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An Archaeological Excavation and Watching Brief at St Martin's Gate, Worcester

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An Archaeological Excavation and Watching Brief at St Martin's Gate, Worcester

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By

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With contributions by
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Summary

A programme of archaeological recording was carried out on a site at the junction of St Martin's Gate and City Walls Road, Worcester (NGR SO 385235 254997) during June 2000 by Birmingham University Field Archaeology Unit, commissioned by Motor Design Group on behalf of Inchcape Motors, in advance of, and during, construction of a new car showroom and associated external works. The site had been heavily disturbed in the post-medieval period, but Roman remains, dating mainly between the first and third centuries AD (Phase 1), were discovered in discrete areas of the site. The remains consisted primarily of a series of pits, the contents of which indicated that iron smelting and smithing had been carried out on, or very close to, the site in the Roman period. The Phase 1 remains were sealed by a 'dark earth' layer, deposited during, or after, the late third - fourth century AD (Phase 2). No intact medieval remains were discovered in the excavated areas, and a ditch of potential Civil War origin was located, running north-south across the centre of the site.

Introduction

This report describes the results of an archaeological evaluation, watching brief and area excavation carried out on a site at the junction of St Martin's Gate and City Walls Road, Worcester (NGR SO 385235 254997) during June 2000. The work was undertaken by Birmingham University Field Archaeology Unit and commissioned by Motor Design Group on behalf of Inchcape Motors, as a condition of planning consent granted by Worcester City Council for a development comprising construction of a new car showroom and associated external works.

The site comprised a parcel of land at the junction of City Walls Road and St Martin's Gate (Figs. 1 and 2), formerly occupied by a car showroom and garage. The site was cleared in 1998-1999. Clearance included the removal of substantial underground fuel tanks, and no structures remained on the site at the time of the archaeological work, apart from boundary walls and fencing.

The site lies within the designated Historic Core of the Roman and Medieval City Archaeologically Sensitive Area (No. 18). It is located just outside the medieval city walls, within the medieval suburb of St Martin's Gate/Silver Street, and lies on Keuper Marl, to the east of the gravel ridge on which the centre of the historic city lies. It is close to the former course of the Frog Brook, which was diverted in to the town ditch in the medieval period. Part of the area around the Frog Brook was known to be marshy in the medieval period (Carver 1980, 21).

Archaeological and Historical Background

There is very little evidence for prehistoric activity in Worcester. A possible Neolithic enclosure was identified at the Deansway site (Dalwood *et al.* 1992), and the focus of Iron Age activity is thought to be in the centre of the historic city (Barker 1969, 14). Recent work has produced possible evidence for prehistoric activity to the north of the historic city, at the Kardonia site (County Archaeological Service 1995) and at the Magistrates' Court site, although the latter may actually represent early Roman occupation (Jones and Vyce 2000) and further work is required to clarify this.

Evidence for Roman activity in Worcester has been derived from numerous observations, evaluations and excavations, and syntheses have been produced by Barker (1969) and Carver (1980). Excavations providing evidence for Roman activity in the centre and south of the historic city include Broad Street (Barker 1969), Sidbury (Darlington and Evans 1992), and Deansway (Dalwood *et al.* 1992). Several smaller-scale pieces of fieldwork to the north of the historic city have yielded Roman remains, including Farrier Street (Dalwood *et al.* 1994), Loves Grove (Edwards 1990), Rea's Timber Yard (Dalwood *et al.* 1994), the Kardonia site (County Archaeological Service 1995), Education Offices, Castle Street (Dalwood *et al.* 1997), the Magistrates' Court (Jones and Vyce 2000) and The Butts (Coates and White 2000). Apart from the work at St Martin's Gate, excavations and observations to the east of the historic city, such as at Tallow Hill/Pheasant Street (Whitworth and Edwards 2001) and Spring Gardens (Mundy 1994), have revealed little evidence for Roman activity.

It has been suggested that the origins of Roman Worcester lay in a defended settlement beneath the centre of the medieval City, with the area around the cathedral forming the core of the Roman settlement, with a suburb lying to the north (Barker 1969). However, more recent work suggests that the settlement was more complex and diffuse than this. A major north-south aligned Roman road was recorded at Broad Street, Blackfriars and Farrier Street (Darlington and Evans 1992, 8), and has been interpreted as the main road north of the Roman settlement towards Greensforge (Dalwood *et al.* 1994, 107). The evidence from numerous archaeological interventions indicates that Roman settlement extended along the north-south road in a ribbon development, and possibly also along a second north-south road aligned on High Street-Foregate Street (Coates and White 2000). It is considered likely that this occupation would have been intermittent, with a number of settlement foci (Kenyon 1999).

The character of the Roman settlement is not yet fully understood, but the ubiquitous evidence for iron working suggests it may have been a specialised industrial small town (Burnham and Wacher 1990, 232-4). Excavations at Deansway in 1988-1989 (Dalwood *et al.* 1992) recorded an extensive sequence of activity from Roman occupation in the first - second centuries AD through to the medieval period. Roman activity included evidence for iron smelting from the second - third century, with a constant background of agricultural activity throughout the Roman period (J. Dinn pers. comm. to S. Watt). Evidence of iron working has also been recovered from Broad Street, Farrier Street, Loves Grove, and the Kardonia site. A possible northward shift of iron working activity through time has been suggested by the dating of iron working at Farrier Street to the third - fourth centuries, although too little is understood about the development of the Roman settlement to be certain.

The site at St Martin's Gate lies to the east of the hypothetical Roman core settlement, and very close to the postulated line of a southwest-northeast aligned Roman Road linking Worcester with Droitwich, the *bradan straete* recorded in an Anglo-Saxon charter of 1038 (White and Baker 2000). It has been postulated that the medieval bridge over the River Severn at Worcester was built on Roman foundations, and that a Roman harbour existed in the Diglis area (Carver 1980, 19-20). Furthermore, it has been suggested that there may have been a Romano-British greyware kiln near the Magistrates' Court site (J. Dinn pers. comm. to S. Watt).

It appears that Roman settlement in Worcester declined from the early-mid-fourth century, with there being no evidence for iron working after 320 AD. Evidence for the post-Roman period is limited to late Roman pottery from the site at Castle Street (Dalwood *et al.* 1997) and the continued use of the south end of the Roman road to Greensforge (Coates and White 2000). Roman deposits in Worcester have been commonly found to be sealed by 'dark earth' layers of varying depths.

The site at St Martin's Gate occupies part of the area of the medieval suburb of St Martin's Gate/Silver Street, just outside the St Martin's Gate entrance to the historic city. The medieval St Martin's Gate was the last of the ancient gates of the city to survive the demolition of the eighteenth century, and is described as having had a 'hornwork of defence' (VCH 1924, 377). Little is known from the archaeological record about the medieval suburbs of Worcester, but the area immediately outside the city walls would have been the domain of industrial activities that could not be located within the confines of the city, and it is likely that it would have been occupied by the dwellings of the lower social groups, which are notably absent from the archaeological record (White and Baker 2000). Much of the city land outside the gate, in the area between Silver St and the city wall, was still undeveloped in 1630 when 'William Beauchamp rented a "little messuage" there and a meadow adjoining with three racks' (Hughes 1980, 286).

Documentary sources indicate that relatively wealthy citizens had houses in the suburb in the first part of the seventeenth century. However, the sources also indicate that almost all of the houses outside the gate were burnt down and destroyed in the Civil War, although it appears that the building that became the Plough Inn, demolished in the 1970s, survived the Civil War demolition (Hughes 1980, 286). A stylised 1651 plan of the city, which either shows the suburbs conventionally or not at all, depicts the area immediately outside St Martin's Gate as cultivated fields, with a Civil War bastion shown defending the gate. Doharty's plan of 1741, a more reliable source, shows buildings all along the street frontages of the site, and these are also shown on Broad's plan of 1768, but no structures further back from the frontages. Young's map of 1779 and Nash's map of 1781 show buildings covering most of the site, and Valentine Green's map of 1795 depicts the buildings in more detail, marking a vinegar manufactory in the northeastern area of the site. Stratford's plan of 1835 and Dewhurst and Nichol's plan of 1838 show less detail, but the 1884 First Edition Ordnance Survey map shows a tannery occupying the northeastern part of the site, the vinegar works having shifted to the east. By this time, the rest of the site was occupied by housing, with some open areas retained as courtyards.

Objectives

The site lies within the designated Historic Core of the Roman and Medieval City Archaeologically Sensitive Area (No. 18). There was a possibility that groundworks associated with the development of the site would disturb surviving remains of archaeological significance. As the groundworks consisted of deep piling within the footprint of the new building, and more shallow disturbances for drainage, services and boundary walls around the new building, there was a two-stage approach to the archaeological recording. This consisted of evaluation by trial trenching, followed by more extensive excavation within the footprint of the new building in advance of construction, and a watching brief of the more shallow surrounding groundworks during construction, including drainage and service trenches, boundary walls, security posts and bollards and other associated works. In the areas that had previously been disturbed by the removal of underground fuel tanks, archaeological monitoring was not deemed necessary.

The trial-trenching phase indicated that significant deposits from the Romano-British period had survived in discrete areas of the site. The objective of the archaeological recording was to provide a detailed record of the character, extent and significance of any such remains to be disturbed by the development, in order to contribute towards a greater understanding of this area of Roman Worcester.

Methodology

Initially, an L-shaped trial trench, approximately 15m x 15m long and 1.6m wide, was excavated within the footprint of the new building (Fig. 2, Area 1). It was located along the northwestern boundary of the footprint in order to avoid the area disturbed by the removal of underground fuel tanks to the southeast. Significant remains dating to the Romano-British period were encountered within the trench, so a more extensive excavation was carried out in areas where remains survived. This consisted of extending the trench to the northwest, widening it at the eastern end, and excavating a new area, approximately 6m x 10m in size, to the south of the original trench (Fig. 2, Area 3).

All modern overburden was removed mechanically using a toothless ditching bucket, under archaeological supervision, down to the uppermost archaeological horizon. Archaeological deposits were recorded and sample-excavated by hand to assess their character and date, all artefacts were recovered and palaeoenvironmental samples were collected from suitable contexts. Recording was by means of pre-printed *pro formas* for contexts and features, supplemented by plans and sections, and monochrome, print and colour slide photography. More shallow groundworks, external to the building footprint, were monitored during construction (Fig. 2), and any significant remains were sample-excavated and recorded as described above.

Stratigraphic Results

Activity on the site can be divided into three phases on the basis of the pottery (see Evans below). Phase 1 dates to the late first - early third century AD. Phase 2 is represented by a 'dark earth' deposit, which could have started accumulating as early as the late third century AD, on the basis of the ceramic evidence (see Evans below). Similar dark earth deposits from other sites in Worcester have been attributed to the late Roman and post-Roman periods. Phase 3 dates to the seventeenth - nineteenth centuries, with some residual medieval material being present.

Phase 1 (Fig. 3)

Area 1

A series of sub-circular pits containing Romano-British pottery (F3-F5) cut the subsoil in Area 1 (2010) at a depth of approximately1.8m below ground level. One of these (F3 - Fig. 4) was relatively large (2.0m in diameter and 0.65m deep), with steep sides and an irregular base, and was filled with a green/grey silty sand (2002) containing 54 sherds of Romano-British pottery, as well as charcoal, tile and slag. The lower fill (2013), a thin layer of redeposited natural, contained no dateable material. A further group of sub-circular pits (F106-F109) was recorded in the east of Area 1 during the watching brief. These could not be sample-excavated for safety reasons, but their character, stratigraphy and relative depth (approximately 47.85m AOD) indicated that they were contemporary with the Romano-British features to the west.

A further feature identified in Area 1 (F6/F20) may have been a north-south aligned linear feature, but the linear nature could not be confirmed, as the feature extended beyond the eastern limit of the excavation and was truncated to the south by modern concrete piles (F8). The feature was at least 2.75m wide and 0.5m deep, with a steep slope on the west side. Large limestone blocks were found at the base of the cut, some with straight sides or signs of working, and it is possible that this feature represents the cut for a wall. The fill (2007/4001), a brown clay-silt, contained a small quantity of Romano-British pottery, a few cultivated cereal grains, and iron working remains in the form of slag and spheroidal hammerscale.

Area 3

A series of negative features, mainly pits, cut the subsoil in Area 3 (3003) at a depth of 48.01m AOD. The pits (F10-F13, F15, F19) were sub-circular and ranged in size from 0.6m to 3m in diameter, and from 0.1m to 0.5m in depth. A posthole (F16 - Fig. 4), containing no dateable material, was also recorded. All of the pits except one (F15 - Fig. 4) contained Romano-British pottery. One of the pits (F10 - Fig. 4) contained large amounts of amphorae, as well as other Romano-British pottery, a piece of heat-cracked stone, spheroidal hammerscale, charred cereal grains and other crop-processing by-products (see Ciaraldi, this volume). Heat-related changes in the subsoil surrounding this feature indicated burning *in situ*, and large pieces of charcoal with iron working slag still attached were recovered from the fill. Another of these pits in Area 3 (F13 - Fig. 4) contained fragments of vitrified charcoal, indicating that the charcoal had been heated to very high temperatures (see Gale this volume).

The largest pit (F11 - Fig. 4), which continued under the south-east-facing section of the trench, had curving sides to a flat base, and a single fill (3006) that contained large quantities (98 sherds) of Romano-British pottery and occasional fragments of degraded bone. This pit cut an east-west aligned shallow gully (F18), possibly a beam-slot, that contained a few sherds of Romano-British pottery. Adjacent to the gully was a shallow scoop, possibly a truncated pit (F19), which also contained Romano-British pottery and fragments of oyster shell.

