

A Roman hypocausted building at Falkirk

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INTRODUCTION

The course of the Antonine Wall, as it approaches Falkirk from the E, is easily plotted through the former policies of Callendar Park. Its alignment has been disputed at the W end of the Park where the frontier line crossed the depression occupied by the now-canalised East Burn. On early OS maps the ditch is shown continuing due W to Rosehall, past the villa of Woodside; but Sir George Macdonald argued that the Wall made a 45° turn to the SW, and crossed the Burn much further S, and that it turned NW at or near the Burn to reach Woodside where its hollow is again visible (Macdonald 1915, 128-31). The NE-SW alignment of the frontier on the E side of the Burn has since been confirmed by aerial photographs¹ as far as the W boundary wall of the Callendar Estate. More recent editions of the OS sheets (fig 1) show the Wall making a sharp turn on a patch of waste ground just E of the Burn. However, a few years ago during the construction of the Cladhan Hotel and the Brockville Club W of the adjacent Kemper Avenue, Dr D J Breeze noted the butt-end of a possible ditch which, if Roman, would suggest that the turn took place W of the Burn itself (Breeze 1975, 200).

In 1980 it was learnt from the Ancient Monuments Branch of the Scottish Development Department that Central Regional Council proposed to convert the strip of waste ground (NGR NS 892796) between Kemper Avenue and the estate boundary wall into a car park; the authors of this report were invited to supervise a small excavation to locate the Antonine rampart and ditch and to determine their alignment more precisely.

Work began amid snow and hail in February 1980, and was scheduled to last for two weekends, but the discovery of window glass and pottery, and subsequently of structural remains of Roman date, caused the excavation to be extended. In the end 11 days were spent on the site between February and April, during which the extent of the surviving remains was determined and the alignment of rampart and ditch defined (fig 2). Two further days of excavation in October 1980 S of the estate wall revealed spreads of associated cobbling.

THE ANTONINE WALL AND DITCH

The stone base of the Antonine Wall was located on a roughly E-W alignment c 10 m N of its expected position (fig 3). The stone base, which lay at a depth of 0.6 m from the modern ground surface, had a width of 4.45 m (14 ft 7 in). A noticeable differentiation in core material was revealed in the long N-S trench beside the estate wall. Broken sandstone cobbles and small pebbles were used in the make-up of the E part of the exposed section, and larger grey unworked boulders were used in the W part, suggesting a demarcation point between two work squads, or at least a

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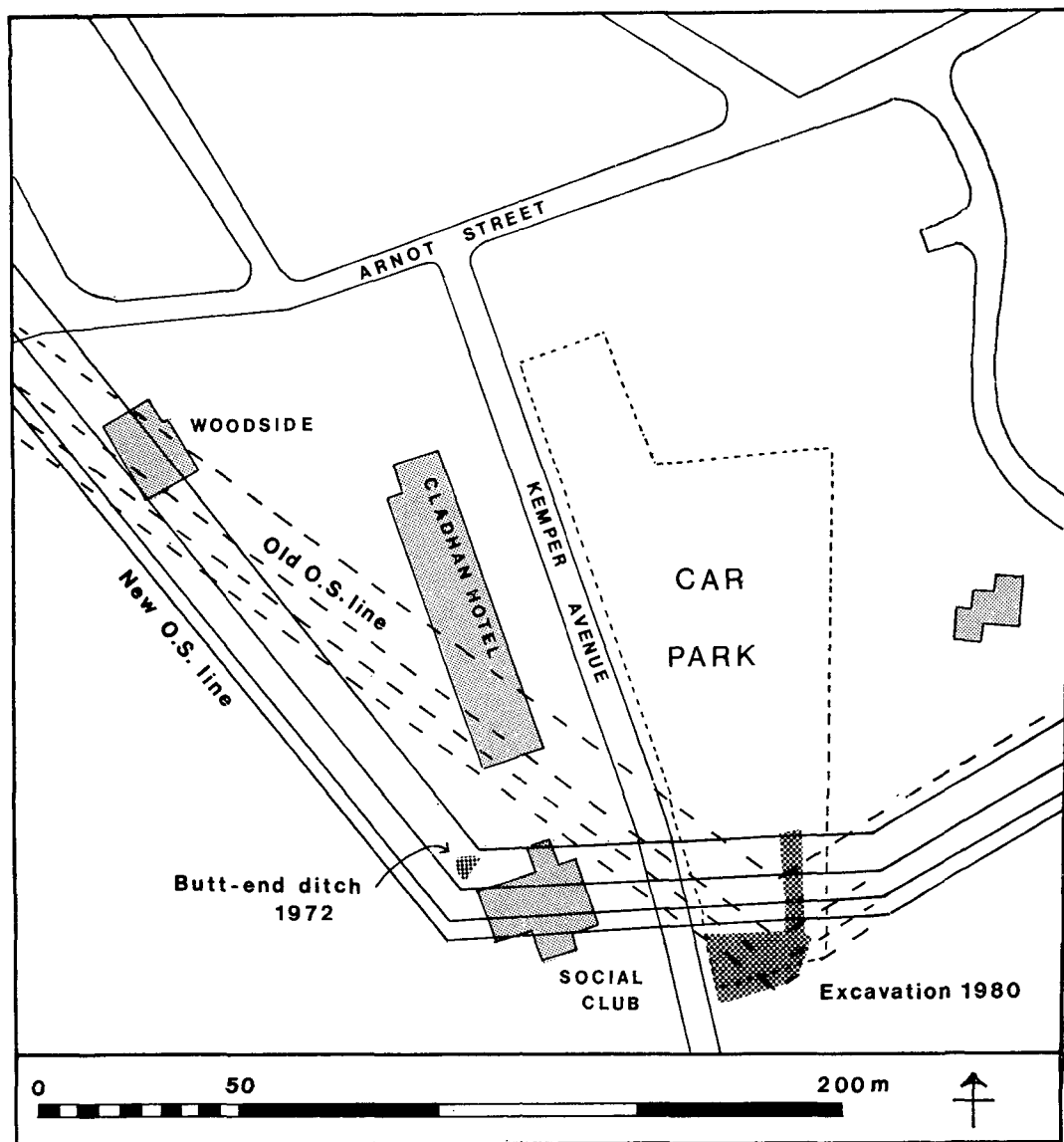


