Some rescue excavation on the line of the Antonine Wall, 1973–6

by L J F Keppie

The Antonine Wall is 60 km (37 miles) in length, but only 4·3–4·8 m (14–16 ft) wide; if the ditch which accompanies the Wall on the N side and the Military Way on its S side are included, we have here a zone of archaeological importance and potential *c* 60 m wide running across central Scotland. As the Wall passes through some of the most populous districts of Scotland it is particularly exposed to modern development. Not merely the forts but also the Wall curtain itself are constantly at risk, from the extension of housing estates and industrial premises, from the construction or improvement of road links, and from the laying of pipelines and cables, for electricity, water, gas or oil (Skinner 1973, 8). In this respect, the Antonine Wall frontier is hardly unique, but whereas it may prove possible to reroute roads or pipelines to avoid known archaeological sites or field monuments, the Wall runs across Scotland without a break: roads and pipelines with a north-south alignment have to cross it somewhere. The following pages give details of 12 excavations or watching-briefs carried out on the line of the Antonine Wall curtain between June 1973 and October 1976. Where possible, excavation took place in advance of construction work or pipelaying, but in some cases all that could be achieved was for the archaeologist to be on hand as an observer, to collect as much information as could be gleaned in the short time available.

In part I eleven of the excavations, most of one or two days' duration, are described in geographical order from E to W. The report on a pipeline at Inveravon (no. 1 in the geographical sequence) is contributed by Mrs Lorna Main, of the Planning Department, Central Region, and a note on a section cut at Balmuildy Road (no. 10) by Mr Alastair Henderson, of the Department of Humanity, University of Glasgow. Part II consists of a report on an excavation of ten days' duration at Bantaskin (Falkirk) in March 1976. In part III a short discussion is attempted on the component parts of the Wall (i.e. rampart, ditch, upcast mound and Military Way) in the light of the excavation work described. The location of all the excavations is shown on fig 1. Unless specified to the contrary, the rampart and ditch were found on the line shown by Sir George Macdonald (1934, pl XIV etc) and on Ordnance Survey maps. Site records, drawings and small finds are deposited in the Hunterian Museum, University of Glasgow.

PART I

1 Inveravon Farm, NGR NS 958797

by Mrs Lorna Main

In October 1976 an ethylene pipeline was laid across the line of the Wall *c* 300 m E of Inveravon Farm. With the cooperation of the contractors an opportunity was afforded of observing pipe-

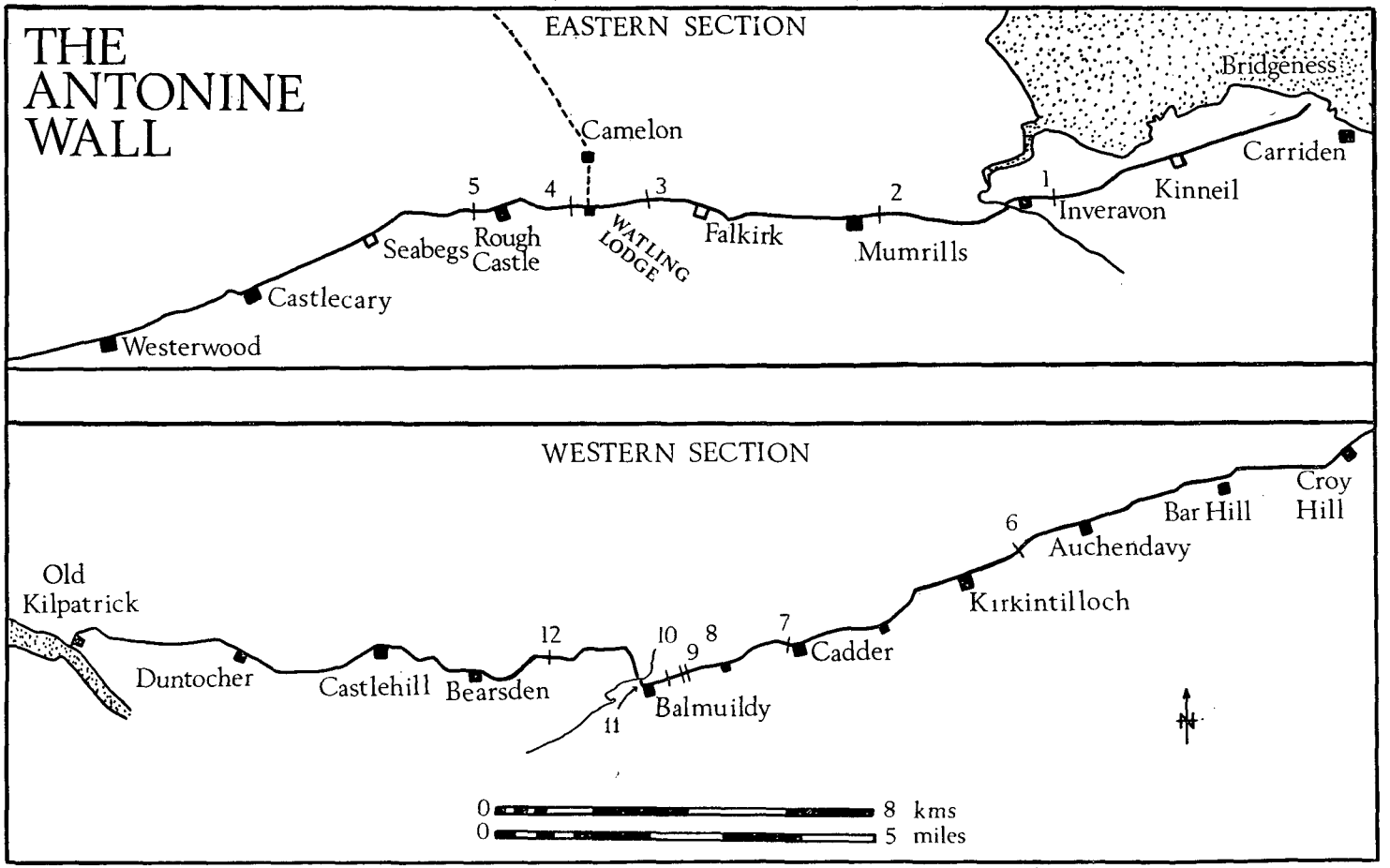


FIG 1 Locations of recent excavations

laying operations. No trace was found of the stone base of the Antonine rampart, but the edges of the ditch were located, at 0·4 m below the modern surface. The ditch had a width of 9·7 m (32 ft) and had a filling of dark brown silt. Nothing remained of the upcast mound on the N side of the ditch.[1]

2 Beancross, NGR NS 924796

In June 1973 a sewage pipe crossed the line of the Wall immediately S of the hamlet of Beancross, *c* 480 m E of the NE corner of Mumrills fort. The stone base of the rampart was located in section on the E side of the pipe-trench, at a depth of 0·685 m. The base was represented by a loose spread of stonework 4·575 m in width; no kerbstones were observed *in situ*, but at least one had been brought up by the mechanical excavator during the cutting of the trench. It was not possible to estimate the original width of the base, and no trace of the superstructure survived. The poor state of the base may be contrasted with the 'excellent condition' noted by Sir George Macdonald during trenching in the same field (1915, 134). The position of the ditch could not be established, owing to the unexpected presence of undulating layers of gravel and pebbles, perhaps laid down during movements of the nearby Westquarter Burn (cf Macdonald 1915, 134–5).

3 Bantaskin, Falkirk – see Part II

4 Oakvale Cottage, Tamfourhill, NGR NS 861798

In August 1973 trenching was carried out on the presumed line of the rampart at Tamfourhill, on the W outskirts of Falkirk, in advance of the realignment of Tamfourhill Road (B 816). Trenches were cut in the garden of the now demolished Oakvale Cottage. The S kerb of the stone base was located, with four kerbstones in position, at a depth of 0·4 m from the present ground surface. Only the southernmost 2·7 m of the core had survived, and a search for the N kerb proved unsuccessful. Of the superstructure all that remained was a band of turfy material 0·075 m thick above the core. A westwards extension of the trench failed to reveal more than a few scattered core-stones, and it seems not improbable that the base had suffered at the hands of an owner of the Cottage, during improvements to the garden.

