A Report in Support of a

Conceptual Design for an Enterprise Geographic Information System

Prepared for

Scott County, Iowa

Final Date: October 30, 2002

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A. Introduction

1. Overview

Scott County has completed the first steps toward the development of an enterprise geographic information system (GIS) for the County. A situation assessment was completed. That investigation documented the existing circumstances as well as a set of issues and opportunities relative to land information systems (LIS) and the potential role of GIS in the County.

With the County's leadership, key County staff, and GeoAnalytics staff, two workshops were held to build a consensus around a conceptual design for GIS/LIS for the County. The conceptual design describes a vision for an enterprise GIS/LIS for Scott County. This report documents the results of that work.

Based both on the situation assessment and conceptual design efforts, it is clear that Scott County government has a strong interest in maximizing its efficiency even further by utilizing new information technologies, leveraging existing resources, and improving operations and business processes.

The intent of the County is to develop a system that is multi-participant and multi-purpose to maximize the benefit for the taxpayers of Scott County. In practice, this means that the County seeks to develop a system that is useful to and upon which other units of government may build their systems. Thus, during the situation assessment, and afterwards, several other units of government were interviewed including several municipality departments (Davenport, Bettendorf, Walcott, and Eldridge), as well as Bi-State Regional Commission, Army Corps of Engineers, local utility companies, Quad City Development Group, Iowa DOT, Missman, Stanley and Associates, Rock Island County, and Medic EMS.

This conceptual design document is intended to provide a high-level vision of the system that will be developed by the County. In addition, this vision defines a set of strategic themes that will be employed by the County to achieve the system vision. The next step in this project (the strategic and tactical plan) will define the explicit strategies, tactics and action steps needed to achieve the vision. The details of the conceptual design are based upon existing conditions within the County, perceived modernization needs expressed by County leadership and staff during the situation

assessment and conceptual system design planning exercises, and GeoAnalytics' many years of experience with local government GIS implementation.

2. Purpose of a Conceptual System Design

Defining a conceptual framework or architecture for a GIS system prior to its implementation is critical to success. A conceptual design is valuable because it describes, at a high level, key components of the system including relevant technologies, databases, organizational practices, and tools or applications. These same system components were used as an organizing framework in the first phase of this project, the situation assessment.

It is important to note that this conceptual design is not a detailed blueprint for system construction, but instead a bridge between GIS opportunities identified in the situation assessment and specific actions that will be outlined in the strategic implementation plan. The conceptual design is intended to accomplish several objectives, including the following:

- **Create a Vision for the System**. At its core, the conceptual design defines the broad vision for what the County wants the system to be and what it intends to accomplish by developing the system.
- **Define an Enterprise Model**. This is important since it reflects the common interests and opportunities within the County for GIS development, access and management that have been identified.
- **Provide an Unconstrained View**. The design portrays at a high level how the GIS system *should* be constructed. It represents a broad model that is unconstrained by specific technical or resource implementation details and/or limitations.
- **Describe System Components**. Components and sub-components of the GIS system are identified and described. These components make up the basis for implementation plan activities and investments.
- **Clarify System Relationships**. Relationships between GIS system components are defined. This helps clarify dependencies that exist between certain investments and activities, which are necessary for effective implementation.
- **Define System Scope**. A very important objective of the conceptual design is to define and articulate the scope and purpose of GIS. This includes what is included in the system and, perhaps more importantly, what is not included in the system.
- **Establish Strategic Themes**. The last objective is the establishment of a set of strategic themes that will guide the development of the system. Strategic themes can be thought of as those approaches to the system design and development that will make the system successful and useful.

3. Methodology

The conceptual design document builds on the situation assessment document completed in the past few months. The development of the conceptual design has been iterative and has involved all members of the Project Team[1]. First, GeoAnalytics

[1] Please see the frontispiece for a complete listing of the Project Team members.

provided education on various models for enterprise GIS implementation. At that meeting, County leadership and key staff participated in an initial brainstorming session. Taking the results of this workshop, GeoAnalytics staff prepared a draft conceptual design for presentation to the County.

The scope of the conceptual design included all five system components: process, data, technology, organization, and applications. Particular effort was focused on the organizational dimensions, namely the system governance and operational models. Governance and operational model formulation are strategic exercises that drive many system facets. In addition, these models define the scope and reach of the system, especially in terms of entity participation. For example, the formal participation of municipalities in system governance would affect not only the number of producer/user nodes, but also the broader system architecture that must be supported.

This report is organized around the five key system components: business process, data, technology, organization, and applications. Most of these components have conceptual design diagrams that illustrate concepts and/or proposed frameworks. To reflect the strategic nature of this design, a description of the proposed governance and operation models precedes those of the system components. This is done because the structure of governance and operations will drive enterprise business processes, data, technology architecture, organizational features, and applications.

4. Strategic Themes

As another part of this effort, a set of strategic themes have emerged and been embraced by the GIS Steering Committee and the Project Team. These strategic themes are not only important from the perspective of the conceptual design; these themes will guide the planning process and system implementation. The Project Team gave substantial consideration to a number of different models for an enterprise GIS. Not any one model stood out as the perfect fit. Instead, a hybrid of various characteristics from the models seemed to better suit the culture of the County. These characteristics form the basis of the strategic themes.

Providing GIS services would be within the County's philosophy. This philosophy, called PRIDE, reflects the core operational values: Professionalism, Responsiveness, Involvement, Dedication, and Excellence. Better response times, more reliable data, better access to data, and integration of core business processes would more efficiently serve the public good.

In summary, the favored characteristics of the operational models point to a largely centrally administered, interoperable model for a County enterprise GIS implementation. A detailed explanation of this model, per system component, is in each of the following sections. Defining characteristics include:

a. Multi-Purpose/Multi-Participant

The strong preference of the County is to develop a system that is County focused, but multi-purposed. This means that the system must be designed and constructed to meet the varied business requirements of County agencies. It also means that the benefits of the system should not be confined to County government. In addition, the County seeks to collaborate with other public and private agencies for cost sharing and data exchange. It is the intent of the County that the

collaboration be less structured and more ad hoc to address specific problems and opportunities. The overall organizational structure is, thus, one that emphasizes opportunistic collaboration but that de-emphasizes formal intergovernmental coordination. This structure gives the County and other agencies more flexibility in the short run while providing a basis that may evolve over time.

b. Efficiency and Effectiveness

The principal purpose Scott County seeks in this effort is to improve governmental efficiency and effectiveness. This has many implications both in terms of how the system is constructed and how it will be deployed.

From the perspective on how the system is deployed, this strategic theme means that the desired outcome is not merely automation, but also business process improvement. While automation affords much efficiency in data maintenance and access, there are even greater potential rewards to process improvement, including integration of the various business systems in the County. The vision of the system for the County explicitly embraces the strategic objective of designing and deploying a system that, to the extent possible, eliminates redundant work and data, leverages technology resources, and makes the most of a centrally *managed* system to provide complete, up-to-date, and accurate data resources.

With respect to how the system is designed and constructed, the efficiency and effectiveness theme means that the County will pursue value in the procurement of systems and data. Value is defined as the balance of function and cost. By way of example, what this means is that the County may not acquire cadastral level parcel mapping (with the highest degree of accuracy). This is because the benefit in terms of business functionality is not in line with the expense of that level of accuracy and resolution. Instead, some high level of “best fit” parcel mapping will serve most needs well.

Another aspect of this strategic theme is to proceed with developing the system in a knowledgeable way, so that it is done right the first time. Hence, the efforts will be to not "throw away" any system components, especially data. Some municipalities conduct pilot projects that are not used in the final data compilation. Scott County wants to avoid this tactic.

The efficiency and effectiveness theme also means that the County may pursue a “low hanging fruit” approach to systems development, i.e., pursuing initially those efforts that are relatively low cost and high value. This also means that the County will pursue the development of a system incrementally, over time. As another strategy, the County may outsource intensive GIS implementation including databases development and maintenance, technology, and applications (e.g. orthophotography acquisition). This can save staffing costs and accelerate system development.

c. Centralized Enterprise System Administration and Management

It is the intent of the County to build a system that, to the extent possible, meets the needs of its various participants. Business needs (their functions and processes) vary among agencies and jurisdictions. At the same time, there are many common

needs for data, technology, and applications. In addition, there are a number of related business processes—between departments, agencies, and jurisdictions. For instance, there are business processes between the County's Recorder, Auditor, Assessor, and Treasurer that are to seen to need improvements with coordination. As well, the parcel update processes and procedures between the County and the Cities of Davenport and Bettendorf have been seen to be quite different. Squarely, there are very common data needs and requirements, but to date, very different processes to meet those needs.

To create a system that meets these varying business needs will require a level of centralized administration and management at the enterprise level. As a result, system governance and those operational parts of the system that are common must be centralized. Specific activities include: coordination, process (work and data flow) redesign, central server administration, procurement of data, and providing service for applications.

The Governance and Operational Models within this conceptual design document address the mechanisms to handle centralized enterprise system administration and management.

d. Decentralized Systems Operations

Although there will be centralized enterprise system administration, it is the intent that operations of GIS and LIS will remain decentralized in a federated system. This means that the County agencies will continue to prosecute their statutory mandates and to use and integrate their business systems with the enterprise GIS system as is appropriate. Decentralized operations will be accomplished through departmental maintenance of GIS data and applications that will serve specific department needs, with necessary coordination from the central GIS unit. Accordingly, data maintenance will still be the responsibility of the custodial agency[2] (e.g., appraisal-related non-spatial data will be managed and maintained by the County Assessor). Those data with enterprise level value will, in turn, be incorporated into the enterprise system database.

Aside from enterprise level applications (e.g., web-based browse and query tools, and other server side components), individual agencies will be responsible for their own business systems and applications that will make use of the enterprise GIS. This will require departmental level skills that may not currently be present. Initially, this may mean that there may be more reliance on the centralized GIS unit for tools and applications. This will give the departments time to "grow" GIS expertise, understand the data standards, realize new needs for applications, and so forth. As well, into the future, the enterprise GIS should provide coordination, standards, common procurements, and system level support.

e. Cost Recovery for Value Added Services

Another discreet strategy theme for an enterprise GIS relates to how access to systems and data will be managed. The County seeks, generally, to have an open

[2] It should be noted that the custodial agency could be different than the statutorily mandated unit. For example, the Auditor is mandated to maintain parcel information, but the digital parcel layer maintenance could be delegated to another unit or outsourced to a vendor.

access policy such that data will be provided at the cost of reproduction (i.e., at variable or marginal cost). However, the County will charge in excess of the direct variable costs for products and services that may be considered value added. This products and services offered in this cost recovery strategy may take many forms, including offering specialized remote access, the publication of specific value added products, development of specific applications, and services to meet individual requester needs. Charges for value added services above marginal costs may apply to both public and private entities. If there is sufficient demand for the products and services, the County may entertain the development of a GIS Service Bureau. Revenue in excess of marginal costs derived from value added services will be applied to enterprise system maintenance and update.

The following is a more detailed definition of the proposed GIS operational model in the context of a countywide GIS Conceptual System Design. Details are provided by each GIS system component.

B. Governance and Operational Model Conceptual Design

The broad system architecture outlined in this conceptual design is defined in large measure by the institutional structure that the system will support. For example, the scope of the architecture of the data communications network used to support the system will be determined by those agencies and entities that are formal participants in the enterprise system. If the focus is on County agencies without formal interaction with other outside agencies, there will be no need to extend the County's network to one that is a regional wide-area network with municipal and other nodes. If municipalities and others are part of a formal, consortium like enterprise, the network must accommodate direct, full-time system access.

