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**2006 ESRI User Conference Paper Presentation:
Tale of Two Missouri Municipal GIS, Branson and Cape Girardeau**

Introductions of Speakers

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Background

A Short History of Branson GIS

The City of Branson GIS Division began in 1994. The City of Branson used Mac-base MapGraphix for a very short time before quickly converting to the ESRI line of product software. The City Engineer had the foresight to begin requesting that mapping and plans be submitted in digital format in the early 1990's. The first digital, geospatial datasets were planimetric and topographic vectors within the city limits area at that time. These coverages were developed by an outside engineering firm for a sewer and water master plan.

In 1996, the City of Branson acquired ArcInfo workstation, and a digitizing table, and began creating a property parcel base map by digitizing County Tax maps. ArcView was utilized mainly for analysis of the data, and to create map layouts. By doing so, the small GIS Division was able to do a few simple mapping applications to illustrate the power of GIS to the City Council and other decision makers to gain political and financial support for the GIS program. Some examples of these applications include tracking the city limits, voting districts and zoning districts.

In 1997, the GIS Division acquired a "GIS-grade" GPS unit to begin field collection of the City's infrastructure. With the support of City Council, the GIS Division was able to acquire new, digital orthophotography, planimetric, and 2-foot contour data in an ArcInfo coverage format.

Late in 1999, the City and County entered into a Memorandum of Agreement to jointly develop a County-wide seamless, digital parcel basemap. This effort led to the development of data sharing agreements between the City, County and other local, State, and even Federal government organizations.

In 2000, the GIS Division began to migrate all spatial datasets from ArcInfo coverage and shapefile format to a Geodatabase format. Branson GIS is currently investigating the possibilities of working with ArcSDE.

In 2001, the City acquired a Lieca GS 50, GPS with radio capability and real-time differential correction as an upgrade from our previous GPS unit. The Lieca provided the ability to not only collect field data in shapefile format, but edit the shapefiles in the field as well. This GPS unit is still utilized to collect City infrastructure features for manipulation and analysis in a Geodatabase.

In 2004, an attempt to give both internal and public access to the City's GIS data, and to utilize the spatial data, the City created an ArcIMS website with the majority of the information available in the GIS. (Insert website URL?)

The GIS Division has also established specifications for electronic submittals of site plans, subdivision plats, and engineering designs, and actually requires electronic submittals of these documents if the submitting entity has the capability and the technology available to them. The specifics include what coordinate system the data should be in, as well as the acceptable data file types. By having these specifications in place, it assists the GIS Division in maintaining and keeping spatial data features current.

The City of Branson, GIS Division attempts to have an updated digital orthophotography update along with planimetric and topographic updates as well, at least every 3 years. For the past 15 years, Branson has been experiencing tremendous growth and development, which requires frequent updates of orthophotography.

The City of Branson GIS Division is a part of the Engineering Department, and serves as a "centralized" GIS. The GIS Division takes direct requests from all City Departments as well as outside entities for maps and geospatial-related projects. For the most part, spatial data maintenance for all Departments is handled in the GIS Division, other than zoning and address changes (managed by the Planning Department) and health code enforcement (managed by the Health Department).

Within the last 5 years the City of Branson GIS program has experienced continued development and expansion. A wide variety of applications have been developed including street infrastructure maintenance, GASB-34 government asset management, economic development, environmental studies, emergency dispatch, etc.

Branson has a much smaller resident population than Cape, but is a tourist destination with several million visitors each year. Branson has excellent funding available for technology and applies these resources for the construction of roads and infrastructure to handle such large numbers of visitors. GIS is used heavily for economic and land development. GIS is used heavily at Branson for traffic studies, real estate inquiries, business ventures, and accurate travel maps directed at visitor awareness.

A Short History of Cape Girardeau GIS

Cape Girardeau GIS began in 1989 when the City Planner convinced the City Manager and the City Council to launch a \$190,000 topographic mapping project. Two foot contours and planimetric information were gathered. The deliverables included a grid of 64 contour files. It took two years to receive this data. Our first technician's (1991-1993) main duties consisted of making maps and extracting data from the resulting 64 grids of contours and planimetric data. The next technician (1993-1996) largely spent his time "heads up" digitizing 15,000 parcels and sketching out the sanitary sewer system. Today, the parcel set has been totally replaced as a result of the County of Cape Girardeau going from paper to digital. The sewer system created during this time has

been gone over with a fine tooth comb which involved researching plans and GPS work in order to add attribute data and correct facility location to sub-meter accuracy. The next technician (1996-1998), unfortunately, did not make much headway with the GIS. When I began at the end of 1998, the metadata was non-existent and much of the coverage and shapefile data was in disarray as well as being stored on one machine (200 MHz) that wasn't even backed up! This was about the time I met Curtis at the 1999 Missouri GIS conference.