5 Bonnyside, NGR NS 837798

Two Natural Gas pipelines have crossed the line of the Wall frontier at Bonnyside *c* 800 m W of Rough Castle fort, within the guardianship area. After representations by the Inspectorate of Ancient Monuments, the Scottish Gas Board agreed to thrust-bore the pipes *below* the Wall-line, thus avoiding disturbance at ground level. It is to be hoped that this may form a precedent for future work, as devastation of a 30 m wide zone of the frontier line was avoided. However, in the course of these operations it proved necessary to cut a trench across the modern access road to Rough Castle, below which the Military Way was believed to run. The Military Way was indeed located below the modern road, but only the S part was accessible owing to construction work in progress. Cobbles forming the lowest stratum of the Roman highway lay immediately below modern road bottoming. These cobbles rested on a double layer of turfwork, of which the bottom course had been laid grass downwards, and the second grass upwards. In some places there were traces of a third-up course of turf.

The Roman roadway did not march exactly with the modern access road; the laid turfwork was found to extend southwards from the S edge of the tarmacadamed surface for a further 1·8 m, terminating below the modern field-dike bordering the access road. No kerb or drainage gutter were observed, but a greyish white staining showed the position of the turf-line in Roman times.

The general marshiness of the ground W of Rough Castle may account for the apparent decision to raise the Military Way on a turf-built *agger*: the resulting mound has continued to serve as a road until modern times, with the field-dike carefully positioned on its S edge (Macdonald 1934, 130).

6 Wester Shirva, NGR NS 684752

In November 1973 the laying of a gaspipe E of Kirkintilloch necessitated the cutting of a trench across the Wall between Auchendavy and Twechar, 200 m W of Wester Shirva farm. In the E side of the pipe-trench the stone base was represented by a spread of stonework 4·3 m wide, at a depth of 1·27 m, but it had been much disturbed. The cause was at once apparent: an extensive pit had been dug in the field for farm refuse, dislodging the Roman stones though not moving them from their original position. Twigs, branches, fence posts and a great mass of decaying vegetation were visible above, among and in part below the Roman stonework. The N and S limits of this stonework were marked by kerbstones; no trace of the superstructure had survived. On the other (W) side of the pipe-trench only a few stones had survived the digging of the refuse pit, but these included kerbstones at the N and S limits of the spread; the distance between the kerbstones was 4·37 m. In the E side of the pipe-trench the S edge of the ditch was visible at a depth of 1·44 m and at a distance of 7·95 m from the N limit of the stonework.

7 Cadder (Towing Path), NGR NS 616726

In January 1976 a Natural Gas pipeline cut through the line of the rampart and ditch *c* 70 m W of Cadder fort. From Torrance westwards to Cawder Mill the pipe-trench followed the course of the Forth and Clyde Canal, being laid on the narrow towing-path which accompanies the Canal on its N and subsequently its W side. The pipe-trench cut through the presumed line of the Wall at the point where the Canal swings sharply S towards Bishopbriggs.

No clear trace of either stone base or ditch was revealed in the pipe-trench. The ground proved to have been made up by *c* 1·2 m presumably in 1773 when the Canal itself was being constructed. At this depth the old pre-canal ground surface was observed, and below it 200 mm of topsoil. In line with the presumed position of the ditch a spread of blue-grey clay could be seen below this topsoil. It is possible that this clay was laid as a raft over the depression formed by the ditch to counteract softness. At a distance of *c* 5 m S of the S limit of this raft, the mechanical excavator brought up several large roughly worked sandstone cobbles, possibly from the core of the stone base. No kerbstones were observed, and no stonework remained visible in section. After digging in the field to the W, Macdonald was able to report (1934, 158) that 'the black lines of the superstructure (were) plainly visible in the side of the cutting for a distance of more than 3 feet from the bottom' (i.e. from the stone base). But on the towing-path itself the superstructure appeared to have been removed even before the construction of the Canal; a mere 200 mm of topsoil remained above the natural clay. A marble of red clay, of a type frequently found on Roman sites, was recovered from spoil heaps in the vicinity of the clay raft.

8 Balmuildy Road (by Cadder Brickworks), NGR NS 588718/589718

In October 1973 the Scottish Brick Co informed the Department of the Environment that a planned extension to their Cadder premises on the S side of Balmuildy Road would incorporate a field through which the Wall passes on its way eastwards from Balmuildy fort towards the fortlet at Wilderness Plantation. Excavation took place to locate the stone base in this field, in particular at two points where access roads to the new premises were envisaged (fig 2).

Three trenches were dug across the presumed line of the stone base at the W end of the

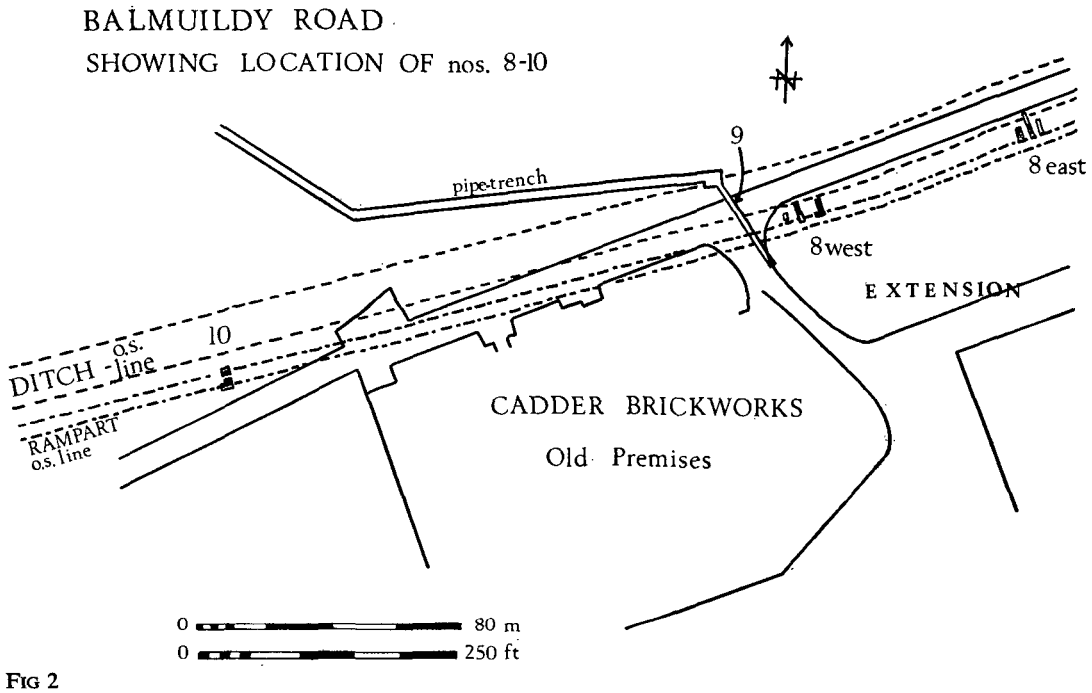


FIG 2

proposed extension. At one point the S kerb of the stone base was found intact, at a depth of 0·33 m; the trench was extended to allow 10 kerbstones to be cleared. The kerbs were hammer-dressed, and small slivers of stone, presumably masons' chippings, had been inserted into gaps between them. In all the southernmost 3·5 m of the base had survived; the remainder had been removed, perhaps when Balmuildy Road was laid out. Traces of turfwork were observed above the core.

A second series of trenches was dug *c* 100 m to the E. The base here was poorly preserved, and much disturbed by field-drains. No kerbs survived. One trench was extended N as far as the dyke bordering Balmuildy Road, and a section of its E side was drawn. For a distance of *c* 5 m from the N limit of the surviving stonework the original Roman turf-line was visible in the form of a thin whitish sandy layer surmounted by a black stripe. At one point a second layer of turfwork could be discerned. In the event the factory extension was held back from the line of the stone base, and access was obtained by widening the existing roadway at the W end of the extension.

9 Cadder Brickworks, NGR NS 588718

In October 1974, just one year after the completion of the work described in no. 8 above, the improvement of sewage facilities for the brickworks resulted in the laying of a pipeline across Balmuildy Road, immediately N of the existing premises (fig 2). Several large undressed sandstone blocks, possibly remnants of the Wall core, were located below the modern road-bottoming, in the fill of a trench dug to receive a tile drain. A small patch of turfwork lying directly on the orangey-sand subsoil to the N of the tile drain was all that remained of the superstructure. The S edge of the ditch was observed in section, and its S face followed to a depth of 2·15 m; it was not possible to estimate the width. In the lower levels of the ditch the fill consisted of a very dark silty soil, overlaid by a mixture of orangey sand and topsoil.