FIG 1 Site location, showing course of Antonine Wall as marked on existing O S sheets (old line) and as established by excavation in 1980 (new line)

change in the type of building material employed. The users of the broken sandstone had finished off their portion with a neat line of angular sandstone blocks running N-S across the base, which would suggest that this part was laid first. The superstructure of the Wall, which survived to a maximum height of 0.18 m, was of clayey earth revetted by turf cheeks c 1 m wide, the normal method of construction along the Wall line anywhere E of Watling Lodge (Keppie 1976, 77). The ditch had a width of 8.55 m and a depth of 3.4 m; it was separated from the stone base of the Wall by a berm of 6.75 m. The fill of the ditch was a brown dirty soil. No trace of upcast could be found on its N side, but cobbles set on both N and S lips marked the edges. Further W the stonework

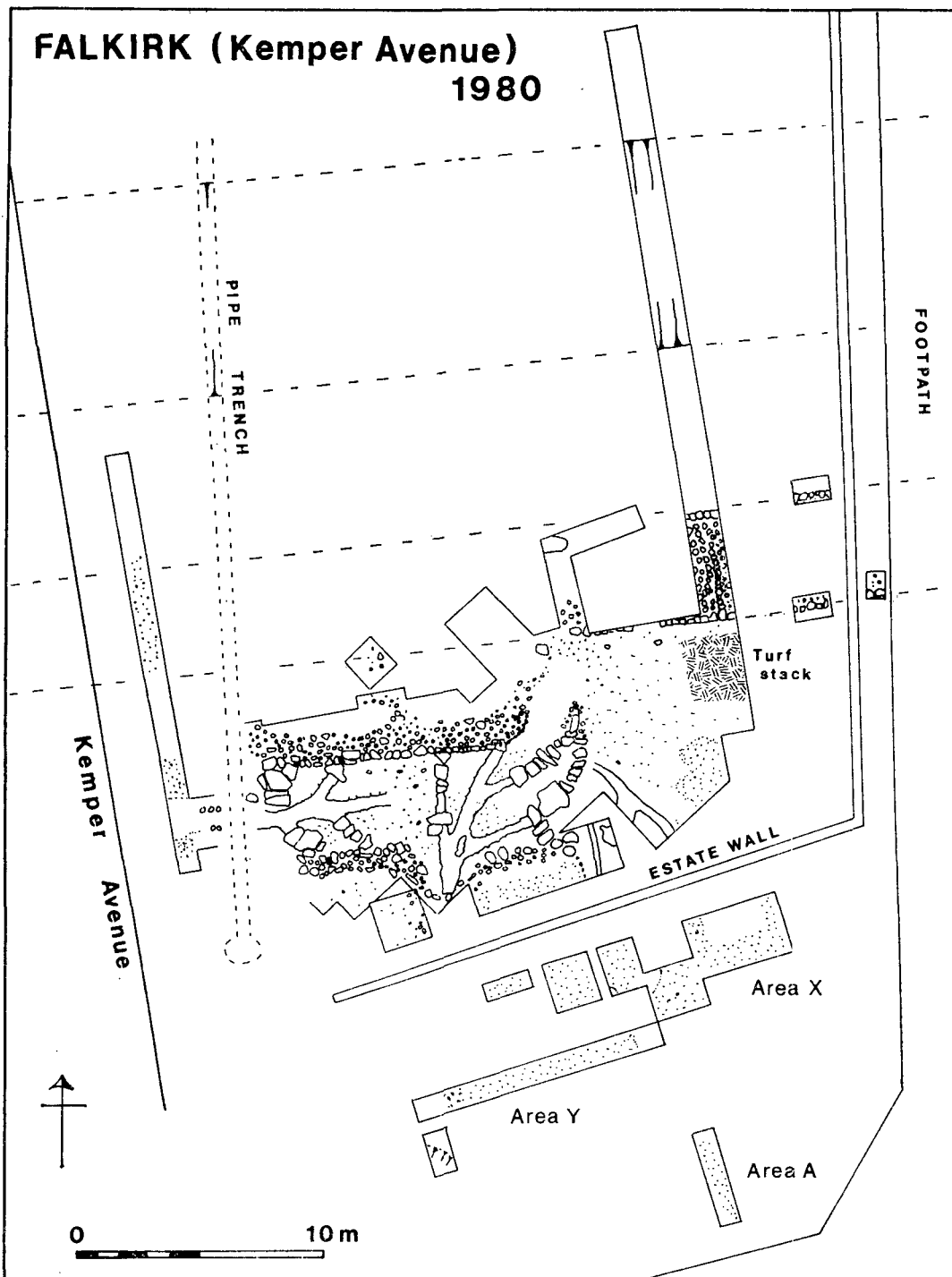


FIG 2 General plan of excavated areas

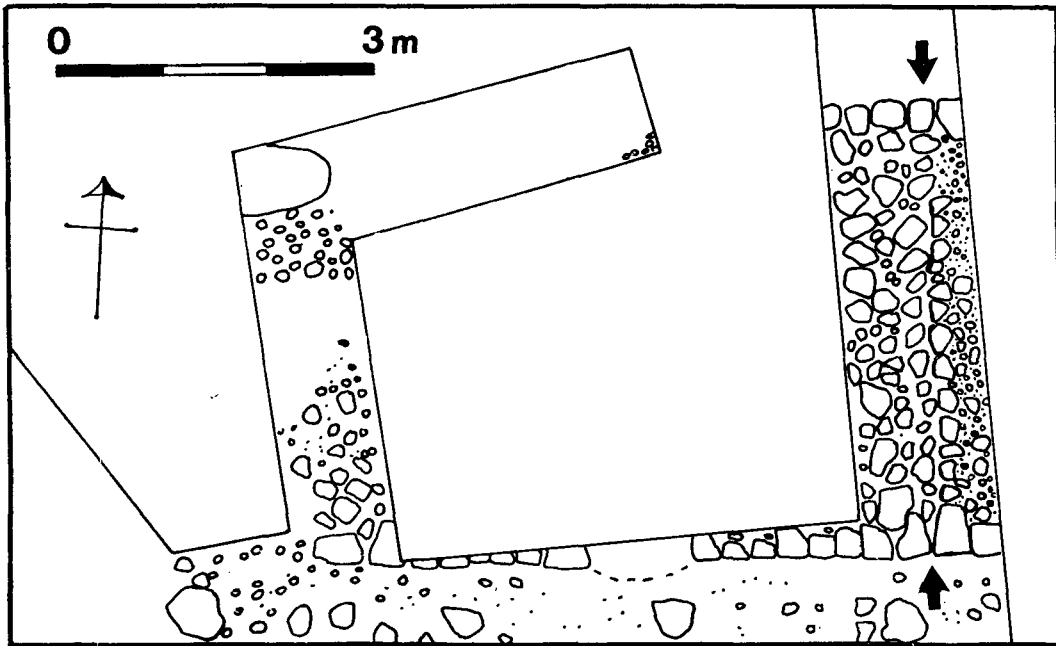


FIG 3 Stone base of Antonine Wall, as located in long N-S trench, showing position of 'demarcation line'

of the base had all but been removed by modern disturbance, only a few cobbles surviving here and there, but the alignment of the ditch was confirmed by observation of its profile in a pipe-trench during realignment of the canalised Burn. To the E of the estate wall a single trench located the S kerb of the stone base at a depth of 1.4 m from the modern surface; above the kerbing was 0.4 m of laid turfwork. It must be clear now that the rampart and ditch, having descended from high ground in Callendar Park, turned to run E-W for about 30 m, before crossing the Burn, and only then turned sharply NW towards Woodside. The butt-ended ditch noticed by Dr Breeze in 1972 lies on this projected line, which should help to confirm a Roman date.

THE BUILDING (fig 4, pls 12 & 13)

Lying parallel to the Antonine Wall, and just 2 m S of its S kerb, was an elongated stone building, measuring overall 6.5 m N-S by at least 14.5 m E-W; below its floors were channelled hypocausts set into the natural gravel, sand or clay to their full depth of 1 m and heated by furnaces against its W and S walls. Two hypocaust systems were located (here designated W and E). The W system was heated from a furnace which appears to lie W of the pipetrench; some cobbling located there may have served as a platform for stoking. The paved central flue running E-W had a length of c 6.4 m and a width of 0.55 m, with at least four and possibly six side-flues, capped but not paved with yellow sandstone, branching off to N and S, and leading to stone-fronted ducts, c 0.25 m square, set into the internal faces of the N and S walls. The flues were edged with five or six courses of dressed sandstone. The sides of the main flue were burnt red for a distance of 3 m from the likely furnace mouth. The flues had a filling of alternate layers of yellow clay and *dirty earth*, perhaps deposited by flooding from the adjacent burn. Mr C Provan kindly reminds us that the collapse of the superstructure of the Antonine Wall could have easily blocked the East

