GIS SITUATIONAL ASSESSMENT

Executive Summary

PROJECT INTENT

In the spring of 2003 St. Clair County contracted with ESRI of Minneapolis to evaluate the current business processes, inventory existing GIS capacity, and recommend actions that will enable departments to utilize GIS technology to improve service delivery.

The intent of this effort was to develop an assessment of the County's existing use of GIS technology and offer GIS solutions to identified issues. The resulting situational assessment is not intended to be used as a GIS implementation plan. It can, however, assist in developing that plan – which is the logical next step for the County.

METHODOLOGY

In order to carry out this task, ESRI surveyed county departments, made on-site visits to each office involved in the effort, and carried on discussions with those departments regarding potential solutions to meeting their GIS business objectives. In the end, the contractor offered a list of industry best practices appropriate for the County as well as recommended action items. Both the best practices and recommended action items are designed to assist the County in attaining its GIS business goals.

SURVEY OF BUSINESS PRACTICES & FINDINGS

Prior to an on-site visit, the contractor requested each department complete a questionnaire. Each department described current business processes including defining business objectives for use of GIS as well as known issues that might hinder successful implementation of GIS.

During the on-site interviews, and particularly during discussions with the IT department, ESRI gathered information concerning existing technology (GIS and non-GIS) and system architecture, data maintained by departments, and organizational structures (GIS, GIS supporting, and non-GIS) now in place.

Departments involved in the survey include:

- Animal Control
- Sheriff (Jail & Road Patrol)
- 911 Dispatch
- Lands and Graphics
- Register of Deeds
- Equalization
- Remonumentation
- Metropolitan Planning
- Health Department
- Drain Commission
- Road Commission
- Information Technology
- Local Cities/Villages/Townships

(ESRI was undertaking a separate yet parallel effort for the County's Office of Emergency Management. A situational assessment for that office has been issued.)

SURVEY FINDINGS

Survey findings were organized into three areas: technology and infrastructure; data issues; and, organizational issues.

Technology and Infrastructure – The County's technology infrastructure is diagramed within the assessment. (Development of a technology solution necessary to meet business objectives is aided with an understanding of the system that exists.)

Data (or GIS Database Review) - Most of the spatial data that the County uses is in the format of coverages. Many of the departments interviewed are beginning to use the same set of grouped spatial data layers that point to the coverages stored on Server 02. Some of the departments store sensitive data locally and laws such as HIPAA control access to that data.

Organization - Each department within the County functions as an individual unit, in concert with other departments where there is benefit. Departments interviewed rely on the parcel data layer and the Assessor data for much of their information.

Most findings relate directly to the County's inability to share or access data in a seamless manner.

INDUSTRY BEST PRACTICES & POTENTIAL GIS SOLUTION

Technology and Infrastructure – Industry best practices that apply to St. Clair County's technology situation are offered. These standards are then translated into potential solutions to St. Clair's condition.

Potential technology solutions include a conceptual IT system diagram suggesting creation of two instances of Microsoft SQL, and installation of ArcSDE. One instance of SQL Server would act as the editing or working server, the other as the publishing server.

ArcIMS would be installed on the publishing server ArcIMS would contain spatial data County departments wish to share across the intranet. Eventually access could be provided via the County's web site.

SQL is an industry standard language used to define and manipulate data.

ArcSDE enables data to be displayed within a spatial or locational context.

ArcIMS enables spatial data to be shared across a network, including Intranet or Internet.

A research project is also offered as a possible solution to the Sheriff's Department's proposed tethering system.

Data - The quality and accessibility of data determines whether the technology will work correctly and whether GIS business objectives will be met. Industry best practices that apply to St. Clair County's data situation are offered. These standards are then translated into potential solutions to our current condition.

A potential solution includes the creation of two ArcSDE geodatabases. One would be an editing or working database, the other a publishing database.

Aerial photography and all other spatial and non-spatial data will be loaded into the ArcSDE geodatabases.

Coverage and CAD data (parcel line data) will be loaded into the ArcSDE geodatabase. This process should be done in a test environment with a subset of the data.

A **geodatabase** is a set of data with a geographic or locational reference.

Coverage is a digital version of a map. Coverage stores features such as arcs, nodes, label points, tics, links, annotation, etc.

A database design should be completed prior to migration of data from coverages to the ArcSDE geodatabases.

Organization – An enterprise or business wide GIS solution requires support throughout the entire organization to ensure that it is a success. To facilitate this, specific roles that individuals will play in the application of GIS should be established. Then, a range of considerations must be addressed to support assignments and implementation of a GIS business solution. These include training of staff based on their role, a deployment strategy for migration of data into the GIS environment, defining data stewardship responsibilities, implementation of an organizational structure to support this technology, as well as others.

GIS ROLES TO BE FILLED

Viewers - Most common role. Staff in this category view and/or print maps supporting departmental business needs.
Editors – Editors are responsible for updating or maintaining spatial or non-spatial data.
Analysts – Analysts apply spatial analysis functions to solve complex problems, usually requiring a process made of several steps.
Database Administrators – This is a support role that maintains spatial and non-spatial databases used by viewers, editors and analysts.
System Administrators - Another support role that may include network administrators, desktop support personnel and web server specialists.
Application Developers - Usually the smallest group of user support staff. In many organizations, outside or contracted personnel staff this role.

RECOMMENDED ACTION ITEMS

Tasks that the County should undertake to move forward with GIS based on the potential solutions listed above are found in the final section of the Situational Assessment. The order in which they were presented is sequential and includes short, mid, and long-term action items. All action items in the same category (short term, mid, or long term) can be completed concurrently.

Technology and IT Infrastructure

1. Evaluate and upgrade desktop machines that will run ArcGIS software according to minimum specifications (short-term).
2. Evaluate the possibility of extending fiber optic line to the Health Department, Drain Commission, Road Commission, and Airport Terminal office (short-term).
3. Upgrade data servers and applications to current GIS software (short-term).

Data

1. Conduct a pilot project for migrating data to the geodatabase in a test environment (short-term).
2. Develop data update procedures for data that the County is editing (short-term).
3. Verify that data from the pilot project supports business requirements (short-term).
4. Migrate the data into the production environment (mid-term).
5. Execute systematic database backup and recovery procedures (mid-term).

Organization

1. Establish technical support procedures based on the solution (mid-term).
2. Develop a training plan (short-term).
3. Develop a phased deployment strategy for applications and data (mid-term).
4. Define data stewardship responsibilities of each department (short-term).
5. Establish systematic database backup and recovery procedures (short-term).
6. Review organizational structure and make changes as necessary to facilitate decision-making and communication at multiple levels (short-term).
7. Establish periodic review of GIS business needs and processes (long-term).
8. Develop a long term GIS implementation plan based on the County's vision for GIS (long-term).

ST. CLAIR COUNTY
SITUATIONAL ASSESSMENT

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Introduction

St. Clair County has requested assistance from Environmental Systems Research Institute (ESRI) to help provide direction for implementing current GIS technology in a reliable, scalable, and maintainable environment.

GIS Planning Process at St. Clair County

This process involved representatives from ESRI meeting with representatives from several departments at the County to gather information in the following major categories:

- GIS Business Needs
- Technology and Infrastructure
- Data
- Organization

This information was used to assess the current situation for County departments and groups in each of the categories listed above. Issues were identified and industry best practices were documented for each category. A potential GIS solution was then developed based on the current situation, best practices and considerations for each category. Finally, decisions and action items were identified for the County to move forward with the implementation.

Purpose of this document

This document can be used as an assessment of the GIS situation at St. Clair County. This document can be revised as necessitated by the unique and evolving needs of the County and the judgment of the participants. This document is the first step in the long-term process of GIS Implementation. This document is not intended to be an Implementation Plan. Implementation Plans contain defined projects with timelines and costs. To efficiently and accurately create an Implementation Plan, it is often necessary to assess an organization's current situation in terms of GIS. This document provides such an assessment complete with the information needed to perform the action items to create an Implementation Plan.

Structure of this Document

This document is structured according to the GIS planning process described above. Section 1 contains the business needs and processes for the County. Section 2 contains the technology and infrastructure aspects. Section 3 contains the data aspects and Section 4 contains the organizational aspects. Section 5 contains the potential GIS solution for the County along with considerations for the three major categories of technology, data, and organization. Section 6 contains steps for moving forward with the implementation of the solution in section 5 laid out in near-term, mid-term, and long-term steps.

1.0 GIS Business Objectives and Business Processes for Departments and Groups Interviewed

Description:
During the on-site meetings, representatives from ESRI met with GIS users from St. Clair County to define their respective business needs. Discussions during these meetings focused on the current business needs for GIS, current business processes, and known issues that might prevent successful use of the GIS. The identified business needs and processes are listed below.

1.1 GIS Business Objectives

Efficiency and consistency are among the goals of most organizations today. GIS business objectives are goals of an organization that could potentially be achieved more efficiently and consistently by the utilization of the properly applied tools provided by GIS. GIS business objectives comprise a subset of the Business Objectives for an organization.

Metropolitan Planning Commission (MPC) – GIS Business Objectives
The Metropolitan Planning Commission (MPC) provides planning services, GIS assistance, and data to St. Clair County. Their GIS business objectives are listed below.

- Monitor growth and land use change in the County using GIS
- Provide GIS modeling for "what if" planning scenarios
- Provide zoning advice and maps to the public and communities
- Assist communities and the public in finding data they need
- Maintain up-to-date, accurate data with appropriate input from individuals and agencies
- Provide assistance to the Corporation in the form of corporate planning, plan implementation, information services (including mapping), and technical services
- Review Farmland Preservation Agreement Applications by Farmers to the State of Michigan and maintain database (includes map of parcels involved). Approx. 200 agreements covering approx. 20,000 acres.
- Assist County departments and others in the effective use of GIS tools and data

Sheriff's Office – GIS Business Objectives
This office is responsible for public safety and law enforcement in St. Clair County. The specific groups represented in this document are 9-1-1 Dispatch, and the County Jail.

