

PSAP Grant Program Grant Ranker

View Application--169--Richmond-Henrico Data Replication

Grant Period: 2010

Tier: Strengthen current equipment and service delivery capability by upgrading existing wireless E-911 related equipment or services (**STRENGTHEN**)

Grant Program: Enhancement **Grant Type:** Regional Initiative

Priority: GIS: high priority (refer to GIS-related Grant Request Prioritization Matrix for a description of GIS projects that would have a high funding priority) (**GIS HIGH PRIORITY**)

Primary PSAP Applicants: Henrico County

Jurisdictions Served: Henrico, County of
Richmond, City of

Project Director:

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GIS Coordinator
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Project Description:

Total Project Cost \$314,500.00

Amount Requested: \$314,500.00

Statement of Need:

The county and the city share a continuous 35-mile long irregular corporate boundary which wraps all the way around the city from the western to the south eastern section of the city. This boundary represents 66% of the total 53-mile perimeter of the city. As the city of Richmond sees itself as largely encapsulated by the county of Henrico, the county sees the area of the city nestled firmly in between its western and eastern portions, where there is a mapping void. Therefore, our localities fit together like two jigsaw puzzle pieces; the city snaps into the void resulting from Henrico's semi-circular shape around the city. (A map is attached to this grant application.) Henrico and Richmond have long partnered and provided public assistance across our lengthy corporate boundary when necessary. But there are many secondary benefits that the localities will realize from this project as well. In addition to providing public safety assistance across our shared jurisdictional boundary, the city and county have a long history of sharing (providing services for) the same public water utility and natural gas utility. Simply stated, the city and county have many interdependencies, and data sharing is of paramount importance to meet both E-911 and other critical regional efforts. We need GIS solutions for maintaining our situational awareness of current infrastructures. Even our agencies outside of emergency services, like Public Works, Public Utilities, and Offices of Emergency Management will realize tremendous advantages in this type of immediate data sharing. By keeping one another apprised of and updated with the most current geospatial information,