The investigations of October 1973 and October 1974 (nos 8 and 9) have shown that the stone base and ditch lie *c* 8 m N of the line shown by Macdonald (1934, pl XXVIIB) and on OS maps. The extension to the brickworks is now complete. A competition was held among employees for a name to be given to the new premises and to the bricks to be made there. The name Centurion Brick Factory was selected; it serves to commemorate the Roman remains found during construction work.

10 Balmuildy Road, NGR NS 586718
by Alastair A R Henderson

In March 1974, the Lower Clyde Water Board began the laying of a 150 mm diameter PVC pipeline beside the hedge bordering Balmuildy Road on its N side (fig 2). As the pipeline was set to cross the line of rampart and ditch at a very acute angle, it was evident that a considerable length of base might be disturbed by its passage. A small area was dug on the presumed line of the stone base and the S kerb was located at a depth of 0·6 m. The turf superstructure had survived to a height of 0·4 m. The characteristic horizontal lines of decayed vegetation were numerous and striking; it was possible to distinguish both the A_2 and B_2 horizons in several of the turf blocks (cf Jardine 1975, 254). Four courses of turfwork, laid grass downwards, could be distinguished. The lowest course did not however lie directly on the stone base; the inequalities of the core had first been levelled off with a layer of yellow clay. A second area was opened up to locate the N kerb, which was found at a depth of 0·35 m. Below it a shelf had been cut into the subsoil; it extended N from the N kerb to a distance of 0·2 m. To what extent the subsoil had been cut away below the core itself could not be ascertained. It may be suggested that this shelf is evidence of terracing of the slope to secure a level surface for the stone base, but in fact the shelf was not utilised for this purpose. It was filled with a grey sticky silt, and the stone base laid on top, only marginally below the original subsoil level. Over the N kerb there survived *c* 200 mm of turfwork; the lowest course of turf had again been laid grass downwards. The width of the base was 4·35 m (14 ft 2 in). As a result of representations made to the Lower Clyde Water Board by the Inspectorate of Ancient Monuments it proved possible to lay the pipeline at a rather shallower depth than had been intended, so that the stone base was left undisturbed.

11 Easter Balmuildy, NGR NS 581718

In March 1974 it was learnt that the Lower Clyde Water Board intended to lay a 0·5 m diameter pipeline across the presumed line of the Wall-frontier, immediately N of the NW corner of Balmuildy fort. Comparison between the plans in use by the contractor (based directly on the OS 25-inch series) and the drawing specially prepared in 1931 by Calder (Macdonald 1934, 163, fig 7), revealed a small but significant discrepancy in the placing of the fort itself in relation to the River Kelvin. Calder's plan was commissioned by Sir George Macdonald in order to elucidate discrepancies noted by him in Miller's plan of Balmuildy (Miller 1922, pl LVIII; Macdonald 1934, 164 n 1). If Calder's plan were accurate (as there was every reason to expect), the trench dug to receive the pipeline seemed likely to cut through not only the Antonine Wall base and ditch, but also the N ditch of the fort and possibly the projecting wing-wall at its NW corner. I am grateful here to Professor Anne Robertson who drew my attention to the potential risk to the fort. Preliminary investigations on the presumed line of the pipe-trench in March 1974 established the general location of stone base and ditch. When the cutting of the trench became imminent, the contractors kindly stripped the topsoil in advance from the area likely to include the stone base, and the work of cleaning and recording the remains continued until the very moment of their destruction.

The base was located at a depth of 200–430 mm from the modern surface; it was set directly on the clay subsoil (fig 3). The base proved to have survived the centuries in an excellent state, apart from damage caused by the passage across it of two field-drains. The kerbstones of the W kerb (the base here being aligned almost due N-S) were unusually large, up to 0·28 m in height; the core was uniformly composed of massive natural boulders. Both kerbs of the base were intact, allowing easy measurements of its width. At the S end of the section the distance between the two kerbs was 4·27 m (14 ft) but the width decreased progressively across the section. A measurement taken at the N end of the section showed a width of 3·96 m (13 ft 9 in). Here a

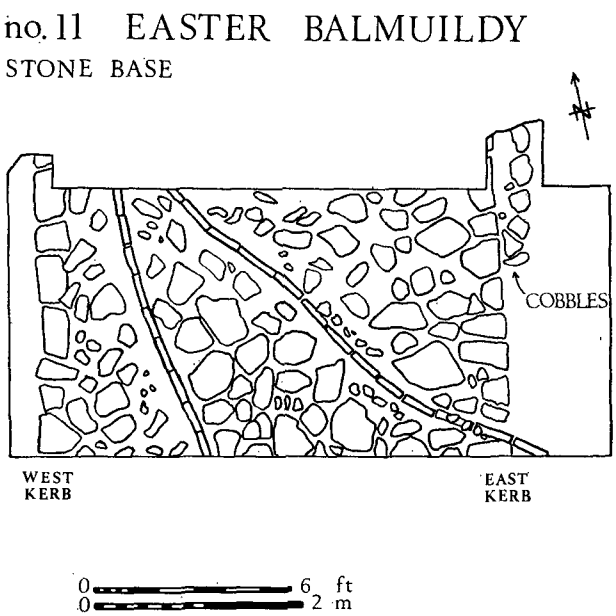


FIG 3

line of undressed sandstone cobbles was observed just E of the E kerb and running parallel to it. In all six cobbles were uncovered. A rim fragment of mortarium of white pipeclay fabric was recovered during cleaning of the base. Above the base only occasional flecks of turfy material had survived. Some fragments of charcoal were recovered from the gap between the E kerb and the line of cobbles, but no traces of turfwork were detected there. It may be that the line of cobbles is evidence for a repair to the stone base of the rampart. Alternatively the cobbles may have been laid to compensate for the narrowing in the width of the base at this point. How far this narrowing continued to the N remains unknown; excavation of the base immediately S of the Kelvin in 1971 some 60 m further N (*DES (1971)*, 28) revealed a width of 4·29 m (14 ft 1 in).

The ditch was observed in section during pipelaying operations by Mr A A R Henderson. It had a width of 6.1 m (20 ft). Three large stones scooped up by the mechanical excavator as it cut through the E lip of the ditch may have served as edging stones; a similar stone was brought up in line with the W lip. No other large stones were observed during the cutting of the trench. The berm had a width of 9·15 m (30 ft). The Military Way was not observed. It was noted above that there appeared to be a discrepancy between the OS sheets and Calder's plan, in the placing of Balmuildy fort. However, it is more probable that the discrepancy results from a movement of the River Kelvin. The most recent revisions of Ordnance Survey sheets show that the S bank of

the River now lies *c* 10 m further N than in Calder's day. This change in the position of the S bank can be ascribed at least in part to dredging of the Kelvin in 1941 (Davidson 1952, 88).

12 Douglas Park, Bearsden, NGR NS 561724

The provision of a water supply for individual greens on Douglas Park Golf Course on the E outskirts of Bearsden has led to the laying of plastic piping across the line of the Wall just E of the 15th Green. As the piping, 65 mm in diameter, was laid mechanically by a mole-plough the digging of a continuous trench across the Course was not necessary. When the mole-plough in its progress across the Course reached the presumed position of the stone base E of the 15th Green, its smooth advance was disrupted and several large stones brought to the surface. With the cooperation of Mr Duncan Smith, Greens Convener, limited clearance of the kerbs took place. Three dressed stones of the N kerb were located at a depth of 0·1 m laid directly on the sandy subsoil. The S kerb was noted at a depth of 0·2 m; above it 20 mm of turfwork had survived. The distance between the kerbs was 4·52 m (14 ft 10 in). At a second point on the Course (E of the 13th Green) where pipelaying operations seemed likely to impinge on the line of the Wall, the stone base was left undisturbed. By chance the pipe, having been laid across the ditch hollow from N to S, reached its terminus just short of the presumed position of the N kerb. In an inspection pit dug by Club staff at the terminal point, some turfy material was noted at a depth of 0·6 m lying directly on the subsoil. This could be interpreted as slip from the adjacent rampart. The depth of coverage of the Roman remains by topsoil was far greater here than at the 15th Green, perhaps as a result of landscaping during the laying out of the Golf Course.