Phase 2

All of the Romano-British features in Areas 1 and 3 were sealed by a very dark, grey-brown organic layer (2003/2011, 3001 – Fig. 4), 0.3-0.5m deep containing iron slag and Romano-British pottery, which ranged in date from the first - third centuries, apart from one sherd of late third - fourth-century Black-burnished ware (see Evans below). The presence of the latter indicates that this layer could not have started accumulating until the late third century AD at the earliest, and indicates that some or all of the artefacts within the layer did not derive from the Phase 1 activity from the site, but from elsewhere in the town. A copper-alloy brooch dating to the late first century (see White below) was recovered from a test pit excavated through this layer in Area 3. Two pieces of post-medieval blast furnace slag were recovered from one of the test pits, but as no other post-Roman finds were recovered from this layer, it is likely that the slag was intrusive, and the layer is interpreted as a late-Roman 'dark earth' deposit. However, as the dark earth layer was not completely hand-excavated, this interpretation should not be regarded as definitive.

Phase 3 (Figs. 2 and 3)

The 'dark earth' layer in Area 1was overlain by a series of post-medieval and modern rubble layers and levelling deposits up to a combined maximum depth of 1.8m in Area 1, and 1m in Area 3. Running through the centre of Area 1, and continuing in the east of Area 3, was a large north-south aligned ditch (F2/F21, F9, F17), approximately 5.5m wide. This feature was not fully excavated for safety reasons, and the upper profile and stratigraphy of the ditch was difficult to define due to later disturbance. Sections excavated through the lower part revealed it to be steep-sided, with a rubble fill (2004/4002, 2008, 3005) containing post-medieval pottery, ranging in date from the seventeenth - nineteenth centuries, including part of a two-handled, blackware cup or mug from the mid-late seventeenth century, and brick, tile and mortar. Sondages excavated through the ditch fill demonstrated that the feature reached a maximum depth of 3m below the modern ground surface and had cut through, and completely removed any earlier deposits. The precise depth of the original feature is difficult to determine due to later disturbance. Demolition rubble sealed both this ditch and a post-medieval cellar wall in the west of Area 1 (F7). The rubble was cut by three sides of a small brick structure (F1), to a depth of 0.7m below the surface, and by a modern disturbance containing concrete piles (F8), which had truncated earlier features.

Various other post-medieval walls were recorded across the site, at an average depth of 0.5m below the modern ground surface, during the watching brief, including a probable cellar abutting parts of a larger building in the southeast of the site (F100), and a northeast-southwest aligned brick wall in the north of the site (F101). In the northwest corner of the site, walls constructed of hand-clamped bricks, set on a foundation consisting of two courses of sandstone blocks, were recorded (F102 and F103). Dense deposits of post-medieval tile were dumped against these walls, which were cutting post-medieval ground make-up and were sealed by modern brick and concrete layers. Two post-medieval brick wells (F104 and F105) were also identified in section during the excavation of a drainage trench.

The Roman pottery by C. Jane Evans with a contribution by Steven Willis

Introduction

A total of 432 sherds of Romano-British pottery, weighing approximately 6.5kg, was recovered during the excavation. Most came from Area 3 (Table 1), the largest groups being from two pits (F11, 98 sherds and F10, 62 sherds). The largest Area 1 assemblage also came from a pit (F3), which produced 54 sherds. All but two sherds came from stratified Roman deposits (Tables 1 and 2). The pottery was fairly fragmentary, but a number of diagnostic form sherds was noted (described below). These, together with the range of fabrics represented (Table 3), indicated a predominantly first - second-century date for the Roman activity. There was evidence for some second - third-century activity, and slight evidence for late third - fourth-century activity in the vicinity, but nothing diagnostically later.

TABLE 1
Summary of the pottery by Area

Area	Qty.	% Qty	Wt. (g)	% Wt.	Av. Sherd Wt. (g)	Rim EVE	% Rim EVE.
1	73	17	691	11	9.5	32	10
3	359	83	5757	89	16	279	90
TOTAL POT	**432**		**6448**		**15**	**311**	

TABLE 2
Summary of the pottery by Phase

Phase	Qty.	% Qty	Wt. (g)	% Wt.	Av. Sherd Wt. (g)	Rim EVE	% Rim EVE.
1	267	61.5	5251	81.5	20	193	62
2	163	38	1103	17	6.7	114	37
3	2	<1	94	1.5	47	4	1
TOTAL POT	**432**		**6448**		**15**	**311**	

TABLE 3
List of fabrics represented

WCM fabric code	Common Name	Archive Code	Description/references (T&D = Tomber and Dore 1998)
3	Malvernian group A, handmade	N02.1	T&D MAL REA, 147, plate 120; Peacock 1967
8?	Black-surfaced grey wares	G08.6	See Ariconium (Willis forthcoming)
8?		G08.7	
8?		G08.8	
12	Severn Valley ware	O02.1	Standard oxidised fabric, unsourced: T&D SVW OX 2, 149, Pl 122; Webster 1976, Rawes 1982
12/20?		W16	Standard oxidised fabric with white slip
12.1		G04.1	Standard fabric, reduced
12.1/20?		W16.1	Standard fabric, reduced with white slip: misfired?
12.2		O03.1	Organic tempered variant, oxidised (elongated voids appearing as black/dark grey streaks in fracture.
12.3		G05	Organic tempered variant, reduced
12.4		O02.2	Variant with limestone temper
13	Sandy oxidised wares	O06.18	
14	Sandy reduced wares	G00	
14/15		G02.2/2.3	Pale sandy grey ware with blackened surfaces (?LNVGW). Wheelmade, hard. Reduced throughout, with a light grey core (5Y 7/1) and dark grey surfaces (GLEY1 4/N). Common white sand <0.1mm and other sparse iron rich inclusions.
16.2	Grog-tempered ware	F017	Cf Gloucester grog-tempered native ware (Ireland 1983 TF2, 100)
19	Malvernian group A, wheelmade		
?20	White-slipped sandy ware	W17	
22	South-east Dorset BB1	B02	T&D DOR BB 1, 127, pl 100; Williams 1977; Seager Smith and Davies, 1993
41.1	Cream wares	P00	
42.1	Amphorae, Dressel 20	A01	Baetican Dressel 20, Peacock and Williams 1986, class 25; T&D BAT AM 1/2, 84-5, pl 61, 62
42.6??	Amphorae	A0	
43	Samian	S0	
109	Eggshell ware	P07.2	
**	'Wroxeter' mortaria	M015	White mortaria; T&D WRX WH, 179, pl 150a-c

TABLE 4
Summary of the Roman pottery assemblage by fabric/source

Common Name (Archive code)	WCM Fabric Code	Qty.	% Qty.	Wt.	% Wt.	Rim EVE	% Rim EVE
Severn Valley ware, oxidised (O02.1)	12	161	37	1367	21	88	28
White-slipped variant, oxidised (W16)	12/20?	3	<1	12	<1	0	0
Reduced variant (G04.1)	12.1	42	10	555	9	97	31
White-slipped variant, reduced (W16.1)	12.1/20?	3	<1	41	<1	0	0
Organic variant, oxidised (O03.1)	12.2	63	14.5	996	15	23	7.5
Organic variant, reduced (G05)	12.3	13	3	105	2	12	4
Limestone-tempered variant (O02.2)	12.4	8	2	71	1	0	0
Total Severn Valley ware		*293*	*67.5*	*3147*	*49*	*220*	*70.5*
Malvernian metamorphic (H)	3	21	5	156	2.4	3	1
Malvernian metamorphic (W)	19	6	1	131	2	0	0
Black-surfaced grey ware - sand (G08.6)	8?	6	1	11	<1	8	2.5
- sand and limestone (G08.7)	8?	1	<1	1	<1	0	0
- organic (G08.8)	8?	1	<1	3	<1	0	0
Sandy oxidised ware (O06.18)	13	1	<1	7	<1	0	0
White-slipped sandy oxidised ware (W17)	20?	1	<1	3	<1	0	0
Sandy reduced ware (G00))	14	1	<1	4	<1	0	0
Grog-tempered ware (F017)	16.2	10	2	159	2.5	0	0
Total Regional/Local wares		**341**	**78.5**	**3622**	**56**	**231**	**74**
South-east Dorset BB1 (B02)	22	33	8	240	4	29	9.3
Nene-Valley-type sandy reduced ware (G02.2)	14/15	1	<1	4	<1	2	<1
Nene-Valley-type sandy reduced ware (G02.3)	14/15	5	1	27	<1	11	3.5
Cream ware (P00)	41.1	2	<1	3	<1	0	0
Eggshell ware (P07.2)	109	1	<1	1	<1	0	0
Wroxeter mortaria (M015)	**	3	<1	33	<1	8	2.6
Total Traded ware		**45**	**10**	**308**	**5**	**50**	**16**
Miscellaneous		16	4	13	<1	0	0
Total uncertain source		**16**	**4**	**13**	**<1**	**0**	**0**
Amphorae, Class 25 (A01))	42.1	18	4	2418	37	0	0
Amphorae (A0)	42.6?	2	<1	58	<1	0	0
Total amphorae		*20*	*4.5*	*2476*	*38*	*0*	*0*
Samian, (S0)	43	12	3	39	<1	30	10
Total samian		*12*	*3*	*39*	*<1*	*30*	*10*
Total Imported		**32**	**7.5**	**2515**	**39**	**30**	**10**
TOTAL POTTERY		**432**		**6448**		**311**	

Methodology

The pottery was recorded in full using the standard BUFAU Roman pottery recording system, described in the project archive. Fabrics were recorded with reference to the Worcestershire County Fabric Series, prefixed WCM in the text (Hurst and Rees 1992, 200-209). Precise form types and broad vessel classes (for example bowl, flagon, mortarium) were both recorded. These were cross-referenced with illustrated forms from other Worcester sites (Darlington and Evans 1992; Buteux and Evans unpub) or other key publications. Other characteristics studied included decoration, evidence for manufacture (overfiring), repair (none noted), use or reuse (e.g. counters). The assemblage was quantified by sherd count, weight and EVE (estimated vessel equivalent). Quantification by rim EVE is presented in this report, although both rim and base EVEs are recorded in the archive. The condition of the pottery varied, but all sherds were abraded to some degree. None of the pottery is illustrated, as all forms are well-published elsewhere.

Discussion

The best evidence for dating Phase 1 was provided by sherds of samian and Black-burnished ware. The samian indicated a date of *c.*AD 120-140/50 for the features in which it was found (F3, F11), although some residual first and earlier second-century material was also present. This date was broadly supported by the presence of BB1. This generally indicates a *terminus post quem* of *c.*AD 120, although small quantities have been found in earlier contexts elsewhere in the region. The large pit in Area 3 (F11) was the only feature to produce form sherds in BB1. These comprised a flat-rimmed bowl or dish (Seager Smith and Davies 1993, type 22/3), a beaded-rim beaker (ibid. type 10), a groove-rimmed bowl (ibid. type 24) and a dish with a slightly-beaded rim (ibid. type 20). The first two of these date broadly to the second century. The latter two, however, support a *terminus post quem* some time in the later second or earlier third century, providing the latest dating evidence for this phase. This is consistent with some of the associated Severn-Valley-ware forms, for example a moderately-splayed tankard and a segmental bowl (Webster 1976, fig. 7.40, fig. 10.65).

A high level of residuality was evident in the assemblage, and a significant quantity of first - early second-century pottery was included. Typically-early coarseware included organic-tempered Severn Valley ware (WCM fabrics 12.2 and 12.3), fragments from a large, grog-tempered storage jar (WCM fabric 16.2), Malvernian wares (WCM fabrics 3 and 19), black-surfaced grey wares (WCM fabric 8), and white wares and white-slipped wares (WCM fabrics 20, 41.1 and 109). The black-surfaced grey wares are similar to the range of transitional fabrics noted at *Ariconium* (Willis forthcoming, 85). These, and the other fabrics, are all found in early-Roman contexts elsewhere in Worcester (Darlington and Evans 1992, 36-39; Buteux and Evans unpub). Some forms were also characteristic first or second-century types. These comprised a Severn Valley ware tankard and carinated bowl (Webster 1976, fig.7.38, fig.9.59-60), and, in reduced Severn Valley ware, a 'waisted' bowl (cf Darlington and Evans 1992, fig. 22.7), fragmentary rusticated jars (cf Darlington and Evans 1992, fig. 22.1), and various beakers (cf Darlington and Evans 1992, fig. 17. 1-3). Malvernian tubby cooking pots were also present (Peacock 1967, fig. 1.1-8). Less-well-dated fabrics included oxidised and reduced Severn Valley wares (WCM fabrics 12 and 12.1) and Dressel 20 amphorae (WCM fabric 42.1).

The pottery from the dark earth layer (Phase 2) was generally contemporary with the pottery from Phase 1. The samian from the dark earth layer in Area 3 (3001), for example, dated to the later second century. One exception was a sherd from a BB1 cook pot decorated with obtuse-cross-hatch burnish from Area 1, (2003). This provided the only evidence of late third - fourth-century activity. From the ceramic evidence, it is possible that the dark earth could have started accumulating any time from the late third century onwards. There certainly appears to have been a change in the depositional processes on the site by the late third - fourth century. The pottery from the dark earth was much more fragmentary than the Phase 1 pottery (Table 2, Av. sherd Wt.). This, and the fact that that most of it appears to be residual, indicates that the pottery from the dark earth is all redeposited. It is not possible to say whether it derives from subsequent disturbance of Phase 1 contexts or was brought onto the site from elsewhere. No joins were noted between the phase assemblages, but this may not be significant given the level of fragmentation in phase 2.'

Histograms have been produced to analyse the composition of the assemblage by fabric, quantified by both weight (Fig. 5) and rim EVE (Fig. 6). Perhaps the most marked feature of these histograms is the biased proportion of amphorae represented when the fabrics are quantified by weight. Most of the amphorae (17 sherds, 2401g) came from a single pit (F10). The associated pottery included fragments from an organic-tempered Severn Valley ware storage jar and various beaker rims. Despite this obvious bias, the charts do give a useful indication of the range of fabrics present. The relatively high proportion of reduced Severn Valley ware is consistent with the evidence from second-century contexts at Sidbury (Darlington and Evans 1992, 45). While it is difficult to draw firm conclusions from such a small sample, the profile of the assemblage by vessel class (Fig. 7) is perhaps worth noting. An emphasis on beakers, bowls and dishes, rather than jars, could reflect the type of activity on the site. A much narrower range of forms came from the dark earth than the Phase 1 assemblage. This must in part reflect the higher level of fragmentation, which made quantification of forms more difficult. There does, however, seem to be an emphasis on jars in the dark earth assemblage. Jars represent 24% by rim EVE in the Phase 1 assemblage, but 49% by rim EVE in Phase 2. This may reflect functional trends on the site, but as the Phase 2 assemblage is mainly residual and its derivation uncertain it is impossible to draw any firm conclusions.

