoise. Nos 18 and 19 were also formed from long pinched-in rods of glass. No 16 comes from a bead formed by winding a thin rod of glass around a wire, before being pinched into segments. Green and blue segmented beads are found in very large numbers on Romano-British sites, most frequently in the third and fourth centuries. Examples from the Hadrian's Wall area include green and greenish-blue beads from Carrawburgh, Chesters, Great Chesters, and Housesteads (ibid, 202).

Six beads (Nos 20, 21, 22, 23, 24, and 25) are cylindrical in section (ibid, 94–6, fig 37 Nos 4–5). Nos 22, 23, 24, and 25 are short, with a maximum length of about 3.5mm, and appear to have been cut from a longer sectioned bead. Green and blue cylinder beads are very common on Romano-British sites, particularly during the late Roman period. Two necklaces from the fourth-century cemetery at Lankhills, Winchester have similar beads (Guido 1979, 298–300, 315, 399), and several short and long examples are known from Hadrian's Wall at Chesters, Great Chesters, and Housesteads (Guido 1978, 210, 212).

One hexagonal bead was found (No 27). These are usually made in green glass and occur throughout the Roman period (ibid, 96–7, fig 37, no 9). Examples from the north of England include two from Corbridge and one each from Kirkby Thore, Carrawburgh, and Chesters (ibid, 216–17).

Eleven dark-blue, blue/green, and opaque green biconical beads were found (Nos 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, and 37), making this the largest single group at Birdoswald (ibid, 97–8, fig 37, nos 12–13). Nos 27 and 28 come from dark blue long biconical beads, another common Roman type (ibid, 98, fig 37, no 14). Examples are known from Verulamium, Silchester, on a necklace from Poundbury Camp, Dorchester, Dorset, and in the north, at Vindolanda and Chesters (ibid, 221–2).

Short biconical beads (ibid, 97–8, fig 37, nos 12–13) are very commonly found on late Roman sites, although earlier examples are known, for example from Maiden Castle, Dorset, in a context dated 25–70 (ibid, 218). These beads were made in two general sizes, with a diameter of either 5–7mm (eg Nos 31, 32, 33, 34, 35, 36, 37), or rather smaller (eg Nos 38 and 39). Dark blue beads have been found on many sites occupied in the late Roman period, including the villas at Barnsley Park and Frocester Court in Gloucestershire, in the Hadrian's Wall area at Vindolanda and Chesters, and at the native site at Traprain Law, in Scotland (ibid, 219). Green biconical beads appear to be less common. Translucent and opaque green biconical beads have been found on late Roman necklaces at Fordington, Dorset (ibid, 220), and Lankhills cemetery, Winchester (Guido 1979, 299, group 363).

Eight short square-sectioned beads were found, seven in opaque blue and one in opaque green (Nos 38, 39, 40, 41, 42, 43, 44, and 45). The beads were very similar in size and form, though they were found in contexts from many different areas of the site. Long and short square-sectioned beads are also frequently found on late Roman sites (Guido 1978, 96, fig 37, nos

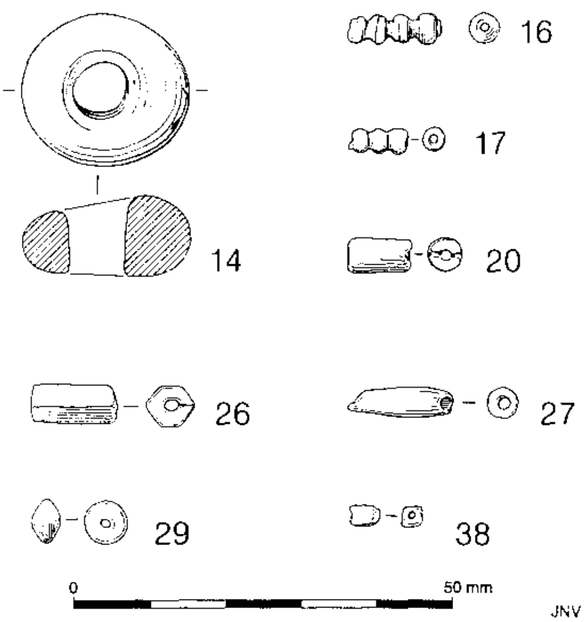

Fig 185 Glass beads (scale 1:1)

6 and 7). Examples are known on a necklace from a burial dated 360–70/80 at Lankhills cemetery, Winchester (Guido 1979, 300, 560), and on a fourth-century necklace from the Roman townhouse at Colliton Park, Dorset (Guido 1978, 213).

Nos 46 and 47 are two small ovoid beads, one green and one blue. No 47 has been formed by winding a thin glass rod around a wire, a method of manufacture common throughout the Roman period (ibid, 91–2). Neither bead shows any trace of being part of a longer segmented bead. Three globular beads (Nos 48, 49, and 50) also appear to have been formed individually, rather than to have been broken from a longer segmented bead.

It is interesting that only one melon bead, No 51, was found during the excavations as they are generally found in considerable numbers on military sites and many are known from northern Britain. Examples are known from Vindolanda (Price 1985, 214, nos 81–2) and Corbridge (Charlesworth 1979, 59, nos 19–20, fig 20). Thirteen fragments of frit melon beads come from Malton (Price and Cottam forthcoming, nos 65–75) and 25 from Ribchester (unpublished).

13. 10062 19 Area A/Period 11
Complete hexagonal bead. Translucent green. Sides slightly flattened, angles and ends of perforation worn.
Length 10mm; width 5mm; diameter of perforation 2mm.

14. 2008 1537 Area B/Period 4b (Fig 185)
Complete annular bead. Blue/green. Irregular D-shaped section. Bubbly. Streaky weathering.
Height 9.7–12.2mm; diameter 20.5–22mm; diameter of perforation 6.7mm.

15. 994 1546 ViaP/Period 4b-5
Approx. 60% of annular bead. Blue/green. D-shaped section. Small bubbles. Heavily worn, surfaces slightly pitted.
Height 9.8–10.8mm; diameter 18.2mm; diameter of perforation 5mm.

16. 2043 1586 Area A/Period 7 (Fig 185)
Segmented tubular bead. Dark green. Wound bead, divided into four uneven spherical segments.
Length 12.5mm; diameter 3–4mm; diameter of perforation 0.5mm.

17. 2239 1490 Area C/Period 5–9 (Fig 185)
Segmented tubular bead. Colourless with gold inner surface. Three spherical segments.
Length 6.7mm; diameter 3.2mm; diameter of perforation 1.5mm.

18. 2118 1641 West berm/Period 4b
Segmented tubular bead. Blue. One spherical segment, trace of further segment.
Length 4.7mm; diameter 4.5mm; diameter of perforation 1.6mm.

19. 858 1338 Area A/Rubble/Period 7–9
Segmented tubular bead. Turquoise. Part of one spherical segment, trace of further segment.
Length 4.5mm; diameter *c* 4.5mm.

20. 750 329 Area A/Surface/Period 8 (Fig 185)
Cylindrical bead. Green. Tapering slightly. Ends worn. Surface dull.
Length 9mm; diameter 4.5–4.7mm; diameter of perforation 1.7–2.2mm.

21. 2435 69 Bld 197/Phe/Floor Layer/Period 5
Cylindrical bead. Green. Flattened. Weathered streaks.
Length 8mm; diameter 3.6–4.7mm; diameter of perforation 1.2–2.2mm.

22. 651 204 Area A/Topsoil
Short cylindrical bead. Opaque green. Ends worn. Surfaces slightly scratched.
Length 3.5mm; diameter 6mm; diameter of perforation 2.3mm.

23. 829 1337 Area A/Period 7–9
Short cylindrical bead. Opaque green. Ends worn. Surfaces slightly scratched and chipped.
Length 3.5mm; diameter 5.6mm; diameter of perforation 2.3mm.

24. 796 1293 Unstratified
Short cylindrical bead. Opaque green. Ends worn flat. Surfaces slightly scratched.
Length 2.5mm; diameter 5.5–5.8mm; diameter of perforation 2.2mm.

25. 915 1486 Area A/Period 6–8
Short cylindrical bead. Opaque green. Ends worn flat. Surfaces slightly scratched. Perforation off-centre.
Length 2.7–3mm; diameter 5.2–5.6mm; diameter of perforation 1.5–2mm.

26. 2254 2628 Bld 4401/Phd/Period 4b (Fig 185)
Hexagonal bead. Green. Dull surfaces. Worn.
Length 12mm; diameter 5–5.5mm; diameter of perforation 2mm.

27. 665 245 Unstratified (Fig 185)
Almost complete long biconical bead, tapering in at each end. Opaque blue. One edge chipped. Surfaces dulled.
Length 13.8mm; diameter 3.4–4.5mm; diameter of perforation 2mm.

28. 2069 1521 Bld 198/Phe/Dump/Period 5
Fragment, long biconical bead. Opaque blue. Surface slightly scratched.
Dimensions 8 x 4.4mm.

29. 845 1338 Area A/Rubble/Period 7–9 (Fig 185)
Complete biconical bead. Dark blue. Slightly scratched.
Height 3.9mm; diameter 6mm; diameter of perforation 1–1.5mm.

30. 868 1338 Area A/Rubble/Period 7–9
Complete biconical bead. Dark blue. Slightly scratched.
Height 3mm; diameter 5.2mm; diameter of perforation 1.5mm.

31. 649 205 Unstratified
Complete biconical bead. Dark blue. Ends worn smooth.
Height 2.7mm; diameter 5.5mm; diameter of perforation 1.7mm.

32. 2384 3812 Bld 4401/Phb/Period 4a
2 fragments, 90% of biconical bead. Dark blue. Surfaces slightly scratched.
Height 3.5mm; diameter 6.5mm; diameter of perforation 2mm.

33. 590 7 Unstratified
Complete biconical bead. Dark green. Surfaces slightly scratched.
Height 4mm; diameter 5.4–5.7mm; diameter of perforation 0.5–1.5mm.

34. 881 1438 Area A/Period 5–9
Complete biconical bead. Green. Slightly scratched.
Height 2.7mm; diameter 5mm; diameter of perforation 1.5mm.

35. 585 7 Unstratified
Complete biconical bead. Blue/green. Surfaces worn.
Height 2.6mm; diameter 5.6mm; diameter of perforation 1.5mm.

36. 893 1403 Bld 198/Phe/Dump/Period 5
Small complete biconical bead. Opaque pale green. Surfaces worn.
Height 2mm; diameter 4mm; diameter of perforation 1–1.5mm.

37. 2114 1417 Bld 198/Phe/Dump/Period 5
Small complete biconical bead. Opaque pale green. Surfaces worn.
Height 2.2mm; diameter 4mm; diameter of perforation 1mm.

38. 931 1489 Area C/Period 5–9 (Fig 185)
Complete square-sectioned bead. Opaque blue. Tapering in at one end.
Length 4.5mm; width 3–3.5mm; diameter of perforation 1–2mm.

39. 3446 278 Bld 197/Phe/dump/Period 5
Complete square-sectioned bead. Opaque blue. Tapering in at one end.
Length 4.3mm; width 3mm; diameter of perforation 1–1.5mm.

40. 759 325 Bld 197/Phe/dump/Period 5
Complete square-sectioned bead. Opaque blue. Tapering in at one end.
Length 4.5mm; width 3mm; diameter of perforation 1–1.5mm.

41. 734 294 Bld 197/Phe/dump/Period 5
Complete square-sectioned bead. Opaque blue. Tapering in at one end.
Length 5.5mm; width 4mm; diameter of perforation 1.5–2mm.

42. 732 298 Bld 197/Phe/dump/Period 5
Complete square-sectioned bead. Opaque blue. Tapering in at one end.
Length 4.3mm; width 2.8mm; diameter of perforation 1.5mm.

43. 919 1489 Area C/Period 5–9
Complete square-sectioned bead. Opaque blue. Tapering in at one end.
Length 3.5mm; width 2.8mm; diameter of perforation 1.5mm.

44. 2383 3821 West berm/Period 2
Complete square-sectioned bead. Opaque blue.
Length 4.8mm; width 2.7mm; diameter of perforation 1.5mm.

45. 527 68 Bld 197/Above Floor Level/ Period 5–6
Complete square-sectioned bead. Opaque green. Tapering in at one end.
Length 4.5mm; width 3.5–4mm; diameter of perforation 1.5mm.

46. 2285 1521 Bld 198/Phe/Dump/Period 5
Small ovoid bead. Dark blue.
Length 3mm; diameter 3mm; diameter of perforation 1.5mm.

47. 2123 1728 West Ditch/Period 4b-5
Small ovoid bead. Green. Wound.
Length 4.3mm; diameter 3.8mm; diameter of perforation 1.5mm.

48. 930 489 Bld 197/Phb
Two joining fragments, complete globular bead. Dark blue.
Height 3.7mm; diameter 4.2mm; diameter of perforation 1.5mm.

49. 2113 1417 Bld 198/Phe/Dump/Period 5
Three joining fragments, complete small globular bead. Dark blue.
Height 2.2mm; diameter 3.5mm; diameter of perforation 1.3mm.

50. 2065 1295 Unstratified
Fragment, globular bead. Dark blue.
Height 6.2mm.

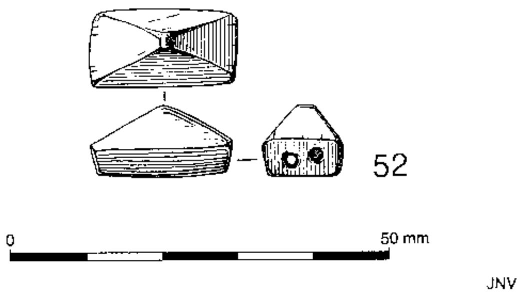

Fig 186 Jet/shale bead (scale 1:1)

51. 775 286 Area B/Period 11
Fragment, frit melon bead. Parts of five vertical grooves. Traces of blue/green glaze.
Dimensions 7 x 12mm.

[JP/SC]

jet/shale

52. 2071 1416 Bld 198/Phe/Dump/Period 5 (Fig 186)
Complete. Pyramidal jet bead with two string holes.
Length 19mm; width 11mm.

53. 2363 2755 Bld 4401/Phd/Period 4b
Complete. Circular section, segmented bead. Irregular segments and depth. Allason-Jones and Miket 1984, 304, no 7.47.
Length 11mm; external diameter 5mm.

54. 10048 4504
Complete. Circular section, segmented bead.
Length 10mm; diameter 7mm.

Brooches

The excavations at Birdoswald recovered 18 copper alloy brooches, of which eight were penannular, seven bow, and four plate. There was also an iron penannular brooch. Snape (1993, 31, tables 4, 5) discusses the proportions of the three types from forts, for all sites along the Wall, and shows the comparative percentages of each type, although only South Shields, Corbridge, Chesters, Vindolanda, Housesteads, Carlisle, and Wallsend had more than 20 brooches. Table 17 presents an updated version of Snape's table 5. The total number of brooches now known from Birdoswald is comparatively low (27) and it is unwise to draw too many conclusions from the figures, especially considering the small proportion of the fort that has been excavated. However, it is interesting to note that the percentage of penannulars is higher than in any other fort and that bow brooches are comparatively under-represented. Plate brooches conform to the average. It is important to note that several of the sites with large numbers of brooches include poorly provenanced antiquarian finds and finds from unstratified contexts. It is not known how meaningful the division of the brooches into bow, plate, and penannular is, or whether it masks chronological changes or changes in fashion. This is a line of research that requires more work before useful conclusions can be drawn.

Table 17 Percentages of bow, plate, and penannular brooches at sites along the Tyne-Solway frontier (after Snape 1993)

	form (% of total)			
site	*Bow*	*Plate*	*Penann*	*totals*
Corbridge	56.4	33.9	9.6	218
Chesters	61.5	17.9	20.5	78
South Shields	67.0	20.0	12.9	209
Vindolanda	65.6	21.3	13.1	61
Housesteads	61.5	25.0	13.7	52
Carlisle	63.0	20.5	16.4	73
Wallsend	63.6	27.3	9.1	33
Birdoswald (old)	62.5	25.0	12.5	8
(new)	44.4	22.2	33.3	27
average for Tyne-Solway frontier	62.2	24.7	13	

Area F produced a well-made example of a fully-developed Trumpet brooch (No 55). It has been suggested that Trumpet-headed brooches started just before the mid-first century along with the Colchester Derivatives. Hattatt (1987, 124–28) describes the possible development of this British type from the Pannonian K–P brooch. Hildyard (1945, 154–8) traces the development of the Trumpet-headed brooch from earlier native Iron Age forms. The full development of the Trumpet brooch came with the acanthus moulding on the bow, at the beginning of the second century, and this fully developed form lasted into the Antonine period. This type has a distribution weighted towards the north but is found throughout England and southern Scotland, both on military and civilian sites, with a number of localised variants. During the second century Trumpets were gradually replaced by Knee-type brooches and other non-bow brooches.

British craftsmen, during the first and second centuries, were not only developing new forms but taking shapes and patterns from one type and applying them to another. The Trumpet head was no exception and numerous variations have been found. There are three main types, usually dated to the middle part of the second century (Hattatt 1985, 113). The Disc and Trumpet (cf No 56) is one of these variants and is the most numerous; it is native to Britain with very few found elsewhere. The type has a wide distribution from the Hebrides through south Wales and southern England; Hattatt (1989, fig 44, table 1) shows the distribution of the *c* 50 provenanced examples known at present.

The Knee brooch originated in Germany in the second century and continued in use during the third century. The type spread up the Rhine, along the Danube, and across into Britain. It was much favoured by the military and gained a popularity almost comparable to such contemporary native types as the Headstud and

Trumpet family. During the second half of the second century Knee brooches were as numerous as this family, which between them shared the bow-brooch market roughly equally. Hattatt (1987, 262) states that of the 200 examples known to him, approximately 30% belong to Hull's Type 173 (cf No 57); and *c* 27% of all provenanced examples come from Hadrian's Wall, with 19% coming from other Roman military sites, mainly in the north. The fact that nearly 50% of all Knee brooches come from military sites provides a clue as to where and by whom they were worn, if not where they were made.

P-shaped brooches are a continental form deriving from the first-century La Téne III type; comparatively few have been found in Britain where the native types, such as the Polden Hill, Headstud, and Trumpet family, were fashionable. The brooches are generally of second- to third-century date. Prior to their development into the light Crossbow they took on a number of distinctive forms (Hattatt 1987, 275). This type of brooch was much favoured by the military particularly in the upper Rhine and upper Danube area. The single bow is the most numerous in Britain with 53 known examples: of the 51 provenanced, 32 alone come from the Hadrian's Wall area. Of the 19 Triple bow examples found, 13 are provenanced and five come from Hadrian's Wall. Birdoswald produced two P-shaped brooches, one with a single bow (No 58) and the other with a triple bow (No 59). Böhme (1972, 5–160, 696–7) illustrates four triple bow P-shaped brooches identical to No 59: from the Rhineland, two from Saalburg, one from Feldberg and one from Osterbrucken. He and states that they come from a southern workshop. The Birdoswald brooch is the fifth known example to come from the same mould as the other four and it is interesting to speculate how this brooch might have arrived at Birdoswald. These *soldatenfibeln* are generally dated to the late second and the first half of the third century.

Crossbow brooches were derived from the P-shaped brooch and continued to retain the 'P' profile. Crossbows were widely known throughout the Roman empire between the third and early fifth centuries, and were the sole bow brooch type to continue in use to the end of the Roman period. The Romanised element of society and the wealthy, wore both P-shaped and Crossbows in the third century and the Crossbow in the fourth as the P-shaped dies out. Hattatt (1985, 128) suggests it is doubtful whether Crossbow brooches were ever made in Britain. Before the fully-developed Crossbow emerged, there were many variants, but the final shape of the fourth century was heavy with onion-shaped knobs. It has often been suggested that they were official or military insignia, 'badges of rank' (Heurgon 1958, 32, and Simon James personal communication). The typological uniformity of Crossbows throughout the Empire and the numerous officials depicted wearing them on sculpture, mosaics, and ivories (Jobst 1975, 93–4; Keller 1971, 171–3) tend to support this idea. Two Crossbows (Nos 60 and 61) of the late form were recovered from the excavations; both are of Hull's Type 192 and incomplete. No 60 is a flawed casting that was nevertheless finished and used (J Bayley personal communication). This suggests a more local manufactory (*contra* Hattatt 1985, 128).

Enamelled Umbonate brooches are generally of a second-century date and Hattatt (1987, 179–80, fig 58) shows a southern distribution with the majority found in the south east. Over 75% of those provenanced lie south of a line between Gwent and the Wash. In addition, recent excavations in Carlisle have produced two examples (Mackreth 1990 and Padley forthcoming) and another one was recovered from Birdoswald. A second type is the enamelled disc with lugs, and while the star pattern is found on a number of other small disc brooches (cf No 64), the form with the metal ribs dividing the space into a six point star with a central dot (cf No 65) is rare and not found outside Britain. The Wheel is a Celtic religious symbol and makers of the early plate brooches adopted this motif. It continued in popularity through the Roman period and into the second century when enamelling became prevalent. The example from Birdoswald (No 66) is enamelled and probably dates from the second century.

The Rhineland appears to be the main source of a flood of trinkets which were exported throughout the western provinces. British evidence suggests that objects made here came from a number of small workshops rather than one large factory but so far no enamellers' workshops have been fully recorded. May (1904) describes the finds at Wilderspool as including an enamellers' workshop but this is open to question, given the details available. It is likely that the enamelling process would have been carried out in the same workshops that made the brooches and copper alloy objects. Not all enamels found in Britain came from the Rhineland, as in many instances those with enamel have close parallels with non-enamelled brooches of local distribution eg 'dragonesque' brooches (Feachem 1951, 33; 1968, 100). It is interesting to note that Birdoswald produced a glass lump (No 298) that was possibly intended to be used to produce enamels.

Of the eight penannular brooches found at Birdoswald, three have Fowler A2 terminals, three Fowler D1 terminals and two Fowler D7 terminals (Fowler 1960, 149–77). Penannular brooches are a long-lived form that goes through the Roman period and into the Dark Ages. Mackreth, in his 1992 lecture to the Roman Finds Group conference, suggested that bowed penannular pins are a northern characteristic and it is interesting to note that four of the penannulars have bowed pins (Nos 67, 69, 70, 73). The remaining four are missing the pin.

In terms of dating both the Fowler A2 and D1 have a broad date span, with the A2 in use from the first to fourth centuries and the D1 from the first to the third century. The A2 brooches have a wide distribution but the greatest numbers have been recovered from Hadrian's Wall and Traprain Law. The D1 has a mainly south-eastern and south-west distribution but examples have been found on Hadrian's Wall. The D7 is a late form, dating from the fourth into the early fifth century. Fowler (1964, 98–160) first suggested a Dark Age date for the D7 brooches, but recent work by Snape (1992, 158–60) shows that not all D7s are identical, and one variant seems to be associated with sub-Roman occupation. Most of the examples come from the northern frontier, with three from South Shields and two from Birdoswald. Interestingly one of the D7s is made of iron (No 74). Both brooches (Nos 73 and 74) come from contexts associated with the backfill between the sleeper-walls of the demolished Building 198, in a context containing coins of Valens and Valentinian.

Only four of the brooches found during the excavations came from stratified contexts associated with the military occupation. Five brooches were unstratified including both the Crossbow brooches (Nos 60 and 61), the Trumpet brooch (No 55), the Knee brooch (No 57), and a penannular; three brooches came from residual contexts including the Wheel brooch (No 66), one of the enamelled Umbonates (No 63), and a penannular. Seven brooches came from contexts associated with the reuse of the *horrea*, six of them were penannulars including the two Fowler D7s (Nos 73 and 74); also associated with this phase was one of the P-shaped brooches (No 58).

Qualitative analysis

by Justine Bayley

A total of 15 Romano-British brooches were analysed qualitatively by X-ray fluorescence (XRF) (Table 18). Seven of the brooches had surviving traces of applied decoration of one type or another (identified in the column headed 'Decor' in Table 18) and in most cases its identity was confirmed by XRF.

The XRF analyses were carried out on the patinated surfaces of the objects and so could only indicate very approximately the relative amounts of the alloying elements zinc, tin, and lead that were present in the copper alloys. The XRF results do however allow an alloy name to be associated with each object with a fair degree of confidence. Bronzes are predominantly copper and tin, brasses mainly copper and zinc, while gunmetals contain significant quantities of tin and zinc in addition to copper. (Leaded) alloys contain a small percentage of lead while leaded alloys have higher lead contents.

Zinc-rich alloys are commonly used for Trumpet-headed brooches like No 56, so this example is typical of its type. It is better preserved than many as some of the applied silver foil survives. No 58 is an example of a late P-shaped brooch. Eight of the 13 other examples analysed are bronzes or leaded bronzes so this example conforms to the pattern. Tinning is common and gilding is known on this type. Other late sheath-footed types are divided bow brooches (No 59) and Crossbow brooches (Nos 60 and 61). Divided bow brooches are almost always leaded bronzes, and over half the examples examined had tinning surviving. Heavy Crossbow brooches like the Birdoswald examples are normally either brass or leaded bronze though other leaded gunmetals are known.

Bow brooches

copper alloy

55. 10013 473.22 Area F/Rampart/Period 2 (Fig 187)
Trumpet brooch. Fully-developed with acanthus, sprung pin, chain loop, straight leg, and moulded foot knob. The central ribs on the foot knob and loop band are knurled as also are the cross ribs, above and below the acanthus, which are present only on the front of the bow. Hull type 158 A, Collingwood type Rii with the acanthus encircling the bow. For parallels see Olivier 1979, 209, fig 84, no 10; and Hattatt 1985, 107, fig 44, no 430.
Length 74mm.

Table 18 Results from a qualitative analysis of the brooches

catalogue number	*Hull group*	*Hull type*	*alloy*	*decor*
56	8	166C	gunmetal	EWA
58	11	186B	bronze	WG
59	11	189	leaded bronze	W
60	11	192	leaded gunmetal	
61	11	192	leaded bronze	
65	plate	264A	bronze	EWA
66	plate	266B	leaded bronze	E
64	plate	267B	bronze	EW
63	plate	268	(leaded) bronze	E
69	penan	P4	bronze	
71	penan	P5	leaded bronze	
72	penan	P5	(leaded) bronze	
68	penan	P6C	(leaded) bronze	
74	penan	P12	iron	
73	penan	P12	bronze	

key to decor: E = enamel, W = tinning/solder, G = gilding, A = applied silver

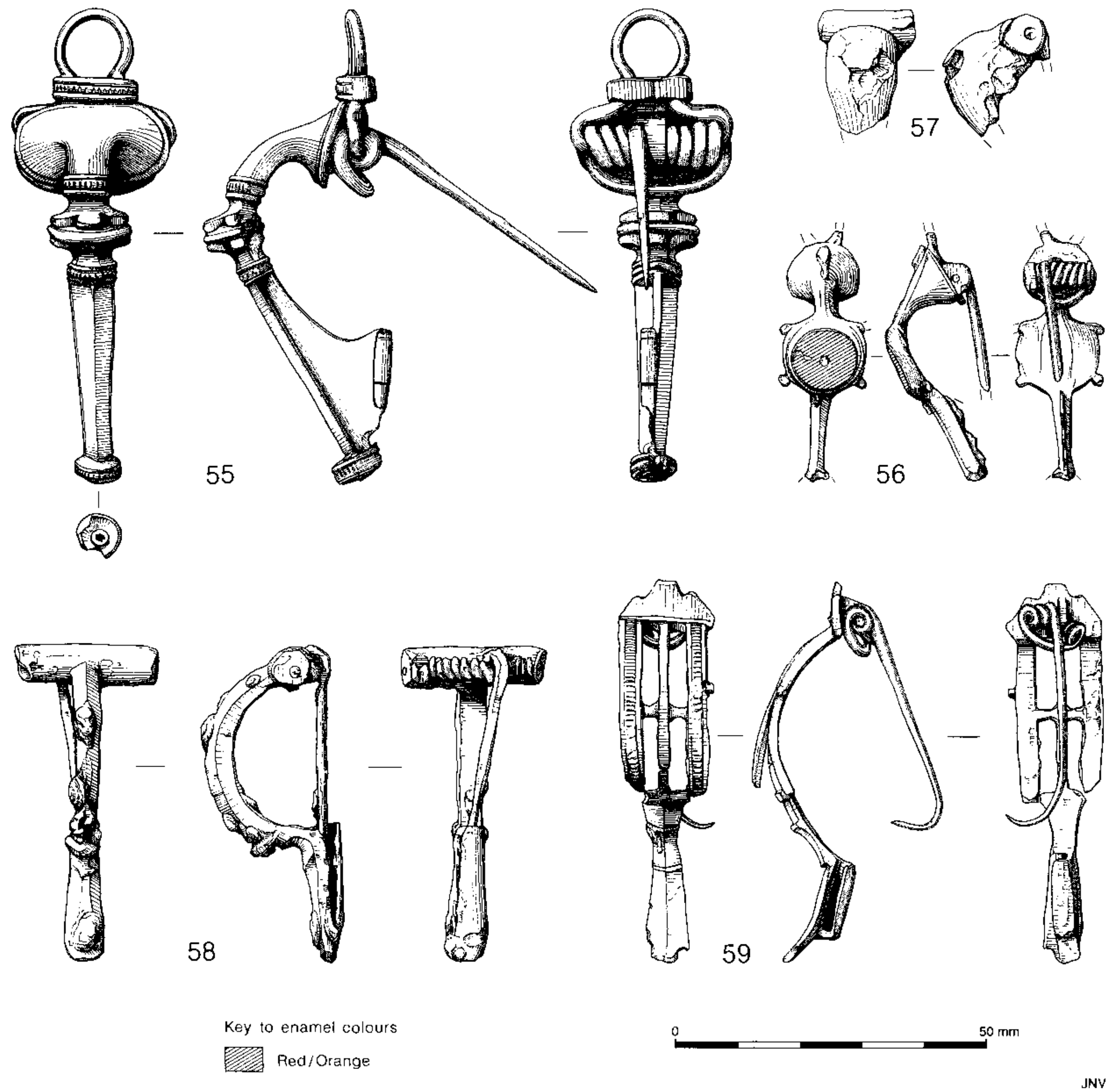

Fig 187 Copper alloy bow brooches (scale 1:1)

56. 927 1465 Area B/Rampart/Period 4a-b (Fig 187)
Disc and Trumpet. The foot and part of the pin is missing. Trumpet head with spring recessed and held between two lugs. A large enamelled disc at the mid bow with two lugs either side and a straight narrow leg. The enamel fills an annular field with a small central spot of reserved metal and now looks pale greenish in colour with a brown surface skin. This would not have been its original appearance: the enamel was probably once opaque red or orange. The brooch was also decorated with strips of silver foil which were soldered into place. Traces of the lead-tin solder can be seen running round the top of the head, down its centre, round the enamel field, on the reserved metal spot and down the centre of the foot. Silver was detected by XRF. Hull type 166 C. See Hattatt 1982, 110, fig 47, no 87 and Hattatt 1985, 114, fig 47, no 453.
Length 41mm.

57. 866 1406 Unstratified (Fig 187)
Knee brooch in fragmentary condition. Semi-cylindrical head with an open spring held between end lugs. Spring pin. Hull type 173. See Hattatt 1985, 122, fig 51, no 478.

58. 628 84 Bld 197/Phe/Floor Layer/Period 5 (Fig 187)
P-shaped brooch. Semi-cylindrical head with half enclosed spring with an axis bar held in end plates. The bow is of a triangular section with one rib at the base of the bow. Spade-shaped leg. Traces of both tinning and gilding survive on this bow brooch. Because of the position and small size of the areas of gilding it was not possible to confirm analytically whether it had been applied as gold leaf or as a mercury amalgam. Either method could have been used as the bulk metal was not leaded. Hull type 186 B. See Hattatt 1987, 278, fig 87, no 1253.
Length 50mm; width across spring case 23mm.

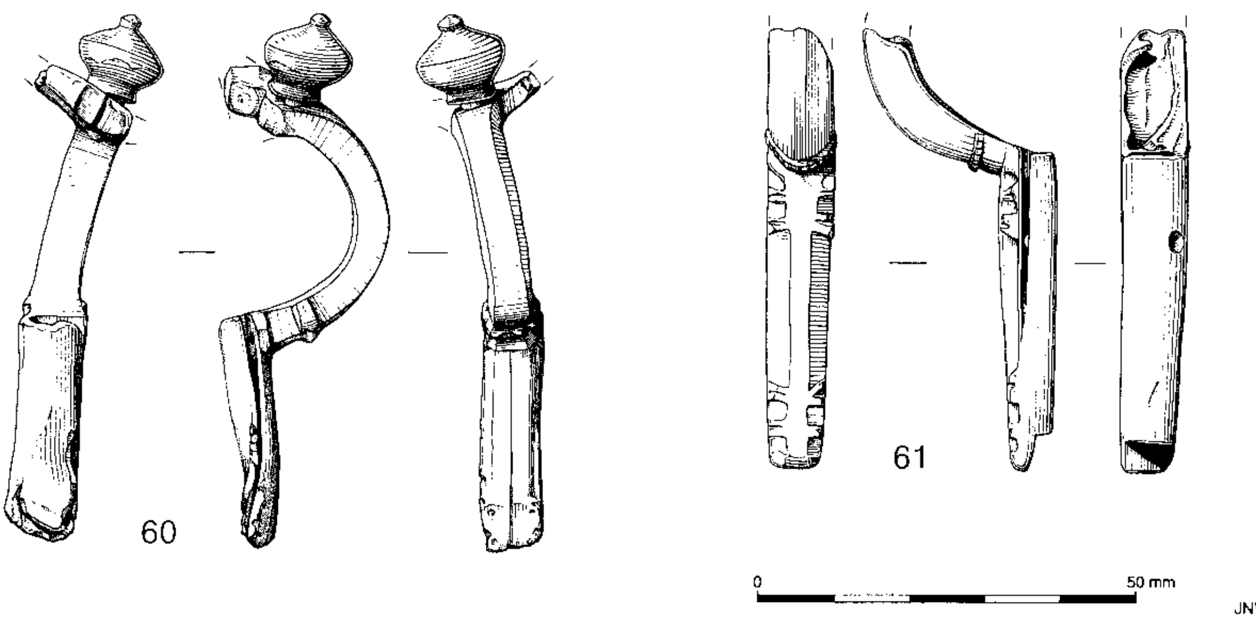

Fig 188 Copper alloy bow brooches (scale 1:1)

59. 2040 1582 Via P/Period 4b (Fig 187)
Broken triple-bowed P-shaped brooch of the third century. The central bow member is narrow and deep. The side ones are wide and decorated with knurled rib in relief, and lateral mid-bow struts between them. The head knob is broken, but mounted on a triangular head piece, of full bow width and the spring with chord internal. Hull type 189. See Hattatt 1987, 277, fig 87, no 1251 and Hattatt 1989, 199, fig 94, no 1670.
Width across bow 14mm.

60. 504 1 Unstratified (Fig 188)
Crossbow brooch. Incomplete. Both arms are broken. An early example of a fully-developed Crossbow, with long foot, decorated with ring and dot, broken at the end. The surviving knob is of a simple onion shape. The bow has a trapezoidal section with a rib near its base. Hull type 192. Keller type K3 *c* 340–70. See Hattatt 1982, 122, fig 53, no 104 for a similar example.
Length 70mm.

61. 583 1 Unstratified (Fig 188)
Fragment of Crossbow brooch. Broken across the bow, with rib at the base. Complete leg, decorated with notches at top and bottom of leg. Hull type 192.
Length 59mm.

62. 2356 4045 PPS/Blocked portal/Period 4a
Copper alloy spring. Fragment of a spring (four coils) from a brooch. With part of the axial bar still enclosed.

Disc and plate brooches

copper alloy

63. 2095 1675 Area B/Period 6–11 (Fig 189; back cover)
Enamelled umbonate brooch. Has a hinged pin with eight peripheral lugs: three small on each side, a solid one at the foot, and a large perforated one at the head. The umbo occupies the central part of the brooch, with a deep groove around it and a small knob at the peak. The surrounding plate slopes backwards and contains a ring of petal-like cells placed radially with alternate blue and opaque yellow enamel, with two of the blue cells also containing some colourless glass. The umbo has five oval cells radiating from the knob, filled with opaque yellow enamel. The background in both rings now looks dull olive green but was probably originally red enamel. Hull type 268. Examples are known from Carlisle: see Mackreth 1990, 112, fig 101, no 21 and Padley 1994, 196, fig 98, no C11; Watercrook: see Olivier 1979, 211, fig 84, no 16; and Hattatt discusses the type (Hattatt 1987, 183, fig 59, nos 1064 and 1065).
Diameter 47mm.

64. 783 414 Bld/4419/Period 4a-b (Fig 189)
Enamelled umbonate brooch. A circle of triangular cells, filled with blue enamel, leaving the bronze dividers as a multi pointed star. Deep groove around the umbo and four peripheral lugs. Hinged pin. Hull type 267 B. See Hattatt 1987, 184, fig 59, no 1066.
Diameter 22mm; length 30mm.

65. 2267 2790 PPS/NT/Period 4a (Fig 189)
Enamelled disc brooch bordered with 12 small lugs. Reserved metal strips separate the six fields of enamel round the circumference from the star-shaped field with its central spot of reserved metal. The central field of enamel is now dark green but was originally possibly red. The other fields are alternately blue and turquoise. There are traces of lead-tin solder and silver on the reserved metal areas, showing this brooch was decorated in a similar way to SF 56. The spring is held between two lugs. Hull type 264 A. See Hattatt 1985, 142, fig 61, no 526 and Hattatt 1987, 172, fig 56, no 1041.
Diameter maximum 20mm.

66. 2214 1962 Bld 4403/Period 6–10 (Fig 189)
Wheel brooch with a central boss and hinged pin. Decorated with millefiori enamel in the inner annular field. The millefiori pattern is a 5 x 5 opaque yellow and translucent turquoise chequerboard cased in turquoise glass. This com-

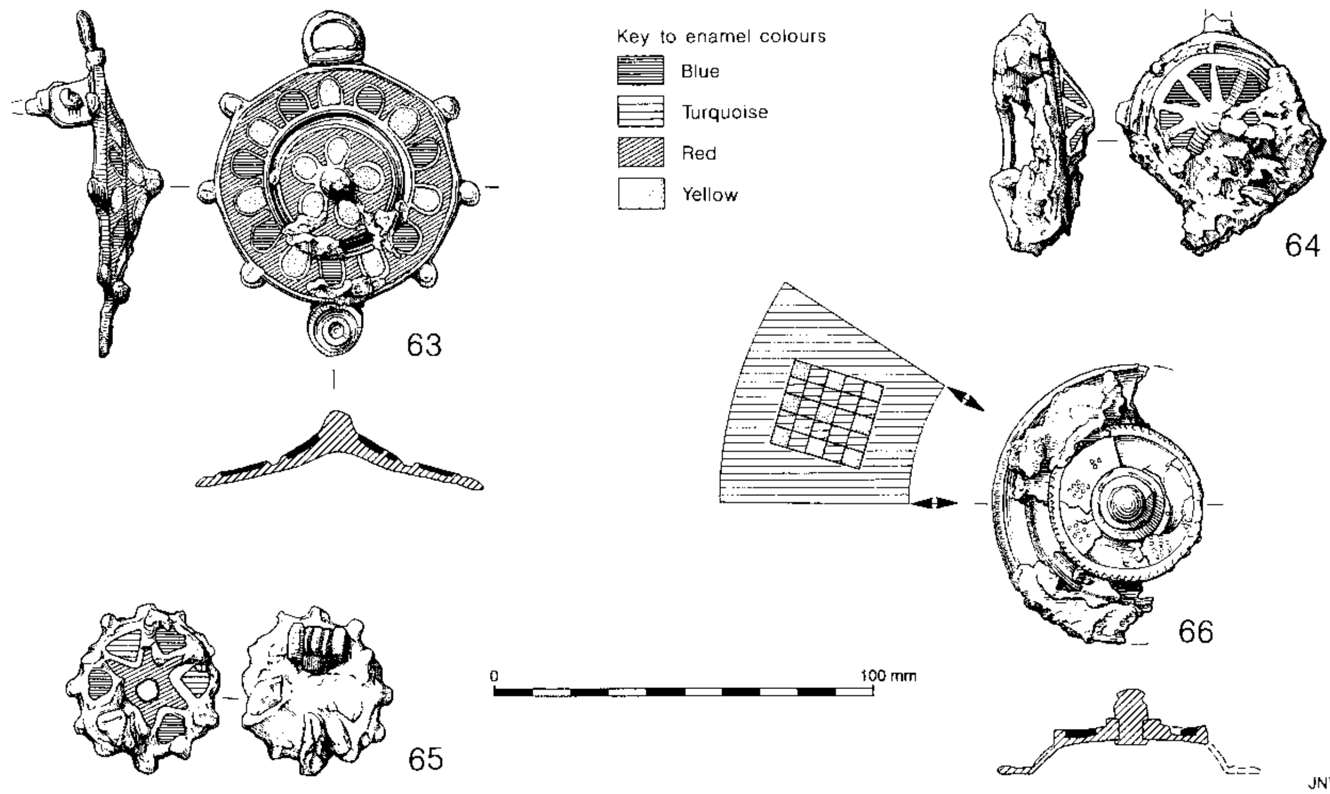

Fig 189 Copper alloy disc and plate brooches (scale 1:1)

bination is unusual. The outer annular field never contained enamel. Hull type 266B.
Diameter 37mm.

Penannular brooches

copper alloy

67. 755 330 Area B/Period 6–11 (Fig 190)
Penannular brooch. Fowler type A2. Milled knobs. Highly-arched pin.
External diameter 21mm.

68. 864 1406 Unstratified
Penannular brooch with pin missing. Fowler type A2. With knobbed ends. Ring distorted. Circular section.
External diameter 2mm.

69. 863 1417 Bld 198/Phe/Dump/Period 5
Penannular brooch. Fowler type D1 terminals. High-arched pin.
External diameter 27mm.

70. 2039 1516 Bld 198/Phd/Dump
Penannular brooch. Complete. Fowler type A2 with a high-arched pin.
External diameter 25mm.

71. 870 1418 Bld 198/Phe/Dump/Period 5 (Fig 190)
Penannular brooch. Complete but missing all but a fragment of the pin. Fowler type D1. The terminals are bent at right angles to the plane of the hoop and pressed flat against it. The terminals are decorated with transverse notches resembling stylised animal heads. This a crude, flat example.
External diameter 32mm.

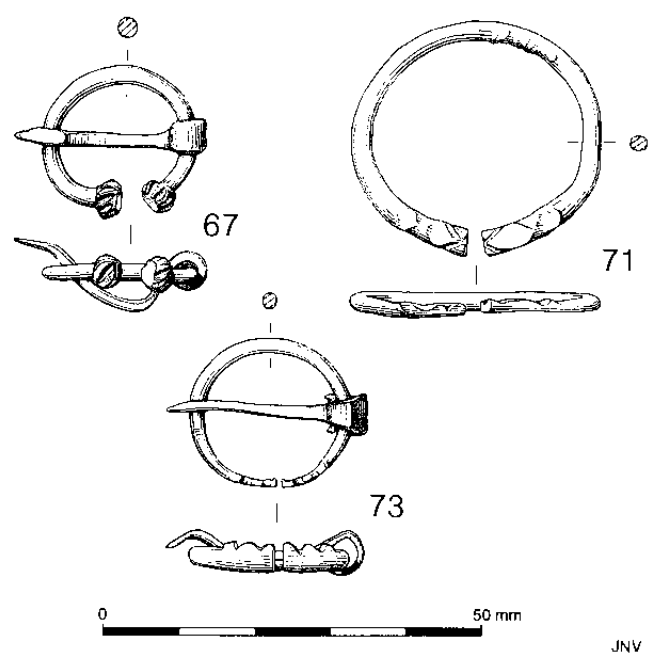

Fig 190 Copper alloy penannular brooches (scale 1:1)

72. 882 1417 Bld 198/Phe/Dump/Period 5
Pin missing. D-shape. Circular-section hoop. Fowler type D1.
External diameter 30mm.

73. 843 1403 Bld 198/Phe/Dump/Period 5 (Fig 190)
Penannular brooch. Fowler type D7. The hoop narrows towards the terminals which have been pinched upwards and are decorated with notches. A parallel comes from South

Shields. This is an unusual variant for which a Dark Age date has been suggested by both Fowler (1964, 98–160) and Snape (1992, 158–60).
External diameter 22mm.

iron

74. 743 272 Bld 197/Phe/Dump/Period 5
Penannular brooch. Fowler type D7. One terminal broken. Pin missing. Slightly distorted.
External diameter 32mm.

Earrings

Allason-Jones (1989, 39) has demonstrated that earrings were widely worn in Roman Britain, and has catalogued over 600 examples. The majority are of copper alloy but others are known in gold, silver, pewter, and glass. Allason-Jones' work has shown that there are three main distributions of earrings: the Hadrian's Wall area; the Bristol Channel; and Lincolnshire, Cambridgeshire and Hertfordshire. The main distribution of gold earrings suggests a bias towards the military north, and two elaborate gold earrings have been found at Birdoswald.

No 75 is a copper alloy example of Allason-Jones Type 1 (ibid, 2) which is the most common type of earring found in Roman Britain. The type has a very wide distribution and has been found on all types of site, with examples being made from copper alloy, glass, pewter, and silver.

copper alloy

75. 776 96 Bld 197/Phe/Dump/Period 5
Plain hoop earring. Allason-Jones Type 1 (Allason-Jones 1989, fig 3 no 141). Penannular of circular section with one end tapering to a point and the other blunt.
Internal diameter 12mm; width 1mm; thickness 1mm.

gold

76. 2221 2601 Bld 4299/Period 6 (Fig 191)
A fragment of a gold earring. Damaged at both ends and bent, possibly an Allason-Jones Type 1 or a hook fragment. With tapering ends.
Width 2mm; thickness 2mm.

77. 627 77 Bld 197/Phe/Floor Layer/Period 5 (Fig 191; Pl 11)
Hexagonal gold earring with a convex face welded to the flat backing plate. The face has grooves running from the corners of the hexagon to a central depression in which a faceted square cylinder bead of opaque green glass (cf Guido 1978, 96) is held by a length of gold wire soldered to the face at both ends. The wire hook has been hammered flat at one end and soldered onto the backing plate.
Length 13mm; width 13mm; length of bead 4mm; width of bead 3mm.

This example sheds much light on other examples found in Roman Britain. It is very close in appearance to the pair from Owmby by Spital (Allason-Jones 1989, nos 50 and 51) which

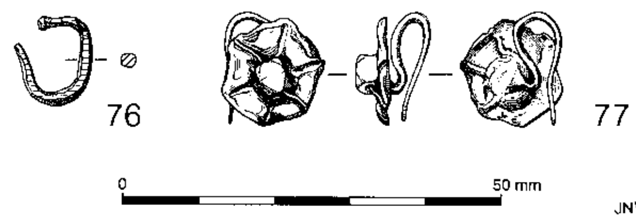

Fig 191 Gold earrings (scale 1:1)

were designated as variants of Allason-Jones Type 13a as they lack a central bead or inset. The evidence of beads being held simply by wire soldered to the face rather than inset suggests that if they were removed for some reason there would be little evidence of their original existence. It is therefore possible that the postulated bead on the example from Bewcastle in Cumbria (ibid, no 4; Type 14) could also have been held by soldered wire. Examples of earrings with wired beads are known in Sofia Museum (ibid, nos 45, 46, and 47: information from Dr Rousseva-Slokoska) and in Istanbul Museum (Ergil 1983, nos 120 and 123).

The fourth-century context of the Birdoswald earring accords well with the fourth-century date of the Owmby by Spital pair as does Guido's suggestion that green glass beads of polygonal form were more popular in the late Roman period (1978, 97).

Finger rings

copper alloy

78. 717 237 Bld 197/Phe/Dump/Period 5 (Fig 192)
A plain, rectangular-sectioned hoop with a recess in the bezel for an intaglio, now missing.
Width across the bezel 13mm; thickness maximum 2mm.

79. 756 336 Bld 197/Phe/Dump/Period 5 (Fig 192)
Plain hoop with D-section. Bezel decorated by five transverse grooves forming a raised triangular point.
Internal diameter 13mm; height 4mm; thickness 3mm.

80. 2354 4045 PPS/Blocked portal/Period 4a (Fig 192)
Ring key in three fragments. Flat ward on an oval-section ring. Ward decorated with a pelta-shaped cut out. For similar examples see Kenyon 1948, fig 86, no 12 and Crummy 1983, fig 89, no 2163.
Maximum height 20mm; thickness 2mm.

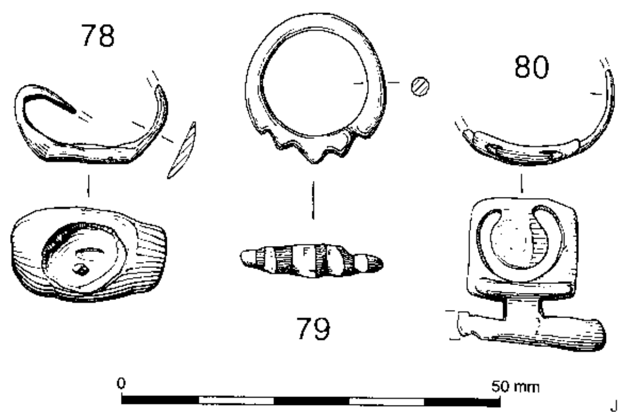

Fig 192 Copper alloy finger rings (scale 1:1)

81. 2430 4279 PPS/ST/Period 4a-b
Plain hoop. Badly corroded. Much of original surface missing. Internal diameter 17mm.

jet/shale

82. 836 1382 Area A/Period 7–9 (Fig 193)
Incomplete. D-section. Broken across the bezel which is decorated with transverse grooves.
Maximum height 6mm; maximum thickness 5mm.

83. 2148 1764 Unstratified
Incomplete. D-section. Plain band, tapering from the bezel.
Maximum height 6mm; maximum thickness 5mm.

84. 612 32 between Blds 197–198/Period 4b-6 (Fig 193)
Complete D-sectioned hoop. Decorated bezel. Broken on one side of bezel. Bezel slightly raised oval. Three incised diagonal grooves to one side of bezel.
Diameter external 24mm; diameter internal 17mm; height 4mm.

glass

No 85 is a fragment of a deep green finger ring, appearing black. Glass finger rings, although not common, are found on a variety of Romano-British sites. Examples in dark green glass are rare, but deep yellow/brown rings, also intended to appear black have been found at Poundbury (Charlesworth and Price 1987, 109, no 9 fig 78), Witcombe villa (Price and Cottam forthcoming, nos 78–9), the temple at Thistleton (unpublished), and Malton (unpublished). The ring from Poundbury has a similar tooled shoulder and flat bezel, and its late Roman context may give some indication as to the dating of these objects.

85. 532 79 Bld 197/Phe/Floor layer/Period 5 (Fig 194)
Fragment of finger ring. Very dark green, appearing black. 50% of plano-convex sectioned hoop with central trail on outer surface, thickening towards bezel. Flattened shoulder, pinched ribs across hoop at either side of flattened oval bezel. Internal diameter *c* 16.5mm; thickness (hoop) 3.5–4.5mm; thickness (bezel) 2.5mm. *[JP/SC]*

Intaglios
by Martin Henig

86. 2336 3572 Area A/Disturbed subsoil beneath Turf Wall/Period 1 (Fig 195; Pl 12)
Cornelian intaglio, ovoid with slightly convex upper face, shape Henig (1978).
Dimensions 19.5 x 15.3 x 4.4mm.
Some iron adheres to the stone and represents the remnants of the signet ring in which it was set. The device is an eagle standing with its body in profile to the left but with head turned to the right (impression described). In its beak is a wreath with long ribbons and on either side is a maniple standard (Webster 1985, 138–9). There is a ground-line.

This is a very familiar motif, expressly associated with the legions. Occasionally the name of the legion is added such as *LEG(io)* XI *C(laudia) P(ia) F(idelis)* on a stone from Bulgaria (Dimitova-Milcheva 1981, No 208) and *LEG(io)* XV *APOLLINARIS* upon an intaglio from Cyprus (Daszewski 1973). There are, however, several eagle-and-standards gems from the province in contexts ranging from the first century to the third, including two from Conquest-period forts in southern Britain, where the presence of legionaries seems virtually certain, and one from Caerleon (Henig 1978, nos 705, 706, and 708). A further example comes from Southwark (ibid, no App 186), where a military guild is attested.

The rich use of patterning especially on the eagle's plumage is a feature which seems to begin on gems in the Flavian period. Among gems found in Britain a good stylistic analogy may be made with the eagle (portrayed with a cornucopia) on a cornelian found in the metalling of a road of probable Trajanic date at Holditch, Staffs (ibid, no 694). If the Birdoswald gem is also Trajanic this would account for the signs of wear on the front of the stone noted by Marjorie Hutchinson (personal communication) in her report, for in that case, the stone would have been worn for about 20 years before loss.

Part of the significance of this object in the story of Birdoswald arises from its Hadrianic context. As is well known the Wall was built by the legions but it was then garrisoned by auxiliaries. The device relates specifically

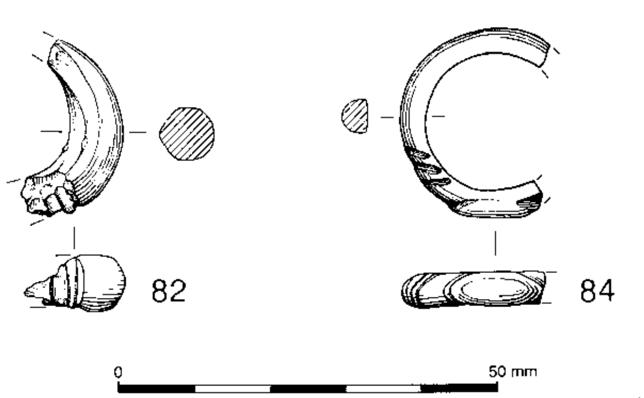

Fig 193 Jet/shale finger rings (scale 1:1)

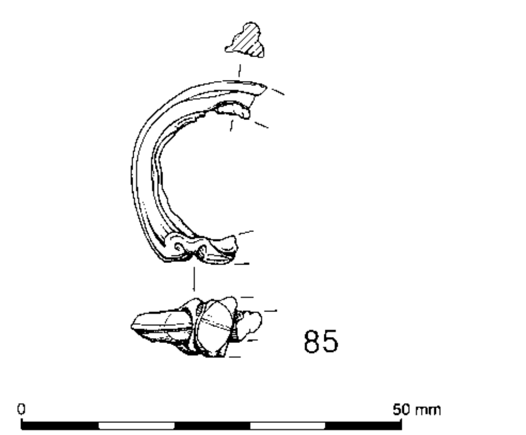

Fig 194 Glass finger ring (scale 1:1)

to the former category and it is hard to escape the conclusion that it belonged to one of the builders of the Turf Wall.

87. 2338 3771 PPS/Cut for ashlar/Period 3 (Fig 195, Pl 12)
Red jasper intaglio, ovoid with flat upper face. Shape Henig F1.
Dimensions 12.7 x 10.5 x 2.6mm.
Shallow bust of youth in profile to the right (impression). He has fine straight hair hanging in a fringe over the brows. Behind the locks are thicker and extend down to the nape of the neck. The physiognomy is regular and well-defined. This gem has been deftly cut with a variety of drills by a skilled engraver and in the present writer's opinion is superior in execution to the vast majority of gems from Britain. The use of red jasper and the richly grooved hair suggest a date no earlier than the second century.

The lack of attributes suggests that this is a portrait of an actual individual. Comparison may be made with three youthful portraits upon red jaspers respectively in the J Paul Getty Museum, Malibu (set in a gold ring of Severan type; Spier 1992, No 331), in Geneva (Vollenweider 1976, no 243), and in Leiden (Maaskant-Kleibrink 1978, no 1169) (formerly in The Hague). The long hair, however, is an affectation more properly belonging to a deity such as Apollo or Harpocrates; in fact a cornelian gem in Vienna portraying in profile a bust of Harpocrates wearing a lotus-crown(?) is fairly close to the type on the Birdoswald stone (Zwierlen-Diehl 1979, nos 1374, 1373 (Harpocrates), 1274, 1275 (Apollo)); Septimius Severus and his family were well-known devotees of the Egyptian deities and Severus modelled his own hair-style on that of Serapis. It is tempting to see the Birdoswald gem (and possibly the Vienna stone just cited) as portraying the young Caracalla or Geta, though in semi-divine guise.

Attention may be drawn to three intaglios from Britain, two of them alluding to the Egyptian gods, dating to the period of the Severan campaigns in the province and their aftermath (Henig 1986). From Silchester comes a plasma intaglio portraying Caracalla as the Genius of the Roman People, with long hair like the bust on the Birdoswald gem (as the reborn god Harpocrates), and a Serapis-*modius* on his head. A cornelian found at Castlesteads (now lost, although a drawing of the stone is extant) depicted a bust of Serapis flanked by two youthful busts. The stars above their heads probably identify the latter as the Dioscuri, although the hair-style of the head on the


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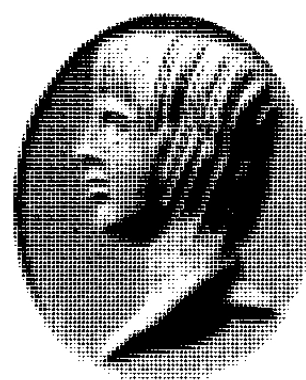
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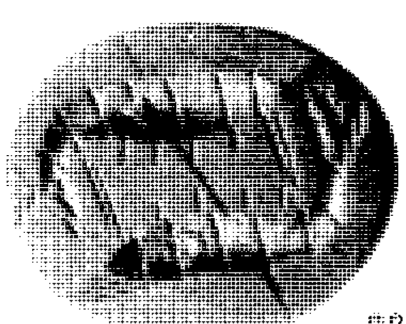
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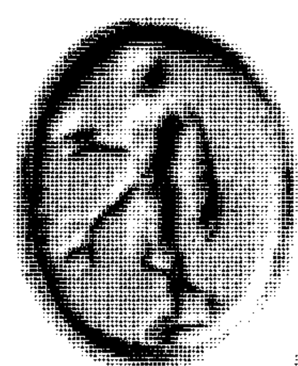
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Fig 195 Intaglios (scale 4:1)

right in particular is very close to that of the Birdoswald youth and may also portray a young Severan as Harpocrates. Finally, a red jasper from South Shields, likewise lost but preserved in impression, shows Caracalla as Mercury. His hair is curly not straight but the face is very similarly executed.

It is, perhaps, possible to ascribe all these intaglios to a workshop based in Britain operating between *c* 208 and 212, when the Court was indeed present in the province, which was for these three years the 'heart' of the Empire. If this is acceptable, the new find would be of the greatest importance and it is even possible that the workshop had an official basis and that the gem was actually presented by the imperial secretariat to an army officer or some other loyal supporter of the dynasty. Marjorie Hutchinson again comments on the surface wear but this seems to me rather superficial for a red jasper. The polish within the cut areas remains brilliant and no very long period of time need have elapsed between manufacture and loss.

88. 10029 473.25 Area G/Unstratified (Fig 195, Pl 12)
Red jasper intaglio, ovoid with flat upper face. Lower side very slightly convex. Shape Henig (1978) F6 rather than F1.
Dimensions 13.5 x 11 x 3mm.
Two shrimps, one upside down and reversed in relation to the other.

A single shrimp is shown on a jasper from the fort at Bearsden, Dumbartonshire, and the same crustacean appears on other intaglios from York, Colchester, and Cirencester (Henig 1978, nos App 193, 715, 716, App 194). The composition somewhat resembles that of a cornelian from Silchester (ibid, no 717) where a shrimp is portrayed swimming in one direction with a dolphin below it swimming in the other. The significance of the two shrimps is uncertain.

The simple device is deftly executed, and effectively ornamented with a few transverse wheel grooves on the body. It can be assigned to the Small Grooves Style and dated to the second century. The gem is polished on the upper face alone.

89. 669 236 Bld 197/Phe/Dump/Period 5 (Fig 195, Pl 12)
Moulded nicolo-glass intaglio. Marjorie Hutchinson comments that 'a layer of blue-grey glass has been fused onto a layer of black glass to imitate the pale blue-on-black appearance of white-on-black onyx'. The regular jeweller's term for such an onyx is nicolo. Flat upper face, bevelling outwards. Shape Henig F2, Hutchinson notes that 'a scar round the side of the stone probably indicates the position of the top of the setting'.
Dimensions 12.2 x 9.9 x 3.5mm.
The subject is *Bonus Eventus* standing in profile to the right (impression described). He is shown in a relaxed stance, his left leg bent at the knee and crossed behind his right leg. He is nude apart from a chlamys worn over his shoulder. The type ultimately derives from a Greek statuary type, probably by Euphranor (Painter 1968, No 55). In his left hand he holds a dish and in his right a branch. There is a short ground-line below his right foot.

Identical nicolo-glass intaglios, ultimately from the same prototype though taken from rather more worn moulds come from Lowbury Hill [now Oxfordshire] and from Poundbury, Dorchester (Henig 1978, Nos 192, App 42). The latter is set in a copper alloy ring of third-century type and is derived from a pit ante-dating the fourth-century cemetery. A similar intaglio, although not from the same mould, has recently been found at Carlisle (Tullie House site, Ian Caruana personal communication). The copying and dissemination of such low-grade intaglios were presumably originated in jewellery workshops producing what might be called 'trinket jewellery'. That such workshops existed in Britain seems certain as Dr Maaskant-Kleibrink has expressed the view (personal communication) that the work of the Snettisham workshop is discernible in similar glass copies.

Two of the intaglios from this site are of considerable interest and historical importance, connected as they are with periods of activity significant for Birdoswald and for the province as a whole. The third engraved gem is a new variant on the type not so far well represented in Britain and reflects literally on Roman taste (ie diet). The final intaglio is of much lower quality and is clearly residual, but represents the type of signet worn by many of the ordinary people of Britain during the Middle Empire. The presence of exact parallels far away in southern Britain indicates a minor aspect of trade in the province, perhaps through the activities of itinerant pedlars.

Pins

bone

The large number of bone pins recovered from Colchester enabled Crummy (1979, 157–63) to establish a chronology for the six predominant types. All the bone pins from Birdoswald appear to be hand carved and one (No 90) is finely made with a gold foil covering. Only a handful of examples of the gold foil covering are known from Britain, though it is probable that in other cases the foil has not survived.

Crummy (1983, 20) points out that the simple tapering shafts of Types 1 and 2, and some Type 6, are liable to break but that the pin would be still be reuseable if repointed. One example from Birdoswald has been so treated (No 93). Five complete bone pins were recovered from Birdoswald: two Type 2 with transverse grooves beneath a conical head (including one covered with gold foil), one Type 3B with a spherical head, and two Type 6 with a reel and bead shaped head.

Types 3 and 6 have a date range from about 200 through into the late fourth or early fifth century, whereas by contrast Type 2 is known from *c* 50–200/250 but is absent from the later third and fourth centuries. Bone pins appear to copy the head types of the metal pins, and may have been made locally at lower cost. Some early bone pins are stained green

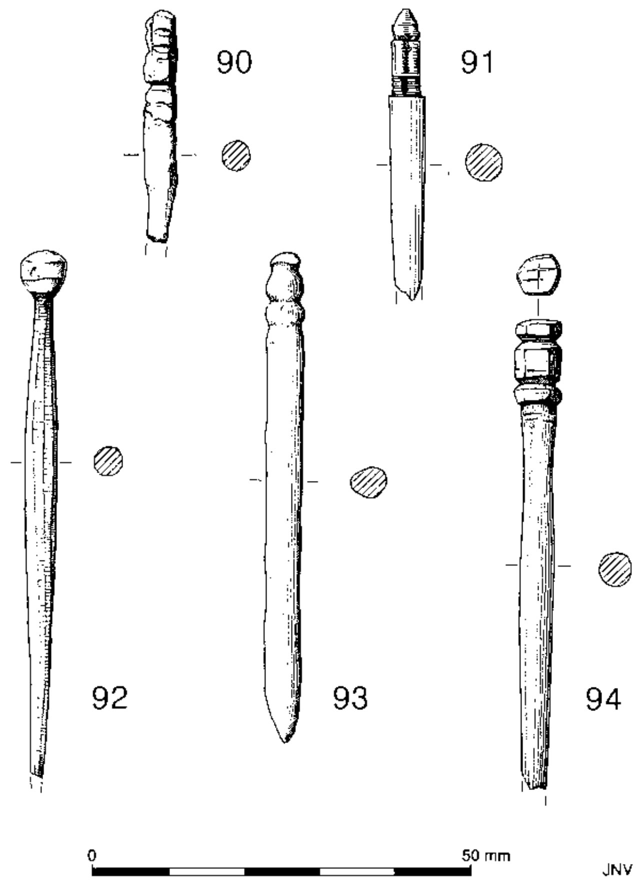

Fig 196 Bone pins (scale 1:1)

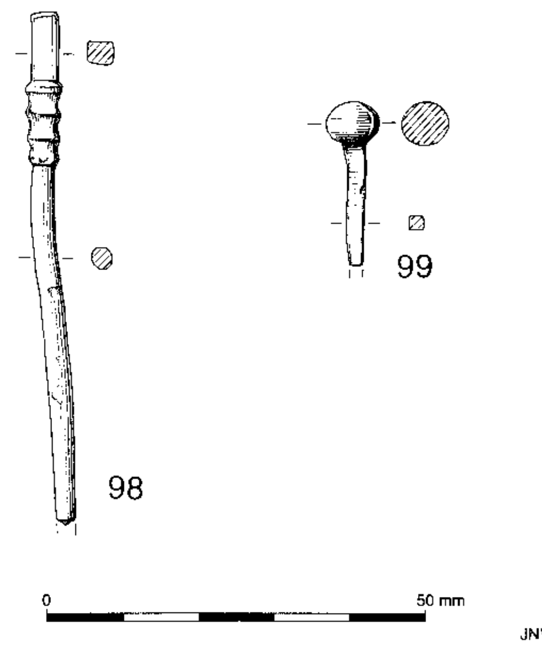

Fig 197 Copper alloy pins (scale 1:1)

and an example from Colchester has been stained red (Crummy 1983, 20); the use of these colours suggests an attempt to imitate copper alloy.

90. 2074 1522 Bld 198/Phe/Dump/Period 5 (Fig 196)
Tip broken off. Crummy type 2. Badly degraded. Three shallow grooves beneath a conical head.
Length 30mm.

91. 2047 1516 Bld 198/Phd/Dump (Fig 196, Pl 13)
Tip broken off. Bone pin, with gold foil around the head. Crummy 1979 Type 2. Transverse groove below the conical head with four grooves lower down. A parallel is known from a Roman villa site near Droitwich and is now in the British Museum (Inv No 1928.7–14.2). A similar example, with a flatter head is known from London (Murdoch 1991, 174 no 489). The London example follows the late first- to second-century trend for elaborately-decorated terminals. A third example is also known from Wroxeter (Bushe-Fox 1913, 31, fig 11).
Length 38mm.

92. 765 354 Bld 197/Phe/Dump/Period 5 (Fig 196)
Tip broken off. Crummy Type 3. Type B head with an elliptical lower half with a low convex upper half. Waisted shaft.
Length 69mm.

93. 630 84 Bld 197/Phe/Floor Layer/Period 5 (Fig 196)
Complete. Crummy Type 6. Repointed in antiquity with three bead decoration on the head.
Length 64mm.

94. 774 385 Bld 197/Phe/Dump/Period 5 (Fig 196)
Tip broken off. Crummy Type 6. Waisted shaft. Reel/bead/reel.
Length 61mm.

95. 965 1500 Ditch/Phf/Period 4b
Incomplete. Broken across the shaft but with tip.
Length 47mm.

copper alloy

96. 850 1405 Area B/Rampart/Period 4b
Pin with loop at end. Square section.
Length 45mm; thickness 6mm.

97. 957 1465 Area B/Rampart/Period 4b
Pin fragment? Square-section shank.
Length 70mm.

98. 2096 1664 West Berm/Period 6–9 (Fig 197)
Incomplete. Rectangular plain head with four reels on a circular-section shaft.
Length 69mm.

99. 2259 2737 Area E/Period 8 (Fig 197)
Incomplete. Cool Type 1. Knobbed head.
Length 21mm.

Buttons

copper alloy

100. 2156 1736 Area B/Rampart/Period 2 (Fig 198)
Fastener. Triangular-shaped loop from a button and loop fastener. Broken across the junction with the head.
Length 26mm; width maximum 22mm.

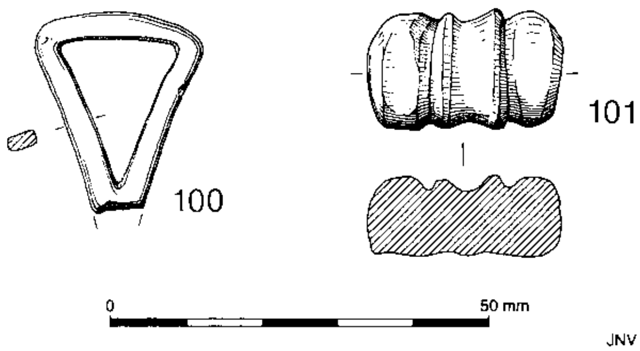

Fig 198 Button and loop fastener (scale 1:1)

bone

101. 2029 1577 Area A/Buried Soil/Period 7–8 (Fig 198)
Dumb-bell button. Complete. The ends are globular with raised ridge on either side of a worn central groove (cf Allason-Jones and Bishop 1988, 83, fig 99, no 285). Usually made in copper alloy but are made of bone particularly in the north. See MacGregor 1976, 134 for a discussion of the type suggesting a first- to third-century date.
Length 26mm; width 15mm.

Leather shoes

(see report by Quita Mould; page 326)

Category 2: toilet and surgical implements

copper alloy

102. 575 127 Bld 197/Phe/Floor Layer/Period 5
Toilet spoon. Small round flat scoop, bent. The top of the shaft is missing.
Length 106mm.

103. 712 235 Bld 197/Phe/Dump/Period 5 (Fig 199)
Toilet spoon. Small round flat scoop, bent. Tapers to a point at other.
Length 120mm; diameter of scoop 6mm.

104. 923 1505 Via P/Period 4b (Fig 199)
Toilet spoon. Decorated small round cupped scoop. Broken. Top of shaft is missing.
Length 127mm; diameter of scoop 6mm.

105. 10011 473.2 Area F/Antiq Trench/Period 11 (Fig 199)
Tweezers. One arm broken half-way down distorted. The blades are virtually parallel sided.
Length 71mm.

106. 958 1522 Bld 198/Phe/Dump/Period 5 (Fig 199)
Fork. Complete. From a chatelaine set? Square-section shank with a suspension loop on one end tapering to a thin fork with three tines. Where the shank narrows the forked end has been bent at a right angle – possibly deliberate.
Length 50mm.

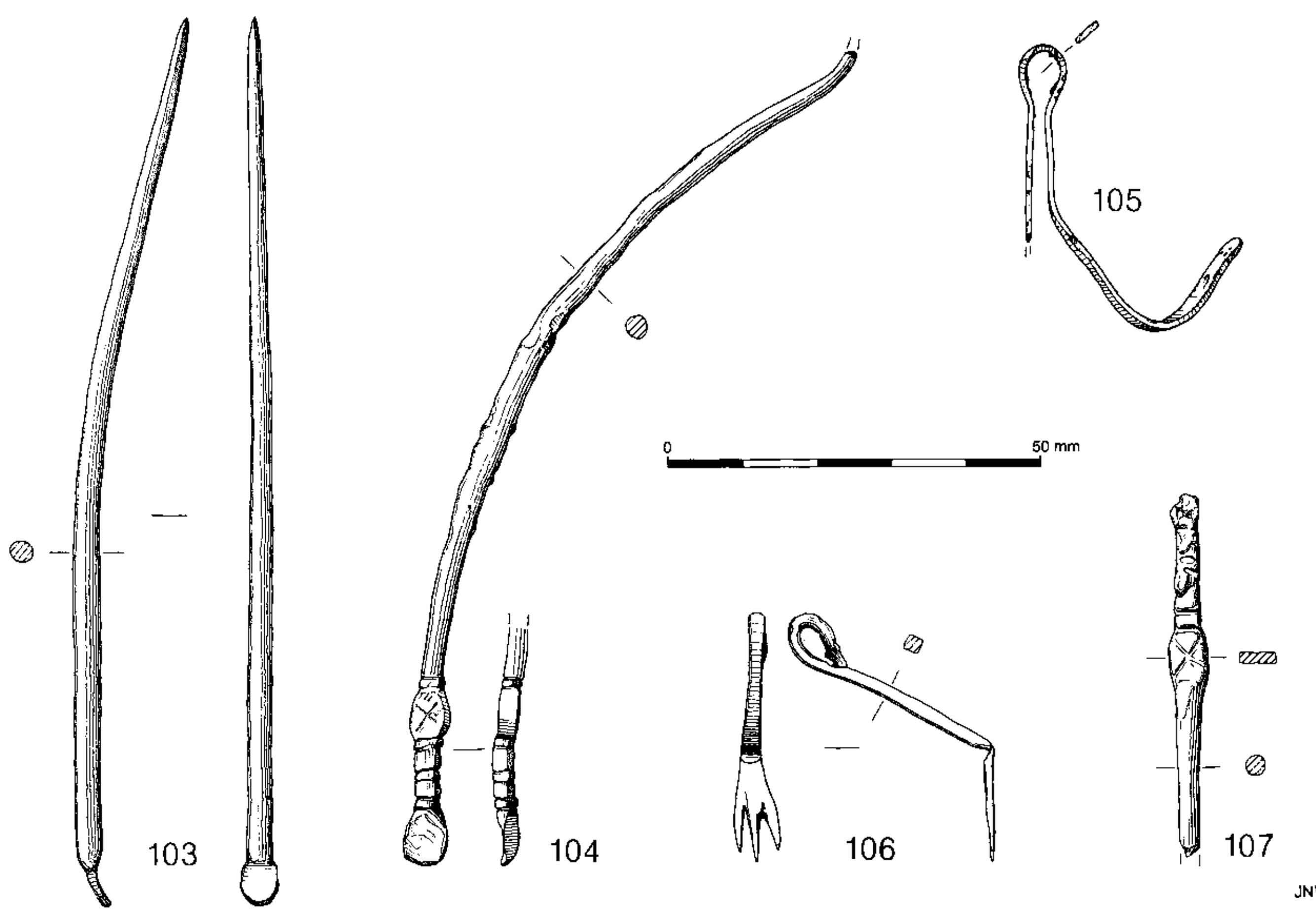

Fig 199 Copper alloy toilet and surgical implements (scale 1:1)

107. 729 299 Bld 197/Phe/Dump/Period 5 (Fig 199)
Incomplete. Highly-decorated handle with incised lines. Possibly a nail cleaner.
Length 49mm.

stone cosmetic pallets

108. 903 1403 Bld/198/Phe/Dump/Period 5
Local buff sandstone. Thin, rectangular pallet with rectangular section. It is well smoothed on all faces and complete (cf Allason-Jones and Miket 1984, 12.67–8).
Length 64mm; width 37mm; thickness 8mm.

109. 581 1 Area A/Topsoil
Complete rectangular slate pallet. Rectangular section. Highly-polished surfaces.
Length 63mm; width 30mm; thickness 7–12mm.

Category 3: textile and weaving tools

Birdoswald produced evidence for spinning and weaving in the form of spindle whorls and a pin beater. No needles were identified, though it is possible that No 95, which has been catalogued as a bone pin, is in fact a needle.

bone

Pin beaters were used as weaving tools and survive in greater numbers than sword beaters. The pin beater was inserted in between individual warp threads and at right angles to the weft. The transverse grooves apparent on the example from Birdoswald (No 110) were probably formed by friction against the warp.

110. 2190 1821 Ditch/Phe/Period 4b (Fig 200)
Pin beater. Triangular section. Decorated with two notches on either side of the rounded head. Tapers to a blunt point. Parallel sides. Series of worn nicks along one side, with evidence of wear on both front and back. MacGregor (1985, 188, fig 101, no 16) illustrates an undecorated example and discusses how they were used.
Length 159mm; width 20mm.

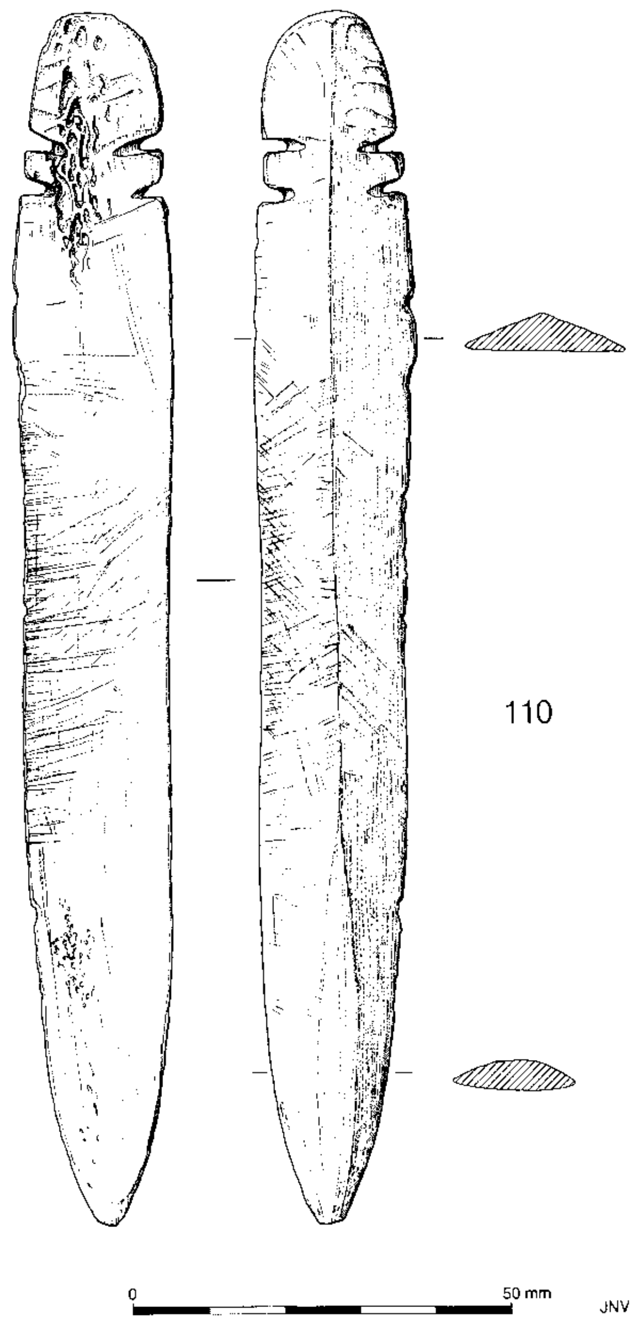

Fig 200 Bone pin beater (scale 1:1)

Spindle whorls

Ten spindle whorls (eight ceramic and two jet) have been identified following the criteria set by Crummy (1983, 67), which suggest that for a pierced pottery roundel to be used as a spindle whorl 'the [central] perforation should be a minimum of 5mm in diameter to allow a spindle to be inserted'. The whorl should be of even thickness and smooth sides and no larger than 50mm in diameter. All the pierced pottery roundels from Birdoswald were sorted using the first three criteria but do include examples over 50mm in diameter. The roundels that did not fit the criteria have been included under gaming counters.

As a number of ethnographic parallels illustrate, the size of the whorl is not important (Crowfoot and Ling-Roth 1974, pl 36, nos 3, 4; pl 43, no 2), and neither is shape, as it is possible to spin using a hooked stick or rectangular shaped whorl (Crowfoot and Ling-Roth 1974, pl 37, nos 4, 5). MacGregor (1975, 186) suggests that weight rather than form is the critical factor in choosing a whorl and yet a wide range of weights were used with no particular evidence for clustering. An attempt to assign a mechanical value to whorls has been made by Oakley and Hall (in Williams 1979, 286–9).

ceramic and samian

111. 633 84 Bld 197/Phe/Floor Layer/Period 5
Central Gaulish samian ware, from a dish or bowl produced in the Antonine period. About a third survives.
Maximum diameter *c* 30mm; thickness 7mm; perforation hole 6mm.

112. 662 207 Unstratified

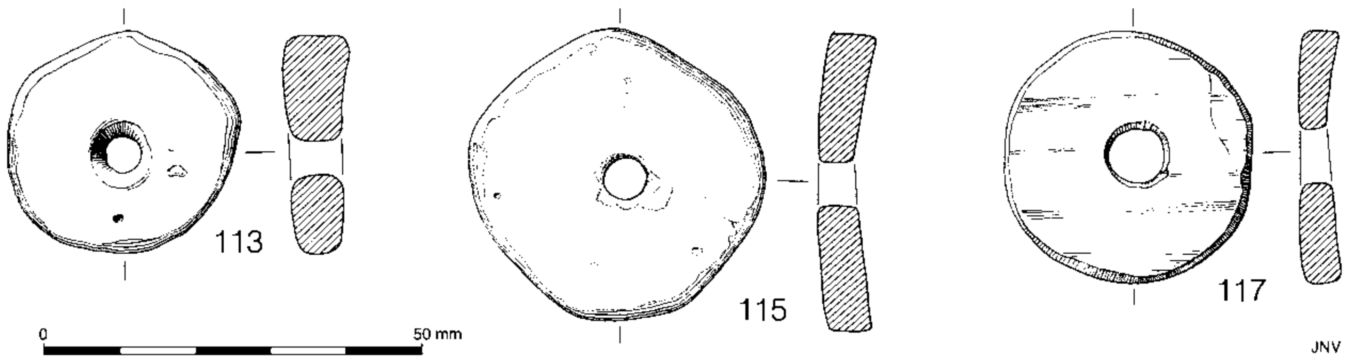

Fig 201 Ceramic spindle whorls (scale 1:1)

113. 844 1329 Area A/Period 11 (Fig 201)
Sandy light grey ware with reddish-yellow/light-grey 'sandwich' core. Fabric 11. Form of vessel from which this sherd derived is uncertain, but it was probably made in the second century. Oval shaped. Worn edges.
Diameter 31mm; thickness 7mm; perforation hole 6mm.

114. 877 1418 Bld 198 Phe/Dump/Period 5
Half spindle whorl, of sandy-grey ware. Well made with smooth rounded edges. Fabric 1. Derived from a vessel of uncertain form with no distinguishing characteristics to allow a close date. Second to fourth century.
Diameter 31mm; thickness 8mm; perforation hole 7mm.

115. 916 1496 Ditch/Phf/Period 4b (Fig 201)
Oval, slightly irregular. Central Gaulish samian ware, from a Form 30 or 37 made in the Antonine period. Complete.
Diameter 40mm; thickness 7mm; perforation hole 6mm.

116. 917 1489 Area C/Period 5–9
Samian. Circular with rounded edges. Central Gaulish samian ware, from a dish or bowl produced in the Hadrianic or Antonine period. Complete.
Diameter 44mm; thickness 9mm; perforation hole 6mm.

117. 2063 1589 Bld 4403/Period 5–8 (Fig 201)
Smooth, rounded edge. Circular. Fabric 1. Shaped from a thin-walled fragment of a cooking pot with no trace of decoration visible. Second to fourth century.
Diameter 34mm; thickness 5mm; perforation hole 7mm.

118. 2115 1521 Bld 198/Phe/Dump/Period 5
Smooth, rounded edge. Central Gaulish samian ware, from a dish manufactured in the Antonine period. Neatly-shaped with about a quarter surviving.
Diameter 35mm; thickness 7mm; perforation hole 5mm.

119. 10059 473.33 Area G/Dump/Period 4a-5
Spindle whorl. Made from the base of a beaker. Probably Cologne fabric (J R Perrin personal communication).
Diameter 44mm.

jet/shale

120. 771 385 Area A/Period 5–11
Decorated with concentric circles. Chipped on one side.
External diameter 43mm; diameter of hole 8mm; thickness 9mm.

121. 905 1403 Bld 198/Phe/Dump/Period 5 (Fig 202)
Decorated with incised lines on the top and the side.
Diameter 29mm; thickness 5mm; perforation hole 6mm.

122. 847 1338 Area A/Rubble/Period 7–9 (Fig 202)
Undecorated
Diameter 38mm; thickness 17mm; perforation hole 8mm.

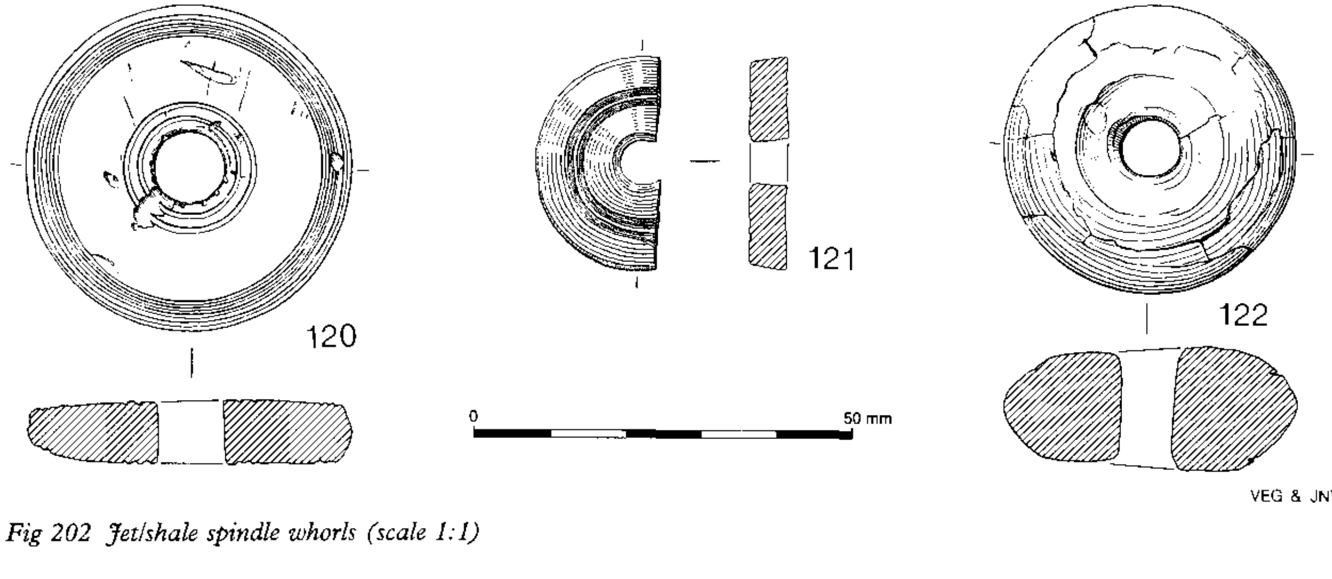

Fig 202 Jet/shale spindle whorls (scale 1:1)

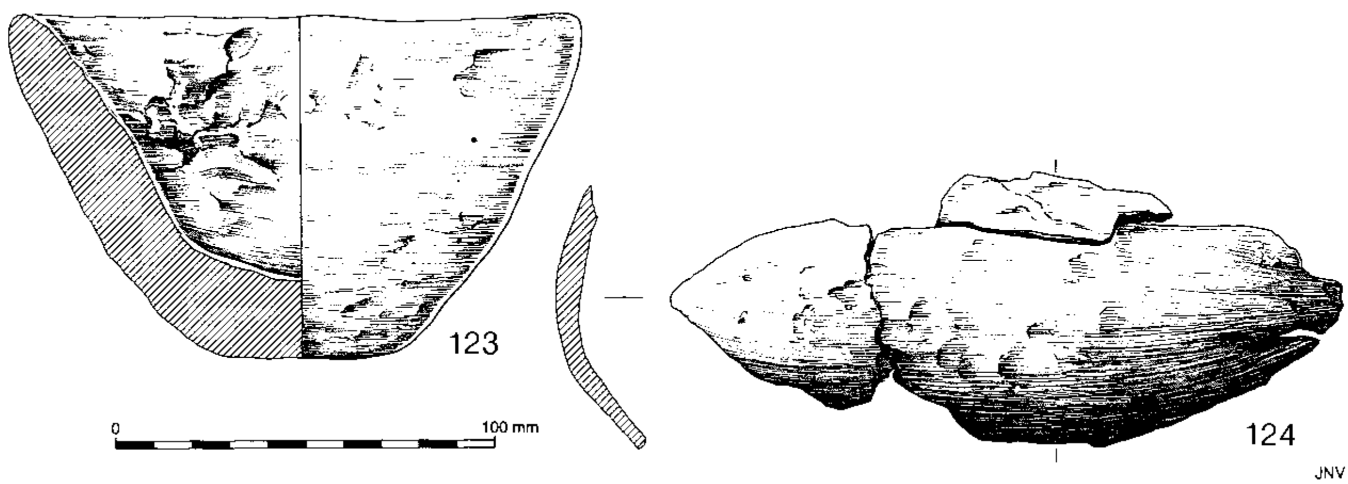

Fig 203 Wooden vessels (scale 1:1)

Category 4: household items

Vessels

glass

(see report by Jennifer Price and Sally Cottam; see page 341)

wooden

123. 2135 1755 Ditch/Phe/Period 4b (Fig 203)
This was found in four fragments.

124. 2192 1760 Ditch/Phf/Period 4b (Fig 203)
Two fragments. Bowl?

copper alloy

125. 2296 2985 PPS/NT/Period 4 (Fig 204)
Patera handle. Incomplete. Handle and part of the bowl. Triangular perforated hole on the end of the handle. Bishop and Coulston (1993, 105) discuss the use of paterae.
Length 94mm; maximum width across the handle 34mm.

126. 959 1505 Via P/Period 4b (Fig 204)
Handle. Incomplete. From a tankard. With a pierced lug for lid fitting.
Length 57mm.

127. 710 235 Bld 197/Phe/Dump/Period 5 (Fig 204)
Spoon. Incomplete. Broken at both ends. Decorative junction and circular section handle with grooved decoration midway along the shaft. A similar example is illustrated in Allason-Jones and Miket 1984, 140, nos 3.327 and 3.328.
Length 70mm; diameter 3mm.

128. 10007 473.1 Area F/Topsoil
Incomplete spoon handle. Broken at both ends, across the swan neck and after a rib.
Length 133mm.

Milling stones

Forty-three complete or fragmentary milling stones were found during the excavations. Unfortunately, the distribution of this sizeable sample over the site says little about the location of milling activities because the stones were often reused as building material or found residually in post-Roman contexts. A full descriptive catalogue and report (Coulston 1992) are contained in the site archive. A representative sample is described here.

129. 913 1475 Ditch/Rubble/Period 5–9 (Fig 205)
Upper Stone. Local red sandstone. One fragment of a beehive quern, broken vertically, and diagonally across the bottom. The upper part of a conical eye survives. The quern is of the native type found in small numbers on Roman military sites (eg Grealey 1974, no 68; Welfare 1984, no 12.72; 1985, fig 60.1, 3).
Approximately 45% surviving.
Thickness 195mm; original diameter 290mm; eye diameter 190mm.

130. 547 1 Area A/Topsoil (Fig 205)
Upper Stone. Mayen lava. One fragment, eroded overall, with damage to side face. The top face has a raised skirt and a shallow hopper with traces of chiselled striae. The eye is a double truncated cone with original upper, medial, and lower diameters of 120, 100, and 110mm respectively. There are two aligned series of striae on the depressed, concave bottom face.
Approximately 16% surviving.
Thickness 600mm; increasing to 95mm at the skirt; original diameter 400mm.

131. 2352 3907 Bld 4402/Pha/Period 4a (Fig 205)
Lower Stone. Mayen lava. One fragment with some chipping on the edge of the skirt. The upper face has two non-radial alignments of striae and a raised breast and eye-surround. The truncated conical eye has an upper diameter of 30mm, and a lower of 60mm. There is notable wear around the eye. The base face is irregular and undressed.
Approximately 22% surviving.
Thickness 30mm; increasing to 40mm at the skirt; original diameter 440mm.

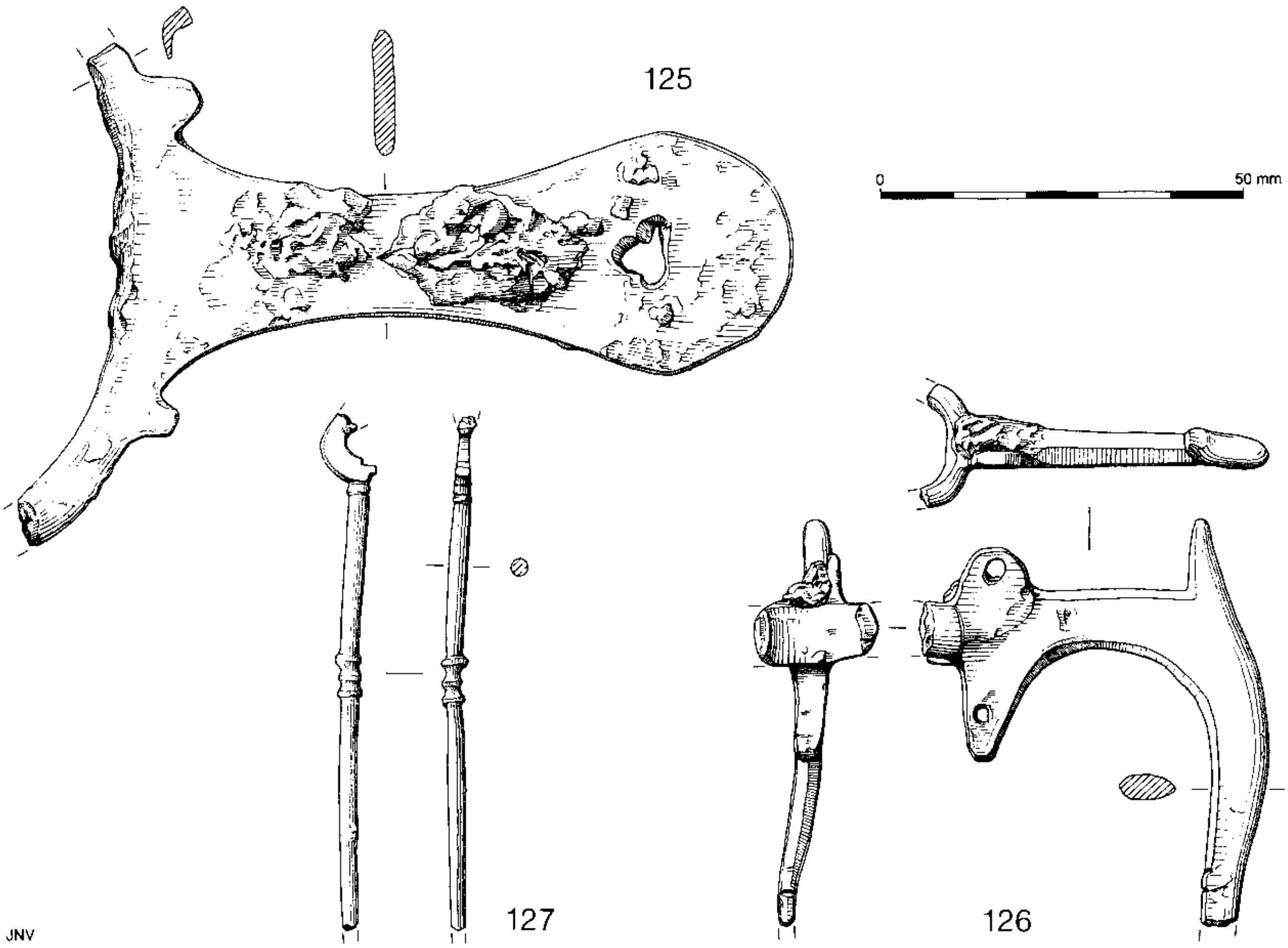

Fig 204 Copper alloy vessels (scale 1:1)

132. 2070 1631 Area A/Hollow way/Period 7 (Fig 205)
Upper Stone. Local buff sandstone. One fragment, worn overall. Both the upper and lower faces are level. The top has two very-worn alignments of striae. The lower face exhibits two concentric curving grind lines and a series of pointed chisel-marks around the skirt and randomly over the break. The stone has been reused and perhaps underwent secondary wear making it difficult to be sure whether the piece is part of an upper or a lower stone.
Approximately 40% surviving.
Thickness 95mm; original diameter 600mm.

133. 2140 1749 Ditch/Phf/Period 4b; 652 220 Area A/rubble/Period 7–10 (Fig 206)
Upper Stone. Local buff sandstone. Two conjoining fragments from different contexts, with some chipping at the break. The raised convex upper surface has some radial striations, and pocking with a pointed chisel towards the skirt. The large eye had a diameter of 160mm. A 130mm long and 100mm wide D-shaped perforation has been cut through the breast and this is crossed by the break between the two fragments. The side face has fine vertical chiselling. The lower face is slightly concave and the surface is dimpled with 10–15mm long depressions. The larger fragment has an inset triangular cutting for a rynd-chase. The scale of this stone, the D-perforation, and the size of the eye suggest use as a millstone rather than simply as a hand-powered rotary quern.
Approximately 25% surviving.
Thickness 85mm; decreasing to 55mm at the skirt; original diameter 830mm.

134. 2410 4080 Bld 4401/Pha/Period 4a (Fig 207)
Upper Stone. Local red sandstone. Two fragments. The piece is very coarsely dressed overall. The level upper face has a 30mm wide collar defining a 100mm diameter, U-shaped hopper. The eye is a double truncated cone with original top and bottom diameters of 45 and 60mm respectively. The side face exhibits vertical chiselling. The concave lower face has some approximately radial chiselling in zones of deep and wide, or narrow gashed tooling.
Approximately 46% surviving.
Thickness 75mm; increasing to 110mm at the skirt; original diameter 380mm.

135. 555 7 Unstratified and 757 249 PPS/Surface/Period 8
(Fig 207)
Lower Stone. Local buff sandstone. Two pieces. Some edge-chipping. The raised convex upper face has been point-chisel dressed and is worn particularly on the skirt. The double truncated cone-shaped eye has an upper diameter of 25mm, and a lower diameter of 45mm. Complete.
Thickness 65mm; decreasing to 25mm at the skirt; diameter 380mm.

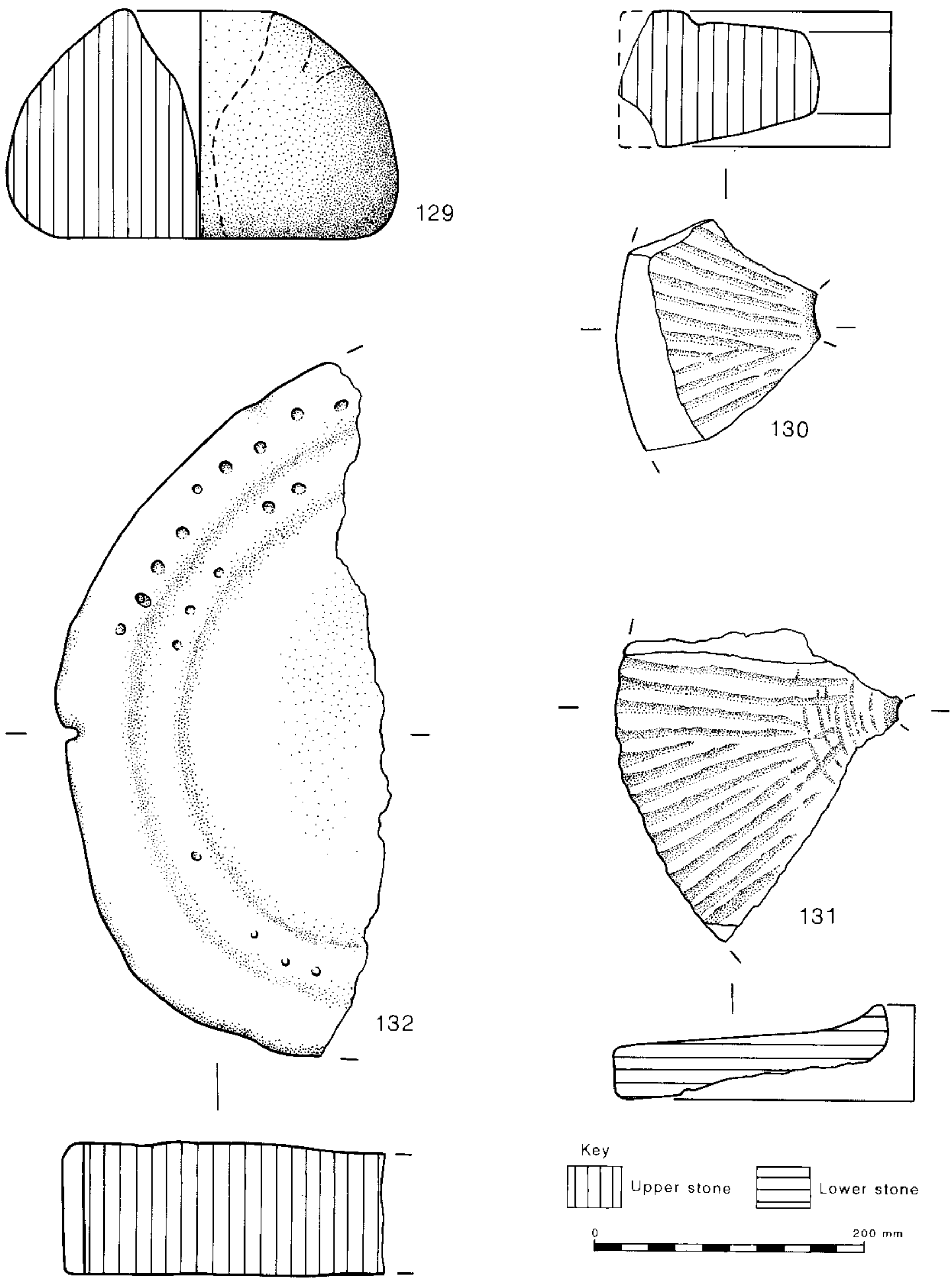

Fig 205 Milling stones (scale 1:4)

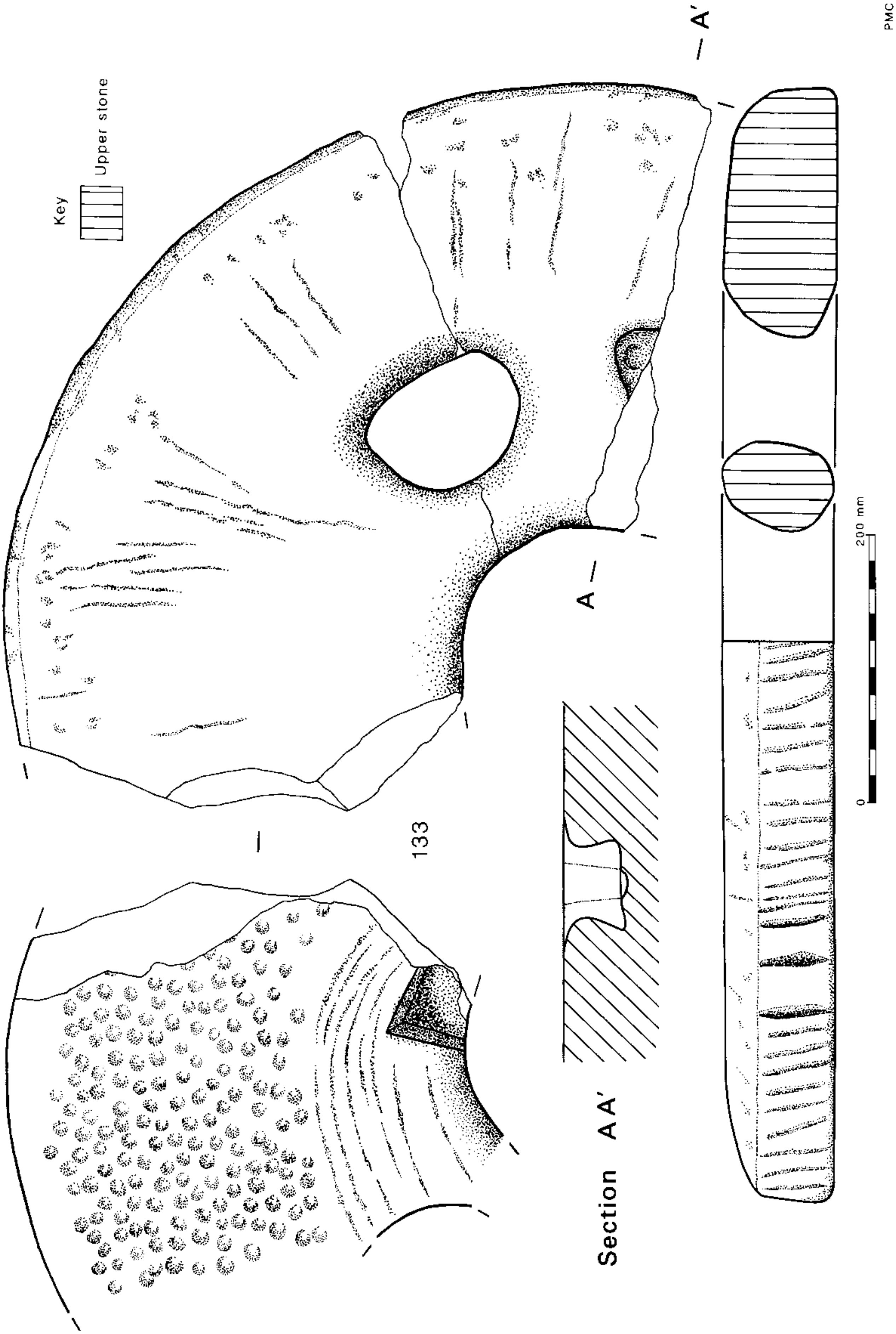

Fig 206 Milling stones (scale 1:4)

136. 2282 2843 ViaP/Surface 3/Period 4b (Fig 207)
Lower Stone. Local buff sandstone. Unbroken, sub-circular stone with some edge-chipping. The upper face is finely dressed on the breast. The skirt is worn smooth. The truncated conical eye has an upper diameter of 28mm and a lower of 50mm, and a raised surrounding collar. The base face is undressed but roughly flat. Complete.
Thickness 70mm; increasing to 37mm at the skirt; diameter 340mm.

137. 549 7 Unstratified (Fig 207)
Lower Stone. Local buff sandstone. One fragment. The raised convex upper face has random dimpling and is ground smooth overall, especially on the skirt with curving score-lines. There is perhaps a damaged cylindrical socket, *c* 120mm in diameter cut through the middle. The side face is dressed smooth, and the base face is flat.
Approximately 37% surviving.
Thickness 155mm; increasing to 110mm at the skirt; original diameter 600mm.

138. 913 1475 West ditch/Rubble/Period 5–9
Lower Stone. Local buff sandstone. One fragment with two diagonal breaks and edge-chipping. The upper face is level and smooth overall with wear on the breast towards the skirt. A central hole, 25mm wide, extends 50mm into the stone and does not perforate it. The base face is convex and has two incised gashes.
Approximately 85% surviving.
Maximum thickness 80mm; original diameter 360mm.

A total of 14 upper stones and only four lower stones in Mayen lava were found. These imported continental querns commonly occur in military use (Curle 1911, pl XVII; Welfare 1985, 156–7). At Birdoswald many have suffered from the soil conditions, but the better preserved examples show all the usual features of 'harps' of striae on the grinding surfaces and vertical striae on the sides. The lower stones usually have a truncated conical eye, while the eye on the upper stones is a double truncated cone, defined by a shallow hopper.

Five of the Romano-British products were made from millstone grit (four upper and one lower stone), but for the rest local buff sandstone (five upper and nine lower stones) was preferred to the marginally-softer and perhaps less-durable red sandstone (five upper and one lower stones). Some upper stones have the characteristically prominent collar and U-shaped hopper (Welfare 1985, 159). The eye of one lower stone is cut into the top surface, but not right through (No 129). The only example of a triangular rynd-chase occurs on the large mill-stone (SF No 725; Cf Welfare 1985, 162).

It is interesting to observe that the fragments of Mayen stones are predominantly from upper pieces. This occurrence has been observed elsewhere (Welfare 1985, 163). It may be ascribed to the greater vulnerability of Mayen upper stones, which had turning handles attached by cuttings into the fabric (Curle 1911, pl XVII), to damage. The buff sandstone querns do not conform to this pattern, partly perhaps because different turning devices were employed on them.

[JCNC]

Category 5: gaming and leisure

Counters

A number of counters have been recovered from Birdoswald; nine (including two stone) were plain and seven pierced. Crummy (1983, 93–4) discusses a number of alternative uses to which the pottery roundels could have been put, and there is insufficient evidence from Birdoswald to support or contradict these ideas. It is possible that some counters (eg No 146) could have been used as reckoning counters (Macgregor 1978, 33) as one surface is abraded from being pushed along on a surface. But this could equally well apply to a game board as a tally board.

The pierced counters have holes made with a drill and many of the holes are hour-glass shaped in section, showing that a drill was used first on one side and then on the other. It is possible that No 149 represents a failed spindle whorl but others have no obvious reason for the perforation unless it was used to string them together.

ceramic

139. 563 107 Bld 197/Phe/Floor Layer/Period 5 (Fig 208)
Central Gaulish samian ware, from a form 31R, made in the mid- to late Antonine period. Complete and regularly shaped.
Maximum diameter 17mm; thickness 7mm.

140. 656 214 Unstratified (Fig 208)
Central Gaulish samian ware, from a dish or bowl produced in the Hadrianic or Antonine period. Complete and regularly shaped.
Diameter 22mm; thickness 7mm.