we'll enhance and support cross-agency and regional needs. Other important benefits will be realized with the Mobile GIS solution. Each deployment of ArcGIS Server Advanced Enterprise comes with 50 field client licenses. Building upon the success of addresses and street maintenance activities, these capabilities can be deployed for numerous other business cases: emergency response/incident capture, asset management, utilities, community development, environmental studies and data capture, etc. This project addresses the continuation of improvements and enhancements to the geographic information systems (GIS) that support the E-911 systems in both the County of Henrico and the City of Richmond. In the ever evolving world of Environmental Systems Research Institute's (ESRI) GIS software, new capabilities are made available for improving data maintenance, increasing our efficiencies, and enabling real-time geospatial data exchanges. The most recent and significant GIS solution that will help the E-911 centers in these localities is ESRI's "ArcGIS Server Advanced Enterprise." Our regional project will focus on the implementation of both the ArcGIS Server software and supporting hardware architecture that will enable us to deploy the proposed GIS solutions. Purchasing, or even upgrading, to ESRI's newest version of AGS software is not a free upgrade and neither locality's GIS budget can afford to purchase AGS Advanced Enterprise. AGS Advanced Enterprise becomes important where the employees in both localities currently do not use mobile field automation solutions for collecting or managing address and street information. Current processes are completely manual. Employees will print hardcopy maps for use during field visits, where by they will draw and mark-up the map with their field inspection notes. Following their field work, the employees will return to their desk in order to enter and edit the address and street information. Both localities see the current methods described here as inefficient and cumbersome. We believe AGS Advanced Enterprise will allow us to achieve greater efficiencies through one-time edits of GIS addressing and streets information from mobile field computers. There are occasions when staff in the 911 centers request large size maps depicting calls for service and other geospatial information to support their planning activities and evaluations associated with public safety business. Currently, the city's 911 center can only provide 11x17-inch maps, which do not allow the mapping of too many features/elements in a legible way. The city 911 center needs the ability to plot large size mapping materials to give to public safety personnel when they are stationed in the field. We believe a plotter will address the hardcopy mapping needs of both 911 centers. In uncertain financial times The Count of Henrico is tightening its budget for FY 2009. Although GIS has been identified as a critical technology, it is expected that very little money will be allocated to move GIS Technology forward in FY2009. In order participate in what will certainly be an outstanding project with The City of Richmond; The Henrico County GIS Office will need financial assistance. The City faces a budget shortfall for FY 2009, which will likely be met through such extreme measures as a reduction in personnel and service costs expenditures during the fiscal year. It is predicable that these budget shortfalls will also have an impact for FY 2010. As a result, the City cannot implement this project without the benefit of financial assistance. There are a number of factors that have contributed to the current budget shortfall and are generally problematic for funding the project proposed here. First, Richmond has a very high rate of poverty, which increases the need for service provision, but limits the City's ability to generate revenue. According to the 2000 US Census, 21.4% of Richmond residents live below the federal poverty level, a rate far exceeding that of the US as a whole (12.0%). Other government measures provide additional insight into the extent of this problem. The US Department of Housing and Urban Development (HUD) maintains data on the number of people who are low- and moderate-income (LMI). HUD has identified 111,170 Richmond residents, 56.2% of the entire population (111,470 divided by 197,790) as being LMI. Another measure of poverty, a proxy measure of child poverty and well being often used in social services, is the number of public school children on the free and reduced lunch program. According to the Virginia Department of Education, 74% of Richmond Public School Students were eligible for free or reduced-price lunch programs in the 2006-2007 school year. To compound matters, Richmond has been losing population to the surrounding Counties. Richmond has lost more than one-fifth of population since 1970, from 249,621 in 1970 to 197,790 in 2000 (US Census Bureau). This trend in population loss can largely be attributed to the retaining of the poorest citizens who continue to live in the older infrastructure. An additional net population loss of 4.1% is projected by the year 2020 (Virginia Employment Commission). This loss of population has negatively impacted the City's tax base and, as a result, its ability to fund projects such as that proposed here. Second, related to poverty and directly impacting revenue to the City is the low rate of homeownership. According to the 2000 Census, only 46.1% of occupied housing units in Richmond are owner-occupied, compared to 68.1 and 66.2% for Virginia and the US, respectively. Finally, unlike city/county governmental structures in other states, the governmental structure in Virginia precludes statutory linkages between independent cities like Richmond and Henrico. As is the case with many older urban centers, fiscal pressures have been exerted on Richmond in particular. Unlike many older urban

centers, however, fiscal pressures exerted on Richmond are further exacerbated by the lack of fiscal linkages with surrounding county entities.

Comprehensive Project Description:

Overview: This project proposes the implementation of ArcGIS Server Advanced Enterprise (AGS) software and supporting hardware architecture in Richmond and Henrico for deploying new GIS capabilities benefiting E-911. It is not the intent for both localities to have identical GIS infrastructures, but two thirds of the grant request budget proposal is to enable our GIS infrastructures to perform effectively. Both localities believe that without a sufficient system backbone, offering these services isn't truly attainable and will be very problematic. Each locality has a certain amount of existing infrastructure and its own architecture plans and methodologies for developing GIS architecture solutions that are reliable, expandable, and will meet the ever growing demands witnessed from GIS. While these GIS infrastructures may differ, they are each designed to better guarantee "up-time" and responsiveness of the respective GIS systems; GIS services for mobile devices and GIS data replication (among the plethora of other existing and emerging GIS services) should be highly available with failover and the ability to manage high volumes of requests. The use of fault-tolerant architectures should be a core requirement of any production system. What are the IT architectural factors that must be addressed in order to reliably deliver mobile GIS and data replication solutions? Geodatabases: databases should exist on at least two servers that permit either an active-passive failover, or active-active solution. This ensures data availability in the event that one database server goes down. Application Servers: ArcGIS Server applications should be multi-tier; separating the database system from the application system on separate servers will distribute the processing loads. When possible, multiple application servers can be set up to balance request loads, just as having multiple database servers can distribute the load. Hardware Load-Balancers: Load-balancers can help provide fault-tolerance and fail-over and manage incoming traffic to a series of servers and associated services. Map Caching: It is highly recommended to utilize ESRI's ArcGIS Server map caching to improve performance. This is a requirement for mobile GIS mapping solutions. Tile Caches take processing resources to generate the map tile images and a lot of storage space is also required for storing the images. The proposed architectures will enable two features for E-911. The first is to employ mobile field GIS maintenance solutions, which is immediately applicable for updating address and street files in our GIS systems. The second is to use geodatabase replication services for sharing geospatial information between localities. While the first two features are dependent upon GIS infrastructure upgrades, there is a third feature to the proposal: to procure a plotter for the Richmond E-911 center, which will support the mapping needs of staff. Our project will also ensure the successful deployment of these technologies by using highly experienced GIS Consultants that will become part of the implementation team. It is expected that the GIS Consultant will help address any technical difficulties and nuances with deploying ArcGIS Mobile solutions using ArcGIS Server Advanced Enterprise and geodatabase replication. These are essentially first generation solutions offered by ESRI, and our experiences tell us that we will need help from experts in this field. A qualified GIS Consultant will be found through a RFP process, managed by Henrico County. The RFP process will also help manage consulting costs. Goals: 1) ArcGIS Server Advanced Enterprise will allow both localities to use a mobile data service for mobile applications with access to the contents of a map document through a Web service. We will use ESRI's "ArcGIS Mobile" solution. Our mobile solution will be designed to be used by GIS applications running in handheld devices such as tablet PCs. This will allow us to discontinue the use of mark-ups on hardcopy maps for both address field inspections and street corrections and verifications. We will achieve greater efficiencies through direct editing of GIS data from the field by trained professionals. 2) ArcGIS Server will allow the localities to share near real-time GIS data, such that when map data is edited by the GIS editing entity, it can be seen immediately by the partnering locality and will be immediately available for use in, or incorporation by, the emergency services mapping applications. Having access to the most current and correct GIS data is important for emergency response. It can be reiterated that by combining information from both localities, a common operating picture can be achieved. 3) Unrelated to the implementation of ArcGIS Server Advanced Enterprise infrastructures, the Richmond E-911 center does not currently have the ability to map out information on large size media for planning, decision-making and emergency responses. This grant proposes to install a large size plotter in that E-911 center to support the creation and output of geospatial information into the 'hands-on' media. Project Activities: 1. Henrico will be the host applicant for the grant and, as such, will be serving as fiscal agent. Richmond will receive grant funds, services, and equipment through Henrico. As fiscal agent, Henrico will be responsible for conducting the procurement process necessary to secure the services of a qualified consultant. 2. Both localities will create a Project Working Group. 3. The GIS Coordinators of Henrico and

Richmond will jointly create, monitor, and follow a Project Implementation Plan. 4. Procure or upgrade to ArcGIS Server Advanced Enterprise software, with price quotes from the State of Virginia's eVA contract, to obtain the best price possible. 5. Procure the hardware to support the AGS infrastructure. Each locality will work with their own Procurement agencies' established contracts to obtain compliant hardware at the best price possible. 6. Establish private, secure computer network (bi-directional) between Henrico and Richmond with the assistance and cooperation of IT support staff to create, test and optimize the network. 7. Perform isolated and systemic testing to: a. Determine that network topography, security, protocols and throughput requirements for data replication are met. b. Validate end-to-end map data changes, file merges, file transfer, data backup. c. Identify and confirm all desired geo datasets are successfully replicating and integrated into both CAD systems. d. Validate ArcGIS Server's office-to-field through put and ArcGIS Mobile's field-to-geodatabase data changes. 8. Procure the ESRI recommended (proven) hardware solution to operate Mobile GIS software for use in the field. 9. Perform installation and testing, validation of GIS data editing functionality from mobile devices using AGS Advanced Enterprise software. 10. Procure the plotter to house in Richmond's 911 centers.

