THE USE OF COAL IN ROMAN BRITAIN

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MOST COMMENTATORS have acknowledged a significant role for coal in Roman Britain (e.g. Collingwood 1937, 37; Collingwood and Myres 1937, 231–2; Richmond 1955, 125–6 and particularly Frere 1987, 288). Forty years ago Graham Webster reviewed the archaeological evidence for its use, and his account (Webster 1955) superseded earlier national and regional accounts (e.g. Cunnington 1932, 173; cf. Webster 1955, 199 n. 2). Since 1955, however, a considerable expansion in both excavation and publication, coupled with developments in recovery, recording and identification procedures, has resulted in a commensurate increase in the quantity and quality of the available evidence, which makes a detailed re-assessment of coal's significance overdue.

The importance of the archaeological evidence is emphasized by the limited literary testimony of the use of coal in the ancient world in general. What references there are are difficult to interpret. Solinus (*Collectaneae rerum memorabilium*, cited in Haverfield 1906, 220–1) refers to a fuel that 'never whitens into ash but, as the flame fades, turns into rocky balls', which was used on the altar of Minerva in Britain, presumably at Bath. But this identifiable description is unique and, as Webster (1955, 199) noted, the fact that the word *carbo* was probably used to indicate both coal and charcoal makes other identifications in classical sources difficult. One or two other references may occur, by Theophrastus (*De Lapidibus*, II, 12–13 and 18), possibly to denote the use of lignite in Thrace, Liguria and Elis (Eichholz 1965, 96–8), and by Pliny (*Natural History*, 34.20), recording the use of *carbo* for bronze working in areas of the provinces short of wood; but the problems are highlighted by the uncertain nature of the fuel noted in Pliny (*Natural History*, 2.111) and regarded by Webster (1955, 199) as natural gas, and by the probable variety of other inflammable substances known to authors such as Theophrastus (*De Lapidibus*, II, 14 and 19), which Eichholz (1965, 96–8) interprets as references to pitchstone and palygorskite. In addition to the problems of interpretation, however, the almost complete silence of classical sources on the use of coal is not unduly significant, considering the limited degree to which they refer to non-political matters in north-western Europe.

The nature and reliability of the evidence

Some 200 Romano-British sites, ranging from small farmsteads to major towns are listed in the Appendix (see p. 00) as having yielded stratified coal. They represent a minimum of several hundred individual contexts, often reflecting temporally or functionally diverse aspects of the same site. Indeed in many instances far more coal-yielding contexts have been identified on sites than published accounts would lead one to believe, and this may well be equally true of other sites where it has been impossible to consult full archives. However, a number of points need to be made about the variety and consistency of this substantial body of evidence. Firstly, it should be noted that excavators' identifications of coal have been accepted at face value because confirmation has rarely been possible. Coal has been taken to include (where the differentiation has been made) fully mineralized

material and the less commonly reported lignite ('brown' or partly mineralized coal) and cannal coal (a mixture of coal particles and shale).[1] Secondly, the quality of evidence represented by the finds listed in the Appendix is variable. Whilst in all cases there seems at least an implication that the finds came from reliable Romano-British contexts, some excavations (marked * in the Appendix), because of their date, quality of recording/publication or stratigraphic integrity, provide far less detailed or reliable information than others. Indeed, some coal-yielding sites have been excluded since their finds came from insecure contexts or were unstratified (see further the note to the Appendix). As several fieldworkers have emphasized to the authors, any unstratified find is unreliable as evidence because of the ubiquity of the use of coal in the nineteenth and early twentieth centuries, even in rural areas, often to fuel steam-driven farm machinery.

It is also clear in at least a few instances that coal included in archaeological levels need not indicate its deliberate collection and use. In coal-bearing areas small quantities might either represent its collection as a curio; or more importantly, on sites with coal in their immediate sub-surface solid or drift geology, purely accidental inclusion in archaeological levels, especially in cut features. This seems most likely to be the case at Chesterfield (Ellis 1989, 55, 57–9, 74 and 81), which is therefore excluded from the Appendix.

Conversely, and probably more importantly, for a number of practical reasons the corpus of evidence for coal use presented here is probably a considerable under-representation of that excavated to date. Although a systematic search was undertaken of all major national and county (and many more minor) journals issued between 1955 and 1993, and of as wide a range as possible of monographs and synthetic works, the quantity of relevant literature means that complete coverage is impossible, even when complemented by an extensive programme of enquiries to independent and full time archaeologists. Moreover, it is clear that the recognition, collection, recording and especially publication of coal finds is still often unsystematic. The use of coal as a fuel and its consequent destruction in most instances also imposes a bias against its identification, and techniques such as fine sieving and flotation, which might identify small coal particles, are not used everywhere. Indeed, the circumstances of rescue excavation often mitigate against the collection and publication of evidence for such phenomena as coal use. Thus, for example, the frequent occurrence of coal on Romano-British sites during the construction of the M5 north of the River Avon could not be evaluated in detail (pers. comm. P. J. Fowler). The volume of citable evidence is further reduced by coal finds being disregarded in areas where they are especially common. This applies particularly to the Hadrian's Wall region, where several fieldworkers have emphasized to the authors that published and archival references probably represent only the larger or more clearly functionally significant discoveries on many sites. Indeed, this problem was noted by Collingwood (1937, 37) and Webster (1955, 199).

Extraction

Evidence for the extraction of coal in Roman Britain is very limited, and no mining site can be identified with absolute certainty; but the most convincing of possible workings are perhaps those south-west of Grindon School (N. G. Ref. NY 783669–814678), which might

1. Other combustible minerals and stones are excluded; but it should be noted that there is evidence for the use of oil shale (Kimmeridge shale) as a fuel, at least in south-west England (Biek 1987; pers. comm. Dr Denford, Winchester Museum).

have supplied Housesteads (Bruce 1978, 138; Northumberland S.M.R. No. 5177). The long accepted identification of the 'bell pits' at Benwell as Roman was rejected by Webster (1955, 200, also noting Richmond's reservations), and more recently in Bruce (Bruce 1978, 69), who prefer to think that there was Roman working of the seams west of the *vicus* on Denton Brook. Ward's assertion (1911, 10) of the presence of coal workings, possibly Roman in date, at Werneth, Lancs., was doubted by Collingwood (1937, 35–7) and Webster (1955, 200), and no supporting evidence has been traced. Three other unpublished sites also have some circumstantial evidence which may suggest Roman coal extraction. At Sutton-in-Ashfield, Nottinghamshire (N. G. Ref. *c.* SK 4615 6215), poorly recorded coin finds came from the vicinity of workable coal outcrops (Nottinghamshire S.M.R. No. 03989); at Tyne Head, Cumbria, possibly Roman coins and a rectangular enclosure may be connected with coal, limestone and silver rich gravel workings (Cumbria S.M.R. No. 12364); and at Moresby traces of open cast coal working occur adjacent to a possible fortlet (Cumbria S.M.R. No. 05630).

Whether any or all of these workings are Roman or not, it seems very unlikely that extraction at this date involved significant sub-surface mining. Rather, we should envisage the exploitation of exposed seams, be it on the surface or by the action of rivers or coastal erosion, and perhaps occasional use of coal included in periglacial deposits. For these reasons, and because of the intensity and extent of later coal exploitation, the lack of extant and authenticated Roman coal workings is not unexpected. The simplest of pick and shovel techniques were presumably employed, and, although archaeological finds in some cases imply the extraction of significant quantities of coal, it seems unlikely that it was sufficiently prized to attract the attention of the imperial authorities, as other mineral deposits did.

Chronology and distribution[2]

There is little evidence of the use of coal before the Roman period. The mention of one or more 'flint axes' embedded in Welsh coal seams (Wilkins 1900, 230) appears incredible, and one wonders, if the reports are reliable, whether geofacts are not involved. Similarly, on the continent, a supposed find of 18–20 Bronze Age celts in Andalusian coal workings (Pratt 1849) was doubted by Davies (1935, 153 n. 6), and it seems highly unlikely that any such finds came from a primary context. Webster (1955, 200), however, cites possible evidence for Palaeolithic coal use in Czechoslovakia, and in Britain at least there does seem to be evidence of minor use of coal in the Bronze Age. A coal bead appeared in a burial at Waterhall Farm, Chippenham (Martin 1975/6, 5 and 10), and the evidence of coal cinders, ash and burnt shale, possibly associated with a poorly recorded accompanied cist cremation from Cwm Car Farm, Dolygaer, near Cardiff (Ward 1902), receives corroboration from certain coal finds amongst the fuel of a secondary urned cremation in a cist at Simonston near Bridgend (Fox 1937, 137 and Appendix V).

Any coherent tradition of the use of coal in the pre-Romano-British Iron Age is hard to establish. The Iron Age *oppidum* at Bagendon seems to have yielded coal (Clifford 1961, 274); but a lack of precise information about provenance makes it difficult to be sure that the finds mean that it was used. More suggestive are the 'scraps' of coal from a pit

2. Where no specific reference is given to sites cited in this and subsequent sections the reader is referred to the relevant entries in the Appendix.

