Managers' Reports

Presented To:	Priorities Committee
Presented:	Wednesday, Oct 22, 2008
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Type:	Managers' Reports

Request for Recommendation

Corporate Geographic Information System (GIS)

Recommendations

That the Corporate GIS Strategy Report be received and budget options be prepared and forwarded to the 2009 budget process for consideration.

Signed By

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Division Review
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Recommended by the C.A.O.
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Financial Implications

If approved budget options totalling $265,000 will be prepared for the 2009 budget.

Background

Introduction

Geographic Information Systems (GIS) have emerged as the preferred way to organize and view much of the data required and used by municipalities and other organizations.

A Corporate GIS means better access to data which results in quicker turn around times in filling citizen requests and in providing answers to complex questions. Other real strengths of GIS lie in the business process improvements it makes possible; in the integration of data from disparate sources to understand issues better; and in the elimination of data duplication.

Earlier this year, the CAO directed the GM of Growth and Development to develop a strategy to implement GIS within the corporation. This has been developed and the attached Executive Summary outlines the main elements of the strategy. A copy of the complete strategy is being distributed under separate cover.

Overview of Strategy

One of the key elements of the strategy, to ensure GIS benefits permeate the Corporation, is to establish business applications which will significantly assist staff and citizens in more efficiently addressing their tasks. To most effectively deliver on this strategy the focus needs to be placed on priorities which will deliver the greatest corporate returns. Once these initial applications are achieved, the focus would shift to other applications in ever widening circles to fully distribute applications to all appropriate Divisions within the Corporation.

To achieve a corporate GIS will require the formalization of the co-operative relationships between departments at the City which have been instrumental in building our GIS foundation. At the strategic level, a transition team consisting of key representatives from each department will be formed to implement the strategy, set priorities and develop policies to guide the implementation of a corporate GIS.

On this basis, the first steps in moving forward with a corporate GIS are to:

- **Establish an interdepartmental Transition Committee** chaired by the Co-ordinator Geographic Information, Surveys and Mapping Services;
- **Undertake GIS needs assessments** in business units across the corporation;
- **Establish priorities** for incorporation of GIS into business processes and begin implementation.

Subject to the review of the Transition Committee, the following projects are anticipated for implementation within the first three years:

- **Infrastructure Assets Database** - capital assets such as property, sewer pipes, water pipes, water and wastewater plants will become the basis for a maintenance management system of the city's extensive inventory of infrastructure;
- **Emergency Services** – Emergency Operations Centre (EOC) will respond to a variety of crisis situations and requires inventories of facilities such as gas pipelines and hazardous materials storage areas as well as the locations of vulnerable populations;
- **Mobile Technology Applications** – will be utilized for infrastructure (culverts, sidewalks,

hydrants, etc…) inspections and maintenance;

- **Transit Route Review and Route Optimization** - will be achieved through linking data from automated fare boxes to other GIS data sets including the street network and population data;
- **New Zoning By-Law** - with the development of a new Zoning By-Law for the City there is the opportunity to use GIS to link property zoning information to land parcel information.

Required Resources

Growing GIS at the city will require a new investment of $265,000 in staff resources including one new GIS position and two new IT positions. Operating funding of $50,000 in 2010 will also be required to support aerial photography and mapping maintenance. Anticipated hardware costs of $100,000 would be taken from the IT Reserve. Budget options have been prepared with respect to these items for council's consideration.

Conclusion

GIS provides a way for the City to manage, integrate, visualize and analyze data and derive new information.

The City has made significant advances in building the foundation for GIS in recent years. To capitalize on these investments, and achieve the inherent efficiencies of this technology, the establishment of a corporate GIS based on this foundation is recommended.

EXECUTIVE SUMMARY

What is GIS?

Geographic Information Systems (GIS) have emerged as the preferred way to organize and view much of the data required and used by municipalities and other organizations.

A GIS is about Information related to Geography (referenced to the earth) which therefore can be mapped. A GIS is a system for capturing, storing, finding, viewing, analyzing and managing data which are spatially referenced.