- Limit the population in the new prison by using programs like the tether system
  1. Monitor tethered individuals on a map
  2. Alerts when a tethered individual enters a "Don't Enter Zone"
  3. Track time away from home for a tethered individual

- Efficiently route and track officers in the field

- Provide routing capabilities to the vehicles

- Exchange data efficiently and accurately with other counties in the Homeland Security Region with St. Clair County

- Interface the new Computer Aided Dispatch software with a mapping system to efficiently locate coordinates for E-911 and wireless 911 calls

- Effectively and efficiently solve crimes using whatever technology will help

Land Information Group – GIS Business Objectives
This group, including the Lands and Graphics, Register of Deeds, Equalization, and Remonumentation edits and maintains all parcel related data. Their combined GIS business objectives are listed below.

- Utilize the most current technology in parcel production as soon as possible

- Create accurate tax parcel maps for the County and the public

- Provide land division guidance for municipalities

- Utilize other County data to make parcel mapping as accurate, efficient, and complete as possible

- Manage images for scanned deeds, recorded and unrecorded surveys, etc. to efficiently deliver them to the application requiring them

- Provide deeds, mortgages, liens, plats, condominium plans, and survey and corner recordations to customers

- Provide market and appraisal data to the State Tax Commission Property Tax Division field staff to use when equalizing values of the State of Michigan

- Publish parcel information on the Internet, such as: Ownership, Legal descriptions, Sale Info, State Equalized Value (SEV), Taxable Values, etc.

- Provide historical documents to contracted licensed surveyors including land corner surveys and copies of dossiers for remonumentation of section corners

- Have surveyors and other businesses have access to current and historical data via the internet

- With the completion of the remonumentation project, provide a spatially accurate parcel data layer to the County

Cities, Villages and Townships (CVT's) – GIS Business Objectives
This group represents the communities with which the County interacts on a regular basis. There is a wide range of GIS business objectives,

- Create, analyze, and print maps using current, accurate data

- Integrate with the County to minimize duplicate entry of data

- Perform various queries for various tasks

- Deliver owner information for parcels to real estate agents for a fee

Health Department – GIS Business Objectives
This department is responsible for public health protection, which is provided by many services including: well permits, water sampling, beach sampling, septic permits, food licensing, food class, temporary food licensing, lead testing, Illicit Discharge Elimination Program (IDEP), storm water program, mobile home park inspections, campground inspections, mortgage evaluations, swimming pools, radon testing, complaints, etc.

- Comply with the requirements of the Health Insurance Portability and Accountability Act (HIPAA)

- Approve permits for wells and septic in a timely manner and mail the information to the correct individual

- Accurately locate and act on outfall problems

- Provide more map based products to the public

- Be a front-runner in the Health Department for integrated GIS that others in the Health Department could follow and modify according to their needs

- Improve efficiency in Department processes including elimination of dual entry of data, etc**.**

Drain Commission – GIS Business Objectives
This department oversees construction & maintenance of storm drains, both enclosed (pipes) and open (ditches). It also delineates special assessment districts (called "Drain Districts") in order to "spread" and collect special drain assessments.

- Spread (divide equitably) and collect from special watershed parcel owners, a special assessment ("drain assessment") that is appropriate for their watershed (drain district) and/or drain project based on benefit from the drain

- Obtain protect, preserve, and document Right of Ways (ROW's) for drains

- Update and/or correct the drain assessment rolls that have previously been developed (typically 30 to 60 years ago) and collect the money (drain assessment) based on the correction. The same process is required for "newer" rolls that are only 1 or 2 years old.

- Create a map of assessment areas by year

- Utilize current technology to make the Drain Commission's work more efficient and accurate

- Perform queries and analysis to assist both the public, other County departments, and the Drain Commission with answering spatial and non-spatial questions about the County's drains

- Accurately delineate drain district boundaries and resolve any errors/issues

- Share data with the rest of the County efficiently to distribute finite staff resources elsewhere

- Provide County drain maps to the public and elsewhere

- Issue permits for drain-related projects, and administer/archive permit system and historical information related to "permitted" and "non-permitted" structures in drains and drain right of ways

Road Commission – GIS Business Objectives
This department meets the transportation needs of the people of St. Clair County.

- Create a road mileage certification report and send it to the state annually to meet state requirements

- Create road plans
- Perform road surveys
- Issue permits for transportation related projects
- Manage ROW information efficiently and accurately
- Provide road maps to the public
- Provide various types of thematic maps to townships, Michigan Department of Transportation (MDOT), consultants, Planning Department, etc.
- Share data with other departments and agencies in as efficient a manner as possible
- Efficiently access original Computer Aided Drafting (CAD) drawings for various features

Information Technology – GIS Business Objectives
This department manages and maintains all County data and telecommunication systems and their supporting infrastructure.

- Provide the County users with hardware and network support, including hardware and software installation and hardware and network troubleshooting
- Map and manage information technology assets (computers, network lines, routers, hubs, etc.)

Animal Control – GIS Business Objectives
This department provides protection of animals and the public in St. Clair County. All licensing and enforcement of animals in St. Clair County is provided through this department.

- Share data and information with Sheriff so that officers of both departments are aware of what might be at a property when answering a call
- Create maps of the locations of certain dog breeds, dog bites, etc.
- Create and maintain a spatial data layer for the addresses where all licensed dogs live
- Share and access accurate spatial and non-spatial data with the rest of the County

- Prepare officers with real-time information about a property as they answer a call (future plan)

1.2 Current Business Processes

To gain a clear understanding of the issues that require solutions related to the above listed business objectives, it helps to summarize the current business processes that depend on GIS. This provides the context for stating the issues in the next section.

Metropolitan Planning Commission (MPC) – Current Business Processes

- Growth and land use change is currently monitored by various means including the incorporation of current Census data and mapping of Census information. Change is also monitored by providing documents about properties to communities and the public over the Internet and allowing them to make changes to the documents. These changes are incorporated and monitored in the County documents at MPC.

- Build out analysis is modeled non-spatially using an Access database and calculations on fields. Area of a zoning district is multiplied by densities that are calculated by probabilities of growth in various areas. This is all done in tabular form resulting in projections of densities for various zoning districts in the future. These projected densities are then applied to maps to assist the public in understanding changes to the Master Plan.

- Zoning advice is provided via consultation over the phone, face-to-face consultation with individuals, educational workshops, and conferences. Maps are provided to communities and the public by the following: paper maps are produced on demand for walk in traffic via in house printers, map documents can be converted to PDF and either e-mailed or burned to CD, data is transmitted to consultants via File Transfer Protocol (FTP), CD or direct download depending on their abilities and need. A public website is maintained where individuals can access linked maps and text documents.

- Most Countywide spatial data is maintained and edited by the Metropolitan Planning Commission. Other departments send proposed changes to data layers to MPC and those changes are made or sent to the state for inclusion in the next release of Framework data. Other departmental data is stored locally at various departments. The Lands and Graphics Department maintains and edits the parcel data.

- Receive information from the State regarding parcels involved in the Farmland Preservation Agreement. This information is then entered and maintained in the database at the County.

- MPC creates map documents and group layers that other departments make use of for their operations. These map documents and group layers are created so that County users can access them across the network regardless of their access permissions to the production or working environments. MPC also assists in the installation and troubleshooting issues of GIS software for other departments. MPC provides CVT's (and consultants) access to the computers and data for use in their planning activities. Occasionally, MPC also provides technical support to agencies using the data.

Sheriff's Office – Current Business Processes

- Current jails are full except for the new jail and no tether program is in place

- Officers' positions are not currently tracked. Officers' positions are only known when officers call them in.

- Routing is currently done manually by officers using their best judgment in the field.

- Data is not currently exchanged between counties.

- There is no mapping system interfaced with the current Computer Aided Dispatch software. St. Clair County is currently in Phase I wireless, which means that a wireless 911 call returns the coordinates of the tower that the cell phone used. The County will be going to Phase II wireless, which will return Latitude and Longitude coordinates of the caller to within 100 feet.

- Do not use GIS analysis in crime solving operations

Land Information Group – Current Business Processes

- Using ArcGIS 8.1 and 8.2, and planning to install ArcGIS 8.3 and implement a parcel data model in the geodatabase

- Using ArcGIS, the MapBook extension, and the current parcel data layer to create tax parcel maps in 11 X 17 and 36 X 48 sizes. There is sometimes great inconsistency between the parcel boundaries and the other data such as aerial photography.

- The Land Information Group has a number of stored images, but does not currently link those to parcel polygon features.

- A remonumentation process is underway using Survey Grade GPS receivers to establish accurate control from which the parcels will be re-delineated using Coordinate Geometry methods in the current (8.3) version of the ArcInfo software.

- Lands and Graphics provides split review letters for land parcels created under the State Land Division Act. These split review letters and drawings are kept in paper form.

- May use OnBase ImageSoft software for management of the scanned imagery

- The Assessor tables are kept on a mainframe computer at the City of Port Huron, which cannot take input in the form of any file due to its storage of data in the EBCDIC format. This results in triple entry of parcel information: once in the County's Equalizer database, once in the Assessor's Equalizer database (done by the Assessor), and once in the mainframe system at the City of Port Huron.

- The Register of Deeds currently has deeds stored in the AS400 database, on microfilm, and paper copies. Pentamation is building a custom project for the Register of Deeds.

- Equalization has deed data stored in the AS400 and Equalizer.

- Lands and Graphics has deed data stored in Equalizer and hand written on index cards.

- Equalization uses the County data to answer various spatial and non-spatial queries on a daily basis, as well as paper copies and e-mail of Excel spreadsheets.

- There are possible plans to purchase the GeoConnector extension, which pulls information from the Equalizer databases and puts it into the geodatabase.

- Parcel annotation for the parcel maps is stored as CAD annotation

- Lands and Graphics and Remonumentation assist surveyors in searching for scanned documents on the network.

Cities, Villages and Townships (CVT's) – Current Business Processes

- Widely varying processes at the many communities for accomplishing their goals. Some use some GIS software while others don't have computers. Some have Internet access while others do not.

- Some get County data via CD, most do not have access to County data.

- Most manually perform queries using paper maps, etc.

- Much time is currently spent tracing down owner information for parcels for real estate agents**.**

Health Department – Current Business Processes

- Data complies with the Health Insurance Portability and Accountability Act (HIPAA). Any storage of data outside of the Health Department building can be accomplished by the entity storing the data signing a Business Associates Agreement

- Permit decisions are made and a tedious process ensues in trying to get the appropriate address to mail the approval information to the individual that owns the property. Assessor information (paper form) is searched to find the correct owner information for the property. This information is then used for the mailing address.

