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## **BARKING ABBEY: A GIS MAP OF A MEDIEVAL NUNNERY<sup>1</sup>**

By Donna Alfano Bussell, English Department, University of Illinois Springfield & Joseph M. McNamara, Geographic Information Systems Laboratory, University of Illinois Springfield

### **Introduction**

When we created a GIS map of Barking Abbey<sup>2</sup> based on Sir Alfred Clapham's 1911 excavation and groundplan (WebMap at <http://bit.ly/VkgVOq>),<sup>3</sup> we had several purposes in

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<sup>1</sup> Donna Alfano Bussell would like to thank Dean James Ermatinger and the UIS College of Liberal Arts and Sciences for providing the support to attend the Introduction to GIS workshop at the UIS Geographic Systems Laboratory on November 4, 2011. She would also like to thank Dr. Yi-Sz Lin, Director of the UIS Geographic Systems Laboratory and Joseph M. McNamara, graduate assistant at the UIS GIS lab for their generosity and technical support throughout this project. Joe McNamara deserves special thanks for his patience, creativity, and willingness to find new ways to apply his knowledge.

Joe McNamara would like to thank the University of Illinois Springfield, the Department of Environmental Studies, and the Geographic Information Systems Laboratory for appointment to his assistantship and support for research and graduate study. He would also like to thank Dr. Yi-Sz Lin, for his countless hours of mentoring and instruction and Dr. Donna Bussell, for presenting a unique opportunity to participate in a cross-disciplinary project.

<sup>2</sup> The abbey underwent several building programs and expansions beginning in the twelfth century. It remained one of the most prestigious and active nunneries in England until its dissolution (Bussell 2012).

<sup>3</sup> See also the *Victoria County History for Essex* (1966). Stable link for WebMap at: <http://univofillinois.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=cbd139329c9e43fbaf4c87d1a3580922>

mind for this project: first, to make the Barking Abbey map and associated images and map layers available for personal, non-commercial use in research and teaching; second, to propose research questions that could be addressed by using this or similar maps; and third to present our project's methodology to humanists who, like one of the authors (Bussell), may be intrigued by the possibilities of using GIS, but are unsure of how to begin a conversation with fellow scholars and GIS specialists.

This project began with questions specific to Bussell's research interests: Could we define coordinates for the historical Barking Abbey (of the twelfth-to-fifteenth century) on the site of its ruins, which are on the grounds of the Barking Abbey green-space in East London? Could we recreate a firmly anchored position for the historical abbey including an outline of the surrounding compound and the interior as well as exterior parameters of the main church?

These research questions appealed to McNamara as they provided an opportunity to use GIS in a cross-disciplinary study that would map a medieval structure and its immediate surroundings on the basis of an early twentieth-century illustration (Clapham's groundplan). The resulting map layers could become the basis for further two and three-dimensional studies of this space, and the process of inquiry would highlight the flexibility of problem-based methods for new applications of GIS skills and concepts.

## **Why Barking Abbey?**

Clapham's groundplan (Clapham 1913) is well known to scholars of Barking Abbey. This detailed illustration makes an excellent starting point for this study because of Clapham's meticulous attention to detail and the accuracy of his drawing.

The original abbey was founded in Anglo-Saxon England in c. 666 in Essex (near the church's ruins in East London). Barking was a royal foundation originally established as a double monastery (i.e., as a house of monks and nuns) by Erkenwald (bishop of London 675-693) for his sister Ethelburg (d. 686/688), a nun who was the first of the abbey's illustrious abbesses. Barking was destroyed in the Viking invasions of the ninth century and re-established as a nunnery in the tenth century (probably at a site near the original foundation) and remained a female monastic community connected to the ambitious literary cultures of London and East Anglia until its closure in 1539 during the dissolution of the monasteries under Henry VIII.<sup>4</sup>