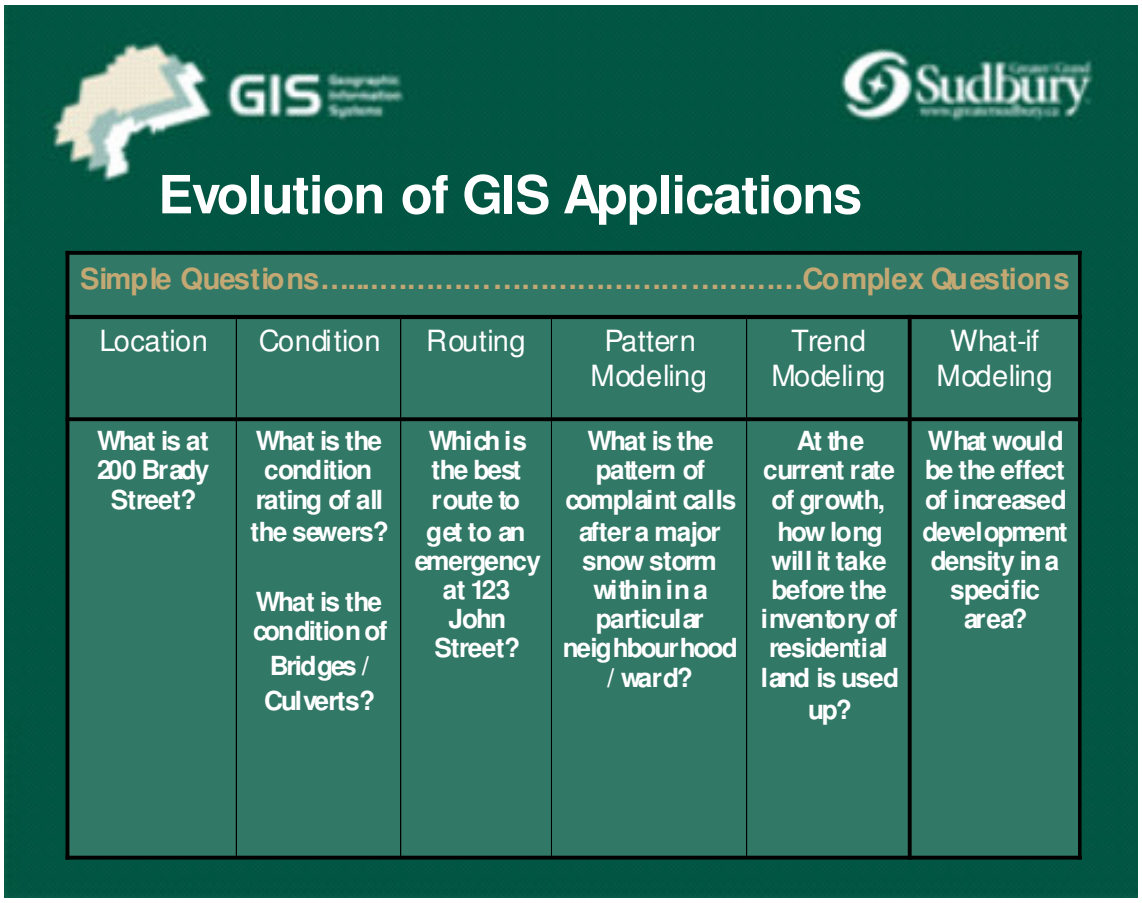
Since much of the information collected by the municipality can be related to addresses, land parcels, or geographic points, there is a tremendous opportunity to use GIS in many business and service processes of the city. Current estimates indicate that more than 80% of the information used within a municipality is directly linked to location.

In Greater Sudbury there is a great deal of data to be managed and understood. The City has more than 60,000 assessment parcels, more than 58,000 address points and an area of 3,627 square kilometres. It is estimated that the 185 business applications now operated by the city handle more than 1 billion database records. If 80% of these are address related, that means 800 million database records which could be used in a GIS.

Better access to data means quicker turn around times in filling citizen requests and in providing answers to complex questions. Other real strengths of GIS lie in the business process improvements it makes possible; in the integration of data from disparate sources to understand issues better; and in the elimination of data duplication.