How will the equipment purchased will support future technologies for PSAP readiness?:

The utilization of ESRI's replication technologies will serve as a blueprint to incorporate GIS data from the Richmond-Henrico GIS user community. Emergencies, such as natural disaster events (e.g. hurricanes), are never restricted to the extent of a single locality and having this broader map base will be important to support a common operating picture. The PSAPs can use the established geodatabase replication services to exchange on-going event (e.g. call types) or infrastructure (e.g. gas lines) information from each other's jurisdiction during an emergency event to provide greater situational awareness.

Budget and Budget Narrative:

The Henrico/Richmond Budget(s) are itemized in a spreadsheet that is included as an attachment to this grant application. The architecture diagrams proposed by each locality are also included in an attachment. The letter designations (A through T) on the itemized budget, architecture diagrams, and the narrative below will permit the reader to cross reference all requested items using these letters. Henrico Budget Narrative: (\$213K) Geodatabase Servers A & C. Calls for two geodatabase servers (\$15K each). Having two geodatabase servers provides a higher degree of availability and reliability. Geodatabase RDBMS B & D. Each of these two geodatabase servers will require SQLServer licensing (estim. \$7K) Application Server E. An ArcGIS Server hardware server is needed (\$8K) Application Software F. An ArcGIS Server Advanced Enterprise software purchase for the AGS server is needed – new (\$40) Mobile Device G. A mobile device for GIS field work/updating is needed (\$5K) Communications Line H. If a VPN solution will not suffice, then a T1 circuit will need to be established (\$500/month) (\$6K) Consulting Services I. Henrico will be the prime on obtaining experienced GIS Consulting services to help both the county and the city implement mobile field solutions with ArcGIS Server Advanced and for geodatabase data replication. (\$110K) Richmond Budget Narrative: (\$101,500) Richmond already has its geodatabase availability and reliability solutions in place, so costs for these resources are not to be incurred. Application Servers J, K. Each of the 2 ArcGIS Server Advanced licenses does not currently have a server on which to run. The city uses Virtual Server environments ("Virtual Machines" = VM) to host production servers. The shared cost model will permit the GIS Team to establish 2 server environments as VMs. (\$2K each) Application Software Upgrades L, M. Request to upgrade 2 of existing ArcGIS Server "Standard" licenses to "Advanced." The use of multi-thread balancing across multiple application servers are highly recommended in Richmond's Geospatial Architecture Plan for providing stability and handling high-volume calls for services. (\$20K each) Application Load-Balancer N, O. Calls for building stability for ArcGIS Server application solutions by using a hardware load-balancer (as prescribed in their Geospatial Systems Infrastructure Plan). (\$10K, plus \$4K for Ethernet connector) Virtual Machines Host Server P. A dedicated host machine will be established for managing the ArcGIS Server application servers and map tile-caching servers (\$12,500); including ESX software for running VMs. (\$7,000) (\$19,500 total) Tile Cache Processing Server Q. While Henrico already has their ArcGIS Server tile caching solutions well planned, the city requests a tile cache processing VM server (\$2K), Tile Cache File Server R. A tile cache VM file server for storing the pre-cached images (\$2K, plus \$5 K for 1 TB of Storage Area Network (SAN) space to be allocated to this server) Mobile Device S. A mobile device for GIS field work/updating is needed (\$5K) Plotter T. A plotter (10K)

Evaluation:

Short Term Outcomes: The county and the city will implement more efficient address maintenance solutions via ArcGIS Mobile. The localities will have more complete base mapping for their common operating picture. The localities will share near-real time changes in their address GIS data via replication services. Intermediate/Long Term Outcomes: The county and the city provide a model that other PSAP's can leverage to enable faster access to local and regional E-911 mapping data through establishing a best practice replication services framework; other Central Virginia localities, plus VITA ISP, can consider replication with Henrico and Richmond as well. Additional data, such as "event" data, can be replicated/shared during emergency events. What measures will be used to determine outcomes? Our project will follow the IT industry's well established project management methodologies. Successful implementation will be defined in terms of project milestones and final project deliverables. We have identified the following categories of our project, each of which will deliver on the following milestones:

ArcGIS Mobile Solution: 1. Project Management Plan & Schedule 2. Project Kick-off 3. Requirements Definition 4. Meeting Agendas and Notes 5. System Architecture and Design 6. Acceptance Testing 7. User Sign-off

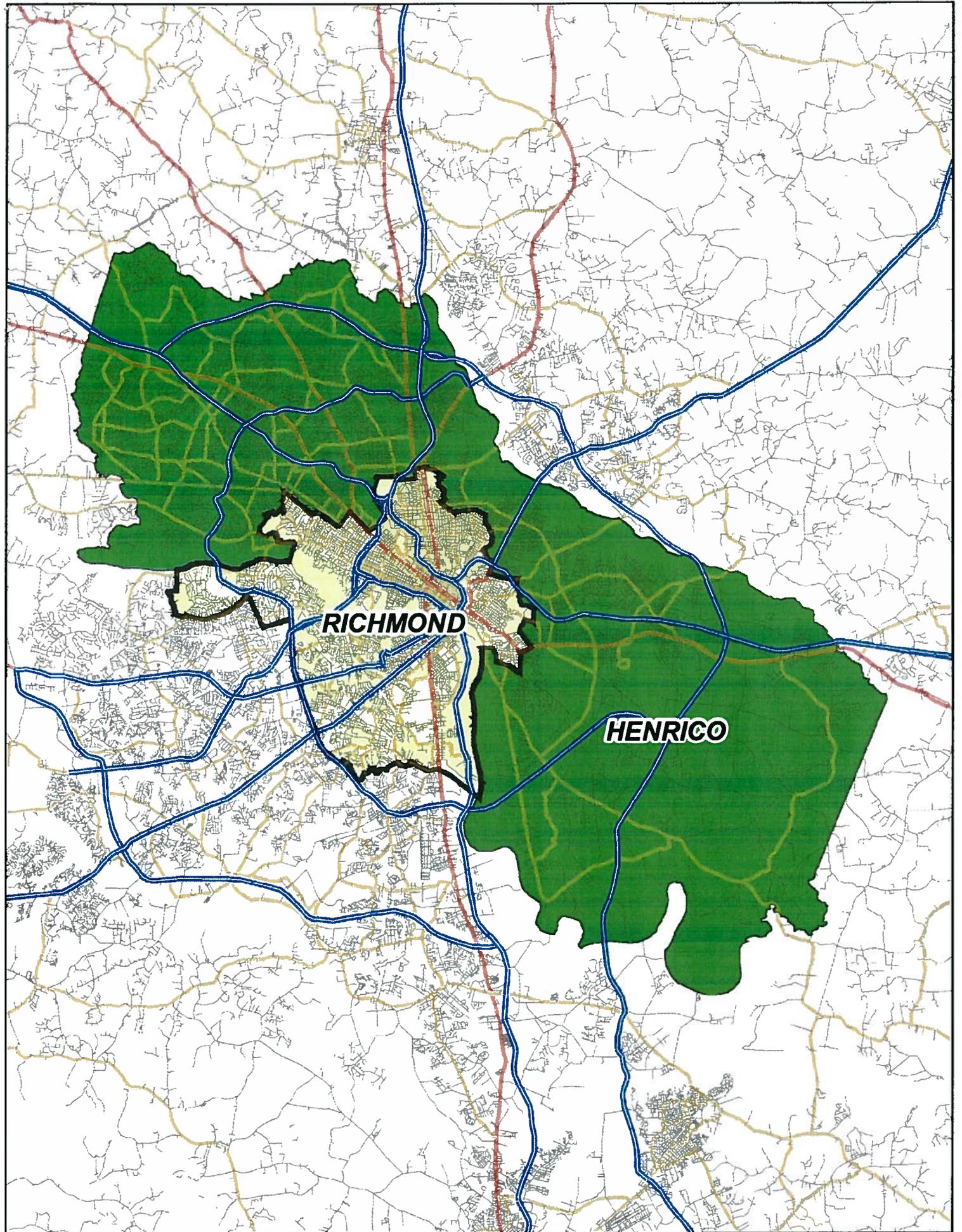
ArcGIS Geodatabase Replication: 1. Project Management Plan & Schedule 2. Project Kick-off 3. Requirements Definition 4. Meeting Agendas and Notes 5. System Architecture and Design 6. Acceptance Testing 7. User Sign-off

