Collaborative Convergence and Maintenance of Disparate Databases

1. Abstract of the Program

Cumberland County, a rural locality by definition, has exceeded its own expectations in terms of geospatial technology and more importantly intra-facility collaboration. Over a three year stint the various Administrative, Constitutional and local State offices have collectively and earnestly worked towards combining and maintaining a single geospatial database. The end goal being a single user-friendly and universal application from which end-users can resolve public information historically maintained in distinct and often archaic formats. While some original datasets were created by outside sources such as vendors or State authorities, the majority (38 of 52) have been derived completely by in-house capture.

This geospatial initiative has reasonably been divided into two phases: 1.) dataset production/maintenance and 2.) public availability. This submission covers the first phase which has recently been completed. It identifies not only the value of the dataset as a useful daily tool, but as importantly the exemplary efforts made by a host of County entities that previously had no geospatial inclination or experience; all of which were organized and achieved with limited outside professional assistance. County staff placed emphasis on gaining useful knowledge through other larger localities that had already constructed enterprise geodatabases as well as increasing staff education through certified ESRI facilities. Where an achievement of this value would require significant expense, the County budget remains relatively unburdened having set aside less than $200,000 over the last three years.

Presently, eleven of thirteen offices use GIS on a daily or weekly basis. More importantly, these offices have resolved a workflow such that the datasets are constantly revised in-house to ensure accuracy. This poises Cumberland to approach the second phase with a ready dataset, allowing for concentration on designing the most effective public interface.

2. The Problem/Need for the Program

One of the more significant roles a locality is responsible for is the generation, maintenance and dispensing of public records ranging from financial details to paper based land records. Historically, the storage and retrieval formats range

from paper to polymer based microfiche or in some cases digital data. Large amounts of records are not electronically available and must either be stored off-site or in other locations not immediately accessible to staff or the public. Larger localities have made great efforts to digitize much of their public records. This process involves teams of people and equipment and poses a strain on budgets or competes with other budget requests such as basic water and sewer service. Smaller localities such as Cumberland (approximately 10,000 residents over 292 square miles) do not typically have the technical staffing or budgets to accomplish such tasks and must concentrate on priority projects.

End users (citizens, realtors, etc.) in the nearby locality of Chesterfield can readily access many of the public databases via the internet. A person interested in purchasing a particular piece of property in Chesterfield can search deeds or other land records from any internet appliance, relieving them of the travel and expense associated with a personal visit to the courthouse. This same person understandably expects that the same method of retrieval will be available via Cumberland's internet site.

The staffing in all public offices recognized the value in working towards digitization and indexing of the public records. Historically, a public document request would involve visiting as many as three different offices owing to the distinct databases. This effort would clearly facilitate or expedite the fulfillment of a public document request. A citizen will ideally be able to limit the number of visits to the courthouse or even offices inside the complex.

3. Description of the Program

Cumberland County's initiative to merge existing databases and digitize previously archived paper data was fully recognized after the Board of Supervisors agreed to set aside monies in capital improvement projects over a three year span. The cost and dedication required to complete such an effort was not readily known, but resolve was maintained to produce a publicly accessible database that is current and accurate.

Owing to the enormity of the project, it was divided into two distinct phases: 1.) dataset production/maintenance and 2.) public availability. The County staffing agreed that by taking the project in-house, financing burdens would be lessened. More importantly, the staffing knowledge and ability to make future recommendations regarding data retention and development would be elevated. (In the past, large projects such as this had been left entirely to outside

professional services. A huge dependency on these costly professional services could therefore be avoided.) The second phase, delivery of the product to the public, would then ideally employ outside professional services that are better equipped to provide the web interfaces.

The key stakeholders in terms of project management were loosely identified as departments or staff members that felt they could contribute meaningful support. After two meetings and six months of hands-on work, the position(s) were filled between the Building Inspection office and the Information Technology office (a total of three persons). On an as-needed basis this team reported to County Administration and Board of Supervisors with terms of progress as well as example applications using live data.

Initially, there was no project timeline and was dependent only on staffing availability. Emphasis was placed on provisioning the 911 communications center with an accurate and up-to-date addressing and street centerline dataset. The efforts were furthered by the orthophotos provided through the Virginia Geospatial Information Network (VGIN) and the centerline verifications provided by State Wireless E911 Board. Working through these datasets, the staff gained the necessary technical experience to proceed with data collection and evaluation.

The value of the geospatially correct information was apparent to all involved and project design moved forward. Goals were set in terms of what datasets were needed, important and even feasible. Consideration was also give to what datasets were already available from outside resources such as VGIN, DCR, VDOT and other state repositories so as to not duplicate efforts.

In addition to public service data, the team decided upon what datasets would be most beneficial to daily activity and decision making. Attribution behind the geospatial information became another identifiable goal. Parcelage, setbacks, sewer taps, water meters, junctions, installation dates, repair dates, etc., all became valuable and obtainable information.

Very quickly it became evident that the wealth of information that was coming was enormous and that it was imperative to collaborate and develop a workflow among the offices that kept the datasets active and accurate. The completion of Phase I was identified as that point at which the offices were able to maintain some 38 or more distinct datasets in-house on at least a weekly basis.