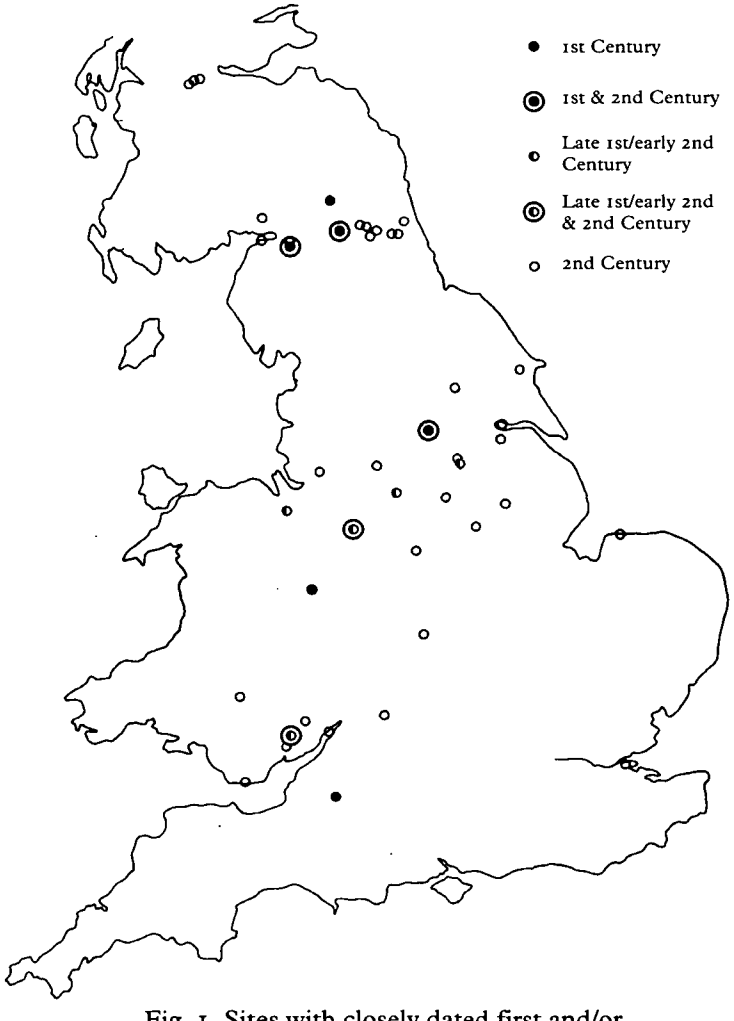

Fig. 1. Sites with closely dated first and/or second century coal finds

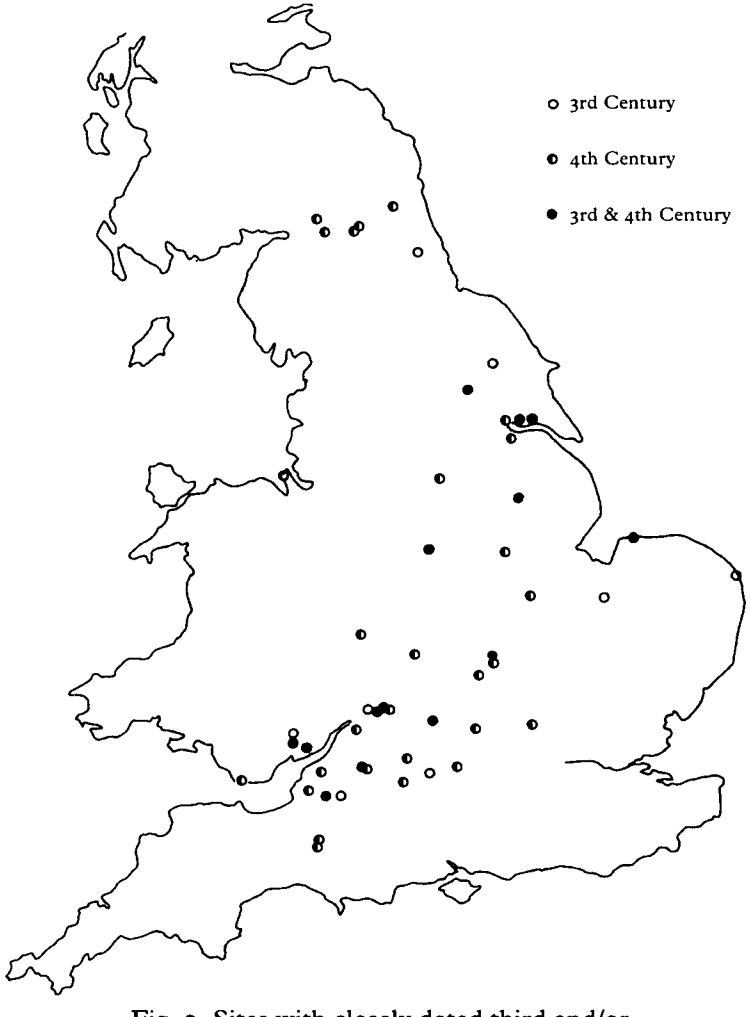

Fig. 2. Sites with closely dated third and/or fourth century coal finds

containing an Iron Age sherd and highly fired clay fragments at the native site of Catcote, Hartlepool (Long 1988, 18 and 20), though the reconstruction of the debris as an iron working furnace is speculative. Similarly, coal from the hearths, if not that from house floors, paved areas and wall cores, at Forcegarth Pasture North in Teesdale (Fairless and Coggins 1980), was presumably being used as a fuel, as it was locally available. However, an Iron Age as opposed to a Roman date for this site rests largely on its lack of pottery compared to a nearby Roman site, which may have been a successor. Coal was also recovered from the enclosure ditch of a very late Iron Age roundhouse at North Cave, Humberside (pers. comm. Ken Steadman, Humberside Archaeological Unit).

Thus the evidence before the Roman conquest need suggest nothing more than sporadic small-scale use, mainly in areas with local coal outcrops. The North Cave finds do however suggest its transportation over some distance. It is not entirely clear how extensive and how early post-conquest use was. Closely dated coal yielding contexts are not common on first-century sites and only outline information is as yet available for certain relevant excavations. However, coal occurred in the mortar of the Caerleon fortress baths built *c.* AD 75 (though whether in this case it represents use as a fuel is not clear; see below) and at the Red House baths, Corbridge, in the 80s or 90s AD. Coal finds also appear on the Castle Street and other sites in Carlisle between the mid-70s/late 80s and 92/3 AD, at the Welbeck Street *vicus* site at Castleford in contexts dating between the 70s and mid-/late 80s AD, and at Vindolanda in the period II and III *praetoria* (*c.* AD 92–7 and 97–103). Less precisely dated first- or first/early second-century finds come from the Brough-on-Noe *vicus*, the small town at Camerton, Heronbridge near Chester, Holditch, the Rossington Bridge potteries, Wroxeter, possibly Tower Knowe, and Usk, among others.

Several of these sites must have obtained coal from a distance which implies its deliberate collection and use. Thus it seems that by the end, and probably well before the end, of the first century the value of coal was recognized along the future line of Hadrian's Wall, in at least parts of central England from Shropshire north west to west Yorkshire and in south Wales and south-west England (fig. 1). As yet, establishing the quantities of coal in use is impossible; but despite the paucity of evidence for the Iron Age, the quite wide geographical distribution of first-century finds, in some cases quite soon after the conquest, suggests a rapid and widespread exploitation. Although very many first-century sites have some military connection, giving an apparent bias to the evidence, this rapid uptake of coal as a fuel might plausibly be suggested as having been led by the army. The military involvement in the early exploitation of other mineral resources, such as lead, is well established (e.g. Whittick 1982, 116–17; Dearne 1990, 229) even if the frequently cited date of AD 49 for its inception derived from an inscription (*RIB* Iii, no. 2404.1 (Dearne 1990, Appendix 1 No. 1)) is less certain than it appears. Moreover the inscription itself may not imply a military involvement in AD 49 (Whittick 1982, 113–15; Dearne 1990, 228–9). If there was some military role in promulgating the use of coal, perhaps the soldiers were previously familiar with the fuel on the continent. The continental evidence is largely beyond the scope of the present paper; but clearly coal from the basin of Decize-La Machine was in use in one Gaulish workshop by the late second century (Bouthier 1972; 1973), while finds of coal at Bonn and in the Saarland have been noted (Elbe 1975, 72 and 355; Wightman 1970, 196).

A further expansion of the use of coal in Britain seems to have occurred in the second century. As figure 1 shows, the more numerous sites which certainly yield coal in the second century cover much the same regions as the first-century examples, but also

additional areas. The east ends of Hadrian's Wall and the Antonine Wall are not surprising additions, given their inception dates; but finds also now appear further south and east in central England both near to coal fields (e.g. Bubbenhall) and further away (e.g. Brough-on-Humber or Rudston), and most notably in south-east England at Brancaster and Cooling. The distribution of sites with definite third- and fourth-century finds (fig. 2) continues this trend. Antonine Wall sites of course disappear; but the emphasis is now strongly on sites mainly away from coalfields on and north of the Humber, south through Lincolnshire into Cambridgeshire and Norfolk (e.g. Barnack and Denver) and especially in south-west and central England from south Somerset (e.g. Lufton) through Wiltshire (e.g. Littlecote) and Oxfordshire (e.g. Camp Corner), even as far as Gadebridge Park in Hertfordshire. However, a sharp decrease in sites with coal finds in previously well represented areas such as Merseyside, Lancashire and Shropshire is apparent.

It is necessary, however, to note that figures 1 and 2 represent only a small percentage of the sites listed in the Appendix. Apart from the possible biases in the collection of the evidence noted above, relatively few sites have one or more 'well dated' contexts yielding coal, even if 'well dated' is taken as a date range of a hundred years, rather than a specific century, as it is on figures 1 and 2. Indeed, even on those sites with one or two 'well dated' finds, many other imprecisely dated examples of coal use occur. The poverty of the accompanying dating evidence masks relatively continuous coal use over a long period, such as is found at more extensively excavated sites such as York or Lincoln, or sites where more chronological precision is available (e.g. Chedworth).[3] Such imprecision in the evidence is very likely to have affected at least the detail of the distribution (as plotted) of the use of coal over time and space, and might well, for instance, be largely responsible for the absence of third- and fourth-century finds in much of north-west England.

These and further problems are highlighted by figures 3*a* and 3*b* which represent the evidence for sites with 'well dated' finds graphically, but using different parameters to figures 1 and 2, in an attempt to chart the frequency of the use of coal over time, irrespective of its geographical distribution. Figure 3*a* shows sites with coal-yielding contexts dated to half centuries (as opposed to whole centuries on figures 1 and 2). Figure 3*b*, on the other hand, takes in a greater body of evidence by considering sites with finds dated to a one-hundred-year period or better (rather than calendric centuries or half centuries). Those sites with finds dated to a fifty-year period are counted as a whole site in the relevant column. Those with finds given a date range, covering parts of two fifty-year periods are counted as half a site in each relevant column. Comparison of the two graphs indicates that the selection of the chronological criteria for inclusion or exclusion significantly affects the graph obtained and warns against taking either as too reliable at least in detail. Some general trends, however, do seem to be common to both. The steady increase in sites from the second half of the first century to the second half of the second century (most notable on figure 3*b*, with twelve sites with certain or possible first-century finds, thirty-six with certain or possible earlier second-century finds, and forty-four with certain or possible finds of AD 150–200), is common to both. It may be that the second half of the second century is a little exaggerated on both graphs because Antonine contexts are readily identifiable, especially on military sites; but it seems very likely that there is a genuine rise in the use of coal. The shared peak of use in the second half of the fourth

3. The possibility of assessing coal use through the numbers and dates of coal-yielding contexts, as opposed to the numbers of sites with coal-yielding contexts, has had, regrettably, to be rejected, since full lists of such contexts have only been available for a minority of sites.

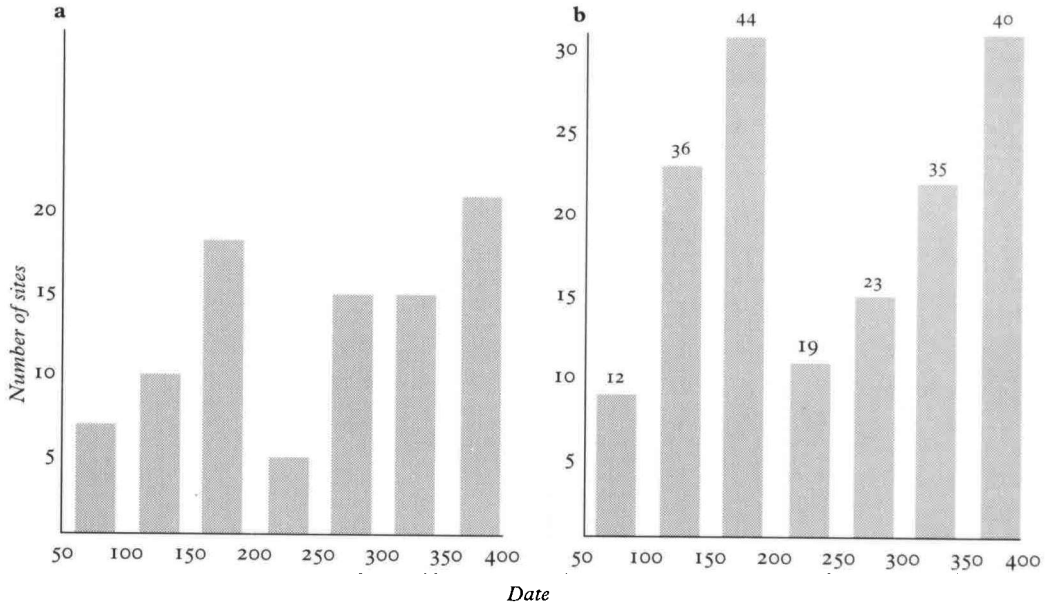

Fig. 3. *a*, Sites with finds dated to calendric half centuries; *b*, sites with finds dated to one hundred year periods or better (counted as a whole site where dated to a calendric half century and as a half site in each of two columns where not). Total number of sites represented in each column in figures.

century, especially given the greater susceptibility of levels of this date to disturbance from ploughing and other factors, seems likely also to be reliable. However, there is little consistency between the graphs for the third and early fourth centuries except for a marked low at the beginning of this period. The reality of the latter is very questionable given the well acknowledged problems of closely dating many third-century deposits and the subsequent immediate return to late second-century levels of coal use at least on figure 3*a*. Indeed, the apparent gradual increase in coal use from AD 250–350 on figure 3*b* in fact represents proportionally more sites counted as half a site in two adjacent columns because their dating is imprecise which may have skewed the graph.

Thus it seems clear that there was a rapid intensification and expansion in the use of coal from the later first into the second century, particularly perhaps the later second century, and this is also supported by the greater number of coal-yielding contexts of second century and later dates on sites with first-century finds. We suspect that this level of use was at least maintained (even if the geographical range of coal use continued to expand) until perhaps the mid-fourth century, but that this is masked in our evidence by dating problems. Certainly, however, even if the use of coal fell off to some extent in the third century, it had returned to a similar and probably higher level than in the later second century by the end of the Roman period. Precisely when it subsequently ceased to be used is at present impossible to gauge. However, at Astley, Frocester Court Villa and perhaps Throplands, finds of coal come from contexts possibly dating into the fifth century. Whilst finds such as that from Grave 48 at Cannington, broadly dated *c.* AD 350–700 (pers. comm. P. Rahtz), may indicate simply late or post-Roman redeposition of Roman material, others, as at Frocester, could equally imply continuing sporadic sub-Roman coal use.