Richmond 911 Center Plotter: 1. Information Systems Request (ISR) for work to be performed 2. Hardware & Network Team Consultation 3. Installation 4. Acceptance Testing 5. User sign-off

How will data be collected and how will evaluations be conducted? Evaluation data will be collected throughout the project as specific milestones are achieved. In particular, the data sources will include those milestone elements from our project management methodologies: Regular Project Status Reports Project Check-lists Project Meeting Agendas & Notes Acceptance Test Plans User Sign-Off Documents. How will data be presented? As part of the overall project, a Project Management Document (Plan and Schedule) shall be developed that incorporates each stage of the project, and provides an audit trail associated with the final short and long term outcomes, final project metrics, and achievement of specific project deliverables.

Attachments

HenricoRichmondAttachments.PDF
MEMORANDUM OF UNDERSTANDING.doc



RICHMOND

HENRICO

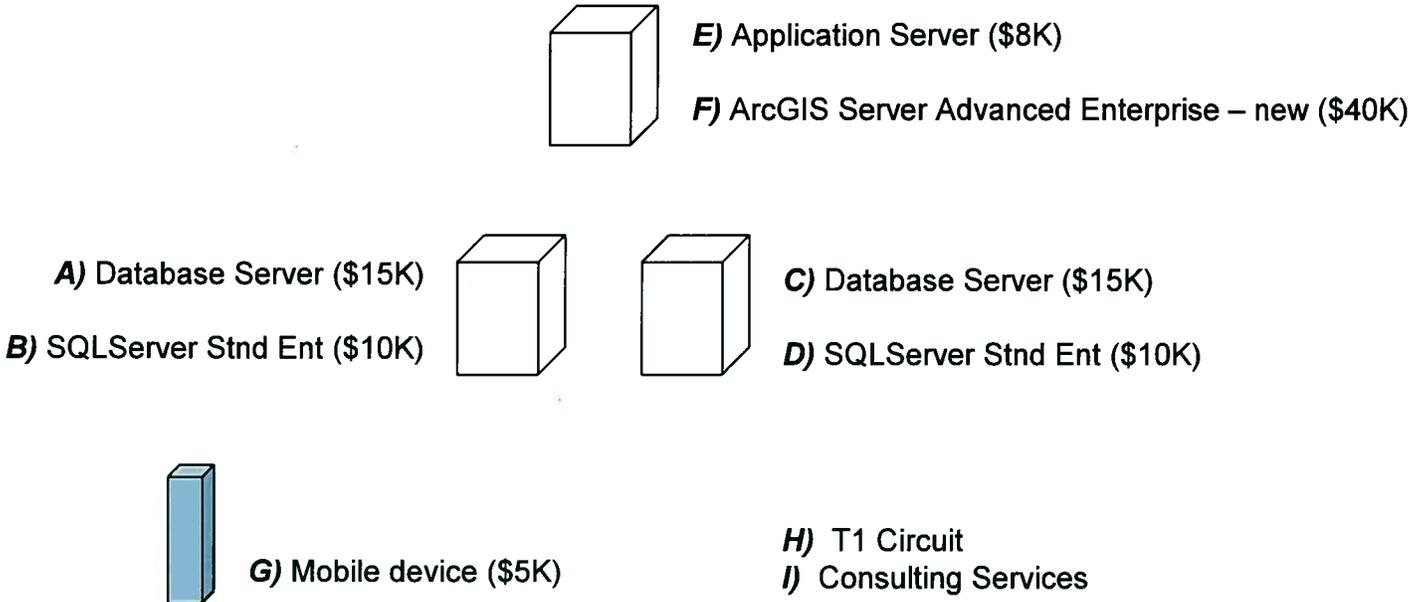
Henrico

A	Geodatabase Server (1)	\$15,000
B	SQLServerStdEnt (1)	\$7,000
C	Geodatabase Server (2)	\$15,000
D	SQLServerStdEnt (2)	\$7,000
E	AGS Application Server	\$8,000
F	ArcGIS Server Adv Ent	\$40,000
G	Mobile Device	\$5,000
	sub total	\$97,000
H	T1 Circuit (\$500/mo.) vs VPN	\$6,000
I	Prime Consulting Services	\$110,000
	sub total plus extras	\$213,000