141. 824 1365 AreaB/NW/Primary Rampart/Period 2 (Fig 208)
Circular, well made with smooth round edges. Central Gaulish (Les Martres-de-Veyre) samian ware, from a Form 30/37 made in the Trajanic period. Complete and very neatly-shaped.
Diameter 17mm; thickness 7mm.

142. 862 1403 Bld 198/Phe/Dump/Period 5 (Fig 208)
Gaming counter. Fabric 26. Likely to have been shaped from a fragment of a late first- to second-century jar. Almost square.
Length 25mm; width 24mm.

143. 874 1416 Bld 198/Phe/Dump/Period 5 (Fig 208)
Central Gaulish samian ware, from a form 18/31 or 31 produced in the Hadrianic or early Antonine period. Crudely shaped and nearly complete.
Diameter 26mm; thickness 11mm.

144. 932 1489 Area C/Period 5–9
Slightly irregular. Central Gaulish samian ware, from a form 31R manufactured in the mid- to late Antonine period. Crudely shaped and almost complete.
Diameter 23mm; thickness 9mm.

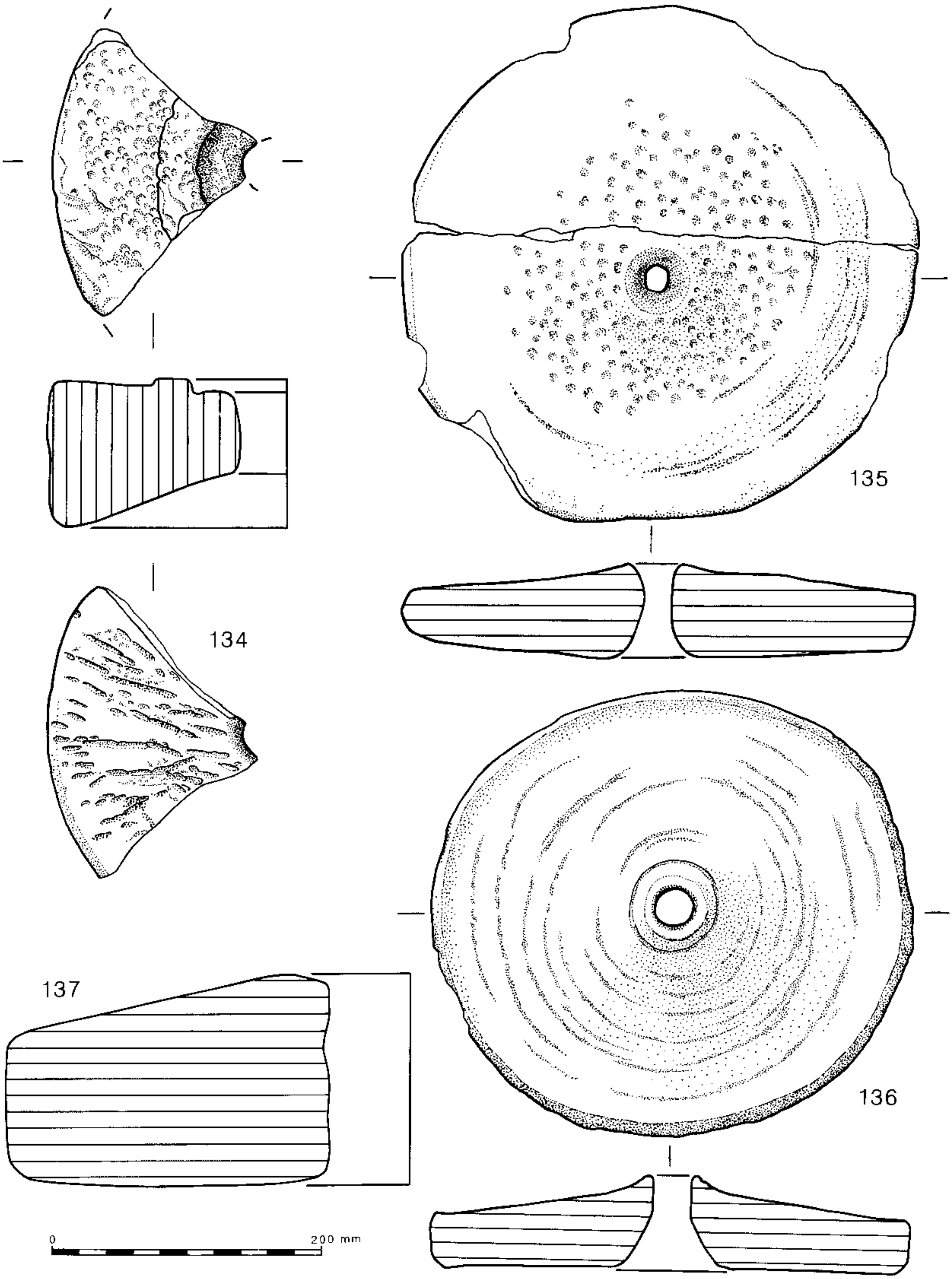

Fig 207 Milling stones (scale 1:4)

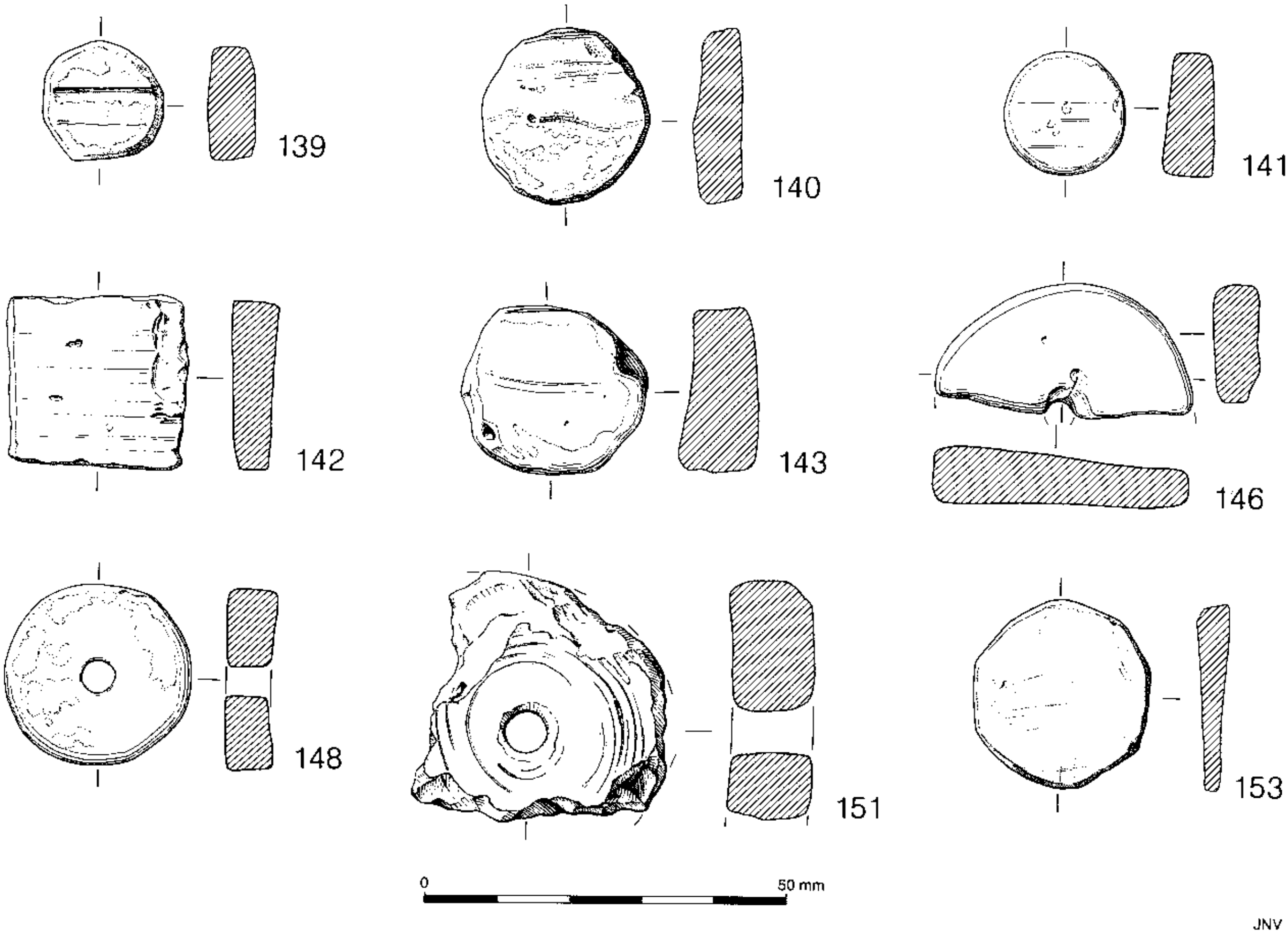

Fig 208 Ceramic counters and stone counter (153) (scale 1:1)

145. 995 1522 Bld 198/Phe/Dump/Period 5
Central Gaulish samian ware, from a Form 37 probably produced in the Hadrianic or early-Antonine period. Fairly regularly shaped and almost complete.

The sherd shows traces of an ovolo and a single-bordered scroll or medallion. The ovolo is probably Rogers B170, which has not yet been noted on any stamped or signed vessels. The absence of a border below the ovolo is unusual for Central Gaulish products.
Diameter 20mm; thickness 6mm.

146. 643 101 Bld 197/Phe/Floor Layer/Period 5 (Fig 208)
Fabric 42. Original vessel form uncertain but probably of second-century date.
Diameter 37mm; thickness 9mm; perforation hole 3mm.

147. 821 1339 PPS/Period 7–8
Incomplete. Abraded, with evidence for a central perforation hole. East Gaulish (Rheinzabern) samian ware, from a dish made in the late second or first half of the third century. Irregularly shaped and about half complete.
Diameter 30mm; thickness 6mm; perforation hole 4mm.

148. 826 1353 Area A/Period 7–9 (Fig 208)
Central perforation hole. Rounded edges. Central Gaulish samian ware, from a dish or bowl produced in the Hadrianic or Antonine period. Very regularly shaped and complete.
Diameter 26mm; thickness 7mm; perforation hole 6mm.

149. 896 1418 Bld 198/Phe/Dump/Period 5
This is in two fragments. Samian. Circular and smooth rounded edges. Perforation hole off centre. Central Gaulish samian ware, from a gritted mortarium manufactured around *c* 170–200. Split horizontally and about half complete.
Diameter 40mm; thickness 6mm; perforation hole 5mm.

150. 975 1403 Bld 198/Phe/Dump/Period 5
Central Gaulish samian ware, from a dish or bowl produced in the Hadrianic or Antonine period. May have been five-sided rather than circular. About half complete with a maximum diameter of *c* 34mm.
Thickness 7mm; perforation hole 5mm.

151. 2099 1686 Via P/Surface 3/Period 4b (Fig 208)
Incomplete. Irregular edge. Central perforation hole. Fabric 6. The thickness of the sherd and the concavity of one of the surfaces might suggest that this object was made from the knob of a lid with a hole drilled pre-firing (cf Howe *et al* 1981 fig 6, 71–3). There are, however, no traces of a colour-coat in the hole or of the curve down into the vessel wall. Moreover, as there is similarly no internal colour-coat, unless it has been worn away, it is therefore more likely to have been fashioned from the base of a vessel with a narrow or 'closed' neck.

This vessel was probably of fourth-century date.
Diameter 44mm; thickness 9mm; perforation hole 7mm.

152. 2211 1914 West Berm/Period 4a–b
Central Gaulish samian ware, from a dish or bowl produced in the Antonine period. Complete and crudely shaped. Central perforation hole.
Diameter 44mm; thickness 8mm; perforation hole 4mm.

stone

153. 2015 1519 Bld 198/Phe/Dump/Period 5 (Fig 208)
Complete, wedge shaped. Roughly shaped edges.
Diameter 25mm.
154. 2035 1520 Bld 198/Phe/Dump/Period 5
Complete, even thickness.
Diameter 38; thickness 13mm.

Dice

bone and antler

Dimensional limitations insure that most bone dice are of a smaller size (10mm or less) than those made of antler and most of the larger Roman dice are probably made of antler. The convention in Roman times, as now, was for the opposing sides to add up to seven.

155. 2255 2735 Bld 4401/Phd/Period 4b (Fig 209)
Small square die with opposing sides adding up to seven. Ring-and-dot markings. MacGregor (1985, 129; Fig 71b) illustrates the type.
Length 10mm; width 8mm; height 8mm.

156. 2418 4211 Bld 4401/Pha/Period 4a (Fig 209)
Die. Opposing sides add up to seven. Almost square. Ring-and-dot decoration. Stained green.
Length approx for each side 14mm.

157. 2339 3886 Bld 4401/Phb(ii)/Period 4a (Fig 209)
Parallelepiped die. The fragment of a quadrangular antler rod which is tapered slightly towards one end. Cancellous tissue on one long face allows the raw material to be identified as antler. The surviving end is rounded at each corner and is undecorated; each long face, in contrast, includes single ring-and-dot ornament. On two adjacent faces the decoration is located towards the end of the object, in one case with further patterning at the opposite end of the face. On the remaining two faces the ring-and-dot decoration is situated about the midpoint of the object.
Length 58mm; original length *c* 75mm; maximum width 8mm.

The form and decoration of this object allow it to be conclusively identified as a parallelepiped die. Dice of this type differ from the familiar cubic form for their elongated shape and for the manner in which just four sides carry numbers; in some cases only three of the four long sides are decorated. A comprehensive catalogue of parallelepiped dice, or *Stabwürfel*, has been produced by Krüger (1982). They fall into three principal types. The broader, rectangular form with numbers generally assigned to the edges of each face is

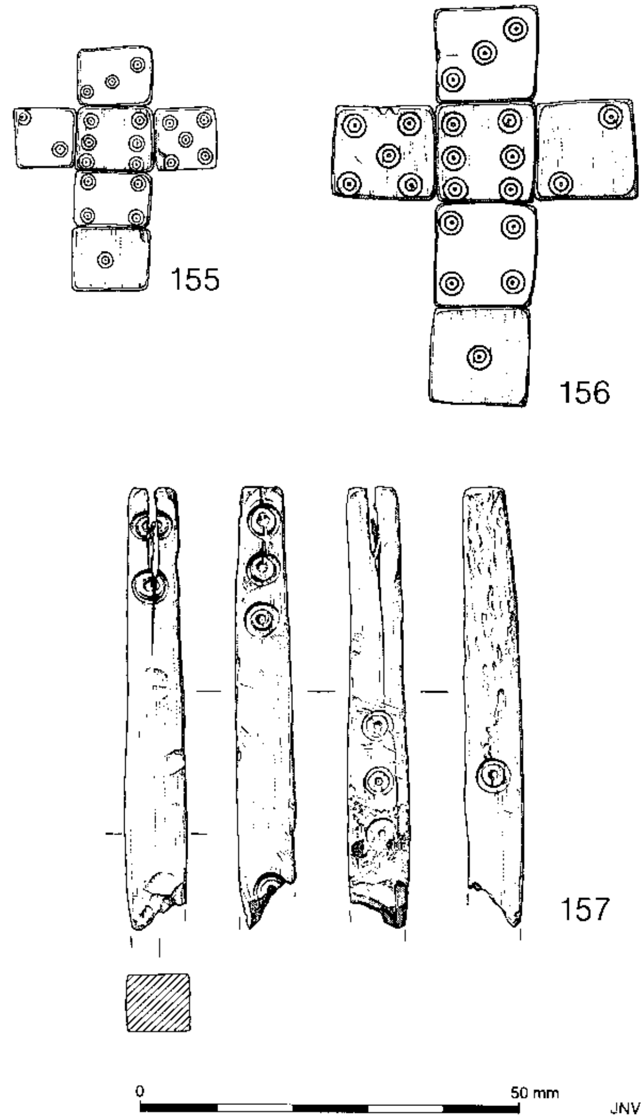

Fig 209 Bone dice (scale 1:1)

considered to derive from Celtic traditions (ibid, 220). Clarke and MacGregor have discussed those of bone and antler retrieved from Western Britain (Clarke 1970; MacGregor 1974, 86–8; 1985, 129). Six further examples of *Stabwürfel* belong to the Westerwanna type, distinguished by the pronounced rounded edges of their rectangular, stout form (ibid, 1982, 153–4).

The Birdoswald die, with its extended rod-like form, can be assigned to a separate group. Roes noted that similar 'bone bars' were known from Frisia, but the decoration of these extends along the entire extent of each long side, and differs fundamentally from that seen here (Roes 1963, 53–4 and pl XLIV, 15–21; Boeles 1951, pl XLIV.7). Roes also displayed a number of pendants, including several of quadrangular form, which are tapered slightly at the head, where they are also pierced (Roes 1963, 63 and pl LI). There is an undoubted resemblance between these bars and the Birdoswald object, although their decoration, which also consists of ring-and-dot motifs, is evenly spread along each side, and this distinction is of some siguificance (ibid, 1963, pl LI, 1, 2 and 5).

Rods similar in both form and decoration to the Birdoswald example are known from Germanic contexts of the Roman Iron Age. Sixteen examples of elongated *Stabwürfel* with similar tapered ends were known to Krüger from ten locations distributed across Denmark, Germany, Poland, and the Czech Republic (Krüger 1982, 148, abbn 27.5, 29.13, 30.1–3, 34.8, 37.1–3, and 6, 44. 5, 6, and 10, karte 10 and tab 3a). A further 66 *Stabwürfel* of elongated form, but without tapered ends, are similarly distributed (ibid, 1982, 145). They include two examples from Vimose found in association with further adjuncts of board and dice gaming (Brondsted 1960, 211 and fig 212d). The group ranges from 46 to 114mm in length and from 4 to 8mm in width; lengths tend to cluster towards the smaller figure.

The decoration on the Birdoswald die can be recognised as part of a numbering scheme under which opposed long faces add up to seven. With *Stabwürfel* the customary arrangement is that the numbers one to three are clustered towards the middle of each long face, while four to six are arranged in two groups at either end of the die. The use of numbers greater than six is rare and is confined to two dice from Hostice, which include ten and 19 motifs on their faces (Krüger 1982, abb 35.1). Two of the faces of the Birdoswald die can thus be identified as carrying the numbers one and three about the middle of their long faces. The remaining faces, where the decoration is confined to the ends, represent the numbers four and six. Opposite faces thus add up to seven on the die. This is the most common combination of numbers on tapered *Stabwürfel*; it can be seen on dice from Mlodzikowo, Tuklat, Körchow, and Sörup, and may originally have been present on further examples (ibid, 1982, tab 3a).

Stabwürfel with tapered ends were deposited in contexts dating from the late pre-Roman Iron Age to the late Roman Iron Age. Under current chronologies they can be placed largely within the early Roman Iron Age (Hedeager 1992, fig 1.5, table 1). Few examples of *Stabwürfel* can be dated after the fourth century and it appears that by this time they had been supplanted by cubical or rectangular dice.

Stabwürfel could be thrown in much the same way as cubical dice although only four numbered fields were available, rather than six, and with some examples only three of the four faces actually include numbers. Tacitus refers in the *Germania* (24) to the deep-seated Germanic interest in chance and the roll of the die but comparatively little is known about the board and dice games practised beyond the Empire in the Roman period. Clarke noted that in three cases the Scottish parallelepiped dice were discovered in groups of two or more, and the same situation prevails for *Stabwürfel* with tapered ends (Clarke 1970, 224). The Vimose find includes two *Stabwürfel* as well as four cubical dice, approximately 80 gaming pieces and fragments of four wooden double-sided gaming boards used for both *ludus latrunculorum* and *ludus duodecim scriptorum* (Krüger

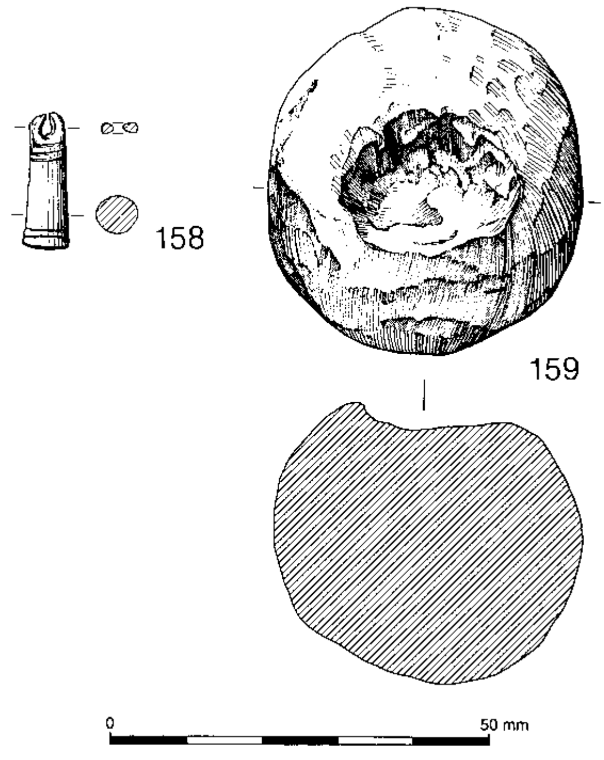

Fig 210 Lead weights (scale 1:1)

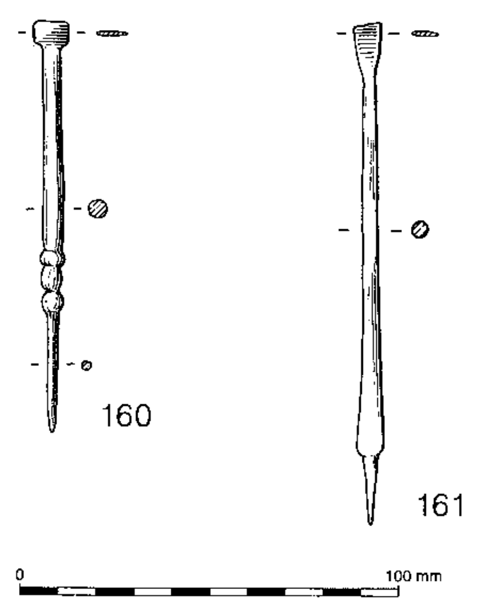

Fig 211 Iron styli *(scale 1:1)*

1982, No 42). Five *Stabwürfel* were retrieved at Hostice, and three came from Mlodzikowo, Leg Piekarski, Sörup, Gro Kelle, and Körchow. At both Sörup and Körchow they were associated with quantities of astragali (Raddatz 1981, 47) and at Gro Kelle a significant grave assemblage included also bone playing pieces (Krüger 1982, 140–1).

As Clarke has noted, the games played with these dice may, as with the use of astragali, relate to the skill in their throwing, as much as to the numbers obtained (Clarke 1970, 226; Knol 1987). *[IR]*

Category 6: weights and measures

lead

158. 2028 1563 Via P/Surface 3/Period 4a (Fig 210)
Small weight. Tall cylindrical shape with a suspension loop at the top.
Length 19mm; diameter maximum 6mm; weight 2.4g.

159. 876 1403 Bld 198/Phe/Dump/Period 5 (Fig 210)
Lead weight with iron attachment. It is only slightly encrusted.
Weight 377g.

Category 7: communication

iron

160. 660 214 Unstratified (Fig 211)
Stylus. Manning type 4 (Manning 1985, 85, fig 24). Eraser and point are distinctly formed and separate from the stem. There is moulded decoration between the stem and the point.
Length 109mm.

161. 786 425 Area B/NW/Primary rampart/Period 2 (Fig 211)

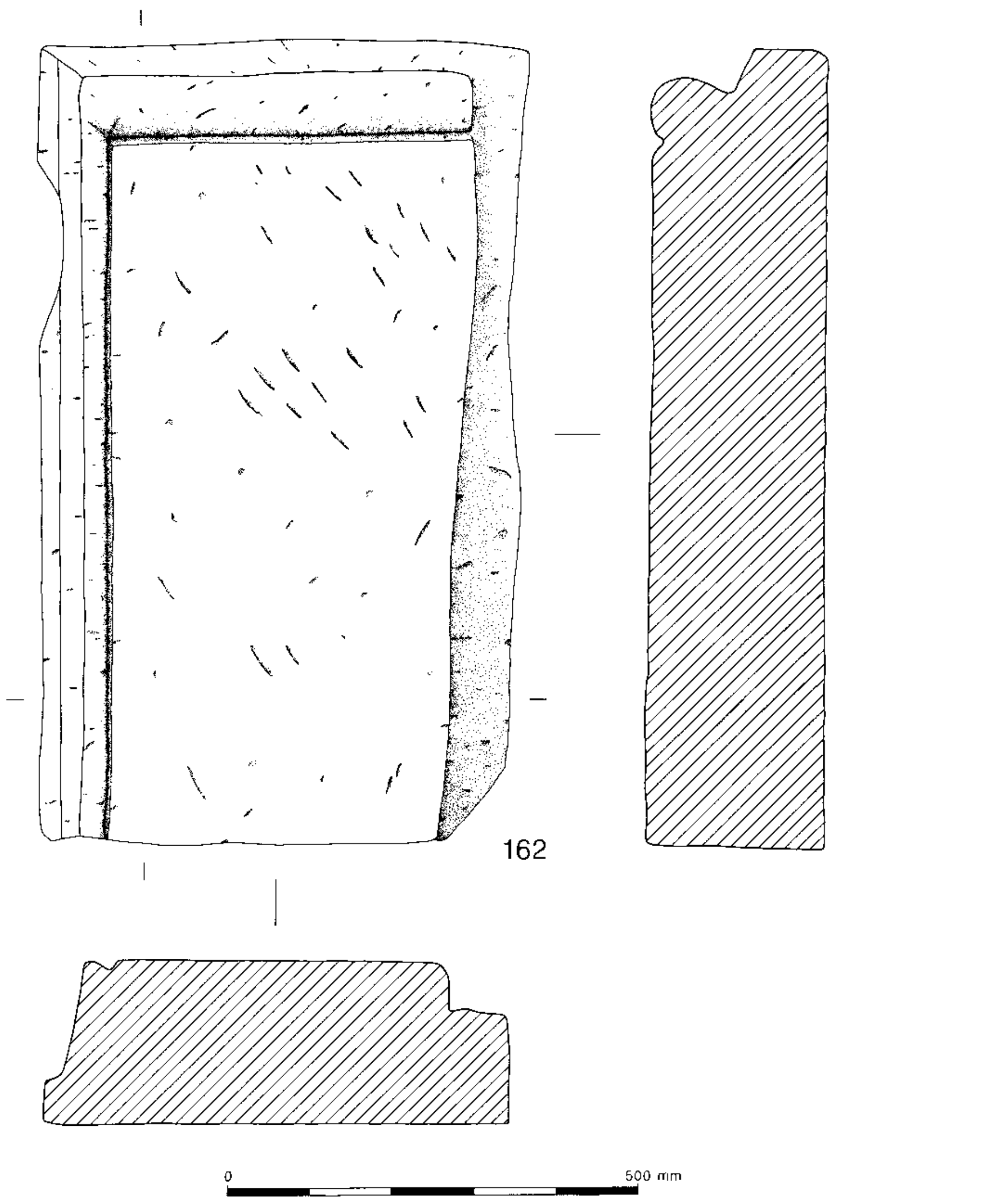

Fig 212 Building stone (scale 1:5)

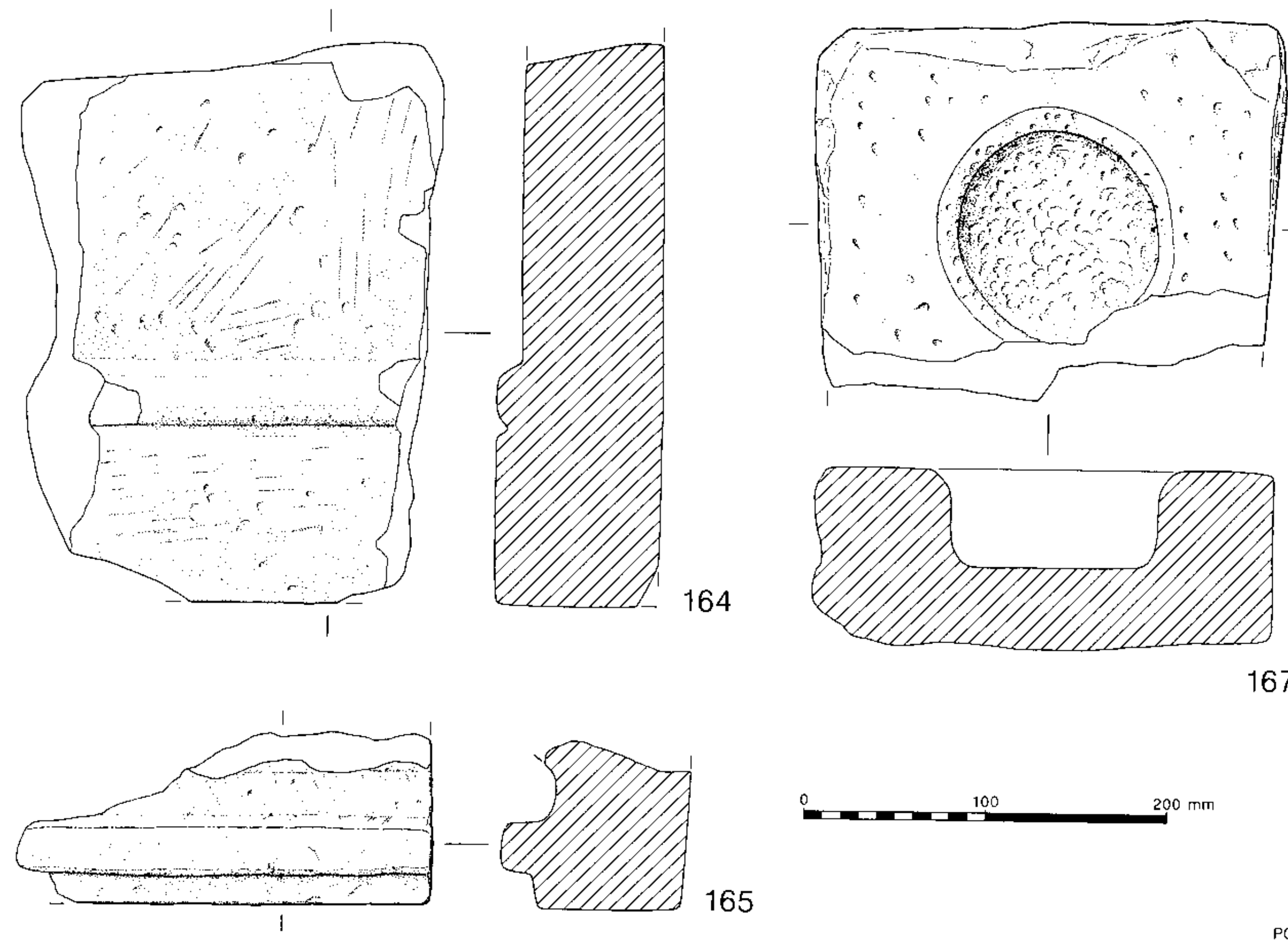

Fig 213 Building stone (scale 1:4)

Stylus. Manning type 3 (Manning 1985, 85, fig 24). Point and eraser are clearly separate from the stem. Eraser has concave sides, the end is worn.
Length 131mm.

Category 9: building materials

window glass
(see report by Jennifer Price and Sally Cottam , page 341)

ceramic building materials
(see summary by Tony Wilmott, in chapter 11)

stone

Large quantities of building stone with signs of specialist function were found on the site. Many of these could be identified as being from specific buildings within the fort, and these have been described within the structural text. At the *porta principalis sinistra* window heads, merlon caps, cornice mouldings, and chamfered stones were found, as well as stones featuring diamond broaching. In the *horrea* were several associated pieces and some reused material, most notably a screen panel which may have originated in the *principia*. The assortment of moulded pieces found without such contexts are less easy to place within a decorative or structural context, and so only a selection are here described and illustrated. A full report on this material is contained in the site archive (Coulston 1992).

Analysis of tool marks on items in the catalogue, and the observation of the unfinished pieces (Nos 10?, 28), contribute to the study of sculpting tools and techniques (Phillips 1976a; Hill 1991a). Most of the work was executed with a point or punch, less involved subsequent bladed chiselling. Neither claw-chisel nor drill appear to have been used. Incompletely-worked stones are not uncommon on sites in the Hadrian's Wall region (Phillips 1977, nos 65, 102, 125, 315; Coulston and Phillips 1988, nos 106, 170, 332, 344, 404; Coulston forthcoming). Architectural sculpture was usually carried out on site, if not *in situ* on the building during construction. Other sculptures were produced for local use and there is little evidence for the transport and 'trade' of works over any distance. There is every reason to suppose that all the carving was executed by military craftsmen (Coulston forthcoming). This was particularly the case for works associated with fort buildings (nos 4–7, 11–33, 31, 33).

162. 3447 400 PPS/Road surface/Period 4b (Fig 212)
Cornice block. Local buff sandstone. Consists of a broad vertical fillet, scotia, torus, and small fillet on the wall line; the moulding originally ran along two adjacent sides, but on the longer side the torus and much of the scotia has been dressed off very neatly with a punch. The mitre has also gone. This stone would have looked impressive in service, but is not work of the highest class. It is however above the average of Roman military execution and was worked by a man who had had more than the usual amount of training.
Length 797mm; width 440mm; thickness 232mm.

163. 2312 2887 ViaP/Surface 1/Period 4b
Moulded dedicatory panel. Local buff sandstone. The right side of the piece is complete, while all the other edges and the back are broken away. The latter surface is worn and compacted. The front surface is worn and the frame is chipped on the left. A double moulding surrounds a recessed panel. This may be identified as a part of a building stone or a piece of decorative architectural sculpture. The back was damaged, then smoothed off by wear, presumably after reuse.
Height 230mm; width 230mm; depth 53mm.

164. 570 85 Bld 197/Phe/Floor deposit/Period 5 (Fig 213)
Moulded dedicatory panel. Local buff sandstone. The back and front surfaces of the piece are complete while all other faces, except for part of the bottom, are broken away. A recessed panel is bordered by a single moulding and a flat margin. The latter exhibits horizontal chisel-marks. The panel has vertical tooling on the right, and diagonal marks with some pecking in the middle and on the left. The back surface has light horizontally-aligned chiselling and more pecking. It is likely that this is a fragment of a dedicatory panel.
Height 310mm; width 220mm; depth 90mm.

165. 2010 1496 Ditch/Phf/Period 4c–5 (Fig 213)
Moulded block. Local buff sandstone. The stone is broken all down one side and at one end. It is chipped overall. On one face of a rectangular-section block there is a prominent rectangular moulding and a second, damaged moulding with a concave profile. The piece presumably formed part of a moulded panel, or perhaps of a plinth block.
Length 225mm; width 85mm; thickness 102mm.

166. 10038 473.003 Area F/Rubble/Period 5–11
Engaged column base. Local red sandstone. The piece is worn overall. It is broken across the bottom, front corner, back, and down the right side. The front of the base is chipped. The top surface is undamaged. A column base stands on a squared plinth. The base exhibits, from top to bottom, a flat top, a stepped lip, two torus mouldings, a scotia, a third torus, and a moulding of less than quarter-round section. There are two alignments of coarse chiselling on the top. The mouldings are well-smoothed, while the scotia has point chisel-pecking within it.

The column which might have been supported by the base would have been approximately 160mm in diameter if it had been a shaft in the round. However, the lower mouldings and scotia of the base appear to have an upstanding edge at the right side, thus, if the carving was finished, the base was engaged. Either a semi-column or quarter-round column may be envisaged. Loss of so much of the piece, and in particular the damage to the bottom face, makes the original function unclear. Its scale and engagement suggest decorative rather than load-bearing architectural use, perhaps beside a doorway or, more likely, flanking an *aedicula*. In the latter case a large-scale cultic or funerary stela might be suggested (cf Coulston and Phillips 1988, 200, no 93).
Height 125mm; width 120mm; depth 115mm.

167. 2093 1495 ViaP/Surface 3/Period 4b (Fig 213)
Pivot Stone. Local buff sandstone. One side of the stone has broken away. A square stone has a cylindrical hole cut in its top surface. The sides and top are well-smoothed while the bottom was roughly shaped.
Height 95mm; width 200mm; depth 260mm; hole diameter 120 mm; hole depth 450mm.

[JCNC/PH]

Category 10: tools

Knives

iron

168. 2027 1566 Bld 198/Phe/Dump/Period 5
Incomplete. Straight-backed knife with rectangular tang continuing the line of the blade. Allason-Jones and Miket 1985, 236, No 5.2.
Length 67mm; width 13mm.

169. 3328 236 Bld 197/Phe/Dump/Period 5 (Fig 214)
Incomplete. Straight-backed knife with tang continuing the line of the blade.
Length 58mm.

170. 559 7 Unstratified (Fig 214)
Manning type 21 (Manning 1985, 117, fig 29). Small knife with short wide symmetrical blade and a convex curve towards the tip. Rectangular section, and flat tang in the centre of the blade.
Length 112mm; length of blade 84mm; width of blade 24mm.

171. 2110 1459 PPS/ST/Period 4a (Fig 214)
Knife, complete with bone handle. End of handle capped with iron fitting. Manning type 18b (Manning 1985, 117, fig 29 pl 55, S7). The back is slightly arched; the edge rises in an even curve to the tip. The tang is in the centre of the blade.
Length 235mm; length of blade 95mm.

Handles

bone and wood/iron

172. 910 1462 Unstratified (Fig 215)
Square-section handle with rectangular hole for a tang. Plain. Possible evidence for mount around the end joining handle and blade.
Length 84mm; width 17mm.

173. 2094 1668 PPS/NT/Period 4a (Fig 215)
Knife. Bone handle badly degraded complete with an iron tang. The base of the handle had a copper alloy decorative stud attached to the iron tang. Possibly dagger?
Length 132mm; width maximum 30mm.

174. 2431 4279 PPS/Blocked portal/ Period 4a (Fig 215)
Handle. Wooden tang, fragmentary, which was encased in a thin copper alloy sheet. Copper alloy ring binding at top between wooden tang and iron fitting. Iron fitting has a corkscrew.
Length 72mm.

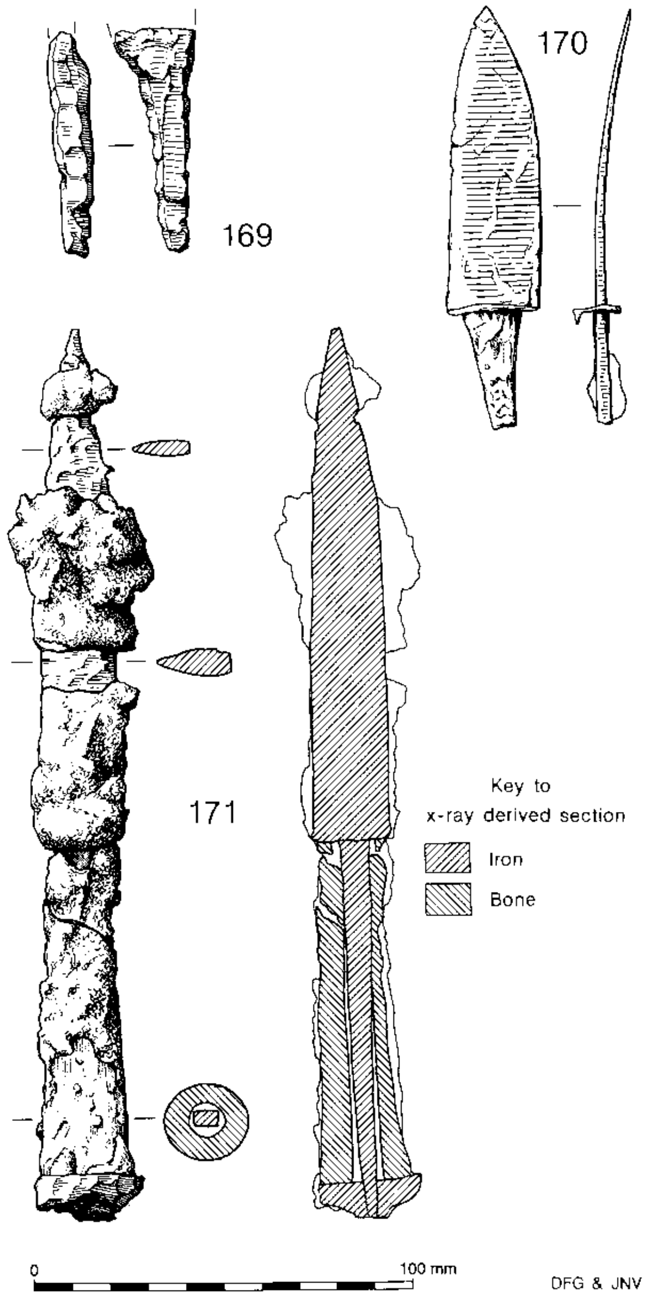

Fig 214 Iron knives (scale 1:2)

175. 3357 4190 Bld 4401/Pha/Period 4a
Incomplete. Thin iron covering around an inner wooden core.
Length 79mm.

Punches and chisel

iron

176. 2460 121 Bld 197/Phe/Floor Layer/Period 5
Punch. Square section tapering to a point.
Length 43mm; width tapering from 9 to 6mm.

177. 3318 4180 Bld 4401/Pha/Period 4a (Fig 216)
Punch. Square section. Blunt end.
Length 43mm.

178. 3356 4122 PPS/Blocked Portal/Period 4a (Fig 216)
Punch. Square section tapering to a point. Manning 1985, 10 plate 5 A23.
Length 75mm; width maximum 18mm.

179. 646 101 Bld 197/Phe/Floor Layer/Period 5 (Fig 216)
Firmer chisel. Complete. Parallel-sided, rectangular-section blade. Widening at the edge. Conical socket. Manning 1985, 22, plate 10 B31.
Length 218mm; width across blade 26mm.

Other tools

iron

180. 3326 245 Bld 197/Phe/Dump/Period 5 (Fig 217)
A pair of dividers, joined at the top by a rivet. Broken across the legs. Rivet damaged. Manning 1985, 11–12 plate 6 A39.
Length 78mm.

181. 3346 1321 Area B/Rampart/Period 4b (Fig 217)
Incomplete. Arched curved back saw, asymmetrical teeth sloping forward, *c* 4 teeth/cm. The asymmetrical teeth suggest it is a fragment of a hand saw. Manning 1985, 19–21 plate 9 B23.
Length 65mm.

182. 3340 425 Area B/NW/Primary Rampart/ Period 2 (Fig 217)
Curry comb. Incomplete. Tang with three prongs, two prongs remain, third is broken. Manning 1985, 61.
Length 119mm.

183. 2073 1516 Bld 198/Phd/Dump (Fig 218)
Awl. Square-section shank with a distinct shoulder tapering to a slender tang. Similar to examples from Old Penrith (Mould 1991, 203, no 762) and Niederbieber (Gaitsch 1980, Taf 47, 234). These points may have been used in leather working or as a punch. Length 130mm.

184. 912 1414 Area B/Rampart/Period 4b (Fig 218)
Awl. Square-section shank with shoulder and tapering to a slender tang. Similar to above.
Length 117mm.

whetstones

Nineteen whetstones were found. Of these, 13 were made of coarse grained buff sandstone, two of compact grey sandstone, two of igneous stone, and one of dark-grey basalt. Though some of these were found in Roman contexts, many were from later contexts, including modern. For this reason only two are selected for description. Neither are illustrated. A full descriptive catalogue of the whetstones appears in the site archive (Coulston 1992).

185. 861 1416 Bld 198/Phe/dump/Period 5
Whetstone in close-grained buff sandstone. Oval cross-section. Broken at one end and well smoothed all over (cf. Allason-Jones and Miket 1984, 12.25–43).
Length 90mm; width 33mm; thickness 16mm.

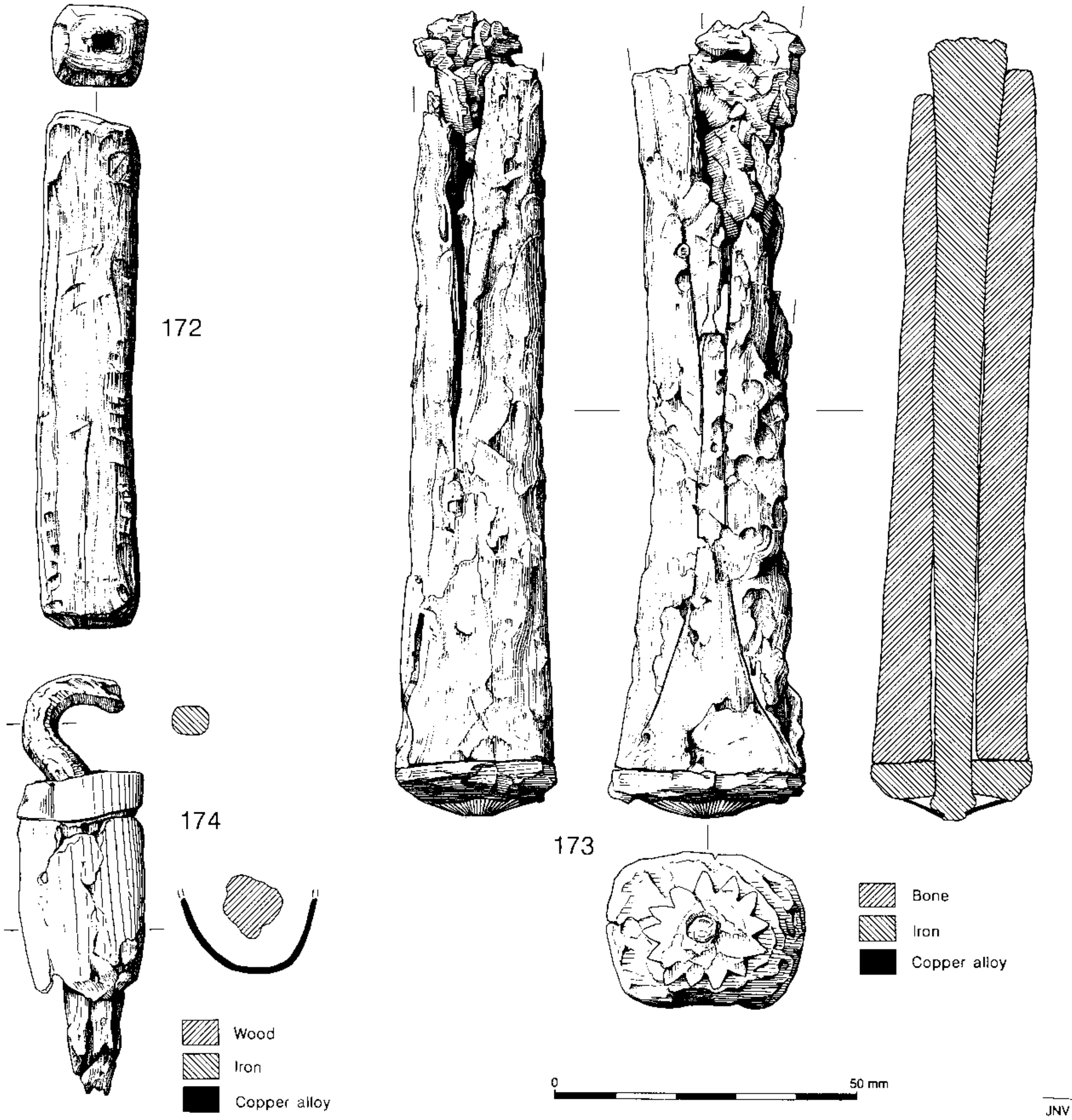

Fig 215 Handles (scale 1:1)

186. 3448 3771 PPS/Cut for ashlar/Period 3
Complete whetstone of compact grey sandstone. Trapezoidal cross-section. Smoothed all over with one particularly concave face. Irregular breaks at ends made before working. Length 145mm; width 30mm; thickness 26mm.

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lead

187. 830 1378 Bld 4401/Phb(ii)/Period 4a
Tile clamp. Two fragments of two tiles encased in lead. Clamp to hold the tiles together but obviously the tiles have broken off.

Category 11: fittings and fasteners

This section includes all the fixtures and fittings for which no definite function could be assigned. For example under studs are bell-shaped studs (eg No 203) that were probably used for decorating furniture, an enamelled stud (No 202) that almost certainly came from a horse harness, and a plain stud, all with the variety of shapes and sizes which could have come from a number of things such as boxes, harnesses, doors, and armour.

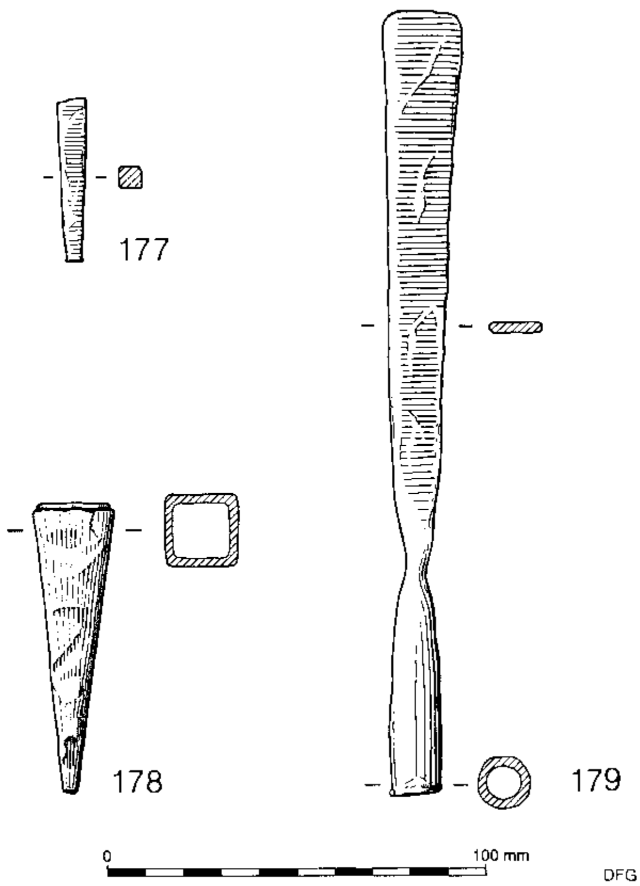


Fig 216 Iron punches and chisel (scale 1:1)

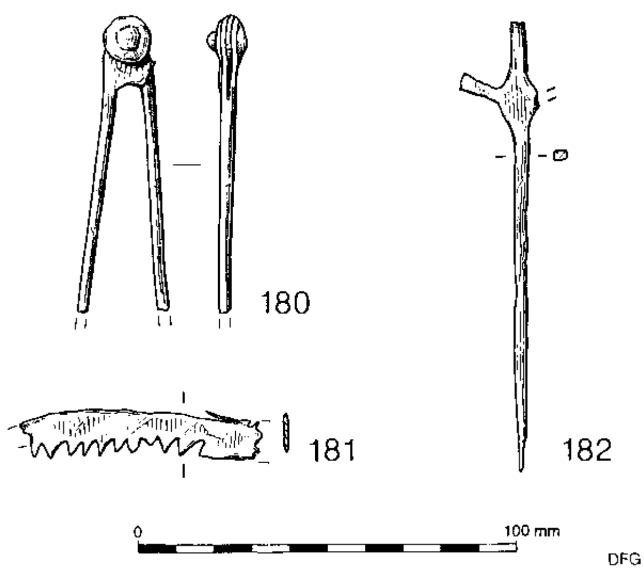


Fig 217 Other iron tools (scale 1:1)

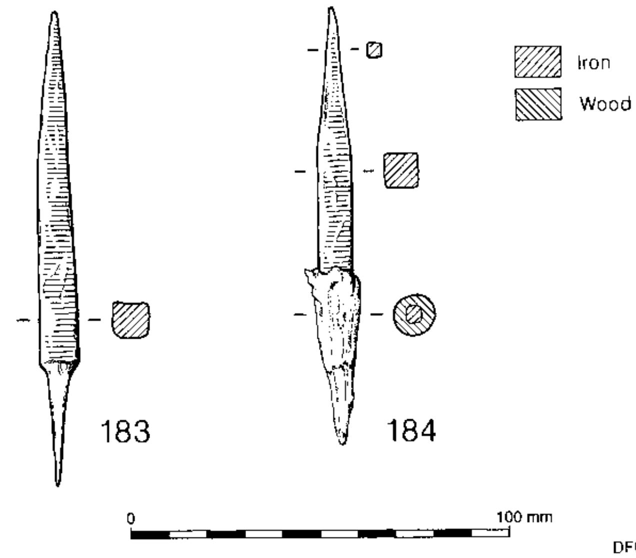


Fig 218 Iron awls (scale 1:1)

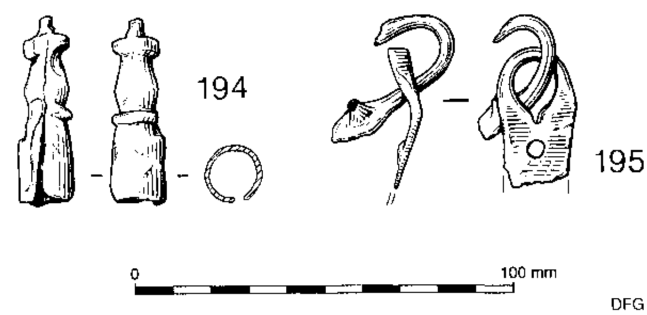


Fig 219 Iron fittings (scale 1:2)

Buckles

iron

188. 888 1416 Bld 198/Phe/Dump/Period 5
Square buckle. Pin missing.
Length 34mm; width 33mm.

189. 974 1403 Bld 198/Phe/Dump/Period 5
D-shaped buckle. Broken. Pin missing.
Length 42mm; width 30mm.

Buckle/brooch pins

copper alloy

190. 837 1392 Area A/Period 9
Pin from a buckle/brooch complete with suspension loop.
Length 28mm.

191. 3350 1417 Bld 198/Phe/Dump/Period 5
Pin possibly from a buckle, possibly a brooch. One end has been hammered flat and bent over to form a suspension loop. Circular section shaft.
Length 61mm.

Fittings

copper alloy

192. 2324 3779 Bld 4401/Phb(ii)/Period 4a
Incomplete. Rod with beaded section. Broken at both ends.
Length 28mm; diameter maximum 13mm.

193. 2062 1605 Ditch/Phd/Period 4a
Incomplete. Circular end with nail hole, broken at the end.
Middle section is also rounded with nail hole.
Length 94mm.

iron

194. 3347 1329 Area A/Period 11 (Fig 219)
Incomplete. Socketed fitting, conical socket, flattened on one

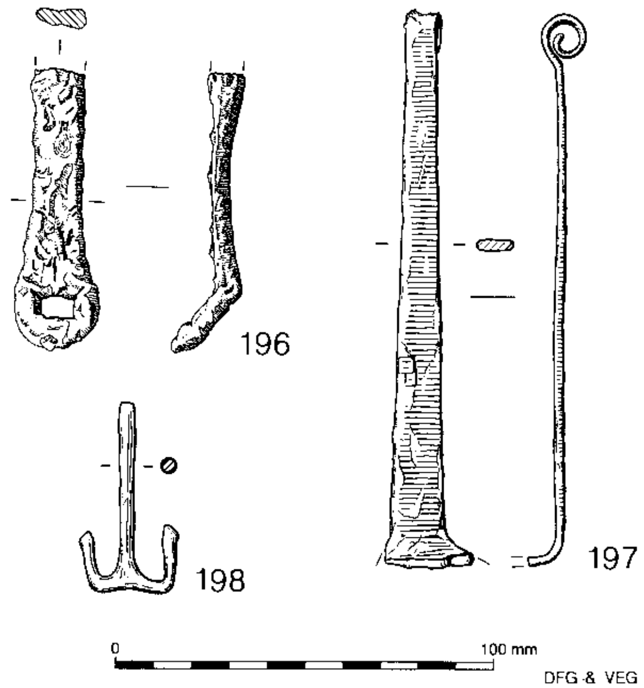


Fig 220 Iron keys (scale 1:2)

side. Decorated by applied horizontal rings on the other.
Length 48mm.

195. 3355 4082 Bld 4401/Phc/Period 4a (Fig 219)
Chesr fitting/box hinge. Iron strap with a rivet hole and loop. Linked through the loop is a fitting with one end flat and rounded complete with rivet, the other broken. Allason-Jones and Bishop 1988, 61, No 116, fig 84.

Locks and keys

iron

196. 2249 2649 Bld 2613/Period 6 (Fig 220)
Barb-spring padlock key broken across the handle. The oval bit is bent at right angles to the handle and has a square cut-out. Manning 1985, 96.
Length 73mm.

197. 642 101 Bld 197/Phe/Floor Layer/Period 5 (Fig 220)
Incomplete. Barb-spring padlock key with one end rolled over to form a loop. The other end bent and broken across the bit. Rectangular-section shaft. Manning 1985, 90, fig 25.1, plate 40 O40.
Length 117mm.

198. 3353 1516 Bld 198/Phd/Dump (Fig 220)
Key. Circular section shaft. T-shaped lift key. Two teeth on the bit.
Length 53mm.

199. 872 1413 Area B/Rampart/Period 4b (Fig 221)
Lock bolt. Almost complete with several triangular cut-outs.
Length 83mm.

200. 2104 1465 Area B/Rampart/Period 4b (Fig 221)
Lock bolt. Complete with rectangular cut-outs. Crummy 1983, fig 136, No 4136.
Length 85mm; width 16mm.

201. 2288 2887 Via P/Surface 1/Period 4b (Fig 221)
Lock pin, with rectangular section shaft broken across the perforated holes. The head has a sunken face around a high

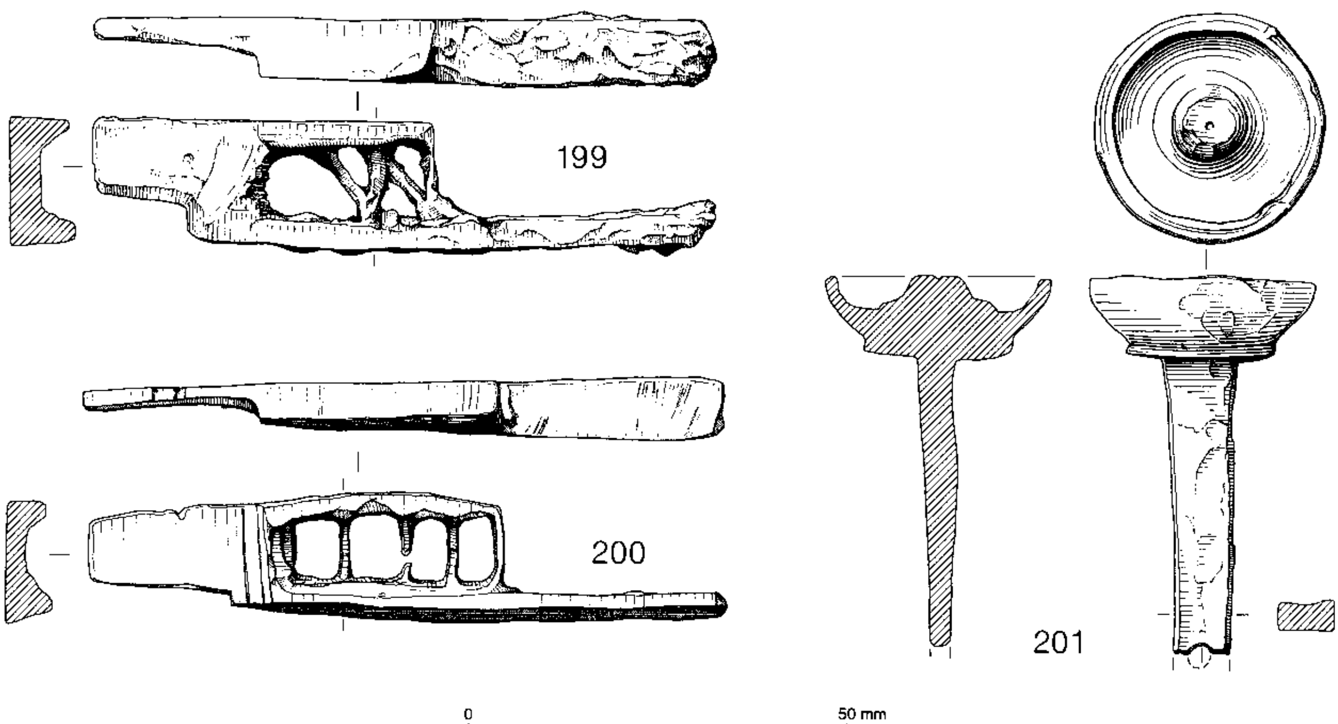


Fig 221 Lock bolts and lock pins (scale 1:1)

central core. Similar to one from Colchester (Crummy 1983, No 4143).
Length 49mm; diameter maximum head 30mm.

Studs

copper alloy

202. 2331 3876 Via S/Period 4a (Fig 222)
Large circular enamelled stud. Four deep grooves with enamel remaining in two outer grooves. A central squarish hole, punched from the back, is not an original feature. There are four fields, a central disc surrounded by three concentric rings, although only the outer two still contain enamel. Both these fields were filled with blocks of millefiori. The pattern in the inner ring is a 3 x 3 white and blue chequerboard with a red border, and that in the outer ring a 'flower' motif with a white centre surrounded by a red ring and white 'petals' set in a blue background.

As is ofren the case, the copper or cuprous oxide in most of the red/orange enamels has oxidised, producing a range of greenish colours; the other colours are less altered. The millefiori patterns are all the more commonly occurring ones, though the yellow/turquoise colour combination of the 5 x 5 chequerboard is unusual. Studs of this type are relatively common in western Roman provinces and it is suggested that they are used for decoration on horse trappings and other leather articles. A late second- or early third-century date for them is generally accepted (Butcher 1982).
Other examples of this type of stud are known from South Shields (Allason-Jones and Miket 1984, 92, nos 3.4, 3.5),

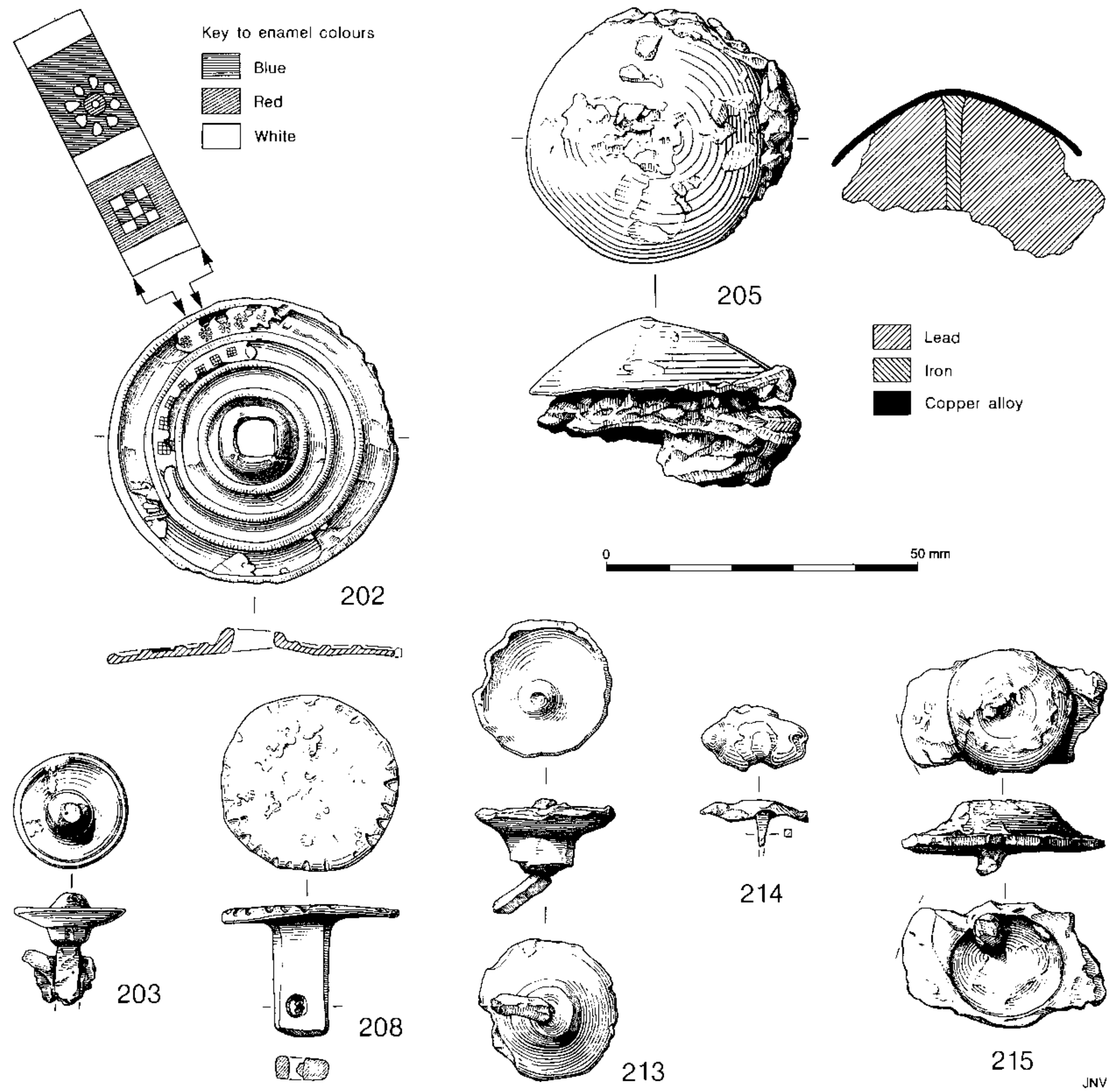


Fig 222 Copper alloy studs (scale 1:1)

Corbridge (Corstopitum Museum 75.589), Housesteads (MA 1956.151.21A), Chesters (Chesters Museum 1098A,1370; Budge 1903, 377, nos 842, 381, 1117), and Bewcastle (Butcher 1991, 33, 154, fig 15).
Diameter 46mm.

203. 746 317 Area A/Period 7–8 (Fig 222)
Bell-shaped stud. Head is decorated with a groove around the edge and raised dome in the centre. The shank is iron and rectangular in section. See Allason-Jones 1985, 95–108 for a discussion of these studs and parallels.
Diameter head 18mm; length 18mm.

204. 865 1418 Bld 198/Phe/Dump/Period 5
Flat-top stud. Square section shank. Broken head, no original edge left.
Diameter maximum head 21mm; length 14mm.

205. 997 1412 Area B/Rampart/Period 4b (Fig 222)
Domed-headed stud with a lead in-fill and an iron shaft. Crummy 1983, fig 120, no 3160.
Diameter 39mm.

206. 2090 1657 PPS/NT/Period 4a
Incomplete.Dome-headed stud with a flat outer flange.

207. 2091 1657 PPS/NT/Period 4a
Dome-headed stud *in situ* in a piece of iron. Iron very badly corroded and only survives under the stud.
Diameter maximum head 15mm.

208. 2266 2790 PPS/NT/Period 4a (Fig 222)
Stud. Complete. Large flat head with a rectangular shaft. The end of the shaft has a hole in it.
Length 22mm; diameter maximum head 39mm.

209. 2342 3965 PPS/Blocked portal/Period 4a
Incomplete, stud with rounded shank.
Diameter maximum head 11mm.

210. 661 224
Copper alloy disc. Plain. Iron stud and back plate.
Length 16mm; diameter 28mm.

211. 2425 4234 Bld 4401/Pha/Period 4a
Complete. Small stud with round global head.
Diameter head 11mm; length 30mm.

212. 2112 1690 PPS/NT/Period 4a
Incomplete. A stud with an iron shank and a lead head that probably originally had a copper alloy capping.

213. 604 3 Unstratified (Fig 222)
Incomplete. Bell-shaped stud, concave centre with raised flange and central dome. See No 203.
Length 20mm; diameter maximum head 23mm.

214. 816 1325 Unstratified copper alloy stud (Fig 222)
Stud. Fragment, with a square-section shank. Head badly distorted

215. 2082 1300 Unstratified copper alloy stud (Fig 222)
Stud. Fragmentary. Large circular stud with only one fragment of the outer edge. Raised bulbous centre with concave centre. Circular shaft fragment

Fasteners

iron

216. 503 1 Unstratified
Double spiked loop with arms bent at right angles; one arm intact, the other broken.
Length 102mm.

217. 2058 605 Ditch/Phd/Period 4a
Joiners dog. Rectangular section, shaping to a point at both ends. Oval shape with both ends overlapping. Manning 1985, 131 plate R53.
Length 49mm; width 9mm.

218. 3354 2601 Period 6
Split pin. Incomplete with one arm missing. Rectangular section.
Length 105mm.

219. 574 127 Bld 197/Phe/Dump/Period 6
Ring with split pin.
Length of pin 86mm; diameter of ring 48mm.

Rings

iron

220. 577 84 Bld 197/Phe/Dump/Period 6
Incomplete. Worn on one side.
Diameter 45mm.

221. 831 1376 Bld 199/Period 6
Incomplete and distorted. One end appears to be flattened.

222. 2388 4082 Bld 4401/Phe/Period 4b
Incomplete.
Diameter external 59mm.

223. 2391 4102 PPS/NT/Period 4a
Complete. With a round section.
Diameter external 42mm.

copper alloy

224. 739 260 Area A/Buried Soil/Period 7–8
Complete. Rectangular section.
Diameter external 20mm.

225. 928 1505 Via P/Surface 3/Period 4b
Incomplete. D-section.

226. 996 1500 Ditch/Phf/Period 4b
Complete but worn on one side. Gilded.
Diameter external 28mm; thickness maximum 5mm.

227. 2041 1585 Bld 198/Phe/Dump/Period 5
Complete, circular section.
Diameter external 31mm.

228. 929 1505 Via P/Surface 3/Period 4b
Incomplete. Rectangular section. Height 4mm; thickness 3mm.
Diameter 30mm.

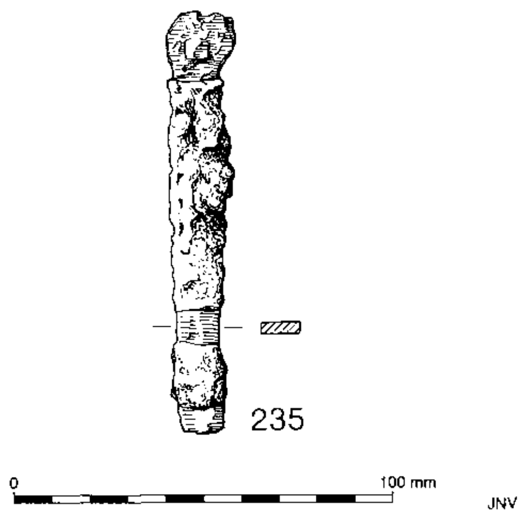


Fig 223 Iron strap/bar (scale 1:2)

229. 2086 1646 Ditch/Phf/Period 4b
Incomplete. Flattened oval section.
Thickness 5mm; height 2mm.

230. 2108 1659 Area C/Robber Trench/Period 6–9
Complete. D-section. Oval shape.
Diameter 35mm.

231. 2132 1752 West Berm/Period 4b
Complete ring. Oval section.
Diameter external 16mm; thickness 3mm.

232. 2279 2758 Bld 4403/Dump/Period 6–10
Incomplete.
Diameter 23mm; height 3mm.

233. 2389 4121 PPS/NT/Period 4b
Complete. D-section. Worn on opposite sides.
Diameter 28mm; height 3mm.

234. 2448 4376 Bld 4400/Phb/Period 2
Incomplete.

Straps/bars

iron

235. 890 1410 Area B/Rampart/Period 4b (Fig 223)
Strap. Incomplete. Probably a door fitting. Two rivet holes with rivets visible.
Length 113mm; width 11mm.

236. 637 77 Bld 197/Phe/Floor Layer/Period 5
Bar. Incomplete, rectangular section, curved at one end.
Length 70mm; width 8mm.

237. 3332 285 Area B/Rampart/Period 5–6
Bar. Incomplete. Rectangular bar, tapering at one end. Bent at both ends and broken.

238. 2359 4014 Bld 4402/Phb/Period 4b
Strapping. Incomplete. Rectangular section, with a hole at one end and broken at the other.
Length of bar 58mm; width of bar 25mm.

Mounts

copper alloy

239. 2351 3998 Bld 4401/Phb(ii)/Period 4a
Incomplete. Circular mount with loop riveted to a fragment of curved copper alloy sheet.
Length 30mm; height 16mm.

240. 557 15 Bld 197/Period 11 (Fig 224)
Incomplete. Curved strip which is broken at one end and the other has a flattened circular end with a rivet below. Rectangular section with incised grooves near the finished end. Possible helmet strengthener.
Length 64mm.

241. 603 3 Unstratified (Fig 224)
Circular flat plain mount, with attachment loop on the back.
Diameter 35mm.

242. 2216 1300 Unstratified
Mount. Decorative square sheet bent to form a ridge. Deliberate.
Length 31mm; width maximum 21mm; height 20mm.

243. 2364 4025 PPS/NT/Period 4a (Fig 224)
Incomplete. Triangular-shaped with a bulbous end. Notched decoration around the circular end, with rivet hole.
Length 45mm.

244. 2392 4082 Bld 4401/Phc/Period 4b (Fig 224)
Mount. Almost complete. Trilobe shape with a pierced hole in each lobe. Staple through the two lower holes.
Length 17mm; width 18mm.

245. 10049 4504 (Fig 224)
Incomplete. Rectangular section mount, curved at one end, with pronounced rib at start of curve. Rib decorated with incised lines and possible decoration on curved end. Two prongs on the back. Obverse has possible evidence for something being mounted on it. Reverse has evidence of another copper alloy sheet. Possible bucket escutcheon.
Length 57mm; height 13mm; thickness 2mm.

Miscellaneous

copper alloy

246. 587 7 Unstratified (Fig 225)
Ferrule. Base has been worn through. Leaded alloy. Decorated with two parallel lines near the top.
Length 27mm; diameter maximum 17mm.

Category 12: agricultural implements

iron

247. 2420 4240 Bld 4401/Phb/Period 4a
Bell. Copper alloy plating over iron core. Rectangular shaped widening at the base with suspension loop and clapper still attached. Bell very badly encrusted and corroded, information came from X-ray. Jackson 1985, 147, no 93 fig 53.

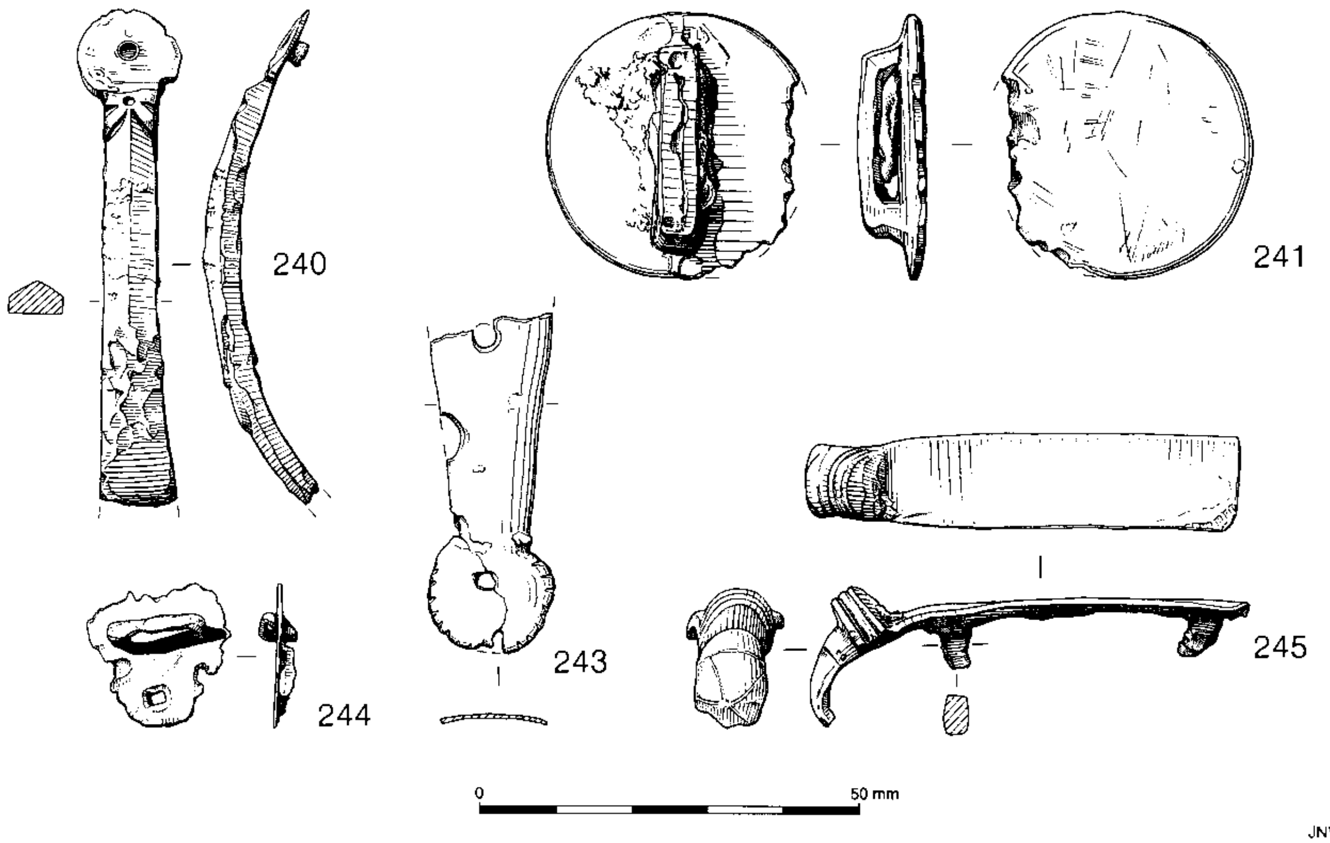


Fig 224 Copper alloy mounts (scale 1:1)

248. 561 7 Unstratified (Fig 226)
Ox-goad. Rees Type 1. Encrusted but complete with spike. Rees 1979, 75 fig 73a
External diameter 18mm; length 25mm.

Category 13: military equipment

Belts, fittings, and armour

copper alloy

249. 873 1403 Bld 198/Phe/Dump/Period 5 (Fig 227)
Belt-plate. Incomplete. Two rivet holes. Edges decorated with notches. Allason-Jones and Bishop 1988, fig 23, 24.
Length 31mm; width 28mm.

250. 904 1403 Bld 198/Phe/Dump/Period 5
Belt plate. Incomplete with six rivet holes around the edge.
Length 32mm; width 27mm; thickness 2mm.

251. 2346 3962 Bld/4401/Phc/Period 4b
Belt plate. Incomplete with a rivet.
Length 20mm; width 18mm.

lead

252. 730 299 Bld 197/Phe/Dump/Period 5 (Fig 227)
Belt plate. Incomplete. Ornate open-work belt-plate. Usually found in copper alloy. Pelta shaped decorative elements around

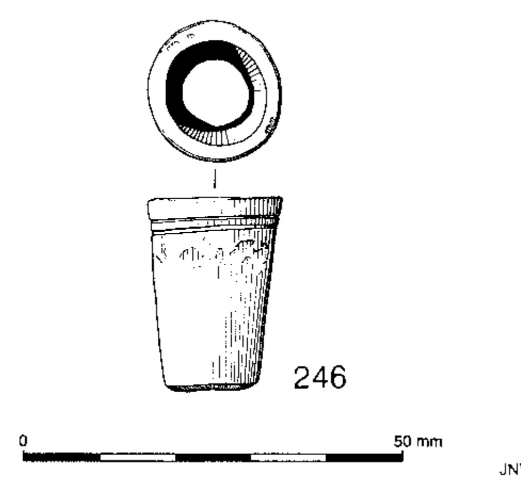


Fig 225 Miscellaneous object (scale 1:1)

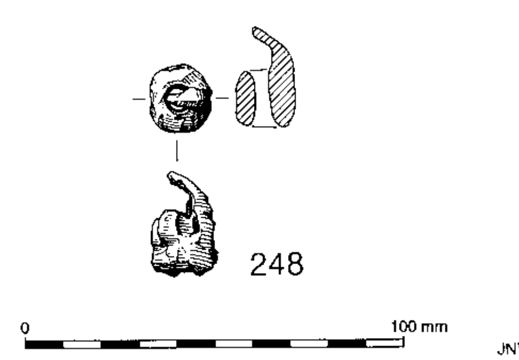


Fig 226 Iron ox-goad (scale 1:2)

the edge. Crummy 1983, fig 157, no 4240.
Length 66mm; width 47mm.

copper alloy

253. 772 386 Area B/Rampart/Period 5–6 (Fig 227)
Belt buckle. With openwork scroll decoration. Pin missing. Second- to third-century type. Mould 1991, 189, fig 93, No 659.
Length 33mm; width 25mm.

254. 943 1474 West Berm/Period 4b (Fig 227)
Small buckle with pin and part of buckle plate. From a *lorica segmentata*.
Length 17mm; width 15mm.

255. 2128 1747 Ditch/Phf/Period 4b (Fig 227)
Small D-shaped buckle. Suspension loop for pin still around the hoop but pin missing.
Length 23mm; width 16mm.

256. 653 215 West Berm/Period 4b-5
Complete. Lozenge section. Late Roman belt fitting possibly from a *cingulum militare*. Crummy 1983, fig 116 no 4253
Diameter 46mm; height 8mm; thickness 9mm.

257. 849 1338 Area A/Rubble/Period 7–9 (Fig 227)
Incomplete scroll buckle tapering to a point at one end and broken at the other. Suspension loop on one side near to the tapering point. Allason-Jones and Miket 1984, 230, No 3.807

258. 736 268 Bld 198/Phe/Dump/Period 5 (Fig 227)
Lorica hamata hinged fitting from front of armour. S-shaped. Pierced at both ends.
Length 91mm.

259. 908 1462 Unstratified (Fig 227)
Washer. Circular disc with decorative notched edge, and central perforation hole. From *lorica segmentata*.
Diameter 19mm.

Spears, bolt heads, and *pilum*

iron

260. 857 1403 Bld 198/Phe/Dump/Period 5 (Fig 228)
Catapult bolt head. Manning type IIA. Flat-bladed bolt head. Leaf shaped blade. Socketed with evidence for fixing; one side has a U-shape cut out, to slide around a pin. Manning 1985, 175, plate 85 V254.
Length 90mm.

261. 3339 286 Area B/Rampart/Period 7–11 (Fig 228)
Catapult bolt head, Manning Type I. Pyramidal head with a conical socket. Manning 1985, 170, plate 82.
Length 69mm.

262. 3343 425 Area B/NW/Primary Rampart/ Period 2a (Fig 228)

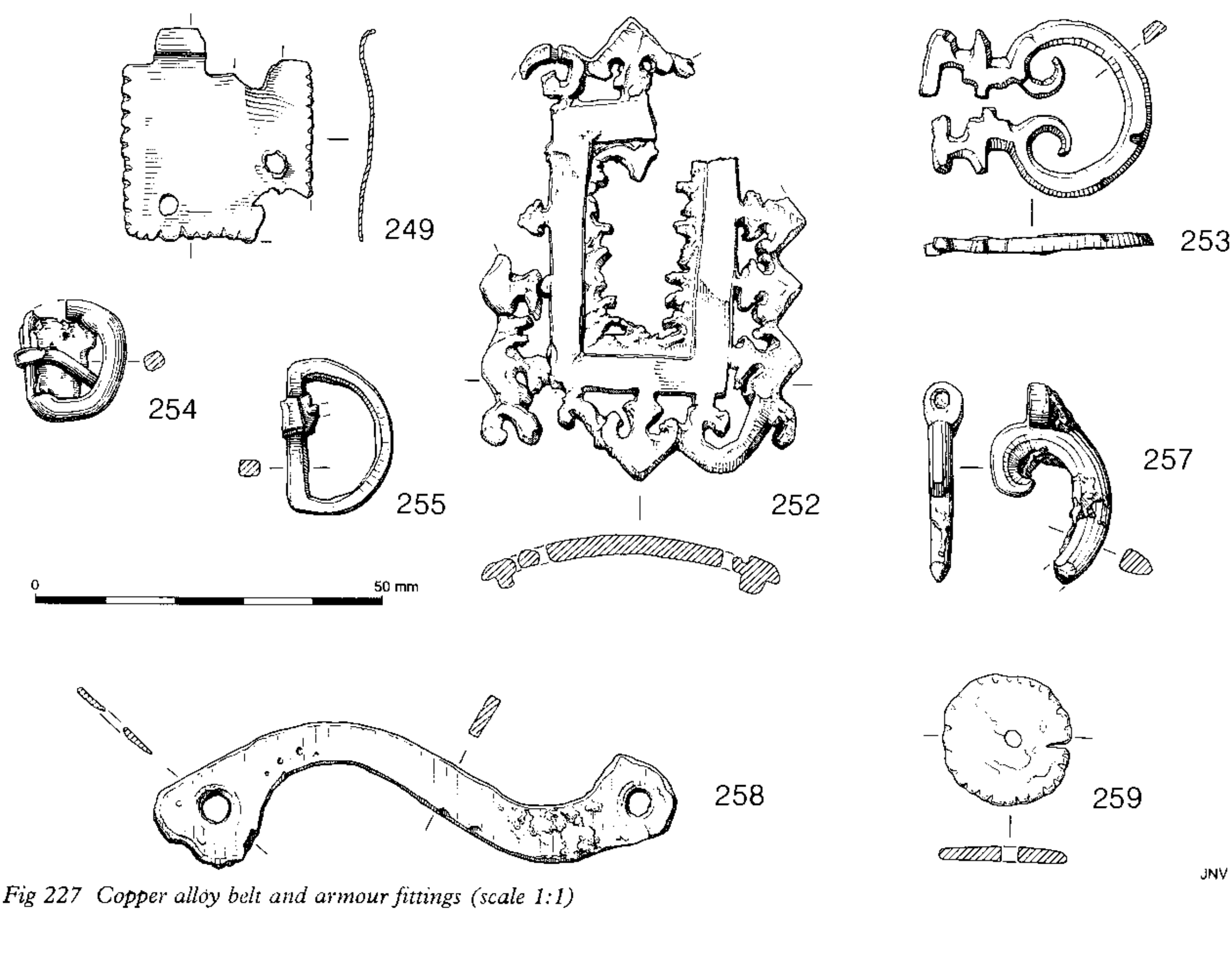


Fig 227 Copper alloy belt and armour fittings (scale 1:1)

Catapult bolt head, Manning Type I. Slender pyramidal head, conical socket with rivet hole. Manning 1985, 170, plate 82.
Length 66mm.

263. 3349 1369 Area B/NW/Period 5–6 (Fig 228)
Spearhead. Incomplete. Conical socket. End opens out to a flat, possibly leaf shape.
Length 20mm; diameter across the socket 15mm.

264. 2048 1500 Ditch/Phf/Period 4b (Fig 228)
Spearhead. Narrow leaf-shaped blade with a conical socket. Manning 1985, plate 76 V26.
Length 250mm; width maximum across the blade 37mm.

265. 3361 4189 PPS/Blocked portal/Period 4a (Fig 228)
Spearhead, Manning Type IA. Leaf-shaped blade with rounded shoulders. Broken across the socket.
Length 51mm.

266. 3329 249 PPS/Collapse Rubble/Period 7 (Fig 228)
Pilum head. A long pyramidal head with a broken rectangular section shank. *Pila* are rare finds in Britain: examples are known from Waddon Hill (Webster 1981, 70, fig 31, 67) and Hod Hill (Durden collection, Manning 1985, 160 V22, plate 75), but a large collection of heads missing their shanks were found at Caerleon in third-century contexts (Nash Williams 1932, 71, fig 20 and 21).
Length 84mm.

267. 3342 425 Area B/NW/Primary Rampart/ Period 2 (Fig 228)
Ferrule. Domed head. Circular section shaft, hollow with traces of wood. Similar examples were found at Newstead (Curle 1911, pl XXXVIII 12–13, 15–17).
Length 54mm.

268. 10017 1 Area F/Topsoil (Fig 228)
Spearhead, with conical socket. Leaf shaped blade, broken.
Length of socket 67mm; width maximum across blade 46mm.

Mounts

copper alloy

269. 523 1 Unstratified
Decorative half moon shaped mount. One central rivet hole. Thin sheet.
Length 37mm; width maximum 11mm.

270. 2242 2682 Unstratified (Fig 229)
Strap mount. Broken. Lower half is semi-circular with two pelta-shaped cut-outs. From a central point two arms rise and are broken at that point. One stud on the back for attachment. Allason-Jones and Miket 1984, 238, no 3.884; Crummy 1983, fig 157, no 4237.
Length 23mm; width 24mm.

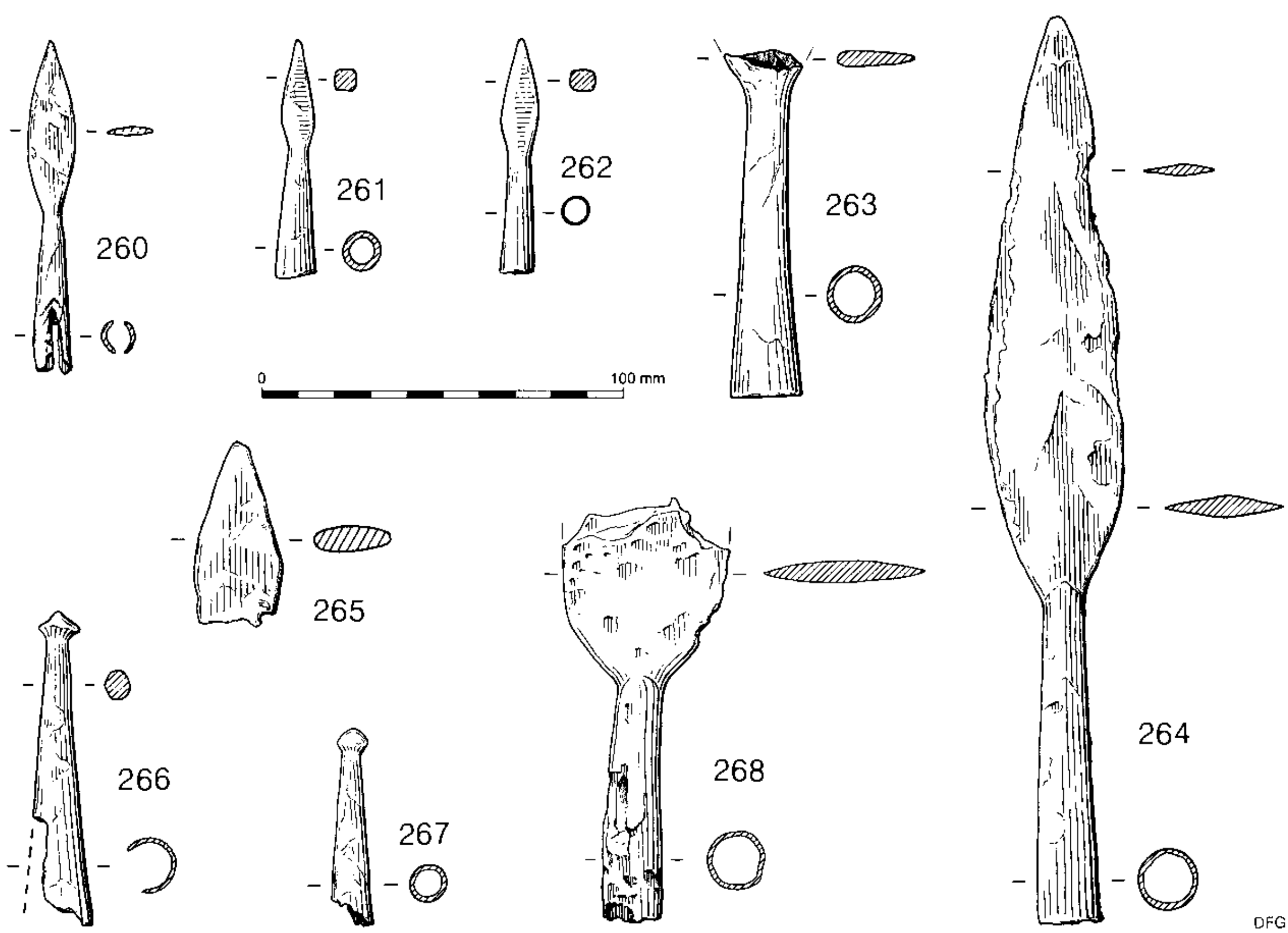


Fig 228 Iron spears, bolt heads, and pilum *(scale 1:2)*

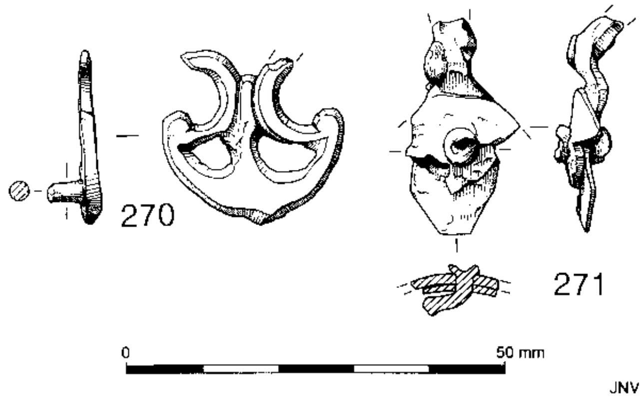


Fig 229 Copper alloy mounts (scale 1:1)

271. 784 225 Area B/NW/Period 7–11 (Fig 229)
Incomplete. All that survives is a fragment of the base plate with a hook and a circular disc riveted onto it. The rivet protrudes out the back and may well have been used to fix the pendant onto leather or wood.
Length 29mm.

Stone balls

272. 3449 1 Area A/Topsoil
Local buff sandstone. The stone is elliptical. Its size suggests use as a sling-missile and may be compared with even smaller examples from South Shields (Allason-Jones and Miket 1984, 12, nos 45–58). Missiles of stone, fired clay, and lead are common enough on military sites to indicate widespread use of slings in Britain (Greep 1987; Griffiths 1989; Bishop and Coulston, 1993).

Vegetius (*Ep Rei Mil*, II, 23) recommends that for training with the sling and bow targets are set up approximately 180m away, which suggests that the potential range of the sling must be greater. Xenophon tells us that the Rhodian slingers had twice the range of their Persian counterparts (*Anabasis* III, 3) and that they could outrange most of the Persian archers (III, 4). Recent experiments have shown that the Persian archers were using a composite bow with a range in excess of 350m, which suggests the Rhodian slingers were achieving similar distances. Connolly (1981, 49) estimates that 350m is the maximum range in line with the Persian archers. It seems that the slingers could easily achieve in excess of 200m and the best in excess of 300m. The sling was a very effective weapon and was sometimes rated more highly than the bow (Vegetius *Ep Rei Mil* I.16).
Maximum diameter 49mm; weight 110g.

273. 2213 1926 West berm/Unstratified (Fig 230)
Local buff sandstone. Irregularly-broken with the loss of approximately 30% of the object. The stone has a well-finished surface with some chisel-pitting. It may originally have displayed the opposing flat facets which often remained when a squared block was worked into a ball.

Stones of similar size and weight are common on fort sites, sometimes in large groups, as at Wallsend and Corbridge (unpublished, cf Allason-Jones and Miket 1984, No 12.59–60, 63–6; Bidwell 1985, 154). They are usually published as artillery shot, but Baatz has suggested that throwing by hand was a more usual practice for use in mural defence (Baatz 1966, 201–2; 1983, 136). However, it would be a mistake to view these stones as designed exclusively for one method of projection alone.
Diameter 80mm; weight 475g.

274. 2375 4030 Bld 4402/Rubble/Period 5–7 (Fig 230)
Local buff sandstone. The stone is undamaged.
The piece is a slightly ovoid shape, with a smoothed surface and two slightly flat opposing surfaces.

Again the question of use arises. Baatz suggests that this type of stone was dropped off a wall using two hands rather than hurled one-handedly outwards over some distance like the smaller balls (Baatz 1966, 202–3; 1983, 136). Certainly the very largest balls, such as those from High Rochester (13–14kg; L Allason-Jones personal communication), are too large to have been shot from artillery and would have been rolled off walls.
Maximum diameter 170mm; minimum diameter 140mm; weight 750g.

[JCNC]

Miscellaneous

275. 2046 1516 Bld 198/Phd/Dump (Fig 231)
Hilt segment. Small thick ring with a square hole in the centre. Raised outer rim with a sunken centre. See Brailsford 1962, 1, A16.
Diameter 18mm.

276. 688 235 Bld 197/Phe/Dump/Period 5 (Fig 231)
Bone pommel? Small knob with a central hole that does not go all the way through. Oval section. Possible end from a sword grip.
Diameter 27mm.

277. 687 217 Ditch/Phd/Period 4a (Fig 231)
Copper alloy shield binding. Fragment of binding, complete with rivet. Traces of iron in the groove. See Brailsford 1962, 1, A9–13 for examples.
Length 56mm; thickness 4mm.

Category 14: religious

278. 705 235 Bld 197/Phe/Dump/Period 5 (Fig 232)
Ceramic statuette. The creamy-pink pipe clay fragment shows the back of a head of hair, combed to either side of central parting. Although much of either side of the head is lost, sufficient still remains to indicate that the sides of the face would originally have been framed by soft rolls of curls which extended round the back of the head and rested on the nape of the neck, part of which still survives. Two long curls hang down to either side. Originally the complete statuette would have had the right arm flexed with the right hand gently holding the ringlet on the right side of the head.
Present height of fragment 38.8mm; present width 30.3mm; maximum depth 13.2mm.

The type can be compared with the complete examples now in the Musée des Antiquites Nationales, St Germain-en-Laye. One piece from Toulon-sûr-Allier (Allier), inv. no 6851, stands some 189mm high (Rouvier-Jeanlin 1972 Type II Group AFF, 102, no 36; 103, no 43 respectively). Jenkins (1958 , 71–6) noted some 100 sites in Britain where complete and

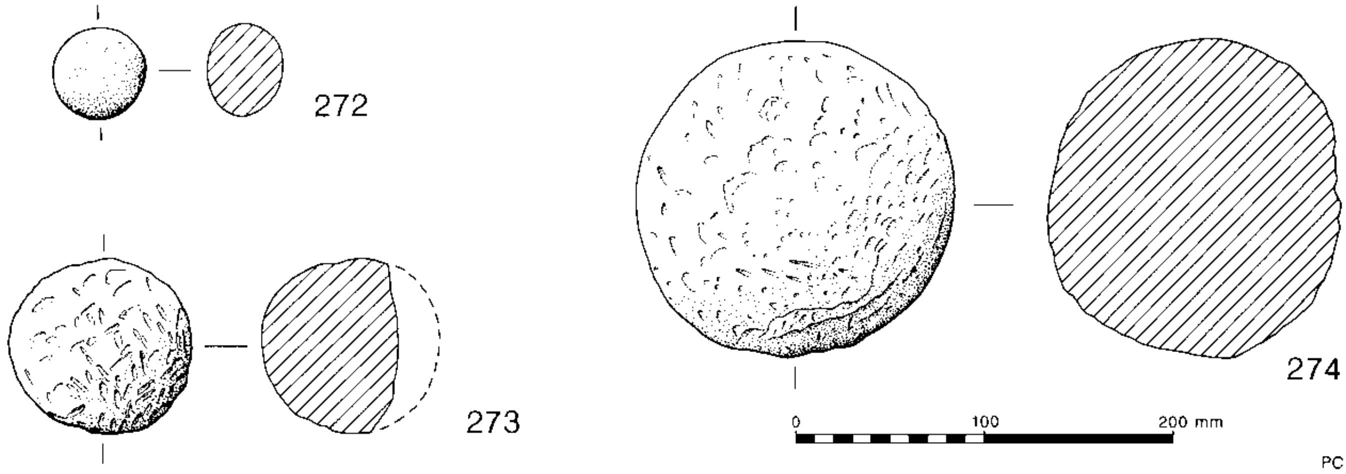


Fig 230 Stone balls (scale 1:4)

fragmentary parts of these Venus figurines had been found. This includes a piece from Birdoswald found during the 1929 excavation (ibid, 74, no 80; Wheeler 1930, 48; and Green 1978, 47, no 3). Since then further examples have turned up during more recent excavations. These include three complete pieces from Mansell Street, London, which were found as part of the burial assemblage of a child interred in a lead coffin (Barber, Bowsher, and Whittaker 1990, 9, pl II).

[GLM]

Stone sculpture

by J C N Coulston

Numbers of finds of sculpture at forts and *vici* along Hadrian's Wall make it clear that survival and recovery depend upon the degree of post-Roman site development, arable land use, and intensity of modern antiquarian and archaeological study. Thus, the central sector forts are disproportionally well represented (Housesteads 118, Vindolanda 50, Chesters 52, Carvoran 29, and Great Chesters 20; figures are approximations based on Coulston and Phillips 1988, with additions) while those on the west have produced very little sculpture (Stanwix 10, Burgh by Sands 4, Bowness 4, and Drumburgh 2). Numbers do not, therefore, necessarily correspond to volume of production.

While stone artefacts are common in excavations, it is unusual to find sculptures in their original functional positions precisely because of the durability and reusability of stone (Coulston and Phillips 1988, xvi–xviii). Some of the pieces were either unfinished, or were recut and heavily worn in the course of reuse. Most are damaged in some way. Archaeological contexts thus seldom provide information for dating. Usually, the most that may be said about the chronology of the sculptures is that they all date approximately to the second or third centuries. This statement is mainly based on the lack of any stone sculpture from northern Britain positively datable to the first or fourth centuries (ibid; Phillips 1977, xiii–iv). One contextual exception among the Birdoswald finds may be the

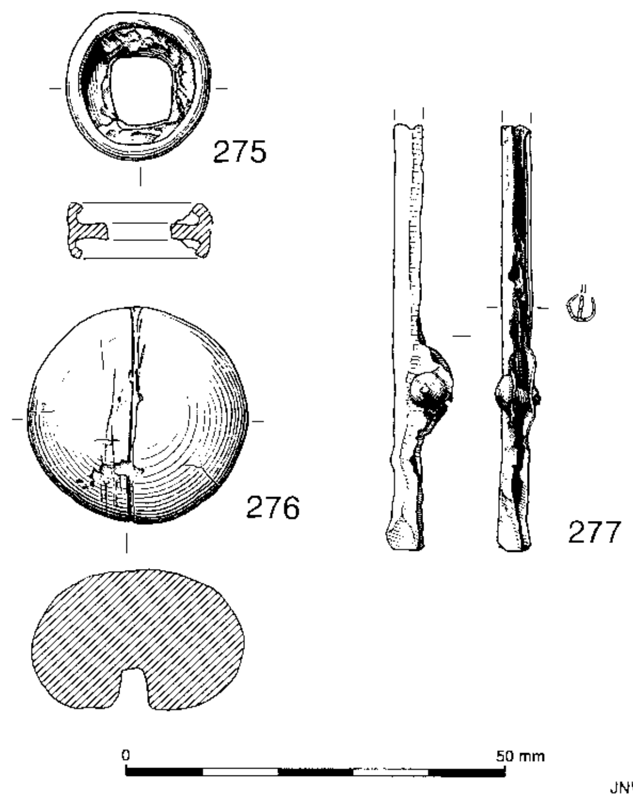


Fig 231 Miscellaneous objects (scale 1:1)

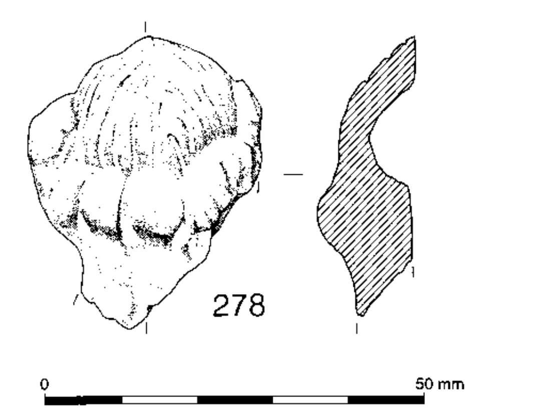


Fig 232 Ceramic statuette (scale 1:1)

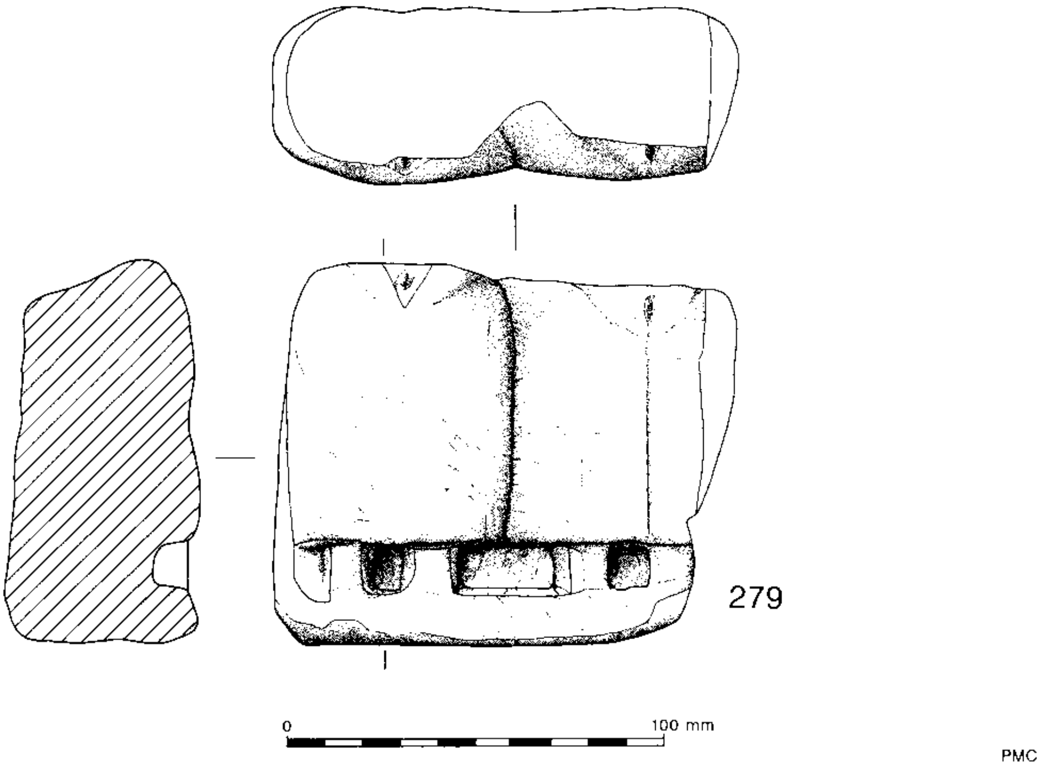


Fig 233 Genii cucullati *sculpture (scale 1:2)*

ithyphallic horse graffito (No 286), although even this does not necessarily date from the construction of the basilican building on which it is carved. It is both visible above floor level and incised. Not being worked in relief, it need not be contemporary with the original dressing of wall blocks. Small altars may have found a place within fort buildings. However, the gravestone (No 282) is clearly imported. Perhaps it was originally erected in the cemetery to the west of the fort (Wilmott 1993) where other stelae have been recovered (Coulston and Phillips 1988, nos 224 and 225?). At a later time when commemoration of the deceased man was no longer important, and when stone for building was required, the gravestone was brought into the fort. Reuse of funerary monuments for military construction work may be paralleled on a number of Wall sites (cf Phillips 1977, nos 254, 264, and 266; Coulston and Phillips 1988, nos 193–6, 205, 207, 211, and 214–15; Coulston forthcoming).

Among the group of new Birdoswald pieces, the most outstanding item is the relief of *genii cucullati*, a major addition to this class of cultic work (No 279). Other figural works provide interesting additions to the body of animal and phallic sculptures from the Wall region.

279. 815 1331 Area A/Rubble/Period 7–9 (Fig 233) Relief of *genii cucullati*. Local buff sandstone. The right side, lower right corner, and top of the stone are broken away with the loss of heads and, probably, a third figure. The back, left side, and bottom surface are complete. Chipped and worn overall. There is a line of natural weakness in the stone in the depression between the two figures, and it is likely that a second such line explains the break along the right side. Height 100mm; width 122mm; depth 50mm.

Two human figures stand on a plinth. Two pairs of ankles are clearly depicted with stubby feet. Both figures wear cloaks down to their lower shin level. The right-hand garment displays a V-shaped neck-opening and a medial line down the convex front surface. There is a hint of a neck-opening at a slightly higher level on the left figure, the front of which is more damaged.

The edge of the stone curves over the left shoulder of the left figure.