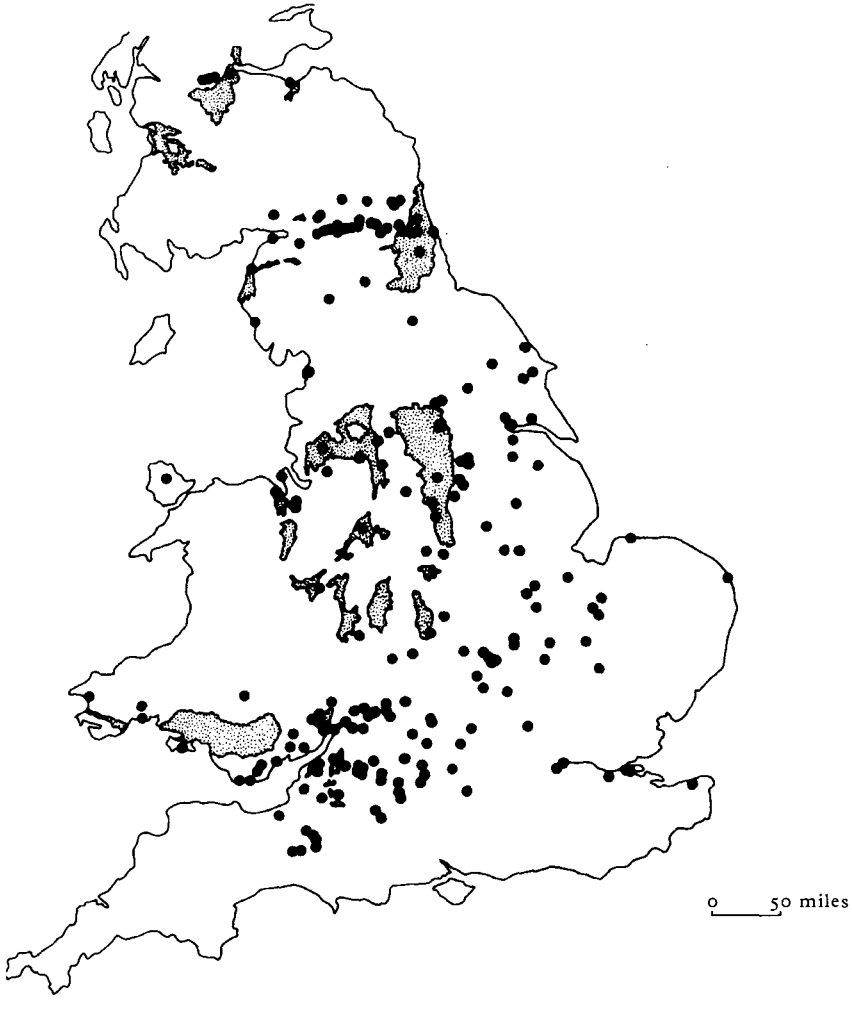

Fig. 4. Romano-British sites with coal finds in relation to major exposed coal fields.

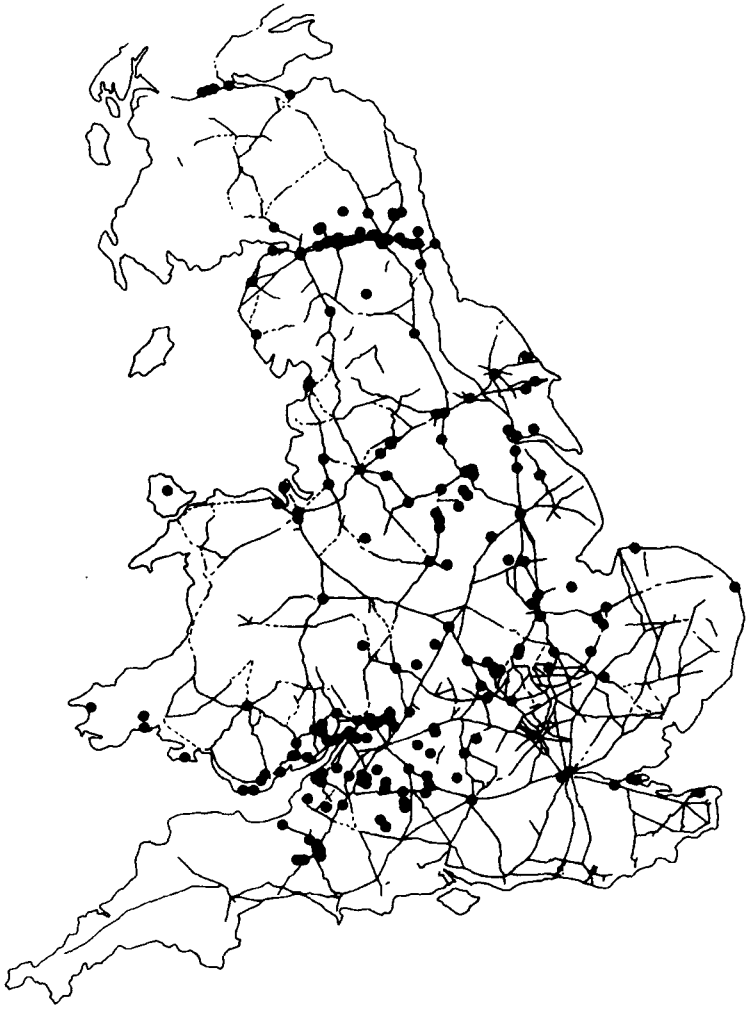

Fig. 5. Romano-British sites with coal finds in relation to known Roman roads (after Margary 1973 Maps 11 and 17)

Leaving aside questions of dating within the Roman period, the overall distribution of sites with coal finds (fig. 4) allows several broad observations to be made. Two special concentrations of sites are notable, as indeed they were for Webster (1955, 200). The first is along Hadrian's Wall, and the second in a broad area either side of the Bristol Channel/Severn Estuary. The latter includes the South Wales littoral, modern Avon and the Forest of Dean and spreading out into south Somerset and west Wiltshire. Of these two areas Hadrian's Wall represents a continuous tradition of intensive use of coal, mainly but not exclusively, from the first century onwards. The Bristol Channel/Severn Estuary area on close inspection seems to imply a large later Roman expansion in the use of coal, building on a lesser but equally long tradition. As the nature of many sites in this area indicates, the main impetus for coal use doubtless came with the founding or elaboration of numerous south-western villas.

Less concentrated but still numerous sites cover much of central England between a line from Merseyside to Flamborough Head and an area from central East Anglia to the Bristol Channel, though within this area there are sometimes large gaps or thinner distributions, the most notable of which is broadly in the West Midlands. Chronologically we have already seen how these sites seem to spread further south and east from the central English coalfields as the Roman period progresses, and, though in some areas such as Oxfordshire villas (e.g. Shakenoak) again make up a significant proportion of sites with finds of coal, overall a range of civil and military establishments is represented. Beyond these areas of relatively dense coal finds much smaller or less dense concentrations can be noted. A small cluster of sites marks the eastern end of the Antonine Wall, another south-western coastal Wales, and a third the Thames valley and estuary, including London. A light scatter of sites appears too in coastal Cumbria and Lancashire, a few more in northern central England south of the Wall, and an occasional site around the south-east coast. Conversely, several areas are conspicuous by their lack of finds. Between the Walls only outpost forts and rural sites near the Hadrianic frontier are represented. Except for Brecon Gaer and Flint, most of mainland Wales is blank, while Anglesey has only the finds from Coed Newydd, which are presumably Roman, and those from the adjacent Din Lligwy hut group, which are cited by Collingwood (1937, 36–7) and others, but are excluded from the Appendix as original records of the finds have not been traced. Much of the south-western peninsula, almost all of southern England south of London, and the majority of Norfolk, Suffolk and Essex are also devoid of finds, barring three coastal south-eastern sites.[4]

Clearly, as figure 4 shows, many of the regions without finds are without exposed coalfields, and often distant from them, while many areas with frequent finds of coal are near to exposed fields. This needs little explanation; but more anomalous is the near absence of sites with finds in the West Midlands, Welsh Marches and Staffordshire. These areas ought in many cases to have had ready access to coal, if outcrops had been recognized, and future work in the region should address the question of whether this is a real anomaly or simply a bias in the currently available evidence. However, few other anomalies of this nature are apparent, except perhaps for the lack of sites at the west end of the Antonine Wall. In any case, what is more significant and probably more informative is the distribution of coal finds in areas without immediate access to exposed coalfields. As figure 4 shows, this highlights broadly the central and eastern sectors of Hadrian's Wall, the

4. A possible record by Weigall (1926, 227) of coal in the museum at Brading villa, Isle of Wight, has not been confirmed and is too anecdotal to be used as evidence.

scatter of sites south of it, Humberside, central eastern England, Lincolnshire and especially the sites spreading out from the Wash, around the south-east coast, along the Thames Valley and in central southern England. Analysis of the provenance of coal samples is beyond the scope of the present discussion; but it is clear that in some instances coal must have travelled considerable distances in Roman Britain, and the implications of this will be considered in more detail below.

Site type and supply

A variety of site types have yielded coal; indeed few categories of settlement are not included in the Appendix. Major towns are represented by London, the *colonia* of York, Lincoln and Gloucester, and the *civitas* capitals of Wroxeter, Caerwent and Silchester. A range of small towns and road-line settlements is represented by, for example, Alchester, Baydon, Camerton and Hibaldstow. Villas are especially common but smaller or less Romanized rural settlements from Marshfield and Vineyards Farm, through villages like Catsgore, to native farms and homesteads such as Elmswell, Hartburn and Huckhoe are included. Equally, military sites appear in the evidence, from fortresses (e.g. Usk) down to Hadrian's Wall milecastles (e.g. Pike Hill), together with many of their associated *vici* (e.g. Brough-on-Noe) or *canabae*/satellite settlements (e.g. Heronbridge or Great Bulmore). Specifically industrial settlements such as Cantley or Wilderspool are also included, together with saltworking sites (Denver) and even a cave (Minchin Hole).

Inevitably, as we have already noted, some of these types of site predominate in certain areas, particularly military sites along Hadrian's Wall and villas in the south-west. But there is no clear evidence for the predominance of military over civil sites or vice versa. Indeed, there is no reason to believe that there was any restriction of supply to particular types of settlement, for there are very major Romanized centres which are absent from the Appendix (e.g. St Albans and Colchester), while many much smaller and less Romanized centres (both near and distant from exposed coal fields) are included. In fact it seems likely that the availability of coal at a distance from deposits may have been more dependent on the communications or trading links of a specific area than on the status of a particular site.

Coal found on sites in or close to exposed coal fields may have been collected locally by its users or at most carried short distances in mule panniers or by cart. The distance of other finds from potential sources (figures 4 and 5) must imply more sophisticated supply arrangements and in some cases these may reflect complex patterns of inter-regional trade, official supply arrangements and wider questions of fuel availability. Three broad means of transport were available in Roman Britain, by road, by river and by sea and it is clear that in purely economic terms road carriage was by far the most expensive and river and particularly sea transport were much cheaper (Duncan-Jones 1982, Appendix 17; Greene 1986, 38–40). Thus, insofar as purely commercial motives can be ascribed to ancient supply mechanisms, the coal finds most distant from potential source areas should be expected where a major part of their journey could be accomplished by sea, and sites on or near navigable rivers ought to extend further from coalfields than those whose accessibility from supplying areas was principally confined to road. To an extent this is indeed the case. The finds most distant from exposed coalfields (rather than hidden ones as in Kent) are those on the north Kent coast, in the upper Thames valley and at Brancaster, all coastal sites or sites reached by short navigable river journeys from the coast. Primarily seaborne shipment from the Northumberland and Durham coalfield therefore seems very likely for

these sites and the finds associated with quays at New Fresh Wharf in London emphasize this. It might also be suggested for some Parisian sites like Crossgates or indeed Brough-on-Humber and for fenland sites like Wyboston; but these are more complex situations.

Demonstrating any greater range for sites on navigable rivers, as opposed to sites mainly accessible by road, is far more difficult for several reasons. Firstly, the extent of navigability of many rivers, even quite major ones, remains unclear; secondly, for many sites in areas such as Lincolnshire, parts of central southern England and the eastern half of Hadrian's Wall, transport routes seem equally available by road and by rivers which may have been navigable; and thirdly, in areas such as south Somerset, mining of various coalfields allows one to suggest alternative routes, namely by sea and the River Parrot from South Wales, or via the Foss Way (Margary 1973, 5b/c) from the Bristol and Somerset field. Indeed, identifying sites which must have received their coal along largely or partly land routes is easier, and we may note sites in west Wiltshire in this category together with, for instance, Brough-on-Noe in the Peak District and Derby. In any case such generalizations probably conceal modes of transport and economic or social mechanisms leading to the supply of coal which will have varied from region to region and even from site to site. In many cases only analysis of the provenance of coal finds is likely to allow even a tentative reconstruction of the supply mechanisms, and no detailed discussion of these matters is presented here (research by A. H. V. Smith, see Acknowledgements). However, in general terms there seems to be evidence to suggest that in some areas, such as along Hadrian's Wall, river and/or land supply was important, while on the east coast such rivers as the Tees and the Humber and its tributaries may have played a significant role in distribution of coal and other products well inland (Selkirk 1983). Road routes, however, may have been significant in some areas, as figure 5 may suggest, and there are some notable correspondences between road lines and bands of sites with finds of coal, for example those from Merseyside to Flamborough Head and Margary's roads 712/28c/810, which run through York to Bridlington. Indeed, Ryknield Street (Margary 1973, 18d) not only cuts coal outcrops but is surfaced with coal at Higham, and it has coal dust inclusions in its makeup and side-ditches at New Tupton and near Chesterfield, as does Wool Street (Margary 1973, 24) in Cambridgeshire.