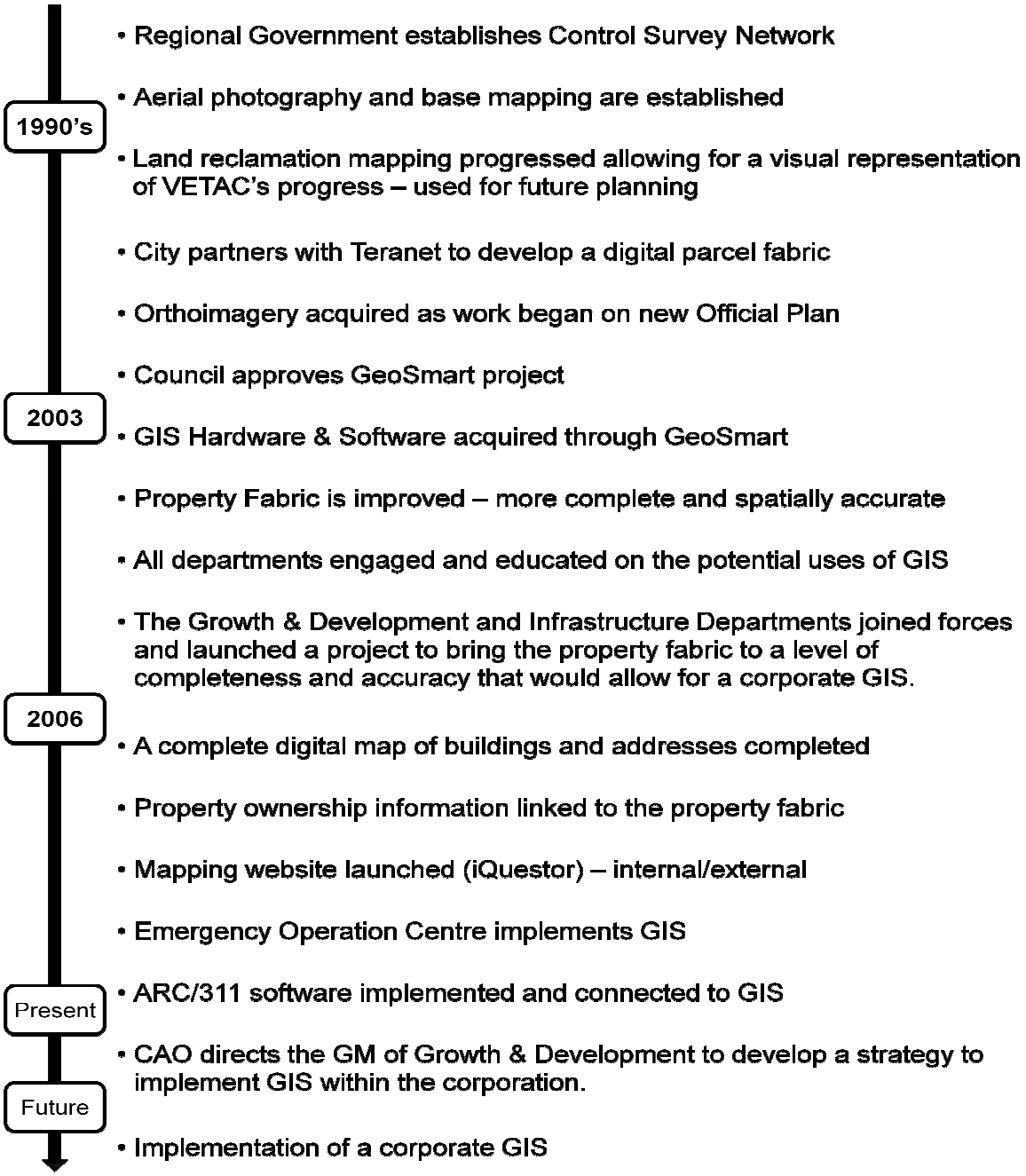
- With GIS, it is possible to generate maps to provide a visual representation of information – for example, how many pothole complaints have occurred in a Ward and where.
- GIS can be the basis for new automated business processes - for example, a building application process which flags new construction within a certain distance of a 911 telephone trunk line.
- Infrastructure information on the 311 request tracking system could be automatically updated through a link to a maintained GIS.
- Automated data sharing can be implemented with new business process improvements – for example, a completed building permit for a Child Care Centre could automatically be sent to the Emergency Operations Centre to update their critical infrastructure data.
- The GIS data warehouse could be the repository for merged tax rolls and property information which could be used by IT staff in all software development and to achieve improvements in the accuracy of the data.

