

II

Signalling and the design of Hadrian's Wall

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A defence system of the size and complexity of Hadrian's Wall, like all systems, required co-ordination and this meant that a network of communications was needed to link the various installations that made it up. For the most part communications would have been by runner or dispatch rider, but the distances involved in even local communications on the Wall can be considerable and in a crisis, at least, basic information would have needed transmitting faster than such means would allow. This necessitated some form of signalling system. Despite much speculation, however, this system has never been convincingly explained; yet had it been absent, Hadrian's Wall would cease to be co-ordinated and, therefore, cease to be a system. It is thus of some importance that the signalling system be investigated and, indeed, shown to exist. We also need to gauge its probable effectiveness and to see what, if any, influence the need for signalling had on the overall design and layout of the frontier works. Only in this way can we judge what importance the Romans placed upon it, which may, in turn, give us an indirect measure of the amount of signal traffic, in other words the amount of trouble, that was expected by the Wall's designers.

This work will attempt to show that a highly effective signalling system did exist at all stages in the development of Hadrian's Wall and that it did exercise a considerable influence over the Wall's design. It will also be suggested that an understanding of this system, as well as lending support to our existing model of the Wall's function and to the still disputed idea that the wall developed from an earlier frontier on the Stanegate, will also help us to understand more fully the relationships

between known sites on or near the frontier and even to discover new ones.

In the absence of modern electronic communications, Roman signalling must have relied on visual methods, except over very short ranges. It is, therefore, vital for any understanding of the signalling system of the Wall to study the fields of view of the installations that made it up, to determine their ability to see and thus signal to one another. A number of anomalies in the layout of Hadrian's Wall have for some time provided the writer with the initial clues needed to form a working hypothesis and in the summer of 1986 these ideas were put to the test in the field (see appendix 1).

As the Wall is too large to be studied in its entirety, a sample study length was chosen, consisting of the 28 mile stretch between milecastle 30 (Limestone Corner) and milecastle 58 (Irthington). This sector was selected for three reasons: it is largely clear of modern forestry¹ and urban development; it contains most of the types of terrain through which the entire Wall runs, including the most difficult areas and, most importantly, it is the wall length in which the Roman installations are most fully known and in which the worker can be most confident that he has at least most of the elements that made up the system available for study.

The intervisibility data obtained make sense only if the idea of a frontier on the Stanegate is accepted, pre-dating or, in its final form, perhaps contemporary with Hadrian's Wall². Controversy still surrounds the exact date, form and even the existence of the Stanegate system as a formal frontier line, but the general consensus, at least among the system's

supporters, is that, as the Roman army pulled out of Scotland³ during the reigns of Domitian and Trajan, this previously unremarkable highway began to acquire an increasingly militarised appearance until, by the beginning of Hadrian's reign, it had become a powerful frontier system in its own right whose size and complexity are only now becoming apparent as a number of recent finds⁴ make it increasingly possible that the Stanegate frontier, like the Wall, ran from coast to coast.

Only in the central 20 mile sector between Old Church Brampton and Vindolanda, however, is the Stanegate anything like fully understood, but in this sector, at least, the final form of the system seems to have been made up of four elements that together form a fairly regular pattern.

Along the road itself was strung a series of large, turf and timber, auxiliary forts at roughly seven mile intervals. Four of these are included in the study sector; Old Church Brampton, Nether Denton, Carvoran⁵ and Vindolanda.⁶ Between each of these was a fortlet, a little over three quarters of an acre in size, which cut the interval between major installations to about three and a half miles. At present, only two such fortlets are known with certainty, at Throp and Haltwhistle Burn, but a third is strongly suspected at Castle Hill Boothby,⁷ between Old Church and Nether Denton.

Finally, and most importantly for the present work, the Stanegate could be linked together by a signalling chain. Some of the forts are actually intervisible, but the rest are connected by a series of signal/watch towers and it is noteworthy that unlike many Roman frontiers, these towers do not occur at frequent intervals in the form of an observation screen, but only where a signalling link between two major sites is required.⁸

The system as a whole, over the study sector, ran as follows: Old Church and Castle Hill are intervisible. Castle Hill is linked to Nether Denton via a tower on Pike Hill,⁹ which was later incorporated into the wall. Nether Denton is connected to Throp by a tower at Mains Rigg, and the remains of a

stone tower and a small turf enclosure just to the east and south respectively of the later wall fort of Birdoswald¹⁰ suggest that Nether Denton also had some sort of forward observation screen to supplement its limited view to the north. Carvoran was dependent for its communications on a tower, which was again later incorporated into the wall, as T 45a. T 45a can see Throp, from full tower height, and also served to link Carvoran with Haltwhistle Burn in the east.

Only the link between Haltwhistle Burn and Vindolanda now remains unknown. Vindolanda is situated in a broad hollow with a very limited view to the east and only slightly better visibility to the west. However, like Carvoran, Vindolanda has an associated signal tower, three quarters of a mile to the east on the commanding ridge of Barcombe Hill. Unfortunately, not even Barcombe can see Haltwhistle Burn so there must have been a second, relay tower to link the two. It has usually been assumed that this lay somewhere on Seatsides, the long hill to the west of Vindolanda, which stretches almost the whole way to Haltwhistle Burn and over which the Stanegate itself runs. However, field walking on the hill failed to find any point that could see both Haltwhistle Burn and Barcombe simultaneously, even from tower height, and a more probable site would have been the western summit of Winshields Hill which offers a splendid view of both sites.

The ideal point on the hill would have been the site of T 40b. This has the double advantage of having a vastly better view to the north, giving it a valuable forward observation role, and of being one of the few places on the Wall line able to see Vindolanda directly, so that a tower here would not have needed relaying by Barcombe. It is interesting to note, therefore, that when T 40b was excavated,¹¹ it proved to be somewhat larger than a standard Wall turret and although the full results were never published it is just possible that, like Pike Hill and T 45a, T 40b was originally a Stanegate signal tower and was later incorporated into the Wall.¹²

The Stanegate frontier was, essentially, an

invasion defence depending on large concentrations of force that could themselves be combined to form a single substantial army and while the road itself would, no doubt, have been patrolled and the fortlets and towers would have allowed reasonably tight surveillance, the Stanegate was still an open frontier and it would have been quite easy for small raiding parties and the like to enter and leave Roman territory unobserved, especially at night or in poor weather. It was to combat these low intensity threats that Hadrian's Wall was built, in the 120's A.D. As initially conceived, the line consisted only of the Wall itself and its attendant milecastles, turrets, ditch and coastal works and the Wall was planned, and to a large extent built, on the assumption that the invasion defence would continue to lie in the Stanegate forts to its south. The Wall was thus a thickening of the original system, not a replacement for it.