There is also the possibility of transport by water via the Car, Cnut's and other Dykes in and around the Fens (if indeed they were viable waterways; Webster 1955, 203). This could even imply the transport of coal from the Humber (Frere 1987, 267–8), which might re-emphasize the significance of east coast trade in coal from Northumberland and Durham (Webster 1955, 203; Greene 1986, 154). Although finds of coal in the Car Dyke might reflect its convenience for rubbish disposal rather than the nature of any cargo which it served to transport, the isolated Fenland finds of coal which Webster (1955, 200–3) regarded as significant certainly now appear less anomalous than they did. It should also be borne in mind that not all sites with finds of coal necessarily had the economic power to attract coal supplies themselves; some may have obtained coal from more prosperous sites nearby (possibly, for example, Brafield-on-the-Green from the villa at Piddington), or they may have benefited simply from lying on the route to particularly prosperous settlements (e.g. Dorchester on the way by road from central English fields to Silchester).

For the uses to which coal was put we are dependent on a limited number of the sites (listed in the Appendix). Even where there is no doubt that the coal has been deliberately collected and brought to a site, the frequently small quantity of coal recovered and nature of many of the contexts concerned (e.g. wells, ditches, rubbish pits, general 'occupation

layers' etc.) indicate only that it was present, not what it was used for. However, it is possible to demonstrate that on at least some sites it was used in some quantity, that its use as a fuel ranged across a number of domestic and craft/industrial contexts, and that it occasionally fulfilled other roles. The quantity of coal stored in the former south guard chamber of the east gate of the Housesteads fort clearly reflects more than casual or occasional use, and other coal stores, or at least reasonably substantial piles of coal, come from sites including Bar Hill, Camerton, Chester-le-Street, Derby, Great Bulmore, Lincoln, Lufton, Manchester, Piddington, Risingham, Templeborough and Wroxeter. Given that most coal brought to a site would be entirely consumed in normal circumstances as a fuel, this body of evidence may suggest that many smaller finds are only the remnants of larger quantities.

Three possible domestic heating roles are apparent for coal: use in braziers, hearths and hypocausts. The first is unlikely to be demonstrable archaeologically, and, whilst many finds in building 'occupation layers' or on villa floors (e.g. Seavington St Mary villa) might be listed, none need necessarily derive from braziers. The use of coal in domestic hearths, on the other hand, is clearly indicated at Star villa in Somerset, where both the hearth and the adjacent ash pit contained coal. However, finds in or associated with hearths in buildings need not all relate to domestic heating, and the relationship of the shapes of hearths and their use remains an unsystematically explored and often problematic subject. Nevertheless, other possible 'domestic' heating hearths (both civil and military) with finds of coal may be noted at Chesters villa, Gatcombe villa, Littleport village, Minchin Hole cave, Piddington villa, Throckley (Wall Turret 10a) and Wallhouses West (Wall Turret 18b). Hypocausts by their very nature provide both more unambiguous contexts and a better chance of coal being preserved. While some finds of coal in collapsed flues encountered in older excavations may sometimes be doubtful, coal clearly formed at least part of the fuel in a number of civil and military heated rooms and baths, especially in south-west Britain and the Hadrian's Wall area. Thus, we may note the evidence at Caistor-on-Sea, Chesters villa, Corbridge (both in the headquarters and especially in the baths *tepidarium* at Red House), Daventry villa, Dry Hill villa, Lancaster (in the flues of the possible *mansio caldarium*), Shakenoak villa baths, Whittington Court villa, Chedworth dining room 5 (where coal finds may indicate use from its inception *c.* AD 160/200 to its end *c.* AD 350–400), and perhaps the Wroxeter baths. A few instances of the use of coal in or associated with possible baking or cooking ovens are also recorded, at Biglands fortlet, Gadebridge Park villa, Gatcombe villa and possibly Mumrills fort annexe. In some instances, too, domestic heating and cooking hearths may have been both formally and functionally interchangeable. Indeed, especially in later Roman so-called 'squatter occupation' in dilapidated or semi-demolished villas, we suspect that some hearths might be used for heating, cooking and limited craft/industrial activities, and that coal finds may represent the fuel of these multi-functional hearths (e.g. at Stanton Low), though the stratigraphic integrity necessary to prove either point is rarely, if ever, present.

The use of coal for craft/industrial processes, principally in metalworking, is relatively easy to demonstrate as a general phenomenon; but ascertaining its specific role or roles is not always as easy. It is clear that coal was not used in pottery kilns (Swan 1984, 6–7), and that its use would have been impractical in Roman kilns which lacked a grate. The single coal fragment from a kiln stoke hole at Bubbenhall, Warwickshire, must, in view of the overwhelming negative evidence from other excavated potting sites, be seen as an accidental inclusion, and indeed it is notable that coal finds from other pottery production

sites such as Cantley, Rossington Bridge and Derby Racecourse come from contexts temporally or functionally unrelated to kilns. However, the finds in the T-shaped flues below a stone floor on a potting site at Norton might suggest that coal was used as a fuel in the drying rather than the firing of pottery. An alternative interpretation of this structure as a floor for drying or malting grain is also possible, and at Vineyards Farm, Gloucestershire, another more typical example of a grain dryer/malter appears to have been fuelled with coal. A T-shaped possible corn dryer at Barton Court Farm also had a piece of coal in its flue pit, while an unusual second/third-century possible corn drying shed, apparently with a 'trench hearth' along one wall, at Wyboston, Bedfordshire, very clearly used coal as a fuel, and two adjoining T-shaped corn dryers at Huntsham also yielded coal. Circumstantial evidence also suggests that coal might have been used as a fuel in salt evaporation in the Fens and elsewhere. The evidence is limited; but at Great Marshes in Norfolk coal occurred with what may have been a brine evaporation hearth, and at Denver a few fragments were recovered, though not in contexts directly associated with salt working. Coal also occurred at Cooling and Cliffe on the north Kent coast, the former of which at least was connected with salt production (Miles 1975, 28–9); but a lack of information from excavations and the involvement of the sites in other activities make it hazardous to draw conclusions here.

It is, however, in metallurgy that coal seems most likely to have found a significant non-domestic role. Some evidence, albeit from early and ill-reported excavations at Flint (Pentre), suggests its use in lead ore processing, perhaps for roasting rather than actual smelting. It was apparently used in smelting at Rise Howe, Cumbria (Coastal Tower 26a), but here there is a significant possibility that the evidence is in fact medieval not Roman (Bellhouse 1984, 50–9). Occasional finds of solidified droplets of lead in coal-yielding hearths (e.g. at Huckhoe) also hint at post-smelting processes, while at Camerton in Somerset pewter workers may have used coal as a fuel. Copper alloy working features have also yielded coal, most notably at Heronbridge near Chester in the late first or early second centuries, where an ash pit and a layer containing coal were associated with a copper alloy working hearth. At Littlecote villa a bronze working hearth in a 'workhall', adjacent to the main buildings, yielded coal, and two villa rooms with furnaces, perhaps for smelting copper, were linked by a corridor containing a pile of coal (pers. comm. B. Phillips). Other evidence perhaps connected with copper alloy working comes from Nettleton building XIII, High Brunton (Wall Turret 26a), and a number of sites such as Brough-on-Humber, where the probability is that ferrous and non-ferrous metallurgy shared the same workshops and indeed hearths.

However, both the largest body of possible evidence and the greatest interpretational problems relate to ferrous metallurgy. At least sixty sites with coal finds present some evidence of a possible connection between coal and ironworking. Indeed, iron slag (though its forms have very rarely been found to have been reliably differentiated) is the most common possible functional indicator found with coal on Romano-British sites. An equation of such coal finds with ironworking of one form or another, has been noted repeatedly, especially in older excavation reports; but in many cases these assumed links, particularly where slags have not been analyzed, should be viewed sceptically. Indeed, small quantities of ironworking residues (anyway amongst the least susceptible of materials to decay) are common finds on Romano-British sites, and in many cases their presence alongside coal need have no significance. Thus, coal amongst metalworking residues on sites such as Barnack must at best serve only as possible support in the absence of better

evidence. Such better evidence, however, is available at several sites. The most convincing is the inclusion of coal in slags, for this demonstrates an association that can only have come about during a metallurgical process. Such inclusions in slags, and in one case specifically in smithing scale, have been identified at Huckhoe, Brough-on-Humber, Lincoln, the Wentloodge Levels, Weston-under-Penyard and possibly Brough-on-Noe. Systematic and detailed slag analysis may reveal many more examples. Slightly less certain but still very convincing evidence for the use of coal in ferrous metallurgy comes from Benwell and Elmswell, where J. A. Smythe identified deposits with coal particles as smithing residues. The direct association of coal with ironworking features is not always easy to prove; but at several sites it seems to be very likely if not actually certain. At Camerton a pile was recorded near an 'iron smelting' furnace; at Marshfield two rooms convincingly interpreted as smithies yielded coal which included some from a hearth and from a pit with possible smithing waste, and at Lufton a coal heap seems to have been associated with what Tylecote regarded as a possible smithing hearth. At Ilchester Mead quantities of coal came from what seems to have been an industrial room with stone built structures identified as metallurgical installations and at Wilderspool, though the excavations by May are difficult to analyse in detail, coal was clearly in use in an area with very many industrial features, most of which probably related to ferrous metallurgy. Other sites where coal finds may well be associated with ironworking features, or where the circumstances make the association of coal and slag particularly likely to be significant, include Caerleon, the Chessels (where rather poor records suggests that coal was found not just near to a forge, but near to an anvil and an iron pig), Dalton Parlours, Ely, Frocester Court, Gatcombe, Huckhoe, Wroxeter and Vindolanda. Thus, it appears to be beyond reasonable doubt that coal was used in ferrous metallurgy, but it is difficult to define in which stage or stages of the conversion of iron ore to finished object it was used as a fuel.[5]

Research on the chemistry of ancient iron ore smelting remains limited because of the many variables of ore type and preparation, fuel supply and furnace form. Until recently it has often been handicapped by a, at best, rudimentary division of the resultant slags. Thus, coal-yielding sites identified by many earlier excavators as being involved in iron smelting, can rarely be accepted as such without reservations. Whether coal could be used in the smelting process is still being debated, bearing in mind such factors as the effects of weathering on the surface outcrops (which were probably exclusively exploited) and the variability of the sulphur content of coal (Tylecote 1986, 168; Cleere 1976, 131; Frere 1987, 288; Fulford and Allen 1992). Suffice it to say that no compelling evidence for coal use in iron smelting has been noted. However, it seems entirely likely that much if not all Romano-British smelting would have produced blooms still highly impure, and requiring extensive hammering under heat, to remove impurities before a readily tradable stock of ingots or bars was produced. The likelihood that this process would take place on or near to the smelting site, even possibly using an old chimneyed smelting furnace cut down to form a low walled bowl hearth,[6] makes any evidence of coal use even on certain smelting sites doubly difficult to interpret. Moreover, even the viability of coal as a fuel for 'primary smithing' remains undemonstrated, though the evidence from the Wentloodge Levels may imply its use. Whether or not smelting or primary smithing involved the use of coal, a more

5. The following and other practical matters are the subject of the complementary research by Dr J. Henderson and Mr D. Tyler, to whom thanks are due for much fruitful discussion pointing out many of the problems noted here.