PART II

THE ANTONINE WALL AT BANTASKIN, FALKIRK, NGR NS 873800 (no. 3 in the geographical sequence)

Construction of Falkirk's *Southern Link* road in the first half of 1976 has destroyed a 45 m length of the stone base and ditch within the former policies of Bantaskin House, between Blinkbonny Road and Anson Avenue, *c* 900 m E of the fortlet at Watling Lodge (fig 4). In all, 44·5 m of the stone base of the Wall were examined, and of this length 40 m were completely stripped except for the provision of baulks and at two points where the presence of tree-stumps impeded the work (fig. 5). A section was cut across the ditch and upcast mound. Between April and June 1976, frequent observation was kept on the construction work. A search for the Military Way was not conclusive, though a possible alignment was identified, and further opportunities were afforded of examining the ditch in section.

The line of the Wall in the grounds of Bantaskin House has never been in doubt. The hollow of the ditch is clearly visible, and has today a width of 16 m and a depth of 3 m. The alignment of the stone base was confirmed by Sir George Macdonald: 'In 1916 several sections were cut across the line of the rampart within the policies of Bantaskin, when it was noticed that here the berm was unusually narrow, sometimes not more than 15 feet. As a rule the foundation was fairly well preserved, although it had suffered somewhat through being too near the surface' (Macdonald 1934, 126).

The stone base uncovered in 1976 proved to be in fine condition, though the dressed stones forming the S kerb had been removed (at an unknown date), and the core disfigured by twin electricity cables laid in 1972. The base lay *c* 2 m N of the line shown on OS maps. The base was located at a depth of 0·3–0·5 m from the modern surface, and lay directly on an orangey clay

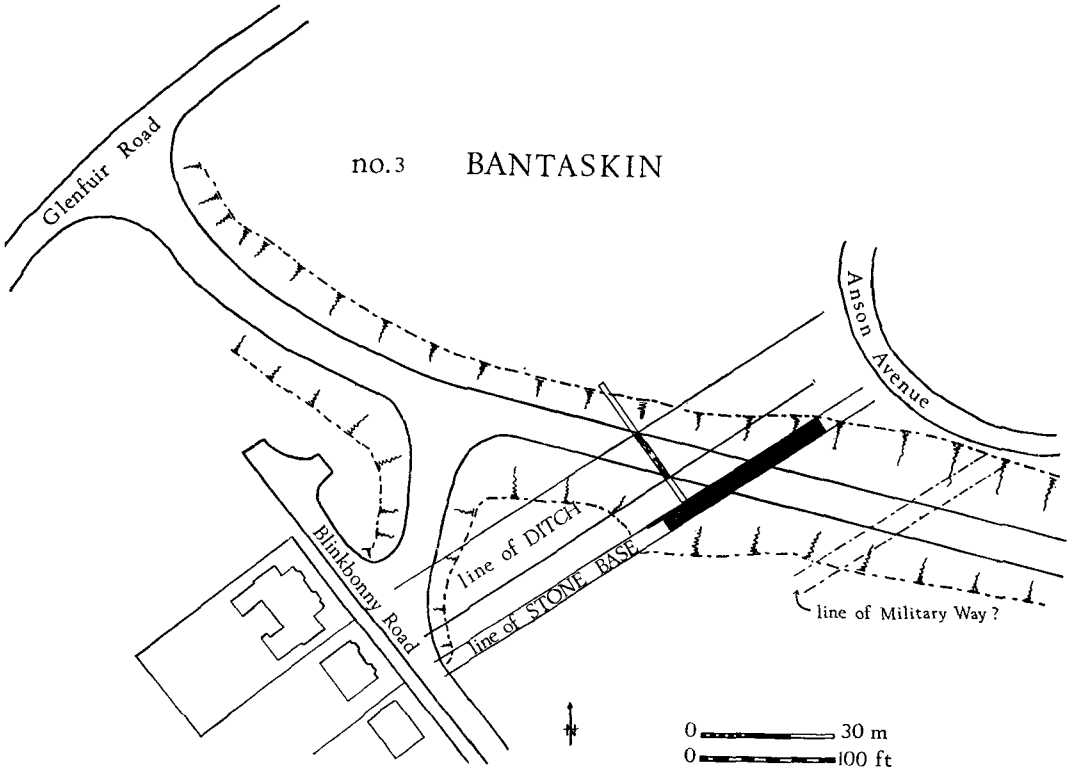


FIG 4 Bantaskin: site location

subsoil. The N kerb and the core were of a yellowish buff sandstone, except over a distance of 3·5 m at the extreme E end of Area 1 where sandstone was replaced as core material by a thin layer of small water-washed pebbles. A row of elongated sandstone cobbles set across the width of the base served as a demarcation line. Over this same 3·5 m the kerbs were of a somewhat larger size, and of reddish sandstone. Perhaps here is evidence of a change in work-squads.

There was evidence of a repair to the N kerb. In Area 2, over a distance of 11·5 m the kerb was found to project northwards by 0·5 m. At first this excrescence seemed possibly indicative of a change-over in work-squads, but as excavation proceeded it became clear that here was evidence of repair work. Both ends of the projecting length of kerb were located, and were marked by roughly squared blocks set at an angle, to link the old kerb line with the new (pl 10a). The new kerb blocked the N exit of a culvert (see below): indeed two of the culvert-capstones were found re-used in the new kerb. The circumstances of the repair can only be guessed at: we must presume that the superstructure had sagged or collapsed completely, and that the decision was taken to dismantle it over a distance of 11·5 m, to take up the existing kerb and to relay it 0·5 m further N; the intervening space was then filled with core-material and the superstructure rebuilt. Nevertheless, it may be wondered why the suspect length of superstructure was not simply cut out and replaced on the existing base. It is suggested below that the presence of a culvert contributed to, if it was not the direct cause of, the weakness of the superstructure. No distinction was detected in construction technique between old and new portions of the core, but there was a noticeable deterioration in the standard of the new kerb W of the culvert. It seemed that not all the old kerbstones were available for re-use.

Three culverts were located during the excavation, and numbered 1 to 3 (from E to W). Each had a capping of massive squared or domed boulders, and was paved with small carefully fitting slabs. *First Culvert:* three capstones remained in position; they were roughly hewn flat-topped boulders and rested on elongated supports with dressed sides. The N exit of the culvert was inaccessible owing to the presence of a massive tree-stump, the roots of which intruded into