4. Use of Technology

Software: Microsoft Windows XP Professional (end-user workstations), Microsoft Windows Server 2003 Server (data storage), ESRI Concurrent-use ArcView 9.3 (data maintenance/production), ESRI Single-use Publisher (map production), ESRI ArcReader 9.2 (end-user mapping), Microsoft Access 2003 (database maintenance), Microsoft Excel 2003 (database maintenance), MSAG TableGIS (data capture)

Hardware: Dell PowerEdge 2950 Server (data storage), Dell Optiplex Workstations (end-user platform), Trimble Pathfinder Pro XT GPS beacon (satellite corrected sub-meter data collection), Panasonic CF-18 Toughbook (data collection vehicle/field use), Hewlett-Packard Designjet 800PS (map production), Hewlett-Packard MFP 42" large format color scanner (image capture/digitization), Cisco Catalyst ethernet based switches, Cisco 2600 series routers

5. The Cost of the Program

The cost of the program can be categorized into three areas: 1.) software/hardware, 3.) educational expenses and 2.) personnel costs. Given that no new employees or outside staffing were required, the personnel costs would equivocally be considered zero as they were previously and permanently hired by the County.

Several of the departments chose to have one or more staff members attend an introductory ESRI certified GIS class. In some cases, depending up their inclination and involvement in data rendition, they attended the second level GIS (II) classes. Expenses typically ranged from $500 to $800 per class per person. A total of eight classes were attended which approached a cumulative expense of $6,400.00.

Equipment costs were both direct and indirect. The County offices were entirely supported by a Cisco based 100 mbps switched network with fiber backhauls between buildings. Individuals responsible for data capture and analysis typically received an enterprise grade workstation with a minimum of two 19"

video monitors. Each workstation was licensed for the ESRI ArcView 9.x product initially. Late in 2007, the licensure was moved to concurrent-use to minimize expenses. Equipment and software expenses are as follows:

- 100 mbps full-duplex network with fiber backbone (no cost, pre-existing)
- Concurrent-use licensure for ESRI ArcView 9.2 ($9,000 per year)
- Single-use licensure for ESRI Publisher Extension ($1200 per year)
- Trimble Pathfinder Pro XT GPS beacon ($2500)
- Panasonic CF-18 Toughbook ($2800 per unit)
- Orthophotography – VGIN 2006 6" upgrade ($32,000)
- Dell PowerEdge 2950 Storage server with 1.5 TB available space (RAID-5 configuration), MS Windows Server 2003 R2 ($5,800)
- Dell Optiplex Workstations, MS Windows XP, MS Office 2003 Professional ($1100 per unit)
- Quad output video adaptor ($400 per unit)
- 19" SVGA monitors ($250 per unit)
- HP Designjet 800PS 42" plotter and HP 800 MFP 42" large format color scanner ($17,000)
- ESRI certified ArcView GIS I & II classes ($800 per class max)

6. The Results/Success of the Program

Phase I of this effort was achieved in late 2008, where the majority of the datasets being developed were delivered to each office, viewable through ArcView 9.x. Each dataset is now under constant maintenance by their respective departments. Items such as structure addressing, road centerlines, water/sewer lines, manholes and meters are added, removed or updated within 24 hours of change. Offices have at their fingertips a means of querying and reporting some 52 distinct datasets which cover the geographic extents of the 292 square mile confines. Offices can often answer their own questions without having to consume additional time from surrounding offices.

In addition to the availability of those datasets to the offices and public bodies, the success of Phase I includes the clear workflow among the offices. Intra-office communications have increased significantly. Offices that were historically unrelated now provide each other with more transitive flow of information, resulting in improved accuracy of public records. For example, Building Inspection assigns and resolves 911 addressing issues. This dataset is

immediately available in the County 911 Communications center. For each change made, the Commission of Revenue is notified and subsequently makes changes to their historical databases residing on the AS-400 platform. (In this particular situation, Phase II will pipe the changes directly into the AS-400 applications, eliminating the separate databases.) This eliminates the potential for confusion at the First Responder and/or customer level where a difference in structure addressing can cause wasted time/energy.

A picture is "worth a thousand words". Whether a Planning/Zoning, Board of Supervisors or departmental meeting, the presence of geospatial data and viewing software has offered a tangible and clarifying approach to discussion and decision making. The querying power of ArcView offers immediate answers to questions previously requiring later reference or evaluation. For example, in a recent Wireless Authority Board (WAB) meeting, the question of population density for an underserviced area was considered. A simple query on up-to-date 911 addressed structures gave an immediate answer which foster a decision process and allowed unexpected progress at the meeting. Such examples are becoming an almost daily occurrence as the staffing evolves in its technical understanding of the products. Furthermore, the level of understanding and ability of the staff has increased such that project recommendations are being made based on first-hand experience with the datasets. A win-win situation!

7. Worthiness of an Award

While the technical details and accomplishments behind this effort are not demonstrative of a "bleeding-edge" approach, the true captive element revolves around the collaborative, organized and fiscally responsible approach to an identifiable goal; a goal that involved offices that historically had no responsibility (in some cases, no working relationship) towards each other in terms of common data. This is an example of a small locality that is comparatively understaffed but posed with many of the same responsibilities as that of a much larger locality such as Chesterfield. The project has been oriented, managed and achieved without outside professional assistance. Staffing identified the benefits and willfully took on responsibilities (additional technical education, field data collection, data quality assurance, etc.) outside their scope of employment. Despite the increasing scope (referred to as project "creep") as the months progress, the same effort by each department is being applied towards future goals. Truly a milestone in Cumberland's history, where more is being accomplished with less!