

# A GIS Analysis of the Location of Late-Eleventh-Century Castles in the Southeastern Midlands of England

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## Abstract

This paper reports on a GIS-based investigation into the location of a series of late-eleventh-century castle sites in the southeastern Midlands of England, built during the period of the Norman Conquest. Specifically, I examine how the proximity of castles to major roads and navigable rivers and the castles' viewsheds influenced the locational choices made by Norman castle-builders in the years 1066-1100. My analysis is based on a GIS which includes castle sites, major late-eleventh-century roads, navigable rivers, as well as a digital elevation model of the study area. The analysis is based on Monte Carlo significance testing, which enables an assessment of the unusualness of a given castle site when compared to a range possible choices which a would-be castle-builder had. The results of the study indicate that the importance of these factors varied considerably and must be considered in conjunction with a wide range of other criteria.

## 1 Introduction

Why did Normans, in the course of their Conquest of England, build castles where they did? The answers given to that question have, traditionally, tended either to have a rather militaristic bent—the work of what has been called the “battering rams and boiling oil” school of castle studies (Coulson 2003:1)—or to be, in effect, defeatist, suggesting such information is unrecoverable (see Brown 1976:217; Pounds 1990:69). But over the past twenty years, what can be called a “revisionist castellology” has slowly been developing: a variety of approaches that attempt to understand castles as more than just pieces of military architecture, isolated physically, culturally, and academically from the rest of the medieval world (e.g., Austin 1984; Coulson 1996; Liddiard 2003). My paper takes further steps in the revisionist direction. Using geographic information systems (GIS), I have investigated the location of a group of medieval castle sites, built in the years AD 1066-1100 and located in the southeastern Midlands of England (Figure 1). In this paper, I examine how the proximity of castles to major roads and navigable rivers and castles' viewsheds influenced the locational choices made by Norman castle-builders. The GIS tools used in my analysis—calculating distances between points and lines and generating viewsheds—are not especially sophisticated,

but their careful application has enabled me to approach old questions in new ways.

Traditional studies of castles often give the impression that castles acted like forts along the Maginot Line, assuming they were carefully located according to some unified, strategic design and were able to block passage along a road or river by their mere presence (Beeler 1956; Butler 1992). It is also fairly easily, and fairly often, assumed that the view from a castle must have been good, and a would-be

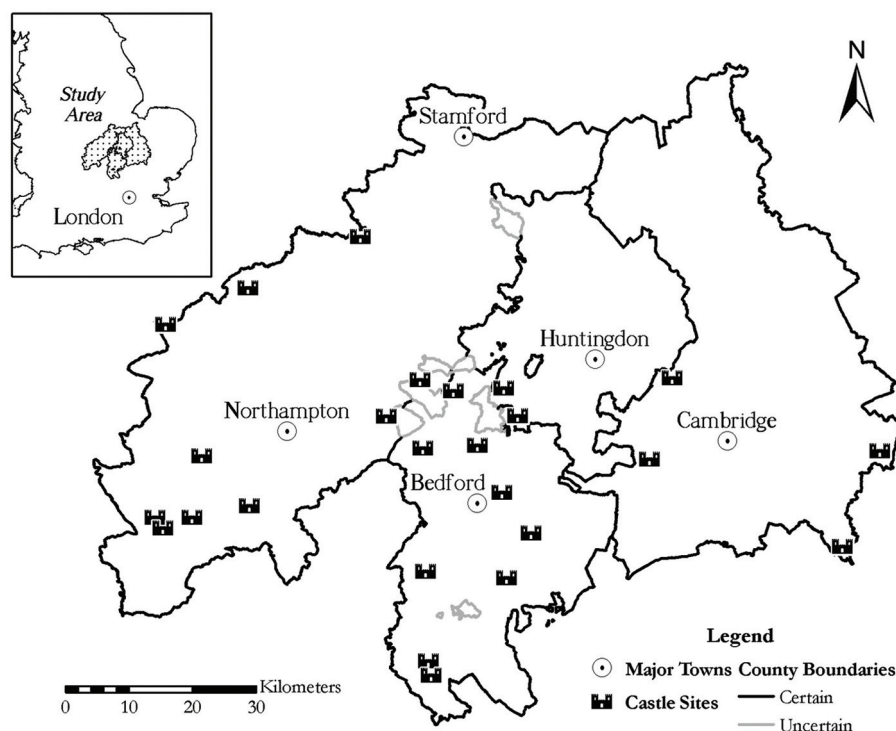


Figure 1. Location of study area and late-eleventh-century castles.

castellan, when choosing the site for his fortress, must have taken the view into account—what Stocker (1992:415-416) calls “nailing the valley.” In my work, I have tried to test these assumptions.

Before going further, I should point out that the castles of the early Norman period in England were, by and large, not the imposing stone edifices most people think of when they hear the word “castle.” Instead, most were built of earthwork ditches and banks, usually surmounted by timber palisades and towers (Higham and Barker 1992). Two of the most common forms of these castles were the ringwork and the motte and bailey. A ringwork was an open, often roughly round, yard enclosed by a bank and ditch. A motte and bailey typically consisted of an earthen mound—the motte—topped by a tower, with an associated courtyard—the bailey—also enclosed by a bank and ditch. I should also note that, despite its name, the Norman Conquest was far from a purely military undertaking. It was, instead, a multifaceted process which affected a complex constellation of political, social, and economic issues over the course of a generation and is still imperfectly understood despite more than a century of intensive scholarship.

The most basic problem for the study of the castles of the Norman Conquest, of course, is determining which castles were actually in existence in the period between 1066 and 1100. The vast majority of the castles in question have little or no contemporary documentation (King 1983), so arguments about whether a particular castle existed in the late-eleventh century are often speculative at best. In a few cases, there is information from archaeological excavation that can be brought to bear on the subject of a castle’s date of construction. But for the most part, there is little to indicate the possible presence of a castle other than earthworks, and these remains are often in less than ideal states of preservation. I have examined the evidence for all the known castle sites in the southeastern Midlands, analyzing a wide variety of sources, including Domesday Book, chronicles, royal and monastic charters, manorial histories, and archaeological evidence, in order to pick out those castles which are likely to have been in existence before 1100 and to eliminate those castles that were not (Lowerre 2005:217-262). I identified a total of 25 castles likely to have been built in the late eleventh century.

The main difficulty in understanding either the relationship between castles and the late-eleventh-century communication, transport, and trade network or the importance of castles’ views has been the lack of a comprehensive, rigorous analysis of a group of castles. Those who adhere to the traditional, military-oriented stance point to those castles that fit their paradigm, while revisionists highlight those which reflect theirs. Rather than continue to pick out illustrative, but anecdotal, examples of castles fitting one set of assumptions or another, I have developed a systematic methodology to examine all the castles in the southeastern Midlands. I compared each castle site to the rest of the landscape in which it was built, and specifically to those portions of the landscape the builder had available to him when he was deciding where to set the carpenters and ditch-diggers to work. I postulated that if having an exceptionally large viewshed was an important factor when choosing a castle’s

location, one should expect the castle in question to have an exceptionally large viewshed when compared to the range of viewshed choices the castle-builder had. And if prospective castellans considered being close to roads or rivers vital to the location of their castles, then the sites ought to stand exceptionally close to such features. The problem, then, is how to determine if a castle’s viewshed or proximity was exceptional or not.

## 2 Monte Carlo Testing

To do this, I have employed a Monte Carlo significance testing procedure: comparing a measured statistic from a single, known sample to a set of measurements generated for a number of random samples. One ranks the measurements, and the statistical significance of a given measurement corresponds to its rank in the scale divided by the total number of samples. The most significant measurements lie at the extreme ends of the range. My use of Monte Carlo testing in a GIS application was inspired by Kvamme (1997) and Fisher et al. (1997). In the tests, I used a confidence level of 0.1 in order to minimize the possibility of a Type I error.