The scale suggests a votive function for this piece. The dress of the two figures identifies them as *genii cucullati* which in northern Britain usually occur in threes, thus it is likely that a third cloaked deity has been lost from the right side of the stone. This new representation may be added to some 16 sculptures of *genii cucullati* from Britain as a whole (Toynbee 1957). The Hadrian's Wall region has already produced six, all differing in size and attributes. The closest parallel in both respects to the Birdoswald piece is one from Vindolanda, which likewise has only two *genii* surviving (Coulston and Phillips 1988, no 153). The remaining head clearly wears a hood which is integral with a knee-length cloak. The edge of the stone follows one god's shoulder. Lower-shin-length cloaks are worn by the *genii* on the well-known Housesteads panel (ibid, no 152). Their hoods are pointed, and their face-opening is closed at the neck in a 'V' which joins the medial opening down the front of the cloak. Similar cloaks with pointed hoods are depicted in profile on a relief from Cirencester (Toynbee 1963, no 76). Two of three *genii* which survive on a work from Carlisle seem to

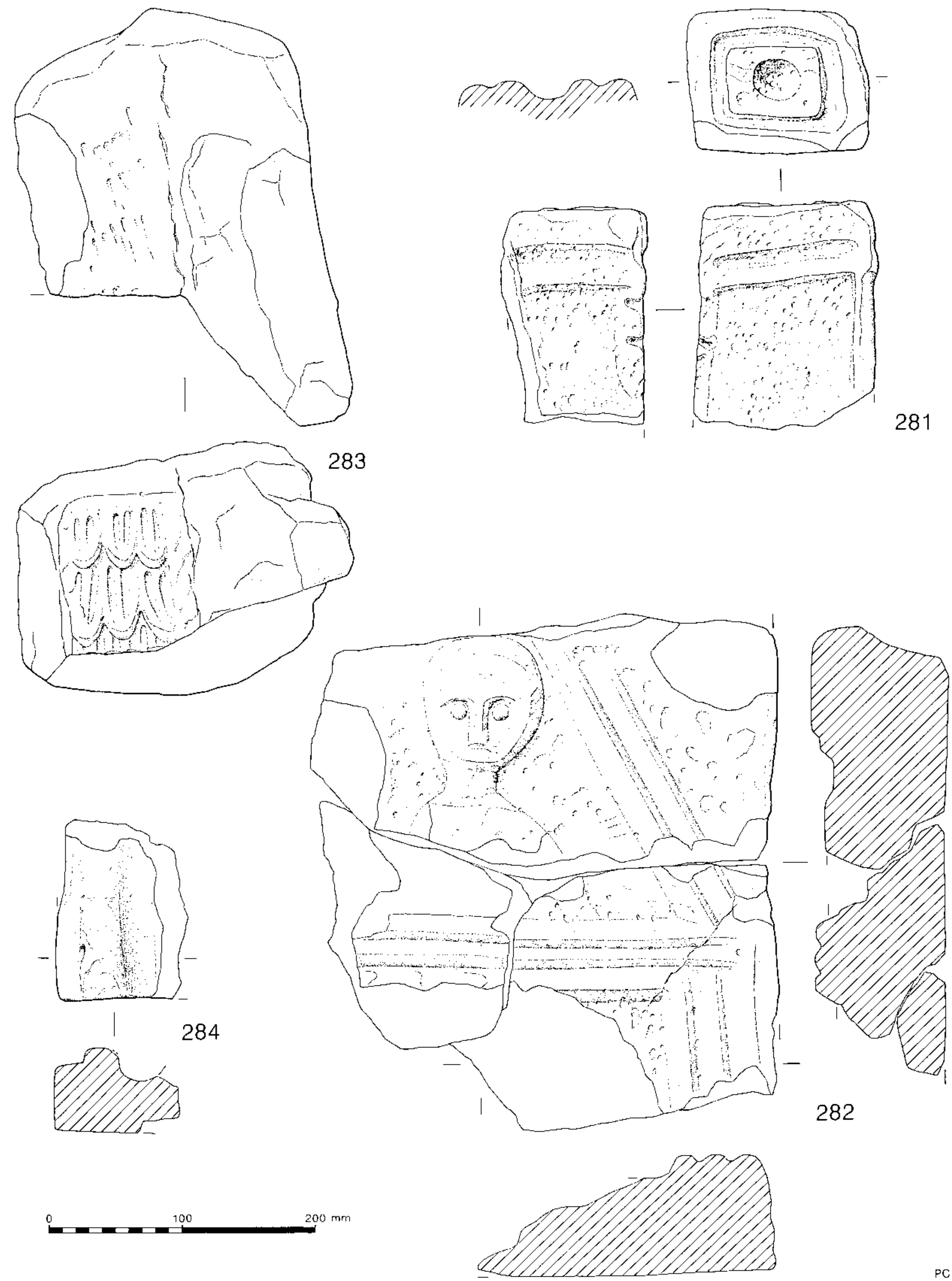


Fig 234 Stone sculpture (scale 1:2)

have their cloaks fastened by a round brooch at the throat (Coulston and Phillips 1988, no 485). A small statuette from Birdoswald wears a much shorter cloak, but one with a medial line down the front (ibid, no 154; cf Bordenache Battaglia 1983, fig 8).

Quite different are the upper-thigh-length cloaks worn by three *genii* on a relief from Netherby. These are fastened at one shoulder in *sagum* fashion (Coulston and Phillips 1988, no 155). The gods each carry an egg(?), perhaps as a fertility symbol. In Gloucestershire a number of reliefs show one or more *genii cucullati* in association with *Matres* (eg Toynbee 1964, pl XLIVb). Another small relief from Netherby shows *genii* carrying objects, the central one of which appears to be a basket or bowl such as borne often by *Matres* (Coulston and Phillips 1988, no 156). The cloak, usually with a pointed hood, also occurs in the art of Roman Italy and the north-west provinces worn by peasants and hunters in particular (Wild 1968, 225; cf Toynbee 1984, pl XLVIIIa). Thus the *genii cucullati* may tentatively be interpreted as male, rural, fertility deities (Toynbee 1957; 1963, 156; 1964, 177–8; Ross 1974, 476–7).

280. 10001 473.001 Area F/Topsoil
Fragmentary altar(?). Local red sandstone. Only the front surface is original, and this is chipped and worn, notably on the top and left margins. The lower front is flat with two incised letters which are all that survive from an inscription: ..]OM[.. Above these is a shallow moulding which delimits a second, projecting, flat zone. Above this are two rows of leaves carved in relief, the upper row projecting out slightly above the lower. Half of each of two lower leaves survive damage, while only the adjoining edges of two upper leaves are visible. On the upper row, and positioned above the centre of a lower leaf, is a damaged, rounded object in higher relief.
Height 210mm; width 140mm; depth 190mm.

The top is recut and chisel-pocked. The left side has been recut and roughly chiselled flat. The right side is also secondary and is smoothly, diagonally and concavely worn so that it merges with the bottom face.

Damage, secondary cuttings, reuse, and subsequent wear by tool-sharpening or feet obscure interpretation of function. The frontal high-relief projection may be a *bukranion*, a motif which sometimes appears on Jupiter altars (cf Phillips 1977, no 49; Coulston and Phillips 1988, no 300). Rows of leaves were applied as decoration on altar capitals (cf Phillips 1977, no 230; Coulston and Phillips 1988, nos 39, 143, 147, 285, 308, 325). The juxtaposition of the two motifs in this case is unusual, and the moulding is comparatively shallow if it delimits the capital and shaft of an altar. However, the fragmentary upper part of an altar is the least unlikely explanation for the stone.

281. 3450 (Fig 234)
Fragmentary altar. Local buff sandstone. The stone is broken across the shaft and chipped on the rear right corner. The upper portion of an altar has a single moulding of rectangular cross-section around all four sides of the capital. The top has a raised margin and the focus is upstanding with a prominent lip. The four corners of the shaft are decorated by vertical mouldings. The front is dressed but uninscribed, and the sides are plain.
Height 165mm; width 133mm; depth 105mm.

282. 2312 3923 ViaP/Surface 2/Drain lining/Period 4b (Fig 234)
Gravestone of a man. Local buff sandstone. The stone is broken into three pieces. Only the right side is complete. All other edges are broken away and the edges of the individual pieces are also badly chipped. Consequently, the top and left portions of the pediment, the left acroterion, and the left portion of the bust's chest have been lost. Only the top and right parts of the lower panel survive. The surface of the lower panel is flaked and chipped with no surviving inscription. The stone is worn overall.
Height 380mm; width 330mm; depth 95mm.

A panel flanked to the right by a triple moulding is topped by a male bust enclosed in a triangular pediment framed by a double moulding. The bust exhibits no drapery. The round head has little indication of hair. The eyes are round and large, the nose is long, and the mouth narrow with a downturned right side. The chin is weak, almost to the point of absence. Shallow horizontal furrows on the forehead may be deliberate modelling, or just chisel-marks remaining from general shaping. There are horizontal, narrow chisel-marks to the left of the pedimental frame, and pecking from a pointed chisel occurs on the acroterion and to the left of the bust. Overall the piece is not technically well-finished or smoothed, and the bust is crudely modelled.

Gravestones with a bust positioned within, rather than below, a triangular pediment have been found at Corbridge, Risingham (Phillips 1977, nos 66, 267), and Vindolanda (Coulston and Phillips 1988, no 209). Together with the new Birdoswald example, they may all be assigned to the third century.

283. 3451 5512 found in a field wall to the west of the fort. (Fig 234)
Decorated panel(?). Local buff sandstone. Parts of the front, top, and right side display original surfaces. The back, bottom, and left side are broken away. The surviving sculpted face is worn and broken along bottom and left, with the resultant loss of lower leaf tips and leaves to the left.
Height 180mm; width 230mm; depth 340mm.

The block is irregularly shaped as a result of serious damage. One surviving sculpted face on the front adjoins a tapering and battered projection to the right. The latter extends 120mm outward and has a small portion of its front face surviving. The sculpture represents three rows of downwardly-overlapping leaves or *squamae*. From top to bottom there are three (height 40mm), three (height 55mm), and two leaves, the lowest missing their bottom third. Each leaf is pointed and has a high relief medial rib and edge. The upper two rows are aligned while the leaves of the bottom row are alternately overlapped. The first and third leaves of the middle row have laterally curving ribs, to right and left, while all the other ribs are straight. A vertical frame, 17mm wide, runs down the right margin, and it seems to join a horizontal frame running along the top. The top of the stone is very irregularly dressed.

The tapering projection in particular makes interpretation problematic. The flat face does not suit sculpture in the round or in high relief. Thus it is perhaps more likely that overlapping leaves are represented, rather than feathers from an eagle or Victory wing (eg Coulston and Phillips 1988, no 387). The most likely alternative is that the leaves form the surround of an inscribed monumental panel. If this was the case, then the projection represents a very deep or wide frame to the right. A partial parallel is found in the four rows of scales recessed into a panel from Housesteads (ibid, no 412). The find spot might suggest that the piece came from a funerary monument in the cemetery in New Field (Wilmott 1993).

284. 724 241 Area A/Rubble/Period 7–9 (Fig 234)
Moulding or anthropomorphic figure(?). Local buff sandstone. The bottom and left sides of the piece are complete, and the right and top are broken away. The back is also damaged, but its lower part may be complete. Break across the right part of the front and chipping on the lower left front. Worn overall.
Height 135mm; width 95mm; depth 55mm.

There are two parallel members in relief running down the stone, and the more complete one on the left tapers to a chiselled step, then expands again below. It is possible that this represents a trousered leg with a damaged, projecting foot. Alternatively, inept sculpting created these features on the marginal mouldings of a panel. Such small fragments are always difficult to interpret with assurance.

285. 3452 2 Unstratified.
Phallus. Local buff sandstone. The stone is undamaged. A phallus is incised on the front of a facing stone. Its shaft tapers to a point.
Height 130mm; width 245mm; depth 40mm.

Phalli were commonly sculpted on the stonework of Roman buildings. They often occur on individual facing stones on military sites (Phillips 1977, nos 175–6; Tufi 1983, No 124; Keppie and Arnold 1984, nos 28, 82; Coulston and Phillips 1988, nos 406–7, 434, 443–7, 449, 458–9, 461, 465–6, 529). In the manner of phallic amulets and rings worn by individuals, these had an apotropaic function warding off the evil eye and ensuring good luck (Turnbull 1978; Johns 1982, 62–75). Perhaps they were believed to aid the success of building projects, or of activities connected with the finished construction, as in the case of pottery kiln phalli

Fig 235 No 286, graffito of horse on the north wall of Building 4403

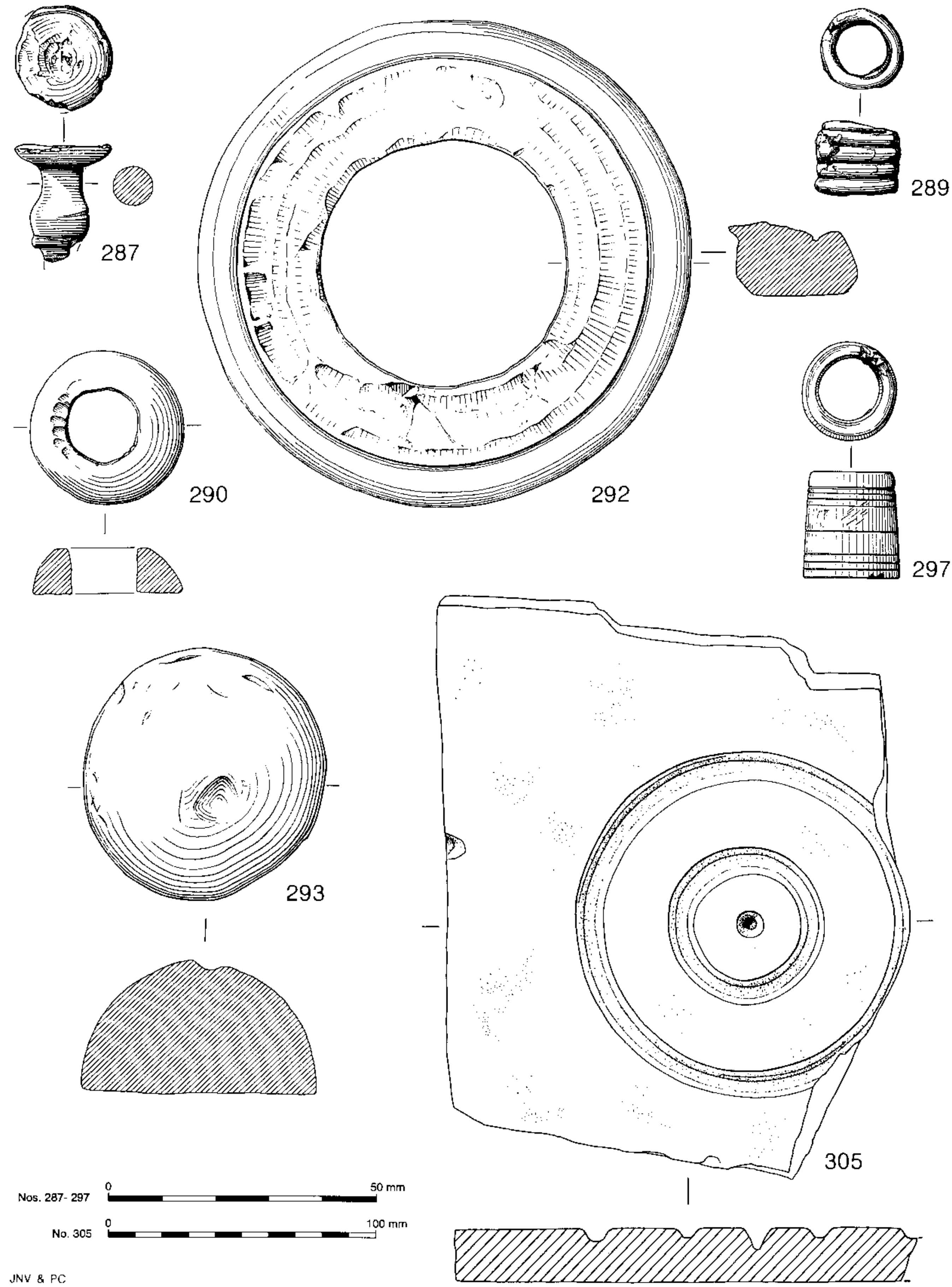


Fig 236 Objects of unknown function (scale 1:1)

(Brewer 1986, no 98). Phalli also appear at points of danger, insecurity, or transition, such as gateways, doorways, baths, and bridges (Coulston and Phillips 1988, nos 404–5, 448, and 457; cf Keppie and Arnold 1984, nos 97–8), and this kind of apotropism in a window context may be seen in the phallus carved into a window voussoir from the *porta principalis sinistra* (Fig 39).

286. 3453 Bld 4403/South wall/Period 2–5 (Fig 235)
Graffito of an ithyphallic horse. Local buff sandstone. Undamaged. A graffito was incised with a point on the front of a block in the third course up in the north, internal face of the basilica south wall, towards the south-west corner. A horse faces right with ears, a shaped head, four legs, and a body tapering towards the hind-quarters. Both a tail and an erect phallus are depicted.
Height 110mm; width 220mm.

The horse was visible inside the building, not hidden below floor-level, as was the case with reliefs and similarly incised graffiti in the riverside baths at Chesters (Coulston and Phillips 1988, nos 384 and 405).

A variety of birds and quadrupeds appear on facing stones and on military quarry-faces. Apart from eagles and unit badges, such as boars and capricorns, many of these have no readily apparent function unless resort is made to the little-understood sphere of Celtic totemic animal imagery (eg Phillips 1977, nos 166, 327–8; Coulston and Phillips 1988, nos 383–4, 386, 389, 395). The Birdoswald horse is similar in style to other incised animals. However, it is set apart from them by its ithyphallic stance and this may have been a reference to the hoped-for strength and/or fecundity of horses in military use. Perhaps there was a direct connection with the function of the basilica. Similarly Roman horse harness often incorporated phallic and lunate pendants for apotropaic effect (Bishop 1988, 107–8).

Category 18: objects of unknown function

287. 2436 2538 Hollow Way/Period 7 Copper alloy object (Fig 236)
Incomplete. Possible seal matrix with badly worn face. No visible detail (even after cleaning). Broken off half way up the handle.
Length 23mm; diameter 20mm.

288. 2281 2727 Via P/Period 4a-5 Copper alloy object
Trefoil-shaped piece of sheet. No obvious means of attachment.
Length 22mm; width 23mm.

289. 2235 317 PPS/ST/Period 7–8 (Fig 236)
Copper alloy spring
Spring. Four coils.
Diameter external 16mm; length 18mm.

290. 2098 1675 Area B/Rampart/Period 4a (Fig 236)
Copper alloy ring/washer
Semi-conical, with central hole. Flat on one side.

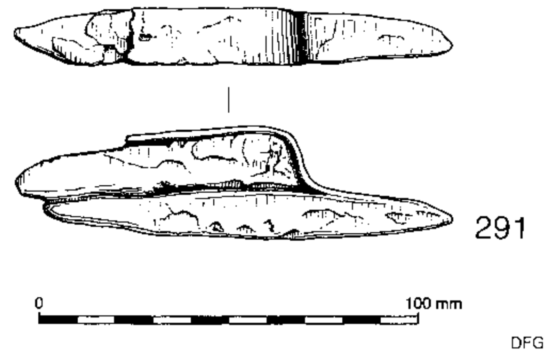


Fig 237 Iron object (scale 1:2)

External diameter 29mm; internal diameter 13mm; height 9mm.

291. 3358 4234 Bld 4401/Pha/Period 4a (Fig 237)
Iron object
Pronged object complete with tang. Central prong square-sectioned, tapering, broken at the end. Second prong has a flat rectangular section and is broken. Possible traces of third prong. There are possible traces of a socket around the tang. Object is badly corroded and encrusted.
Length 14mm; width maximum 47mm.

292. 2009 1520 Bld 198/Phe/Dump/Period 5 (Fig 236)
Ceramic vessel base.
Complete samian footring, smoothed and reused. Possible pot stand/loom weight. A complete Form 30 or 37 footring. East Gaulish (Rheinzabern) samian ware produced in the late second century or first half of the third. This is the applied type of footring, which sometimes became detached from the bowl, but it could have equally well have been removed deliberately from a broken vessel. Apart from the expected wear on the base, part of the broken or sheared-off upper surface is also worn smooth, suggesting secondary use. The exact nature of this is uncertain.
Diameter 93mm.

293. 742 260 Area A/Buried Soil/Period 7–8 (Fig 236)
Bone object
Possibly intended as a spindle whorl or dagger pommel. Worked ball joint, cut flat and smoothed with possible drill hole in the top. The hole has gone off-centre (fairly shallow) and the piece abandoned.
Diameter external 46mm; height 20mm.

294. 10058 18 Area F/Rampart/Period 2 Bone Object
Fragment of worked bone. Polished at one joint end. Broken at the other. Two roughly scored lines, towards either end. The area between the lines is polished.
Length 104mm; diameter 11mm.

295. 10061 33 Area G/Dump/Period 4a-5 Bone Object
Unfinished object. Tapers towards a point rounded at one end, broken at the other, unfinished traces of tool marks. Possibly an unfinished pin or pin beater.
Length 139mm; width maximum 14mm.

Table 19 Chronological breakdown of coins from Birdoswald (coin numbers are separated into 21 issue periods)

		1987–91		*casual finds*	*1928–29*	
period	*date*	*no*	*%*	*no*	*no*	*%*
I	(to AD 41)	1	0.7	–	–	
IIa	(41–54)	–		–	–	
IIb	(54–68)	–		–	–	
III	(69–96)	3	2.0	–	–	
IV	(96–117)	12	8.2	1	4	10.3
V	(117–38)	11	7.5	–	2	5.1
VI	(138–61)	7	4.8	–	5	12.8
VIIa	(161–80)	4	2.7	–	–	
VIIb	(180–92)	2	1.4	2	1	2.6
VIII	(193–222)	4	2.7	–	5	12.8
IXa	(222–38)	2	1.4	–	1	2.6
IXb	(238–59)	2	1.4	1	–	
X	(259–75)	10	6.8	1	7	17.9
XI	(275–96)	23	15.6	–	–	
XII	(296–317)	2	1.4	–	–	
XIIIa	(317–30)	13	8.8	–	1	2.6
XIIIb	(330–48)	28	19.0	–	7	17.9
XIV	(248–64)	9	6.1	1	2	5.1
XVa	(364–78)	13	8.8	–	4	10.3
XVb	(378–88)	–		–	–	
XVI	(388–402)	1	0.7	–	–	
totals		*147*	*6*	*39*		
1st–2nd century		11		1	–	
to early 3rd century		3		1	–	
3rd–4th century		17		–	1	
total Roman		178		8	40	
post-Roman		5		–	1	
grand total		183		8	41	

296. 10076 18 Area F/Rampart/Period 2 Bone object
Fragment of worked bone. Broken at both ends. Flat rectangular shape. Slightly-convex upper surface. Flat back. Signs of saw marks. Unfinished. Possible box mount.
Length 109mm; width 14mm.

297. 592 32 Between Blds 197–198/Period 4b-6 Bone object.
Complete. Pierced and finished top and bottom. Decorated with incised parallel lines. Mount?
Height 20mm; diameter at base 18mm.

298. 2230 2608 Area A/Rubble/Period 7 Tessera
Opaque turquoise lump, roughly cubic in shape. Such lumps are often classed as tesserae, but this does not seem likely as only a single example has been found at Birdoswald. It is possible that the lump indicates some form of manufacture of glass objects or enamels at the site, although no other evidence for glass working is known.
Dimensions 8.5 x 9 x 9.5mm.

Stone Discs

299. 3454 24 Bld 198/Rubble/Period 5–10
Local buff sandstone. Flat disc unsuitable for use as a pallet and too large for a gaming counter (cf Allason-Jones and Miket 1984, No 12.23–4)
Diameter 75mm; thickness 10mm.

300. 3455 68 Bld 197/Phe/Rubble/Period 5
Local buff sandstone. Complete disc.
Diameter 75mm; thickness 14mm.

301. 3456 102 Bld 196/Phe/Roof Collapse/ Period 5
Local buff sandstone. Complete disc.
Diameter 75mm; thickness 9mm.

302. 3457 2601 Area A/Layer/Period 6
Local buff sandstone. Complete disc.
Diameter 80mm; thickness 13mm.

303. 3458 2572 Area A/Topsoil
Local buff sandstone. Complete disc.
Diameter 64mm; thickness 15mm.

304. 3459 2572 Area A/Topsoil
Local buff sandstone. Large fragmentary disc with burning around the skirt.
Original diameter *c* 160mm; thickness 18mm.

305. 101 576 Bld 197/Phe/Floor Layer/Period 5 (Fig 236)
Incised stone in fine-grained, compact, and very hard buff sandstone. The back is broken across a natural bedding. Two conjoining sides are also broken, one following the weakness of the outer incised circle, and there is a small amount of chipping on the edges of the other two sides. The front is well-smoothed. On the front are two incised concentric circles and a central hole. The circles were perhaps scored with one point of a compass, with the other point forming the hole. The function of this piece is unclear.

Table 20 Legible coins of the Augustan system from Birdoswald, separated into denominations

	den	*ses*	*dup*	*as*	*dup/as*
Republic (to 27 BC)	1	–	–	–	–
Vespasian (AD 69–79)	2	1	–	–	–
Domitian (81–96)	–	1	–	–	–
Nerva (96–8)	–	–	–	1	–
Trajan (98–117)	2	4	3	2	–
Hadrian (117–38)	3	2	–	3	–
Antoninus Pius (138–61)	2	3	1	1	–
Marcus Aurelius (161–80)	2	2	–	–	–
Commodus (180–92)	2	–	–	–	–
Septimius Severus (193–211)	2	–	–	–	–
Elagabalus (218–22)	2	–	–	–	–
Severus Alexander (222–35)	1	–	–	–	–
Maximinus I (235–8)	1	–	–	–	–
illegible 1st–2nd century	4	3	–	1	4
totals	*24*	*16*	*4*	*8*	*4*

key: *den* = *denarius*; *ses* = *sestertius*; *dup* = *dupondius*; *as* = *as*

Table 21 The relative percentages of Roman coins from Birdoswald collections, separated into four chronological phases

	1987–91 excavations	*casual finds*	*1928–29 excavations*
Phase A (to 259)	32.7	66.7	46.2
Phase B (259–96)	22.4	16.7	17.9
Phase C (296–330)	10.2	2.6	–
Phase D (330–402)	34.7	16.7	33.3

Coins

by John A Davies

A total of 183 coins were recovered from excavations at Birdoswald between 1987 and 1991. The Roman coins total 178, of which 147 are closely identifiable. The Roman coins are catalogued in Table 23 with context information in Table 24. A chronological breakdown of the coins is provided in Table 19, in which the Roman coins are separated into 21 chronological Issue Periods (numbered I-XVI).

This assemblage contains a substantial group of 80 unstratified and residual coins. Other distinct groups within the collection represent occupation, construction, and backfilling activities in specific areas during the development of the site. In addition to the information derived from these excavated coins there are also records of previous finds from the site. A small number of casual finds have been recovered over the years and there is a more substantial assemblage of finds excavated from the barrack block in 1928–29 (Richmond 1930). Both additional groups are summarised in Table 21 for comparison. The 1987–91 coins will initially be considered together, as a group.

Coins from the 1987–91 excavations span the entire duration of Roman Britain. The earliest example is a Republican *denarius*, struck during the early first century BC. Republican *denarii* are commonly found on British sites with a military association. The earliest Imperial issues are two *denarii* and a *sestertius* which are much later, belonging to the Flavian period (69–96). These early Roman issues belong to the initial Hadrianic occupation at Birdoswald which introduced a substantial pool of coin to the site and which contained a significant proportion of coins struck during earlier reigns. The length of time during which first-century coins stayed in circulation before loss could be very long indeed; some *sestertii* of Vespasian remained in use until the mid-third century (Reece 1987, 16–17). The coinage used during the reign of Hadrian would have mainly included coins of that emperor, diluted with those of his predecessor, Trajan, and with a lesser number struck under the Flavian emperors, as shown here. Republican silver was officially withdrawn by Trajan soon after 100 and the single example from 1987–92, together with an early find, must be some of the latest to have remained in circulation in Britain.

The two smaller coin groups summarised in Table 19 begin in Issue Period IV (96–117), again with coin current during the Hadrianic construction of the stone fort. An additional find of coin from the site came in 1930, with a hoard of *denarii*, discovered in the base of a small cooking pot (Richmond 1931). In common with the 1987–91 excavated coins, these 22 silver coins spanned the years from the Republic to Hadrian and were probably deposited soon after 121.

Table 22 Allocation of legible fourth century coins from Birdoswald to mints

period	*London*	*Trier*	*Lyons*	*Arles*	*Rome*	*Siscia*	*Ticinum*	*irregular*
XII (296–317)	1	1	–	–	–	–	–	–
XIIIa (317–30)	4	5	–	1	–	–	1	–
XIIIb (330–48)	–	7	3	–	1	1	–	6
XIV (348–64)	–	4	–	1	–	–	–	3
XVa (364–78)	–	–	3	4	1	–	–	–
totals	*5*	*16*	*6*	*6*	*2*	*1*	*1*	*9*

Table 23 Catalogue of Roman coins

cat no	*issuer/reign*	*denomination*		*type*	*mint*	*date*	*reference*
1	Republic	*denarius*	obv	laureate head Jupiter r; below DOSSEN	Rome	87 BC	Crawford 348–51
			rev	triumphal quadriga r; in exergue L RVBRI			
2	Vespasian	*denarius*	rev	PON MAX TR P COS VI	Rome	75	RIC II: 90
3	Vespasian	*denarius*		COS -, Mars advancing r		69–79	
4	Domitian	*sestertius*				81–96	
5	Nerva	*as*				96–8	
6	Trajan	*denarius*	rev	P M TR P COS IIII P P	Rome	101–2	RIC II: 50
7	Trajan	*denarius*	rev	P M TR P COS IIII P P	Rome	101–2	RIC II: 50
8	Trajan	*dupondius*	rev	SPQR OPTIMO PRINCIPI S C; ALIM ITAL in ex.	Rome	103–17	RIC II: 460
9	Trajan	*dupondius*	rev	SPQR OPTIMO PRINCIPI, S C	Rome	103–11	RIC II: 533
10	Trajan	*sestertius*				98–117	
11	Trajan	*sestertius*				98–117	
12	Trajan	*sestertius*				98–117	
13	Trajan	*sestertius*				98–117	
14	Trajan	*dupondius*				98–117	
15	Trajan	*as*				98–117	
16	Trajan	*as*				98–117	
17	Hadrian	*denarius*	rev	PARTH F DIVI NER NEP P M TR P COS; PIETAS	Rome	117	RIC II: 13
18	Hadrian	*denarius*	rev	illegible; CONCORD in ex	Rome	117	as BMC III: 9
19	Hadrian	*denarius* frag	rev	P M – III	Rome	117–38	
20	Hadrian	*denarius*				117–38	
21	Hadrian	*sestertius*	rev	PONT MAX TR POT COS III, S C	Rome	119	BMC III: 1146
22	Hadrian	*dupondius*	rev	SALVS PVBLICA, SC	Rome	119–21	RIC II: 604a
23	Hadrian	*as*	rev	illegible; ship, arched cabin in stern, l	Rome	117–38	as RIC II: 674
24	Hadrian	*as*	rev	PONT MAX TR POT COS S C	Rome	118–38	as BMC III: 1173
25	Hadrian	*sestertius*				117–38	
26	Hadrian	*sestertius*	rev	illegible; female figure draped l, holding vertical rod		117–38	
27	Sabina	*as*			Rome	128–37	
28		*as*				79–138	
29	Antoninus Pius	*as*	rev	BRITANNIA COS IIII, S C	Rome	154–5	RIC III: 934
30	Antoninus Pius	*sestertius*		illegible; female figure standing l	Rome	138–61	
31	Antoninus Pius	*sestertius*				138–61	
32	Antoninus Pius	*dupondius*				138–61	
33	Faustina I	*sestertius*	rev	illegible; female figure standing		138–61	
34	Diva Faustina	*denarius*	rev	AVGVSTA	Rome	141–61	RIC III: 371
35	Diva Faustina	*denarius*	rev	AETERNITAS S C	Rome	141–61	RIC III: 1161
36		*as*				80–161	
37	Lucilla	*denarius*	rev	CONCORDIA	Rome	161–80	RIC III: 759
38	Marcus Aurelius	*sestertius*	rev	SALVTI AVG COS III, S C	Rome	168–71	as RIC III: 964
39	Marcus Aurelius	*sestertius*	rev	illegible; Mars? adv r		161–80	
40	Faustina II	*denarius* frag	rev	FECVND AVGVSTAE	Rome	161–75	RIC III: 676
41	Antonine emp	*sestertius*				138–80	
42		*sest/dupond/as*		(diameter 28mm (incomplete))		41–180	
43		*dupondius/as*		(diameter 22mm)		41–180	
44		*dupondius/as*		(diameter 24mm)		41–180	
45	Commodus	*denarius*		IOV IVVEN P M TR P XIIII COS V DES VI		Rome	189 RIC III:
187							
46	Commodus	*denarius*	rev	P M TR P XVII IMP VIII COS VII P P	Rome	192	RIC III: 237
47		*sestertius*		(diameter 34mm)		41–192	
48		*sestertius*		(diameter 30mm)		64–192	
49		*dupondius/as*		(diameter 29mm)		41–192	
50		*dupondius/as*		(diameter 23mm; incomplete)		41–192	
51	Septimius Severus	base *denarius*	rev	VICTORIAE BRIT		210–11	as RIC IV: 332
52	Julia Domna	*denarius*	rev	MATER DEVM	Rome	196–211	RIC IV: 564
53	Elagabalus	*denarius*		VICTORIA AVG	Rome	218–22	RIC IV: 158
54	Elagabalus	*denarius*	rev	illegible; figure sacrificing at altar		218–22	
55		*denarius*		(diameter 16mm)		31 BC–AD 235	
56	Julia Mamaea	*denarius*	rev	VESTA	Rome	222–35	RIC IV: 360
57		*denarius* frag		(diameter 11mm)		31 BC–AD 235	
58		*denarius* frag		(diameter 17mm)		31 BC–AD 235	
59		*denarius*		(diameter 19mm)		41–235	
60	Maximinus I	*denarius*	obv	MAXIMINVS PIVS AVG GERM; bust r, laur, dr		235–8	unlisted type
			rev	PVDICITIA; P veiled, seated l			
61	Philip II	*antoninianus*	rev	P M TR P II COS P P	Antioch	244–9	RIC IV: 249
62	Gallienus	*antoninianus*	rev	GERMANICVS MAX V	Rome	253–60	RIC V: 18
63	Gallienus	*antoninianus*	rev	illegible; figure of Salus?		260–68	
64	Marius	*antoninianus*	rev	CONCORDIA MILITVM	Cologne	268	RIC IV: 632
65	Victorinus	*antoninianus*	rev	PAX AVG	Cologne	268–70	as Elmer 682
66	Victorinus	*antoninianus*	rev	VIRTVS AVG	Cologne	268–70	Elmer 699

Table 23 continued

cat no	issuer/reign	denomination		type	mint	date	reference
67	Victorinus	*antoninianus*	rev	PROVIDENTIA AVG	Trier	268–70	Elmer 743
68	Tetricus I	*antoninianus*	rev	LAETITIA AVGG	Trier	270–74	Elmer 787
69	Tetricus I	*antoninianus*				270–74	
70	Tetricus I	*antoninianus*				270–74	
71	Tetricus II	*antoninianus*	rev	PIETAS AVGG	Cologne	270–74	Elmer 773
72	Tetricus II	*antoninianus*	rev	SPES AVGG	Trier	270–74	
73	Barb radiate, Claudius II		rev	female figure standing l, with sceptre (diameter 18mm)		270–84	
74	Barb radiate, DIVO CLAVDIO		rev	CONSECRATIO, altar (diameter 16mm)		270–84	as RIC V: 261
75	Barb radiate, DIVO CLAVDIO		rev	CONSECRATIO, altar (diameter 17mm)		270–84	as RIC V: 261
76	Barb radiate, Postumus		rev	VICTORIA AVG (diameter 15mm)		270–84	
77	Barb radiate, Victorinus		rev	INVICTVS (diameter 20mm)		270–84	
78	Barb radiate, Victorinus		rev	PAX AVG (diameter 14mm)		270–84	
79	Barb radiate, Tetricus I		rev	COMES AVG (diameter 15mm)		270–84	
80	Barb radiate, Tetricus I		rev	PAX AVG (diameter 15mm)		270–84	
81	Barb radiate, Tetricus I		rev	PAX AVG (diameter 14mm)		270–84	
82	Barb radiate, Tetricus I		rev	PAX AVG (diameter 14mm)		270–84	
83	Barb radiate, Tetricus I		rev	PAX AVG (diameter 15mm)		270–84	
84	Barb radiate, Tetricus I		rev	SPES PVBLICA (diameter 16mm)		270–84	
85	Barb radiate, Tetricus I		rev	VIRTVS AVG (diameter 17mm)		270–84	
86	Barb radiate, Tetricus I		rev	female figure standing l (diameter 17mm)		270–84	
87	Barb radiate, Tetricus I			(diameter 16mm)		270–84	
88	Barb radiate, Tetricus I			(diameter 16mm)		270–84	
89	Barb radiate, Tetricus II		rev	female figure standing l, with cornucopiae (diameter 20mm)		270–84	
90	Barb radiate, Tetricus II		rev	female figure standing l, with sceptre, by altar (diameter 16mm)		270–84	
91	Barb radiate			(diameter 14mm)		270–84	
92	Barb radiate			(diameter 14mm)		270–84	
93	Barb radiate (incomplete coin)			(diameter 15mm)		270–84	
94	Barb radiate (incomplete minim)			(diameter 12mm)		270–84	
95	Allectus	*antoninianus*	rev	PAX AVG (illegible)		293–6	
96	Licinius	*follis*	rev	GENIO POP ROM	London	312–13	RIC VI: 249
97		*follis*				294–317	
98	Constantine I	*follis*	rev	VICTORIAE LAETAE PRINC PERP	London	319–20	RIC VII: 158
99	Constantine I	*follis*	rev	BEATA TRANQVILLITAS, VOT/IS/XX	London	321–2	RIC VII: 221
100	Constantine II	*follis*	rev	BEATA TRANQVILLITAS, VOT/IS/XX	London	321–2	RIC VII: 236
101	Fausta	*follis*	rev	SALVS REIPVBLICAE	London	324–5	RIC VII: 300
102	Constantine I	*follis*	rev	VIRTVS EXERCIT	Trier	320	RIC VII: 258
103	Constantine I	*follis*	rev	BEATA TRANQVILLITAS, VO/TIS/XX	Trier	322	RIC VII: 341
104	Constantine I	*follis*	rev	SARMATIA DEVICTA	Trier	323–4	RIC VII: 435
105	Crispus	*follis*	rev	PROVIDENTIAE CAESS	Trier	324–5	RIC VII: 450
106	Constantine II	*follis*	rev	PROVIDENTIAE CAESS	Trier	324–5	RIC VII: 455
107	Constantine I	*follis*	rev	VICTORIAE LAETAE PRINC PERP	Arles	318–19	as RIC VII: 190
108	Constantine II	*follis*	rev	DOMINOR NOSTROR CAESS, VOT/X	Ticinum	320–1	RIC VII: 162
109	House of Constantine	*follis*	rev	PROVIDENTIAE AVGG/CAESS		324–5	
110	House of Constantine	*follis*	rev	PROVIDENTIAE AVGG/CAESS		324–5	
111	Constantine I	*follis*	rev	GLORIA EXERCITVS, 2 standards	Trier	332–3	RIC VII: 538
112	Constantius II	*follis*	rev	GLORIA EXERCITVS, 2 standards	Trier	332–3	RIC VII: 546
113	VRBS ROMA	*follis*	rev	wolf and twins	Trier	332–3	RIC VII: 547
114	Constantine I	*follis*	rev	GLORIA EXERCITVS, 2 standards	Lyons	332	RIC VII: 249
115	CONSTANTINOPOLIS	*follis*	rev	Victory on prow	Lyons	330–31	RIC VII: 246
116	Constantine I	*follis*	rev	GLORIA EXERCITVS, 2 standards	Lyons	332	RIC VII: 254
117	House of Constantine	*follis*	rev	GLORIA EXERCITVS, 2 standards		330–35	
118	House of Constantine	*follis*	rev	GLORIA EXERCITVS, 2 standards		330–35	
119	House of Constantine	*follis*	rev	GLORIA EXERCITVS, 2 standards		330–35	
120	CONSTANTINOPOLIS	*follis*	rev	Victory on prow		330–35	
121	Theodora	*follis*	rev	PIETAS ROMANA		337–40	
122	Theodora	*follis*	rev	PIETAS ROMANA		337–40	
123	Constantius II	*follis*	rev	GLORIA EXERCITVS, 1 standard		337–40	
124	House of Constantine	*follis*	rev	GLORIA EXERCITVS, 1 standard	Siscia	337–40	as RIC VIII: 79
125	Constans	*follis*	rev	GLORIA EXERCITVS, 1 standard		337–40	
126	Constans	*follis*	rev	VICTORIAE DD AVGG Q NN	Trier	347–8	RIC VIII: 189
127	Constans	*follis*	rev	VICTORIAE DD AVGG Q NN	Trier	347–8	RIC VIII: 189
128	Constans	*follis*	rev	VICTORIAE DD AVGG Q NN	Trier	347–8	RIC VIII: 196
129	Constans	*follis*	rev	VICTORIAE DD AVGG Q NN	Trier	347–8	RIC VIII: 198
130	House of Constantine	*follis*	rev	VICTORIAE DD AVGG Q NN		347–8	
131	Constantius II/ Constans	*follis*	rev	VICTORIAE DD AVGG Q NN		347–8	

Table 23 ***continued***

cat no	*issuer/reign*	*denomination*		*type*	*mint*	*date*	*reference*
132	Constantius II/ Constans	*follis*	rev	VICTORIAE DD AVGG Q NN		347–8	
133	VRBS ROMA	*follis*	rev	wolf and twins (diameter 14mm; irregular)	as Trier	341–6	as RIC VII: 522
134	VRBS ROMA	*follis*	rev	wolf and twins (diameter 14mm; irregular)	as Trier	341–6	as RIC VII: 542
135	CONSTANTINOPOLIS	*follis*	rev	Victory on prow (diameter 13mm; irregular)		341–6	
136	CONSTANTINOPOLIS	*follis*	rev	Victory on prow (diameter 15mm; irregular)		341–6	
137	VRBS ROMA/ CONSTANTINOPOLIS	*follis*		(diameter 12mm; irregular)		3416	
138	Constans	*follis*	rev	GLORIA EXERCITVS, 1 standard (diameter 15mm; irregular)	as Lyons	341–6	
139	Constans	*follis*	rev	FEL TEMP REPARATIO, Phoenix on rock	Trier	348–50	RIC VIII: 226
140	Constans	*follis*	rev	FEL TEMP REPARATIO, Phoenix on rock	Trier	348–50	RIC VIII: 228
141	Constans	*follis*	rev	FEL TEMP REPARATIO, galley	Trier	348–50	RIC VIII: 243
142	Constantius II/Constans		rev	FEL TEMP REPARATIO, galley		348–50	
143	Constantius II		rev	FEL TEMP REPARATIO, falling horseman	Trier	350–53	RIC VIII: 259A
144	Decentius		rev	VICTORIAE DD NN AVG ET CAE	Arles	350–53	RIC VIII: 183
145	Magnentius		rev	SALVS DD NN AVG ET CAES (diameter 29mm x 24mm; irregular)		353	
146	House of Constantine		rev	FEL TEMP REPARATIO, falling horseman (diameter 11mm; irregular)		354–64	
147	House of Constantine		rev	FEL TEMP REPARATIO, falling horseman (diameter 16mm; irregular)		354–64	
148	Valentinian I	(AE3)	rev	GLORIA ROMANORVM	Lyons	364–75	RIC IX: 10a
149	Valentinian I	(AE3)	rev	GLORIA ROMANORVM	Lyons	364–75	as RIC IX: 10a
150	Valentinian I	(AE3)	rev	GLORIA ROMANORVM	Lyons	364–75	
151	Gratian	(AE3)	rev	GLORIA NOVI SAECVLI	Arles	367–75	RIC IX: 15
152	Valens	(AE3)	rev	GLORIA ROMANORVM	Arles	364–75	RIC IX: 16b
153	Valentinian I	(AE3)	rev	SECVRITAS REIPVBLICAE	Arles	367–75	RIC IX: 17a
154	Valens	(AE3)	rev	SECVRITAS REIPVBLICAE	Arles	375–8	RIC IX: 18b
155	Valens	(AE3)	rev	SECVRITAS REIPVBLICAE	Rome	375–8	RIC IX: 24b
156	Valens	(AE3)	rev	SECVRITAS REIPVBLICAE		364–78	
157	House of Valentinian	(AE3)	rev	GLORIA ROMANORVM		364–78	
158	House of Valentinian	(AE3)	rev	GLORIA ROMANORVM		364–78	
159	House of Valentinian	(AE3)	rev	SECVRITAS REIPVBLICAE		364–78	
160	House of Valentinian	(AE3)	rev	SECVRITAS REIPVBLICAE		364–78	
161	House of Theodosius	(AE4)	rev	VICTORIA AVGGG		388–95	
162		(AE)		(diameter 16mm)		260–378	
163		(AE)		(diameter 22mm)		287–364	
164		(AE)		(diameter 17mm)		320–78	
165		(AE)		(diameter 15mm)		260–378	
166		(AE)		(diameter 22mm)		287–353	
167		(AE)		(diameter 10mm)		275–402	
168		(AF)		(diameter 14mm)		260–402	
169		(AE)		(diameter 10mm)		275–364	
170		(AE)		(diameter 10mm)		260–395	
171		(AE)		(diameter 13mm)		341–95	
172		(AE)		(diameter 13mm)		341–95	
173		(AE)		(diameter 10mm)		330–95	
174		(AE)		(diameter 18mm)		260–378	
175		(AE)		(diameter 14mm)		270–402	
176		(AE)		(diameter 16mm)		270–378	
177		(AE)				330–78	
178				(diameter 9mm+)		330–95	

The initial episode of heavy coin loss continued into the Antonine period and lasted until the end of Antoninus Pius' reign (138–61). It then dropped to a lower but steady rate of loss which continued through to the later third century, when the coinage in circulation underwent a change and the last denominations of the Augustan system went out of circulation. The denominations recovered from Birdoswald that represent the years to 260 are shown in Table 20. The range of types is dominated by *denarii*, which is quite unlike the situation recorded from Romano-British civil sites. *Denarii* are usually sparsely represented within assemblages prior to the end of the Antonine period (192) but here they outnumber all other denominations and belong to all Issue Periods. *Sestertii* are the second most common type. *Aes* denominations do not continue later than the reign of Marcus Aurelius (161–80) here, and there are no denominations smaller than the *as* present.

There are several coins of numismatic interest. One *as*, of Antoninus Pius (No 25), carries the figure of *Britannia* on its reverse, with head in hand (Toynbee 1924). This is one of a growing number of issues of the years 153–55 now known to have had a specifically

Table 24 Roman coins, context, and phasing

coin	*small find number*	*context*	*phasing detail*
1	2300	2954	Bld 4402/Phb/Period 4b
2	2330	3823	Bld 4401/Phc/Period 4b
3	737	261	West Berm/Period 4a
4	768	381	Bld 197/Phe/dump\ Period 5
5	2018	1558	ViaP/surface 3/Period 4b
6	812	1331	Area A/Period 11
7	2201	1365	Area B/Primary rampart\Period 2
8	828	1329	Area A/Period 11
9	2078	1480	Bld 4407/Period 8
10	2223	2572	Area A/topsoil
11	2292	2914	ViaP/Period 4a
12	2302	2887	ViaP/surface /Period 4b
13	2303	2954	Bld 4402/Phb/Period 4b
14	2306	2887	ViaP/surface 1/Period 4b
15	546	1	Area A/topsoil
16	2241	2675	ViaP/surface 3/Period 4b
17	2309	3738	Area A/hiatus soil/Period 2
18	2210	1864	unstratified
19	2394	4129	Bld 4401/Phb(i)/Period 4a
20	2445	4356	Bld 4400/Phb/Period 2
21	617	33	Area B/Primary rampart\Period 2
22	2447	4380	Turf Wall Ditch fill/Period 2
23	2412	4200	PPS/Blocked Portal/Period 4a
24	2101	1365	Area B/Primary rampart\Period 2
25	769	237	Bld 197/Phe/dump\Period 5
26	2307	2887	ViaP/surface 1/Period 4b
27	2134	1718	Bld 4406/Period 7
28	2439	4325	Bld 4401/Pha/Period 4a
29	770	316	Area A/rubble/ Period 7–8
30	2189	1827	PPS/blocking wall/Period 4a
31	2293	2905	Bld 4402/Pha/Period 4a
32	648	205	unstratified
33	2215	1300	unstratified
34	2130	1705	Bld 198/Phd/dump
35	2301	2887	ViaP/surface 1/Period 4b
36	620	3	unstratified
37	856	1422	unstratified
38	2085	1459	PPS/ST/Period 4a
39	2310	3740	Bld 4402/Pha/Period 4a
40	2374	4062	Bld 4401/Phb(i)/Period 4a
41	2233	2628	Bld 4401/Phd/Period 4b
42	2289	2929	Bld 4401/Phb(ii)/Period 4a
43	2283	2572	Area A/topsoil
44	2291	2773	ViaP/surface 2/Period 4b
45	2034	1520	Bld 198/Phe/dump\Period 5
46	2227	2582	BLd 4406/Period 7
47	822	1327	Area B/Rampart/Period 3–5
48	609	3	unstratified
49	835	1390	unstratified
50	644	101	Bld 197/Phe/Floor layer/Period 5
51	2020	1558	ViaP/surface 2/Period 4b
52	526	46	Bld 197/Phe/Floor layer/Period 5
53	2433	121	Bld 197/Phe/Floor layer/Period 5
54	879	1416	Bld 198/Phe/dump\Period 5
55	709	237	Bld 197/Phe/dump\Period 5
56	568	101	Bld 197/Phe/Floor layer/Period 5
57	2124	1727	Ditch/Phf/Period 4b
58	2413	4209	Bld 4401/Pha/Period 4a
59	2329	3802	PPS/NT/Period 4a
60	2257	2673	ViaS/surface/Period 6
61	2060	1562	PPS/ST/Period 4a
62	625	75	Betw Bld 198 and 197/ Period 4b–5
63	884	1440	ViaP/surface 3/Period 4b
64	2328	3797	unstratified
65	611	3	unstratified
66	589	1	Area A/topsoil
67	797	1293	Area C/topsoil
68	621	3	unstratified
69	853	1418	Bld 198/Phe/dump\Period 5
70	2290	2773	ViaP/surface 2/Period 4b
71	2349	3797	unstratified
72	2217	1300	unstratified
73	2219	2573	ViaP/surface 2/Period 4b
74	2152	1786	ViaP/surface 2/Period 4b
75	513	3	unstratified
76	685	235	Bld 197/Phe/dump\Period 5
77	596	3	unstratified
78	2340	3965	PPS/Blocked Portal/Period 4a
79	610	3	unstratified
80	964	1488	Area C/unstratified
81	681	231	Bld 197/Phe/dump\Period 5
82	735	260	Area A/Buried soil/Period 7–8
83	2382	4081	Bld 4401/Phb(ii)/Period 4a
84	2220	2573	ViaP/surface 2/Period 4b
85	794	1300	unstratified
86	2335	3923	ViaP/surface 2, drain/Period 4b
87	2348	3797	unstratified
88	680	206	unstratified
89	2274	2727	ViaP/surface 2/Period 4b
90	2280	2843	ViaP/surface 3/Period 4b
91	522	1	Area A/topsoil
92	2284	2727	ViaP/surface 2/Period 4b
93	2378	4014	BLd 4402/Phb/Period 4b
94	2030	1505	ViaP/surface 3/Period 4b
95	586	1	Area A/topsoil
96	668	231	Bld 197/Phe/dump\Period 5
97	766	206	Area A/topsoil
98	767	317	Area A/Periods 7–8
99	606	7	Area A/topsoil
100	2294	2887	ViaP/surface 1/Period 4b
101	719	238	Bld 197/Phe/dump\Period 5
102	683	206	unstratified
103	584	1	Area A/topsoil
104	509	3	unstratified
105	720	238	Bld 197/Phe/dump\Period 5
106	2273	2650	ViaP/surface 2/Period 4b
107	2234	2635	ViaS/surface/Period 4b–5
108	636	84	Bld 197/Phe/Floor layer/Period 5
109	638	99	Betw Bld 198 and 197/ Period 4b–5
110	529	68	Bld 197/Phe/Floor layer/Period 5
111	751	280	Bld 197/Phe/dump\Period 5
112	731	268	Bld 197/Phe/dump\Period 5
113	564	107	Bld 197/Phe/Floor layer/Period 5
114	715	235	Bld 197/Phe/dump\Period 5
115	859	1338	Area A/rubble/Period 7–9
116	716	235	Bld 197/Phe/dump\Period 5
117	909	1416	Bld 198/Phe/dump\Period 5
118	511	3	unstratified
119	2238	2673	ViaP/surface /Period 6
120	2026	1573	Area A/Period 7–9
121	921	1485	Ditch/Phf/Period 4b
122	718	237	Bld 197/Phe/dump\Period 5
123	713	236	Bld 197/Phe/dump\Period 5
124	524	24	Area A/Period 11
125	875	1417	Bld 198/Phe/dump\Period 5
126	869	1338	Area A/rubble/Period 7–9
127	745	326	Bld 197/Phe/dump\Period 5
128	682	237	Bld 197/Phe/dump\Period 5
129	2246	317	Area A/Periods 7–8
130	2434	90	Area A/Period 7–9
131	2271	2673	ViaP/surface /Period 6
132	2272	2673	ViaP/surface /Period 6
133	714	236	Bld 197/Phe/dump\Period 5
134	761	363	Bld 197/Phe/dump\Period 5
135	773	385	Bld 197/Phe/dump\Period 5
136	2248	2698	ViaP/surface 3/Period 4b
137	2270	2673	ViaP/surface /Period 6
138	752	292	Bld 197/Phe/dump\Period 5
139	2051	1314	Area A/topsoil
140	608	3	unstratified
141	887	1416	Bld 198/Phe/dump\Period 5
142	591	1	Area A/topsoil
143	2038	1560	Bld 198/Phe/Roof collapse\ Period 5
144	2080	1300	unstratified
145	2261	2673	ViaP/surface /Period 6
146	798	1311	Bld 198/Phe/dump\Period 5

Table 24 ***continued***

coin	small find number	context	phasing detail
147	880	1418	Bld 198/Phe/dump\Period 5
148	795	1300	unstratified
149	510	3	unstratified
150	521	38	Bld 198/Phe/dump\Period 5
151	898	1416	Bld 198/Phe/dump\Period 5
152	602	3	unstratified
153	780	206	Area A/topsoil
154	764	3	unstratified
155	899	1416	Bld 198/Phe/dump\Period 5
156	2243	2673	ViaP/surface /Period 6
157	848	1338	Area A/rubble/Period 7–9
158	883	1418	Bld 198/Phe/dump\Period 5
159	811	1328	Area A/Rubble/Period 7–9
160	2081	1300	unstratified
161	645	101	Bld 197/Phe/Floor layer/Period 5
162	803	1317	unstratified

Table 24 ***continued***

coin	small find number	context	phasing detail
163	806	1317	unstratified
164	825	1353	Area A/Period 7–9
165	827	1357	Area A/Period 7–9
166	860	1418	Bld 198/Phe/dump\Period 5
167	885	1432	Area A/Period 7–9
168	886	1443	Area A/Period 7–9
169	2111	1520	Bld 198/Phe/dump\Period 5b
170	512	3	unstratified
171	531	71	Bld 197/Phe/Floor layer/Period 5
172	567	142	Bld 197/Phe/dump\Period 5
173	624	4	Area B/topsoil
174	686	236	Bld 197/Phe/dump\Period 5
175	2089	1657	PPS/NT/Period 4a
176	2244	2673	ViaS/surface/Period 6
177	2440	4356	Bld 4400/Phb/Period 2
178	747	365	Area A/Rubble/Period 7–9

British association (Walker 1988, 294–5). There is a *denarius* of Maximinus I (No 55) which is a previously unlisted variety. This issue of the years 235–8 depicts *Pudicitia* seated left. Coins of this emperor are not commonly found on British sites. Just one of the large number of *denarii* is a base-metal copy (No 47), originally plated, which is perhaps surprising as a relatively high proportion of stray find examples recovered from civil sites tend to be silver-plated types, as is becoming increasingly apparent through evidence from metal-detector finds.

The strength of the component formed by coins of the Augustan system within the overall assemblage is emphasised in Table 21, in which the coinage of the site is shown in percentage terms, broken down into four chronological phases (A–D), as originally employed by Reece (1974). Totals derived from the other two, smaller, site groups are also shown for comparison and reinforce the overall pattern observed. In contrast to other British sites, Phase A is high. Civil sites tend to have a Phase A value of up to 15–20%. It tends to be sites with a military origin that have more substantial early coin loss.

There are more coins representing the years from 260 onwards, as is the normal case for Romano-British sites. For Phase B (259–96) there are no coins struck by rulers of the Central Empire later than the sole reign of Gallienus (260–8); coins of the first part of this phase (Issue Period X, 260–75) are otherwise exclusively 'official' *antoniniani* of the Gallic Empire (Marius, 268; Victorinus, 268–70; and the Tetrici, 270–3). The issue of Marius, from the Cologne mint (No 59), is a rare site find. The later radiate coinage (Issue Period XI, 275–96) is made up almost exclusively of irregular *antoniniani*, copies (or 'barbarous' radiates) of earlier Gallic Empire issues, which comprise 22 of the 23 coins of those years. Within this period the breakaway 'British' empire of Carausius and Allectus (287–96) is represented only by a single issue of Allectus.

Phase C coinage (296–317) is remarkably strong for a Romano-British site. It is made up of *folles* mainly from the London and Trier mints. However, it is Phase D that is numerically strongest, as is the case on Romano-British sites in general. All of these coins are bronzes. Coin loss remained high until Period XVa (364–78) after which there is just a single Theodosian small bronze issue of the years 388–95, which closes the Roman coin list.

The legible fourth-century issues are summarised in Table 22 with their mints of origin. A total of 46 coins are shown there. The importance of the London mint prior to its closure in 326 is reflected in the figures. Trier was the major supplier from then until *c* 353, after the fall of Magnentius. Trier was then replaced by Lyons and Arles. Unlike the situation in the late third century, irregular coins of the fourth century are not numerous on this site. Most of these later irregular coins are copies of mid-Constantinian types, currently dated to the earlier 340s. Later copies are a single imitation of Magnentius (350–3) and just two *Fel Temp Reparatio*, 'falling horseman', types which can be extremely numerous on some Romano-British sites. 'Falling-horseman' imitations have been recorded in higher numbers at some Romano-British sites, including Sleaford, Lincolnshire (Davies forthcoming, a), and Scole, Norfolk, and Suffolk (Davies, forthcoming, b); see Tables 23 and 24.

Leather

by Quita Mould

The leather was examined following freeze-drying by the Rescue Section of the Conservation Department of the AML (HBMC). Species identification was made by grain pattern, where possible, using low-powered magnification. As the grain pattern of sheep and goatskin is indistinguishable, the term sheep/goat is used in the text, although it may be assumed that the leather so identified is goatskin. Shoe sizes were estimated from measurements of insoles and the sole area of one-piece shoes using modern English shoe-size scales with a 10% allowance for shrinkage.

The leather items mentioned in the text are followed by their small find (AOR) number in brackets. This will enable cross-reference to the archive. Illustrated examples also have a catalogue number which is reproduced in Figures 238–42. A full descriptive catalogue of every leather object found is given in the archive.

The nature of the assemblage

A large quantity of leather items (692 examples) was recovered from the excavations at Birdoswald. The vast majority (98%) was recovered from six successive recuts of the butt end of the ditch on the south side of the west gate of the stone fort and referred to throughout the report as Ditch Phases a–f. 19% of the leather occurred in Ditch Phases a–c belonging to Periods 2–3 (the second century), and 79% occurred in the third- and fourth-century Ditch Phases d–f of Periods 4a–4b. The leather comprised principally shoe components (44%) and waste leather (41%), with a small quantity of tentage (6%) and scrap leather (9%) occurring, the latter likely to have been torn from the discarded shoe uppers and tentage (Table 25).

Although 41% of the total assemblage was waste leather it occurred in too small a quantity in individual contexts to be considered significant. A small amount of primary waste was recovered (Table 26), including hide edges and udders, which indicates that complete hides were cut up in the vicinity. Similarly, the secondary waste, which included intersectional cutting pieces and trimmings from sole pattern cutting and a small quantity of cut-outs apparently from the pattern cutting of fastening loops from shoe uppers, indicates that some small-scale shoe manufacture was undertaken on the site, although it is impossible to recognise with certainty the type(s) of shoe being made. The relatively high proportion of waste leather in Ditch Phase a (78%) does suggest that it is principally a small dump of shoemaking or cobbling debris (Table 25); however, the proportions recovered from the other ditch recuts do not point to the deliberate dumping of shoemaking waste on a large scale, rather the disposal of more general rubbish of which cobbling/shoemaking waste was a part. The shoe finds themselves also look increasingly like the disposal of general rubbish rather than cobbling waste over time. The shoes become noticeably more fragmentary in the fourth century; although 39% of the shoes of nailed construction came from Ditch Phase f, none were sufficiently well-preserved for the upper style to be recognised, unlike the nailed shoes from earlier ditch recuts.

Shoes

Four principal methods of shoe construction were found in the Birdoswald assemblage, with a possible hybrid method combining stitching and nailing being also noted. The proportions of shoes made of each construction are given in Table 27; as the majority of the shoes recovered are represented by fragmentary components a minimum count for each type is given in each case.

The majority of the shoes were practicable working footwear. The sandals (12% of the shoe assemblage) and the stitched shoe, being essentially lightweight,

Table 25 Types of leather recovered

category				*ditch phases*				
	a	*b*	*c*	*d*	*e*	*f*	*other*	*totals*
shoe	12	2	3	36	96	152	2	*303*
tentage	3	1	–	19	2	13	6	*44*
waste	83	15	1	33	58	93	2	*285*
scrap	9	–	–	10	9	28	4	*60*
totals	*107*	*18*	*4*	*98*	*165*	*286*	*14*	*692*

Table 26 Waste leather

waste type				*ditch phases*				
	a	*b*	*c*	*d*	*e*	*f*	*other*	*totals*
primary	2	–	–	5	7	9	–	*23*
secondary shoemaking								
intersec	9	–	–	2	–	11	–	*22*
trim	20	–	–	10	3	15	–	*48*
cut-out	7	1	–	1	3	1	–	*13*
other	–	1	1	8	10	15	–	*35*
secondary other	45	13	–	7	35	42	2	*144*
totals	*83*	*15*	*1*	*33*	*58*	*93*	*2*	*285*

indoor wear, reflect a higher status segment of the community. Insufficient numbers were recovered to allow detailed analysis; however, the size range displayed by measurable shoes from Ditch Phases e and f (Period 4b; late third to mid-fourth century) included children's, adolescents'/women's and men's footwear indicative of a 'normal' balanced population. Assemblages dating from the early third century onwards commonly reflect a normal population at military sites, rather than the preponderance of male sizes seen in second-century military groups (van Driel-Murray 1987, 33).

Shoes of nailed construction

The majority of the shoes were of nailed construction (69%), the most commonly used constructional technique throughout the Roman period. As is usually the case the bottom units had survived in much better condition and in greater numbers than their shoe uppers. Forty bottom units were sufficiently complete for their attributes to be recorded and these are given in Table 28; in addition a further 58 (minimum count) bottom unit fragments were recovered.

Constructional thonging

In all but six cases (7% eg 2165; Fig 238, No 4) the insole, worn grain upward to the foot, and middle or middle packing were held together by constructional thonging. The thonging was used to hold the upper components in place while the shoe was lasted and bottom unit components nailed into position. The thonging either ran in a central line from toe to seat (type 1), occurred at each side of the tread forming a diamond pattern at the forepart (type 2) or ran around the

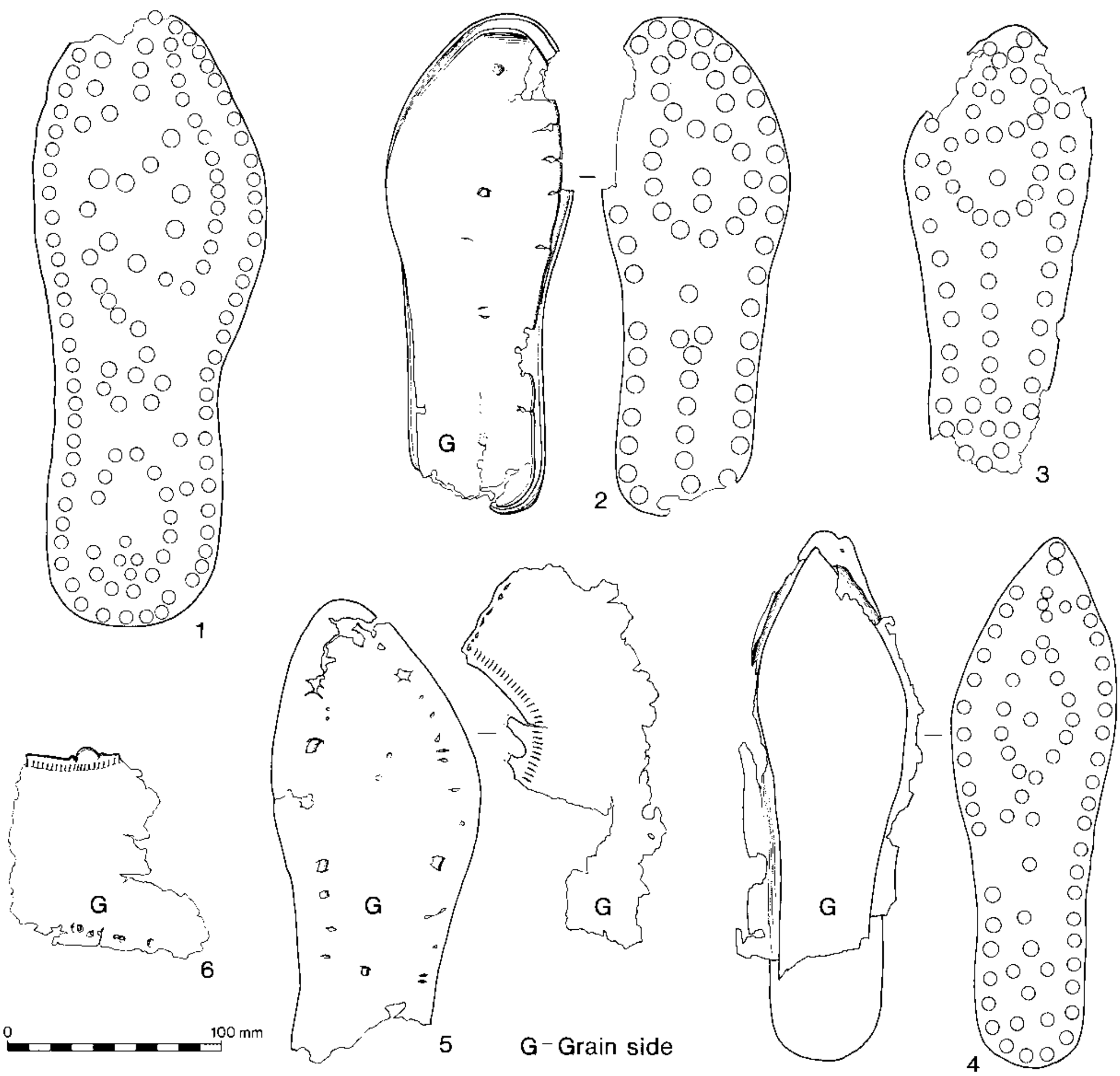


Fig 238 Roman footwear (scale 1:3)

Table 27 Shoe constructions (minimum numbers recovered)

category	*ditch phases*							
	a	*b*	*c*	*d*	*e*	*f*	*other*	*totals*
nailed	4	2	1	5	20	21	1	*54*
sandal	–	1	–	1	3	4	–	*9*
stitched	–	–	–	–	1	–	–	*1*
stitched/nailed	–	–	–	1	1	–	–	*2*
one-piece	–	–	–	1	4	7	–	*12*
totals	*4*	*3*	*1*	*8*	*29*	*32*	*1*	*78*

Table 28 Shoes of nailed construction

ditch phase	*context number*	*small find number*	*S*	*M*	*ML*	*IN*	*N*	*TS*	*CT*	*U*	*L*	*HS*	*size*	*l/r*
a	1846	2193	+	+	–	+	C4	/	+	+	–	–	3+	*r*
a	1846	2203	/	/	/	+	A1	o	+	+	–	/	3+	*r*
a	1846	2204	–	–	+	+	A1	/	+	/	/	+	6+	*l*
a	1846	2648	+	+	–	/	C3	/	–	+	–	/	c12+	*r*
c	1845	2194	+	–	+	+	C3	p	+	+	–	+	7+	*l*
d	1771	2165	+	–	–	+	A4	p	–	–	+	/	5	*r*
e	1760	2167	+	–	–	+	C	r	+	–	–	–	3	*r*
e	1760	2168	+	–	+	+	B1	o	+	+	–	–	c10	*l*
e	1760	2169	+	+	–	+	C4	r/o	+	+	–	–	8	*l*
e	1760	2170	+	+	–	+	C1	r	+	+	–	+	10	*r*
e	1760	2174	+	–	–	+	A1	/	–	–	–	–	4+	*r*
e	1821	2178	+	–	+	–	B1	/	+	–	–	+	c9+	*r*
e	1821	2179	+	–	+	+	B3	r	+	/	/	/	3	*r*
e	1821	2180	+	–	+	+	B1	r	+	+	–	–	2+	*r*
e	1821	2181	+	–	+	+	A1	r/o	+	+	–	–	3+	*l*
e	1821	2182	+	–	+	+	B1	r/o	+	+	–	–	3+	*l*
e	1821	2183	+	–	+	+	C1	r	+	+	–	+	2+	*l*
e	1821	2184	+	–	+	+	C3	o	+	+	–	–	4	*l*
e	1821	2196	/	/	/	+	B	o	+	/	/	/	c8	*r*
f	1500	938	+	+	+	+	A2	r	+	–	–	–	3	*l*
f	1500	939	+	+	–	+	A1	p	+	+	–	–	10+	*r*
f	1500	945	+	+	–	+	B1	p	+	+	–	–	6	*r*
f	1500	946	+	+	–	+	B2	/	+	–	–	–	3+	*r*
f	1500	948	+	–	+	+	B2	p	+	+	–	–	6	*r*
f	1500	950	+	/	/	/	B1	o	/	/	/	/	/	*l*
f	1500	952	+	–	+	+	C4	o	+	–	–	–	10+	*l*
f	1500	967	+	–	+	+	B4	p	+	+	–	+	c9	*l*
f	1500	972	+	+	–	+	B	p	+	–	–	–	c11	*r*
f	1500	976	/	+	+	+	C3	o/p	+	–	–	–	12	*r*
f	1500	978	+	+	–	+	B	p	+	+	–	–	4	*l*
f	1500	981	+	+	+	+	B2	o/r	+	–	–	+	2	*l*
f	1500	2003	+	–	+	+	B1	o	+	+	–	–	5	*l*
f	1500	2004	+	+	–	+	A3	o/p	–	–	–	–	4	*l*
f	1500	2013	/	/	/	+	B	o	–	/	/	/	3	*l*
f	1500	2017	+	+	–	+	C1	r	+	+	–	+	9	*l*
f	1500	2021	+	+	+	+	A1	o/p	+	+	–	+	11	*l*
f	1500	2053	+	+	–	/	C4	/	/	/	/	/	10	*r*
f	1500	2147	+	–	+	+	A	o	+	+	+	+	8	*l*
f	1755	2150	+	+	+	+	C4	r	+	+	–	+	5+	*l*
fort N wall	1776	2176	+	–	–	+	B1	o	+	+	–	–	C10	*l*

abbreviations:

+	present	–	absent
/	no data		
S	sole	*M*	middle
ML	middle packing	*IN*	insole
N	nailing	*TS*	toe shape (o oval, r round, p pointed)
CT	constructional thonging	*U*	uppers
L	lining	*HS*	heel stiffener
c	child size		
l	left	*r*	right

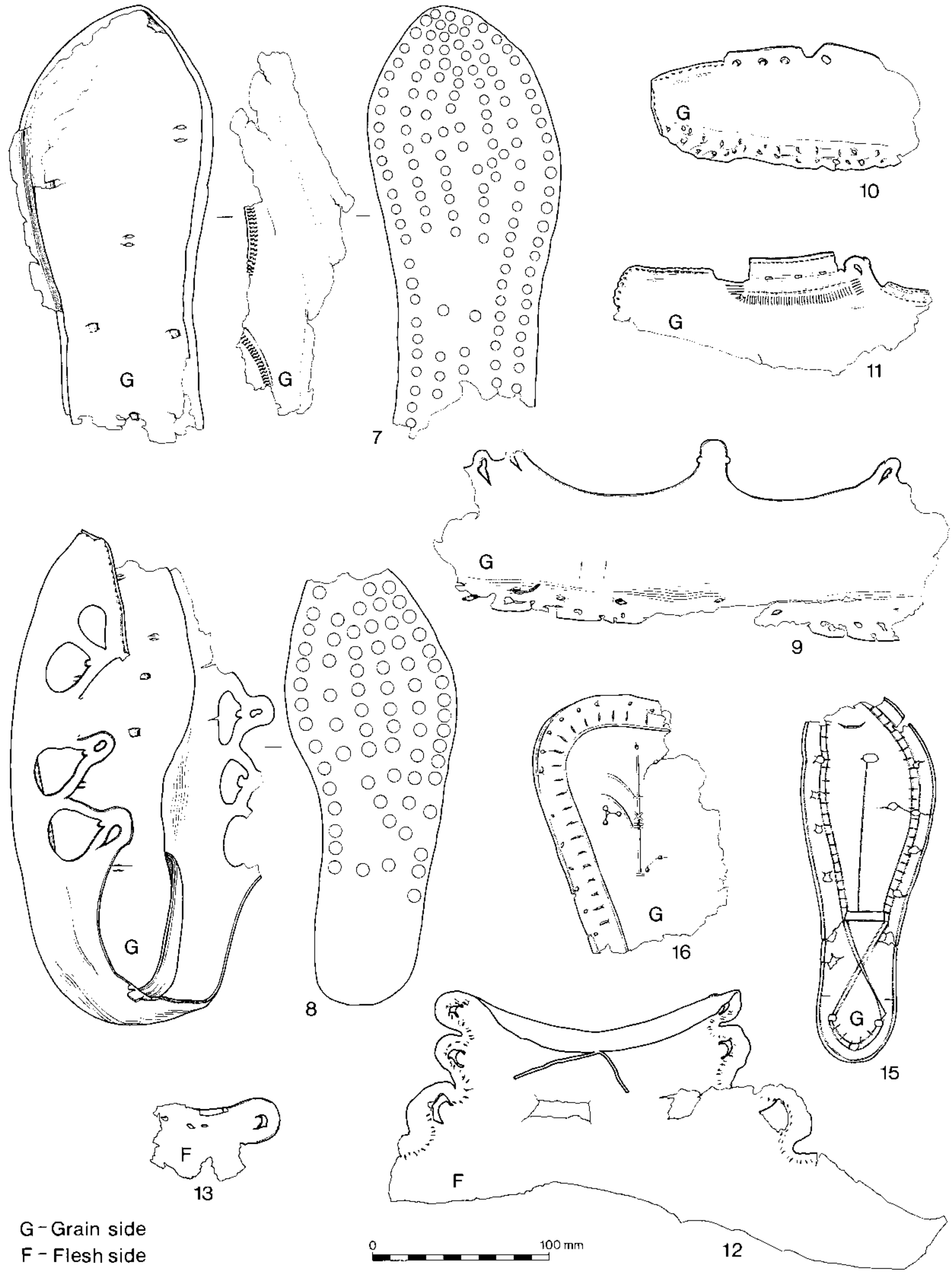


Fig 239 Roman footwear (scale 1:3)

Table 29 Nailed shoes constructional thonging

thonging	*ditch phases*							
	a	*b*	*c*	*d*	*e*	*f*	*other*	*totals*
type 1	–	–	1	–	8	7	1	*17*
type 2	2	–	–	–	1	7	–	*10*
type 3	–	–	–	–	1	6	–	*7*
no thonging	1	–	–	1	1	2	–	*5*
totals	*3*	–	*1*	*1*	*11*	*22*	*1*	*39*

perimeter (type 3). The quantity of bottom units with classifiable constructional thonging was small (39 examples, see Table 29). Type 1 thonging was found most frequently (17 examples eg 2194; Fig 239, No 8) and predominated in Ditch Phase e, although each of the three types were found in similar numbers in Ditch Phase f. The thonging is most likely to reflect the style of shoe upper; no correlation between type of constructional thonging and nailing pattern or shoe size was detectable. Rhodes (1991, 195–6) has suggested that type 2 constructional thonging is a northern British variant as no examples are recorded among the known continental assemblages, and few from southern Britain (examples are known from London and Caernarvon (ibid, 195). The presence of type 2 thonging at Birdoswald in Ditch Phase f, associated with pottery dating as late as the mid-fourth century (Analytical Group 10), among which little residuality could be identified, must represent one of the latest recorded occurrences.

In addition to constructional thonging, one insole (2207) was originally sewn to its upper by a slightly-raised rib, made by tunnel stitching on the flesh side. A sole (700) with no discernible constructional thonging had oblique stitching present along the edge of the flesh side of the seat suggesting the upper had been attached by whip stitching. These may represent particular styles of upper as yet unidentified.

Nailing patterns

Three principal nailing patterns could be distinguished: A, B, and C (as recognised at Billingsgate Buildings; Rhodes 1980, 105–7), each of which could be subdivided. The most easily distinguished patterns are illustrated in Figure 243 and briefly described below:

Type A: closely-spaced row of peripheral nailing with a decorative pattern of nails at the tread and seat.

Type B: widely-spaced peripheral nailing with a lozenge pattern infilling the tread and a central row running down to infilling at the seat.

Type C: heavily-nailed with a closely-spaced single or double row of peripheral nailing and several vertical rows within.

At Birdoswald the heavy nailing, type C, was the most commonly occurring pattern overall (43%), however, type B nailing became increasingly popular in the fourth century accounting for 43% in Ditch Phase f.

These three main nailing patterns show a high degree of standardisation and occur on shoes found throughout the north-west provinces throughout the Roman period. The recognition of certain distinctive patterns, such as those used at the tread of type A nailing patterns, increasingly suggests that some may have been used over a restricted period of time, possibly on a particular style of shoe. Seven examples with a leaf/tendril design (Fig 243: A1) at the tread were found at Birdoswald (for example 2203.1, 2021.1; Fig 238, No 1). This pattern has also been found on a number of other sites in Britain, for example New Fresh Wharf (MacConnoran 1986, 218) and Queen Street, London (MacConnoran 1982 fig 37, 120) Brayford Wharf East, Lincoln (type 2A), Old Penrith, Cumbria (Thornton 1991, 923 fig 114), Castle Street, Carlisle (Padley 1991, fig 210, 887), and Vindolanda (Metcalfe and Longmore 1973, 38 fig 1). At Birdoswald the leaf/tendril pattern was found associated with a distinctive latchet fastening boot (2185; Fig 239, No 12, Fig 244: 2.5) of a type dating to the third century; this association has also been noted among continental assemblages (van Driel-Murray 1987, 38), although latchet boots do occur with other patterns of nailing.

The related S-shaped pattern (938; Fig 238, No 2, Fig 243: A2) has also been found at the same London sites (New Fresh Wharf, MacConnoran 1986, 215; Queen Street, MacConnoran 1982, fig 36, 116) as well as on several continental sites, for example at Bonn (van Driel-Murray 1983, taf 2, 26, early second century), Saalburg (Busch 1965 taf 9, 195, 198), and Zugmantel (Busch 1965 taf 35, 761, 765).

A single example of a circular tread pattern with a central nail (2004; Fig 238, No 3, Fig 243:A3) and a lozenge tread pattern with a central nail (2165; Fig 238, No 4, Fig 243:A4) were found at Birdoswald; both patterns were also found at Billingsgate Buildings (type Avii and Aviii respectively, Rhodes 1980, 107 where other continental parallels are cited), the lozenge pattern also occurring at Bar Hill (Robertson *et al* 1975, fig 26, 59). Ross (1971, 25) has suggested that the lozenge pattern (Fig 243:A4) is a second-century introduction.

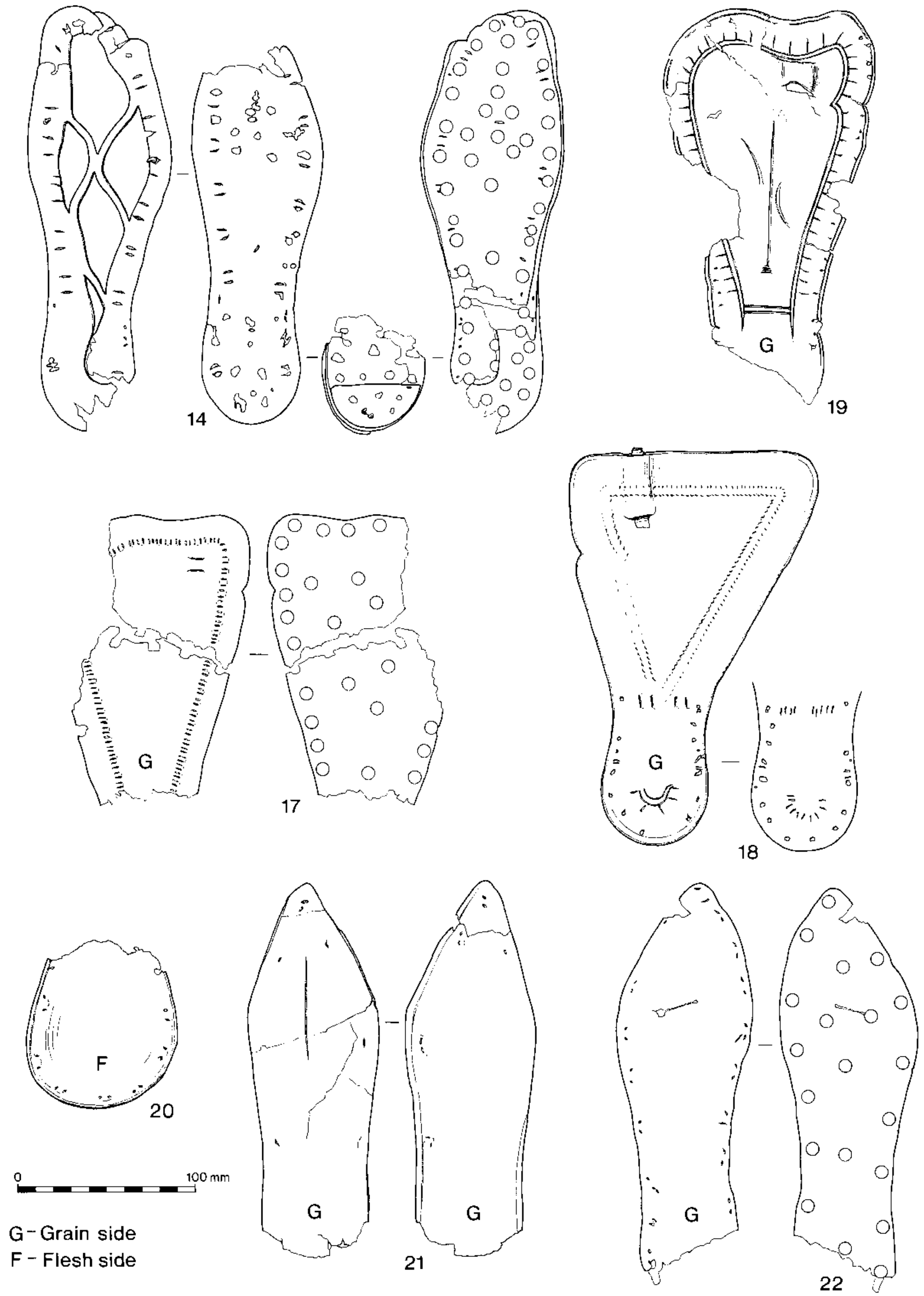


Fig 240 Roman footwear (scale 1:3)

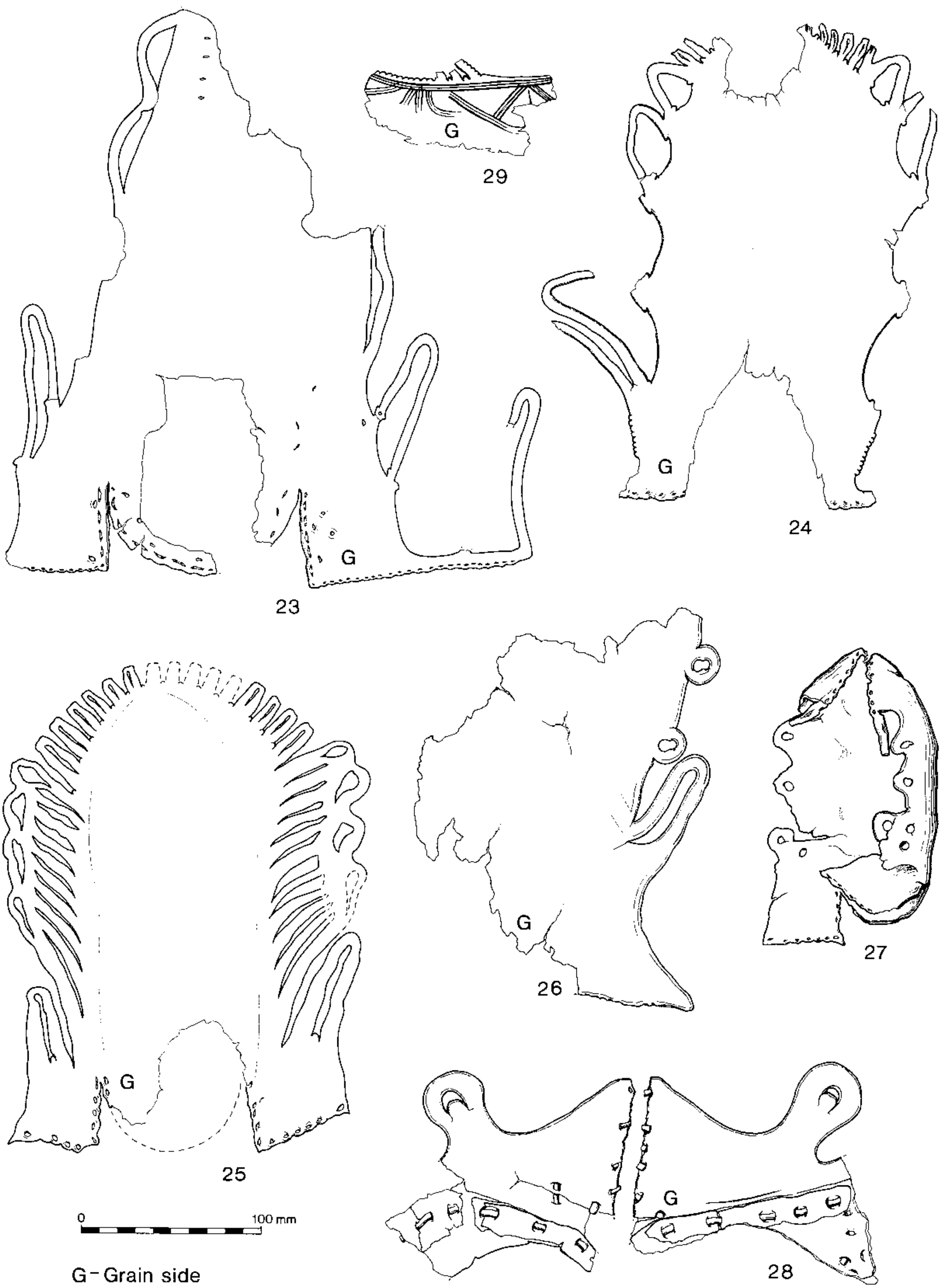


Fig 241 Roman footwear (scale 1:3)

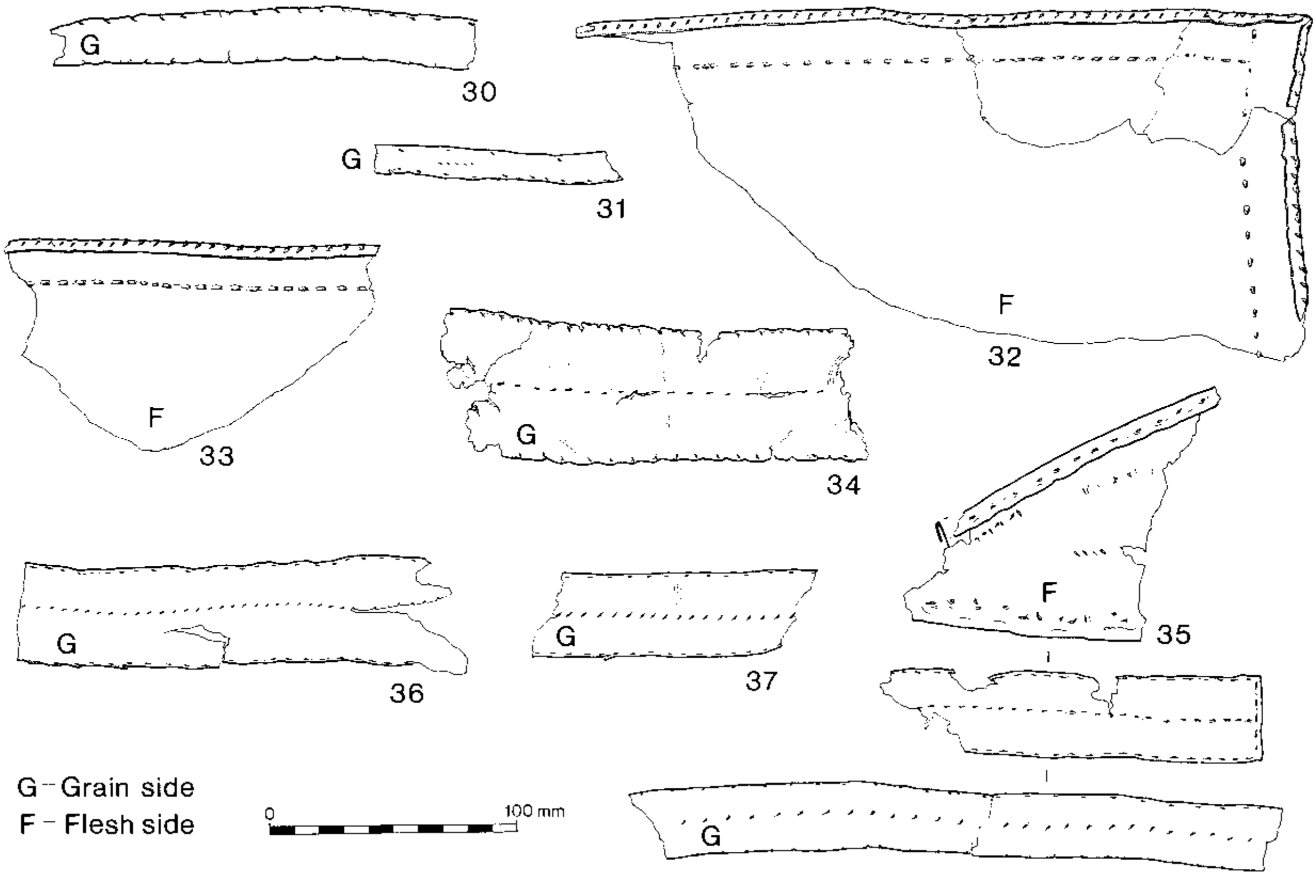


Fig 242 Tent leather (scale 1:3)

The classification adopted at Birdoswald was chosen because the distinction between light (B), heavy (C), and decorative (A) nailing was the most easily distinguished when dealing with fragmentary bottom units. In order to compare wider trends in nailing, rather than the specific matching of individual patterns cited above, it is necessary to relate it to other nailing classifications namely Carol van Driel-Murray's types 1, 2, and 3 (1983, 20–22) to which Padley's types A, B, and C for Carlisle correspond. Birdoswald types A, B, and C1 correspond to van Driel-Murray's type 1 (single line of peripheral nailing), Birdoswald types C2 and C3 to type 2 (double line of peripheral nailing), and Birdoswald type C4 to type 3 (single peripheral line with a double off-side row). At Vindolanda single peripheral row nailing becomes increasingly popular over time at the expense of double off-side row nailing, representing 80% of the nailing patterns found in the third- to fourth-century inner ditch (Carol van Driel-Murray personal communication). At Birdoswald single peripheral row nailing also predominates in Ditch Phases e and f of late third- to mid-fourth-century date (27 of total 38 classifiable).

Toe shape

At Birdoswald the toe shape of the bottom unit was discernible in 33 cases. While shoes with types A and B nailing occurred in both oval and pointed toe shapes those with type C nailing occurred most frequently with round toes; this is likely to be simply a reflection of the correlation of heavy nailing and practical round toes on working outdoor shoes.

Upper styles of shoes of nailed construction

Nine bottom units possessed substantial remains of their uppers and a further 30 had fragmentary remains of their uppers present, principally fragments of lasting margin and heel stiffener. Remains of four uppers of nailed construction were found disassociated from their bottom units (2163, 2164, 2185, Fig 239, Nos 9, 11, 12; 2202, Fig 238, No 6).

Five styles of upper were recognised (see Fig 244). Four are variations of a latchet fastening shoe which can be paralleled by shoes from second century contexts at Hardknott and Bar Hill. The fifth, a taller latchet fastening boot tying with integral laces, is of a type known from third century contexts throughout the Empire.

Style 1: A shoe (2203, Fig 238, No 5) from the fill of Ditch Phase a (1846), associated with mid- to late second-century pottery, comprises an insole and an area of the right side of the vamp decorated with rouletted vertical slashes, with a central toe seam and the base of

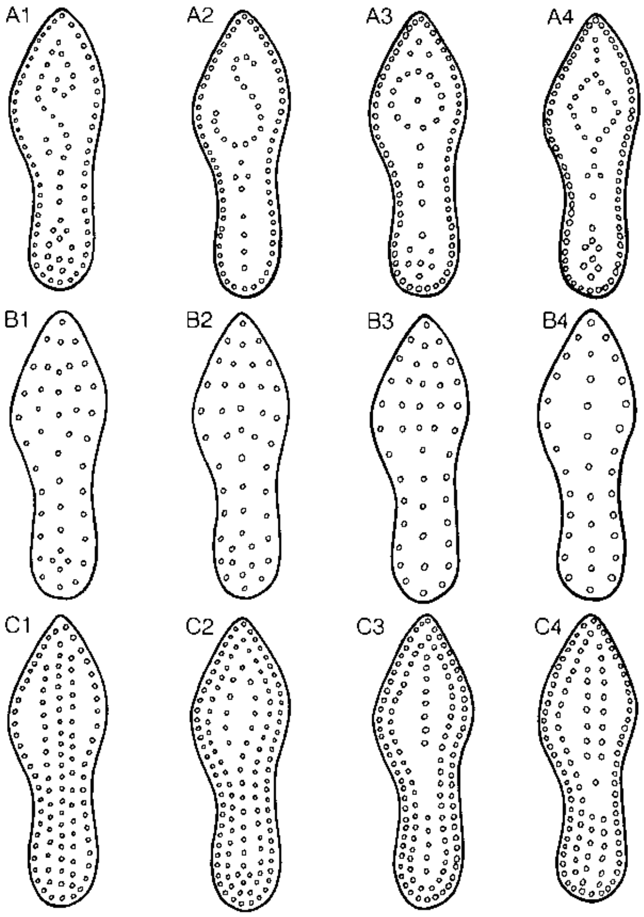


Fig 243 Roman footwear: nailing patterns

fastening loops remaining (see Fig 244.1). It appears to come from a shoe similar to examples from Hardknott (Charlesworth and Thornton 1973, 2 and 4), an example from The Lanes, Carlisle (M54, Padley personal communication) and a fragment with rouletting from Bar Hill (Robertson *et al* 1975, figs 23 and 20, nos 143 and 145, their calceus type B) suggesting a mid-second-century date. Rouletted decoration along the top edge of the upper is commonly found (for example 2150, 2164, Fig 239, Nos 7, 11; 2202.2, Fig 238, No 6), being present on several different shoe styles it can not be used as diagnostic of any one particular style.

Style 2: Represented by a shoe (2194, Fig 239, No 8) with type C3 nailing and a closed upper made of a single piece of calfskin with a seamed toe, possibly originally with a tab at centre front. The shoe has a series of five lobed loops ending in small fastening latchets through which it was laced. The centre back has a lobed finial, the plain cut top edge dropping below the ankle before the ankle loop (see Fig 244.2). The style is comparable with a shoe from Bar Hill (ibid, fig 22, no 5, their type A calceus), where the angular heel finial can be exactly paralleled, and another with only two pairs of latchets from the Saalburg (Busch 1965, taf 18, 282).

The Birdoswald example was found in the fill of Ditch Phase c, with mid- to late second-century pottery, and its similarity to the Bar Hill shoe substantiates this dating. It belongs to a general latchet fastening style of shoe, common and widespread throughout the north-west provinces and, apparently, worn by all ages and both sexes (van Driel-Murray 1987, 36).

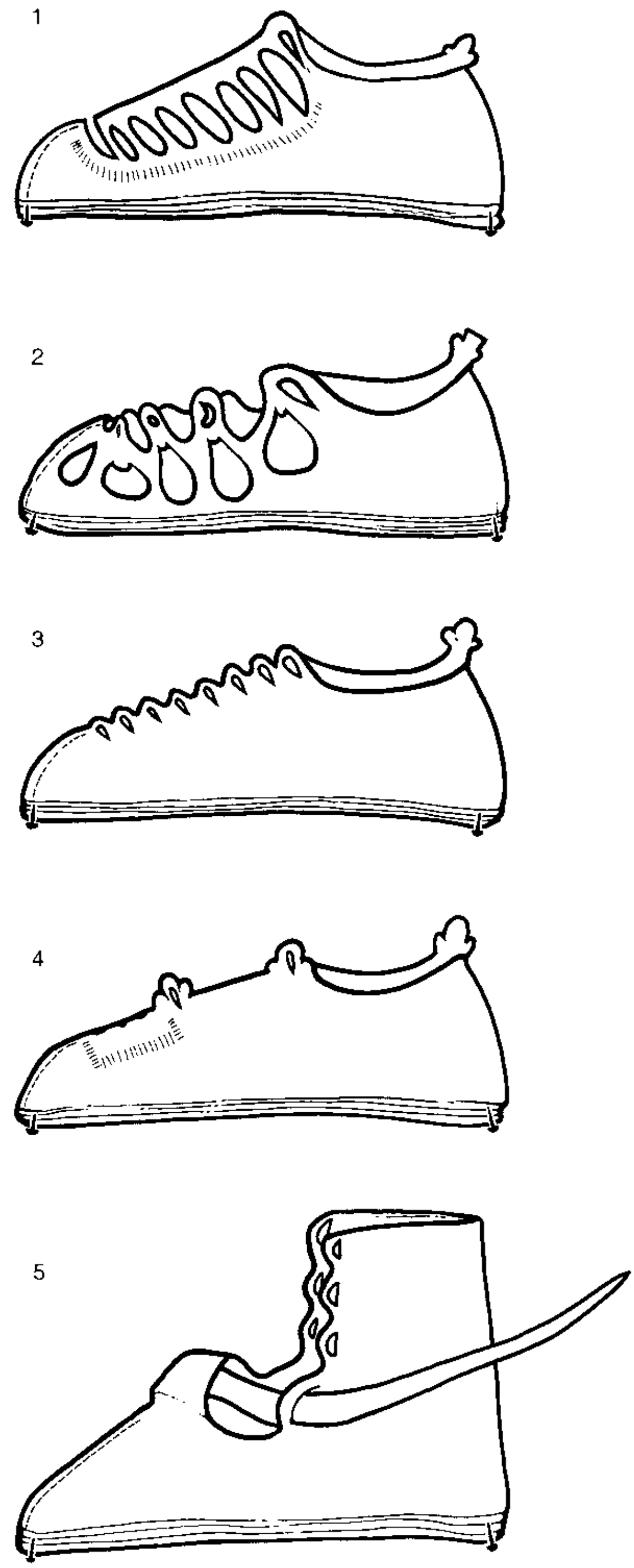


Fig 244 Shoes of nailed construction: upper styles

Table 30 Sandals

ditch phase	*context number*	*small find number*	*thong*	*N*	*TSC*	*size*	*indec*	*l/r*
b	1848	2470	A	B	/	/	/	/
d	1796	2153	A	B	+	6	–	*r*
e	217	671	B	A	/	/	+	*l*
e	217	677	A	C	/	/	/	*r* (poss seat frag)
e	217	692	B	B	+	2	+	*r*
e	1821	2186	A	B	/	/	/	/
f	1500	2025	B	B	+	/	/	*l*
f	1755	2146	*B	*	+	4	+	*r*
f	1755	2526	/	/	/	/	/	/ (poss repaired frag)
f	4060	2366	B	A	+	4+	+	*l*

abbreviations:

+	present	–	absent	/	no data

COMP	component	I	insole
M	middle	S	sole
W	wedge	THONG	constructional thonging
N	nailing	TSC	toe scallop
INDEC	insole decoration	TUN ST	tunnel stitching
l/r	left/right	*	seat only

Style 3: Represented by the quarters (backpart) area of a calfskin upper (2163, Fig 239, No 9), not directly associated with a bottom unit, found in the mid fill of Ditch Phase d (1771). The shoe is peaked at centre back with a decorative, lobed finial and has the remains of a series of very small fastening latchets (see Fig 244.3) reminiscent of a decorated shoe from Hardknott (ibid, fig 5 no 5), again suggestive of a mid- to later second-century date. A shoe fastening with a series of comparably small loops rather than latchets has been found at Castle Street, Carlisle, in a deposit dated from 105 to the mid- or late Hadrianic period (Padley 1991, fig 209, 905). It should be noted that the presence of a toe seam shown in Figure 239 is surmised from the Hardknott example and another with a plain centre back from the Saalburg (Busch 1965, taf 11, 211).

Style 4: This style is represented by two upper fragments (2202.1, Fig 239, No 10, of calfskin; 2164, Fig 239, No 11, of sheep/goatskin) from the fill of Ditch Phase a (1846) and the mid fill of Ditch Phase d (1771) respectively. The shoe has a central toe seam, hemmed edge with crescentic lace holes at the fold, small, lobed fastening latchets and a tab at centre back (see Fig 244.4). Similar characteristics can be seen on examples from the Saalburg (ibid, taf 12, 213, taf 13). Fragments with similarly hemmed top edges with crescentic lace holes at the fold found at Bar Hill (Robertson *et al*, fig 24, 47 and 48) and in the first- to late second-century assemblage from Castle Street, Carlisle (Padley 1989, 4), again suggest a second-century date; however, examples at Vindolanda appear to post date 200 (van Driel-Murray personal communication). The sheep/goatskin fragment (2164), if not residual to its context, may suggest with Vindolanda that the style was in use in the third century along the northern frontier.

Style 5: Fragments of two examples (2185, 2021.2; Fig 239, Nos 12, 13) of a latchet fastening shoe of sheep/goatskin with integral laces/thongs were found (see Fig 244.5) in early to mid-fourth-century contexts (1821 and 1500 respectively). The larger fragment (2185) has three pairs of latchets originally reinforced by an internal lining. It can be paralleled by examples with two pairs of latchets from Vindolanda (van Driel-Murray personal communication) and New Fresh Wharf (MacConnoran 1986, 220–1, 8.6, 8.7, 8.10) and with four pairs of latchets at Vindolanda, the Saalburg (Busch 1965, taf 10, 209), Zwammerdam and, indeed, from third-century contexts on sites across the north-west provinces (van Driel-Murray 1987, 38, fig 8). The London examples have a side seam, those from the Saalburg have a single seam up the toe at centre front; the seaming on the Birdoswald examples is unknown, Vindolanda appears to have both.

A shoe from the well at Skeldergate, York (MacGregor 1978, fig 28, 353, 354), is of a different style but fastens with similar latchets with lunate lace holes, so it is possible that the sheep/goatskin latchet fragment (2021.2) from Birdoswald comes from a different style of shoe; however, this is unlikely as its associated bottom unit (2021.1, Fig 238, No 1) had type A1 nailing leaf/tendril motif, a nailing pattern with which the third-century shoe type is frequently associated, see nailing patterns above. Similar quarters latchets were also found on a shoe of one-piece construction (see below Fig 246.6).

Sandals

Components from a minimum of nine individual sandals were found, being some 12% of the shoes recovered, the same proportion as at Billingsgate Buildings

(Rhodes 1980, 115). The attributes of the fragments found are given in Table 30.

The sandal represents a highly fashionable type of footwear. The bottom unit, uppers being but rarely found, shows distinct changes in both constructional techniques and shape through time (as described by van Driel-Murray 1987, 34–6 and fig 5). As in shoes of nailed construction, the sandal bottom unit components were held together with nailing, types A and B. In addition, a line of thonging ran around the edge; at first on the same line as the peripheral nailing (type A thonging) but from the end of the second century onwards lying to the inside of the nailing (type B thonging), eventually being no longer used and represented by a line of decorative rouletting only (ibid, 35).

The earliest sandal with diagnostic features (2153, Fig 240, No 14; Fig 245.1) was found in the top fill of Ditch Phase d (1796). As in all the sandals recovered from the excavations it was represented by the cattlehide bottom unit only. The bottom unit being scalloped around the outline of the toes and having an estimated shoe size of *c* Adult 6 was probably worn by a man and is likely to date to the end of the second century when the wearing of sandals was adopted by men (ibid, 34).

The insole of a sandal (692, Fig 239, No 15) with linear decoration and of similar 'natural foot' shape (see Fig 245.2) occurred in the bottom fill of Ditch Phase e (217). Having a single toe scallop and measuring an adult size 2 it is likely to have been worn by a woman or adolescent. The type B peripheral thonging suggests a late second-century date.

The other sandal fragments sufficiently complete to be diagnostic (671, Fig 239, No 16; 2025, 2146, 2366, Fig 240, Nos 17–19) all have excessively broad toes with a single notch at the great toe, fine and closely spaced type B thonging and insoles with linear decoration (see Fig 245.3). These broad toed sandals appear to have been worn by men during the later third century. At least one example (671 and possibly 2366) has type A nailing with groups of three hobnails at the tread, a pattern also found on a stitched and nailed shoe of mid- to late second-century date from Castle Street, Carlisle (ibid, fig 214, 987), a shoe of nailed construction at Dalton Parlours (Mould 1990, 321, no 11 and fig 142), part of a small assemblage from a well likely to date to the second half of the third century, and a sandal from Mainz (Gopfrich 1986, Abb 40, 54).

The broad toe is at its most exaggerated in a sandal insole from the main fill of Ditch Phase f (2146, Fig 240, No 18). Here the big toe scallop has degenerated into a nick at the exterior edge to mark its former position (see Fig 245.4). The peripheral thonging is no longer present at the forepart but appears in a vestigial form as rouletted decoration running around the perimeter. The forepart is unnailed and unthonged; thonging does occur at the waist and around the seat, the waist being associated with the attachment of the upper; see below. The inter-toe slot at the big toe does

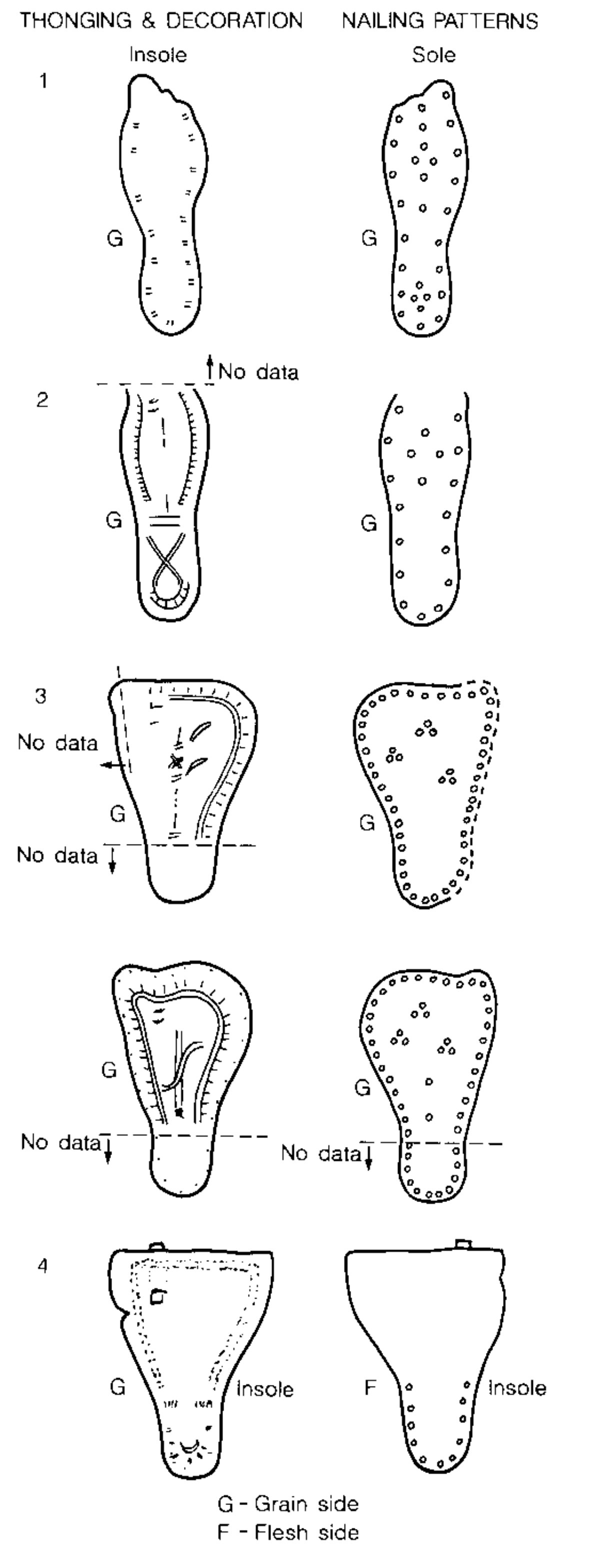


Fig 245 Sandals: thonging, decoration, and nailing patterns

not penetrate the leather of the insole as in the other Birdoswald examples, but emerges from the middle of the leather from between the grain and the flesh sides, a feature also found in the broad-toed sandals from New Fresh Wharf (MacConnoran 1986, 8.20 and 8.23); these and a further four examples were of single layer construction; however, this was not the case with the Birdoswald example. The crisp nature of the thong

Table 31 Shoes of stitched construction

ditch phase	*context number*	*small find number*	*TUN ST*	*N*	*size*	*l/r*
d	1605	2076	+	B	6	*l*
e	217	670	+	–	/	*r* (seat area)
e	217	706	+	+	/	/ (fragments only)
e	217	707	+	–	3	*r*

[for abbreviations see Table 30]

slots and nail holes, and the unworn nature of the flesh side of the insole, all indicate that it had been protected by a sole and, while the nailing around the seat may have secured the seat area of the sole or, more likely, a separate clump seat repair, the forepart of the insole and sole must have been held together by glue originally. Similar nailing present only around the seat is also seen on examples from New Fresh Wharf (ibid, 8.22, 8.23, 8.24 p 223).