The institutional structure is defined first by the governance and second by the operational system models. The governance model defines, formally, system participation and sponsorship, including key stakeholders, whose interests must be advanced by the system. It also defines a set of interested parties, whose purposes may be important, but not critical to the system and its design. The operational model defines what system and its operators will do to advance the collective and special interests of the sponsors. At a very basic level, the operational model establishes those functions and processes that will become the responsibility of the system and those who administer it.

As an overview, there are several key levels from GIS program management in both of the governance and operations models. These are:

- The County Board. The Board has the ultimate authority for policy, budget, and directives.
- The GIS Steering Committee. This committee acts as a liaison between the Board and the GIS program's governance and operations.
- The GIS Technical Committee. This committee contains the County department heads that develop the GIS program's directives, recommendations, etc.
- The IT Department and the Geographic Information Division. They implement the programs' directives.
- Ad Hoc Technical Task Forces. They act as staffing for technical research and issues.
- User Groups. They provide feedback on the GIS Program as well as have agreements for participating in the Program.

1. County Enterprise GIS Program Governance Model

As was noted in the Strategic Themes, Scott County seeks to develop a system that is County focused, but multi-purposed. As such, the County intends to collaborate, though not necessarily partner, with other units of government and private agencies for cost sharing and data exchange. This means that the collaboration will be less structured and more ad hoc to address specific problems and opportunities. The overall organizational structure is, thus, one that emphasizes opportunistic collaboration but that de-emphasizes formal intergovernmental coordination. This structure gives the County and other agencies more flexibility in the short run while providing a basis that may evolve over time.

The governance of the Scott County GIS will involve key County stakeholders. Because of the varied interests of these stakeholders, a more democratic model will be pursued. It has been said that in democratic structures, those with a stake in the outcome must have a voice in the process. In this case, those with a stake in the outcome are County departments, administration, elected officials, and the public at large. Because this proposed system would hopefully involve multiple agencies, there is a need for a more formal governance mechanism.

To a lesser extent, municipalities and other public and private agencies are interested parties to the system. However, because of the current focus on the County government aspects of the system, these external agencies will not take a formal leadership role in the governance of the system. The governance model does, however, provide the basis for these entities to create more formal relationships with the County as needed. These relationships may take the form of memorandums of understanding or joint venture agreements.

a. Charter

Successful multi-purpose, multi-participant GIS programs all have one factor in common, an underlying charter that describes the roles, responsibilities, accountabilities, and, more broadly, the terms of engagement among participants. The charter document is an important instrument in these circumstances because it establishes procedures and processes for decision-making, dispute resolution, and establishing commitments of public resources. The charter may be as informal as a memorandum of understanding between agencies or as formal as a legislative act of the County Board. Regardless of form, the structure and operating principles must be documented and accepted by the County Board.

b. Key Governance Functions

There are a number of functions that the governance model must support. Execution of those functions will be the responsibility of all participants including program sponsors, administrative agencies, and users. At a high level, these functions fall under the general concept of coordination.

The success of an enterprise GIS for the County is going to be dependent in many ways on the strength of its coordination efforts. The principal challenge will be to provide both relevant and robust products and services for County departments and other participants. In addition, while there is some commonality of interest among participants, there is not complete alignment of interest. Accordingly, the IT Department and Geographic Information Division staff will be challenged in many ways to promote and sustain common interests, while at the same time grappling with the allocation of limited resources to fulfill all divergent interests.

There are a number of discrete coordination functions that must be supported, including, but not limited to the following:

1) Technology Resource Procurement

All procurements of technology products and services, including those requested by individual departments, would be reviewed by the IT Department and the Geographic Information Division, which would determine priorities from a centralized County GIS perspective.

2) Development of Standards

Standards are essential to the efficient and effective operation of the GIS program. There are many types of standards that must be supported, including:

- **Data Quality**. Data quality standards for data held in the data repository.
- **Metadata Standards**. This involves minimum documentation for each GIS data layer, such as content, date created, custodian, any coding or abbreviation schema, geographic projections, and the like.
- **Procedural Standards**. Procedural standards for data update and conversion schedules, and repository methods.
- **Technology Standards**. Technology standards to ensure interoperable interaction with the system. Technology standards are also in the domain of the IT Department.

3) Establishment of Priorities

The GIS program will be faced with resource constraints. It must, therefore, be able to set relevant, attainable priorities on a wide range of issues. Although this project's strategic plan will outline a roadmap of priorities, it will only be for the startup phase of the GIS program. In the future, the program will need to balance services between departments such as application development, database designs, and modeling/analysis requests.

4) Issue Resolution/Consensus Building

Since the interests of the County departments are not perfectly aligned, issue resolution will be a key function. This will involve policy setting, facilitation, and leadership. The GIS Steering Committee should also be a key unit for consensus building, communication, and setting priorities. The County Board would be the ultimate arbitrator for any outstanding issues.

5) Communication and Marketing

Cultivating and sustaining the GIS will be an important challenge for the County. Building both decision maker and user support will require education about the benefits of the system. Communication will also be key in priority setting and dispute resolution. It is expected that this function will be an ongoing one as the GIS develops, matures, and evolves.

c. Governance Structure

Figure 1: Governance Model below, depicts a conceptual view of a governance model for Scott County. This model supports both policy analysis and operational decision-making levels of GIS implementation.

This model is based on the premise that the County will not enter into any formal partnerships or create consortia with other units of government in the near term. However, this model provides considerable flexibility to form project specific relationships to work with other public and private sector agencies. These other agencies can influence enterprise GIS program directions through informal mechanisms as well.

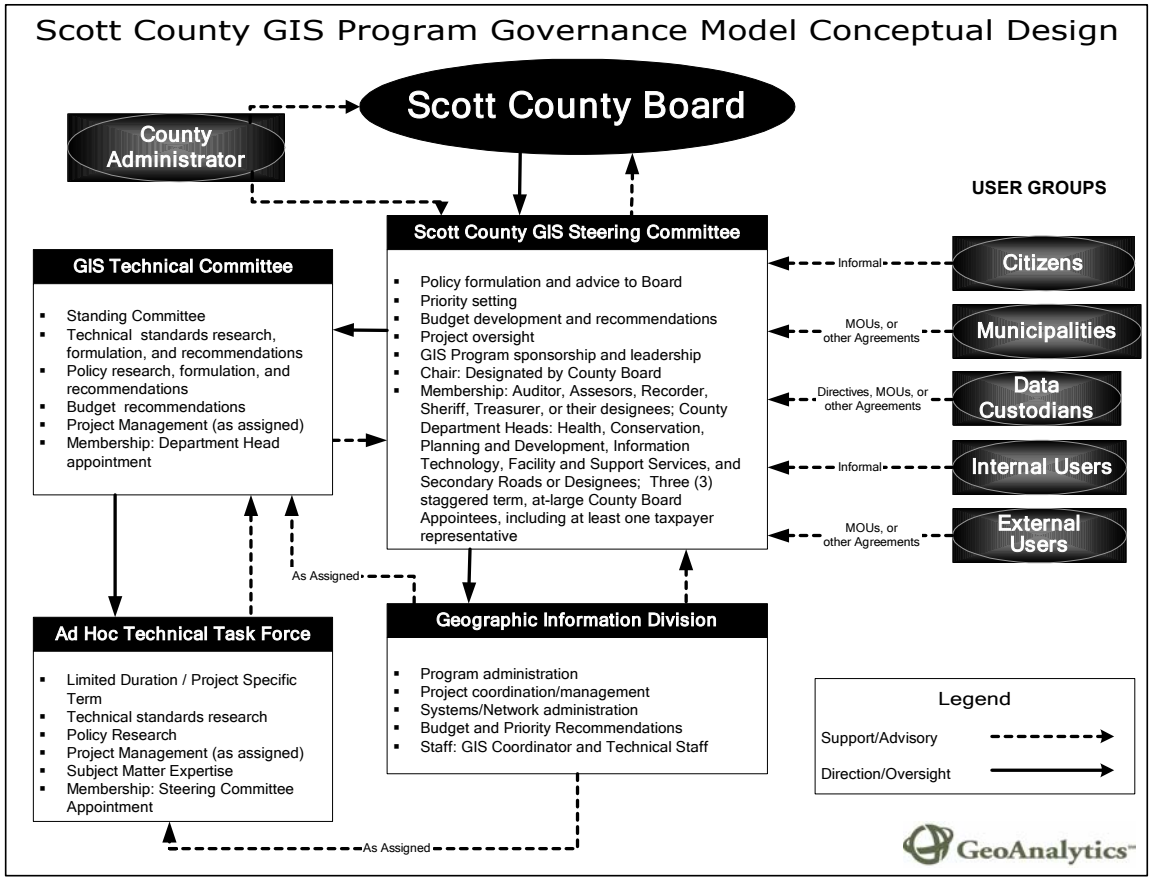
The benefit of the model is that it is flexible and will be relatively easy to implement at this time. The risk of the model is that the County may have to develop its countywide GIS on its own without the benefit of the data investments made by the Cities of Davenport and Bettendorf. Without a formal partnership or consortia these Cities may be reluctant to provide their parcel and base map data to the County. If that happens, the County will have to develop these data on its own. Should that happen, development of a County system would be much more expensive and would run the risk of duplicative maintenance and other processes.

With that caveat in mind, this model will accommodate a multiple kinds of formal and informal relationships with other units of government and the private sector. Furthermore, as stakeholders and interested parties continue to work together, the model may evolve. Key external agencies with which formal and informal arrangements may be made include:

- Bi-State Regional Commission,
- Municipalities,
- State of Iowa Departments of Administration, Agriculture and Land Stewardship, Natural Resources, Revenue and Finance, and Transportation,
- Federal agencies such as Natural Resources Conservation Service, Transportation, and the Army Corps of Engineers.

As with any arrangement, these agreements are to be clearly defined and documented, whether they simply focus on GIS data sharing or on collaborative investments in GIS database development, technology, or applications.

Figure 1: Governance Model



This model embraces the strategic themes identified above. This governance model breaks participation into three discreet levels: The "Sponsorship Level", i.e., the County Board. The second is the "Administrative Level" which is comprised of those entities who will take responsibility for day-to-day system management and direction. The administrative level is composed of the GIS Steering Committee the Geographic Information Division and the GIS Technical Committee. The third, and arguably the most important, is the "User Groups Level". Users include not only affected County staff, but also users from other units of government, citizens, public interest groups, and the private sector. The following narrative provides a brief summary and rationale of the key features of this model organized by level of participation, including their relationship to the strategic themes.

1) Sponsors

The primary sponsors for the Scott County GIS Program will be the County Board. The sponsorship role will be supported by leadership and staff from County offices and departments. Sponsors provide strategic and policy leadership, appropriations for GIS program funding, and political support.

At the policy level, it will be important for the Board to embrace all of the strategic themes detailed above[3]. Those strategic themes will carry forward to form the basis for policy, priority setting, and budgetary decisions. It is hoped that the County Board will give the GIS Steering Committee and the Geographic Information Division sufficient responsibility and authority to make the GIS program successful. At the same time, the GIS Steering Committee and the Geographic Information Division will need to be accountable to and communicate with the County Board in its role as a program sponsor.

2) Administration

At an administrative level, there are three discrete entity types: the Scott County GIS Steering Committee, the GIS Technical Committee, and the Geographic Information Division. The role of each is discussed in the following.

a) Scott County GIS Steering Committee

The Countywide GIS Committee serves as the governing body for this multi-purpose, multi-participant effort. In a sense, this Committee serves as the board of directors for the GIS Program. The role of this Committee is largely policy and strategic. However, this group will have oversight of the GIS program. It will hold its charges, the IT Department and Geographic Information Division, accountable for performance. In turn, it will be accountable to its Sponsors, namely the County Board, and the general public.