A number of features of the Wall's design and layout have long puzzled students of it. Firstly, although the system's builders usually went to great lengths to occupy the most commanding ground, it sometimes follows a weak tactical line when stronger ground was available close by. Just as perplexing, if less well known, however, is the curious positioning of some of the milecastles.

Although the only ancient literary reference to the building of Hadrian's Wall states that its purpose was "To separate the Romans from the Barbarians."¹³ Hadrian's was no Berlin Wall and it was never designed to be uncrossable. It was vital that the army could move through it freely for interception and maintenance purposes, and it was also important that civilian traffic, trade and, perhaps, transhumance could continue. It was the milecastle gates that allowed these movements. They were frequent enough for the Wall to offer no serious inconvenience, yet secure enough to allow close scrutiny of travellers and to collect the import and export duties that provided an appreciable part of the empire's revenues. It is, therefore, puzzling to find a number of milecastles so sited that their north gates front directly onto the tops of precipitous cliffs,

while others are only accessible with difficulty. Indeed MC, 35¹⁴ stands at the top of such a massive cliff that it simply never had a north gate, only a blank wall. What is still more perplexing is that these milecastles often have usable passes very close to them which were ignored.

The explanation often given is simple and, at first sight, appealing. Hadrian's Wall, it is suggested, was an example of the inflexible "You are not paid to think" attitude supposedly prevalent in the military in all ages. The Wall was built to a neat plan drawn up by someone with a tidy mind but little or no knowledge of the terrain. This plan demanded milecastles at exact mile intervals and was slavishly followed no matter how inappropriate it turned out to be on the ground.

Militarily, however, the Romans were not fools, or they would not have ruled a continental empire for more than half a millenium. We must, therefore, be careful to study the reasoning behind oddities in their military planning before dismissing them as irrational and this argument does have a decisive weakness which is of vital importance to the present work. This is the simple fact that the milecastles are not set at regular, let alone Roman mile, intervals. They are often close, but although a plan has been closely followed, some leeway seems to have been allowed.¹⁵

Despite its rather primitive equipment, Roman surveying was extremely precise¹⁶ and if the milecastles had been intended to be at mile intervals we could expect them to be so to within a few yards. A Roman mile was 1618 yards, but in the area studied in 1986 not one of the 17 milecastles for which figures are available was 1618 yards from its neighbour and only three were within 20 yards of this figure. On the other hand, three were over 180 yards out and one, MC 41, was more than 230 yards from its measured mile point. In all, the average milecastle is 70 yards off position.

It has been suggested to the writer that this may only serve to inform us that Roman surveying, while accurate as to direction, was less so on distance, but further study of the statistics appears to refute even this. For

although there is a total range in the deviation of milecastles from their measured mile positions of 440 yards, the average milecastle spacing is one Roman mile and three inches, an inaccuracy rate of only 0.000072% and the length of the study sector as a whole is only two yards out over 28 miles of some of the roughest terrain in Britain. In these circumstances, only the smallest of the spacing deviations can safely be put down to bad surveying and we are left to conclude that, within limits, the milecastles were deliberately sited.

In a few cases the reason for the deviation is clear. For example, both MC 38 and MC 48 would have had streams running through them in their measured mile positions, while MC 45 would have been built on a split level. In other cases, however, the theoretical position offers a better building site than the one actually chosen and we must look for another more general explanation.

Bearing in mind the cliff top sites referred to, it could be suggested that milecastles were being moved to better defensive and lookout points, but a number of milecastles have actually been moved down from the heights into much lower positions. For example, the measured position of MC 39 would have placed it on the summit of a peak at the eastern end of Peel Crag. This site presents a flat building platform, enjoys magnificent 360° visibility and stands at the top of a range of sheer cliffs. Yet the Romans chose to build the installation 89 yards to the east in the deep hollow known as Castle Nick where it has a much more restricted field of vision and is far more accessible and so less defensible. Likewise the measured position of MC 41 lies at the top of the westernmost spur of Winshields Hill where at 1200' above sea level it again offers strong defences and a splendid all round view, while still providing a flat building platform. Yet the milecastle was built 232 yards to the west on much weaker ground with a very limited view to the east.

Alternatively, the sites may have been moved to positions chosen for their improved access, to facilitate the fortlets' role as transit points, but here the opposite problem arises,

for a number of milecastles whose measured positions lie in passes have been moved to higher, less accessible ground. For example, the measured position of MC 43 lies in a small pass, 200 yards west of the fort of Great Chesters, which now carries two field roads, yet the milecastle as built actually underlies the fort. A much better example, however, is MC 53. The measured position of this installation lies in a splendid pass created by the valley of the Banks Burn, a natural route which now carries one of the few direct north-south roads through the area, yet the fortlet is built on a site half way up Hare Hill, to the west, which is so awkward to ascend that the modern farm road has been forced to run up the hill in the Wall ditch.

Just as interesting is the way in which some milecastles were not re-sited when one might have expected them to be if access was a prime consideration. The best examples of this are two of the cliff top sites and probably the two best known milecastles on the Wall, MC 37 and MC 42. Both installations have, in fact, been sited a little to the west of their measured positions (by 50 and 23 yards respectively) and in both cases this has been done to improve their accessibility for both have been moved from sites where their north gates would have fronted onto sheer cliff tops to sites where the cliffs break up just enough that while the ground is still far too steep and broken for wheeled vehicles, access on foot is possible.

However, both MC 37 and MC 42, have passes a little to their west which would have made them accessible to any form of traffic and the pass at MC 42 is indeed used today by a field road and visitors' footpath, yet although we have seen the Romans prepared to build milecastles over 200 yards from their measured mile points and although MC 37 and MC 42 would require total deviations of only 130 and 55 yards respectively to put them into their passes, the Romans failed to take advantage of the potential.