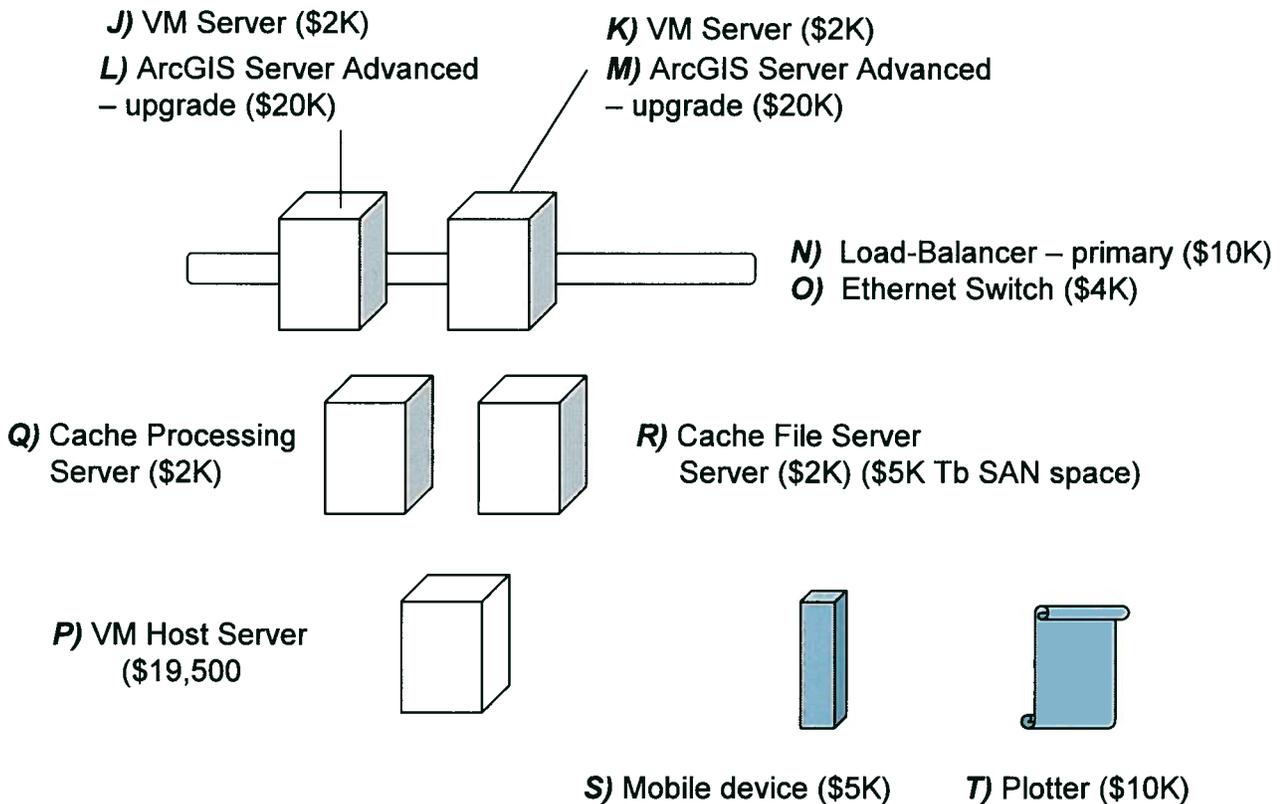
Richmond

J	Virtual Machine AGS Server (1)	\$2,000
K	Virtual Machine AGS Server (2)	\$2,000
L	AGS Server Upgrade (1)	\$20,000
M	AGS Server Upgrade (2)	\$20,000
N	Load-Balancer	\$10,000
O	Ethernet Switch	\$4,000
P	VM Host Server & ESX OS	\$19,500
Q	Cache Processing Server	\$2,000
R	Tile Cache File Server (\$2K + \$5K)	\$7,000
S	Mobile Device	\$5,000
T	E-911 Center Plotter	\$10,000
	sub total	\$101,500
	TOTAL:	\$314,500

Henrico – Project Architecture



Richmond – Project Architecture



MEMORANDUM OF UNDERSTANDING
between
COUNTY OF HENRICO AND CITY OF RICHMOND
for
WIRELESS E-911 GRANT

This Memorandum of Understanding (the "MOU") is entered into this ____ day of October, 2008, by and between Henrico County, Virginia (the "County") and the City of Richmond, Virginia (the "City") in order to document their agreements pertaining to a joint grant application for a cooperative GIS-based initiative benefiting E-911.

1. The parties agree to apply jointly for the Wireless E-911 Enhancement Program – Regional Grant (FY10) from the Virginia Information Technology Agency.

2. The parties agree that the County will act as the "host applicant" and, as such, will be the fiscal agent should the grant be awarded to the parties.

3. As fiscal agent, the County will be fully responsible for fulfilling all grant requirements including, but not limited to, reports, control of and accounting for funds, and distribution of services and equipment purchased with the grant award.

4. The County shall receive all grant funds and disburse same as specified in the grant application.