In this study, I used the random samples to simulate the various places a prospective Norman castellan might have visited when deciding where to locate his castle, since it is impossible to know exactly what locations the castellan actually considered at the time. I have assumed, however, that a Norman lord, when deciding where to establish his stronghold, would have been limited in his choice to those lands over which he had tenurial control. I have, therefore, drawn the random points for the Monte Carlo simulations from a series of layers representing the lands held by the various castle-builders. These layers are based on “historic” parish boundaries (Kain and Oliver 2001a, 2001b) and on information derived from Domesday Book, the record of the great survey carried out in 1086 on the orders of William the Conqueror (Williams and Erskine 1986-1992; Williams 2000). Domesday Book contains a wealth of information about a wide variety of variables, including landholding, tax assessments, agricultural resources, and population, all linked to named locations, and it covers the vast majority of England. Linking this information about who held how much land and where to polygons representing the eleventh-century land-units named in Domesday Book has enabled me to model the areas each would-be castle-builder had available when deciding where to fortify (Lowerre 2005:204, 206-208).

For my work, I used a scheme of intensity-based random sampling in which the random points were assigned to each polygon where a given Norman lord held land based both on the size of the parish and on the percentage of manorial assets the castle-builder held there. Put simply, when the GIS determined where to place the sample points, a large vill where the castle-builder held most of the assets was assigned a larger number of random samples than a medium-sized vill where he held a moderate amount of property, or a small vill where he held little. It is, of course, possible that a castle-builder might have held a large proportion of the resources recorded for a given vill but that the actual area

of land he controlled was relatively small, e.g., if he controlled a large number of peasants, several mills or churches but little actual arable land or meadow. Such a scenario is, however, unlikely.

The lands of Gunfrid de Chocques, builder of the castle of Wollaston in Northamptonshire, illustrate the sampling method well (Figure 2). The random points drawn from Gunfrid's lands cluster most in those villi where he held the highest percentage of the villi's resources, e.g., Wollaston, Long Buckby, and Grimsbury. Fewer points were drawn from the villi where he held a smaller proportion of the villi's assets, and no points at all were drawn from Weston Favell, where de Chocques held only about 1% of the land, livestock, people, and other appurtenances recorded for the villi in Domesday Book.

### 3 Proximity to Major Roads and Navigable Rivers

By employing the Monte Carlo testing procedure just outlined, it is possible to examine rigorously the question whether the castles of the southeastern Midlands were located unusually close to the highways and major water routes of the region. The medieval roads used here represent, as well as possible, the network of major cross-country routes which traversed the southeastern Midlands in the late-eleventh century. The rivers are those that were navigable—that is, “used regularly for the transport of goods and passengers” (Hill 1981:11)—in the same period. These datasets, shown in Figure 3, were created using a wide variety of primary and secondary sources (Lowerre 2005:198-216). It is a simple matter for the computer to calculate the distance of each castle and its associated set of random points to the roads and rivers stored in the GIS. For the tests, I calculated only the simple linear distance from castle sites and random sample points to the roads and rivers.

This method, of course, does not take into consideration how difficult it might have been to get from each point to the nearest

feature of interest. For example, a location that is, as the crow flies, close to, say, a road might have been on the other side of an impassable ravine, whereas another point that is, by linear measurement, farther away from the road was, in actuality, much more accessible. This limitation of my analysis is perhaps most obvious when considering the distance of various random points to rivers flowing through the Fens of northern Cambridgeshire and northeastern Huntingdonshire. Such locations may have been relatively

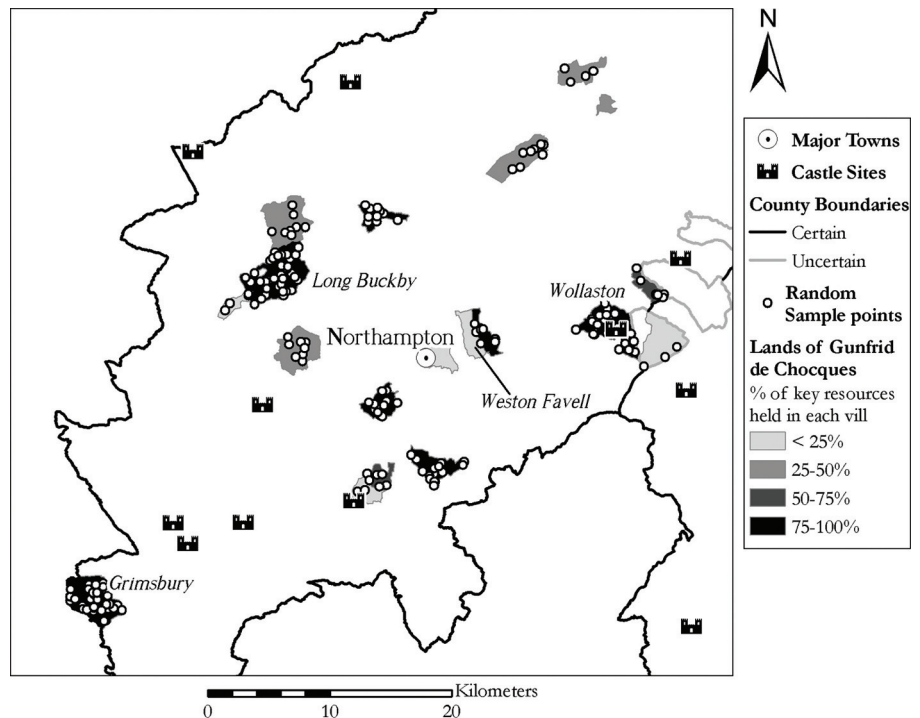


Figure 2. Lands of Gunfrid de Chocques with random points used for Monte Carlo simulations.

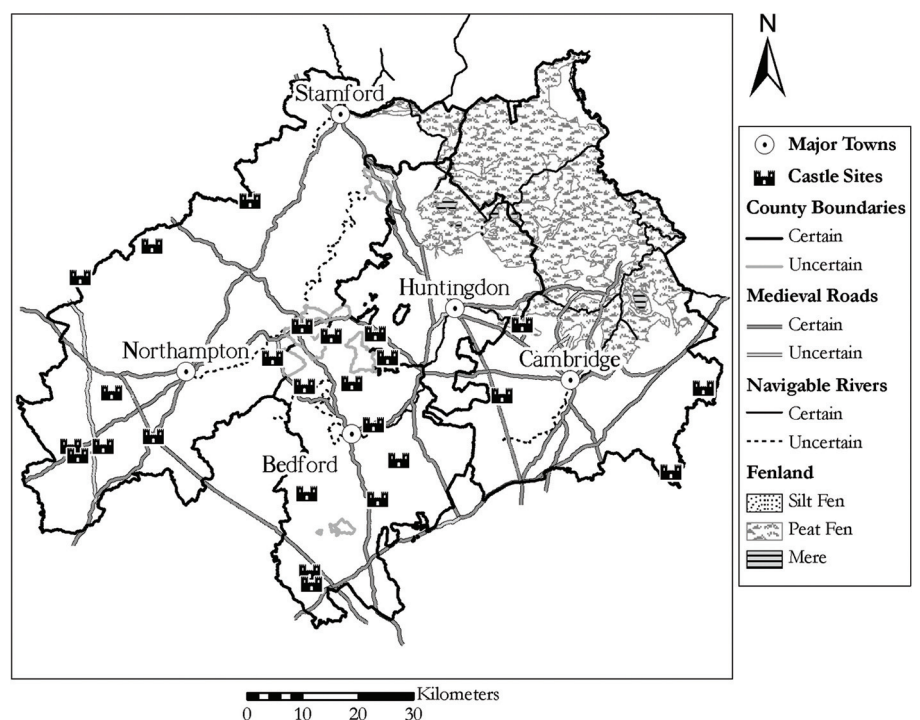


Figure 3. Castle sites in relation to major medieval roads and navigable rivers.

near a major navigable river, but getting from them to the rivers may have been quite difficult.

Were the scope of this study smaller, it would perhaps have been feasible to calculate least-cost paths to landscape features for each castle and every random point used in the Monte Carlo simulations, based on, say, a slope-derived cost surface. It would then be possible to compare the cost of travel from each castle and its associated sample points to roads and rivers, rather than just the simple Euclidean distance between two points. For this study, however, the necessary amount of processing time for calculating least-cost paths and the disk storage space for the resulting data would have been prohibitively great. It should also be noted the calculation of least-cost paths is not without its problems: van Leusen (1999:217-218) points out that both the technological approaches taken by GIS programs to determining least-cost paths and the nature of the computer models on which the determinations are made are far from perfect.