In terms of data handling and analysis, GIS tools allow the user the ability to query a pool of data and to ask a range of questions from the simple to the complex. The following diagram illustrates this:



History of GIS at the City

The beginnings of our GIS can be traced back to the early days of regional government and continued to the present time. Many significant milestones have been reached and are described on the timeline below.



Moving Forward with GIS – The Opportunities

The City is now at a strategic crossroads with respect to GIS. The foundation is in place upon which to build a corporate GIS which benefits all business units of the corporation.

One of the key ways of making GIS benefits permeate the Corporation is to establish business applications which will significantly assist staff and citizens in more efficiently addressing their tasks. To most effectively deliver on this strategy the focus needs to be placed on priorities which will deliver the greatest corporate returns. Once these initial applications are achieved the focus is then to continue to implement additional applications in ever widening circles to fully penetrate the daily business needs for applications of all Divisions within the Corporation. Examples of priorities for implementation include:

- Infrastructure Services has a huge inventory of assets including water and sewer systems, storm drainage systems, sidewalks, roads, signs and culverts. Community Development manages other assets including parks, trees and recreational facilities. Contemporary asset management and maintenance management systems utilize GIS to inventory and effectively plan for maintenance and replacement. Most large municipalities already use GIS for asset and maintenance management;

- Infrastructure Services continually plans and implements snow plowing, sanding and salting of roads and sidewalks which can utilize GIS capabilities for optimization of routing. Waste and recycling routes can benefit in the same way.

- Emergency Services can use GIS to improve emergency vehicle routing, for emergency response planning and for predicting spill and plume impacts; Also, hazardous material storage areas can be identified and described using GIS. The City's Emergency Operations Centre depends on GIS data for emergency planning and response.

- Growth and Development require GIS for managing and analyzing all of the land based information that goes into land development and environmental protection issues, for linking transit fare box data to route scheduling, and to incorporate GIS into automated processes such as development application tracking.

- Community Development can use GIS for establishing detailed databases of parks and facilities for easy viewing and access by staff and the public. All groups can utilize GIS for inspection and property maintenance and management functions.

- Corporately, a GIS data warehouse provides the opportunity to store/retrieve data from across departments eliminating duplicated efforts and ensuring data accuracy, completeness and currency.

Steering the Course – Governance

To achieve a corporate GIS will require the formalization of the co-operative relationships between departments at the City which have been instrumental in building our GIS foundation. At the strategic level, a transition team consisting of key representatives from each department will be formed to implement the strategy, set priorities and develop policies to guide the implementation of a corporate GIS. At an operational level, GIS staff in Growth and Development will work closely with IT staff in Administrative Services to identify opportunities and implement GIS capabilities and analysis into business processes in departments across the City.

In order to proceed with a corporate GIS, the following steps need to be undertaken:

- Establish an interdepartmental Transition Committee chaired by the Co-ordinator of Geographic Information, Surveys and Mapping Services
- Develop data standards, metadata standards and data maintenance/custodianship policies
- Build a data warehouse to contain all GIS data and other data as appropriate
- Undertake GIS needs assessments in business units across the corporation
- Establish priorities for incorporation of GIS into business processes and begin implementation
- Build a Digital Terrain Model (DTM) to support engineering work throughout City

Work programs anticipated for the first three years include:

1. ***Infrastructure Assets Database*** – A stable and well supported GIS system will allow Infrastructure Services to build a complete spatially referenced model of the City's entire water and wastewater infrastructure network. A properly inventoried and maintained infrastructure will enable the department to implement a cost effective maintenance management system for all linear assets. This inventory would allow the City to:
    - Automate the link between citizen requests and maintenance work orders
    - Demonstrate compliance for maintenance standards
    - Provide a system to improve decision making
    - Better assess total costs of operations

2. ***Mobile Technology Applications*** – Provide connected mobile technology in the field using handheld devices to provide instant updates for infrastructure maintenance and inspections such as culvert inspections, hydrant maintenance, sidewalk maintenance, etc… Personnel would have the ability to access large amounts of data on a variety of technologies while on-site.