6. We are grateful to Jane Cowgill for this suggestion.

likely context for its exploitation as a fuel is in 'secondary smithing', that is the working of ingots of metal into finished items, and their repair when necessary. We have already noted specific smithing residue identifications with coal inclusions, and, although some coal-yielding sites such as the Wentloodge Levels, Chesters or its neighbour Park Farm villa had ready access to iron ores, and in some cases can be shown to have been smelting them, many more sites, like Brough-on-Noe or Marshfield, are far from ores, produce no suggestion of smelting and are likely to have obtained their metal as traded ingots and perhaps recycled scrap metal. Again, work on the practicalities of using coal for this 'secondary smithing', especially if it had a high sulphur content, seems to have been limited; but factors such as the absorption of sulphur from coal must have posed fewer problems in at least some 'secondary smithing' operations than in the 'primary smithing' of a probably 'spongy' bloom. Thus, though far more work would be desirable on slag analysis, the chemistry of ancient ferrous technology and experimental confirmation of the viability of coal as a fuel, present evidence suggests strongly that coal was used frequently and widely by ordinary blacksmiths in Roman Britain.

The foregoing are probably the most important uses to which coal was put; but it remains to mention one or two instances of other, probably rarer, uses. At Trentholm Drive in York substantial quantities of coal were found in what seems to have been an *ustrina* or public cremation pyre, used from the second half of the second to the early third century, and this evidence is supported by coal from one of the associated cremation burials of the early-third century. More ambiguous is the evidence of small coal inclusions in mortars (and plasters), which may suggest coal fuelled lime burning. Only at Lincoln has coal been noted in plaster, and here the proximity of a coal store argues for contamination during plastering (pers. comm. Jane Cowgill, City of Lincoln Archaeological Unit). However, coal inclusions in mortars (not included in the Appendix, except for Caerleon) occur at Caerleon (Zienkiewiecz 1986, 54, 343 and *passim)*, Binchester, Piercebridge, Housesteads and Denton Burn, Newcastle (pers. comm. Dr G. C. Morgan). Further finds occur in the mortar of a wall on the 1988 Caerleon Museum Street site (Frere *et al.* 1989, 263; pers. comm. D. Zienkiewicz). It may be that burnt lime uncontaminated with fuel residues was preferentially selected for plaster as opposed to mortar production. However, coal particles even in mortars need not derive from lime burning. Certainly at Caerleon, although both angular and rounded particles were detected, the coal could have derived from nearby riverine sands, with coal inclusions being used as aggregates in the mortars. Only rarely, as at Piercebridge, where burnt coal particles have been identified in mortars, can its use as a lime burning fuel be inferred with some conviction (pers. comm. Dr G. C. Morgan), and so on present evidence it may well have served the purpose only occasionally.

Finally, it is also necessary to note a little evidence that may imply the use of coal other than as a fuel.[7] A lead lined stone sarcophagus burial near Caerwent seems to have been enclosed in a slab cist, 'closely filled in with what seemed to be small coal, unburnt, rammed in tight and hard' (Morgan 1856, 11–13). The date of the burial is uncertain, resting only on its form and proximity to Caerwent, and the apparent use of iron struts to support the lead lid is unusual; but there must be a possibility, if not probability, of a

7. The use of some coal substances for jewellery production is beyond the scope of this paper, but clearly occurred (e.g. Teichmüller 1992). In at least one instance cannal coal was used to produce a mould (Britnell 1989, 78, 134).

Roman date. If so, and if the coal identification was correct, the coal packing was presumably deliberately chosen, and one might speculate that the subterranean origins and colour of coal could have made its use in a funerary rite appear appropriate. If not, however, it may fall into the same category as the use of coal to surface at least one road, at Higham on Ryknield Street, where that road cut coal deposits, namely that it was used simply as a locally available material.

Discussion

It is clear that over much of Roman Britain coal played a significant role as a fuel. Except for what seems to have been minor and localized Iron Age use, it can be seen to have been first used in the first century AD, with a probably rapid growth and spread in exploitation. It is obvious that it served a range of functions, some well established, amongst which domestic heating and metallurgical applications appear to have predominated, while limited evidence hints at others. The exact role of coal in metallurgy remains uncertain and this requires further research. However, even if, as seems certain, wood and charcoal were the most widely used and generally favoured fuels in Roman Britain, the value of coal was clearly recognized, and many of its outcrops were exploited throughout much, if not all, of the period. Moreover, in several areas coal must clearly have been transported some distance to sites such as London, Cooling, Cliffe, Brancaster, Caistor and Denver, while even sites in south Somerset and Humberside are relatively distant from exposed coalfields. Whilst in some of these instances relatively cheap seaborne transport may be postulated, the coal perhaps being carried as ballast in empty vessels returning from north east England, it is clear that coal must at times have travelled by river and costly road routes in some areas. This suggests that for one reason or another it was sufficiently in demand to bear its haulage costs. The implication must be, either that for at least some purposes it was regarded as superior to wood and charcoal (or peat in areas like the fens), or that the availability of those other fuels was sufficiently limited to make it worthwhile 'importing' coal as an alternative. The first of these alternatives is difficult to accept. Although coal is quite variable in its properties, it would seem to present little advantage over charcoal or wood, except in the quantity required, though it can probably be regarded as superior to peat in domestic contexts. Technologically, especially if not coked, it is difficult again to define any clear advantage in coal use, and in ironworking at least, its sulphur content might pose problems.

In areas where coal was immediately available, its ease of procurement may often have led to its temporary or more permanent use, convenience overriding any disadvantages. Elsewhere, however, its deliberate haulage might well suggest that the other fuel resources were at a premium, and so its increasing occurrence in areas away from exposed coalfields in later Roman times should be noted. Indeed, its most frequent occurrence is not, as one might expect, between the South Midlands and North Yorkshire, where exposed deposits are very extensive, but along the line of Hadrian's Wall, where fuel requirements for the military and the *vici* were considerable, and in the heartland of villa and small town settlement in south Wales and particularly south-west England. Even though there are biases in the evidence, such as the attractiveness of forts and villas to earlier excavators, it is difficult not to suspect that the pattern of Romano-British use of coal may have been at least partly influenced by pressure on timber resources in those particularly densely settled regions which were either relatively near to coal outcrops or had medium distance waterborne communications routes leading to them. Thus, although far more evidence and

a more systematic approach to coal find collection, analysis and publication are required, the widespread use of coal may prove to be a reflection of increasing pressure on other natural resources in the face of their long-term exploitation by growing populations, being used to fuel hungry amenities such as hypocausted heating and the product of equally fuel dependent metallurgical industries.

APPENDIX

Only those sites have been included for which there is some more or less detailed and reliable source of information, which suggests that coal was recovered from Romano-British deposits. The inclusion of a site, however, has often taken account of its date of excavation, and less stringent standards have been used for the evaluation of clear statements of finds of Romano-British coal from nineteenth- and early twentieth-century excavations than for later finds. Indeed older excavations, those with limited publication, or with finds where there is some uncertainty about the stratigraphic integrity of the deposits, have been marked *. Upwards of twenty-three Romano-British sites, and further unreliable finds on a handful of listed sites, have been excluded for one reason or another, even in a few cases though they were included in earlier summaries of the evidence by Webster (1955) or others. Thus the security of the stratification (if any) of the finds is too dubious to be accepted, or the contexts are very likely to be post-Roman, at the following: Old Penrith II (pers. comm. C. Richardson, Tullie House Museum); Otby Beck (Phillips 1934, 128); Rise How (Bellhouse 1984, 50–1); Swalcliffe Barn (pers. comm. D. Pearson, Oxfordshire Museums Service); Topley Farm Lane (Nottinghamshire S.M.R. No. 04980); Ancaster (Webster 1955, 216 n. 1; Todd 1981, 90–106); Bothwellhaugh (Keppie 1981, 73); Brougham (pers. comm. C. Richardson; Dr A. P. Fitzpatrick, Wessex Archaeology); Broughton Lodge (pers. comm. Dr A. H. V. Smith; A. G. Kinsley, Trent and Peak Archaeological Trust; for the site Kinsley 1993); Clapton-in-Gordano (Collingwood and Taylor 1924, 234–5); and Claxby Beck (Webster 1955, No. 51). At Little Abingdon/Balsham (Cambridgeshire S.M.R. No. 06249), Brading (Weigall 1926, 227), and Thurgarton (pers. comm. M. Bishop, Nottinghamshire County Council) there is insufficient confirmation that coal finds were made. A minority of excavations from which the former National Coal Board or L. Biek obtained and analyzed coal (as listed in records kindly made available by Dr A. H. V. Smith, supplemented by information from Justine Bayley of the Ancient Monuments Laboratory) could not be specifically identified or any published/archival information on them traced: 'Brough', Cumbria; Fen Drayton; Glooston; Halewood; Ilchester; Old Edlington; Thistleton; Wigginton; and Tebay. Of listed sites with further but disregarded finds only the large river bed deposits at Chester (Shrubsole 1887, 85–7) are of any note.

The entries in the alphabetical list give the most common modern name, county or Scottish region and settlement type (where reasonably established) for each site; the main sources of information on the coal finds (with published accounts of sites in which coal finds were not noted given in parentheses); and a brief summary of the contexts of the finds, etc. Some minor sources duplicating the information in those cited have been omitted, and it should be noted that finds on roadlines etc. not at settlement sites (e.g. on Ryknield Street) are collected under the name of the road or waterway.

Alcester, Warwicks. (Small Town)

Gas House Lane: 3rd–4th cent. finds; Birch Abbey: pits and layers. Few details available.
Pers. comm. Dr A. H. V. Smith; Warwick Museum

Astley, Worcs. (?Farmstead)

Presumably 3rd–4th cent. ditches, 4th–early 5th cent. well and partly burnt in ash deposits. Coal in gravel deposits at site.
Walker 1958, 31, 36

Bar Hill, Central Region (Fort)

6 in. thick layer in 6 x 5 ft. pit in or next to *praetorium* (Antonine).
Macdonald and Park 1906, 62; Robertson *et al.* 1975, 22

Barnack, Cambs. (?Farmstead)

4th cent. ditches with metalworking residues and post hole in aisled building.
Simpson 1993, 111, 123, 126

Barton Court Farm, Oxon. (Farmstead/Villa)

1 fragment from flue pit of ?2nd half 4th cent. T-shaped corn dryer.
Miles 1984, 47; pers. comm. D. Miles and A. Dodd, Oxford Archaeol. Unit

*Baydon, Wilts. (Road Line Settlement)

Evidently with Fe slag but few details.
Cunnington 1867, 108

*Beckhampton, Wilts.

No details available.
Pers. comm. P. H. Robinson, Devizes Museum

Benwell, Tyne & Wear (Fort)

a) ?2nd cent. burnt deposit, building B room 9.
Petch 1928, 516

b) With smithing scale in thick analyzed ?workshop deposit.
Simpson *et al.* 1941, 22

Bewcastle, Cumbria (Fort)

*a) 4 fragments (3 burnt). No details.
Pers. comm. C. Richardson, Tullie House Museum; Richmond *et al.* 1938

b) Finds from 3 contexts. No details.
Pers. comm. C. Richardson

Biglands, Cumbria (Fortlet)

Turf walled, charcoal filled ?cooking hearth area (*c.* AD 125–40) and other uncertain contexts.
Pers. comm. C. Richardson, Tullie House Museum; Potter 1977

Birdoswald, Cumbria (Fort)

a) (?Early) 4th cent. phase, main E. gate N. guardchamber, coal and coal ash.
Gillam 1950, 67

b) No details available.
Pers. comm. Central Archaeol. Service

Birrens, Dumfries & Galloway (Fort)

Hadrianic and Antonine I burnt layers; Antonine I inter phase rubble and well.
Robertson 1975, 48, 58, 63, 69, 105, 263–4

Bowling Green Farm, Oxon. (Village)

From stone-cut pit with domestic debris.
Pers. comm. D. Pearson, Oxfordshire Museums; A. Dodd, Oxford Archaeol. Unit

Brafield-on-the-Green, Northants. (?Farmstead)

?With hearth and slag. Few details available.
RCHM (E) 1979, 7 No. 21

Brancaster, Norfolk (?*Vicus*)

?2nd cent. ditch; early 3rd cent. ditch; 2nd–4th cent. layer; 4th cent. metalling.
Hinchcliffe and Green 1985, 128–9

Brawdy, Dyfed (Hill Fort)

No details available.
Pers. comm. Dr K. R. Dark

Brecon Gaer, Powys (Fort)

(?Earlier) 2nd cent. layer in N. guardroom of W. gate.
Wheeler 1926, 19

Brockworth, Glos. (?Farmstead(s))

Few details available.
Rawes 1981, 73

Brough-on-Humber, Humberside (Town)

a) 'On almost all sites and at most periods' including late Antonine floor, yard and destruction deposits with Fe working evidence; Antonine ash layer; 4 ?late Antonine to *c.* AD 360–400 phases of Fe/Ae working building including large coal ash deposit in pit.
Wacher 1969, 69–70, 227–31; pers. comm. Prof. J. Wacher

b) Welton Rd suburb: 2nd/3rd cent. pit; 3rd cent. ditch; 3rd/early 4th cent. ?beam slot; mid-/late and late 3rd cent. rubble; late 3rd/early 4th cent. levelling.
Pers. comm. Ken Steedman Humberside Archaeol. Unit

Brough-on-Noe, Derbys. (*Vicus*)

a) 1 lump from pit (*c.* AD 80–120).
Bishop *et al.* 1993, 63

b) Possible identification in Fe slag (late 2nd/3rd cent.)
Drage 1993, 88

Bubbenhall, Warwicks. (Isolated Kiln)

1 fragment from 2nd cent. kiln stokehole.
Pers. comm. N. Palmer, Warwick Museum

*Buckden, Cambs.