The results of the Monte Carlo simulations, summarized in Table 1, show that only a small number of castles were

located unusually close to the major roads and navigable waterways of the southeastern Midlands. Only four of the 25—Towcester, Goldington, Higham Ferrers, and Odell—lay exceptionally close to the main lines of travel and trade when compared to the lands from which their builders had to choose. These results suggest that their builders—King William, Hugh de Beauchamp, William Peverel, and Walter the Fleming—deliberately chose their castles' locations because of their proximity to the major roads and navigable rivers of the southeastern Midlands. In all of these cases, however, there are important caveats that must be considered before accepting the conclusion that the castle-builders chose their sites because they wished to have their fortifications adjacent to a river or road.

The location of the castles at Higham Ferrers and Towcester (shown in Figure 4) near the junctions of main medieval ways may, in a way, have been coincidental. Both villas were major administrative centers in the late pre-Conquest period, a fact which is, at least to some extent, attributable to their positions at the intersection of major

overland routes (Foard and Ballinger 2000:12-13, 20; Foard 1985:192). Whether William Peverel and William the Conqueror would have seen the sites primarily as centers of administration and lordship which had the added benefit of being located with convenient access to the local highways or the other way around is impossible to tell. Indeed, these factors are unlikely to have been viewed as independent.

Walter the Fleming's castle at Odell, which ranked closer to the area's roads and rivers than about 95% of the random points drawn from his lands, was raised on a site overlooking the River Ouse (Figure 5). It is not certain whether the Ouse was navigable as far as Odell in the late-eleventh century (Edwards and Hindle 1991). If it was navigable only as far as a point well downstream from the castle, the fortifications would not have been among the locations Walter the Fleming held that were closest to major lines of communication. And even if the waterway was usable by sizable boats as far upstream as Odell, it is unclear what impact the presence of a castle might have had on water-borne traffic. The earthworks and palisades would certainly have been symbols to travelers, indeed to anyone within sight of the castle, of the power of the man who erected it, but whether Walter had any mechanism for stopping boats moving along the Ouse is unknown. It may

*Table 1. Results of Monte Carlo significance tests for castles' distance to major roads and navigable rivers.*

Name	County	Probable Builder	p =
Towcester	Northamptonshire	King William	0.011
Goldington	Bedfordshire	Hugh de Beauchamp	0.038
Higham Ferrers	Northamptonshire	William Peverel	0.040
Odell	Bedfordshire	Walter the Fleming	0.047
Culworth	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.220
Kimbolton	Huntingdonshire	William de Warenne	0.260
Cainhoe	Bedfordshire	Nigel d' Aubigny	0.322
Swavesey	Cambridgeshire	Count Alan	0.377
Tilsworth	Bedfordshire	William Peverel	0.440
Bourn	Cambridgeshire	Picot of Cambridge	0.480
Wollaston	Northamptonshire	Gunfrid de Chocques	0.493
Weedon Lois	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.510
Great Staughton	Huntingdonshire	Eustace of Huntingdon	0.533
Farthingstone	Northamptonshire	William de Keynes	0.560
Old Warden	Bedfordshire	William Speke	0.577
Sulgrave	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.580
Sibbertoft	Northamptonshire	Humphrey, tenant of Robert, Count of Mortain	0.583
Totternhoe	Bedfordshire	Walter the Fleming	0.645
Yielden	Bedfordshire	Geoffrey de Mowbray/ Geoffrey de Trelly	0.670
Thurleigh	Bedfordshire	Hugh the Fleming	0.810
Lilbourne	Northamptonshire	Earl Aubrey	0.820
Ridgemont	Bedfordshire	Walter, brother of Seiher/ Walter the Fleming	0.905
Castle Camps	Cambridgeshire	Aubrey de Vere	0.933
Rockingham	Northamptonshire	King William	0.940
Kirtling	Cambridgeshire	Countess Judith	0.949

also be that ease of access to the highway for himself and his household loomed larger in Walter's mind than did interdicting hostile forces or eliciting tolls from travelers. Members of the late-eleventh-century aristocracy and their associated household traveled frequently, moving from estate to estate, much like the more famously peripatetic royal court. Many

of the individuals who built castles in the southeastern Midlands, Walter the Fleming included, had honors that were widely dispersed across both the region and the kingdom. Some may also have moved between England and their Continental homelands (Crouch 1986:156; Stenton 1961:72-74). Under these circumstances, siting a castle near a major thoroughfare would make a great deal of sense.

The last example, Goldington, most likely built by Hugh de Beauchamp, was nestled between the River Ouse, below Bedford, and the main road leading east from that town toward St. Neots and on to Huntingdon (Figure 5). From the motte and bailey, Hugh or his men would have been well-placed to monitor traffic both along the road and the river. Again, whether the garrison might have used the site to control traffic, for example, by collecting tolls, is open to question. As sheriff of Bedfordshire, Hugh de Beauchamp would have had significant control over the borough of Bedford, doubtless a better site for the taking of fees from travelers and merchants than an earthwork and timber castle downstream and down the road from town. The castle would, however, have been a potent reminder to all those moving along either road or river of de Beauchamp's power as a lord in his own right, beyond his powers as the king's surrogate. And, as suggested for Odell, de Beauchamp may have valued the speed with which he could travel to and from his castle, either by boat or on land.

It seems clear, then, that lords in the four counties studied here did not prefer to erect their castles especially near the region's main routes of communication, transport, and trade. Only about one-sixth of the region's castles were placed exceptionally close to rivers

and roads. Where castles were in close proximity to principal lines of communication, castle-builders may have been more interested in providing themselves and their households with easy access to these routes, rather than controlling others' use of roads and rivers. These castles may have acted as checkpoints, places to stop travelers and merchants

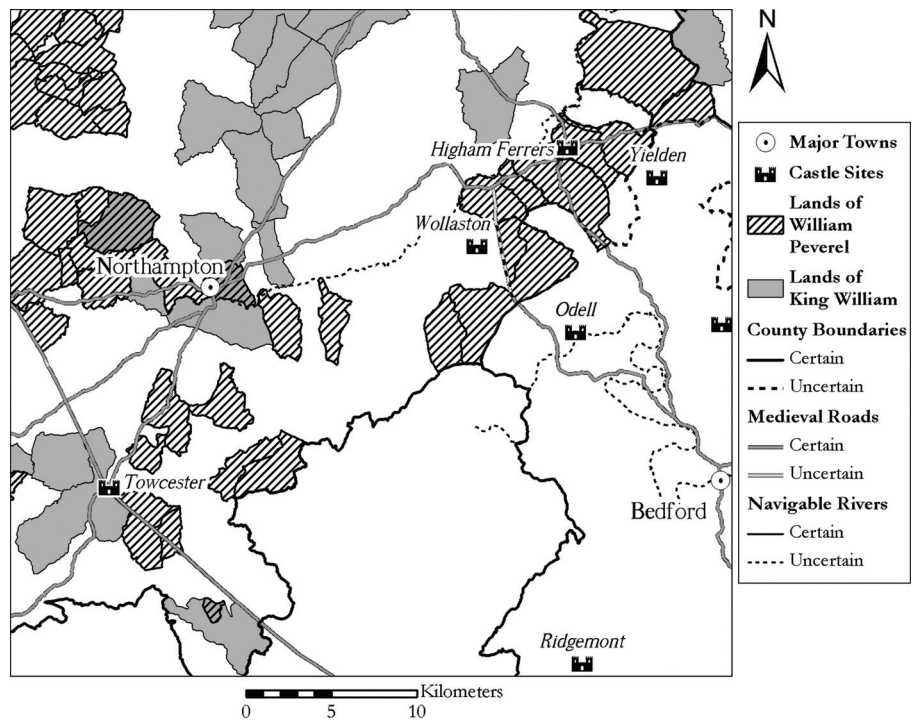


Figure 4. Location of castles at Higham Ferrers and Towcester in relation to major medieval roads and navigable rivers.