Burn for a while, or caused its level to rise, which could have resulted in an overflow into the adjacent hypocaust flues. Analysis of a soil sample from the main W flue may provide additional evidence of flooding (Appendix 4). Very little soot was observed in the flues, but several large fragments of burnt wooden beams were recovered from them (Appendix 3). The E hypocaust system was fed from a furnace lying on the S side of the building, from which flues spread out to ducts in the walls. At the point where the flues diverged, a small central plinth gave support to the capstones (pl 11b). All the flues were paved, capped, and edged with yellow sandstone; their filling was of dirty clayey soil. The S furnace had been blocked at some stage by sandstone kerbing set across its mouth, Stone kerbing located to the SW of the furnace mouth may have formed the edge of the stoke-hole.

In contrast with the flues, the walls of the building were of ramshackle construction. The walls, which had a width of 1 to 1.1 m, and survived to a maximum height of 0.6 m above the capstones, consisted of undressed natural boulders, with only a few dressed sandstone blocks used here and there in the inner faces of the N and S walls. The apparent instability of the walling contrasts with the evident care taken in laying out the hypocausts, and may suggest that two different work squads were involved. It also seems that the building as completed was narrower than the flue-builders had intended. Both N and S walls partly overlay the flue system, so that at two ducts in the N wall (N1 and N2) capstones had to be gouged-through to allow air to reach the vertical ducts. One of the flues of the E system (N4) was similarly overlain by the walling, and the lining for a duct was carefully built over the top of one of its capstones. We might have expected that the paving slab itself would then have been gouged through to provide an exit for the hot air. In the event this flue and that immediately to the E (N5) were extended to new ducts 1.8 m to the N in roughly-made channels. Both flues may have been intended to serve a small annexe to the N, unless they subsequently acted as chimneys against the outer N face of the main N wall. The S flue of the E system (S3) was completely overlain by the main S wall, with no trace of a duct.

It was not clear what had constituted the original flooring within the building. The capstones



FIG 4 Hypocausted building, showing hypocaust systems. The course of each flue is lightly stippled; ducts indicated by heavier stippling

of the flues themselves formed an uneven surface and the gaps between them were filled with small cobbles. Above the capstones was a layer of dirty clayey soil up to 0.2 m thick, some dumps of pebbles, and localised patches of burning. This material was topped in the E section of the building by a compact spread of small pebbles interspersed with a few fragments of sandstone slabbing; at the W end of the building, Roman layers had been removed by modern disturbance down to the capstones. There was no trace of *opus signinum* flooring. Numerous fragments of window glass came from above the pebbling, but no stratified small finds derived from lower levels.

Remnants of foundation cobbling, possibly of two buttresses, were noted outside the building to the N. To the SE of the E hypocaust system a U-shaped channel, in part capped and roughly edged with thin sandstone slabbing, had been dug into the natural sand. Within the building, the channel terminated immediately above one of the capstones of the E flue system. The channel appeared to slope downwards towards the building. There were no small finds from its dirty sandy fill, but here and there the edges were stained with burning, which might suggest that its purpose was to serve as a flue drawing off hot air or gases. The entire feature may be secondary. Close to the SE corner of the excavated area the channel split into two parts, one of which terminated nearby.