The Samian by Steven Willis

A total of 12 sherds of samian pottery (*terra sigillata*) was submitted for identification and dating. The catalogue presented below adheres to a consistent format. Sherds are listed by context. The following data are given: sherd count, sherd type (e.g. rim or body; there are no base/footring sherds), source (South Gaulish is abbreviated to SG, Central Gaulish to CG), vessel form (where identifiable), weight of sherds in grams, the percentage of any extant rim (i.e. the RE figure, where 1.00 would represent a complete circumference) and the rim diameters, and an estimate of the date of the item in terms of calendar years (this being the date range of deposits with which like-pieces are normally associated). The presence of other features such as burning and sherd joins is noted.

<u>F3, Context 2002</u>

Body, SG La Graufesenque, from a decorated bowl, either Drag. 29 or 37, 1g, *c.*AD 60-100. A blurred bead border is discernible.

Body, CG Lezoux, Drag. 18/31R, 2g, *c.*AD 120-150.

Rim, CG Lezoux, Drag. 18/31, 6g, RE: 0.08, Diam. 180mm, *c.*AD 120-150.

<u>Context 3001</u>

Rim, CG Lezoux, probably Drag. 33, 1g, RE: 0.03, Diam. *c.*130mm, *c.*AD 140-200.

Body, CG Lezoux, from a bowl or dish, 4g, *c.*AD 140-200.

Rim, CG Lezoux, Drag. 31, 8g, RE: 0.08, Diam. 170mm, *c.*AD 150-200.

Context 3002
1 rim sherd and a conjoining body sherd, CG Lezoux, Drag. 18/31, 4g, RE: 0.05, Diam. 160mm, *c.*AD 120-150. Both burnt.

F11, Context 3006
Body, CG Les Martres-de-Veyre, Drag. 18/31, 4g, *c.*AD 100-120/130.
Rim, CG Lezoux, Drag. 33, 7g, RE: 0.08, Diam. 130mm, *c.*AD 120-140.
Rim, CG Lezoux, Drag. 18/31, 7g, RE: 0.01, Diam. 180mm, *c.*AD 120-140.
Body, CG Lezoux, form not identifiable, 0.5g, *c.*AD 120-200.

This assemblage of samian is too small to permit any detailed discussion, and in any case comes from a range of contexts within which much of it occurs as residual material. Nonetheless, the balance of the assemblage in terms of sources and chronology is probably representative for this specific area of Worcester. The predominance of second-century Lezoux sherds, together with a presence of some earlier samian, is unsurprising. The chronology of the samian sits comfortably with the dating of the coarse pottery from the four contexts within which the samian is present. In particular the samian evidence from context 2002 is consistent with the suggested dating of that context, on the basis of other indicators, as assignable to the first half of the second century. All the sherds are small, with the average sherd weight falling below 4g. This may in part reflect the residual status of a proportion of the group. On the other hand, the sherds are comparatively unabraded and show very little sign of weathering. The soil environments of this part of Worcester seem, therefore, conducive to the survival of samian vessel surfaces and decoration, which are key elements for both dating this pottery and, in turn, early- and mid-Roman contexts.

Conclusions

This small assemblage of Roman pottery adds to the existing body of data recorded from Worcester, for example the major excavations at Sidbury (Darlington and Evans 1992), Deansway (Buteux and Evans unpub) and, more recently, the Magistrates' Court (Jones and Vyce 2000). The quantity of first-century material is paralleled elsewhere in Worcester, with significant levels having been noted in particular on the Deansway site. As more work is done in Worcester and more quantified data are published, the character and distribution of these early assemblages need to be explored. Future work will be enhanced by the recent and imminent publication of a number of early-Roman sites that may be pertinent to understanding early-Roman Worcester in its wider regional context. These include *Ariconium*, Herefordshire (Willis forthcoming), excavations in Alcester (Lee *et al.* 1994: Booth and Evans 2001), the Metchley Roman fort (Greene *et al.*, 2001; Hancocks forthcoming) and the Wroxeter baths and *macellum*, Shropshire (Timby *et al.* 2000; Darling In press).

The medieval and post-medieval pottery by C. Jane Evans, with specialist identification by Stephanie Rátkai

The excavations also produced seven sherds of medieval pottery and 38 sherds of post-medieval pottery. The medieval pottery included Worcester-type unglazed ware (Hurst and Rees 1992, fabric 55), Worcester-type sandy glazed ware (ibid., fabric

64.1) and Malvernian unglazed ware (ibid., fabric 56), all dating to the twelfth or thirteenth century, together with sherds of glazed Malvernian ware (ibid., fabric 69) dating from the fourteenth - sixteenth century. The post-medieval pottery included typically seventeenth- and eighteenth-century coarse wares, including slip wares and black-glazed wares, as well as characteristically nineteenth-century wares. Of potential interest were fragments from a saggar used in porcelain production (context 1001) and a fragment of unglazed porcelain (context 1002). Waste from Royal Worcester porcelain production is fairly ubiquitous on sites in Worcestershire, sometimes being used as hardcore. However, the St Martin's Gate site is very close to one of the smaller porcelain works in Worcester, owned by the Grainger family (Pat Hughes pers. comm.), which could make these finds more significant.

The Roman brooch by Roger White

Introduction

A Roman brooch was recovered from a test pit (Test Pit 1) excavated through the dark earth layer in Area 3 (3001). It was stabilised through conservation at Wiltshire Museums Service. The conservation involved mechanical removal of corrosion products with the cleaned surface being coated with Incralac.

Description

The overall dimensions of the brooch were c.60mm by 23mm Despite the conservation, the brooch is in a poor state of preservation, with the original surface only surviving on the dorsal and ventral parts of the brooch. However, conservation has at least arrested further decomposition. In design, the brooch is basically T-shaped, with a strongly arched bow. The arms are cylindrical in section but are poorly preserved, especially at their ends, so that only the axle bar is prominent here. The only decoration visible is two dots placed one above the other at the junction of the arms and the bow. Those on the lefthand side are better preserved and one still holds a dot of red enamel. A plain hook above the arms holds a remnant of the wire spring. Below this, at the start of the bow, is a stud that has been identified in the conservation report as made of iron. A pierced hole lies below this. It too presumably once held a stud. The remainder of the bow has five panels that gradually decrease in area but which once held enamel. The second panel from the top is still filled with enamel that is now a dull grey colour but which may originally have been yellow or white. The end of the bow tapers away and is flattened for the catch plate which is, however, entirely lost.

Discussion

The brooch can be confidently assigned to the Head-Stud brooch group, a large and important class of T-shaped brooches that evolved in the later first century AD and was in production and use until the later second century, with some remaining in use perhaps into the third century. The brooch was popular in the Midlands and there is strong evidence for regional types indicating localised production (e.g. Philpott 1999). In genesis, the type is clearly derived from the Colchester brooches, so that the stud was originally conceived as a functional device for riveting the hook holding the brooch spring to the brooch bow (Hattatt 1989, 80-1, no.1524). However, in the majority of Head-Stud brooches, the stud has achieved a purely skeumorphic and decorative function and is thus often highly decorated and/or enamelled. Analysis of the pin mechanisms shows that the type could have a Colchester type sprung pin, a simple sprung pin or, later, a simple hinged pin. Our example belongs in the first group and thus is probably late-Flavian in date (Mackreth 1994, 164-5). Three decorative types of enamelling are known: a single cell running down the bow, a series of rectangular cells also on the bow, or a lozenge-and triangle pattern that can be found on the arms in addition to the bow (*ibid*, no.36, fig. 77). This last type of enamelling is virtually exclusively reserved for the later hinged-pin variety and at least one example of this type is known from Worcester itself (Mackreth 1992, 73-5). The twin dots of enamel seen on the St Martin's Gate example is a rare feature and the author knows of no parallel to it. However, this is unlikely to be an important diagnostic feature and merely reflects the wide variety of producers of brooches of all types at this date (*ibid.*).

The charred plant remains by Marina Ciaraldi

Introduction

A sampling programme was designed for the recovery of biological remains from the excavated features. Soil samples of 20 litres were taken from all dateable features, in accordance with the guidelines outlined in the 'On-site Guide to Environmental Sampling and Processing' (BUFAU, Procedure No.2). A monolith for the recovery of pollen was also taken from the southeast-facing section of Area 3 (see Fig. 4, S.1 and Greig, this volume).

Methodology

Six soil samples were processed by using bucket flotation. The light fraction (flot) of the soil was recovered using a 500μm sieve while the heavy fraction (residue) was recovered on a 1mm mesh. The residues were sorted by eye, and the flots were scanned under a low-power stereomicroscope. The identification of the seeds was carried out by comparison with modern reference material. The taxonomic nomenclature for the wild species follows Stace (1991), while that of the cereals follows Zohary and Hopf (1994).

Identification

The plant macroremains recovered from the samples, though generally well preserved, presented some distortion due to their exposure to high temperatures (especially in the case of cereal grains).

Grains of spelt (*Triticum spelta* L.) and bread wheat (*Triticum aestivum* s.l.) are notoriously difficult to distinguish (Hillman *et al.* 1996). In the case of the plant assemblage from St Martin's Gate, the grains of spelt had a clear, more general 'slim' aspect, with straight sides and a low lateral profile (Jacomet 1987). In a few cases it was possible to identify the wheat grains as bread wheat (*Triticum aestivum* s.l.) on the basis of their overall rounded shape and by the lack of a dorsal ridge. Grains with a short and rounded appearance and a rather steep embryo scar were identified as club/bread wheat (*Triticum aestivum-compactum* Schiem.).

Forklets and glume basis were damaged, with only the basal part of the glumes preserved, and for the most part they could only be identified as spelt/emmer (*Triticum dicoccum/spelta*), as none of the features characteristic of the two species was preserved. In a few cases, however, a highly pronounced primary keel and secondary veins were visible, and these could be assigned to spelt (Jacomet 1987).

The presence of twisted grains of barley suggested that six-row barley (*Hordeum vulgare* L.) was present in the assemblage. Many detached coleoptiles were also identified, possibly belonging to cereals, on the basis of their size.

Discussion

The samples discussed are from features which are all within Phase 1, dating broadly to the first - third century AD. Two of them were collected from pits (F10/3004 and F13/3008), while one was from a potential ditch fill (F6/2007).

All the samples examined contained a mixture of cereal grains and crop processing by-products, while the presence of fruit plants, such as *Prunus* sp. or hazelnut (*Corylus avellana* L.), was only occasional.

The cereals identified include species commonly present on Roman sites, with spelt (mainly represented by chaff) largely predominant. A few grains of free-threshing wheat and bread/club wheat (respectively *Triticum aestivum* s.l. and *Triticum aesitvum/compactum*) were also identified. Often free-threshing wheat is sparsely represented in charred plant assemblages due to the different sequence of crop processing stages and a low chances of contact with fire. It is probable that the hexaploid rachis internodes identified in the assemblage belong to bread wheat, as these tend to be the only by-product of free-threshing wheat. The identification of emmer (*Triticum dicoccum* Schübl.) is based on the presence of emmer-like characters on a few forklets and glume basis and has to be considered uncertain. The presence of germinated grains of wheat and barley and numerous detached coleoptiles is also noticeable. These are often interpreted either as evidence of the production of beer or as an indication of bad storage conditions. In the case of the present assemblage, both interpretations are possible.

The group of wild plants includes species of weeds often present in plant assemblages from Roman sites in this region such as Deansway and Blackfriars (see Moffett 1987, 1995; Monckton 1999b). The group includes a mixture of by-products characteristic of fine sieving and final stages of cleaning, such as large seeded grasses like *Lolium* sp. or brome grass. The final stages of cleaning of crops take place either just before consumption or before the crop is stored. High numbers of large seeded grasses have already been reported from Roman deposits in Worcester, for instance at Deansway (Moffett 1995) and Blackfriars (Moffett 1987). The similarity in species composition and numerical proportion suggests that similar agricultural practices were adopted on sites in this area of the west Midlands. The proximity of the Worcester sites could also suggest that the cereals were cultivated under similar ecological conditions, if not in the same field. The presence of species such as *Carex* sp., *Scirpus* sp. and spikerush

(*Eleocharis uniglumis/ palustris*) in other Roman assemblages from Worcester (Moffett 1987 and 1995) would support this idea. These plants are not typical cornfield weeds but they are often found in the vicinity of drainage channels or poorly-drained areas of fields. The common finding of spikerush seeds amongst charred crop waste suggests that it was a weed associated with cereals in ancient times (Jones 1988).

Heath grass (*Danthonia decumbens* L.), a plant nowadays found in heaths and acid grasslands, is thought to have been a common weed of ard-cultivated fields (Hillman 1981 and Hillman 1982b). This species seems to have been particularly common in Iron Age/Romano-British plant assemblages from Wales (Hillman 1982a; Ciaraldi forthcoming) and northeast England (van der Veen 1992). Hillman (1981) suggested that heath grass could be an indicator of the use of ards, rather than mouldboards, for ploughing. Ards do not cut the soil as deeply as mouldboards, allowing the permanence of perennial plants in cultivated fields. Statistical analysis of plant assemblages from the northeast of England has shown that heath grass is always associated with a spelt crop (van der Veen 1992). This might have been the case for the Midlands, but more evidence is needed to support this.