This application would take advantage of Global Positioning System (GPS) technology; mobile operating systems and device platforms such as smartphones, pocket PCs/PDAs, laptops, and tablet PCs; GIS and navigation software for mobile platforms; and wireless communications including Internet GIS access, Wi-Fi, broadband, and Bluetooth capabilities.

Looking further ahead, the City could utilize similar technologies to inventory, assess and maintain city signs.

3. ***Winter Control Operations*** – GIS can be used to further expand support of winter control operations within the corporation. The Active Citizen Request (ACR) system used with 311 is integrated into the current GIS system. Improved support for GIS will enable the corporation to further integrate ACR in the field using mobile technology for winter control operations to deal with issues in a timely and effective fashion. GIS will then be expanded to allow departments to analyze winter control data generated from automated vehicle locators (AVL) and provide better information for planning purposes. In addition, using GIS will enable staff to analyze call data from the ACR and superimpose this information over snow removal data to provide more accurate information on winter control operations.

   In future years, other AVL applications could be developed to provide more efficient means of assigning tasks and routes in other fleet-based work areas and coordinating work assignments where multiple crews are involved.

4. ***Transit Route Review and Route Optimization*** – GIS can be used to link data from automated fare boxes to other GIS data sets including the street network and population data. Through using route optimization features of GIS, existing transit route and ridership data can be evaluated to determine where route revisions are appropriate to achieve more efficient and effective transit service.

   Looking ahead, beyond three years, other possible transit applications include using GIS and AVL technologies to provide transit users with real-time information on wait times at bus stops.

5. ***New Zoning By-Law*** – With the development of a new Zoning By-Law for the City there is the opportunity to use GIS to link zoning information on properties to land parcel information. Not only will this allow city staff to quickly determine the zoning of a property using an address or parcel number, but citizens can be provided the same information on the City's website using a web-based GIS application. GIS will also provide a way to map property zoning in colour or black and white and to overlay zoning over aerial photographs.