The terms of the roles and responsibilities of this Committee will be determined as part of its charter or bylaws. Key roles may be to establish priorities and approve budgets, provide policy research and recommendations for the Board, and to have high level project oversight. This group may also establish policies. Example policies range from the establishment of binding technical standards to public access/cost recovery.

The Committee members, shown in Figure 1: Governance Model, should, at this initial stage, be composed of the following:

- The County Department heads or their designees with only one representative from each affected department. The Departments will include: Health, Conservation, Planning and Development, Information Technology, Facility and Support Services, and Secondary Roads.
- Appointed or elected Officials or their designees (the Auditor, Assessor, County Attorney, Treasurer, Recorder, and Sheriff).
- The County Board would appoint three at-large representatives who would have staggered terms of appointments. One of these appointees should be a taxpayer representative for (the citizen group). The other two may be County Board members or others

[3] If those strategic themes defined in section A.4 are not acceptable to the County Board, other approaches may be substituted. The key issue is to make this effort a strategic one.

(e.g., municipal or regional planning representation) at the discretion of the Board.

The charter may stipulate that member composition may change according to GIS Program interest. Because the Committee will be primarily policy setting (not technical) group, it will be important to have members who are competent with policy matters. Taxpayer representation will enhance accountability and bring an outside perspective to the program.

It is assumed that this committee will reach consensus on any issues before it. If consensus is not reached, the charter may stipulate how to resolve issues (such as the Board have the ultimate authority). The County Administrator is seen to be the facilitator between the Steering Committee and the Board.

b) GIS Technical Committee

The Technical Committee is another key part of the governance and management of GIS within County government. It would act as advisory to the Board and provide the research and recommendations for policies, technical standards, and budget items.

The committee would be a standing committee of members appointed by each Office or Department head. Because this group will deal with technical issues, representatives should be experienced both in the realm of agency business processes as well as technical (technological) expertise. This committee should be a self-directed team that advances the agenda of the Board and the Steering Committee.

This committee would manage any ad hoc technical task forces as well as work directly with the Geographic Information Division as needed.

Key governance related roles include:

- Policy research and documentation
- Budget recommendations
- Priorities recommendations
- Technical research and task force management
- Program advocacy
- Outreach and education
- Other duties as assigned by the GIS Steering Committee

c) Geographic Information Division

The Geographic Information Division, staffed by the GIS Coordinator, will be administratively attached to the Information Technology Department. Nominally, staff will report to the Director of the Information Technology Department who, in turn, would report to the Steering Committee.

Key governance related roles would include:

- Policy implementation (e.g., data standards, data sharing, etc.)
- Project management and coordination
- Systems and network administration (limited to Enterprise GIS)
- Overall program coordination

The GIS Coordinator would automatically be a member of the GIS Technical Committee.

d) Ad Hoc Technical Task Force(s)

On a periodic basis, special task forces may be established to carry out specific tasks or projects on behalf of the GIS Steering Committee. For example, a task force may be established to plan for, conduct procurement, and provide project management for a specific data conversion effort. Task forces may assist in researching and building consensus for specific technical standards. Membership on task forces would vary according to subject matter expertise and stakeholder status.

Normally, GIS Technical Task Forces will be of limited duration, existing to solve a particular problem. However, the County may find it beneficial to establish a standing committee comprised of staff to provide ongoing advice for issues of longer duration (e.g., information policy). If an ongoing committee or task force is created, the GIS Coordinator should take a proactive role in communicating the agenda of this group to all department heads, providing an opportunity for all interested to have a voice at this level of involvement. Such a committee should have a charter and a permanent, core membership, including representatives from the key user or producer agencies or departments.

3) Users

System users will play an important role in a countywide system. From a work perspective, users are the key beneficiaries of the system. If the system is not useful and usable, none of the broader benefits will transpire. Users will also contribute to the system in meaningful ways. Some of these contributions include the following:

a) Program Advocacy

It will be incumbent upon users to be advocates for the program. If a GIS program will help users do their jobs better and more efficiently, that information must be provided to County leadership and elected officials. Advocacy may include the measurement and documentation of improvements such as response times to public inquiries, search times for information, report delivery times, etc.

b) Ad Hoc Support and Counsel

Advocacy does not mean just political advocacy. It also means being engaged in the process of system design and development to make sure that the system is practical and useful. User participation in various task

forces and committees will help make the system better, more relevant, and more practical.

c) User Group

Another useful mechanism for system support is the creation of a user group. The purposes of a user group are varied. However, these groups can serve to advance formal and informal education and training. User groups are particularly helpful in providing peer-to-peer support. The formation of a user group as the system is being developed, and once it is up and running, will be an important factor in making the system successful.

d) Categories of Users and Forms of Influence

Figure 1: Governance Model depicts a role for many agencies, both internal and external to the County to participate in and influence the GIS Program. The following details the forms of influence and arrangements that may be accommodated by this governance mode.

- **Citizens.** Citizens may influence the GIS Program in the usual, informal ways. The presence of a taxpayer representative on the GIS Steering Committee offers another venue for policy influence. Citizens may be more vested and, therefore, more influential in this process than may be expected. This may be particularly poignant if the media becomes involved in system funding and public access issues.
- **Municipalities.** Municipalities throughout the County have a vested interest in the system, its processes and outputs. The influence of municipalities may be formal and informal. Informally, they may lobby the County in the ways they do now. In addition, the influence of municipalities may take the form of agreements or memorandums of understanding. These agreements could be of limited duration, e.g., for a specific project. They may of a longer term where agreements may be reached with respect specific ongoing work and data flows. These later arrangements may have a more profound effect on the system and its management.
- **Data Custodians.** The designation of enterprise data and terms of data custodianship will have to be fleshed out further. These terms may take the form of directives for data custodians internal to the County. They may also be subject to agreement or memorandum of understanding should the County take that approach. Any data custodians who are outside of County government will have to be bound by some arrangement or agreement.
- **Internal Users.** Internal users may participate in various forms through a user group or informal discussion. Clearly, the success of the Enterprise GIS Program will be measured largely by how much utility and relevance the program has for users across the County.
- **External Users.** Much like municipalities, external users may formally or informally influence the system management. External users may include developers, real estate brokers/agents, title

insurance companies, attorneys, public interest groups and others. These kinds of organizations are typically very savvy politically. They will use whatever means they have available to them to make the system useful for their business purposes. This category of users can, therefore, be helpful or disruptive to the success of the GIS Program. Accordingly, the County is encouraged to take the interests of these parties into consideration as the system evolves.

Each of these categories of users will be important to the success the of GIS program. That being said, communication and, where appropriate, formal agreements will advance the objectives of the GIS Program.

2. County Enterprise GIS Program Operational Model

With the backdrop of the Governance Model, the next strategic driver is the Operational Model. The Operational Model is the mechanism by which the GIS Program will be implemented. This model is intended to bring about the strategic themes identified above[4]. As with the Governance Model, there are three categories of actors: Sponsors, Administration, and Users. This description of the Operational Model is organized by those categories. Figure 2: Operational Model (below) proposes and illustrates the internal operations of the Scott County GIS Program.

It should be noted that much of what the Operational Model defines are Enterprise GIS business processes. Section C Process Conceptual Design (page 21 below) identifies a number of other enterprise level processes that are not part of the Operational Model to be supported by the GIS program.

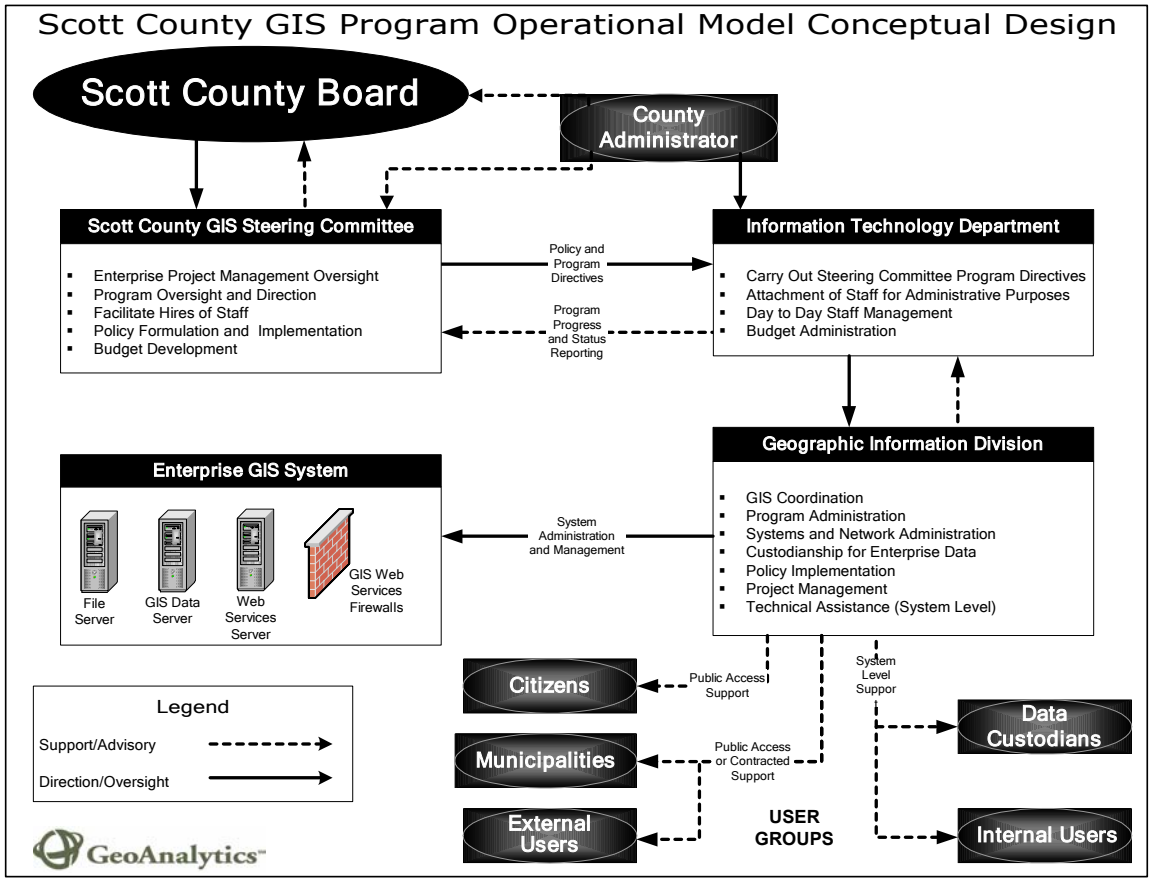
a. Sponsors

The Sponsors of Enterprise GIS, the County Board, will create the broad operational direction for the Program. These Sponsors also bring the ultimate authority in the decision making process. In their County Board role, the Sponsors must balance, at a very high level, the needs and resources of the GIS Program against other County functions. In short, Sponsors bring leadership, financial resources, and direction to the effort. In the final analysis, Sponsors also provide the forum for accountability.

From a strategic perspective, the Sponsors will be the final arbiters of what the strategic themes are and how the GIS Program will advance them. It is expected that the Board will be particularly interested in the efficiency and effectiveness theme as the justification for the Program. At the same time, because the Board seeks responsiveness and effectiveness in carrying out the County's mandated functions, the multi-purpose, multi-participant theme will be important. Inherently the County Board is interested in the enterprise level effectiveness. That will likely be the focus of accountability for the GIS Program.

[4] The explicit strategies for implementation will be identified in the Strategic and Tactical Plan. These strategies and, ultimately, the tactics that will be employed are all intended to affect the strategic themes.