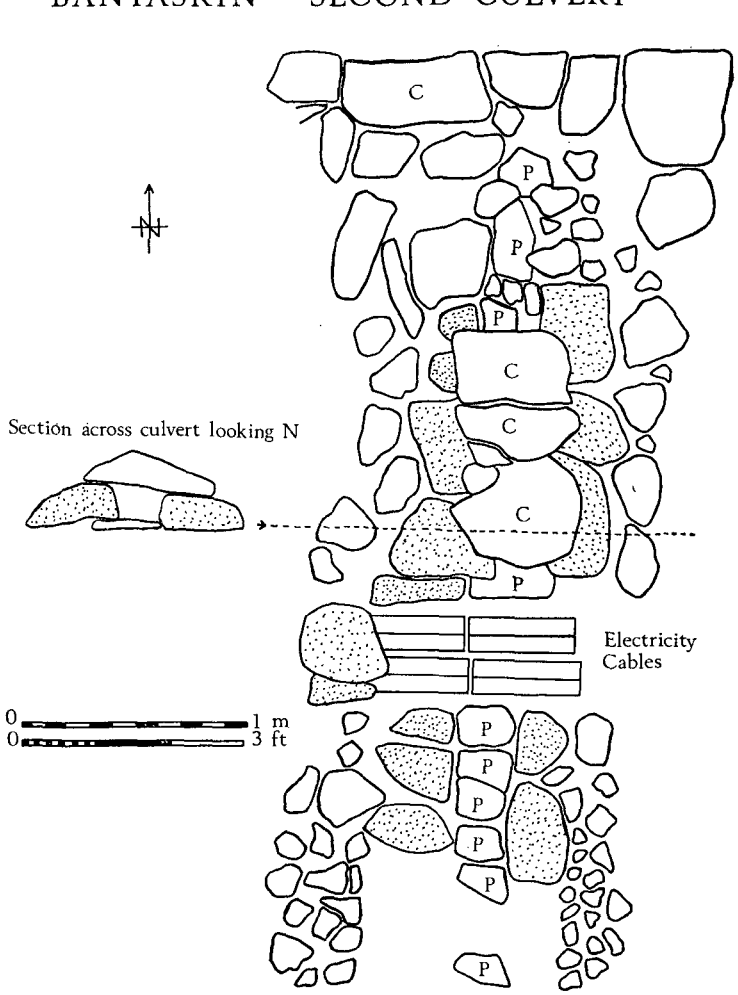
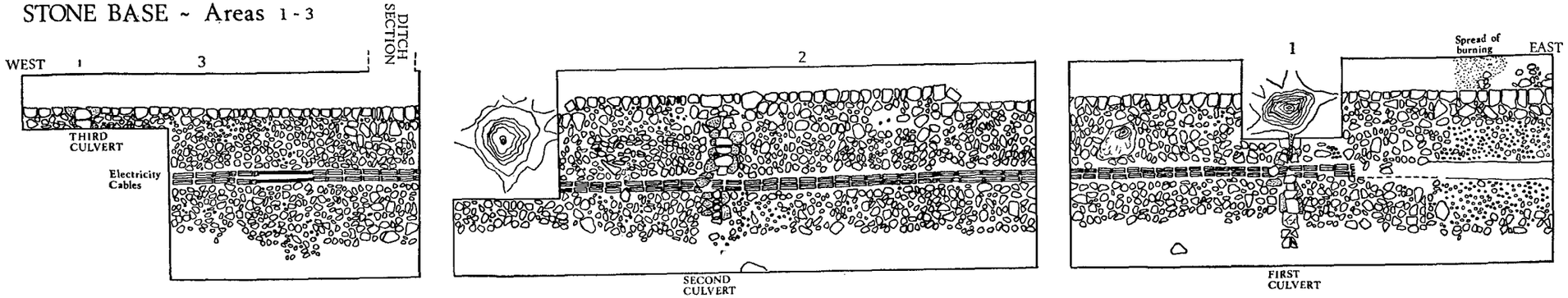


FIG 6 Bantaskin: second culvert (C = capstone, P = paving slab; boulders supporting capstones are stippled)

the trench. The removal of the S kerb had resulted in the loss of the capstones and their supports over the southern part of the culvert. However, the paving slabs had survived for a further 0·6 m. *Second Culvert* (fig 6): three capstones (here massive domed boulders) remained in position, resting on roughly dressed stones. Great care had been taken to plug any gaps between the capstones. The N outlet of the culvert was blocked by the repaired N kerb, which passed across its mouth without a break (pl 10b). It was evident that several capstones and supports had been removed in the course of repair work, and as noted above two of the capstones had been re-used

no.3
BANTASKIN
STONE BASE ~ Areas 1 - 3



Section across Ditch and Upcast Mound

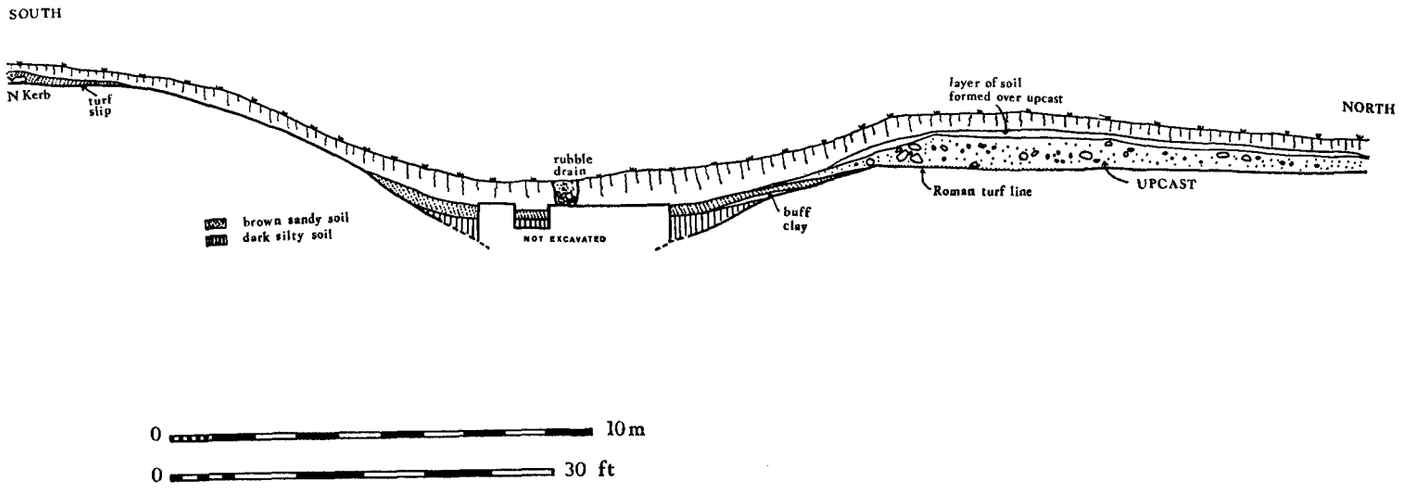


FIG 5

as kerbs. With the loss of the S kerb it is not possible to say whether the S end of the culvert had been likewise blocked. Several cobbles had however been placed across the culvert-passage in its N half. The paving slabs forming the base of the culvert were 0·25 m wide. The alignment of the culvert in relation to the base suggested that it was designed to carry water southwards away from the ditch. The gap between the first and second culverts was 16·2 m. *Third Culvert:* only the N outlet of this culvert was examined during the excavation. Two domed capstones were revealed, resting on the N kerb and behind it roughly dressed supports; below were narrow paving slabs 0·2 m wide. The gap between the second and third culverts was 18·5 m. The loss of the S kerb over the entire excavated length of base prevented sure measurement of its width, but as noted above the slabs forming the paving of the first culvert, lying at a slightly lower level than the other

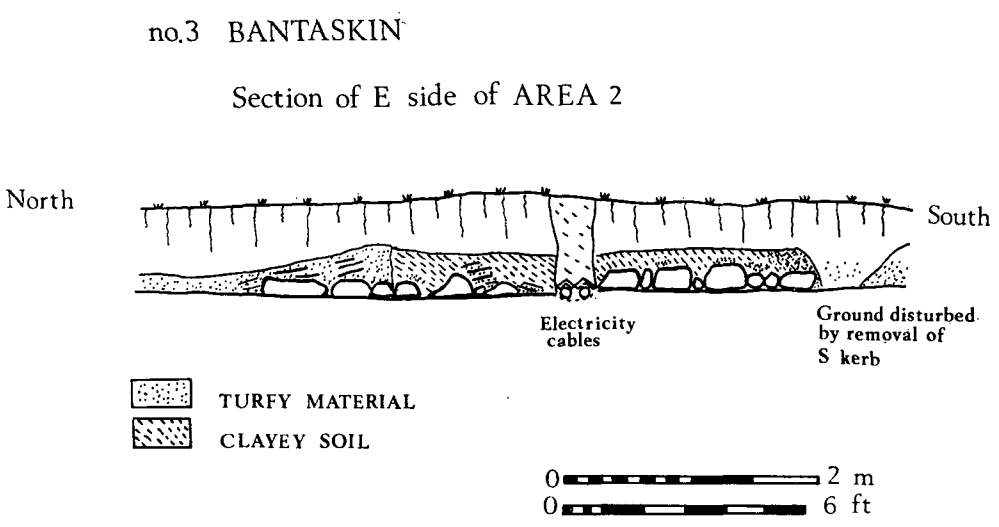


FIG 7

stones of the base, had survived beyond the core for a further 0·6 m; the paving slabs terminated with such neatness as to suggest that here is evidence for the original width of the culvert, hence of the stone base itself. The distance between the estimated position of the N kerb (obscured here by a tree-stump) and the S limit of the paving was 4·59 m (14 ft 11 in). After the end of the excavation proper it proved possible to locate the original S end of the paving of the third culvert, giving a width of 4·67 m (15 ft 1 in).