Sandal uppers

No sandal uppers could be identified but indications of upper styles were present on the bottom units surviving. Where present, all had a large double thong slot to hold a thong passing through the gap between the great and the second toe and a gap in the peripheral thonging at the waist where an instep strap, as at Vindolanda (Metcalfe and Longmore 1973 fig 1 and fig 3), or possibly latchet-tying quarters, as seen on the child's sandal from Dalton Parlours (Mould 1990, fig 143 No 16, 234–5), were positioned. Additional thonging was present across the waist on two examples to secure the upper at the instep (2146, 2186).

Shoes of stitched construction

A minimum of three shoes of stitched construction were found, representing 4% of the shoe assemblage, with the insole, lasting margin of the upper and the sole held together by tunnel stitching around the perimeter. The attributes of the examples found are given in Table 31. Three fragments of bottom unit of stitched construction (670, 707, Fig 240, Nos 20, 21; 706) occurred in the bottom fill of Ditch Phase e (217). These included a pointed-toed insole of sheep/goatskin (707) and the seat area of a cattlehide sole (670), possibly from the same shoe. The impression made by bracing thread at the tread of the insole (707) indicates that the shoe was braced during construction.

A cattlehide sole (2076, Fig 240, No 22), also with a pointed toe, was found in the fill of Ditch Phase d (1605). In addition to worn tunnel-stitching around the perimeter on the flesh side the sole had very widely-spaced type B nailing (*c* 30mm apart). It may represent a shoe of stitched construction with the sole reinforced by nailing or possibly the stitching relates solely to the attachment of the upper. A similar feature occurred on two shoes from Billingsgate Buildings whose soles had been stitched on before they were nailed (Rhodes 1980, 116, nos 537, 559) and a mid- to late second-century shoe from Castle Street, Carlisle (Padley 1991, fig 214, 987). This may represent a hybrid stitched- and nailed-shoe construction; alternatively, the stitched shoes may have been nailed at some point in their lives either to make a sturdier shoe or to fix a loose sole without renewing it completely. The latter explanation is thought less likely as nails would only then be required around the perimeter. It appears to be a deliberate construction method, perhaps used on a particular style of upper yet to be identified. It should be noted that the two fragments of stitched bottom unit (706) from the fill of Ditch Phase d also have the suggestion of perimeter nailing present.

Stitched uppers

No possible stitched-shoe upper remains were recovered from the excavations. The uppers identified as belonging to shoes of stitched construction at New Fresh Wharf come from highly-decorative, light shoes of mule type suggesting that, like the sandal, they represent an expensive, highly-fashionable style of footwear worn only by the well-to-do.

Shoes of one-piece construction

A minimum of 12 shoes were found to be of one-piece construction, being cut from a single piece of cattlehide with a seam around the heel and at centre back, representing 15% of the shoe assemblage. Where sufficient survives the sole area of the shoes appear to have been heavily worn at the toe and seat (for example 970, 2136, 2173, Fig 241, Nos 23–25; 2465), several having tunnel stitching (970, 987, Fig 241, Nos 23, 26; 2465) or thonging (984, Fig 241, No 28) for the addition of a clump repair, the latter with a fragment of the clump repair remaining *in situ*.

Six different styles of one-piece shoes were recognisable, see Figure 246. Note that the gathered toes shown on styles 1A, 1B, and 4 are supposition only – no data were available in these cases – and that the pronounced asymmetry of the cutting patterns has been omitted for clarity.

Style 1A: plain fastening loops (2465)

Style 1B: plain fastening loops with a single decorative lobe between the long quarters loop (970, Fig 241, No 23). This example has a particularly tall back seam (*c* 105mm).

These plain styles have been found throughout the north-west provinces and appear to have had a long period of popularity in Britain. For example, they occur in the late first- to mid-second-century assemblage from Billingsgate Buildings (Rhodes 1980, nos 637, 656), first- to second-century assemblages at Carlisle (Padley 1991, 233 and personal communication), at the Antonine fort at Bar Hill (ibid, fig 20), in well deposits dating to the second half of the third century at Dalton Parlours (Mould 1990, 233), and in both the Antonine ditch and third- to fourth-century inner ditch at Vindolanda (van Driel-Murray personal communication).

Style 2: gathered toe comprising series of small loops separated by lobes, extending into fastening loops with decorative lobes and long quarters loops with denticulated interior edges (2173, Fig 241, No 24). Denticulated edges were also found on a loop (2516) and a strap fragment (2126) likely to come from a more decorated version of similar style.

Style 3: gathered angular toe loops with lobes between, series of slits at each side with plain fastening loops above and internally lobed quarters loops, with a slightly asymmetrical cutting pattern (2136, Fig 241, No 25). This shoe has an exact parallel from Vetchen, the Netherlands (van Driel-Murray personal communication) where it was found associated with very broad toed sandals like Birdoswald type 3 above.

Style 4: long, plain quarters loops with simple circular lower loops (987, Fig 241, No 26).

Style 5: child's shoe with central toe seam extending into the beginning of an integral thong/lace by which the shoe laced up the foot, lower loops with circular punched fastening holes and quarters latchets again with round fastening hole and a pair of smaller, probably decorative, punched holes below (986, Fig 241, No 26).

Style 6: backpart only surviving, peaked at centre back with quarters latchets with crescentic fastening holes (984, Fig 241, No 28). The thonged, rather than stitched, back seam is a late feature which occurs on shoes of later third- and fourth-century date.

In addition four fragments of upper with impressed linear decoration and a serrated top edge with multiple loops and small decorative lobes between were found (2141, Fig 241, No 29). Areas of wear suggest they also come from a shoe of one-piece construction but the style is unknown.

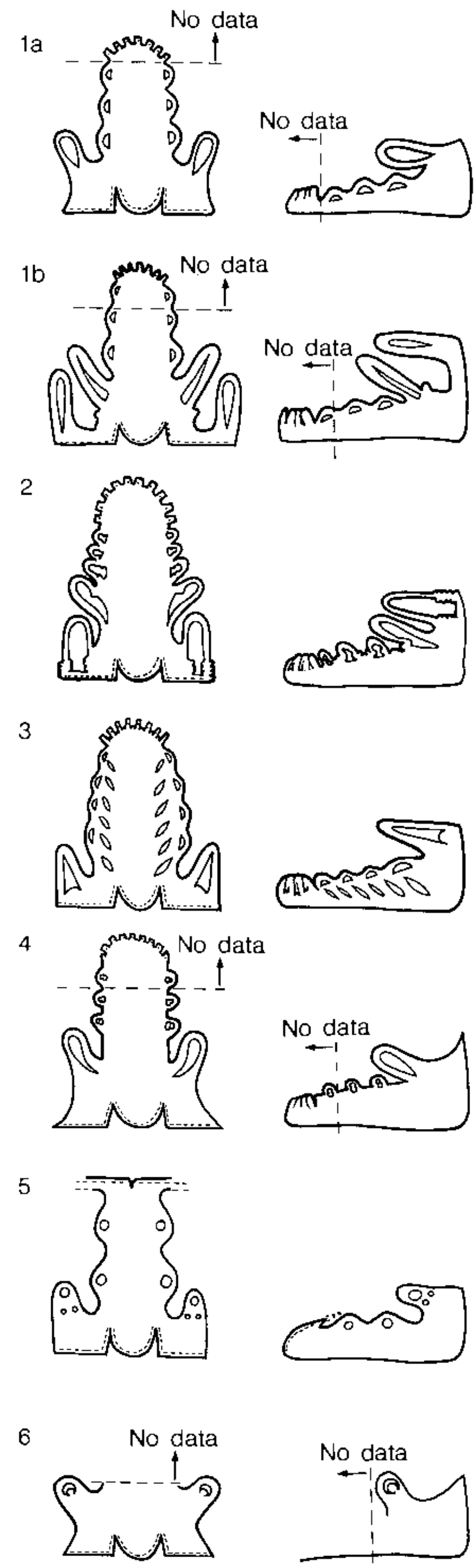


Fig 246 Shoes of one-piece construction

Shoes of one-piece construction became increasingly popular during the third century (van Driel-Murray 1987, 34) and this is well illustrated at Birdoswald (Table 26). Shoes of this construction occurred only in Periods 4a and 4b, principally in Ditch Phases e and f associated with later third- to mid-fourth-century pottery (Analytical Groups 9 and 10); none occurred in deposits prior to Ditch Phase d, which contained pottery dating into the mid-third century (Analytical Group 7). The more decorated one-piece shoes show a high degree of diversity which makes the occurrence in Vetchen of an exact parallel for a Birdoswald example interesting but not altogether surprising when the widespread occurrence of several of the nailing patterns is considered.

Repair

Many of the shoes had been heavily worn before being discarded. 8% of the total shoe assemblage showed signs of repair; however, repair as indicated by the occurrence of differing sizes of hobnails was impossible to detect due to the extent of iron encrustation. On shoes of one-piece construction, where evidence of repair was better preserved, the figure rose to 31%.

Salvage of reusable leather

A small proportion (6%) of the total shoe assemblage showed evidence of having had the uppers deliberately cut from the bottom unit before being thrown away, suggesting that the reusable leather had been salvaged for cobbling; however, bearing in mind the poor preservation of the uppers this may also be an under representation.

Tentage

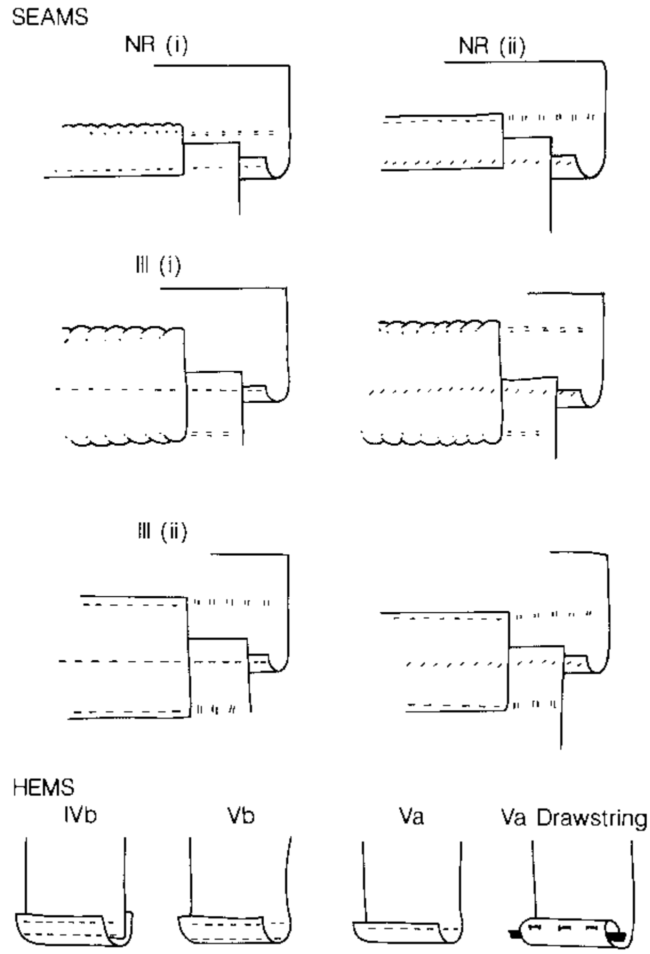


Fig 247 Tentage seams and hems

Previously the study of the important collection of leather tentage recovered from the promontory fort in the vicinity of these excavations produced the seminal article on Roman tentage by McIntyre and Richmond (1934, 62–90). The material found during the present excavations comprised only small pieces torn from the seams of tent panels and, as considerable research on larger assemblages of better preserved tentage has been undertaken recently (Vindolanda, van Driel-Murray, 1990, 109–37; Castle Street, Carlisle, Winterbottom 1991, 244–307), only a preliminary identification of the fragments recovered is offered here. A small quantity of tentage was recovered from the Period 2 peaty layer (4130) through which Ditch Phase a was cut, and from each ditch fill, with the exception of Ditch Phase c, see Table 25 above. Tentage was a significant component (19%) of the leather finds from Ditch Phase d only.

Most of the tentage comprised lengths of torn seam bindings and a small amount of leather cut from tent panel seams. The fragments represent the debris produced when salvaging reusable material during the day to day repair of equipment. 31% showed evidence of having been deliberately cut up prior to being discarded, a number having stitching from patching and repair (2068, Fig 242, No 33; 988, 991, 2471). The fragments of tent panel were too small for any associations between pieces to be established or original dimensions to be estimated. The seams and hems used to join the panels are of the standard types apparently universally employed on Roman tentage and described by Winterbottom in her recent study of the tentage from Castle Street, Carlisle (ibid, 245–51). Examples of seams with a narrow reinforcement binding (NR) and seams with wide bindings (seam III) were found at Birdoswald, along with four possible types of hem, a bound hem (type IVb), folded hems (Va and Vb), and a drawstring variant (of type Va) (see Fig 247). No certain examples of an unbound seam (type II) were recognised. The narrow seam bindings were attached to the flesh side of the tent panel with either two lines of straight stitches (NRi, 2533.3, Fig 242, No 31) or a line of oversewn (whip) stitching along one edge and a line of straight stitching along the other (NRii, 2522.1, Fig 242, No 35). Similarly, the wide seam bindings were secured to the flesh side of the tent panels using either straight stitching (IIIi, 2159, 2033, 2521, Fig 242, Nos 35–7) or oversewn (whip) stitching (IIIii, 2067, 2068, 2409, Fig 242, Nos 32–4). Where identifiable, the vast majority of the tentage was found to be of sheep/goatskin, as was the case at Vindolanda (van Driel-Murray, 1990, 118); the tentage from the promontory fort (McIntyre and Richmond 1934) was said to be of calfskin.

A small rectangular fragment of calfskin (2075) from Ditch Phase d was similar in shape to a patch used to repair sheet V10 tent I from Vindolanda (van Driel-Murray 1990, 135 fig 10), but in shape and size it was also reminiscent of the satchel panels found at the Valkenburg (Groenman-van Waateringe 1967 fig 68 reconstruction illustrated) and it may have been torn from such a panel.

Roman glass

by Jennifer Price and Sally Cottam

Excavations at Birdoswald produced 590 fragments of glass. Of these, 474 were from vessels (80%), 53 from window panes (9%) and 46 from objects (8%). A further 17 fragments (3%) were severely melted. There were very few strongly-coloured vessel fragments, but colourless and blue/green vessel glass was well represented. There was also a little late Roman green glass (Table 32).

Most of the fragments had very little weathering but it is noteworthy that some, both blue/green and colourless, were affected by strain cracks.

Tablewares formed 42% of the total assemblage, and household containers, principally bottles, 38%. The material ranges in date from the late first or early second century to the fourth century. Within this time span, finite periods of glass use have been identified. There was a small group of late first- to early second-century vessels, including colourless cast and strongly-coloured fragments. The vessel types in use during this early period were plates, cups and bowls, jugs and flasks, and square bottles. The absence of specifically first-century vessel forms such as pillar moulded bowls and cylindrical bottles supports an early second-century starting date.

Glass vessels were also used at Birdoswald for drinking, serving, and storing liquids in the second and third centuries. Many common Romano-British vessel types are present during this period, including colourless cups with fire rounded rims, colourless cylindrical bottles, several blue/green jug forms, bath flasks, and square bottles. The lack of colourless biconical wheel-cut drinking cups, frequently found on early to mid-second century sites, is notable, but it is not possible to refine the precise periods of use of glass within the third century. Only a few fourth-century fragments were found, principally drinking cups and a bottle, indicating that glass use had reduced considerably in the late Roman period.

The majority of the material comes from stratified contexts, although a significant amount of residuality is also evident. There was no evidence for concentrations of particular forms or similarly-dated vessels in any area of the site. Fragments of window glass came from a range of contexts spread over a wide area, as was the case with the objects.

In some cases the glass has survived in quite large fragments, suggesting that collection of broken pieces for re-melting was not always important at Birdoswald. A number of base and rim fragments showed a considerable amount of wear, indicating that many of the vessels were used intensively, or over a long period. Many of the broken body fragments are also heavily worn on all surfaces, possibly suggesting that they lay as pieces on the ground for some time after breakage. A small group of the first- to third-century fragments show evidence of careful grosing or other reworking along the broken edges so that the pieces could be reused, possibly as tools or gaming counters.

Table 32 Summary table of Roman glass

colour	*number of fragments*	*% vessel glass*
strongly coloured	3	1.2%
colourless	83	33.4%
pale green	3	1.2%
blue/green	140	56.2%
late Roman green	20	8.0%
totals	*249*	*100.0%*

The earliest group of tableware dates to the later first to mid-second centuries. Two fragments (Nos 1, 2) are colourless cast glass, possibly from the same vessel. Colourless cast glass appears in archaeological contexts in the mid- to late Neronian period and was used to produce a variety of tablewares in the late first century. Production appears to have ceased in the early second century as cast vessels become rare after this time. Finds from sites on the Antonine Wall such as Cramond (Maxwell 1975, 198 nos 6–7, fig 16) suggest that some colourless cast forms continued in use until at least the second quarter of the second century.

The rim fragment (No 1) comes from a conical vessel, possibly similar to a bowl from Watercrook (Charlesworth 1979, 232 no 165 fig 93). There is little evidence for the body shape of No 2, but high base rings of this type are found on some cast plate forms, including examples from Gloucester (Charlesworth 1974, 75 no 4 fig 29), and Chichester (Down and Rule 1971, fig 3.16 no 19). Similar base rings are known from Rushmore, Cranborne Chase (Pitt-Rivers 1884, 126 no 6 pl XLIV), and Lincoln (The Lawn, unpublished).

No 3 very probably comes from the base of a tubular rimmed bowl. Bowls with tubular rims are found at various times throughout the Roman period, but their principal period of use in Roman Britain occurs in the first and early second centuries. The complete vessel had a vertical tubular rim with the edge folded out and down, a straight or slightly concave sided upper body, a strong carination, and a straight lower body tapering in to an applied base ring. Strongly-coloured vessels become increasingly rare after the end of the first century, although a yellow/brown bowl was found in the Antonine pit at Felmongers, Harlow (Price 1987, 188 no 4, fig 1).

The deep yellow/green of No 3 is unusual and difficult to parallel. Green and olive-green tubular rimmed bowls were found at Verulamium (Charlesworth 1984, 151–3, nos 55–8, fig 62 nos 23–4). A pale yellow/green bowl was found in an early second-century burial at Stansted, and yellow/brown examples are known from a first century pit at Newstead (Curle 1911, 272), from a Flavian context at Cirencester (Charlesworth 1982, nos 84–5, fig 34), from a Trajanic pit at Hemel Hempstead (Charlesworth 1974/6, 117 fig LXIVa, pl 41), and from the Antonine pit at Harlow, mentioned above.

A second base fragment, No 4, also comes from a strongly-coloured vessel. It is yellow/brown with a tubular base ring and concave base. There is no indication of the form of the body, but tubular base rings are found on a number of first- to second-century cups (eg Isings 1957, form 37) and bowls (eg Isings 1957, forms 41, 42, and 69). No 4 and the previous fragment, No 3, have both been carefully reworked around the edge of the base after breakage for reuse, possibly so that the base rings can be used as tools for smoothing, or perhaps as counters or lids.

No 11 has a nearly complete profile, lacking only the rim. It comes from a conical facet-cut beaker of the later first and early second centuries. Facet-cut beakers were formed from a blown blank, which was ground on the outside surfaces to produce the foot and rim, leaving a central zone to be decorated with facet-cutting. These beakers were made in several shapes, tall and narrow, or short and wide such as this beaker and the intact vessel from a burial at Barnwell, Cambridgeshire (Harden *et al* 1987, no 104).

Although fragments of facet-cut beakers are not uncommon on later first- and early second-century Romano-British sites, comparatively few can be positively identified as coming from short and wide beakers. The horizontal cordons above and below the zone of facets identifies the Birdoswald beaker with a series of vessels classed by Oliver as Group II (Oliver 1984, 36) and the three rows of large circular facets cut as diamonds are paralleled within this group. A complete vessel from the Trier museum is almost identical to the Birdoswald example in form and decoration (Oliver 1984, 37, fig 5), and fragments from another very similar beaker were found at Pentre Farm, Flint (Price 1989, 81, no 5 fig 29). Other fragments from vessels of this form are known from Eastgate, Gloucester (Price 1983, 169, fig 98 no 11), and Castleford (unpublished).

Eight fragments come from a colourless indented vessel (No 10), most probably a beaker, with two abraded bands below the rim. The complete vessel had a ground rim, four or more indents, and probably either a concave or a pushed-in base ring or small foot. Colourless indented beakers have been found quite frequently on first- and second-century Romano-British sites including Doncaster (Buckland 1986, fig 11), Richborough (Bushe-Fox 1932, 85 No 61 pl XV), Exeter (Charlesworth 1979, 224 no 18 fig 70), and elsewhere. However the combination of wheel-cut decoration and indents on this vessel is best paralleled by a group of three colourless beakers from the Antonine pit at Felmongers, Harlow, mentioned above in connection with No 3 (Price 1987, 203–4 nos 15–17, fig 2). A very similar rim and upper body fragment, with a slightly outurned rim and at least one abraded band, was also found at Verulamium (Charlesworth 1984, 156, no 104, fig 63 no 55).

A number of blue/green cups, bowls, jars, jugs, and flasks are also of later first- to mid-second-century type. Seven fragments, Nos 35–41, probably come from three blue/green tubular rimmed bowls, similar in form to the deep yellow-green example, No 3 above. Blue/green examples were in use at the same time as strongly-coloured bowls, and remained popular during the first half of the second century. Two blue/green bowls were found in early Flavian pits at Richborough (Bushe-Fox 1949, pl LXVIII nos 369 and 372), another in a late Flavian-Trajanic pit at Blackfriars Street, Carlisle (Price 1990, 172, no 39 fig 162 M/F 2/73), and one in the Antonine pit at Felmongers, Harlow, dated around 160–70 (Price 1987, 188, 202, no 5 fig 1). No 35 has a blue/green horizontal marvered trail below the rim, a very unusual feature on bowls of this form. Nos 36–41 which were nearly all found in the same building, probably come from the same vessel. This bowl appears to have had a shallow body, similar to a blue/green bowl from Verulamium (Charlesworth 1984, 153, no 68, fig 62 no 27).

Two base fragments, Nos 42–3, come from vessels which cannot be identified precisely. Both have tubular pushed-in base rings, which are very commonly found on a range of first- and second-century vessels including cups, bowls, and jars (eg Isings 1957, forms 41, 42, and 69).

Four rim fragments come from blue/green jars (Nos 44–7). Several forms of jar were commonly used during the first and second centuries as household containers. Nos 44 and 45 have outurned rims with rolled-in edges, similar to the rim on a blue/green indented jar from the Antonine pit at Felmongers, Harlow (Price 1987, 205 no 24 fig 3). Other examples are known from Verulamium (Charlesworth 1972, 205, fig 76 nos 28–30; 1984, 167, nos 262–3, fig 67 nos 116–7), Housesteads (Charlesworth 1971, 35, fig 10), and elsewhere.

Nos 46–7 come from the rims of tubular rimmed jars. Tubular rimmed jars were made in several shapes during the first and second centuries, and it is not possible from this fragment to determine the form of this example. Blue/green ovoid vessels are known from many sites, including Verulamium (Charlesworth 1972, 204, fig 76 no 26) and Richborough (Bushe-Fox 1932, 84, no 57 pl XV). Mould-blown square-bodied jars with tubular rims were also popular in Roman Britain and examples are known from Chichester (Down and Rule 1971, fig 5.22 79e), Cirencester (Thorpe 1935, pl ii), and elsewhere.

Two rim fragments have been identified as coming from first- to mid-second-century jugs (Nos 50 and

51). No 50 has an irregular narrow folded rim tapering in to a cylindrical neck, and a folded upper handle attachment. The rim is very similar in form to that on a long necked blue/green jug from Verulamium (Charlesworth 1972, 202, no 1, fig 76 no 20), and probably comes from a first- or early second-century conical or globular jug (Isings 1957, forms 52 and 55). Long necked jugs were made in both strongly coloured and blue/green glass and were often decorated with ribs. Apart from yellow/green and yellow/brown jugs, strongly coloured examples are rare after the first century, but in blue/green they continue to be popular. Examples from both occupation sites and burials are numerous. These include a complete conical jug from Turriff, Aberdeenshire (Thorpe 1933–4, 439–44), jugs from burials at Bartlow Hills (Gage 1834, 5, pl ii fig 1) and Faversham (Thorpe 1935, 27, pl IV, f), and fragmentary vessels from Richborough (Bushe-Fox 1949, 158 no 368, pl LXVII) and Inchtuthil (Price 1985, 310, no 3 fig 93).

The ribbed neck and upper body fragment No 55 also comes from a jug of this general group. This vessel had a cylindrical neck, a globular or discoid body, and narrow vertical ribs. A substantially complete yellow/brown globular jug from a pit at Enfield also has ribs continuing up the neck of the vessel (Price 1977, 155, no 2 fig 27, pl 8) as does a globular blue/green jug from Cologne (Harden *et al* 1987, 119, no 51). Nos 52 and 53, which also have folded rims and cylindrical necks, may also come from long-necked conical or convex bodied jugs of this general type.

Three vessels have lower bodies and bases suggestive of flasks, although from these fragments it is not possible to make a positive identification, and they might also come from jugs or jars. No 60 is the best preserved example, with 48 fragments, many of which join. It has a wide convex lower body and a small, slightly concave base, typical of the most commonly-found first- and early second-century form of flask. The complete vessel may have had a folded rim, cylindrical neck and an ovoid body (Isings 1957, form 16). Many examples are known from first-century sites, including at least five nearly intact vessels from Colchester (Harden 1947, 304 83–4 pl LXXXVIII; Charlesworth 1985, MF 1:A8 b and c, fig 17) and at least three vessels from Fishbourne (Price and Cottam 1996, nos 101, 103–4). Nos 61–2 also come from convex-bodied vessels with concave bases, possibly similar in form to No 60.

The second chronological group from Birdoswald dates from the second to mid-third centuries. The colourless tableware of this period includes at least 12 cups or bowls, two jugs or bottles as well as a variety of body fragments from vessels which cannot be recognised with certainty.

The most common single form of tableware at Birdoswald is the colourless cylindrical cup with a vertical fire-rounded rim, straight sides, and double base ring (Isings 1957, form 85b). At least five examples have been recognised (Nos 5, 14–17, 21–23). Nos 5 and 17–20 all have the rim and body typical of this form and the base fragment. No 24 shows the diagnostic tubular pushed in base ring and inner circular trail. These are the most common glass drinking vessels of the mid- second to early third centuries and they are found in nearly all domestic glass assemblages of this period. Numerous examples have been found on many sites in northern England including York (Harden 1962, 136, fig 88 no 202.6), Carlisle (Price 1990, fig 161 nos 28–30), Corbridge (Allen 1988, 293 nos 42–4, fig 132), Vindolanda (Price 1985, 207, nos 8–11 fig 77), and Piercebridge.

The three rim fragments, No 5, are of particular interest. Below the rim five painted dots survive as part of a horizontal row. These are white, pale green, deep pink, pale yellow, and pale blue. No further decoration is visible, but there can be no doubt that this vessel belongs to a group of cups decorated with animal fights and chases, gladiatorial contests, fishes etc, found in the north-west provinces and outside the northern frontier. Where the rim is preserved, these vessels are invariably decorated with one or more rows of painted dots below the rim, arranged either as single dots side by side, or in groups associated with horizontal streaks. The Birdoswald fragments are most probably of the first variety. The group is best represented by a well-preserved series of cups from sites in Seeland, Denmark, and Germany (Fremersdorf 1971, 63–7, taf 3 and 7–10). A number of fragments have been found in Britain, principally at sites on or close to the northern frontier, but also from Caerleon (Allen 1986, 111, no 61 fig 43), Colchester (Cool and Price 1995, 62–3, fig 4.3 no 227), Lincoln, and Chester (the last two both unpublished). The most outstanding example was found in the late fort ditch at Vindolanda in 1991 (Birley nd, fig 23). This vessel shows a substantial section of a gladiatorial contest and has a row of alternating red and blue dots below the rim. Other fragments from sites on or near Hadrian's Wall include two from Housesteads, two from Corbridge, one from Chesters (Charlesworth 1959, fig 5; Curle 1931, 294 fig 5 no 2; Fremersdorf 1971, 64 abb 4 no 1), and one from Carlisle (unpublished).

The use of five different colours in the upper border of dots on the Birdoswald cup is notable. A single colour, often red or yellow, or two alternating colours is more usual, as on the rim fragment from Housesteads, which has alternate yellow and red dots (Curle 1931, 294, fig 5 no 2), or on the Vindolanda gladiator cup, which has blue and red dots, although a fragment from Clickhimin, Shetland has dots of red, yellow, and blue (Fremersdorf 1971, 64 no 5, taf 9 no 3).

Several slight variants of the colourless cylindrical cup have been noted, also of mid-second- to early third-century date. These include vessels decorated with narrow horizontal unmarvered trails below the rim and sometimes on the lower body. These cups are found with single base rings, for example three cups from a second-century deposit at Housesteads (Charlesworth 1971, 34, figs 1–3), or double base rings, such as on a complete cup from a burial dated *c* 200 at Baldock (Westell 1931, 274, G104, 4828, fig 6). The form is probably represented at Birdoswald by the body fragment No 9 and possibly the base fragment No 23, which has a low coiled base ring, very similar to the bases of the cups from Housesteads. No 16 also comes from a colourless drinking cup with a fire-rounded rim, but appears to have a slightly convex body, similar to a vessel from Vindolanda (Price 1985, 207, no 7 fig 77).

Three rim fragments (Nos 6–8) come from at least two colourless bowls with outsplayed fire-rounded rims. This form of bowl has not often been recognised on Romano-British sites. It is best illustrated by two nearly intact examples from a burial at Hauxton, Cambridgeshire, dated to about 200 (Harden 1958, 12–13, nos 3–4, fig 7). A similar date can be assumed for these fragments.

Two colourless base fragments with a very high tubular base ring (Nos 21–2) are almost certainly from the same vessel. They probably come from a bowl with a cylindrical body and a fire-rounded rim (Isings 1957, form 87). Isings quotes two dated examples from Italy, one from the late first to early second century, and one from the later second century. The form is also known in the north-west provinces. Morin-Jean notes examples from a cemetery at Poitiers (Morin-Jean 1913, 127–8, type 82 fig 162) and another was found at Neuville-le-Pollet, Seine Maritime (Sennequier 1985, 13 no 5). In Britain similar vessels have been found at Castor (unpublished) and at the third-century cemetery at Brougham, Cumbria. Here a blue/green bowl was found in grave thought to date to the period 250–70 (Cool 1990, 171, fig 2 no 7). The colourless bowl from Birdoswald is also likely to be third century in date.

A further colourless base fragment (No 27) probably comes from a cup or bowl, although the form is difficult to identify positively. It can possibly be compared to the colourless cylindrical cups discussed in connection with Nos 17–20 and 24–6.

Two fragments come from the neck and shoulder of colourless jugs, flasks, or bottles. No 28 is a neck fragment with a slight tooled constriction and No 29 comes from a horizontal shoulder. These two pieces could come from a variety of vessels, but are most likely to be from colourless cylindrical bottles such as those from Hauxton (Harden 1958, 12, no 2 fig 6) and Corbridge (Charlesworth 1959, fig 10 no 1) or cylindrical flasks, with or without handles, such as examples from York (Harden 1962 fig 89, HG 182, fig 90 HG 146.3–4). All these vessels have sets of closely spaced wheel-cut lines on the body, similar to those on fragment No 31 which also comes from a cylindrical vessel.

Five colourless facet cut fragments (Nos 12–15) form one of the most interesting groups of glass from Birdoswald. A minimum of three vessels is probably represented. Late second- to early fourth-century facet-cut vessels are decorated with a very wide range of designs. Circular, oval, and rice grain facets are used either singly or in combinations to produce more complex designs, as on fragments from Verulamium (Charlesworth 1984, 156, no 106, fig 63 no 57). Richborough (Bushe-Fox 1928, pl XXV no 75), Frocester Court villa (Price 1979, 41, no 5, fig 16), Silchester (Boon 1974, fig 36 no 4), and many other sites in Roman Britain. Two fragments from the same vessel (No 13) are decorated with deep curved wheel-cut lines, probably part of an arcaded frieze, containing large circular facets. Although no exact parallel can be found for this design, the fragments are comparable to vessels from Verulamium, from a pit dated 300–15 (Charlesworth 1972, 206 nos 8–9, fig 78 nos 48–9). The thick wall of the Birdoswald fragments suggests that the fragments come from low on the body of the vessel.

Cups and bowls with similar wheel-cut arcading are known from Cologne and elsewhere in the Rhineland (Fremersdorf 1967, taf 54, 55, 57, and 67). In particular, a deep hemispherical bowl found in Cologne has a very similar arrangement of a triangular motif containing a vertical rice grain facet, in association with circular facets (Fremersdorf 1967, taf 69). No 14, which has a pale greenish tinge, has a similar form of decoration to No 13, showing linear cutting, and rice grain and circular facets. This fragment can also be compared to bowls found at York (Harden 1962, 137, fig 88 HG 162) and Verulamium (mentioned above), and with vessels from elsewhere in the north-west provinces, including examples from Cologne (Fremersdorf 1967, taf 66 and 103) and Meuspfad (Fremersdorf 1967, taf 61).

The most unusual of these facet-cut fragments is No 12. Nearly the whole profile of this deep, convex, thick-walled bowl is preserved except for the edge of the out turned rim and the centre base. The upper body of the vessel is decorated with one horizontal rice grain facet above a deep horizontal wheel-cut line. On the middle and lower sections of the body are two rows of large circular facets. Circular facets are quite commonly used as the principal form of decoration on bowls, as on examples from Colchester (Hull 1958, 79, fig 35 no 1) and Verulamium (Charlesworth 1984, 154, no 84 fig 632 no 36). These very large facets are very much rarer, and parallels from Roman Britain have not been found.

The use of large circular facets can be seen in several traditions of facet cutting. These include cups and bowls from fifth-century Scandinavia (Fremersdorf 1967, taf 36–7, 50, 52–3) as well as vessels from within the Roman Empire. However, the high quality of the glass of the Birdoswald bowl, as well as the form and the use of rice grain facets, place this piece firmly within the Roman tradition, and bowls of similar shape and design are found among third- and early fourth-century vessels from Cologne. A thin-walled greenish colourless deep bowl found in Neusser Strasse, Cologne also has horizontal rice grain facets below the rim (Fremersdorf 1967, taf 46) and a further close parallel from Luxemburger Strasse, Cologne, also greenish colourless, appears to have quite thick walls as well as a similarly deep wheel-cut line below the rim (Fremersdorf 1967, taf 51). The final facet cut fragment, No 15, has part of a wide circular facet. The thickness of the wall on this fragment suggests that it comes from very low on the vessel, which was possibly similar in form and design to No 12.

Second- and third-century blue/green vessels have been divided into two main groups: cups, bowls, and jugs are intended as tableware, whereas jars, flasks, and bottles are intended as containers. Several bases, which cannot be firmly identified, may also come from general household containers.

Only three blue/green cups or bowls were firmly distinguished. No 32 is a cylindrical cup or bowl with an out turned fire-rounded rim from a fourth century context. The form of the rim possibly relates the vessel to the colourless bowls found at Hauxton, mentioned in connection with Nos 6–8 above, although blue/green out turned fire-rounded rims have been found on third and fourth century vessels at Silchester (Boon 1974, 239, fig 36 no 7), Frocester Court villa (Price 1979, 43, no 27 fig 17), and Portchester (Harden 1975, 369, no 7 fig 197).

Nos 33–4 have vertical fire-rounded rims, and are very probably from vessels similar in form to the colourless cylindrical cups discussed above in connection with Nos 5, 14–17 and 21–3. Examples in blue/green glass are less common than the colourless vessels, but are known from Vindolanda (Price 1985, 209, nos 23–6 fig 77), Carlisle (Price 1990, 163, MF2/73 no 41), Stonea (Jackson and Potter 1996), and elsewhere.

The number of fragments from jugs and flasks found at Birdoswald is notable. In addition to the five blue/green jugs discussed above (Nos 50–3 and 55), there is a spouted jug, a jug with trails, and five fragments from different handles.

No 48 is part of the rim, neck, and handle of a jug decorated with narrow blue/green horizontal trails around the neck. The body of the vessel may also have had trail decoration, similar to that on a jug from Verulamium (Charlesworth 1972, 204, fig 76 no 24). The division of the handle attachment into two strands suggests that the vessel had a chain handle. A second fragment from Birdoswald (No 58) also comes from this form of handle, though probably not from the same vessel. Blue/green and colourless chain handles were quite popular in Roman Britain and elsewhere in the north-west provinces. Isings associates two jug forms with chain handles, a later second to third century spouted jug and a third- to fourth-century ovoid jug (Isings 1957, forms 88c and 120c). In Britain they are known on ovoid and globular jugs, although well-preserved jugs with these handles are comparatively rare. Blue/green ovoid jugs with chain handles are known from Colchester (Thorpe 1935, 17, pl VI, d) and Bucknowle Farm, Dorset (unpublished), and a colourless globular jug was found at Kingsbury, St Albans (unpublished). Other examples include a funnel mouth jug decorated with trails from Piercebridge, parts of blue/green handles from Westgate, Gloucester, the Parks, Lincoln (unpublished), and many other fragments.

No 49 comes from a jug with a pouring spout. These vessels were made in colourless, strongly coloured and, more usually, blue/green glass. Several slightly different forms have been recognised, but all have a globular or discoid body. The spout was formed either by pinching in the rolled-in rim, or by pulling it out at one end. Jugs with pouring spouts are quite commonly found on Romano-British sites, and elsewhere in the north-west provinces, from the later first to the third century. They can be plain, or decorated with trails or ribs. The handle on No 49 is sited opposite the spout, as on a jug from Skeleton Green, buried with a coin of Antoninus Pius (Charlesworth 1981, 271 B XXXV b, fig 106 no 11), two jugs from Bath (Scarth 1864, pl XLIV), and another from Verulamium (Charlesworth 1984, 166 no 245, fig 67 no 104). It is possible that No 48 also comes from a jug with a pouring spout on which the handle appears to be at a right angle to the spout, a feature found on a jug from Colchester (May 1930, 278, 91 no 229, pl LXXXVI). Five fragments from the same vessel, No 54, may also come from a jug with a pouring spout.

The handle fragments Nos 56–7 and 59 represent three different blue/green jugs. Only the form of No 56 can be reconstructed, a wide ribbon handle with a least three shallow ribs pulled down onto the shoulder of the vessel.

Two joining rim fragments (No 63) come from a small vessel with a very narrow curved handle below the rim. Part of the rim edge is broken on the side opposite the surviving handle so no trace of a possible second handle remains. The vessel may have been a bath flask, with a folded rim, short cylindrical neck, globular body, concave base, and two looped handles. The base fragment No 64 probably comes from a similar vessel.

Globular bath flasks were commonly used in many parts of the Roman world as containers for bath oils in the later first to third centuries (Isings 1957, form 61). Examples from Britain were made both in blue/green and colourless glass, and several different rim and handle forms are known. The very thin handles on this example suggest a second century or later date. A large group of flasks, including several blue/green examples, was found at the legionary bath-house at Caerleon (Allen 1986, 105 nos 32–42). Complete vessels are known from Corbridge (Forster 1908, 297 fig 30) and from a second-century burial at Ospringe (Whiting 1926, 123 XL, no 141 pl XVI).

One decorated body fragment is worth detailed comment (No 70). It comes from a slightly convex-sided blue/green vessel, with a thick irregular blue/green trail, scored diagonally across in the manner of snake thread decoration. Snake thread decorated vessels have often been found in burials in Cologne (eg Fremersdorf 1959, passim), and they were probably made somewhere nearby in the lower Rhineland during the late second and early third centuries. Fragments of snake thread glass have been found on several sites in Roman Britain, although no intact vessels are known. The trails are often brightly coloured, usually blue or yellow, and applied to colourless vessels, although colourless trails are also common. No 70 is broadly comparable with a colourless fragment with broad trails from Chichester (Charlesworth 1978, 269 no 27 fig 10.22), though blue/green vessels decorated with snake thread trails have not often been recorded.

Five base fragments from vessels with concave bases cannot be positively identified (Nos 65–9). They may belong to jars, jugs, or flasks of first- to third-century date. One of the bases (no 66) has a pontil scar, indicating that it was held on the pontil while the rim was worked or fire-rounded, or while a handle or hot decoration was added to the body.

Little late Roman glass was found at Birdoswald. Twenty-one fragments, representing a minimum of 7 individual vessels, date from the fourth century (about 5% of the assemblage).

Three fragments (Nos 72–74) come from conical beakers with cracked-off rims, straight sided bodies, and concave bases. Conical beakers are one of the most common fourth-century drinking vessels, appearing on a wide range of late Roman sites in Britain and elsewhere in the Roman world (Isings 1957, form 106). Four vessels were found in the fourth-century cemetery at Lankhills, Winchester (Harden 1979, fig 27 nos 382, 391, 530, and 634), and examples are known from Silchester (Boon 1974, fig 36, no 8), Portchester Castle (Harden 1975, 371 nos 11 and 12), Towcester (Price and Cool 1983, 120–2, nos 30–4, fig 47), and elsewhere.

One fragment (No 71) is from a yellow/green bowl with a cracked-off rim, decorated with horizontal abraded bands below the rim and indents on the main area of the body. Conical and segmental bowls, with or without indents, are very commonly found on late Roman sites. In Britain examples are known from a variety of sites, including the villas of Barton Court Farm, Abingdon (Price 1986, MF6:A9 no 3 fig 117) and Hucclecote, Gloucestershire (Clifford 1933, 334, fig 10), and at military sites such as Portchester Castle (Harden 1975, 369 no 1 fig 197) and in the north, at Vindolanda (Price 1985, 210 no 34).

Fifteen fragments (No 75) come from rim and neck of a late Roman bottle of good quality pale green glass. The vessel had a collar rim, a funnel mouth, and at least one handle. The cylindrical body may have been tall and narrow (Isings 1957, form 127), or slightly wider and shorter (Isings 1957, form 126). Both forms are known with either one or two handles, and quite commonly a thick horizontal trail below the rim, as on a bottle from Strasbourg (Arveiller-Dulong and Arveiller 1985, 169, 93 no 372). They were probably used as storage vessels for liquids, although the occurrence of decoration on some bottles from Cologne, Trier, and elsewhere in the Rhineland indicates that they were also used as tableware (Fremersdorf 1967, taf 152–62). Cylindrical bottles are quite frequently found on late Roman sites in Britain and elsewhere in the north-west provinces. In Britain examples have been found in late Roman graves at Lankhills, Winchester (Harden 1979, 219, no 549, fig 27) and at the Butt Road cemetery, Colchester (Cool and Price 1995, 201–3, fig 11.15, no 2257).

Nearly half the vessel fragments come from blue/green bottles. All but one of the fragments are certainly from first- to second-century bottles and the majority of these, on the evidence of the base and body fragments, are square.

No 76, however, is a body fragment from a small mould-blown cylindrical bottle with four horizontal corrugations. It comes from a distinctive and apparently long-lived vessel type found in the north-west provinces. These are usually called Frontinus bottles, on account of the name often found in raised relief on the base of the bottle. The complete vessel would have a folded rim, sometimes with a slightly funnel mouth, a narrow cylindrical neck, a cylindrical body decorated with two bands of horizontal corrugations, a concave base often with an inscription in a ring, and one or two angular handles (Isings 1957, forms 89 and 128).

The earliest mould-blown cylindrical bottles of this form date from either the late first century or the very first years of the second century, as at Nijmegen (Isings 1957, 107), and the vessel form is also common in the third and fourth centuries.

The earlier vessels are generally blue/green, while later bottles tend to be greenish in colour. The strong blue/green of the Birdoswald vessel suggests a second- to third-century date.

These bottles have often been found in Britain, particularly from late Roman sites, and fragments include two bottles from Dover (unpublished), a base from Silchester (Boon 1974, fig 36 no 13), a fragment from Coventina's Well, Carrawburgh (Allason-Jones and McKay 1985, 39 no 133 and fig), Vindolanda (Price 1985, 213 no 51 fig 78), Towcester (Price and Cool 1983, 123–4 nos 57–60, fig 48), and elsewhere. Complete vessels are known from the Butt Road cemetery, Colchester (Cool and Price 1995, 204–6, fig 11.17 no 2259), Milton-next-Sittingbourne, Kent (Thorpe 1935, pl II, b), and Faversham (Harden *et al* 1968, 62 no 79).

The most numerous single vessel type at Birdoswald is the blue/green prismatic bottle. Only square or rectangular bottles can be identified positively, and there are at least eleven examples of these forms. The actual number is however likely to be very much greater in view of the amount of prismatic body fragments.

Prismatic bottles are usually the commonest glass vessels on occupation sites of the first and second centuries. They were used as containers for liquids or semi-liquids and were produced in a range of sizes. Some are tall and narrow, such as bottles from Silchester (Boon 1974, fig 36 no 10) and Coventina's Well, Carrawburgh (Allason-Jones and McKay 1985, 39 no 131 and fig), and some are shorter and wider, for example a bottle from Carlisle (*JBAA* 1864, 84, pl 4 no 3). The range in rim diameters from Birdoswald (44–80mm) suggests that a broad range of vessel sizes is represented to contain a variety of substances.

The bodies and bases of prismatic bottles were almost always blown in a mould. The folded rim was turned out, up, in, and flattened. An angular handle was applied to the shoulder and attached to the neck below the rim. The handle is often reeded and pulled down into points on the shoulder (Nos 90–94), although some are ribbed (eg No 95) and some plain (eg Nos 96–7). Vertical scratch marks on the side of many of the vessels (eg No 99) suggest that they were lifted in and out of tight fitting crates of wood or basketry.

The bases of prismatic bottles are nearly always decorated with designs, carved into the base of the mould and thus appearing in relief. Concentric circles, the commonest motif, were probably used to strengthen the vessel base. Some designs are more complex, involving geometric motifs, letters, or occasionally pictures.

Three from Birdoswald deserve further attention. The first, No 98, has a complex geometric design of arcs converging at the corners of the base, joined by short cross bars. Close to the corner is a small raised pellet, possibly to steady the vessel. A bottle with a base design identical in shape and size was found at Colchester (Cool and Price 1995, 194–5, fig 11.9, no 2153). Like the Birdoswald vessel, this had a circular pontil mark at the centre of the base.

No 107 has the remains of two letters, a capital I, and one diagonal bar of an A (or an inverted V). The size and arrangement of these two letters are identical to that on complete bases from Antonine pits at Alcester (Price and Cottam 1994, 225, fig 105, no 25; RIB, 2419.144) and Towcester (Price 1980, 66–8 no 16, fig 16; RIB 2419.146). Two further base designs can be compared to the Birdoswald bottle. A small incomplete vessel from Usk has the moulding **\ I** between L-shaped corner pellets (RIB 2419.146) and a bottle from Cramond has the letters **S Λ I** in retrograde (RIB 2419.143).

The most distinctive base moulding from Birdoswald (No 111) shows a leaf-like motif, possibly a palm frond, at one side of three concentric circles. No exact parallel has been found from Roman Britain, although a similar motif, comes from a base found at Colchester (Cool and Price 1995, 199, fig 11.12, no 2205). Two bases found at Straubing on the Danube also have palm fronds beside concentric circles (Walke 1965, 144 taf 77 nos 9–10).

The excavations also produced 50 fragments from cast window panes and three from blown panes. Of the cast fragments, 46 were blue/green and four pale green. They come from contexts ranging across the excavated area, but there is a noticeable concentration of window fragments in the north-west corner of the fort and an apparent absence of fragments from the most southerly building excavated.

Cast window panes were commonly used in the first to third centuries, and many probably survived throughout the fourth century. They were produced by pouring molten glass into a tray, leaving a pane with the characteristic rough grainy texture on one side and a smooth glossy upper side (Boon 1966, 43–4). The molten glass was pushed into the corners and edges of the tray, leaving tooling marks on the upper surface which can be seen on the blue/green corner fragment from Birdoswald.

Only three blue/green fragments of fourth-century blown window glass were found. This type of window pane was formed by cutting along the length of a cylinder of glass which was then opened out to form a flat sheet.

Catalogue of the Roman glass

Cast vessels

Colourless

1. 217 Ditch Phase d/Period 4a (Fig 248)
Rim and upper body fragment, bowl. Very pale greenish tinge. Rounded rim edge, straight-sided upper body, tapering in slightly. Interior and exterior surfaces ground. Little surface weathering. Many strain cracks.
Present height 22mm; rim diameter *c* 200mm; thickness 2–4.5mm.

2. 2947 Bld 4401/unstrat (Fig 248)
Lower body and base fragment, plate or bowl. Trace of horizontal lower body. High, straight-sided base ring, tapering out slightly. All surfaces ground. Dull.
Present height 20mm; base diameter *c* 100mm; thickness 3–5mm.

Blown vessels

strongly coloured

3. 792 1290 Area C/unstrat (Fig 248)
Base fragment. Deep yellow/green. Bowl. Trace of flat lower body, applied pad base, low diagonal base ring, edge worn. Little surface weathering. Many strain cracks.
Present height 12.5mm; base diameter *c* 55mm; thickness 3.7–5.5mm.

4. 635 77 Bld 197/Phe/Floor layer/ Period 5 (Fig 248)
Base fragment. Yellow/brown. Tubular base ring, concave base with central kick. Junction with lower body grosed. Base edge worn. Bubbly, strain cracks.
Present height 19.5mm; base diamerer 62mm; thickness 2.5–4mm.

Also one yellow/brown body fragment

Colourless

polychrome decoration

5. 1475 Area rubble/Period 6–11 (Fig 248)
Three rim fragments, two joining, cup. Vertical rim, edge fire-rounded. Horizontal row of painted dots below rim. Parts of five dots surviving, in two groups: white, green, and red; yellow and blue.
Present height 15.3mm; thickness 4–6mm.

trails

6. 237 Bld 197/Phe/dump/Period 5 (Fig 248)
Rim and upper body fragment, cup. Greenish tinge. Nearly horizontal rim, edge fire-rounded, sloping in towards upper body. Narrow horizontal trail below rim. Rim edge worn. Occasional small bubbles. Dull.
Present height 12mm; rim diameter 130mm; thickness 1–3.5mm.

7. 237 Bld 197/Phe/dump/Period 5
Rim fragment, cup/bowl. Outsplayed rim, edge fire-rounded. Narrow horizontal trail below rim. Rim edge worn.
Present height 12mm; rim diameter 140–160mm.

8. 237 Bld 197/Phe/dump/Period 5
Rim fragment, cup/bowl. Outsplayed rim, edge fire-rounded. Narrow horizontal trail below rim.
Present height 13mm; thickness 1.2–3.5mm.

9. 2628 Bld 4401/Phd/Period 4b
Body fragment, ?cup. Greenish tinge. Straight-sided upper body, turning out slightly below rim. Narrow horizontal trail.
Present height 15mm; thickness 0.8–1.8mm.

indented and cut

10. 1520 Bld 198/Phe/dump/Period 5
Eight body fragments, two joining, cup. Upper body turning out below rim (missing). Vertical body with parts of at least two indents. Two horizontal abraded bands below rim and above indents. Patches of cloudy weathering.
Present height 52mm (2 joining frags); thickness 0.8–3mm.

cut

11. 1504 Area A/Rubble/Period 7–11 (Fig 248)
Body and base fragment, conical cup. Straight side tapering in to diagonal foot, flat base. Outside surface cut away, leaving a shallow horizontal ridge on upper body, a raised decorated zone, a high horizontal ridge on lower body and a diagonal foot. Decorated zone has three rows of oval facets set in quincunx to form diamonds. Small, shallow, oval facets set between larger ones on top row. Horizontal polishing marks on outside surface, vertical polishing marks in facets. Occasional small bubbles. Outside surface lightly pitted, strain cracks.
Present height 70mm; base diameter *c* 45mm; thickness 3–6mm.

12. 1342 Area A/unstrat
Body fragment, bowl. Straight-sided upper body, turning out slightly below rim. Convex lower body, tapering in. One horizontal rice-grain facet above deep horizontal wheel cut line. Parts of four large circular facets, in two horizontal and vertical rows. Surface pitted, strain cracks, heavy vertical and horizontal scratching.
Present height 67.5mm; thickness 3.2–5.2mm.

13. 1 Area A/topsoil (Fig 248)
Two body fragments. Greenish tinge. Thick walled, convex body. Wheel and facet-cut: rice-grain facet in triangular area formed by parts of three deep wheel-cut circles, one containing part of circular facet: rice-grain facet in triangular area formed by parts of three deep wheel-cut circles. Surface scratched. Small bubbles. Strain cracks.
Dimensions 20.5 x 27mm; thickness 2.5–5.5; 20.3 x 26mm; thickness 3.5–5.7mm.

14. 205 Area A (Fig 248)
Body fragment. Convex body. Part of large circular facet, with parts of three long diagonal rice-grain facets to one side. ?Horizontal wheel-cut line, part of V-shaped cut design. Pitted, strain cracks.
Dimensions 23 x 23.4mm; thickness 1.7–3.2mm.

15. 1 Area A/topsoil
Body fragment. Very thick slightly convex wall. Part of large circular facet. Surface worn.
Dimensions 14.2 x 22mm; thickness 8.2–10.5mm.

16. 2947 Bld 4401/unstrat (Fig 248)
Rim and upper body fragment, cup/bowl. Vertical rim, edge fire-rounded. Upper body expanding out.
Present height 16mm; rim diameter *c* 80mm; thickness 1–3mm.

17. 1387 W Berm/Period 4b–5
Rim and upper body fragment, cup. Greenish tinge. Vertical rim, edge fire-rounded. Straight-sided upper body, tapering in slightly.
Present height 25mm; rim diameter 120mm; thickness 1.7–3.7mm.

18. 577 84 Bld 197/Phe/Floor layer/Period 5
Rim and upper body fragment, cup. Greenish tinge. Vertical rim, edge fire-rounded. Straight-sided upper body, tapering in slightly. Occasional small bubbles.
Present height 18.5mm; rim diameter *c* 90mm; thickness 1–3mm.

19. 2674 Area A/unstrat
Three joining fragments, rim and body, cup. Vertical rim, edge fire-rounded. Straight-sided body, tapering in slightly.
Present height 25mm; rim diameter *c* 80mm; thickness 1.2–3.7mm.

20. 1459 PPS/ST/Period 4a
Five fragments, joining in two groups, rim and body, cup. Vertical rim, edge fire-rounded. Straight-sided upper body. Many strain cracks.
Present height 18.5mm; thickness 1.5–2.7mm.

21. 236 Bld 197/Phe/dump/Period 5 (Fig 248)
Base fragment, cup/bowl. Trace of lower body tapering in. High, narrow, vertical, tubular base.
Present height 18mm; base diameter *c* 75mm; thickness 2–3.8mm.

22. 69 88 Area B/Period 7–11
Base fragment, cup. Trace of lower body tapering in. High, narrow, vertical, tubular base.
Present height 20mm; base diameter *c* 75mm; thickness 2–3.5mm.

23. 101 89 Area B/Period 7–11
Lower body and base fragment, ?cup. Part of lower body tapering in to low applied base ring, edge rounded and worn.
Present height 3.1mm; base diameter 35mm; thickness 1–1.5mm.

24. 2590 Area A/unstrat (Fig 248)
Base fragment, cup. Part of tubular pushed-in base ring, slightly concave base. Central trailed coil ring with pontil scar. Small bubbles. Strain cracks.
Present height 8mm; base diameter 42mm; thickness 1.3–7.5mm.

25. 1764 Area D/topsoil
Base fragment, cup. Slightly concave base, edge missing. Complete central trailed coil ring with pontil scar. Small bubbles. Edge worn.
Present height 7mm; diameter (trail) 4.5–5.mm; thickness 2mm.

26. 846 1338 Area A/Rubble/Period 8–11
Base fragment, cup. Flat centre base, edge missing. Complete trailed coil ring with small pontil scar. Broken edges neatly grosed. Occasional small bubbles. Ring edge worn.
Present height 6mm; diameter (trail) 24mm; thickness 2.5mm.

27. 566 85 Bld 197/Phe/dump/Period 5
Base fragment, ?cup/bowl. Trace of lower body. Slightly concave base. Low applied base ring, edge of inner ring. Many strain cracks.
Present height 8.5mm; base diameter *c* 60mm; thickness 2.5–6.5mm.

Jugs/flasks/bottles

28. 205 Area A/unstrat
Neck fragment. Part of lower cylindrical neck, tapering in slightly to constriction. Trace of shoulder. Tooling marks. Elongated bubbles.
Present height 14.5mm; thickness 3.5mm.

29. 2660 ViaS/Period 5–7
Shoulder fragment, flask/bottle. Horizontal shoulder, thickening slightly towards neck. Trace of cylindrical upper body.
Present height 7mm; thickness 1.3–2.5mm.

Decorated body fragments

30. 7 Area A/topsoil
Body fragment. Conical lower body, tapering in. Two close-set horizontal abraded lines. Light scratches.
Present height 14mm; thickness 2.5–4.5mm.

31. 2628 Bld 4401/Phd/Period 4b
Body fragment. Straight-sided body. Eleven narrow, close set horizontal abraded bands. Light vertical scratches.
Present height 26mm; diameter *c* 160mm; thickness 1.2mm.

Also three pale green body fragments

Blue/green

Cups and bowls

32. 1418 Bld 197/Phe/dump/Period 5 (Fig 248)
Fifteen rim and body fragments, 13 joined in 3 pieces, cup. Out-turned rim, edge fire-rounded, convex body.
Present height (3 fragments) 40mm; rim diameter 100mm; thickness 1–2mm.

33. 1875 Area D/unstrat
Rim and body fragment, cup. Vertical rim, edge fire-rounded. Straight-sided upper body. Rim edge worn.
Present height 15.2mm; rim diameter 80mm; thickness 1.5–3.5mm.

34. 2649 BLd 2613/interior/Period 6
Rim and body fragment, cup. Vertical rim, edge fire-rounded. Straight-sided upper body. Rim edge worn.
Present height 10.5mm; thickness 2–3.3mm.

35. 1459 PPS/ST/Period 4a (Fig 248)
Rim and body fragment, cylindrical bowl. Vertical tubular rim, edge bent out and down and in. Straight-sided upper body. Shallow horizontal marvered trail below rim. Small elongated bubbles, aligned horizontally.
Present height 29.7mm; rim diameter 165mm; thickness 1.7–2.2mm.

36. 1331 Area A/Period 9–11
Rim fragment, bowl. Tubular rim, edge bent out and down and in. Rim edge worn.
Present height 8.2mm; rim diameter *c* 170mm.

37. 1 Area A/Topsoil
Rim fragment, bowl. Slightly in-turned tubular rim, edge bent out and down and in. Rim edge slightly worn. Small bubbles.
Present height 11.5mm; rim diameter 120mm; thickness 0.8mm.

38. 237 Bld 197/Phe/dump/Period 5
Rim fragment, bowl. Slightly in-turned tubular rim, edge bent out down and in. Rim edge slightly worn. Small bubbles.
Present height 11.7mm; rim diameter 120mm; thickness 0.8mm.

39. 101 Bld 197/Phe/Floor layer/Period 5
Rim fragment, bowl. Slightly in-turned tubular rim, edge bent out and down and in. Rim edge slightly worn. Small bubbles.
Present height 10.5mm; rim diameter 120mm; thickness 0.8mm.

40. 120 85/207 Bld 197/Phe/Floor layer/Period 5
Rim fragment, bowl. Slightly in-turned tubular rim, edge bent out and down and in. Rim edge slightly worn. Small bubbles.
Present height 7.5mm; rim diameter 120mm; thickness 1mm.

41. 237 Bld 197/Phe/dump/Period 5
Rim fragment, bowl. Slightly in-turned tubular rim, edge missing, bent out and down and in. Rim edge slightly worn. Small bubbles.
Present height 8mm; thickness 1mm.

42. 205 Area A/unstrat
Base fragment, ?bowl. Trace of horizontal lower body, tubular pushed-in base ring. Outside edge grosed

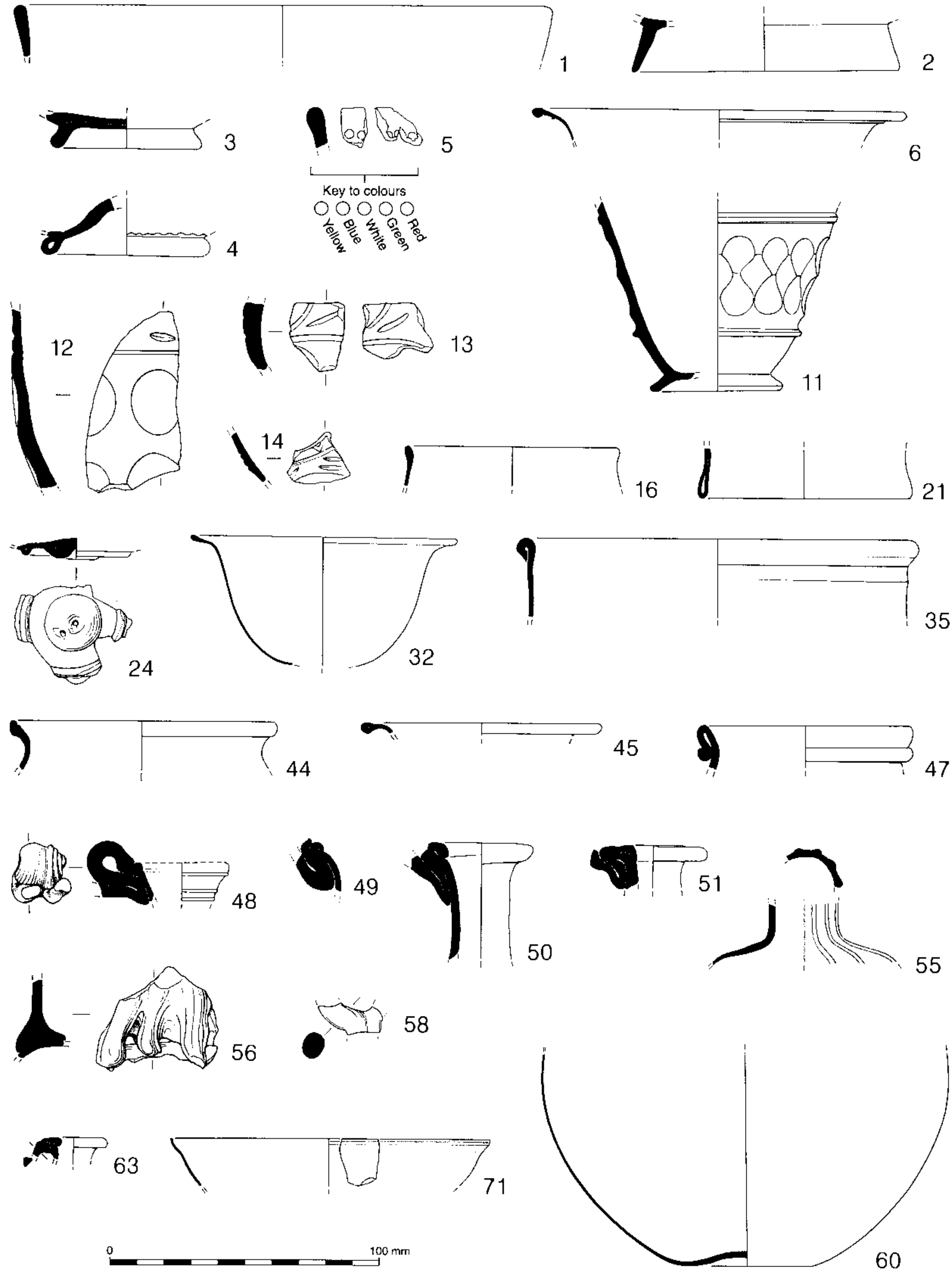


Fig 248 Romano-British glass (scale 1:2)

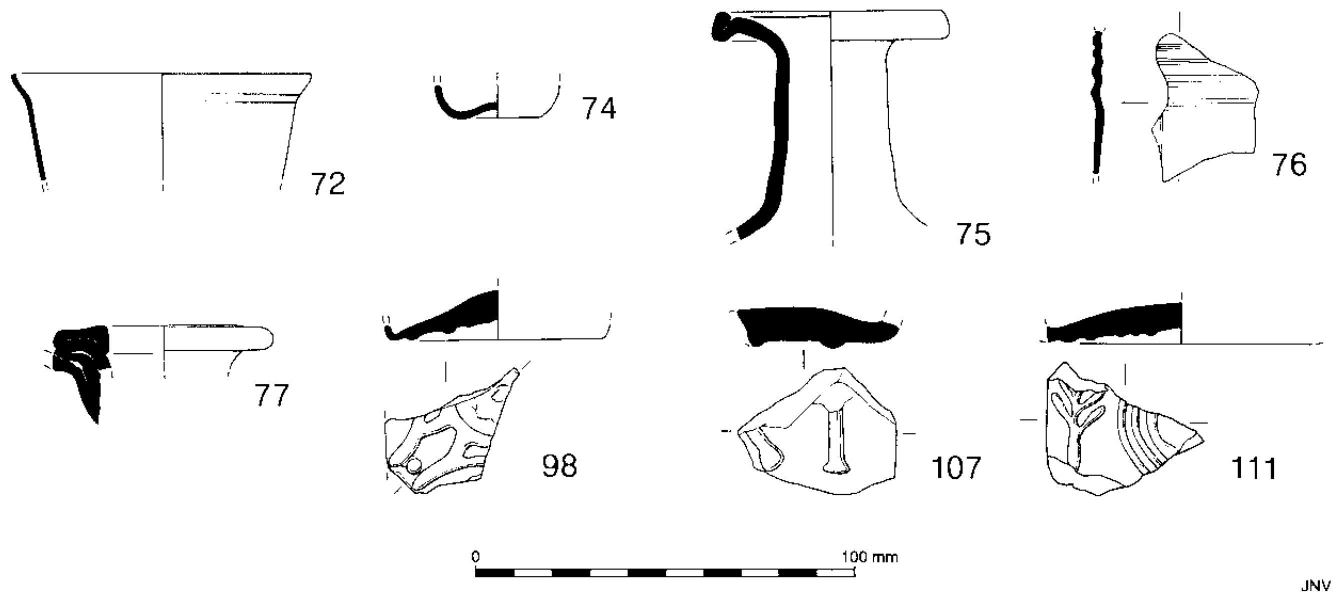


Fig 249 Romano-British glass (scale 1:2)

and ground smooth. Ring of wear on underside of base.
Present height 8.5mm; base diameter 64mm.

43. 1 Area A/Topsoil
Base fragment, ?cup/bowl. Tubular pushed-in base ring, concave base with central kick. Broken edge of body worked smooth. Heavy wear on all surfaces of base ring.
Present height 11mm; base diameter 50mm; thickness 4.5–6mm.

Jars

44. 1416 Bld 198/Phe/dump/Period 5 (Fig 248)
Rim and upper body fragment. Out-turned rim, edge fire-rounded and thickened, tapering in to constriction. Part of upper body expanding out. Small elongated bubbles aligned parallel to rim.
Present height 18mm; rim diameter 90mm; thickness 1.8–4.5mm.

45. 1336 Area A/Rubble/Period 7–11 (Fig 248)
Rim fragment. Horizontal outsplayed rim, edge rolled in and smoothed, tapering in to constriction. Bubbly.
Present height 5mm; rim diameter 90mm; thickness 1.5mm.

46. 1443 Area A/Period 7–9 (Fig 248)
Rim fragment. Very pale. Vertical tubular rim, edge rolled in then bent out and down. Trace of upper body tapering out.
Present height 13mm; rim diameter *c* 60mm; thickness 3–5mm.

47. 7 Area A/Topsoil
Rim fragment. Vertical collar rim, edge rolled in, then bent out and down to form tubular rim. Trace of upper body expanding out. Some bubbles. Rim edge heavily worn.
Present height 16mm; rim diameter 82mm; thickness 3–3.5mm.

Also one upper body fragment

Jugs/flasks

48. 2887 ViaP/surface 2/Period 4b (Fig 248)
Rim, neck, and handle fragment, jug. Rim edge folded in and down. Funnel mouth tapering in to cylindrical neck. Looped upper handle attachment, dividing into two on lower loop to form ?chain handle. Parts of three narrow unmarvered horizontal trails around mouth.
Present height 21mm; thickness 2.7mm.

49. 2628 Bld 4401/Phd/Period 4b (Fig 248)
Rim, neck, and handle fragment of jug with pouring spout? Rim edge rolled in and down unevenly. Funnel mouth tapering in to cylindrical neck. Part of upper folded handle attachment, top edge missing. Trace of narrow strap handle. Yellow/brown streaks and black specks. Small and medium bubbles, some elongated. Rim worn.
Present height 21.5mm; rim diameter *c* 38mm; thickness 2–4mm.

50. 801 1314 Area A/Rubble/Period 7–11 (Fig 248)
Rim, neck, and handle fragment, jug. Complete irregular folded rim, edge bent out, up, in, and flattened. Cylindrical neck, folded upper handle attachment below rim, ribbon handle. Streaks of small bubbles, elongated in neck. Occasional black specks. Tooling marks on inside surface of neck below rim.
Present height 46mm; rim diameter 40–41.5mm; thickness 3–3.5mm.

51. 1602 BLd 4406/Period 7 (Fig 248)
Rim, neck, and handle fragment, jug. Wide horizontal folded rim, edge bent out, up, in, and flattened. Narrow cylindrical neck, folded upper handle attachment below rim, top edge missing.
Present height 19.2mm; rim diameter 40mm; diameter aperture 14mm; thickness 4mm.

52. 1520 Bld 198/Phe/dump/Period 5
Rim and neck fragment, jug/flask. Horizontal folded rim, edge bent out, up, in, and flattened. Cylindrical neck. Rim edge worn.
Present height 8.7mm; rim diameter 36mm; thickness 3mm.

53. 348 Bld 197/Phe/dump/Period 5
Rim fragment, jug/flask. Narrow horizontal folded rim, edge bent out, up, in, and flattened. Trace of cylindrical neck.
Present height 6.3mm; rim diameter 40mm.

54. 1431 1455 Area A/Period 7–9
Five fragments, three joining, rim and neck, jug/flask ?with pouring spout. Irregular rim, edge rolled in. Funnel mouth, tapering in to wide cylindrical neck. Elongated bubbles, black specks.
Present height 27mm; thickness 1.5–2.5mm.
Also one folded rim fragment.

55. 2887 ViaP/Surface 1/Period 4b
Neck and shoulder fragment, jug/flask. Cylindrical neck, wide, slightly convex shoulder and upper body. Five narrow vertical ribs on neck and shoulder, fading slightly on one part of lower neck. Small bubbles, elongated in neck.
Present height 19mm; thickness 1–3mm.

Also three cylindrical neck fragments and one shoulder fragment.

56. 1742 Ditch Phase f/Period 4b (Fig 248)
Two joining handle and shoulder fragments, jug or bottle. Lower part of broad ribbon handle with three rounded ribs, pulled down onto convex shoulder, expanding out.
Present height 36mm; thickness 1.5–11mm.

57. 1567 Area A/Rubble/Period 7–9
Handle and shoulder fragment, jug. Lower part of narrow strap handle with central trail, applied to part of shoulder. Heat distorted.

58. 204 Area A/Topsoil (Fig 248)
Handle fragment, jug. Junction of two loops of chain handle. Surfaces very worn.
Present height 12mm; thickness 10–11.5mm.

59. 1641 Ditch Phase e/Period 4b
Handle fragment, jug or bottle. One edge of broad ribbon handle. One vertical irregular rib near edge of handle. Yellow/brown streaks, many elongated bubbles.
Present height 18.5mm; thickness 5.5–10mm.

Also four handle fragments, jugs

60. 1500 Ditch Phase f/Period 4b (Fig 248)
48 body and base fragments, 25 joining in 5 groups, jug/flask. Wide, convex lower body, tapering in to slightly concave base. Very bubbly, some cloudy streaks and black specks.
Present height (base and lower body) 49mm; base diameter 44mm; thickness 1–1.5mm.

61. 1 Area A/Topsoil
Lower body and base fragment, ?jug/flask. Convex lower body, tapering in to slightly concave base. Base edge worn. One large bubble, many small bubbles.
Present height 9mm; thickness 1.5–2.5mm.

62. 245 Bld 197/Phe/dump/Period 5
Five fragments, body and base ?jug/flask. Convex body, tapering out to slightly concave base. Small bubbles.
Dimensions (largest fragment) 27.5 x 16.3mm; thickness 1–2mm.

Bath flasks

63. 1388 1517 Bld 198/Phe/dump/Period 5 (Fig 248)
Two joining rim fragments, bath flask. Nearly complete horizontal folded rim, edge bent out, up, in, and flattened. Narrow cylindrical neck. Part of narrow upper handle attachment on underside of rim and neck.
Present height 7.5mm; rim diameter 25.5mm; thickness 1.5mm.

64. 1552 Area C/unstrat
Lower body and base fragment, ?bath flask. Trace of convex lower body curving in to small flat base. Circular pontil scar.
Dimensions 11 x 20mm; thickness 1.4–2.8mm.

Unidentified base fragments

65. 1577 PPS/Posthole/Period 6
Lower body and base fragment. Part of convex lower body curving in to slightly concave base. Occasional bubbles.
Dimensions 11 x 19mm; thickness 1–1.5mm.

66. 304 Bld 197/Phe/dump/Period 5
Base fragment. Flat base, ?trace of base ring. Circular pontil scar in centre of base. Two edges re-worked.
Dimensions 16 x 17.2mm; thickness 1.5–4mm.

67. 1705 Bld 198/Phd/dump/Period 5
Base fragment. High concave base. Bubbly.
Present height 13.5mm; thickness 3.5–4.5mm.

68. 1338 Area A/Rubble/Period 7–11
Base fragment. Concave base. Tiny bubbles.
Dimensions 18.2 x 18.5mm.

69. 1516 Bld 198/Phe/dump/Period 5
Base fragment. High concave base, thickening towards centre.
Dimensions 24 x 18mm; thickness 2.3–4.7mm.

Blue/green body fragments

decorated

70. 1544
Body fragment. Slightly convex. Thick self-coloured irregular trail, scored across five times. Small bubbles, elongated in trail.
Dimensions 16 x 17.5mm; thickness 0.8–3.5mm.

Also five blue/green decorated, and 15 undecorated body fragments.

Late Roman glass

71. 1390 Ditch Phase f/Period 4b (Fig 248)
Rim and body fragment, shallow bowl. Yellow/green. Small curved rim, edge cracked-off, slightly convex upper body tapering in. Trace of upper part of one indent. Light horizontal abrasion at rim, two bands of horizontal abrasion below rim.
Present height 23mm; rim diameter *c* 120mm; thickness 1.2mm.

72. 15 Area A/Pit/Period 11 (Fig 249)
Rim and body fragment, conical beaker. Pale green. Small curved rim, edge cracked-off. Straight-sided upper body tapering in. Two narrow horizontal bands of abrasion below rim. Small bubbles.
Present height 27.8mm; rim diameter *c* 80mm; thickness 1.7mm.

73. 2947 Bld 4406/Period 7
Lower body and base fragment, beaker. Greenish colourless. Straight-sided lower body tapering in to small concave base with pointed central kick. Base edge worn.
Present height 12.5mm; base diameter 16mm; thickness 2–4.3mm.

74. 68 Bld 197/Phe/Floor layer/Period 5 (Fig 249)
Lower body and base fragment, beaker. Greenish colourless. Straight-sided lower body, tapering in to concave base. Light scratches. Tiny bubbles.
Present height 9mm; base diameter 21mm; thickness 1.7–2.5mm.

75. 2786 Bld 4406/Period 7 (Fig 249)
15 rim, neck, and shoulder fragments, 13 joining, jug or bottle. Pale green. Wide rim, irregular vertical edge folded down, out, and up, funnel mouth tapering in. Cylindrical neck, expanding out slightly to junction with shoulder. Trace of handle scar below rim. Tooling marks at base of neck. Elongated bubbles.
Present height 60mm; rim diameter 57.3–59.2mm.

Also one convex, lower body fragment

Blue-green bottles

decorated

76. 1500 Ditch Phase f/Period 4b (Fig 249)
Body fragment, cylindrical bottle. Straight-sided body, parts of four close set irregular mould-blown ribs. Part of vertical mould seam. Small and medium bubbles.
Present height 39.3mm; body diameter *c* 60mm; thickness 1.3–2.8mm.

undecorated rims, necks, shoulders, and handles

77. 1520 Bld 198/Phe/dump/Period 5 (Fig 249)
Rim, neck, and handle fragment. Horizontal folded rim, bent out, up, in, and flattened. Trace of cylindrical neck. Upper part of broad angular reeded handle, attached to neck below rim. Small bubbles, elongated in handle. Occasional yellow/brown streaks and black specks. Inner edge of rim worn.
Present height 26.7mm; rim diameter 54mm; diameter aperture 24mm; thickness 3.5–5mm.

78. 1417 Bld 198/Phe/dump/Period 5
Rim and neck fragment. Pale blue/green. Horizontal folded rim, bent out, up, in, and flattened. Cylindrical neck. Trace of handle attachment on underside of rim. Small bubbles. Occasional yellow/ brown streaks and black specks. Inner edge of rim worn.
Present height 11.5mm; rim diameter 44mm; thickness 4mm.

79. 1559 Bld 4404/Period 7
Rim and neck fragment. Horizontal folded rim, bent out, up, in, and flattened. Cylindrical neck. Small-medium bubbles, elongated in neck. Occasional yellow/brown streaks and black specks. Rim worn.
Present height 31.5mm; rim diameter 68mm; thickness 6mm.

80. 1633 Bld 198/Phe/dump/Period 5
Rim fragment. Horizontal folded rim, bent out, up, in, and flattened. Trace of handle attachment at rim edge. Small bubbles.
Present height 8.5mm; rim diameter 68mm.

81. 29 Area A/Pit/Period 11
Rim fragment. Horizontal folded rim, bent slightly in, then out, up, in, and flattened. Trace of cylindrical neck. Handle scar on rim edge. Heavily worn.
Present height 8.2mm; rim diameter 66mm.

82. 1560 Bld 198/Phe/Roof collapse/Period 5
Rim fragment. Horizontal folded rim, bent out, up, in, and flattened. Trace of cylindrical neck. Neck edge grosed. Heavily worn.
Present height 9.9mm; rim diameter 44mm.

83. 1 Area A/Topsoil
Rim fragment. Horizontal folded rim, bent out, up, in, and flattened. Trace of cylindrical neck. Worn.
Present height 7.2mm; rim diameter 60mm.

84. 7 Area A/Topsoil
Rim fragment. Horizontal folded rim, bent out, up, in, and flattened. Trace of cylindrical neck. Small bubbles, yellow/brown streaks. Worn.
Present height 7.5mm; rim diameter 54mm.

85. 1403 Bld 198/Phe/dump/Period 5
Rim fragment. Horizontal folded rim, bent out, up, in, and flattened, forming small inner lip over neck cavity. Trace of cylindrical neck. Heavily worn.
Present height 8.2mm; rim diameter 44mm.

86. 2736 ViaP/Surface/Period 3–4b
Rim fragment. Horizontal folded rim, bent out, up, in, and flattened. Heavily worn.
Present height 11mm; rim diameter 80mm.

87. 34 Area A/Pit/Period 7–11
Rim fragment. Horizontal folded rim, bent out, up, in, and flattened. Handle scar on rim edge. Heavily worn.
Present height 6mm; rim diameter 46mm.

88. 1517 Bld 198/Phe/dump/Period 5
Rim fragment. Horizontal folded rim, bent out, up, in, and flattened. Heavily worn.
Present height 6.8mm; rim diameter *c* 70mm.

89. 1382 Area A/Pit/ Period 9–11
Neck fragment. Cylindrical neck tapering in slightly to tooled constriction. Trace of shoulder expanding out. Small bubbles, some elongated. Heavy scratching.
Present height 34mm; neck diameter 34mm; thickness 3.5–5mm.

Also eight cylindrical neck fragments, four neck and shoulder fragments, and six shoulder fragments.

90. 2659 BLd 4403/floor/Period 2–4b
Handle fragment. Part of vertical section of angular reeded handle. Trace of change of angle. Ten vertical ribs. Elongated bubbles.
Present height 38.5mm; thickness 4.5–5.5mm.

91. 3710 Bld 4403/floor/Period 2–4b
Handle fragment. Part of lower section of angular reeded handle, curved shoulder. Ten shallow vertical ribs pulled down slightly into points. Small bubbles, elongated in handle.
Present height 21.5mm; thickness 4–6.5mm.

92. 1 Area A/Topsoil
Handle fragment. Part of lower section of angular reeded handle, curved shoulder. Eight vertical ribs pulled down into points on shoulder. Small bubbles, elongated in handle.
Present height 10.5mm; thickness 3–9mm.

93. 7 Area A/Topsoil
Handle fragment. Part of lower section of angular reeded handle, curved shoulder. Five vertical ribs, pulled down, lower ends missing.
Present height 21mm; thickness 4–8mm.

94. 4200 PPS/Blocked portal/Period 4a
Handle fragment. Part of lower section of angular reeded handle, trace of shoulder. Six vertical ribs pulled down into points on shoulder. Elongated bubbles.
Present height 33mm; thickness 3.5–8mm.

Also five fragments, reeded handles.

95. 207 Area B/Topsoil
Handle fragment. Vertical section of angular handle. Part of one vertical rib, traces of two further shallow ribs. Yellow/brown streaks and black specks. Elongated bubbles.
Present height 46mm; thickness 7.5–10.5mm.

96. 256 Bld 197/Phe/dump/Period 5
Neck and handle fragment. Cylindrical neck. Folded upper attachment and horizontal section of broad angular handle. Change of angle. Yellow/brown streaks and black specks. Many elongated bubbles.
Present height 22.5mm; neck diameter *c* 75mm; width of handle 64.7mm; thickness 5–18.5mm.

97. 2681 ViaP/Surface/Period 6
Handle fragment. Trace of cylindrical neck. Part of folded upper attachment and horizontal section of broad angular handle. Many elongated bubbles. Surfaces very worn.
Dimensions 37 x 26mm; thickness 6–16.5mm.

undecorated square/rectangular bottles

Twenty body fragments

98. 1 Area A/Topsoil (Fig 249)
Base fragment. Trace of two straight sides. Slightly concave base. Raised design: parts of two arcs converging at corner (missing). Two short diagonal bars joining arcs to central circle. Circular pellet between arcs near corner of vessel. Circular pontil mark. Lightly worn.
Dimensions 22.5 x 42mm; thickness 2–9mm.

99. 1365 Area B/Primary Rampart/Period 2
Two joining lower body and base fragments. Part of two straight sides. Slightly concave base. Trace of curved raised design. Vertical scratches on lower body. Base edge worn.
Present height 59.3mm; thickness 6–8.5mm.

100. 2838 ViaP/Period 4a
Three joining lower body and base fragments. Two straight sides. Part of raised base design: ?circle and right-angled feature. Fragments distorted by heat. Base edge worn.
Present height 25.5mm; thickness 5–9.5mm.

101. 214 Area A/Topsoil
Lower body and base fragment. Part of two straight sides. Flat base.
Present height 18.5mm; thickness 2.5–4.2mm.

undecorated prismatic bottles

One neck and shoulder fragment, and three shoulder and upper body fragments.

102. 1331 Area A/Period 9–11
Handle and shoulder fragment. Lower section of small angular reeded handle. Curved shoulder edge. Eleven vertical ribs pulled down into points on shoulder. Trace of straight-sided upper body. Elongated bubbles.
Present height 16.5mm; width 20.5–34.5mm; thickness 2–10mm.

103. 1581 ViaP/surface 3/Period 4b
Handle and shoulder fragment. Pale green. Part of lower section of angular reeded handle. Curved shoulder edge. Thirteen vertical ribs pulled down into points on shoulder. Straight-sided upper body. Elongated bubbles.
Present height 43.5mm; thickness 3–8mm.

104. 204 Area A/Topsoil
Handle, shoulder, and body fragment. Part of lower section of broad, plain ribbon handle. Curved shoulder edge. Straight-sided upper body. Worn on broken edge of handle.
Present height 32.5mm; thickness 5.7–11mm.

Also seven upper body fragments and 128 prismatic body fragments.

105. 34 Area A/Pit/Period 9–11
Base fragment. Part of one straight side. Flat base. Raised base design: part of one circle. Slightly worn.
Present height 18mm; thickness 6–8.5mm.

106. 56 Area A/Pit/Period 9–11
Base fragment. Part of one straight side. Flat base. Raised base design: part of one circle. Slightly worn.
Present height 18mm; thickness 6–7mm.

107. 2212 1863 West berm/silt/Period 4a (Fig 249)
Two joining base fragments, plus 13 tiny chips. Edge of one straight side. Concave base. Raised base design. Parts of two letters: lower right bar of A, nearly complete I. Bubbly patches, base edge worn.
Dimensions 41 x 34mm; thickness 4–9mm.

108. 1433 Area A/Period 7–9
Base fragment. One straight side. Flat base. Raised base

design: one circle, trace of further design. Worn.
Dimensions 23 x 33.5mm; thickness 5–8mm.

109. 1 Area A/Topsoil
Base fragment. Edge of one straight side. Flat base. Raised base design: part of straight moulding, traces of further design. Slightly worn.
Dimensions 21 x 26mm; thickness 4.5–9.5mm.

110. 2843 ViaP/Surface 3/Period 4b
Base fragment. Trace of one straight side. Flat base. Raised base design: part of one shallow circle with further interior design. Heavily worn.
Dimensions 12.5 x 26mm; thickness 7–9mm.

111. 1705 Bld 198/Phd/dump (Fig 249)
Base fragment. Flat base, trace of straight side. Raised base design: straight stemmed leaf parallel to side, with at least five tendrils in opposing pairs, three close-set concentric circles. Pitted and slightly worn.
Dimensions 42 x 35mm; thickness 4–7mm; diameter outside circle 35mm.

112. 4082 Bld 4401/Phc/Period 4b
Base fragment. Flat base. Raised base design: three concentric circles. Slightly worn on base, heavy scratching on inner surface.
Dimensions 19 x 25mm; thickness 7mm.

113. 1417 Bld 198/Phe/dump/Period 5
Base fragment. Slightly concave base. Raised base design: circle, trace of further design. Slightly worn.
Dimensions 29 x 23.5mm; thickness 7–8mm.

114. 7 Area A/Topsoil
Base fragment. Slightly concave base. Raised base design: circle. Slightly worn.
Dimensions 33 x 9mm; thickness 4–5.7mm.

115. 7 Area A/Topsoil
Base fragment. Slightly concave base. Raised base design: part of straight moulding. Base pitted and slightly worn.
Dimensions 40 x 12.5mm.

116. 2585 Area A/Period 7–9
Base fragment. Melted and distorted. Raised base design: part of circle.
Dimensions 32.5 x 15mm; thickness 5–9mm.
Also two lower body and base fragments, and two base fragments from prismatic bottles.

Window glass

matt/glossy

Blue/green: one corner fragment, 12 edge fragments, and 33 mid pane fragments.
Pale green: four mid-pane fragments.
Colourless: one mid-pane fragment.

late Roman blown window glass

Blue/green: two edge fragments and one mid-pane fragment.
Also 17 melted fragments and one chip.

Inscribed stones and graffiti

by R S O Tomlin

The stones and graffiti have already been published in *Britannia* (exact references below).

Inscribed stones

1. 3 unstrat (Fig 250)
Irregular mass of buff sandstone, 0.33 x *c* 0.55m, 0.31m thick, found in 1987 just north of the site of the *porta principalis sinistra*. Part of the original quarry face survives, with incised marks left by tools. Some of them are letters:

(i) Pecked with a pick among intersecting lines: 0 (or D).

(ii) Cut with a chisel, a sequence of four letters: the first at right-angles to the second, the second inverted in respect to the third and fourth: R (or B), B, A, A.

(iii) Cut with a chisel, possibly another letter A(?).

These letters seem only to be random doodles done at the quarry face. (*Britannia* xix (1988), 494, no 13)

2. 196 South wall/Bld 198 (Fig 250)
Grey sandstone building stone, 0.34 by O.13 m, found in 1987 reused upside down in the east face of the fourth buttress from the east end of Building 198. Roughly inscribed in letters *c* 25 mm high:

IVLIVS

The imperial *nomen gentilicium* Iulius is very common, particularly among soldiers, but it is nevertheless used sometimes without a distinguishing cognomen: see for example RIB 1950, a graffito at the local quarry at Coombe Crag, and No 5 below. This is presumably a workman's informal signature, like RIB 1927 at Birdoswald (*Britannia* xxi (1990), 365, no 4).

3. 2732 ViaP/Rubble/Period 5–8 (Fig 250)
Buff sandstone building stone, 0.29 x O.ll m, 0.20 m thick, roughly incised:

)CLAGISI, probably *(centuria) CL(audi) Agisi*, 'the century of Claudius Agisus'

The letters are of cursive form (note the A and G, and the ligaturing of C and G with the succeeding letter). The centurion's name could be read as *CIAGISI*, but the initial sequence *CIA* is not a Roman form and in any case very rare. It seems better, therefore, to read CIA by understanding the second letter as a 'long' L of cursive form. The imperial *nomen gentilicium Claudius* is very common, and is regularly abbreviated to *CL*, while the cognomen *Aeisus* is attested in Noricum (CIL iii 5542) and Pannonia (CIL iii 10883) (*Britannia* xxii (1991), 296, no 6).

4. South wall/Bld 4403 (Fig 250)
Buff sandstone building stone, 0.22 x O.14 m,

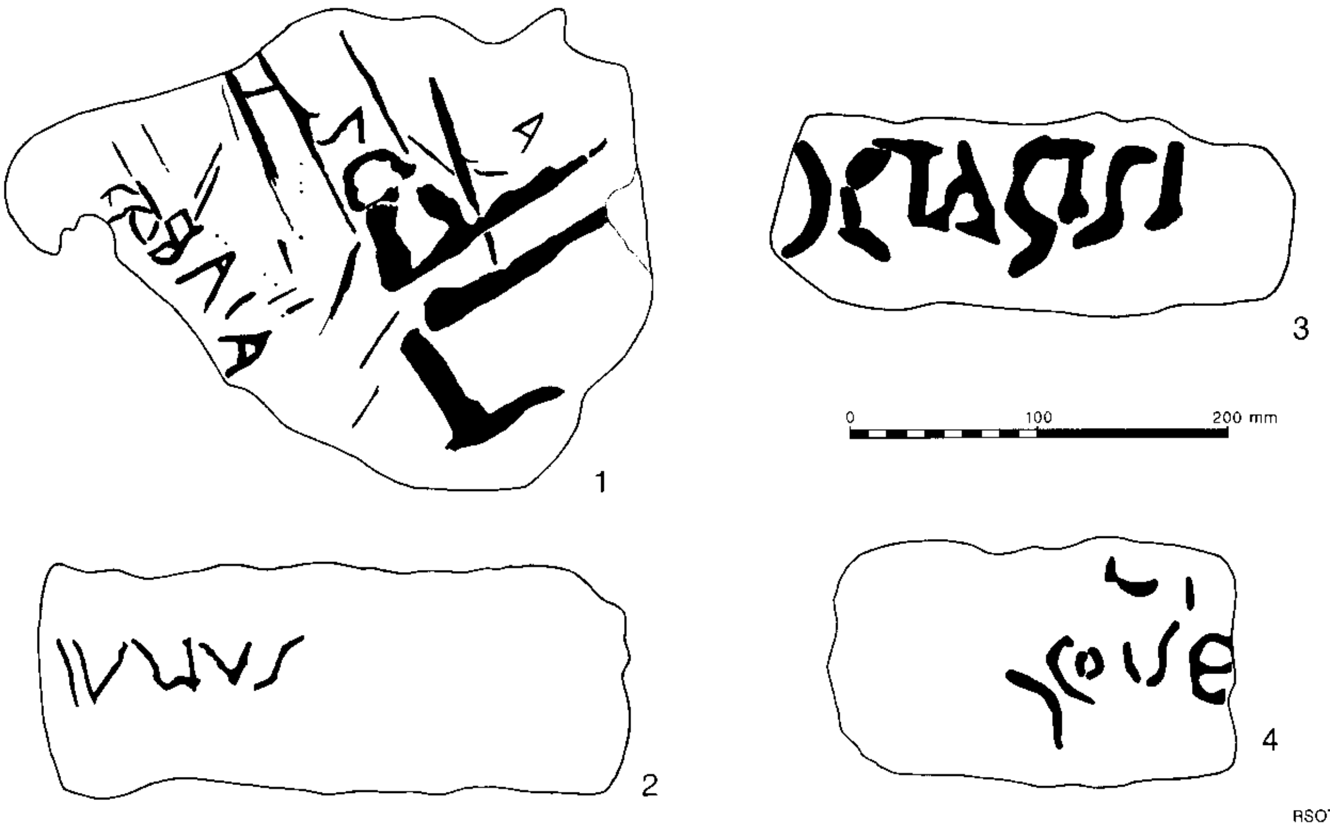


Fig 250 Inscribed stones (scale 1:4)

roughly incised:

.. [...] I)COVE[... I *(centuria) Cover ... 1*

Too little survives of the irregular letters in line 1 for identification: CH for *C(o)ho(rtis)* and LI for *L(egion-is) I[I Aug(ustae)]* are both possibilities. The centurion's name could be read as *COISEI ... I*, but no such name is known and the sequence of letters is not a Latin form. Instead of IS, therefore, it is better to read a cursive *V* (note the form of E) and to suppose the centurion bore a name of Celtic etymology cognate with *Coventina*: compare CIL xiii 6028; *lulius Coventi (filius)* (*Britannia* xxii (1991), 297, no 7).

Graffiti

These graffiti have all been made after firing, in capital letters, and it is generally accepted these are the owners' names. (*Britannia* xxiii (1992), 318–19.)

5. 326 Bld 197/Phe/dump/Period 5 (Fig 251)
Base sherd of a samian vessel, scratched underneath:

IVLI[...], Iuli [... ?l or *Iuli[us]*

For the name Iulius see note to No 2 above.

6. 7 Area A/unstrat (Fig 251)
Base sherd of a samian vessel, scratched underneath:

IVN[...], probably *lun[iusl*

7. 1823 1365 Area B/Primary rampart/Period 2 (Fig 251)
Two rim sherds of a samian dish (form 18/31: stamped, St12), scratched above the foot ring:

[...]MARTINIDIIC, *Martini Dec(urionis)*, '(Property) of Martinus the decurion'

The *cognomen* Martinus is common, and already attested at Birdoswald (RIB 1912).

8. 381 Area A/Rubble/Period 7–9 (Fig 251)
Base sherd of a samian vessel, scratched underneath:

[...]RE, probably Re(...) .

The same text, an abbreviated personal name, occurs on a samian vessel at Rocester (*Britannia* xxii (1991), 306, no 45).

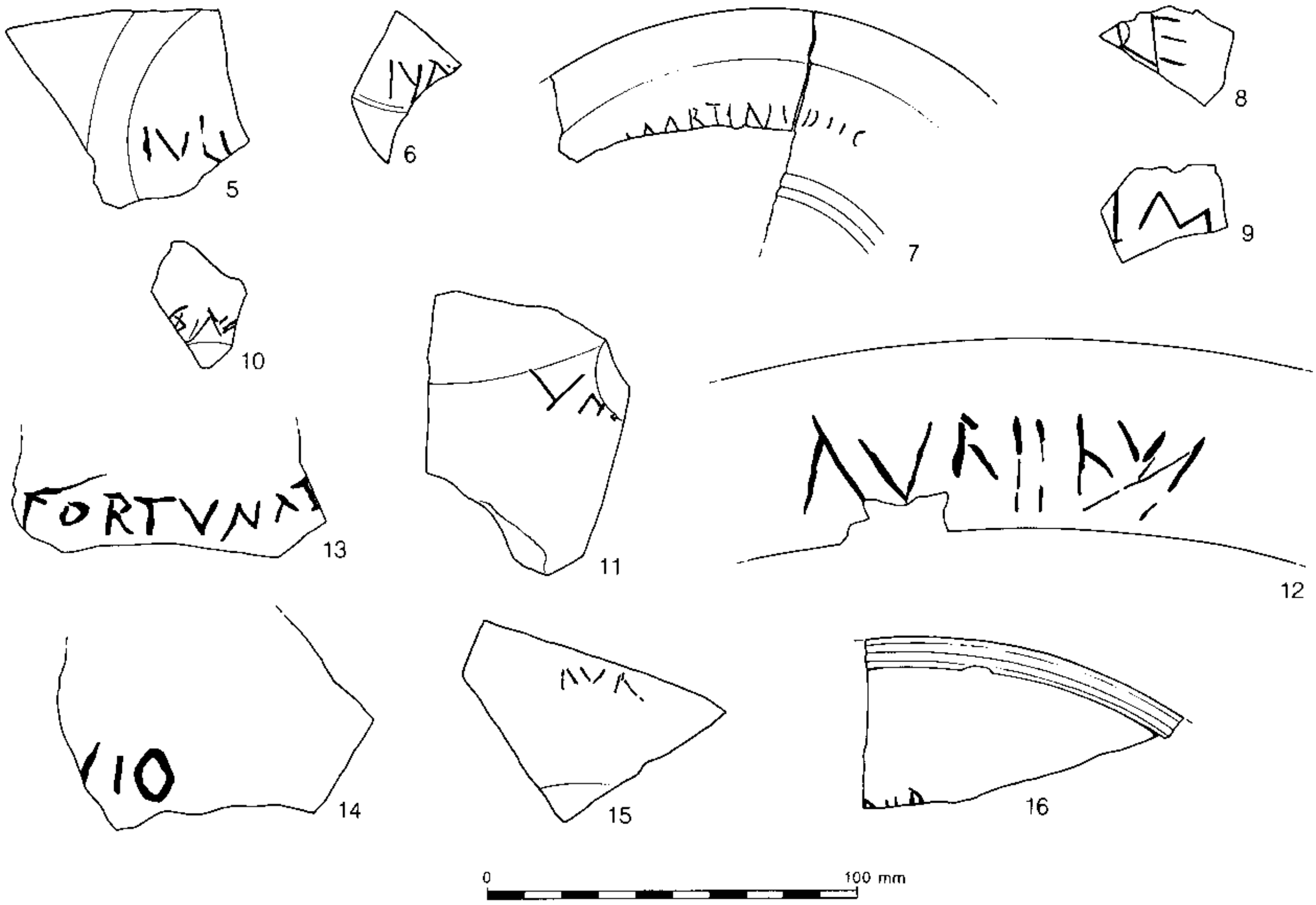
9. 2435 1575 Bld 4401/Phb(ii)/Period 4a (Fig 251)
Base sherd of a samian vessel, scratched underneath:

[...]AM[...].

A is unbarred. I could be read, but the slope in relation to M suggests A.

10. 240 Area B/unstrat (Fig 251)
Wall sherd of a samian vessel (probably form 31), scratched above the angle with two overlapping graffiti, indicating a change of ownership.

(i) [...]CA.[... I
(ii) [... IDIV.[... I, possibly [... *]idius*



RSOT

Fig 251 Graffiti on pottery (scale 1:2)

11. 326 Bld 197/Phe/dump/Period 5 (Fig 251)
Wall sherd of a samian vessel (form 31R). Scratched above the angle, inverted with respect to the bowl:

VN(or *M*). [...].

The sequence of strokes requires the reading V not (inverted) A. The V is enlarged as an initial letter.

12. 314/327 Bld 197/Phe/dump/Period 5 (Fig 251)
Ten sherds preserving almost half the circumference of a BBI dish. Five of the sherds conjoin, preserving a complete graffito incised on the wall:

AVRIILVI, *Aurel(ius) Vi(ctor)* or *Vi(talis)*

The incised marks between V and I seem to be casual. The reading otherwise is certain, and the graffito should not be seen as a blundered *Aurelius. Aurelius,* the most common imperial *nomen gentilicium* of them all, is often abbreviated to *AVREL* and Victor and Vitalis are two of the most common *cognomina* in Roman Britain. There are four instances of Aurelius Victor in the RIB Index, at three of the Wall forts and at Risingham.

13. 838 1388 Bld 4406/Period 7 (Fig 251)
Rim sherd of a BBI pot, scratched immediately below the rim:

[... IFORTVN[... 1, *Fortunatlus*]

Fortunatus is a common *cognomen*, already attested at Birdoswald (RIB 1907).

14. 305 Bld 197/Phe/dump/Period 5 (Fig 251)
Wall sherd of a BBI vessel, scratched below the rim:

[...]VIO

The first letter could be N but looks more like V. This is presumably a *cognomen* in *-io*, eg Calvio or Silvio.

15. 1459 PPS/ST/Period 4a (Fig 251)
Wall sherd of a samian bowl (form 31 or 31R), scratched after firing in cursive letters:

AVR[, >*Aurelii*

'[Property] of Aurelius'

16. 7 Area A/topsoil (Fig 251)
Rim sherd of a samian bowl (form 31 or 31R) with a graffito scratched on the wall. Only the tops of the letters survive:

Perhaps [.....]PIIR[....]

Discussion

No attempt has been made to discuss whether the finds from Birdoswald are typical of an assemblage from a Wall fort. At present no comparative research has been done, largely because of the problems involved in trying to synthesise material from different parts of a fort, and from excavations of differing quality. The evidence of the small finds, such as it is, is considered along with that of other materials in Chapter 15.

This discussion concentrates on the dating evidence provided by the small finds, the distribution of the objects and bias in the archaeological record. Evidence for the garrison of Birdoswald is considered, as is the issue of whether it is possible to assign particular types of artefact to one gender of user.

Dating

The single early brooch from Birdoswald is a stray find said to have come from south of the fort. It is an unusual type, Almgren Form 16 (Snape 1993, 118, A381), and is an almost exact parallel of a brooch from Vindolanda (Snape 1993, 72, 174) with no other known parallel in Britain. The type is common in Belgian cemeteries (Simpson, Hawkes, and Hull 1979, 334), with a link between Belgium and Vindolanda provided by the *cohors* I *Tungrorum*, who with *cohors* VIII *Batavorum* are attested at Vindolanda *c* 95–105 (Bowman and Thomas 1983, 47–50). It has also been suggested that *cohors* I *Tungrorum* could have been at Birdoswald in the early Hadrianic period, on the basis of a tile stamp found at Hare Hill. This is weak evidence for the siting of a unit, as Roxan (1985, 97) has pointed out, and this contention is discussed elsewhere. This brooch type is traditionally thought to have gone out of use by the late first century but it is possible that individual examples may have continued to be used by Tungrians outside their homeland and the type may have had a longer life span than previously thought.

The brooches from the 1987–92 work could range in date from the first to the early fifth centuries, but there is nothing to indicate that any of them were definitely first century. The majority of the brooches would fit into a second- to third-century date range with the only exceptions being two penannulars (Nos 73, 74) with Fowler's type D7 terminals, which Snape (1992) has suggested may well be as late as the fifth century. Certainly the evidence from Birdoswald would support a late fourth- or fifth-century date as both brooches were recovered from layers associated with the disuse of Building 198 in Periods 5–6. A gold earring with a glass bead (No 77) was recovered from Building 197 in the same period and Allason-Jones (1989, 11) has suggested that this type of earring is also fourth century. The evidence suggests that the reuse of the *horrea* (Building 197 and 198) and the phases of timber building which followed, continued well into the fifth century. The probability that Roman style artefacts continued in use after the end of the fourth century should be considered.

Although there is substantial evidence for occupation well into the sub-Roman period in Periods 5 and 6, there is very limited evidence for Anglian occupation on the site. The only such evidence is artefactual, and consists of a gilt bronze pin recovered from nearby and reported by Cramp (1964, 90–93; see Appendix 2, Fig 297, No 6), and a trefoil headed brooch said by Bruce (1853, 251, pl 3) to have been found in the vicinity of Birdoswald and now in the Museum of Antiquities in Newcastle (Appendix 2, Fig 297, No 5).

Aside from the coins, limited dating evidence can be drawn from the finds. All fall into the second- to fourth-century date range as might be expected, with the majority being consistent with a second- to third-century date. The small finds have such a broad general date range that they do not provide any evidence for the postulated period of abandonment in the late second and early third century. The brooches which might have been expected to provide additional dating evidence also fall into the broad second- to fourth-century category, with no definite first-century forms, though there are several late forms that could continue into the fifth century (for example Nos 73, 74). Unfortunately a number of the key brooches were either unstratified or were residual in later contexts.

Distribution

The only evidence for dumping on the site was found outside the *porta principalis sinistra*, where large quantities of animal bone and virtually all the leather were recovered from six separate phases of the ditch, but there was very little pottery or metalwork recovered (one nail and a couple of unidentifiable iron fragments). The ditch deposits did not reflect a single episode of dumping, but several episodes throughout the life of the fort for the disposal of the same types of refuse. The fort ditch was recut five times, and the disposal patterns which produced the characteristic ditch assemblages were clearly a continuous element in the life of the fort and probably the *vicus*. A small amount of primary leather waste was retrieved, indicating that hides were being cut up in the vicinity and that some small-scale manufacturing was taking place, but no large scale cobbling waste was recovered. This would appear to be general rubbish disposal were it not for the limited range of materials recovered from the deposits. In total 692 items of leather were recovered, including 303 shoe fragments, 44 fragments of tentage, 285 waste pieces, and 60 pieces of scrap. The majority of the shoes were practical working footwear, but sandals represent 12% of the assemblage reflecting a higher status element of the community. Ditches 5 and 6 (third to fourth century) produced a 'normal' balanced assemblage with women's and children's shoes represented. The shoes are all heavily worn and there is evidence for reusable leather from the uppers being salvaged before the bottom units were discarded. Previous excavations in the 1930s recovered substantial quantities of tentage and led to the publication of the pivotal article on Roman tentage by McIntyre and Richmond (1934, 62–90). The tentage fragments recovered from the recent excavations add little to our understanding of the subject as the assemblage represents only a small quantity of debris produced from salvaging reusable material.

It is unusual to find any quantity of military equipment within forts, as the army normally repaired equipment where possible or else recycled it, along with all the scraps (Bishop and Coulston 1993, 33–7). Birdoswald is no exception. There is much evidence for deliberate clearance and abandonment of military sites, for example the deposition of ten tons of iron nails in a pit at Inchtuthil (Manning 1985 291), and the pit deposits within the fort annexe at Newstead (Curle 1911, 114, and 347) which contained broken equipment. By recycling material, the Roman army kept the demand for resources low and took most of their metal with them. The best example of the sorts of objects kept for recycling comes from the Corbridge hoard which appears to have been a box of scrap packed for transport and abandoned at the last moment (Allason-Jones and Bishop 1988, 109).

The group of 69 stone artefacts adds considerably to the number of pieces already known from Birdoswald (26: Coulston and Phillips 1988, 184: Appendix 2). It demonstrates how productive area excavation can be in this respect, an observation further strengthened by recent work at South Shields and Carlisle (Coulston forthcoming). Numbers of finds of sculpture at forts and *vici* along Hadrian's Wall make it clear that survival and recovery depend upon the degree of post-Roman site development, arable land use, and intensity of modern antiquarian and archaeological work.

It is interesting to note the lack of structural fittings and fasteners: there is only one joiner's dog, one double-spiked loop and one ring with a split pin. There is only one piece of strapping that might have come from a door. This dearth of material, which presumably resulted from rubbish disposal and recycling, is in marked contrast to other sites. Old Penrith (Mould 1991 185), for example, produced a great range of structural fittings including window grille fragments, angled brackets, T-staples, chain links, and wall hooks. Cart and harness fittings are also lacking, and there are no lynch pins, horseshoes (from stratified contexts), spiked collars, or related material. What is present is a large number of rings that could have been harness fittings, but could also have been put to a number of other uses.

Who garrisoned Birdoswald?

While there is only a small amount of military metalwork from the site, there is enough to provide some clues to the types of armour worn and the weapons used.

The D-shaped buckles (Nos 254, 255) and the washer (No 259) are all from *lorica segmentata*, whereas the fastening hook (No 258) is from the centre of a mail shirt (*lorica hamata*). The ways in which armour fragments enter the archaeological record, and how this can affect their interpretation, has been recently discussed (Bishop and Coulston 1993, 33–41). Large composite items like *lorica segmentata* are prone to corrosion due to the interaction between iron and copper alloy components. The armour required frequent repair, and is therefore found quite regularly. Conversely, *lorica hamata* is much less prone to damage and loss of pieces, as the only vulnerable part is the fastening hook at the front (Frere 1974, fig 31, nos 66a, 66b; Niblett 1985, fig 63, no 22; fig 65, no 44). Thus the presence of *hamata* is likely to be masked by finds of *segmentata* (Bishop 1988, 2).