Figure 2: Operational Model



b. Administration

1) GIS Steering Committee

The purpose of this Committee is to give direction and oversight regarding the GIS Program and GIS/LIS matters generally across the County. Explicit operational responsibilities include:

- **Policy Formulation and Implementation**. One of the primary roles of this group will be to establish policies, at the strategic level, for Enterprise GIS. This will include higher-level policy development that will direct relations, rights, and responsibilities among Sponsor level participants for the GIS Program.
- **Annual Budget Development/Business Planning**. A recurring, but extremely important, function for this group will be setting priorities for GIS development, budgeting, and business planning. These tasks should be undertaken on an annual basis.
- **Staff Direction and Oversight**. Although this group will not be responsible for day-to-day management of enterprise GIS staff, it will set the broad directions for staff activity. Again, the purpose is to provide the entity to which staff action will be held accountable.

- **Advise/Consent GIS Staffing.** This committee will facilitate the staffing issues for the GIS program (the Geographic Information Division). The County Administrator has the authority to formally hire and fire any staff in the County.
- **Enterprise Project Management Oversight.** One of the most important roles of this Committee will be as the entity to which project management will be held accountable.
- **County Board Liaison.** This Committee will also serve as the County Board's liaison to the GIS Program. This involves both communication and accountability. This will be an extremely important role for the Committee in order to represent the interests of the County.

2) Information Technology Department

Because the GIS Program will be in a startup phase for some period of time, initially a prudent course is to administratively locate the Geographic Information Division (GID) in the Information Technology Department (ITD). The rationale for this location includes the immediate availability of administrative structure. Perhaps more importantly is the close interrelationship of GIS with Information Systems (IS) and various business systems supported by the ITD. For a variety of reasons, locating the GID in this administrative location may also be sensible in the long run as well. Although, at some point it may be appropriate to separate those functions[5]. For now, location within ITD meets one of the key best practice criteria, namely that the location of GIS coordination is outside of a line agency that has specific business functions that rely on GIS.

In this model, ITD will have the following responsibilities in regard to the GIS Program:

- **Budget Administration.** The department head will work with the GIS Steering Committee on the GIS Program budget and when ratified, administer it.
- **Execution of Steering Committee** Directives**.** Since the Steering Committee will formulate policies (directives), this department will be responsible for their execution and completion. Of course, other departments will undoubtedly be involved, but the IT Department will be the coordinating and managing entity.
- **Daily Staff Management.** The IT department head will manage both the IT staff and the GIS staff on a day-to-day basis.
- **General Administration.** This department will provide general administrative support for operational services.
- **System Administration.** Scott County is very fortunate to have a solid information technology plan, structure, and department. Many of the enterprise GIS system administration functions fold nicely within this framework. This includes all centralized technology and data assets.

[5] In time, as the GIS program moves into an operational phase if the program grows significantly with staff and provision of services, it may be appropriate for the GIS Program to stand on its own as its own department.

At a technology level, this will involve management and administration of enterprise file, data and web services, networks and network devices, firewalls, software license management, and technology procurements and upgrades. As some point, separation of these functions may be appropriate, particularly if other jurisdictions formal part of the system. Until that time, management of GIS assets is not decidedly different than management of other County enterprise IT/IS resources.

3) Geographic Information Division

The demands of a County GIS Program warrant the creation of a GID to support varied enterprise GIS needs across County government. This Office will be responsible for:

- **GIS Program Coordination**. These responsibilities involve a range of activities including: acting as staff for the Technical Committee; documenting and implementing relevant policies; providing logistical support for GIS program-related meetings; and facilitate communication among participants using formal (e.g., newsletters) and informal methods.
- **Program Administration**. This office will also be responsible for Program administration such as budget management (with the IT Director), approval of expenditures, and Iowa Open Records Laws and open meetings compliance, etc.
- **Enterprise Data Custodianship**. This office will fulfill the responsibilities of data custodianship for those data that are either strictly enterprise or that may be decentralized, but part of an enterprise data repository. Custodial responsibilities include: data maintenance; data documentation or metadata; data access; and data distribution.
- **GIS Technical Support**. Part of the responsibilities of the Office will be technical support for the system and for enterprise data custodianship. Unless a service bureau is formed, technical assistance will be limited to system level support. It would also include training on enterprise systems, applications, and data.
- **Project Management**. The last key responsibility of this office is project management. Certainly in the beginning, there will be a number of projects, data conversions, system designs, etc. How effectively these projects are managed will have a tremendous impact on the success of the GIS program overall.

To meet the demands of the GIO, it will be necessary to staff the office with a GIS Coordinator Position. It is clear that the GIS Steering Committee and the IT Department are not in a position to operationally manage the countywide GIS. As well, there is not enough staff capacity within the ITD to fully manage the GIS program. As a result, the County should create a position for a person with sufficient knowledge and experience to become a coordinator of GIS functions. This person would be, in the startup phase, the only member of the new Geographic Information Division.

Initially, this position would be responsible for:

- Management of procurements for data and technology for GIS projects.
- Project management for data conversion, applications development, and system development.
- Coordination of work and data flow process changes within the associated county departments (e.g., parcel data flow between the Auditor, Assessors, and Treasurer, and so on).
- Coordinating all support needs from the departments, and either do the support themselves, or work with consultants to ensure that the work is completed.
- This person would also take leadership in creating GIS databases, and getting initial applications designed and constructed.

c. Users

The third arm of this operational model is the users, which includes the other data custodians, internal users, external users in other agencies, all of the municipalities in the county, and the general public. Their role in this operational model is obvious. There are, however, a few points relative to implication of users.

GIS knowledge and capabilities will vary greatly amongst users across the enterprise. It will drive initial application development to the lowest common denominator. Future development with data and applications will become more user specific. For instance, to initiate a general browse and query application that works with the most commonly used data sets would be useful to 80-90% of the users and their needs. In time, as users become accustomed to using GIS data and are trained in using GIS software, more sophisticated needs will arise for more diverse data and applications.

As noted in the strategic themes, the model for GIS in Scott County is marked by centralized management and administration and decentralized operations. As the Scott County GIS develops, users and their departments will need to become empowered to develop their own, agency-specific GIS programs. Obviously, there will be enterprise applications that will serve many business functions. At the same time, integration of business applications with GIS will be the responsibility of individual agencies. For example, if GIS is going to be part of pavement management, it will be up to the Secondary Roads Department to make that happen.

Another important implication from a user perspective is training. While the countywide GIS can provide many opportunities for education and training of staff, individual agencies will have to address these critical elements within their program needs (e.g., design of geodatabase models for sewer systems). Another aspect is timing of training. Training should not continue at the County unless there is an immediate need for it. Too often, GIS training occurs long before it can be used, rendering it much less useful.

The final point is that the development of a countywide GIS is a long-term process. There are several steps that take a long time to develop such as parcel conversion. As a result, agencies will have the time to sensibly ramp up for the effort.

C. Process Conceptual Design

This conceptual design document, as with the situation assessment, is outlined using the five system components: Process, Data, Technology, Organization and Application. Inherently, GIS is an integrating technology. It enables and encourages the assimilation and sharing of diverse information and business functions through a common technology window.

To implement a countywide GIS, there are two process dimensions. The first is the role and function (the operations) of the "Enterprise" GIS, or the countywide system. Much of that was discussed in the previous section on the Operational Model. However, there are significant enterprise processes that were not discussed. The second dimension is the role and function (i.e. operations) of existing departmental business functions relative to GIS. These two dimensions are discussed in turn.

1. Enterprise GIS Processes

The needs for enterprise level system functions have been well discussed and documented in the workshops and the situation assessment document. It is agreed that the automation of key land records and other related spatial data are now virtually mandated by the technically and, in some cases, functionally obsolete systems that exist in the County. As well, a number of inefficient processes have been identified. The benefits of collaboration within County government and, potentially, between the County and other external agencies, has been recognized and documented.

In the short term, the GID will function as a start-up operation. At least initially, this will be a single person operation. Obviously, there will be many aspects of the GIS Program that will have to be implemented. As a result, much of what the GIS Coordinator will be doing will involve project management and coordination. Key start functions will include:

- **System Design.** The next step in the system development following completion of the strategic and tactical plan will be to more deeply engage in a system design. These design exercises will be critical to the development of systems that have broad applicability to support business across County agencies. These activities will include logical and physical design and construction. Undoubtedly there will be a series of design efforts as individual system components and subcomponents are brought online.
- **Data Procurement.** Because so much of the geographic and land information held by the County is in manual form, the early years of the Program will be marked by planning for, procuring, and quality controlling base and other enterprise level data. Project management will be critical during these efforts. Essential data to be procured include base and image mapping and parcels.
- **Technology Procurement.** The County will need to acquire and deploy a range of technologies, including workstation and server hardware and software.
- **Policy Mechanism Formulation and Development.** Although the outcome of this project will lay out base system elements, during the start-up phase considerable effort will be required for policy mechanism formulation and implementation. Much of this is administrative and organizational, but it will require a wide range activities from research, facilitation, communication, etc. The

GIS Coordinator will have to be able to work with agencies, the public, decision makers, and other interested parties.

As the GIS Program matures, the skills required will also evolve. In the beginning key skills will include project management, policy analysis and formulation, and a thorough understanding of spatial technology and concepts. It is expected that the person staffing this office initially will have good high-level GIS technical skills *and* will also possess good management expertise, particularly project management skills. Those initial skills will always be necessary. However, as data and technology is acquired, greater hands on technical skills will become very important. These skills include applications development and GIS database management.

2. County Business Processes Supported by GIS

The situation assessment phase reviewed many of the processes, or business functions, that may affect or be affected by development of the County GIS program. The resulting analysis illustrated opportunities for the improvement or streamlining of existing processes. Existing inter-departmental workflows, such as site address tracking, development plan review, and workflows between the County and other entities (such as property assessment data transfer), should be streamlined where necessary. This will improve the efficiency and effectiveness of County operations and enhance investments made in digital data and GIS technology.

The following is a listing of County agency business processes that will be supported by enterprise GIS. Some of these, such as parcel mapping, will be part of the system early on. The balance of these functions is more long-term and will come on line when the system is more fully developed. Other functions, not identified, will be added to the list in the future as capabilities from the GIS are realized within County departments.

a. Parcel Mapping

Participants in the situation assessment phase and at the conceptual design workshop indicated a desire not only for digital parcel boundaries and linked information but also timelier parcel data exchange between agencies. It is clear that digital parcel boundaries and related data (annotation, etc.) will become enterprise data because nearly all departments require some level of parcel information.

In the short run, the County will need to solicit a suitable data conversion firm for parcel conversions. As well, the County will need to work with the Cities of Davenport and Bettendorf on a parcel mapping agreement to utilize their investments. These cities have invested much in their digital orthophotography base map and digital parcel layer. It would be in the taxpayers' best interest to incorporate the City's investments in the countywide enterprise GIS. In return, when the parcel conversions are completed, parcel maintenance by a County unit may be in the Cities' best long-term interest.