Particular attention was paid to the make-up of the superstructure, as Bantaskin lies in the 15 km sector E of Watling Lodge in which, according to Sir George Macdonald, the superstructure was not of laid turf, but of topsoil revetted by clay cheeks. More recent work has suggested that this conclusion may require modification, and any opportunity of examining the superstructure in this sector is especially welcome. The superstructure at Bantaskin was examined and drawn at several points. It was at once apparent that its make-up was not uniform across the width of the base. A section drawn at the E end of Area 2 was particularly informative (fig. 7). Over the N kerb was a mass of greyish lumpy clay, identifiable as turfwork by its colour and texture; over the remainder of the core an orangey buff clayey soil formed the superstructure, with some distinctive greyish patches. Despite the loss of the S kerb and consequent disturbance at higher levels, it seemed likely that turf had been laid over the S kerb. The turfwork survived to a height of 0·6 m; evidence for layering was obtained in the form of horizontal rusty-brown

lines. There was no trace of the dark (often dense black) lines which normally represent decayed organic matter in laid turfwork. The repaired N kerb was also overlaid by turfy material again *c* 1 m wide. The conclusion reached was that the superstructure at Bantaskin was of clayey soil (with some turf blocks thrown in) revetted by turf cheeks *c* 1 m in width. Samples of the cheeks and the central part of the superstructure were submitted for analysis to Dr James Dickson of the Botany Department, University of Glasgow, who has confirmed a distinction between cheeks and core material.

An additional feature of interest was a spread of roughly worked cobbles lying N of the N kerb at the extreme E end of Area 1 (fig 5). These cobbles overlaid a patch of burning which extended from the N kerb northwards for 1·5 m; the burning itself overlay a flat slab lying on subsoil. It could be that the cobbles and burning represented a hearth in use by a group engaged on the building or rebuilding of the Wall, who sheltered in the lee of the rampart from the prevailing and often ferocious SW wind. There were no associated finds and it may be rash to suggest a Roman date for these features.

A section was cut across the berm, ditch and upcast mound (fig 5). As the stone base was set on the crest of a northwards slope, the berm itself was not flat but dropped away in a sharp curve, becoming almost an extension to the S face of the ditch. The S lip of the ditch was located at a distance of 8·25 m from the N kerb of the stone base; rampart slip, predominantly turfy, was noted in section and on the surface of the berm for a distance of 2·5 m from the N kerb. The ditch was found to have a width of 12 m (39 ft) and despite the northwards slope both lips were found to be almost the same level. The sides of the ditch were followed to a depth of 1·75 m when the inflow of water from a rubble-drain laid in the ditch prevented further work. Ditch-fill consisted of a buff sandy soil overlying a very dark silt. From this silt was recovered a fragment of animal bone (see below). Both before and after the excavation proper, further opportunities were afforded of checking the alignment of the ditch, to W and E of the excavated section. Shortly before the excavation began the electricity cables which had run along the stone base were rerouted to the N and re-laid below the new road. This work involved cuttings across the ditch. Further, in June 1976 at an advanced stage of the construction work, after a series of deep cuttings had been made through the ditch and during landscaping of the embankments to either side, it proved possible to identify the ditch edges. These observations confirmed the position and alignment of the ditch noted during the excavation itself. The upcast from the ditch proved to have been spread out on its N side over a distance of at least 11 m; the upcast consisted of a hard purply grey clay containing numerous pebbles and small stones. At 1 m N of the N lip of the ditch was a group of large boulders. Slip from the upcast bank had however overflowed this revetment (if the stones are to be identified as such) and had crept down the N face of the ditch itself. The top surface of the upcast mound was hard and stoney, and above it was an 0·1 m thick layer of dark soil which had formed over it in Roman times. Below the upcast the Roman turf-line was clearly visible in the form of a 0·05 m layer of greyish turfy material; there was once again no black stripe. From above the upcast came a lead musket ball and a red clay marble, the latter possibly of Roman date. The N limit of the upcast mound could not be located, as the presence in the immediate vicinity of the new re-routed (and live) electricity cables discouraged further extension of the trench. The enormously wide and deep excavation required to re-lay the electricity cables below the new road has destroyed the stratigraphy over a wide area at the vital point, and although observation was kept in the hope of establishing the N limit of the upcast mound more exactly, no further data were obtained. It is however likely that the mound did not extend much further N.

The line of the Military Way could not be established with any certainty, though a possible

alignment was noted. Cobbles observed in section on both sides of the road embankment *c* 22 m behind the stone base could, if accepted as evidence for its course, indicate an E-W alignment, parallel to the Wall rampart itself. Stonework observed at a point 30 m further S probably belonged to a rubble drain.

FINDS

1 Flint scraper (fig 8, 1)
(the following note has been kindly provided by Dr E W MacKie)
An unusual form of end scraper, of a translucent honey-coloured flint. Length 56 mm; maximum width 17 mm. The implement (triangular in shape) is formed from a flake struck from a prepared core; fine secondary working has converted the thicker end into a steep-faced end scraper and has been continued along both sides to form a blunt point. The purpose of the secondary working was presumably to ensure a sound grip for the fingers. The scraper is probably of neolithic or bronze-age date. (Above stone base, Area 1)

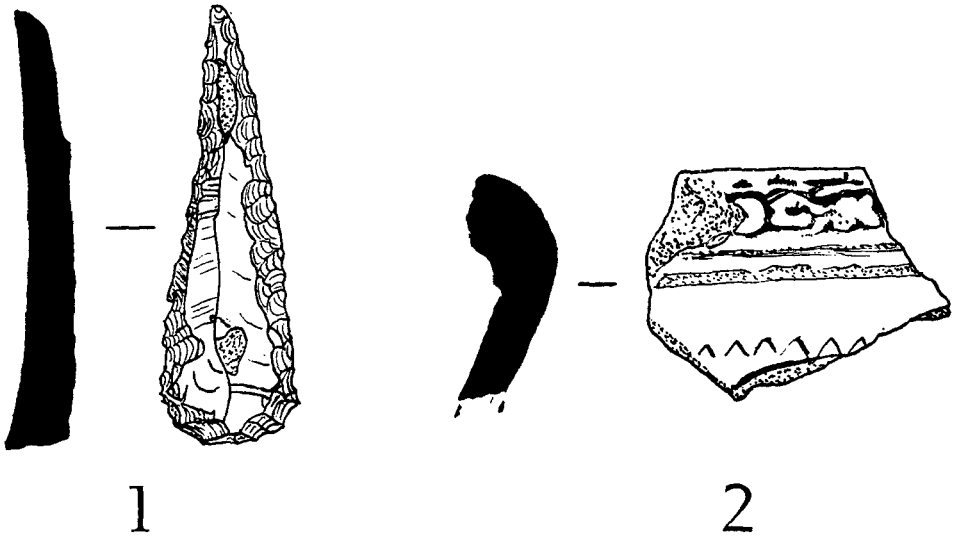


FIG 8 Bantaskin: small finds (scale 1 : 1)

2 Animal bone, left radius of horse. (Ditch section, from dark silt) (kindly identified by Miss E Macartney)

3 Lead musket ball, one face slightly flattened, diameter 16 mm. (Above upcast)

4 Ball of red clay, perhaps a marble, diameter 15 mm. (Above upcast)

5 Coarse ware, rim fragment (fig 8, 2)
(The following note has been kindly contributed by Mr Peter Webster, University College, Cardiff)
Rim fragment of a jar in orange-buff fabric, with a roped design on the rim and wavy line decoration on the body. The diameter (*c* 320 mm) excludes a narrow necked jar, and a vessel reminiscent of a metal jug may have been intended (cf Robertson, Scott and Keppie 1975, fig 52.7). (Area 1, topsoil).

6 Eight fragments of green-glazed late medieval ware. (Areas 2, 3, topsoil)

Of the small finds made during the excavation, only the rim fragment (no. 5) is certainly of Roman date.

PART III

Each of the rescue excavations and watching briefs described above has supplied details which help to increase our understanding of the work carried out by the Roman army on the line of the Antonine Wall frontier 1800 years ago. The total clearance of a 40 m length at Bantaskin (equal to the combined lengths of the two sections permanently exposed in Hillfoot Cemetery, Bearsden) was particularly rewarding. In the following paragraphs some attempt is made to assess our knowledge of the component parts of the Wall in the light of this and other recent work.