The scroll buckles and the open-work belt plate are all indicators of a second-century date. Birdoswald produced a range of weapons, from spearheads and *pilum* heads to catapult bolt heads, sling-missiles, and large stone balls. Much discussion has taken place over the years as to the armour and equipment used by legionaries and auxiliaries. Maxfield (1986, 59–72) questioned whether there was any real distinction between legionary and auxiliary equipment, and Bishop and Coulston (1993, 208) have also considered the issue, and conclude that 'the pairing of *pilum* with curved shield, spear with flat shield is everywhere evident'. They go on to suggest that while the question of who wore the *lorica segmentata* is irrelevant, there is no evidence that it was ever worn by auxiliaries (ibid, 209). By the early third century the difference between legionaries and auxiliaries had disappeared and both the *lorica segmentata* and *pilum* continued to be used:

> ...fighting styles of legionaries and auxiliaries were coming closer together, preferring the versatility of the earlier auxiliary style of weaponry to the specialised legionary heavy infantryman of old.
>
> (ibid, 209)

In the light of this and the lack of stratified material it would be dangerous to draw any conclusions from the metalwork on the types of units garrisoned at Birdoswald.

From epigraphic evidence it is known that Birdoswald was garrisoned by *cohors* I *Aelia Dacorum*, a *cohors milliaria peditata* during the entire third century. Though no direct evidence exists for any second century garrison, a graffito on a samian sherd names Martinus, a *decurio*. This implies that a Hadrianic garrison included an auxiliary cavalry element. The few fragments of *lorica segmentata* and the *pila* ought to be legionary equipment. There is no problem in envisaging the presence of legionaries at times at Birdoswald (ibid); legionaries built the fort, and legionary centurions in acting command are attested epigraphically on at least three occasions (RIB 1880, 1876, 1912).

Allason-Jones (1988, 197) has suggested that the turrets may have been garrisoned by units in the nearest fort and by looking at the evidence from the finds we may find further evidence for this. Apart from the graffiti and the gravestones, the evidence from the finds at Birdoswald is unlikely to provide any answers as to who the garrison were at any given time. However, without comparative data from other sites along the Wall, subtle hints and trends may well be masked. It may be no coincidence that both Birdoswald and its nearest turret, 49b (Simpson 1913, 297–397), produced enamelled items. The turret produced an enamelled handle and an enamelled plate brooch in the shape of a running dog (Appendix 3, Fig 297, Nos 2, 4), while few other turrets along the Wall have produced enamelled items.

Gender

One line of research that has been attracting attention in recent years is whether it is possible to 'sex' a small find, ie to identify objects associated with either males or females. Hingley (1989, 41–5) has divided some objects between the sexes on the basis of function and then used the groupings to discuss the use of space. This approach appeared to be rather simplistic and relied on a number of assumptions which were not tested or critically appraised. Allason-Jones (1995, 22–30) subsequently looked at some groups of finds to see if there were any classes of artefacts that could be termed male or female, and showed that it is very difficult to assign a particular type of artefact to one gender, as the issue is very complex and there appear to be exceptions in most categories. Brooches, earrings, finger rings, and armlets could have been worn by either sex, and, while bead necklaces are worn by women for decorative purposes, they could also be worn by children of either sex to hold an amulet (ibid, 22–30). Thus 'jewellery ... is not as clear an indicator of gender as might be expected' (ibid, 27). However, it appears that jet had a special significance for women, and the only clear male jet object is a scabbard chape from Bonn (Hagen 1937); jet artefacts and possibly hair pins may therefore indicate a female presence.

An attempt was made to see how the Birdoswald finds fitted Allason-Jones' pattern. This was done in particular to establish whether any difference existed between the second- to third-century 'military' period when women would not necessarily be expected within the fort (though van Driel-Murray (1995) has demonstrated the presence of women and children in second century Vindolanda), and the mid- to late fourth-century Periods 5–6, when women would not be unexpected. From Birdoswald the list of objects, other than the obvious military equipment, that can tentatively be assigned as male is small: there are two intaglios, two Crossbow brooches, one melon bead, and one, or possibly two, earrings. Even these are debatable, and this on a site where men are present in large numbers and one might expect to be able to identify objects associated with males. The number of artefacts that could be associated with women is correspondingly small: two highly decorative earrings, six pins (five bone, one copper alloy), and thirteen jet/shale artefacts: five armlets, three beads, two finely-made finger rings, and three spindle whorls. The problem is not helped by the fact that during the military phases the fort was kept very clean, and there are no rubbish pits associated with these phases. The stratified jet/shale artefacts are all from contexts of Periods 5–6, and there are some residual objects. Therefore all the jet/shale objects are associated with the later phases of the fort, and are very likely to have belonged to women.

Brooches are worn by both sexes but it is uncertain whether particular types were only worn by one sex or used by both, and the majority of the brooches from Birdoswald come from unstratified contexts or are residual. The brooches that do come from stratified contexts do not tell us anything about who was wearing them as they are all from late third-century or later contexts, at which time the presence of women might be expected. The two Crossbow brooches might have contributed something to our knowledge of who wore them and whether they are badges of rank; however, they were unstratified.

Over 42 beads (including one melon bead and two of jet) of differing types were found, with the largest stratified group coming from the periods associated with the reuse of the *horrea* (Buildings 197 and 198). The remaining stratified beads (seven in total) all occur singly across the site. It appears that all the beads from Birdoswald either come from contexts associated with the late occupation of the site, or were found in open public areas where women might be expected.

Four intaglios were recovered from the excavations and two of these can be shown to belong to the military phase; the devices indicate that they were almost certainly owned by men. No 86 is a gem with a 'familiar motif, expressly associated with the legions' (Henig, page 283). It was found in a Hadrianic context beneath the Turf Wall, and was probably lost during its construction. No 87 shows the bust of a youth, possibly the young Caracalla or Geta in semi-divine guise. This gem could have come from a workshop based in Britain, and the gem was possibly presented by the imperial secretariat to an army official or loyal supporter (Henig, page 285). The other two are more ambiguous, as one is unstratified and the other comes from the reuse of the *horrea* (Buildings 197 and 198). These are more likely to belong to either sex and the devices are not gender specific.

The turrets were only occupied by the military for a total of 40 years in two separate stages, but they produced artefacts traditionally assumed to be female in male contexts. The presence of nail cleaners, needles, and tweezers, all traditionally assumed to be female, reminds one how dangerous it is to assign a particular group of artefacts to one sex purely on the basis of function (Allason-Jones 1988, 220). Allason-Jones (1995, 22–30) has demonstrated how difficult it is to prove that one type of object is solely or even usually associated with either males or females, let alone use the evidence in theories about the use of space, such as Hingley (1989, 41–5) tried to do at North Warnborough. The evidence from Birdoswald warns that one cannot make assumptions as to who is or is not on the site at any particular period, or how the space was used, as the finds can not be 'sexed'.

Conclusions

The most noticeable point about the assemblage from Birdoswald is the quality of some items. The enamelled brooches and stud show evidence of a preference for highly coloured and decorative objects. Birdoswald has produced a high number of enamelled items given the area excavated.

The brooches form a useful group for comparison with the other collections from along both the Wall and the Stanegate, the percentage of penannular brooches to bow and plate being unusual.

The small finds from Birdoswald are a small, but significant assemblage of Roman artefacts which could be compared with material from the other forts along both Hadrian's Wall and the Antonine Wall. More research is needed on finds from military sites, not just Hadrian's Wall, before these assemblages can be fully understood. At present there is a wealth of information that needs to be considered on a national scale rather than a site-by-site basis, before such questions as the size and type of the units garrisoned at the different military establishments can be addressed.

13 The animal bones

by Karen Izard

Introduction

Animal bones weighing 169.7kg were recovered by hand from stratified deposits and 1.8kg were recovered by sieving. The analysis of this bone was undertaken to address a series of specific questions regarding the presence of environmental, dietary, and social indicators. Most of the bone recovered reflected dietary behaviour including such factors as food storage and preparation. A detailed report was produced as part of the Ancient Monuments Laboratory Report Series (Izard 1993).

A general economic picture has been established by previous zooarchaeological reports from Roman sites throughout Britain: Portchester (Grant 1975; 1990), Housesteads (Grove 1988), Corbridge-*Corstopitum* (Meek and Gray 1911; Hodgson 1968), South Shields (Hodgson 1971), Vindolanda (Hodgson and Smith 1985), Sheepen (Luff 1982), Exeter (Maltby 1979), Caerleon (O'Connor 1986), and York (O'Connor 1988). The Roman diet was dominated by cattle, caprines (sheep/goat), and pig. The proportions of each consumed differs between civilian and military sites (King 1984). Most bone waste from a military diet tends to consist of cattle bones. These also tend to dominate a civilian site and are usually accompanied by a high proportion of caprine bones. King has suggested that different types of military sites may be distinguished on the basis of diet; for example, a legionary site tends to have a high proportion of cattle as well as a relatively high proportion of pig bones. By contrast, a base for an auxiliary unit tend to have a higher proportion of caprines rather than pig.

Several specialists (Grant 1985, 396; 1990, 136; Maltby 1979, 31; O'Connor 1988, 86) have concluded that during the Roman period in Britain cattle may have been used for haulage and for milking as was traditional in Italy (Davis 1988, 183). Cattle were usually slaughtered at a mature age and there is very little evidence of the slaughtering of calves. In contrast, the proportion of younger caprines on Romano-British sites is generally higher. In Italy very immature pigs were a delicacy available only to the wealthy or the upper ranks of the military, and in Roman Britain pigs were also slaughtered when they were young. Similar conclusions have been drawn from excavations in the Dutch Eastern River Area (Lauwerier 1988). Other animals such as deer, fish, and fowl were eaten in smaller quantities, probably to vary the diet.

Horse, dog, and cat have also been found in Romano-British military deposits. Dogs vary greatly in size, suggesting that they were used for several purposes, the smaller ones in particular as household pets (Harcourt 1974). Butchery marks on some horse bones indicate that these animals were eaten as well as being used for riding and as draught animals.

Methods

The animal bone (168.8kg) selected for analysis came primarily from the stone fort rampart in Areas B and F (Period 2), the ditches outside the *porta principalis sinistra* and the two *horrea* (Buildings 197 and 198). The bone from these areas was recovered from well stratified, sealed, and datable contexts. The majority of bone on site was hand recovered and the two *horrea* were extensively sampled and processed by flotation. All the >4mm residue and between 25% and 100% of the >2mm fraction of each 10 litre sample taken was sorted for animal bone.

Table 33 Numbers of counted bone for each species within each area

species	*Period 2*	*ditch*	horrea	
	TR	*TR*	*TR*	*WS*
cattle	29	22	410	11
caprines	10	29	182	14
(sheep)	(1)	(17)	(30)	(5)
(goat)	(+)	–	–	–
pig	13	15	52	5
horse	+	17	5	1
dog	–	23*	1	6
cat	–	2	–	–
red deer	+	4	4	1
roe deer	–	–	+	+
galliforms	2	–	5	1
(chicken)	(2)	–	(2)	(1)
(black grouse)	–	–	(3)	–
pigeon	–	5*	–	1
woodcock	–	–	–	1
greenfinch	–	–	–	1
Prunellidae	–	–	–	1
Sturnidae	–	–	–	1
Motacillidae	–	–	–	1
stoat	–	–	–	1
vole	–	–	–	27
(bank vole)	–	–	–	(4)
(field vole)	–	–	–	(9)
(water vole)	–	–	–	(10)
common shrew	–	–	–	2
water shrew	–	–	–	1
wood mouse	–	–	–	1
house mouse	–	–	–	3
Lagomorph	–	–	–	4
(hare)	(1)	–	17$	(1)
(rabbit)	–	–	–	5
amphibian	–	–	–	5
fish	–	–	–	+
totals	*54*	*317*	*660*	*89*

key: *TR* = trench recovered material
WS = wet sieved material
* = refers to counts that include several bones from one skeleton
\+ = refers to species that are represented by 'non-countable' skeletal parts
$ = refers to contaminant bones; these are not included in the totals or in any other table or calculations

The Ancient Monuments Laboratory provided the comparative skeletal collection on which identifications were based. The following bones were selected as 'countable' representatives of the skeletal remains of animals: more than half of any lower tooth, mandibles with 'countable' teeth, any part of the articular or fusion surface of the glenoid of the scapula, distal humerus, distal radius, radial carpal, distal metacarpal, the acetabulum of the pelvis, distal tibia, astragalus, calcaneum, distal metatarsal and the second phalanx. The 'countable' skeletal parts for birds included the scapula, humerus, radius, carpometacarpus, the acetabulum of the pelvis, tibiotarsus, and the tarsometatarsus. These bones were chosen because they are easily identifiable, robust, and provide useful measurements and indications of sex and age.

For each of these 'countable' elements, species, weight, sex, age, butchery, gnawing marks, burning, and pathology were recorded where possible. Measurements were taken following the definitions provided by von den Driesch (1976). Pig and cattle tooth eruption and wear states were recorded following Grant (1982). Caprine tooth eruption and wear states were recorded following Payne (1987).

The size and proportions of the cross-section of the shaft of the pubis bone of caprines and cattle were used to indicate sex. In females, pubic bones are small and have a flatter cross-section. Two measurements were taken, SHPu (the diameter of the smallest circle that can contain the shaft of the pubis), and SBPu the smallest diameter of the shaft of the pubis at the same point (Payne personal communication).

Out of 218 trench recovered bones, only one 'non-countable' bone was identified as probable goat (a proximal metacarpal) and 48 were identified as definite sheep (Table 33), so it is reasonable to conclude that the majority of Birdoswald caprines were sheep.

In order to assess whether the pig bones were from domesticated or wild animals, the tooth widths were compared with those of wild specimens from outside the British Isles. This measurement was selected as it is the least affected by age and environmental variables (Payne and Bull 1988).

Residuality was recorded by the pottery specialist and assessed as being high (80%), moderate (40%) or low (10%). Those contexts where the residuality has been recorded as high have not been included within this analysis.

Preservation

Bones recovered from Period 2 were reasonably preserved although some were extremely eroded with little or none of the original surface. Most of the bones from the ditches were better preserved as indicated by their intact, smooth surfaces. This was due to the waterlogged, anaerobic conditions of these contexts. Pathology, butchery, and evidence of gnawing were well defined and therefore easily detected (Table 34). In contrast the bone from the *horrea* was well worn, brittle, and more fragmented. This bone was a washed-out yellow to mid-brown colour with bone surfaces not always present. This made identification more difficult and obscured cut and gnawing marks.

Relative representation of species

Table 33 lists the species and their abundance. Only 54 countable bones were identified from Period 2, the stone wall rampart and the blocked *porta quinta dextra*.

Table 34 Number and percentage of trench recovered bones butchered, gnawed, and burnt from the ditch and *horrea*

ditch		*cattle*	*caprine*	*pig*	*horse*	*red deer*	*dog*	*bird*
number of bones excluding teeth		189	28	13	18	4	23	5
butchered	number	–	95	4	3	2	3	2
	%	50	14	23	11	75	9	–
gnawed by dog	number	–	–	–	–	–	–	1
gnawed by rodent	number	3	–	–	1	–	1	–
	%	15	–	–	5.5	–	4	–
?	number	1	–	–	–	–	1	–
	%	0.5	–	–	–	–	4	–
burnt	number	–	–	–	–	–	–	–
	%	–	–	–	–	–	–	–
horrea		*cattle*	*caprine*	*pig*	*horse*	*red deer*	*dog*	*bird*
number of bones excluding teeth		319	169	43	1	3	1	4
butchered	number	59	20	4	–	–	–	–
	%	18.5	12	9	–	–	–	–
gnawed by dog	number	–	4	–	–	–	–	–
	%	–	2.3	–	–	–	–	–
gnawed by rodent	number	1	–	–	–	–	–	–
	%	0.3	–	–	–	–	–	–
burnt	number	7	1	2	–	–	–	–
	%	0.6	0.6	4.6	–	–	–	–

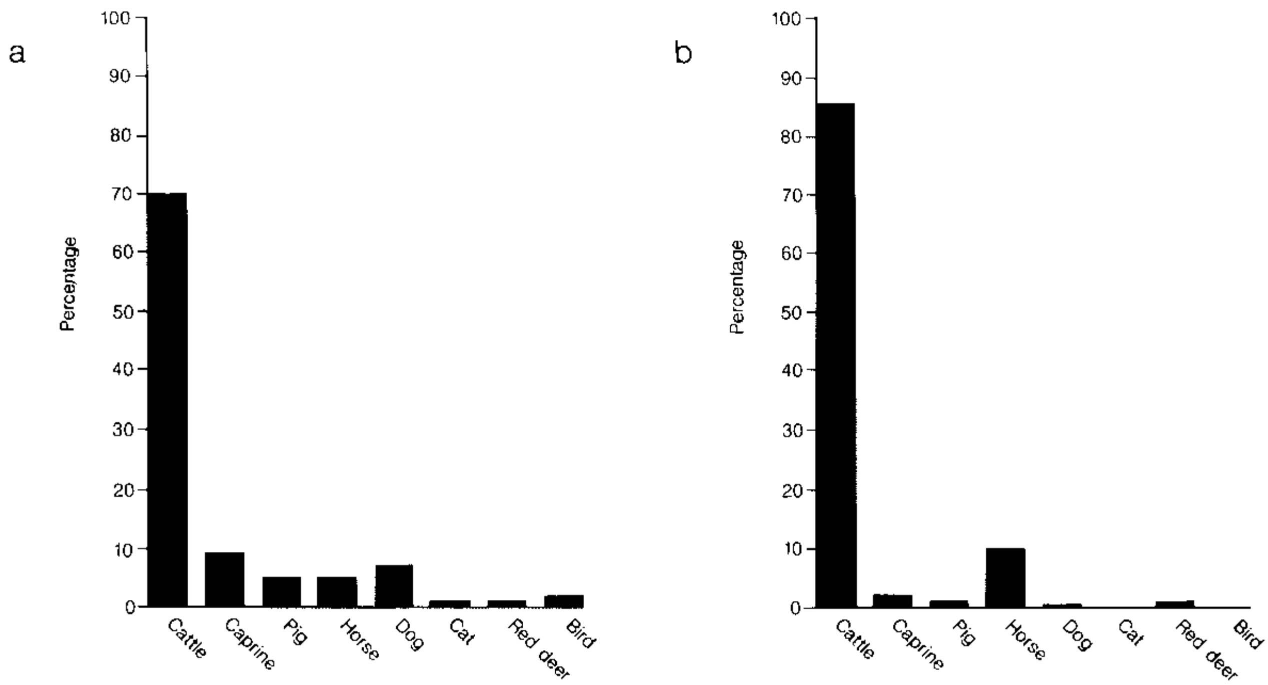


Fig 252 Proportion of species within the ditches: number (a) and weight (b)

The taxa included cattle, caprine, pig, horse, chicken, and red deer. Cattle were the most numerous (53%), followed by pig (24%). The number of identifiable bones is small and no definite conclusions can be made.

Figure 252 shows the relative abundance of species in the ditch assemblages. Both histograms illustrate the dominance of cattle (70% by number and 86% by weight). Caprines are the second most frequent followed by dog, horse, and then domestic pig. The comparison between wild pig measurements and those from Birdoswald form Table 35. The proportion of dog is biased as the majority of the bones come from the same skeleton. The numbers of bird bones are also biased due to the presence of a partial skeleton. The other species were only represented by a small number of bones. Only seven bones showed signs of gnawing. Rodents may have been responsible for the marks on five of these, while the animal responsible for the marks on the other two is unknown.

The *horrea* also have cattle, sheep, and pig but in somewhat different proportions as illustrated by Figure 253. Although cattle are again most numerous (62% by number and 84% by weight), there is a greater number of caprine bones (28%) than in the ditches. The proportion of pig bones is similar to that in the ditches. The other species represented are horse, dog, red deer, and bird. Four bones had gnaw marks which can be attributed to dogs in contrast to the gnaw marks in the ditches, all of which appear to be rodent.

The presence or absence and proportional variation of species between the ditches and *horrea* are probably in part due to recovery bias, as the ditches were not extensively sampled.

Table 35 Comparison between the anterior widths of pig lower molars from Birdoswald and Wild Boar from Turkey in 10^{-4} metres (Payne and Bull 1988)

mandibular teeth	*wild boar (Turkey)*	*Birdoswald*			
M1	119	94	–	–	–
M2	157	132	119	117	–
M3	183	156	139	13	152

The bone from the *horrea* recovered from sieving is listed in Table 33. The most obvious effect was on the number of countable elements for the small mammals. The sieved material recovered at least seven species of small mammal including two species of shrew and three of vole. The presence of vole is unlikely to be related to grain storage as they feed on grass. Other possible explanations for their inclusion in the *horrea* assemblage may be as part of an owl pellet or redeposited with the backfill. Scattered small mammal bones incorporated in this backfill would explain the absence of complete rodent skeletons.

The recovery of the larger and medium sized animals from the *horrea* was compared with those from the sieving using the chi-square statistic. At a 95% level of confidence and with one degree of freedom, the chi square value (6.9856) was greater than the cut-off value provided by the table of percentage points of the chi square distribution. This indicates a significant difference between what was recovered by sieving and by hand during the excavation. The sample material provided a more accurate account of the number of medium sized animals actually making up the deposit.

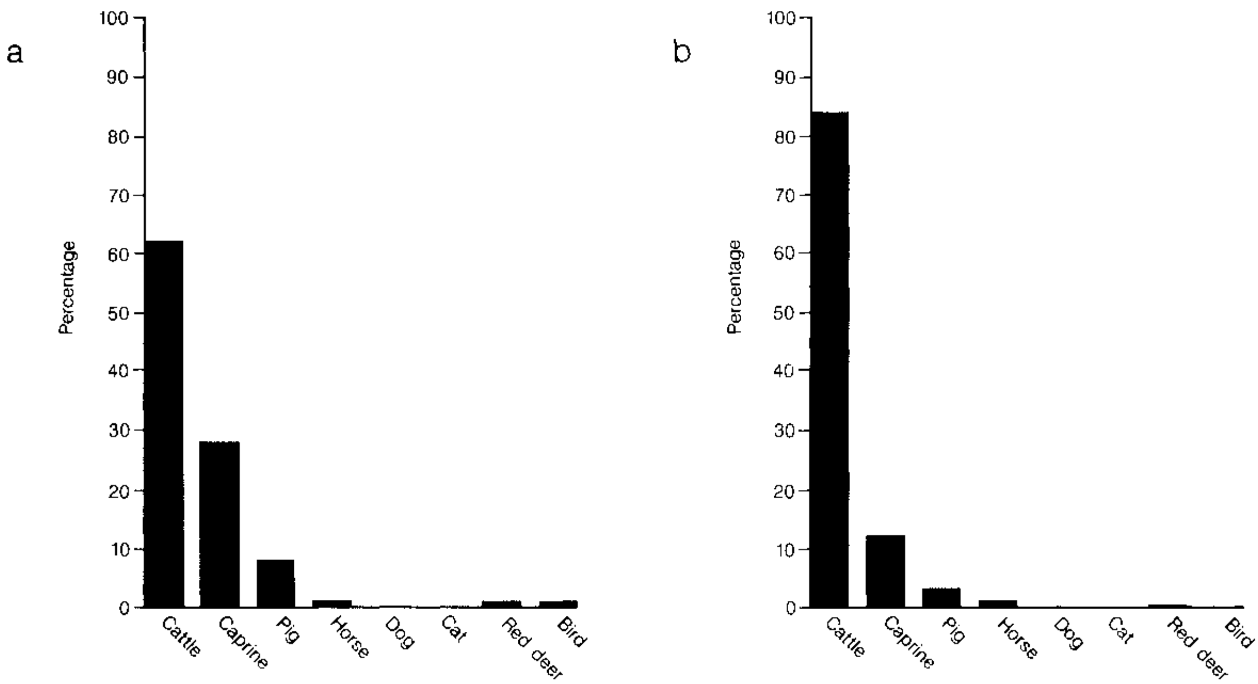


Fig 253 Proportion of species within the horrea: *number (a) and weight (b)*

Anomalous cattle skull

One of the cattle skulls found in Ditch Phase 6 was worth special notice. This skull has a series of holes in the parietal bone which occurred before death (Fig 254). Luff has also published a first-century skull with similar lesions (1982). There are five other examples from York (Ryder 1970) two from Exeter (Maltby 1979), and several from Lush Lane, Beverley (O'Connor personal communication), though these are all medieval. Despite the suggestion of an acute inflammatory condition caused by the increased

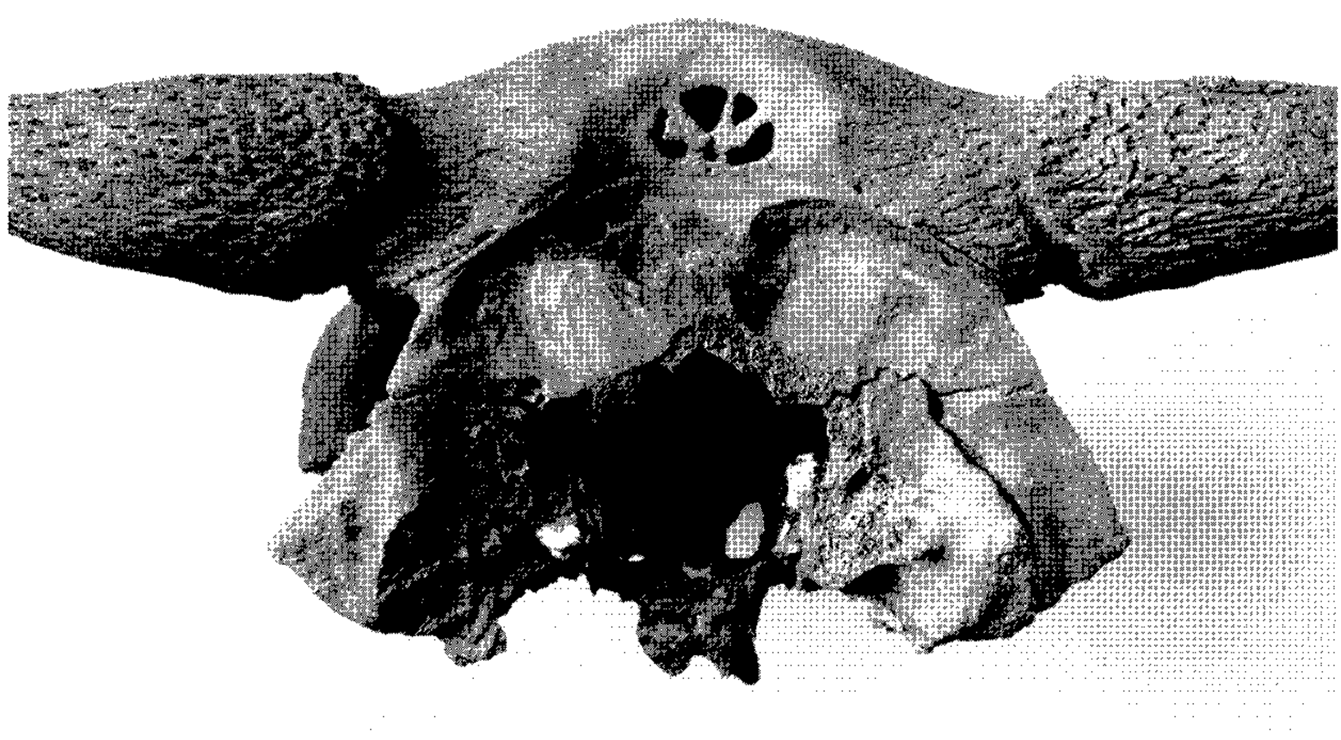


Fig 254 Cattle skull showing abnormal pathology

vascularisation perhaps by cattle wearing yokes (Ryder in Luff 1982), the lesions are considered congenital by Brothwell (personal communication) but the cause is unknown.

Discussion

Environmental indicators

A limited, though significant insight into the nature of environments in the vicinity of the fort is provided by the presence of a number of species in the assemblages. These data supplement the evidence from pollen and macrobotanical analyses.

The species present in the *horrea* assemblages do not indicate the environment beneath the floors of these buildings, as the bones were deposited as part of the general sub-floor backfill. The presence of the three species of vole, two of shrew, and of amphibian suggests that the locality included land which was neither cultivated nor grazed, and which thus afforded cover. Similar conclusions have been described by Younger (1994) at South Shields. This kind of habitat is also required by black grouse. The water vole and shrew, as well as the amphibian, would have required moist habitats.

Birdoswald had a high incidence of cattle incisors with a notch on either the mesial or distal sides of the tooth. This notching is due to 'long grass, perhaps associated with abrasive soil, being drawn between the teeth in grazing' (Miles and Grigson 1990, 494–5). There were 5 (17%) out of the 29 cattle incisors that had this notch. This may suggest that the grazing feed was locally harsh.

That red deer were hunted for food is shown by the butchery marks on three out of four of the bones recovered. Seasonal hunting may be indicated by unshed antler. A five-point antler from the ditch may even suggest sport hunting for trophies.

Dietary indicators

Tooth eruption and wear data indicate that very few cattle were slaughtered younger than three and a half years of age (Table 36). Epiphysial fusion data also indicate the use of adult and elderly animals. Similarly, the majority of caprines were older than two years when slaughtered (Table 37). The limited amount of data for pig suggests that juvenile pigs were the most commonly slaughtered.

Analysis of pelves indicates that the majority of the cattle recovered at Birdoswald were female (Fig 255), whereas proportions of both sexes of caprines were nearly equal (Fig 256). Genders of pigs were determined by analysis of teeth. Of these three times more male teeth, represented both by intact jaws and loose teeth, were recovered.

Many specialists have discerned butchery patterns by analysis of faunal remains from Roman sites. From the bone at Birdoswald, evidence for organised butchery

Table 36 Age estimation of cattle

	J	*I*	*S*	*A*	*E*
Period 2	–	–	–	–	–
horrea	–	–	–	4	2
ditches	–	–	1	9	18

note: Age was determined using O'Connor's (1984) interpretation of Grant's (1982) wear stages.

key:
J = juvenile — first permanent molar not in wear
I = immature — first permanent molar in wear, second not in wear
S = subadult — second molar in wear, third not in wear
A = adult — third molar in wear, but not heavily
E = elderly — third molar heavily worn

Table 37 Age estimation of caprines

months/years	*6mth*	*6mth–2yr*	*2–3yr*	*3–4yr*	*4–6yr*
Period 2	–	–	–	–	1
horrea	1	–	6	2	2
ditches	–	–	–	2	2

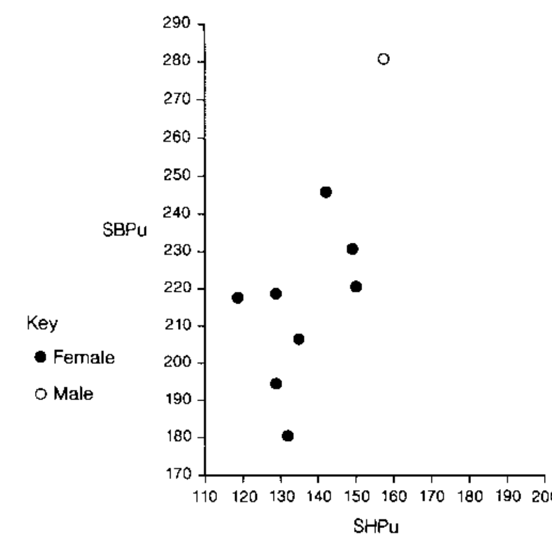


Fig 255 Identification of cattle sex based on pubic shaft measurements

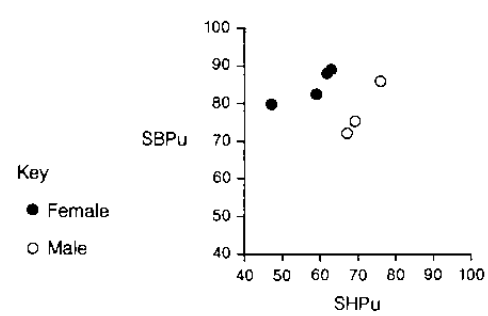


Fig 256 Identification of caprine sex based on pubic shaft measurements

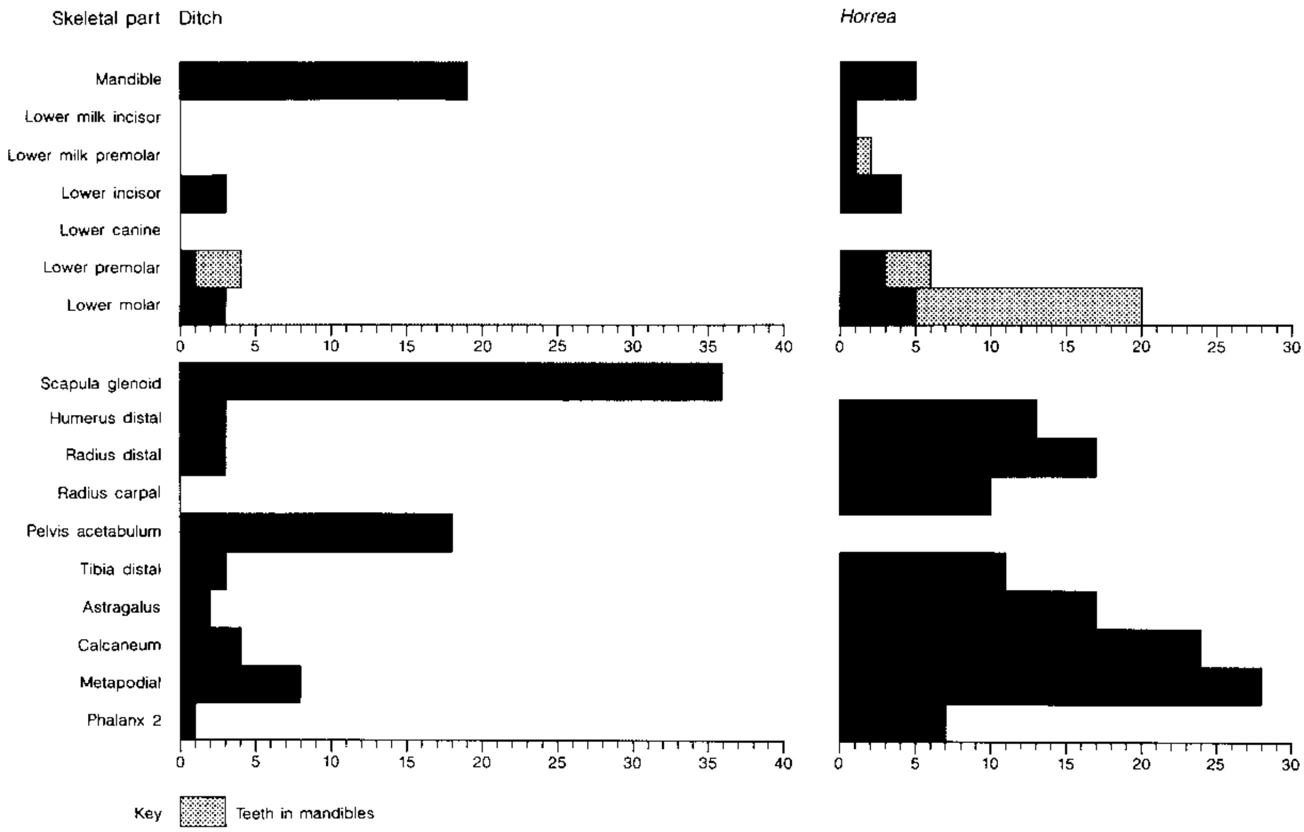


Fig 257 Relative representation of different parts of the cattle skeleton from the ditches and horrea

Note to Figs 257 and 258: actual numbers have been divided into how many times an element occurs within the body, eg the number of second phalanges was divided by eight. In the case of the pelvis which is in three parts before fusion and is often broken into three parts, the most frequently occurring part, either the ilium, the ischium, or the pubis, will be representative of the pelves

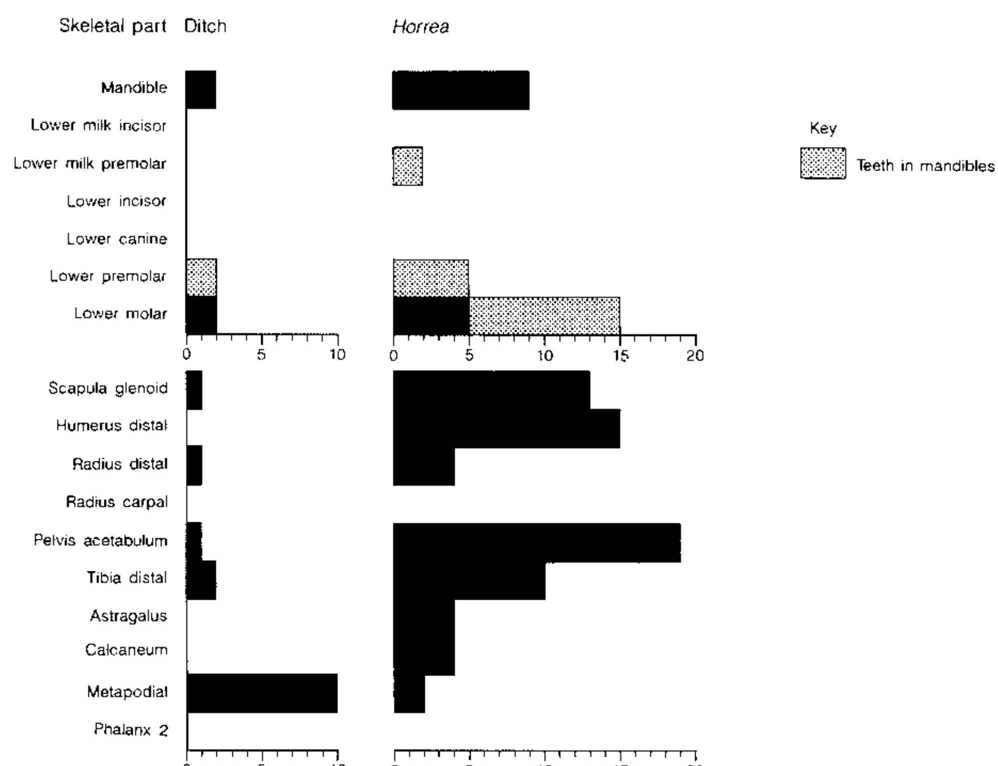


Fig 258 Relative representation of different parts of the caprine skeleton from the ditches and horrea

Table 38 The quantities of cattle, caprine, and pig bones within the ditch sequence

ditch phase		*a, b, & c*			*d*			*e*			*f*	
species	*C*	*S*	*P*	*C*	*S*	*P*	*C*	*S*	*P*	*C*	*S*	*P*
elements												
mandible	4	–	1	2	–	1	7	1	1	25	3	–
lower incisor	1	–	–	1	–	–	2	–	–	8	–	–
lower canine	–	–	–	–	–	–	–	–	–	–	–	1
lower premolar 3	1	–	–	–	–	–	–	–	–	–	–	–
lower premolar 4	–	–	–	–	–	–	1	–	–	–	–	–
lower molar 1/2	–	–	1	–	–	–	7	–	–	3	1	–
lower molar 3	–	–	–	1	–	–	5	–	–	3	–	–
scapula	1	–	–	12	–	–	12	–	–	47	2	–
humerus	–	–	–	–	–	–	3	–	–	3	–	–
radius	–	–	–	1	–	–	3	1	–	2	–	–
radial carpal	–	–	–	–	–	–	–	–	–	–	–	–
metacarpal	1	4	–	–	1	1	6	–	–	2	1	–
pelvis	–	–	–	3	–	1	5	1	1	3	–	–
tibia	–	–	2	–	3	–	3	–	–	3	–	1
astragalus	–	–	–	–	–	–	1	–	–	3	–	–
calcaneum	–	–	–	1	–	–	4	–	–	2	–	–
metatarsal	2	3	–	1	3	1	6	3	–	8	2	1
metapodial	–	–	–	2	–	1	1	–	–	2	–	–
2nd phalange	–	–	–	1	–	–	–	–	–	7	–	1
totals	*10*	*7*	*4*	*25*	*7*	*5*	*66*	*6*	*2*	*121*	*9*	*4*

key: *C* = cattle *S* = caprines *P* = pig

and storage was suggested by the range of skeletal elements and their relative proportions. One third of the bones in the ditch assemblage had been butchered. Although all the cattle skeletal elements are represented there was an extraordinarily heavy predominance of scapulae and metapodials. Every type of element exhibited butchery marks caused by chopping or slicing. The forelimbs may have been hung on hooks for storage or for smoking suggested by the holes in at least 17 of the 65 scapulae. The proportions are indicative of Roman primary butchery. This suggests that the cattle came into the fort as livestock and were subsequently slaughtered. Throughout the history of the fort as represented by successive ditch fill episodes, scapulae remain the most common skeletal parts (Fig 257). The patterns observed for the cattle were not evident in the caprine and pig bones.

It has been noted that the ditch was filled and recut (page 358), and therefore unavailable for waste disposal by the time that the sub-floors of Buildings 197 and 198 were backfilled. Any change in the bone assemblages between these environments may thus be significant. Although there was still a predominance of cattle bones in the *horrea*, the presence and ratio of species differed and the disposal methods had slightly changed. The material from the *horrea* exhibited far less butchery than the ditch. Only 14% of elements had butchery marks. Unlike the ditch assemblage, there is a low ratio of caprine metapodials to humerus and tibia (Fig 258). This may indicate that the foot bones were removed during the skinning process. There is no discernible pattern of selective disposal for any of the species. The range of skeletal parts was different and there were less of the larger cattle bones such as skulls and scapulae (Fig 257) and only the smaller bones of animals such as horse.

Social indicators

It has been established that older animals were generally brought to the site and slaughtered. The choice of the adult animals was probably a decision either of the military authority or the auxiliary unit themselves though this cannot be determined zooarchaeologically. The unit would probably have been supplied from local resources. A local breed may be reflected by the fact that the cattle from Birdoswald may have a slightly greater frequency of the genetic trait of reduced talonid on the third molar. The common frequency in Roman assemblages is 10–20% (Maltby 1979), whereas at Birdoswald it is 25% (13 out of 53). Local farmers may have worked to military contracts stipulating the supply of animals carrying the optimum quantity of meat.

The low proportion of both pigs and chicken which were considered as high-status foods in Italy might reflect their consumption by the few higher-status individuals in the fort, namely the officers.

Conclusions

As a military site, Birdoswald fits into King's (1984) model with cattle dominating the diet. With respect to this high proportion of cattle, Birdoswald also conforms to King's expectations of an auxiliary unit. There is not enough evidence to determine the actual importance of caprines and pig to the diet and to test whether their proportions are consistent with King's model.

Similar socio-economic patterns have been revealed from all excavated forts along the Wall where bone assemblages have been analysed. The proportion of domesticated animals is similar and the diet is supplemented by wild animals. Sites such as Birdoswald and

South Shields demonstrate the importance of a sampling strategy in original research designs. Sampling will tend to add to the quantity and range of bone recovered, thus providing a more accurate representation of species.

More comprehensive recovery of all the animal bone and the publication of full reports is an important trend in northern military sites. This animal bone report contributes to a base for further comparative analyses of Roman forts along Hadrian's Wall. Sites with extensive sieving programmes would provide a more accurate economic interpretation of life and the environment during the centuries of Roman control.

14 The medieval and modern periods

This chapter describes and discusses a succession of Periods (7–11) in which the area to the north of the *porta principalis sinistra*, near the northern edge of Area A and beyond, became the main centre of activity. These Periods culminated in the construction of the existing farm buildings.

The medieval and later periods denote a sharp change in the focus of the site. During the sub-Roman Period 6 the area immediately to the south and east of the *porta principalis sinistra* was the focal point of the site. During Period 7 this gate was maintained as the way into the walled area of the former fort, and the succession of farms contained in its north west corner became the heart of the settlement. Some of the principal buildings of these farms fell within Area A, but the associated working areas were concentrated to the north. The area to the south of the former *via principalis* was apparently shunned by the inhabitants of the farming settlements.

A variety of sources of information have been explored for the study of Periods 9–11. The archaeological evidence for the periods was found to be concentrated in a narrow band to the north of Area A, and found scattered in other areas. Additional data derive from the architecture of the farmhouse by which Periods 9–11 are identified. No thorough study of this building has been undertaken, but a partial survey carried out by Paul Barker of Cumbria County Council during 1987 resulted in the basic sequence becoming known. The results of this work are drawn upon in this chapter, as is the survey work of John Robinson from which the ground plan at Figure 270 is drawn. Also in 1987, Keith Blood and Donny Mckay of the Royal Commission for Historic Monuments (England) conducted a survey of the earthworks in and around the fort as part of that body's continuing work in the Roman frontier zone. This survey was of particular use in demonstrating the post-Roman use of the landscape (Fig 280). Further information comes from photographs, paintings, and the accounts of visiting antiquaries. The latter sources have frequently been drawn upon in the past for the information which they give for the Roman period, most notably in Birley's (1961) *Research on Hadrian's Wall.* However they also have a value in revealing the contemporary condition of the site. The period between the thirteenth and sixteenth centuries is illuminated by the study of documentary sources.

The combination of data from these disparate sources has provided an outline of the history of Birdoswald during the post-Roman period. Though post-Roman Housesteads has been documented to some degree (H Welfare personal communication), this approach to the installations of the Roman frontier during their reuse as features in the later landscape remains to be widely explored. The example of Birdoswald suggests that there is still much to be learned of the evolution of the modern Hadrian's Wall landscape during the last millennium.

The archaeological evidence

Period 7: The tower house and hollow-way (Site Phase 13)

Period 7 was defined both spatially and stratigraphically as the last phase during which the *porta principalis sinistra* stood as the main entrance to the walled area (Fig 259). This gate was the access to a hollow-way (2599), which turned northwards along the former *intervallum* road. The hollow-way respected a new building, Building 4406, which was constructed over the west end of the former Roman Buildings 4401 and 4403, reusing their foundations.

The *porta principalis sinistra*

Several factors combined to indicate that this gate remained in use as the entrance to the walled area at this time. The gate was respected by the footings of Building 4406 (Fig 259), the south side of which was directly aligned with the south wall of the north tower. This might either relate to the desired spatial relationship between the gate and the building, or to the need to reuse the foundations of the earlier Roman Buildings 4401 and 4403 as part of Building 4406, or, most likely, to both considerations. It is significant that the footings of Building 4406 were not constructed of robbed stone. Stones of the required size would have been readily available in the piers of the gate structure (Figs 30, 31) and would surely have been utilised were the gate in a ruinous condition. Medieval pottery of Period 7 was found on the road surface (400) beneath the rubble of the collapsed gate suggesting that the north portal remained in use, and the north portal of the gate gave directly into the hollow-way, with which it was stratigraphically associated.

Within the north portal of the gate the last Roman flagstone surface (400) continued to provide the paving for traffic through the gate. The need to resurface this road at the eastern side of the portal established the crucial relationship between Periods 6 and 7; the exterior surface (2673) associated with the Period 6 timber Buildings 4298 and 4299 was sealed by the resurfacing. The new surface was of stone flags (2698), and incorporated a large, reused decorated slab which had been placed upside-down (Fig 212, No 162).

The hollow-way

The hollow-way (2599) consisted of a shallow, worn, linear feature with sides sloping gently, and merging

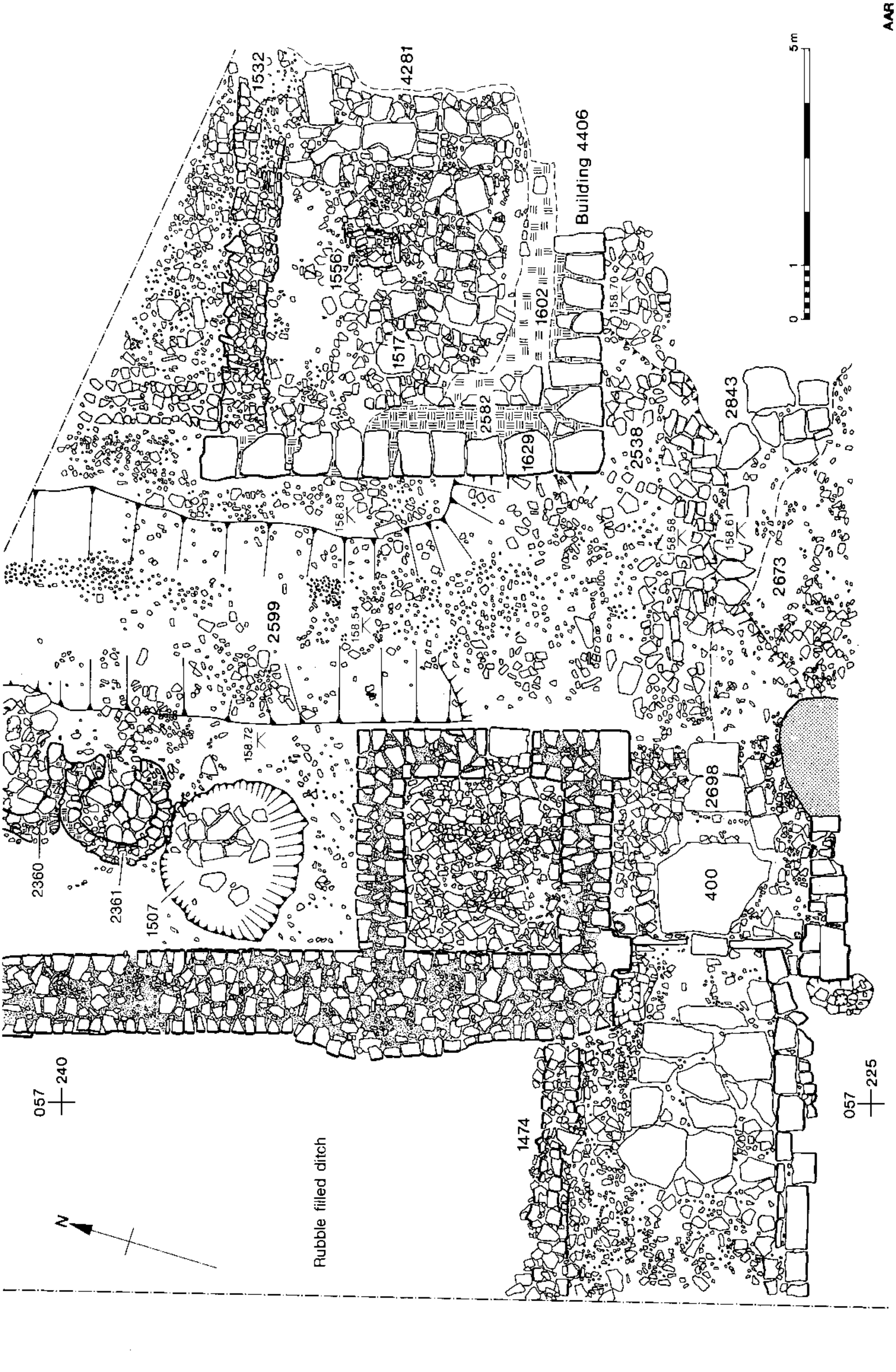


Fig 259 Plan of west gate, hollow-way, and Building 4406, Period 7

imperceptibly with the bottom. It ran from north to south along the former *intervallum* road, and turned westwards into the north gate portal. Its excavated dimensions were a length of 9.60m and a width of 3.50m wide, and it was worn to a maximum depth of 340mm.

The hollow-way respected and was functionally associated with Building 4406. The foundation of this building was constructed upon a strip of the earlier, Roman road surface which had been worn away within the bounds of the adjacent hollow-way. The building thus protected the Roman stratigraphy, demonstrating that the hollow-way had worn away a series of Roman road surfaces and repairs. This implies that the route represented by the hollow-way was used only after the construction of the building. The wearing of the hollow-way implies a long period of use, as the surfaces through which it was worn were extremely resilient, and this in turn suggests a long life for the building. The uppermost layer through which the hollow-way was worn was the Period 6 sub-Roman surface (2673). This surface overlay the flagstones (2843) of the third major resurfacing of the *via principalis* in Period 4b. This Roman surface had been heavily robbed between Periods 4b and 6. Where flagstones survived on the south side of the hollow-way (Fig 259) they prevented further wear. In the area immediately to the east of the gate portal, however, the stones had been robbed away, allowing the hollow-way to be worn through to the characteristic sett-like flags of the second major resurfacing of Period 4b. This surface was reused as the bottom of the hollow-way in Period 7.

At its southern end the hollow-way was rather wider than to the north. This broadening coincided on the west side with the Roman doorway into the north tower of the gate, and it is probable that this doorway, and therefore the tower itself, was in contemporary use with the hollow-way. Similarly on the east side the broadening might indicate a door position at the southern end of the west wall of Building 4406 (Fig 259).

When the *porta principalis sinistra* finally collapsed, the rubble (1631) sealed the Period 7 flagging (2698), and also filled the south end of the hollow-way. This further indicates that the gate and the hollow-way were in contemporary use.

Building 4406

The remains of the west end of the Roman Building 4401 were incorporated in the fabric of a new stone building. The partial robbing of the latest west wall (2955) of the earlier Building 4401, Phase d (Fig 123), was sealed by the massive footings (1629), which also partially sealed the latest Roman road surfaces. These footings consisted of rectangular sandstone blocks of an average size of 820 x 650 x 250mm (Figs 243, 260). They were roughly tooled, and did not resemble any Roman stonework within the fort. It must be concluded that they were purposely quarried for this building, and were not reused Roman materials. The blocks were laid very closely together, parallel to the outer faces of the south and west walls of the former Building 4401 at a distance of 200–400mm. They were set on a layer of hard clay (2582) 60mm thick, which was also packed into the space between the backs of the stones and the outer faces of the Roman walls.

The footings survived on two sides, and were robbed to the north and east. It seems that in laying the foundations for the north wall of this building the remains of the combined south wall of Building 4403 and north wall of Building 4401 were utilised. These walls were stabilised by packing the gap between them with a mass of solidly wedged rubble and clay (1532, Fig 259).

The building measured 7m externally north–south, and at least 5m east–west. Both the building foundations and its associated stratification had been destroyed in more recent times to the east by a more recent robbing of surfaces (4281 is the edge of this robbing). Within the building, the structural clay (2582) was sealed by a second layer of thick pink clay (1602) laid as a levelling for a flagstone floor. The earliest such floor was very fragmentary, consisting of small pieces

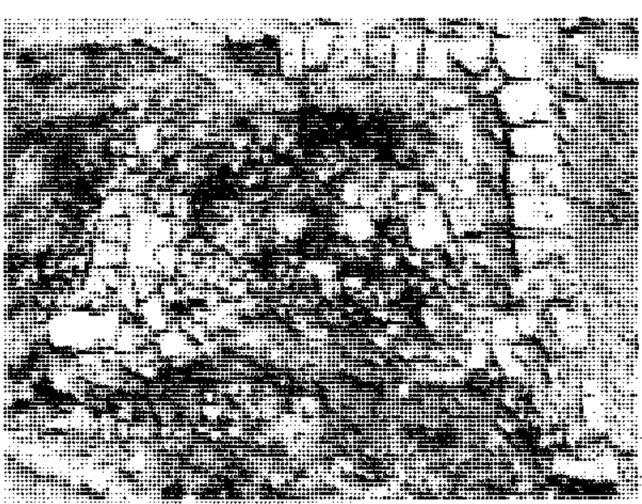


Fig 260 Building 4406 from north showing wall foundations, robbing on north side, and original flagstone floor

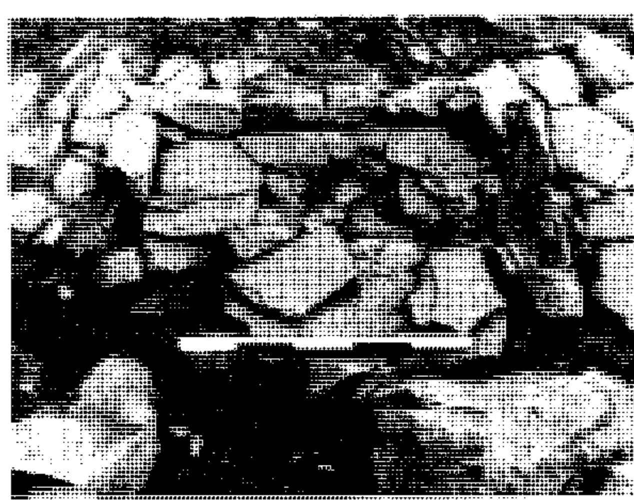


Fig 261 Stone-kerbed post pad in centre of floor of Building 4406

of laminated sandstone pressed into a layer of dark brown clay (1559) which was heavily contaminated with charcoal. The second flagged floor (1517) covered nearly all of the interior of the building. It was made of mixed and irregular flat stones which were laid very closely together, and were very worn. A stone feature (1556; Fig 261), comprising one sandstone flag surrounded on three sides by a neat kerbing of rectangular pieces of limestone, was built into this floor. Though initially interpreted as a hearth, this feature was rather small, and exhibited no sign of burning.

Period 7 in Area B

The soil deposits overlying the rampart which have been notionally allocated to Period 6 were sealed by a cobbled surface (14; Fig 262). Upon this surface a substantial drystone wall (12) 800mm wide was built. This wall must originally have been butted against the north wall of the fort. The fact that this new wall overlay the southern edge of the lower courses of the fort wall and that both of these walls were robbed simultaneously, suggests that the fort wall had been narrowed to approximately half its original width before the butting wall was erected.

Period 7/8: collapse and dilapidation (Site Phase 13/14)

Collapse and robbing of west gate and fort walls

The *porta principalis sinistra* and west wall of the fort did not have a single 'collapse phase'; on the contrary, episodes of collapse were interleaved with the construction of buildings. These phases were far from simple to excavate. All of the rubble was similar, having originally been derived from Roman structures, and robbed Roman material was used to construct buildings upon these collapse deposits. These buildings in turn decayed, and were sealed by further rubble.

The fact that the archaeological evidence for the degradation of the west defences during the latter part of Period 7 and Period 8 was sealed by later buildings demonstrates that the principal phase of robbing and collapse of the *porta principalis sinistra* and curtain wall took place during the continued occupation of the site, and that these aspects were not simply post-desertion phenomena. Though the reuse of stonework during both of these phases demonstrated that some stone robbing had occurred, there were no conventional robber trenches, suggesting that it was the standing walls which were being robbed. Such robbing would have further accelerate the decay of the standing Roman fabric.

The collapse of the gate is attested by a widespread rubble layer which filled the southern end of the Period 7 hollow-way (1631), as well as the gate portal (319; Fig 263). The layer also continued to the immediate east of the gate (316=317=2608=2617). It consisted predominantly of stone facing, including many diamond-broached pieces, and some window voussoirs. At least 50% of the deposit was of facing stone, the rest was much smaller material, probably representing fallen core work (Fig 263). Collapse deposits also lay to the west of the curtain wall, to the north (273=1430) and south of the gate portal (320=1338), and within the north tower of the *porta principalis sinistra* (384=1334). Immediately in front of the former north portal of the gate lay an area of dense smaller rubble (317) consisting of large pebbles and sandstone fragments. This appears to represent core work which had collapsed on top of the already fallen facing stones. To the south of the area, an intact panel of the facing of the east wall of the south tower had collapsed on top of this small rubble (315). The remaining portion of this collapse shows six courses fallen at a very steep angle. Most of the stones stood upon their faces, and were close enough together to suggest that they had fallen as an intact panel (Fig 264).

The sequence of collapse can be interpreted as follows. To begin with, usable facing stones were robbed from the lower part of the walls, that is from areas within easy reach. This would have caused the remaining facing stones above to become loose. They eventually fell out, as attested by the spreads of large pieces of rubble (319). This phenomenon (though robbing has now stopped) may be seen in the medieval walls of Bewcastle castle. A similar phase of robbing has been fossilised by the modern consolidation of the south wall of the Roman town of Caerwent. The core, no longer retained by the facing stones, then began to spread at the base of the wall while unsupported facing stones higher up the wall continued to collapse. After the upper facing stones had fallen away from the core this too slipped or fell, creating the deposits of smaller rubble above the larger which could be seen on both sides of the curtain wall.

It should be assumed that after the collapse of the gate the fort walls were made quite low in the occupied area of the site, as high crumbling walls would constitute an obvious hazard. From this point onwards it is necessary to suppose that the robbing of standing walls and continuing degradation and collapse of the ruins was a part of the landscape at Birdoswald.

This phase of collapse was followed by limited quarrying of the gate structure itself, attested by the excavation of a large oval robbing pit (2761) measuring 2.90 x 1.75m and 0.86m in depth, to remove the eastern pier of the west gate *spina*. To the north of the north tower the southernmost of the range of three ovens was also robbed at this time (1507; Fig 259).

New roads and soil accumulation

With the *porta principalis sinistra* now out of use it became necessary to create an alternative access to the

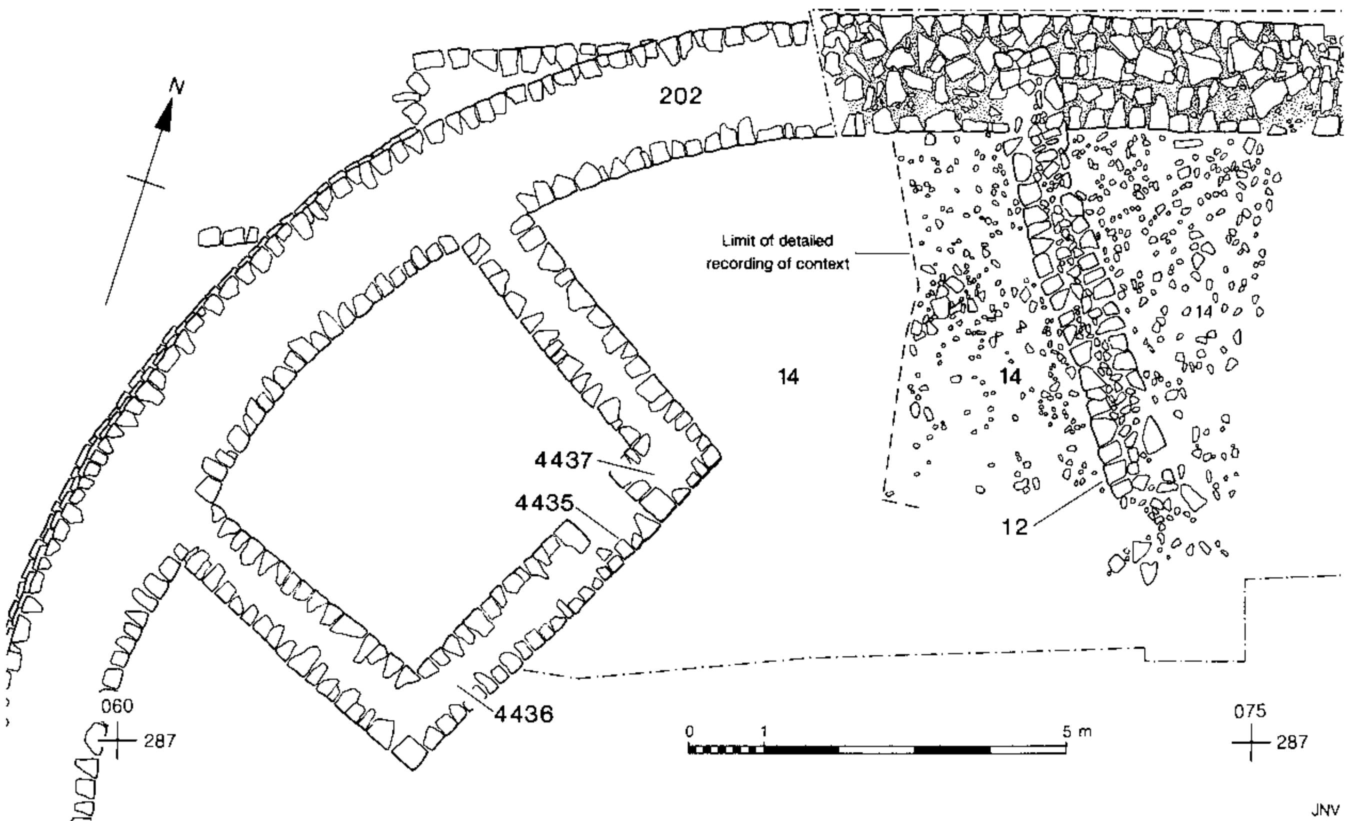


Fig 262 Wall and surface of Period 7 in Area B

Fig 263 View southwards of rubble collapse in the porta principalis sinistra *area: the south-west corner of Building 4406 is visible in the bottom left*

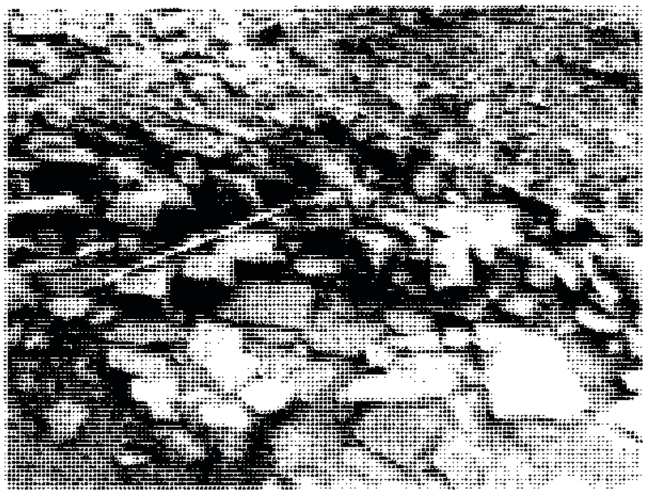


Fig 264 Coursed wall collapse from an intact panel (315)

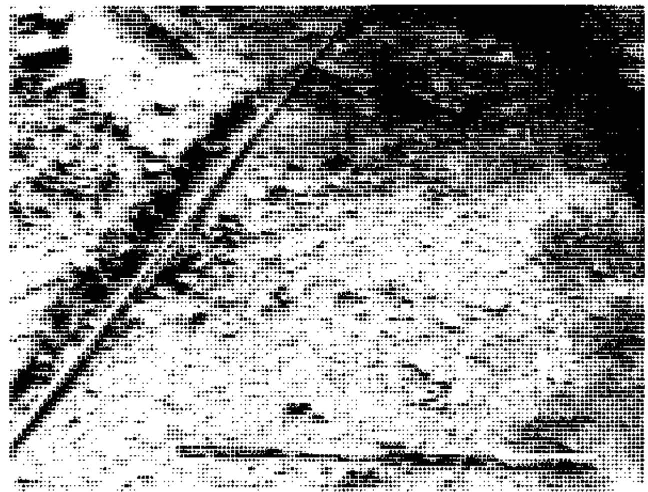


Fig 265 Period 7/8 roadway (1667) laid through the west wall of the fort, 13m north of the porta principalis sinistra

buildings in the north-west corner of the fort. This was done by robbing a stretch of wall, beginning 13m north of the former gate. Through this 2.85m wide breach was laid a straight, east–west road made up of dense, evenly laid, and compacted cobbles (1667; Figs 265, 268). The foundations of Building 4406 were butted by a series of cobbled surfaces (382, 1601), which seem to have acted as a spur path to the main route. This may still have served Building 4406, replacing the earlier hollow-way. The path ended at the south west corner of Building 4406, where the piles of rubble which had fallen from the gate were not cleared away. In the northern part of the area various resurfacing patches were laid on the junction of the path and road,indicating that both were well used.

The new roads appear to have been laid simultaneously with the accumulation of a buried soil. This soil layer blanketed the collapsed rubble very thinly, and lensed out to the south of the gate (260; Fig 268), although to the north of the north tower of the gate it was quite thick and extensive. The deposit consisted of a uniform dark-brown to dark yellow-brown friable, pebbly loam. The depth of the deposit varied from 0.28m in the north, where it was banked against the west wall of the fort, to 0.08–0.14m in the south, where it was level, exposed, and sealed far later. A similar buried soil was found covering Area C and Area E, where it predated the structures of Period 8. In Area C the deposit was sampled, and subjected to micromorphological examination.

Post-Roman buried soil in Area C

by Maureen McHugh

The soil was a very dark grey-black stony, sandy silt loam, comprising a complex mix of minerals, sedimentary detritus, organic matter, and occupation debris. Human-occupation rubbish includes abundant fragments of charcoal, wood, pottery, and bone. The random distribution of this debris, the presence of relic root channels, some associated with organic matter coatings or plant remains, the presence of earthworm burrows and some very weakly expressed gley morphology (pale mottles) suggest a fairly prolonged period of soil development, plant growth, and faunal activity prior to burial. Topsoil macromorphology suggests a soil primarily made up of components derived from human activity which has at some time supported plant growth and which has been reworked by soil fauna. Although this period was prolonged enough for a thorough mixing of soil constituents within the topsoil and for the establishment of earthworm burrows within the subsoil, it precluded any substantial mixing between the two or the gleying of the subsoil.

The inorganic soil components were very abraded and poorly sorted. Microcrystalline iron oxides (goethite), which were common throughout, are probably not directly linked with human activity, though Pettry and Bense (1989) found that midden deposits were enriched in iron as a result of prolonged habitation. They are however thought to reflect the reorganisation of soil constituents in a chemically active soil environment rich in organic matter.

Occupation debris included carbonised and degraded wood (20% of the total soil area in places) which was often embedded in resin-like substances and associated with fine coal detritus. Other human-occupation refuse includes possible coprolites, building rubble, and ash residues. It is thought that most of this reflects the gradual accumulation of occupation wastes.

Overall phosphate levels far exceed those documented in midden soils (Pettry and Bense 1989) while the parallel distribution of phosphate within each fraction suggests a non-normal soil system, characteristics which are consistent with prolonged and intensive occupation (Eidt 1977). Levels of occluded iron and aluminium-associated phosphates exceed those in the other Birdoswald soils by more than ten-fold, confirming that occupation was indeed prolonged.

Soil macromorphological and micromorphological characteristics, together with phosphorus data, combine to suggest that this soil accumulated in conjunction with prolonged and intensive occupation.

The presence of clay mineral, humified plant material, relic root channels, and faunal burrows suggests ongoing soil processes of considerable duration. These processes however were concomitant with the gradual accumulation of anthropogenic debris so that the presence of 'normal' soil features need not imply a period of desertion.

Dating

The medieval pottery is catalogued below. No pottery other than residual Roman material was recovered from the interior of Building 4406. The debris from the collapse of the curtain wall and gate in Period 7/8, during the lifetime of Building 4406, contained pottery of Fabrics 1 and 3 dating from the twelfth to the fourteenth centuries. An important indicator was the presence of a large body sherd of the thirteenth- to fourteenth-century Fabric 3 on top of the flagstones (400) of the north portal of the *porta principalis sinistra*, and beneath the earliest collapse debris from the gate (1338), suggesting an approximate fourteenth century *terminus post quem* for this collapse. In Area B, thirteenth–fourteenth century pottery of Fabrics 4 and 6 was found beneath the cobbled surface associated with the Period 7 drystone wall (12).

In the interface (389) between the dense collapsed core material (317) from the west wall and *porta principalis sinistra*, and the overlying soil accumulation (260) of Period 7/8, was a large sherd of a jug of fifteenth-century date in Fabric 9 (Fig 279, No 4). This seems to reflect the primary deposition of this vessel, as other sherds were found in successive levels (204, 220). As the structures of Period 8 overlay the soil accumulation (260) this sherd provides an approximate *terminus post quem* for these structures. It is possible to advance the following dating: the pottery of the twelfth to fifteenth centuries appears to represent the use of the *porta principalis sinistra* as the entrance to the hollow-way during Period 7, and the occupation of

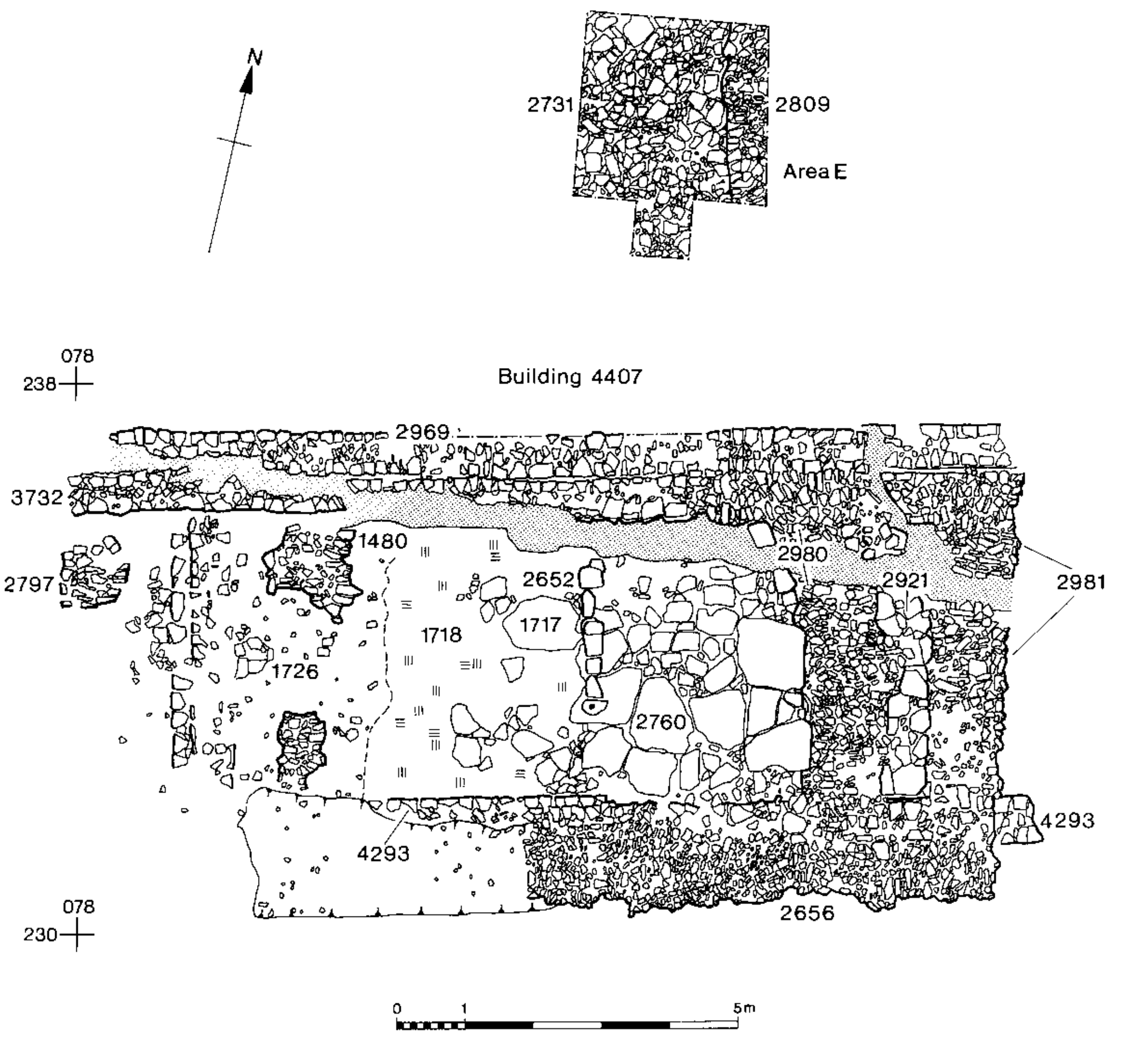


Fig 266 Plan of Building 4407 in Area A, with contemporary features in Area E to the north

Fig 267 Building 4407 from the east: the cobble foundations of the two rooms of the building can be seen reusing the walls of the earlier Building 4402

Building 4406 probably began during the fourteenth century. The building seems to have continued in use during the gradual decay of the gate and curtain wall. The gate finally fell, or was demolished, probably in the late fourteenth or fifteenth century. With such small amounts of stratified material residuality is impossible to assess; though thirteenth- and fourteenth-century pottery definitely predates the collapse of the gate, this collapse could have been as late as the fifteenth century. The new entry to the north of the gate would thus have been made during the lifetime of Building 4406. This may be confirmed by the fact that a series of cobbled surfaces acting as an offshoot from the new main entrance appear to have served Building 4406, replacing the earlier hollow-way. The construction of Building 4406 can thus only be dated broadly to sometime between the thirteenth and fifteenth centuries, with a balance of probability weighted towards the latter end of this range.

Period 8: the bastle house and early farm buildings (Site Phase 14)

Period 8 is marked in particular by the construction of outbuildings in the area of the former *porta principalis sinistra*. These reused the standing fabric of the gate. The history of these structures may have extended into Period 9. The identification of Building 4407 with this phase is stratigraphically and spatially secure, and it appears that this was the principal building of the period.

Building 4407

The most substantial excavated structure of this phase was a building which overlay and incorporated the remains of Roman Building 4402 (Figs 266, 267). The foundations of this building (1480=2656=2980=2981) were of a type not encountered in earlier or later Periods. They were 1.09m wide and 350mm deep, comprising large flat stones, including reused flags, facing stones, cobbles, and occasional boulders, laid herringbone fashion in two courses. At the west end of the building the foundations for the west wall (1480) were broken by a gap of 1.6m probably for the

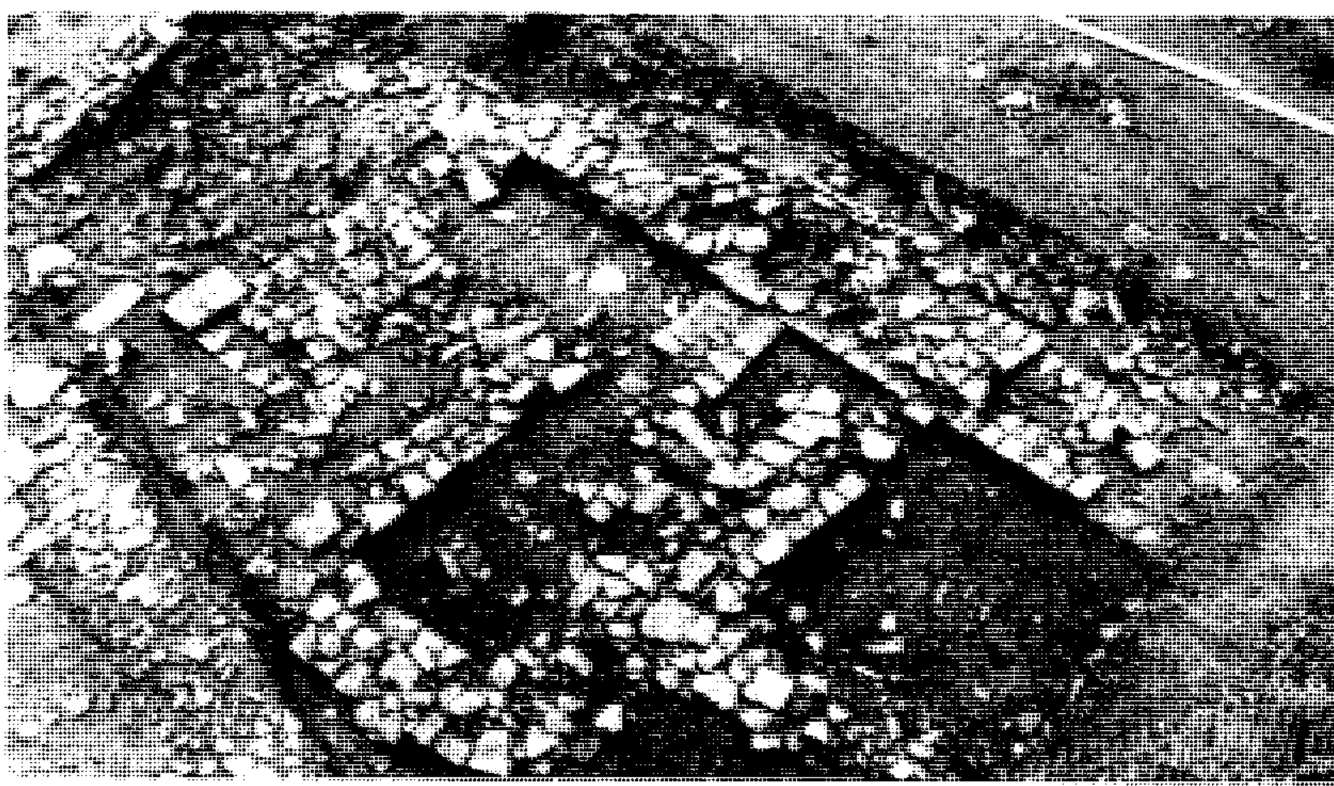


Fig 269 Building 4500, embodying the fort curtain wall and the south wall of the north tower of the porta principalis sinistra: *view from north-east*

entrance to the building. Further to the west beyond the building is a small outlying rectangle (1.6 x 1.2m) of similarly constructed foundations (2797), though the relationship of this to the main building is not clear.

The external dimensions of the building were 10.3 x 6.6m. Inside it was divided by a strip of foundation of identical width to those of the exterior walls into two 'rooms' measuring 6.6 x 4.4m and 4.4 x 0.74m. The floors of these rooms comprised flagstones (2760=1717=2921) laid on a clay levelling deposit (1718). They survived relatively intact in the eastern half of the building, though they were badly robbed and more fragmentary to the west. The larger room was later divided by a flimsy wall (2652) which appeared to form an internal partition, a door pivot stone found adjacent to this wall would seem to confirm the interpretation, unless this had been reused.

It was apparent that the walls of Buildings 4402 and 4403 must have been visible when this building was erected. The combined north wall of Building 4402 (3732) and south wall of Building 4403 (2969) were used as the north wall of the new building as they had been further west, on the north side of the Period 7 Building 4406. They were only replaced by pitched stone footings (2980, 2981) in the north east corner. The south wall of Building 4402 (4293) was largely removed, though parts of its internal face were reused as the northern face of the pitched stone foundation.

In Area E a pitched stone foundation, identical to those of Building 4407 (2809; Fig 266, was found to run north–south at the eastern edge of the area. It is possible that it bonded or butted the north wall of Building 4407, though it may equally have been a separate building. This was associated with a cobble surface (2731) which may have been interior or exterior.

Outbuildings and enclosures over the *porta principalis sinistra*

A series of new buildings and enclosures were now built above the buried soil layer (260). These structures (Figs 268, 269) utilised the ruins of the north tower of the *porta principalis sinistra* and the robbed foundations of Building 4406. A surface combining paving and cobbles (329=350=1494) coincided largely with that of the former hollow-way, and was used in association with the new buildings.

Building 4501

On the eastern side of the former hollow-way, the newly laid exterior surfaces respected a wall of reused Roman stones (402=1497) with a rubble core and some traces of clay bonding. It stood one course high, and was built upon the surviving foundation (1629) of the Period 7 Building 4406. To the east of this wall a paved floor (401=1524=1518) incorporated an almost complete Roman quernstone (748), and also the robbed top of the west wall of Building 4403 as a part of the surface. This was the only surviving fragment of a building which must have extended some distance eastwards.

Building 4500

The south and part of the west walls of the north gate tower of the *porta principalis sinistra*, including the original doorway into the tower from the *intervallum* road (Fig 268) were reused as part of the fabric of Building 4500. This marked the final reuse of these long-lived Roman structures.

The new walls of the building (346, 347, 348, 349) were formed of rough, drystone walling, which survived to only one or two courses in height. All were built of reused Roman facing stones, some with diamond broached decoration, including roughly dressed reused Roman core material and flagstones. Despite the quality of the stones used, the walls were well-coursed and averaged 650mm in thickness. Three walls (347, 348, 349), the northernmost of which (349) butted the west curtain wall of the fort, formed a sub-rectangular room, measuring 4.70 x 2.20m internally with rounded corners and a bowed east wall. The room was entered through a gap in the south wall (347) leading from an outer room measuring 3.10 x 2m. The outer room was defined to the south and east by the walls of the Roman gate tower, which must still have been standing to some height. The entrance to the building appears to have been by way of the former gate tower doorway. The exterior surface (350) stopped short at this entrance, giving way to flooring (333). In the larger room the north wall of the gate tower was reused and built onto by an angle of walling (310), which formed a structure measuring 700 x 650mm. Though no burning was associated with this feature, it is still perhaps best interpreted as a hearth. To the north of the larger room, and bonded into the side of its north wall (349), was a further wall (346) which had clearly been part of the building, though it had been so heavily robbed that it petered out totally to the north and had lost both faces. This wall suggests that the north side of the building may have abutted the new access road (1667; Fig 268).

The internal surfaces of Building 4500 (333=334=335) comprised compacted earth with frequent small pebbles. Within the entrance a blocking wall (309) was apparently constructed in order to divide the outer room.

Building or Enclosure 4502

This building occupied the blocked former south portal of the *porta principalis sinistra*. It was separated from Building 4500 by a hard, level, compact surface of sandstone fragments and pebbles (267) laid over the rubble in the north portal.

The north wall of the enclosure was formed by the *spina* of the gate, which was altered by the addition of

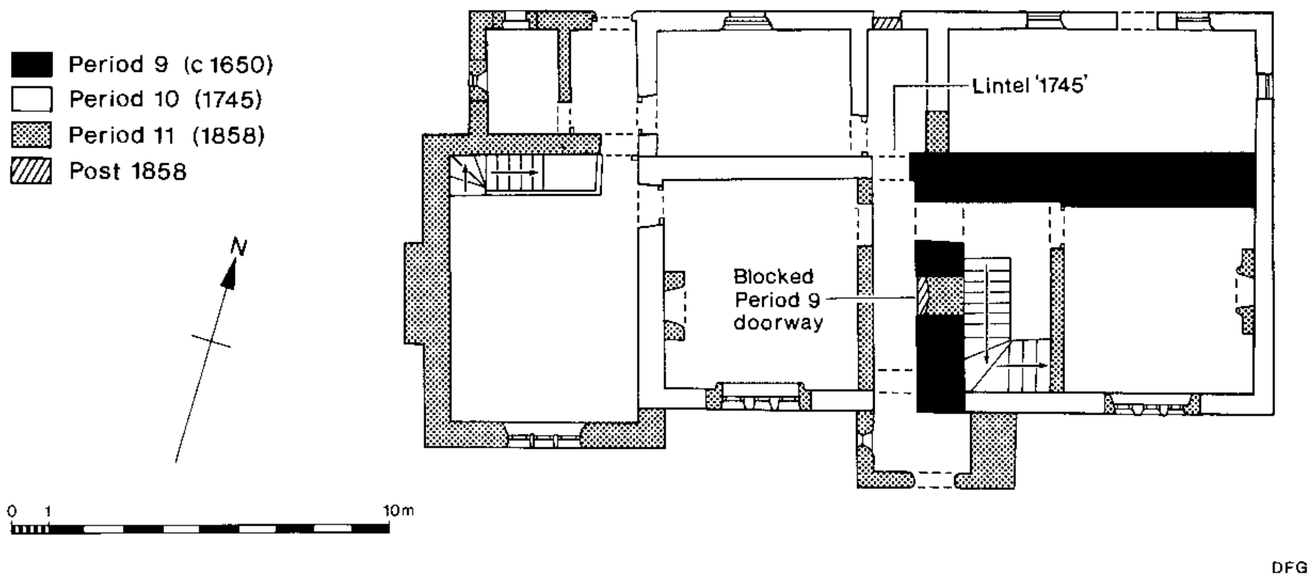


Fig 270 Phase plan of Birdoswald farmhouse

a length of drystone walling (223) which stood up to four courses high. It was constructed in a markedly poorer fashion to Building 4500, including fragments of merlon cap, and granite and white limestone boulders. The core comprised fragments of broken building stone, but there was no sign of any bonding material. There was a return to the south, which was bonded with the *spina* modification at its eastern end (421). This was only 1.40m long. Both walls were 0.90m wide, and seem to have formed two sides of a pen, with an entry on the east side. The floor of this enclosure was formed of a hard compact layer of silty clay (365) which had been laid before the north and east walls were erected. The surface to the north (267) postdated the enclosure.

Fort wall reinforcement to the south of Enclosure 4502

A reinforcing wall (1504=1547) ran southwards from the north wall of the south gate tower, which also formed the south wall of Enclosure 4502. This wall comprised a single (east) face with a maximum of two surviving courses of large facing stones including rough boulders, several of which were of white limestone fossilised coral like the stone used in the latest stone fort wall in Area F, and a reused window voussoir. Between this wall and that of the fort lay a mass of earth and stone (1548=1504). It seems clear that this was a deliberate reinforcement of the standing fort wall. The line of the south wall of the south gate tower was crossed by this wall. It is thus apparent that the south and east walls of the tower had ceased to exist by Period 8. The north wall of the tower, on the other hand, survived as the south wall of Enclosure 4502.

Dating

Contexts associated with Period 8 contained residual sherds of Fabrics 7 and 8, but also Fabric 10 dating to the fifteenth to seventeenth centuries. Some of this pottery was found residually in the demolition deposits of the structures of this phase, which were sealed by the Period 9 Building 4503. Despite this broad range of date, architectural parallels with Building 4407 suggest that the phase should be placed in the late sixteenth to early seventeenth century.

Period 9: the early modern farm (Site Phase 15)

The standing farmhouse

This Period is the first to be associated with a visible phase in the standing farmhouse, of which two surviving walls are attributable to this Period (Fig 270). These seem to constitute the original west and north walls of the house. The walls are 1.40m thick and are built of randomly laid coursed rubble with a rubble and clay core. The stone utilised in the construction is exclusively reused Roman facing stone. The west wall stands to full height for a single storey only, above which it has been reduced and refaced. The north wall survives to eaves height, a total of 6.50m. These walls were surface built without foundation trenches, and it is salutory to note that this massive stone structure, if demolished, would have left almost as little archaeological trace as the Period 6 Building 200.

In the centre of the west wall is a doorway (Fig 271). The door jambs are formed of randomly sized large blocks with an internal chamfer. The monolithic lintel is formed at the base into a rough, flat representation of a four-centred arch within a chamfer of a type described by Brunskill (1987, 134) as sub-medieval. This doorway was reused during Period 11 as a niche to accommodate a statue, and the square hole on its south side seems to have been a later feature. The upper storey of the north wall contains a blocked window with a timber lintel and sill, both substantially longer than the window was wide, built into the wall. The window opening measured 1.08m wide and 1.38m high, and was briefly revealed when the wall was replastered in 1989.

The excavated evidence

There was little archaeological evidence assignable to this phase. The spatial distribution of a number of animal burials, including dogs, sheep, calves, at least one cat and a foetal horse, suggests that the disposal of dead farm animals on the south side of the house now began, and some of these burials cut the robbed footings of Building 4407. The burials took the form of articulated skeletons within shallow pits (eg Fig 272). Such burials also occurred in Areas B and D, and it seems likely that these were disused or garden areas during this Period.

The final reuse of the walls of the former Roman Buildings 4402 and 4403 took place during this Period. To the east of the farmhouse the gap between the north wall of Building 4402 (3732) and south wall of Building 4403 (2969) was used as a drain. The drain reused the western 7m of the gap between the walls (Fig 273); this was modified towards the west, where a segment of new drain (3711) was used to create a curve towards the house. It was capped off with flat stones and core work, such that when first excavated the two walls appeared as a single, very thick wall.

In the area of the former *porta principalis sinistra*, the remains of the Period 8 buildings were swathed in a rubble collapse horizon (226, 249, 225, 241; Fig 258). As in earlier periods it was possible to specify the

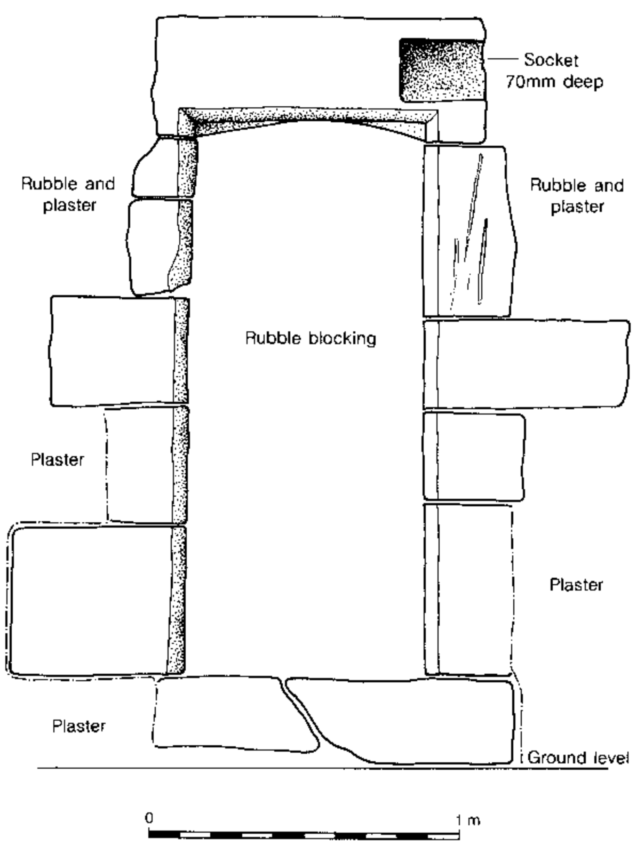


Fig 271 Elevation of Period 9 doorway inside Birdoswald farmhouse

Fig 272 Animal burial of Period 9, in this instance a calf

Fig 273 Period 9 drain (3711) utilising the gap between the walls of Roman Buildings 4402 and 4403

process of collapse. Larger facing stones (249, 226) were the result of the collapse of Building 4500, while the smaller material (241, 225) represents the continued spreading of core material from the decaying fort curtain wall.

Building 4503

Above the collapsed rubble (249), and following the same line as the south wall of the north tower of the gate was a wall, running east–west, with a trace of a return (208; Fig 274). This was the south wall of a building which again reused the west wall of the fort as its western wall. The eastern wall of the structure survived only fragmentarily (266; 1402; 1404). The only interior surface of this structure may be represented by an area of compact loam which survived in the south west angle of the building (247).

Period 10: the eighteenth-century farm (Site Phase 16)

The farm buildings of the latter part of this Period appear in the background of John Storey's engravings of Potter's excavations on the south and east gates of the fort (Potter 1855b; 1855c). The best representation of the phase is, however, the watercolour by Henry Richardson (Pl 2). The only excavated features definitely associated with this phase were within the farmhouse, in Area C.

The south and east walls of the farmhouse building were demolished. The remaining two walls were incorporated into a rectangular building of two storeys, based on a ground floor plan consisting of two rooms divided by a central through-passage (Fig 270). The doorway to the north of the through-passage was built of large upright stone slabs with a massive lintel (Fig 275) carrying a cartouche with the inscription *ABM 1745* (Fig 276) on its north side. The position of the inscription suggests that this was the main door to the house from the outside, and therefore that the house 'faced' the farmyard.

In Area C excavation demonstrated that the foundation block (1576) of the eastern door jamb which supported the dated lintel was incorporated within a layer of large, uniform, well set cobbles (1564=1718; Fig 259). It seems likely that this was a farmyard surface laid at the same time as the extension of the farmhouse. It is probable that this Period also saw the erection of at least some of the farm buildings to the north of the house. The relative levels between the cobbles in Area C and the modern concrete farmyard suggests that the cobbled yard laid in or around 1745 continued in use until sealed by concrete in the 1950s (J Baxter personal communication).

On the farmhouse plan (Fig 270), an extension to the north is shown as part of this Period. This was certainly an addition to the 1745 two-cell and through-passage plan, and had been added by the time of the Richardson painting. The foundations for the extension

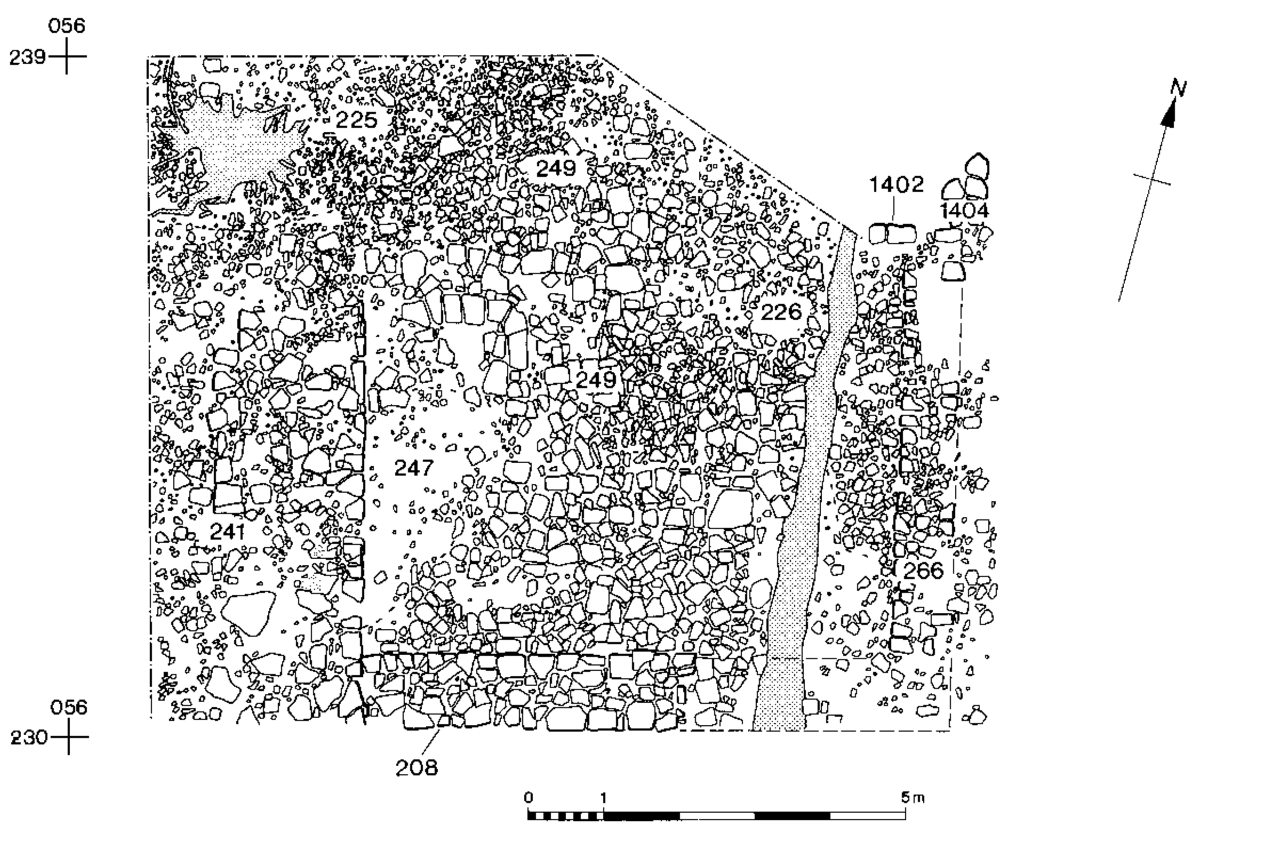


Fig 274 Building 4503 and preceding deposits of rubble collapse

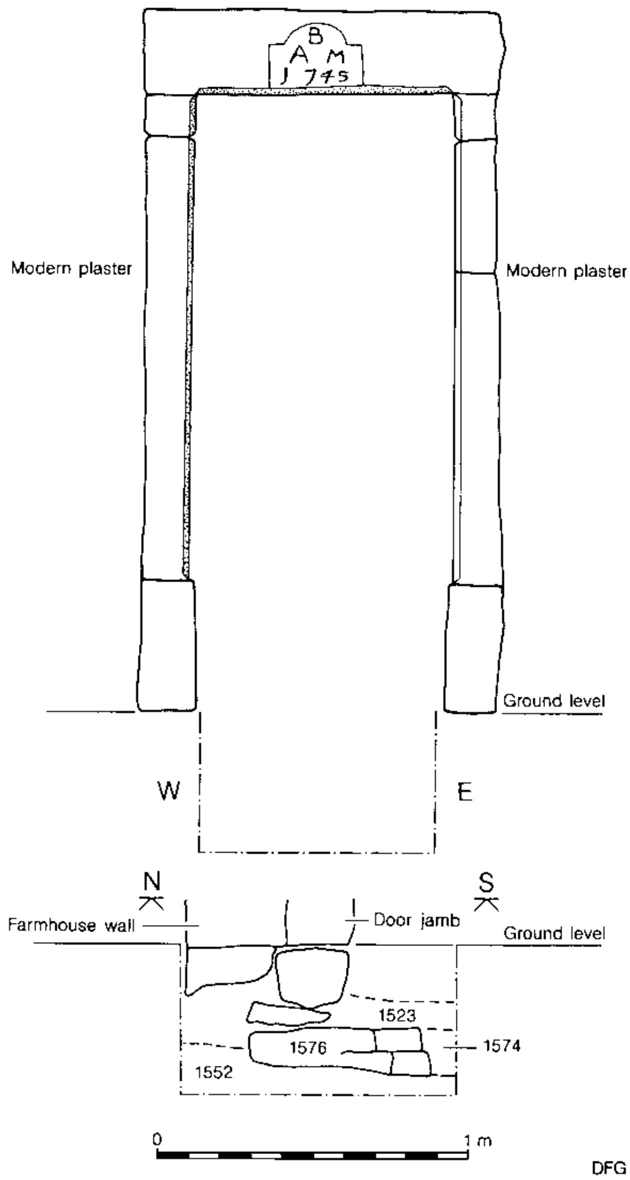


Fig 275 Period 10 doorway to farmhouse, and section around foundation block

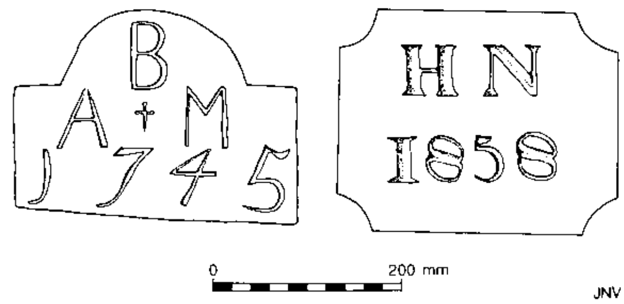


Fig 276 Datestones in the farmhouse of Anthony and Margaret Bowman, 1745 and of Henry Norman, 1858

Fig 277 Birdoswald farmhouse and garden before excavation began in 1987

cut the cobbled surface associated with the 1745 doorway. The extension was two storeys in height, consisting of two service rooms and an extension northwards of the through passage. The house was covered by a single catslide roof, with the main gable over the two south rooms and a sweeping rear pitch. It seems likely that the orientation of the house was changed when the extension was built, so that the house now 'faced' the fort. It would thus have been the front of the house which Richardson illustrated in 1849 (Pl 2).

Period 11: The nineteenth-century farm (Site Phase 17)

The standing farmhouse

During this Period the farmhouse achieved its present appearance (Fig 277). The date 1858, and the initials of the owner, Henry Norman (Fig 276), appear on the datestone over the southern porch which was now added. It was Norman who now gave the house its characteristic nineteenth-century gothic appearance. The gabled front porch, with a privy above, was provided with an ornamental facade featuring a stepped gable and a central door with datestone above. On the west end of the building a two-storey addition with a kitchen on the ground floor and two rooms above was constructed. The exterior appearance of this extension was in the form of a crenellated tower which was entirely ornamental. The extension was covered by a continuation of the plain-gabled slate farmhouse roof, with a hollow shell representing the tower top above. The chimneys for the additional rooms were carried to the tower top by way of a half-projecting chimney piece in the west tower wall, but provision for drainage and guttering was positioned on the verges of the gable within the hollow tower facade. A flat roof added to the top of tower in the later 1960s was a useful photographic platform during the early stages of the present excavation, but was rotten at the sides and unsafe by 1992. The tower, like the rest of the building, was built with Roman squared rubble robbed from the fort, with large blocks in the quoins. The quoins bear the marks of modern dressing, so it is not possible to be certain whether these were originally Roman stones or not. The base and the floor level of the second storey of the tower are marked by plinth courses. On the top of the chimney on the west side of the tower parapet is a blank carved shield. The south facade of the building was rendered, and the surface of the render scored to imitate ashlar. The crenellated parapet of the tower was supported on ornamental corbels, while corbels at the eaves of the gabled roof imitate exposed rafters. The stone mullions to the front windows, with their carved rustication, were also an addition of this period.

Internally, the centre of the house was changed by the construction of a large hallway and staircase (Fig 270). The Period 9 doorway was partially blocked, leaving a plastered niche on the west side. A new passage was broken through at the angle of the surviving Period 9 walls. This led to a stairwell which occupied the western third of the oldest room in the house. The remainder of this room was partitioned off, with a door provided from the stairwell. The two main living rooms were also provided with large stone fireplaces. When the floor in the south-eastern room was lifted, the joists were found to consist of reused structural timbers.

Evidence for Norman's decorative scheme for the interior of the house survives beneath the wallpaper in the central hall and stairwell, which was entered from the front porch. Like the exterior front facade the walls here were rendered and scored to imitate ashlar. They were painted in two zones: a dado in dark brown, and the remainder of the walls in a light red, probably red-lead based, paint. The large blocks which framed the Period 9 doorway were not plastered or painted, but formed a feature. The doorway became a full-height niche, the plastered back of which was painted cream. The niche was probably created to house a statue discovered during the Potter excavations of the 1850s.

The excavated evidence

Drains, in the form of cylindrical field tiles, were cut through the archaeology to the immediate south of the house (shaded as later linear intrusions, Figs 50, 117, 124). One of these served a down-pipe from a now-vanished building which is recorded in the Richardson painting as existing on the eastern end of the farmhouse (Pl 2). Any archaeological trace of this building in Area D had been removed by gardening activity.

As part of his renovation Henry Norman was responsible for 'levelling the broken ground in front of the farmhouse to form a new garden' (Norman 1860). This garden survived until 1987 when it was excavated as Area A. It was bounded on the south side by the south wall of the former Roman *horreum*, Building 197. When Norman landscaped his garden, he cleared out the alley between Building 197 and the adjacent building to the south. The Roman wall was utilised to divide the garden from the field beyond in the manner of a ha-ha or concealed ditch, and was incorporated into a garden wall. At the eastern end of the building this was a simple matter of adding extra height to the standing Roman wall and embellishing the top with coping stones (Fig 278). On the western end, however, the *horreum* wall was not sufficiently long for Norman's purpose. To continue the ha-ha, he dug a trench across the *intervallum* road to meet the west curtain wall of the fort. On the north side of this trench he constructed a wall to continue the line of the south *horreum* wall (18). He was clearly concerned to achieve a consistent finish, as the end facing stones of the south west end 'buttress' of the *horreum* were robbed, and the wall extension was bonded with the Roman wall such that the coursing was identical. Even the string course of the Roman wall was replicated in the extension. The stone for this work appears to have been taken from a robber trench (30; Fig 25) in the north wall of Building 197 (1207). This trench would have produced 118m of facing stone, and the additional ha-ha wall contained 116m of stone. The robber trench also produced sufficient string course material. It seems therefore that Norman quarried a part of the invisible *horreum* wall in order to find suitable stone to complete his ha-ha in Roman style. The robber trench is dated by a complete pancheon which was broken, probably deliberately, in the bottom.

Norman's plan included an impressive entrance and exit to his premises. Remnants of a semi-circular paved area in front of the farmhouse (1329) beneath the later path and lawn may be part of the 'carriage sweep' mentioned in a 1901 sale document (Walton and Lee 1901). This drive led from the modern road down the west wall of the fort and through the gap which had been made in the fort wall in Period 7/8. It then ran along the front of the house and round the east side of the farm to emerge and meet the road again. The gate posts of the exit comprise masonry piers with pyramidal stone copings; similar gateposts were originally provided to the entrance in the north-west corner of the fort. These can be seen in a photograph taken in 1878, which is now in the Danson Archive in Liverpool Museum (B.3.260).

Fig 278 Henry Norman's ha-ha at the eastern end of Building 197: the eastern buttress on the south side of the horreum *wall can be seen to the left, and the chamfered end buttress is built into the Victorian wall*

In 1987 a mature rhododendron hedge was cleared from the top of the ha-ha wall, and a large monkey-puzzle tree (*Araucaria*) which stood in front of the house was felled. Both tree and hedge were at the end of their lives, though a photograph taken *c* 1900, in which they do not appear, shows that these were not planted as part of Norman's garden scheme.

Medieval and Post-medieval pottery

by Catherine M Brooks

Introduction

The quantities of medieval and early post-medieval pottery from the site were very small: there were only 11 medieval sherds, representing about 10 vessels in eight different fabrics. Reduced grey wares, normally common in the late medieval/early post-medieval period, are represented by 22 sherds (about 11 vessels). There is one sherd of early post-medieval red coarse ware, and 12 sherds of post-medieval stonewares, representing two vessels. The fabrics are described in detail below.

Many of the fabrics are similar in appearance to medieval fabrics defined at Carlisle, and these similarities are noted. They do not necessarily carry the implication that the Birdoswald vessels came from precisely the same sources as the Carlisle ones, however; they may simply reflect the attributes of broad regional traditions, as yet undefined owing to the scarcity of stratified pottery groups outside Carlisle.

The date ranges suggested for the Birdoswald fabrics are approximate, and are based on parallels of fabric and form at Carlisle, where several well-dated groups of pottery serve to provide a general chronological framework for the main fabric types (Brooks forthcoming), and elsewhere. The search for parallels of form and decoration is, however, hampered by the small size of most of the sherd material.

Fabric series

Fabric 1: Pinkish-red oxidised fabric, hard smooth clay matrix with large rounded to sub-angular quartz grits, sparse but sometimes quite large, occasionally up to 2mm across. The one example has a buff internal surface, probably a slip. This fabric is similar to the finer examples of Red Gritty ware, Fabric 2, at Carlisle.

There is one sherd, from context 384.
Date range: *c* twelfth–early thirteenth century
Form: probably a cooking pot

Fabric 2: Coarse ware with frequent small rounded to sub-rounded quartz grits up to 0.5mm across. Dark grey-brown core, sometimes fully oxidised to light reddish-brown; surfaces range from reddish-brown to grey-brown. This fabric is equivalent to coarser examples of Fabric 5 at Carlisle.