The abbey's wealth placed it among the "big five" women's communities in England during the late Middle Ages.<sup>5</sup> It is an important site for understanding women's roles as patrons, writers, and leaders in religious communities. Barking and other prominent women's houses used their own building programs and property improvements to enhance the quality of their material and spiritual lives and to advance their status among their peer institutions. Because of the massive destruction of monastic houses during dissolution, however, scholars of insular religious life have much less material evidence available to them than they otherwise might have had. Today only the barest outlines of Barking Abbey (as it existed between the twelfth and

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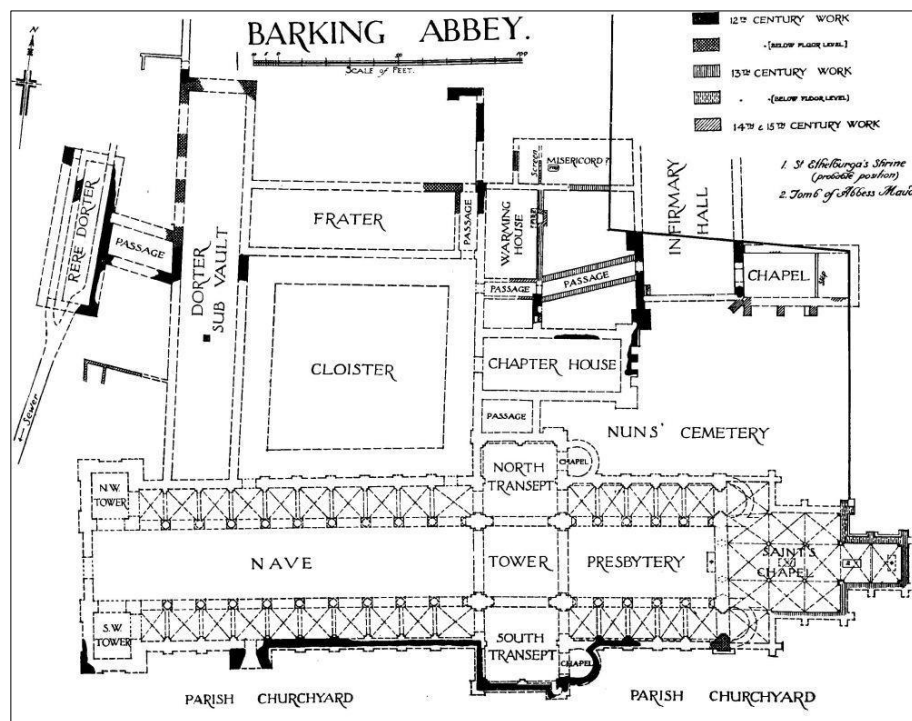
<sup>4</sup> Studies are too numerous to cite here but notable assessments of the material culture of the lives of women religious and the conditions of book production and circulation among women's communities in East Anglia include Doyle (1958), Wogan-Browne (2001), Gilchrist and Oliva (1993), Erler (2006), Russell (2003), and Blanton (2007, especially 173–227).

<sup>5</sup> David N. Bell's term for the five insular nunneries with an annual income of over £500. These five comprise 4% of the 132 houses assessed c. 1535; see *What Nuns Read* (1995) pp. 10–11. It was the third richest house at the time of the Domesday survey (c. 1086). Its abbesses held the rank of baron from the conquest onward.

fifteenth centuries) can be seen in its ruins.<sup>6</sup> Yet physical signs of the community's importance are still visible in the remains on the Barking Green in East London.<sup>7</sup>

## Research Potential

Before discussing methodology, we would like to address a basic question: Why create a GIS map of Barking Abbey, especially when Clapham's groundplan is quite accurate and remains an indispensable resource for teaching and research?



**Figure 1** A.W. Clapham, Groundplan of Barking Abbey.

<sup>6</sup> First excavated in 1911. See A. W. Clapham, "The Benedictine Abbey of Barking," *Essex Archaeological Transactions* 12 (1911), 69–87.