- The Health Department GPS maps outfalls into streams or ditches and records attributes into the GPS data logger. A digital photo is then taken of the outfall location. A determination of which parcel the outfall comes from is often made in the field if possible. The outfall Global Positioning Systems (GPS) data is converted into shapefiles using the Pathfinder Office software. Health Department employees then hand enter data associated with the owner of the property that the outfall came from into the Illicit Discharge Elimination Program (IDEP) database. To get owner information, employees currently go through the City of Port Huron tax roll mainframe application. This information is then hand entered into the IDEP database.

- The IDEP application stores data in an Access database. In order to realize the benefits of the relational database management system there is a process underway to convert the IDEP application to use Microsoft SQL Server and add it to the EnviroTrack SQL Database (which is already located on the SQL Server).

Drain Commission – Current Business Processes

- Develop parcel ID number ranges based on historical numbering convention and areas involved, and then create a list for special assessments. This list is refined by trial and error to parcel ID number ranges that are in a certain district multiple times until the correct list of parcel numbers in a particular drain district is achieved. The area of each parcel in each drain district is then calculated by hand measurements on paper maps and/or manual calculation based on legal descriptions (meets & bounds, bearing & distance descriptions, etc). The total assessment is then "spread", i.e. divided among parcels based on drain district, drain project, and amount of benefit, using the DOS based Benco drain assessment software. Paper reports of the special assessment are sent out to the townships and to the City of Port Huron for the tax roll creation. All assessments have to be done by October each year.

- Benco is a non-spatial application, which uses hand entered data to determine benefit, and spread the assessment across the parcel information entered.

- Benefit is affected and/or measured by many variables: parcel area, elevation, soil type, run-off coefficient, distance from drain, slope and topography, etc.

- Inspect and document condition of existing (already established) "county drains" and "inter-county drains" (legal designations). Evaluate need for maintenance, type of problem, location of problem, etc. Have approximately 407 drains that comprise about 800 miles of watercourses in the county. NOTE: This does not include road ditches or natural watercourses.

- The Drain Office verifies signatures on petitions and eligibility of petition-signers by checking: Recorded Deeds (at Register of Deeds Office) and tax delinquency (at County Treasurer's Office). Both offices are 11 miles away from the Drain Commission and we drive there.

- Provide information to the public in response to their questions, such as: What drain district (if any) is my property in? Why? Is a certain property wet? Is it in a floodplain? Does it contain regulated wetland? How close is it to your drain? How wide is the Drain Right-of-Way ("R.O.W.") for this drain? Are there problems with this drain? When was last assessment for this drain?

- Process applications and issue permits for all culverts and/or bridges over county drains. This entails determining upstream flow and required size, site inspection(s) and, of course, keeping record of structure, size, date, location, etc. NOTE: All of the above is done for over 400 drains, but often the inquiry/application turns out to be for a natural watercourse for which the Drain Commission has no authority and/or little information.

- All analysis is completed using paper maps and the Benco software

- Permit conditions, expiration dates, construction drawings, and inspection schedules, times and dates are kept on paper records

- Manually create mailing lists for providing affected parcel owners with the information about a certain drain

- Using maps of the drain districts that were created in 1917

- Request print-out of most-current parcel map from Lands & Graphics Department, drive 22 miles (round trip) to retrieve it, then transfer (hand draw) old "original" boundary onto "new" parcel map. Visually identify parcels that are "inside" or "outside" or "partially inside and partially outside" of district boundary.

- For newly proposed districts that do not yet exist, watershed boundaries are visually estimated. Mailing labels are prepared for legal notices that must be mailed to all potentially affected property owners at their "tax-bill-mailing-address" which is often different than the parcel address. Similar mailings are prepared for old, "already-in-existence" districts when a "new" maintenance project is requested by petition.

Road Commission – Current Business Processes

- Use RoadSoft software to manage road asset information, create road plans, create reports, and perform most of the other data related functions in the Road Commission. RoadSoft stores data in Access databases.

- Use Leica GPS units to perform road surveys and enter data

- Contract out the creation of road maps to a private contractor

- Drive downtown to get parcel information and then hand enter that information into databases

- Create thematic maps using the RoadSoft software

- Collect and store current traffic count information, which comes in the form of the cross street names, feet from the intersection, and count information

- Original CAD drawings are currently stored with CAD software and in paper form in the office.

- Maintain ROW data for new roads, but not for existing roads

- Use Michigan Framework data

- Do not share and use County data

Information Technology – Current Business Processes

- Currently maintain a Visio diagram of the entire network as well as information about the various hardware and software

Animal Control – Current Business Processes

- There is no current information about parcels. Officers are currently unaware as they approach a parcel whether the owner has a gun, what dog breed and how many dogs, etc.

- Currently all information about the 26,000 licensed dogs in the County is stored in Pentamation (uses Access database) and tied to the license number and address of the dog. This is a non-spatial data layer.

- County spatial data is not currently shared, and the dog license information is not shared with the rest of the County**.**

1.3 Issues Associated with Current Business Processes

Issues that are associated with the current business processes are the obstacles and "pain" that hinder the County in meeting the above stated business objectives. The solutions that follow in sections 2 – 5 of this document are geared toward addressing these issues in order to meet the stated business objectives. The issues are listed by department below.

Metropolitan Planning Commission (MPC) – Issues

- There is a need for more efficient and accurate information exchange among the MPC, the public, communities, and SEMCOG. Documents are changed at the community level after download, and the changed document is not returned in full to MPC so that all of the changes can be monitored. The reasons and authority for the changes to the information are not readily available or easily traceable by MPC. The issuing of permits for parcels occurs at the community level. Permit tracking is not currently done in the Equalizer program that is used to store parcel information both at the communities and at the County. This results in a communication gap between communities, the Lands and Graphics Department, and MPC. The

communities often lack staffing, technology, training, and data and, therefore look to the County to fill those gaps.

- Since the zoning districts are spatial (polygons) the non-spatial modeling of build out analysis and population density projection is cumbersome and not as efficient as spatial modeling and spatial (area based) "what if" scenarios.

- A significant amount of time is involved in making maps for the public and distributing these maps. This time could be allocated to other tasks if the public could retrieve their own maps. Difficulties are arising from having multiple versions of the ArcGIS software installed on different machines so that map documents cannot efficiently be shared and utilized on all desktops.

- The parcel data does not currently line up with aerial photography and other spatial data, thereby making it difficult to produce maps with parcels overlaid on other data including photography. Aerial photography is georeferenced, but not corrected in terms of radiometric distortion and orthometric distortion. It is also difficult to get current parcel information associated with the parcel polygons.

- There is a need for interface/information exchange with the State department that administers Farmland Agreements so that data regarding these parcels does not have to be re-entered.

- GIS is a tool used by the Metropolitan Planning Commission to accomplish their goals. MPC has provided some technical support for GIS to other departments in the County because of their extensive use of and experience with GIS tools. MPC is not officially organized as a GIS technical support department. This creates some efficiency/workflow issues within the MPC.

Sheriff's Office – Issues

- Without some program like a tether system to keep track of some prisoners in their homes, the new jail will fill up at the rate the current jails did.

- By not having the ability to track officers or their vehicles real-time, allocation of officers to an incident is not as efficient as it could be. Also officers that are in trouble could be more quickly located, possibly saving lives

- Even though the officers are well aware of the streets in St. Clair County, they do not always have the most current information about the roads and the optimum route to get from where they are to where they need to be.

- Data sharing between counties is required with the new Homeland Security measures.

- Currently there is no mapping solution. The new CAD system requires a mapping system, as does Cellular E-911 Phase II.

- Crime solving could be more efficient with the abilities of GIS analysis because of the spatial nature of crime.

Land Information Group – Issues

- The capabilities of the geodatabase and the parcel data model will assist the County in catching up 8 months of parcel splits that are waiting to be completed.

- The history of the parcel data layer with some inaccuracy due to poor control during the digitizing process has made the use of the parcel polygons with other data very difficult due to the locational and spatial error.

- Tax parcel maps are currently labeled with the old tax numbering system. However, all the indexes are based off of the new numbering system. As a result, all the parcels need to be labeled with the new tax numbering system.

- A large amount of time, which could be used for other tasks, is being spent preparing tax parcel maps for the public and others.

- As time goes on, more assessors are starting to move their tax roll databases from the City mainframe to an Equalizer database (stored locally) because it provides them more control of their tax roll. However it makes it more difficult for the County to track and maintain current tax information, tax maps, and tax parcel sales.

- Equalization is having trouble with the grouped layers of data that are currently available bogging down their computers.

- Redundancy in the workflow – triple entry of Equalizer information

- Software products that won't communicate with each other cause decreases in efficiency and accuracy due to human error.

- Inability to store data electronically for the Equalization employees causes decreased efficiency due to searching through paper documents.

- When contracted surveyors need to do research, material needs to be pulled from hardcopy files and copied or searched for from the images that have been scanned. This takes time away from other needed tasks.

- Surveyors need to come into the office to get research material from scanned documents. They have no outside access to network where scanned documents are stored. This requires Land Information Group staff to spend time assisting surveyors in finding what they are looking for.

Cities, Villages and Townships (CVT's) – Issues

- For those CVT's that do have GIS software, one of the major issues is the currency and accuracy of the parcel data. Updates are available from the County twice a year. The parcel data layer is not accurate enough to use with any other data. Permit tracking is not done in the Equalizer software. Most of the CVT's use the Equalizer software, but then print out the papers for changes and send them to the County rather than sharing the data electronically. This results in multiple entry of the same data. Some CVT's spend a large amount of time making maps. Most lack training with any GIS software.

Health Department – Issues

- One of the biggest problems currently faced by the Health Department is the fact that they cannot get a parcel ID, with an address in a timely fashion. Addressing of new parcels is performed by the communities that the new parcels are in. This new address takes time to get into the database that is kept at the City of Port Huron in the Assessor information. This creates multiple problems with the tracking of both septic and well permits and the mailing of permit information to the correct individual.

- Using the different disjointed software to get all of the needed information for outfalls and act on that information is cumbersome and takes time that could be allocated to other tasks. Downloading the data from the main frame at the City of Port Huron is time consuming. Hand entering the data from the owner information of the parcels is inefficient and time consuming.