The plant assemblage from St Martin's Gate is interesting not only for the information that it provides on Roman agricultural practices in Worcester, but also in relation to other aspects of the archaeological evidence. Quantities of metal slag, possibly deriving from iron smelting, were recovered from several of the Phase 1 features. Slag and spheroidal hammerscale were also present in all the samples examined. In a sample from a pit in Area 3 (F10/3004), the evidence of burning *in situ* and the presence of charcoal with fragments of slag attached (see Gale, this volume), seems to suggest a direct relation between the charred plant remains and the activity of smelting. Barker (1969, 63) reported on the presence of large heaps of slag as evidence of a Roman industry of iron smelting around St Martin's Gate and Talbot Street. Later, Carver (1980, 26) suggested that the presence of a nearby river would have been ideal for any industrial establishment in this area of the town.

The evidence suggests that the charred plant assemblage could possibly be interpreted as relating to metalworking activities, perhaps in the form of fuel. Evidence of the use of crop by-products as fuel or as tinder is already known from other Roman sites in the Midlands. The presence of large assemblages of spelt chaff associated with corndriers, for instance, is well known (Bowker 1982 and 1983; Nye and Jones 1994; Jackson *et al.* 1996; Letts 1996; van der Veen 1996; Monckton 1999a; Moffett and Ciaraldi 2000). In particular, evidence of the use of fine sieving by-products as tinder comes from Catsgore (Hillman 1982b), Tiddington (Moffett 1986) and Deansway (Moffett 1995). At Stowmarket (Murphy 1989) and at Postwick (Murphy unpub) the charred remains of fine sieving waste were associated with pottery kilns. Similar evidence of the use of crop processing by-products as fuel during Roman times is also well attested in temperate and arid regions (van der Veen 1999).

The only case known to the author of the use of cereals in iron smelting activities comes from Denmark, from a Late Roman-Germanic Iron Age site (Mikkelsen 1997), although in this case the entire crop was used as fuel. Excavations of the iron smelting furnaces in Denmark have revealed that twigs and branches, as well as straw, were used to retain the charcoal and the bog ore in the furnace while the initial iron extraction was carried out (Mikkelsen forthcoming). It is possible that by-products from crop processing were used as fuel either for a particular part of the iron working process (for instance to retouch metal objects), or because there was a more general scarcity of wood fuel, as indicated by the evidence from the charcoal remains (see Gale, this volume.)

TABLE 5
Plant remains from St Martin's Gate, Worcester

	Feature/Context		F10/3004	F6/2007	F13/3008
	Area		3	1	3
	Vol. soil processed		13	15	13
	Seeds/litre		33	0.9	3.6
	Cereals				
spelt	*Triticum* cf. *spelta*	g	4		
bread wheat	*Triticum aestivum* s.l.	g			4
bread/club wheat	*Triticum* cf. *aestivum/compactum* germinated	g	1		
wheat	*Triticum* sp.	g	4		2
wheat	*Triticum* sp. Germinated	g	4		
barley	*Hordeum vulgare*	g	2		2
barley	*Hordeum vulgare* germinated	g	1		
six-row barley	*Hordeum vulgare* twisted	g	1		
barley	*Hordeum vulgare* hulled	g	1		
barley	*Hordeum vulgare* tail	g	1		2
cereals	Cereals	g	22	5	8
cereals	Cereals – germinated	g	2		
cereals	Cereals – pitted	g	2		
cereals	Cereal/large *Poaceae*	col	18		
	Chaff				
emmer/spelt	*Triticum dicoccum/spelta*	glb	35		5
emmer/spelt	*Triticum dicoccum/spelta*	f			3
spelt	*Triticum spelta*	glb	68		5
spelt	*Triticum spelta*	gl	3		
spelt	*Triticum spelta*	f	1		
hexaploid wheat	*Triticum* sp. Hexaploid	ri	5		
wheat	*Triticum* sp.	base fork	20		
wheat	*Triticum* sp.	ri	23		
barley	*Hordeum vulgare*	ri	1		
	Weeds				
fat hen goosefoot	*Chenopodium album*	s	2		
grass vetchling	*Lathyrus nissolia*	s	1		
vetch/tare	*Vicia/Lathyrus*	s	15	3	3
small leguminosae	*Medicago/Melilotus/Trifolium*	s	3		1

knotgrass	*Polygonum aviculare*	s	1		
knotgrasses	*Polygonum* sp.	s			1
sheep's sorrel	*Rumex acetosella*	s	3		1
docks	*Rumex* sp.	s	8		
cleavers	*Galium aparine*	s	3		
bedstraws	*Galium* sp.	s	2		
daisy family	*Asteraceae (Alchemilla* type)	s	1		
spike- rushes	*Eleocharis uniglumis/palustris*	s	3		
club-rush	*Scirpus* sp.	s	1		
sedges	*Carex* sp.	s	1		
oats	*Avena* sp.	a	2		
rye-grasses	*Lolium* sp.	s	2		
meadow-grasses	*Poa* sp.	s			1
soft/rye brome	*Bromus hordeaceus/secalinus*	s	102		
thymothy grass	*Phleum pratensis*	s	12		
heath-grass	*Danthonia decumbens*	s			1
grasses	*Poaceae*	s		3	
grasses	*Poaceae Poa* type	s	42		1
small grasses	small *Poaceae*	ci/cn	2		
large grasses	large *Poaceae Lolium* type	cn			6
	Other				
hazelnut	*Corylus avellana*	sh	2	1	
	Prunus sp	st		1	1
	Indet	s	2		

Conclusion

Despite the small size of the plant assemblage from St Martin's Gate, its importance is unquestionable. The species of weeds present in the assemblage are found in most of the plant assemblages from Roman sites in the region. This raises the question as to whether this can be considered to be evidence for the existence of homogenous agricultural activities in the region during Roman times. The evidence suggests that there may be other possible common practices among sites within the region, such as the use of crop waste for fuel in association with different 'industrial' activities. However, although the regular use of crop by-products as fuel or tinder in Roman Britain is now well attested, the scale at which this occurred is less clear. It is not clear, for instance, whether the use of crop by-products is limited to producer sites or if it was part of a long-distance exchange system. It is to be hoped that future work will be able to address this problem.

The pollen by James Greig

Summary

Two pollen samples from a pit of Romano-British date provided only a little poorly-preserved pollen, which might be indicative of an open, occupied place, by analogy with a better-preserved assemblage from excavations at Sidbury (Sawle 1977), also in this part of Worcester.

Introduction

Pollen samples were collected from the southeast-facing section of Area 3. This sample included the organic fill of a pit (F11/3006) and the dark earth layer (3001) which sealed it.

Methodology

Two monolith tins were collected, to sample the section of pit fill (F11/3006) and the overlying dark earth layer (3001), as recorded on the section drawing (Fig. 4, S.1). Small sub-samples for pollen analysis were taken every 5 cm throughout this section. Two pollen samples from 35cm, representing the dark earth layer, and from 70cm, representing the pit fill, were processed using the standard method. Sub-samples of approximately 1 cm^3 were dispersed in dilute NaOH and filtered through a 70µm mesh to remove coarser material, which was then scanned under a stereo microscope. The finer organic part of the sample was concentrated by swirl separation on a shallow dish. Fine material was removed by filtration on a 10µm mesh. The material was acetolysed to remove cellulose, stained with safranin and mounted on microscope slides in glycerol jelly. Counting was done with a Leitz Dialux microscope. Identification was carried out using the author's pollen reference collection, seen with a Leitz Lablux microscope. Standard reference works were used, notably Fægri and Iversen (1989) and Andrew (1984).

Results

The pollen types have been listed in Table 6, using the nomenclature and order of the taxa according to Bennett (1994) and Kent (1992) respectively. Pollen was poorly preserved and sparse, so outline counts were carried out based on five traverses of each pollen slide, and a scan of the rest of the slide under low power. Most of the pollen was of *Lactuceae*, a group which includes dandelions, hawkbits and sow thistles, a pollen type that is so robust that it is the last to decay away. It therefore seems that conditions were not suitable for the preservation of most pollen. *Centaurea nigra* (knapweed) was present in the sample from 70cm, another robust pollen grain. Other pollen grains such as *Poaceae* (grasses), *Cerealia* (cereals) and *Chenopodiaceae* (goosefoot, fat hen, orache) were pale and thin from partial decay. They show open grassy or weedy conditions. *Alnus* (alder) pollen was also found in the sample from 35cm.

A few grains were found in a very fresh state such as *Tilia* (lime), and are thought to be modern, as the lime trees were flowering at the time of excavation, in mid-July.

Correlation with other sites

A useful comparison to St Martin's Gate is the site at 23-29 Sidbury, Worcester, which was excavated by John Sawle in 1976-7 (Sawle 1977). A large ditch, possibly dating from the first century AD, contained plenty of good pollen, with around 20 pollen taxa, showing very open, occupied surroundings with grassland and weeds, and a trace of cereals (Greig unpub). It is possible that the large pit (F11) at St Martin's Gate originally had a similar pollen assemblage, but only the traces have survived. The good pollen preservation at Sidbury demonstrates the value of looking for pollen at sites such as this, as useful results can be obtained. However, due to the poor preservation from the samples assessed at St Martin's Gate, it was not considered to be worthwhile to carry out any further analysis, as this would have been unlikely to yield any more information.

TABLE 6

Pollen and spores from F11	35 cm	70 cm	
spores			
Pteridium	1	1	bracken
pollen			
Alnus	2	-	alder
Chenopodiaceae	+	-	goosefoot
Tilia	+	-	lime (probably modern)
Centaurea nigra	-	2	knapweed
Lactuceae	9	13	a group of composites
Anthemis-tp.	-	2	mayweeds etc.
Poaceae	2	-	grasses
Cerealia-tp.	1	-	cereals

Charcoal by Rowena Gale

Introduction

Charcoal from two pits (F10 and F13) and a ditch (F6) was analysed. The presence of abundant metal-working slag suggests that the charcoal may represent associated fuel deposits.

Materials and methods

Bulk soil samples were processed by flotation and sieving using 1mm and 500 micron meshes. The resulting flots and residues were scanned under low magnification and the charcoal separated from plant macrofossils. Charcoal fragments measuring >2mmin cross-section were considered for species identification.

The charcoal was rather poorly preserved and some fragments were vitrified. The charcoal was prepared for examination using standard techniques: fresh transverse surfaces (TS) were exposed by fracturing and scanned using a x20 hand lens. The charcoal was then sorted into groups based on the anatomical features observed on the TS. Representative fragments from each sample were selected for detailed study at high magnification. Transverse (TS), tangential (TLS) and radial planes (RLS) were prepared and the three surfaces supported in washed sand. The wood structure was examined using a Nikon Labophot microscope at magnifications of up to x400 and matched to prepared reference slides of modern woods. Where possible, the maturity (i.e. heartwood/sapwood) of the wood was assessed and the number of growth rings was recorded.

Results

The results of the charcoal analysis are summarised in Table 7 and discussed in the following text. In Table 7 heartwood is indicated as (h), sapwood as (s), and twiggy fragments as (t). The anatomical structure of the charcoal was consistent with the taxa or groups of taxa given below. It should be noted that some related taxa are anatomically similar and secure identification to genus level may be difficult or impossible. These include members of the Pomoideae (*Crataegus, Malus, Pyrus* and *Sorbus*) and Salicaceae (*Salix* and *Populus*). Where a genus is represented by a single species in the British flora this is named as the most likely origin of the wood, given the provenance and period, but it should be noted that it is rarely possible to name individual species from wood features, and some exotic species of trees and shrubs were introduced to Britain from an early period (Godwin 1956; Mitchell 1974). Classification follows that of *Flora Europaea* (Tutin *et al.* 1964-80).

Taxa identified:

Aceraceae.	*Acer campestre* L., field maple
Betulaceae.	*Betula* spp., birch
Corylaceae.	*Corylus avellana* L., hazel
Fagaceae.	*Quercus* spp., oak
Oleaceae.	*Fraxinus excelsior* L., ash
Rosaceae.	Subfamilies:
	Pomoideae which includes *Crataegus* spp., hawthorn; *Malus* sp., apple; *Pyrus* sp., pear; *Sorbus* spp., rowan, service tree and whitebeam. More than one species may be represented in the charcoal.
	Prunoideae. *Prunus spinosa* L., blackthorn.
Salicaceae.	*Salix* spp., willow, and/ or *Populus* spp., poplar.
Ulmaceae.	*Ulmus* spp., elm.

Area 1

The potential linear ditch feature (F6) was possibly the construction trench of a wall. Subsequent deposits in its fill (2007) included large quantities of metal-working slag and pottery. Charred seeds, cereal grains and charcoal were sparse. The charcoal was composed mainly of fragments too small to identify. Larger pieces included oak (*Quercus* sp.) heartwood and sapwood (probably from fairly juvenile wood), ash (*Fraxinus excelsior*), elm (*Ulmus* sp.) sapwood, a member of the hawthorn/*Sorbus* group (Pomoideae) and a twiggy piece of hazel (*Corylus avellana*), charred diameter 3mm. A small piece of coal-like material was also present.

Area 3

Charcoal associated with metal-working waste was also examined from two pits (F13 and F10). The sample from the fill of one of the pits (F13/3008) consisted of fragments up to 10mm in the longest axis. Despite the poor condition of the charcoal, a wide range of taxa was identified, including oak (*Quercus* sp.) sap and heartwood, maple (*Acer campestre*), ash (*Fraxinus excelsior*), hazel (*Corylus avellana*), birch

(*Betula* sp.), elm (*Ulmus* sp.), willow/ poplar (*Salix* sp./ *Populus* sp.), and member/s of the hawthorn/*Sorbus* group (Pomoideae). Many pieces of oak had undergone vitrification, a glass-like condition brought about through exposure to temperatures exceeding 800° C. (Juliette Prior pers. comm.), during which cell walls become plastic and fuse together with consequent loss of recognisable structures. Some small fragments rather similar in appearance to the vitrified charcoal probably derived from coal. Charred cereal grains and chaff and weed seeds were also present.