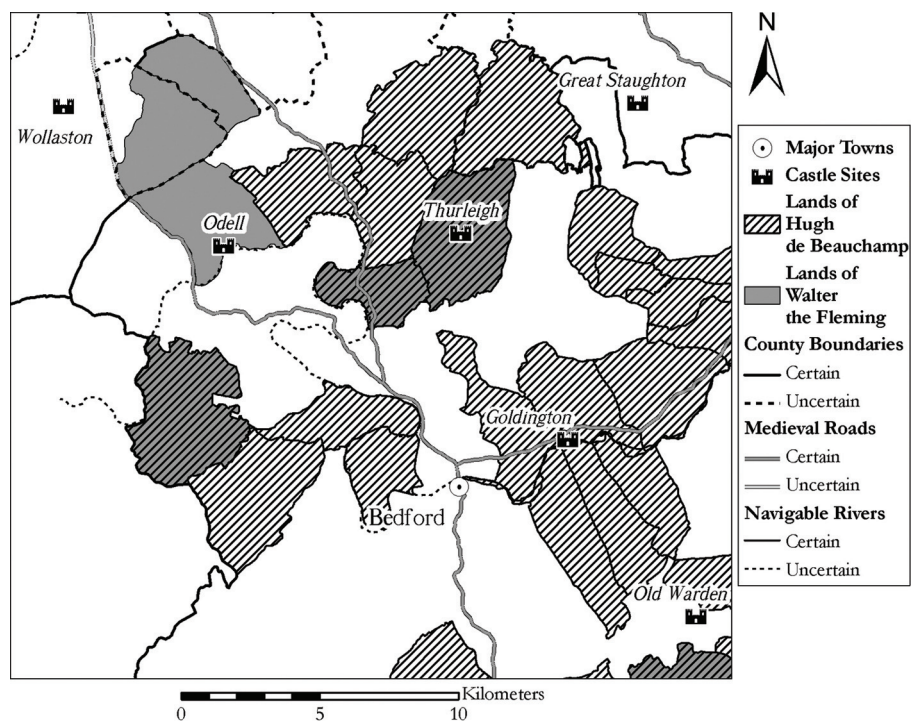


Figure 5. Location of castles at Odell and Goldington in relation to major medieval roads and navigable rivers.

and exact fees from them, but there is no direct evidence of this having occurred. The traditional, military-oriented image of castles being built on or near roads or rivers in order to control them does not stand up to scrutiny in the southeastern Midlands. This is not to say that those men who built castles close to rivers and roads would have failed to make use of their castles' positions in a time of armed conflict. It should, however, neither be assumed that all castles were located near lines of communication, nor that those that were, were placed there for military or strategic purposes.

#### 4 Viewsheds

Viewshed analysis has become a popular part of the GIS toolkit, and both the basic approach and the various problems associated with viewshed analysis are well understood (for further discussion, see Lowerre 2005:156-157). I discuss here only a few of the various permutations of viewshed analysis that I have undertaken, namely castles' simple, "raw" viewsheds, their views of the roads and rivers discussed above, distance-differentiated viewsheds, and the intervisibility of castle sites.

In order to examine whether castles in the southeastern Midlands were sited in order to have exceptionally large views of the surrounding landscape, I applied the Monte Carlo testing procedure described above. For those interested in such details, I used a raster digital elevation model (DEM) with 50 m x 50 m cells, using data derived from 1:63,360 scale topographic maps published by the Ordnance Survey in 1942 or earlier, maps for which the copyright has expired (EDX Engineering, Inc. 1994). Following van Leusen's (1999:219-220) guidelines for good practice in viewshed analysis, I ensured that the DEM was extensive enough to avoid any edge effects and that the curvature

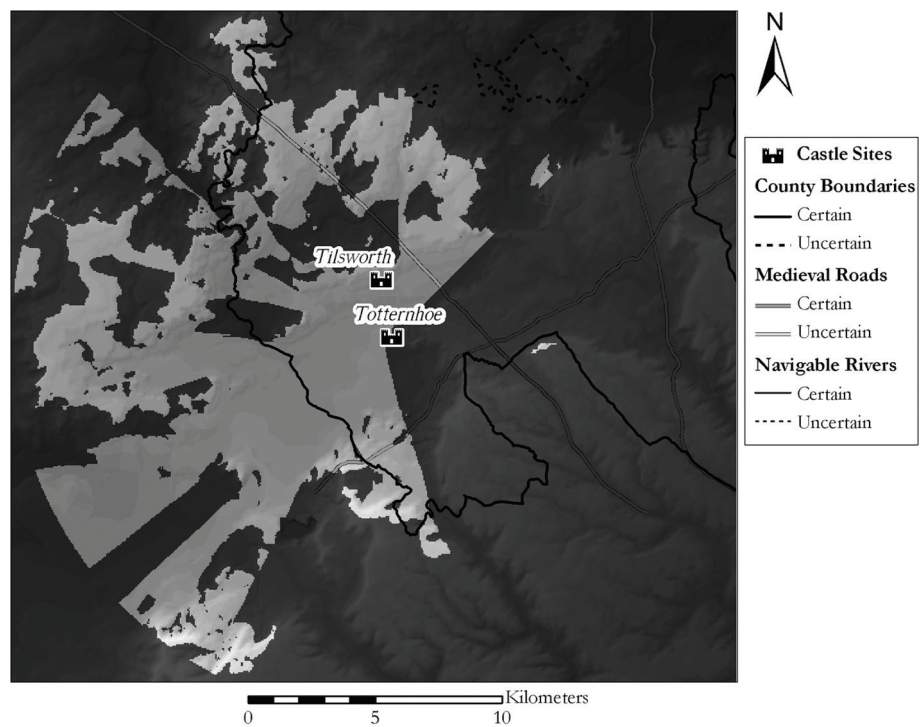


Figure 6. Totternhoe castle viewshed.

Table 2. Results of Monte Carlo significance tests for castles' "raw" viewsheds.

Name	County	Probable Builder	p =
Totternhoe	Bedfordshire	Walter the Fleming	0.023
Wollaston	Northamptonshire	Gunfrid de Chocques	0.05
Great Staughton	Huntingdonshire	Eustace of Huntingdon	0.065
Ridgemont	Bedfordshire	Walter, brother of Seiher/Walter the Fleming	0.09
Higham Ferrers	Northamptonshire	William Peverel	0.12
Tilsworth	Bedfordshire	William Peverel	0.14
Old Warden	Bedfordshire	William Speke	0.173
Farthingstone	Northamptonshire	William de Keynes	0.18
Swavesey	Cambridgeshire	Count Alan	0.268
Rockingham	Northamptonshire	King William	0.357
Culworth	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.37
Castle Camps	Cambridgeshire	Aubrey de Vere	0.383
Kimbolton	Huntingdonshire	William de Warenne	0.39
Weedon Lois	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.4
Goldington	Bedfordshire	Hugh de Beauchamp	0.415
Lilbourne	Northamptonshire	Earl Aubrey	0.43
Sibbertoft	Northamptonshire	Humphrey, tenant of Robert, Count of Mortain	0.49
Sulgrave	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.5
Odell	Bedfordshire	Walter the Fleming	0.51
Towcester	Northamptonshire	King William	0.59
Bourn	Cambridgeshire	Picot of Cambridge	0.68
Kirtling	Cambridgeshire	Countess Judith	0.707
Thurleigh	Bedfordshire	Hugh the Fleming	0.8
Cainhoe	Bedfordshire	Nigel d'Aubigny	0.908
Yielden	Bedfordshire	Geoffrey de Mowbray/Geoffrey de Trelly	0.96

of the earth was taken into consideration when calculating the viewsheds. I calculated visibility within a 15 km radius around each castle and its associated random points. For each viewshed, I set the level of the observer's "eye" at 2.75 m, a figure meant to model, albeit roughly, the height of a Norman sitting on his horse while scouting the countryside for a good site to fortify.

#### 4.1 "Raw" Viewsheds

A glance at Table 2 shows that there were four castles that had viewsheds which were unusually large when compared to the range of choices represented by the random points: Totternhoe, Wollaston, Great Staughton, and Ridgemont. Perhaps the best example is the motte and bailey at Totternhoe in southern Bedfordshire, which Walter the Fleming or his tenant Osbert raised near the end of a large chalk promontory, overlooking the headwaters of the River Ouzel, shown in Figure 6. The castle at Totternhoe had the largest viewshed of any castle in the southeastern Midlands, about 190 sq. km, and this view was more extensive than almost 98% of the random points drawn from Walter the Fleming's lands.