- An issue with finding an efficient way to hyperlink digital imagery and other documents to the outfall points was discussed.

- There is currently no plotter at the Health Department, making the task of printing a map a cumbersome process of driving downtown to get the output.

Drain Commission – Issues

- Much of the "pain" experienced by the Drain Commission in their workflow centers around the fact that all data is in paper form and stored in the Benco application format. The Benco application involves tedious data entry that has to be completely redone if an error is made or if there is any change in district such as a lot split, lot sale, lots combined, etc.

- It is difficult and time consuming to find and physically retrieve all pertinent data for a given inquiry due to volume and differing locations of information. It is difficult or impossible to know if you've found everything there is to find for a given inquiry.

- The "satellite" location also introduces some inefficiencies when Drain Commission employees must travel to downtown Port Huron to the "main campus" to retrieve or view documents.

- Access to County data is essential to making use of the current technology in making the Drain Commission's workflow more efficient and sharing drain data with other departments that need it.

- Accurate parcel polygons with current owner information "attached" to the polygons is essential to meeting the parcel needs of the Drain Commission.

- Using paper records and database software to track permit applications and permitted structures and/or activities is inefficient and uses staff resources that could be allocated elsewhere.

Road Commission – Issues

- RoadSoft software meets the Road Commission's needs for the applications that they are using it for, with the possible exception of the map-making portion. The map-making portion of the application does not allow you to add in other layers than the base data layers that are included.

- Contracting out the creation of road maps may not be necessary if the ability to make road maps of similar or better quality exists in-house.

- Occasionally experience difficulty dialing in to retrieve CORS data for the road GPS surveys

- Driving downtown to get owner information for parcels is inefficient. Sharing of data with the County would improve the rest of the County's information for roads, and would help the Road Commission create more complete and accurate thematic maps.

- Experience difficulty storing traffic count information when two traffic counts are taken for the same road segment with the current traffic count software

- Storing CAD drawings in paper form makes gathering the drawings needed, cumbersome and inefficient with today's technology.

Information Technology – Issues

- The current method of keeping track of hardware and software does not provide real-time alerting of problems or spatial analysis of problems given an outage. There is also no current spatial analysis capability for "what if" planning for IT asset management.

Animal Control – Issues

- Safety of the Animal Control officers and other County officers is of primary importance. The lack of information about what an officer could find at a property potentially puts the officer in unnecessary danger.

- Not having spatial data for the locations of dog breeds, bites, etc. makes spatial analysis involving those topics impossible.

- Without accurate spatial and current non-spatial data from the County, making maps with the needed information on them is not possible. The County parcel data layer is not currently accurate enough in places to put with other data on a map.

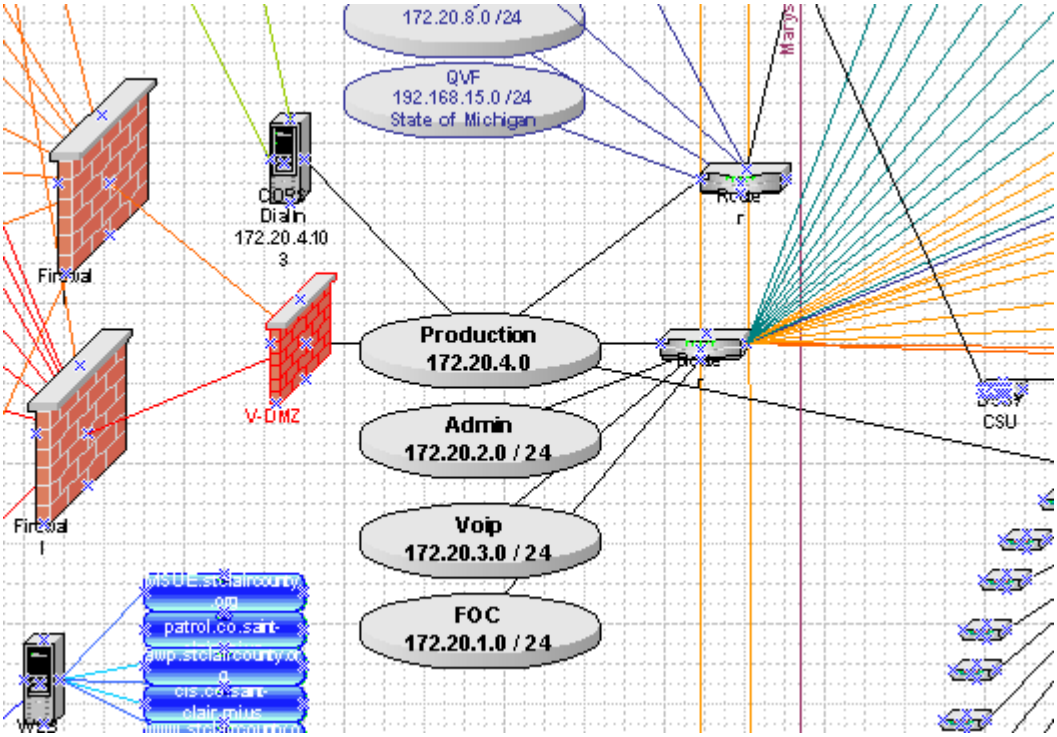
2.0 Technology and IT Infrastructure Review

Description:
Technology and infrastructure are composed of a mix of hardware and software designed to support the business objectives of an organization. When considering GIS business objectives in light of a GIS implementation, some upgrades and replacements of existing technology are often necessary. A review of the current technology utilized by St. Clair County is provided below, along with common best practices in the areas of technology and infrastructure. These best practices are listed to provide context for the discussion of considerations that are unique for the GIS solution defined in section 5.

2.1 Current Technology and Infrastructure Situation

Two subsets of the current diagram of technology and infrastructure are provided in **Figure 1 - Current Situation Downtown Port Huron** and **Figure 2 – Current Situation Satellite Departments**. This information was gathered from interviews with St. Clair County staff and provided in Visio drawing form and verified by Brian Briese. The full diagram is attached as Appendix A.

Figure 1 – Current Situation Downtown Port Huron



The following departments are on the fiber optic backbone in close proximity to the Production server: Metropolitan Planning Commission, Sheriff's Office, Land Information Group, and Information Technology. Spatial data used by all of the departments that use the County data is physically located on a shared network drive on the Production server as grouped layer files. The layer files point to coverages stored on Svr02 in the Information Technology Department. Other data used by all of the departments that create their own data is physically stored at the various departments on their computers. Some of the cities, villages, and townships have access to the St. Clair County network via various line sizes ranging from modem to T1, while others do not currently have access at all.

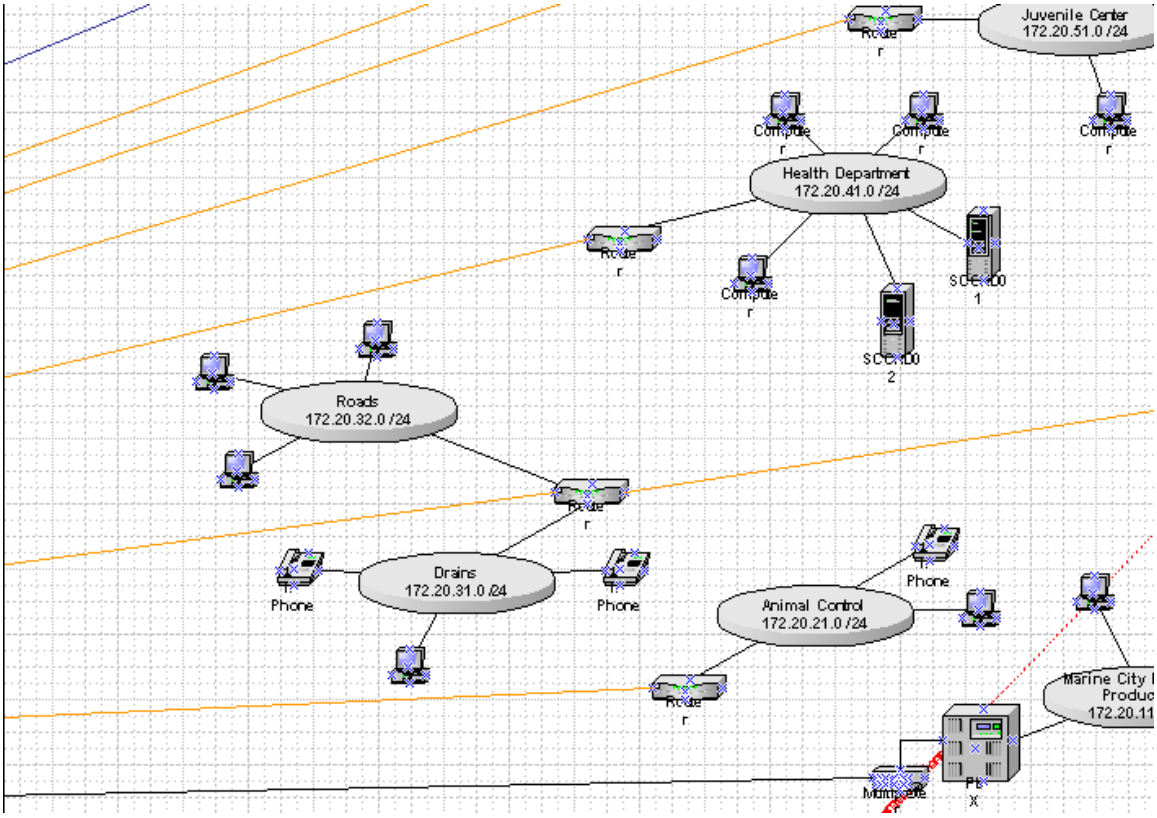


Figure 2 – Current Situation Satellite Departments

The other departments interviewed including: the Health Department, Drain Commission, Road Commission, and Animal Control Department are located across town as satellite offices. These departments are all connected to the Production server environment by T1 lines. Fiber optic line is being extended to the new jail, which is close to the Health Department; so future plans may include extending fiber optic line to the Health Department as well as the Intermediate School District, Drain Commission, Road Commission, and Airport Terminal Office.

The desktop computers in the different departments and communities vary widely by processor speed, amount of physical memory (RAM), and operating system. Minimum specifications for computers to run any of ESRI's software can be found at http://www.esri.com/software/index.html. Click on the software of interest, and then click on the system requirements link.