2 lumps in rescue finds; no details.
Cambs. S.M.R.

Burradon, Northumberland (Farmstead)

?2nd cent. pit hearth and drainage ditch.
Jobey 1970, 86

Caerleon, Gwent (Fortress, *Canabae* & Civil Areas)

a) 'Half burnt . . . under a tessellated pavement'.
Wilkins 1888, 3; 1900, 230

b) 3rd/early 4th cent. layer with Fe slag including coal. Also in bed of R. Usk.
Threipland 1965, 136

c) 3rd cent. drain and river bed near wharves.
Adams *et al.* 1965

d) ?Associated with Fe/Ae working (Antonine).
Boon 1964, 30

e) Baths: mortar of primary phase (*c.* AD 75) and raised drain base (*c.* AD 100/10); late 2nd cent. foundation trench; ?4th cent. drain sediments; 4th cent. squatter occupation. Museum St (1988): mortar of wall (? AD 85/90). Telecom Site (1987): 4th cent. post-military levels. Museum St (1983–5): 2nd cent. Ae/Fe working in *?praefectus castorum's* house.
Zienkiewicz 1986, 54, 343, *passim*; 1993, 57; pers. comm. D. Zienkiewicz

Caerwent, Gwent (Town)

a) Fill of slab cist containing lead lined stone sarcophagus.
Morgan 1856, 11

*b) Vague reference to find in houses.
Martin *et al.* 1901, 316

c) With and embedded in Fe slag in levelling below mosaic.
Storrie 1883; 1894, 130

d) ?4th cent. hearth and below floor of large town house.
Ashby 1905, 300; Ashby *et al.* 1911, 413; pers. comm. Newport Museum

e) Orchard/Courtyard House (1983) site: late 2nd – late 3rd cent. layer; late 3rd cent. and another well; late 3rd cent. make-up layer; mid-4th cent. building debris.
Pers. comm. R. J. Brewer, Nat. Museum Wales

Caistor-on-Sea, Norfolk (Fort)

Early/mid-3rd /?late 3rd cent. hypocaust channels, unsealed rubble above (and topsoil above mid-/late 4th cent. smithing waste pit).
Darling 1993, 133–4 and microfiche; pers. comm. M. Darling, City of Lincoln Archaeol. Unit

Camerton, Somerset (Small Town)

Including with 1st cent. hearth, below 3rd cent. floors and a dump near Fe and Pewter working building (mid-3rd cent.). Details limited.
Wedlake 1958, 63, 80–2, 94

Camp Corner, Oxon. (Farmstead)

?Immediately post-Roman drainage ditch (?derived from earlier Fe working).
Gray 1973, 12

Cannington, Somerset (Cemetery)

Grave 48 (*c.* AD 350–700) and ?earlier rock-cut feature.
Pers. comm. Prof. P. Rahtz

Cantley, S. Yorks. (Potting/Indus. Site)

Upper fill of chimneyed Fe working feature.
Cregeen 1956/8, 46

Car Dyke, Cambs. (Canal/Main Drain)

Upper silt/peat fill (late 3rd – mid-4th cent.).
Clarke 1949, 150; Browne 1978, 69

Carlisle, Cumbria (Fort/Town)

Annetwell St: mid-2nd cent. and later soil dumps and buildings. Few details available. Other sites: 'scattering of fragments.' included in late 70s/mid-80s to AD 92/3 contexts at Castle St.
Pers. comm. Tim Padley, Carlisle Archaeol. Unit; cf. Caruana forthcoming

*Carvoran, Northumberland (Fort)

'. . . very large coal cinders . . . in digging up some of the foundations of the station'.
Bruce 1867, 248

*Castlecary, Central Region (Fort)

Antonine layers abutting burnt granary walls.
Christison 1902/3, 313

*Castle Copse /Brailwood, Wilts. (Villa)

No details available.
Pers. comm. P. H. Robinson, Devizes Museum

Castleford, W. Yorks. (*Vicus*/Town)

Wellbeck St (1(74)) site: phase 1 *vicus* levels (early 70s–mid/late 80s); phase 2 *vicus* levels (*c.* AD 90–140); phase 3 civil/commercial area (*c.* AD 140–180); post-*c.* AD 180 burials and stone robbing activity. Other sites: details not available.
Pers. comm. W. Yorks. Archaeol. Service

*Castleshaw, Greater Manchester (Fort/Fortlett)

From 'early excavations' and 1963/4 work. No details available.
Pers. comm. Dr J. Prag, Manchester Museum; N. Redhead, Greater Manchester Archaeol. Unit

Castle Stairs, Tyne & Wear (R. Tyne Dumps)

Quantities in ?quay/causeway dumps (*t.p.q. c.* AD 160 and 2nd quarter 3rd cent.).
Passmore *et al.* 1991, 17–18

*Castlesteads, Cumbria (Fort)

'Some coal ashes' evidently in buildings.
Hutchinson 1794–7, 114

Catsgore, Somerset (Village)

Unspecific reference to coal and coal-ash slags in Fe working area.
Leech 1982, 125

Catterick, N. Yorks. (Town)

No details available.
Pers. comm. Central Archaeol. Service

Catterick (Bainesse Farm) (Satellite Area)

No details available.
Pers. comm. Central Archaeol. Service

Chedworth, Glos. (Villa)

Continuous sequence of finds (*c.* AD 100/40 to *c.* AD 350/400) from fill of quarry pits and overlying dining room 5 including hypocaust of *c.* AD 160/200–350/400.
Pers. comm. Dr R. Goodburn

Chessels (The), Glos. (Village)

With forge, anvil and Fe pig but few other details available.
RCHM(E) 1976, 79

*Chester, Cheshire (Fortress/Town)

'Small fragment' from 1954 excavation in Bridge St.
Webster 1955, No. 20(i)

Chester-le-Street, Co. Durham (Fort)

Many finds including probable coal store in post-Antonine to 4th cent. officers' quarters converted to industrial use, and late Roman hearth and gully on/near *via vicanaria* between barracks.
Frere and Tomlin 1991, 238; report forthcoming in *Archaeol. Aeliana;* pers. comm. Dr M. C. Bishop; J. Pickin, Bowes Museum

Chesters, Glos. (Villa)

a) Layer at side of baths furnace passage.
Scott-Garrett 1938, 103

b) With Fe slag in ditch (*c.* AD 250–400); with charcoal in small cooking/heating hearth.
Fulford and Allen 1992, 191

Chew Down, Somerset (?Farmstead/Village)

No details available.
Pers. comm. Central Archaeol. Service

Chew Valley Lake, Avon (Villa/Industrial Settlement)

3rd cent. ?Fe working depression; 4th cent. villa; nearby settlement (Herriott's Bridge); ?coal ash slag of unstated provenance.
Rahtz and Greenfield 1977, 44, 55, 78, 342–3

Cliffe, Kent (Coastal Site)

No details available.
Pers. comm. Dr A. H. V. Smith

*Coed Newydd, Gwynedd (Fe Working Site)

Presumed R-B. Coal in mound below 'smelting floor' with slag (cf. Crew 1990, 53; smithing not smelting).
Baynes 1920; RCHM Wales 1937, lxxx, 137
[N.B. for the nearby hut group at Din Lligwy see the comments on p00]

*Compton Grove, Glos. (Villa)

No details available.
RCHM(E) 1976, 38

Cooling, Kent (Saltern/Later Pottery)

2nd cent. fill of 1st cent. ditch.
Pers. comm. Alec Miles, Lower Medway Archaeol. Res. Group

Corbridge, Northumberland (Fort/Supply Base/Town)

a) Red House: outside baths *tepidarium* stokehole (*c.* 80–90s AD).
Daniels 1959, 167

b) 'A quantity' on a floor (?early Antonine).
Foster and Knowles 1910, 267–8

c) 'At least a tomato tray full' from hypocaust inserted into a room of the early Antonine *principia.*
Webster 1955, No. 15ii

*Coygan Camp, Dyfed (Hill Fort)

'Small quantities' from ?N. entrance pathway and above IA/RB burials.
Wainwright 1967, 179

*Crosby Ravensworth, Cumbria (Farmstead)

In sand below roundhouse; in recess in wall of oblong enclosures/house.
Collingwood 1908, 367; 1909, 301, 307; pers. comm. C. Richardson, Tullie House Museum

Crossgates, N. Yorks. (Farmstead)

Flued 'fire hole' in roundhouse (?late 3rd cent. to late 4th cent.).
Rutter and Duke 1958, 66

Croy Hill, Strathclyde (Fort)

6 in. layer of coal ash on parts of N.E. tower walls; granary, or earlier, pit; *sacellum* floor (Antonine).
MacDonald 1931/2, 252; 1936/7, 40, 63, 70

Cwm Brwyn, Dyfed (?Farmstead)

Stone lined pit near ?furnace/ovens; and elsewhere.
Ward 1907, 206

Dalton Parlours, N. Yorks. (Villa)

With Fe slag and hammerscale filling ?anvil pit. Date unclear, most likely 4th cent.
Wrathmell and Nicholson 1990, 70

*Daventry, Northants. (Villa)

From ruined hypocausts in two rooms of substantial villa.
Botfield 1853, 384, 388; RCHM(E) 1981, 66

Denton, Lincs. (Villa)

1 fragment from base of well filled mid-late 4th cent. (near baths).
Greenfield 1971, 40–1

Denver, Norfolk (Saltern)

Late 2nd/early 3rd cent. major road ditch; 1st half 3rd cent. layer; ?undated layer; unsafe finds from earlier work.
Gurney 1986, 133–4, 141

Derby, Derbys. (Fort/*Vicus*/Town/Industrial Area)

a) Pre mid-3rd cent. drainage ditch (N.E. fort corner).
Brassington 1982, 77

b) Thick pile, pit finds and sealing layer finds in late 2nd/early 3rd cent. industrial area of former or functioning fort.
Wheeler 1985, 54–63

c) ?Early/mid Antonine or later road ditch; Hadrianic/ Antonine, later 3rd and first half 4th cent. well fills.
Dool 1985, 158, 177–9

Doncaster, S. Yorks. (*Vicus*)

Mid-2nd cent. pit.
Buckland and Magilton 1986, 48, 197

Dorchester, Oxon. (Small Town)

St Birinus site: pit fills.
Pers. comm. D. Pearson, Oxfordshire Museums; A. Dodd, Oxford Archaeol. Unit

Dropshort, Bucks. (Small town)

No details available.
Pers. comm. Central Archaeol. Service

Dryhill, Glos. (Villa)

4th cent. villa. In flues below room 6.
RCHM(E) 1976, 6

Elmswell, E. Yorks. (?Farmstead)

In ash in bowl-shaped hearth identified as smithing residue.
Corder 1940, 29 n. 1

Ely, S. Glamorgan (Villa)

Finds apparently associated with furnace etc. probably for Fe smithing not smelting (cf. Crew 1990, 154).
Storrie 1894, 130; Wheeler 1925, 268

*Enford, Wilts.