The W and E walls of the building could not be located. Although it might seem that the former had been destroyed when the East Burn was canalised, the presence of edging stones belonging to the main flue W of the pipeline indicates that the building extended further W. The pipeline cannot itself mark the ancient course of the East Burn, which must have lain further W, below modern Kemper Avenue. No trace whatsoever could be found of a wall delimiting the building on the E, on the line suggested by the limits of the flue system. Immediately E of the flues the natural ground surface sloped sharply upwards and continued on a level with pebbling located within the building itself. The ground may therefore have been terraced to receive the hypocausts. As it is impossible to suppose that the building was open-ended, it must be imagined that some cobbles were set on the sloping natural to form the footings for a wall, but no trace remained. Further E the original Roman ground surface was easily determined, but no evidence of occupation was noted except at the SE corner of the excavated area where a neat spread of rammed pebbling was evident. At the extreme E end of the excavated area was a stack of laid turf, topped by rough cobbling and by thick burning, from which several fragments of amphora were recovered (Appendix 1). It was clear that this could not represent slip from the adjacent rampart, but as modern intrusions had substantially disturbed this zone, it was not possible to determine the true limits of the stack. It could not be determined whether this feature should be related to the adjacent Antonine rampart as a possible means of access to it, or be related to the hypocausted building; the proximity of the stack to the demarcation line in the Antonine Wall base might suggest that it consisted of unused building material for the superstructure.

In case the building should prove to extend to the S, trial trenching was carried out S of the estate wall in an area recently landscaped and grassed over. Excavation revealed spreads of rammed pebble flooring at a depth of 1 m, which extended S of the building for at least 16 m by at least 16 m E-W (fig 2).

DISCUSSION

The building lay immediately S of the Antonine Wall and small finds (Appendices 1 & 2) confirmed its use in the Antonine period of Roman occupation of Scotland. What was found at Falkirk was essentially a single elongated room heated by two hypocaust systems with a courtyard area to the S. There was no evidence for an internal N-S partition within the building wall to demarcate the two hypocaust systems; the internal facing stones of both the N and S walls, here

of squared sandstone, passed by the likely position of such a partition without a break. It remains possible, even probable, that a wooden partition stood there, but no foundations or post-holes were evident. The recovery from the interior of the building of much burnt wood, and daub with wattle impressions, might indicate the presence of a wooden partition. Precisely how access was gained to the interior of the building was not established, but a door, whether internal between the two 'rooms', or external, may be implied by the 2 L-shaped staples (Appendix 2).

The building was initially interpreted as a military bathhouse, presumably belonging to the as yet unlocated Falkirk Roman fort. It lay adjacent to an adequate water supply and was equipped with hypocausts on a scale which seemed inappropriate to any other class of building. On the other hand, the Falkirk building lies c 800 m E of the most likely site for the missing fort (see below); there was no trace of *opus signinum* flooring, or of any bath as such. Channelled hypocausts, in which heat was directed along stone-lined passages instead of being able to circulate freely among stone or brick-built pillars, are associated in the military north of Britain with the *laconicum* (hot dry room) of a bathhouse, which took the form of a small circular or (in later times) square room opening off the *frigidarium* (for a discussion, see Macdonald & Curle 1929, 446). The lack of soot in the flues at Kemper Avenue indicates that charcoal was the fuel employed, which is appropriate for a *laconicum*. Thus the building found in 1980 could represent the *laconicum* belonging to a large bathhouse situated mainly to the E or S. The presence of the Burn to the W and the Antonine Wall to the N preclude its extension in either direction. The S furnace seemed awkwardly positioned for the area it was required to heat; it might be suggested that the area E of that furnace was occupied by a further room in the suite, but excavation revealed only areas of pebbling, probably external to the building, and perhaps forming a courtyard area. If interpretation as a bathhouse is fraught with difficulty, other possibilities are worth exploring. Firstly, the hypocausts could belong to the heated range within a commanding officer's house, (ie that belonging to the missing Falkirk fort), but the situation of the building immediately S of the Antonine Wall seems to preclude such an identification. On the other hand, the channelled hypocausts seem more suited to heated buildings of the civilian south of Britain; many villas were so heated. It may be possible to suppose that the Falkirk building lay within the annexe of a fort, with an industrial purpose, eg as a drying floor for corn or even pottery (cf Goodchild 1943, 148). But the discovery of window glass in some quantity seems inappropriate to these industrial uses. Perhaps the building should be identified as part of an inn for travellers along the Wall, as for example was found a few years ago on Hadrian's Wall at Vindolanda (Birley 1977, 44) where ranges of rooms, some heated, flanked a central courtyard. Similar buildings outside forts at Benwell, Melandra Castle and Brecon have been interpreted as inns, though there is no secure evidence as to their purpose (Petch 1928, 52; Wilson 1967, 180, fig 6; Wheeler 1926, 66). The temptation to describe such sites as *mansiones* is best avoided. In Scotland a poorly preserved stone building outside the fort at Newstead has been seen as an inn (Curle 1911, 93), and more recently aerial photography has revealed other possible examples, in timber, outside the forts at Easter Happlew and Birrens (Steer 1957, 99; St Joseph 1951, 57). Dr Breeze has pointed out that Falkirk is the fort S of the Antonine Wall closest to the road through the Wall at Watling Lodge, and it may therefore have served as a convenient stopping place for travellers. The Falkirk building therefore could be seen as part of a much more extensive complex with a range of heated rooms along its N front and a large courtyard to the S, perhaps flanked on one or more sides by other rooms, beyond the limits of the 1980 trenching. Given the presence of the East Burn on the W side of the site, and the proximity of the Antonine Wall to the N, we should have to look to the E and S for further elements, but these areas are not currently accessible.