One remaining explanation would be that the milecastles were sited for signalling purposes. If this was the case quite considerable adaptation of the line has been allowed for

signalling and the deviations in spacing may, therefore, hold clues as to how the system functioned. To understand their significance, however, three basic questions must be answered: to whom would the installations have been signalling? How would they have done it? and to what end?

The answer to the first question is straightforward. A Wall installation faced with trouble would have wanted to summon help from the nearest concentration of force, in other words from the nearest fort and, at the time the Wall was built, this meant from the forts on the Stanegate. A great deal of ingenuity has been used by some scholars in trying to devise a means of signalling laterally along the Wall,¹⁷ while others have been puzzled by the impossibility of doing so, because the milecastles and turrets are not always intervisible with their neighbours. In fact there would be little point in such a system because, initially, the lightly manned Wall had little on it worth signalling to and we can be confident that signalling would have been oriented to the south.

The second and third questions are more difficult. Ever since Polybius¹⁸ methods have been suggested by which the Romans could have sent complex visual signals using heliographs, semaphore, combinations of torches and the like. It cannot be denied that over short distances, in clear air, such systems might have been practicable, but they were most emphatically not on Hadrian's Wall. The ranges forbid them in an age without optics as does the local climate.¹⁹ Such systems would also have had painfully slow transmission speeds and would have required a great deal of highly trained and specialised manpower.

It is probable, in fact, that signal traffic was both simple and infrequent and any detailed messages would have been carried by runners or horsemen. This is not, however, to deny signalling a valuable role.

In emergency conditions, time is important and any time saved precious. When a Wall installation came under threat it would probably have dispatched a messenger to the nearest fort with news of the exact situation.

However, a simple signal beacon lit at the same time would instantly have given the fort's garrison two vital pieces of information. Firstly, they would know that there was trouble, and secondly, they would be able to see exactly where that trouble was. The result would be that instead of having to alert a resting unit, the messenger would arrive at the fort to find its garrison already on a combat footing, or even meet it on the move. Not only would the time thus saved be considerable, but it would increase in proportion to the distance between the troubled site and its nearest fort, which would go some way towards minimising the potential weakness of the extremities of a fort's sector of responsibility.

Such a system would also have had other advantages. As signalling would involve only the lighting of a pre-prepared beacon of some sort it would be simple to operate and could have been run by the usual Wall garrison without specialist signalmen. The danger of messages being garbled in transmission, reception, or relay would also largely disappear, and the system can even be argued to have had a deterrent value because its operation would have been extremely conspicuous.

It is usually assumed that all military signalling must be carried out in secret, but in a defensive system, there are advantages in flaunting the existence of detection apparatus to the enemy and in making sure that he knows when he has been detected. Modern burglar alarms exploit this principle and the sight of Roman signal beacons flashing across the landscape coupled to a knowledge of the speed and strength of response of which the frontier defences were capable must have been distinctly sobering to any raiding party not already deterred by the very existence of the system.

The question to be answered, therefore, is: are the deviations in milecastle spacing consistent with an attempt to fit the Wall with a comprehensive signalling system oriented to the South? The answer would appear to be yes.

It is immediately apparent from even a cursory inspection that Wall installations tend

to have a good view to the south even in those sectors that have limited visibility to the north. Secondly, the six oddities already cited are all explicable in terms of this theory and the data suggest that while the Romans did indeed attempt to site the milecastles in accessible positions the needs of signalling took priority. For example, had MC 37 been sited in its adjoining pass it would have lost contact with Barcombe which linked the milecastle as actually sited with Vindolanda. Likewise, MC 42 would have lost its current direct link with Haltwhistle Burn, because its pass is obscured by Cawfields Crag. So, although the Romans did their best to provide some access to these installations, the otherwise superior pass sites had to be foregone.

The situations of MC 43 and MC 53 are identical. These milecastles should, as stated, have been sited in passes simply on spacing grounds, but once again these positions were not in visual contact with Stanegate installations and both fortlets had to be moved to sites where signalling was possible. MC 43 moved east to a position visible from Haltwhistle Burn and MC 53 moved west to a point intervisible with Castle Hill, which may in itself be considered as additional evidence for the existence of that fortlet.

Where milecastles could be made more accessible without compromising signalling, however, the Romans took full advantage of the opportunity and this is the position at MC 41 and MC 39. MC 41 was moved down Winshields Hill into what is, in fact, the lowest point visible from Haltwhistle Burn, while the re-siting of MC 39 in Castle Nick was a dramatic improvement made possible only because, from tower height, the site is still just intervisible with Barcombe.

One of the questions posed in seeking the signalling system, the importance placed upon it by the Romans, would, then, appear to have been answered. Signalling was given priority, even over the prime function of the milecastles which were sited accordingly. There does, however, seem to have been a limit imposed, for it would have been perfectly possible to build MC 35 in a position where it would have

been both accessible and in visual contact with the nearest Stanegate site, in this case Barcombe. Unfortunately, this would have necessitated a full third of a mile deviation to the site of T 34b and so the fortlet was left on its cliff.

Signalling also seems to have taken priority over some tactical considerations, because some of the odd lines taken by the Wall can also be explained by the need for Wall/Stanegate intervisibility, the prime example being the sector between MC 49 above Willowford, and MC 52. Throughout most of this stretch the Wall clings to the edge of the north side of the Irthing valley, but at close range to the north is a ring of hills which, while enjoying commanding views themselves, obscure the Wall line's own view north. The extra work required to take in these hills would have been negligible in terms of that expended on the system as a whole, yet the hills were ignored. The explanation is that the Wall at this point runs along the most northerly line visible from Nether Denton and Mains Rigg. Indeed only the turret and milecastle gate tower tops would have been above the skyline as things were. With the Stanegate running near the bottom of the steep-sided Irthing valley, the tactically superior ground, despite its higher elevation, was simply out of sight and could not be used.

The final test must come from the full intervisibility data. If the wall had been designed around a comprehensive, Stanegate oriented signalling system, one might expect all Wall installations, both milecastles and turrets, to be directly intervisible with a Stanegate fort, fortlet or tower or, if the terrain made this impossible, at least to be sited so that the signals of any one blind Wall installation could be relayed to the Stanegate by another. This is exactly the pattern indicated by the data (see fig. 1).