In these four cases, it seems likely that the size of the viewshed was a major contributing factor to the choice of their locations. The question is whether the castle-builders wanted to be able to see great swathes of the surrounding countryside from their fortresses or whether they were more interested in those out in the surrounding countryside seeing their castles. On the basis of the viewsheds alone, it is impossible to answer this question. It may be that both issues played a role in their decisions. But of all the castles in the region, only these four had exceptionally large viewsheds. These results suggest that having an exceptional view was occasionally, but not often, a primary consideration when choosing a castle site. Building a castle in the southeastern Midlands in the late eleventh-century did not make you lord of all you surveyed, and for many post-Conquest lords, this was perfectly acceptable.

#### 4.2 The View of Roads and Rivers

Perhaps more interesting than the issue of viewshed quantity is that of viewshed quality—what could be seen from a castle, rather than

just how much. The question of viewshed quality is difficult to address, particularly because it is not clear what aspects of the landscape the Normans especially wished to see. Here, I discuss whether castle-builders had any preference for sites from which they could see unusually long stretches of roads and rivers.

Earlier, I examined how close castles lay to the region's major lines of communication, but one can also incorporate them into the viewshed analysis in order to examine whether or not there was a preference for locating castles in places where great lengths of road or river could be seen. One might assume that castles which were themselves unusually near to roads and rivers would have been able to see and be seen from unusually long stretches of roads and rivers, but this was not always the case. It is simple to determine the length of each segment of the roads and rivers that lay within the areas visible from the observation points. The total length of road or river visible from each castle and each random sample is then summed, and these sums compared using the Monte Carlo testing procedure. In the following analysis, I deal first with roads, then rivers, then both together.

Table 3 shows that only three castles were placed so as to see an unusually large portion of the major roads running through or near their builders' lands. Considering that the overall view from the castle was unusually extensive,

Table 3. Results of Monte Carlo significance tests for total length of road visible from castles.

Name	County	Probable Builder	p =
Higham Ferrers	Northamptonshire	William Peverel	0.070
Wollaston	Northamptonshire	Gunfrid de Chocques	0.080
Great Staughton	Huntingdonshire	Eustace of Huntingdon	0.082
Old Warden	Bedfordshire	William Speke	0.13
Ridgemont	Bedfordshire	Walter, brother of Seiher/ Walter the Fleming	0.137
Swavesey	Cambridgeshire	Count Alan	0.137
Farthingstone	Northamptonshire	William de Keynes	0.170
Kimbolton	Huntingdonshire	William de Warenne	0.177
Totternhoe	Bedfordshire	Walter the Fleming	0.267
Towcester	Northamptonshire	King William	0.307
Sulgrave	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.440
Goldington	Bedfordshire	Hugh de Beauchamp	0.49
Tilsworth	Bedfordshire	William Peverel	0.500
Castle Camps	Cambridgeshire	Aubrey de Vere	0.550
Odell	Bedfordshire	Walter the Fleming	0.563
Weedon Lois	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.670
Culworth	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.670
Bourn	Cambridgeshire	Picot of Cambridge	0.698
Cainhoe	Bedfordshire	Nigel d'Aubigny	0.705
Yielden	Bedfordshire	Geoffrey de Mowbray/ Geoffrey de Trelly	0.730
Lilbourne	Northamptonshire	Earl Aubrey	0.880
Thurleigh	Bedfordshire	Hugh the Fleming	0.940
Kirtling	Cambridgeshire	Countess Judith	N/A
Rockingham	Northamptonshire	King William	N/A

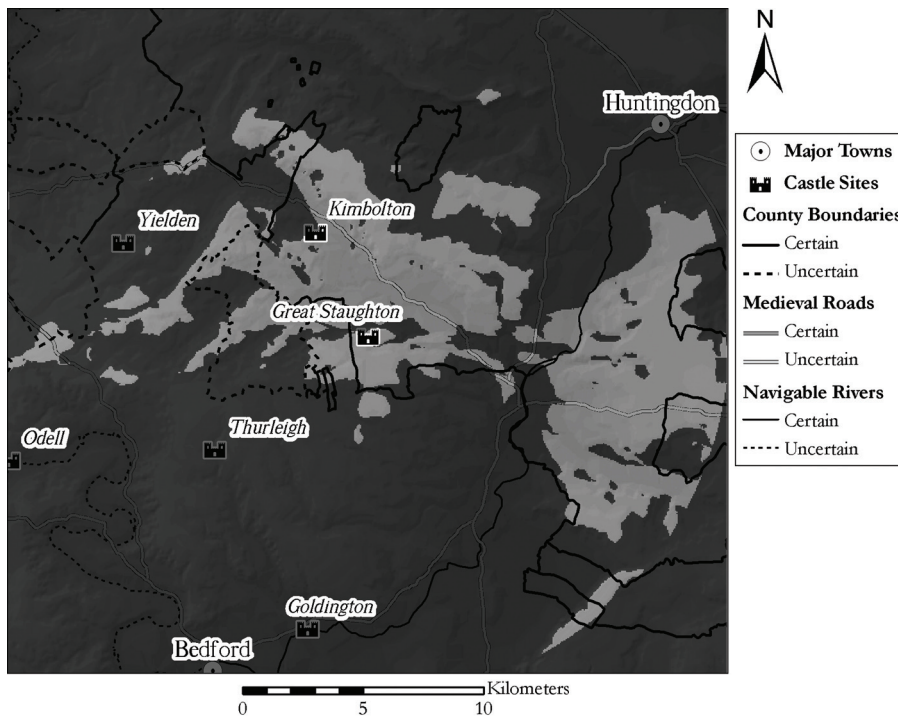


Figure 7. Great Staughton castle viewedshed.

Table 4. Results of Monte Carlo significance tests for total length of river visible from castles.

Name	County	Probable Builder	p =
Odell	Bedfordshire	Walter the Fleming	0.010
Higham Ferrers	Northamptonshire	William Peverel	0.035
Swavesey	Cambridgeshire	Count Alan	0.136
Old Warden	Bedfordshire	William Speke	0.180
Kimbolton	Huntingdonshire	William de Warenne	0.197
Great Staughton	Huntingdonshire	Eustace of Huntingdon	0.292
Ridgemont	Bedfordshire	Walter, brother of Seiher/ Walter the Fleming	0.040
Wollaston	Northamptonshire	Gunfrid de Chocques	0.040
Goldington	Bedfordshire	Hugh de Beauchamp	0.377
Bourn	Cambridgeshire	Picot of Cambridge	0.517
Kirtling	Cambridgeshire	Countess Judith	N/A
Lilbourne	Northamptonshire	Earl Aubrey	N/A
Sibbertoft	Northamptonshire	Humphrey, tenant of Robert, Count of Mortain	N/A
Tilsworth	Bedfordshire	William Peverel	N/A
Towcester	Northamptonshire	King William	N/A
Yielden	Bedfordshire	Geoffrey de Mowbray/ Geoffrey de Trelly	N/A
Cainhoe	Bedfordshire	Nigel d'Aubigny	N/A
Castle Camps	Cambridgeshire	Aubrey de Vere	N/A
Rockingham	Northamptonshire	King William	N/A
Sulgrave	Northamptonshire	Giles de Picquigny, brother of Ansculf	N/A
Culworth	Northamptonshire	Giles de Picquigny, brother of Ansculf	N/A
Farthingstone	Northamptonshire	William de Keynes	N/A
Thurleigh	Bedfordshire	Hugh the Fleming	N/A
Totternhoe	Bedfordshire	Walter the Fleming	N/A
Weedon Lois	Northamptonshire	Giles de Picquigny, brother of Ansculf	N/A

it is perhaps not surprising that Eustace of Huntingdon's Great Staughton commanded exceptional views of the major roads in the vicinity. A glance at Figure 7 shows that much of the road visible from Great Staughton lay outside the vill in the area where he held land. Given that the road ran, for the most part, outside areas where he had direct tenurial control, Eustace may have been seeking to remind those traveling along the main route crossing southern Huntingdonshire of his presence and importance.