There are two sherds, from contexts 7 and 214.
Date range: *c* later twelfth–early fourteenth century
Forms: cooking pot, bowl (Fig 279, Nos 1, 2)

Fabric 3: Pale buff to pale grey gritty fabric, with frequent sub-rounded to sub-angular quartz inclusions, up to 0.5mm across, and sparse sub-rounded dark brown inclusions, at least some of which may be grog. Olive glaze. This fabric is similar to Fabric 3 at Carlisle.

There is one sherd, from context 1338.
Date range: *c* late twelfth–thirteenth/fourteenth century
Form: jug, with horizontal grooves on shoulder

Fabric 4: Orange sandy fabric, with partially reduced grey core. Moderate rounded to sub-rounded quartz grits up to 0.5mm across. Brown glaze, over whitish slip. This fabric is similar to the finer examples of Fabric 5 at Carlisle.

There is one sherd, from context 240.
Date range: *c* thirteenth–fourteenth century
Form: jug, with traces of incised decoration

Fabric 5: Buff fabric with pale grey core, surfaces ranging from buff to light orange. There are numerous small quartz inclusions and moderate larger sub-rounded ones up to 0.5mm across. Splashy olive glaze. This fabric is similar to Fabric 13 at Carlisle.

There is one sherd, from context 1764.
Date range: *c* thirteenth–fourteenth century
Form: jug

Fabric 6: Fairly smooth fine sandy fabric, partially oxidised orange-buff, partially reduced light grey. There are moderate small rounded to sub-rounded quartz inclusions, with sparse larger rounded inclusions up to 0.4mm across. Olive glaze. This fabric is similar to Fabric 11 at Carlisle.

There are two sherds, probably from the same vessel, from contexts 207 and 240.
Date range: *c* thirteenth–fourteenth century
Form: jug

Fabric 7: Partially Reduced Grey ware 1: Sandy fabric with reduced dark grey core, surfaces oxidised buff to reddish-brown. There are moderate small quartz inclusions and sparse larger sub-rounded ones up to 0.4mm across. Olive glaze. This fabric is similar to **Partially Reduced Grey ware**, Fabrics 15 and 17, at Carlisle.

There are two sherds, from contexts 334 and 1432.
Date range: *c* thirteenth–fourteenth century

Forms: jugs; one example is an applied 'arm' from a jug with anthropomorphic decoration (Fig 279, No3).

Fabric 8: Partially Reduced Grey ware 2: Buff sandy fabric with reduced light grey core; surfaces range from light brown to reddish-brown. Fairly dense clay matrix, with moderate rounded to sub-rounded quartz inclusions up to 0.4mm across. Splashy olive glaze. This fabric is similar to **Partially Reduced Grey ware**, Fabric 19, at Carlisle.

There is one sherd, from context 1494.
Date range: *c* thirteenth–fourteenth century
Form: jug

Fabric 9: Late Medieval Reduced Grey ware 1: Smooth fine sandy fabric, reduced dark grey with an outer margin of light grey; interior surfaces are buff or dark grey. The quartz inclusions are mostly tiny, with sparse larger rounded or sub-rounded inclusions up to 0.5mm across. Olive to olive-brown glaze, often flaking or abraded, and sometimes slightly lustrous, perhaps as a result of soil conditions.

This fabric is similar to **Late Medieval Reduced Grey ware**, Fabric 41, at Carlisle.

There are two vessels represented by five sherds, from contexts 204, 220, 389, and 1909.

Date range: *c* fourteenth–early seventeenth century, with a *floruit* in the fifteenth and sixteenth centuries
Forms: jugs (Fig 279, No 4)

Fabric 10: Late Medieval Reduced Grey ware 2: Smooth fine sandy light grey to grey fabric, finer in texture than Fabric 9; internal surfaces range from reddish-buff or buff to grey. Glazes as for Fabric 9. Like Fabric 9, this fabric is similar to **Late Medieval Reduced Grey ware**, Fabric 41, at Carlisle.

There are about nine vessels, represented by 17 sherds, from contexts 204, 218, 227, 249, 256, 329, 1328, 1418, 1432, and 1484.

Date range: *c* fourteenth–early seventeenth century, with a *floruit* in the fifteenth and sixteenth centuries
Forms: jugs, bung-hole cisterns, and one ?money box or flask

Fabric 11: Post-medieval red coarse ware. Orange-red fine sandy ware, perhaps an oxidised version of Fabric 10. Dark olive glaze.

There is one sherd, from context 241.
Date range: *c* sixteenth–seventeenth century
Form: bowl, with internal glaze (Fig 279, No 5)

Fabric 12: Grey-bodied brown salt-glazed stoneware, ?German or English.

There is one sherd, from context 204.
Date range: *c* seventeenth century
Form: bottle

Fabric 13: Cream-bodied brown-slipped salt-glazed stoneware, English.

There is one vessel, represented by 11 sherds from contexts 1, 1329, and 1331.
Date range: eighteenth century
Form: bottle

Fabric 14: Unglazed red earthenware, modern.

There are two sherds, from contexts 385 and 1338.

A late post-medieval pancheon

by Sarah Jennings

Two thirds of a cream bowl or pancheon was recovered from the robber trench (30) created in 1860 when Henry Norman removed a part of the north wall of Building 197 to create his ha-ha. It seems to have been placed in the robber trench deliberately to mark the removal of stone. This vessel is a typical example of a range of pottery used in kitchens and dairies from the late eighteenth century through to the twentieth century. In northern England this type of pottery is often called Late Sunderland slipware, but wares of this type were made in numerous places, and most local potteries using red earthenware clays would have produced very similar vessels. This pancheon was wheel thrown in a dull orange-brown fabric; the entire inner surface to the top of the rim is covered with a thick white slip, which appears pale yellow under a clear lead glaze. The glaze extends slightly further over the rounded rim edge than the slip, but there are only patches of roughly wiped slip and glaze on the outer surface of the bowl. The base and lower vessel wall have been well and very neatly trimmed and the smoothed base is slightly pushed in.

Pancheons, or cream bowls, had numerous uses; for proving bread, as mixing bowls, or for separating cream from milk to name but a few. Because of the relatively soft nature of both the glaze and the underlying slip, signs of use or wear, such as score marks in the glaze from stirring with a metal spoon, are often evident. On this example, however, there is no such evidence apart the usual crazed glaze. Even the basal edge shows little sign of wear or abrasion, and the combination of both these factors suggest that it was broken fairly soon after it was acquired.

Discussion

As this group of pottery is so small, and the sherds so fragmentary, few conclusions can be drawn from it. The tentative dating suggested for the medieval wares appears to agree with that put forward on other grounds for the phases in which some of them were found, though some sherds occurred residually in topsoil and late levels.

The scarcity of medieval pottery contrasts markedly with the 485 sherds from the long houses excavated in the former milecastle 35 (Sewingshields), though these finds are held to reflect the proximity of Sewingshields Castle and the wealth of the Manor of Sewingshields in the thirteenth to fifteenth centuries (Coleman-Smith and Pearson 1984, 125). There are several possible reasons for the lack of material at Birdoswald. Most significant is possibly the fact that the excavated area was little used during the medieval period, with occupation concentrated in the north west corner of the site, beneath the modern farm. It is possible that the excavated buildings, outbuildings, and yards were kept fairly clear of domestic rubbish, which may have been disposed of elsewhere. Potsherds which became incorporated with midden material would have been spread on the fields, for example; this method of dispersal is a well known phenomenon. Another possible explanation may be that the medieval farmers at Birdoswald did not in fact use very much pottery, relying instead on non-ceramic containers and tablewares; this seems to have been the case at some other rural sites in southern Scotland and the Borders area. At Threave Castle in Kircudbrightshire, for example, in waterlogged levels dating mainly from *c* 1370 to the seventeenth century, surprisingly little pottery was found, although tablewares in wood were well preserved (Good and Tabraham 1981). It may be that both of these possible explanations have some bearing here.

Illustrated sherds (Fig 279)

1. Cooking pot, Fabric 2. Reddish-brown to grey-brown core; surface slightly blackened externally. (Context 214).

2. Bowl, Fabric 2. Surfaces abraded; oxidised, with core partly reduced dark grey in places. (Context 7).

3. Applied 'arm' from anthropomorphic jug, Fabric 7. Olive to olive-brown glaze externally. (Context 1432).

4. Neck and shoulder of jug, Fabric 9. The smooth external glaze, flaking in places, ranges from olive to olive-brown, and is slightly lustrous in places, probably as a result of soil conditions. Handle thumbings remain although the handle and the rim do not survive. The neck is carinated and there is a slight ridge or cordon at the base of the neck. The ridging on the shoulder gives a stepped or cordoned effect, and is similar to a **Late Medieval Reduced Grey ware** jug, probably fifteenth-century, from The Lanes, Carlisle (Brooks forthcoming). (Four sherds from contexts 204, 220, and 389).

5. Bowl, Fabric 11, post-medieval red coarse ware. Glossy dark olive glaze internally and over top of rim. Sooted externally. (Context 241).

Post-medieval coins

by John A Davies

1 623 3 unstrat
Louis XIII Illegible AE issue, 1610–43

2. 809 1317 unstrat
Royal farthing token, Maltravers 'round', 1634–6
Obv: CAROLVS D G MAG BRIT.
Rev: FRAN ET HIB REX.
(North 2280–82)

Field survey evidence: the post-Roman landscape

An analytical field survey of the fort and its environs was conducted in 1987 by the RCHME (Blood 1987), and the survey plan is published here (Fig 280). The notation in red overlying the survey plan is an attempt to relate the documentary sources to the relict landscape.

Inside the fort the survival of Roman buildings to a late date seems to be attested by the distribution of narrow ridge and furrow cultivation. This lies in the southern half of the site, and runs up to the sites of the *principia* and *praetorium* which survive as high stony banks. In the south-west corner of the fort is a large raised platform which does not appear to coincide with a buried Roman structure. This too is avoided by the ridge-and-furrow. A rebuilding of the south-west wall of the fort has long been considered as part of a post-Roman farm

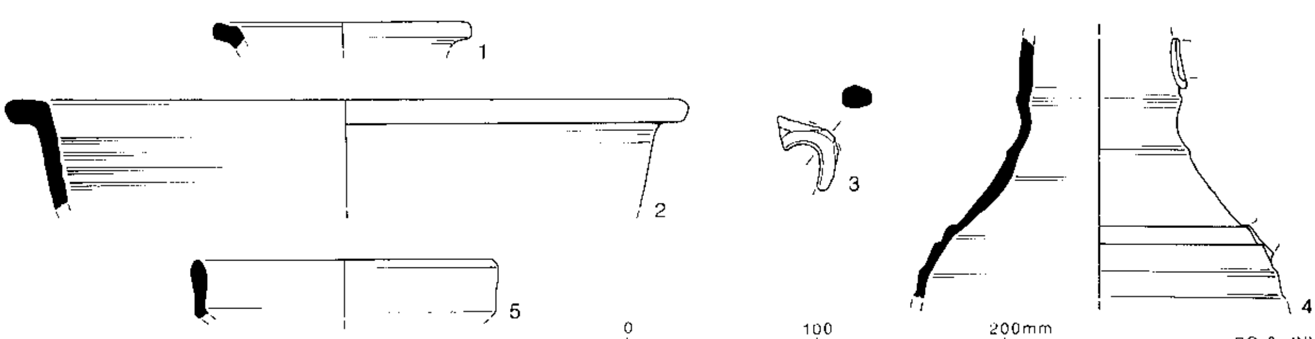


Fig 279 Medieval and Post-medieval pottery (scale 1:4)

building (Daniels 1978, 201), and the whole platform may indicate the existence of a second medieval or later habitation in the south-west corner of the fort, possibly incorporating the high-standing south-west angle tower.

Outside the bounds of the fort the evidence for the post-Roman period consists almost entirely of ridge-and-furrow cultivation. No ridge-and-furrow survives in the field to the west of the fort which was called Haithwood in 1901 (Walton and Lee 1901). The field may have been ploughed recently, and is very heavily disturbed by modern field drains. In West Field, which lies between Haithwood and the fort, the ridge-and-furrow changes direction at a field boundary which runs diagonally across the field. To the north of this boundary the ridge-and-furrow runs approximately north-west to south-east; to the south its direction is parallel with the dividing bank. The fact that the latter alignment continues around the south-east corner of the fort and on to the spur to the south would seem a good indication that the spur was longer when the field was ploughed than it is today. If this were not the case it would have been impracticable to plough so close to the edge of the cliff in the narrow neck between it and the fort corner. This is further proof that erosion has taken considerable toll on the spur, a process which, as noted above, continues today. To the east of the fort aerial photographs taken in 1948 and 1957 (St Joseph 1951, BC62; Salway 1965, A195, A248) show further ridge-and-furrow. This has not survived more recent ploughing which continued into the 1960s (J Baxter personal communication).

There are few other surface indications of the post-Roman use of the site but two may be mentioned. At the northernmost surviving end of the east curtain wall of the fort a drying kiln is broken through. The stoke hole to the kiln lies on the outside of the wall, and the kiln itself is built into the bank formed by the fort rampart. It is circular, with stone revetted sides which slope inwards towards the flagged floor. Kilns identical to this are not uncommon, and vary greatly in date. An identical kiln was found at a settlement referred to in 1604 at Loaning Burn in Upper Redesdale (Charlton and Day 1982, 154–7, pl VIb). At Back Silver Street, Durham, a similar kiln was well-dated archaeologically to the thirteenth century (Clipson 1980, 110). At Housesteads a further kiln post-dated the seventeenth-century bastle house (Whitworth 1990, 129), and another was set into a bank outside the fort at Bewcastle (Sainsbury and Welfare 1990, 144). The nearest example to Birdoswald seems to have been a kiln built of reused Wall stone, which was found cut into the south mound of the Vallum at High House (Swinbank 1952, 46–52). Analysis proved that this was not connected with either metalwork or lime burning, and it was therefore probably an agricultural drying kiln. The second possible post-Roman feature is a building excavated in 1898 in the western part of Chapelfield (Fig 280; Haverfield 1899, 353). This building was interpreted as a cottage measuring 10.36 x 6.4m with a 3.04m square annexe. It was built directly on the clay subsoil, and no dating evidence was recovered from it. The building could either have been a Roman *vicus* structure or a post-Roman building. It certainly does not appear in the *Gilsland Survey* of 1603, unlike the farm in the north-west corner of the fort and the cottage contained within milecastle 49. If post-Roman, therefore, it must either pre-date or ante-date 1603. The field name is of unknown antiquity, but suggests the presence of a ruined stone building. It is possible that this building was Roman and that the field was named after its remains, though any conclusion on the date of the structure must remain speculative.

Documentary evidence

The documentary evidence for Birdoswald, though sparse, is significant. Sources quoted below between *c* 1200 and 1603 are, as far as is known to the writer, complete. These sources are also of the most direct relevance to the archaeology. After 1603 the history of the site is briefly sketched, stressing those proprietors and tenants whose work is visible in the archaeological or structural record, or whose encounters with antiquaries and archaeologists are recorded. An attempt has been made to relate the documentary sources to the extant landscape (Fig 280). Particularly useful in this respect have been the twelfth- to thirteenth-century charters, especially the grant to Wetheral Priory *c* 1200, the *Gilsland Survey* of 1603 with its tenure map, and a sale document of 1901 which records field names which have become extinct within the last 90 years.

The earliest records of the place occur in the early thirteenth century. The tenement of Birdoswald formed part of the Barony of Gilsland which was granted to Hubert de Vaux (=Vallibus) by Henry II in 1157–8 (*Lanercost Cartulary*, i.8). It is likely that the Barony existed as an estate before this date (Newman 1985, 158).

The earliest known tenant was one Walter Beivin, who paid a mark for Birdoswald in 1211 (Graham 1922, 11), and witnessed a charter between 1164 and 1194 (*Lanercost Cartulary*, i.10). He was a benefactor of the Priory of Wetheral, and *c* 1200 granted 20 acres of land 'in the field of Bordoswald' to the monks of the Priory (*Wetheral Register*, No 127). He also granted a furlong (*cultura*) in 'Burthoswald' 'on the north side of the old Wall' (*ad aquilonem Antiqui Muri*) *c* 1194–1220 (*Lanercost Cartulary*, ii.168) to the Priory of Lanercost. Walter's nephew, Ralph (Radulph), confirmed the grant to Wetheral (*Wetheral Register*, No 128). A charter dated to *c* 1230–32 (J Todd personal communication; correcting Prescott's (1897, 225) date of 1214; *Wetheral Register*, No 125) by which John de Denton granted 8 acres to Wetheral Priory was witnessed by 'Radulpho de Bordeswald'. It seems certain that these references to Ralph were to the same individual. The use of 'Bordeswald' as a surname strongly suggests that Ralph had a dwelling on the site, and in all probability Walter also lived there before him.

The 20 acres granted to Wetheral were described as

> ...the land called Haythwait, as far as the great oak which stood upon the ancient fosse; from that oak as far as the breach in the Wall wherein lay the footpath leading from Trewermain [Triermain]; from the said breach, as far as the oak standing on the Wall towards the east; and from the last mentioned oak as far as the fosse leading to the slope (*cundos*) of Irthing.
>
> (translated by Graham 1922, 25)
> with amendment by J Todd
> (personal communication)

A list of field names in Birdoswald on a sale document of 1901 (Walton and Lee 1901) includes *Haithwood,* at 17.20 acres. It is plain both from the bounds of this field and the remarkable survival of the name that it comprises at least part of the same *Haythwait* as was granted to Wetheral. The original field seems to have been subdivided and its boundaries have shifted (Fig 280). The western boundary of the field lies 95m west of the point at which the farm track to Triermain runs northwards from the road which now follows the Wall line. It seems unlikely that this route has changed greatly. Bruce (1885, fig p 206) illustrated the path running along the same course as today, but through a breach in the Wall; subsequent robbing has removed all trace of the breach. It seems likely, therefore, that the original west boundary of *Haythwait* lay adjacent to this path. The south west corner of the present field lies on the visible Vallum ditch (the 'ancient fosse'), which formed the south side of the field. Erosion of the river cliff has removed part of the Vallum ditch to the extent that the earthwork could be read as a 'fosse leading to the slope of Irthing'. The north side of the field is partially defined by the surviving Wall and partly by a recent field wall built upon its foundations; originally the Wall itself constituted this boundary. The eastern field boundary may survive in the recorded earthworks (Fig 280). *Haythwait* was a field of twenty acres. If its western boundary is marked by the Triermain path then the present eastern boundary of Haithwood must be a later subdivision. By subtracting the portion of Haithwood west of the path, an area of 13.12 acres remains. Adding the area between the east edge of Haithwood to the area of north–south aligned ridge-and-furrow in West Field, which is defined to the south by the diagonal ancient field boundary line, gives an area of 20.69 acres. This suggests that if this old field boundary was not the eastern edge of *Haythwait,* it was remarkably close to it.

Haythwait is mentioned again when, among other grants to Wetheral, it was confirmed by Robert de Vaux, Ralph's overlord (*Wetheral Register,* No 193). In 1230–31 a chaplain of Wetheral, one Simon, quitclaimed the plot to the Priory from which he held it, as the conveyance to him by the Chapter of St Mary's at York was not in his possession (*Wetheral Register* No 129; Graham 1922, 25).

The Barony as a whole came into the possession of the de Multons in 1240 (Todd 1991, i.26), and Birdoswald is next mentioned in the *inquisition post mortem* of Thomas de Multon III in 1295, when 26 shillings of land at 'Burdeoswald in Erdington' was held by John Gillett at one tenth of a knight's fee (Graham 1922, 25; *Cal inq p m* iii, No 285). In 1318 the de Multon heiress, Margaret, married Ranulf de Dacre who thus became Lord of Gilsland (Summerson 1993, 252), and the Dacres retained the barony until the end of the sixteenth century. Throughout the fourteenth century Gilsland was subject to periodic raids by the Scots. It was burned in 1311 by Robert Bruce, and was raided again in 1333 and 1345 (ibid, 212, 227, 264, 272). The instability of the area is reflected in the *inquisition post mortem* of Margaret de Dacre in 1362, where it is recorded that Naworth Castle was of little value as it required frequent repair and was in constant peril from the Scots (*Cal inq p m* ix, No 317).

Birdoswald was a part of the manor of Triermain, which was held of the Barony of Gilsland by a junior branch of the de Vaux family from the mid- thirteenth century (Graham 1911, 250). This family continued in importance in the area, and appears to have been at Birdoswald during most of the fifteenth century. One John Vaux is called 'of Burdoswalde' in a document of 1425, again suggesting a residence on the site (Hodgson 1840, 206), and in 1485 'the heires of John Vaux [held] Bordoswald by homage fealite and paid to freefarme by yeare 4d' (*Feodar of Gillesland*; Cumbria CRO). In the *Feodar of Thomas Lord Dacre of Gillesland* (Cumbria CRO) compiled in 1502 Birdoswald appears as part of the Manor of Triermain (*Tredermain*), which was held by Rowland Vaux (also recorded as Rowland de Wallibus or Rowland Waugh) for a seventh part of a knights fee (*per vij.m. partem foedi mili*). The 1490 *Rental of the cell of Wetheral* shows that the 20 acres of *Haythwait* were still held by the Priory at this time, but were occupied by Rowland Vaux, and produced nothing (*et nihil dat*).

In 1588 Leonard Dacre was attainted of high treason, and an inquisition was held of the manors late in his possession. This included a description of the boundaries of the manor of Triermain in which Birdoswald appears as a reference point:

> From thence up the heads of Dundley Rigge to Troutebeck. From thence up King [Water] to the Middle Shealdes. From thence to Irdinge [Irthing]. From Irdinge down to Brudesolle [Birdoswald], from thence to the Wall Bowers...
>
> (Graham 1911, 252)

Thus the lordship boundary followed Hadrian's Wall from milecastle 49 on the Irthing to milecastle 51 (Wall Bowers).

By the last quarter of the sixteenth century the tenements of Birdoswald were held by individuals of the local Tweddle 'surname' (or clan; Ramm *et al* 1970, 70; Dixon 1979, 242). This period of intense border raiding is catalogued in the *Calendar of Border Papers*, and has been described by Fraser (1971). Birdoswald was not immune from the depredations of reivers. In June 1590 Lord Thomas Scrope, Warden of the English West March, wrote to Lord Burghley to detail 'some few of the greatest of the late Scottish outrages upon us which are meetest for redress' (*Cal Border Papers*, i.355). He included the following complaints:

> St Andrewes 1588: Hobbe Twedell of Burdoswolde [complains] upon 'olde' Will Ellot and 'young' Will Ellot of the Steill, 'lang' John Ellot etc for taking 30 kye [cattle] and oxen, a horse, a meare [mare] and insight [household goods]
>
> November 1588: Robert Tweddell of Burdoswalde [complains] upon George Nickson of Kelleley, Jenkin his son, John Nickson and Eddy of Larenstoneburne, Dand Ellot of Braydley etc for taking 26 kye and oxen, 2 horse spoile etc
>
> (ibid, i.356)

The Elliots and Nixons were notorious among the reiving surnames of Liddesdale in present-day Borders Region (Fraser 1971, 42–46), where the Steel, Braidley, and Larriston Burn (Larenstoneburn) are all located. 'William Ellot of the Steill' was a signatory to the *Assurance of Liddesdale* at Hermitage Castle in 1584, and 'Dand Ellot of the Brandley' is mentioned in 1583 in a 'List of the Ellottes of the head of Lydall' sent to Burghley by Thomas Musgrave, Captain of Bewcastle (Barton 1944; *Cal Border Papers* i.355). The names of all of the Birdoswald raiders occur repeatedly in the *Border Papers*.

Hobbe and Robert Tweddle were by no means defenceless; they had been present as part of the contingent from 'Treddermaine Lordshippe' at the Eskdale Ward Muster in February 1581 at which they each supplied a jack, a steel cap and a spear (*Cal Border Papers*, i.40). The large numbers of beasts stolen further demonstrates that the Tweddles of Birdoswald were not among the poor farmers of whom there were so many in the Barony of Gilsland (Dixon 1979, 243). Unfortunately there are no surviving probate inventories for this period for Birdoswald, so it is impossible to be more specific.

In 1590 Scrope wrote a 'Breviate of attempts committed by ... adherents and favourers of Buccleuch on Her Majesties subjects in the West Marches'. The Tweddles were raided again:

> Robert Tweddall of Birdoswald and his neighbours complaine on Pawtie of the Hairlawe etc for burning and cutting up their doors, and taking 40 kye and oxen, 40 sheep and insight
>
> (*Cal Border Papers*, ii.265)

In 1596 Peter Armstrong of Harelaw was a friend of the notorious Kinmont Willie Armstrong, and was involved in the events leading to his capture (Tough 1928, 260). Harelaw lies just over the Scottish border (Region of Dumfries and Galloway). The burning of doors was a favourite means of breaking and entering, and had its countermeasure in the quenching holes positioned over the ground floor doors of some stone houses (Peter Ryder personal communication). The fact that the raiders resorted to such measures suggests the existence of a stone house at Birdoswald at least by 1590.

As late as 1597 Thomas Carleton of Askerton Castle could state that:

> Within this fower years bypast the barronie of Gillesland was equal to the best part of the Borders ... £10,000 will not repaye the losses by fier sword, spoyle, and oppression by the Scot and enemies
>
> (*Cal Border Papers*, ii.466)

Carleton himself had assisted Scott of Buccleuch in his raid to spring Kinmont Willie from Carlisle Castle in 1596 (Summerson 1990, 190), and was shot dead as a result of a complex feud in 1598 (Fraser 1971, 303–4). It is extraordinary under these violent conditions that only a year later, in 1599, the first recorded antiquarian visitor, Reginald Bainbrigg, was brave enough to come to Birdoswald. He described the site in a letter to William Camden who had, possibly wisely, missed it.

> Frome Lanercost I folowed the Wall all ruin ated, til I came to Burdoswald, whiche doth seame to have bene some great towne, by the great ruynes thereof. The inhabitants did shew me the plaice where the churche stode, the inscriptions ther are either worne out by the tracte of tyme or by the clownishe and rude inhabitants defaced. I found this inscription [RIB 1885] in a stone at Thomas Tweddailes house at Burdoswald...
>
> (Haverfield 1911, 365)

After the acquisition of the Gilsland Barony by Lord William 'Belted Will' Howard (1563–1640) of Naworth Castle, a survey was conducted describing each tenement. In this document a full description of the teneurial pattern at Birdoswald emerges for the first time. For us the relevant entry is to:

> Two tenements adjoining more easte called High Burdosell between the Pight [Picts'] Wall on the north; Irding & Lowe Burdosell on the south & backing easte wth a narrow end upon a cotage of Henr. Twedells. Hereof Thos Twedell hath one tenemt with the Stonehouse, Jeffrey Twedell the other Tenemt
>
> (*Gilsland Survey*, 1603)

It is clear from the map accompanying the Field Book of this survey (Durham Univ Library Special Collections, Howard of Naworth MSS C713/15) that this refers to the fort and to land immediately to the east. Three tenements to the west (apparently the former *Haythwait* which seems to have been subdivided at this time) were held by the two Tweddles and Richard Carocke. Carocke was also tenant with Jo. Tweddle of the two tenements of 'Lowe Burdosell', which consisted of the land between the cliff south of the fort on the one hand and the Irthing on the other. One of these tenements is represented by the extant farmhouse of Underheugh. The land to the east of 'High Burdosell' was tenanted by 'Henr Twedell, a cotage and Yarde at the east ende of the former, by the said Wall north, buttinge east upon Irdinge' (*Gilsland Survey*, 1603). That this tenement of Henry Tweddle is represented by the post-Roman building found within milecastle 49 (Harrows Scar) (Richmond 1956a) is shown by both the description and the survey map (Fig 280).

Thomas Tweddle's 'Stonehouse' in the *Gilsland Survey* is obviously the dwelling visited by Bainbrigg. In 1610 Tweddle was among many Naworth tenants who surrendered their tenant rights to 'Belted Will' Howard, 'beseeching ... our tenements by lease for such number of yeares as our heires shall have no cause to say that wee are unnaturall parents' (Ormsby 1878, 413).

The inscription noted by Bainbrigg in Tweddle's house was almost certainly built into the fabric of the building. Had it not been, it would probably have joined other inscriptions from the site which ended up in the collections of 'Belted Will' Howard; as it was it remained on the site until sold to the Tullie House Museum in 1901. Howard appears to have had a great interest in antiquities, and was a member of the first Society of Antiquaries (ibid, lviii–lix) which was abolished by James I and VI because of suspicions of its possible political intent (Daniel 1981, 46). Many Birdoswald inscriptions (RIB 1875, 1887, 1889, 1898, 1899, 1900, 1902, 1906, 1907, 1916) were seen at Naworth by Bainbrigg, Horsely, and finally Stukeley, who recorded them as being 'quite neglected and exposed' (Stukeley 1725, 58); it seems that Howard's descendants, like those of his contemporary, Thomas, Earl of Arundel (1585–1646; Cook 1975, 247), did not share the interests of their antiquarian forebear. Much of the collection had been given to Sir Thomas Robinson of Rokeby Castle by the time of Gough's edition of Camden (1789, iii 4591). Not all the pieces went to Rokeby, however, and Abbatt (1849, 46) was able to note 'a great many stones from Birdoswald' still at Naworth during the first pilgrimage of the Roman Wall.

The Parish Registers of Lanercost, and the preliminary genealogical work undertaken by John Robinson, show that the descendants of Thomas Tweddle were still at Birdoswald in 1669, and those of Jeffrey Tweddle of High Birdoswald survived there until the following century. The story is complicated, however, and it is not clear which of the many names recorded from Birdoswald were the chief tennants of the extant farm between the mid-seventeenth and mid-eighteenth centuries. It was during this period that John Horsely visited the site and described it thus:

> The fort of *Burdoswald* stands on a large plain, at the head of a steep descent towards the river, having the outbuildings chiefly on the south-east. *Severus's* wall ... forms the north rampart of this station; and *Hadrian's vallum*, which is lost near the fort, must have fallen in with the southern. The foundations of the houses within this fort are very visible. I measured the thickness of their walls, and found them to be about twenty-eight inches, and the distance, or breadth of passage, between the rows of houses or barracks to be no more than thirty-two inches. The ramparts around the fort are in the third degree, and the ditch in the second, excepting on the north side, where it is not so much. The foundations of the west rampart is distinct and measured about five foot. There are regular entries visible on the north and south sides, opposite to one another, as also faint appearances of entries on the east and west. In the northern part of the station there seem to be the ruins of a temple ... and over against the entry are the ruins of the *praetorium* on which a house or two stand at present.
>
> (Horsely, 1733, 152–3)

The datestone of 1745 (Fig 276) inside the house records rebuilding in that year by 'AMB'; Anthony and Margaret Bowman. The Bowmans were certainly freeholders, possibly the first. Hutchinson (1797, 65) recorded that 'the Lords of Gilsland have at length demised the farms [of Birdoswald] to the tennants' The local importance of the date 1745 need hardly be stressed, and the effect of the '45 on the Bowman family can only be guessed at. The Jacobites arrived in Carlisle on November 9 (Summerson 1990, 215). The locality was certainly affected by the rebellion, as the Young Pretender lodged at Brampton during the short siege of Carlisle (Beattie 1928, 69), and six rebels were hanged in the town in October 1746 (ibid, 231).

The Bowmans are both buried in Lanercost churchyard. Anthony died in 1778, and was succeeded by his son William. William Bowman, 'the proprietor and occupier of these once imperial premises' (Hutton 1813, 67), was eventually a very friendly host to William Hutton on his tour of the Wall in 1802, having at first taken the old antiquary for a tax inspector, 'for an ink bottle and book are suspicious emblems' (ibid). Bowman would have been 62 years old at the time of Hutton's visit; he died in 1824 at the age of 84, and his headstone in Lanercost churchyard carries the curious spelling 'Birdozwell'. His son, another William, is noted as the freeholder in E Bowman's 1830 *Survey of Gilsland Barony* (Cumbria CRO).

CUMBERLAND.

PARTICULARS, PLAN, VIEWS AND CONDITIONS OF SALE

OF THE

VERY DESIRABLE AND HIGHLY HISTORICAL

Residential and Agricultural Estate,

KNOWN AS

BIRDOSWALD,

Situate in the Parish of Waterhead, formerly Lanercost, about 2 miles from the well-known health resort of Gilsland, famous for its Medicinal Waters, and having a Station on the Newcastle and Carlisle Branch of the North Eastern Line of Railway, 7 miles from the Market Town of Brampton, and 18 miles from the City of Carlisle. It comprises

A COMFORTABLE RESIDENCE,

Substantially built of stone, with cemented front and slated roof, having a square Tower on the Western side.

It is pleasantly situate with southern aspect, amidst nicely-timbered Grounds, and is approached from the Road by a Carriage Sweep, with two Entrance Gates. It commands extensive views of the surrounding picturesque scenery, while immediately in front of the House is the site of the very interesting Old Roman Camp Amboglanna, which was the most important station on the line of the wall.

THE EXCELLENT AND SUBSTANTIAL FARM BUILDINGS

Are situate to the rear of the Residence.

The Land is practically all in Grass, and comprises some fine old rich Pasture, Meadow and Arable Land, and is well known as one of the best Dairy and Grazing Farms in the district. It extends over an area of about

221a. 3r. 12p.;

ALSO ADJOINING IS THE

CAPITAL FARM, KNOWN AS UNDERHEUGH,

COMPRISING

A STONE-BUILT AND SLATED DWELLING HOUSE AND SUITABLE FARM BUILDINGS,

Which, together with the excellent RICH PASTURE, MEADOW and ARABLE LAND, covers an area of about

50a. 0r. 37p.;

ALSO THE

GRAZING FARM, KNOWN AS LORD'S GATE,

COMPRISING

A STONE-BUILT AND SLATED COTTAGE, WITH FARM BUILDINGS ADJOINING,

Together with the PASTURE LAND, covering an area of about

32a. 1r. 21p.;

The whole extending over an area of about

304a. 1r. 30p.:

Messrs. WALTON & LEE

Have received instructions to offer the above for SALE BY AUCTION,

AT THE "COUNTY" HOTEL, CARLISLE,

On Saturday, the 28th September, 1901,

AT TWO O'CLOCK PRECISELY

(UNLESS PREVIOUSLY DISPOSED OF BY PRIVATE TREATY).

Copies of these Particulars may be obtained of Messrs. [illegible] & Cousins, Solicitors, Brook House, Walbrook, E.C.; or of the Auctioneers, at their Offices,

10, MOUNT STREET, GROSVENOR SQUARE, LONDON, W.

Vacher & Sons, Printers, Westminster.

Fig 281 Summary of the Birdoswald property in 1901, from the sale details of that year (Walton and Lee 1901) (reproduced by permission of Tullie House Museum, Carlisle)

During the mid-nineteenth century the site changed hands at least twice. William Bowman II sold the property to Thomas Crawhall in 1830 or '31, and John Hodgson (1840, 207) records that Crawhall had undertaken excavations in the *porta decumana* in 1831. Crawhall's collection of antiquities, many from the site, was reconstructed in part by Cowen (1965). Crawhall died on 14 September 1833 (ibid, 11) only 12 days after Hodgson's visit.

Whether he purchased the property from Crawhall's estate or whether another owner intervened, by 1849 Henry Norman had purchased the property. Norman's interest in the place appears to have been considerable, and may well have been excited by the first pilgrimage of Hadrian's Wall in 1849 (Birley 1949, 6). His impact on the site created the Birdoswald which visitors saw until 1987. He was responsible for levelling the garden (Norman 1860), and gothicising the farmhouse by building the tower and the porch over which appear his initials and the date 1858 (Fig 276). He instigated and encouraged the excavations on the fort gates which were undertaken by the Potter brothers (Potter 1855a), and reported his findings while laying out his garden to the Society of Antiquaries of Newcastle-upon-Tyne (Norman 1860). Around this time the altar which had been noted by Bainbrigg in Thomas Tweddle's house in 1599 (RIB 1885) lay in the garden (Bruce 1867, 255–6), though it was later housed in Norman's 'Altarhouse'. The 'Altarhouse' collection was later recorded by Haverfield (1898b), and included a number of important inscriptions (RIB 1873, 1877, 1880, 1885, 1891, 1897, 1903, 1913, 1915, 1916, 1917).

The Hadrian's Wall pilgrims of 1886 were permitted to enter the farmhouse and noted that 'in the modern

BIRDOSWALD,

AS THE

SITE OF THE OLD ROMAN CAMP OF AMBOGLANNA,

Has acquired such a wide-spread reputation as to render almost superfluous any allusion to its many archæological attractions. Its natural position and extent made it

THE MOST IMPORTANT STATION ON THE LINE OF THE WALL

(Of which well preserved remains are to be seen on the Property), built about the year 120 A.D. by Emperor Hadrian from the district now known as Wallsend to the Solway Firth, as a defence against the Picts from the North.

EXCAVATIONS ON A SMALL SCALE

Have already brought to light remains of massive walls and gateways, together with many fine altars, coins and other relics of the Roman occupation, and without doubt further treasures of that interesting period await the explorer. A detailed description of the camp will be found in the pages of Dr. Bruce's well known work on the Roman wall. The view from the steep banks of Birdoswald to the South, with the River Irthing winding like a silver thread along their base, is rightly considered

ONE OF THE MOST BEAUTIFUL IN CUMBERLAND,

A view compared by a former Earl of Carlisle to that of Troy. Hence to the antiquary and lover of nature alike Birdoswald offers

UNDOUBTED CLAIMS AND ATTRACTIONS

seldom to be met with.

Fig 282 Details of the archaeological attractions of Birdoswald in 1901, from the sale details of that year (Walton and Lee 1901) (reproduced by permission of Tullie House Museum, Carlisle) farmhouse is incorporated an ancient pele house, the shouldered doorway into it being pointed out. This is now walled up to form a recess for the fine seated figure ...' (*Trans Cumberland Westmorland Archaeol Antiq Soc* 1886, 144). The 'ancient pele' was the Period 9 building; Norman had transformed its west doorway (Fig 271), which now opened into his entrance passage (Fig 270), into a niche formed to contain the seated statue of the goddess Fortuna which had been found during the Potter excavations of 1850 (Potter 1855a, 68; Pl 14).

Henry's son Oswald (who may even have been named after the site) was acknowledged by Haverfield (1898a, 173) as the proprietor by whose permission the excavations of 1895–98 took place. However, in 1901 Oswald Norman put the Birdoswald estate up for sale by auction. A sale specification (Walton and Lee 1901) survives in the Tullie House Museum, Carlisle (acc no 1993–57; Figs 281, 282). Oswald Norman was certainly interested in capitalising his assets; as well as the estate, which was bought by Joseph Wright, he sold the statue of Fortuna and the 'Altarhouse' collection to the Tullie House Museum during 1901 (Museum accession records, prices not recorded; Colin Richardson personal communication). It was by permission of Irwin Wright, Joseph's successor, that the excavations of the 1920s and '30s were carried out. In 1936 Wright sold the property to the then Lord Henley (Epitome of Title, Cumbria CC), from whose Scaleby Castle estate it passed into ownership of Cumbria County Council in 1984. The last tenants of Birdoswald, and the last to inhabit the dwelling house on the site, were Mr and Mrs John Baxter and their family. At the time of writing (1994) John Baxter and his son Michael still possess grazing rights on the land which are exercised from their tenant farm at Kiln Hill.

Discussion and interpretation

The interpretation of the medieval and post-medieval periods at Birdoswald draws upon an unusually wide range of data from the several sources described above. In this discussion an attempt will be made to draw these disparate threads together.

Archaeologically, one of the most important aspects of the analysis of the medieval and post-medieval phases at Birdoswald has been to show the longevity of Roman structures on the site, and the way in which they were utilised by successive generations of occupants. The routes through the site remained largely unchanged from the second to the nineteenth centuries (Fig 285). Though the movement of robbed stone and the broad phases of robbing have been examined for the western end of Hadrian's Wall (Whitworth 1984), account has rarely been taken of the use of the Wall and its installations in the post-Roman period except as quarries.

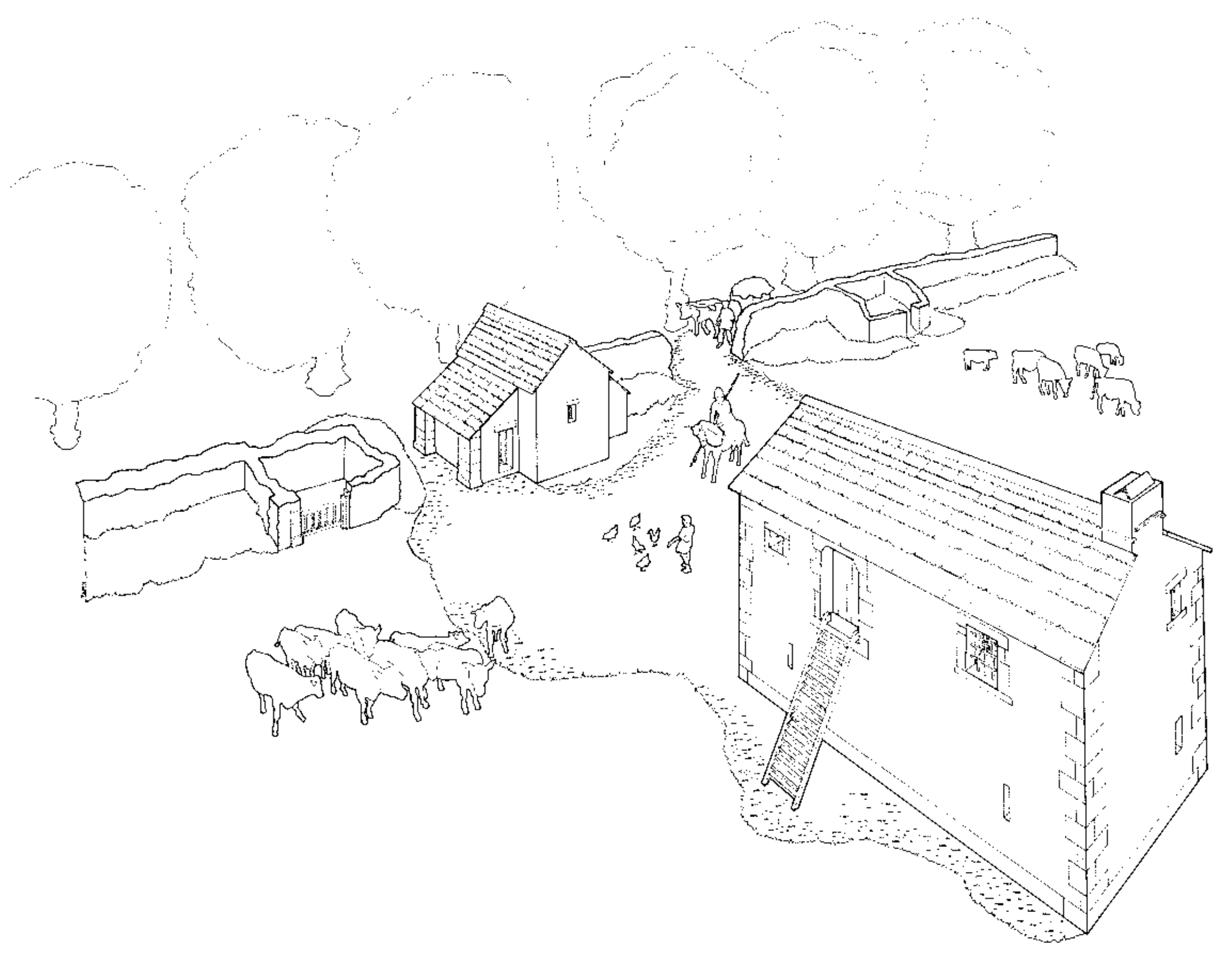


Fig 283 Reconstruction of the Period 7 buildings in Area A

Period 7

The relationship of Building 4406 and the hollow way of this Period to the *porta principalis sinistra* of the fort suggests that this gate was still largely intact, and may even have been re-roofed, as it is inconceivable that an unsafe structure would have been used as a main entry. This interpretation is shown in the reconstruction drawing (Fig 283). The survival of Roman gates in urban contexts and their continued use for other purposes, often ecclesiastical, are well attested throughout the western empire (Greenhalgh 1989, 42, 86, 117). At Trier the massive *Porta Nigra* had its stones broken in order to obtain iron and lead from the ties used in the structure. The gate lay unused, away from settlement for 600 years until used by St Simeon as a hermitage in 1028 (Cüppers 1979, 27). It subsequently became a church, and still stands. Many examples of the survival of city gates built on a somewhat humbler scale could be cited from Britain. The Newport Arch at Lincoln still stands, while the Roman Worth Gate at Canterbury, which was reused in medieval times, was demolished in the late eighteenth century (Frere *et al* 1982, 19). In several cases at Canterbury, churches appear to have been established in the surviving upper storeys of Roman gates (ibid, 88–9). Demonstrating the survival of fort gates is more difficult, but there are examples. The layout of gates and streets in the Cripplegate fort in London determined the layout of a portion of the medieval and later City (Grimes 1968, 17–29). The east gate of the fort, which was analogous in size and layout to fort gates on the Wall (ibid), was removed before the end of the thirteenth century, though there are historical indications that it remained in use as a residence throughout the Saxon period (Dyson and Schofield 1980, 34). At York there is some evidence to suggest that the south-east gate of the legionary fortress formed the nucleus of a Danish royal palace in the tenth century (RCHME 1972, 8). In the legionary fortress of Chester the streets of the medieval city lie over their Roman predecessors, and on the sites of the east and west gates they seem to respect the surviving portals of part-blocked double gateways (Strickland 1994, 7). On the Wall itself recent work at Bowness (Austen 1991b) suggests that the modern village layout is also based upon the Roman fort plan; the main street enters and leaves the fort by way of the east and west gates, and appears to have been diverted around the *principia* in the centre of the fort. In order for this village plan to develop, the fort gates must have been usable and the *principia* high standing until the village had become well established. The first known documentary reference to a village at Bowness dates to 1292 (Whitworth 1984). The resilience of Roman structures of all kinds is often overlooked, and there are many examples of buildings for which there is archaeological evidence for late survival. At the Roman temple of Pagan's Hill, Somerset, it has been argued that medieval pottery found beneath collapsed Roman roofing material demonstrates that the temple was 'largely intact ... in the twelfth to fourteenth century' (Rahtz and Watts 1989, 333, 361), while at Caerleon the legionary fortress baths, including at least some vaulting, survived until the thirteenth century (Zienkiewicz 1986, 262–5). The reuse of antique foundations and standing fabric in medieval buildings has frequently been recorded in other provinces (Greenhalgh 1989, 150–51), where it was seen as an economical building method.

As there is pottery as early as the twelfth century from the site, and Building 4406 is unlikely to have been built before the fourteenth century, it is possible that it was the successor to other structures which were not recovered during these excavations. The massive foundation stones were deliberately cut for this building, rather than being casually robbed. This, together with the wall thickness, suggests a building of some height and pretension. Although the east wall is missing, it seems unlikely that the building was much longer

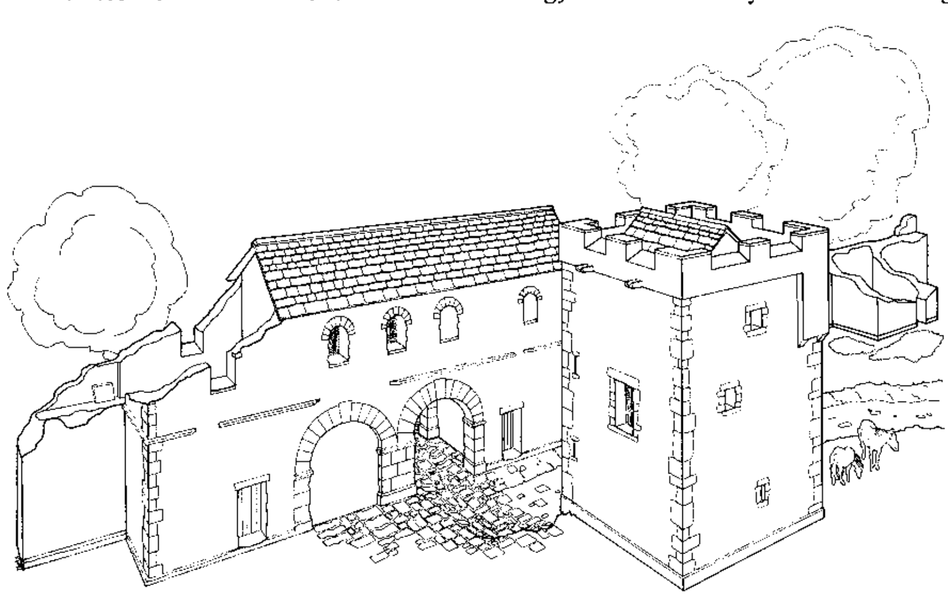


Fig 284 Reconstruction of the Period 8 buildings in Area A

from east to west than the area recorded. The virtually square foundation suggests a tower. The tower house in the churchyard at Corbridge shares similar dimensions to Building 4406, and was certainly in existence before 1415 (Wood 1965, 168; Rowland 1987, 10, 93). Vicars pele houses such as the Corbridge building tended to stand alone, whereas other towers may now be shown to have been parts of larger houses, usually in the mid-fourteenth century tradition of a solar tower standing at the end of a hall (Ryder 1992b, 62–3). The free-standing, solitary, tower house is more characteristic of the Scottish side of the border, and these are usually later medieval in date. Ryder (1990, 5, 47–50) has noted three solitary towers at Elsdon, Great Tosson, and Biddlestone, all in Northumberland. All have barrel-vaulted basements and ground floor entrances leading into a lobby from which a newel stair afforded access to the upper floors. The thick walls allowed mural stairs, passages, and garderobes. The Biddlestone tower may have been fourteenth century in date. Elsdon is sixteenth century in style and Great Tosson appears to be a fifteenth-century building. At Monk in Allendale (Ryder 1992a, 361–2) a range of bastle houses has as its earliest component a square building with sides 6.6m long; slightly smaller than the north–south dimension of Building 4406. The surviving superstructure of the building suggests that it was originally a small tower. Ryder (ibid, 371) has suggested that this building in particular might have been earlier than the late sixteenth-century bastle houses of the area, and the shape of its doorway has suggested that it was of later medieval date. The relatively small base size of the projected tower, Building 4406, is typical of the small tower houses of the sixteenth century on the Scottish side of the border, which have an average base size of 70 sq m (Zeune 1992, 203).

The reconstruction drawing (Fig 283) shows a free-standing tower erected next to the Roman gate. A roof is reconstructed on the Roman structure, as there is no reason to suppose that the upper storey of the gate was not serviceable. There is a possibility that the medieval architecture typical of the area may have been adapted to the special conditions at Birdoswald, and that the gate and Building 4406 should be viewed together, with the upper storey of the gate used as a hall and Building 4406 as a detached solar tower, or even as a temporary refuge.

Period 7 would appear to represent the period of the recorded tenancies of Walter Beivin (before 1211), his nephew Radulph de Birdoswald (before 1214), John Gillett (1295), and John (by 1425) and Rowland (by 1490) Vaux. The range of archaeological dating does not allow the identification of Building 4406 with any individual tenancy.

The vicinity of Birdoswald was almost certainly utilised as a source of stone during this period. In Lanercost Priory, which was founded *c* 1166, and completed *c* 1220 (Whitworth 1984), an altar of the *cohors* I *Aelia Dacorum* IOM series (RIB 1881) was built into the clerestory passage at the south-east angle of the church. This stone had travelled some 5.8km to the Priory site, and it is odd to see Birdoswald used as a quarry rather than the slightly nearer site at Castlesteads. The only advantage that Birdoswald has as a source is that both it and Lanercost are located on the river Irthing. It may be significant that the group of altars, of which the Lanercost example is one, seem to originate from near the river cliff above Underheugh; perhaps material from close to the river was being exploited. If so it is also possible that Willowford bridge was partially robbed at this time. At present the Irthing is not really navigable, and certainly not by a vessel carrying large pieces of stone, but the profile of the river has been subject to constant change so it may have been possible during the twelfth and thirteenth centuries. Transport of ready-dressed stone by river would certainly have been more economical if it were possible; at Tutbury Castle in 1314 the carriage of stone overland some five or six miles (8–9.6km) from a quarry was more costly than the actual stone cutting (Salzman 1952, 117). Much closer to the fort, the twelfth-century church of Over Denton embodies Roman voussoirs in its chancel arch which are thought to come from Birdoswald (Richmond 1957, 181). An altar from the fort (RIB 1895) was found in a step in the same building. Triermain Castle, to the north of Birdoswald, also embodies Roman stone including two inscriptions (RIB 1943, 1944). The first documentary reference to the castle is *c* 1295 (McIntyre 1926), and a licence to crenellate was granted in 1340 (*Cal Pat Rolls*, 14 Edw III, 417). It might be argued that the footpath recorded as leading from Birdoswald to Triermain and which formed the boundary of *Haythwait* field *c* 1200 was the route along which building materials were transported.

Period 8

Building 4407 conforms in many respects to the class of small, defensible buildings known as bastle houses (Ramm *et al* 1970, 61; Ryder 1990, 2–4; 1992a, 351; 1992b, 64–5). Dixon (1979, 240) has preferred the older term pele house. These are defined as rectangular buildings, typically measuring around 10.5 x 7.5m, of two storeys with steeply pitched gables. The living accommodation was provided on the first floor, with a ground floor byre beneath. Walls, which were built of irregular blocks weakly mortared, were around 1.20m thick. In the ground floor there was a single doorway in the centre of one of the gable walls. The upper storey was reached by means of a ladder, which in many cases was subsequently replaced by a stone stair (Ramm *et al* 1970, 61). Buildings of this type are well dated to the later sixteenth and early seventeenth century, and their characteristic architecture is a result of the extraordinary social conditions which prevailed in the area during this period, and in particular the extensive raiding to which the border was subject (ibid, 70; Dixon 1979, 242; Fraser 1971).

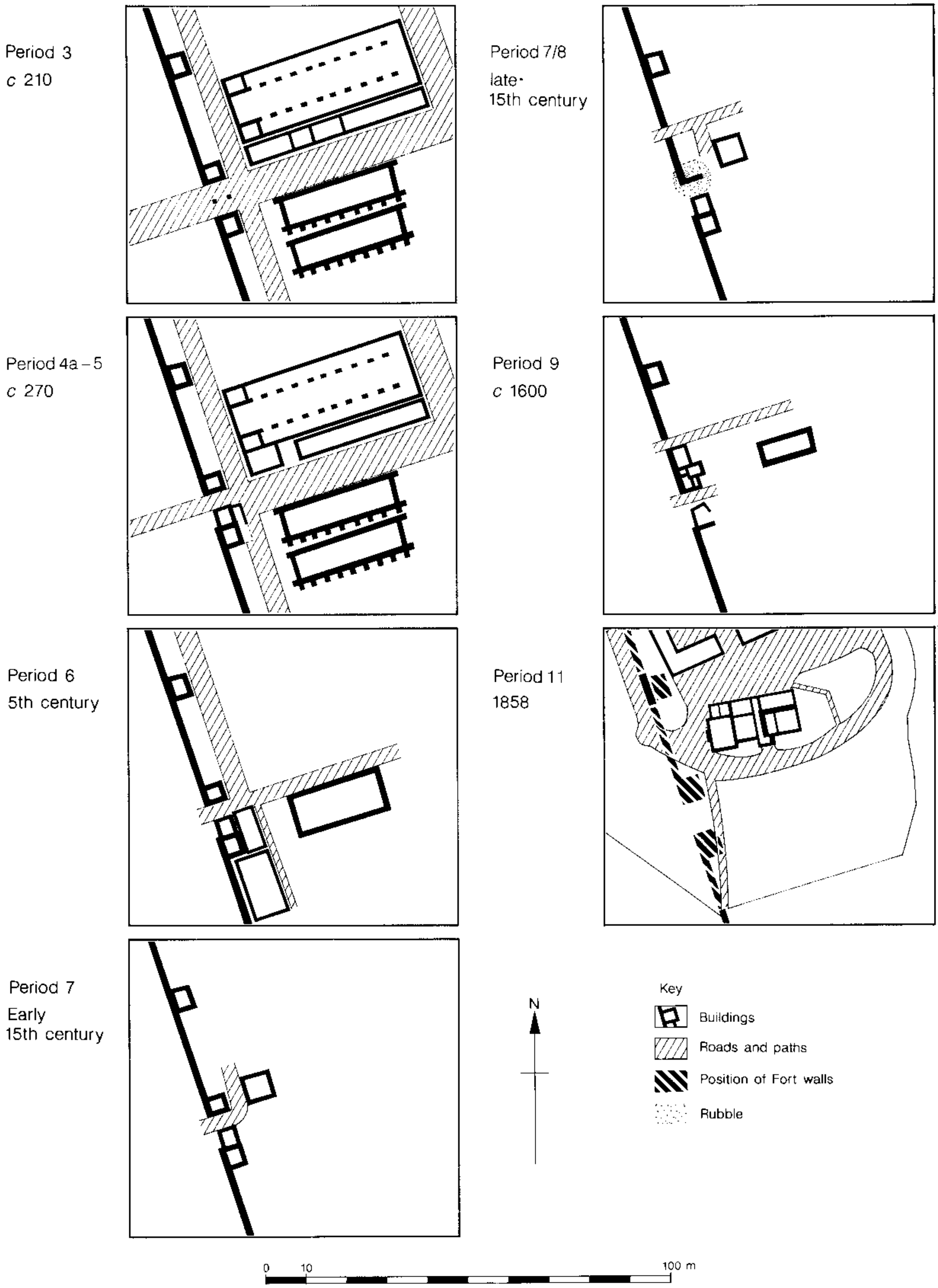


Fig 285 Outline plans to show changing access patterns within Area A

Building 4407 falls close to the typical dimensions of bastle houses (10.3 x 6.6m), and has a doorway in the west gable wall. The narrow corridor at the eastern end is not typical, though Peter Ryder (personal communication) has suggested that the strip of foundation separating the rooms might have supported a heavy fireplace and chimney stack at first floor level. Such fireplaces are usually located at the end opposite the ground floor byre door, but tend to be either recessed into thick end walls or carried on heavy corbels (Ryder 1992a, 373–4). There is no evidence for an external stone stair. The upper floor may have been carried on a vault or on timber beams. The reconstruction drawing of this phase (Fig 284) shows Building 4407 as a typical bastle house based on the surviving example at Black Middens, Northumberland. The only other fort on the Wall where such a building has been recorded is at Housesteads, where the building was added to the south side of the east tower of the west gate (Whitworth 1990).

The closely datable architectural function and form of this building combine with the archaeological dating to suggest an historical context for Period 8. It is suggested that Building 4407 was a bastle house, and the principal dwelling of the farm at Birdoswald during the later sixteenth and early seventeenth century. As such the building would have been the 'stonehouse' of the 1603 *Gilsland Survey*, and the house of Thomas Tweddle visited by Reginald Bainbrigg. The evidence of door burning during the raid of 1590 suggests that it was built before that date, and it may also have witnessed the raids of 1588. We know from Bainbrigg that an altar was reused in the fabric of the building (RIB 1885).

The buildings which overlay the *porta principalis sinistra* in Period 8 share several characteristics with thirteenth- to fifteenth-century buildings at Sewingshields (Haigh and Savage, 1984, 55–65). Both sets of buildings featured irregular, curvilinear walls of poorly laid, reused, Roman stone. At Sewingshields at least one building is interpreted as having had turf walls constructed on the stone base (Ramm *et al* 1970, 195). Building 4500 is similar in size and plan to many of the small shieling and farmstead buildings of drystone construction which were used as dwellings in the border area as late as the seventeenth century (ibid, 3, figs 1, 9), and which reused part of Hadrian's Wall on Mons Fabricius (Crow 1995, 101). Little can be said concerning the function of these buildings except that they were probably agricultural, and were subsidiary structures to the bastle house, Building 4407.

During Period 8 we have the first description of the appearance of the ruinous Roman fort, and Bainbrigg was impressed. To him the 'great ruynes thereof' suggested a 'great towne'. There was certainly much more of the fort's buildings left than there is today. His short account contains interesting implications: for the inscriptions to have been 'worne out by the tracte of tyme or by the clownishe and rude inhabitants defaced' they would have to have been visible. Though this may have been within the walls of later buildings it is possible that there were inscriptions visible in ruinous structures. Bainbrigg recorded inscriptions from the site at Naworth, and 'Belted Will's' collection had, therefore, already been formed by 1599. The better accessible inscriptions might thus have been removed already. Bainbrigg was shown 'the plaice where the churche stode'. There is a clear possibility that the remains of one of the basilican structures of the fort, either Building 4403 or the cross-hall of the *principia*, might have inspired this interpretation; surviving remains of Building 4403 would have closely resembled the remains of dissolved abbeys which were a prominent feature of the late sixteenth-century landscape of England. We can be certain that at least some part of Building 4403 survived as late as Period 8, as its south wall, together with parts of the south and north walls of Building 4402, were incorporated into the fabric of the bastle house, Building 4407, as they had been in the Period 7 tower, Building 4406. If there was a great deal of Roman building surviving in 1599 it would explain the limited amount of ploughing within the fort walls attested in the surviving earthworks.

However great the survival of some Roman buildings may have been in 1599, such survival was obviously patchy. The *porta principalis sinistra* would have been barely recognisable. The collapse of this gate was almost complete, and the fallen masonry would certainly have been quarried for building materials. It is an archaeological commonplace that in the robbing of stone from ancient sites the minimum of effort was used. Once found below ground, walls were simply followed. On a site like Birdoswald it is unlikely that walls would have been dismantled carefully from the top. Fallen stone would have been plentiful and easily secured. If large amounts of stone were required a wall might be deliberately toppled, though this would have been a hazardous undertaking. It is also possible that unsafe structures were deliberately demolished.

Building 4500 reused the south and part of the west walls of the north tower of the gate including its original doorway. This would have appeared as a composite building incorporating a Roman door and two massive piers (Fig 284). It seems that the Tweddles of Birdoswald and their predecessors were concerned to use as much sound ancient fabric as they could in order to minimise the effort of new construction.

Period 9

Archaeological dating is no longer useful for this and subsequent periods. It is, however, possible to suggest a construction date for the earliest phase of the extant farmhouse from architectural parallels. The core of the standing building conforms to the bastle type in the thickness of its walls, although it displays architectural pretension in the form of its door (Fig 271), and the upper storey window in the north wall which is larger than is common in bastles. The fact that the building lacks substantial foundations such as those of Building 4407, and that foundations similar to those of Building 4407 lie beneath it, demonstrates clearly that it post-dates the excavated bastle. The context for this building may well be found in the class of 'undefensible bastles' defined by Ramm *et al* (1970, 72–3) as continuing the bastle tradition into more secure times, incorporating architectural features of the second half of the seventeenth century. Doorhead mouldings like the one at Birdoswald can be seen on both upper and lower storeys of the house of this class and date at West Side, Allendale (Ramm *et al* 1970, 82, pl 33). It seems likely that the building was erected in the mid-seventeenth century. Period 9 ends with the additions to the house built in 1745.

The walls of the former Roman Buildings 4402 and 4403 were now reused for the last time, when the space between them was utilised for a drain. The fact that this was possible shows that the two walls must still have been visible for a considerable distance. Horsely's description of the fort, first published in his *Britannia Romana* of 1732, noted that the 'foundations of the houses within this fort are very visible'. Unless Bainbrigg was given to hyperbole, which does not generally seem to be the case, this implies that during the 133 years since Bainbrigg the 'great ruynes' had been considerably reduced by collapse and robbing. Horsely's most intriguing comment, however, is his statement that 'over against the entry are the ruins of the *praetorium* on which a house or two stand at present'. This, it seems to the writer, is a very good description of the position and state of preservation of the basilican Building 4403. It is situated against the entry to the farmyard from the west, and the farmhouse lies directly upon it; furthermore, its remains would have suggested an important building within the fort, as it may have suggested a church to Bainbrigg. The archaeological evidence demonstrates that the walls of the building were still visible during this Period. It is interesting to speculate how much of the piers and arcades may have survived and for how long.

It seems that the defences of the fort were in poor condition by this time, though the *portae decumana* and *praetoria* were still very visible. The latter gate was built over when the road from Gilsland to Lanercost was built. This was not part of General Wade's Military Road constructed after the Jacobite rebellion of 1745 and utilising the stones of Hadrian's Wall (Johnson 1989, 119) to the horror of antiquaries like William Stukeley (Lukis 1887, 41–2). The Military Road follows the line of the modern A69 between Greenhead and Brampton (Lawson 1966, 191). However, the effect of the construction of the road on the Wall beyond Birdoswald and through Banks was very similar; the course of the Wall was followed, and its stone used to lay the base.

Two coins which are assignable to Period 9 were found in topsoil deposits. These were of the reigns of Charles I and, oddly, of Louis XIII of France.

Period 10

In 1745 the freeholders, Anthony and Margaret Bowman, extended the dwelling house and laid out at least part of the farmyard and its buildings. The building as altered was two storeys high, three bays wide and one room deep with a central doorway. This plan is very typical of the type of small farmhouse which predominated in the area during the eighteenth century (Grundy 1992, 81). The gradual deepening of the house, in this case to the north, changing its orientation, is again a typical development of ordinary houses in the countryside of Cumbria and Northumberland (ibid). It is of interest that the house was turned to 'face' the fort. It had originally been built to face the farmyard, the workaday centre of the settlement, but this alteration implies the development of interest in the area to the south of the farm, and possibly a change in the fortunes or standards of the inhabitants.

The construction of the farmhouse and other buildings required a great deal of stone, and the Bowmans' improvements were typical of the building works undertaken during the eighteenth and early nineteenth centuries along the line of the Wall which resulted in the loss of much of the surviving remains of the frontier (Whitworth 1984). Farm building was by no means the only use found for Roman stone. The Enclosure Acts resulted in the construction of field walls. The act for the manors of Triermain and Lanercost was passed in 1802, and that for the parishes of Upper and Lower Denton in 1777 (ibid, 17). Hutton (1813, 56) remonstrated with stone robbers on the Wall at Planetrees, and when he arrived at Birdoswald to be entertained by William Bowman, his comment that 'all the Roman Buildings are down; Mr Bowman's fold etc stand upon the very works' (ibid, 68) marks the final stage in the gradual attrition of Bainbrigg's 'great ruynes'.

Period 11

The final archaeologically defined Period is also closely datable by means of the datestone of 1858 in the farmhouse porch, and through documentary references. Henry Norman was clearly a man who knew how he wanted the site to look. He made the most of the antiquity of the site while making improvements in true Victorian style. The area of Gilsland was briefly a fashionable spa during the early nineteenth century. Sir Walter Scott visited the area first in 1797 (Douglas 1931, 347), and the area was deeply enmeshed in the romanticisation of border history. Norman had the gates excavated by the brothers Potter in order to create an arcadian vision of a classical, ruinous landscape among which his sheep would graze. His house was built as a mock medieval pele house, harking back to the great period of the border, and the border ballads which Scott had done so much to promote. Even his garden wall incorporated the wall of a Roman building (Building 197). In ensuring that the ha-ha wall would appear the same along its entire length, Norman robbed the north wall of the *horreum* building. His interest in antiquity may have prompted the deposition of a pancheon in the robber trench in order to mark his work to future excavators. Certainly, his interest extended to publishing some account of his findings (Norman 1860).

15 The history of the fort and conclusions

This final chapter is intended to present a summary of the conclusions on the history of Birdoswald which are now possible as a result of the recent work, and of the reconsideration of earlier work. Some of the discussion contained in the preceding chapters is briefly reappraised, and further conclusions are added. This gives the opportunity to examine ideas not yet tackled, to incorporate aspects of the study of the finds as a whole, and to emphasise the place of Birdoswald within the wider frontier framework.

Period 1: before the stone fort

The point of departure for this discussion is the status of the landscape of Birdoswald and its environs on the eve of the construction of the Wall. The evidence of pollen analysis from Birdoswald and Appletree (Chapter 2) has enabled a detailed picture to be drawn against the background of more regional pollen work. The general impression of the pre-Roman environment of the Wall zone is of a patchwork of land use. In general there is evidence for accelerated woodland clearance in Weardale *c* 100 BC, reaching the Tyne valley somewhat later (Turner 1983, 10). Both the eastern and western flanks of the zone show evidence for pre-Roman arable farming (east: Jobey 1965, Bennett 1883a, 1983b; west: Charlesworth 1979, Smith 1978), while in the central, upland sector, Dumayne (1993) has shown that a major decline in woodland pollen took place during the Iron Age, and that an open landscape greeted the Wall builders on their arrival in the area. This is certainly confirmed at Appletree, where grazed moorland had existed for some time before the building of the Wall.

On the Birdoswald spur itself, dense deciduous woodland survived until the construction of the Turf Wall. This is unsurprising; the spur, with its steep surrounding cliff, and with a peat bog in its centre would have been of little use for grazing, and would perhaps not have merited clearance before the military potential of the site with its extensive views was realised. Birdoswald was probably one of many residual patches of woodland on the line of the Wall; another, which was not cleared until the Wall was built, has been identified by Dumayne (1993; 1994) at Fozy Moss near Sewingshields.

A broad chronology for the pre-Stone Fort phases may now be attempted (Table 2; Figs 286–7), although there is considerable room for refinement should this ever prove possible. The first building on the promontory may have been a signal tower related to the Stanegate, and if so was probably of Trajanic date (Fig 286a). This installation may have had its less than ideal position dictated by the natural vegetation and topography, as the first significant impact on the pollen record of the promontory was the construction of the Turf Wall early during the Wall building process. The Turf Wall and its ditch have frequently been examined at Birdoswald during the century since their first discovery by Haverfield (1897a).The Turf Wall and ditch describe a straight line through the area which was later occupied by the stone fort. It seems clear that the construction was a rapid process, and also that the builders of this wall were responsible for the clearance of the woodland on the spur. The building was so speedy that tree clearance did not register in the pollen record before the turfs were laid. The Turf Wall appears to have been built complete with turret 49a (Richmond 1957, 179), which was later demolished and completely robbed. It is probable that the centurial stone found reused in the primary stone fort Building 4403 (Fig 250, No 4) was robbed from the nearby site of this turret, as there is no other explicable source for this inscription.

The polygonal ditched and banked enclosure on the end of the spur with its rectangular inner enclosure, contained early Hadrianic pottery, and it is suggested that this might be a construction camp for the legionary builders of the Turf Wall, designed to take advantage of the shape of the promontory. The important collection of tentage leather from Birdoswald is from the primary fill of the ditches of this enclosure (McIntyre and Richmond 1934), and must derive from its occupation. This effectively argues against the postulated prehistoric date of the enclosure. The Turf Wall and its stone turret (Fig 286b) were probably completed during the governorship of Platorius Nepos (122–*c* 126) as this is attested by the accepted reading of the timber inscription from milecastle 50TW (RIB 1935). It is probable that the cornelian intaglio with a legionary motif (Fig 195; No 86) found beneath the Turf Wall in Area A was dropped by one of the builders.

It has been suggested above that the morass in the centre of the site (Fig 286a) was drained and backfilled in preparation for the construction of a turf and timber fort. The earthen rampart of this fort was apparently constructed upon a stone base, part of which was found in the south east corner of the stone fort (Simpson and Richmond 1932, 141–2). It is probable that the Vallum was laid out to respect this early fort, as this is the only conclusion which adequately accounts for the relationship between the south west corner of the stone fort and the Vallum itself. The proposed early fort (Fig 286c) would have been smaller than the stone fort, and would have been contained to the south of the Turf Wall. Though it is possible that the early fort was unfinished, the records of spread rubbish, contained by the rampart, yet sealed by the earliest levels of the stone fort, strongly suggest that it was, however briefly, occupied.

Very little of the detail of these early phases on the site is known, and the question of the existence, form,

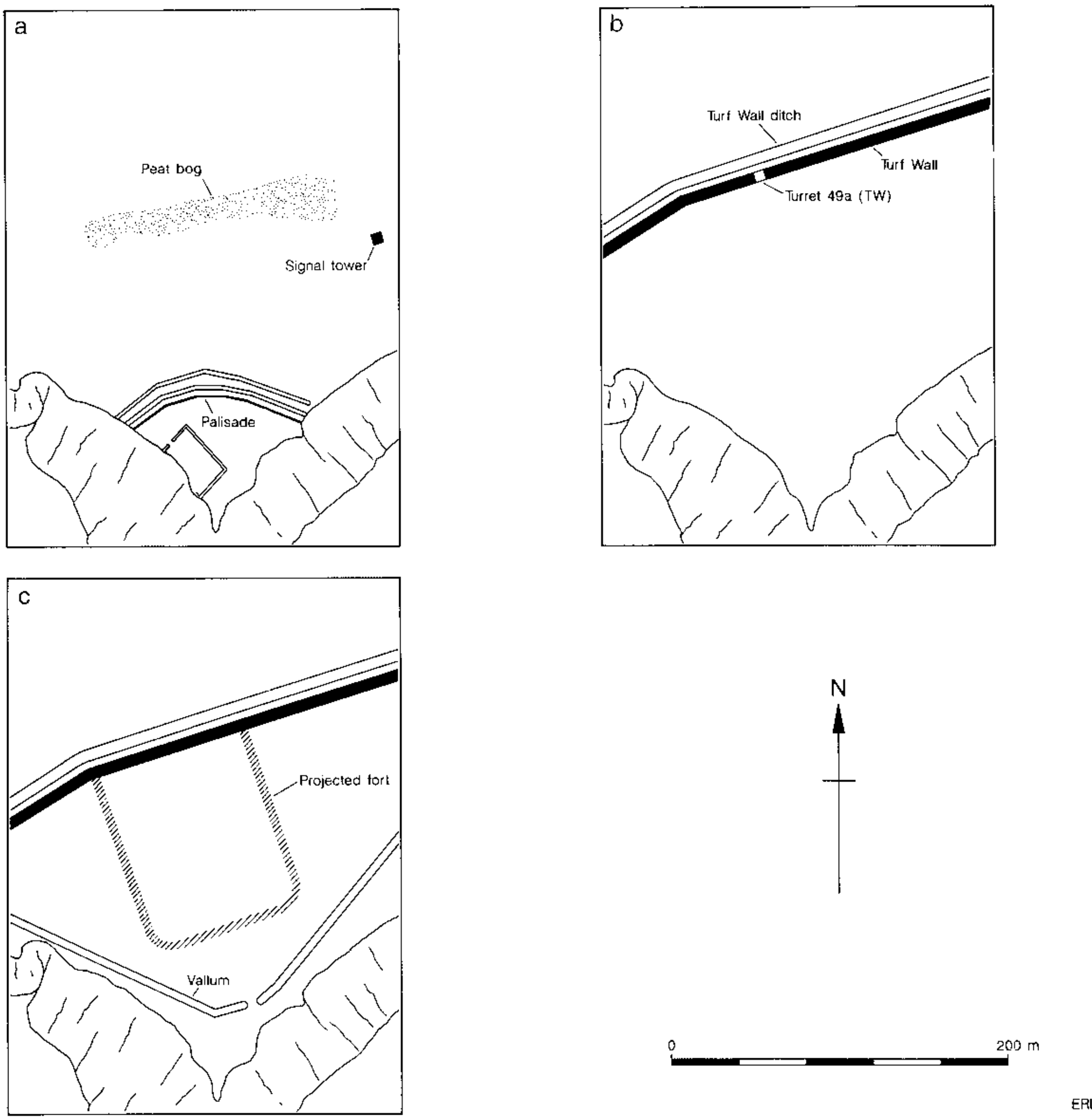


Fig 286 Outline plans to show phases in the pre-stone fort development of Birdoswald

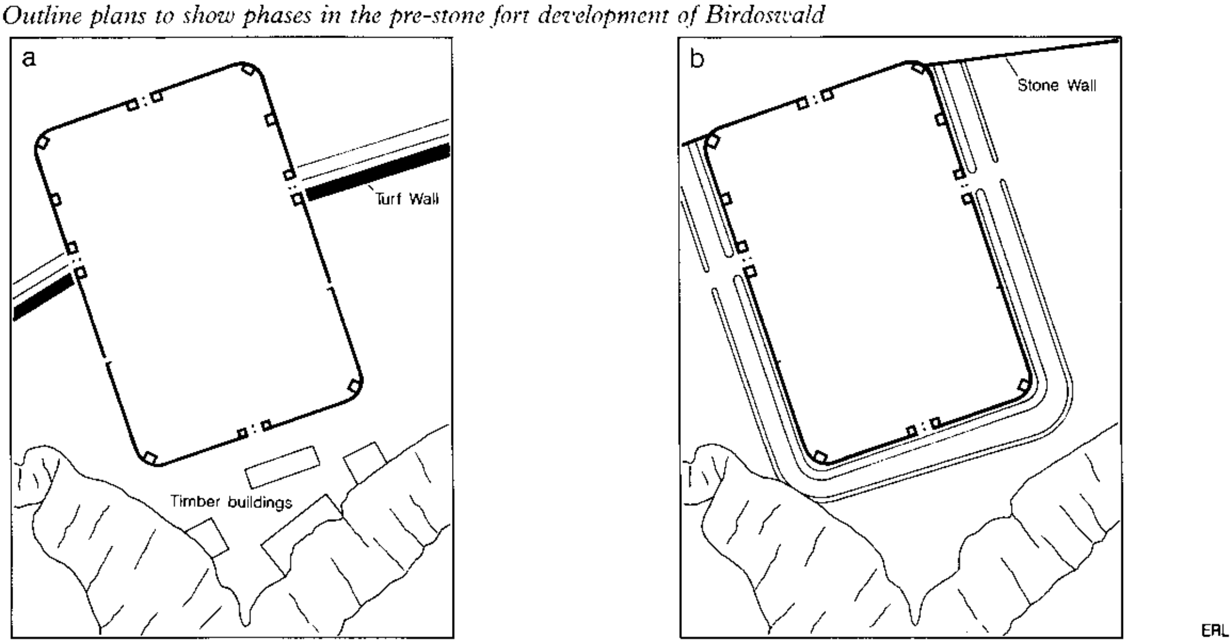


Fig 287 Outline plans to show the relationship between the stone fort and (a) the Turf Wall, (b) the Stone Wall during Period 2

date, and duration of an early fort occupation remains one of the most important outstanding problems of the history of Birdoswald. Of particular importance are questions relating to the status of the two early hoards from the site, and of the finds from the primary rampart of the stone fort. The hoard from the area of the *retentura* of the stone fort might have been from the floor of a primary building of the stone fort (as Richmond (1931) presumed), or of an early fort. The arm purse hoard could have been dropped by one of the builders of the stone fort rampart (Richmond 1950a, 1954), or could have been redeposited from earlier occupation levels during rampart building. The pottery from the stone fort rampart (Analytical Group 1) shows a smaller range of vessel forms than do Analytical Group 2 and the 1929 Alley deposit, both of which come from the primary occupation of the stone fort. This might be an accident of discovery, or a true indication that a smaller range of pottery was available at a slightly earlier date in the fort's history which is represented by redeposited material. All these questions must remain open.

Period 2: the construction and first occupation of the stone fort

In contrast to the earlier phases, the history of the construction of the stone fort, described in Chapter 4, is very clear in its detail. The fort was designed to project to the north of the Turf Wall (Fig 287a). This is clear from the fact that the two *portae principales* and the *porta praetoria* lay to the north of the Wall, while the two *portae quintanae* were provided for lateral communication to the south of the linear barrier. A combination of the evidence of stonemasonry and soils analysis allows a detailed view of the history of the fort's construction. Firstly, the Turf Wall within the enceinte was demolished together with its stone turret and the first fort. The Vallum ditch was backfilled and the Vallum crossing was robbed. A start was then made on the construction of the curtain walls and the six gates. This effort was not sustained, however, and a hiatus occurred, during which scrub was allowed to grow within the abandoned shell of the part-built fort. This was later burned off and there may have been a period of animal penning, but the hiatus was followed by an energetic resumption of work towards the completion of the fort. The defences and gates were finished, internal streets, buildings, and the drainage system were installed, the fort rampart was raised and the ditches were excavated. It is probable that the first series of timber buildings on the promontory were erected as temporary quarters for the fort builders, and that the fort ditches which cut these buildings were the last additions to the plan.

Despite the recovery of this sequence, it should be stressed that very little is yet known of the layout of the primary phase of the stone fort. That what is known is atypical complicates the picture still further. There are only four known building plans, all in the *praetentura*.

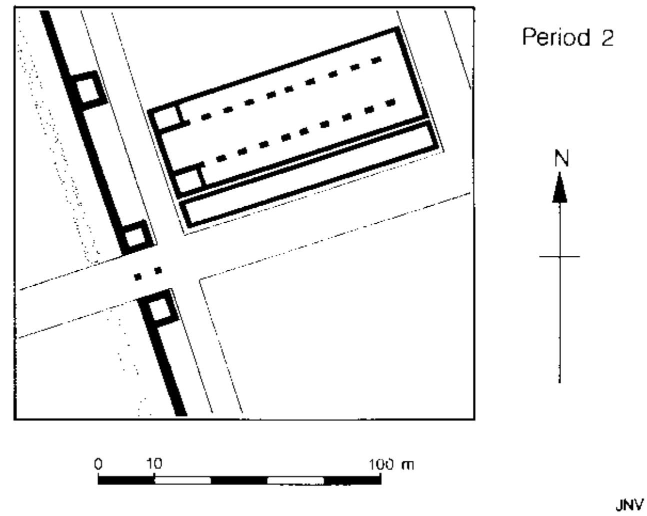


Fig 288 Summary plan of Area A in Period 2

Two of these are the long, narrow, undivided buildings, Building 4400 and its eastern counterpart excavated in 1929. Behind the eastern building was a barrack block divided into *contubernia*, but behind the western building was the basilica, Building 4403. This is as yet unique in any auxiliary fort, and adds to the repertoire of buildings which might be expected in such a fort. It has been identified above as a *basilica exercitatoria*.

The final identifiable act during Period 2 was the construction of a Stone Wall replacing the primary Turf Wall. The fact that the new barrier was built up to the north corners of the stone fort rendered the *portae quintanae* redundant, and they were blocked and demolished (Fig 287b).

There is evidence to suggest that the fort remained incomplete until the initiation of Period 3. Certainly the outer ditch was not completed, though it seems likely that the inner ditch was. It may simply have been decided to dispense with the idea of a multiple ditch system. More importantly, the excavated area to the south of the *via principalis*, adjacent to the *porta principalis sinistra*, remained vacant throughout the second century (Fig 288) after a start on a buttressed building had been abandoned. As the site of the later *horrea*, indeed the site where primary *horrea* might be expected, this is an important location, and the fact that it was not used raises a number of questions.

The various changes in plan, bursts of activity, and halts during Periods 1 and 2 are impossible to date with any accuracy. They begin with the decision to build the Turf Wall, and end with the construction of the new stone wall between milecastles 49 and 51. In the scheme proposed by Breeze and Dobson (1987, 82–5) for the building of Hadrian's Wall, the Turf Wall in the Birdoswald sector would have been built in 123. The construction of the Vallum and of the primary forts (at Birdoswald the turf and timber establishment) would commence in 124, and continue until late in the decade. This timetable assumes the initiation of work on the Wall in 122, following Hadrian's visit to Britain in that year.

There is, however, another model. The suggestion of C E Stevens (1966, 39) that the Wall may have been begun in 120 under the governorship of Pompeius Falco, and that the decision to add the Vallum to the scheme was consequent on Hadrian's visit in 122 has recently been raised again by Hill (1991, 34–5). He sees the high quality of the masonry of the Vallum crossing at Benwell as being a result of the presence of the Emperor. Bennett (1990, 492) has also amplified Stevens' idea, suggesting that the linear barrier with milecastles and turrets was begun under Falco, with the decision to build forts upon the mural line following under Nepos, possibly at imperial behest while Hadrian was present in the province (ibid).

To suggest that the forts and Vallum were both commenced at Hadrian's instance is not unreasonable, as it has long been accepted that they were begun at broadly the same time, perhaps with the Vallum decision marginally post-dating the fort decision (Breeze and Dobson 1987, 83). When applied to the complexities of Birdoswald and its adjacent sector of the Wall this alternative chronology gives a few more years in which the changes on the site might occur. The fragment of wooden inscription from milecastle 50TW which apparently records Nepos does not necessarily imply that the Turf Wall in this area was commenced between *c* 122–6, but that it was completed during this period. If the Turf Wall and its milecastle were completed and the fort and Vallum decisions occurred *c* 122, at the beginning of Nepos' governorship, a very short period would have elapsed after the construction of the Turf Wall before the Vallum was begun. This is actually attested at milecastle 50TW, where the Vallum mounds were placed upon ground denuded of turf (Simpson and Richmond 1937a, 169), suggesting that the Vallum followed very shortly after the Turf Wall. This would fit either the Breeze and Dobson timetable, or that of Stevens (1966, 106), in which the Turf Wall is completed and the Vallum and primary forts begun in 123, and the Vallum completed in 125. Using Stevens' chronology it is possible to suggest that a small turf and timber fort on the Turf Wall, bounded to the south by the Vallum and its stone gateway, may have been built and garrisoned as early as *c* 125/6. Bennett (1990, 449–50) has suggested the Trajanic samian recorded in the earliest levels at Birdoswald, and also the two coin hoards, indicate an early date for the fort at Birdoswald (though he takes the Stone Fort as primary) and therefore for his Phase II (the fort decision) on the Wall.

Although the Stevens (and Bennett) chronology would add a few years to the time span during which the alterations at Birdoswald took place, it is not necessary to take this as accepted in order to account for the changes. The *terminus ante quem* for the entire sequence is provided by the presence of later Hadrianic pottery in the primary occupation deposits of the Stone Wall milecastle 50 and turrets 50 a–b which are associated with the replacement in stone of the eastern end of the Turf Wall. The Breeze and Dobson chronology would give a perfectly adequate span of 18 years for the sequence, from clearing the site for the Turf Wall to demolishing the *portae quintanae* (122–*c* 140).

There is virtually no evidence for the nature of the primary garrison of the fort. The only direct evidence is the samian graffito from the primary north rampart of the stone fort which records the name of the *decurio* Martinus. This may be held to indicate the presence of auxiliary cavalry. The presence of an apparent infantry barrack block and a building interpreted as an infantry *basilica exercitatoria*, however, would seem to suggest that the first garrison might have been mixed or, in other words, a *cohors equitata*.

A major question which remains unanswered, and is unsatisfactorily addressed by the results of the recent excavations, is that of the status of the fort during the period of the occupation of the Antonine Wall, and through the later second century. Throughout this century the fort appears to have been maintained in use. There is a total lack of evidence for desertion or dilapidation during this period, and the state of the fort contrasts favourably with the stratigraphic evidence for a late third-century desertion. The apparent maintenance of the fort in good order, however, contrasts with the failure to build on the site of the later *horrea*. The evidence begins to suggest a small garrison, which had no need for storage buildings of the capacity of standard, large, military *horrea*. The fact that these buildings were not finished during the first build of the fort might not present a problem to an attenuated garrison. The evidence of the stamped and decorated samian could be taken to suggest continued, though reduced occupation of the site between 140 and 160. Unusually for Wall forts, similar wares to those from Antonine Scotland are represented. In terms of coin finds, Shotter (1995, 25) has noted that the indicators of Antonine desertion are not as marked in the Birdoswald assemblage as they are at other Wall sites, such as Castlesteads. Shotter (ibid) further remarks that the coin list reflects strong occupation in the later second century, though there are few indications of this in the excavated structures.

The *in situ* finds assemblage for Periods 1–2 is very small. Only 6.5 kg of pottery was recovered from stratified contexts of these Periods, representing a minute 2.3% of the overall site assemblage, despite the fact that Periods 1–3 cover the first century of occupation. Finds from stratified contexts include lost coins, small personal possessions, and military equipment, but there are extraordinarily few even of these. Coarse pottery and samian ware included the range of vessels and wares which might be expected for Wall forts during these periods, though there may be a smaller range for the earliest part of Period 2 or Period 1, indicating a growth in supply as full Wall occupation developed. The small bone assemblage is the only evidence for diet during these periods. Of the bones, 53% were cattle, indicating a predominance which continued throughout the fort's history, but sheep, pig, horse, chicken, and red deer were also represented.

Periods 3–4a: the third century

These periods are extensively discussed in Chapter 9 and an outline only is necessary here. The third century is the only period for which we can be certain of the garrison of Birdoswald. This was *cohors* I *Aelia Dacorum*, a milliary, peditate cohort raised in Dacia under Hadrian, and which had been stationed in Britain for the best part of a century before it arrived at Birdoswald. This cohort, under the tribune Aurelius Julianus, was responsible for the definitive construction of Period 3: the building of the *horrea* (Fig 289a), during the years 205–8, which is recorded on a major inscription found in 1929 (RIB 1909). Julianus suffered the loss of an infant son while stationed at the fort. The *horrea* were only part of a major building programme which continued throughout the first quarter of the third century, and included the partial rebuilding of both *portae principales*. In the case of the *porta principalis sinistra* ashlar masonry was employed; the only such masonry in the fort. This aspect of the building programme was dated by an intaglio of unusual quality, possibly depicting one of the young Severi (Fig 195, No 87).

Period 4a was defined by the blocking of the south portal of the *porta principalis sinistra*, the laying of new road surfaces and drains, and the use of workshops, Buildings 4401 and 4402 (Fig 289b). Industrial debris in the form of hammer-scale, evidence for the use of heat, stone boxes, or tanks, and a hearth attest to the practice of ironworking during this period in Building 4401 and in the ground floor of the *porta principalis sinistra* and its annexe. It is not possible to suggest what industry was practised in Building 4402.

Cohors I *Aelia Dacorum* continued to observe official religious practices, evidenced by the IOM altar series, at least until the reign of Probus (276–82), though in 297–305 the final major inscription from the site records that the *praetorium* was 'covered in earth and fallen into ruin' (RIB 1912) . This has consistently been interpreted since 1929 as signifying rebuilding during the years 297–305, after a period of desertion. Unlike the mid-second century, when there is no evidence at all for desertion, this late third-century withdrawal has archaeological substance. There is something of a hiatus in the coin list after a very strong run of coins of the Gallic Empire, with only a single coin representing the reigns of the usurpers Carausius and Allectus. The list then picks up in the early fourth century. The ironworking in the excavated gate and in Building 4401 ceased, and in both cases this cessation is associated with coins of the Gallic Empire. Building 4401 collapsed and was not immediately rebuilt, and the fort ditch was allowed to silt up and flood the berm, thereby causing the fort drainage system to back up. These are conditions which were not permitted to occur before or after the later third century, and form presumptive proof of a period of desertion. The backing up of the drainage system, it is suggested, would have had serious consequences in the low lying parts of the fort, and might have contributed largely to the dilapidation recorded in RIB 1912 (for full assessment, see p 198).

Like the second-century deposits, third-century contexts contained few stratified finds. There are a number of factors which explain this. Firstly, the areas excavated would not have been the sites where objects would primarily have been used. The primary second-century buildings, the *porta principalis sinistra*, the *basilica exercitatoria* (Building 4403), and the long narrow Building 4400 were supplemented in the early third century by the two *horrea*, Buildings 197 and 198. None of these were areas of habitation or of work, and the only objects which might have been used in them would have been articles of personal adornment, small possessions such as coins, military equipment, containers for stored goods, and perhaps for food or drink for immediate use. In the *horrea*, tools appropriate to warehousing might have been used. The nature of all of these buildings, however, militates against the deposition of finds. Within the basilica and the *horrea* there would be no

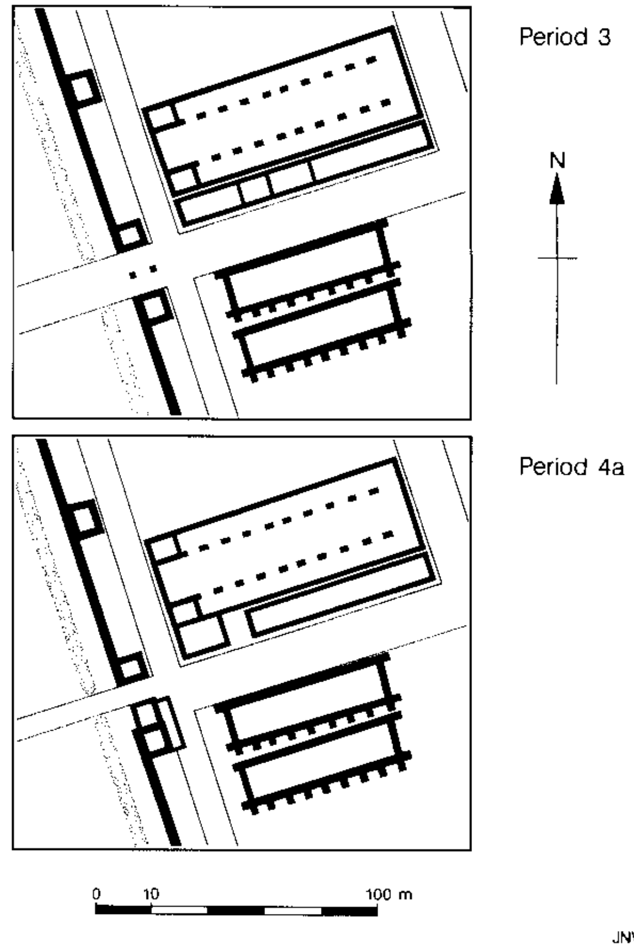


Fig 289 Summary plans of Area A in Periods 3 and 4a

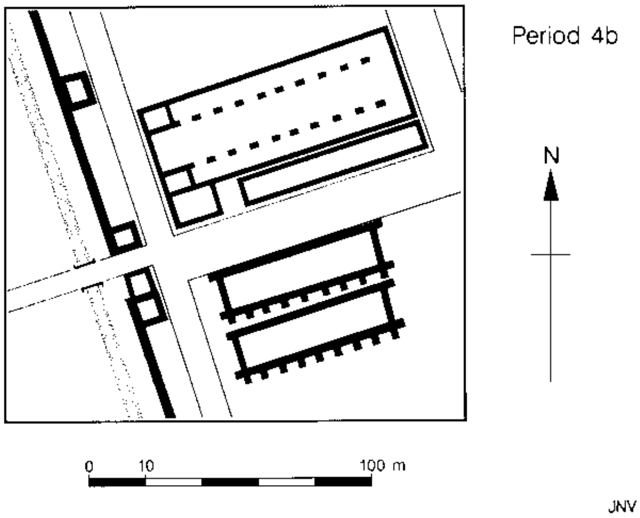


Fig 290 Summary plan of Area A in Period 4b

opportunity for archaeological deposits to accumulate. The raised *horrea* floors would have been cleaned, and the flagstones stopped any significant accumulation in the sub-floors. If the basilica was used for military exercise it would almost certainly have been kept spotless. The gate also would have been used for guard and sentry purposes, and the main accommodation floor was probably the storey above the arches, rather than the ground floor of the towers. Of the Period 2–3 buildings, only the long narrow Building 4400, with occasionally replaced earth, clay, and stone floors, provides an environment favourable to the loss and recovery of finds. In Period 4a, the rapidly accumulating working deposits of the ironworking buildings, Building 4401 and the *porta principalis sinistra*, retained some finds, though most rubbish, including large-scale working debris and accumulated floor surfaces, was clearly removed for disposal elsewhere. If objects were not much used in these areas of the fort, still less were they deliberately disposed of. Most finds in the excavated areas can be explained by casual loss within the working buildings or in the on the streets of the fort. Like Period 2, the finds from Periods 3–4a primarily consist of small personal possessions and items of equipment. Some of these objects, for example a broken patera handle, a knife, small iron rings, and fragments of fittings, which were found in the ironworking buildings, might be interpreted as scrap awaiting recycling or objects for repair, an industry suggested by the presence of a small crucible. However, most finds were again predominantly small, easily-lost, personal possessions: coins, brooches, studs, and dice. Ditch Phase d, in Period 4a, contained in its silt the earliest significant assemblage of finds from this environment. It is clear that redundant footwear and animal bones were the predominant materials disposed of in the fort ditch. Pottery was sparse, metal objects were virtually not present, and there was also very little in the way of industrial debris. The reasons for this selectivity are far from clear. It is possible that bones and leather were simply the commonest waste product, and were therefore thrown away more casually than other materials. A comparison with similar sites, even where leather does not survive, would be instructive. This pattern of disposal seems to have occurred from the earliest period of the fort's occupation, and continued until the final silting of the ditch.

Period 4b: the early fourth century

The restoration of fort buildings after the apparent desertion of the late third century is recorded in RIB 1912, showing work taking place on the *praetorium*, *principia*, and bath-house. This appears also to be attested archaeologically at the *porta principalis sinistra*. The ditch was recut, but this time it was continuous across the gate portal, and was bridged by means of a stone bridge-culvert (Fig 290). Building 4401 was also rebuilt (Building 4401 Phase c).

The energetic recommissioning of the fort seems to have been the work of *cohors* I *Aelia Dacorum*, who may now have returned to the fort, as they were the garrison recorded in the *Notitia Dignitatum*. During this period, the fort ditch was recut for a final time, and Building 4401 was rebuilt once more. During Period 4b there is no sign of the ironworking which was such a feature of Period 4b. There is no reason to suppose that all of the excavated buildings were not fully in use during this period. Every indication is that the *horrea*, Buildings 4401 and 4402, and the basilica were all now used in a full restoration of the function of the fort.

Evidence for the life of the fort from the second to the mid-fourth century

An important factor in the life of the fort would have been the pattern of rubbish disposal, and this raises the question of the paucity of finds from the 1987–92 excavations. It has been stressed elsewhere in this volume, by Louise Hird and Jan Summerfield, that pottery and finds from the site are relatively sparse. There are no rubbish pits, and the only place where dumping appears to have taken place was in the fort ditches, though even here a very characteristic pattern of selective disposal took place. The only other rubbish deposit up to the mid-fourth century is contained in the Period 5 sub-floor backfill of Building 197, where a greater range of material was found. It is generally concluded that rubbish was probably disposed of down the river cliff. Though such a disposal pattern is not archaeologically attested elsewhere in Roman Britain to the knowledge of the writer (with the possible exception of High Rochester; J Crow personal communication), it is implied by Saxon finds made at the bottom of the cliff below the monastery at Whitby (White 1984) and is common practice in hilly regions in various parts of the world (observed by the writer in the Andes, Carpathians, Urals, and Karakorums among others).

The paucity of finds makes it extremely difficult to discuss any area of life in the fort with any confidence, to distinguish meaningfully between periods, or areas of activity within periods. To this extent the results of the excavation are unbalanced, focusing primarily upon the nature of buildings. Building form explains building function in the case of the basilica and the *horrea*, and only in Period 4a is it possible to deduce from recovered material (primarily hammer scale; Table 9) that certain buildings were used for metalworking. A few finds, however, do give indications of general trends in the patterns of occupation.

One of the most important questions concerns the nature of the garrison and its make up. There is a small amount of military equipment, mostly from third- and fourth-century deposits, including material associated both with legionary and auxiliary troops. The presence of *lorica segmentata* and *pila* is not, however, by itself necessarily indicative of a legionary presence at any time (*pace* Bishop and Coulston 1993, 206–9), though such a presence during the third century is attested in the epigraphic evidence, and it makes sense to view these areas of evidence together. On three occasions during the third century legionary centurions were used to command *cohors* I *Aelia Dacorum*, while another legionary, G Cossutius Saturninus, *miles* of *legio* VI *Victrix Pia Fidelis*, was buried at Birdoswald during the third century (Wright and Phillips 1975, 133). *Cohors* I *Aelia Dacorum* had been in Britain for a long time, and must have largely drawn recruits from the province by the time of its arrival at Birdoswald. The use on inscriptions of the Dacian ethnic weapon, the falx, and the fact that a child buried at Birdoswald bore the Dacian name Decibalus (RIB 1920; Wilmott 1993), however, does suggest some contact with the unit's original home area. There are no direct ethnic indicators among the finds, though a third-century brooch (No 59) from the same mould as four from Germany might indicate recruitment from the continent. The garrison seems to have been fond of enamelled objects, as an unusual number of such items were found at Birdoswald and at the adjacent turret 49b (Appendix 2, Fig 297).

The shoes from the ditches of the third- and fourth-century fort reflect, as is common for this period on military sites, a 'normal' population of men, women, and children, and van Driel-Murray (1995) has persuasively concluded from the Vindolanda footwear assemblage that women and children were a feature of life within the fort walls. As the ditch lies outside the walls of the fort, this is not necessarily evidence for the families of soldiers occupying the walled area of the fort itself, as some of this material may be the refuse of the population of the fort *vicus*. Examination of the other finds for indications of gender has not proved conclusive for the second to fourth centuries at Birdoswald. It has occasionally been argued that the so-called chalet style of barrack block which occurs in a number of forts, notably Housesteads, during the fourth century reflects a diminution in the garrison, and the movement of soldiers' families into the forts (Daniels 1980). The only evidence from Birdoswald for such a diminution is the apparent officer's house which overlies a traditional *centuria* barrack block in the eastern *praetentura*. There is no evidence from the finds for an increased feminine presence at this time.

The animal bone throughout the fort's occupation includes a vast preponderance of cattle, and among the cattle bones a high proportion of shoulder blades, many of which were pierced with holes. This seems to indicate that meat hung in storage, possibly within the *horrea*. It may have been preserved by salting or smoking. Most of the cattle used were female, and indications that the assemblage was the result of primary butchery showed that, logically, the meat was brought to the site on the hoof and slaughtered *in situ*. Adult and even elderly animals were used, and there are signs that the beasts had been raised on rough grazing. A genetic trait indicates the presence of a local breed. Sheep/goat was also common, and red deer were hunted for food.

Other dietary information, in the form of a limited quantity of carbonised grain, was recovered from the *horrea*. This showed that both wheat and barley were used. Though wheat might have been transported from a supply depot, barley would have grown locally. It has been suggested above that grain was probably distributed in sacks and processed in the barracks. The large numbers of milling stones unearthed and the ovens in the rampart around the fort attest to this process.

Apart from the possibility of 'imported' wheat there are no exotic food taxa among the macrobotanical samples. The finds assemblage is again too poor to address the question of long distance supply or of the sort of markets the fort was exploiting.

The presence of high-status personnel is apparently attested by the sandals which form 12% of the footwear assemblage. The low proportion of chicken and pig among the animal bone assemblage might indicate that these relatively choice meats were being consumed by the garrison's officers.

The less mundane aspects of fort life are represented in the small body of evidence for religious practice. The IOM altars, and the parade-ground ceremonies which they represent, have been discussed as an aspect of the annual official observances of the fort. More personal religion might be seen in the small personal altar (No 281), the portable or votive relief of the *genii cucullati* (No 279) and the pipeclay Venus figurine (No 278). These are in addition to earlier finds of altars to Roman deities such as Silvanus (RIB 1905), Neptune (Wright and Hassall 1974, 462) and Celtic deities like Latis (RIB 1897), relief sculptures depicting Hercules and Jupiter, Mercury, Mars Cocidius, the Matres, and a wheel representing Jupiter or Fortuna (Coulston and Phillips 1988, nos 34, 82, 162, 366, and 462), and statues of Commodus in the guise of Hercules, Fortuna, and a *genius cucullatus* (ibid, nos 15, 154, 190). The fort cemetery located to the west of the fort (Wilmott 1992) may have been the source for the shattered tombstone (No 282) reused in a drain in Period 4b.

Periods 5–6: the later fourth century and after

These Periods have also been extensively discussed above, and only a summary is required here.

Around 350 it would appear that one of the *horrea* changed its function, and the second collapsed and was not rebuilt. As in the earliest period, the fort's inhabitants clearly no longer required these buildings for storage. It is logical to see this as the result of a drastic reduction in garrison size, and possibly of the existence of a system of local supply with no element of stockpiling. The north *horreum* was used as a quarry, and it seems likely that the building excavated in 1929 was renovated at the expense of Building 198. Though the fill of the sub-floor of Building 197 contained a number of finds, the evidence of the coins and pottery demonstrates that some of this assemblage was residual. The dumping in the robbed Building 198, however, appears to be a deposit entirely generated in the late fourth century. Pottery and coins are almost entirely dateable to this period. If this is the case, the small-finds assemblage becomes more interesting, as it potentially represents an intact deposit of objects in use from *c* 350. If so it must be significant that the deposit includes four out of eight penannular brooches found during 1987–92. A further brooch (Appendix 2, No 2) was found in 1929 in deposits associated with Level IV, the later fourth-century deposit which may have utilised robbed stone from Building 198 in its construction.

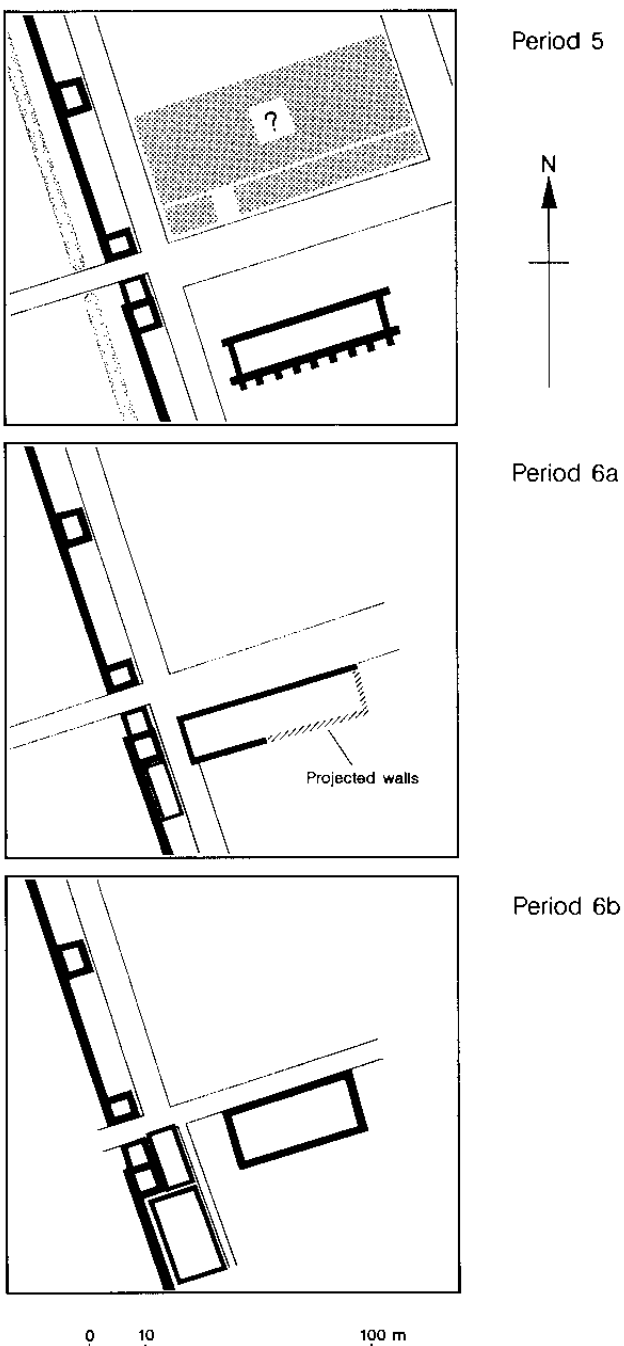


Fig 291 Summary plans of Area A in Periods 5 and 6

Although the floor of Building 197 might have been kept clean for a long time, eventually the interleaved deposits of silt and stone floor patching began to develop. This was associated with the use of a stone-built hearth at the western end of the building, and it is possible that the *horreum* was now used as a hall, in the sub-Roman sense of that word (Fig 291a). The good-quality finds from the hearth area may indicate that this was the position occupied by the leading figure in the community, whether we regard him as a Roman military commander, or something more akin to a sub-Roman warband leader.

It seems likely, and is argued above (pages 217 and 228), that the first large, rectangular timber-built structure (Building 199) was the successor to the reused Building 197. This structure utilised the foundations of the former *horreum*, Building 198, and was accompanied by a small post-built service building constructed against the wall of the fort to the south of the *porta principalis sinistra*. The north wall of the next building in the sequence, Building 200, was parallel with the *spina* of the gate, suggesting that its relationship and appearance with the gate had been carefully considered. This building was also accompanied by service buildings, this time two, which were built on the surface of the *via sagularis* (Fig 291c).