<sup>7</sup> See Roberta Gilchrist's pioneering study of the archaeological evidence, which outlines various expansions of the abbey: *Gender and Material Culture*, pp. 30, 66, 88–9, 97–99, and 113–43. See also L. M. C. Weston's perceptive analysis of the documentary and archaeological evidence, "The Saintly Female Body and the Landscape of Foundation in Anglo-Saxon Barking," *Medieval Feminist Forum* 43 (2007), 12–25 (pp. 14–18).

One of the primary reasons is that maps and illustrations provide different kinds of information. First, there is a question of preserving a sense of the abbey's physical presence. As a survey of historical satellite imagery and the record of illustration indicate, time continues to exact its toll on the site. Beyond this, a GIS map gives us an immediate sense of the abbey's footprint because it displays the outline of the abbey and its environs in relation to modern structures and landmarks (such as warehouses and roadways). As our GIS map demonstrates (figures below), the abbey church and surrounding grounds would still be considered quite large even by modern senses of the dimensions of modern buildings. It would have been an even more impressive structure in the high and late Middle Ages, especially if one considers the surrounding estates and properties.<sup>8</sup> One research opportunity would be to expand the map, or create a (speculative) model based on the map, to show these properties. Such modeling might support investigations of the economic, environmental, and political impact of the abbey or generate new questions about the management challenges faced by its abbesses.

Other research topics that could possibly be addressed through this and similar maps are those concerned with the relationships between the abbey and its neighbors. One can get a sense of the abbey's distance from other important contemporary sites or markers (e.g. St. Margaret's, a nearby church built in the twelfth-century). By creating additional layers to the map, one might display routes for processions to a variety of locations such as the church cemeteries and neighboring churches or other sites. From this, we may get further insight into how the women of this community related to their parish neighbors and how this activity compares to women's communities in a larger regional (East Anglian) context. Kay Slocum has already taken a step in

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<sup>8</sup> Brown and Bussell (2012) pp. 10-11, n.37.

this direction by examining the distance and details of the nuns' processions and visits to its neighboring churches.<sup>9</sup>

Another set of questions may involve the use of the spaces of the church, cloister, and graveyards during important celebrations (e.g. Easter, feast days of its founding abbesses) attested to in liturgical documents, administrative texts, and narratives associated with the abbey. The state of the abbey's ruins can make it difficult to appreciate how integral the physical site was to the nuns' creative engagement with the texts and practices of their religious life. The Barking ordinal, for example, contains information on orientation and movement of people and objects in the church. There were processions through the church and its surrounding complex, and between the church and other sites. Our GIS map can be used or modified to display these procession routes. By doing so, we may be able to get more perspective on nuns' conceptions of themselves. We could, for example, enhance the study of Barking's late-medieval Paschal Celebration, which was significantly revised by Barking Abbey's nuns and designed for the space of the church outlined in our map.<sup>10</sup> Likewise, we could learn something more about the actions depicted in the legends of the founding abbesses and their translations to new tombs in the church as commemorated by the Flemish monk Goscelin during twelfth-century. (The foundresses's legends were commissioned by Ælgifu [Ælfgiva], the eleventh-century abbess of Barking (c. 1066–c.1086) as part of an extensive building program.) Even imaginary processions could be usefully represented. For example, in Goscelin's legends one of the celebrated (and long dead) foundresses moves her tomb to its destined place under her own initiative, taking

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<sup>9</sup> "Tracing Sacred Pathways: Processions as Barking Abbey" Session: Digitizing Sacred Space: Barking Abbey, Forty-Eighth International Congress on Medieval Studies, Western Michigan University, May 12, 2013.

<sup>10</sup> On the Barking nuns' innovations in liturgy and liturgical drama and other rituals, see Slocum (2012), Stevenson (2012), and Yardley (2006, 2012).

herself away from a workman she considered unworthy for the task. The mapping of narrated movements in the physical space is not as whimsical as it may sound. The visionary choices of the dead and their translation in the church space say much about the spiritual, social, and economic goals of the living (which are at least partly pursued through a building program).<sup>11</sup> The case of the abbess Ælgifu makes the point. She had the task of repositioning the abbey for a post-conquest Norman episcopacy that may have been suspicious of Barking's Anglo-Saxon heritage and was certainly doubtful about the veracity of women's narratives.