The City of Cape Girardeau used PC Arc/Info until 1998 when it purchased Arc/Info 7.x and ArcView GIS 3.x. Arc/Info 7.x was used to edit coverages and ArcView 3.x was used to create maps. Coverages were placed on the City's "intranet" and accessed by users who were trained to use ArcExplorer. In 2001 the GIS Program upgraded to Arc/Info ArcGIS 8.1. Since 2003, the City has been adding copies of ArcView concurrent use. The GIS Program now has 5 copies of concurrent use ArcView GIS 9.1. There are now 42 GIS Users of ArcExplorer and ArcView. Users generally start off in ArcExplorer. They take the first steps and then begin to see the usefulness of GIS and want to do more. Most beginners end up graduating to ArcView or not using GIS at all. Unfortunately, it is a trend for higher management to quit using the software and rely on their subordinates to obtain information for them by using the GIS

Unfortunately, no digital ortho-photography was acquired during the 1989 topographic mapping project. Of course, contours and planimetrics were; however, it was not discovered until 2001 that the mapping control used was slightly deficient in quality. In 1999 the City acquired a USGS DOQQ which covered the Cape Girardeau area. This photography is low resolution orthophotography that dates back to 1996. Problems with contour accuracy could be spotted by looking at structures on the photography versus roof linework on the planimetrics. These problems were confirmed when the City partnered with the County of Cape Girardeau to acquire high resolution and high accuracy photography in 2001. Some areas of the topographic mapping were within tolerable levels of inaccuracy (sub-meter) and other areas could be as far as 15 feet off in regards to horizontal accuracy. Obviously, this means that the vertical could not be on a mark suitable for Cape Girardeau GIS Program standards as well. Also, for some unknown reason, the company which created the contours used broken lines through tree stands. This type of linework is fine for paper map production but limited with respect to GIS analysis. In 2006 the City of Cape has flown its own photography and is also planning to develop an entire new set of two foot contours and planimetric data either photogrammetrically from these new aerials or through the use of LIDAR.

In 2001 the City of Cape GIS Program obtained a Trimble Pro XRS sub meter GPS unit. This unit has been used intensively throughout multiple projects including street system, water system, sanitary system, storm system, and, other miscellaneous projects. Two Trimble GeoXT units have been added to the compliment for use by our Public Works department personnel. They were chosen for the ability to acquire sub-meter accuracy using "BoB" and the ease of being hand-held. The units were initially used to map utility facilities. Now these units are used to locate these same facilities as digging and locating regulations have increased.

In 2003 the City of Cape Girardeau passed an ordinance requiring developers to submit digital copies of plans along with the usual paper copies. These digital copies are required to be provided in DXF format and in the Missouri State Plane East coordinate

system. That same year, the conversion to Geodatabase was complete. Currently, a move to ArcSDE is being considered. However, a look at the new ArcSDE version for small workgroup is eagerly anticipated.

In order to move CGGIS to the Internet, Cape Girardeau GIS choose to use the "Export Map" functionality of ArcMap to create PDFs. These PDFs are loaded onto our website provider's server via a PDF loader of their creation. Users access to our maps without the expense of paper maps with some added Adobe Acrobat functionality such as word searching. This is a simple and low cost (no cost to the GIS program) way to get data and maps to the internet for use by anyone. However, when updates occur, a re-export of all maps must be made.

Cape Girardeau is a hub for jobs in the area. It serves as a central economy to many smaller satellite communities in the area. The population of Cape is around 39,000, but surges to around 100,000 during business hours. Having Southeast Missouri State University adds to the economy as well as a center in the area. Cape Girardeau also has the best medical facilities between St. Louis and Memphis. Being situated on the Mississippi River makes Cape a good spot to locate manufacturing. Cape maintains a modest but steady growth of 10-12% per year.

Similarities in Approach

Both the City of Branson, and the City of Cape Girardeau, have several similarities to their G.I.S. implementation and use. Both entities use ESRI products for spatial data creation, maintenance. Also, both entities encourage the use of the common software to other local government agencies that either currently or potentially will share GIS data and information. By, utilizing common data and software formats, along with establishing data-sharing agreements, datasets are easily shared amongst GIS users, and maintenance responsibilities can be shared as well.