At the time of the writing of this document, the minimum requirements for ArcView and ArcInfo are given below. ArcSDE and ArcIMS requirements are server and operating system specific and are consulted during a server sizing procedure.

ArcView

Hardware Requirements
CPU Speed:
450MHz Minimum
Memory/RAM:
128 MB minimum
Operating System
Windows NT 4.0 with Service Pack 6a (or)
Windows 2000 (or)
Windows XP (Home Edition and Professional)

ArcInfo

Hardware Requirements
CPU Speed:
450MHz Minimum
650MHz Recommended
Processor:
Pentium or Higher
Memory/RAM:
128 MB minimum
256 MB recommended
Swap Space:
300 MB minimum
Utilizing Windows Terminal Server technology may require additional MB, depending on the number of clients accessing the server.
Disk Space:
ArcInfo Desktop 8.3:
605MB NTFS
690MB FAT32

ArcInfo Workstation 8.3:
695MB NTFS

Disk Space Requirements:
Disk spaces do not include the 50MB of system drive space needed for installation (typically C:\Winnt\System32). The disk space requirement for each of the ArcInfo 8.3 components are provided in the Setup program.
Notes:
Internet Explorer 5.0 requirement:
Some features of ArcInfo 8.3 require a minimum installation of Microsoft Internet Explorer 5.0 or greater Version 5.0. If you do not have an installation of Microsoft Internet Explorer Version 5.0 or higher, you must obtain and install it prior to installing ArcInfo 8.3.

If you are using a non-English operating system, you must obtain and install the appropriate language version of Internet Explorer 5.0 or higher prior to installing ArcInfo 8.3.

License Manager Requirements:
Simple TCP/IP, Network Card or Microsoft Loopback Adapter.

For best performance (ArcInfo Desktop 8.3), the following is recommended:
- True color monitor with a minimum of 16MB video card

- An OpenGL graphics card is recommended to optimize performance in ArcScene. Texture mapping will be better optimized using an OpenGL graphics card with 32MB, or more, of on-board texture memory.

-Installation on a fast, NTFS (New Technology File System) hard drive is strongly recommended.

The software licensed by County departments varies widely, but includes ArcGIS 8.1, and 8.2 (floating), Microsoft Office Suite, Adobe Acrobat, RoadSoft, TerraModel, Equalizer, EnviroTrack, Pentamation, and many other applications that perform tasks specific to individual departmental needs. Most of these applications that include database capabilities store the data in Access or SQL Server databases. This open database storage lends itself well to integrating the communication of these databases with ESRI software solutions.

2.2 Best Practices for Technology and Infrastructure

Best practices in the area of technology and infrastructure are established to aid in matching the correct solution for technology and infrastructure to the business objectives.

1. Match software solution with type of user and business needs

   Rationale:
   - Ensures the users' functional needs are met
   - Reduces costs associated with the customization required to apply a software solution designed for one type of user to meet the needs of all types of users (i.e. one-size-fits-all)
   - Better manage software license costs

   Examples:
   - Desktop solution for spatial data editors and analysts
   - Web based solution for viewers
   - Use GIS tools to maintain GIS data

2. Leverage COTS (Commercial Off The Shelf) technology (see ESRI publication: ESRI GIS Partner Solutions for State and Local Government, for a current sampling of COTS providers that have partnered with ESRI)

Rationale:

- Minimize application development costs and time
- Minimize costs for application upgrades and on going maintenance
- Reduces risk of unexpected complications for highly engineered applications
- Rely on software manufacturers to manage compatibility between versions

3. Minimize the complexity of the IT environment

   Rationale:

   - Reduces the number of points of failure
   - Increases overall stability and performance
   - Minimizes the cost of maintenance and support
   - Maximizes ease of administration

   Examples:

   - Locate production servers on same network domain or subnet (minimize number of routers, switches, firewalls, gateways between data severs, web servers, application servers)
   - Minimize complexity of network between editing server and editors
   - Multiple operating systems
   - Different RDBMS platforms
   - Varied hardware platforms for servers and desktops
   - Excessive software applications
   - Complex network configuration

4. Periodically review hardware and network environment

   Rationale:

   - Maximizes performance
   - Maximizes stability
   - Facilitates capital investment forecasting

   Examples:

   - Monitor network capacity and use
   - Size data servers, web servers, and application servers based on evolving demand
   - Provide fail-over as necessary

5. Establish separate environments

   Rationale:
   - Reduces downtime caused by conflicts between development and production schedules in the same environment
   - Allows better testing procedures
   - Contributes to better deployment and user confidence

   Examples:
   - Development environment for application and database development
   - Testing environment for performance and integration testing to emulate production environment
   - Production editing environment for transaction editing
   - Production data publishing for view and query users

2.3 Technology and IT Infrastructure Department Matrix

The Departments are shown below according to which Departments are likely to be directly affected by following these best practices.

Table 1 – Technology and IT Infrastructure Best Practice Recommendations

Best Practice Recommendations	Metropolitan Planning Commission	Sheriff's Office	Land Information Group	CVT's	Health Department	Drain Commission	Road Commission	Information Technology	Animal Control
Match software solution with type of user and business need	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Leverage COTS (Commercial Off the Shelf) Technology	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Minimize the complexity of the IT environment								**X**	
Periodically review hardware and network environment								**X**	
Establish separate environments								**X**	

3.0 GIS Database Review

Description:
Data is a critical element of the success of any GIS. The quality and accessibility of the data determines whether the technology will work correctly and whether the GIS business objectives will be met. Most of the spatial data that the County uses is in the format of coverages. The current data situation is given below followed by best practices for data.

3.1 Current Data Situation

Many of the departments interviewed at St. Clair County are beginning to use the same set of grouped spatial data layers that point to the coverages stored on Svr02 at the Information Technology Department. These coverages are mostly based on the Michigan Framework data.

Some of the departments store sensitive data locally and laws such as HIPAA control access to that data. The Road Commission stores most its data locally. There is interest in all of the departments sharing and integrating their data. This interest was repeated at each interview.

Appendix B contains the GIS Data Directory put together by the Metropolitan Planning Commission, which lists the data layers that are available through Planning. These layers are stored as coverages in the various workspaces that are listed in the Directory. Changes to the coverages that come from the Michigan Framework data go through the Planning Commission to the state where they may be incorporated in the next release of the Framework data. These releases of data occur quarterly. Employees of the Planning Commission edit some of the coverages. The Lands and Graphics Department edits and maintains the parcel data layer. Metadata for the coverages is currently stored in a file cabinet in the Planning Commission. Access is limited to some of the coverages, which have sensitive data.

The Sheriff Department owns a street address database that they would be willing to share with the rest of the County to help in this GIS endeavor.

3.2 Best Practices for Data

The reason for establishing best practices for data is to match data solutions to business objectives.

1. Utilize most suitable spatial database management technology that supports business needs

   Rationale:

- Maintains data integrity
- Provides for consistent data entry
- More robust security
- Better performance for multiple simultaneous users
- Provides access to data from other organizations

Examples:
- Storing data in a Relational Database Management System (RDBMS) instead of a file based system
- Topology rules
- Attribute validation rules
- Spatial data sharing network (Geography Network)

2. Consolidate geographic data published for use by multiple agencies into a common data format.

   Rationale:
   - Simplifies data access
   - Easier to administer
   - Easier to maintain data integrity
   - Easier to maintain metadata

   Examples:
   - CAD data integrated with geographic data
   - Raster data with vector data

3. Separate editing database from publishing database

   Rationale:
   - Allows each database to be tuned appropriately for each use (indexes and grid levels)
   - Allows for normalizing data in the editing database and de-normalizing data in the publishing database
   - Allows database design to be optimized for each use

   Examples:
   - Editing database for parcel editing and a publishing database for web or desktop access

4. Establish data standards

   Rationale:
   - Clarifies data quality requirements
   - Ensures data quality, accuracy and usefulness

   Examples:
   - Locational Accuracy
   - Attribute Accuracy
   - Precision
   - Currency
   - Completeness
   - Compatible formats
   - Geographic coincidence
   - Connectivity/topology

5. Establish data update and maintenance procedures

   Rationale:
   - Reduces the probability of conflicting results
   - Allows the frequency of updates from editing to publishing database to vary depending on business needs
   - Improves user confidence by providing up-to-date information
   - Ensures business needs are met

   Examples:
   - Transactional procedure for individual features
   - QA/QC procedures for multiple features
   - Replacement procedure for entire layers
   - Replacement procedure for multiple layers at a time
   - Replication procedure for the entire database

6. Establish a database design

   Rationale:
   - Ensures the data will meet the business requirements
   - Provides a clear understanding of how the data is organized and structured
   - Clarifies the relationship between business data and spatial data
   - Ensures that the applications can access data correctly

7. Establish data backup and recovery procedures

   Rationale:
   - Limits down time in case of failure
   - Reduces the risk of data loss
   - Reduces costs of data replacement

   Examples:
   - Incremental backup procedure for high frequency changes
   - Full backup procedure for less frequent changes
   - Testing procedure for data recovery

8. Assess data prior to publishing it

   Rationale:
   - Ensures data meets business needs
   - Ensures data meets established data standards
   - Identifies what data preparation is necessary
   - Identifies what data is incomplete

   Examples:
   - Quantitative assessment for geographic and attribute completeness
   - Qualitative assessment comparing currently available data with established standards
   - Gap analysis to identify what data is missing and what changes are necessary

3.3 Data Department Matrix

The Departments are shown below according to which Departments are likely to be directly affected by following these best practices.

Table 2 – Data Best Practice Recommendations

Best Practice Recommendations	Metropolitan Planning Commission	Sheriff's Office	Land Information Group	CVT's	Health Department	Drain Commission	Road Commission	Information Technology	Animal Control
Utilize most suitable spatial database management technology that supports business needs	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Consolidate geographic data published for use by multiple agencies into a common data format	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Separate editing database from publishing database	**X**		**X**					**X**	
Establish data standards	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Establish data update and maintenance procedures	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Establish a database design	**X**		**X**					**X**	
Establish data backup and recovery procedures	**X**		**X**					**X**	
Assess data prior to publishing it	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

4.0 Organization Review

4.1 Current Organization Situation

A review of the current organizational situation for support of GIS at St. Clair County is given below.