The other pit from which material was analysed (F10) showed signs of *in situ* burning. Charcoal was comparatively abundant, with fragments of up to 20mm in the longest axis, and charred cereal grains, chaff, and weed seeds were also frequent. The larger fragments of charcoal mostly originated from blackthorn (*Prunus spinosa*) (one piece of blackthorn stem carried a thorn) and member/s of the hawthorn/*Sorbus* group (Pomoideae). Oak (*Quercus* sp.) and maple (*Acer campestre*) were also present. Roundwood diameters of blackthorn were estimated (from fragmented radial sections) to have been in excess of 50mm when living. The pieces examined included 16 growth rings, which varied in width but which did not suggest coppiced wood. Some fragments of blackthorn (*Prunus spinosa*) charcoal and bark (unidentified but morphologically similar to blackthorn) were attached to metal slag.

Discussion

Analysis of the charcoal supports the suggestion that the area was a focus of industrial activities in the Roman period, particularly metal-smelting. Charcoal from the fills of a ditch (F6) in Area 1 and two pits (F10 and F13) in Area 3, was closely associated with metal-working slag and thus attributed to deposited fuel residues, while vitrified charcoal in one of the pits (F13) attests to burning at high temperatures. Other materials from these features included pottery, charred weed seeds, and cereal grains and chaff from cereal processing waste. While the latter could be interpreted as dumped domestic waste, it could also represent the remains from industrial use, perhaps for tinder or fuel (see Ciaraldi, this volume). By implication, similar domestic origins for the charcoal, although unlikely, cannot be ruled out.

The taxa identified from the fuel residues included oak (*Quercus* sp.), blackthorn (*Prunus spinosa*), member/s of the hawthorn/*Sorbus* group (Pomoideae), maple (*Acer campestre*), elm (*Ulmus* sp.), birch (*Betula* sp.), hazel (*Corylus avellana*), ash (*Fraxinus excelsior*) and willow/poplar (*Salix* sp./ *Populus* sp.). Assuming an industrial origin for these residues, it is clear that fuel (probably charcoal) was provided from a wide range of taxa. The relatively small quantity of identifiable charcoal in these samples, however, did not allow an assessment of species dominance or selection. It is interesting to note, though, the apparent importance of non-oak species, particularly in one of the pits (F10), where blackthorn and member/s of the hawthorn group were abundant. Blackthorn wood was not recorded from the other pit (F13) or the ditch (F6), but in this pit blackthorn charcoal was attached to metal slag, verifying its use in the smelting process.

In many areas of Britain charcoal residues from Roman metal-working sites have demonstrated a strong preference for oak or oak and hazel fuel, e.g. at Bardown, Sussex (Cleere and Crossley 1995), Blakeney and *Ariconium*, Gloucestershire (Gale 1963), Woolaston, Gloucestershire (Figueiral 1992), Pomeroy, Devon (Gale 1999), Welwyn Hall, Hertfordshire (Gale, unpub), Scole, East Anglia (Gale in prep. a), Packenham, Suffolk (Gale, in prep. b), Lefevre Walk and Parnel Road, Bow, London (Gale, in prep. c).

Environmental conditions and the local availability of wood for charcoal-making would have been critical factors in determining the species used; locally produced charcoal was preferable since imported charcoal tended to fracture when carted over long-distances (Galloway *et al.* 1996). Pollen residues were scarcely present in the Roman levels and apart from alder (*Alnus glutinosa*), no other tree species were recorded (Greig, this volume). Palynological evidence from other sites in this part of Worcester suggest that in the first century A.D. the district was mainly open grassland (Greig, this volume). The wide range of species represented in the fuel residues, particularly shrubby species, such as blackthorn (*Prunus spinosa*) and the hawthorn group (Pomoideae), may reflect this woodland depletion, and evidence of cereal processing waste and possibly coal could be interpreted as a means of boosting fuel supplies.

Apart from blackthorn (*Prunus spinosa*) roundwood (see above) the charcoal was generally too comminuted to assess for evidence of the use of coppiced rods. Growth ring distribution in the fairly chunky stems of blackthorn, which probably measured about 50mm in diameter when living, were not indicative of coppice growth. It is worth noting the apparently sparse use of hazel (*Corylus avellana*), which is usually common and frequently coppiced in many British plant communities (Rackham 1990), and the non-use of alder (*Alnus glutinosa*), which was present in the pollen record (Greig, this volume). Could this imply alternative uses for these species? The output of iron from this region is unknown but if production was concentrated in this area (see above) and relatively continuous, the rate of fuel use may have out-paced supply, thereby contributing to the general paucity of woodland.

TABLE 7
Charcoal from Roman iron-making contexts

Key. h = heartwood; s = sapwood; t = twig

Samp	Cont	*Acer*	*Betula*	*Corylus*	*Fraxinus*	Pomoideae	*Prunus*	*Quercus*	Salicaceae	Ulmus
Area 1, linear feature F6										
2	2007	-	-	1t	3	1	-	21s,9h	-	1s
Area 3, pit F10										
4	3004	21	-	-	-	53	55	16h	-	-
Area 3, pit F13										
6	3008	2	1	2	2	2	-	17s,26h	1	1

The Slag by Annette Hancocks

A range and variety of industrial waste was recovered from the site, the major component of which was 4478g of tap slag. This would have derived from a bloomery furnace and attests to iron smelting on, or near, the site. The material is highly dense, has a lava-like flow on its upper surface, and a blue-grey colour on fracture.

Large quantities of spheroidal hammerscale were recovered from bulk samples during wet sieving. The presence of this material from bulk samples is noted in Table 8. Hammerscale results from the solidification of small droplets of liquid slag expelled from within the iron during hot working. This is significant because it is often found in the immediate vicinity of the smithing hearth and anvil.

TABLE 8: Quantification of slag by type (weight in grams)

Context /Feature	**Tap slag**	**Fuel ash slag**	**Vitrified hearth lining**	**Undiagnostic iron working slags**	**Blast Furnace slag**	**Spheroidal hammerscale**	**Haematite**	**Iron debris**	**Total**
1005 (W/B)	68g	-	-	-	-	-	-	-	**68g**
1006 (W/B)	78g	-	-	-	-	-	-	-	**78g**
2002 (F3)	280g	25g	-	716g	-	-	-	-	**1021g**
2007 (F6)	1313g	-	-	1824g	-	-	-	-	**3137g**
3000 (Tr.2)	-	-	-	-	-	-	2g	-	**2g**
3001 (TP1)	10g	-	-	-	-	X	-	-	**10g**
3001 (TP2)	2005g	42g	127g	990g	199g	-	-	92g	**3455g**
3002 (Tr.2)	417g	-	-	-	-	-	-	119g	**536g**
3004 (F10)	-	-	-	-	-	X	-	-	-
3006 (F11)	90g	-	-	-	-	X	-	-	**90g**
3008 (F13)	-	-	-	-	-	X	-	-	-
4002 (F20)	217g	-	-	-	-	-	-	-	**217g**
Total	**4478g**	**67g**	**127g**	**3530g**	**199g**	-	**2g**	**211g**	**8614g**

Discussion by Lucie Dingwall

The Roman Period

There was no evidence for pre-Roman activity at St Martin's Gate, but the remains from the site, although limited in extent, suggest that industrial activity was located in the vicinity in the early and middle Roman period, possibly in association with agricultural activities. Iron working slag was recovered from most of the Phase 1 features, although the quantities are very small in comparison to other sites in Worcester. However, the limited number of Roman features should be taken into consideration when comparing quantities of artefacts.

The iron working activity at St Martins Gate, dating from the first - third centuries, is broadly contemporary with that from Deansway, and earlier than that from Farrier Street and Broad Street. Excavations at Broad Street and Deansway have yielded iron working hearths and primary dumps of smelting slag (Dalwood *et al.* 1994, 105), whereas at the St Martin's Gate site, no iron working structures were recorded, no crucibles or moulds were recovered, and most of the slag occurred in dumps of material mixed with domestic rubbish, such as pottery. However, a high proportion of the slag recovered is tap slag, which could be indicative of a smelting furnace in the near vicinity. This is supported by the recovery of slag with charcoal still attached, the evidence for *in situ* burning in one of the pits, and indications of high temperatures as displayed by the vitrified charcoal. The lack of structural evidence for furnaces may be due to the small size of the area excavated, or to the fact that Roman remains have only survived in discrete areas of the site. It is possible that structural evidence for iron working could survive in areas of the site that were not disturbed, and remain to be discovered in the future.

Of particular significance is the retrieval of spheroidal hammerscale from the pits, which has a clear association with the occurrence of smithing in the near vicinity (Starley 1995). This could be either primary smithing of the bloom, or secondary smithing of objects for manufacture or repair. Smithing was often found in the immediate vicinity of the hearth and anvil, and did not require purpose-built structures (McDonnell 1995). The lack of evidence for smithing at other Roman sites in Worcester has led in the past to the characterisation of the iron industry in Worcester as a production centre for iron that was used elsewhere (Dalwood *et al.* 1992, 124). However, this apparent absence of smithing may in part be due to the fact that hammerscale was not looked for, or recognised, in samples from past excavations. More recent work suggests that smithing was widespread (James Dinn pers. comm.).

The palaeoenvironmental remains have produced important information about fuel usage in the area in the Roman period, and it is unusual to find plant remains in direct association with metalworking. This clearly suggests that the charcoal represents deposited fuel residues associated with metalworking, rather than dumped domestic waste. The availability of charcoal may have been the most important factor in determining the location of furnaces, as large quantities were needed and could not easily be transported over great distances (McDonnell 1995). The suggestion that crop by-products were being used as fuel due to scarcity of wood supplies is supported by the evidence from Farrier Street that cereal chaff was used for fuel (Dalwood *et al.* 1994, 105).

Although the quantities of iron working residue recovered from the site at St Martin's Gate are relatively small, the character of the archaeological remains fits well with the emerging picture of the establishment of a major iron smelting industry in Worcester in the second century (Jones and Vyce 2000), and its characterisation as a Roman small town with a primarily industrial function (Burnham and Wacher 1990). The dating for Phase 1 is consistent with other early Roman contexts in Worcester. There was no evidence for iron working at Deansway until the second - third century (Dalwood *et al.* 1992), and none from Broad Street and Farrier Street until the third - fourth century (Dalwood *et al.* 1994, 105). At Deansway, it is clear that although iron working was important in the second-third centuries, it did not replace agriculture, and the early Roman activity at both Farrier Street and Deansway has been interpreted as low intensity, predominantly rural, occupation (Dalwood *et al.* 1994).

There was very little evidence generally for structures of Roman date on the site, with the exception of an isolated posthole and a possible robbed-out wall in Phase 1. However, the recovery of domestic pottery from the site indicates that even if people were not actually living on the site, they were living close by (animal bone is notable for its absence). The lack of structural evidence may be due to the ephemeral nature of many poorer class dwellings and industrial buildings in the Roman period (White and Baker 2000). It is also likely that the earliest buildings on the site would have been timber buildings, which are less likely to survive in the archaeological record. The paucity of structures, and the evidence for crop-processing, supports the interpretation of the activity at the site as being similar in character to the early Roman occupation identified at Deansway.

It has been suggested that the Roman activity to the north of the historic city represents an industrial suburb of the small town, to the north of the postulated nucleus of the Roman settlement. However, the gathering body of evidence from various excavations and observations indicates that occupation of the town was intermittent over certain areas in the early Roman period (Dalwood *et al.* 1994, 107), suggesting that the Roman settlement was diffuse in character, with a number of different foci (County Archaeological Service 1995). The location of iron working at St Martin's Gate, away from the postulated 'industrial suburb' in the north, would support this view. No evidence was found on the site of the historically documented Roman road towards Droitwich (White and Baker 2000), but the location of iron working in the near vicinity of an important road would be consistent with the evidence found in the north of the city for such activities along the major north-south Roman road to Greensforge. The location of the site close to the Frog Brook may also be significant, as there is no doubt that transport, both river and road, would have played a significant role in the location of iron working, both at a local level and a wider regional level (Darlington and Evans 1992, 98).

The evidence from Sidbury and Farrier Street indicated that outlying areas of the town were abandoned by the late fourth century (Darlington and Evans 1992; Dalwood *et al.* 1994), although, unusually for Worcester, the County Education Offices in Castle Street yielded pottery dating to the late fourth - early fifth centuries (Dalwood *et al.* 1997). The dark earth layer from Phase 2 at St Martin's Gate is paralleled elsewhere in Worcester. Such deposits, ranging in depth from 0.6 - 1.2m, have been identified at many other sites in the city, including Farrier Street, Deansway, the Kardonia site and Castle Street. Several of these contained medieval and post-medieval artefacts from later re-working. The presence of late third - fourth-century pottery in the dark earth layer at St Martin's Gate indicates a late third-century, or later, date for deposition. It is possible that this later pottery was redeposited from the Phase 1 activity on the site, which would extend Phase 1 into the fourth century. However, the complete absence of any material later than the third century in the Phase 1 assemblage makes this interpretation less likely. It is more probable that the dark earth layer was partially or wholly composed of material derived from elsewhere in the vicinity, and this is supported by the level of fragmentation of the pottery. It is impossible to establish this for certain, since the ceramic assemblage is too small and fragmentary to enable the identification of vessel joins between the two phases, or to be able to make conclusive statements regarding functional differences between the ceramics in the two phases, other than the higher proportion of jars in Phase 2 (see Evans above).

Scientific analyses on the dark earth deposits from Farrier Street (Macphail 1994) indicated that they were formed by agricultural and faunal reworking of domestic refuse, which would support the interpretation that at least some of the Phase 2 material at St Martin's Gate may have originated from elsewhere. The presence of dark earth deposits has been taken to indicate an absence of late Roman or immediate post-Roman occupation in the area. However, it could be argued that the evidence of gardening or farming as represented by the dark earth deposits must indicate some level of occupation, and how intense this occupation may have been remains a matter of debate. However, any such occupation is likely to have involved the use of comparatively ephemeral buildings that would be unlikely to leave surviving traces (Coates and White 2000).