Leaving aside, for the moment, the first four miles of the study area, from MC 30 to MC 34, whose Stanegate sites are unknown, all 72 of the remaining Wall installations are in direct visual contact with a Stanegate site, despite very difficult terrain, with the single exception

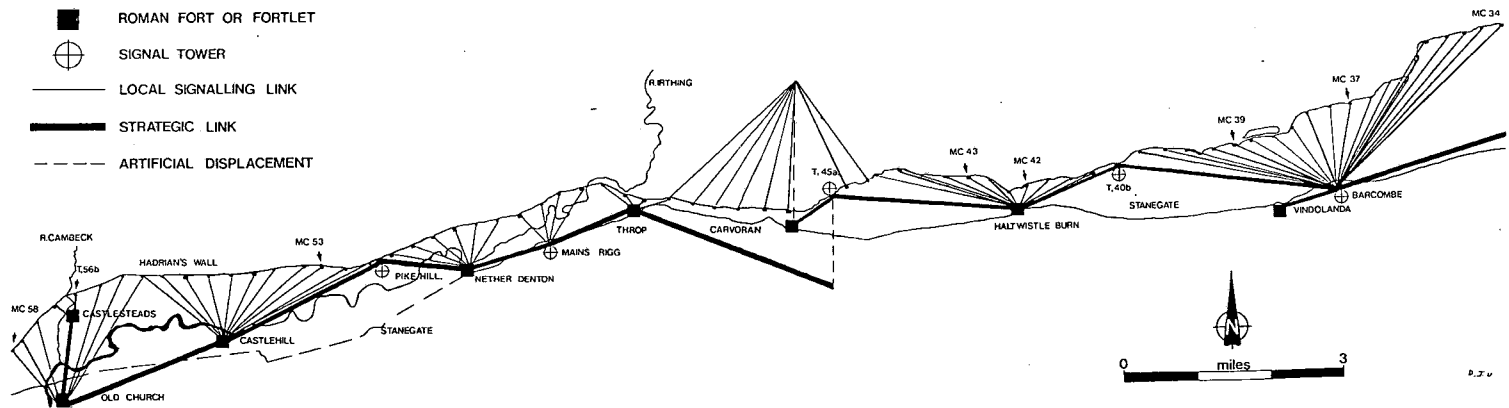


Fig. 1. The signalling system of Hadrian's Wall: Stanegate phase.

of T 56b and even this could easily relay to Old Church Brampton via its neighbour, MC 57. Furthermore, the data would seem to indicate fairly clear spheres of responsibility, with each Stanegate installation overseeing a particular length of Wall. It would, therefore, appear that Hadrian's Wall did have an efficient signalling system in its initial phase, at least within the study sector, and the Wall itself can be seen more clearly than ever to have been merely an adjunct to the Stanegate frontier, around which it has been carefully tailored. The skill with which the Wall's designer grafted this complex addition onto a system that was probably never designed to receive it is remarkable and his often sorry reputation needs to be re-assessed.²⁰

Until now, the present work has sought to present a hypothesis along with the writer's basic evidence in support of it, but this evidence is quite dismissible as co-incidence. Having used known sites on a well understood part of the Wall to discover the signalling system, it began to appear possible that the process of investigation could be reversed and that an understanding of the system could itself be employed in a search for new sites in a less well understood sector. It cannot be stressed too highly that what follows is conjecture, but even so the results proved interesting.

This idea was first used in an attempt to explain the lack of direct intervisibility between T 56b and a known Stanegate site. At first sight this lack of contact may appear unimportant. The turret is the only installation tested to have no direct Stanegate link and even it has a simple one stage relay to the fort of Old Church Brampton. Unfortunately, the situation is more serious because it would have been perfectly simple to give T 56b a direct link to Old Church and the very line of the Wall in the turret's vicinity appears to show a flagrant disregard for Stanegate-oriented signalling.

On the two mile sector from MC 56 to MC 58, Hadrian's Wall follows a tactically absurd line. Instead of running over the bold hill that carries the Wall fort of Castlesteads, it follows a route round the north of the hill and along

the valley of the Cambeck. In doing so it puts itself at a threefold disadvantage. The line is here longer than it need have been. The Wall faces steeply rising ground immediately to its north, and its line puts Castlesteads Hill between itself and Old Church Brampton, cutting off T 56b completely.

Castlesteads Hill is so obviously a superior position that the Wall can only have avoided it for a reason. The hill has fine all round visibility and its sheer north face is all but impregnable,²¹ yet its other sides are easy to ascend and would have presented no technical difficulties to the Wall builders. The only explanation must be that there was already something on the hill when the Wall was built, and as a minor installation like a tower would simply have been incorporated into the line, in the manner of Pike Hill, that something can only really have been Castlesteads fort.

Although Castlesteads was virtually obliterated by 18th century landscaping, excavation²² has been able to show that below the stone Wall fort there are traces of an earlier turf and timber fort. Because Castlesteads lies on the turf sector of Hadrian's Wall, it has always been assumed that this turf fort belonged to a Turf Wall phase. But the possibility exists that the turf fort may predate the Wall altogether and might instead have formed part of the Stanegate.²³ At first sight this does appear unlikely because of the proximity of the known Stanegate fort of Old Church Brampton, less than two miles to the south²⁴ and because Castlesteads lies at some distance from the Stanegate road. But if Castlesteads can be re-dated, the problem of T 56b disappears because Castlesteads is in direct visual contact with T 56b along with every other Wall installation on the MC 56-58 sector and it can also see the Stanegate sites of Old Church Brampton, Castle Hill and Pike Hill, so that the Wall's signalling system, in the study sector at least, would be left with every single Wall installation directly linked to a Stanegate site.

If knowledge of the signalling system can thus be used, however tentatively, to offer an explanation of an anomalous site, it seemed

possible that it could also be used to prospect for completely new ones. An attempt was, therefore, made to locate the fortlet that should lie between the forts of Carlisle and Old Church Brampton. Two rules of thumb which had emerged from the field work were to be of additional help in this search. Firstly, each Stanegate site tends to be at the eastern limit of the field of view of its western neighbour and, secondly, the Wall tends to be built along the northern limit of view of the Stanegate.