For one unit to manage the parcel maintenance, there are several issues that will need to be worked out. One of them is maintenance cycles that will need to be agreed upon. For instance, maintenance cycles could be at least six (6) times per year, if not more. Ultimately, if the agreement is that the County would perform the work, the County should consider the creation of a GIS Technician position, to

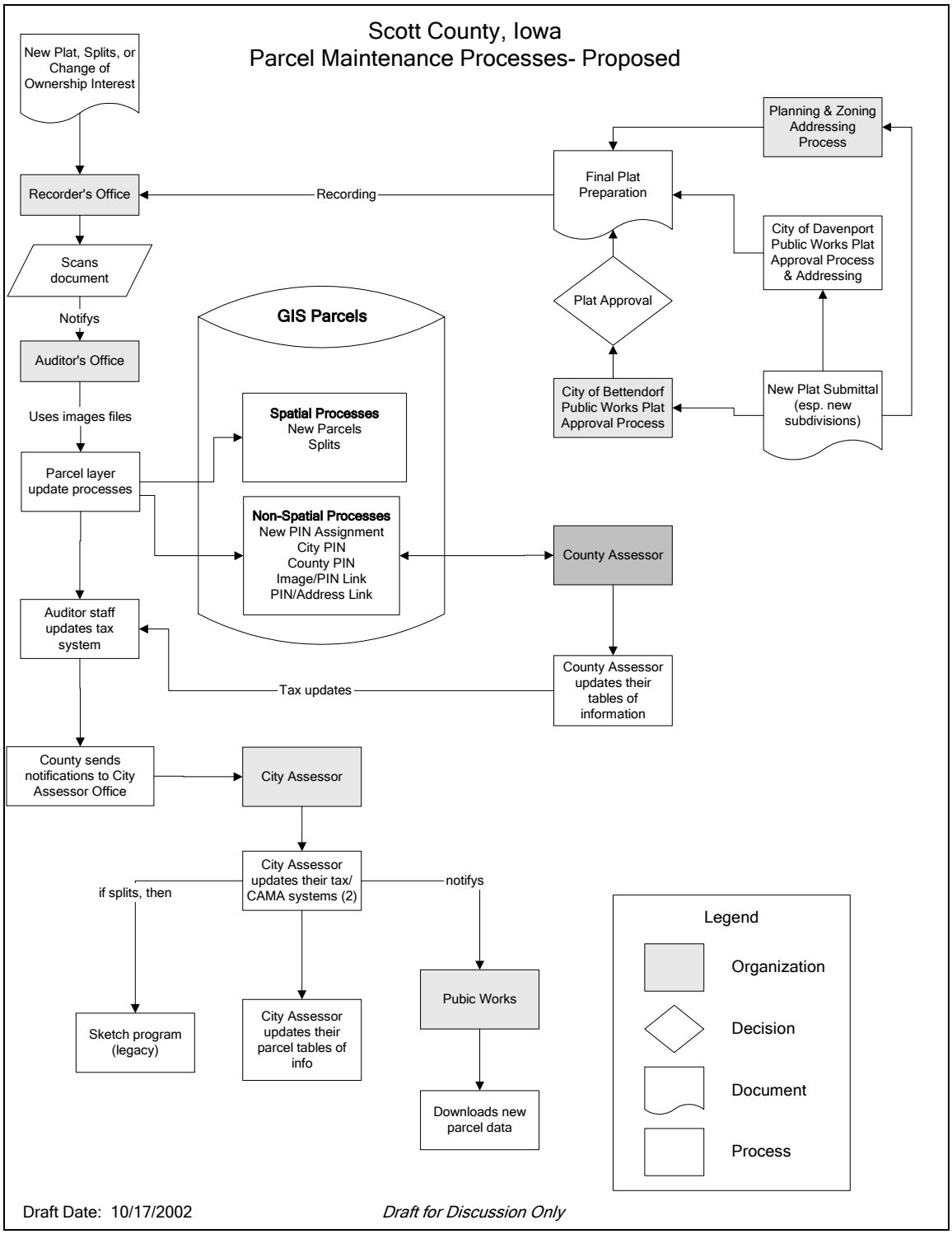
fulfill GIS parcel mapping maintenance needs. The other option is to outsource the work to a local parcel service provider.

As part of the maintenance cycles, the processes at the City and the County Assessors' need to be considered as well as the taxing cycle. This can be handled by versioning the parcel and tax databases so they are not only in sync time wise, but integrated and saved as a "snapshot" for either the County or City Assessor or the Treasurer's business functions.

Within the situation assessment document was a diagram showing the parcel mapping process. A proposed and draft diagram to change that process is presented below (see Figure 3: Proposed New Parcel Process below). The parcels will be converted into a GIS framework with spatial and non-spatial components. One unit, such as the Auditor's office, maintains the core parcel information. Other information, specific to other offices or departments, is maintained in each specific office. For instance, the County Assessor may wish to keep notes on its assessments in a separate table that can then be linked to the parcel layer. All departments who wish to have parcel information can access the parcel GIS layer. Permissions can be set to who has read or read/write access including restricted write access to specific tables.

The new process promotes minimization of duplicative efforts, increasing access to the most important GIS layer, and having more timely data updates.

Figure 3: Proposed New Parcel Process

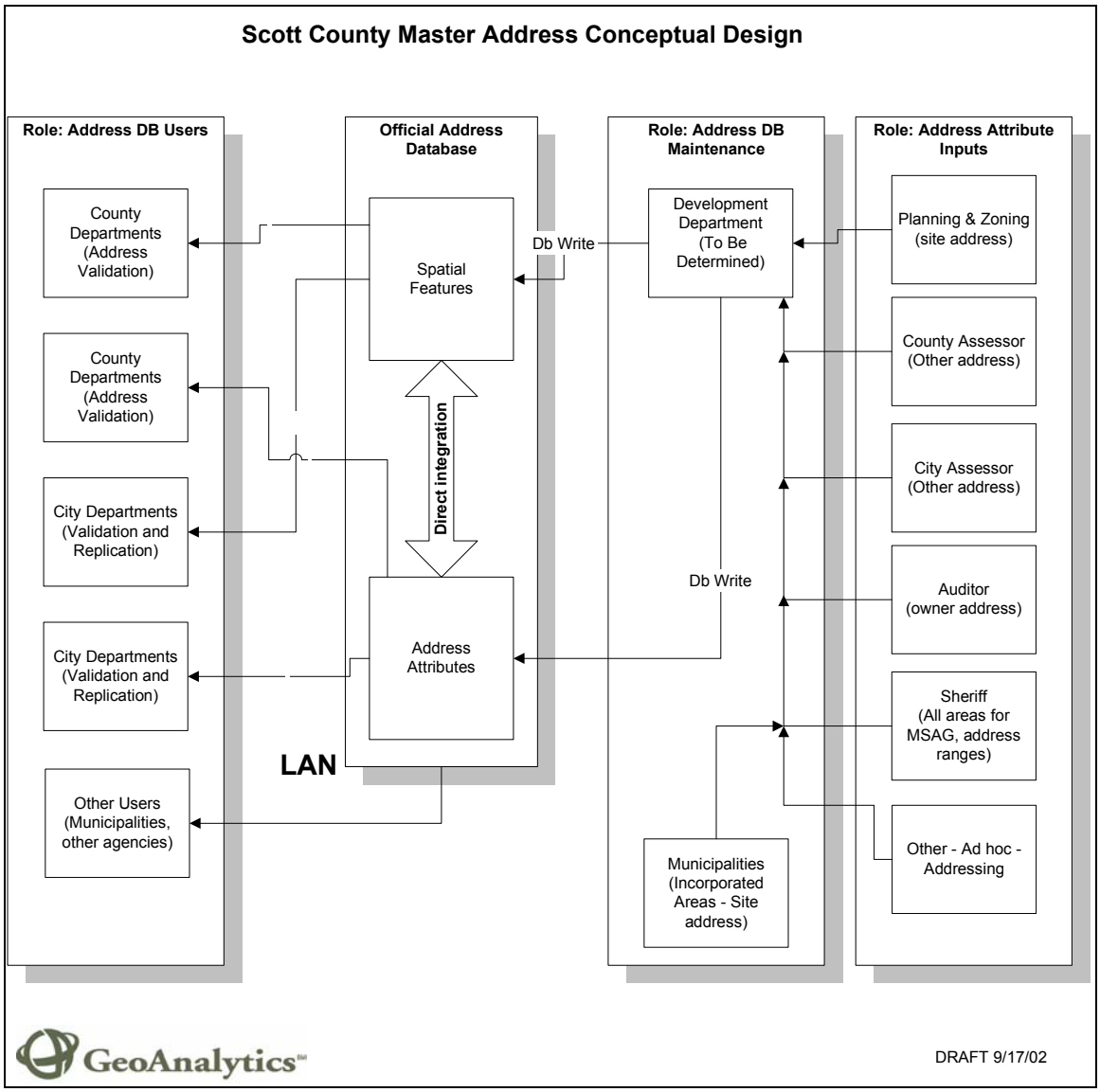


b. Master Address Database

One of the more key pieces of information, tightly linked to the parcel layer, is address. A master address database should be constructed, which will cross-reference any location address to a parcel or geographical area. Frequently, there

are more than one type of address per area such as owner's address, postal address, utility billing address, local knowledge address (e.g., Rabbit Run versus Hwy D) and so on. A master address database will link all of these kinds of addresses to one or more parcels or geographical areas. The diagram below depicts a possible master address database process.

Figure 4: Address Process Example Conceptual Design



c. Property Ownership and Valuation

Information based on location, such as sales of nearby properties or proximity to features such as industrially zoned land, can be used to enhance the current process of assessing property value. Along with this information, GIS map displays will assist the City and County Assessor's Offices in supporting property valuation during the appeals process.

d. Property Owner Notification

GIS will support the needs of several departments for fast and reliable creation of address mailing lists, based on location. Activities that necessitate direct, written landowner notification as it relates to public comment on rezoning applications, creation of public policy, environmental hazards, etc., will be streamlined through availability of a site and mailing address database. This database, linked to GIS, should be accurate and up-to-date in terms of address content and physical location.

e. Document Management Integration

Tying non-spatial data, such as scanned documents, to spatial data, such as parcels, will increase the level of convenience for internal and public access to documents. Non-spatial image-based data include plats, surveys, photographs, deeds, and the like. The purpose is to integrate this spatial (particularly property data) and non-spatial data to reduce the amount of time and effort locating areas and their associated documents. The precondition for this capability is that once documents are scanned and indexed, they are linked to a location in the GIS database via a key such as site address or PIN. This linkage should be established in conjunction with the parcel conversion processes and the current document imaging process in the Recorder's office.

Again, if there is to be more than one document imaging system initiated in the County, the optimal solution is to adopt the same system, or if not, then interoperable systems. Having an open index or database is the key to interoperability, integration, and/or functionality of imaging systems with GIS.

f. Infrastructure Asset Management

Another future endeavor with GIS is infrastructure asset management. The City of Walcott realizes this benefit by having a work order management system tied, via ArcView, to digital sewer data. The County would be well served to use GIS asset management in the Secondary Roads Department to better manage the inventory and maintenance of bridges, culverts, roads and signs. Pavement and other asset management systems coupled with GIS offer efficiencies in the development of rolling five-year management and maintenance plans. Existing data can be augmented with location such as x, y coordinates, and linked with the GIS base map, increasing the department's ability to inventory assets (signs, etc.) to create reports and plans, view, analyze and manipulate data geographically.

g. Infrastructure Information Tracking

Handwritten records of inspection results, right-of-way survey documents, and Computer Aided Drafting (CAD) technology for mapping locations of the County street system, should be integrated and standardized as part of an overall County GIS. This will promote more seamless integration of different data sets encouraging more data sharing opportunities and simpler use of information across multiple departments and business areas to support daily decision-making.

h. Site Assessments

The map overlay capability provided by GIS will aid in site assessment activities by enabling inclusive views of several map layers in one display. GIS will be used to study patterns or potential impacts that would not easily be distinguished with a visual analysis of disparate maps.

i. Enhanced Permitting and Land Management

Integrating the health and building permitting processes with GIS will enhance current activities from those and other departments. Planning and Zoning, Health, Assessor, and other departments can use GIS to review the location and status of existing developments and plats, location and status of permits, owner/occupant data, and zoning designations. GIS integration with permit tracking systems affords the opportunity to better manage licensing, code violations, etc.

j. Health Inspection and Complaint Management

The Health Department could benefit from GIS access to information maintained by other departments in support of tracking inspections and complaint data for wells, septic systems, illegal dumping, and other areas. For example, access to property ownership information in GIS will replace the current process of consulting the Auditor's Office to identify this information. In addition, a site address link in GIS would enable the department to map new and existing data that is traditionally indexed by address.

k. Economic Development

Systems and data can be developed to support attracting and siting new businesses within the County. This, of course, would increase tax revenue but also provide more opportunities for the public good (e.g., employment, improved services, etc.). The Quad City Development Group is the external agency that could work with the County and utilize its GIS for economic planning. The County can more effectively represent and promote their interests with ready access to current property and land-use information. As well, Rock Island County has a GIS and Economic Development Department that wants to launch a regional economic development web mapping service (using ArcIMS) to assist in attracting larger businesses to the area.

l. Public Safety Location Identification

Integration of all maps and location identification will enable public safety staff to extend the accuracy of location-based information and to more efficiently perform dispatching and response. This includes the potential use of GIS to map cell tower locations and sectors, enabling better identification of the location of incoming wireless calls.

m. Incident Data Management

GIS can be used to map crime and other incident locations by address, enabling analysis of incident patterns, potential problem areas, even activities that cross the jurisdictional boundaries. The CODY Computer System, which manages law enforcement information, will probably require some connections or translations with the County GIS.

n. Enhanced Premises Intelligence

Integration of locations and documents with GIS will enable public safety staff to be better prepared for response to emergency situations. Sheriff and EMS personnel would be able to access scanned documents of premises by clicking on a property and revealing information about an area that may otherwise be unavailable. Examples include the location of ingress paths, hazardous materials, and nearest fire hydrants. This is a longer-term capability, as documents would have to be scanned and geo-referenced as a prerequisite.

o. Public Access

By delivering basic browse and query capabilities to County desktops, responses to commonly asked questions will be at the fingertips of staff members. The GIS system will bring together location-based databases from various programs, enabling any staff member with access to the system to respond to a multitude of inquiries. Ultimately, it is expected that some public access via the Internet or lobby kiosks will also be provided.