Falkirk Roman Fort. Whatever interpretation is adopted, the building is unlikely to have

stood alone, away from a fortified military site offering it protection. The question of the location of the missing Falkirk fort to fill the 5 mile gap between Rough Castle and Mumrills must be reopened (fig 5). The older antiquarians preferred a site in the Pleasance, on high ground overlooking the West Burn (Horsley 1732, 172; Maitland 1757, 173) and Nimmo reports that substantial quantities of stonework, some hearths and numerous small finds including a coin, a samian bowl, and possibly an inscribed stone were found there c 1815 (Nimmo 1880, 38). A siting in the Pleasance was endorsed by Sir George Macdonald, (1934, 214), but the more recent Ordnance Survey *Map of the Antonine Wall* placed the fort further W on Arnothill, probably because the latter site is more nearly equidistant between Rough Castle and Mumrills. The presence of the hypocausted building at Kemper Avenue could suggest that the fort be looked for some way E of the Pleasance, either on sloping ground near Woodside, or in Callendar Park. The fact that the building lies E of the Burn could suggest that it was associated with a site in Callendar Park, though aerial survey¹ has not revealed any traces of structures lying there behind the Antonine Wall. It may be worth noting that Sir Robert Sibbald, on the authority of Dr Christopher Irvine, reported 'A Castle at the West-side of the House of Calendar' (Sibbald 1707, 30). If Falkirk fort is to be sought in the vicinity of the East Burn, there would appear to be a sufficient gap between it and Rough Castle for yet another fort, unless the presence of Camelon fort, just N of the Wall, was deemed to offer adequate protection to this sector.² On the other hand, the hypocausted building may have stood close to a fortlet. Kemper Avenue lies exactly 2 Roman miles W of Mumrills, and c 1 Roman mile W of the putative fortlet at Langtoun (Laurieston) which is noted by Pont (Blau 1654, 6) and Sibbald (1707, 30). The butt-ended ditch observed in 1972 could indicate a causeway, easily associated with a fortlet (Breeze 1975, 200). The matter is perhaps best left for excavation or chance discovery to resolve at some future date.

Medieval and Later Occupation. Numerous sherds of green glazed wares were recovered, particularly during trial trenching S of the estate wall, sometimes associated with spreads of cobbling overlying the Roman levels (Appendix 5). In more recent times the ground here has been landscaped, presumably when the adjacent blocks of flats were erected, and a thick layer of dark

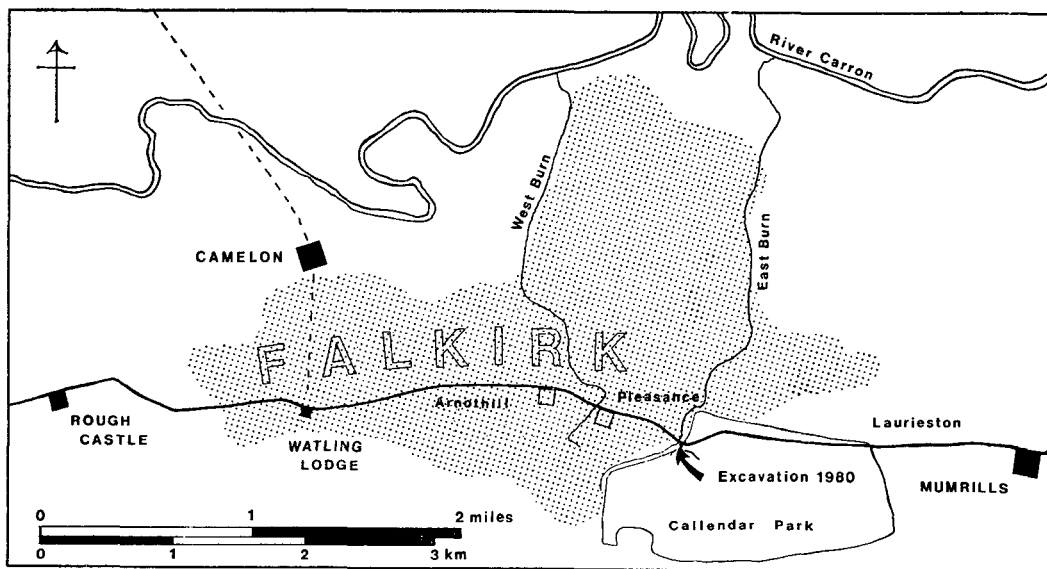


FIG 5 Roman sites on the Antonine Wall between Rough Castle and Mumrills

soil containing 18th to 20th-century wares was imported onto the site, raising the ground surface by as much as 0.4 m in the areas examined. N of the estate wall, a trackway of large boulders, 2 m wide, on a NE-SW alignment, was found at a depth of 0.2 m from the modern surface, and should perhaps be associated with the medieval occupation; the trackway may be thought to predate the estate wall itself. Several dog-burials disturbed the Roman levels on the site, and these can be linked to a former use of the zone as greyhound kennels.

NOTES

- 1 RAF 106G Scot UK Print Nos 5097-8. Kindly made available by Mr J L Davidson, of the Archaeology Branch, Ordnance Survey.
- 2 The Anonymous Traveller of 1697 refers to 'some rows of stone on the inside of the ditch, probably the remains of some *castellum*' at Bantaskin on the W outskirts of Falkirk (Macdonald 1934, 215); this would be a suitable site for an intermediate fort, but it is not clear that the reference is to anything apart from the stone base of the Antonine Wall itself.

APPENDIX 1

Roman pottery

By Anne Anderson

Samian ware

- 1 Side fragment of decorated bowl Dr 37, showing a slightly squared, double bordered ovolo with straight plain tongue ending in a swollen tip with a central hole, similar to Laxtucissa ovolo 2 or Albucius ovolo 1 (Stanfield & Simpson 1957, 184, 214). Bordered by a horizontal wavy line. Below, a festoon containing a foliate design; panel, utilising a large astragalus border, containing a figure of Mercury. Central Gaulish, style of Laxtucissa or Albucius, Early Antonine. E of building, cleaning down on to natural.
- 2 Base fragment of decorated bowl Dr 37, Central Gaulish, Antonine. E of building, cleaning down on to natural.
- 3 Base fragment of plain dish Dr 18/31, Central Gaulish, Hadrianic/Antonine. Clayey soil over capstones, E hypocaust.
- 4 2 side fragments of plain dish Dr 18/31, Central Gaulish, Hadrianic/Antonine. E of building, cleaning down to natural.

Fine Ware

- 5 Footring fragment of hemispherical bowl or platter. Fine, fairly soft, micaceous blue grey fabric. Orange glossy colour coat. Derived from a Gallo-Belgic or Samian form. Antonine? Clayey soil over capstones, E hypocaust.