The furthest point east along the Stanegate that can be seen from Carlisle is a hamlet called High Crosby, almost exactly half way to Old Church, and the likely fortlet site appeared to be at the highest point, under or just to the north of a modern farm. The site lies just north of the Stanegate and has an excellent view of the Wall line, especially to the west. It is not intervisible with Old Church, but a link could have been provided by just one signal tower placed in the northern part of what is now Carlisle airport where it could also have overseen the small section of Wall not directly visible from either High Crosby or Old Church, thus extending the sector in which every known Wall installation is intervisible with a Stanegate site at least as far west as MC 63.

This is a very promising result because when the Stanegate was first traced through High Crosby,²⁵ early second century Roman pottery was found in its ditches at exactly this point, suggesting to the excavator that there had been settlement nearby, leading her also to predict a fortlet under the same farm.

With this encouragement, a second experiment was conducted, this time from Barcombe Hill. The furthest point east along the Stanegate that can be seen from Barcombe is a farm called Grindon Hill and once again a fortlet has long been suspected to lie at this point, mainly on spacing grounds as the farm is $3\frac{1}{2}$ miles from Vindolanda. The farm can see the Wall line and it is also the point at which a Roman road to Housesteads leaves the Stanegate. Unfortunately, excavation to find a fortlet here has failed to find any trace and doubts

have been cast on the need for such a site in this rather desolate spot. However, the methods used in 1986 predicted that the fortlet would not have lain under the farm at all, but on a hill about 300 m to the north-west, where no excavation has taken place.

In the sector MC 33 to T 34a, Hadrian's Wall runs for some distance with higher ground just to its south, so that Barcombe's view of it ends at MC 34. It would, however, have been easy to extend this tower's area of responsibility to the east by running the Wall a little to the north of its actual line. In view of the small amount of extra work required, the fact that this was not done suggests that something else was able to take up responsibility for the Wall at the point where Barcombe loses sight of it and this can only have been the Grindon Hill fortlet. Grindon Hill Farm loses contact with the Wall just to the west of MC 33 leaving almost a whole Wall mile blind, but the more northerly hill site boasts a view that overlaps with Barcombe's by over a mile and may, therefore, prove a stronger contender than the traditional location to be the fortlet site despite its rather greater distance from the Stanegate road. This position would also have given the fortlet advantages in its purely Stanegate phase as it enjoys a better view of both the north and its own environs.

The next suspected Stanegate site to the east is at Newbrough, where a 4th century fortlet is known to underlie the churchyard.²⁶ The traditional Stanegate model predicts that this small village, $3\frac{1}{2}$ miles east of Grindon Hill, should contain a full cohort fort and although the reader is again warned that this is speculation, there are two candidates for its location. The first, Newbrough A, is the church yard, where an earlier fort may yet await discovery beneath the 4th century structure²⁷ and the second, Newbrough B, is a field about a third of a mile further east where a series of crop marks have been discovered from the air²⁸ which appear to include a ditch of Roman military layout enclosing a marching camp or fort of about 8 acres. Neither site has any great advantage over the other and no attempt will be made here to identify the true fort site.

What can be done is to try to provide any fort that may have existed with communications. Newbrough lies in a hollow beside the South Tyne and neither fort site can see either Grindon Hill or the Wall. A fort here must, therefore have been dependent for its communication on a nearby tower.

Any signal tower serving Newbrough must fulfil four criteria. It must have a good view of the Wall, it must be visible from Grindon Hill, it should have a good view to the east to continue the system further and it should be able to see at least one and preferably both of the Newbrough fort sites. The only place that meets these requirements is a desolate hill to the north of Newbrough church, called Torney's Fell, and if there was a tower linking Newbrough to the rest of the Stanegate it can only have been here. Sadly, although unploughed, the fell has been badly scarred by drainage work, making a ground search difficult, but one candidate site has been detected in the form of a low mound raised slightly above the level of the moor and, unlike its

surroundings, well drained. A number of stones protrude from the mound's surface, but although a resistivity survey here produced a pronounced high, without excavation the writer remains dubious of the site.

Torney's Fell is also in visual contact with the Wall fort of Carrawburgh. This fort is known to overlie an earlier, rectangular, turf structure and amongst a number of interpretations offered by its excavator was the possibility that this site could have formed some sort of forward observation post for the Stanegate,²⁹ similar to that at Birdoswald. Carrawburgh is visible from Grindon Hill, but Newbrough would have been its nearest fort and Torney's Fell is well placed to link the two.

It should be stressed again that this exercise in site prospecting has been purely speculative and there is little physical evidence that any of these sites existed. But the results are still interesting especially when plotted on a map with their Wall intervisibilities (see fig. 2) because again every Wall installation can see a Stanegate site and each Stanegate installation