The existence of these structures and the identification of these Periods are the most significant results of the excavations. Nowhere else on Hadrian's Wall, or indeed in northern Britain, has such definite evidence of sub-Roman continuity been identified. This, of course, means that the most fundamental questions of date, status, function, and character must remain controversial. An average chronology has been offered, based on the potential for survival of the buildings. This chronology suggests a lifetime of 50 years for each of Periods 5 and 6, with a start date *c* 420. This brings the end of Period 6 to *c* 520, though other chronologies are possible, and it is entirely reasonable to suggest a later terminal date, perhaps as late as the early seventh century. Comparison of the Birdoswald evidence with the scanty evidence for the fate of *limitanei* in the

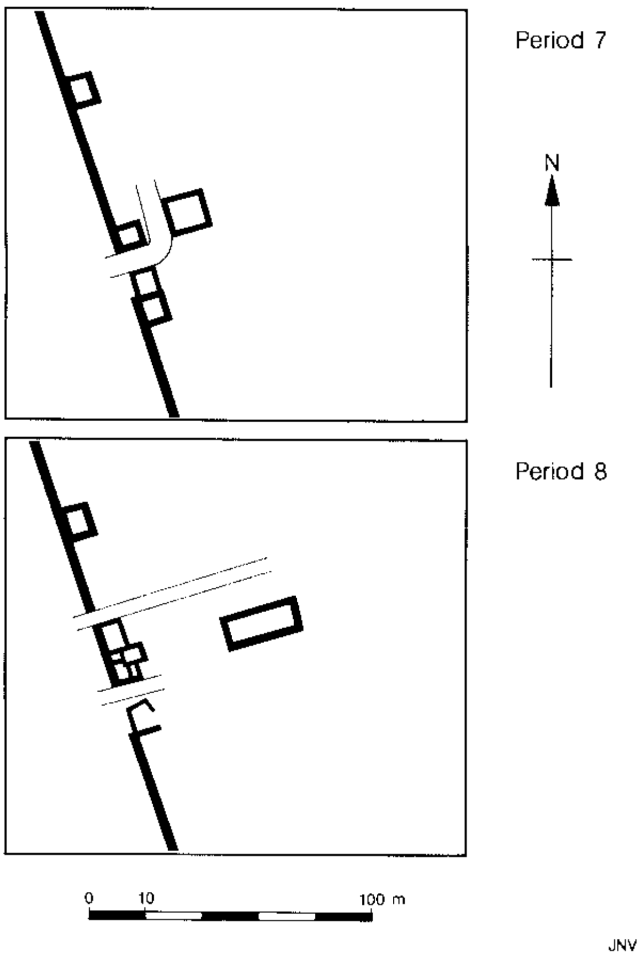


Fig 292 Summary plans of Area A in Periods 7 and 8

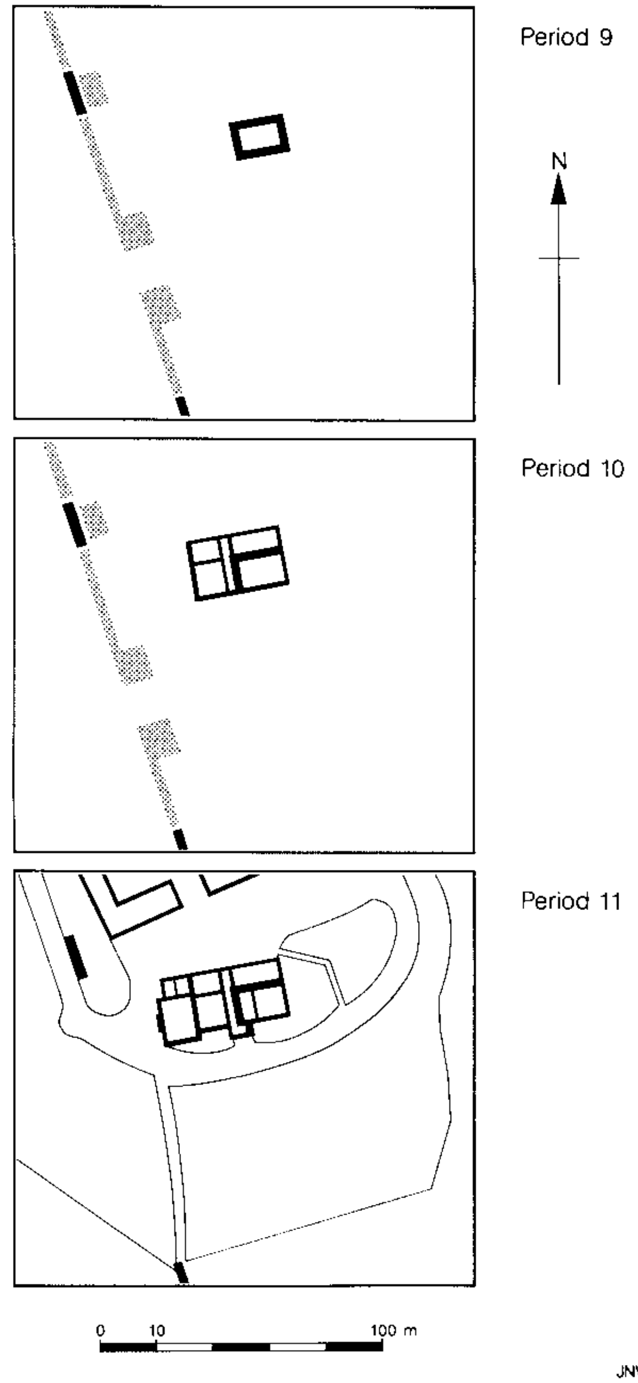


Fig 293 Summary plans of Area A in Periods 9–11

late Roman west suggests that no general conclusion on this matter is possible, but that different units, even within the same province and on the same frontier will have had different responses to the situation in which they found themselves. At Birdoswald it is suggested that the garrison remained as a self-perpetuating social unit, possibly dependent upon receiving supplies from the hinterland which had hitherto delivered tax in kind to the army. It is suggested that this was a symbiotic relationship in which the suppliers of the fort's population were offered armed protection in return. The architectural form of the large timber buildings recall the halls of the sub-Roman and Anglo-Saxon periods. One can, perhaps, see the former garrison emerging through time as a social unit with a strong relationship with a hereditary commander or 'head-man, who might take on an identity similar to that of a petty king of the period. Eventually it might not be possible to distinguish the heirs of the *limitanei* of Birdoswald from the other armed groups which inhabited sub-Roman Britain, though it may be that they derived legitimacy from a Roman heritage and possibly the use of Roman symbolism. A comparison has been made between Birdoswald and the reoccupied hillforts of the south-west and the fortified sites of Scotland. It is quite possible that the sub-Roman fortified sites which must have existed in northern England are none other than the Roman forts themselves. Evidence for the period is scanty because it is, by its very nature, difficult to identify and recover. It is also susceptible to later damage, and has not, in any case, yet been generally sought. This must become a prime focus for future work on the northern forts.

There is at least a possibility that the small-long brooch recorded by Bruce does come from Birdoswald. If so it may well be an artefact contemporary in use with Period 6. The eighth-century ring-headed pin, however, cannot be held to synchronise with any known structural period on the site, and is a tantalising indication that continuity of occupation may have run on until later centuries in some other part of the fort.

Periods 7–8: the medieval and modern periods

These periods have been discussed at length in the preceding chapter. The earliest post-Roman documentary reference to the site in the late twelfth century predates by some time the earliest post-Roman pottery by which the structures of Period 7 are dated, which is of the fourteenth and fifteenth century. The tower house of Period 7 (Building 4406; Fig 292a) is probably of this date: the period of the tenancy of the Vaux family. It is, however, probable that the twelfth- to thirteenth-century settlement is also located in the sheltered and protected north-west corner of the Roman fort, beneath the buildings and yards of the modern farm.

Even as late as the fifteenth century it would appear that the *porta principalis sinistra* was serviceable and in use, and it has been suggested that it may have provided a detached solar to the tower house. Although it is not possible to know how much of the Roman fabric of the fort remained standing, it is clear that the standing double walls of Buildings 4403 and 4401 were utilised as part of the tower house.

On the demolition or collapse of the gate the entrance to the farm complex was simply moved 10m northwards (Fig 292b). By the later sixteenth century, Period 8, the tower house had gone and the farming settlement of Birdoswald had assumed a common border form: that of a bastle house, with room for stock on the ground floor and habitation above. The recorded instances of reiving clearly show the wisdom of adopting this architecture. Again, standing Roman fabric was employed in the construction of the bastle (Building 4407), and the farm buildings constructed within the ruins of the former *porta principalis sinistra* also utilised the fabric of the gate in their construction. The description by Reginald Bainbrigg of the 'great ruynes' of Birdoswald in 1599 demonstrates that substantial Roman structures had survived.

The Tweddle tenants of the farm during the sixteenth and seventeenth centuries were probably responsible for the construction of the 'undefended bastle' which forms the core of the modern farmhouse in Period 9 (Fig 293a), though little more can be said of this period. In Period 10 (Fig 293b) the building was transformed into a rectangular, plain farmhouse by Anthony and Margaret Bowman in 1745. The extant farm buildings and yards were, at least in part, laid out at the same time. The descriptions of the site by John Horsely in 1733 and William Hutton in 1801 mark the gradual decay and disappearance of the 'ruynes' seen by Bainbrigg. This was probably in part due to the increased use of stone for the farm buildings and enclosures.

In 1858 the tower and porch were added to the farmhouse by Henry Norman, who also laid out the garden in front of the farmhouse. Although Norman's predecessor, Thomas Crawhall, had done some limited excavation, Norman was the first to undertake major excavations. His commissioning of the Potter brothers in 1850 may have been prompted by the interest which derived from the first Wall Pilgrimage the previous year. The work certainly led to one of the earliest, thorough reports of archaeological work *per lineam valli.*

Oswald Norman sold the property on in 1901, though he had earlier allowed the excavations conducted by Francis Haverfield in the 1890s to take place. His successor, Irwin Wright, likewise permitted the major works of 1927–33, during which the basic framework of knowledge of the early development of Birdoswald and the Wall was established. The sale of the site to Lord Henley followed, with the placing of the walls and gates of the fort into state guardianship. On the death of Lord Henley, Cumbria County Council took over ownership of the site, produced a management plan, and, on the acquisition of funds, initiated the excavation works which form the basis of this volume.

Appendix 1: the Maiden Way north of Birdoswald

In 1989, excavations were made for the installation of a biodisc sewage treatment plant immediately to the north of the public road which partially runs along the line of the north wall of the fort. This work was observed by the writer (Fig 294). Most of the hole excavated covered the site of a pre-existing septic tank, but new digging was required in order to lay pipelines.

The pipe trenches revealed part of the road which led north from the fort towards Bewcastle: the Maiden Way. The road comprised a mass of cobbles laid directly onto the weathered old ground surface. These were 350mm deep in the centre of the road and 280mm deep towards the edges. At each side of the road was a drain constructed of two courses of facing stones. At one point the western drain was capped by a flat stone, though how general this capping was could not be established.

When projected from the *porta praetoria* of Birdoswald fort, the course of the road heads for the centre of the Midgeholme Moss, confirming the line of the road projected on the Ordnance Survey (1975) map of Hadrian's Wall. Augering in the rivulet that runs through the moss detected a pronounced rise and the presence of substantial timbers on line with the road and gate. This may imply that a causeway was laid across part of the Moss to carry the Maiden Way northwards.

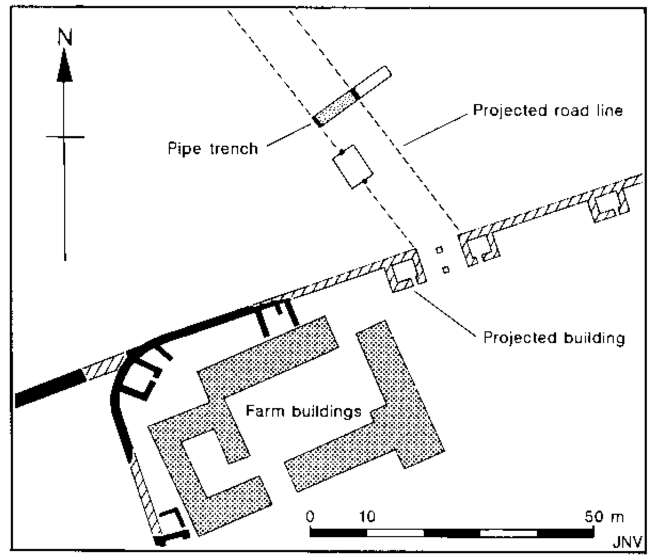


Fig 294 The Maiden Way north of Birdoswald, and the site of the 1991 watching brief

Appendix 2: other small finds from Birdoswald

Very few objects from Birdoswald have been published prior to the present volume, and those which have are not readily accessible. For this reason it has been felt appropriate to publish (or republish) a number of provenanced small finds from the site.

Unless otherwise stated all accession numbers quoted relate to the Tullie House Museum, Carlisle accession record (hereafter, THM). The list is based upon one kindly supplied by Colin Richardson of Tullie House Museum.

Objects from the building excavated in 1929

These objects were first published by Richmond (1931, 132–4, fig 4). No changes have been made to his descriptions except to bring bibliographical references into a style consistent with this volume. They are allocated accession numbers THM 31–1929: 1–19 and are listed in this order (1–19) below.

Richmond's original illustration of some of these objects is reproduced as Fig 295. Illustrated objects are indicated by means of an asterisk. For discussion of the dating of the various levels, see chapter 1.

*1. Attachment for leather strap (cf Cannstatt: ORL, 28, taf viii, 22).

*2. Level IV, Room IVa (Fig 295, No 3D): Penannular brooch, bronze with horse-head terminals. This relatively rare type is assigned by Reginald Smith (1914) to the fifth century. Wheeler (1924, 137–8) brings it down to the third century.

*3. Level IV, Room IVa (Fig 295, No 5C): Flat disc brooch, bronze and blue enamel. The design is a conventionalised peacock, with two plants filling space below tail and in front of breast. Identical form from Ambleside (Haverfield and Collingwood 1915, 461, fig 182). The peacock motif may be derived from the posthumous *Consecratio* coins of the deified Faustina I, but the execution is purely Celtic (cf Bushe-Fox 1913, fig 10, no 16, where a Celtic artist borrows a sea-eagle from a Black Sea coin).

*4. Level IV, Room IVa (Fig 295, No 2C): Cross-bow brooch, silver. This is the earliest form of cross-bow fibula. An exactly similar type is in Tullie House Museum from Brough (Haverfield 1919, pl ii no 8B).

*5. Level III, Room IIId (Fig 295, No 4B): Brooch with split bow, tinned bronze. Commoner on the German *limes* than in England, as Haverfield (1919, 7) and Bushe-Fox (1928, ii, 43) point out. Other examples from Housesteads (Soc Antiqs Newcastle 1865, 225) and Corbridge (Forster and Knowles 1909, fig 19; Forster and Knowles 1913, 274).

*6. Level I, Alley (Fig 295, No 1A): Surgical probe, bronze. From the Alley, Hadrianic level. cf Poltross Burn (Gibson and Simpson 1911, 442, fig 21, no 23 for a similar instrument of less delicate type). No doubt these were common enough among the equipment of the *medicus ordinarius*, (*vide* Cheesman 1914, 43–4).

7. Level IV, Room IVa: Plain bronze ring.

8. Level IV, Room IVb: Oval disc brooch of bronze, once enamelled with central cone bezel. Examples from Carlisle (Haverfield 1919, 11, no 11A).

9. Level IV, Outside Room IVd: Small tube or sheathing of bronze. From outside IVd unstratified (cf Curle 1911)

10. Level IV, make-up: Bronze stud.

11. Level I, unstratified above Alley: Scrap of tinned bronze.

12. Level III, Room IIIa: Small tube or collar.

*13. Level III, Room IIIa (Fig 295, No 7B): Bronze stud for attachment to leather.

*14. Level I, Room Ia, (Fig 295, No 10A): Bronze pin-head attached to iron pin. cf Benwell (Petch 1928, pl xxii, no 6).

*15. (Fig 295, No 9C) Open-work plate of bronze. *Faute de mieux*, we classify as horse-trappings; the German is *Beschlage* and *Gurtelzierate*, cf Corbridge (Forster and Knowles 1911, fig 35), Kastell Pfunz, (ORL, 142, pl xiii, nos 17 and 52).

*16. Scabbard mounting of bronze, (Fig 295, No 11C). From make-up of IVa. Such objects are familiar enough, but I [Richmond] find no exact parallel for the shape.

17. Intaglio; a dolphin cut in jasper. From the make-up of IIIG.

*18. Belt fastener of bronze, (fig. No.12B) From IIIa; cf Corbridge (Forster and Knowles 1911, 188, fig 33) which is described as a harness mounting, but compare similar pattern carried out in enamel at Newstead (Curle 1911, pl xxxiv, no 25); also Ruckingen, ORL, 38, pl ii, 9; Osterburken, ORL, 2, pl vi, 8; Carnuntum, RLO, 9, fig 38.

*19. Bronze object, either a buckle or a ring on the end of a staple (fig no 6C).

The accession code 31.1929 also includes an iron bucket handle mount, iron nails, a copper alloy ring or penannular brooch minus its terminals, another copper alloy brooch, a piece of copper alloy binding, and an iron socketed spearhead.

Objects from the rampart at Birdoswald

1. Copper alloy arm purse containing a Hadrianic hoard of 28 *denarii*. Found embodied within the fort rampart to the north of the *porta principalis dextra* in 1949 (THM Acc No 80–1951.1–28: Fig 296).

3. Gold earring, Allason-Jones (1989) Type 15, generally known as the 'Hercules Club'. This type of pendant can be used as an earring, for example the pairs known from Intercisa (Alfoldi *et al* 1957, nos 6–8) or worn as necklaces, either singly, in pairs, or in groups (Marshall 1969, no 2747; Hoffman and Von Claer 1968, no 136). The examples from Britain date from the first to fourth century and the Birdoswald earrings appears to date from the third century (Simpson and Richmond 1933, 259–60: THM Acc No 97.1975).

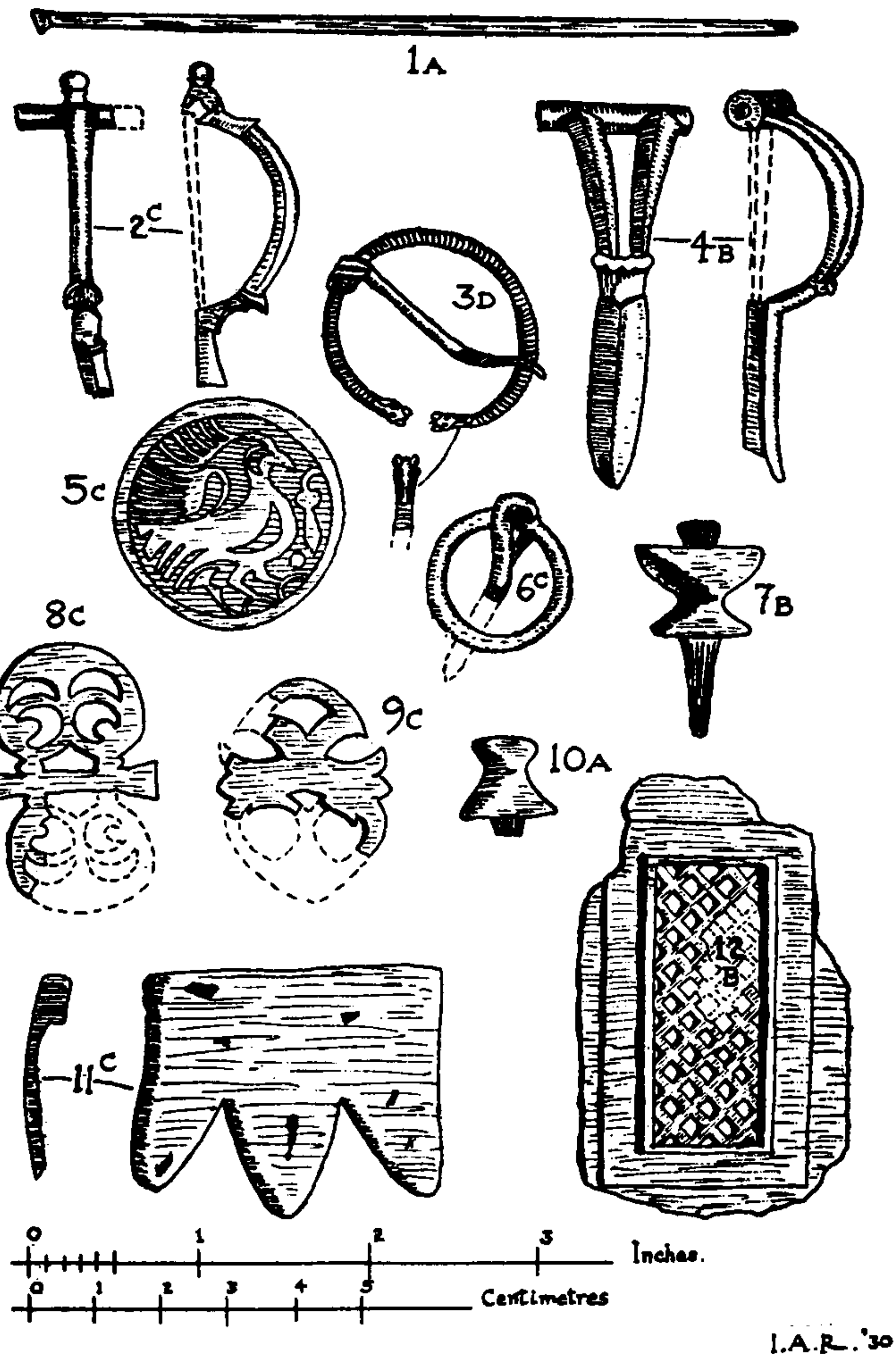


Fig 295 Finds from the 1929 excavation, drawn by Sir Ian Richmond (from Simpson and Richmond 1931)

Objects from Birdoswald turret (49b)

The following enamelled objects may demonstrate a connection between the turret and the garrison of Birdoswald, which probably provided troops to man the turret. For these objects see also Allason-Jones 1988 and Simpson 1913.

2. Bronze dog brooch, enamelled (THM Acc No 4.1913.1: Fig 297).

4. Copper alloy knife handle with milleflori decoration (THM Acc No 4.1913.9: Fig 297).

Anglian objects from Birdoswald

5. Small-long brooch from the Crawhall collection. Sixth century. (Bruce 1853, 251, pl 13; Cowen 1965, 13: Newcastle Museum of Antiquities).

6. Anglian disc headed pin made of gilded bronze. Eighth century. (THM Acc No 40.1965: Cramp 1964, 90–93).

Inscriptions and sculpture from Birdoswald in other corpora

Sculpture: see Coulston Phillips 1988, nos 34, 50–2, 82, 89, 95, 154, 157, 162, 190, 224–5, 266–7, 270, 314–16, 366, and 458–63.

Inscriptions: see RIB, nos 1872–1929: Wright 1961, 194; Wright and Hassall 1974, 468; Wright and Phillips 1975, 133; Tomlin 1991, 309.

NB A concordance of stone objects with both sculpture and inscriptions follows:

Coulston and Phillips 1988, no 50: RIB 1877
Coulston and Phillips 1988, no 51: RIB 1889

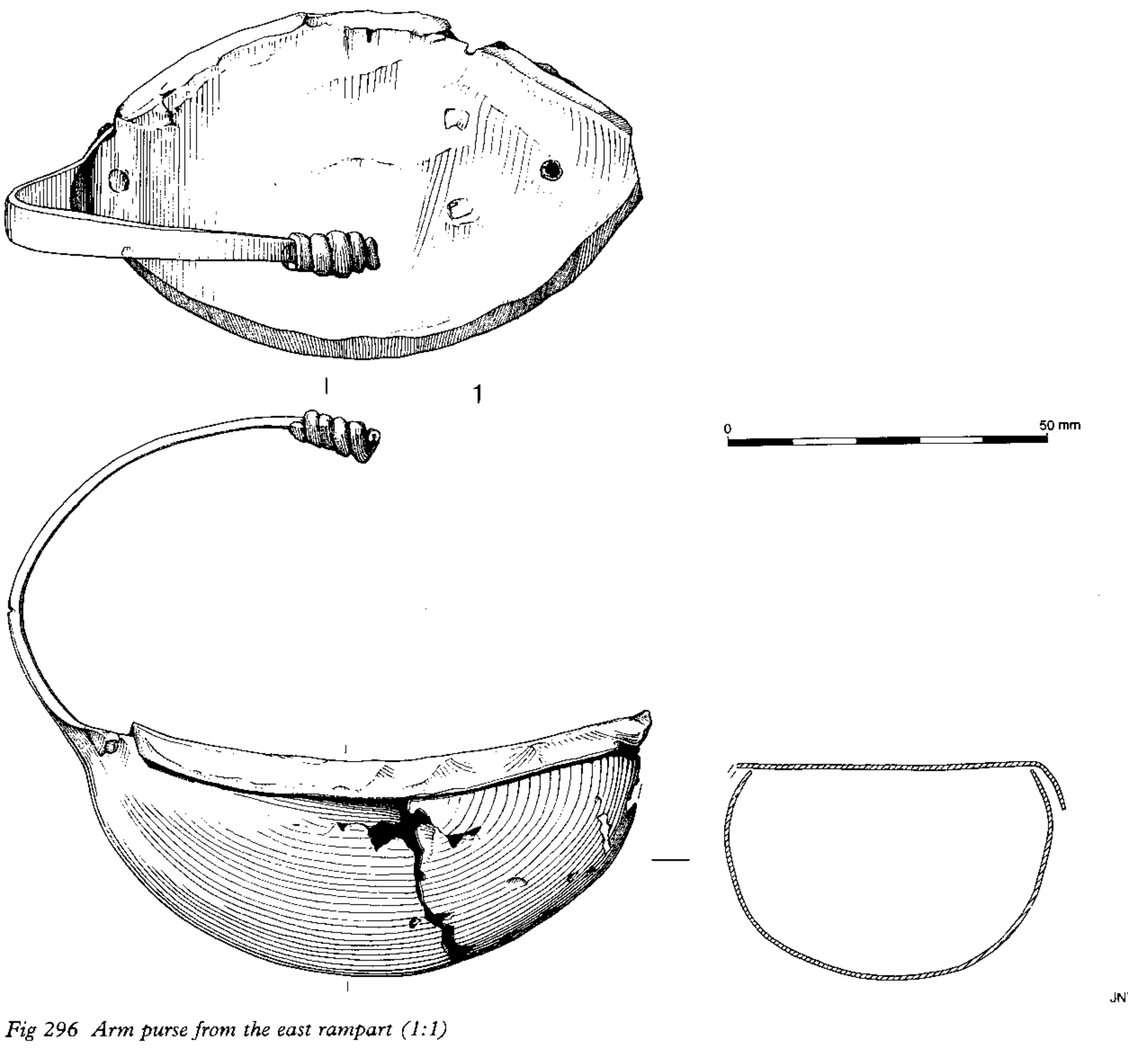


Fig 296 Arm purse from the east rampart (1:1)

Coulston and Phillips 1988, no 52: RIB 1896
Coulston and Phillips 1988, no 95: RIB 1905
Coulston and Phillips 1988, no 157: RIB 1897
Coulston and Phillips 1988, no 225: RIB 1920
Coulston and Phillips 1988, no 266: RIB 1914
Coulston and Phillips 1988, no 267: RIB 1909
Coulston and Phillips 1988, no 89: Wright and Hassall 1974, 462
Coulston and Phillips 1988, no 224: Wright and Phillips 1975, 133

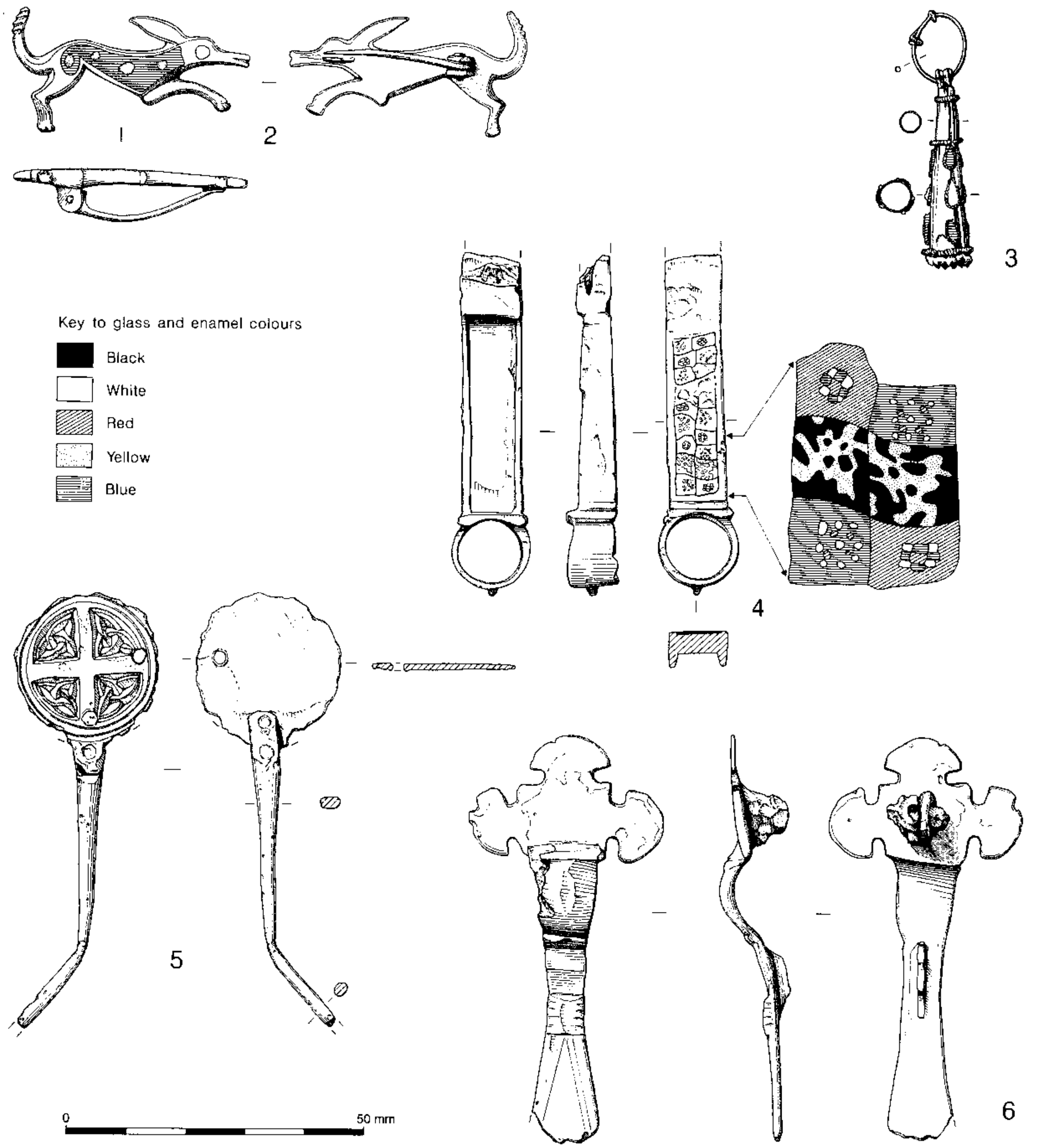


Fig 297 Roman (2–4) and Anglian (5–6) objects from Birdoswald and the immediate area (1:1)

Appendix 3: Pollen data

Tables 39–43 present the pollen counts from the samples discussed in Chapters 2 and 4. Figures 298–300 display the same data in the form of detailed pollen diagrams. Table 44 gives the technical names of taxa attested in pollen analysis together with their English equivalents.

Table 39 Pollen percentages from the morass sample (Figs 13 and 14)

		morass
trees and shrubs		
	Alnus	38.0
	Betula	9.6
	Carpinus	+
	Corylus avellana-type	10.0
	Crataegus-type	–
	Fraxinus	+
	Pinus	3.2
	Prunus-type	+
	Quercus	19.0
	Rosaceae (cf *Rubus*)	+
	Salix	+
	Tilia	–
	Ulmus	1.3
climbers		
	Hedera	+
	Lonicera	+
dwarf shrubs		
	Calluna	+
	Vaccinium	–
	Empetrum	+

Table 39 *continued*

spore formers		
	Polypodium	4.4
	Pteridium	1.5
	Pteropsida monolete indet	3.0
	Sphagnum	+
herbs		
	Aster-type	+
	Caryophyllacae indet	+
	Chrysosplenium	–
	Cyperaceae	+
	Filipendula	+
	Geum	+
	Hypericum perforatum-type	–
	Melampyrum	+
	Papaver rhoeas-type	–
	Plantago lanceolata	+
	Poaceae	4.8
	Potentilla-type	+
	Ranunculus-type	+
	Rumex indet	–
	Teucrium	+
	Trifolium-type	–
	Urtica diocia	–
	Valeriana dioica	–

Table 40 Pollen percentages from the Turf Wall 1 and Turf Wall 2 samples at Birdoswald (Figs 13, 15, and 16)

	Turf Wall 1 *depth (mm)*							*Turf Wall 2* *depth (mm)*				
	40	60	70	170	210	220	230	80	190	200	320	330
trees and shrubs												
Alnus	24	14	13	8	22	34	43	28	32	37	s	
Betula	32	10	11	9	33	27	9.2	22	23	4.1	p	
Carpinus	–	–	–	–	–	–	–	+	+	+	a	n
Corylus avellana-type	10	5.1	8.1	6.2	10	11	20	15	10	28	r	o
Fagus	–	–	–	–	+	–	–	–	–	–	s	
Fraxinus	+	+	+	+	+	+	–	–	+	+	e	
Ilex	–	–	–	–	+	–	–	–	–	–		
Pinus	+	–	–	+	–	+	+	+	+	+	p	p
Quercus	8.4	4.1	3.7	3.4	12	12	16	7.9	9.9	14	o	o
Salix	+	–	+	+	+	+	–	+	+	+	l	l
Tilia	–	–	–	+	–	–	–	–	–	–	l	l
Ulmus	+	–	+	–	–	+	+	+	+	+	e	e
											n	n
dwarf shrubs												
Calluna	3.7	19	12	35	5.9	–	+	1.7	1.8	+		
Vaccinium	+	–	–	+	+	–	–	–	–	–		
Erica	–	+	–	–	+	–	–	–	–	–		
Empetrum	–	–	–	–	+	–	–	–	–	–		
spore formers												
Polypodium	1.4	+	–	+	1.2	+	3.9	1.9	1.4	2.4		
Pteridium	1.5	2.7	2.8	1.8	1.7	4.1	+	+	1.1	+		
Pteropsida monolete indet	1.1	1.5	2	+	1.1	1.5	+	2.7	4.8	4.9		
Sphagnum	+	–	+	–	+	+	+	+	+	+		
herbs												
Apiaceae (cf *Angelica sylvestris*)	–	–	–	–	–	–	–	–	–	–		
Apiaceae indet	–	–	–	+	–	+	–	–	–	–		
Artemisia	+	–	–	–	–	–	–	–	–	–		
Aster-type	–	–	+	–	–	–	–	–	–	–		
Cereal type	–	+	–	–	–	–	–	–	–	–		
Chenopodiaceae indet	+	–	–	–	–	–	–	–	–	–		
Cirsium	–	–	+	–	–	–	–	–	–	–		
Cyperaceae	2.8	2.6	2.3	1	1.7	1.1	–	1.2	+	+		
Fabaceae indet	–	–	+	–	–	–	–	–	–	–		
Filipendula	–	–	+	+	+	–	+	–	+	–		
Lactuceae indet	–	+	–	+	+	–	–	+	–	+		
Melampyrum	–	–	–	–	–	–	+	+	1.1	+		
Plantago lanceolata	+	1.4	3.6	2.3	+	–	+	+	+	+		
Poaceae	10	36	37	29	6.2	6.3	4.5	15	8.3	4.3		
Polygonum indet	–	–	+	–	–	–	–	–	–	–		
Potentilla-type	+	+	1.9	+	+	+	+	+	+	+		
Ranunculus-type	–	+	+	+	–	+	+	+	–	+		
Rumex acetosella	–	–	+	–	+	–	–	–	+	+		
Rumex indet	+	+	+	+	–	–	–	+	–	–		
Sinapis-type	–	–	+	+	–	–	–	–	+	–		
Succisa	+	–	–	–	+	–	+	–	+	–		
Trifolium-type	+	–	–	–	–	–	–	–	–	–		
Urtica diocia	–	–	–	–	–	–	–	–	+	–		

Table 41 Pollen percentages from the Appletree Turf Wall sample (Figs 1 and 17)

	depth (mm)											
	25	35	45	60	140	150	160	170	230	240	260	280
trees and shrubs												
Acer	–	–	–	+	–	–	–	–	–	–	–	–
Alnus	20	16	4.7	22	18	21	16	25	22	14	3.9	25
Betula	36	15	2.9	15	11	8.6	9.8	14	22	12	2.5	22
Carpinus	–	–	–	–	–	–	–	+	+	–	–	–
Corylus avellana-type	11	17	7	10	20	22	16	23	20	13	5.4	15
Crataegus-type	–	–	–	–	–	+	–	–	–	–	–	–
Fraxinus	–	+	+	–	+	–	+	+	+	–	–	+
Ilex	+	–	–	–	–	–	–	–	–	+	–	+
Pinus	–	–	–	–	–	–	–	–	+	+	–	–
Quercus	11	7	3.3	6.4	13	9.6	11	12	16	29	2.1	16
Salix	–	–	–	+	–	–	–	–	+	–	–	–
Ulmus	+	+	–	+	–	–	–	+	–	–	–	+
climbers												
Hedera	–	–	–	–	–	–	–	–	+	–	–	–
dwarf shrubs												
Calluna	+	6.2	55	13	16	6.3	10	+	+	6.7	60	+
Vaccinium	–	–	–	–	–	–	+	–	–	–	–	+
Erica	–	–	–	–	–	–	–	+	–	–	–	–
spore formers												
Lycopodium annotinum	–	–	–	+	–	–	–	+	–	–	–	–
Lycopodium davatum	–	–	–	–	–	–	–	–	–	+	–	–
Polypodium	1.9	1	+	5.4	2.5	7.5	3.1	7.2	2	2.8	+	2.4
Pteridium	2.5	4.2	3.1	3.1	+	2.4	1.7	3.1	2.2	1.5	2.9	1.8
Pteropsida monolete indet	3.3	+	1.1	2.6	1.9	5.7	4.1	3.3	4.3	1.3	+	5.6
Sphagnum	+	+	+	+	+	+	+	+	+	+	7.3	+
herbs												
Archillea-type	–	+	–	–	–	–	–	–	–	–	–	–
Caryophyllaceae indet	–	–	–	–	–	+	–	+	+	–	–	+
Chenopodiaceae indet	–	–	+	–	–	+	–	–	–	+	+	–
Cirsium	–	–	–	–	–	+	–	–	–	–	–	–
Cyperaceae	+	2.2	3.6	1.2	1.9	1.6	3.9	1	+	+	+	+
Filipendula	+	–	–	–	–	–	–	–	–	–	–	+
Hypericum perforatum-type	–	–	–	–	–	–	–	–	–	+	–	–
Lotus-type	–	+	–	–	–	–	–	–	–	–	–	–
Melampyrum	–	–	–	–	–	–	–	–	+	+	–	+
Papaver rhoeas-type	–	–	–	–	–	–	–	–	+	+	+	–
Plantago lanceolata	–	+	2.8	+	+	1.8	+	+	+	1.1	2.2	+
Poaceae	12	27	14	18	13	11	22	9.1	7.7	15	13	8.2
Potentilla-type	–	+	–	–	+	+	+	+	+	+	+	+
Ranunculus-type	–	+	–	+	–	+	+	+	–	+	+	+
Rhinanthus-type	+	–	–	–	–	–	–	–	–	–	–	–
Rumex acetosella	–	–	–	–	–	–	–	–	–	–	–	+
Rumex indet	–	+	+	–	–	+	–	–	+	–	–	+
Rumex obtusifolius-type	–	–	–	–	–	–	–	–	–	–	–	+
Stachys sylvatica-type	–	–	–	–	–	–	+	–	+	–	–	–
Succisa	+	–	+	+	–	+	–	+	+	+	–	+
Trifolium-type	–	–	+	–	–	–	–	–	–	+	–	+
Urtica diocia	–	–	+	–	–	–	–	–	+	+	–	–

Table 42 Pollen percentages from the sample from the north rampart of the stone fort at Birdoswald (Fig 13)

depth (mm)	60	110	170	220	270	290	300	330
trees and shrubs								
Alnus				22	23	17		45
Betula	s			13	12	20		10
Corylus avellana-type	p			25	17	20		15
Fraxinus	a	n	n	–	+	+	n	–
Pinus	r	o	o	–	–	+	o	–
Quercus	s			1.1	5.2	12		16
Salix	e			–	–	+		–
Ulmus				–	–	–		1.1
dwarf shrubs								
Calluna	p	p	p	19	5.2	4.8	p	–
	o	o	o				o	
spore formers	l	l	l				l	
Polypodium	l	l	l	1.9	+	+	l	2.7
Pteridium	e	e	e	2.2	4.3	1	e	+
Pteropsida monolete indet	n	n	n	1.9	–	+	n	2.4
Sphagnum				1.5	1.7	1		–
herbs								
Apiaceae indet				–	–	+		–
Aster-type				+	+	+		+
Cereal type				–	+	–		–
Cyperaceae				–	–	1.5		+
Filipendula				–	–	–		+
Plantago lanceolate				–	–	+		–
Poaceae				12	29	19		6
Potentilla-type				+	–	+		–
Trifolium-type				–	–	+		–

Table 43 Pollen percentages from samples in the Period 2 hiatus horizon (Fig 47)

hiatus horizon samples	*HS1*	*HS2(L)*	*HS2(U)*	*HS4(L)*	*HS4(U)*
trees and shrubs					
Alnus	16	18	14	25	21
Betula	13	18	12	19	12
Carpinus	–	–	–	–	–
Corylus avellana-type	18	20	17	22	15
Crataegus-type	–	+	+	+	–
Fraxinus	–	–	+	+	–
Pinus	+	+	–	–	+
Prunus-type	–	–	–	–	–
Quercus	16	4.4	3.3	8.8	3.8
Rosaceae (cf *Rubus*)	–	–	–	–	–
Salix	–	+	+	+	–
Tilia	–	+	–	–	–
Ulmus	–	+	+	+	+
climbers					
Hedera	–	–	–	–	–
Lonicera	–	–	–	–	–
dwarf shrubs					
Calluna	+	12	15	3.8	9.4
Vaccinium	–	–	+	–	–
Empetrum	–	–	–	–	–
spore formers					
Polypodium	–	1.2	+	1.3	1.1
Pteridium	–	1.1	1	+	+
Pteropsida monolete indet	+	1.4	–	+	+
Sphagnum	2.7	4.4	6.5	2	1.5
herbs					
Aster-type	+	+	+	+	+
Caryophyllacae indet	–	–	–	–	+
Chrysosplenium	–	–	+	–	–
Cyperaceae	1.2	–	+	+	–
Filipendula	–	+	+	+	–
Geum	–	–	–	–	–
Hypericum perforatum-type	–	–	+	+	–
Melampyrum	+	+	–	+	+
Papaver rhoeas-type	+	–	–	–	–
Plantago lanceolata	+	+	+	–	–
Poaceae	30	16	26	15	32
Potentilla-type	+	–	–	–	1.1
Ranunculus-type	–	–	+	–	–
Rumex indet	–	–	+	–	–
Teucrium	–	–	–	–	–
Trifolium-type	–	–	+	–	–
Urtica diocia	–	–	+	–	–
Valeriana dioica	–	–	–	–	–

key: *(L)* = lower sample
(U) = upper sample

Table 44 Pollen taxa with English names

plant groups	*possible/probable taxa*	*English name*
trees/shrubs/climbers		
Acer campestre	*Acer campestre*	field maple
Alnus	*Alnus glutinosa*	alder
Betula	*Betula* spp	birch
Carpinus	*Carpinus betulus*	hornbeam
Corylus avellana-type	*Corylus avellana*	hazel
Crataegus-type	*Crataegus monogyna*	hawthorn
Fagus	*Fagus sylvatica*	beech
Fraxinus	*Fraxinus excelsior*	ash
Hedera	*Hedera helix*	ivy
Ilex	*Ilex aquifolium*	holly
Lonicera	*Lonicera periclymenum*	honeysuckle
Pinus	*Pinus sylvestris*	pine
Quercus	*Quercus* spp	oak
Rosaceae (cf *Rubus*)	*Rubus fruticosus* agg	bramble
Salix	*Salix* spp	willow
Tilia	*Tilia cordata*	lime
Ulmus	*Ulmus* spp	elm
dwarf shrubs		
Calluna	*Calluna vulgaris*	ling/heather
Empetrum	*Empetrum nigrum*	crowberry
Erica	*Erica cinerea/tetralix*	bell heather/cross-leaved heath
Vaccinium	*Vaccinium* myrtillus	bilberry
crop plants		
Cereal-type	*Triticum* or *Hordeum* or *Avena*	wheat or barley or oats
spore formers		
Polypodium	*Polypodium vulgare*	polypody fern
Lycopodium davatum	*Lycopodium davatum*	stag's-horn clubmoss
Lycopodium annotinum	*Lycopodium annotinum*	interrupted clubmoss
Pteridium	*Pteridium aquilinum*	bracken
Sphagnum	*Sphagnum* spp	Sphagnum moss
Pteropsida monolete indet	*Dryopteris* spp/*Thelypteris palustris*	buckler ferns/marsh fern
herbs		
Achillea-type	*Archillea millefolium* or *Anthemis arvensis/cotula*	yarrow/or chamomile (corn/stinking)
Apiaceae (cf *Angelica sylvestris*)	*Angelica sylvestris*	wild angelica
Apiaceae indet	*Heradeum sphondylium*	hogweed
Artemisia-type	*Artemisia vulgaris/absinthum*	mugwort/wormwood
Aster-type	*Senecio* spp/*Tussilago farfara/Petasites hybridus/ Pulicaria* spp/*Bellis perennis*/Eupatorium *cannabinum/Carduus nutans*	ragworts/colt's foot/butterbur/ fleabanes/daisy/hemp agrimony/musk thistle
Caryophyllaceae indet	*Cerastium* spp/*Stellaria* spp/*Silene* spp	mouse-ears/stitchworts and chickweeds/campions
Chenopodiaceae indet	*Atriplex* spp or *Chenopodium* spp	orache or fat hen/good King Henry
Chrysosplenium	*Chrysosplenium oppositfolium/alternifolium*	golden saxifrage (opposite-leaved/alternate-leaved)
Cirsium	*Cirsium palustre/arvense/dissectum*	thistle (marsh/creeping/meadow)
Cyperaceae	*Carex* spp	sedges
Fabaceae indet	*Vicia* spp	vetches
Filipendula	*Filipendula ulmaria*	meadowsweet
Geum	*Geum rivale/urbanum*	avens (water/wood)
Hypericum perforatum-type	*Hypericum perforatum/tetrapterum*	St John's wort (perforate/square-stalked)
Lactuceae indet	*Tragpogon pratensis/Taraxacum* spp/*Crepisspp/ Hieracium* spp/*Pilosella* spp/*Hypochaeris* spp/ *Leontodon* spp/*Picris* spp/*Sonchas* spp	goat's beard/dandelion spp/hawk's beard spp/hawkweeds/mouse-ear hawkweeds/cat's ears/ hawkbits/ox-tongues/sow thistles
Lotus-type	*Lotus corniculatus/pedunculatus*	bird's foot trefoil (common/greater)
Melampyrum	*Melampyrum pratense/sylvaticum*	cow-wheat (common/small)
Papaver rhoeas-type	*Papaver rhoeas/argemone*	poppy
Plantago lanceolata	*Plantago lanceolata*	ribwort plaintain
Poaceae	Discussed in text	grasses
Polygonum indet	*Polygonum* spp/*Persicaria* spp	knotweeds/bistorts
Potentilla-type	*Potentilla erecta/reptans*	tormentil/creeping cinquefoil
Ranunculus-type	*Ranunculus acris/repens/bulbosus/flammula*	buttercup (meadow/creeping/bulbous)/lesser spearwort
Rhinanthus-type	*Rhinanthus* minor/*Euphrasia* spp/*Veronica* spp/*Pedicularis*	yellow rattle/eyebrights/ speedwells/lousewort
Rumex acetosella	*Rumex acetosella*	sheep's sorrel
Rumex indet	*Rumex* spp	dock
Rumex obtusifolius-type	*Rumex obtusifolius/palustris*	dock (broad-leave/marsh)
Sinapis-type	*Cardamine pratensis/Rorippa* spp/*Brassica nigra*/B. Ssp *campestris*	lady's smock/yellow cresses/black mustard/wild turnip
Stachys sylvatica-type	*Lamium album*	white deadnettle
Succisa	*Succisa pratensis*	devil's bit scabious
Teucrium	*Teucrium scorodonia*	wood sage
Trifolium-type	*Trifolium repens/pratense*	clover (white/red)
Urtica dioica	*Urtica dioica*	common nettle
Valeriana dioica	*Valeriana dioica*	marsh valerian

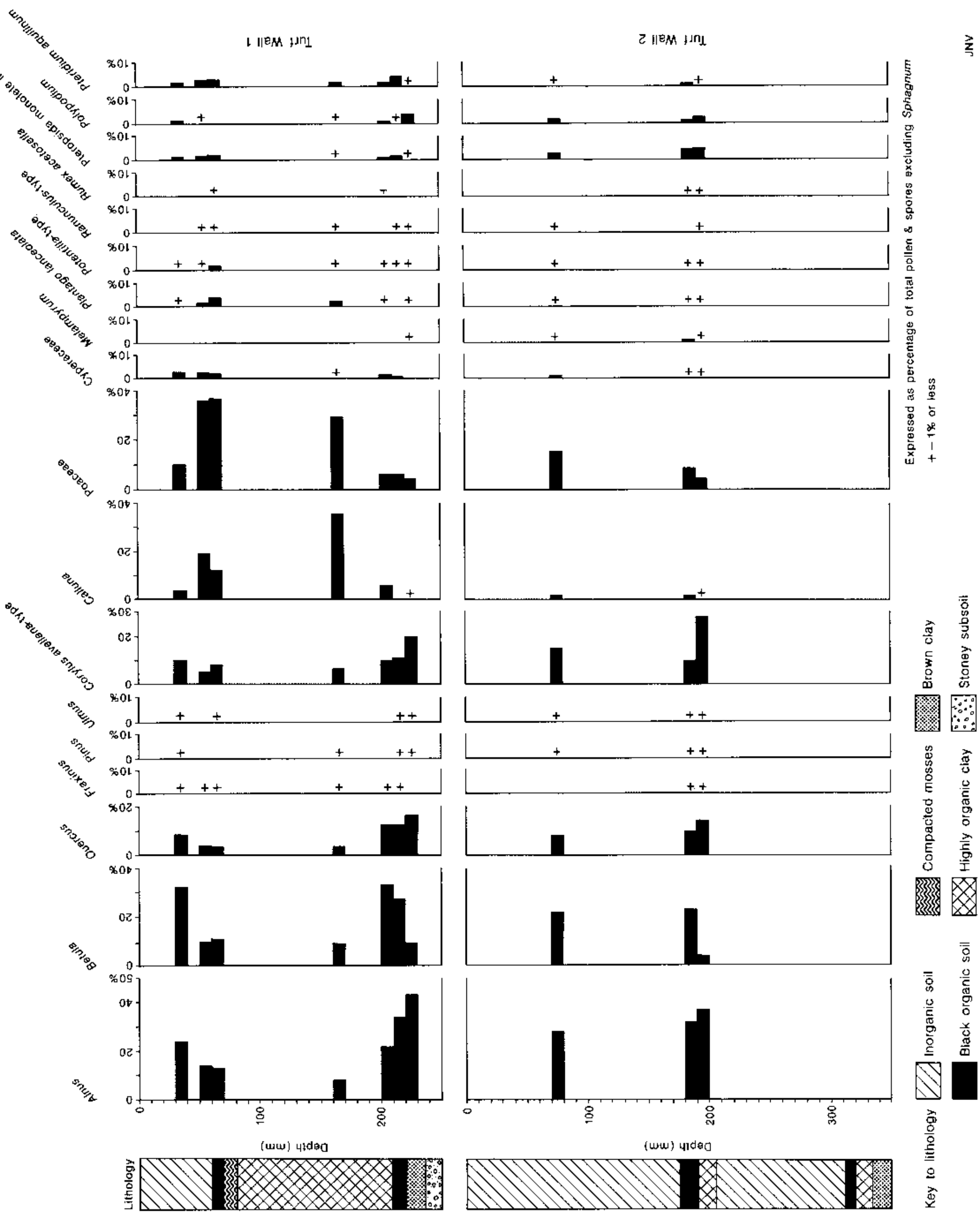


Fig 298 Pollen diagram of samples from the Turf Wall at Birdoswald

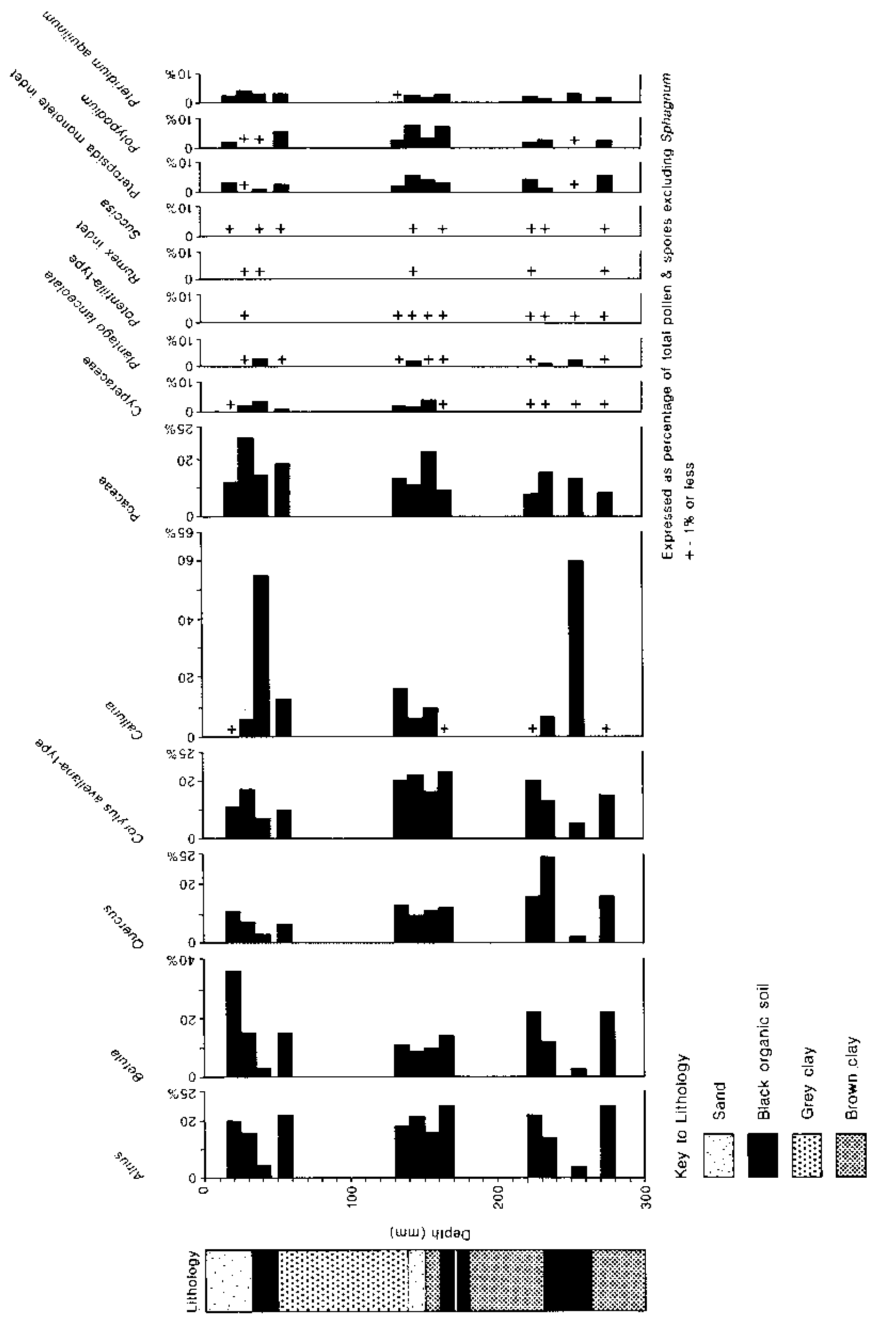


Fig 299 Pollen diagram of samples from the Turf Wall at Appletree

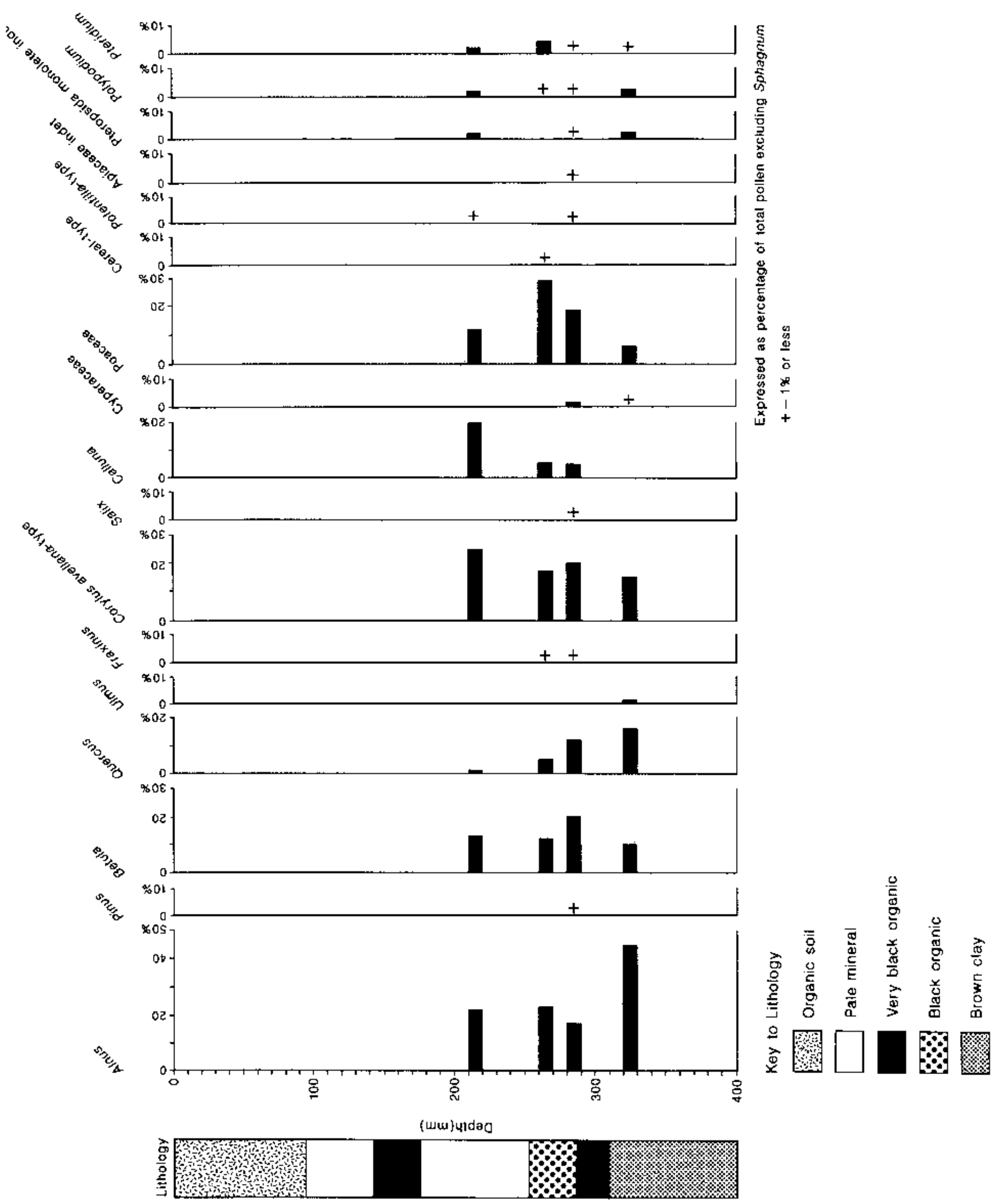


Fig 300 Pollen diagram from the stone fort rampart

Bibliography

Abbreviations

AE *L' Annee Epigraphique*
Cal Border Papers Bain 1894 (Rolls Series)
CRO County Record Office
D Figure type in Dechelette 1904
Gillam Gillam 1970
Gilsland Survey Graham, 1934
ILS *Inscription Latinae Selectae*
O Figure type in Oswald 1936–7
ORL *Der Obergermanisch-Raetische Limes der Römerreiches* (Reichs-Limeskommission 1894–1937)
RIB Collingwood and Wright 1956
RIC Mattingly *et al* 1923–67
RLO *Der Romische Limes in Österreich* (Österreichischen Akademie der Wissenschaften 1900–89)
Rogers Motif in Rogers 1974
S&S 1958 Stanfield and Simpson 1958
S&S 1990 Stanfield and Simpson 1990

Ancient sources

Columella *De Re Rustica,* trans E S Forster and E Heffner 1979, Loeb (London)
Dio trans E Cary, 1917, Loeb (London)
Pliny the Elder *Plinii Naturalis Historia,* trans H Rackham 1950, Loeb (London)
Procopius *Wars,* trans H B Dewing, 1914–28, Loeb (London)
Tacitus *Agricola* and *Germania,* trans M Hutton, 1970, Loeb (London)
Xenophon *Anabasis,* trans R Warner, 1949, Penguin Classics (Harmondsworth)
Vegetius *Epitoma Rei Militaris,* trans N P Milner, 1993 (Liverpool)
Vitruvius *De Architectura,* trans F Grainger, 1934, Loeb (London)

Modern sources

NB The successive *Reports of the Cumberland Excavation Committee* contained in *Trans Cumberland Westmorland Antiq Archaeol Soc* each contain a number of papers under separate (usually combined) authorship. In both bibliography and text references these individual papers are cited in preference to the overall reports.

Abbatt, R, 1849 *A history of the Picts or Romano-British wall and of the Roman stations and Vallum taken during a pilgrimage across that part of the island in the month of June 1849,* London

Abercromby, J, 1902 Account of the excavation of the Roman station at Inchtuthil, Perthshire, undertaken by the Society of Antiquaries of Scotland in 1901, *Proc Soc Antiq Scot,* **36**, 182–246

Addyman, P V, 1981 Cruck buildings: the evidence from excavation, in Alcock 1981, 37–9

Alcock, L, 1972 *'By South Cadbury is that Camelot....': excavations at Cadbury Castle 1966–70,* London

—, 1987 *Economy, society, and warfare among the Britons and Saxons,* Cardiff

—, 1988a *Bede, Eddius and the forts of the North Britons,* Jarrow Lecture 1988, Jarrow

—, 1988b The activities of potentates in Celtic Britain, AD 500–800: a positivist approach, in *Power and politics in early medieval Britain and Ireland* (eds S T Driscoll and M R Nieke), Edinburgh, 22–39

—, 1995 *Cadbury Castle, Somerset: the early medieval archaeology,* Cardiff

Alcock, N W, 1981 *Cruck construction: an introduction and catalogue,* CBA Res Rep, **42**, London

Alfoldi, M R, Baroczi, L, Fitz, J, Poczy K S, Radnoti, A, Salamon, A, Sagi, K, Szilagyi, J, and Vago, E B, 1957 *Intercissa II (Dunaupentele): Geschichte der Stadt in der Römerzeit,* Budapest

Allason-Jones, L, 1988 'Small finds' from turrets on Hadrian's Wall, in *Military equipment and the identity of Roman soldiers: Proceedings of the Fourth Roman Military Equipment Conference* (ed J C Coulston), BAR, **S394**, 197–233, Oxford

—, 1989 *Ear-rings in Roman Britain,* BAR, **201**, Oxford

—, 1995 Sexing small finds, in *Theoretical Roman archaeology: second conference proceedings* (ed P Rush), Worldwide Archaeol Ser, **14**, 22–32

Allason-Jones, L, and Bishop, M C, 1988 *Excavations at Roman Corbridge: the hoard,* HBMCE Archaeol Rep, **7**, London

Allason-Jones, L, and McKay, B, 1985 *Coventina's Well: a shrine on Hadrian's Wall,* Newcastle-upon-Tyne

Allason-Jones, L, and Miket, R, 1984 *The catalogue of small-finds from South Shields Roman fort,* Newcastle-upon-Tyne

Allason-Jones, L, Bennett, J, and Welsby, D A, 1984 2 The finds from Milecastle 54, Randylands, in L Allason-Jones, J Bennett, G Jobey, and D Welsby, Museum Notes 1984, *Archaeol Aeliana,* 5 ser, **7**, 228–35

Allen, D, 1986 The glass vessels, in Zienkiewicz 1986, 98–116

—, 1988 The Roman glass from Corbridge, in Bishop and Dore 1988, 287–293

Anderson, A, 1980 *A guide to Roman finewares,* VORDA Res Ser, **1**, Highworth

Anderson, A, Fulford, M G, Hatcher, H, and Pollard, A M, 1982 Chemical analysis of hunt cups and allied wares from Britain, *Britannia,* **13**, 229–38

Anderson, J M, and McFayden, A, 1976 *The role of terrestrial and aquatic organisms in decomposition processes: 17th symposium of the British Ecological Society,* Oxford

Anderson, S Th, 1979 Identification of wild grasses and cereal pollen, *Danmarks Geologiske Undersogelse Årbog,* **1978**, 69–92

Archaeol J, 1859 Proceedings of the meetings of the Archaeological Institute, *Archaeol J,* **16**, 375

Arnold, C J, 1982 The end of Roman Britain: some discussion, in Miles 1982, 451–9

Arthur, P, and Marsh, G, (eds) 1978 *Early finewares in Roman Britain,* BAR, **57**, Oxford

Arveiller-Dulong, V, and Arveiller, J, 1985 *Le verre d'époque romaine au Musée Archeologique de Strasbourg,* Notes et Documents des MusEes de France, **10**, Paris

Astill, M J, 1996 Fire damage in Roman buildings, *ARA,* **2**, 11–12

Austen, P S, 1991a *Bewcastle and Old Penrith, a Roman outpost fort and a frontier* vicus*: excavations 1977–78,* Cumberland Westmorland Antiq Archaeol Soc Res Ser, **6**, Kendal

—, 1991b How big was the second largest fort on Hadrian's Wall at Bowness on Solway, in *Roman frontier studies, 1989, proceedings of the XVth International Congress of Roman Frontier Studies* (eds V A Maxfield and M J Dobson), Exeter

—, 1994 Recent excavations on Hadrian's Wall at Burgh-by-Sands, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **94**, 35–54

Austen, P S, and Breeze, D, 1979 A New inscription from Chesters on Hadrian's Wall, *Archaeol Aeliana*, 5 ser 7, 115–26

Avery, B W, 1980 *Soil classification for England and Wales (higher categories)*, Soil Survey Technical Monograph, **14**, Harpenden

—, 1985. Argillic horizons and their significance in England and Wales, in *Soils and quaternary landscape evolution* (ed J Boardman), London

Avery, B W, and Bascomb, C L, 1974 *Soil survey laboratory methods*, Soil Survey Technical Monograph, **6**, Harpenden

Baatz, D, 1966 Zur Geschuttzbewaffnung römischer Auxiliartruppen in der frühen und mittleren Kaiserzeit, *Bonner Jahrbücher*, **166**, 194–207

—, 1983 Town walls and defensive weapons, in *Roman urban defences in the west (eds J Maloney and B Hobley), CBA Res Rep, 51, London, 136–40*

Babel, U, 1975 Micromorphology of soil organic matter, in *Soil components volume I: organic components* (ed J E Gieseking), New York

Bailey, R N, Cambridge, E, and Briggs, H D, 1988 *Dowsing and church archaeology*, Wimborne

Baillie, M G L, 1991 Suck-in and smear: two related chronological problems for the 1990s, *J Theor Archaeol*, **2**, 12–16

Baillie-Reynolds, P K, 1938 *Excavations on the site of the Roman fort of* Kanovium *at Caerhun, Caernarvonshire*, Cardiff

Bain, J, 1894 *Calendar of Border papers*, London

Barber, B, Bowsher, D, and Whittaker, K, 1990 Recent excavations of a cemetery of Londinium, *Britannia*, **21**, 1–12

Barber, J W (ed), 1993 *Interpreting stratigraphy*, Edinburgh

Barber, K E, 1981 *Peat stratigraghy and climatic change – a paleoecological theory of cyclic peat bog rotation*, Rotterdam

Barber, K E, Dumayne, L, and Stoneman R E, 1993 Climatic change and human impact during the late Holocene in Northern Britain, in *Climate change and human impact on the landscape* (ed F M Chambers), London, 225–36

Barber, K E, Chambers, F M, Dumayne, L, Haslam, C J, Maddy, D, and Stoneman R E, 1994 Climatic change and human impact in North Cumbria: peat stratigraphic and pollen evidence from Bolton Fell Moss and Walton Moss, in *The Quatenary of Cumbria: field guide* (eds J Boardman and J Walden), Oxford, 20–49

Barker, P, 1975 Excavations on the site of the Baths Basilica at Wroxeter 1966–74: an interim report, *Britannia*, **6**, 106–17

—, 1977 *Techniques of archaeological excavation*, London

—, 1981 *Wroxeter Roman city: excavations 1966–80*, London

—, 1985 Aspects of the topography of Wroxeter, *Viroconium Cornoviorum*, in Grew and Hobley 1985, 109–17

—, 1986 *Understanding archaeological excavation*, London

—, (ed) 1990a *From Roman* Viroconium *to medieval Wroxeter: recent work on the Roman city of Wroxeter*, Worcester

—, 1990b Open area excavation, illustrated by the excavation of the baths basilica at Wroxeter Roman city, Shropshire, England, in *Lo scavo archeologico: dalla diagnosi All'Edizione* (eds P Francovich and D Manacorda), Firenze, 205–34

Barker, P, White, R, Pretty, K, Bird, H, and Corbishley, M, 1997 *The baths basilica, Wroxeter, excavations 1966–90*, English Heritage Archaeol Rep **8**, London

Barton, E, 1944 The Elliots of Larriston, *Trans Hawick Archaeol Soc*, 10–19

Bateman, N, 1985 Warehousing in Roman Britain, in *The port of Roman London* (ed G Milne), London

Bates, C J, 1895 *A history of Northumberland*, Newcastle upon Tyne

Bathurst, W H, 1879 *Roman antiquities at Lydney Park, Gloucs*, London

Beattie, D J, 1928 *Prince Charlie and the Borderland*, Carlisle

Beckett, K, and Beckett G, 1979 *Planting native trees and shrubs*, Norwich

Bellhouse, R L, 1989 Drumburgh, in Daniels 1989b, 19–20

Bennett, J, 1983a The examination of Turret 10a and the Wall and Vallum at Throckley, Tyne and Wear, 1980, *Archaeol Aeliana*, 5 ser, **11**, 27–60

—, 1983b The Vallum at Wallhouses, Northumberland: excavations in 1980 and 1981, *Archaeol Aeliana*, 5 ser, **11**, 61–78

—, 1983c The end of Roman settlement in northern England, in Chapman and Mytum 1983, 205–32

—, 1986 Fort sizes as a guide to garrison type: a preliminary study of selected forts in the European provinces, in *Studien zu den Militargrenzen Roms III, Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemburg*, **20**, 707–16, Stuttgart

—, 1988 The principal gateways of masonry forts on the Hadrianic frontier in England: aspects of their construction, planning and probable appearance, in Bidwell *et al* 1988a, 113–41

—, 1990 The setting, development, and function of the Hadrianic frontier in Britain, unpubl PhD thesis, Univ Newcastle upon Tyne

—, forthcoming a The Roman frontier from Wallsend to Rudchester reviewed

—, forthcoming b A transection of Hadrian's Wall at Crosby on Eden, Cumbria

Bennett, K D, Whittington, G, and Edwards, K J, 1984 Recent plant nomenclatural changes and pollen morphology in the British Isles, *Quaternary Newsletter*, **73**, 1–6

Bidwell, P, 1979 *The legionary bath-house and basilica and forum at Exeter*, Exeter Archaeol Rep, **1**, Exeter

—, 1985 *The Roman fort of Vindolanda*, HBMCE Archaeol Rep, **1**, London

—, 1989 South Shields, in Daniels 1989b, 85–9

Bidwell, P, and Holbrook, N, 1989 *Hadrian's Wall bridges*, HBMCE Archaeol Rep, **9**, London

Bidwell, P, and Watson, M, 1989 A trial excavation on Hadrian's Wall at Buddle Street, Wallsend, *Archaeol Aeliana*, 5 ser, **17**, 21–8

Bidwell, P, Miket, R, and Ford, B (eds), 1988a *Portae cum Turribus: studies of Roman fort gates*, BAR, **206**, Oxford

Bidwell, P, Miket, R, and Ford, B, 1988b The reconstruction of a gate at the Roman fort of South Shields, in Bidwell *et al* 1988a, 155–231

Bidwell, P, and Speak, S, 1994 *Excavations at South Shields Roman fort, vol I*, Soc Antiqs Newcastle upon Tyne Monogr Ser, **4**, Newcastle upon Tyne

Birley, A R 1982 Introductory note in Jackson 1982, 61

Birley, E B, 1930a Part II: the pottery, in Richmond and Birley 1930, 169–98

—, 1930b Part III: the inscriptions, in Richmond and Birley 1930, 198–202

—, 1930c Excavations on Hadrian's Wall West of Newcastle upon Tyne in 1929, *Archaeol Aeliana*, 4 ser, 7, 143–78

—, 1932 Materials for the history of Roman Brougham, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **32**, 124–39

—, 1935 A note on the second cohort of Tungrians, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **35**, 56–60

—, 1939 Die *Cohors* I *Tungrorum* und das Orakel des klarischen Apollo, *Germania*, **23**, 189–90

—, 1949 *The centenary pilgrimage of Hadrian's Wall*, Kendal

—, 1951 The Roman fort and settlement at Old Carlisle, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **51**, 16–39

—, 1961 *Research on Hadrian's Wall*, Kendal

—, 1966a Birdoswald Fort, in *Programme of the Centenary Meeting at Carlisle*, Cumberland Westmorland Antiq Archaeol Soc, Carlisle

—, 1966b *Alae* and *cohortes milliaria*, in *Corolla memoriae Erich Swoboda dedicata, Römische Forschungen in Nieder österreich*, 56–67, Graz

———, 1977 Joseph Parker, the antiquary (1804–1877), *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **77**, 161–7

Birley, E B, Brewis, P, and Charlton, J, 1934 Report for 1933 of the North of England Excavation Committee, *Archaeol Aeliana*, 4 ser, **11**, 176–84

Birley, E B, Dobson, B, and Jarrett, M (eds), 1974 *Roman frontier studies, 1969*, Cardiff

Birley, R, 1970 Excavations at Chesterholm-Vindolanda, 1967–69, *Archaeol Aeliana*, 4 ser, **48**, 97–156

Birley, R, [no date] *Vindolanda*

Bishop, M C, 1988 Cavalry equipment of the Roman army in the first century AD, in *Military equipment and the identity of Roman soldiers: Proceedings of the Fourth Roman Military Equipment Conference* (ed J C Coulston), BAR, **S394**, 67–195, Oxford

—, 1989 *O Fortuna*: a sideways look at the archaeological record and Roman military equipment, in van Driel-Murray 1989, 1–12

Bishop, M C, and Coulston, J C N, 1993 *Roman military equipment from the Punic wars to the fall of Rome*, London

Bishop, M C, and Dore J N, 1988 *Corbridge: excavations of the Roman fort and town 1947–80*, HBMCE Archaeol Rep, **8**, London

Blackburn, K, 1928 Report on an investigation of the bottom of the Vallum ditch at Birdoswald with a view to ascertaining how long the ditch was open, in Richmond 1929, 308–9

Blake, B, 1959 Excavations of native (Iron Age) sites in Cumberland, 1956–58, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **59**, 1–14

Blockley, K, 1980 The Marlowe car park excavations, *Archaeol Cantiana*, **96**, 402–5

Blockley, K, Blockley, M, Blockley, P, Frere, S S, and Stow, S, 1995 *Excavations in the Marlowe car park and surrounding areas*, The Archaeology of Canterbury, **5**, Canterbury

Blood, K, 1987 Birdoswald (BANNA) Roman fort and environs, unpubl field survey, RCHME

Boeles, P C J A, 1951 *Friesland tot de elfde eeuw*, 'S-Gravenhage

Bohme, A, 1972 Die Fibeln der Kastelle Saalburg und Zugmantel, *Saalburg Jahrbuch*, **29**, 5–112

Boon, G C, 1966 Roman window glass from Wales, *J Glass Stud*, **8**, 41–5

—, 1972 *Isca: the Roman legionary fortress at Caerleon, Mon*, Cardiff

—, 1974 *Silchester, the Roman town of Calleva*, Newton Abbott

—, 1977 Gold in glass beads from the ancient world, *Britannia*, **8**, 193–207

—, 1984 Laterarium iscanum: *the antefixes, brick, and tile stamps of the second Augustan legion*, Cardiff

—, 1987 *The legionary fortress of Caerleon-Isca*, Caerleon

Bordenache Battaglia, G B, 1983 *Corredi funerari di eta imperiale e barbarica nel Museo Nazionale Romano*, Roma

Bosanquet, R C, 1904 The Roman camp at Housesteads, *Archaeol Aeliana*, 2 ser, **25**, 193–300

Bowman, A K, and Thomas, J D, 1983 *Vindolanda: the latin writing tablets*, Britannia Monogr, **4**, London

Brailsford, J W, 1962 *Hod Hill I: antiquities from Hod Hill in the Durden Collection*, London

Branigan, K, 1968 The origins of cruck construction: a new clue, *Medieval Archaeol*, **12**, 1–13

Breeze, D J, 1972 Excavations at the Roman fort at Carrawburgh, 1967–9, *Archaeol Aeliana*, 4 ser, **50**, 81–144

—, 1974 The organisation of the career structure of *immunes* and *principales* of the Roman army, *Bonner Jahrbücher*, **174**, 251–4

—, 1982 *The northern frontiers of Roman Britain*, London

Breeze, D J, and Dobson, B, 1972 Hadrian's Wall: some problems, *Britannia*, **3**, 182–208

—, 1976 *Hadrian's Wall*, 1st edn, London

—, 1987 *Hadrian's Wall*, 3rd edn, London

Brewer, D, and Frankl, E, 1985 *Arthur's Britain*, Cambridge

Brewer, R J, 1986a The beads and glass counters, in Zienkewicz, 1986, 146–56

Brewer, R J, 1986b *Corpus signorum Imperii Romani, Great Britain I, 5: Wales*, Oxford

Brewis, P, 1925 Roman Rudchester, *Archaeol Aeliana*, 4 ser, **1**, 93–120

—, 1936 A cruciform brooch from Benwell, *Archaeol Aeliana*, 4 ser, **12**, 117–22

Brickstock, R J, 1987 *Copies of the* Fel Temp Reparatio *coinage in Britain*, BAR, **176**, Oxford

Brodribb, G, 1987 *Roman brick and tile*, Gloucester

Brondsted, J, 1960 *Danmarks oldtid. III jernalder*, Copenhagen

Bronk Ramsay, C, 1994 *OxCal (v 2.0) a radiocarbon calibration and analysis program*, Oxford

—, forthcoming Radiocarbon calibration and the analysis of stratigraphy, Proceedings of the 14th international C14 conference

Brooks, C M, forthcoming The medieval pottery, in McCarthy, forthcoming, Fascicule **3**, *The Roman and medieval pottery*

Brown, A L, 1961 Camlann and the death of Arthur, *Folklore*, **71–2**, 612–23

Bruce, J C, 1853 *The Roman Wall*, 2 edn, Newcastle upon Tyne

—, 1867 *The Roman Wall*, 3 edn, Newcastle upon Tyne

—, 1859 Visit to Cilurnum, Borcovicus etc, *Proc Soc Antiqs Newcastle upon Tyne*, **1**, no 28, 255–60

—, 1885 *The handbook to the Roman Wall*, 3 edn, London

Brunskill, R W, 1987 *Illustrated handbook of vernacular architecture*, 3 edn, London

Bruton, F A, 1911 *Excavation of the Roman forts at Castleshaw: second interim report*, Manchester

Buck, C E, Litton, C D, and Smith, A F M, 1992 Calibration of radiocarbon results pertaining to related archaeological events, *J Archaeol Sci*, **19**, 497–512

Buckland, P C, 1986 *Roman South Yorkshire: a source book*, Sheffield

Budge, E A W, 1903 *An account of the Roman antiquities preserved in the museum at Chesters, Northumberland*, London

Bullock, P, Fedoroff, N, Jongerius, A, Stoops, G, Tursina, T, and Babel, U, 1985 *Handbook for soil thin section description*, New York

Bulmer, W, 1969 The Provisioning of Roman forts: a reappraisal of ration storage, *Archaeol Aeliana*, 4 ser, **47**, 7–13

Burrow, I, 1981 *Hillfort and hill-top settlement in Somerset in the first to eighth centuries AD*, BAR, **91**, Oxford

Busch, A L, 1965 Die Römerzeitlichen Schuh und Lederfunde der Kastelle Saalburg, Zugmantel und Kleiner Feldberg, *Saalburg Jahrbuch*, **22**, 158–210

Bushe-Fox, J P, 1913 *First report on the excavations on the site of the Roman town at Wroxeter, Shropshire, in 1912*, Soc Antiqs London Res Rep, **1**, London

—, J P, 1928 *Second report on the excavations of the Roman fort at Richborough, Kent*, Soc Antiqs London Res Rep, **7**, London

—, J P, 1932 *Report on the excavations of the Roman fort at Richborough, Kent*, Soc Antiqs London Res Rep, **10**, London

—, J P, 1949 *Report on the excavations of the Roman fort at Richborough, Kent*, Soc Antiqs London Res Rep, **16**, London

Butcher, S, 1982 A Roman stud from Colchester, *Essex Archaeol Hist*, **14**, 146–9

—, 1991 Millefiori and enamel stud, in Austen 1991, 34

Buxton, K, and Howard-Davies, C, forthcoming *Ribchester excavations*, Lancaster Imprint Ser

Callender, M, 1965 *Roman amphorae*, London

Camden, W, 1600 *Britannia*, 5 edn, London

Cameron, R A D, and Kerney, M P, 1979 *A field guide to the land snails of Britain and north-west Europe*, London

Carruthers, F, 1990 Arthur: ancient legend or Cumbria's local hero, *Cumberland News* 30 November 1990

Caruana, I D, 1989 Stanwix-*Petriana*, in Daniels 1989b, 31–2

—, 1991 Stamped tile, in Austen 1991, 112

—, forthcoming *The Roman forts at Carlisle: excavations at Annetwell Street, 1973–84*

Caruana, I D, and Hird, L, forthcoming Roman tile and brick, in Caruana, forthcoming

Carver, M O H, 1995 Roman to Norman at York Minster, in Phillips and Heywood 1995, 177–222

Casey, P J, 1971 Excavations at Brecon Gaer 1970, *Archaeol Cambrensis*, **120**, 91–101

—, 1979a Magnus Maximus in Britain: a reappraisal, in Casey 1979b, 66–79

—, 1979b *The end of Roman Britain*, BAR, 71, Oxford

—, 1985 The coins, in Bidwell 1985, 103–16

—, 1991 The coins [from Bewcastle], in Austen, 1991 34–40

—, 1992 The end of garrisons on Hadrian's Wall: an historico-environmental model, *Inst Archaeol Bull*, **29**, 69–80

Casey, P J, Noel, M, and Wright, J, 1992 The Roman fort at Lanchester, Co Durham: a geophysical survey and discussion of garrisons, *Archaeol J*, **149**, 69–81

Chang, S C, and Jackson, M L, 1957 Fractionation of soil phosphorus, *Soil Sci*, **84**, 133–44

Chaplin, R E, 1965 Report on the animal remains, in Woodfield 1965, 193–200

Chapman, J C, and Mytum, H C (eds), 1983 *Settlement in north Britain 1000 BC–AD 1000, BAR*, **118**, Oxford

Charles, F W B, 1982 The construction of buildings with irregularly spaced posts, in Drury (ed) 1982, 101–12

Charlesworth, D, 1959 Roman glass in northern Britain, *Archaeol Aeliana*, 4 ser, **37**, 33–58

—, 1971 A group of vessels from the commandant's house, Housesteads, *J Glass Stud*, **13**, 34–7

—, 1972 The glass, in Frere 1972, 203–7

—, 1974 Glass vessels, in Hassel and Rhodes 1974, 15–100

—, 1974/6 The glass bowl, in Three Roman buildings in the Bulborne valley (D S Neal), *Herts Archaeol*, **4**, 1–135

—, 1975 The commandant's house, Housesteads, *Archaeol Aeliana*, 5 ser, **3**, 17–42

—, 1978 The Roman glass, in *Chichester excavations III* (A Down), 267–273, Chichester

—, 1979a Glass, in The Agricolan supply base at Red House Corbridge (W S Hanson, C M Daniels, J N Dore, and J P Gillam), *Archaeol Aeliana*, 5 ser, 7, 1–88

—, 1979b Glass, beads, and armlets, in Potter 1979, 230–4

—, 1979c Glass, in Bidwell 1979, 222–31

—, 1979d Plough marks beneath 21, Annentwell Street, Carlisle, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **79**, 146–7

—, 1981 The glass, and glass from the burials, in *Skeleton Green, a late Iron Age and Romano-British site* (C Partridge), Britannia Monogr, **2**, 119–271

—, 1982 The glass, in *Cirencester excavations I: early Roman occupation at Cirencester* (J Wacher and A McWhirr), Cirencester, 106–7

—, 1984 The glass, in *Verulamium excavations III* (S S Frere), Oxford, 145–73

—, 1985 The glass, in R Nibblet, *Sheepen: an early Roman industrial site at Camulodunum*, CBA Res Rep, **57**, London, MF 1:A5–A9, 3:F1–F11

Charlesworth, D, and Price, J, 1987 The Roman glass, in *Excavations at Poundbury, Dorchester, Dorset 1966–1982, vol I, The settlements* (C S Green), Dorset Nat Hist Archaeol Soc Monogr, 7, 108–9, MF2 E11–F4

Charlesworth, D, and Thornton, J H, 1973 Leather found in Mediobogdum, the Roman Fort of Hardknott, *Britannia*, **4**, 141–52

Charlton, D B, and Day, J C, 1982 Excavation and field survey in Upper Redesdale: part IV, *Archaeol Aeliana*, 5 ser **10**, 149–70

Cheesman, R G, 1914 *Auxilia of the Roman imperial army*, Oxford

Chirila, E, Gudea, N, Lucacel, V, and Pop, C, 1972 *Castrul roman de la Buciumi*, Cluj

Christie, W W, 1973 *Lipid analysis: isolation, separation, identification, and structural analysis of lipids*, Oxford

Christison, D, 1896 Account of the excavation of Birrens, a Roman station in Annandale, undertaken by the Society of Antiquaries of Scotland in 1895, *Proc Soc Antiqs Scot*, **30**, 81–204

Clack, P A G, 1982 The northern frontier: farmers in the military zone, in Miles 1982, 377–402

Clapham, A, 1988 *Housesteads fort, Hadrians Wall, Northumberland: interim report*, Ancient Monuments Laboratory Report 186/88

Clapham, A R, Tutin, T G, and Moore, D M, 1987 *Flora of the British Isles*, 3 edn, Cambridge

Clarke, D V, 1970 Bone dice and the Scottish Iron Age, *Proc Prehist Soc*, **36**, 214–32

Clarke, G N, 1979 *Pre-Roman and Roman Winchester 2: the Roman cemetery at Lankhills*, Oxford

Clarke, J C, 1990 Stone roofing slabs, in Wrathmell and Nicholson 1990, 164–5

Clayton, J, 1903 *An account of the Roman antiquities preserved in the Museum at Chesters, Northumberland*, London

Clifford, E M, 1933 The Roman villa, Hucclecote, near Gloucester, *Trans Bristol Gloucs Archaeol Soc*, **55**, 322–76
Clifton-Taylor, A, 1987 *The pattern of English building*, London
Clipson, J, 1980 Back Silver Street, Durham, 1975–6 excavations, *Archaeol Aeliana*, 5 ser, **8**, 109–26
Clough, T H McK, and Laing, L R, 1969 Excavations at Kirkconnel, Waterbeck, Dumfriesshire, 1968, *Trans Dumfries Galloway Natur Hist Antiq Soc*, **46**, 128–39
Clymo, R S, Oldfield, F, Appleby, P G, Pearson, G W, Ratneser, P, and Richardson, N, 1990 The record of atmospheric deposition on rainwater-dependant peatland, *Phil Trans Royal Soc London*, **327**, 105–14
Coleman-Smith, R J C, and Pearson, T, 1984 The medieval pottery from Sewingshields, in Haigh and Savage 1984, 125–32
Collingwood, R G, 1924 The last years of Roman Cumberland, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **24**, 247–55
—, 1928 Old Carlisle, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **28**, 103–19
—, 1930 Another forged rock inscription, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **30** 120–22
—, 1935 3 The inscription from the Turf Wall at High House, in Report of the Cumberland Excavation Committee for 1934, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **35**, 229–32
Collingwood, R G, and Wright, R P, 1956 *The Roman inscriptions of Britain*, Oxford
Connolly, P, 1981 *Greece and Rome at war*, Oxford
Conway, R S, 1906 *Melandra Castle*, Manchester
Cook, B F 1975 The classical marbles from the Arundel House site, in Excavations on the Site of Arundel House in the Strand, WC2 in 1972 (M J Hammerson), *Trans London Middlesex Archaeol Soc*, **26**, 247–50
Cool, H E M, 1986 A Romano-British gold workshop of the second century, *Britannia*, **17**, 233–7
—, 1990 The problem of 3rd century drinking vessels in Britain, *Annales du 11e Congrès de L'Association pour l'Histoire de Verre, 1988*, Paris, 167–75
Cool, H E M, and Price, J, 1995 *Roman vessel glass from excavations at Colchester 1971–85*, Colchester Archaeol Rep, **8**, Colchester
Cooper, A, 1987 Post-fire vegetation succession and pollen analytical studies of Iping Common, unpubl diss, Univ London
Corder, P, 1930 *The defences of the Roman fort at Malton*, Roman Malton and District Report, **2**, Leeds
—, 1937 A pair of fourth-century Romano-British pottery kilns, near Crambeck, *Antiq J*, **17**, 392–413
Coulston, J C N, 1981 A sculptured Dacian *falx* from Birdoswald, *Archaeol Aeliana*, 5 ser, **9**, 348–50
—, 1992 Report on stone objects from excavations at Birdoswald, 1987–92, unpubl report in Birdoswald site archive
—, forthcoming Stone sculptures, in Caruana forthcoming
Coulston, J C N, and Phillips, E J, 1988 *Corpus Signorum Iimperii Romani: Great Britain I, 6: Hadrian's Wall west of the North Tyne, and Carlisle*, Oxford
Cowen, J D, 1948 The Carvoran spearhead again, *Archaeol Aeliana*, 4 ser, **26**, 142–4
—, 1965 The Crawhall collection, *Archaeol Aeliana*, 4 ser, **43**, 1–20
Cox, K G, Price, N B, and Harte, B, 1976 *An introduction to the practical study of crystals minerals and rocks*, London
Cramp, R, 1964 Anglo-Saxon pin from Birdoswald, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **64**, 90–93
—, 1991 *Catalogue of Anglo-Saxon and Viking antiquities in the Museum of Antiquities, Newcastle upon Tyne*, Newcastle upon Tyne
—, 1983 Anglo-Saxon settlement, in Chapman and Mytum 1983, 263–98
Craster, H H E, 1911 The coins, in Gibson and Simpson 1911, 436–41
—, 1913 The coins, in Simpson 1913, 335–7
Crawford, O G S, 1931 Arthur and his battles, *Antiquity*, **9**, 277–91
Crow, J G, 1988a Notes on the north gateway of Mc39, Castle Nick, in Bidwell *et al* 1988a, 143–54
—, 1988b An excavation of the north curtain wall at Housesteads, 1984, *Archaeol Aeliana*, 5 ser, **16**, 61–214
—, 1989 *Housesteads Roman fort*, London
—, 1991 A review of current research on the turrets and curtain of Hadrian's Wall, *Britannia*, **22**, 51–64
—, 1995 *The English Heritage book of Housesteads*, London
Crowfoot, G M, and Ling Roth, H, 1974 *Hand spinning and woolcombing*, Bankfield Museum Notes, 2 ser, **12**, Bedford
Crummy, N 1979 A chronology of bone pins, *Britannia*, **10**, 157–64
—, 1981 Bone working at Colchester, *Britannia*, **12**, 277–85
—, 1983 *The Roman small finds from excavations in Colchester 1971–79* Colchester Archaeol Rep, **2**, Colchester
Cumbria County Council, 1987 *Birdoswald: a conservation, management and development plan*, Carlisle
—, 1989 *Birdoswald: the next five years*, Carlisle
Cumbria Gazette, 1987a Was it King Arthur's grave?, *Cumbria Gazette*, 23 July 1987
—, 1987b Finds at the fort – but no Arthur, *Cumbria Gazette*, 6 August 1987
Cunliffe, B W, 1968 *Fifth report on the excavations of the Roman fort at Richborough, Kent*, Rep Res Comm Soc Antiq London, **23**, Oxford
—, 1975 *Excavations at Portchester Castle, vol 1: Roman*, Rep Res Comm Soc Antiq London, **32**, London
Cunliffe-Shaw, R, 1963 *Post-Roman Carlisle and the kingdoms of the north-west*, Preston
Cüppers, H, 1979 *Trier, Porta Nigra*, Mainz
Curle, A O, 1905 Description of the fortifications on Ruberslaw, Roxburghshire and notices of Roman remains found there, *Proc Soc Antiqs Scot*, 4 ser, **3**, 219–32
Curle, J, 1911 *A Roman frontier post and its people: the fort of Newstead in the Parish of Melrose*, Glasgow
—, 1931 An inventory of objects of Roman and provincial Roman origin found on sites in Scotland not definitely associated with Roman constructions, *Proc Soc Antiqs Scotland*, **66**, 277–397
Curwen, J F, 1913 *The castles and fortified towers of Cumberland, Westmorland, and Lancashire north of the sands*, Cumberland Westmorland Antiq Archaeol Soc, extra ser, **13**, Kendal

Dacre, J A, 1985 An excavation on the Roman Fort at Stanwix, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **85**, 53–70
Dalwood, H, 1992 The use of soil micromorphology for investigating site formation processes, in Steane 1992, 3–6
Daniel, G, 1981 *A short history of archaeology*, London
Daniels, C M, (ed) 1978 *J Collingwood Bruce's Handbook to the Roman Wall*, 13 edn, Newcastle upon Tyne

—, 1979 Fact and theory on Hadrian's Wall, *Britannia*, **10**, 357–64
—, 1980 Excavation at Wallsend and the fourth-century barracks on Hadrian's Wall, in *Roman frontier studies 1979, pt i* (eds W S Hanson and L J F Keppie), BAR, **S71(i)**, Oxford, 173–200
—, 1989a Wallsend, in Daniels 1989b, 77–83
—, (ed), 1989b *The eleventh pilgrimage of Hadrian's Wall* Newcastle upon Tyne
Dannell, G B, 1971 The samian pottery, in *Excavations at Fishbourne 1961–1969, vol 2: the finds* (B Cunliffe), Rep Res Comm Soc Antiqs London, **27**, 260–318, Leeds
Dark K R, 1992 A sub-Roman re-defence of Hadrian's Wall, *Britannia*, **23**, 111–20
—, 1994 *Civitas to kingdom: British political continuity 300–800*, Leicester
Daszewski, W A, 1973 A legionary gem from Nea Paphos, *Rep Dept Antiquities Cyprus*, **1973**, 202–11
Davies, B, 1992 Spot-dates as qualitative data?, in Steane 1992, 30–39
Davies, C, and Turner, J, 1979 Pollen diagrams from Northumberland, *New Phytologist*, **82**, 783–804
Davies, J A, forthcoming a The coins, in *Excavations at Old Place, Sleaford*, East Anglian Archaeology
—, forthcoming b The coins, in *Excavations at Scole*, East Anglian Archaeology
Davies, R W, 1968 A note on a recently discovered inscription from Carrawburgh, *Epigraphische Studien*, **5**, 108–11
—, 1968 The training grounds of the Roman cavalry, *Archaeol J*, **125**, 71–100
—, 1971 The Roman military diet, *Britannia*, **2**, 122–142
—, 1974 Roman military training grounds, in Birley *et al* 1974, 20–26
—, 1977 *Cohors* I *Hispanorum* and the garrison of Maryport, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, 77, 1–16
Davis, S, 1988 *The archaeology of animals*, London
Déchelette, J, 1904 *Les vases céramiques ornés de la Gaule romaine*, Paris
Detsicas, A P, 1968 Figured samian from Birdoswald, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **68**, 31–50
Dickinson, B, 1986 Potters stamps and signatures on samian, in Miller *et al*, 1986, 186–98
—, 1990 The samian ware, in McCarthy 1990, 213–36
Dickinson, B M, and Hartley, B, 1988 Samian potters stamps from Corbridge, in Bishop and Dore 1988, 221–8
—, 1993 The samian stamps, in *The Roman pottery*, Report on the excavations at Usk 1965–76 (W H Manning), Cardiff, 207–15
Dickinson B M, and Hartley K F, 1971 The evidence of potters' stamps on samian ware and on mortaria for the trading connections of Roman York, in *Soldier and civilian in Roman Yorkshire* (ed R M Butler), 127–42, Leicester
Dimitrova-Milcheva, A, 1981 *Antique engraved gems and cameos in the National Archaeological Museum in Sofia*, Sofia
Dindal, D L, 1990 *Soil Biology Guide*, London
Dixon, P, 1979 Towerhouses, pelehouses, and Border society, *Archaeol J*, **136**, 229–39
Dobson, B, and Mann, J C, 1973 The Roman army in Britain and Britons in the Roman army, *Britannia*, 4, 191–205
Donaldson, A M, and Turner, J, 1977 A pollen diagram from Hallowell Moss, near Durham City, UK, *J Biogeography*, 4, 25–33
Donaldson, G H, 1990 A reinterpretation of RIB 1912 from Birdoswald, *Britannia*, **21**, 207–14
Dore, J N, and Gillam, J P, 1979 *The Roman fort at South Shields: excavations 1875–1975*, Soc Antiqs Newcastle upon Tyne Monograph, **1**, Newcastle upon Tyne
Douglas, G, 1931 Scott at Gilsland, *Trans Berwicks Nat Club*, **27**, 347–9
Down, A, and Rule, M, 1971 *Chichester excavations 1*, Chichester
Drury, P J, 1975 Chelmsford, in *Small Towns of Roman Britain* (eds W Rodwell and T Rowley), BAR, **15**, 159–74, Oxford
—, (ed), 1982 *Structural reconstruction: approaches to the interpretation of the excavated remains of buildings*, BAR, **110**, Oxford
Dumayne, L, 1993a Invader or native? – vegetation clearance in northern Britain during Romano-British time, *Veget Hist Archaeobot*, **2**, 29–36
—, 1993b Iron Age and Roman vegetation clearance in northern Britain: further evidence, *Bot J Scot*, **46**, 385–92
—, 1994a New evidence for human impact on vegetation in north Cumbria since the Neolithic, in *North-west wetlands survey, annual report 1994* (eds R Middleton and R Newman), 21–8, Kendal
—, 1994b The effect of the Roman occupation on the environment of Hadrian's Wall: a pollen diagram from Fozy Moss, Northumbria, *Britannia*, **25**, 217–24
Dumayne, L, and Barber, K E, 1994 The impact of the Romans on the environment of northern England: pollen data from three sites close to Hadrian's Wall, *The Holocene*, **4**, 165–73
Dumayne, L, Stoneman R E, Barber, K E, and Harkness D, 1995 Problems associated with correlating radiocarbon dated pollen diagrams with historical events, *The Holocene*, **5**, 118–23
Duncan-Jones, R P 1978 Pay and numbers in Diocletian's army, *Chiron*, **8**, 541–60
Durand-Lefebvre, M, 1963 *Marques de Potiers gallo-romains trouveés à Paris*, Paris
Dyson, T, and Schofield, J, 1980 *Archaeology of the City of London*, London

Eagle, J, 1989 Testing *plumbatae*, in van Driel-Murray 1989, 247–54
Edwards, K J, 1989 The cereal pollen record and early agriculture, in *The beginnings of agriculture* (eds A Milles, D Williams, and N Gardner), Symposia of the Association for Environmental Archaeology, **8**, BAR Internat Ser, **496**, Oxford, 146–67
Eiden, H, 1949 Untersuchungen an den spätrömischen Horrea von St Irminen in Trier, *Trierer Zeitschrift*, **1949**, 73–98
Eidt, R C, 1977 Detection and analysis of anthrosols by phosphate analysis, *Science*, **197**, 1327–33
Ellis, S P, 1984 An archaeological study of urban domestic housing in the Mediterranean AD 400–700, unpubl PhD thesis, noted in Dark, 1984
English Heritage, 1985 *Central Excavation Unit manual, part 2: recording*, Portsmouth
—, 1991 *The management of archaeological projects 2*, London
—, 1992 *Central Archaeology Service site recording manual, version 6*, Portsmouth
Ergil, T, 1983 *Ear rings: the catalogue of the Istanbul Archaeological Museum*, Istanbul

Esmonde-Cleary, A S, 1989 *The ending of Roman Britain*, London

Evans, A T, and Moore, P D, 1985 Surface studies of *Calluna vulgaris* (L) hull and their relevance to the intepretation of bog and moorland pollen diagrams, *Circaea*, **3**, 173–8

Evans, J, 1989 Crambeck: the development of a major northern pottery industry, in *The Crambeck Roman pottery industry* (ed P R Wilson), 43–90, Yorkshire Archaeol Soc, Leeds

Evans, J G, and Limbrey, S, 1974 The experimental earthwork on Morden Bog, Wareham, Dorset, England: 1963–72, *Proc Prehist Soc*, **40**, 170–202

Faull, M L, 1984 Settlement and society in north-east England in the fifth century, in Wilson *et al*, 1984, 49–56

Feachem, R W, 1951 Dragonesque fibulae, *Antiq J*, **3**, 32–44

Fernie, E, 1983 *The architecture of the Anglo-Saxons*, London

Ferris, I M, and Jones, R F J, 1991 Binchester: a northern fort and vicus, in *Roman Britain: recent trends* (ed R F J Jones), Sheffield

—, 1996 Binchester Roman fort: revised assessment and research design, unpubl

Fölzer, E, 1913 *Die Bilderschüsseln der Ostgallischen Sigillata-Manufakturen*, Bonn

Forster, R H, 1908 Corstopitum, report of the excavations in 1907, *Archaeol Aeliana*, ser 3, **4**, 205–303

Forster, R H, and Knowles, W H, 1909 Corstopitum, report of the excavations in 1908, *Archaeol Aeliana*, ser 3, **5**, 305–424

—, 1911 Corstopitum, report of the excavations in 1910, *Archaeol Aeliana*, ser 3, **7**, 256–379

—, 1913 Corstopitum, report of the excavations in 1912, *Archaeol Aeliana*, ser 3, **9**, 230–80

Fowler, E, 1960 The origins and development of the penannular brooch, *Proc Prehist Soc*, **26**, 149–77

—, 1964 Celtic metalwork of the fifth and sixth centuries AD: a reappraisal, *Archaeol J*, **120**, 98–160

Fowler, P J, 1971 Hill-forts, AD 400–700, in *The Iron Age and its hill-forts* (D Hill and M Jesson), Univ Southampton Monog Ser, **1**, 203–13

Fraser, G M, 1971 *The steel bonnets*, London

Fremersdorf, F, 1959 *Römische Gläser mit Fadenauflage in Köln*, Die Denkmäler des Römischen Köln, **5**, Köln

—, 1967 *Die Römischen Gläser mit Schliff, Bemalung und Goldauflagen aus Köln*, Die Denkmaler des Römischen Köln, **8**, Köln

—, 1970 *Seltene Varianten Steilwandiger Römischer Glasbecher Des 3 Jahrhundert aus Köln*, Kölner Jahrbuch fur Vor-und Frühgeschichte, **11**, 59–72

Fremersdorf, F, and Polonyi-Fremersdorf, E, 1984 *Die Farblosen Gläser der Frühzeit in Köln 2 und 3 Jahrhundert*, Die Denkmäler des Römischen Köln, **9**, Köln

Frere, S S, 1978 *Britannia*, 2 edn, London

—, 1983a *Verulamium excavations, vol II*, Rep Res Comm Soc Antiqs London, **41**, London

—, 1983b Roman Britain in 1982: sites explored, *Britannia, 14, 279–335*

—, 1984 Roman Britain in 1983: sites explored, *Britannia*, **15**, 265–332

—, 1991 Roman Britain in 1990: sites explored, *Britannia*, **22**, 221–92

Frere, S S, and St Joseph J K, 1974 The Roman fortress at Longthorpe, *Britannia*, **5**, 1–129

Frere, S S, Stow, S, and Bennett, P, 1982 *Excavations on the Roman and medieval defences of Canterbury*, Archaeology of Canterbury, **2**, Maidstone

Fulford, M G, and Huddleston, K, 1991 *The current state of Romano-British pottery studies*, English Heritage Occasional Paper, **1**, London

Gage, J, 1834 A letter from John Gage to Hudson Gurney, *Archaeologia*, **25**, 1–23

Gaitsch, W, 1980 *Eiserne römische Werkzeuge*, BAR, **S78**, Oxford

Gelfand, A E, and Smith, A F M, 1990 Sampling based approach to calculating marginal densities, *J American Statistical Assoc*, **85**, 398–409

Gentry, A P, 1976 *Roman military stone built granaries in Britain, BAR, 32, Oxford*

Gibson, J P, and Simpson, F G, 1911 The milecastle on the Wall of Hadrian at the Poltross Burn, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **11**, 390–461

Gillam, J P, 1939 Romano-British Derbyshire ware, *Antiq J*, **19**, 429–37

—, 1950 Recent excavations at Birdoswald, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **50**, 63–8

—, 1952 Birdoswald 1950, unpubl Ms notes lodged with excavation archive at Tullie House Museum

—, 1953 Excavations at Low Brunton milecastle, no 27, in 1952, *Archaeol Aeliana*, 4 ser, **12**, 165–74

—, 1961 Excavations at Haltonchesters, *Durham University Gazette*, **6**

—, 1970 *Types of Roman coarse pottery vessels in northern Britain*, Newcastle upon Tyne

—, 1973 Sources of pottery found on northern military sites, in *Current research in Romano-British coarse pottery* (ed A Detsicas), CBA Res Rep, **10**, 53–65, London

—, 1974 The frontier after Hadrian– a history of the problem, *Archaeol Aeliana*, 5 ser, **2**, 1–16

—, 1976 Coarse fumed ware in north Britain and beyond, *Glasgow Archaeol J*, **4**, 57–90

Gillam, J P, Harrison, R M, and Newman, T, 1973 Interim report on the excavations at the Roman fort of Rudchester, 1972, *Archaeol Aeliana* 5 ser, **1**, 81–6

Gillam, J P, and Mann, J C, 1970 The northern British frontier from Antoninus Pius to Caracalla, *Archaeol Aeliana* 4 ser, **48**, 1–45

Gimingham, C H, 1972 *Ecology of heathlands*, London

—, 1992 *The lowland heathland management handbook, no 8*, Peterborough

Godwin, H G, 1975 *History of the British flora: a factual basis for phytogeography*, 2 edn, Cambridge

Goldney, F B, 1901 *Proc Soc Antiqs London*, 2 ser, **18**, 279–81

Good, G L, and Tabraham, C J, 1981 Excavations at Threave castle, Galloway, 1974–78, *Medieval Archaeol*, **25**, 90–140

Goodburn, D, 1991 A Roman timber framed building tradition, *Archaeol J*, **148**, 182–204

Goodrich, N L, 1986 *King Arthur*, New York

Gopfrich, J, 1986 Römische Lederfunde aus Mainz, *Saalburg Jahrbuch*, **42**, 5–67

Gough R (ed), 1789 *Camden's Britannia*, London

Graham, T H B, 1911 Extinct Cumberland castles, part III, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **11**, 233–58

—, 1922 The Lanercost Foundation Charter, part II, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **22**, 24–43

—, 1934 *The Barony of Gilsland: Lord William Howard's survey taken in 1603*, Cumberland Westmorland Antiq Archaeol Soc, Extra Ser, **16**, Kendal

Grant, A, 1975 The animal bones, in Cunliffe 1975, 378–408, 437–50

—, 1982 The use of tooth wear as a guide to the age of domestic ungulates, in *Ageing and sexing animal bones from archaeological sites* (eds B Wilson, C Grigson, and S Payne), BAR, **109**, Oxford, 91–108

—, 1990 Animals in Roman Britain, in *Research on Roman Britain 1960–1989* (ed M Todd), Britannia Monograph Ser, **11**, 135–47, Oxford

Grealey, S, 1974 Querns, in *Roman Manchester* (GDB Jones), 129, Manchester

Green, H J M, 1982 The origins and development of cruck construction in eastern England, in Drury 1982, 87–99

Green, M J, 1978 *Small cult-objects from the military areas of Roman Britain*, BAR, **52**, Oxford

Greene, K, 1978 Imported finewares in Britain to AD 250: a guide to identification, in Arthur and Marsh 1978, 15–31

—, 1986 A comment on Housesteads ware, *Scot Archaeol Rev*, **4**, 33–4

Greenhalgh, M, 1989 *The survival of Roman antiquities in the Middle Ages*, London

Greep, S J 1987 Lead sling-shot from Windridge Farm, St Albans and the use of the sling by the Roman army in Britain, *Britannia*, **18**, 183–200

Greig, J R A, 1982 The interpretation of pollen spectra from urban archaeological deposits, in *Environmental archaeology in the urban context* (eds A R Hall and H K Kenward), CBA Res Rep, **43**, 47–65, London

—, forthcoming The early history of the cornflower (*Centaurea cyanus* L.) in the British Isles, *IWGP Proceedings*, Nitra

Grew, F, and Hobley, B (eds), 1985 *Roman urban topography in Britain and the western empire*, CBA Res Rep, **59**, London

Griffiths, W B 1989 The sling and its place in the Roman Imperial army, in *Roman military equipment: the sources of evidence, proceedings of the fifth Roman Military Equipment Conference* (ed C van Driel-Murray), BAR, **S476**, 255–79, Oxford