Coarse Wares

- 6 Side and base fragment of jar, in a coarse micaceous, rather powdery grey fabric, with red ironstone and large quartz inclusions; abraded surfaces. Burnishing on exterior surface. Copy of a Black-burnished ware jar. On natural, E of building.
- 7 Rim fragment of jar in Black-burnished ware 1. Cf Gillam 1970, Form 135. Signs of sooting under rim. Antonine. Clayey soil over capstones, E hypocaust.
- 8 2 adjoining shoulder fragments (joining), with cordon, of a jar in pinkish orange Severn Valley ware, with mica and red ironstone inclusions. In branch flue, W hypocaust.
- 9 3 base and side fragments of a jar in a coarse micaceous, rather powdery grey ware, with an abraded grey surface and burnishing on exterior surface. Hand made; copy of Black-burnished ware jar. Clayey soil above E hypocaust.

Amphorae

- 10 13 body fragments of at least 7 amphorae, in gritty buff fabric. On natural E of building (1), over cobbling on top of turf stack (6), over capstones of E hypocaust (2), in fill of flue N4, E hypocaust (4).

APPENDIX 2

Roman Small Finds

By Paula Fojut

Stone

Fragment of a 42 mm diameter jet armlet. On natural, E of building (fig 6.1).

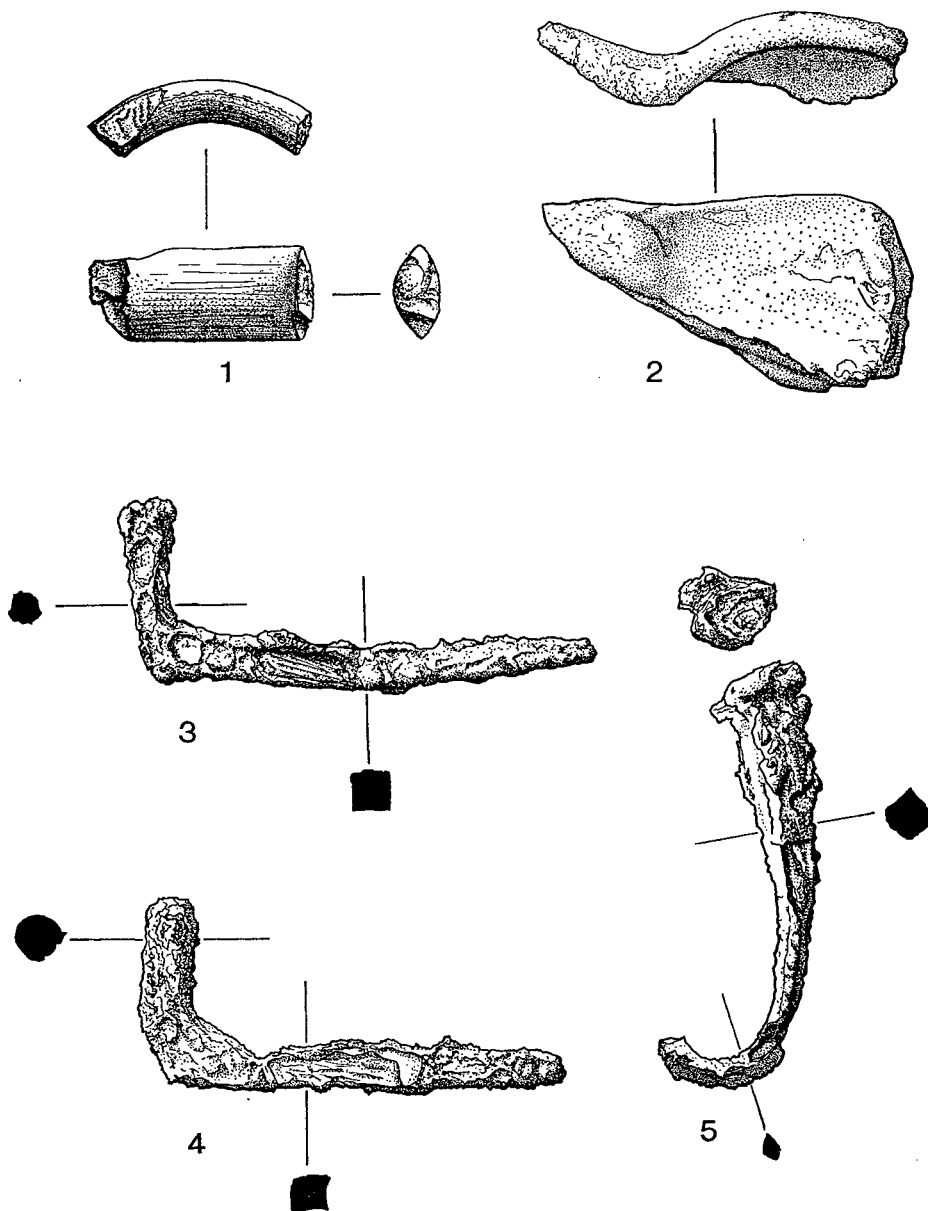


FIG 6 Kemper Avenue: Roman small finds, Nos 1-2 at 1/1; nos 3-5 at 1/2

Clay

Portion of brick (?) in dried buff clay, with one or possibly two original knife-cut (?) edges. Debris, S furnace area.

2 fragments of brick (?) of hard red or pinkish-red clay. Debris over S furnace; cleaning N wall of building.

1 fragment of roof tile (?) of soft buff clay, preserving internal right-angled corner. Debris over S furnace.

129 fragments of clay daub, some burnt grey or grey-black, 6 with wattle impressions. In flue N2(4), interior of W room (1), interior of E room (60), debris over S furnace (46), in main W flue (16), on natural S of Antonine Wall base (2).

Body fragment of 'crusie'-type open lamp, preserving part of spout, in a very coarse hard micaceous grey fabric, with sooting around rim (fig 6.2). On natural E of building.

Glass

103 fragments of blue-green window glass, some with moulded edges, one fragment fused. Debris over S furnace (14), debris over N Wall (4), interior of W room (3), interior of E room (54), SE corner of E room (17), SW corner of E room (11).