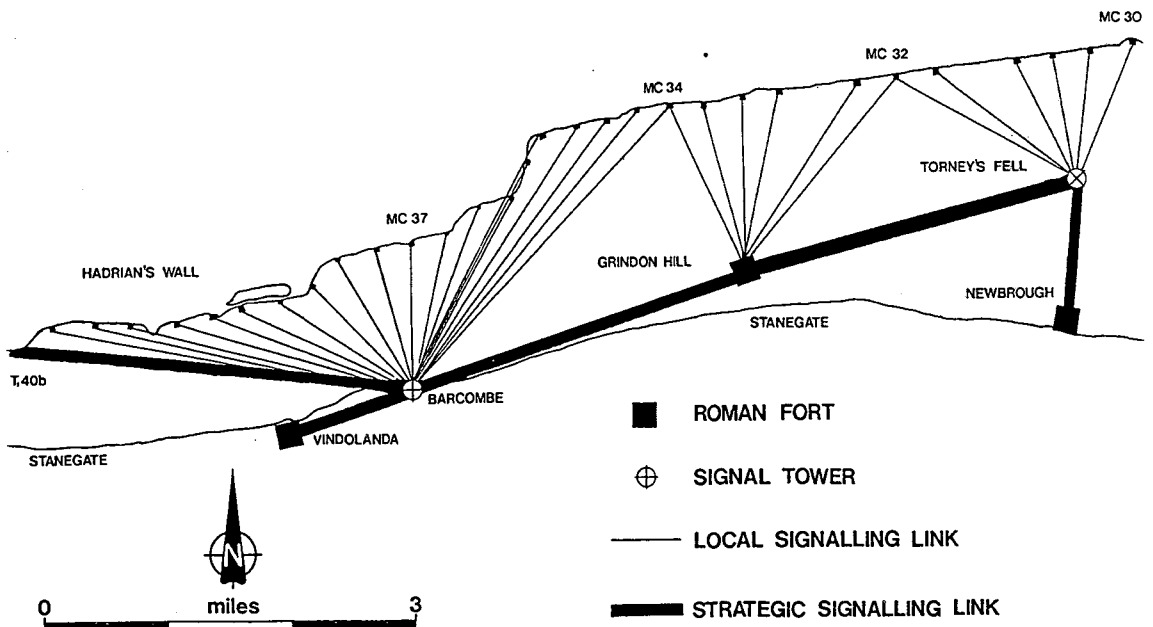


Fig. 2. The signalling system of Newbrough and Grindon Hill.

overlooks a fairly clearly defined length of Wall. The system already described is thus continued for at least a further four miles to the point where the study sector ended at MC 30. East of Newbrough the course of the Stanegate itself is poorly understood, so the credible limit of usefulness of the method has been reached. A further stage in the Wall's development does, however, remain to be considered.

So far the present work has concerned itself only with the Wall's earliest phase, and as this was probably never fully completed, we have been studying an intention as much as an operational reality. For just as the Wall was nearing completion, the frontier was subjected to a major re-design in which a new series of forts on the line of the wall itself replaced the older bases on the Stanegate.

The abandonment of the forts around which it had been designed obviously forced a complete change of orientation on the Wall's signalling system towards bases which its designers could not have foreseen. It is, therefore, interesting to attempt to see how the Romans coped with this problem, always assuming that, with the greater proximity of the main frontier forces, they had attempted to do so.

To some extent, the Stanegate never was abandoned. Carvoran remained in use (or was quickly re-occupied),³⁰ as did Vindolanda,³¹ Pike Hill and T 45a, and we can now tentatively add Castleheads and perhaps T 40b to this list. In some areas, therefore, the disruption can be exaggerated. Nevertheless, elsewhere the old installations did cease to exist and the discontinuity is nowhere more apparent than at Birdoswald where, on a two mile front, even the course of the Wall was moved, onto a more northerly line which, although in full view of the new fort (the original line was not), was completely out of sight of the Stanegate.

In fact the Romans did remarkably well. The new forts were sited in highly visible positions³² and it is possible to map out a signalling system with the Wall forts in place (see fig. 3). Even so a significant number of wall installations now needed their signals relaying via a second before they could reach a

fort or strategic tower (for example, MC 33, T 41a and T 54a) and MC 48 would have required a double relay before its signals could reach Birdoswald, despite the relative proximity of the two sites. The interfort system also remains largely secure. Castlesteads is linked to Birdoswald via the old Pike Hill tower, Birdoswald to Carvoran via T 45a, which also serves to link Carvoran with Great Chesters, and Housesteads and Carrawburgh are actually intervisible.³³ Only on the sector between Housesteads and Great Chesters does the modified system still appear to break down (see appendix two).

While showing the obvious characteristics of a "botched job", the local signalling system of the re-styled frontier was a considerable achievement, especially in view of the inflexibility of the raw material, and this suggests that a need was still felt for communications between the wall installations and the principal garrison forts, along the lines already proposed for the original design. The field work is continuing, and it is to be hoped that the future will bring further confirmation of the original signalling system and extend our knowledge of it to other sectors of the Wall.

Acknowledgements

The writer wishes to thank Miss S. Swain and Mr. B. Waslin for their help in the field and Mr. R. E. Birley, Major G. H. Donaldson and especially Dr. B. Dobson for their comments on the draft manuscript.

Appendix One: Methodology

For two reasons it was thought best that intervisibilities should be checked in the field rather than from maps. Firstly, 25' contour maps are not accurate enough to show conclusively whether or not borderline sites are intervisible, and secondly, it was felt that if signalling had influenced the Wall's design, subtle variations in its layout would be easier to detect and explain on the ground.

The programme of work was simply to visit every Roman installation in the study area and compile a list of every other Roman installation each could see along with any relevant

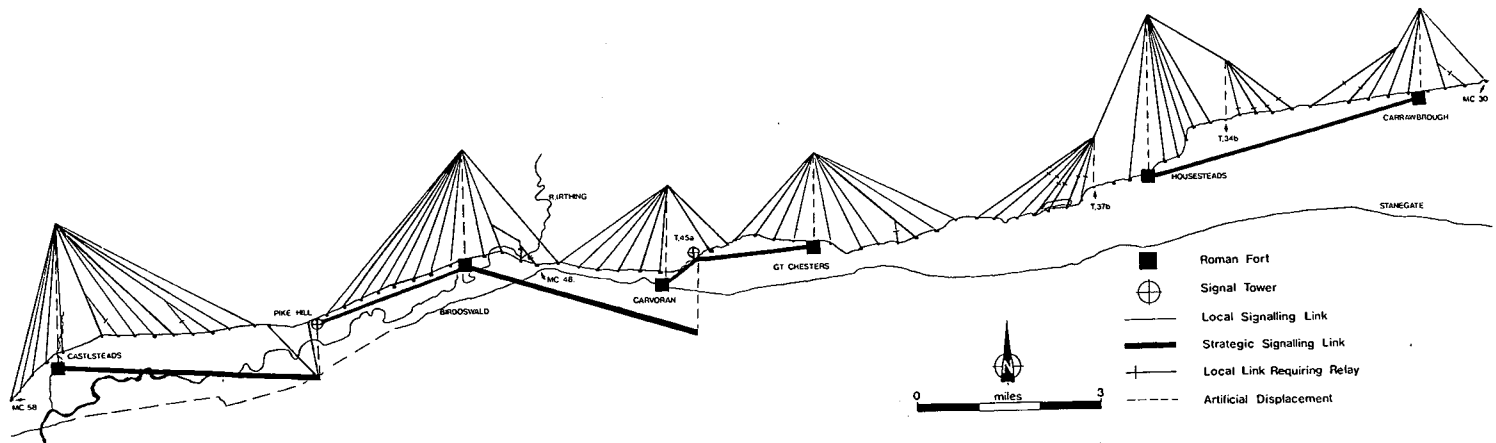


Fig. 3. The signalling system of Hadrian's Wall: Wall Fort phase.

topographical points. Today, however, many installations are obscured from one another at ground level and to test whether or not these sites would have been intervisible from tower height³⁴ a method of low level aerial photography was contrived with a camera mounted on the top of a tall staff. Where modern tree cover was present a version of the Roman's own system was employed in which a flash gun was fired from the top of the camera staff on one site, towards an observer on a target site.