The medieval period

The lack of medieval activity on the site is paralleled by the sites at Loves Grove and Rea's Timber Yard, which also produced no medieval features and very little medieval pottery. This has been attributed to the fact that these areas lay outside the limits of the planned medieval suburb (Dalwood *et al.* 1994, 107). However, at the St Martin's Gate site it is likely to be a result of the possible ephemeral nature of structures in this area and subsequent destruction during the Civil War, followed by extensive ground disturbance in the later post-medieval period. Excavations at Tallow Hill/Pheasant Street (Whitworth and Edwards 2001) demonstrated that post-medieval activity had truncated the alluvium in this area.

The post-medieval period

The post-medieval brick walls located during the excavation and the watching brief correlate relatively closely with properties and property boundaries marked on the First Edition Ordnance Survey map of 1884. However, the position and size of the deep, north-south aligned, post-medieval linear ditch running across the site raises the possibility that this ditch may relate to a Civil War earthwork, since it does not correspond to any post-medieval property boundaries marked on the historic maps. A putative Civil War ditch was identified at Farrier Street (Dalwood *et al.* 1994, 108), and very tentatively interpreted as relating to one of the artillery bastions projecting from the city wall, as depicted on the plan of the 1651 defences. The upper profile of the ditch at St Martin's Gate was heavily disturbed, making it difficult to make definitive statements regarding date and original depth. However, the lower fill did not contain any pottery later than the late seventeenth century, and it remains a possibility, therefore, that this ditch may represent earthworks relating to one of the Civil War sieges. There was no evidence for bank material, and the position and alignment do not correlate with the reinforcement of the city walls, but as at Farrier Street, it may relate to an artillery bastion projecting from the wall, which would explain why it was not identified in the north of the site during the watching brief. The Farrier Street ditch was much narrower, with a width of less than 2m, compared to 5m at St Martin's Gate, but the latter was situated at a gateway, which may explain the difference.

The archaeological evidence from the watching brief in the northwest corner of the site may support the documentary evidence for a tilehouse in the area in the late medieval and early post-medieval periods. A tilehouse is recorded as having stood opposite the gate in what is now Silver Street, first mentioned in 1455, and continuing in use by the Marson family into the seventeenth century (Hughes 1980, 285). A brick kiln is also mentioned. It is possible that the sandstone foundations recorded during the watching brief (F102 and F103) represent the reuse of earlier building foundations relating to this tilehouse, which was presumably destroyed during the Civil War, although the sandstone could have been robbed-out from the city walls. The dense concentration of post-medieval tiles recorded during the watching brief in this area may also be related to the tilehouse. There was no evidence for any kiln structures in the vicinity, but these may survive nearby, in areas left undisturbed during the development.

Conclusions

The site at St Martin's Gate, although providing limited and fragmentary structural evidence for the Roman period, yielded significant artefactual and palaeoenvironmental remains, which, when studied in the context of other published work in the city, provide significant new information about Roman iron working in Worcester and about the character of the settlement. The evidence for early iron working is particularly important, as understanding the development of the Roman iron working industry in Worcester has been identified as a key research objective (Dalwood et al. 1994, 111). There is not enough evidence to be able to interpret potential shifts in patterns of iron working activity or settlement, but the excavation has provided firm evidence for the extent of the Roman settlement into this area of the town. The survival of remains potentially relating to the Civil War is of particular interest, as many of the defensive earthworks were not documented, and archaeological evidence is the only way to establish accurate locations for these features. There may also be potential for late-medieval and early post-medieval archaeological remains surviving in the northwestern area of the site, undisturbed by the recent development, that could be associated with, and enhanced by, documentary evidence. The archaeological work has clearly demonstrated that despite extensive post-medieval and modern disturbance, there is significant archaeological survival in the northern and western part of the site.

9.0 References

Andrew, R., 1984 *A Practical Pollen Guide to the British Flora*. Quaternary Research Association, Technical Guide 1, Cambridge.

Barker, P. A., 1969 'The Origins of Worcester', *Trans Worcs Arch Soc* 3rd Series 2, 7-116.

Bennett, K. D., 1994 Annotated Catalogue of Pollen and Pteridophyte Spore Types of the British Isles. Unpublished Report.

Booth, P., and Evans, J., 2001 *Roman Alcester, Northern Extramural Area, 1969-1988 Excavations*, Roman Alcester Series, Vol. 3, CBA Res Rep 127.

Bowker, C. H., 1982 'Environmental Research at Wasperton', *West Midlands Archaeology* 25, 25-6.

Bowker, C. H., 1983 'Environmental Research at Wasperton, Second Interim Report', *West Midlands Archaeology* 26, 29 -35.

Burnham, B. C., and Wacher, J., 1990 *The 'Small Towns' of Roman Britain*.

Buteux, V., and Evans, J., unpublished 'The Iron Age and Romano-British Pottery', in C. H. Dalwood (ed), *Excavations at Deansway, Worcester 1988-89*, unpublished typescript, on file at Worcestershire County Council Archaeological Service.

Carver, M. O. H., 1980 'Medieval Worcester', *Trans Worcs Arch Soc* 3rd Series 7, 1 – 292.

Ciaraldi, M., forthcoming 'The Plant Remains from Melin y Plas and Cefn Du', in A. Davids and E. G. Hughes, *Excavations on Anglesey 1999: A55 Anglesey DBFO Scheme.*

Cleere, H., and Crossley, D., 1995 *The Iron Industry of the Weald*, Merton Priory Press.

Coates, G., and White, R., 2000 *Final Report on an Archaeological Evaluation on Land at 14-20 The Butts, Worcester*. BUFAU Report No. 741.01.

County Archaeological Service, 1995 *Kardonia, Farrier Street, Worcester. Assessment and Post-excavation Proposal.* Hereford and Worcester County Council 22105.

Dalwood, C. H., Buteux, V. A., and Jackson, R. A., 1992 'Interim Report on Excavations at Deansway, Worcester 1988-1989', *Trans Worcs Arch Soc* 3rd Series 13, 121-128.

Dalwood, C. H., Buteux, V. A., and Darlington, L., 1994 'Excavations at Farrier Street and Other Sites North of the City Wall, Worcester', *Trans Worcs Arch Soc* 3rd Series 14, 75 – 114.

Dalwood, H., Buteux, V., and Pearson, E., 1997 *Evaluation at Former County Education Offices, Castle Street, Worcester.* Hereford and Worcester County Council.

Darling, M. J., in press, 'The pottery' in G. Webster, *The Legionary Fortress at Wroxeter: Excavations by Graham Webster, 1955-85.*

Darlington, J,. and Evans, J., 1992 'Roman Sidbury, Worcester: Excavations 1959-1989', *Trans Worcs Arch Soc* 3rd Series 13, 5-104.

Edwards, R. E., 1990 *Evaluation at Love's Grove, Worcester*. Hereford and Worcester County Council, County Archaeological Service Internal Report No. 43.

Fægri, K., and Iversen , J., 1989 *Textbook of Pollen Analysis* (4th edn.). Wiley, Chichester.

Figueiral, I., 1992 'The Fuels', in M. G. Fulford and J. R. L. Allen (eds), 'Iron-making at the Chesters Villa, Woolaston, Gloucestershire: Survey and Excavation 1987-9', *Britannia* 23, 159-208.

Gale, R., 1999 'Charcoal', in A. Fitzpatrick, C. A. Butterworth, and J. Grove, *Prehistoric and Roman sites in East Devon: the A30 Honiton to Exeter Improvement*

DBFO Scheme, 1996-9, Vol. 2: Romano-British Sites, Wessex Archaeology Report No 16, 2, 372-384.

Gale, R., In prep. a 'Charcoal', in J. Cowgill, J. McDonnell, and J. M. Mills, *Iron Working Report for the Scole and Oakley Road Improvement Project.*

Gale, R., In prep. b 'Charcoal', in J. Cowgill, *Roman Iron Working at Packenham, Suffolk.*

Gale, R., In prep. c 'Charcoal', in J. Rackham, *Lefevre Walk and Parnell Road, Bow, London.*

Gale, R., 1963 *Ariconium: the Identification of Charcoal from Bridgewater's Excavation, HWCM 21357-60 and 10767*, unpublished.

Gale, R., unpublished *Welwyn Hall, Welwyn, Herts.: Charcoal.*

Galloway, J. A., Keene, D., and Murphy, M., 1996 'Fuelling the City: Production and Distribution of Firewood and Fuel in London's Region, 1290-1400', *Economic History Review*, 69 (3), 447-472.

Godwin, H., 1956 *The History of the British Flora*, Cambridge.

Greene, S., Dickinson, B., Evans, J., Hancocks, A., Hartley, B., Hartley, K., Pengelly, H. and Williams, D., 2001 'Pottery (areas 1-6)', in A. E. Jones 2001, Roman Birmingham I, Metchley Roman Forts Excavations 1963-4, 1967-9 and 1997, *Trans Birm Warwicks Archaeol Soc.*, **15**, 90-7

Hancocks, A., forthcoming 'Romano-British pottery', in A. E. Jones, 'Roman Birmingham, Volume II. Metchley Roman Forts: Excavations 1998-9', *Trans Birm Warwicks Archaeol Soc.*

Hattatt, R., 1989 *Ancient Brooches and Other Artefacts,* Oxbow.

Hillman, G., Mason, S., de Moulins, D., and Nesbitt, M., 1996 'Identification of Archaeological Remains of Wheat: the 1992 London Workshop', *Circaea,* 12 (2), 195-210.

Hillman, G., 1981 'Reconstructing Crop Husbandry Practices from Charred Plant Remains of Crops', in R. Mercer, *Farming Practice in British Prehistory,* 123-162.

Hillman, G. C., 1982a 'Crop Husbandry at the Medieval Farmstead, Cefn Graenog', in R. S. Kelly, 'Excavation of a Medieval Farmstead at Cefn Graenog Clynnog, Gwynedd', *The Bulletin of the Board of Celtic Studies*, part 4, 859-908.

Hillman, G. C., 1982b 'Evidence for Malting Spelt', in R. Leech, *Excavations at Catsgore 1970-1973, a Romano-British Village.* Western Archaeological Trust Excavation Monograph 2, Gloucester, 137-141.

Hughes, P. M., 1980 'Houses and Property in Post-Reformation Worcester', in M. O. H. Carver 1980.

Hurst, D., and Rees, H., 1992 'Pottery Fabrics: a Multi-period Series for the County of Hereford and Worcester', in S. G. Woodiwiss (ed), *Iron Age and Roman Salt Production in the Medieval Town of Droitwich. Excavations at the Old Bowling Green and Friar Street*, CBA Research Report 81, 200-209.

Ireland, C., 1983 'The Roman Pottery', in C. Heighway, *The East and North Gates of Gloucester and Associated Sites. Excavations 1974-81*, Western Archaeol Trust Excavation Monograph 4, 96-124.

Jackson, R. A., Hurst, J. D., and Pearson, E. A., 1996 'A Romano-British Settlement at Leylandii House Farm, Norton and Lenhwick', *Trans Worcs Arch Soc* 3rd Series 15, 63-72.

Jacomet, S., 1987 *Prehistoric Cereal Finds: a Guide to the Identification of Prehistoric Barley and Wheat Finds*. A Translation by James Greig of Prähistorische Getreidefunde: Eine Anleitung sur Bestimmung Prähistorischer Gersten und Weizwn Funde.

Jones, M., 1988 'The Arable Field: a Botanical battleground', in M. Jones (ed), *Archaeology and Flora of the British Isles*, Oxford University Committee for Archaeology, Oxford, 86-92.

Jones, E., and Vyce, D., 2000 *Worcester Magistrates Court, Castle Street, Worcester. An Interim Statement of an Archaeological Excavation*. Archaeological Investigations Ltd.

Kent, D. H., 1992 *List of Vascular Plants of the British Isles*, Botanical Society of the British Isles, London.

Kenyon, D., 1999 *Croft Road/The Butts & Newport Street, Worcester. Archaeological Assessment.* C.A.T. Report 991116.

Lee, F., Lindquist, G., and Evans, J., 1994 'Romano-British Coarse Pottery', in S. Cracknell and C. Mahany (eds), *Roman Alcester: Southern Extramural Area. 1964-1966 Excavations. Part 2: Finds and Discussion*, CBA Research Report 97, 3-92.

Letts, J., 1996 'Charred Plant Remains', in R. J. Williams, P. J. Hart, and A. T. L. Williams (eds), *Wavendon Gate, a Late Iron Age and Roman settlement in Milton Keynes*, The Buckinghamshire Archaeological Society, Monograph Series 10, 244-256.

Mackreth, D. F., 1992 'The Brooches', in J. Darlington and J. Evans, 'Roman Sidbury, Worcester: Excavations 1959-1989', *Trans Worcs Arch Soc* 3rd Series 13, 73-77

Mackreth, D. F., 1994 'Copper Alloy and Iron Brooches', in S. Cracknell and C. Mahany, *Roman Alcester: Southern Extramural Area. 1964-1966 Excavations. Part 2: Finds and Discussion*, CBA Research Report 97, 162-170.

Macphail, R. I., 1994 'Soil Micromorphology', in C. H. Dalwood *et al.* 1994.

McDonnell, G., 1995 *Iron working Processes*. Historical Metallurgy Society: Archaeology Datasheet No. 3.

Mikkelsen, P. H., 1997 'Straw in Slag-Pit Furnaces', in L. Nørbach (ed), *Early Iron Production – Archaeology, Technology and Experiments*, Technical Report No.3, Historical Archaeological Experimental Centre, Lejre, 63-66.

Mikkelsen, P. H., forthcoming *Slag – with an Impression of Agricultural Practices.*

Mitchell, A., 1974 *A Field Guide to the Trees of Britain and Northern Europe*, London, Collins.

Moffett, L., 1986 *Crops and Crop Processing in a Romano-British Village at Tiddington: The Evidence from the Charred Plant Remains*, AML Report, London, 15/86.

Moffett, L., 1987 *Two Roman Pits from Worcester, Blackfriars*, AML Report, London 203/87.

Moffett, L., 1995 *Botanical Remains from Worcester Deansway*, AML Report, London 39/95.