No details.
Pers. comm. P. H. Robinson, Devizes Museum

Flint (Pentre), Clwyd (?Pb Processing Site)

With lead 'scoria' on flagged floor; in lead ?smelting hearth with slag and charcoal.
Ffoulkes 1856, 308; Atkinson and Taylor 1924, 10, 20–1

Forcegarth Pasture, Northumberland (Farmstead)

Post *c.* AD 200 storage pit fills with Fe slag droplets.
Fairlees and Coggins 1980, 31, 34; 1986

*Foxcote, Bucks. (Villa)

No details available.
Gents. Mag. 1843, 303

Frocester Court, Glos. (Villa)

27+ contexts of late 2nd/early 3rd–5th cent. including pits, ditches, hearth, ?smithy and kitchen floor.
Gracie 1970, 37; pers. comm. E. G. Price; Gracie and Price, 1979

Fulham Palace Moat, Greater London

Late 3rd cent.+ gravel surface foundations; late 4th cent./medieval bank.
Arthur and Whitehouse 1978, 70–1

Gadebridge Park, Herts. (Villa)

?Constantinian destruction above kitchen ovens.
Neal 1974, 38

Gatcombe, Avon (Villa)

Many contexts including ?smithy (*c.* AD 360–70/80), hearth (*c.* AD 350/60), ?bakery (*c.* AD 300–70/80), ?smithy (*c.* AD 270/86 – before AD 370/80).
Branigan 1977, 109

Gloucester, Glos. (*Colonia*)

a) Bon Marche: various including floor in ?late 3rd cent. house; city wall bank (?*c.* AD 96/8 with possible contamination to *c.* AD 300).
Hunter 1963, 64–5

b) Westgate St: 3rd/4th cent. on stone tile floor with Fe slag.
Heighway and Garrod 1980, 81

Goldsland, S. Glamorgan (?Farmstead)

Boundary ditch with part smelted Fe ore.
Pers. comm. C. Mumford, Goldsland Archaeol. Group

Great Bulmore, S. Glamorgan (*Canabae* satellite)

Coal ?store (*c.* AD 150/60–200) in building 11; pit with Fe slag (*c.* AD 160–200).
Zienkiewicz 1985, 10; pers. comm. D. Zienkiewicz

*Great Chesters, Northumberland

No details available.
Gibson 1903b, 48

Great Marshes (Welney), Norfolk (?Saltern)

Possibly associated with brine evaporation.
Webster 1955, No. 46; Phillips 1970, No. 5394c

*Great Witcombe, Glos. (Villa)

Large pieces and ash from 2/3+ rooms. Few details.
Lysons 1818/19; Clifford 1954, 27

Greyhill (Bewcastle) Cumbria (Civil Hilltop Site nr. Fort)

First half 4th cent. or earlier hearth with Fe flecks and clinker.
Woolliscroft *et al.* 1989, 71

Gubeon Cottage, Northumberland (Farmstead)

2nd cent. or later. Small pieces in occupation layers.
Jobey 1957, 179

Hartburn, Northumberland (Farmstead)

Antonine or later layer; between paving in ?Roman house.
Jobey 1973, 45, 49

Heronbridge, Cheshire (*Canabae* Satellite)

Ash pit and layer associated with late 1st/early 2nd cent. Ae working hearth.
Hartley 1954, 8–9

Hibaldstow, Humberside (Roadline Settlement)

Inside and outside building IV including pit (post *c.* AD 140/70 – mid-4th cent.).
Smith 1987, 191

Higham Ferrers, Northants.

With charcoal and slag in burnt lower fill of quarry pit 2nd-4th cent.
Meadows 1992, 85

High Brunton, Northumberland (Wall Turret 26a)

Layers of wall periods Ia. 3 and Ib (?Ae workshop in later period).
Woodfield, 1965 113–18

*High Cross, Leics. (Small Town)

?Coal fuel slag. Context not stated.
Greenfield and Webster 1964/5, 38–9

High Nash, Glos. (Temple)

4th cent. level below floor of final temple phase.
Pers. comm. M. Walters, Clwyd-Powys Archaeol. Trust

*Holbeach, Lincs. (?Farmstead)

No details available (mainly ?4th cent. site).
Webster 1955, 215; Phillips 1970, 309–10, No. 341'65

Holditch, Staffs. (?Industrial Settlement)

Large amount of charcoal, coal and 'coal-clinker' inc. coal-cinder in hearth (Flavian to first half 2nd cent.); two 2nd cent. hearths.
Charlton 1961, 32, 37–8

Housesteads, Northumberland (Fort & *Vicus*)

a) Samples from ?Bosanquet's work.
Pers. comm. L. Allason-Jones, Soc. Antiq. Newcastle Museum.

b) 'Nearly a cartload of coals' in S. guardchamber of blocked E. gate (?4th cent.).
Bruce 1978, 138, 145

c) *Vicus*: 'a coal bunker apparently attached to a cobbler's shop'.
Birley 1981, 125

Hucclecote, Glos. (Villa)

With debris from 1st phase villa in 'occupation trench' below later room V.
Clifford 1933, 333

Huckhoe, Northumberland (Farmstead)

'On every part of the site except beneath enclosure walls' including wall cores; occupation layers; rock-cut hearth with Pb droplets and Fe 'smithing' slag with coal embedded (?mainly late 2nd/early 3rd cent.+).
Jobey 1959, 278, *passim.*

Hull, Humberside (Settlement)

3rd cent. ditch; post mid-4th cent. ditch and pit; (and post mid-4th cent. subsoil).
Pers. comm. Ken Steedman Humberside Archaeol. Unit

Huntsham, Herefordshire (Villa)

In ash layers in 2 adjoining large T-shaped corn dryers in aisled barn (late 3rd/early 4th cent.).
Bridgewater 1965, 182

Ilchester Mead, Somerset (Villa)

With slag and iron in floors of S. wing rooms 5 and 6 industrial phase (with stone structures including ?bloomery 'smelting' hearth) (?post mid-4th cent.).
Hayward 1970, 123

Inveresk, Lothian (*Vicus*)

'small amounts throughout the sequence' (Antonine).
Thomas 1988, 158

Irby, Merseyside (Farmstead)

Late 3rd cent. ditch with some Fe slag.
Philpott 1993, 23; pers. comm. Dr R. A. Philpott, Liverpool Museum.

Kingsweston, Glos. (Villa)

With Fe slag etc. near hearth (?builders waste) below villa (*t.p.q. c.* AD 270).
Boon 1950, 11

*Knook Down, Wilts. (Village(s))

No details available.
Hoare 1812, 84–5; Cunnington 1932, 170, 206

Lancaster, Lancs. (Forts/Town)

a) 1 fragment in Weary Wall footings.
Droop and Newstead 1928, 35.

b) Small quantities with wood in *?mansio* baths *caldarium* fire tunnel (?from last ?early/mid-4th cent. firing); pieces over large area of ?Mitre Yard site.
Jones and Shotter 1988, 63

Lechlade, Glos. (Villa)

27+ contexts of villa phase (mid-2nd cent.+) including coal and coal dust from ditches and pits; coal and coal dust in large layer E. of building III hypocausts (late 3rd/4th cent.); pits, ditches, gullies and silt filled hollows in enclosure groups (late 3rd/4th cent.).
Allen *et al.* 1993, 176–7, microfiche 2, 96–7); pers. comm. T. Allen, Oxford Archaeol. Unit

Lincoln, Lincs. (*Colonia*)

Finds on at least 9 sites in contexts of at least mid-/late 2nd–v. late 4th cent. including building floors; ?coal shed at rear of and floor of mid-/late 3rd cent. building with hearth sequence (possibly smithy) and in wall plaster; with Fe slag and hammerscale (latter and coal accruing to Fe objects) from 3 flooring phases of late 3rd/4th cent. building with hearth; mid-/late 2nd cent. contexts with smithing slag and hammerscale.
Pers. comm. Jane Cowgill, City of Lincoln Archaeol. Unit

Littlecote, Wilts. (Villa)

22 contexts of AD 170–80 – 400+ including ditches. middens, floors, yards, hypocaust (*c.* AD 240–80) and especially later 3rd cent. fill of Ae working hearths in 'workhall' and residue from pile in corridor linking 2 villa rooms with Ae working hearths.
Pers. comm. B. Phillips

Littleport, Cambs. (?Village)

Floors of huts with hearths (?1st–3rd cent.).
Fowler 1950, 8

Llantwit Major, S. Glamorgan (Villa)

?Fe working furnace (*?c.* AD 300); early – mid-/late 4th cent. floor of S. range; other contexts perhaps connected with Fe smithing.
Winks 1888, 414; Storrie 1894, 131; Nash-Williams 1953, 108, 117, 124–8, 157

London, Greater London (City)

a) New Fresh Wharf: ?late 2nd cent. silted waterfront; 2nd–4th cent. silt in quay.
Archive Reports at Museum of London; Miller *et al.* 1986

b) Further possible finds. No details available.
Pers. comm. H. Swain and A. Wardle, Museum of London

*nr. Long Lane, Notts.

With Fe slag, charcoal and 2nd–4th cent. pottery.
Notts. S.M.R. No. 04768

*Low Ham, Somerset (Villa)

With slag in shallow excavations on largely unexplored wing of villa.
Webster 1955, 216 n. 1; Dewar 1955/60, 59

Lufton, Somerset (Villa)

Heap associated with Fe ?smithing hearth (?mid to third quarter 4th cent.).
Hayward 1972, 63

*Manchester, Greater Manchester (Fort/*Vicus*)

a) Large store near E. fort gate and *vicus* finds.
Roeder 1899, 119, 138, 164, 169

b) 1972 and 1977/8 sites (*vicus*): No details available.
Pers. comm. Dr J. Prag, Manchester Museum; Jones and Grealey 1974; Walker 1986

Marshfield, Avon ('Semi' Villa)

Including third quarter 3rd cent.+ pit, hearth and sealed fill of depression with Fe slag in small smithy; floor of last quarter 4th cent. ?smithy.
Blockley 1985, 58–9, 264, *passim*

*Maryport, Cumbria (*Vicus*)

'iron debris mixed with small coal'; a quantity in a stone building.
Robinson 1881, 248, 251

*Maxey, Cambs. (?Farmstead)

No details available.
Simpson 1993, 111; Gurney *et al.* 1993; pers. comm. J. Neve, Fenland Archaeol. Trust

Melandra Castle, Derbys. (*Vicus*/Fort Baths)

With furnace lining etc. in rubbish over baths *tepidarium*.
Pers. comm. Dr J. P. Wild, Manchester University.

Menagerie Wood, Notts. (?Farmstead)

Layers, boundary ditch and pits (2nd–4th cent.).
Garton *et al.* 1988, 28–30

Minchin Hole, W. Glamorgan (Cave)

1 lump from domestic/minor craft hearth 3.
Branigan *et al.* forthcoming

Monmouth, Gwent (Small Town)

Fragments and dust from 2nd cent. post hole with Fe slag (Fe working area).
Walters 1988

*Mother Anthony's Well, Wilts. (Villa)

No details available.
Pers. comm. P. H. Robinson Devizes Museum

*Mucklebank, Northumberland (Wall Turret 44b)

Presumably in area of burning on S. inner wall.
Gibson 1903a, 16

Mumrills, Central Region (Fort/Fort Annexe)

?Coal ash slag from Agricolan fort or Antonine fort annexe baking oven.
Robertson 1941/2, 122, appendix

Nettleton, Wilts. (Shrine/Industrial Settlement)

Unspecific references to a number of finds in 6 buildings but including late 4th cent. with burning and Ae working crucibles; Fe working and probably pewter working areas.
Wedlake 1982, 68, 220

Newton Kyme, N. Yorks. (Fort)

Over 20 contexts inc. foundation trenches/ditches, wall, pits and layers dated AD 150–180 to late 4th cent. or later.
Pers. comm. J. Heron, Sheffield University; material examined by M. J. D.

North Cave, Humberside (Farmstead)

Enclosure ditch and pit (2nd – mid-3rd cent.); trackside ditch (late 3rd – mid-4th cent.); ditches and dereliction deposits (mid-/late 4th–?early 5th cent.).
Pers. comm. Ken Steedman Humberside Archaeol. Unit

Northfleet, Kent

3 small piles nr. hypocaust flue/stokehole below building debris.
Ansell 1985

Norton, N. Yorks (Pottery nr. *Vicus*)

Fill of T-shaped flue below stone pottery or grain drying floor (*?c.* AD 220–80).
Hayes and Whittey 1950, 17

Nurston, S. Glamorgan

With Fe slag and burnt ?furnace lining in gully (?2nd cent.).
RCHM (Wales) 1976, 120 No. 765

*Nuthills, Dorset (Villa)

Floor of room with painted plaster and stone basin.
Collingwood and Taylor 1924, 237

Orton Longueville, Hunts. (?Industrial Site)

Rubble beside bath house.
Dakin 1961, 67

*Papcastle, Cumbria (Fort)

'A quantity of cannal' in disturbed building 'as in other parts [of the fort]'.
Collingwood 1913, 140

Park Farm (Lydney), Glos. (Villa)

Few details but including 2nd cent. context in building.
Webster 1955, 213, n. 1; Fitchett 1986; Pers. comm. Dr A. H. V. Smith

*Park Rd Barrow, Wilts. (?R-B Barrow)

No details available.
Pers. comm. P. H. Robinson Devizes Museum

Piddington, Northants. (Villa)

Including hypocaust fuel store, room 22 (v. late 2nd/early 3rd–4th cent.); Mid-/late 4th cent. midden; associated with hearth in room 4; ?coal store N. of main villa.
Friendship-Taylor and Friendship-Taylor 1989, 3; *Current Archaeol.* 117 (1989) 319; pers. comm. R. M. and D. E. Friendship-Taylor, Upper Nene Archaeol. Soc.