Finally, it is possible that additional two-dimensional or even three-dimensional visualization could be undertaken using the Barking GIS map. For example, changes in the building structure or interior features over time could be delineated. So could the placement of the natural resources (e.g., waterways and roadways) central to the abbey's economy and relationships to its neighbors.<sup>12</sup> Another project that comes to mind is the inclusion of "text" or "illustration" bubbles within the map (or map layers) that contain information about the space available in various documents and literature.<sup>13</sup> Additionally, it may be possible to use map information as a basis for creating three-dimensional visualizations of the internal or external spaces using programs such as Google Sketchup or AutoCAD.<sup>14</sup> This would give a sense of the subjective experience of being in or moving through the spaces depicted.

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<sup>11</sup> Slocum (2012), pp. 110-113, 118-122.

<sup>12</sup> Complementing studies such as Gilchrist's (1997, 2005).

<sup>13</sup> Staley (2006), especially pp. 39-42.

<sup>14</sup> Visualizing the past has become much more integrated in scholarship and teaching because of tools like Google Sketchup, the basics of which can be learned in a matter of hours. Bussell has had first-year students use Sketchup for final projects in her first year seminar. Detailed examples of the more advanced projects can be viewed in the 3-D Warehouse at Sketchup: <http://sketchup.google.com>. This and other tools can also be used to explore interiors and textures, for example, as these are being discussed at BlenderArtist.org for buildings in a medieval market scene: <http://blenderartists.org/forum/showthread.php?249812-Medieval-Market-Scene/page3>



For such research purposes, a full archeological survey is not needed. Rather, a georectified map, which involves importing historical satellite imagery from Google Earth into ArcGIS10, serves very well. In this process, Clapham's groundplan is aligned with the ruins on the Barking Green. This map can provide a foundational tool for considering these and other questions about the abbey's physical plant and the use of its diverse spaces. We hope this project will provide a modest starting point for interdisciplinary conversations about the history of the Barking abbey community and the concepts of space that were important to it. Such conversations are already well underway in more comprehensive projects such as, [\*Mapping Medieval Chester\*](#), [\*The Map of Early Modern London\*](#), [\*Mapping the Medieval Urban Landscape\*](#) and [\*Mapping the Medieval\*](#). In terms of our methodology, we are participating in the larger scholarly project of developing spatial databases in GIS for a range of historical sites.<sup>15</sup> The focus of our map, however, is purposefully narrow in scope. We wanted to create the basic mapping data for study of a women's monastic community that has been largely destroyed, and to do so using the resources available at a small public liberal arts university (which did not allow for on-site surveys).

## Methodology

The process we used to create the Barking Abbey GIS map is well known among those who use ArcGIS10 software, and there are many resources available for learning it.<sup>16</sup>

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<sup>15</sup> cf. the process description for *Mapping the Medieval Urban Landscape*:  
[http://www.qub.ac.uk/urban\\_mapping/images/flowchart.gif](http://www.qub.ac.uk/urban_mapping/images/flowchart.gif)

<sup>16</sup> A comprehensive explanation of editing (digitizing) features in Arc10 can be found in ESRI's ArcGIS Resource Center for Desktop 10):  
[http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/What\\_is\\_editing/001t00000001000000/](http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/What_is_editing/001t00000001000000/)  
[On the same site, see the information on](#) KML to Layer Conversion (folder tree with the "Shapefile Toolset" for conversion to .shp):  
<http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/001200000004w0000000> [For the](#) information on

Nonetheless, as Bussell has learned from several conference talks on the Barking Abbey GIS map, there is still wide variance in the knowledge of this technology among humanists. It can be a mystifying process initially for scholars who do not have the experiences, resources, or institutional contacts to pursue GIS map creation and file conversion very easily on their own. In this section, we provide a transparent account of the production of the Barking Abbey GIS Map and, by doing so, aim to make the process accessible to graduate students or scholars in the humanities who want to use or add to this map or who are beginning to work with specialists in GIS on their own mapping projects.