Appendix Two: Barcombe B

In the Wall fort phase of Hadrian's Wall the area between Great Chesters and Housesteads appears to become unworkable. By assuming that all the milecastles and turrets between MC 38 and T 40a were relayed into Housesteads via T 37b, it is just about possible to devise local links between every Wall installation on the sector and the forts. But Housesteads and Great Chesters themselves are not intervisible and there are no other known installations which could have served as relay

stations between them. We are therefore faced with a break in the interfort chain without which Hadrian's Wall could cease to be a single unified system under emergency conditions. Worse still, neither fort can see Vindolanda which now appears to have been in use throughout the period. The obvious solution would have been for the Romans to have retained the old tower on Barcombe Hill but this was abandoned.³⁵

A very tentative solution may be offered by a possible second tower (Barcombe B)³⁶ which can be seen as a distinct mound on the westernmost spur of Barcombe Hill, almost due south of Vindolanda. At ground level its principal view is to the south and west³⁷ and its view to the north-east is very limited indeed, so that at first sight it would appear to have little part to play in signalling on the Wall. Yet despite its rather awkward position, flash testing in 1986 was able to show that a tower on this site could, from full height, have seen Housesteads, to the north-east, although it could not have seen a single yard further. The

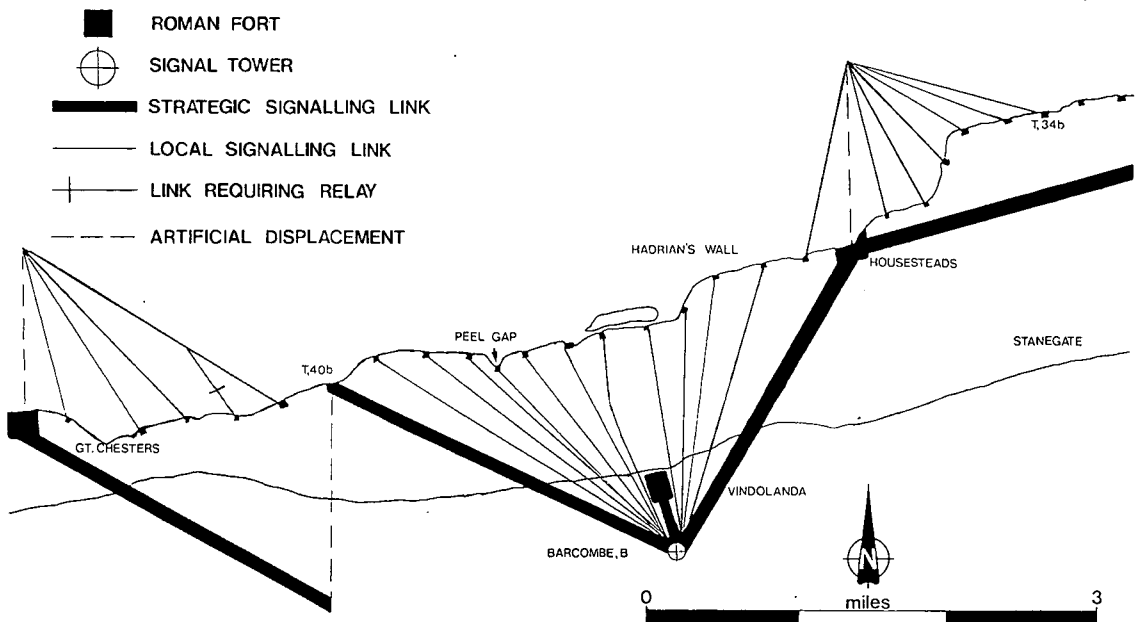


Fig. 4. The signalling system of Barcombe, B.

site would also have been intervisible with T 40b, allowing communications with Great Chesters. It could have seen all the Wall installations between T 40b and Housesteads, including the recently discovered tower in Peel Gap³⁸ and it has a magnificent view of Vindolanda.

Once again, this is speculation. The site of Barcombe B is unexcavated. But if the tower were proved both to exist and to date from the correct period, the signalling system for the area would become that shown in Fig. 4.

NOTES

¹I have been unable to investigate the question of tree cover in Roman times.

²D. J. Breeze and B. Dobson, *Hadrian's Wall*, Chapter 1, 3rd ed. London (1987). C. M. Daniels, "Problems of the Roman Northern Frontiers", *SAF* 2 (1970) p. 93. B. Dobson, "The Function of Hadrian's Wall", *AA*⁵ 14 (1986) p. 1. Dobson suggests that the final form of the Stanegate may be contemporary with or only date to the years immediately preceding the building of the wall.

³The chronology of the Roman withdrawal from Scotland is uncertain. See D. J. Breeze, *The Northern Frontiers of Roman Britain* London (1982) Chapter 4, and S. S. Frere, *Britannia* London 3rd ed. (1987) Chapter 7.

⁴East of Corbridge see, N. McCord and G. Jobey, "Notes on Air Reconnaissance in Northumbria and Durham II", *AA*⁴ 49 (1971) p. 120. P. T. Bidwell, cited by S. S. Frere, "Roman Britain in 1985", *Britannia* 17 (1986) p. 375. For the west, E. Birley and R. L. Bellhouse, "The Roman Site at Kirkbride Cumberland", *CW*² 63 (1963) p. 126. R. L. Bellhouse and G. G. S. Richardson, "The Roman Site at Kirkbride Cumberland", *CW*² 75 (1975) p. 58. R. L. Bellhouse and G. G. S. Richardson, "The Trajanic Fort at Kirkbride; the Terminus of the Stanegate Frontier", *CW*² 82 (1982) p. 35. G. D. B. Jones and N. J. Higham, *The Carvetii*, Gloucester (1985) Chapter 2 and G. D. B. Jones, "The Solway Frontier: Interim Report 1976-81", *Britannia* 13 (1982) p. 283.