5. The County shall be responsible for the procurement and management of a consultant contract awarded for the benefit of the parties in connection with the grant.

6. Both parties agree that they shall at all times comply with the grant guidelines and state law applicable to the grant.

7. The City agrees that it shall take all steps necessary to assist the County in fulfilling its obligations as fiscal agent for the grant.

8. Should the parties receive the grant, and should the Commonwealth of Virginia or any entity thereof subsequently determine that any portion of the grant has been spent in violation of the grant guidelines or state law, or any services or equipment purchased with grant funds have been spent in violation of the grant guidelines or state law, and require reimbursement, the parties shall reimburse the Commonwealth in proportion to the benefit each party received from (1) the grant funds that the

Commonwealth has determined were spent in violation of the grant guidelines or state law, or (2) the services or equipment that the Commonwealth has determined were used in violation of the grant guidelines or state law.

9. Both parties agree that upon receipt of the final award notification letter from the Virginia Wireless E-911 services board for this grant, the governing bodies of the respective parties must give final approval for official acceptance of any awarded funds.

10. This MOU shall be null and void should a PSAP Grant not be awarded to the parties.

11. This MOU may be modified by the written mutual consent of the parties.

HENRICO COUNTY, VIRGINIA

By: _____

Title: _____

CITY OF RICHMOND, VIRGINIA

By: _____

Title: _____