A Digital Look Back

Texas Historic Overlay Project Helps TxDOT Build for the Future

BY TY SUMMERVILLE

Imagine the swath of right of way that Texas cowboys needed in 1866 to herd more than 260,000 cattle to Kansas railheads in just one year. The drives often began in south Texas, moved steadily through the rolling hill country of Austin, up through Waco and finally to Fort Worth before heading into Indian Territory, known today as Oklahoma.

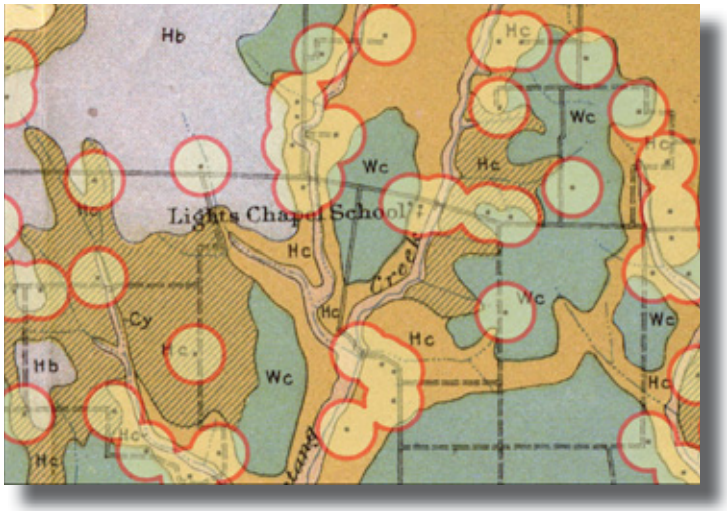
These cattle routes are best depicted on historic route and property maps produced in the late 1800s, many of which are maintained by organizations such as the Museum of South Texas History and the Texas State Library and Archives Commission. For the Texas Department of Transportation (TxDOT), these kinds of maps provide more than just a fascinating footnote about Texas history. They are, in fact, an integral part of the day-to-day planning, design and construction of the nation's largest state highway system.

Cultural Resource Management

In years past, the TxDOT handled historic research on a project-by-project basis, which was costly and time consuming. In 2005, the TxDOT Environmental Affairs Division looked to improve the efficiency and accuracy of the cultural research effort. Cultural resource management is an essential part of the agency's quest to honor the state's cultural and archaeological resources. Today, the Texas Historic Overlay plays a vital role in TxDOT's efforts to preserve and protect valuable resources along its almost 80,000 miles of state highways, while securing right of way for highway widenings and new alignments.

Teaming with PBS&J, TxDOT began development of the Texas Historic Overlay project, the first ever GIS-based statewide historic map inventory developed for transportation-related cultural resource management. The database stores thousands of historical maps, many of which may be useful for identifying cultural resources that may be affected by highway construction and operation. Each map is geo-referenced to a common coordinate system, available as part of TxDOT's existing statewide GIS and made available to their archeologists, historians, and other professionals for use in planning highway construction and improvement projects.

Historic High Probability Areas



High probability areas are shown as red buffers around structures identified on a 1918 soils map. The calculated horizontal positional accuracy of the geo-referenced map is used to determine buffer distance.

Finding a Common Datum

The Texas Historic Overlay project began with an effort to gather out-of-print historic maps – created between 1722 and 1988 – with significant cultural detail. The effort focused on the eastern half of Texas, which is comprised of 62 counties covering 145,000 square miles. In total, this included over 3,000 historic maps. Over the course of two years, the Texas Historic Overlay team solicited information from 162 libraries, museums and repositories. Once gathered, the team scanned, digitized and geo-referenced each map into a single system.

The greatest technical challenge of this multi-year effort was geo-referencing the multiple coordinate systems, many of which predate the North American Datum of 1927, to a modern coordinate system. Due to the age of most of the source maps and variations in spatial referencing information available, map experts developed a variable approach to geo-referencing the selected source maps. PBS&J developed customized datum transformations to translate the historic maps in which the source map images were transformed into a common coordinate system using an appropriate vector registration overlay. The most accurate vector registration overlay, if available, was a series of coordinate grid lines that replicate the coordinate grid used on a source map.

Completed in early 2007, the Texas Historical Overlay information has been integrated into TxDOT's existing statewide GIS. It is available to TxDOT and approved consultants for use in developing historic trends in land use, development and vegetation, and to manage the state's cultural resources while planning state road and highway projects.

Historic Routes, New Roads

In the last year, TxDOT engineers, planners and consultants have had an opportunity to put the Texas Historic Overlay to the test in a variety of projects ranging from road widening to new highway construction.

Eugene Foster, a Senior Scientist at PBS&J and Project Manager for the Texas Historic Overlay effort noted, "Just about every project we do for TxDOT includes use of the Texas Historic Overlay in the early stages to identify likely locations for resources that once existed in the landscape. We typically use that information early on to compare and refine project alternatives."

The data is also used to develop survey scopes and budgets and helps guide the historians and archeologists in their field surveys and right of way acquisitions. A prime example is the new location Loop 9 facility around Dallas, Texas. The planning team overlaid several historic topographic maps, including early 20th century Trinity River Levee District maps from the Texas Historic Overlay, on top of the proposed project alternatives within the GIS. Using this method, the historians recommended to the project planners that one alternative should be dropped or revised because it presented a high level of risk for impacts to historic properties and other types of resources.

Foster remarked, "We've saved the project planners countless hours on projects just like this because of the Texas Historic Overlay. For our own technical studies, we also improve our initial predictions, speed up our field investigations, and ultimately provide assessments that are more accurate and complete than ever before."

A historic map from 1943 was merged with a 1996 aerial photo to show the shoreline change along the Gulf Coast.

On another project, PBS&J was contracted to assess the cultural resources, namely the possible presence of unmarked graves, in the area surrounding a proposed bridge on State Highway 130 over State Highway 71 near Austin. Planners needed to survey about 15.7 acres of land located adjacent to the proposed bridge site. The team pulled area maps from the Texas Historic Overlay to locate cemeteries, and then overlaid remote-sensing data gathered at the site in an effort to find unmarked graves. While no unmarked graves were located, the team was able to clearly identify the old SH71 alignment, as well as some potential historic sites. The entire site analysis took just three days.

Many Applications

Numerous historians and archaeologists have used the Texas Historic Overlay map collection to similar advantage for other clients as well. One of the most visible examples of this is the redevelopment project in downtown San Antonio, which was designed to restore the historic Main Plaza located about a mile from the famed Alamo, into a pedestrian-friendly plaza for the millions of annual visitors and residents. The Main Plaza links the historic San Fernando Cathedral to the Plaza and the nearby San Antonio River. The Texas Historic Overlay geographic database was used to identify and avoid sensitive archaeological and cultural resource sites during construction activities, as mandated by the Antiquities Code of Texas.

The Texas Historic Overlay project has yielded enormous benefits, saving time and money while preserving important cultural and archaeological resources. Although some maps are restricted as a result of agreements between TxDOT and the individual libraries and repositories that own the paper copies, the rest of the maps are available to the public through the Texas Natural Resource Information System website at www.tnris.org. ✪