It is important to start with the best satellite imagery available for the site. This may not be the most recent imagery or that available in the Basemaps for ArcGIS10. Working with the archaeological remains on the Barking green (**Figure 2**), our first step was to obtain the optimized satellite imagery. We needed this to identify the abbey's historic location as accurately as possible and select control points (i.e. location referents on the ground) to georectify the satellite images with Clapham's map. We completed this step in Google Earth by aligning remnant ruins of the abbey visible on satellite images to Clapham's map. Georectification is often performed using other suites of GIS software such as ESRI's ArcGIS; however, we found that the most current satellite image provided by the Bing Maps Basemap in ArcGIS10 was not ideal for visualizing the ruins on the ground. Google Earth, in contrast, provides a "Historical Imagery" tool, which allowed us to isolate past images which best distinguish the outlines of the medieval structure and to perform an image overlay alignment. The image which best displayed the Barking Abbey ruins was taken on 31 December 2005, and provided the perfect display of

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image overlay functionality (georeferencing our image) in Google Earth, see:  
<http://geochalkboard.wordpress.com/2007/08/02/using-the-image-overlay-tool-in-google-earth/>

on-ground features due to the time of day the image was captured, sun angle, seasonality, vegetation structure, and contrast between sunlight and shadows.

## Comparison Between Satellite Imagery Used for the Overlay



Google Earth 'Historical Image'  
taken 12/31/2005

BingMaps Online Basemap Image  
Available in ArcGIS10

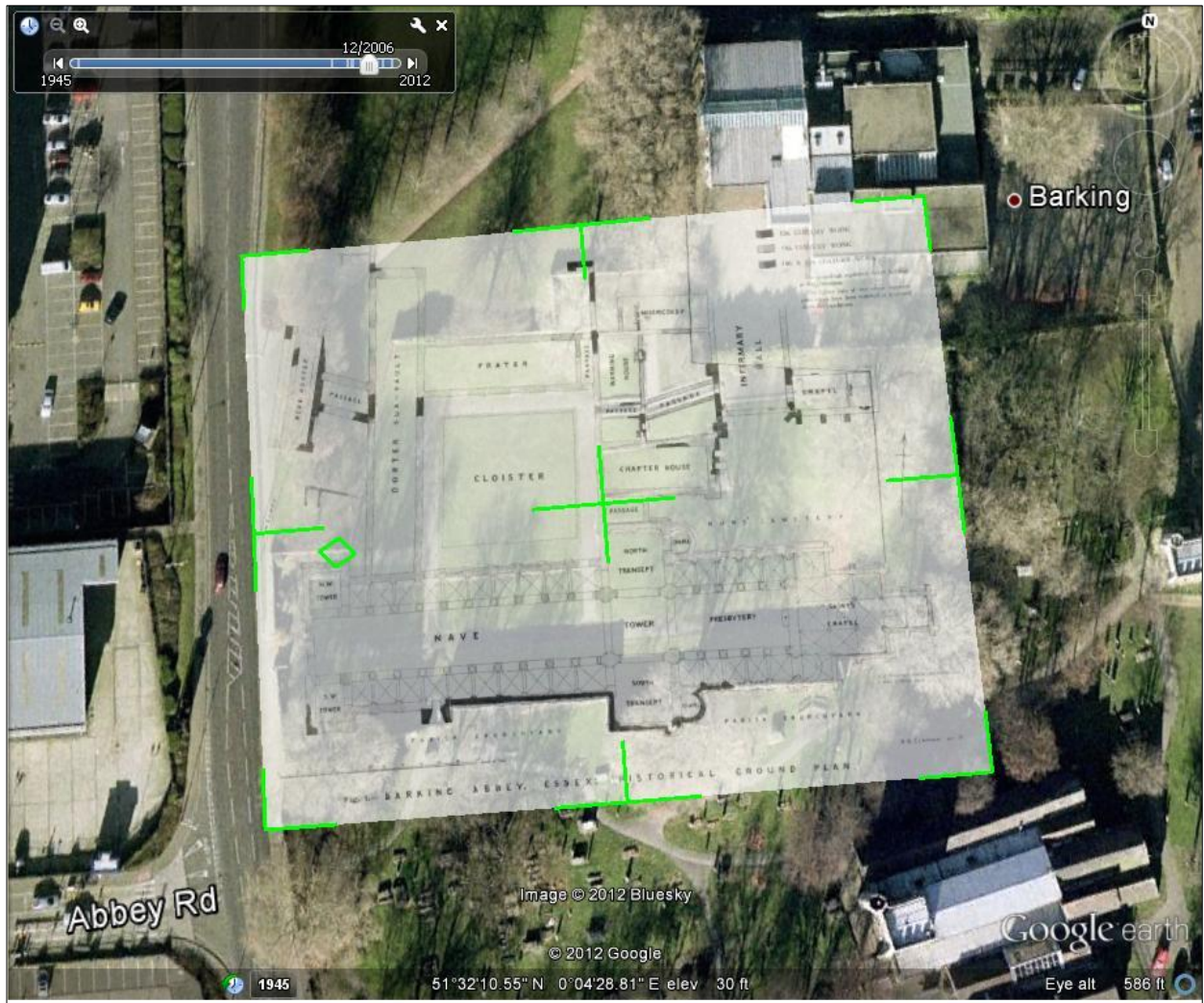
**Figure 2** Showing the difference between satellite images used to locate the Barking ruins on the ground. The Google Earth “Historical Image” from 12/31/2005 is shown left; BingMaps Online Basemap Image in ArcMap is shown on the right.