Moffett, L., and Ciaraldi, M., 2000 'The Charred Plant Remains', in S. Palmer (ed), 'Archaeological Excavations in the Arrow Valley, Warwickshire', *Trans Birm Warwicks Archaeol Soc* 103, 18-19, 32-33, 52, 162-170, 207.

Monckton, A., 1999a *Charred Plant Remains from Corn Driers and Other Contexts of a Romano-British Settlement Site at Billesley Manor Farm, Warwickshire*, AML Report No. 25/99.

Monckton, A., 1999b 'The Environmental Evidence', in A. Connor and R. Buckley (eds), *Roman and Medieval occupation in Causeway Lane, Leicester*, Leicester Archaeology Monographs No. 5, 309-362.

Mundy, C., 1994 *Watching Brief on an Extension to Spring Gardens Health Centre.* SMR 100246.

Murphy, P., 1989 'Plant remains', in J. Plouviez, 'A Romano-British Pottery Kiln at Stowmarket', *Proceedings of the Suffolk Institute of Archaeology* 37, 8-10.

Murphy, P., unpublished *Charred Macrobotanical and other Remains from a Roman Pottery Kiln, Heath Farm, Postwick: an assessment 1997.*

Nye, S., and Jones, M., 1994 Plant Remains from the Mausoleum Site, in R. Williams (ed), *Brancroft: the Late Bronze Age and Iron Age settlements and Roman Temple-Mausoleum. Vol II*, The Buckinghamshire Archaeological Society, Monograph Series 7, 562-565.

Peacock, D. P. S., 1967 'Romano-British Pottery Production in the Malvern District of Worcestershire', *Trans Worcs Arch Soc* 3rd Series 1, 15-28.

Peacock, D. P. S., and Williams, D. F., 1986 *Amphorae and the Roman Economy: an Introductory Guide.*

Philpott, R. A., 1999 'A Romano-British Brooch Type from North-Western and Northern England', *Britannia* 30, 274-86.

Rackham, O., 1990 *Trees and Woodland in the British Landscape*, Dent.

Rawes, B., 1982 'Gloucester Severn Valley Ware: a Study of the Roman Pottery Forms', *Trans Bristol and Gloucester Archaeol Soc* 100, 33-46.

Sawle, J., 1977 *Worcester Sidbury Excavation - the Second Season: Background,* HWCM 117, unpublished report.

Seager Smith, R., and Davies, S. M., 1993 'Black Burnished Ware Type Series. The Roman Pottery from Excavations at Greyhound Yard, Dorchester, Dorset, Wessex Archaeology', in P. J. Woodward, S. M. Davies, and A. H. Graham, *Excavations at the Old Methodist Chapel and Greyhound Yard, Dorchester 1981-1984*, Dorset Natur Hist and Archaeol Soc Monograph Series 12.

Stace, C., 1991 *New Flora of the British Isles,* Cambridge, Cambridge University Press.

Starley, D., 1995 *Hammerscale.* Historical Metallurgy Society: Archaeology Datasheet No. 10.

Timby, J., Evans, J., Darling, M. J., and Faiers, J. E., 2000 'The Pottery', in P. Ellis (ed), *The Roman Baths and Macellum at Wroxeter: Report on the Excavations by Graham Webster, 1955-85,* English Heritage Archaeological Report 9.

Tomber, R., and Dore, J., 1998 *The National Roman Fabric Reference Collection: A handbook.* MoLAS Monograph 2.

Tutin, T. G., 1964-80 *Flora Europaea,* 1-5, Cambridge.

van der Veen, M., 1992 *Crop Husbandry Regimes.* Sheffield Archaeological Monographs 3.

van der Veen, M., 1996 'Charred Grain Assemblages from Romano-period Corndriers in Britain', *Archaeology Journal* 146, 302-319.

van der Veen, M., 1999 'The Economic Value of Chaff and Straw in Arid and Temperate Zones', *Vegetation History and Archaeobotany* 8, 211-224.

VCH 1924 *Victoria History of the County of Worcestershire, Volume 4*, London.

Webster, P. V., 1976 'Severn Valley Ware: A Preliminary Study', *Trans Bristol and Gloucester Archaeol Soc* 94, 18-46.

White, R., and Baker, N., 2000 *A Desk-Based Assessment of the Star Hotel, Worcester and Adjacent Land.* BUFAU Report No. 672.

Whitworth, A., and Edwards, R., 2001 *Evaluation at Tallow Hill and Pheasant Street, Worcester.* Archaeological Services, Worcestershire County Council.

Williams, D. F., 1977 'The Romano-British Black-burnished Industry: An Essay on Characterization by Heavy Mineral Analysis', in D. P. S. Peacock (ed), *Pottery and Early Commerce: Characterization and Trade in Roman and Later Ceramics*, 163-220.

Willis, S., forthcoming, 'The Iron Age and Roman pottery', in R. Jackson, *The Roman Settlement of Ariconium, near Weston-under-Penyard, Herefordshire: An Assessment and Synthesis of the Evidence.*

Zohary, D., and Hopf, M., 1994 *Domestication of Plants in the Old World*, Clarendon Press, Oxford.

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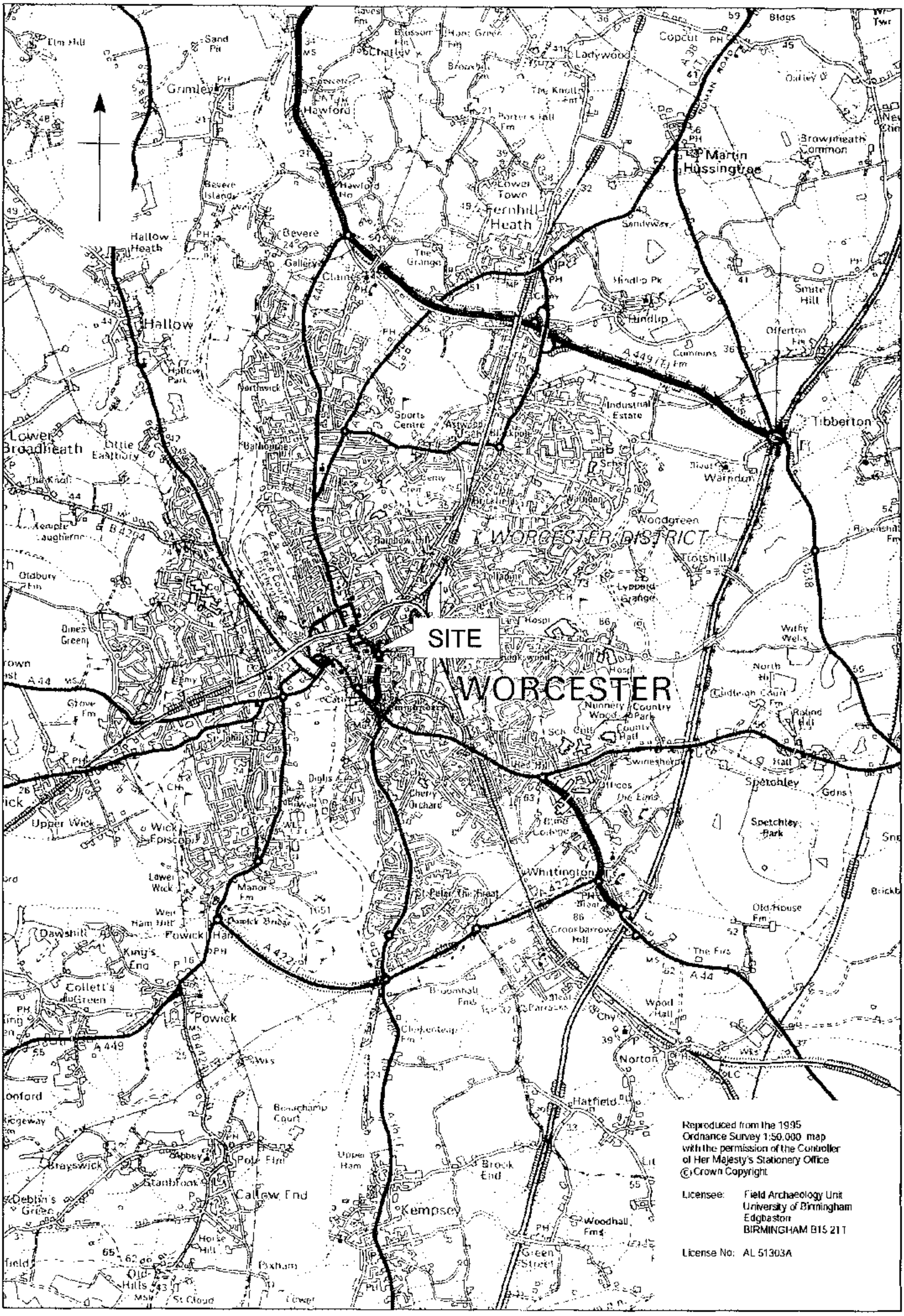
SITE
WORCESTER
WORCESTER DISTRICT
Grimley
Hawford
Hallow
Hallow Heath
Lower Broadheath
Claines
Fernhill Heath
Martin Hussingtree
Tibberton
Warndon
Woodgreen
Trotshill
Spetchley
Spetchley Park
Whittington
Norton
Powick
Kempsey
Callow End
Hatfield
A 44
A 449
A 422
A 38
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BIRMINGHAM B15 2TT
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Fig.1

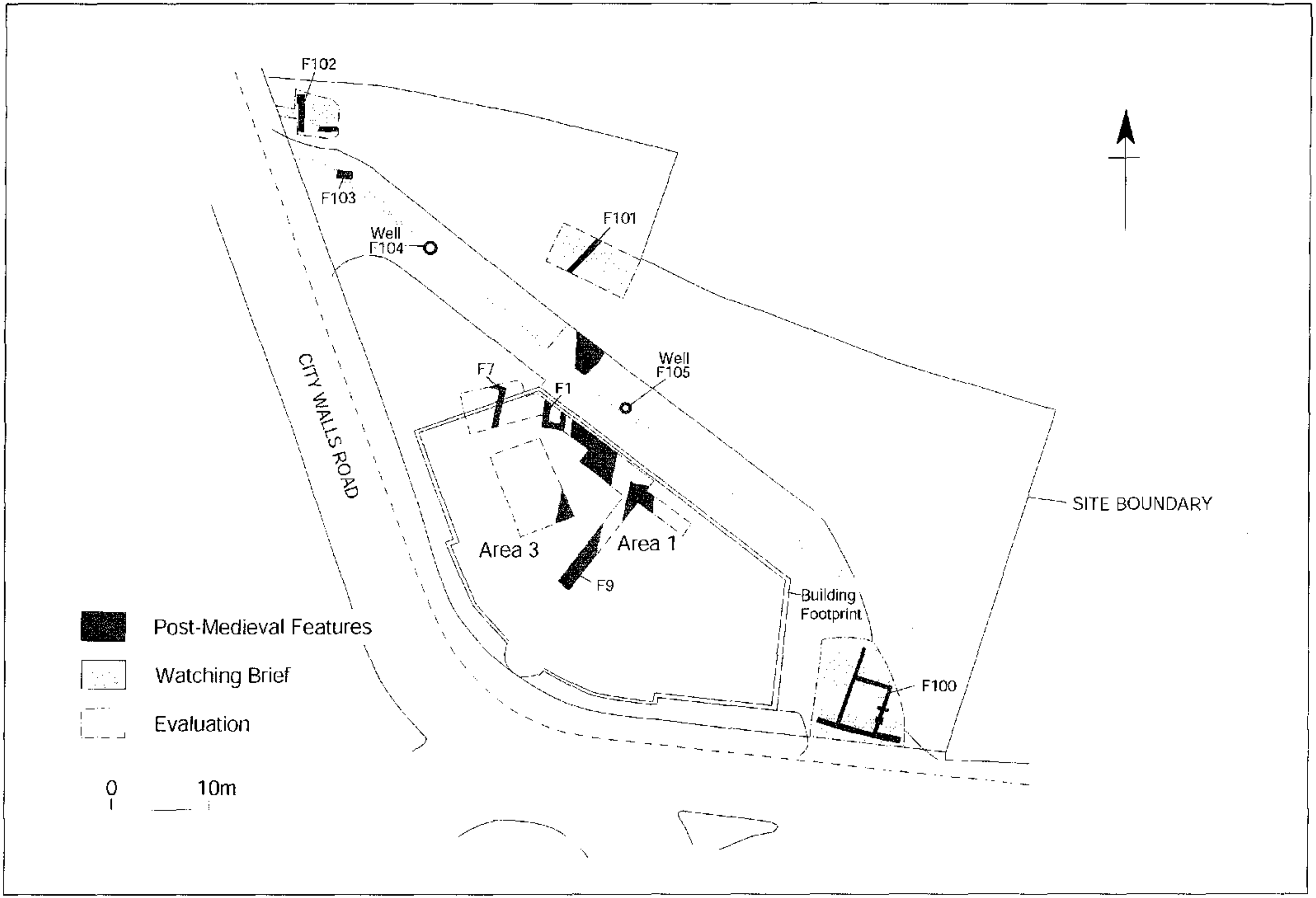
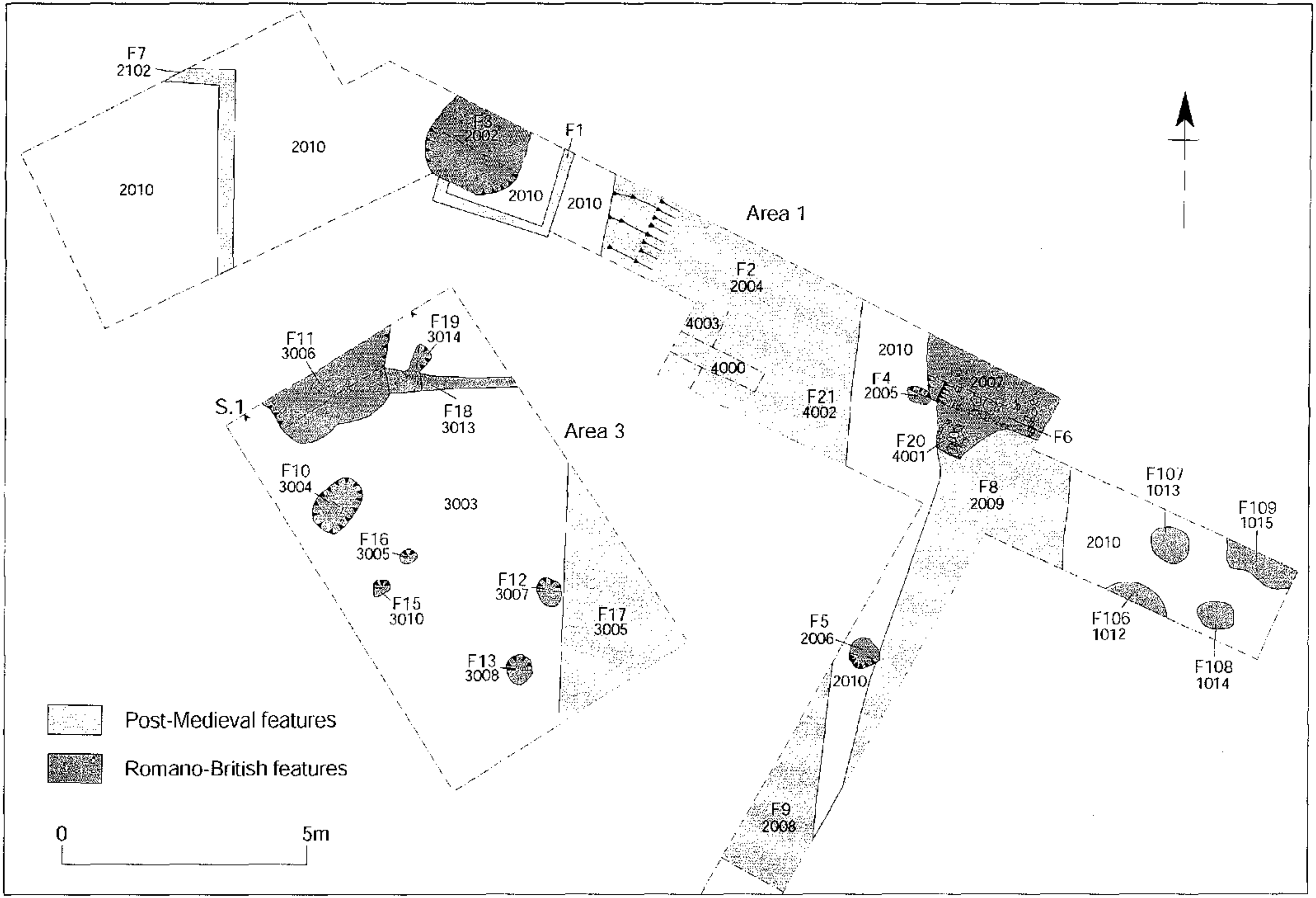