William Peverel, too, was able to observe considerable lengths of the roads that lead to his castle at Higham Ferrers, and it is noteworthy that these roads passed, to a great extent, through vill in areas where he did control. In theory, Gunfrid de Chocques's Wollaston offered exceptional views of the roads in the area, but most of the highways were a considerable distance from the castle. Comparison with Walter the Fleming's castle at Totternhoe shows that a castle with a wide view, indeed the widest of any castle in the region, did not necessarily command an impressive panorama of the region's major roads (Figure 6). Three castles—Rockingham, Kirtling, and Sibbertoft—offered their builders no view whatsoever of the region's major roads.

I applied the same approach to the navigable rivers of the region, and Table 4 summarizes the results of this analysis. Of particular note here is the fact that more than half of the region's castles (14 of 25) caught not so much as a glimpse of any of the region's navigable rivers. To some extent, this is due to the fact that there were fewer navigable rivers traversing the southeastern Midlands than there were roads. Eastern Cambridgeshire, southern Bedfordshire, and all of Northamptonshire beyond the Nene valley were a considerable distance from navigable waterways. Furthermore, it was sometimes the case that navigable rivers could only be seen from a fraction of a castle-builder's



lands. So the fact that a navigable river could be seen at all from a castle was somewhat unusual. Nevertheless, only Odell, the site of Walter the Fleming's castle, was truly exceptional in its placement in relation to the visibility of navigable rivers.

As I noted above, it is not certain that the Ouse was, in fact, navigable above Bedford. If it was not, obviously Walter the Fleming could not have chosen Odell because of its admirable view of the local waterway. If, however, the Ouse was used regularly to transport goods and people, Walter and his men would have been exceptionally well-placed to observe movements along the river, and those in boats would have had the castle in sight for roughly ten kilometers of their journey.

Finally, I combined the total visible lengths of roads and rivers which could be seen from castles and random sample points, allowing an examination of whether views of the regional transport and communication network as a whole influenced the siting of castles. The results of the Monte Carlo tests are presented in Table 5. Higham Ferrers, Wollaston, and Ridgemont were the only sites with scores in the top decile.

Given that Higham Ferrers and Wollaston both scored well in the separate tests for views of roads and rivers, it is not surprising that they should have done well in the combined test. Ridgemont also shows an unusual propensity for seeing lines of communication, but, again, all of the lengths of road and river visible from the castle were at a considerable distance from the site. Interestingly, the site of Hugh de Beauchamp's castle at Goldington, which was located exceptionally close to the main road and river running to the east of Bedford, did not have exceptionally good views of them. The site's low-lying position near the Ouse accounts for this fact.

### 4.3 Distance and Viewsheds

The simple viewsheds used thus far provide only a simplistic model of the view from any given point in the landscape. A binary viewshed does not take into consideration how far away a portion of the landscape is—all the computer is concerned with is “visible or not visible.” In reality, it may be possible to see a hill 15 km away, but its features will not be clear. One way of addressing this issue is to determine

Table 5. Results of Monte Carlo significance tests for combined total length of road and river visible from castles.

Name	County	Probable Builder	p =
Wollaston	Northamptonshire	Gunfrid de Chocques	0.010
Higham Ferrers	Northamptonshire	William Peverel	0.030
Ridgemont	Bedfordshire	Walter, brother of Seiher/ Walter the Fleming	0.078
Great Staughton	Huntingdonshire	Eustace of Huntingdon	0.123
Swavesey	Cambridgeshire	Count Alan	0.139
Old Warden	Bedfordshire	William Speke	0.14
Farthingstone	Northamptonshire	William de Keynes	0.170
Kimbolton	Huntingdonshire	William de Warenne	0.18
Odell	Bedfordshire	Walter the Fleming	0.207
Totternhoe	Bedfordshire	Walter the Fleming	0.303
Towcester	Northamptonshire	King William	0.340
Goldington	Bedfordshire	Hugh de Beauchamp	0.423
Sulgrave	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.440
Tilsworth	Bedfordshire	William Peverel	0.510
Castle Camps	Cambridgeshire	Aubrey de Vere	0.567
Culworth	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.670
Weedon Lois	Northamptonshire	Giles de Picquigny, brother of Ansculf	0.670
Bourn	Cambridgeshire	Picot of Cambridge	0.7
Cainhoe	Bedfordshire	Nigel d'Aubigny	0.713
Yielden	Bedfordshire	Geoffrey de Mowbray/ Geoffrey de Trelly	0.750
Lilbourne	Northamptonshire	Earl Aubrey	0.880
Thurleigh	Bedfordshire	Hugh the Fleming	0.94
Kirtling	Cambridgeshire	Countess Judith	N/A
Sibbertoft	Northamptonshire	Humphrey, tenant of Robert, Count of Mortain	N/A
Rockingham	Northamptonshire	King William	N/A

what proportion of a given viewshed was at what distance from the viewing point. By analyzing distance in a viewshed, it is possible to develop a more nuanced understanding of how well the visible area could actually be seen.

The method used here divides each viewshed into a series of concentric distance bands or zones measured from the point of observation, comparable to Wheatley and Gillings's (2000) “Higuchi viewsheds.” These bands simulate the decrease in visual clarity as the distance from the observer increases. I used a total of five zones, the distances of which are shown in Table 6.

Figure 8 illustrates the viewshed from Great Staughton

Table 6. Viewshed zones and distances from observation points.

Zone	Distance from observation point
1	1-500 meters
2	501-1,500 meters
3	1,501-3,500 meters
4	3,501-7,500 meters
5	7,501-15,000 meters

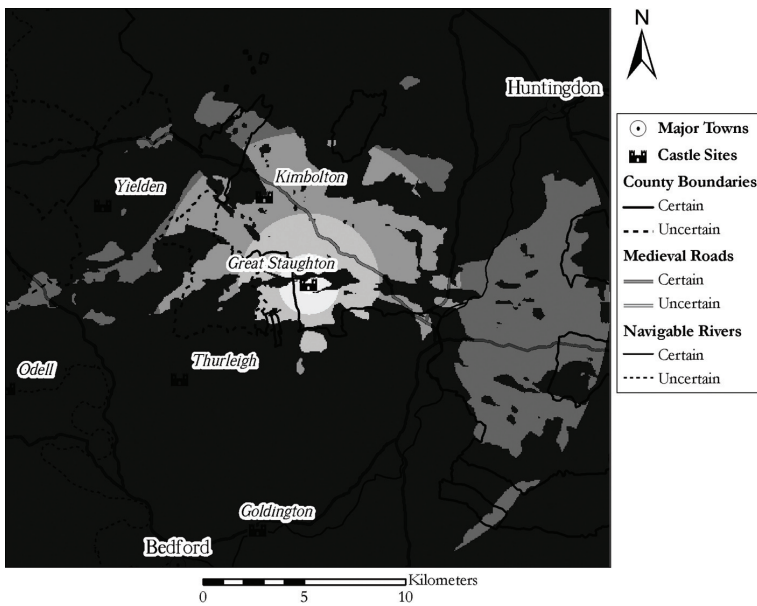


Figure 8. Great Staughton castle viewshed with distance bands indicated by shading.