*Pike Hill, Cumbria
(Wall Tower Between 52 & 52a)

Bottom and top levels in turret.
Pers. comm. C. Richardson, Tullie House Museum; Simpson and McIntyre 1932; 1933

*Quinton, Northants.

No details available.
Pers. comm. Dr A. H. V. Smith; R. M. and D. E. Friendship-Taylor

*Ratcliffe-on-Soar, Notts.

No details available.
Pers. comm. Dr A. H. V. Smith

*Ravenglass, Cumbria (Fort)

4 pieces of ?coal. No details available.
Pers. comm. C. Richardson; Potter 1979, 1–138

*Reculver, Kent (Fort)

No details available.
Ansell 1985

Risingham, Northumberland (Fort)

'More than a cartload of coal' near ?hypocaust/baths furnace in fort.
Bruce 1867, 335

Rossington Bridge, S. Yorks.
(Pottery/Industrial Settlement)

Areas not associated with potting (late 1st – mid-2nd cent.).
Pers. comm. Dr P. Buckland University of Sheffield

*Rudchester, Northumberland (Fort)

3 pieces 'at a low level' in trench across *praetorium*.
Brewis 1925, 108

Rudston, Humberside (Villa)

?2nd cent. ditches associated with building 6.
Pers. comm. B. J. Sitch, Hull Museum; Stead 1980

*Rushall, Wilts (Village)

No details available.
Goddard 1922, 34, 224

Ryknield St, Derbys. (Road)

a) nr. Chesterfield: Coal dust in roadside ditch.
Oakley 1955, 145, n3

b) Higham: phase 1 road surfaced with 1–2 in. coal (road cuts outcrop).
Saunders 1959, 113–15, 117–18

c) New Tupton: 2–10cm thick coal dust layer on 1st phase road and inclusions in 2nd phase make up.
O'Brien and Todd 1976, 23–5

St Oswalds, Northumberland
(Wall Turret 25b)

From 4 layers of wall period Ia.
Woodfield 1965, 116–18

Sapperton, Lincs. (Small Town)

'Various sealed deposits ... often directly associated with hearths, kilns, ovens etc' (2nd/3rd cent.).
Pers. comm. Brian Simmons

Scarcliffe Park, Derbys. (Farmstead)

Small fragments from ?hut platform hearth (?2nd cent.)
Lane 1973, 19, 35

*Scrattawood, Notts. (Farmstead)

No details available.
Pers. comm. Dr A. H. V. Smith; Worksop Archaeol. Soc. 1965; Challis and Harding 1975, 94, 136–7

Seavington St Mary, Somerset (Villa)

'A few fragments' in soot on a floor (?late 3rd/4th cent.)
Poole 1949

Sewingshields, Northumberland
(Wall Turret 35)

With hearth debris, fuel ash slags and sheet Ae fragments from ?4th cent. hearths.
Haigh and Savage 1984, 107

Shakenoak, Oxon. (Villa)

a) Building A: several hundred pieces from villa including baths (AD 240/70 – mid-4th cent.; mid-4th cent – AD 430+).
Brodribb *et al.* 1968, 42

b) Building B: several hundred pieces from room B XXII floor (demolition layer, mid-3rd cent.).
Brodribb *et al.* 1971, 55

nr. Silbury Hill, Wilts.

From rubbish pit (?4th cent.).
Wilkinson 1869

Silchester, Hants. (Town)

From wooden tank in courtyard of or outside large building; other finds.
Hope 1907, 449; Boon 1957, 182, n. 30

Slack, W. Yorks. (Fort Annexe)

1 piece from clay layer (primary site activity).
Pers. comm. J. H. Rumsby, Tolson Memorial Museum; Hunter *et al.* 1967/70

S. Shields, Tyne & Wear (Fort/Supply Base)

*a) Unspecific reference.
Bruce 1876, 170

b) S. gate of enlarged fort: E. guardchamber in cut feature with Fe slag etc. (late 2nd – early 3rd cent.); W. guardchamber in latest surviving layer (?4th cent.).
Miket 1983, 33, 35

Stanton Low, Bucks. (Villa)

Late and disturbed (?industrial) 'slum' levels in buildings II & IV inc. with Fe (?&Ae) industrial/domestic and associated with hearths (mid-/later 4th cent.).
Woodfield and Johnson 1989, Microfiche 3, 69

*Stanton St Quintin, Wilts. (Villa)

No details available.
Cunnington 1932, 170, 203

Stanwick, Northants. (Villa)

No details available.
Pers. comm. Central Archaeol. Service

Stanwix, Cumbria (Fort)

Post *c.* AD 125 rampart and interval tower construction trample; Antonine or later robber trench; pre-3rd cent. pit.
Dacre 1985, Microfiche 41, *passim*

Star, Somerset (Villa)

From ash pit and stone surround of fireplace in room 2 and silt in corridor (AD 330s/340s).
Barton 1964, 86

*Stockton, Wilts. (Village(s))

No details available.
Goddard 1922/4, 229 n. 1

*Stoke Gifford, Avon. (?Farmstead)

From damaged site with Fe working evidence.
Parker 1978

Stonehill, Avon. (Indus. Site)

In layers of *c.* AD 200. Haematite mining/smelting and Ae working evidence. Coal seam on site. Full details not available.
Pers. comm. J. Cornwell and E. Frayne, Avon. Highways Dept.

Templeborough, S. Yorks. (Fort)

1.5 x 0.8 x 0.3m deep pile against inner wall of *praetorium* (?4th cent. workshop phase; cf. Dearne 1986, 130).
May 1922, 37

Thorpe-by-Newark, Notts. (Small Town)

?early military layers; building destruction debris (later 2nd cent.).
Pers. comm. Prof. J. Wacher; Nick Cooper, Leicester University

Throckley, Tyne & Wear (Wall Turret 10a)

Series of 6+ hearths and occupation levels of wall period Ia (vallum cuts adjacent seams).
Bennett 1983, 37, 40

Throplands, Northants. (Farmstead)

Mainly late 3rd–late 4th/early 5th cent. contexts perhaps associated with small scale Fe smithing.
Hunter and Mynard 1977

Tiddington, Warwicks. (Industrial Settlements)

*a) Post hole with Fe slag and pit near 'furnace' (??Antonine).
Fieldhouse *et al.* 1931, 14

b) 40 finds including pits, ditches, post holes, well etc. (late 2nd–late 4th cent.).
Pers. comm. N. Palmer, Warwick Museum; Rankow *et al.* 1982, 361

Towcester, Northants. (Small Town)

Roadside ditches, building, pit etc. in mainly industrial Fe and Pb working-phase (*c.* AD 330 – 70+).
Brown *et al.* 1983, microfiche 125–7

Tower Knowe, Northumberland (Farmstead)

Including part burnt coal possibly from 1st cent. timber house and hearth pit; ?Roman house and wall core.
Jobey 1973a, 75

*Truckle Hill, Wilts. (Villa)

No details available.
Pers. comm. P. H. Robinson, Devizes Museum

Usk, Gwent (Fortress/Town)

Including Antonine fill of latrine pit; Hadrianic/Trajanic ?demolition pit; 2nd cent. gullies; 2nd/3rd cent. enclosure ditch; mid-/late 3rd cent. well.
Pers. comm. Prof. W. Manning; Manning 1981

Vindolanda, Northumberland (Fort/*Vicus*)

'Coal dust and lumps of coal . . . frequent . . . in pre-Hadrianic layers and in the later 2nd cent. and 4th cent. *vicus* and military areas' including with crucibles and smithing waste in period II *praetorium* (AD 92–7); similar in period III *praetorium* (AD 97–103); *fabrica* (AD 120 – *c.* 140).
Birley 1977, 76; Grew *et al.* 1981, 323; pers. comm. R. Birley, Vindolanda Trust

Vineyards Farm, Glos. (Farmstead)

Near 4th cent. ovens; ?4th cent. ash pit; around and in flue of T-shaped ?corn dryer (?4th cent.); late Roman oval furnace pit.
Rawes 1991, 84

Wallhouses West, Northumberland (Wall Turret 18b)

Including in building 13 (AD 325–400).
Pers. comm. Swindon Museum; Anderson and Wacher 1980

Water Newton, Cambs. (Town)

Rubbish pit by Billing Brook.
Webster 1955, No. 49

Wentloodge Levels, Gwent (Coastal Industrial Sites)

Finds in primary and secondary contexts at Rumney Great Wharf, Horse Pill, Ley Pill, Whitescourt and Severan House Farm with Fe ore, furnace fragments. Fe smithing and forging slags probably representing smelting and primary smithing including 'furnace/hearth bottoms' with entrapped coal (?principally 2nd – 4th cent.).
Allen and Fulford 1986, *passim*; 1987, *passim*

Weston-under-Penyard, Hereford and Worcs. (Town)

*a) No details available.
Jack 1923, 26, 31; Davies 1935, 153 no. 6

b) With charcoal above Fe furnace (2nd–4th cent.); with Fe slag in working hollow and postholes; Fe slag with entrapped coal in stakehole (2nd cent.+); with slag in furnace/pit contaminated with 17th/18th cent. pottery.
Bridgewater 1965, 126–7, 129–30

Whittington Court, Glos. (Villa)

In flues of hypocaust of room IV, period 2 (?late 3rd/early 4th cent. or later).
O'Neil 1952, 35

Wigan (The Wiend), Greater Manchester (?Industrial Settlement)

With Fe slag from ?industrial hearths (mid-2nd cent. and earlier).
Jones and Price 1985, 27

Wilderspool, Cheshire (Industrial Settlement)

a) Poorly reported early work: cannal and mineral coal associated with ?Fe working hearths from extensive indus. area.
Various including May 1899, 3, 18; 1905, *passim*

b) Later work (?misprints in report): large quantities including from ?figure of 8 and other ?Fe working furnaces, post hole, slots and layers (mainly 2nd cent.).
Hinchliffe *et al.* 1992, 97, 116

Winterton, Humberside (Villa)

From areas away from main villa including yard ditches and pits of AD 140/200–300/400. Full details not available.
Pers. comm. Dr R. Goodburn

*Witney, Oxon.

Upper Roman floors.
Pers. comm. Dr A. H. V. Smith

*Woodchester, Glos. (Villa)

'A considerable quantity of coal ashes' ?in main mosaic floored room.
Lysons 1796, 12; Playne 1880/1, 146

Wool St, Cambs. (Road)

Thin layer between foundations and surface.
Dewhurst 1963/4, 50

Wroxeter, Shropshire (Major Town)

*a) Unspecific references.
Gents. Mag. 1859

b) Baths ?fuel store/stokehole; room in *macellum*; pile in building W. of baths and N. of *macellum*.
Wright 1872, 55, 115, 138, 151, 159, 195

c) Heap by hearth with Fe slag in S.E. corner of forum (?late 1st cent.).
Atkinson 1942, 15

d) 1953 bath site—no details available.
Webster 1955, No. 25v

e) P. Barker's excavations—no details.
Pers. comm. J. Bayley, Anc. Mon. Lab.

Wyboston, Beds. (Farmstead)

Ash and 6 in. thick layer sealed by collapsed wall of ?corn drying shed with 'trench hearth' (2nd cent. or later).
Tebbut 1957, 80–4

York, N. Yorks. (*Colonia*)

a) The Mount: Cemetery ?rubbish pit (?earlier 3rd cent.).

Dickinson and Wenham 1956/8, 295

b) Blossom St: 2 roadside rubbish pits (Severan/early 3rd cent.).

Wenham 1965, 542–4

c) Trentholm Drive: 'Nearly a bucketful of coal & ash' from funeral pyre (second half 2nd–early 3rd cent.); cremation burial (early 3rd cent.).

Wenham 1968, 21, 102–3

*d) Low Petergate: Uncertain ?Roman context.

Wenham 1972, 92

e) Various finds at Wellington Row, 1–9 Micklegate and 35–41 Blossom St including mid-2nd–late 4th cent. contexts.

Pers. comm. Gill Woolrich, York Archaeol. Trust

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