This optimized satellite image provided a necessary base for overlaying Clapham’s groundplan.

**(Figure 3)** After the overlay was performed, a polygon of the full extent of the historic abbey grounds was digitized in Google Earth.<sup>17</sup> Polygons representing other structures were also drawn using Google Earth, adding abbey buildings (e.g. the Chapter House, Infirmary, Warming House), polygons representing the abbey church and areas within

<sup>17</sup> The overlay and polygons are drawn in (tracing or outlining the various building shapes and space markers) using the tools in Google Earth. For additional information, refer to the resources given in n.15.





**Figure 3** Showing the image overlay process in Google Earth using Clapham's survey image from 1913 on a satellite image from 12/31/2005.

the abbey church (e.g. the Nave, Presbytery, and Saint's Chapel), and other areas within the historic abbey grounds (e.g. Nuns' Cemetery, Dormer Sub-Vault, Cloister) as referenced in Clapham's groundplan.

After a total of 26 different polygons (**Figure 4**, representing internal and external structures as shown on Clapham's groundplan) were digitized, we saved *each* polygon as a .kml



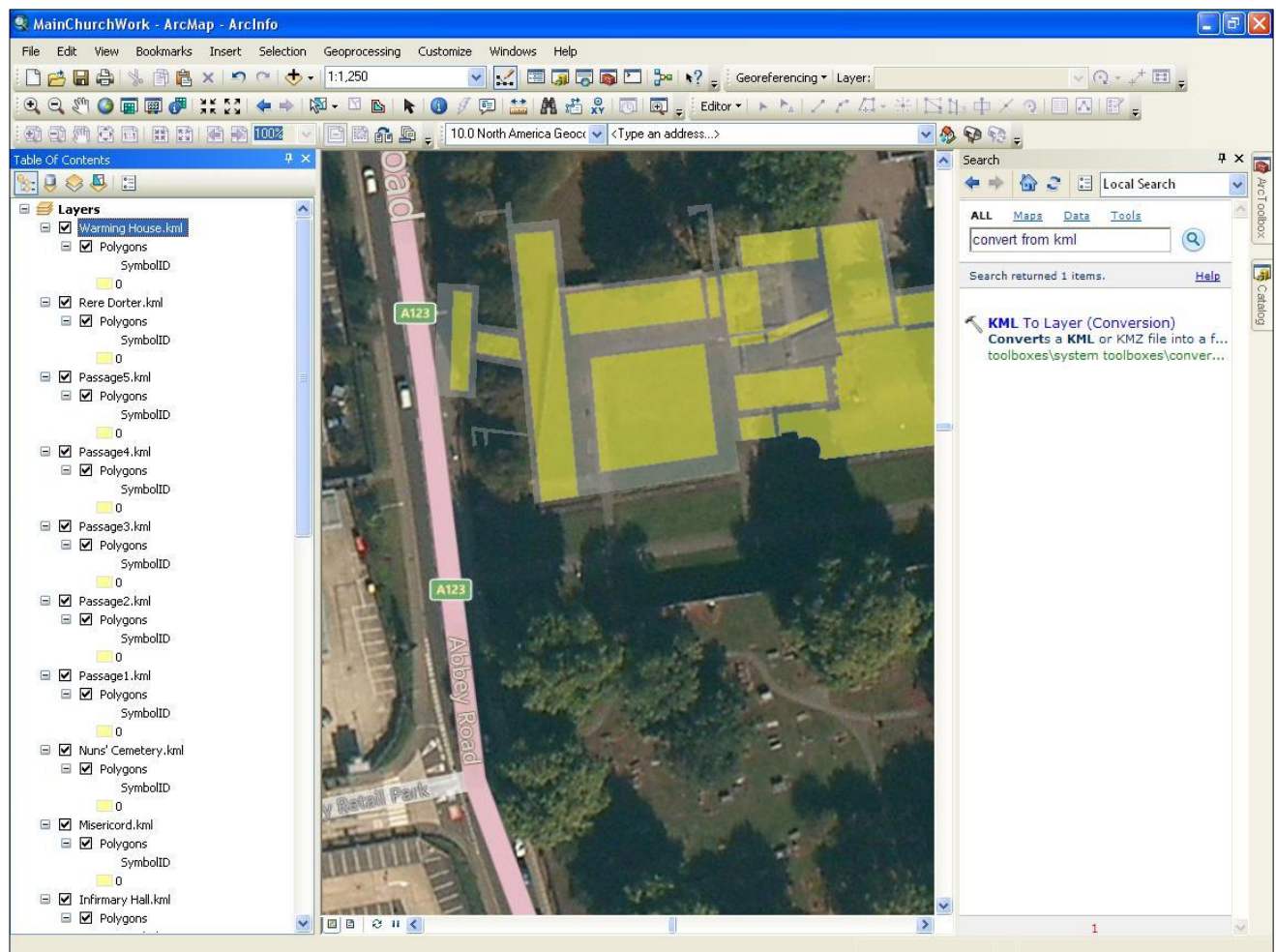
**Figure 4** Digitizing polygons of the internal Abbey church structures using the Clapham image as a reference

(Google Earth file type) and then converted these files for usage in ArcGIS using the “KML to layer” conversion tool in ArcToolbox.<sup>19</sup> **(Figure 4)** It’s important to note that the file conversion from .kml in ArcGIS was not robust. Conversion from .kml files in ArcMap produces place-mark file types for each item, created within its own geodatabase (.gdb) and accompanied by a layer (.lyr) file. For ease, compatibility, and organizational purposes, we exported each polygon out of this format to .shp (shapefile) formats into new organized geodatabases representing the

<sup>19</sup> For the conversion, go to the Arc Tool Box, choose Conversion Tool, choose KML to Layer Conversion. We recommend converting one polygon at a time.



abbey church and the rest of the abbey grounds; we then used the ‘merge’ tool in ArcMap to create two new comprehensive shapefile layers for the two collections of polygons (the abbey church and the rest of the abbey grounds).