Iron

1 lump of slag. Interior of E room

2 L-shaped staples, probably designed to support drop-hinges: the longer arms are square in section and respectively 110 mm and 120 mm long; the shorter arms are circular in section and 50 mm and 45 mm long. (fig 6.3 & 4). Debris over S furnace; over capstones, E room.

12 corroded nails or bolts (eg fig 6.5). Over main N wall (3) branch flue, W hypocaust (1), interior of E room (3), debris over S furnace (3), E of main building (2).

Lead

Many fragments of melted lead, mostly very small and with uncertain primary function; one fragment preserves dove-tail indentation, which perhaps once held an iron cramp. From main W flue, embedded against bottom course of kerbing, N side.

Coin

(identified by Professor Anne S Robertson)

Domitian (AD 81-96) Denarius Silver Wt 2.35 gm
 Obv (IMP CAES) DOMIT (AVG GERM) PM TR P X(. . . ?)
 Rev Illegible

The coin is very corroded, and may have been burnt. Date: AD 90-96. Removal of clayey soil, above E hypocaust system, next to main N wall.

APPENDIX 3

Wood

By Camilla Dickson

Charcoal samples recovered from the flues of the building and during clearance of the interior were examined, with the following conclusions.

Most of the charcoal from the flues was of wooden beams at least 18 to 22 cm in diameter and was of *Alnus* (alder), *Betula* (birch) and *Fraxinus* (ash). On the other hand, *Quercus* (oak) was represented in only one flue-sample and in the room-interiors. These represent substantial timber beams, perhaps from the roofing of the building. They are less likely to be remnants of fuel used to feed the furnaces. The small pieces of *Salix* (willow) and *Sorbus aucuparia* (rowan), all 1 to 2 cm in diameter, found in the room-interiors, could have been part of woven partitions. All the wood is from trees which would have been readily available in the vicinity of the Antonine Wall. The use of *Fraxinus* (ash) (Sample K) is of interest. Although oak is assumed to have been the main structural timber used in Roman forts, charred planks or boards of ash have been identified from Birrens, Dumfriesshire (Crewe 1975, 269). Ash is often a component of secondary woodland on better soils.

TABLE 1

List of samples: all measurements approximate; diameters only given.

A.	<i>Alnus</i> , 10 cm	<i>Betula</i> , 20 cm	<i>Fraxinus</i> , 20 cm	Interior of W room
B.	<i>Alnus</i> , 20 cm	<i>Betula</i> , 20 cm		Cleaning main N wall
C.	<i>Alnus</i> , 18 cm	<i>Betula</i> , 20 cm	<i>Fraxinus</i> , 20 cm	Cleaning on to capstones, E hypocaust.
D.	<i>Alnus</i> , 20 cm	<i>Betula</i> , 14 cm	<i>Fraxinus</i> , 18 cm	Flues of W hypocaust.
E.	<i>Salix</i> , 1.5 cm			Interior of E room.
F.	<i>Betula</i> , 4 cm	<i>Alnus</i> , 28 cm	<i>Quercus</i> , 18 cm	Interior of E room.
G.	<i>Betula</i> , 28 cm			Interior of E room.
I.	<i>Fraxinus</i> , 8 cm	<i>Sorbus aucuparia</i> , 2 cm		Over main N wall.
J.	<i>Betula</i>	<i>Salix</i> , 1 cm		Interior of E room.
K.	<i>Fraxinus</i> , 3 pieces, each shaped on two sides to flat faces at right angles, the other two cut faces having burnt away. Two pieces are from wood of at least 50 years of age. 10 cm in diameter, cut to 5.5 × 5.5 cm minimum and 6.2 × (cut face lost) cm. The third piece is at least 25 years old, 10 cm in diameter, cut to 5.5 cm × (cut face lost).			
L.	<i>Alnus</i> , 18 cm	<i>Betula</i> , 9 cm	<i>Fraxinus</i> , 18 cm	Flue, E hypocaust.
M.	<i>Salix</i> , 1 cm and 2 cm.			In upper channel, E end of building.
N.	<i>Fraxinus</i> , 26 cm			Debris over flue channel, W end of building.
O.	<i>Alnus</i> , 28 cm	<i>Fraxinus</i> , 28 cm		Main flue, E hypocaust.
P.	<i>Quercus</i> , 22 cm			Main flue, E hypocaust.
Q.	<i>Alnus</i> , 28 cm	<i>Betula</i> , 10 cm	<i>Fraxinus</i> , 28 cm	Flue N1, W hypocaust.

APPENDIX 4

Soil Sample from lowest level of fill, main flue of W hypocaust

By R Golightly

The sample was neutral in reaction, and had a moderately low phosphorus and moderate potassium status. About 10% of the sample was too coarse to pass the 2 mm sieve, and amongst this coarse material I noticed charcoal fragments of various sizes, together with an assortment of smooth and angular stones, all showing signs of burning; some of the angular ones showed heat fractures. The physical analysis showed that it contained 4.5% organic carbon. The material was completely devoid of clay-sized particles and had a very sizeable silt-plus-fine-sand fraction (71%). This type of distribution is strongly indicative of wind and/or water sorting and it is probable that both may be involved, since during the use of the stoke-hole a considerable draught would have been generated, which might have contributed to the high silt content. It is felt however that wind action alone cannot account for the total absence of clay-sized particles. Clay would tend to bake hard in the heat, and wind would not have moved it. A more logical theory suggests that the stokehole and flue became flooded soon after abandonment.

APPENDIX 5

Medieval and post-medieval finds

By Diana Fox

i From excavated areas N of the estate wall

- 1 1 body fragment from cooking pot or storage jar, oxidized, with badly abraded internal and external brown-green glaze. Over pebbling, E of building.
- 2 1 body fragment from jug (?), reduced, external surface missing. Unstratified.
1 body fragment from jug, reduced, with slight external rilling and olive-green glaze.
- 3 1 base fragment from cooking pot, oxidized with reduced core, with knife-trimmed basal angle and internal and external brown-green glaze, 10 cm diameter. Over S wall of building.
All 16th to 17th century AD
- 4 1 body fragment, oxidized, surface washed/slurried. Possibly modern. Debris over S furnace area.
- 5 Base fragment of jar, in a fairly coarse hard micaceous buff fabric, with large quartz inclusions, and almost black external surface. 12th/13th century. Flue channel, E hypocaust

ii From excavated areas S of the estate wall

- 6 1 rim fragment of small porcelain jar with yellow line decoration around top of rim.
1 raised base of white salt-glazed stoneware bowl/plate, Mid 18th century.
1 body fragment of small bowl. Dark bodied white-trailed slipware, internally glazed. Mid 18th century.