4.1.1 Organizational Structure

For St. Clair County's GIS organization, each department functions as an individual unit, in concert with other departments where there is benefit. Most departments rely on the Metropolitan Planning Commission for the data and GIS support they need. Many of the departments have and will maintain their own layers of spatial data. All departments interviewed rely on the parcel data layer and the Assessor data for information for their workflows. There is no current individual GIS Department at the County.

4.1.2 Technical Support Structure

The first line of technical support at St. Clair County for GIS is generally the Metropolitan Planning Commission. The second line of GIS support is often the Lands and Graphics Department. The Information Technology Department provides hardware and network support, as well as software installation and upgrade.

4.1.3 Procedures for Development and Deployment

The departments interviewed at St. Clair County rely on the Information Technology Department to provide application development and deployment. Data development and deployment is primarily accomplished through the Metropolitan Planning Commission, and the Lands and Graphics Department.

4.1.4 Organizational Roles

The current organizational roles with required GIS skills are identified below. Each role is a necessary part of the GIS organizational support structure. It is important that the enterprise organization identify its staff in these roles to determine where there may not be enough support for the GIS endeavor.

Viewers

This is the most common type of end-user and therefore the most populated category. The main function provided in this category is map viewing and/or printing to support departmental business needs. Staff identified in this category includes: staff in every department interviewed. Any user of GIS data who would not be editing the spatial or attribute data would be a viewer. Staff may be identified in this category in the in each department. Staff in many of the departments would be categorized as viewers

of other departments' data, but editors of the data under their stewardship. The local communities and general public could be categorized as viewers for some of the applications of GIS.

- *GIS Skills:* Navigate map view, display and symbolize features, query features, produce hard-copy maps
- *GIS Training:* Introduction to ArcGIS I, Introduction to ArcGIS II

Editors

This type of user is responsible for updating or maintaining spatial or non-spatial data in the GIS. At the County, the parcel editors in the Land Information Group, GIS users in the Metropolitan Planning Commission, Drain Commission, Road Commission, and Health Departments would fit into this category, as well as possibly some users in the local communities.

- *GIS Skills:* In addition to Viewer skills, edit spatial and non-spatial data, manage geographic data, perform Geocoding, and perform simple spatial analysis such as buffering and spatial overlays.
- *GIS Training:* Introduction to ArcGIS I, Introduction to ArcGIS II, Building Geodatabases I, What's New in ArcGIS 8.3

Analysts

Staff in this category are responsible for providing spatial analysis functions to more complex geographic questions. Spatial analysis usually requires a process made of several steps. Some potential examples of spatial analysis are: predicting future population densities in certain zoning types, and calculating the amount of storm-water drainage in a given geographic area based on elevation.

- *GIS Skills:* In addition to Viewer and Editor skills, perform complex queries, perform analytical functions such as flow analysis for geometric networks and 3-dimensional analysis, build and use a Geodatabase.
- *GIS Training:* Introduction to ArcGIS I, Introduction to ArcGIS II, Building Geodatabases I, Building Geodatabases II (optional), What's New in ArcGIS 8.3

Database Administrators

This is a support category necessary to maintain both the spatial and non-spatial databases used by viewers, editors and analysts. While this may be an existing position or role in the Information Technology Department, it is important that the people designated to provide database support to the GIS, fully understand the complex nature of spatial data and GIS user needs.

- *GIS Skills:* Understand Geodatabase concepts, storage formats and data loading procedures. Understand ArcSDE software architecture, ability to install ArcSDE, configure database for best performance, load and tune data.
- *GIS Training:* Introduction to ArcSDE using ArcInfo 8, ArcSDE Administration for SQL Server, Building Geodatabases I, Building Geodatabases II, Introduction to ArcIMS (optional)

System Administrators

Another support category that may include network administrators, desktop support personnel and web server specialists. People in this category are usually involved in the implementation planning, installation and deployment stages. While GIS may not be their only support function it is important that they also understand the unique needs of GIS users and have a basic understanding of GIS technology.

- *GIS Skills:* Understanding of how server-side GIS technologies can be integrated together, perform both desktop and web server software installations.
- *GIS Training:* Introduction to ArcSDE for ArcInfo 8, Introduction to ArcIMS

Application Developers

This is usually the smallest group of user support staff. In many organizations, this category is staffed by outside personnel on contract. People assigned to this category must be fully versed in the GIS technology being used to deploy the applications. These applications may be desktop-based, server-based or web-based depending on the organizational business need.

- *GIS Skills:* Ability to capture user requirements and translate them to a system design. Ability to use the system design to develop and deploy GIS applications to meet end-user needs. Specific programming abilities include Java, and/or Visual Basic.
- *GIS Training:* Introduction to ArcGIS I, Introduction to ArcGIS II, Building Geodatabases I, Building Geodatabases II, What's New in ArcGIS 8.3, various customization and programming courses.

4.2 Organization Best Practices

Best practices for Organization are established to provide a guide for evaluating an organization's ability to support a GIS implementation.

1. Periodically review GIS business needs and existing procedures

   Rationale:
   - Ensures that other best practices meet real user needs
   - Reduces costs associated with activities that don't meet real user needs
   - Facilitates understanding of how GIS can be used to meet expanding needs of each department
   - Refines current procedures to improve efficiency

2. Develop technology/IT infrastructure policies

   Rationale:
   - Ensures hardware and software compatibility
   - Clarifies testing requirements and procedures
   - Clarifies application and database development procedures

- Ensures software and hardware upgrades are successful
- Ensures applications and databases are deployed successfully
- Ensures new users have necessary equipment and training
- Allows for phased implementation approach

Examples:
- Data backup policies
- Standard desktop images
- Data security policies

3. Define data stewardship responsibilities

   Rationale:
   - Ensures data standards and requirements are met
   - Clarifies data editing and verification responsibilities
   - Allows identification of a contact person for specific data sets

4. Establish organizational structure

   Rationale:
   - Provides an environment for decision making
   - Ensures that individual projects have the necessary support structure
   - Improves knowledge transfer for technical information
   - Improves communication between staff about projects

   Examples:
   - Executive level for steering and policy decisions
   - Project level for managing and coordinating activities
   - Technical level for sharing knowledge
   - Core GIS team

5. Establish technical support procedures

   Rationale:
   - Ensures end users needs are met
   - Helps identify potential technical problems
   - Helps identify potential training needs
   - Clarifies the technical reporting and resolution procedures

6. Identify staff in each user role

   Rationale:
   - Allows for assessment of skill level relative to user needs
   - Provides information necessary for the development of a training plan
   - Clarifies the responsibilities of each participant

   Examples:
   - Viewers
   - Editors
   - Analysts
   - Programmers

7. Establish systematic processes for development and deployment

   Rationale:
   - Minimizes disruption to production operation
   - Ensures that delivery/deployment results are successful
   - Manages cost of development and deployment

   Examples:
   - Application development process
   - Software deployment process
   - Hardware and software upgrade process
   - Data deployment process

4.3 Organization Department Matrix

The Departments are shown below according to which Departments are likely to be directly affected by following these best practices.

Table 3 – Organization Best Practice Recommendations

Best Practice Recommendations	Metropolitan Planning Commission	Sheriff's Office	Land Information Group	CVT's	Health Department	Drain Commission	Road Commission	Information Technology	Animal Control
Periodically review GIS business needs and existing procedures	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Develop technology/IT infrastructure policies								**X**	
Define data stewardship responsibilities	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Establish organizational structure	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Establish technical support procedures								**X**	
Identify staff in each user role	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Establish systematic processes for development and deployment	**X**		**X**					**X**	

5.0 Potential GIS Solution for Meeting the Business Objectives

A potential solution for most of the issues and GIS business objectives listed in section 1 is given below for St. Clair County, along with characteristics and considerations in the three main areas of Technology and IT Infrastructure, Data, and Organization.

5.1 Technology and IT Infrastructure Solution

A conceptual diagram of the potential GIS solution for St. Clair County can be found in Figure 3. This part of the solution covers the hardware, software, application and network infrastructure. Some of the connectivity to ArcSDE and ArcIMS is not shown to avoid confusion. Changes to the current Technology and IT Infrastructure situation as seen in Figure 1 and 2 include the creation of 2 instances of Microsoft SQL Server and installation of ArcSDE 8.3 for each instance on the 8 CPU Serv02 machine located at the St. Clair County Information Technology Department. One instance of SQL Server would act as the Editing Server and the other instance would act as the Publishing Server.

ArcSDE (Arc Spatial Database Engine) spatially enables a standard database system. ArcSDE allows Microsoft SQL Server to communicate with spatial data applications such as ArcView, ArcInfo, and ArcIMS. ArcSDE is a service, which translates information between the spatial applications requesting data and the database system.

ArcIMS (Arc Internet Map Server) provides the capability of serving spatial data (maps and attributes) across the Internet to a standard web browser. This allows users to view and query (ask questions) spatial and attribute data without having GIS software installed locally on their desktop computer.

Editors would edit the data on the editing server instance using locally installed ArcInfo software, while all viewers (ArcReader, ArcView, and ArcIMS) would access the publishing server. Periodic replication would occur between the editing and publishing instances. Svr02 is a large capacity server with 8 CPU's, 8GB of RAM, and plenty of storage in Redundant Array of Inexpensive Disks (RAID) arrays. Connectivity between editors and the server at minimum is a T1 line with the exception of local communities. This connectivity is adequate.

The other applications, which have database capabilities, store data either in Access or SQL Server tables. The SQL Server tables would be readily accessible by ESRI applications. The Access data tables may need a periodic conversion, or Open Database Connectivity (ODBC) connection from the ESRI applications for connectivity to that information. Data would be transferred from the Equalizer databases on a periodic basis to update the editing instance of ArcSDE using the GeoConnector extension. Some research into the conversion and replication processes may be necessary.

ArcIMS 4.0.1 would be installed on a server with direct connection to the publishing instance of ArcSDE. A server sizing exercise will be necessary to ensure that the correct

size ArcIMS server is used for the expected load. ArcIMS would initially contain applications that County departments wish to make available to other departments and local communities, which have access. Once the applications are created and refined, the functionality can be extended to the public. The appropriate security measures will have to be taken in locating the ArcIMS server in relation to firewalls and DeMilitarized Zones (DMZ's) once functionality is extended to the public. This should all be done according to IT's security policies.