D. Organizational Conceptual Design

There are inherent relationships that exist between producers and users of land information throughout an enterprise. In this case, an enterprise organization is, at the least, Scott County's Offices and Departments. On a grander scale, the enterprise would also include other governmental entities and external agencies that would be in some sort of partnership with the County.

An enterprise or countywide GIS can be viewed as a partnership. The Scott County GIS organizational structure should strive for an interoperable, collaborative model. Because of the County's interest in the development of multi-purpose, multi-participant GIS program, the organizational dimension and the principals of partnership are of even greater importance.

The organizational component of this conceptual design has two realms. One realm is the County government. This realm was discussed under the Operational Model section. The other relates to countywide GIS, which includes other external agencies such as municipalities etc. Other dimensions include program governance, intra and intergovernmental relations, funding, information policy, and staff development. All of these factors are discussed in the following section.

The organizational system component deals with a number of other issues, including funding, public access, liability, etc. The following briefly summarizes the organizational considerations.

1. Funding Options

The GIS Steering Committee should consider funding options for the GIS Program. One such option, common with many organizations such as in the Rock Island County Geographic Information Division, is to have a portion of the recording fee to pay for its GIS system. Ch. 22 § 22.2 3. a. and § 22.3 of the Iowa Code provides:

> **§ 22.2 Right to examine public records--exceptions.**
> 3. However, notwithstanding subsections 1 and 2, a government body is not required to permit access to or use of the following:
>
> a. A geographic computer data base by any person except upon terms and conditions acceptable to the governing body. The governing body shall establish reasonable rates and procedures for the retrieval of specified records, which are not confidential records, stored in the data base upon the request of any person.

The impact of this section is to permit governments in Iowa to charge in excess of the cost of reproduction for digital geographic information. In addition the County may charge for value added services. Once the GIS program has been implemented, there is a good possibility of reaping financial returns that can be cycled back into the GIS program. These would include licensing, royalty or subscription fees from the distribution of GIS data, as well as the costs of GIS services that the County will be able to offer to the community.

As well, Scott County has essential purpose bonds that can be used for developing the GIS system.

The issuance of Essential Purpose Bonds is described in sections 331.443 and 331.445:

> 331.443 Essential county purpose bonds.
> 1. A county which proposes to carry out an essential county purpose within or without its boundaries, and to contract indebtedness and issue general obligation bonds to provide funds to pay all or any part of the cost of a project shall do so in accordance with this part.
>
> 2. Before the board may institute proceedings for the issuance of bonds for an essential county purpose, a notice of the proposed action, including a statement of the amount and purposes of the bonds, and the time and place of the meeting at which the board proposes to take action for the issuance of the bonds, shall be published as provided in section 331.305. At the meeting, the board shall receive oral or written objections from any resident or property owner of the county. After all objections have been received and considered, the board, at that meeting or a date to which it is adjourned, may take additional action for the issuance of the bonds or abandon the proposal to issue the bonds. Any resident or property owner of the county may appeal the decision of the board to take additional action to the district court of the county, within fifteen days after the additional action is taken, but the additional action of the board is final and conclusive unless the court finds that the board exceeded its authority. The provisions of this subsection with respect to notice, hearing, and appeal, are in lieu of any other law.

331.445 Categories for general obligation bonds.

> The board may issue general obligation bonds pursuant to a resolution adopted at a regular or special meeting by a majority of the total number of supervisors. Each subparagraph of section 331.441, subsection 2, paragraphs "b" and "c", describes a separate category.
>
> Separate categories of essential county purposes and of general county purposes may be incorporated in a single notice of intention to institute proceedings for the issuance of bonds, or separate categories may be incorporated in separate notices, and after an opportunity has been provided for filing objections, or after a favorable election has been held, if required, the board may include in a single resolution and sell as a single issue of bonds, any number or combination of essential county purposes or general county purposes. If an essential county purpose is combined with a general county purpose in a single notice of intention to institute proceedings to issue bonds, then the entire issue is subject to the election requirement in section 331.442.

Additionally, one example of an Essential County Purpose is:

> "The acquiring, developing, and improving of a geographic computer data base system suitable for automated mapping and facilities management. " This definition can be found in section 331.441.2.b.
>
> Finally, it is clear that the development of a system that will support the needs of County agencies will require a financial commitment for maintenance. Ultimately, some funding will have to be derived from the property tax base. This funding could take the form of dedicated general revenues or capital improvements. Decisions as to

the precise mix of funding options will have to be made as part of the plan implementation.

2. GIS Information Policy

Funding options are part of a larger subject matter, GIS Information Policy. Ultimately, the County and other participants in Countywide GIS will have to make determinations and draft policies relating to GIS data sharing, redistribution, access restrictions, privacy rights, and the pricing of information per open records laws and possible cost recovery.

3. GIS Skill Development

Staff skills will be developed in order to effectively manage and utilize investments made in GIS technology and data. One example of an express need for staff skill development would be for general data maintenance and development. Skill enhancement can be achieved through formal outside training, in-house training, and/or through relationships with private project consultants. Regular attendance at GIS professional association meetings, that offer low cost workshops, is an excellent venue for staff training.

4. GIS Services

Providing services to County partners, external agencies, and the public is an organizational issue because, depending on the level of these services, it will require staffing, skill sets, and other resources. One example is mapping requests. Although developing general applications to provide maps to the general public and several agencies may automate the process, requests for more specialized maps will eventually increase over time.

The type of services the County offers is an area for future consideration as it not only affects the County's resources but those in other entities as well such as the Quad Cities Development Group and the Bi-State Regional Commission.

Bi-State is very actively involved in the region including providing GIS based services, primarily for planning purposes. At this time, their resources (staffing) cannot manage all foreseen requests that may occur in Scott County once the data becomes available. Therefore, Scott County may wish to assign, in the future, a task force to study the interactions between Bi-State's services and what Scott County may offer.

The potential task would then be to work out what kind of GIS services will be provided to the County's staff, municipalities, external agencies, and the public. The range is quite extensive (from nothing to a fully customized) so that the County has the flexibility and time to grow a “service bureau.”

E. Data Conceptual Design

The situation assessment identified those data sets in both spatial and textual formats that the County collects, produces, and uses. Data has logical relationships that have implicit requirements or necessities. These relationships were defined in the situation assessment such as integration, quality, integrity, etc. In the following sections, these relationships, in terms of strategies, are discussed.

1. Data Automation and Integration

Opportunities to integrate traditionally separate land record databases will be pursued. Base map components, including parcels, orthophotography, geodetic control network, and street centerlines could be provided by or converted by a private vendor, or they can be created over a long period of time by internal staff.

Resource map layers, such as taxing districts and zoning designations, may be converted by individual departments, or procured as an external service. Integration of many departmental records will be accomplished through data scrubbing, ongoing maintenance of relevant indices (e.g. PIN, site address, permit number, etc.), and the reference to location that is implicit with every GIS database.

The GIS Steering Committee will work to identify pressing needs for data automation and integration from a countywide perspective, and to assign priorities where limited resources are available to complete the work necessary to incorporate data into the system.

2. Central Data Repository

Consistent with the strategic themes of multi-purpose systems, centralized enterprise system administration and decentralized system operations, Scott County will develop a central data repository. This repository will be a publication database organized to permit easy access to enterprise and key departmental data. Departmental data that is published in the data repository will be provided designated data custodians (see section E.3 Data Custodianship below for a more detailed description).

The central data repository concept is intended to simplify access while maintaining data security. With the exception of transactional updates from data custodians, this will be "read only" database with replication capabilities for project work. It is expected that is the database is designed well enough, the central data repository can be the target for business applications across the County. The repository would also be used to serve enterprise level applications.

3. Data Custodianship

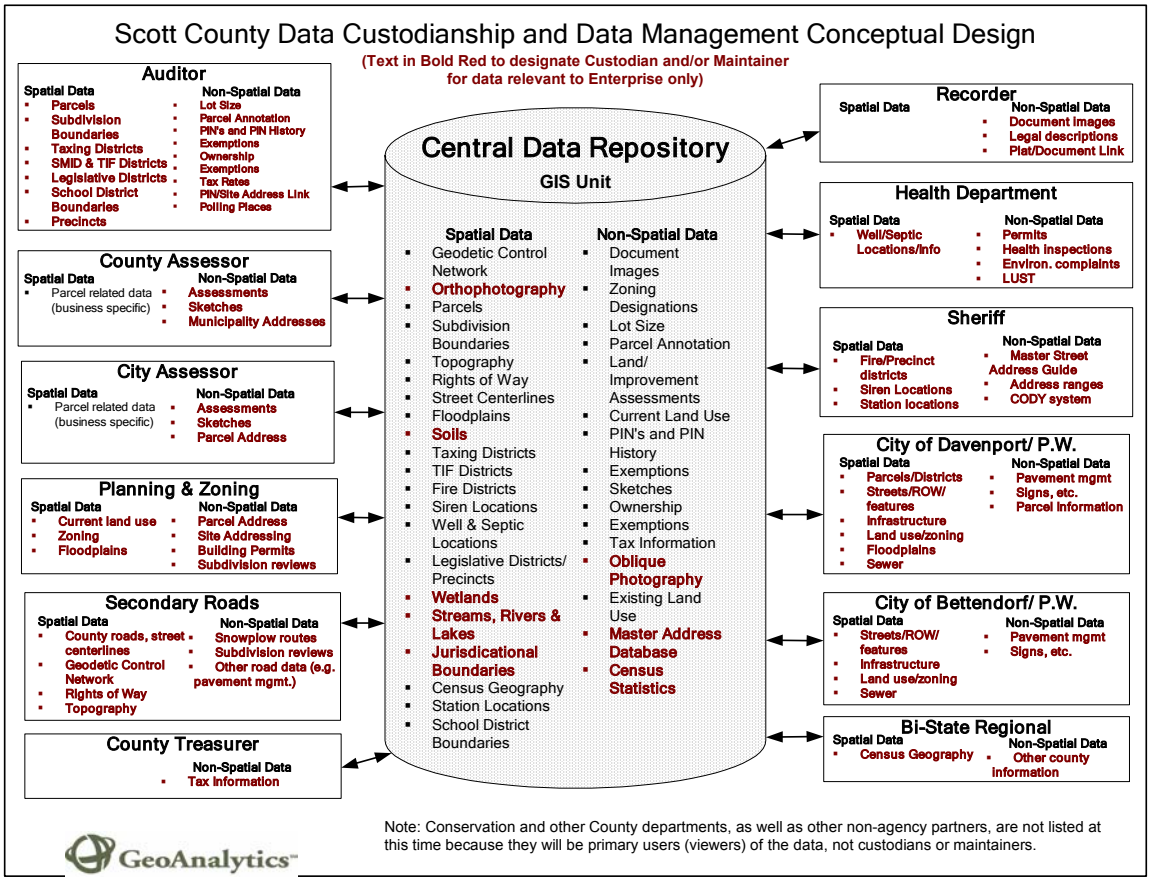
The County GIS will be made up of a defined set of GIS databases and custodians. Figure 5 illustrate these components, as they will exist for Scott County's GIS data.