⁵The dating of Carvoran is insecure, but a Trajanic occupation is suggested by a Domitianic corn measure found on the site, with Domitian's name erased.

⁶R. E. Birley, *Vindolanda* London (1977) p. 105

and fig. 26, and G. D. B. Jones, *Hadrian's Wall From The Air* Manchester (1979) p. 28. The new Burgh-by-Sands forts have 8. acre phases and Washing Well is of large, if as yet unspecified, size. This acreage may prove to be a diagnostic feature in the search for more Stanegate forts. However, a number show signs of having been cut down to half size at some point in their occupation and the chronology of these phases is often uncertain.

⁷F. G. Simpson, *CW*² 34 (1934) p. 154. The writer has found Roman glass in a cattle scrape on the site.

⁸The writer accepts that signalling may not have been the only function of these towers.

⁹They are not intervisible as stated in the original report, F. G. Simpson, op. cit. note 7. For Pike Hill see F. G. Simpson and J. McIntyre, "Pike Hill", *CW*² 33 (1933) p. 271.

¹⁰I. A. Richmond, *CW*² 28-33 (1928-33). Doubts have been cast on the turf structure, but the stone tower (*CW*² 31 (1931) p. 130) seems well attested.

¹¹C. E. Stevens, cited in "Roman Britain in 1946", *J.R.S.* 37 (1947), p. 168.

¹²The writer has been unable to trace either the excavator's notes or any person who took part. The excavation was staffed by P.O.Ws, Professor G. D. B. Jones has been kind enough to show me unpublished aerial photographs of Winshields which show a number of rectangular and circular structures on the hill, but these proved too large for consideration as an alternative tower site.

¹³S. H. A. Hadrian, II, 2. *Trans A. R. Birley.*

¹⁴D. Haigh and M. Savage, "Sewingshields", *AA*⁵ 12 (1984) p. 33.

¹⁵A milecastle's spacing is measured from its eastern neighbour. For a table of known spacings see R. G. Collingwood, "Hadrian's Wall, a System of Numerical References", *PSAN*⁴ 4 (1930) p. 179.

¹⁶O. A. W. Dilke, *The Roman Land Surveyors*, Newton Abbot (1971).

¹⁷Most recently by R. Selkirk, "Roman Signal Stations", *Archaeology Today* Vol. 8, Number 1 (Feb 1987) p. 26.

¹⁸Polybius, X, 43-47, G. H. Donaldson, "Roman Military Signalling on the North British Frontiers", *AA*⁵ 13 (1985) p. 19. The latter's minimalist views have greatly influenced my own.

¹⁹Long range visibility is possible surprisingly often on the wall, but with misty air, resolution is poor. Consequently, although a single beacon would usually have been visible, it would often have been impossible to distinguish the individual elements of any combination, especially with the naked eye.

²⁰See fn 2 above.

²¹The North face of Castlesteads Hill is a river cliff. It may not have been quite so steep in Roman times because the river is eroding into the hill and has, in fact, removed part of the fort.

²²I. A. Richmond and K. S. Hodgson, "Excavations at Castleheads", *CW*² 34 (1934) p. 159.

²³I am grateful to Mr. R. E. Birley for this suggestion. See also B. Dobson, *op. cit.* note 2, p. 17.

²⁴The two pre-wall forts at Burgh-by-Sands are in still greater proximity, although their chronological relationship is not yet understood. See G. D. B. Jones and K. Maude, "The Solway Frontier in 1984", *The Manchester Archaeological Bulletin* 1 (1987) p. 3.

²⁵F. G. Simpson, reporting excavations by K. S. Hodgson, *CW*² 36 (1936) p. 182. A watching brief of construction work just East of High Crosby farm in 1985 failed to find any trace of a fortlet, see S. S. Frere, "Roman Britain in 1985", *Britannia* 17 (1986) p. 383, but the ground is such that the best position would have been to the North.

²⁶F. G. Simpson, *P.S.A.N.*⁴ 4 (1930) p. 163.

²⁷F. G. Simpson, *ibid.*, considered that the stone defences of the late fortlet contained much re-used material, but Stanegate forts contained little stone.

²⁸I am grateful to Professor Jones for access to unpublished aerial photographs.

²⁹D. J. Breeze, "Excavations at the Roman Fort of Carrawburgh 1967-1969", *AA*⁴ 50 (1972) 87.

³⁰Carvoran is known to have been occupied in A.D. 136-138 (*R.I.B.* 1978), but its exact history over the transition period is, as ever, unknown.

³¹I understand from Mr. R. E. Birley that the 1986/7 excavation seasons at Vindolanda provided

evidence of unbroken occupation throughout the 2nd century.

³²The prime example is Benwell, but even Great Chesters with its limited view to the North is visible from almost all the wall installations from T 40b to T 45a.

³³It must be remembered that Carrawburgh is a comparatively late addition to the wall fort chain, although still Hadrianic, I see no difficulty in envisaging a fairly drawn out transition, especially if there really was already a post at Carrawburgh.

³⁴See R. L. Bellhouse, "Roman Sites on the Cumberland Coast 1966-67", *CW*² 69 (1969) p. 79. E. Birley, *Research on Hadrian's Wall*, Kendal (1961) Chapter 4, and R. E. Birley, *Vindolanda*, London (1977) Chapter 9. The height of a man should be added to the operational height of at least the flat-topped reconstructions.

³⁵P. Woodfield, "Barcombe Hill, Thorngrifton", *AA*⁴ 44 (1966) p. 71. This small excavation found only Flavian dating evidence. This, however, underlay a thick layer of laid clay. It seems unlikely that so much trouble would be taken to level a site if it was to be abandoned and Trajanic occupation might be inferred. This was probably short lived and there is certainly no evidence for occupation reaching much into the reign of Hadrian. See also G. Jobey, *AA*⁴ 47 (1969) p. 183.

³⁶I am grateful to Mr. R. E. Birley for pointing out this site.

³⁷Mr. Birley believes that its role was to link Vindolanda with Whitley Castle, which it cannot see but to which it could be connected via relay towers.

³⁸J. Crow. As yet unpublished.