F102
F103
Well
F104
F101
Well
F105
F7
F1
CITY WALLS ROAD
SITE BOUNDARY
Area 3
Area 1
F9
Building
Footprint
F100
Post-Medieval Features
Watching Brief
Evaluation
0
10m

Fig.2


F7
2102
2010
2010
F3
2002
F1
2010
2010
Area 1
F2
2004
4003
4000
F21
4002
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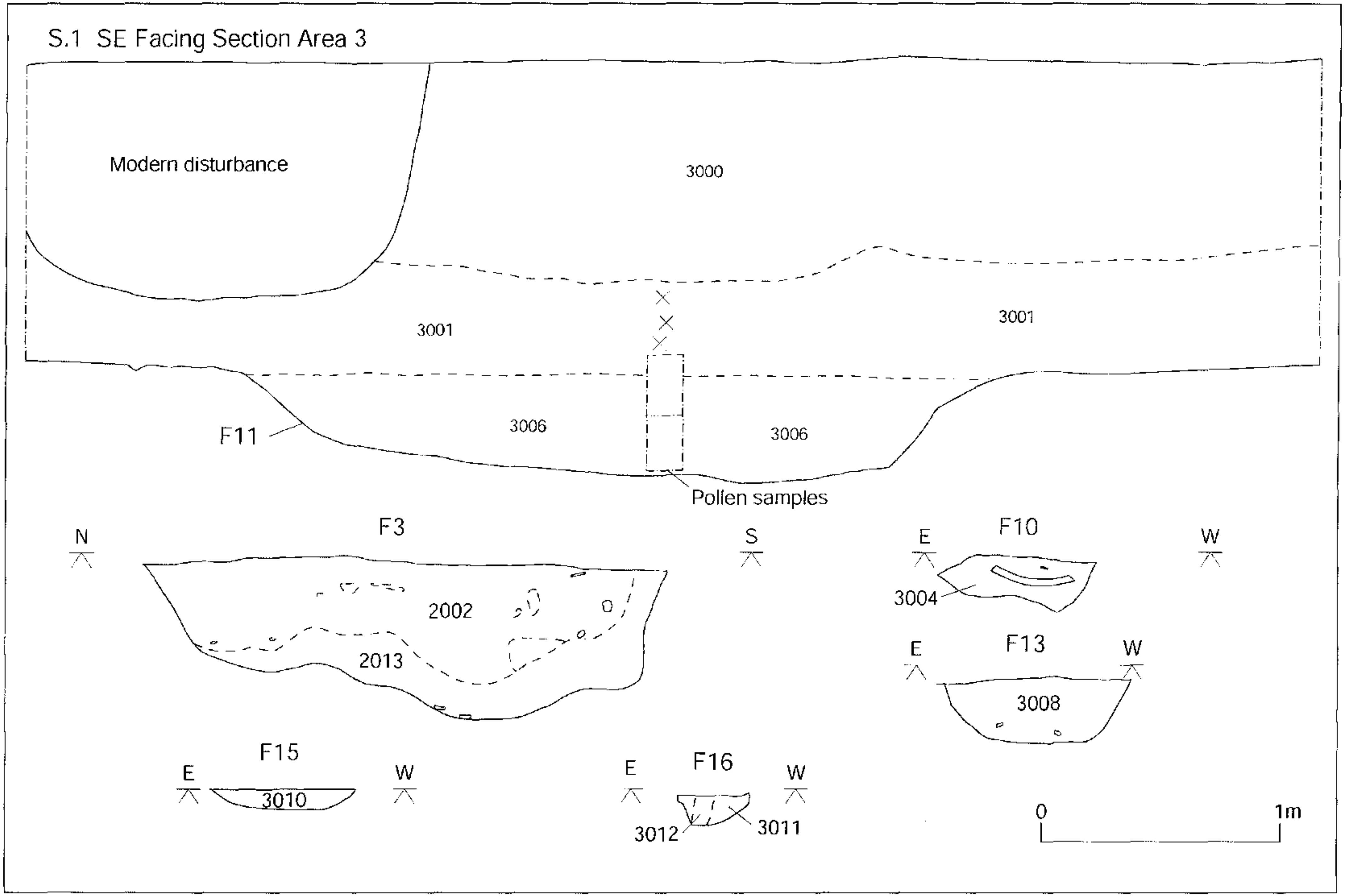
2005
2007
F6
F20
4001
F8
2009
F107
1013
F109
1015
2010
F106
1012
F108
1014
F5
2006
2010
F9
2008
F19
3014
F11
3006
F18
3013
S.1
Area 3
F10
3004
3003
F16
3005
F12
3007
F15
3010
F17
3005
F13
3008
Post-Medieval features
Romano-British features
0
5m

Fig.3


S.1 SE Facing Section Area 3
Modern disturbance
3000
3001
3001
3006
3006
F11
Pollen samples
F3
N
S
2002
2013
F10
E
W
3004
F13
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3008
F15
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F16
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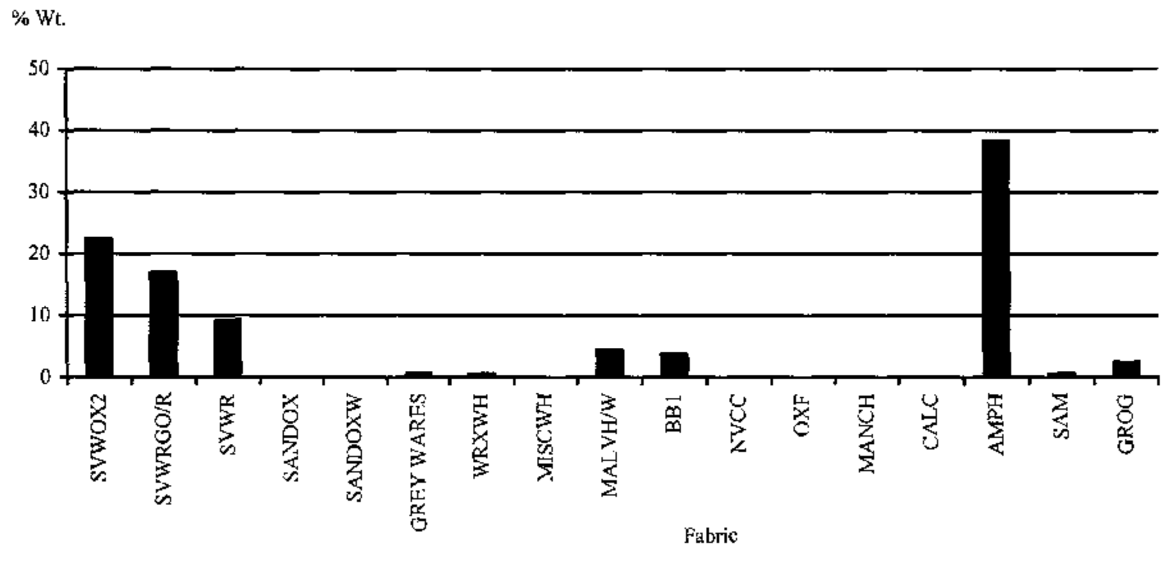
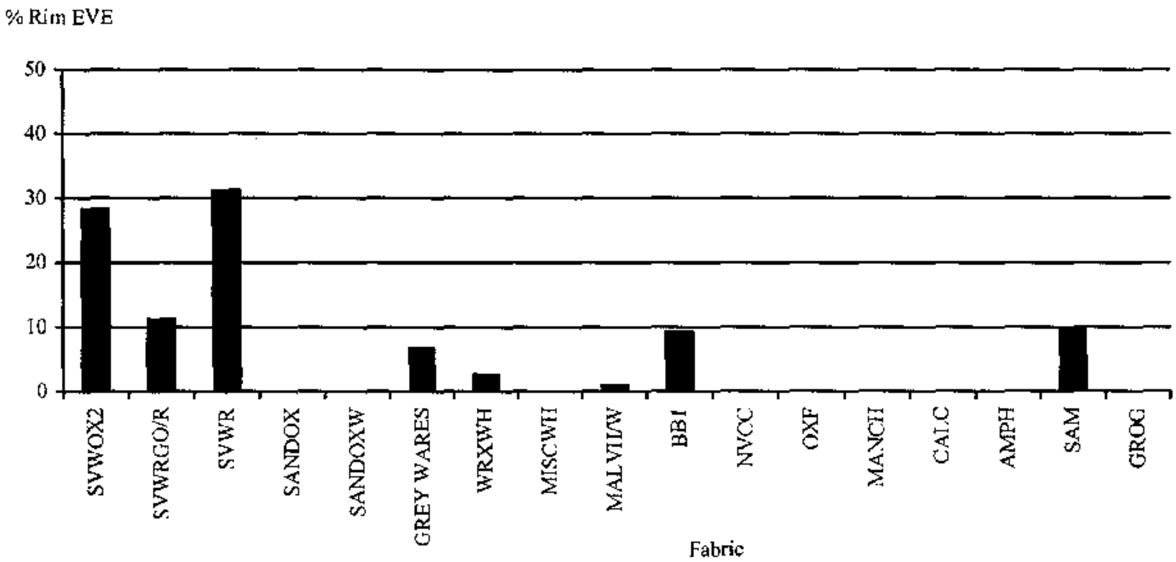
3011
0
1m
Fig.4



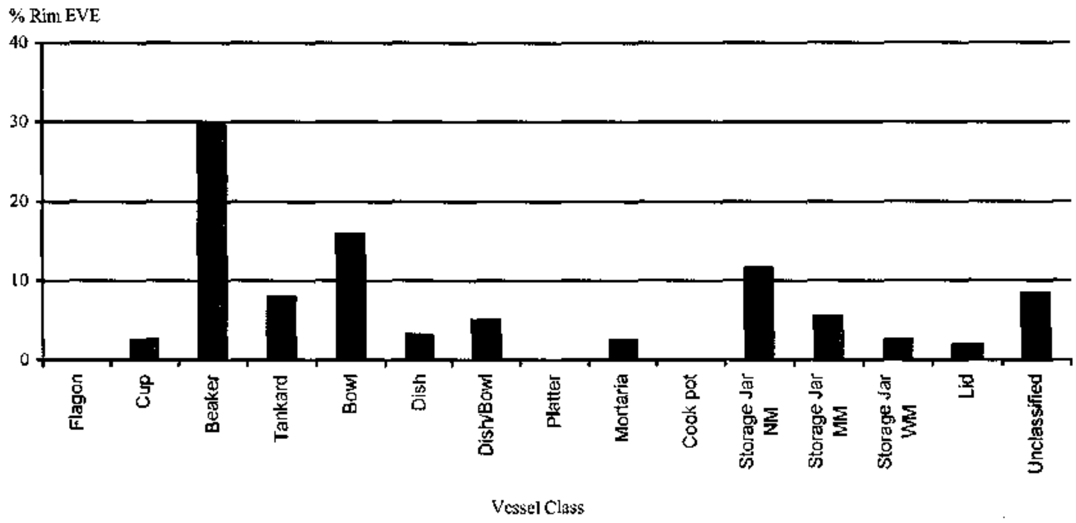
Assemblage profile by fabric (% Weight)

Fig. 5



Assemblage profile by fabric (% Rim EVE)

Fig. 6



Assemblage profile by vessel class (% Rim EVE)

Fig. 7