Custodial responsibilities for data maintenance, including maintenance schedules and metadata documentation, will be outlined and followed to ensure proper representation of records. Where necessary, custodial responsibilities for data

maintenance will reflect not only the needs of the custodian but also of other end users of the data.

As Figure 5 illustrates, GIS data will be decentralized with respect to custodianship, but centralized as part of a comprehensive GIS data repository that serves all County GIS user needs. GIS databases that serve no enterprise purpose such as project specific files or sensitive records (e.g., certain data produced by the Sheriff's Office) would be stored locally on departmental workstations or servers. Storage in the central repository (with access restrictions) offers the benefits of data archiving and backup, and reliability of technical support for data serving.

Figure 5: Data Custodianship and Management



The following sections outline the custodial responsibilities for each department. The diagram above only illustrates maintenance of the *enterprise* data and not those data each department needs for only its own business functions. As well, the diagram does not portray users of the data, which will be, presumably, all County offices and departments (e.g., Sheriff's Office or Emergency Management Agency.

a. Auditor

By law, the Auditor is the official custodian of parcel and tax information for the County. What is not clear, at this time, is if this office will maintain the parcels after their conversion. Staff will most certainly be heavily involved with the conversion process by providing key components of information, quality

assessment and quality control. This office should take a lead role with collaborative agreements with the City of Davenport for parcel maintenance and data sharing.

b. County Assessor

The County Assessor's office will be responsible for its own department specific information as well as providing relevant, but limited parcel attribute data into the enterprise system.

c. City Assessor

Like the County Assessor, the City Assessor's role is to input any crucial parcel attribute, including graphic data, into the central data repository.

d. Planning and Zoning

This department, as they are currently entrusted with building permits, site addressing, and plat reviews, should be part of the overall parcel information stored in the repository. As well, they would be the custodians for the GIS layers of current land use, zoning, and floodplains. These data will be published centrally.

e. Secondary Roads

As this Department serves transportation, engineering, and public works functions, they would be the custodians for the geodetic control network (the public land survey grid, monuments, GPS collections, etc.), topography (e.g., digital elevation models), and transportation GIS layers such as street centerlines and rights of way. Other GIS data layers that others may use would be snowplow routes and other road data (signs, bridges, pavement, etc.).

f. Treasurer

This Office is responsible for collecting revenues for all County departments, primarily property taxes and motor vehicle fees. The Office would be custodian for the GIS links to the tax statements, including payment history.

g. Recorder

The Recorder's office would be the custodian for the document imaging systems for plats and other legal documents. They could also be responsible for maintaining the link between the document and the parcel GIS layer. Document images are not considered to be spatial data because they are graphical in nature only and they are linked with a tabular reference to spatial data.

h. Health Department

The Health Department would be the custodian of enterprise data such as well and septic locations and information, health permits, health inspections, environmental nuisance complaints, and leaking underground storage tanks (LUST).

i. Sheriff's Office

This office would maintain the fire and precinct district boundaries (matched against the parcel layer). Siren locations, station locations, and other pertinent public safety locations would also be maintained. As part of the Master Address Database, the Sheriff's Office would maintain the MSAG files for address ranges. The CODY system would utilize the enterprise GIS for mapping capabilities (and quality checking).

In the event appropriate arrangements can be made, the follow entities may also act as data custodians *and* clients of the central data repository.

j. City of Davenport, Public Works

The Public Works department would manage all of the current and future GIS layers for the area within the City's limits. Parcels, and their maintenance, may not reside with the City in the future, depending on the agreements made between the City and the County. Their GIS data layers could then be "posted" to the central repository for use by all partners.

k. City of Bettendorf, Public Works

Likewise, this Public Works department would manage those GIS layers for this city's limits. The County should do parcel maintenance for this City, and provide good Intranet access to the data repository.

l. Bi-State Regional Commission

Bi-State and other agencies like NRCS, Army Corps of Engineers, would provide GIS layers for which they are custodians. Bi-State would distribute and maintain the TIGER Census geography. NRCS would do the same for soils and the Army Corps for floodplains.

4. Database Design

For any data, spatial or non-spatial, that is converted to GIS, a thorough exercise in database design will ensure that the intended use of data is appropriately supported by its content, quality and comprehensiveness. The database design must accommodate both the business needs and applications of the intended users of the system. Data design will be critical to the success the GIS Program, regardless of its final form. Database design takes place in the logical and physical design phases of system implementation, which is beyond the scope of this project.

Participants in the design exercise should include data custodians and users, with direction and guidance from the GIS expert performing the conversion. Data needs should be evaluated to determine the best approach for capturing the new data. Highly intensive data capture, or data scrubbing projects, would be better accommodated by a private consultant in order to achieve faster completion with appropriate quality assurance procedures. County GIS users can complete secondary data layers that have a flexible completion schedule.

5. Data Quality

The accuracy of digital land records maintained and used by the County and shared with external agencies will be sufficient to yield the most cost effective benefits to the County and its taxpayers. Generally, cost of data capture, conversion, and maintenance increases with increased accuracy. Accuracy standards that direct all future GIS data collection should be drafted by the GIS Steering Committee or an assigned task force committee. Suggested minimums for data quality standards will be presented in the final phase of this project, the Strategic and Tactical Implementation Plan. Detailed standards will be developed in future projects, namely the logical and physical design phases.

Standards to be developed for data quality will include:

a. Positional Accuracy

Positional accuracy refers to the accuracy with which a location on a map can be tied to a discrete geographic coordinate, such as a latitude/longitude, or other x, y coordinate. By obtaining and referencing a reliable network of geodetic (survey) control points as part of orthophotography acquisition, Scott County can increase the accuracy of the GIS base layers and all derivative layers. There are three alternative approaches for positional accuracy standards.

- A single accuracy standard for large-scale GIS layers that are captured from survey techniques (PLSS corners, subdivision plats, etc.) and any layers that are derived from these layers.
- A less stringent accuracy standard for the creation of small-scale GIS data layers compiled from aerial photography, such as wetland boundaries, soils, and vegetation types. At a minimum, national map accuracy standards should be adopted as a standard.
- Project-specific GIS databases would not have to meet a specific accuracy standard as this should be left to the discretion of individual departments and users. If project GIS data were intended for eventual publication in the central data repository, then some accuracy standard would be applied.

b. Referential Integrity

Related to positional accuracy is consistency in the compilation of digital land records. To ensure referential integrity, all map layers, existing and new, will need to be aligned in the same coordinate space and registered to some base (e.g. survey control network, base map, etc).

A thorough quality control process should be included in any data conversion project, to ensure that all data is properly registered to the base map and framework layers as well as ensuring that other requirements for GIS data (e.g. attribute content) are in compliance.

c. Comprehensiveness

Notwithstanding positional and referential accuracies, each shared GIS data layer should meet a minimum standard for comprehensiveness and currency. For example, the tax parcel layer will be required to contain a Parcel Identification Number (PIN) for each polygon, with no "empty" polygons or extra PINs. In

addition, shared data layers should strive to cover the entire County geography or beyond, not just partial areas.

d. Currency

All the spatial fidelity possible is of little value if the data is out of date. Many data elements have a relatively long shelf because the landscape (topography, soils, etc.) does not change that much. Virtually all data has ongoing utility for historical and change analysis purposes. However, some physical and administrative features are constantly changing and, thus, have a relatively short life cycle. Some data such as parcels have two life cycles. One is annual in conjunction with the certified tax roll. The other is much shorter for emergency services and planning purposes.

Whatever the shelf-life of data, there needs to be defined, regular update schedules that match business process that should be mandatory

e. Citation of Data Quality

Any printed or digital distribution of the information contained in the GIS will be annotated with references to the accuracy, comprehensiveness, and currency of each data layer that appears on the distribution.

f. Metadata

Metadata, or descriptive information about each data layer, should be clearly documented as to attribute definitions, scale and accuracy, custodianship, update cycle, and so on. By providing accompanying documentation with GIS data, the County will help to prevent inappropriate or misunderstood use of the data it publishes. It would also decrease the liability risks.

g. Data Access and Distribution

Efficient exchange and transfer of GIS data (with the exception of confidential information) between departments and among external agencies is a primary goal of the County GIS program. There is a need for a data access and distribution policy to address issues such as data access, distribution, privacy, copyrights and licensing, and cost recovery, within the context of open records law. As discussed earlier in the Organizational Component section, the GIS Steering Committee, together with the GIS staff within Information Technology office (and perhaps others) would be responsible for drafting GIS policies.

F. Technology Conceptual Design

1. Summary GIS Technology Architecture

The County has been implementing a sound IT Plan for the past few years. Beyond the implementation of this solid IT foundation, some basic recommendations can be made for GIS system architecture. This technology conceptual design includes a number of elements and requirements. There are three basic categories of technology: 1) Software, 2) Hardware, and 3) Network Communications. GIS uses and activities will define how technology is deployed and configured. The County's preference for a centralized GIS operational model will also shape the technology deployment and configuration.

To best accomplish business functions, the County will continue to use a centralized serving environment that will serve the needs of the majority of users in the County. Centralized browse and query applications will serve the needs of most GIS users. For departmental staff with more advanced analytical needs, individual GIS workstations will be configured with GIS software and applications.

a. Software

The County has decided to use ESRI as its primary GIS technology provider. ESRI recently migrated its core GIS technology from legacy software architecture, based on procedural programming languages and file-based, geo-relational data structures, to a multi-tier, object software architecture and data structure. This new architecture will better position the County in the future to integrate GIS with other business solutions such as its new tax system or web-based applications.

To best accomplish the business functions of the County, and keep technology costs to a minimum, a deployment of an internal web application server will serve the needs of the majority of users in the County. By taking this approach, individual training and licensing costs are minimized, and most needs will be easily fulfilled. A custom web mapping application will be developed for the majority of users who need to browse and query the database for information about the County. This Intranet application would operate and be viewed in web browsers on the desktops of the County staff and at public access points.