Width of the stone base

The width of the stone base was by no means uniform, and measurements of between 14 ft (4·3 m) and 16 ft (4·8 m) have been recorded (Robertson 1973, 12). In a paper presented in an earlier volume of these *Proceedings* an attempt was made to show that variations in width might be linked to the activities of particular legions or even of the work squads within a single legionary construction length (Keppie 1974, 151); details obtained during several of the excavations described above were incorporated in a list attached to that paper. Two excavations carried out in 1976 (above, nos 3, Bantaskin, and 12, Douglas Park) have provided additional information. At Bantaskin two measurements of 4·59 m and 4·67 m (14 ft 11 in and 15 ft 1 in) were obtained, despite the loss of the S kerb. These measurements can be linked to other data obtained in the Falkirk area, e.g. at Watling Lodge, Tayavalla, Tentfield and Rough Castle, which suggest that the width of the Wall-base within this sector was *c* 4·6 m (15 ft). On the Golf Course at Douglas Park, Bearsden, a measurement for the stone base of 4·52 m (14 ft 10 in) was obtained. Douglas Park lies within a work sector (Summerston to Castlehill) known to have been built by legion VI *Victrix*. However, the measurement at Douglas Park in 1976 does not fit easily into the pattern of information already known from that sector. At Crow Hill, Hillfoot Cemetery, Thorn Road and Bearsden fort the Wall base has a width of 4·3 m (14 ft). However, it has already been suggested (Keppie 1974, 160) that the Summerston-Castlehill sector can be divided into at least two sub-sections in which the Wall-base was completed to different specifications. This subdivision may account for the unexpected width obtained at Douglas Park, but it must be stressed that many more measurements are needed before any except tentative conclusions can be drawn.

Culverts

The presence of culverts, that is of covered drains set into the stone base, was first noted by Horsley,[2] who was a witness to wholesale removal of the base over Ferguston Muir, Bearsden, in the late 1720s (1732, 163, 167). Culverts have been frequently located during excavation. Stretches of base permanently displayed in Hillfoot Cemetery, in the Peel Park, Kirkintilloch, and on Golden Hill, Duntocher, incorporate a culvert. Culverts are normally set at a slant to the base, and have a capping of fairly massive stones, with small paving slabs below. Their purpose was perhaps two-fold, as the Antonine Wall Committee shrewdly observed: 'Although these are through drains, with an entrance at the one kerb and an exit spout at the other, it is probable that in addition to carrying off water from the higher side of the vallum they afforded an outflow for the moisture trickling from the body of the vallum into and along the stone base below' (Glasgow Archaeological Society 1899, 127).

The following list gives the location of the culverts known along the line of the Antonine Wall from E to W.

	LOCATION	REFERENCE
1	Mumrills	Macdonald 1915, 120
2	Bantaskin (3 culverts)	Above, pp 69–71
3	Tayavalla	Glasgow Archaeological Society 1899, 128 n 2
4	Seabegs Place (2 culverts)	*DES* (*1972*), 40; 1973, 51
5	W of Seabegs Place	*DES* (*1968*), 44
6	Seabegs Wood	Glasgow Archaeological Society 1899, 97
7	Tollpark	Visible on ground
8	Tollpark (Hag Knowe)	MOPBW 1964, 15
9	Bar Hill	Glasgow Archaeological Society 1899, 89
10	Kirkintilloch	Robertson 1964, 182
11	Cawder House	Stuart 1852, 320–1
12	Cawder House G.C. (2 culverts)	Robertson 1964, 195
13	Wilderness Plantation	Wilkes 1974, 53
14	Summerston (several culverts)	Horsley 1732, 163, 167
15	Hillfoot E	Macdonald 1934, 165
16	Hillfoot W	Macdonald 1934, 165
17	Thorn Farm	Glasgow Archaeological Society 1899, 128 n 1
18	Golden Hill, E side	Robertson 1957, 11
19	Golden Hill, W side	Robertson 1957, 63
20	Carleith	*DES* (*1971*), 18

We must not suppose that the culverts always carried water northwards into the ditch, though with the stone base normally set on a northwards-facing slope it was natural that they should often do so. At least 3 excavated culverts were clearly set to carry water which had gathered at the N side of the rampart towards the S (see list above, nos 2 [Second Culvert], 9, 19). It seems clear that culverts were placed not only where the base was particularly at risk from the build-up of water, e.g. where it dipped into a gully, or had to cross the path of an existing stream, but were spread out at intervals along its line whatever the needs of the terrain. Thus the builders of the Antonine Wall may have benefited from experience gained during the construction of the Hadrianic frontier (Breeze and Dobson 1972, 199 n 87). We may suspect that they were regularly spaced, but as yet can say little about the gaps between them, as the culverts have almost always occurred singly in excavated sections. However, at Bantaskin in 1976 three culverts were located within a single excavated length of base, at intervals of 16·2 and 18·5 m. Excavation by E J Price in the garden of Seabegs Place House in 1972 revealed two culverts *c* 30 m apart (*DES* (*1972*), 40; 1973, 51), but as the base was not comprehensively cleared there may have been an additional culvert between the two located.

Repairs to the stone base and superstructure

The excavation at Bantaskin also produced evidence for additions to the stone base. The N kerb had been taken up and relaid 0·5 m further N, and the intervening space filled with core material. Such repairs (if this is the correct word to employ) were perhaps common. Investigation by Professor J J Wilkes at Tollpark in 1964 revealed an extra line of kerbstones parallel to the S kerb, at a distance of 0·9 m from it, but not linked to the original kerb in any way. This extra kerbing extended over a length of nearly 30 m, and involved the blocking of a culvert (MOPBW

1964, 15). The new kerb was overlaid by laid turfwork. Something similar was observed by Macdonald at Westerwood (1933, 281), and at unspecified points between Falkirk and Inveravon (1915, 122). The additional line of cobbles noted at Easter Balmuildy in 1974 may be evidence of similar though localised repair-work. This repair-work cannot be dated. It could have been part of an on-going care and maintenance operation, or have been carried out at the beginning of the second Antonine phase of occupation when repairs, or at least a comprehensive inspection of the Wall, would have been essential. If excavation at Bantaskin had been confined to a single section across the base, the fact that the latter had been broadened by 0·5 m would not have been perceived. Doubts must arise as to whether some of the very broad widths noted along the Wall-frontier, e.g. at Carleith, the Stey Step and over Croy Hill, incorporated additions or repairs to an originally somewhat narrower base (Keppie 1974, 156).

Width of the ditch and of the berm

In the same paper attention was drawn to variations in the width of the Antonine Ditch (Keppie 1974, 161), in particular to the fact that over the W third of the line it measures well below 12·3 m (40 ft) which is often stated to be its normal width. Details obtained during two of the above excavations (no. 9 Cadder Brickworks, no. 11 Easter Balmuildy) were included in the list attached to that paper. Towards the E terminus of the Wall-line, the ditch was also below 12·3 m in width. The measurement of 9·7 m (32 ft) obtained at Inveravon Farm (above no. 1) in 1976 provides confirmation. The full width of 12·3 m has been proved by excavation only in the central area of the Wall-line, over a distance of about 20 km. The measurement of 12 m obtained at Bantaskin in 1976 allows this distance to be extended E by a further kilometre, and Bantaskin replaces Tentfield as the most easterly attested occurrence of the 'broad' ditch.[3] The boulders scooped up in the line with the ditch-edges at Easter Balmuildy may be further evidence for the placing of edging stones along the lips of the ditch. It must be emphasised that we know little about the frequency of these stones. They were first noticed by the Antonine Wall Committee, but are seldom encountered *in situ* (Glasgow Archaeological Society 1899, 104, 112; Robertson 1957, 11). Where the ditch is at full width of 12·3 m, the berm, that is the level space between the rampart and ditch, is normally 6 m (20 ft) wide. However, when the ditch narrows, so the berm has been found to widen. Quite probably the measurements are interrelated (Keppie 1974, 162). It may also be pointed out that with a berm of 9 m (30 ft), the width most frequently found W of Kirkintilloch, soldiers on the rampart top (here assumed to be at a height of 3 m) would no longer have an unrestricted view into the ditch.