Grime, J P, Hodgson, J G, and Hunt, R, 1988 *Comparative plant ecology, a functional approach to common British species*, London

Grimes, W F 1968 *The excavation of Roman and medieval London*, London

Grimm, E C, 1991 *TILIA and TILIA*GRAPH*, Springfield, Illinois

Groenman van Waateringe, W, 1967 *Romeins lederwerk uit Valkenburg Z H*, Gröningen

Grove, R, 1988 The bone report, in Crow 1988, 100–110

Grundy, J, 1992 Small domestic buildings of the countryside, in Grundy *et al* 1992, 58–67

Grundy, J, McCombie, G, Ryder, P, Welfare, H, Pevsner, N, 1992 *Buildings of England: Northumberland*, London

Gudea, N, 1979 The defensive system of Roman Dacia, *Britannia*, **10**, 63–87

Guido, M, 1978 *The glass beads of the prehistoric and Roman periods in Britain and Ireland*, Soc Antiqs London Res Rep, **35**, London

—, 1979, The Glass Beads, in Clarke 1979, 292–4, 297–300

Haalebos, J K, 1974 Zu den Trierer Bilderschüsseln von Zwammerdam (Gemeinde Alphen aan de Rijn), *Rei Cretariae Romanae Fautorum Acta*, **14–15**, 55–60

Habert, T, 1893 *La poterie antique parlante*, Paris

Hadrian's Wall Consultative Committee, 1984 *The strategy for Hadrian's Wall*, Newcastle upon Tyne

Hagen, W, 1937 Kaisezeitliche Gagarbeiten aus dem rheinischen Germanien, *Bonner Jahrbücher*, **142**, 77–144

Haigh, D, and Savage, M, 1984 Sewingshields, *Archaeol Aeliana*, 5 ser, **13**, 32–147

Harbottle, B, Fraser, R, and Burton, F C, 1988 The Westgate Road milecastle, Newcastle upon Tyne, *Britannia*, **19**, 153–62

Harcourt, R A, 1974 The dog in prehistoric and early historic Britain, *J Archaeol Sci*, **6(2)**, 151–76

Harden, D B, 1947 The glass, in *Camulodunum, first report on the excavations at Colchester 1930–1939* (C F C Hawkes and M R Hull), Soc Antiqs London Res Rep, **14**, London, 287–307

—, 1958 Four Roman glasses from Hauxton Mill, Cambridge, 1870, in Roman discoveries from Hauxton (J Liversidge), *Proc Cambridge Antiq Soc*, **51**, Appendix 1, 12–16

—, 1962 Glass in Roman York, in *An inventory of the historical monuments in the city of York, 1, Ebvracvm* (RCHME), 136–41

—, 1975 The glass, in Cunliffe 1975, 368–74

—, 1979a Glass vessels, in Clarke 1979, 209–20

—, 1979b Glass, in Excavations at 48–50 Cannon Street, City of London (A Boddington), *Trans London Middlesex Archaeol Soc*, **30**, 1–38

Harden, D B, Pinder-Wilson, R H, and Tait, H, 1968 *Masterpieces of glass*, London

Harden, D B, Hellenkemper, H, Painter, K, and Whitehouse, D, 1987 *Glass of the Caesars*, London

Harding, J S, 1981 Regeneration of birch (*Betula pendula* Ehrh and *Betula pubescens* Roth), in *The regeneration of oak and beech: a literature review* (eds A N Newbold and F B Goldsmith), Discusion papers in Conservation, **33**, London

Harrison, A F, 1987 *Soil organic phosphorus: a review of world literature*, Wallingford

Hartley, B R, 1968 Samian, in Excavations on the Carrawbugh car park site, 1964 (D Charlesworth), *Archaeol Aeliana*, 4 ser, **45**, 6–16

—, 1972 The Roman occupation of Scotland: the evidence of samian ware, *Britannia*, **3**, 1–55

Hartley, K F, 1990 The mortaria, in McCarthy 1990, 237–63

Hartley, K F, and Webster, P V, 1973 Romano-British pottery kilns near Wilderspool, *Archaeol J*, **130**, 77–103

Haselgrove, C (ed), forthcoming *Time, space, and culture in Iron Age Britain*

Hassall, M W C, 1976 Britain in the *Notitia*, in *Aspects of the* Notitia Dignitatum (eds R Goodburn and P Bartholomew), BAR, **S15**, 103–17, Oxford

—, 1983 The internal planning of Roman auxilliary forts, in *Rome and her northern provinces* (ed B Hartley and J Wacher), 96–131, Gloucester

Hassall, M W C, and Tomlin, R S O, 1992 II Inscriptions, in Roman Britian in 1991 (S S Frere, M W C Hassall, and R S O Tomlin), *Britannia*, **23**, 309–24

Hassell, M, and Rhodes, J F, 1974 Excavations at New Market Hall, Gloucester, *Trans Bristol Gloucs Archaeol Soc*, **93**, 15–100

Hattatt, R, 1982 *Ancient and Romano-British brooches*, Oxford

—, 1985 *Iron Age and Roman brooches*, Oxford

—, 1987 *Brooches of antiquity*, Oxford

—, 1989 *Ancient brooches and other artefacts*, Oxford
Haverfield, F, 1897a Report of the Cumberland Excavation Committee, 1895, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **14**, 185–97
—, 1897b Report of the Cumberland Excavation Committee, 1896, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **14**, 413–33
—, 1898a Report of the Cumberland Excavation Committee, 1897, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **15**, 172–90
—, 1898b Inscriptions preserved at Birdoswald, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **15**, 197–200
—, 1899 Report of the Cumberland Excavation Committee for 1898, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **15**, 345–64
—, 1901 Report of the Cumberland Excavation Committee for 1900, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **1**, 75–92
—, 1911 Coton Iulius F.VI. Notes on Reginald Bainbrigg of Appleby and William Camden and on some Roman inscriptions, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **11**, 343–78
—, 1918 The Roman name of Birdoswald fort, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **18**, 223–9
—, 1919 The Tullie House fibulae, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **19**, 1–16
Haverfield, F, and Collingwood R G, 1920 The provisioning of Roman Forts, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **20**, 127–42
—, 1914 First report on the exploration of the Roman fort at Ambleside, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **14**, 433–65
Havinga, A J, 1984 A twenty-year experimental investigation into the differential corrosion susceptibility of pollen and spores in various soil types, *Pollen et Spores*, **26**, 541–58
Hawkes, C F C, 1940 An Aylesford type La Tene III brooch from Arundel Park and the dating of the type, *Antiq J*, **20**, 27–81
Hayes, R H, 1988 *North-east Yorkshire studies: archaeological papers* (ed P R Wilson), Leeds
Hedeager, L, 1992 *Iron Age societies*, Oxford
Heim, J, 1962 Recherches sur les relations entre la vegetation actuélle et le spectre pollinique récent dans les Ardennes Belges, *Bull Soc Roy Bot Belgique*, **96**, 5–92
Henig, M, 1978 *A corpus of Roman engraved gemstones from British sites, BAR*, **8**, Oxford
—, 1986 Caracalla as Hercules? a new cameo from South Shields, *Ant J*, **66**, 378–80
Hesse, P R, 1971 *A text book of soil chemical analysis*, London
Heurgon, J, 1951 The Amiens Patera, *J Roman Stud*, **41**, 22–4
—, 1958 *Le Trésor de Tenes*, Paris
Higham, N, 1981 The Roman impact upon rural settlement in the north, in *Rural settlement in the Roman north*, (eds P Clark and C Hazelgrove), Newcastle upon Tyne
—, 1992 *Rome, Britain, and the Anglo-Saxons*, London
Hildyard, E J W, 1945 The ancestry of the Trumpet fibula, *Antiq J*, **25**, 154–8
—, 1958 *Cataractonium* fort and town, *Yorks Archaeol J*, **39**, 242–65
Hill, P H, 1990a *Whithorn 3: excavations 1988–90, interim report*, Whithorn
—, 1990b *The Whithorn excavation, 1990 supplement*, Whithorn
Hill, P R, 1981 Stonework and the archaeologist: including a stonemason's view of Hadrian's Wall, *Archaeol Aeliana*, 5 ser, **9**, 1–22
—, 1991a Survey of excavated and standing stone, Birdoswald Roman fort: parts 1 and 2, unpubl report in Birdoswald site archive
—, 1991b Hadrian's Wall: some aspects of its execution, *Archaeol Aeliana*, 5 ser, **19**, 33–9
—, 1992 Survey of excavated and standing stone, Birdoswald Roman fort: part 3, unpubl report in Birdoswald site archive
Hill, P R, and Dobson, B, 1992 The design of Hadrian's Wall and its implications, *Archaeol Aeliana*, 5 ser, **20**, 27–52
Hind, J G F, 1989 The Vallum, the Turf Wall, and the Brigantes, *Northern Hist*, **25**, 1–17
Hingley, R, 1989 *Rural settlement in Roman Britain*, London
Hird, M L, forthcoming The Roman pottery, in McCarthy forthcoming, Fascicule 3, *The Roman and medieval pottery*
Hodgson, E, 1897 Notes on the excavations on the line of the Roman Wall in Cumberland, in 1894 and 1895, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **14**, 390–407
—, 1898 Notes on the excavations on the line of the Roman Wall in Cumberland, in 1896 and 1897, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **15**, 201–10
—, 1899 Notes on the excavations on the line of the Roman Wall in Cumberland, in 1898, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **15**, 365–76
Hodgson, G W I, 1968 A comparative account of the animal remains from Corstopitum and the Iron Age site of Catcote near Hartlepool, County Durham, *Archaeol Aeliana*, 4 ser, **46**, 127–62
—, 1971 Report on the animal remains recovered from the site of the Roman fort at South Shields (County Durham), *Archaeol Aeliana*, ser 4, **49**, 135–7
Hodgson, G W I, and Smith, C, 1985 The animal remains, in Bidwell 1985, microfiche 2: G1–G7
Hodgson, J, 1840 *History of Northumberland*, part II, vol 1, Newcastle upon Tyne
Hoffman, H, and von Claer, V, 1968 *Antiker gold und silberschmuck*, Mainz
Hogg, A H A, 1968 Pen Llystyn: a Roman fort and other remains, *Archaeol J*, **125**, 101–92
Hogg, R, 1965 Excavation of the Roman auxiliary tilery, Brampton, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **65**, 133–68
Holbrook, N, 1991 A watching brief at the Roman fort of Benwell-*Condercum*, 1990, *Archaeol Ael*, 5 ser, **19**, 41–5
Holbrook, N, and Bidwell, P, 1991 *Roman finds from Exeter*, Exeter Archaeol Rep, **4**, Exeter
Holder, P A, 1982 *The Roman army in Britain*, London
Hope, L E, and May T, 1917 *Catalogue of the Roman pottery in the museum, Tullie House, Carlisle*, Kendal
Hope-Taylor, B, 1966 Doon Hill, in Medieval Britain in 1965 (eds D M Wilson and D G Hurst), *Medieval Archaeol*, **10**, 175–6
—, 1977 *Yeavering, an Anglo-British centre of early Northumbria*, Dept of the Environment Archaeol Rep, 7, London
—, 1980 Balbridie and Doon Hill, *Current Archaeo*, **72**, 18–20
Horsely, J, 1728, *Britannia romana*, London
—, 1733 *Britannia romana*, 2 edn, reprinted Newcastle upon Tyne, 1974

Howard, P, 1979 *Camboglanna, Birdoswald fort on Hadrian's Wall: a short history and guide*, Newcastle upon Tyne

Howe, M D, Perrin, J R, and Mackreth, D F, 1981 *Roman pottery from the Nene valley: a guide*, Peterborough City Museum Occassional Paper, **2**, Peterborough

Hull, M R, 1958 *Roman Colchester*, Rep Res Comm Soc Antiq London, **20**, Oxford

—, 1963 *The Roman potters' kilns of Colchester* Rep Res Comm Soc Antiq London, **21**, Oxford

Huntley, B, Huntley, J P, and H J B Birks, 1981 PHYTOPAK: a suite of computer programs designed for the handling and analysis of phytosociological data, *Vegetatio*, **45**, 85–95

Huntley, J P, 1990 *Macrobotanical remains from the Roman fort of* Banna *(Birdoswald, Cumbria)*, Ancient Monuments Laboratory Report 104/91

Hurst, H R, 1986 *Gloucester: the Roman and later defences*, Gloucester

Hutchinson, M E, 1990 *Identification of material of three intaglii from Birdoswald, Cumbria*, Ancient Monuments Laboratory Report 104/91

Hutton, W, 1813 *The history of the Roman Wall*, reprinted 1990 as *The first man to walk Hadrian's Wall, 1802*, Newcastle upon Tyne

Innes, J B, 1988 Report on pollen analysis, from Midgeholme Moss, Birdoswald, Cumbria, unpubl, Inst Prehistoric Sci and Archaeol, University of Liverpool

Innes, J B, and Shennan, I, 1991 Palynology of archaeological and mire sediments from Dod, Borders Region, Scotland, *Archaeol J*, **148**, 1–45

Isaac, B, 1988 The meaning of the terms *limes* and *limitanei*, *J Roman Stud*, **78**, 125–47

Isings, C, 1957 *Roman glass from dated finds*, Groningen

Izard, K, 1993 *The animal bones from Birdoswald, CAS Site 420, Cumbria, 1987–90*, Ancient Monuments Laboratory Report 13/93

Jackson, K H, 1982 Brigomaglos and St Briog, *Archaeol Aeliana*, 5 ser, **10**, 61–6

Jackson, R, 1985 Objects of iron, in Bidwell 1985, 130–52

Jackson, R, and Potter T, 1996 *Excavations at Stonea, Cambridgeshire 1980–1985*, London

Jacobsen, G L, and Bradshaw, R H W, 1981 The selection of sites for paleovegetational studies, *Quaternary Research*, **16**, 80–96

James, E, 1988 *The Franks*, Oxford

James, S, 1984 Britain and the late Roman army, in *Military and civilian in Roman Britain: cultural relationships in a frontier province* (eds T F C Blagg and A King), BAR, **136**, 161–86, Oxford

James, S, Marshall, A, and Millett, M, 1984 An early medieval building tradition, *Arehaeol J*, **141**, 182–215

Jarrett, M G, 1969 *The Roman frontier in Wales*, Cardiff

Jarrett, M G, and Mann J C, 1970 Britain from Agricola to Gallienus, *Bonner Jahrbücher*, **170**, 178–210

Jarrett, M G, and Stephens, G R, 1987 The Roman garrisons of Maryport, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **87**, 62–6

Jenkins, F, 1958 The cult of the 'pseudo-Venus' in Kent, *Archaeologia Cantiana*, **72**, 60–76

Jewell, P A, and Dimbleby, G W, 1966 The experimental earthwork on Overton Down, Wiltshire, England: the first four years, *Proc Prehist Soc*, **32**, 313–42

Jobey, G, 1965 Stotts House 'tumulus' and the Military Way, Walker, *Archaeol Aeliana*, 4 ser, **17**, 77–86

Jobey, I, 1979 Housesteads ware: a Frisian tradition on Hadrian's Wall, *Archaeol Aeliana*, 5 ser, **9**, 127–43

Jobst, W, 1975 *Die römischen Fibeln aus Lauriacum*, Forschungen in Lauriacum, **10**, Linz

Johns, C, 1982 *Sex or symbol: erotic images of Greece and Rome*, London

Johnson, A, 1983 *Roman forts*, London

Johnson, P (ed), 1996 *Roman architecture in Britain: proceedings of a conference held at the Museum of London, 23–24 November 1991*, CBA Res Rep, London

Johnson, S, 1989 *Hadrian's Wall*, London

Jones, A H M, 1964 *The later Roman empire*, Oxford

Jones, G D B, and Little, J H, 1973 Excavations on the Roman fort at Pumpsaint, Carmarthenshire: interim report 1972, *Carmarthen Antiq*, **6**, 3–21

Jones, G B D, and Shotter, D C A, 1988 *Roman Lancaster: rescue archaeology in an historic city 1970–75*, Manchester

Jones, G B D, and Walker, J, 1983 Either side of Solway: towards a minimalist view of Romano-British agricultural settlement in the north-west, in Chapman and Mytum 1983, 205–32

Jones, M J, 1975 *Roman fort-defences to AD 117*, BAR, **21**, Oxford

Jones, R F J, 1981 Change on the frontier: northern Britain in the third century, in King and Henig 1981, 393–414

Journal of Roman Studies, 1954 Roman Britain in 1953, *J Roman Stud*, **44**, 81–111

—, 1960 Roman Britain in 1959, *J Roman Stud*, **50**, 210–42

—, 1961 Roman Britain in 1959, *J Roman Stud*, **51**, 157–98

Karnitsch, P, 1959 *Die Reliefsigillata von Ovilava*, Linz

Keevil, G D, 1991 Redlands farm villa, *Current Archaeology*, **122**, 52–5

Keevil, G D, Shotter, D C A, and McCarthy, M R, 1989 A *solidus* of Valentinian II from Scotch Street, Carlisle, *Britannia*, **20**, 254–5

Keller, E, 1971 *Die spätrömischen Grabfunde in Südbayern*, Münchner Beitr z Vor- und Frühgesch, **14**, München

Kent, J P C, 1951 Coin evidence and the evacuation of Hadrian's Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **51**, 4–15

Kenyon, K, 1948 *Excavations at the Jewry Wall site, Leicester*, Oxford

Keppie, L J F, and Arnold, B J, 1984 *Corpus Signorum Imperii Romani, Great Britain I, 4: Scotland*, Oxford

Keys, D, 1987 Britons took over Roman fortress *The Independent*, 7 September 1987

Kilbride-Jones, H E, 1938 Glass armlets in Britain, *Proc Soc Antiqs Scotland*, **72**, 366–95

—, 1980 *Zoomorphic penannular brooches*, London

Kilgour, I N L, 1985 *Soils in Cumbria III*, sheet NY 56 (Brampton), Soil Survey Record, **83**, Harpenden

Kilham, K, 1994 *Soil ecology*, Cambridge

King, A, 1984 Animal bones and the dietary identity of military and civilian groups in Roman Britain, Germany, and Gaul, in *Military and civilian in Roman Britain: cultural relationships in a frontier province* (eds T F C Blagg and A C King), BAR, **136**, 187–217, Oxford

King, A, and Henig, M (eds), 1981 *The Roman west in the third century: contributions from archaeology and history*, BAR, **109**, Oxford

Kingsley, W, 1960 *Chemistry for fire engineers*, London

Klein, F, 1995 *Die römische Villa Rustica in Oberndorf-Bochingen, Kreis Rottweil*, Archaologische Ausgrabungen in Baden-Württemburg 1994, Stuttgart

Knol, E, 1987 Knucklebones in urns: playful grave-goods in early medieval Friesland, *Helinium*, **27**, 280–88

Knorr, R, 1919 *Töpfer und Fabriken verzierter Terra Sigillata des ersten Jahrhunderts*, Stuttgart

Knowles, W H, and Forster, R H, 1909 Corstopitum: report on the excavations of 1908, *Archaeol Aeliana*, 3 ser, **5**, 305–424

Kromer, B, Rhein, M, Bruns, M, Schoch-Fischer, H, Munnich, K O, Stuiver, M, and Becker, B, 1986 Radiocarbon callibration data for the sixth to eighth millennia BC, *Radiocarbon*, **28**, 954–60

Krüger, T, 1982 Das Brett und Würfelspiel der Spätlatenzeit und römischen Kaiserzeit im freien Germanien, *Neue Ausgrabungen und Forschungen in Niedersachsen*, **15**, 135–324

Laing, L R, 1969 Timber halls in Dark Age Britain: some problems, *Trans Dumfries Galloway Natur Hist Antiq Soc*, **46**, 110–27

Lamb, H H, 1977 *Climate and man*, London

Lauwerier, R C G M, 1988 *Animals in Roman times in the Dutch eastern river area*, ROB, Nederlandse Oudheden, 12, Amersfoort

Lawson, A J, 1975 Shale and jet objects from Silchester, *Archaeologia*, **105**, 241–76

Lawson, W, 1966 The origin of the military road from Newcastle to Carlisle, *Archaeol Aeliana*, ser 4, **44**, 185–205

Leeds, E T, 1945 The distribution of Angles and Saxons archaeologically considered, *Archaeologia*, **91**, 1–106

LeQuesne, C, forthcoming *The Roman defences of Chester*

Lewis, M, 1993 A palynological investigation of deposits from Midgeholme Moss, a valley mire adjacent to Birdoswald Roman Fort, Hadrian's Wall, Cumbria, unpubl diss, King's College, Univ London

Liebeschuetz, W, 1986 Generals, federates, and *bucellarii* in Roman armies around AD 400, in *The defence of the Roman and Byzantine east* (eds P Freeman and D Kennedy), BAR, **S267**, Oxford, 463–74

—, 1993 The end of the Roman army in the western Empire, in Rich and Shipley 1993, 265–76

Limbrey, S, 1975 *Soil science and archaeology*, London

Ling, R, 1985, The mechanics of the building trade, in Grew and Hobley, 1985, 14–27

Linick, T W, Suess, H E, and Becker, B, 1985 La Jolla measurments of radiocarbon in south German oak tree-ring chronologies, *Radiocarbon*, **28**, 20–32

Liversidge, J, 1977 Roman burials in the Cambridge area, *Proc Cambs Archaeol Soc*, **67**, 11–38

Longley, D, 1982 The date of the Mote of Mark, *Antiquity*, **217**, 132–4

Loughlin, N, 1977 Dales ware: a contribution to the study of Roman coarse pottery, in Peacock 1977a, 84–146

Luff, R, 1982 *A zooarchaeological study of the Roman north-western provinces*, BAR, **S137**, Oxford

Lukis, W C, 1987 *The family memoirs of Rev William Stukeley vol III*, Pubs Surtees Soc, **80**, London

Lutz, M, 1971 Les vases de la forme Drag 29 et 29/37 de saturninus et Satto, *Rei Cretariae Romanae Fautorum Acta*, **13**, 56–81

Lysons, S, 1797 *An account of the Roman antiquities discovered at Woodchester in the county of Gloucester*, London

Maaskant-Kleibrink, M, 1978 *Catalogue of the engraved gems in the Royal Coin Cabinet, The Hague: the Greek, Etruscan, and Roman collections*, The Hague

McCarthy, M R, 1990 *A Roman, Anglian, and medieval site at Blackfriars Street*, Cumberland and Westmorland Antiq Archaeol Soc Res Ser, **4**, Kendal

—, 1991 *Roman waterlogged remains at Castle Street*, Cumberland and Westmorland Antiq Archaeol Soc Res Ser, **5**, Kendal

—, forthcoming *Roman and medieval Carlisle, The Lanes, volume 1: excavations at Old Grapes, Crown and Anchor, and Lewthwaites Lanes 1981–2*

McCarthy, M R, Summerson, H R T, and Annis R G 1990 *Carlisle castle: a survey and documentary history*, HBMCE Archaeol Rep, **18**, London

MacConnoran, P, 1982 Leather footwear, in Excavations at Queen Street, City of London, 1953–60 and Roman timber-lined wells in London (T Wilmott), *Trans London Middlesex Archaeol Soc*, 33, 55–61

—, 1986 Footwear, in Miller *et al* 1986, 218–26

McDonnell, J G, 1991 *The ironworking evidence from Birdoswald Roman fort, Cumbria*, Ancient Monuments Laboratory Report 100/91

MacGregor, A, 1974 The Broch of Burrian, North Ronaldsay, Orkney, *Proc Soc Antiqs Scot*, **105**, 63–118

—, 1978 Roman finds from Skeldergate and Bishophill, *The archaeology of York: the small finds*, **17/2**, 50–54

—, 1985 *Bone, antler, ivory, and horn: the technology of skeletal materials since the Roman period*, London

MacGregor, M, 1976 *Early Celtic art in north Britain*, Leicester

McHugh, M, forthcoming *Soils at Birdoswald: the environment and site function*, Ancient Monuments Laboratory Report

McIntire, W T, 1926 Triermain castle, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **26**, 247–54

McIntyre, J, and Richmond, I A, 1934 Tents of the Roman army and leather from Birdoswald, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **34**, 62–90

McKercher, R B, and Anderson, G, 1968 Content of inositol penta- and hexaphosphates in some Canadian soils, *J Soil Sci*, **19**, 47–55

MacKreth, D F, 1973 *Roman brooches*, Salisbury

—, 1990 The brooches, in McCarthy 1990, 105–13

Mallick, A U, and Gimingham, C H, 1985 Ecological effects of heather burning, 11 effects on seed germination and vegetative regeneration, *J Ecology*, **73**, 633–44

Maloney, C, 1990 *The Upper Walbrook in the Roman period*, The archaeology of Roman London, vol 1, CBA Res Rep, **69**, London

Maltby, M, 1979 *The animal bones from Exeter 1971–1975*, Exeter Archaeol Rep, **2**, Sheffield

Mann, J C, 1989 Birdoswald to Ravenglass, *Britannia*, **20**, 75–80

Manning, A, 1995 The effect of Roman occupation on vegetation in the north British frontier zone: a palynological study of ditch deposits at Vindolanda Roman fort Northumberland, unpubl BSc diss, Univ Edinburgh

Manning, W H, 1975a Economic influences on land use in the military areas of the Highland zone during the Roman period, in *The effect of man on the landscape: the Highland zone* (eds J Evans, S Limbrey, and H Cleere), CBA Res Rep, **11**, 112–16

—, 1975b Roman military timber granaries in Britain, *Saalburger Jahrbuch*, **32**, 105–29

—, 1976 Blacksmithing, in *Roman crafts* (eds D Strong and D Brown), 143–53

—, 1985 *Catalogue of the Romano-British iron tools, fittings, and weapons in the British Museum*, London

—, 1988 Timber gateways with a note on iron fittings, in Bidwell *et al* 1988, 1–24

Marsden, P, 1987 *The Roman forum site in London*, London

—, 1994 *Ships of the Port of London: first to eleventh centuries AD*, English Heritage Archaeol Rep, **3**, London

Marshall, F H, 1969 *Catalogue of the jewellery, Greek, Etruscan, and Roman in the Department of Antiquities, British Museum*, London

Mattingley, H, *et al*, 1923–67 *The Roman Imperial coinage*, London

Maxfield, V A, 1981 *The military decorations of the Roman army*, London

—, 1986 Pre-Flavian forts and their garrisons, *Britannia*, **17**, 59–72

Maxwell, G, 1972 Excavations on the Roman fort at Crawford, Lanarkshire, *Proc Soc Antiqs Scot*, **104**, 147–200

—, 1974 Objects of glass, in Rae and Rae 1974, 163–224

May, T, 1904 *Warrington's Roman remains*, Warrington

—, 1930 *Catalogue of the Roman pottery in the Colchester and Essex Museum*, Cambridge

May, T, and Hope L E, 1917 Catalogue of the Roman pottery in the museum, Tullie House, Carlisle, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **17**, 114–97

Meek, A, and Gray, R A H, 1911 Report of the 1910 excavations at Corstopitum: animal remains, *Archaeol Aeliana*, 3 ser, **7**, 220–67

Metcalfe, A C, and Longmore, R B, 1973 Leather artefacts from Vindolanda, *Trans Museum Assistants Group*, **12**, 38–43

Mercer, E, 1975 *English vernacular houses*, London

Miket, R, 1978 Two early Anglo-Saxon brooches from Chesters and Chesterholm *Archaeol Aeliana*, 5 ser, **6**, 177–80

—, 1982 An Anglo-Saxon Small-Long brooch from Hylton, *Archaeol Aeliana*, 5 ser, **10**, 213

—, 1984 An Anglo-Saxon Small-Long brooch from Cleadon, Tyne and Wear, *Archaeol Aeliana*, 5 ser, **13**, 214–16

—, 1985 Two Anglo-Saxon brooches provenanced to near Corbridge, Northumberland, *Archaeol Aeliana*, 5 ser, **10**, 213

Miket, R, and Pocock, M, 1976 An Anglo-Saxon cemetery at Greenbank, Darlington, *Medieval Archaeol*, **20**, 62–74

Miles, D (ed), 1982 *The Romano-British countryside: studies in rural settlement and economy*, BAR, **103(ii)**, Oxford

Miller, L, Schofield, J, and Rhodes, M 1986 The Roman quay at St Magnus House, London, *London Middlesex Archaeol Soc Special Paper, 8, London*

Millett, M, 1981 Whose crisis? The archaeology of the third century: a warning, in King and Henig 1981, 525–30

—, 1987 A question of continuity: Rivenhall reviewed, *Archaeol J*, **144**, 434–8

—, 1990 *The Romanisation of Britain*, Cambridge

Millett, M, and James, S, 1983 Excavations at Cowdery's Down, Basingstoke, Hampshire 1978–81, *Archaeol J*, **140**, 151–279

Milne, G, 1985 *The port of Roman London*, London

Mook, W G, 1986 Recommendations/resolutions adopted by the twelfth International Radiocarbon Conference, *Radiocarbon*, **28**, 799

Moore, P D, 1988 The development of moorland and upland mires, in *Archaeology and the flora of the British Isles: human influence on the evolution of plant communities* (ed M Jones), Oxford Univ Comm Archaeol Monograph, **14**, Botanical Soc Brit Isles Conference Rep, **19**, 116–22

—, 1993 The origin of the blanket mire revisited, in *Climate change and human impact on the landscape* (ed F M Chambers), London, 217–24

Moore, P D, Evans A T, and Chater, M, 1986 Palynological and stratigraphic evidence forhydrological changes in mires associated with human activity, in *Anthropogenic indicators in pollen diagrams* (ed K-E Behre), Rotterdam, 209–20

Moore, P D, Webb, J A, and Collinson, M E, 1991 *Pollen analysis*, 2 edn, Oxford

Morgan, G C, 1988 A survey of Romano-British wallplaster, *J Oil and Colour Chemists' Assoc*, **12**, 417–28

Morin-Jean, 1913 *La verrerie en Gaule sous l'empire romain*, Paris

Morris, J, 1973 *The age of Arthur*, London

Morris, P, 1979 *Agricultural buildings in Roman Britain*, BAR, **70**, Oxford

Mould, Q, 1990 The leather objects, in Wrathmell and Nicholson 1990, 231–5

—, 1991 Metalwork, in Austen 1991, 185

Murdoch, T, 1991 *Trinkets and treasures*, Museum of London, London

Murphy, C P, 1986 *Thin section preparation of soils and sediments*, Soil Survey of England and Wales, Rothamstead

Murray, A S, 1895 On a bronze statuette of Hercules, *Archaeologia*, **55**, whole issue

Mylius, H, 1949 *Zur rekonstruktion der römischen Horrea in Trier, Trierer Zeitschrift*, **1949**, 98–106

Nash Williams, V E, 1932 The Roman legionary fortress at Caerleon, II, *Archaeol Cambrensis*, **87**, 99–157

National Fire Protection Association, 1948 *National Fire Protection Association handbook*, Massachusetts

Neal, D S, Wardle A, and Hunn, J, 1990 *Excavation of the Iron Age, Roman, and medieval settlement at Gorhambury, St Albans*, HBMCE Archaeol Rep, **14**, London

Németh, M, 1991 Aquincum: Erschlie ungen in den Jahren 1981–88, *Budapest Régiségei*, **28**, 97–106

Newbold, P, 1913 Pottery and periods of occupation, in Simpson 1913, 339–59

Newman, R, 1984 The problems of rural settlement in northern Cumbria in the pre-Conquest period, in *Studies in late Anglo-Saxon settlement* (ed M L Faull), Oxford, 155–76

Niblett, R, 1985 *Sheepen: an early Roman industrial site at Camulodunum*, CBA Res Rep, **57**, London

Nikolaus-Havé, F, 1986 Der Herkules von Birdoswald-Unikum oder Fälschung, *Archäeologische Anzeiger*, **3**, 571–81

Norman, H, 1860 An account of recent excavations at Amboglanna (Birdoswald), *Archaeol Aeliana*, 2 ser, **4**, 249

Norman, H J, 1987 Heathland vegetation succession and the associated pollen record following a fire in 1976: Trotton Common, West Sussex, unpubl diss, King's College, Univ London

Nouwen, R, 1996 The Vindolanda Tablet 88/841 and the cohors I Tungrorum Millaria, in *Archaeological and historical aspects of west-European societies* (ed M Lodewijkx), Acta Archaeologica Lovaniensia Monographiae, 8, 123–4, Leuven

Oakley, G E, and Hall, A D, 1979 The spinde whorls, in *St Peters Street, Northampton: excavations 1973–76* (J H Willims), Northampton Archaeol Monograph, **2**, 286–90, Northampton

O'Connor, T, 1984 *Bones from the General Accident site*, The Archaeology of York, **15/2**, London

—, 1986 The animal bones, in *The legionary fortress at Caerleon, volume II: the finds* (ed J D Zienkiewicz), 223–46, Cardiff

Oldenstein, J, 1986 Neue Forschungen im spätrömischen Kastell von Alzey: Vorbericht über die Ausgrabungen 1981–85, *Bericht der Romisch-Germanischen Kommission*, **67**, 289–356

Oliver, A, 1984 Early Roman facetted glass, *J Glass Stud*, **26**, 35–63

Olivier, A C H, 1979 Brooches, in Potter 1979, 206–12

Ordnance Survey, 1975 *Ordnance Survey map of Hadrian's Wall*, 2 edn

Ormsby, G (ed), 1878 *Selections from the Household Books of Lord William Howard of Naworth Castle*, Pub Surtees Soc, **68**

Oswald, F, 1937 *Index of figure types on* terra sigillata *(samian ware)*, Liverpool

—, 1948 *The* terra sigillata *(samian ware) from Margidunum*, Nottingham

Padley, T G, 1989 The leather shoes from Castle Street, Carlisle, *Archaeological Leather Group Newsletter*, **6**, 2–5

—, forthcoming *The Roman and medieval finds*, in McCarthy forthcoming, Fascicule **2**

Page, A L, Miller, D R, and Keeney, D R, 1982 *Methods of soil analysis, part 2, chemical and microbial properties*, Agronomy, **9**

Painter, K S, 1968 in Harden *et al*, 1968

Pauli, L, 1980 *The Alps: archaeology and early history*, London

Payne, S, 1987 Reference codes for wear states in the mandibular cheek teeth of sheep and goats, *J Archaeol Sci*, **14**, 609–14

Payne, S, and Bull, G, 1988 Components of variation in measurements of pig bones and teeth, and the use of measurements to distinguish wild from domestic pig remains, *Archaeozoologia*, **2**, 27–66

Peacock, D P S, 1977a *Pottery and early commerce: characterization and trade in Roman and later ceramics*, London

—, 1977b Bricks and tiles of the *Classis Britannica:* petrology and origin, *Britannia*, **8**, 235–48

Peacock, D P S, and Williams, D F, 1986 *Amphorae and the Roman economy: an introductory guide*, London

Pearson, G W, and Stuiver, M, 1986 High precision calibration on the radiocarbon timescale, 500–2500 BC, *Radiocarbon*, **28**, 839–62

Pearson, G W, Pilcher, J R, Baillie, M G L, Corbett, D M, and Qua, F, 1986 High precision C14 measurement of the Irish oaks to show the natural C14 variations from AD 1840–5210 BC, *Radiocarbon*, **28**, 911–62

Pentecost, A, 1984 *Introduction to freshwater algae*, Richmond

Percival, J, 1976 *The Roman villa*, London

Perrin, J R, 1995 Roman coarse pottery, in Phillips and Heywood 1995, 324–45

Petch, J A, 1928 Excavations at Benwell (Condercum), second interim report, *Archaeol Aeliana*, 4 ser, **5**, 46–74

Petculescu, L, 1987 Roman military granaries in Dacia, *Saalburg Jahrbuch*, **43**, 66–76

Pettry, D E, and Bense, J A, 1989 Anthropic epipedons in the Tombigbee valley of Mississippi, *Soil Sci Soc America J*, **53**, 505–11

Pflaum, H-G, 1955 Deux carrieres equéstres de Lambese et de Zana, *Lybica*, **3**, 123–54

—, 1961 *Les carrieres procuratoriennes equéstres sous le haut-empire romain*, Paris

Phillips, D, and Heywood, B, 1995 *Excavations at York Minster, volume I: from Roman fortress to Norman cathedral*, London

Phillips, E J, 1976 Unfinished Roman sculptures in north Britain, *Archaeol J*, **133**, 50–56

—, 1977 *Corpus Signorum Imperii Romani, Great Britain I, 1: Corbridge, Hadrian's Wall east of the North Tyne*, Oxford

Philp, B, 1981 *The excavation of the Roman forts of the Classis Britannica at Dover, 1970–77*, Dover

Pilcher, J R, 1991a Radiocarbon dating, in *Quaternary dating methods: a users guide* (eds PL Smart and P D Frances), 16–36, Cambridge

—, 1991b Radiocarbon dating for the Quaternary scientist, in *Radiocarbon dating: recent applications and future potential* (ed J J Lowe), *Quaternary Proceedings*, **1**

—, 1993 Radiocarbon dating and the palynologist: a realistic approach to precision and accuracy, in *Climate change and human impact on the landscape* (ed F M Chambers), London

Pitt-Rivers, A H L F, 1884 *Excavations at Cranborne Chase near Rushmore on the borders of Dorset and Wiltshire*, London

Pitts, L, and St. Joseph, J K, 1985 *Inchtuthil: the Roman Legionary Fortress*, Britannia Monogr Ser, **6**, London

Potter, H G, 1855a Amboglanna: communicated to the Society of Antiquaries of Newcastle upon Tyne, Nov 6, 1850, *Archaeol Aeliana*, 1 ser, **4**, 63–9

—, 1855b Amboglanna: communicated to the Society of Antiquaries of Newcastle upon Tyne, Nov 5, 1851, *Archaeol Aeliana*, 1 ser, **4**, 69–75

—, 1855c Amboglanna: communicated to the Society of Antiquaries of Newcastle upon Tyne, Dec 1852, *Archaeol Aeliana*, 1 ser, **4**, 141–9

Potter, T W, 1979 *Romans in north-west England*, Cumberland Westmorland Antiq Archaeol Soc Res Ser, **1**, Kendal

Prescott, J E, 1897 *The registry of the Priory of Wetherhal*, Kendal

Price, J, 1977 The Roman glass, in Excavations at Lincoln Road, London Borough of Enfield, 1974–1976 (A Gentry, J Ivens, and H McClean), *Trans London Middlesex Archaeol Soc*, **28**, 101–89

—, 1979 The glass, in Frocester Court Roman Villa, 2nd Report 1968–77, the courtyard (HS Gracie and E G Price), *Trans Bristol Gloucs Archaeol Soc*, **97**, 9–64

—, 1980 The Roman glass, in Excavations in Park Street, Towcester, 1963–8 (G Lambrick), *Northants Archaeol*, **15**, 35–118

—, 1983 The Roman vessel glass, in *The east and north gates of Gloucester* (C Heighway), Western Archaeol Trust Excav Monogr, **4**, 168–70

—, 1985a The Roman glass, in *Inchtuthil, the Roman legionary fortress* (L F Pitts and J K St Joseph, Britannia Monogr, **6**, 303–12

—, 1985b The glass, in Bidwell 1985, 206–14

—, 1986 Vessels of glass, in *Archaeology at Barton Court Farm, Abingdon, Oxon* (D Miles), CBA Res Rep, **50**, Oxford

—, 1987 Glass from Felmongers, Harlow in Essex: a dated deposit of vessel glass found in an Antonine pit, *Annales du 10e Congrès de l'Association Internationale pour l'Histoire du Verre*, Paris, 185–206

—, 1988 Romano-British bangles from East Yorkshire, in *Recent research in Roman Yorkshire* (eds J Price and P R Wilson), BAR, **193**, Oxford, 339–66

—, 1989 The glass, in *Pentre Farm, Flint 1976–81* (T J O'Leary), BAR, **207**, Oxford, 77–86

—, 1990 Roman vessel and window glass, in McCarthy 1990, 163–79

Price, J, and Cool, H E M, 1983 Glass from the excavations of 1974–76, in Excavations at Towcester, Northamptonshire: the Alchester Road suburb (A E Brown and C Woodfield), *Northants Archaeol*, **18**, 115–124

Price, J, and Cottam, S, 1994 Glass, in *Roman Alcester, southern extramural area 1964–1966 excavations: Part 2, Finds and discussion* (eds S Cracknell and C Mahany), CBA Res Rep, **97**, Oxford, 224–8

Price, J, and Cottam, S, 1996 Glass, in *Excavations at Fichbourne 1969–88* (B Cunliffe, A Down, and D Rudkin), Chichester

Punt, W, and Clarke G C S, 1984 *The north-west European pollen flora I*, Oxford

Punt, W, Blackmore, S, and Clarke, G C S (eds), 1988 *The north-west European pollen flora V*, Oxford

Raddatz, K, 1981 *Sörup I: ein Gräberfeld der Eisenzcit in Angeln, Offa-Bücher*, **46**, Neumünster

Rae, A, and V, 1974 The Roman fort at Cramond, Edinburgh: excavations 1954–66, *Britannia*, **5**, 163–224

Rahtz, P A 1977 The archaeology of West Mercian towns, in *Mercian Studies* (ed A Dornier), 107–31, Leicester

—, 1982 Celtic society in Somerset, AD 400–700, *Bull Board Celtic Studies*, **30**, 176–200

Rahtz, P A, and Watts, L, 1989 Pagan's Hill revisited, *Archaeol. J*, **146**, 330–71

Rahtz, P A, Woodward, A, Burrow, I, Everton, A, Watts, L, Leach, P, Hirst, S, Fowler, P, and Gardner, K, 1992 *Cadbury-Congresbury 1968–73: a late Roman hilltop settlement in Somerset*, BAR, **223**, Oxford

Ramm, H G, McDowall, R W, and Mercer, E, 1970, *Shielings and bastles*, London

Reece, R, 1974 Clustering of coin finds in Britain, France, and Italy, in *Coins and the Archaeologist* (eds J Casey and R Reece), BAR, **4**, 64–77, Oxford

—, 1987 *Coinage in Roman Britain*, London

Rees, S E, 1979 *Agricultural implements in prehistoric and Roman Britain*, BAR, **69**, Oxford

Reynolds, N, 1980 Dark Age timber halls, and the background to the excavation at Balbridie, in *Settlements in Scotland 1000 BC–AD 1000* (ed L M Thomas), Scottish Archaeological Forum, **10**, 41–60

Rhodes, M, 1980 Leather footwear, in *Excavations at Billingsgate Buildings 'Triangle', Lower Thames Street, London, 1974* (D M Jones), London Middlesex Archaeol Soc Special Paper, **4**, 99–128, London

—, 1991 The shoe, in The Roman body found on Grewelthorpe Moor in 1850: a reappriasal (R C Turner, M Rhodes, and J P Wild), *Britannia*, **22**, 191–201

R C Turner, M, Rhodes, and J P Wild,

Rich, J, and Shipley, G (eds), 1993 *War and society in the Roman world*, London

Richardson, K M, 1960 A Roman brooch from the Outer Hebrides with notes on others of its type, *Antiq J*, **60**, 200–13

Richmond, I A, 1929 Excavations on Hadrian's Wall in the Gilsland-Birdoswald-Pike Hill Sector, 1928, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **29**, 303–15

—, 1930a The University excavations on Hadrian's Wall, 1929, *Durham Univ J*, **March 1930**, 1–7

—, 1930b The University excavations on Hadrian's Wall, 1930, *Durham Univ J*, **December 1930**, 1–7

—, 1931 Excavations on Hadrian's Wall in the Birdoswald-Pike Hill Sector, 1930, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **31** 122–34

—, 1950a A Roman wrist purse from Birdoswald, in Recent excavations at Birdoswald (J P Gillam), *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **50**, 69

—, 1950b Excavations on the Roman fort at Newstead, 1947, *Proc Soc Antiqs Scot* **84**, 1–37

—, 1954 The Birdoswald hoard and its composition, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **54**, 56–61

—, 1955 Roman Britain and Roman military antiquities, *Proc Brit Acad*, **41**, 297–315

—, 1956a Excavations at Milecastle 49 (Harrows Scar), *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, 56, 18–27

—, 1956b Cote How tower (16a) on the Cumberland Coast, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **56**, 62–6

—, (ed) 1957 *J Collingwood Bruce's Handbook to the Roman Wall*, 11 edn, Newcastle upon Tyne

—, 1961 A new building inscription from the Saxon Shore fort at Reculver, Kent, *Antiqs J*, **41**, 224–8

—, 1963 *Roman Britain*, 2 edn, London

Richmond, I A, and Birley, E B, 1930 Excavations on Hadrian's Wall in the Birdoswald- Pike Hill sector, 1929, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **30** 169–205

Richmond, I A, and Child, F A, 1942 Gateways of forts on Hadrian's Wall, *Archaeol Aeliana*, 4 ser, **20**, 134–54

Richmond, I A, and Gillam, J P, 1950 Excavations on the Roman site of Corbridge 1946–49, *Archaeol Aeliana*, 4 ser, **28**, 152–201

Richmond, I A, and Hodgson, K S, 1934 Excavations at Castlesteads, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **34**, 159–65

Richmond, I A, and McIntyre, J, 1939 The Agricolan fort at Fendoch, *Proc Soc Antiqs Scotland*, **73**, 110–54

Richmond, I A, and Simpson, F G 1935 6 The use of clay instead of turf in the Great Wall at Randylands and Garthside, in Report of the Cumberland Excavation Committee for 1934, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **35**, 244–7

Ricken, H, 1948 *Die Bilderschüsseln der römischen Töpfer von Rheinzabern, Tafelband*, Speyer

Ricken, H, and Fischer, C, 1963 *Die Bilderschüsseln der römischen Töpfer von Rheinzabern, Textband*, Bonn

Rickman, G E, 1971 *Roman granaries and storebuilding*, Cambridge

Ritchie, A, and Breeze, D J, 1990 *Invaders of Scotland*, Edinburgh

Rivet, A L F, and Smith, C, 1979 *The place names of Roman Britain*, London

Robinson, H R, 1975 *The armour of Imperial Rome*, London

Robertson, A, Scott, M, and Keppie, L, 1975 *Bar Hill: a Roman fort and its finds*, BAR, **16**, Oxford

Rodwell, W J, and Rodwell, K A, 1985 *Rivenhall: investigations of a villa, church, and village, 1950–1977*, CBA Res Rep, **55**, Chelmsford Archaeol Trust Rep, **4**, London

Roes, A, 1963 *Bone and antler objects from the Frisian Terp mounds*, Haarlem

Rogers, G B, 1974 *Poteries sigilées de la Gaule centrale*, Gallia supplément, **28**, Paris

Ross, A, 1974 *Pagan Celtic Britain. studies in iconography and tradition*, London

Ross, L, 1971 Romano-British shoes from London, unpubl MA diss, Inst Archaeol, Univ London

Rouvier-Jeanlin, M, 1972 *Les figurines gallo-romaines en terre cuite au Musée des Antiquités Nationales*, Gallia Supplément, **24**, Paris

RCHME, 1972 *Inventory of the historic monuments in the City of York, II: the defences*, London

Roxan, M, 1985 The Roman military diploma, in Bidwell 1985, 93–102

Rowland, T H, 1987 *Medieval castles, towers, peles, and bastles of Northumberland*, Warkworth

Ryder, M L, 1970 The animal remains from Petergate, York 1957–58, *Yorks Archaeol J*, **42**, 418–28

Ryder, P F, 1990 Bastles and towers in the Northumberland National Park, unpubl, Northumberland CC

—, 1992a Bastles and bastle-like buildings in Allendale, Northumberland, *Archaeol J*, **149**, 351–79

—, 1992b Fortified buildings, in Grundy *et al* 1992, 58–67

Sainsbury, I, and Welfare, H, 1990 The Roman fort at Bewcastle: an analytical field survey, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **90** 139–46

St Joseph, J K, 1951 Air reconnaissance of north Britain, *J Roman Stud*, **41**, 52–65

Salway, P, 1965 *The frontier people of Roman Britain*, Cambridge

—, 1981 *Roman Britain*, Oxford

Salzman F, 1967 *Building in England down to 1540*, Oxford

Scarth, H M, 1864 *Aquae Sulis, or notices of Roman Bath*, London

Schönberger, H, 1969 The Roman frontier in Germany: an archaeological survey, *J Roman Stud*, **59**, 144–97

—, 1975 Kastell Künzing-Quintana: die Grabungen von 1958 bis 1966, *Limesforschungen*, **13**, Berlin

Scull, C, 1991 Post-Roman Phase I at Yeavering: a re-construction, *Medieval Archaeol*, **35**, 51–63

Selkirk, A, 1980 Balbridie, *Current Archaeol*, **70**, 326–8

Sennequier, G, 1985 *Verrerie d'epoque romaine: collections des Musée Départementaux de Seine-Maritime*, Rouen

Sharpley, A N, and Smith, S J, 1989 Fractionation of inorganic and organic phosphorus in virgin and cultivated soils, *Soil Science Soc America Proc*, **49**, 127–30

Sharpley, A N, Tiessen, H, and Cole, C V, 1987 Soil phosphorus forms extracted by soil tests as a function of pedogenesis, *Soil Sci Soc America J*, **51**, 362–5

Shaw, R C, 1926 Excavations at Willowford, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **26**, 429–506

Sherlock, S J, and Welch, M G, 1992 *An Anglo-Saxon cemetery at Norton, Cleveland*, CBA Res Rep, **82**, London

Shiel, N, 1977 Carausian and Allectan coin evidence from the northern frontier, *Archaeol Aeliana*, 5 ser, **5**, 75–6

Shotter, D, 1995 *Roman coins from north-west England: first supplement, 1995*, Lancaster

Simpson, F G, 1913 Excavations on the line of the Roman Wall in Cumberland during the years 1909–1912, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **13**, 297–397

—, 1928 Excavations on Hadrian's Wall in the Gilsland-Birdoswald-Pike Hill sector, 1927, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **28**, 377–88

—, 1930 Note, in Richmond and Birley 1930, 202–5

Simpson, F G, and MacIntyre, J 1933 2 Banks Burn to Randylands, in Report of the Cumberland Excavation Committee for 1932, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **33**, 262–71

Simpson, F G, and Richmond, I A, 1932 1 Birdoswald, in Report of the Cumberland Excavation Committee for 1931: Excavations on Hadrian's Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **32**, 140–45

—, 1933 1 Birdoswald, in Report of the Cumberland Excavation Committee for 1932: Excavations on Hadrian's Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **33**, 246–62

—, 1934a 1 Birdoswald, in Report of the Cumberland Excavation Committee for 1933: Excavations on Hadrian's Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **34**, 120–30

—, 1934b 5 Banks East Turret, 52a, in Report of the Cumberland Excavation Committee for 1933: Excavations on Hadrian's Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **34**, 148–52

—, 1935 6 The use of clay instead of turf in the Great Wall at Randylands and Garthside, in Report of the Cumberland Excavation Committee for 1934, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, 35, 244–7

—, 1936 The Roman fort on the Stanegate and other remains at Old Church, Brampton, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **36**, 174

—, 1937a Report of the Cumberland Excavation Committee for 1936: The Vallum at Milecastles 51, Wall Bowers and 50TW, High House, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser **37**, 157–77

—, 1937b The fort on Hadrian's Wall at Halton, *Archaeol Aeliana*, 4 ser, **14**, 151–71

—, 1941 The Roman fort on Hadrian's Wall at Benwell, *Archaeol Aeliana*, 4 ser, **19**, 1–43

—, 1952 The Roman fort at Drumburgh, in Report of the Cumberland Excavation Committee for 1947–1949, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser **52**, 9–16

Simpson, F G, Richmond I A, and McIntyre, J, 1934 3 Garthside turrets, 54a, in Report of the Cumberland Excavation Committee for 1933: Excavations on Hadrian's Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **34**, 138–44

—, 1934b 4 Milecastles on the line of the Turf Wall, in Report of the Cumberland Excavation Committee for 1933: Excavations on Hadrian's Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **34**, 144–8

—, 1935 1 The stone wall, turf wall and Vallum west of Burgh-by-Sands, in Report of the Cumberland Excavation Committee for 1934, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **35**, 213–20

Simpson, F G, Richmond I A, and St Joseph, K, 1935a 2 The turf wall milecastle at High House, in Report of the Cumberland Excavation Committee for 1934, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **35**, 220–32

—, 1935b 4 The turf wall turrets between Wallbowers and Harrow's Scar, in Report of the Cumberland Excavation Committee for 1934, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **35**, 232–6

—, 1936 1 The Vallum at High House turf wall milecastle 50 TW, in Report of the Cumberland Excavation Committee for 1935, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **36**, 158–70

Simpson, F G, and Shaw, R C, 1922 The purpose and date of the Vallum and its crossings, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **22**, 353–433

Simpson, G, 1964 *Britons and the Roman army*, Oxford

—, (ed), 1976 *Watermills and military works on Hadrian's Wall*, Kendal

—, 1995 The samian pottery, in Phillips and Heywood 1995, 272–90

Simpson, G, Hawkes, C F C, and Hull, M R, 1979 Some British and Iberian penannular brooches and other early types in the Rhineland and the '*Decumantes Agri*', *Antiqs J*, **59**, 319–42

Simpson, G, and Rogers, G, 1969 Cinnamus de Lezoux et quelques potiers contemporains, *Gallia*, **27**, 3–14

Smith, G H, 1978 Excavations at Tarraby Lane, *Britannia*, **9**, 19–56

Smith, I M, 1982 Recent excavations at the Dod, in *Later prehistoric settlement in south-east Scotland* (ed D W Harding), Univ Edinburgh, Dept Archaeol Occas Pap, **8**, 129–35

—, forthcoming *Excavations at the Dod, Borders Region, 1979–81*

Smith, J T, 1963 Romano-British aisled houses, *Archaeol J*, **120**, 1–30

—, 1981 The problems of cruck construction and the evidence of distribution maps, in Alcock 1981, 5–24

Smith, R A, 1914 Irish brooches of five centuries, *Archaeologia*, **67**, 223–50

Snape, M E, 1992 Sub-Roman brooches on the northern frontier, *Archaeol Aeliana*, 5 ser, **20**, 158–60

—, 1993 *Roman brooches from northern Britain: a classification and a catalogue of brooches from sites on the Stanegate*, BAR, **235**, Oxford

—, 1994 The brooches, in Bidwell and Speak 1994, 177–84

Society of Antiquaries of Newcastle upon Tyne, 1865 Fibulae from *Borcovicus*, *Arch Aeliana*, 2 ser, **6**, 225

—, 1946 Report of the council for the year ending 31st December 1945, *Proc Soc Antiqs Newcastle upon Tyne*, 4 ser, **10**, 274–80

Sommer, C S, 1984 *The military vici in Roman Britain*, BAR, **129**, Oxford

Spier, J, 1992 *Ancient gems and finger rings: catalogue of the collections of the J Paul Getty Museum*, Malibu

Stace, C, 1991 *New flora of the British Isles*, Cambridge

Stanfield, J A, 1929 Unusual forms of terra sigillata, *Archaeol J*, **86**, 113–50

Stanfield, J A, and Simpson, G, 1958 *Central Gaulish potters*, London

—, 1990 *Les potiers de Gaule centrale*, Rev Arch Sites, Hors-série, **37**, Gonfaron

Steane, K (ed), 1992 *Interpretation of stratigraphy: a review of the art*, CLAU Archaeol Rep, **31**, Lincoln

—, 1993 Land use diagrams: a hierarchy of site interpretation, in Barber 1993, 11–14

Stevens, C E, 1966 *The building of Hadrian's Wall*, Cumberland Westmorland Antiq Archaeol Soc, extra ser, **20**, Kendal

Strickland, T J, 1994 The survival of Roman Chester: an overview, in *Excavations at Chester: Saxon occupation within the Roman fortress* (S Ward), City Chester Archaeol Service Excav Survey Rep, 7, 5–17

Stuiver, M, and Pearson, G W, 1986 High precision calibration of the radiocarbon timescale AD 1950–500 BC, *Radiocarbon*, **28**, 805–38

Stuiver, M, Kromer, B, Becker, B, and Ferguson, C W, 1986 Radiocarbon age calibration back to 13,300 years BP and the C14 age-matching of the German oak and US bristlecone pine chronologies, *Radiocarbon*, **28**, 969–79

Stuiver, M, and Reimn, P J, 1986 A computer program for radiocarbon age calculation, *Radiocarbon*, **28**, 1022–30

Stukeley, W, 1725 *Itinerarium curiosum*, 2 edn, London

Summerson, H R T, 1990 Section 2: the history of Carlisle Castle from 1092 to 1962, in McCarthy, Summerson, and Annis 1990, 118–260

—, 1993 *Medieval Carlisle: the city and the Borders from the late eleventh to the mid-sixteenth century*, Cumberland Westmorland Antiq Archaeol Soc, extra ser, **25**, Kendal

Swan, V G, 1984 *The Roman pottery kilns of Roman Britain*, RCHM supplementary ser, **5**, London

Swanton, M J, 1973 *The spearheads of the Anglo-Saxon settlements*, London

—, 1974 *A corpus of pagan Anglo-Saxon spear types*, BAR, **7**, Oxford

Swift, M J, Heal, O W, and Anderson, J M, 1979 *Decomposition in terrestrial ecosystems: studies in ecology*, **5**, Oxford

Swinbank, B, 1952 Excavations at High House paddock, Cumberland, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **52**, 46–54

—, 1954 The Vallum reconsidered, unpubl PhD thesis, Univ Durham

Swinbank, B, and Gillam, J P, 1951 Pottery from the Vallum filling at Birdoswald, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **50**, 54–62

Syers, J K G, Smillie, G W, and Williams, J D H, 1972 Calcium fluoride formation during extraction of calcareous soils with fluoride: I implications to inorganic P fractionation schemes, *Soil Sci Soc America Proc*, **36**, 20–25

Tainter, J A, 1988 *The collapse of complex societies*, Cambridge

Taylor, J, 1991 *The Roman pottery from Castle Street*, McCarthy 1991, Fascicule 4, Carlisle

Thomas, C, 1986 *Celtic Britain*, London

Thomas, E, and Witschel, C, 1992 Constructing reconstruction: claim and reality of Roman building inscriptions from the Latin West, *Papers Brit School Rome*, **60**, 135–77

Thompson, F H, 1958 A Romano-British pottery kiln at North Hykeham, Lincolnshire: with an appendix on the typology, dating, and distribution of Rustic ware in Great Britain, *Antiq J*, **38**, 15–53

Thornton, J H, 1991 Shoe leather, in Austen 1991, 219–24

Thorpe W A, 1934 A glass jug of Roman date from Turriff, *Proc Soc Antiqs Scotland*, **68**, 439–43

—, 1935 *English Glass*, London

Tiessen, H, Stewart, J W B, and Cole, C V, 1984 Pathways of phosphorus transformations in soils of differing pedogenesis, *Soil Sci Soc America J*, **48**, 853–8

Tiessen, H, Stewart, J W B, and Moir, J O, 1983 Changes in organic and inorganic phosphorus composition of two grassland soils and their particle size fractions during 60–90 years of cultivation, *J Soil Sci*, **34**, 815–23

Tipping, R, 1995 Holocene evolution of a lowland Scottish landscape: Kirkpatrick Fleming Part II, regional variation and land-use change, *The Holocene*, 5, 83–96

—, forthcoming Pollen analysis, late Iron Age and Roman agricultural change around Hadrian's Wall, in *Time, space, and culture in Iron Are Britain* (ed C Haselgrove), forthcoming

Tipping, R, and Carter, S, 1994 Soil pollen and micromorphological analyses of old ground surfaces on Biggar Common, Borders Region, Scotland, *J Archaeol Sci*, **21**, 387–401

Todd, J E, 1991 The Lanercost Cartulary, unpubl PhD thesis, Univ Lancaster

Tomlin, R S O, 1979 Meanwhile, in north Italy and Cyrenaica..., in Casey 1979b, 253–70

—, 1991 II Inscriptions, in Roman Britain in 1990 (S S Frere and R S O Tomlin), *Britannia*, **22**, 293–311

Tough, D L W, 1928 *The last years of a frontier*, Oxford

Toynbee, J M C, 1924 Britannia on Roman coins of the second century, *J Roman Stud*, **14**, 152

—, 1957 *Genii Cucullati, Latomus*, **28**, Leiden

—, 1963 *Art in Roman Britain*, London

—, 1964 *Art in Britain under the Romans*, London

Trans Cumberland Westmorland Antiq Archaeol Soc, 1886 Excursions and proceedings: a pilgrimage along the Roman Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, o ser, **9**, 124–51

Trotter, F M, and Hollingworth, S E, 1932 *The geology of the Brampton District*, London

Tufi, S R 1983 *Corpus Signorum Imperii Romani*, Great Britain I, 3: Yorkshire, *Oxford*

Turnbull, P, 1978 The phallus in the art of Roman Britain, *Bull Inst Archaeol*, **15**, 199–206

Turner, B J (ed), 1971 *British regional geology: northern England*, London

Turner, J, 1979 The environment of northeast England during Roman rimes as shown by pollen analysis, *J Arch Sci*, **6**, 285–90

—, 1983 Some pollen evidence for the environment of north Britain, 1000 bc–AD 1000, in Chapman and Mytum 1983, 3–28

van der Veen, M, 1988 Carbonised grain from a granary at South Shields, north-east England, in *Der Prähistorische Mensch und seine Umwelt* (ed H Küster), *Forschungen und Berichte zur vor- und frühgeschichte in Baden-Württemburg*, **31**, 353–65, Stuttgart

van Driel-Murray, C, 1987 Roman footwear: a mirror of fashion and society, in *Recent research in archaeological footwear* (eds D E Friendship-Taylor, J M Swann, and S Thomas), Assoc Archaeol Illustrators & Surveyors Technical Paper, **8**, 32–42

—, 1990, New light on old tents, *J Roman Military Equipment Stud*, **1**, 109–37

van Driel-Murray, C, and Gechter, M, 1983 Funde aus der Fabrica der legio I Minervia am Bonner Berg, *Rheinische Ausgrabungen*, **23**, *Beitrage zur Archäeologische des römischen Rheinlands*, **4**, 1–83

Visy, Z 1989, *A római limes Magyarzágon*, Budapest

Vollenweider, M L, 1976 *Musée d'art et d'histoire de Généve. Catalogue raisonée des sceaux, cylindres, intailles et camées II*, Mainz

von den Dreisch, A, 1976 *A guide to the measurement of animal bones from archaeological sites*, Peabody Museum Bull, **1**, Harvard

Wacher, J S, 1971 Yorkshire towns in the fourth century, in *Soldier and civilian in Roman Yorkshire* (ed R Butler), 163–77, Leicester

—, 1974 *Towns of Roman Britain*, London

Wade-Evans, A W, 1949 *Guasmoric*, ie Palmcastre, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **49**, 219–20

Walke, N, 1965 *Das römische Donaukastell Straubing-Sorviodurum*, Limesforschungen, **3**, Berlin

Walker, D R, 1988 Roman coins from the sacred spring at Bath, in *The Temple of Sulis Minerva at Bath II: finds from the Sacred Spring* (ed B Cunliffe), Oxford Univ Comm Archaeol, **16:2**, Oxford

Walker, T W, and Syers, J K, 1976 The fate of phosphorus during pedogenesis, *Geoderma*, **15**, 1–19

Wallace, C, and Webster, P V, 1989 Jugs and lids in black burnished ware, *J Roman Pottery Stud*, 2, 88–92

Walton and Lee, Messrs, 1901 *The Birdoswald Estate near Gilsland, Cumberland*, sale document, London

Wardhaugh, A A, 1989 *Land snails of the British Isles*, Aylesbury

Watson, G R, 1954 The Birdoswald hoard: the pay and the purse, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **54**, 61–6

Waugh, H, and Goodburn, R, 1972 The non ferrous objects, in *Verulamium excavations vol I* (S S Frere), Soc Antiqs London Res Rep, **28**, 115–160, London

Webster, G, 1981 *Rome against Caratacus*, London

—, 1985 *The Roman imperial army*, 3 edn, London

Webster, L E, and Cherry, J, 1975 Medieval Britain in 1974, *Medieval Archaeol*, **19**, 220–60

—, 1976 Medieval Britain in 1975, *Medieval Archaeol*, **20**, 158–201

Webster, P V, 1976 Severn valley ware: a preliminary study, *Trans Bristol Glos Archaeol Soc*, **94**, 18–46

Welfare, A T, 1984 Milling stones, in Allason-Jones and Miket 1984, 353–61

—, 1985 The milling-stones, in Bidwell 1985, 154–64

Welfare, H, and Swan, V, 1995 *Roman camps in England*, London

Welsby, D A, 1980 Roman building inscriptions recording buildings collapsed through age or destroyed by the enemy?, *Archaeol Aeliana*, 5 ser, **8**, 89–94

—, 1985 The pottery from the two turrets at Garthside on Hadrian's Wall, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser **85**, 71–6

—, 1982 *The Roman military defence of the British provinces in its later phases*, BAR, **101**, Oxford

—, 1990 Observations on the defences of Roman forts in north Africa, *Antiquités Africaines*, **26**, 113–29

Wenham, L P, 1939 The garrisoning of Maryport, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **39**, 19–30

West Yorkshire Archaeology Service, 1984 *In search of Roman Castleford*, Wakefield

Westell, W, P, 1931 A Romano-British cemetery at Baldock, Herts, *Archaeol J*, **88**, 247–301

Wheeler, R E M, 1924 *Segontium and the Roman occupation of Wales*, London

—, 1926 The Roman Fort at Brecon, *Y Cymmrodor*, **37**, 20–68

—, 1930 *London Museum catalogue no 3: London in Roman times*, London

Wheeler, R E M, and Wheeler, T V, 1932 *Report on the excavation of the prehistoric, Roman and post-Roman site in Lydney Park, Gloucestershire*, Soc Antiqs London Research Rep, **9**, London

White, A, 1984 Finds from the Anglian monastery at Whitby, *Yorkshire Achaeol J*, **56**, 33–40

White, R, 1990 Excavations on the site of the Baths basilica, in Barker 1990, 3–8

Whiting, W, 1926 The Roman cemeteries at Ospringe: description of finds, concluded, *Archaeol Cantiana*, **38**, 123–57

Whittaker, D, 1993 Landlords and warlords in the later Roman empire, in Rich and Shipley 1993, 277–303

Whitworth, A M, 1984 The Hadrianic frontier system between Bowness and Gilsland: an analysis of the Wall material and its reuse in later structures, unpubl diss, Univ Durham

—, 1990, The Housesteads bastle, *Archaeol Aeliana*, 5 ser, **18**, 126–9

—, 1992, The cutting of the Turf Wall at Appletree, *Trans Cumberland Westmorland Antiq Archaeol Soc*, n ser, **92**, 49–56

Wild, A (ed), 1988 *Russell's soil conditions and plant growth*, 11 edn, London

Wild, F, 1975 Samian ware, in *Birrens (Blatobulgium)* (A Robertson), Edinburgh

Wild, J P 1968 Clothing in the north-west provinces of the Roman empire, *Bonner Jahrbücher*, **168**, 166–240

—, 1970 Button and loop fasteners in the Roman provinces, *Britannia*, **1**, 137–55

Wilkes, J J, 1966 Early fourth-century rebuilding in Hadrian's Wall forts, in *Britain and Rome* (eds M G Jarrett and B Dobson), 114–38, Kendal

Williams, D F, 1977 The Black Burnished industry: an essay on characterisation by heavy mineral analysis, in Peacock 1977a, 163–215

Williams, J, 1971 Tynron Doon, Dumfriesshire: a history of the site with notes on the finds 1924–67, *Trans Dumfries Galloway Natur Hist Antiq Soc*, **48**, 106–20

Williams, T, forthcoming Development of early Roman London: east of the Walbrook, CBA Res Rep

Wilmott, T, 1987 Birdoswald excavations 1987, English Heritage *Conservation Bull*, **3**, 12

—, 1989a Birdoswald: Dark Age halls in a Roman fort? *Current Archaeol*, **116**, 288–91

—, 1989b Birdoswald, Cumbria, in *The work of the Central Excavation Unit [now Central Archaeological Service] 1987–88* (ed J B Kerr), 13–7, London

—, 1990 Birdoswald, Cumbria, in *The work of the Central Excavation Unit [now Central Archaeological Service] 1988–89* (ed C Halpin), 16–8, London

—, 1991a *Excavations in the middle Walbrook valley, 1927–1960*, London Middlesex Archaeol Soc Special Paper, **13**, London

—, 1991b Archaeology and the public at Birdoswald, *The Field Archaeologist*, **15**, 264–6

—, 1991c A military basilica at Birdoswald, *Roman Research News*, **3**, 8

—, 1993 The Roman cremation cemetery in New Field, Birdoswald, *Trans Cumberland Westmorland Antiq Archaeol Soc*, **93**, 79–85

—, 1995 *Birdoswald: a short history and souvenir guide*, Carlisle

—, forthcoming A new type of building in an auxilliary fort: the Birdoswald basilica, in *Roman frontier studies 1995*, The Netherlands, forthcoming

Wilmott, T, and Rahtz, S P Q, 1985 An Iron Age and Romano-British site near *Magnis* (Kenchester) Herefordshire: excavations 1977–79, *Trans Woolhope Natur Fld Club*, **45**, 36–185

Wilson, J, 1904 The medieval name of Old Carlisle, *The Antiquary*, **41**, 409–11

Wilson, P R, Jones, R F J, and Evans, D M, 1984 *Settlement and society in the Roman north*, Bradford

Wilson, R, 1980 *Roman forts*, London

Wiltshire, P E J, 1992 *Interim palynological report from Birdoswald Roman fort and Appletree turf wall, Cumbria*, Ancient Monuments Laboratory Report 3/92

Wiltshire, P E J, and Moore, P D 1983 Paleovegetation and paleohydrology in upland Britain, in *Background to paleohydrology, a perspective* (ed K J Gregory), Chichester, 433–51

Winterbottom, S, 1991 The sheet leather objects, in McCarthy 1991, Fascicule **3**, T Padley and S Winterbottom, *The wooden, leather, and bone objects from Castle Street, Carlisle*, 244–307

Wood, I, 1987 The fall of the Western Empire and the end of Roman Britain, *Britannia*, **18**, 251–62

Wood, Margaret, 1965 *The English medieval house*, London

Wood, Michael, 1981 *In search of the Dark Ages*, London

Woodfield, C, 1965 Six turrets on Hadrian's Wall, *Archaeol Aeliana*, 4 ser, **43**, 87–200

Woodward, A, and Leach, P, 1992 *The Uley shrines*, HBMCE Archaeol Rep, **17**, London

Wooliscroft, D J, 1989 Signalling and the design of Hadrian's Wall, *Archaeol Aeliana*, 5 ser, **17**, 5–20

Wrathmell, S, and Nicholson, A (eds), 1990 *Dalton Parlours Iron Age settlement and Roman villa*, Yorkshire Archaeol, **3**, Wakefield

Wright, R P, 1961 Roman Britain in 1960, II, Inscriptions, *J Roman Stud*, **51**, 191–8

—, 1978 Tile-stamps of the Ninth Legion, *Britannia* **9**, 379–83

Wright, R P, and Hassall M W C, 1974 Roman Britain in 1973, *Britannia*, 5, 396–480

Wright, R P, and Phillips, E J, 1975 *Roman inscribed and sculptured stones in Carlisle Museum*, Carlisle

Young, C J, 1977 *Oxfordshire Roman pottery*, BAR, **43**, Oxford

—, (ed), 1980 *Guidelines for the processing and publication of Roman pottery from excavations*, Directorate Ancient Monumenrs and Historic Buildings Occasional Paper, **4**, London

Younger, D A, 1994 The small mammals from the forecourt granary and the south west fort ditch, in Bidwell and Speak 1994, 266–8

Yule, B 1992 Truncation horizons and reworking in urban stratigraphy, in Steane 1993, 20–22

Zienkiewicz, J D 1986 *The legionary fortress baths at Caerleon*, Cardiff

Zwierlein-Diehl, E, 1979 *Die Antiken Gemmen des Kunsthistorischen Museums in Wien II*, Munich

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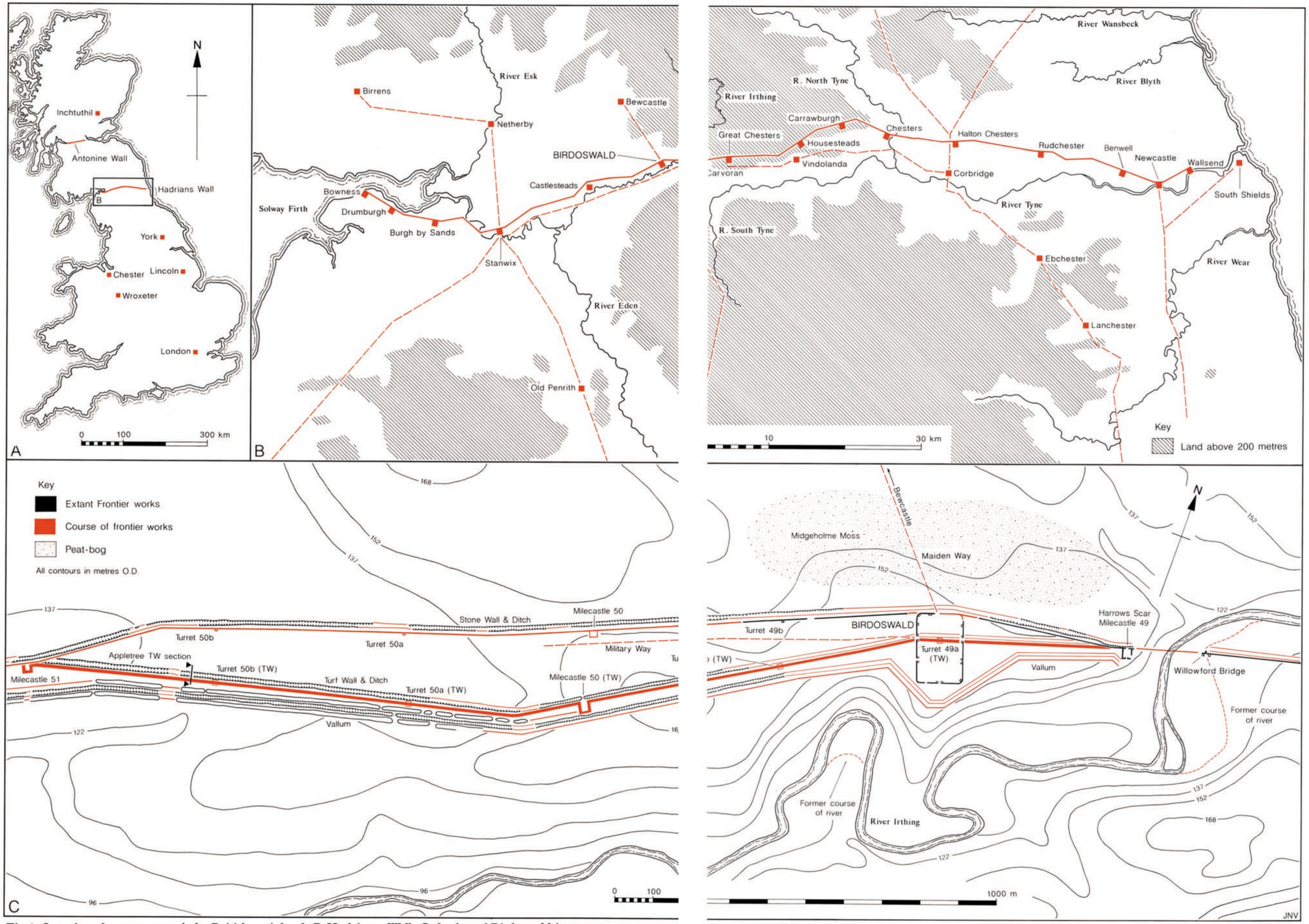


Fig 1 Location plan sequence: A the British mainland, B Hadrian s Wall, C the fort of Birdoswald in context with the complex of frontier works in the immediate area

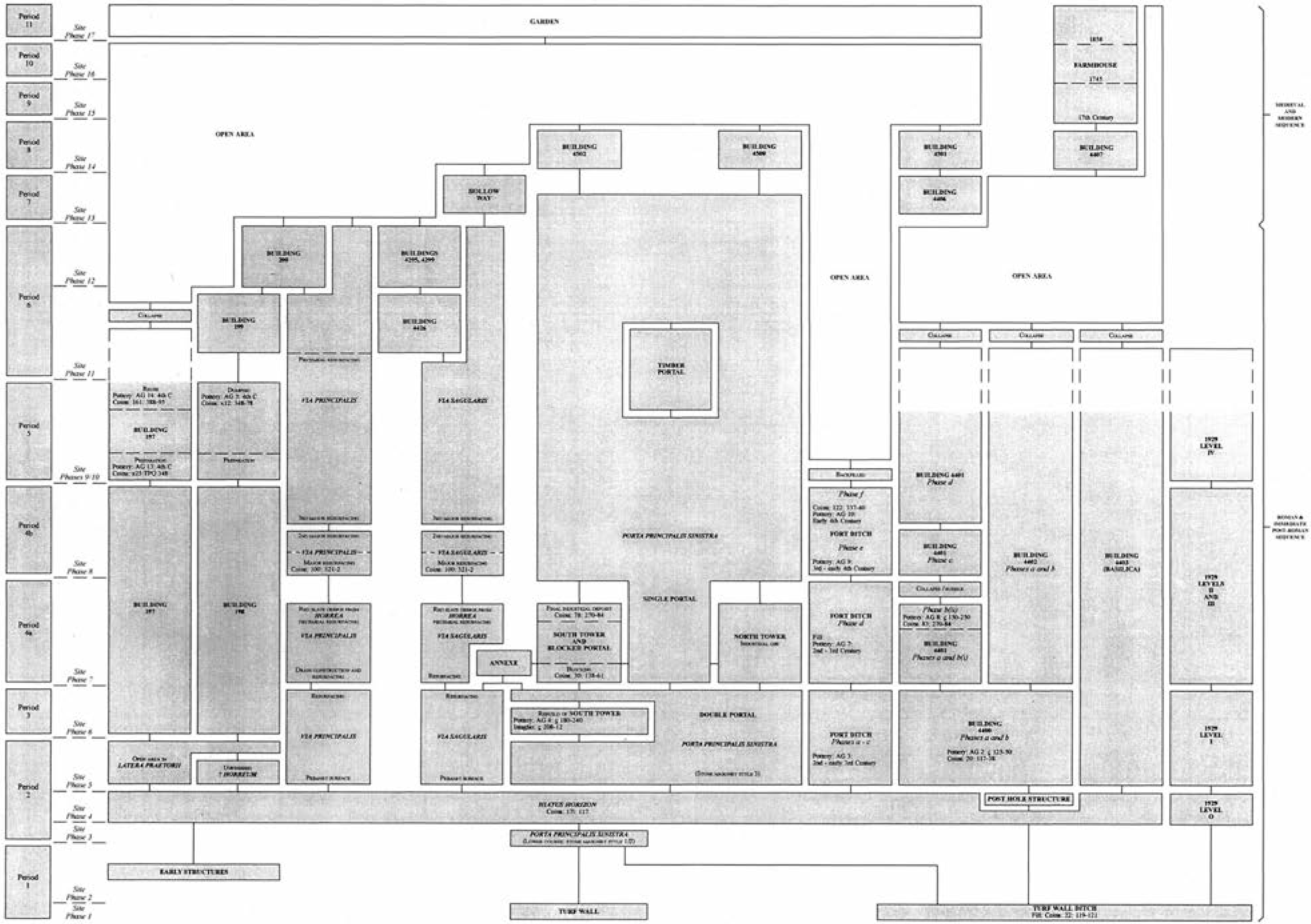


Fig 11 Land use diagram demonstrating the complexities of phasing

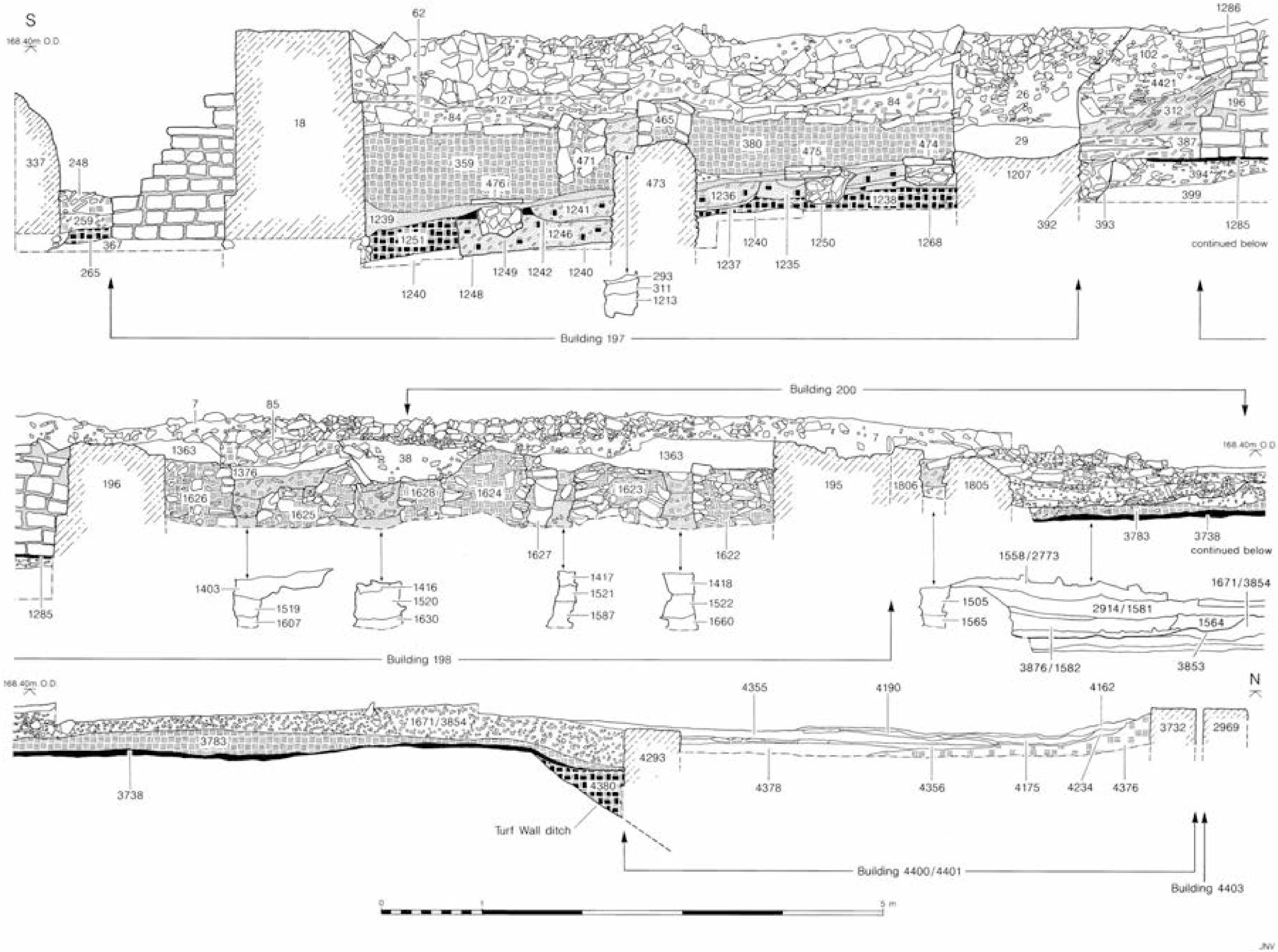
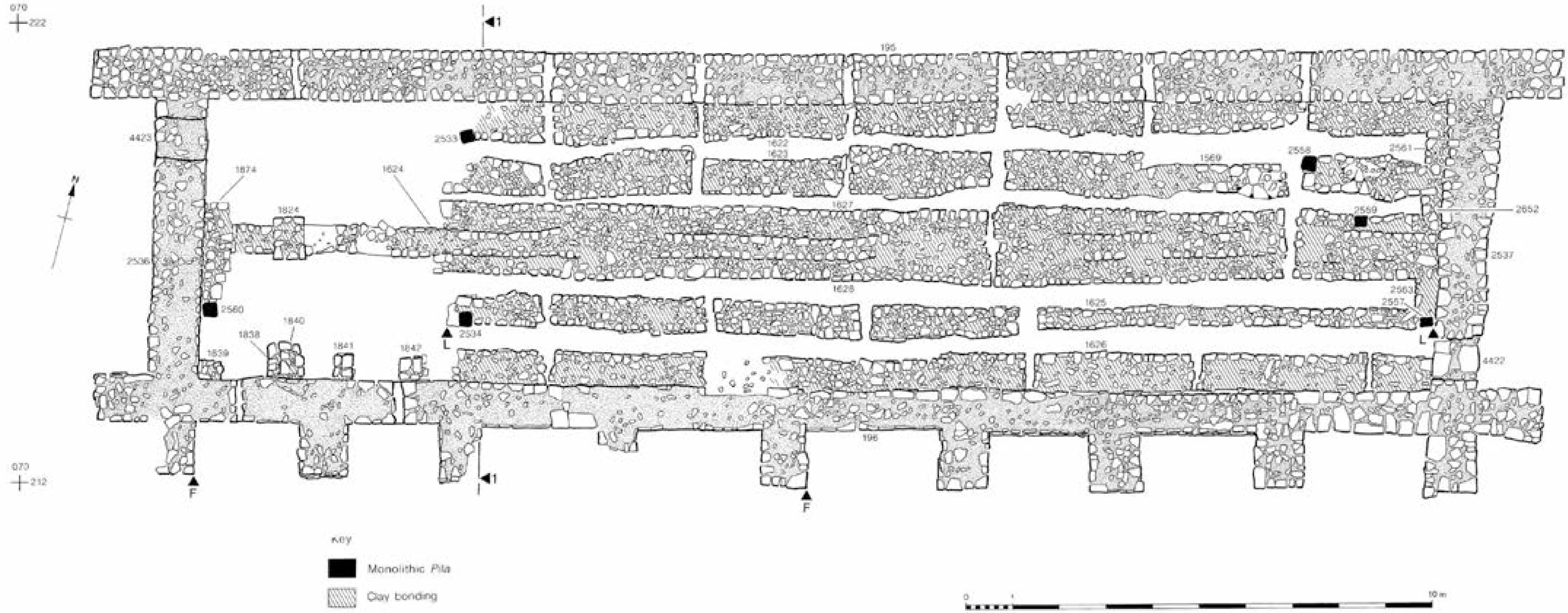


Fig 25 Section 1 (for location see Fig 9)

Fig 50 Buildings 4403 and 4401. Building 4400 (to south) is shown as subdivided in Period 2b: the suggested interpretation of Building 4403 is shown in red



JNV & SLR

Fig 69 Plan of Building 198, the north horreum at Phase c, with locations of Elevations F, L

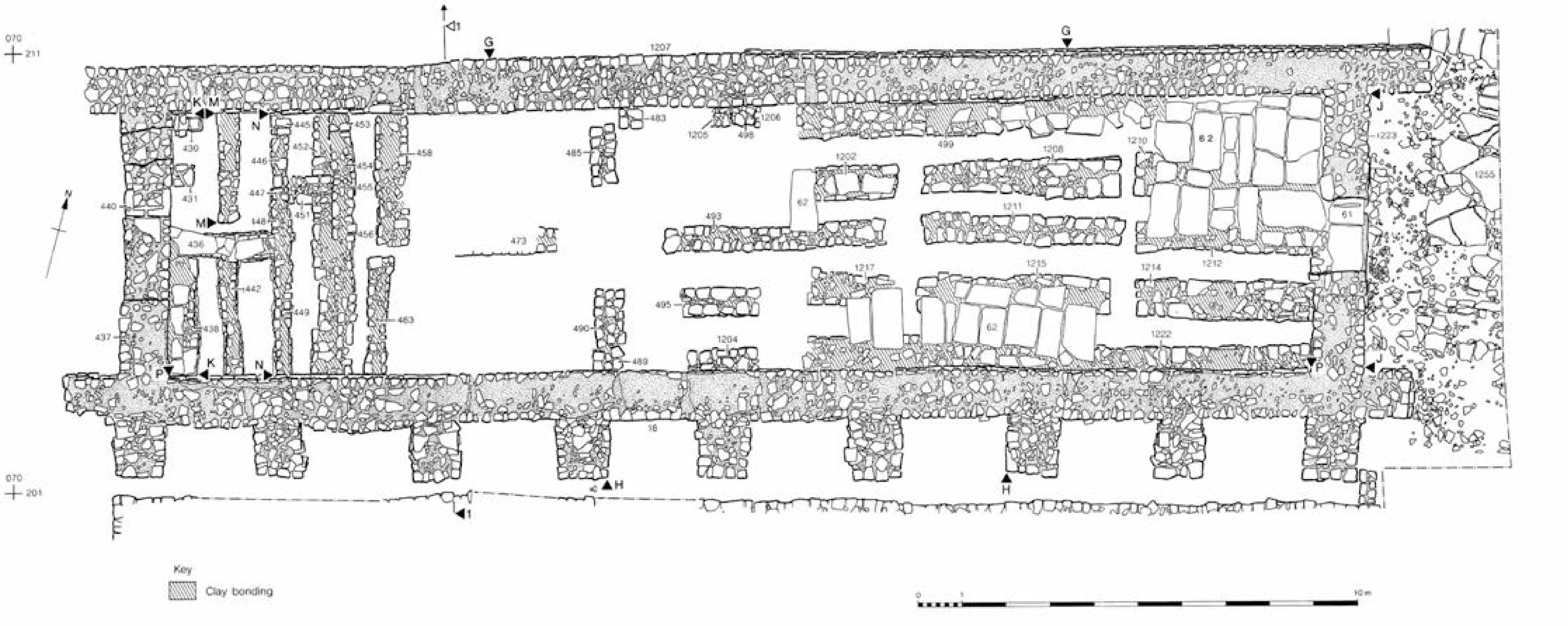


Fig 70 Plan of Building 197, the south horreum at Phase c, with locations of Elevations G–K, M–P

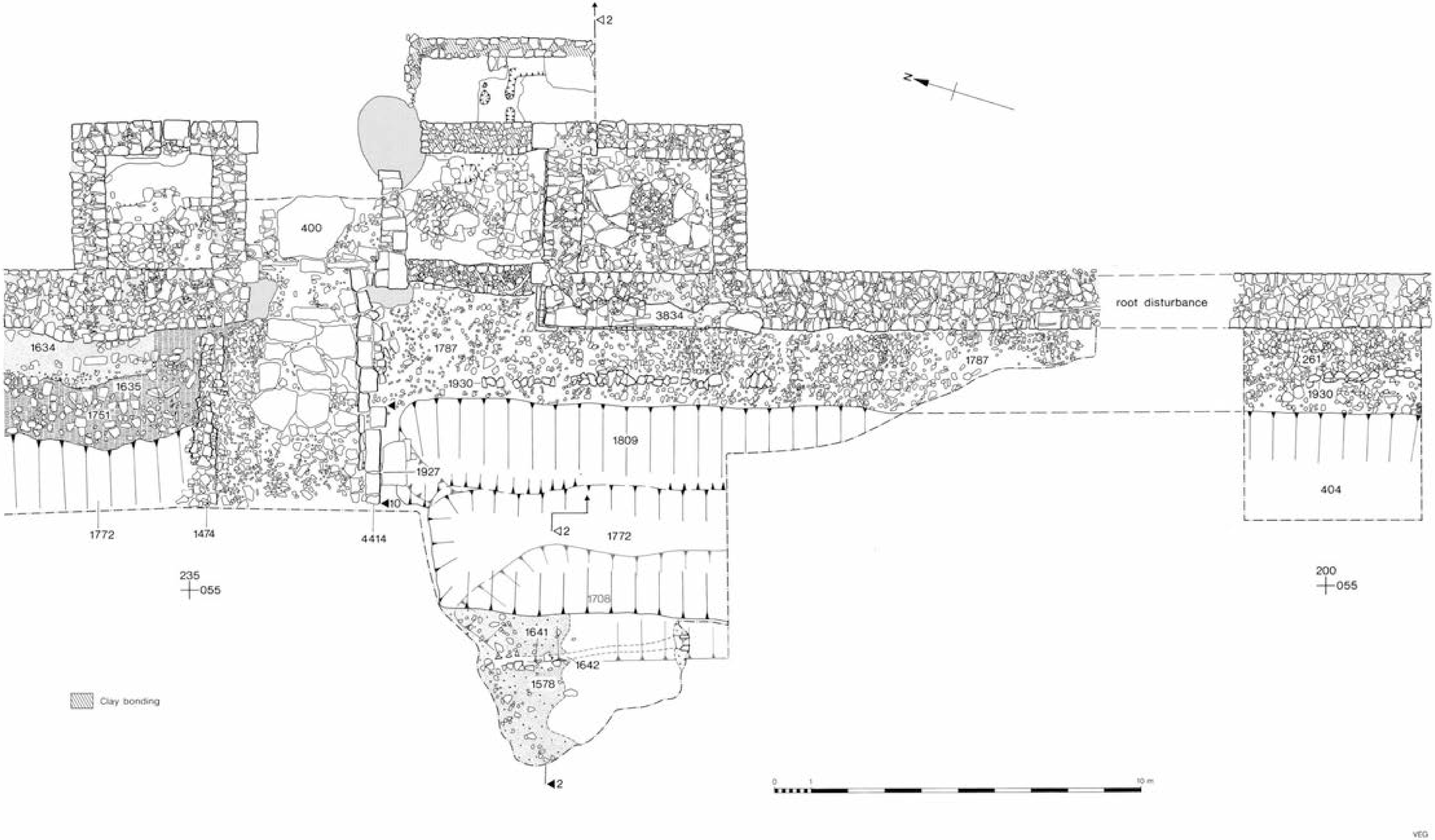


Fig 118 General composite plan showing principal features of the porta principalis sinistra *and associated defences during Periods 2b–4b: the Period 4a ditch (1708) and the Period 4b leat, associated with ditch 1772, are shown in red*

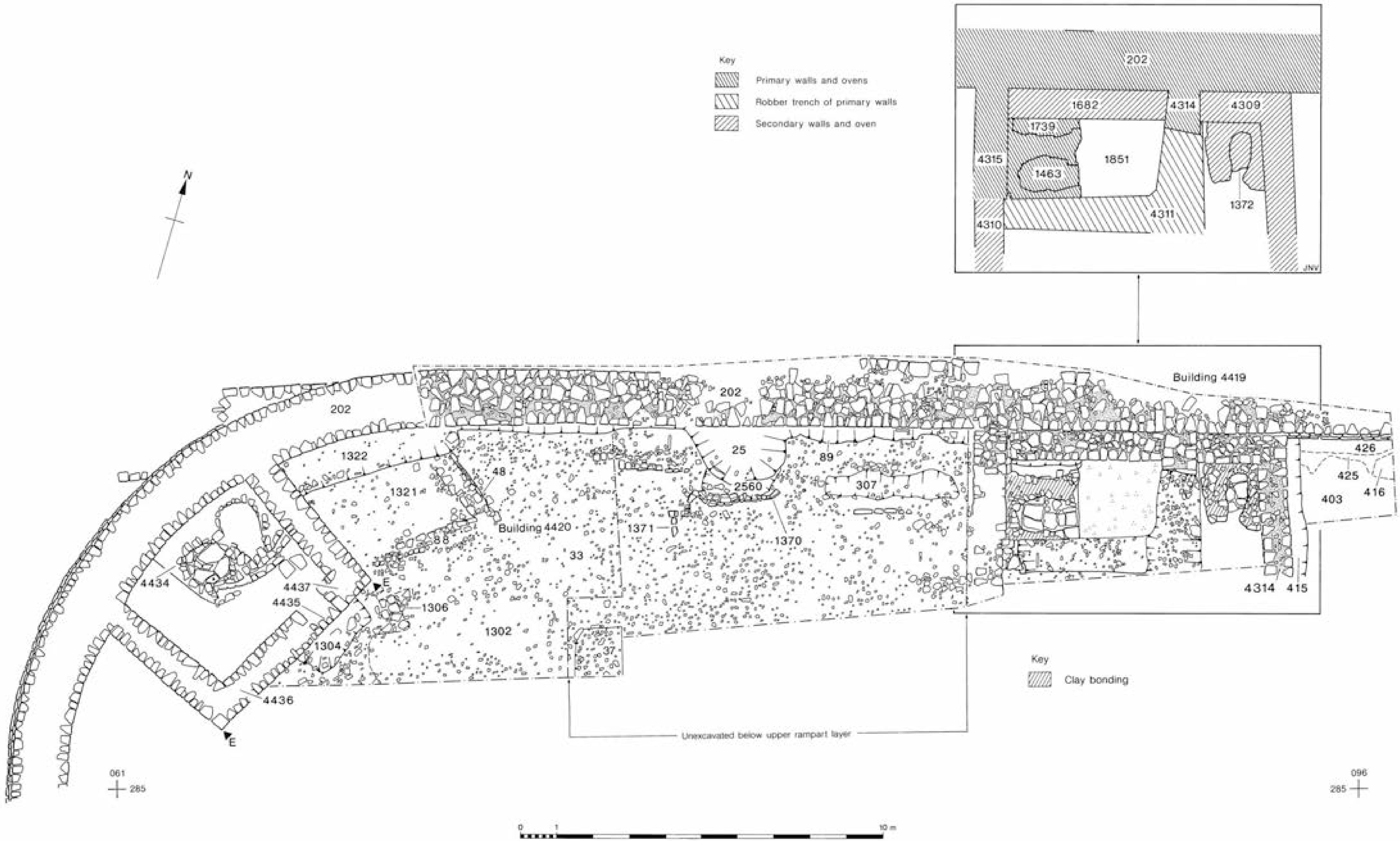


Fig 126 General plan of excavations in Area B: the inset plan shows a simplified version of the phasing detail in Building 4419

Fig 132 Plan of Area F showing the porta quintana dextra *and the collapsed coursing of the east curtain wall*

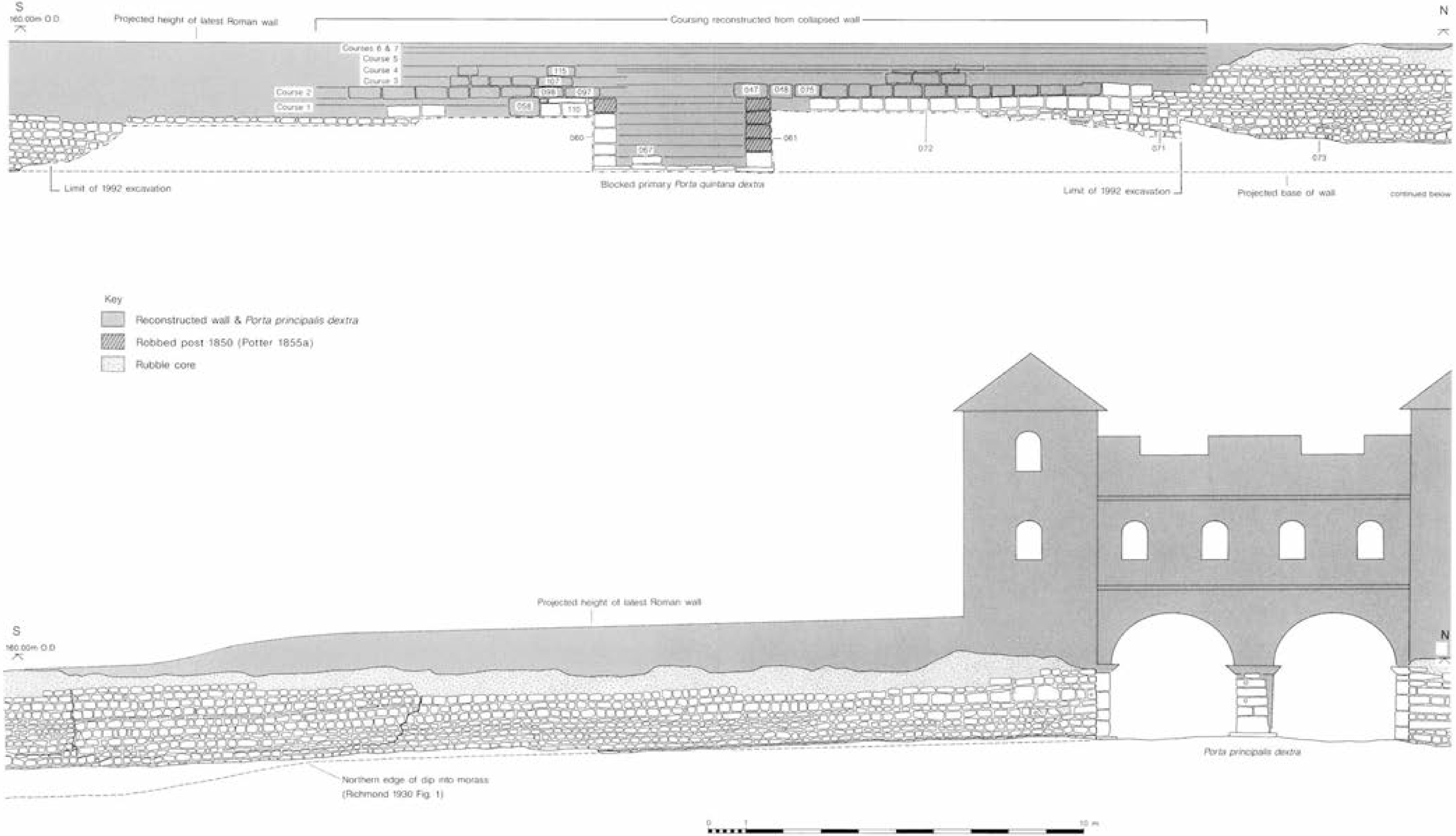
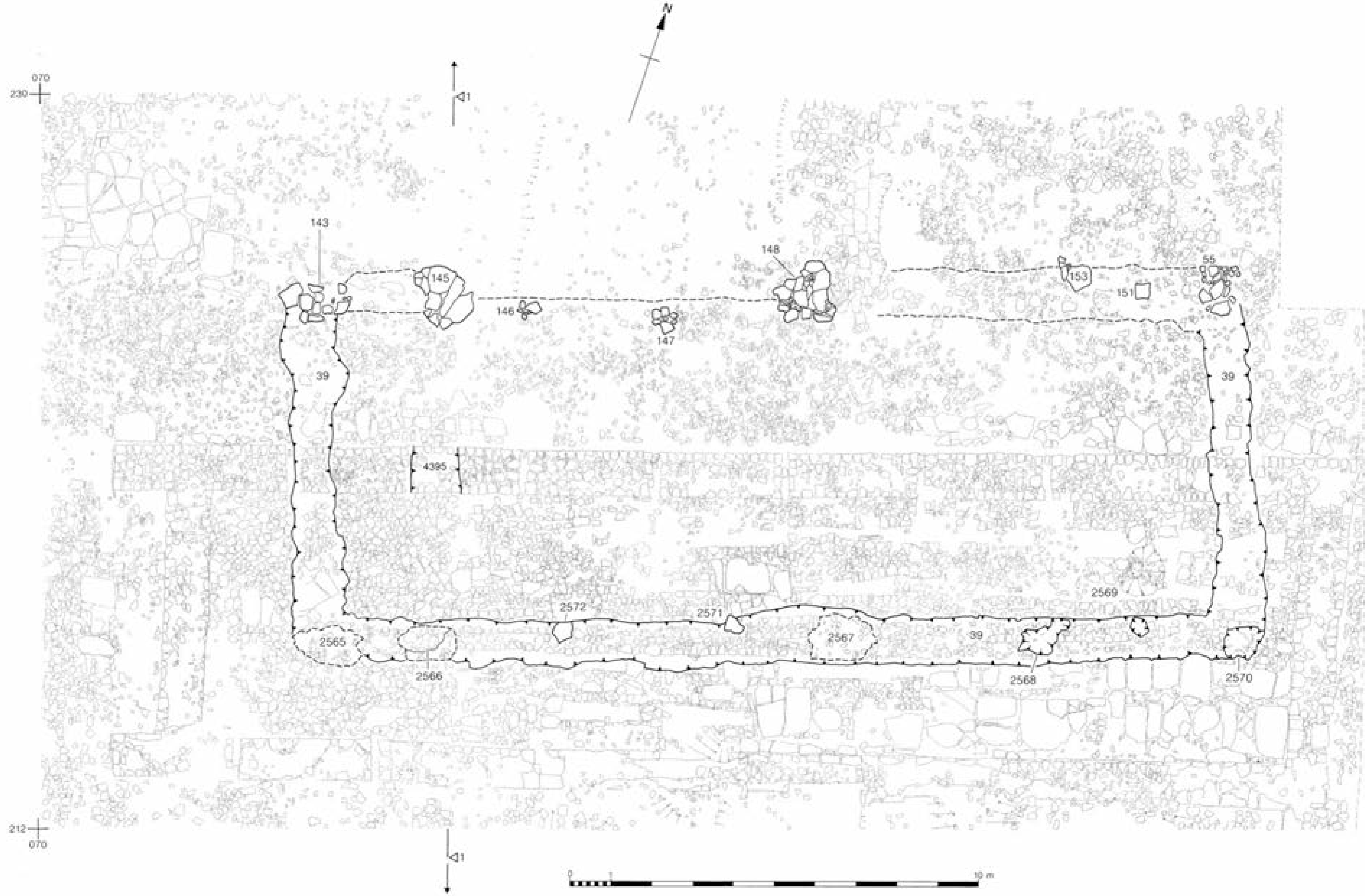


Fig 133 Elevation of the east curtain wall of the fort showing the collapsed coursing around the porta quintana dextra *reconstructed to the level of the latest wall top: the* porta principalis dextra *is also reconstructed (to identify numbered stones, see Fig 132)*



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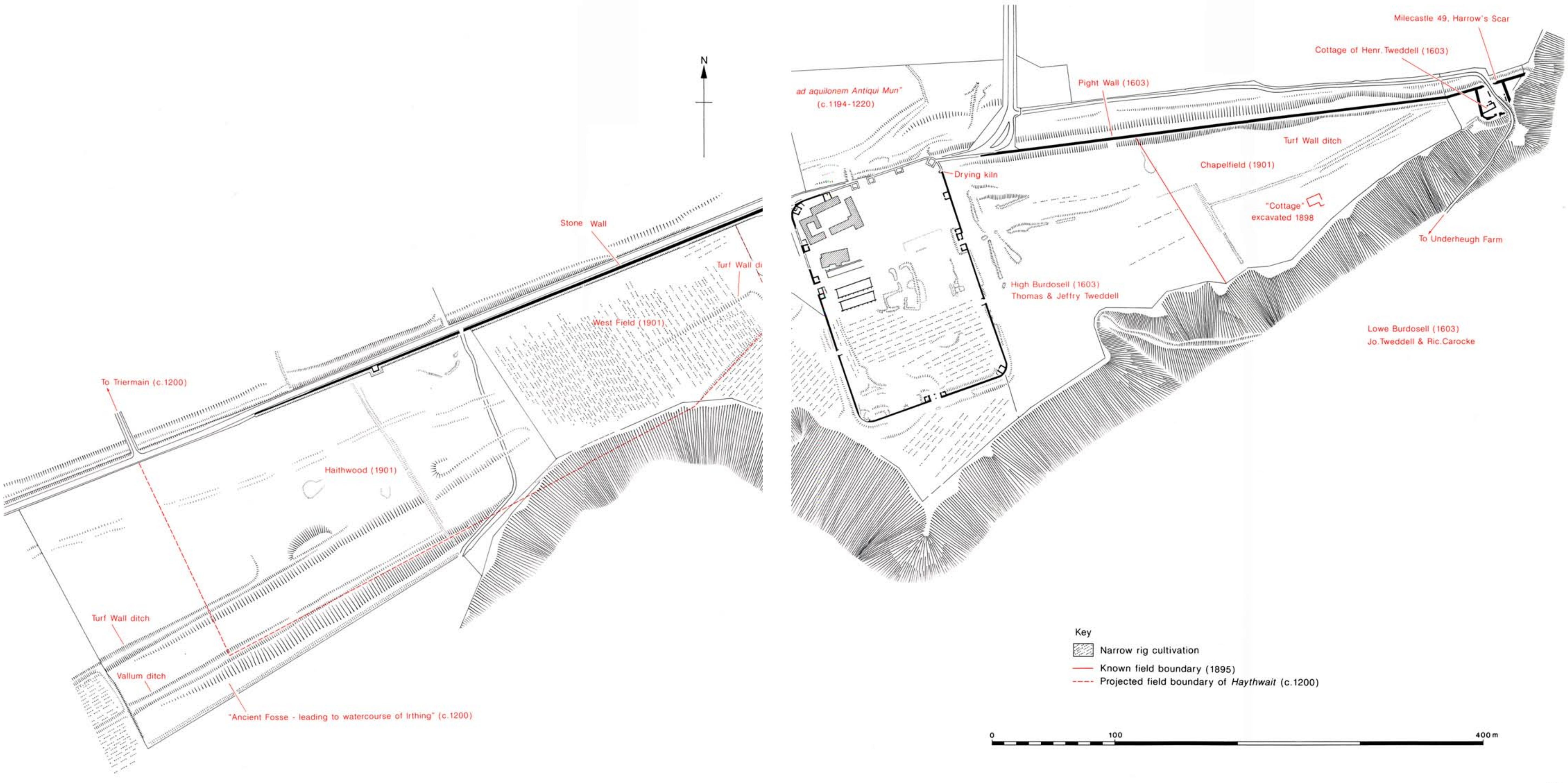

Fig 280 Survey plan of existing earthworks and features at Birdoswald: references to documentary evidence are shown in red (based upon RCHME survey plan; Crown Copyright)

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Graffito of stallion from south wall of basilica building 440.