Both entities had similar approaches in the early stages of spatial data creation as well. ArcInfo 7.x workstation was utilized by both Cities for the digitizing and editing of base map datasets. ArcView 3.x what utilized by both for the analysis of the information, and the creation of hard-copy map layouts.

The City of Branson and the City of Cape Girardeau both had planimetric and topographic mapping completed by outside firms to assist in establishing a foundation for their G.I.S. systems. Also, both entities digitized parcel base maps in house with ArcInfo 7.x software. The parcel base being a parent layer for a number of datasets including, City Limits, Zoning, etc.

Another similarity is that the Cities partnered with their local County governments to acquire new orthophotography, as well as have the County assist in parcel base map maintenance. To further assist in maintenance, and improving the quality of the data, both entities have developed regulations requiring engineering and development firms to submit plans and plats in an electronic format, incorporating the use of a common coordinate system so that new infrastructure and subdivision/land information could easily brought into the Cities' G.I.S. for display.

Both entities are currently researching the benefits and feasibility of migrating to ArcSDE

Differences in Approach

Although there are similarities in approach with the two Cities in G.I.S. development and use, there are differences as well. In order to make spatial data and the power of G.I.S. functionality available to individuals and entities outside of the City of Branson, the City has chosen to utilize ArcIMS to create a useful G.I.S.-based interface for query and map creation. In contrast, the City of Cape Girardeau is currently creating PDF exported maps for distribution of their G.I.S. information.

Although both organizations are structured as more of a “centralized” G.I.S., each G.I.S. office falls under a different Department in the two cities. At the City of Cape Girardeau, the G.I.S. is under the Planning and Development Department. At the City of Branson, the G.I.S. Division is a part of the Engineering Department. Both entities have the challenge of providing G.I.S. services to all City Departments and outside entities as well.

There are also cultural and environmental influences that affect the approach to G.I.S. usage in the two cities. The City of Cape Girardeau is a traditional city with a mix of residential, manufacturing and service-based economy; whereas, the City of Branson is a widely-known tourist destination, and is mainly a tourism-based economy. The City of Cape Girardeau and the City of Branson utilize G.I.S. for traditional municipal G.I.S. applications, but Branson has several projects and applications devoted to assisting the navigation of tourists and visitors, as well as applications to assist in finding traffic and infrastructure solutions for high volumes of visitors.

Problems Encountered

Some of the problems and issues encounter by both entities in the development and maintenance of their G.I.S. programs are not uncommon for other municipalities. One constant issue is education. It is necessary to explain G.I.S. and the benefits to elected officials, decision-makers, and the public to gain verbal and financial support. As the G.I.S. programs expand, outside entities have the opportunity to become involved with the municipal G.I.S. in some capacity, whether it be the school system, community groups, local utility and telecommunication. This is virtually a never ending process as new elected officials take office, and to ensure the continuation of G.I.S. funding.

Another challenge is the coordination of G.I.S. development efforts among local entities. Cost and data sharing can be very effective financially, as well as create an effective and efficient regional G.I.S. empowered environment. Cost and data sharing efforts do not always occur with ease. Agreeing on software platforms, data structures, and the division of cost takes a great deal of negotiating. It is in each individual entities best interest to get the most return on their investment, even though the true purpose is mutual benefit amongst all participating entities. Some of the issues faced include: selecting a common software platform, selecting a common spatial data file type, selecting a common coordinate system, designing a database structure, and determining the most fair way to divide costs.

Another problem is the availability and condition of source mapping documents. In order to develop the base spatial datasets for a G.I.S., it is important to have available and reliable source documents to create the foundation of the G.I.S. basemap. Just a few of the problems include: outdated, poor, hardcopy maps; digital files of an outdated, or difficult-to-use file type; or even no data at all. In the case of now data at all, it can be very expensive for an entity to create base spatial datasets from scratch.

Summations

By reviewing the G.I.S. development process of the City of Cape Girardeau, and the City of Branson, Missouri, it is apparent that there are several common practices, which are found in municipal G.I.S. applications worldwide. But, there are also differences, which are influenced by environmental, cultural, governmental, and financial variables. What a local government or municipality interested in developing a G.I.S. program must understand, is that although there are several common guidelines, G.I.S. provides a great deal of flexibility to meet the individual needs of a municipality. The power of G.I.S. and its applications has virtually no end, and can be applied to all facets of municipal government, with an ability to grow, expand, and change to meet the challenges of any city.

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