The upcast mound

Material dug out from the ditch was generally thrown out on its N side to form what has become known as the 'upcast mound' (Horsley 1732, 163; Glasgow Archaeological Society 1899, 138ff). The upcast served to heighten the counterscarp of the ditch and formed a substantial barrier in its own right. The prime purpose of the (often very large) edging stones on the N side of the ditch was probably (as suggested to me recently by Mr H B Millar) to prevent the upcast slipping back into the ditch. The upcast mound is especially conspicuous over Croy Hill where it consists of stone quarried from the ditch. Where the ditch itself was set into a sharp northwards-facing slope, for example at Watling Lodge, the greater part of the counterscarp must have been artificially made up from upcast material.

The Military Way

Running parallel to the rampart and ditch, and at a distance of between 15 and 45 m to the S, ran the Military Way, which served as a lateral communications link for the army. Unlike the

stone base which has to some extent been protected against damage by a thick skin of turf, the Military Way has always been exposed to the plough. Traces surviving into the mid-20th century are nevertheless quite numerous, though excavation is a rare occurrence (*DES* 1962, 46). The part-section obtained at Bonnyside in 1975 showed that the road bottoming had been raised up on a turf-built *agger*. Where full excavation has taken place, the results suggest that the Military Way had a width of at least 5–5·5 m (17–18 ft), and was flanked by drainage gutters (Macdonald and Park 1906, 18f).

The composition of the superstructure

Over the greater part of its length, the superstructure of the Antonine Wall was of laid turfwork, to a height of perhaps 3 m (10 ft). The turf was laid in courses, grass downwards; as many as 20 courses have been observed in section (Steer 1957, 164ff; Glasgow Archaeological Society 1899, 76, 89, 119). Some 30–35 courses must have been needed to produce a height, after allowance for settlement, of 3 m. The dimensions of individual turf blocks are occasionally observed (Breeze 1974, 171). The layers have now been reduced by compression to a thickness of *c* 75 mm. Both faces of the rampart sloped upwards at a sharp angle. It is possible that the N face was somewhat steeper (Steer 1957, 166; Robertson 1973, 10). That the superstructure was of laid turf (as stated by the 4th-century biographer of Antoninus Pius) was established for certain by the Antonine Wall Committee which cut numerous sections across it in the 1890s. Though the Committee's trenches were confined to a 16 km sector in the middle of the Wall-line, it was a reasonable conclusion that turf had been employed throughout the entire 60 km. Sir George Macdonald was the first to point out that this did not appear to be necessarily so.

In 1911 Macdonald began an extensive programme of excavation with a view to establishing the precise course of the rampart and ditch where no remains were visible at ground level. None of his trenches cut anywhere E of Watling Lodge revealed traces of laid turf. Instead substantial quantities of clay were observed: 'This clay was not diffused at random through the native soil. It was mainly concentrated in two heaps, one at either margin of the foundation; and it had been laid directly upon the stones, the interstices between which it often filled. The greatest height to which the marginal heaps were observed to rise was 15 inches, while they generally extended inwards for a distance of about 3 feet. . . . The 8 feet in the centre consisted almost entirely of earth; such stray patches of clay as showed themselves were probably accidental' (Macdonald 1915, 120–1). The rampart here described is clearly one composed of soil revetted by clay cheeks, 1 m in width at front and rear. Opportunities of examining the superstructure in the sector between Watling Lodge and Bridgeness have not been frequent in recent years, but sufficient information has been amassed to suggest that Macdonald's conclusion on the composition of the superstructure requires modification in one important respect.

Sections cut across the stone base by Mr J H Hendrie in Polmont Park in 1960 revealed a superstructure of sand or of sandy topsoil revetted by cheeks of turf 0·85 m wide (Steer 1961b, 322); a similar make-up with revetments 0·5 m wide was noted by Dr Steer 130 m W of Mumrills fort in 1958. In sections cut immediately E and W of Mumrills, Dr Steer observed a superstructure of sandy soil revetted by cheeks of stiff yellow clay (1961a, 94). The excavation at Bantaskin in 1976 revealed a superstructure of clayey soil revetted by cheeks of turf 1 m in width.[4] At Bantaskin the layering was noted in one section only and even there only after very careful cleaning. It seems possible that the clay cheeks seen by Macdonald were in many cases likewise of turf cut on a clayey soil, turfwork in which the familiar horizontal black stripes were not visible. That this might be so was suggested to me some years ago by Professor Anne Robertson, and the suggestion has been reinforced by the results of a recent study of fort-

defences (Jones 1975, 80). The stray patches of clay noted by Macdonald in the main body of the superstructure may similarly be interpreted as turf blocks or fragments of blocks, perhaps broken or discarded during the build-up of the revetments. Turf-revetted ramparts were frequently employed by the Roman Army. The widths of the revetments as shown by excavation vary according to the overall width of the rampart, and in particular according to the cohesiveness of the central fill (Jones 1975, 78). Recent experiments in the reconstruction of a turf-revetted rampart have greatly helped our appreciation of the structural problems involved (Hobley 1971, 23), and make clear that the revetments used on the Antonine Wall are abnormally narrow. The stone base itself must have acted as a stabilising factor, but it is not impossible that the layers of turf employed in revetments on the Antonine Wall were fastened together with wooden pegs or 'pickets'. Evidence for the use of such 'pickets' has recently come to light at Malton (*Britannia*, 2 (1971), 252), and the technique has a long history in military engineering (cf Macauley 1869, 68; James and Stotz 1958, 80ff).

The conclusion that the superstructure over the 15 km from Bridgeness to Watling Lodge was uniformly turf-revetted is not justified by the present evidence. *Clay* was employed immediately W and E of Mumrills fort, but Steer has suggested that its use was strictly local (1961a, 95). In 1967 during investigation of the fort site at Inveravon, a section across the stone base revealed a rampart of turf from kerb to kerb (Robertson 1969, 40). Further work in the sector between Bridgeness and Watling Lodge is essential before more can be said.

The change in the composition of the superstructure was placed by Macdonald at Watling Lodge, the point at which the Roman highway to Camelon and the 'outpost forts' branched off from the line of the Military Way and headed north. Excavation immediately W of Watling Lodge has revealed a turf-built rampart (Macdonald 1925, 285; cf Breeze 1974, 166). The reason for the change has not been established, and Macdonald did not commit himself beyond the following statement, from which it nevertheless appears that he saw the change in purely environmental terms: 'It may be that in Roman times the eastern part of the isthmus was thickly wooded, so that the sods suitable for building would not be readily procurable, whereas from the point of division westwards the country was open moorland, overgrown with herbage and therefore calculated to provide exactly the material that a caespiticious wall required' (1934, 87). It must be admitted that botanical evidence for the environment of the Wall-frontier in Roman times is sadly lacking, and it is to be hoped that future work will fill this gap. In the meantime it is tempting to suppose that turf did become more readily available or of higher quality once the building squads had passed Watling Lodge, and that a decision was taken to employ it as the sole building material. An additional strand of evidence may be adduced. Geological Survey Maps of Central Scotland (cf One-Inch Series, Drift Edition, Sheet 31) show that over most of its length the frontier-line was set upon deposits of boulder clay, except near its E end where for a distance of 6–7 km beds of brick clay, sand and gravel intrude. The latter are encountered first at Polmonthill and extend westwards to a point *c* 400 m W of Watling Lodge. The coincidence is interesting and perhaps significant. Dr W G Jardine, with whom I have discussed these problems, considers that the change in the nature of the subsoil could have had a noticeable effect on the quality of the turf available at ground level. Further research is required on this aspect of the Wall's construction.

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NOTES

1 A second pipeline has since been laid across the Wall a short distance to the E.

2 Timothy Pont in *Blaeu's Atlas* (1654) refers to 'the wall of square stone going through the breadth of the Wall, just against the towers'. The drawing which accompanies Pont's description (Glasgow Archaeological Society 1899, 36) could suggest that he had culverts in mind.

3 Almost certainly the 'broad' ditch was employed further E, at least as far as Callendar Park, if not Polmonthill, but its width has not been established by excavation.

4 For similar revetments, cf Steer 1957, 166. It may be noted that the widths of the revetments can be linked to the dimensions of turf blocks specified by Vegetius (*De Re Militari*, iii. 8).

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a Bantaskin: repair to N kerb of stone base

b Bantaskin: repaired N kerb blocking mouth of culvert