Viewers that have been identified in the departments according to the organizational roles laid out in section 4 have some choices as to which application best fits their needs. ArcIMS delivers applications that allow simple spatial query and mapping in an Internet browser. Those viewers that need to get quick current information about data such as parcels and owner information, perform some buffering and mailing list generation, and other simple viewing; but don't need to make and print highly detailed maps would benefit from ArcIMS. The viewer only needs to have an Internet browser installed on his/her machine. This may be ideal for some of the local communities, sheriff patrol cars, Animal Control responders, Office of Emergency Management first responders, etc. Viewers that need to do the above and also make professional detailed maps for printing would benefit from using ArcView 8.3. ArcView 8.3 also includes the analysis capabilities needed by the departments interviewed. ArcReader is a freely downloadable map document reader that is available and ideal for individuals that need to print pre-made map documents with the most current data (if they have access to the data server). This application can be optimal for individuals at the local communities that agree on the format of a map document and periodically need to print maps in those formats with the most current data. This viewer solution would require a license of the ArcPublisher extension for the individual or department that is creating the published map files for the users of ArcReader. ArcReader is the current technology application providing the ArcExplorer functionality.

A research project should be completed to determine the amount of customization to the standard ArcGIS software that might be necessary to track the tether systems for the Sheriff's Office real-time.

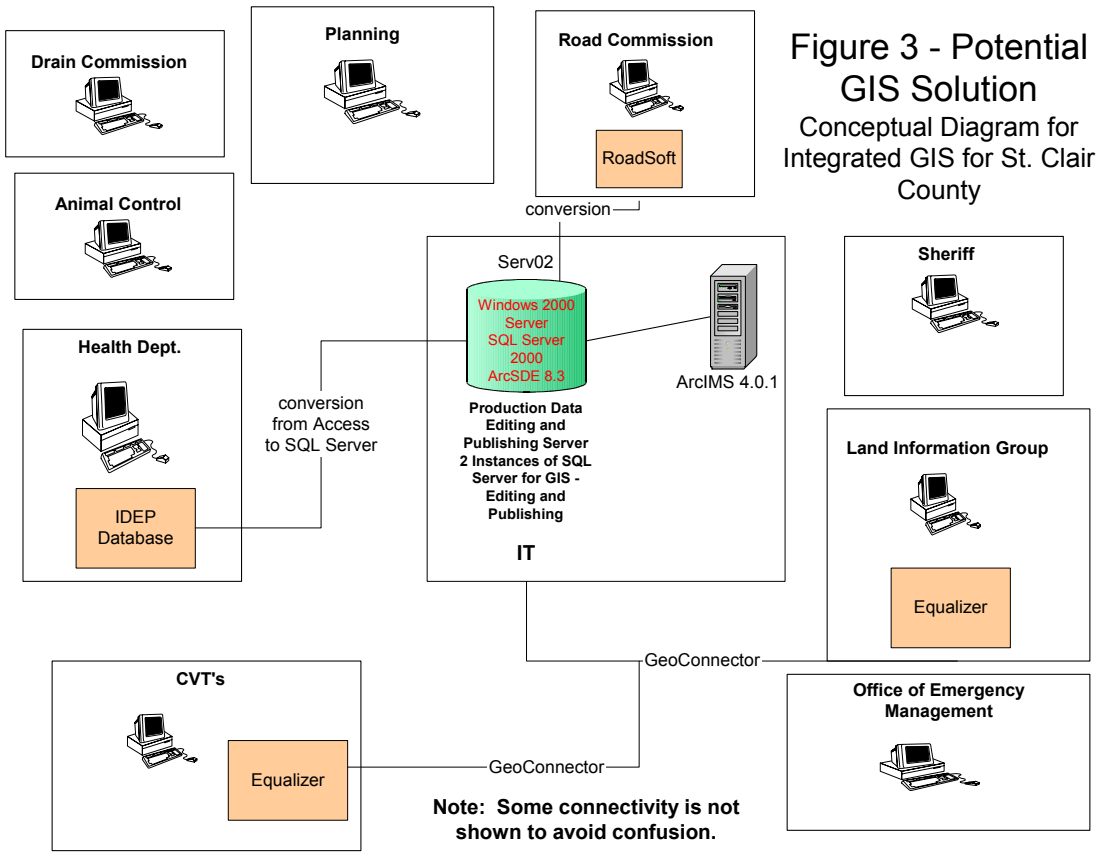


Figure 3 - Potential GIS Solution
Conceptual Diagram for Integrated GIS for St. Clair County

Figure 3 – Potential GIS Solution

5.2 Data Solution

The data component of this potential GIS solution is composed of the creation of 2 ArcSDE geodatabases – an editing geodatabase and a publishing geodatabase. The ArcSDE geodatabase along with the parcel data model will provide the functionality and data protection required by the departments of St. Clair County. The geodatabase will not solve the inaccuracy issues with the current parcel data layer. The remonumentation project will solve those issues.

Aerial photography and all other spatial and non-spatial data will be loaded into the ArcSDE geodatabases. Options for the aerial photography include a seamless ArcSDE raster mosaic, an embedded raster catalog, or a file based raster catalog. Any of these three options will provide the functionality of bringing up the correct imagery behind any spatial data, no matter where you zoom or pan.

Coverage and CAD data will be loaded into the ArcSDE geodatabase. This process should be done in a test environment with a subset of the data. The test environment should be set up as identically to the production environment as possible. The test environment could potentially be a third instance of ArcSDE on Serv02, or it could be set up on another server.

Some of the data considerations unique to this solution are given below.

- All spatial data would be migrated to the geodatabase environment
- Utilizes the most suitable spatial database management technology that supports business needs
- Consolidates published data into one common data format and one accessed copy of the data
- Could potentially allow single entry of Equalizer information that would be stored in geodatabase tables and extracted by the Equalizer software at the City of Port Huron
- Separates the editing data from the publishing data
- The stewards would need to assess the data layers under their stewardship to ensure that data meets business needs prior to publishing
- Require establishment of data update and maintenance procedures (editing, metadata, QA/QC, etc.) for County data at the department level
- Require development of database designs for each geodatabase

A database design should be completed prior to migration of the data from coverages to the ArcSDE geodatabase. Part of this design process includes evaluating the current data layers for geographic and attribute quantity and quality. Gaps in the quantity or quality of data can be identified, and plans to fill those gaps can be developed at this time. Many of the departments interviewed discussed data layers that they would like to have access to that would help their workflow. Some of these data layers exist in coverage form. Others do not exist at the County. The layers are listed below by the departments that requested them. All departments wanted the ability to look up current owner information on a spatially accurate parcel data layer.

<u>Office of Emergency Management</u>
Hazardous Material Sites
Building diagrams
Facility and site water and sewer system
Drainage
Chemical transportation routes
Evacuation routes
Emergency Response Agencies
Schools
Evacuation routes
Pipelines
Bridges
Water plants
Government buildings
Main utility centers
Utility substations
Water system grids
Rail lines
Expressways

Manufactured home parks
Topographic data
Accurate digital elevation model

Land Information Group
Tax Maps
Tract Cards
Recorded Surveys
Recorded Corner Surveys
Unrecorded Surveys
Government Survey & Notes
County Surveyor Notes on Government Survey
Remonumentation Points
Remonumentation Dossier Information
Septic Tank / Well Denials
AG land Field Tile location
Tax Roll Information (current & history)
Ortho Aerial Photography
Register of Deeds Database
Recorded Deeds, Land Contracts, etc.
Recorded Plats
Recorded Condominium Plans
Road Right of Way (easement & fee title)
Drain Right of Way (easement & fee title)
Railroad Right of Way
Hazardous Material Sites
Building diagrams
Facility and site water and sewer system
Drainage
Chemical transportation routes
Evacuation routes
Schools
Evacuation routes
Pipelines
Utility substations
Water system grids
Rail lines
Expressways
Manufactured home parks
Topographic data
Accurate digital elevation model
Sand pits
Medical facilities
Chemical routes
Wetlands
Woodlands

Flood plains
Zoning data that has not been generalized for all communities
Easements for drains
Easements for roads
Natural waterways
Power lines
Gas lines
Sewer

Health Department
Roads
Rivers and Streams
Drains
Municipalities
Section Lines
Township Lines
Road Crossings
Municipal Zoning
Parks (county/municipal)
Riparian Corridors
Riparian Landowners
Various Categories of Planning Ordinances
County Owned Facilities/Land
New Development
Regulated Wetlands
Accurate Parcel Map
Aerial Photography
Watersheds
County Drains (regulated and non-regulated)
Private Storm Water Systems and Appurtenances
Erosion/Sedimentation/Pollution Problem Areas
Illicit Discharge Locations (outfalls)
Soil Types
Land Uses/Type of Vegetation
Natural Bodies of Water
Flood Plains
Section Corners
Property Owner Data
Septic Tank/Well Denials
Rail Lines
Expressways
Topographic Data
Wetlands
Woodlands
Easements for Drains
Natural Waterways

Drain Commission
Accurate Parcel Map
Aerial Photography
Digital Elevation Model
Water flow direction
Watersheds
Drain Assessment Districts
County drains
Bridges and culverts
Drain easements/R.O.W. documents, drain plans & other drain documents "linked" to map
Other (City, Twp, Village) municipal storm sewer systems and appurtenances
Private storm water systems & appurtenances
Public utilities and/or infrastructure assets (gas line and power line corridors).
Erosion/sedimentation/pollution problem locations
Illicit discharge locations (outfalls)
Beavers/Beaver Dam activity locations
Drain Right of Ways
Soil types, with permeability and/or run-off coefficients
Land uses, type of vegetation
Private ditches
Natural watercourses (creeks, streams, rivers)
Natural bodies of water (ponds, lakes, wetlands)
Flood plains
Engineered/constructed bodies of water (detention ponds, retention ponds, wetlands)
Deeds
Plats
Utility easements
Section corners
Survey maps
Condos
Scanned images of Road Commission records
Right of ways held by the Road Commission specifically for drainage

Road Commission
Topographic data
Water flow direction
Aerial photography
Bridges and culverts
Truck routes
Sand pits
Soil types
Property owner data
Lands and Graphics mapping and property description data
Deeds

Plats
Utility easements
Section corners
Survey maps
Condos
Drain plans
Drain easements
Right of way documents
Scanned images of records

Environmental Services Department
NOAA/NGS vertical and horizontal control stations
CORS locations
Controlling corners
Solid waste disposal facilities
Materials processing facilities
Recycling drop-off locations

IT
Layer of sites and hardware assets

Animal Control
Sheriff data – weapons at properties, etc.