Staff responsible for more intensive GIS operations, such as system administration, data editing, and scenario modeling and analysis, will utilize a combination of ESRI's ArcInfo and ArcView software, installed on individual workstations, to accomplish these tasks. With the extensions available to ArcView, these staff could accomplish even the most sophisticated modeling and analysis with a relatively low investment in licenses or training.

b. Hardware

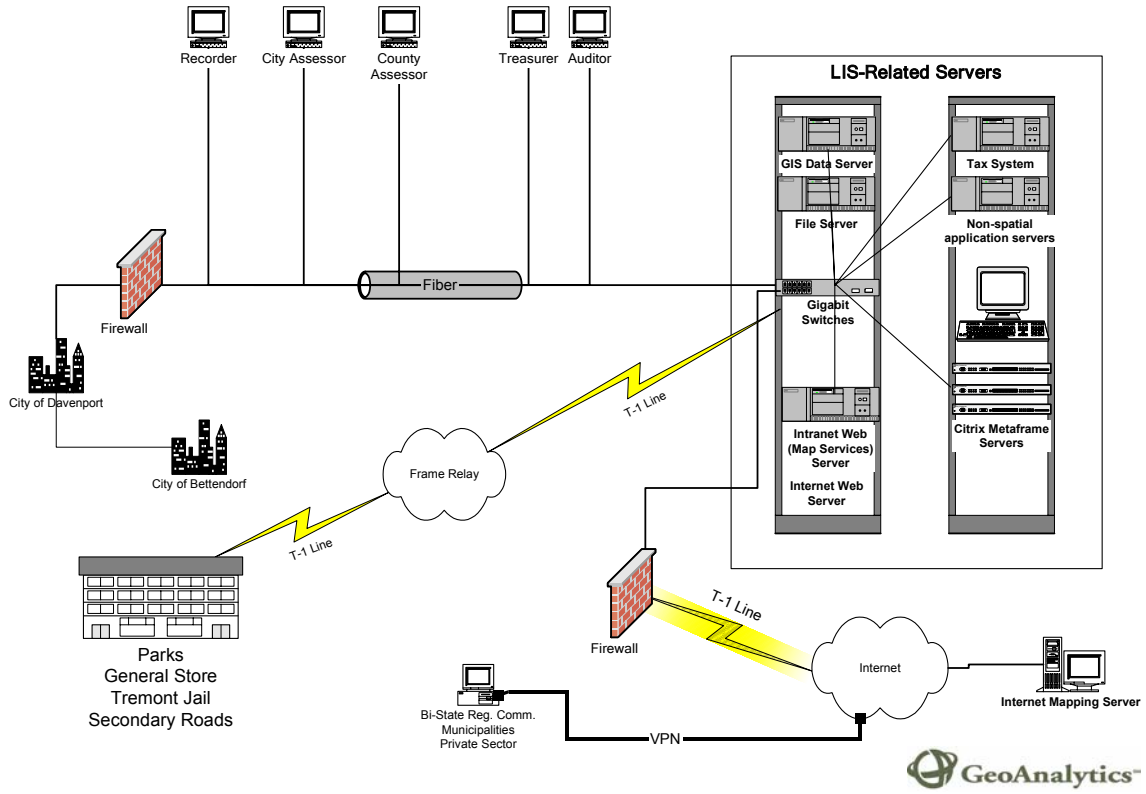
The purpose of Figure 6 is to depict base technology architecture, data communications network connectivity, and location of function by type of user for the new GIS being implemented by the County. This is a conceptual design and therefore represents the system as it *should be*. While this conceptual model is

based on the current network infrastructure, it is expected that the network will change over time.

Because the County has a made a large investment in Citrix Metaframe technology, these servers may be utilized to deploy desktop GIS applications, most likely for browse-and-query users. The feasibility of this option will depend upon the load on the Citrix servers at the time that the GIS is ready to be rolled out.

A web-based or Citrix Metaframe option for the browse-and-query applications would enable the County to get GIS to most users' desktops without the expense of upgrading the client computers. It would also eliminate the task of maintaining another program on users' workstations.

Figure 6: Network and Technology Conceptual Model



1) Servers

The base-serving environment for GIS and related business applications would be built on the Windows 2000/NT operating system. The suggested minimum specifications for servers include:

- Dual processor ready
- Single Processor (1.4+Ghz) with 133Mhz or 200Mhz bus speed; dual processor recommended.
- 256K Cache
- 1GB SDRAM, 133 MHz

- 3 186B SCSI hard drives
- PERC3-DI RAID 5 (Hardware)
- Tape Backup
- Backup software
- To network these systems, a Gigabit capable switch would connect the database server to the network backbone.
- Factory support service

2) GIS Workstations

The suggested minimum specifications for GIS workstations for editing or modeling are the following. Standard specifications change rapidly and could be upgraded within a few months of this report.

- Windows 2000 Operating System
- Single Processor (1000+Mhz) with 133Mhz or 200Mhz bus speed
- 256K Cache
- EIDE Controller and Hard Drives (Serial ATA, as it becomes available, would be a better alternative.)
- 512 MB RAM
- 20 GB Disk Storage
- 24X CD-ROM Drive
- High-end OpenGL video card with 16-64 Mb of RAM.
- 19-21" High Resolution Color Monitor
- Fast Ethernet (100 Mbps) Network Interface Card (NIC) configuration

3) Browse-and-Query Desktops

If the browse-and-query applications are deployed either using a web-based tool or Citrix Metaframe, the existing client workstations would be sufficient if they can run a web browser.

c. Network

The County is well positioned for success, based on the existing network. The fiber WAN connections between buildings and the LANs within buildings have been well designed and should position the County to take advantage of Gigabit network speeds.

1) Local Area Network (LAN) Configuration

The current County LAN configuration has, at a minimum, Category 5 copper cabling and has Category 6e cabling in many locations. New switches purchased are Gigabit capable. This network is more than adequate for the GIS.

2) Wide Area Network (WAN) configuration

The existing fiber-based WAN between County buildings and departments have been well designed and should serve the County departments well. The frame relay system for the outlying parks, secondary roads (remote office), and general store seems to be working out as well. It appears that the fiber

connection to the City of Davenport should work for data sharing though the details will need to be worked out. The City Assessor's office connects to the County with a terminal emulation (a separate PC is needed). Connections to other municipalities and external agencies will need to be configured according to those users' needs. The City of Bettendorf "piggybacks" onto the City of Davenport's fiber backbone. Many groups have high bandwidth connections to the Internet.

G. Application Conceptual Design

The Application Component of the Conceptual GIS System Design describes priority business functions that can be supported by GIS. GIS application development is tightly linked to business processes. This is of paramount importance because, in the end, the true value of the County GIS will be measured by how it enhances the efficiency and effectiveness of departments, the decision-making responsibilities of elected officials, and the communication between the County and the public.

The County is planning to migrate to a new tax system very soon. Implementing a new system at this time provides the opportunity to purchase an interoperable system that can easily be integrated with the GIS. New tax system applications can be designed in such a way to also access the GIS data.

The County already realizes that applications will need to be migrated from the existing ZIM applications onto other platforms. As part of that process, user requirements would have to be re-gathered, work and data flow processes evaluated, and overall needs analyzed for priority development work. During the situation assessment, it was indicated that the top priority would need to be the tax assessment application.

The following describes some of the top GIS business applications that could benefit many staff at the County and be part of overall system implementation. These are grouped into two categories, countywide or enterprise level applications and departmental level application. It is important to note that the list of applications, especially at the departmental level, will likely be extended once the values of the GIS program are realized internally.

1. Enterprise GIS Applications/Functions

There are several applications that will serve across departmental and jurisdictional purposes. These enterprise-level applications include the following:

a. General GIS Browse and Query for County Staff

This application will provide county staff and elected officials with the ability to quickly access a wide range of computerized land information in a visual, map format. This tool will enable parcel and address based queries to facilitate public service by providing responses in a more efficient and visual manner.

This application will be built using web-based technology but will be served internally (Intranet), and not on the Internet. It is expected that this application will serve high-resolution graphics and spatial objects. Because this tool will provide access to a wide range of data, it will not be available to the public.

b. Public GIS Data Access

To accommodate public access needs, a separate low-bandwidth browse and query tool will be developed and deployed. This tool will provide the general public with basic capabilities for the browse and query of select County GIS data. The data available will be limited for privacy and security concerns. Example data that may be published include: refuse collection, floodplain delineations, zoning

designations, permit information, etc. The tool will be web-based and could be served from internal County servers or through an external web hosting service.

c. Address Geo-Coding Tool

This tool will allow automated site address locating, from source input of single or multiple addresses. This would also find addresses based on address range or street intersection.

d. Document Imaging Integration

At a minimum, it will be important to develop tools that can link document imaging systems with the County GIS. The objectives of this tool are that future GIS applications can access document information and images. GIS and document imaging system integration will require integration at both a database and application level.

e. Data Maintenance Tools

Ultimately, the development of tools to support data maintenance and update will be important. In this way, staff will have user-friendly GIS tools for tracking and maintaining department-specific GIS data layers. These may include parcels, taxing or legislative districts, zoning designations, highway information, etc.

f. Property Owner Notification Tool

The purpose of this tool will be to automatically generate mailing address lists for the landowner notification process, based on GIS parcel and address database queries performed by the user of the application. The quality of the output will be limited only by the quality (currency and accuracy) of the address records database. This kind of tool would benefit multiple departments, including Zoning, Health, and Secondary Roads.

2. Departmental GIS Applications/Functions

The following details some possible tools that could be developed to support department-specific business functions.

a. Property Valuation Support

Integration of computer aided mass appraisal (CAMA) and GIS has been an objective of local governments across the nation. The tools that integrate these systems enable query and display of property record data, including sales information to support or justify changes to assessed value during the appeals process. In addition, these tools offer the ability to better visualize the physical location and lot and improvement dimensions of infrastructure as well as the spatial relationship to other features including other parcels, rights-of-way, and water bodies

b. Asset Management System

Asset management tools are useful in a variety of business contexts. These tools can be particularly useful in the Secondary Roads Department to support

pavement management, sign/signal inventory management, and bridge management.

c. Permit Management System

Integrating zoning, permitting, licensing, and code enforcement processes with GIS will enhance current activities in the Planning and Zoning Department and Health Departments. Virtually all permits and licenses are tied to a parcel. Integration of these systems is becoming very prevalent. County agencies and others, including potentially the public, can use GIS to review the location and status of existing developments and plats, location and status of permits, owner/occupant data, and zoning designations.

d. GPS/GIS Integration

Ultimately, various departments will use GPS to capture and map the location of physical features on the landscape. Examples include manhole covers, wellheads, outfalls, signs, ingress/egress points, and accident events. This tool would help a number of agencies capture this data and upload into GIS database.

e. Routing Tool

Basic routing tools can be used by any number of departments to support service delivery. These can be used to dispatch inspectors, route snowplows, and deliver elderly services.

f. Map Overlay Capability

There is value at the departmental level for the capacity to create basic overlays such as response zones, station locations, municipal boundaries, street centerlines, building locations, etc.

g. Site Assessment/Selection

These tools provide decision-support for overall land development review and management processes. GIS capabilities will allow users to review the location and status of existing and proposed developments and plats. In addition, these tools enable economic development agencies to assist in the selection of sites for proposed development.

h. Incident/Crime Analysis

Incident analysis applications are being used by many law enforcement agencies. These tools provide a spatial perspective on incident locations and patterns and crime statistics by neighborhood. Such a tool will also assist law enforcement officials in making better resource utilization planning decisions and public officials the opportunity to make more proactive choices in governance and ensuring public safety and welfare.

i. First Responders Premises Information Display

These applications provide on-demand access and display of premises information prior to and while responding to an emergency response call. Such a tool will be able to display various layers of GIS data including hazardous materials, special

needs resident information, property boundaries and building footprints, as well as document imagery, such as building schematics, and shut-off locations.

j. Redistricting Tool

These applications enable easy creation of alternative redistricting scenarios, including statistical summaries and map rendering for each alternative. These tools may be applied voting precinct boundaries and other boundaries like SMID and TIF.

H. Conclusion

In summary, this document has attempted to define a conceptual design (both a vision and framework) for the implementation of an enterprise GIS for Scott County. The design is based on the centralized model identified by County project staff and GeoAnalytics.

Project participants have made several important recommendations about the direction of their countywide GIS system. These are reflected in the design discussions within this report. Notwithstanding, there are many more detailed decisions that must still be made for each of the GIS system components. These will become part of the physical implementation of the final system.