- 1 body fragment of dark brown glazed red earthenware. 18th-19th century.
 1 raised base, 10 cm in diameter, of tin glazed earthenware with blue leaf decoration. 18th century.
 3 fragments (joining) of (?) cooking pot/bowl, including 1 of base, oxidized with abraded internal brown-green glaze and drops of glaze on exterior, 12 cm in diameter.
 1 base fragment of cooking pot, oxidized, with abraded internal olive-green glaze. The external surface is badly worn but there is a trace of brown-green glaze. c 12 cm in diameter.
 2 indeterminate fragments, oxidized and abraded.
 2 fragments of jug, reduced grey with external olive-green glaze.
 4 fragments ridge tile/drainage duct, red earthenware with gritty external surface.
 1 fragment red earthenware roof tile.
 1 fragment red earthenware ridge tile.
 2 fragments red baked clay daub. The larger piece is roughly smoothed on one side.
 2 fragments green bottle glass, not dateable.
 1 tooth.
 1 bent nail, rusted. Area A, modern infill.
- 7 1 base of lead glazed white-trailed slipware, decorated interior, no glaze on external surface, 16 cm in diameter. 18th century.
 1 fragment of lead glazed white-splashed slipware bowl with internal decoration and dark brown external glaze. 18th century.
 1 rim fragment of cooking pot, oxidized with reduced core and internal surface. The interior has a brown-flecked olive green glaze. The wide rim was probably everted and has a deep internal bevel. 16 cm in diameter.
 1 base fragment of cup, oxidized with thick internal brown glaze, 5 cm in diameter.
 2 body fragments (joining) of cooking pot, oxidized, with brown-flecked olive-green glazed interior and drops of brown-green glaze on external surface.
 2 body fragments of large bowl, reduced with patches of red on external surface. The interior has abraded olive green glaze and the exterior has streaks of glaze.
 2 body fragments, reduced with patches of red on surfaces, with olive-green glaze on exterior and interior. One fragment has an incised vertical line on external surface.
 1 large body fragment of jug, reduced, with olive-green glaze and wide-spaced faint rilling on external surface.
 2 body fragments, oxidized with internal reduction, badly abraded.
 2 body fragments, oxidized with reduced core. These fragments are gritted with fine sand and are soft and quite worn. 1 fragment is part of a base but the angle and diameter are not defineable. Both are possibly residual as they appear to be earlier than the rest of the material from this level.
 Area X, imported topsoil.
- 8 1 rim fragment in finely gritted fabric. The rim is upright and rounded. The brownish-orange colour of the fabric may be due to later burning. Possibly pre-15th century, c 12 cm in diameter.
 2 thick body fragments from jugs. Both are reduced grey with olive-green glaze on external surface. One has slight oxidization on exterior.
 1 body fragment from jug, reduced, with external olive-green glaze.
 1 body fragment from cooking pot, reduced, with internal olive-green glaze. All 16th to 17th century AD.
 Area X, below upper cobbling.
- 9 1 rim of white salt-glazed stoneware jar. Mid 18th century.
 1 body fragment of cooking pot, oxidized with reduced internal surface. The interior is glazed olive-green and the exterior has been knife-trimmed.
 2 shoulder fragments of jugs (two different vessels), reduced, with abraded external olive-green glaze. Each has a raised shoulder cordon. One fragment is smooth whilst the other is slightly gritted.
 1 body fragment of jug, reduced, with red patches on exterior. The external surface is glazed olive-green and has an incised wavy line decoration.
 2 body fragments of (?) jug, oxidized, with abraded external light brown glaze.
 1 fragment of red earthenware, highly fired. Possibly modern.

4 pieces of red earthenware (?) roof tile/drainage duct with gritty external surface (Same as in Area A).

1 piece of clay pipe stem. Bore diameter 7/64". Most likely 17th century.

1 body fragment of cooking pot, oxydized, with internal olive-green glaze.

1 body fragment of jug, reduced, with external olive-green glaze.

4 pieces red earthenware (?) ridge tile/drainage duct with gritty external surface.

Area Y, imported topsoil.

- 10 1 body fragment of white trailed slipware with decoration chipped off.
 3 body fragments of jug, reduced, with external olive-green glaze. One fragment has faint incised horizontal lines—possibly accidental.
 2 fragments of badly abraded red earthenware. One has trace of light brown glaze.
 1 fragment of green window glass.
 1 base fragment, 10 cm in diameter, oxydized exterior with reduced interior and core. The fabric is soft and finely gritted with sand. Pre-15th century.
 Area Y, above upper cobbling.
- 11 1 body fragment of red earthenware, badly burnt and malformed from heat.
 Area Y, below upper cobbling.

This collection of pottery is, with the exception of the three pieces of gritty red ware, of the late medieval or early post-medieval period. The comparatively large amount of internally glazed fine red ware cooking pots in association with the body fragments of olive green glazed grey jugs could date the assemblage from c 1450 to at least 1700. However, the cup and large mixing bowl from imported topsoil in Area X would tend to date that level to the 17th century, as paralleled by unpublished material from the John Brown house in Muirkirk, Ayrshire, now in the National Museum of Antiquities of Scotland (Fairbairn 1927, 287). This is reinforced by the paucity of clay pipe fragments, only one being represented (Area Y, above). This fragment, although probably early, may be intrusive.

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Site records are deposited with the National Monuments Record, Edinburgh; copies, together with the finds, are in Falkirk Museum.

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a Kemper Avenue: general view of building from the W



b Kemper Avenue: flues of E hypocaust system, from the SE, showing central plinth and unused duct (N4)



Kemper Avenue: Stone-fronted duct (N3), from the SW