Sheriff's Office
SARA Title III sites
Gun ownership
Medical facilities
Schools
Bus routes
Commerce routes
Chemical routes

CVT's
Tax Maps
Tax Roll Information (Current and History)
Wetlands
Woodlands
Flood plains
Zoning data that has not been generalized for all communities
Cemeteries
Easements for drains
Easements for roads
Natural waterways
Power lines
Gas lines

Cable
Sewer

5.3 Organization Solution

This enterprise solution requires the organizational support throughout the enterprise to ensure that it is a success. The organizational roles were established in section 4. These roles should be represented by enough individuals throughout the County to provide for the demand that is specific to St. Clair County. Some of the organizational considerations unique to this solution are listed below.

- End users will require training based on their role
- A deployment strategy and plan should be developed. The timing for migrating the data and application environments for editors and viewers needs to be determined. A phased approach may be necessary.
- Training for technical support staff is required
- Data stewardship responsibilities of each department should be defined
- Systematic data backup and recovery procedures for GIS data should be established
- Organizational structure should be established that facilitates decision making and communication at multiple levels
- Process should be established to systematically review GIS business needs and existing procedures
- Current policies for technology and IT infrastructure should be reviewed and new policies should be developed to address GIS related responsibilities
- Long term GIS implementation plan should be developed for the County based on the County's vision for GIS
- The IT Department should sign the Business Associates Agreement with the Health Department so that they qualify under HIPAA requirements

6.0 Summary and Recommended Action Items

In the previous section, a solution was outlined based on the business objectives for St. Clair County and the current GIS situation. For this solution, considerations have been developed that were based on industry standard best practices in each of the areas of technology and IT infrastructure, data, and organization. This section will outline important action items in which the County will need to engage to move forward toward its GIS vision.

6.1 Action Items

Tasks that the County should perform to move forward with GIS based on the critical decisions above are listed below. The items listed within each subsection are in sequential order. ST indicates short term action items which should be done first. MT indicates mid term action items and LT indicates long term action items. All action items in the same category (short term, mid term, or long term) can be completed concurrently.

6.1.1 Technology and IT Infrastructure

- (ST) Evaluate and upgrade any desktop machines that will run ArcGIS software according to the specifications at http://www.esri.com/software/index.html
- (ST) Evaluate the possibility of extending fiber optic line to the Health Department as well as the Intermediate School District, Drain Commission, Road Commission, and Airport Terminal Office
- (ST) Upgrade data servers and applications to current GIS software
    - Design network configuration to support the solution
    - Order hardware needed
    - Order software needed
    - Install hardware
    - Install software

6.1.2 Data

- (ST) Conduct pilot project for migrating data to the geodatabase in a test environment
    - Assess the data prior to migration
    - Develop data migration procedures
    - Make any changes to data prior to migration
    - Develop a database design
    - Execute the data migration procedures
    - Verify data migration is successful
- (ST) Develop data update procedures for data that the County is editing
    - For layers in the editing database
    - For replicating data to the publishing database
- (ST) Verify the data from the pilot project supports business requirements
    - Test editing and viewing applications against the pilot data
- (MT) Migrate the data in the production environment
- (MT) Execute systematic database backup and recovery procedures

6.1.3 Organization

- (MT) Establish technical support procedures based on the solution
    - Define problem reporting procedures
    - Define problem resolutions procedures
        - Time lines
        - Person responsible
    - Define problem closure procedures
    - Define call tracking and review procedures
- (ST) Develop a training plan
    - Verify the staff in each user role
    - Review curriculum paths to match skill set requirements for each user role
    - Develop a training schedule for County staff
- (MT) Develop a phased deployment strategy for applications and data
    - Proof of concept
    - Prototyping
    - Pilot Project
    - Production
- (ST) Define data stewardship responsibilities of each department
    - Editing responsibilities
    - QA/QC responsibilities
    - Metadata responsibilities
- (ST) Establish systematic database backup and recovery procedures
- (ST) Review organizational structure and make changes as necessary to facilitate decision making and communication at multiple levels
    - Executive level for steering and policy decisions
        - County Administrator, Assistants to County Administrator, Department Heads
    - Project level for managing and coordinating activities
        - Department Heads, Assistants to Department Heads
    - Technical level for sharing knowledge
        - Department employees
    - Core GIS team
        - GIS Analysts, GIS Specialists
- (LT) Establish periodic review of GIS business needs and processes
- (LT) Develop a long term GIS implementation plan that is based on the County's vision for GIS

6.2 Conclusion

The action items are the result of the synthesis of the current situation at St. Clair County, industry best practices and unique considerations. These action items establish the basis for the County to develop a detailed Implementation Plan necessary to achieve its GIS vision.

Appendix A – IT Infrastructure Diagram

NetworkDiagram03.vsd

Appendix B – GIS Data Dictionary

Location on County Intranet

`http://intranet/file_library/GIS%20Group/DataDirectory_Booklet.pdf`

Appendix C – Glossary of Terms and Acronyms

ArcIMS	ESRI's Arc Internet Map Server – software that allows the utilization of GIS tools on a standard web browser
ArcSDE	ESRI's Arc Spatial Database Engine – software that spatially enables standard Relational Database Management Systems
Attribute	1. A characteristic of a geographic feature described by numbers, characters, images and CAD drawings, typically stored in tabular format and linked to the feature by a user-assigned identifier (e.g., the attributes of a well might include depth and gallons per minute). 2. A column in a database table.
CAD	Computer-aided design - an automated system for the design, drafting, and display of graphically oriented information.
COGO	1. Abbreviation of the term COordinate GeOmetry. Land surveyors use COGO functions to enter survey data, to calculate precise locations and boundaries, to define curves, and so on. 2. The name of the ArcInfo coordinate geometry software product.
Coverage	1. A digital version of a map forming the basic unit of vector data storage in ArcInfo. A coverage stores geographic features as primary features (such as arcs, nodes, polygons, and label points) and secondary features (such as tics, map extent, links, and annotation). Associated feature attribute tables describe and store attributes of the geographic features. 2. A set of thematically associated data considered as a unit. A coverage usually represents a single theme such as soils, streams, roads, or land use.
Data model	1. The result of the conceptual design process. A generalized, user-defined view of the data related to applications. 2. A formal method of describing the behavior of

	the real-world entities. A fully developed data model specifies entity classes, relationships between entities, integrity rules and operations on the entities. 3. ArcInfo coverages and grids use a georelational data model, a hybrid data model that combines spatial data (in coverages or grids) and attribute data (in tables). Other data models used in ArcInfo include tins, images, and grid.
Database design	The formal process of analyzing facts about the real world into a structured database model. Database design is characterized by the following phases: requirement analysis, logical design and physical design.
DEM	Digital Elevation Model - 1. A digital representation of a continuous variable over a two- dimensional surface by a regular array of z values referenced to a common datum. Digital elevation models are typically used to represent terrain relief. Also referred to as 'digital terrain model' (DTM). 2. An elevation database for elevation data by map sheet from the National Mapping Division of the U.S. Geological Survey (USGS). 3. The format of the USGS digital elevation data sets.
Feature class	1. A classification describing the format of geographic features and supporting data in a coverage. Coverage feature classes for representing geographic features include point, arc, node, route-system, route, section, polygon and region. One or more coverage features are used to model geographic features; for example, arcs and nodes can be used to model linear features such as street centerlines. The tic, annotation, link, and boundary feature classes provide supporting data for coverage data management and viewing. 2. The conceptual representation of a geographic feature. When referring to geographic features, feature classes include point, line, area, and surface.
Georeference	To establish the relationship between page coordinates on a planar map and known real-world coordinates.

GIS	Geographic Information System
GPS	Global Positioning System - A system of satellites and receiving devices used to compute positions on the Earth. GPS is used in navigation, and its precision supports cadastral surveying.
Layer	A thematic set of spatial data described and stored in an ArcStorm database or a LIBRARIAN map library. Layers organize a database or map library by subject matter (e.g., soils, roads, and wells). Conceptually, layers in a database or map library environment are exactly like coverages.
ODBC	Open Database Communication - A standard API (application program interface) used to communicate with database management systems, developed by Microsoft, and incorporated in ArcView Version 2. ArcView supports ODBC for DBMSs on the Microsoft Windows platform.
Pixel	Picture Element – an individual grid cell in raster images and data layers
Raster	Spatial data layer or image where data is stored in the form of rows and columns of equal sized cells
RDBMS	Relational database management system - A database management system with the ability to access data organized in tabular files that can be related to each other by a common field (item). An RDBMS has the capability to recombine the data items from different files, providing powerful tools for data usage.
Shapefile	ESRI spatial data format that stores data of like geometry in a simple thematic form
SQL	Structured Query Language - A syntax for defining and manipulating data from a relational database. Developed by IBM in the 1970s, it has become an industry standard for query languages in most relational database management systems

Table	A set of data elements that has a horizontal dimension (rows) and a vertical dimension (columns) in a relational database system. A table has a specified number of columns but can have any number of rows. A table is often called a relation. Rows stored in a table are structurally equivalent to records from flat files in that they must not contain repeating fields.
Topology	The spatial relationships between connecting or adjacent coverage features (e.g., arcs, nodes, polygons, and points). For example, the topology of an arc includes its from- and to-nodes, and its left and right polygons. Topological relationships are built from simple elements into complex elements: points (simplest elements), arcs (sets of connected points), areas (sets of connected arcs), and routes (sets of sections, which are arcs or portions of arcs). Redundant data (coordinates) are eliminated because an arc may represent a linear feature, part of the boundary of an area feature, or both. Topology is useful in GIS because many spatial modeling operations don't require coordinates, only topological information. For example, to find an optimal path between two points requires a list of the arcs that connect to each other and the cost to traverse each arc in each direction. Coordinates are only needed for drawing the path after it is calculated.
Vector	Spatial data layer where data is stored as points, lines, and polygons