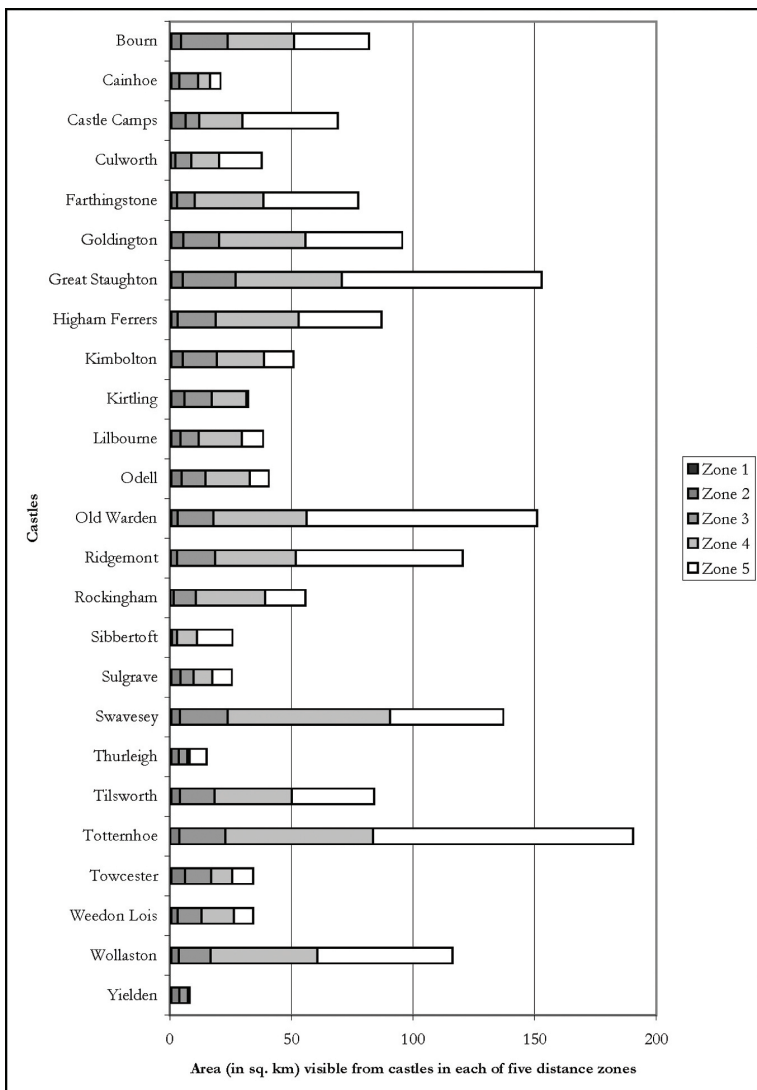


Figure 9. Area (in sq. km) visible from castles in each of the five distance zones.

divided into the five distance bands. To simulate how the clarity of viewed objects decreases as the distance from the observer increases, the visible areas covered by each distance band become increasingly opaque.

The visible area within each distance band can be summed, and the values for each distance band in every viewshed calculated for individual castles and their associated random sample points. One can also compare the visible areas within each distance range to the total visible area, what Wheatley and Gillings (2000:19) have called the “percentage-of-possible-view.” The areas and percentages of the total visible area for the castle sites are presented in Figure 9 and Figure 10.

Figure 9 and Figure 10 display the subtle differences in the viewsheds of the various castles, differences obscured in the simple, binary viewsheds. For example, it is clear that the majority of the total area visible from several castles was in the furthest distance band, 7.5 km and more away from the sites. Indeed, the viewsheds of most castles were dominated by more distant rather than nearer views. Out of the total of 25 castles in the region, nine had one-third or more of their visible areas lying within the first three distance bands, but only three—Cainhoe, Kirtling, and Yielden—had more than half their viewsheds in distance zones 1-3. These figures are skewed slightly by the fact that Yielden’s viewshed was very small: only a very limited area could be seen at a distance of 3.5 km or beyond, and the viewshed did not extend at all into Zone 5.

Analysis of the distance-refined viewsheds can be taken further. It is possible, again using the Monte Carlo approach, to compare the visible area in each distance band within the castles’ viewsheds with the same figures for the random sample points drawn from their castle-builders’ lands. Table 7 summarizes the results of this analysis. The apparently extreme p-values for Goldington and Lilbourne (marked with a \* in Table 7) are the result of the way the visible areas within each zone and the Monte Carlo rankings are calculated. According to the viewshed analysis, it was possible to see everything within 500 m of the site of the castle, but that was also true of 15 of the random points drawn from Earl Aubrey’s lands and of 83 points taken from Hugh de Beauchamp’s lands. When ranking the values from the castle and the random points, there is no way of breaking the tie between the castle site and the other points, so they are all given a rank of 1 and a correspondingly low p-value. This is one of the quirks of the testing procedure. It should, however, be clear that neither Lilbourne nor Goldington were exceptional among locations

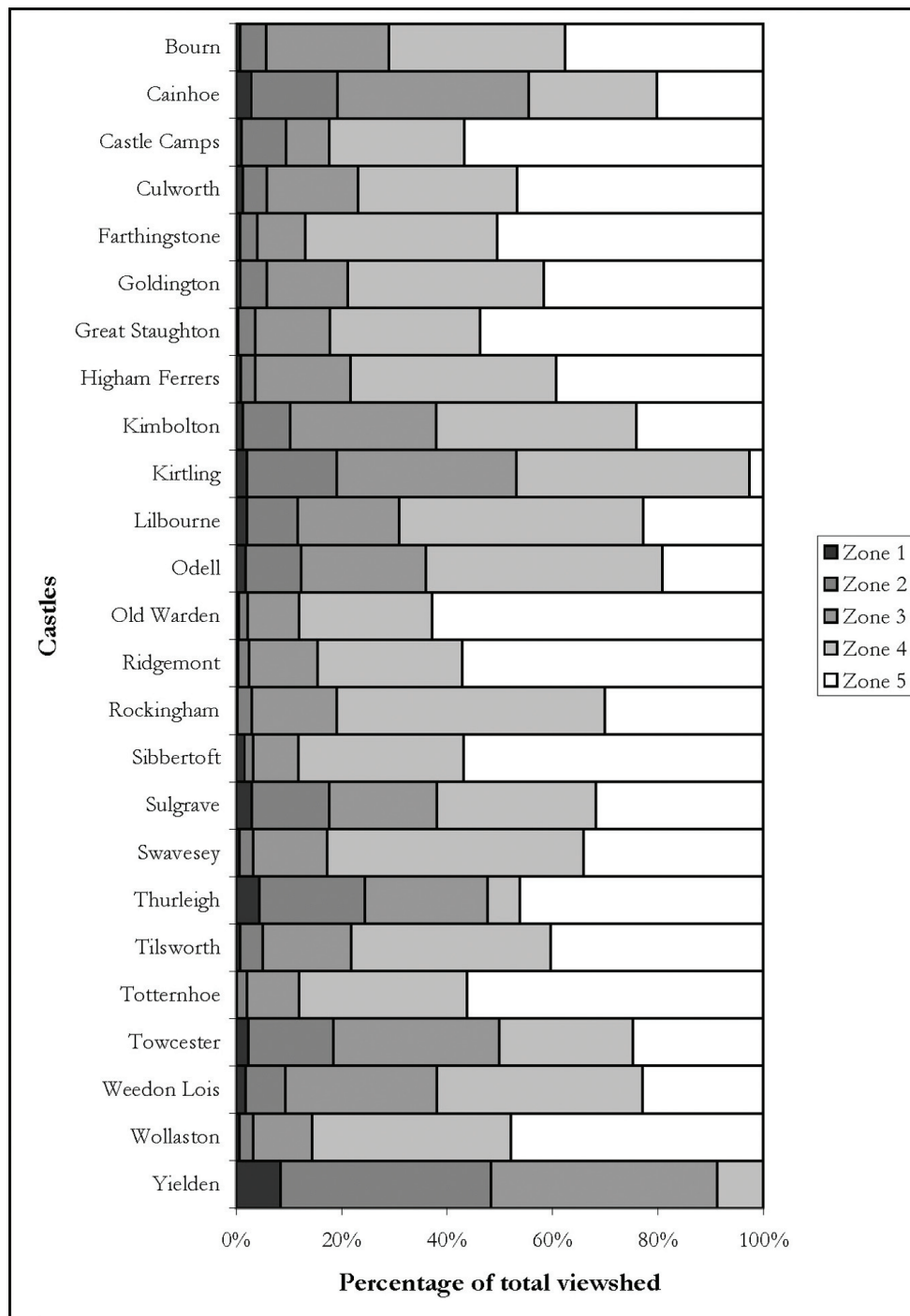


Figure 10. Percentage of total area visible from each castle in each of the five distance zones.

in their builders' holdings because everything within a 500 m radius was visible.