**Figure 4** Showing the conversion from “KML to Layer” in ArcMap.

One other issue emerged with the conversion from .kml to .shp file types; after the polygons were converted and displayed in .shp file type, map output files failed to draw. This was due to the different file formats and topology between ArcGIS and Google Earth (in which the polygons were originally digitized in). This means that the polygons of the church and other buildings

produced in .kml (in Google Earth and successfully displayed in ArcMap after file conversion) still had to be redrawn in ArcMap to produce sharable maps of the final product. (**Figure 5**)



**Figure 5** Final Barking Abbey, Essex, GIS Georeferenced Ground Plan

Despite the difficulties with conversion into ArcGIS, Google Earth's "Historical Imagery" feature provided a key advantage in this process given the state of the ruins for the church and the surrounding complex. We were fortunate that Clapham's rendering was detailed and accurate. This made the task much faster and less labor (and cost) intensive than it would have been otherwise.

Nonetheless it would still be possible to complete the georeferencing with poorer quality images and on-ground surveys. The main limitation would be the availability of site-specific

points of interest or location referents, as they may not always be visible or easily located using satellite imagery; in this case, our points of interest (the ruins) were easy to locate and align with Clapham's on-ground survey. This issue may be alleviated by conducting an on-ground survey with a GPS device (when possible). We were again fortunate that multiple high-quality images of this area (taken within the last five-to-ten years) were available. Some locales have superior chronological coverage more publically available than others; having multiple quality images to choose from allows for more accurate geo-referencing.

## **Conclusion: Getting Started with Mapping**

For those who are relatively new to the use of GIS and other mapping technologies, and whose access to these resources may be limited, it may be useful to focus on the problem of data-gathering first.<sup>21</sup> As Louis Hamilton's work on the "Medieval Mediterranean" demonstrates, there are many resources for mapping or expanding maps and making them accessible.<sup>22</sup> Of these options, GIS has advantages for incorporating good deal of sharable data into maps.

The best way to begin may be to engage in a collaborative problem-solving approach with those who have expertise in the software and its applications. This allows one to take full account of the goals, skills, experiences and perspectives of all those involved. The first task in this collaborative approach is to articulate questions that the data could address, even if the data

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<sup>21</sup> A good introduction to GIS and GIS tutorials can be found at: <http://hcl.harvard.edu/libraries/maps/gis/tutorials.html>. On the value of digital mapping in the humanities, especially for history and literary study, see Kelsey Brannen's blog post "Enhancing Teaching and Learning Practices with Digital Mapping Approaches" (HASTAC, 11/9/2011; <http://hastac.org/blogs/kelseybrannan/2011/11/09/enhancing-teaching-and-learning-practices-digital-mapping-approache-0>) and the HASTAC Scholar's Program blog post "Visualizing Geography: Maps, Place, and Pedagogy" (HASTAC 3/11/2013; <http://hastac.org/forums/visualizing-geography-maps-place-and-pedagogy>)

<sup>22</sup> <http://users.drew.edu/lhamilto/cincproject/Method4Map.html>



for digitizing a structure or spatial representation does not yet exist or is only partly extant. Sometimes these questions may require novel uses of a technology and a creative synthesis of tools that have been used for other purposes. We hope this study provides additional information for such discussions as well as material for the study of Barking Abbey and other spaces of religious life and devotional practice.

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### **Abstract**

We outline the methods that we used to create a GIS-based map of Barking Abbey, a British nunnery founded c. 666 and razed in 1539. This article includes images of a GIS map based on Sir Alfred Clapham's 1911 groundplan of the abbey (and the map layers) as well as a link to a WebMap. We hope the map and methods discussion will be useful to humanists who are relatively new to the value of GIS (and the use of Google Earth in georectification) for studying devotional practice, liturgical performance, and the conceptualization of physical space in religious life. We also suggest how this map may be used for further research on Barking Abbey and the implications of mapping for other sites with scant physical remains for which a full archeological survey may not be feasible.

### **Key Words**

Barking Abbey, GIS map, ArcGIS, Sir Alfred Clapham, groundplan, Google Earth