Table 7 indicates that only the king's castle at Towcester may have had an exceptionally good view of the landscape in its close vicinity, i.e., in distance zones 1 and 2. The two castles noted previously as having the largest overall binary viewsheds, Great Staughton and Totternhoe, had extremely extensive Zone 3 and 4 viewsheds, as did both of William Peverel's castles at Higham Ferrers and Tilsworth. Old Warden, Ridgemont, and Swavesey had exceptional Zone 4 and 5 views. Overall, there was a slight bias toward having unusually extensive views of areas farther away as opposed to close to the castle sites.

This characterization of the castles' viewsheds has significant ramifications. The fact that none of the sites had exceptionally good views of the landscape immediately adjacent to them suggests that a prime "military" concern, namely keeping an eye on the perimeter, may not have been high on every castle-builder's list of criteria. In some cases, the poor visibility of the area right next to the castle site may be the result of the resolution of the DEM on which the viewsheds are based or on the fact that only a single point was used to represent each castle and random sample. A prospective castellan and his men would doubtless have moved around an area they thought had potential, testing the view from various points within a small radius. The castle-

builder would also have been aware that, once he actually constructed his motte and bailey or ringwork on his chosen site, it would be possible to observe the surrounding landscape from a greater height, standing atop the castle ramparts or tower, thus improving the overall view. But even allowing for inaccuracies due to the relative simplicity of the digital model used, none of the castles seems exceptionally well-placed to keep their immediate environs under close surveillance. This is not to say that castellans or their lookouts could not keep watch over the lands just beyond their palisades, but rather that it is clear they could have chosen more amenable sites, had close perimeter surveillance been a top priority.

The results of the Monte Carlo tests lend credence to an interesting, alternative explanation. It may be that some castellans meant for their castles to be seen from afar. The viewsheds calculated for this study indicate that, sometimes, people in substantial portions of the countryside, lying well away from the castle itself, could see the fortifications. Indeed, the visual impact of castles at a considerable distance is an oft-repeated element of medieval literary descriptions of castles (Liddiard 2005:123-126). The castle site would be an easily discernable focal point in the landscape. Plastering, painting, or whitewashing the walls could

heighten the visual impact of a castle, as was famously done to William the Conqueror's White Tower in London. Castles were also, obviously, stationary. It is far easier to see a feature in the landscape that does not move, such as a castle, than one that does, e.g., ploughing peasants, travelers, or an oncoming hostile raiding party.

#### 4.4 Intervisibility of Castles

The final element of my discussion of castles' viewsheds is intervisibility; that is, whether other fortresses could be seen from any given castle. I have not conducted Monte Carlo tests in order to examine how the intervisibility of castle sites might have affected choices of castle location because of the difficulties surrounding the chronology of the castles' construction. Given the very tight time-frame of my study, certain knowledge of the specific order in which the castles in the region were built is unattainable, and so it is impossible to test whether a given castle or castles could be seen when a Norman lord was choosing where to establish another fort. It is, however, possible to examine the intervisibility of castles once the Conquest-period castellation of the southeastern Midlands was complete.

I calculated new viewsheds for all of the castles, setting both the observer's "eye" height and the target offset to 5 m, rather than the 2.75 m used in the forgoing analyses. Of course, the heights of walls and towers at individual castles doubtless varied somewhat, but since detailed information on the superstructures of the castles is lacking, it was necessary to use a uniform measurement. So, could the castellans of the southeastern Midlands, standing atop their castles' palisades or towers, see other castles? The answer is, by and large, no. Given that many castles were relatively widely dispersed across the landscape, this fact is perhaps not surprising. Of the total of 25 castles in the region, only two pairs of sites were intervisible—Kimbolton and Great Staughton in Huntingdonshire and Totternhoe and Tilsworth in Bedfordshire.

It is not clear why these two pairs of castles, out of all the fortifications in the region, should have been intervisible. The builders—William de Warenne and Eustace of Huntingdon and Walter the

Table 7. Results of Monte Carlo significance tests for castles' viewsheds, according to area (in km<sup>2</sup>) within distance bands in each viewshed. Highly significant values are printed in bold.

Name	Zone 1 p =	Zone 2 p =	Zone 3 p =	Zone 4 p =	Zone 5 p =
Bourn	0.875	0.645	0.27	0.653	0.737
Cainhoe	0.76	0.57	0.702	0.895	0.873
Castle Camps	0.67	0.127	0.713	0.47	0.24
Culworth	0.92	0.9	0.54	0.41	0.29
Farthingstone	0.62	0.58	0.34	0.12	0.17
Goldington	0.005*	0.315	0.325	0.325	0.487
Great Staughton	0.857	0.283	<b>0.033</b>	<b>0.087</b>	0.105
Higham Ferrers	0.235	0.665	<b>0.04</b>	<b>0.085</b>	0.245
Kimbolton	0.727	0.237	0.12	0.313	0.51
Kirtling	0.703	0.103	0.403	0.59	0.9
Lilbourne	0.01*	0.26	0.54	0.33	0.42
Odell	0.477	0.215	0.37	0.37	0.683
Old Warden	0.853	0.877	0.36	0.38	<b>0.07</b>
Ridgemont	0.945	0.698	0.108	0.128	<b>0.072</b>
Rockingham	1	0.94	0.457	0.227	0.41
Sibbertoft	0.93	0.99	0.88	0.53	0.25
Sulgrave	0.22	0.16	0.63	0.51	0.45
Swavesey	0.524	0.673	0.218	<b>0.071</b>	0.437
Thurleigh	0.723	0.633	0.857	0.923	0.633
Tilsworth	0.545	0.34	<b>0.065</b>	<b>0.09</b>	0.25
Totternhoe	0.997	0.335	<b>0.055</b>	<b>0.028</b>	<b>0.025</b>
Towcester	0.327	<b>0.09</b>	0.357	0.677	0.563
Weedon Lois	0.79	0.7	0.19	0.32	0.45
Wollaston	0.54	0.47	0.14	<b>0.02</b>	0.11
Yielden	0.585	0.44	0.86	0.97	0.905

Fleming and William Peverel, respectively—were not, so far as is known, hostile toward each other, but neither were they obviously close comrades (Lowerre 2005:28-33). So, having a rival's, or an ally's, castle under direct observation from one's own castle was not greatly significant to castle-builders in the southeastern Midlands. One potential explanation is that castle-builders wished to monopolize the view, that is, ensure that those living around their castles could see only their castles and not those built by others. In the end, it is clear that, whatever else the region's castle-builders wished to see from atop their own castles, it was not their neighbors' fortifications.

## 5 Conclusions

Three main themes emerge from my analysis of proximity to roads and rivers and the various permutations of viewsheds. First and foremost, assumptions about the ideal location for a castle made by what Stocker (1992) has called the "armchair-strategic view" do not stand up to scrutiny. There were, of course, cases where Norman lords did choose to build their fortresses close to roads or rivers, or on promontories that enjoyed wide vistas. But Conquest-era castles in the southeastern Midlands neither uniformly sat athwart strategic routes, nor were they uniformly placed to command panoramic views of the surrounding countryside.

Second, in those cases where a castle's site seems to fit the military-minded paradigm, one can put forward convincing, non-military arguments to explain the choice of location. Proximity to the region's main highways and waterways may have facilitated travel by the castle-builders themselves. And extensive viewsheds suggest that castles were meant to be seen from far and wide, as a means of advertising the social and political position and strength of their builders, rather than that their builders were fixated on the early detection of hostile forces.

Finally, analyzing castles' proximity together with their viewsheds suggests the trade-offs made when sites were chosen. Great Staughton, for example, had an exceptional viewshed and was unusually well-placed to see and be seen from one of the main routes across southern Huntingdonshire. The castle was not, however, particularly close to that road nor, indeed, to any other. Had Eustace the sheriff wanted to use his castle as a fortified checkpoint or tollbooth, he would doubtless have erected it closer to the highway than he did. But to do so would have sacrificed the wider visual impact of the castle for the sake of physical proximity to the road.

These results help demonstrate the give-and-take and balancing of circumstances and motivations that went into choosing a site for a castle in late-eleventh-century England. There are, of course, various ways in which the methods used could be refined, but I hope I have made clear how, using GIS, it is possible to tease from the evidence the thinking of individual castle-builders and see how different castellans, when faced with diverse situations, made diverse choices for the locations of their fortifications.

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