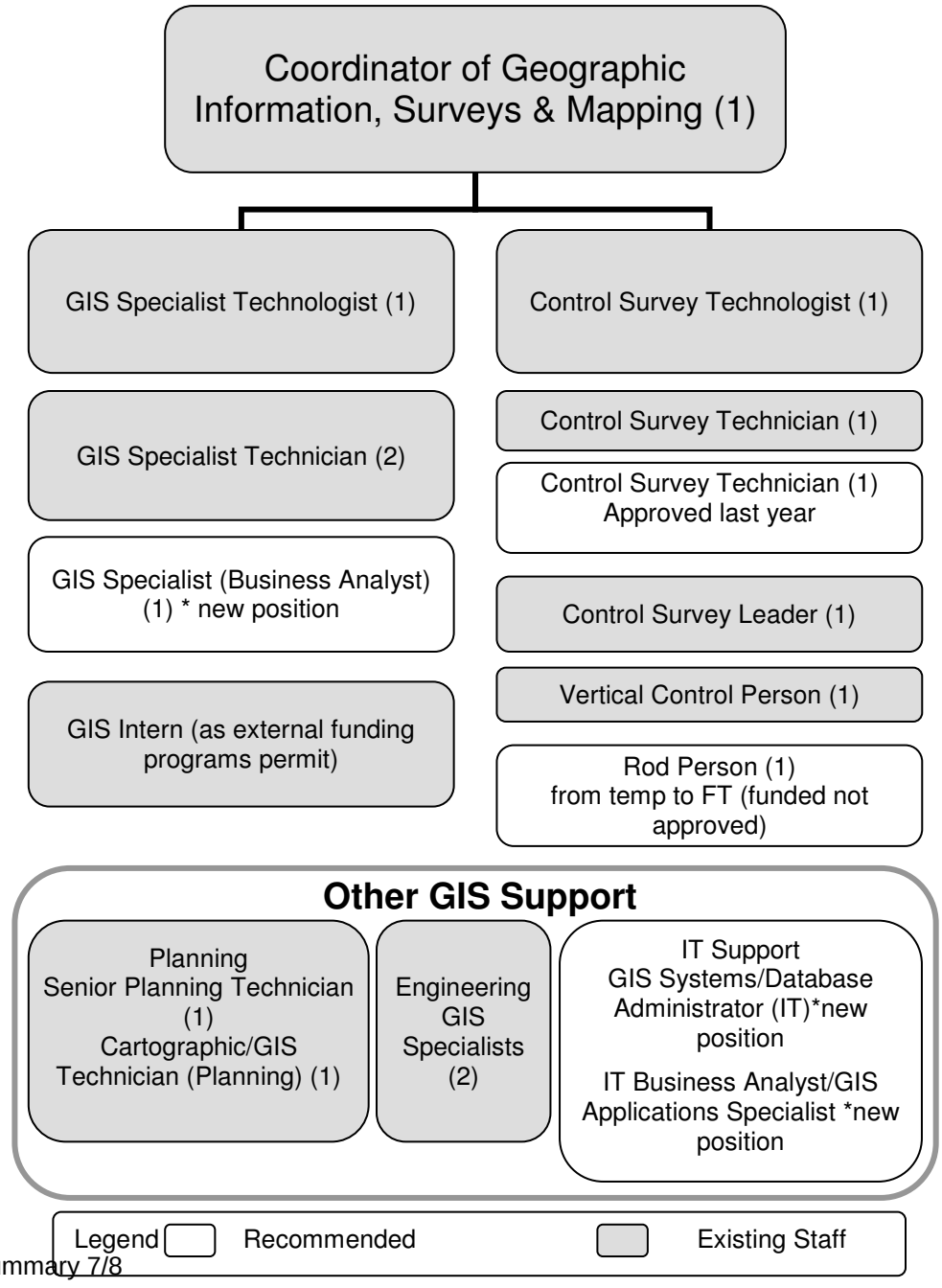
6. ***Emergency Services*** – With the establishment of the Emergency Operations Centre (EOS), the city is well positioned to anticipate and respond to a variety of crisis situations. To a large extent, however, emergency preparedness depends on the availability of accurate information. Spatial inventories of facilities such as gas pipelines and hazardous materials storage areas as well as the locations of vulnerable populations are key to maximizing the effectiveness of the EOS.

Resource Requirements

Like any other municipal infrastructure, GIS requires significant maintenance, clear policies and appropriate staff to administer and operate it. Growing GIS at the city will require an investment of $349,000 in staff resources to maintain the hardware, software and databases associated with GIS and to work with individual business units to develop GIS applications.

These include the addition of one new GIS permanent position to the Geographic Information, Surveys and Mapping Section to provide the capacity to work with other departments and provide GIS analysis, dataset development and mapping and to develop their GIS capabilities. Also, two new IT positions are proposed to provide the GIS systems/database support and to develop business process applications for departments.

The following organizational chart illustrates the recommended staff complement.



Operating funding of $50,000 will also be required to support aerial photography and mapping maintenance. It is proposed that anticipated hardware costs of $100,000 be taken from the IT Reserve. The following Chart summarizes the staff and financial resource requirements for the GIS.

Interdepartmental GIS Operating Budget Request

PURPOSE:		To continue development and maintenance of core GIS (Geographic Information System) and implement initial GIS applications.				
ITEM		**NEEDED**	**FUNDED**	**FTE GAP**	**Funding GAP**	**CONTRIBUTIONS**
1	Aerial Photography & Mapping Maintenance	$100,000	$ 50,000		$50,000	Operating Budget Option (2010)
2	Completion & Maintenance of Core Data & Provision of Mapping	6.0 FTE	4.7 FTE	1.3 FTE	$84,000	Internal Recoveries :Finance, EMS, Fire, Assets, Sewer&Water, Roads, Police (Survey GIS Technician) Part time hours Planning Services Budget Option (rod person)
3	Development of GIS Services	6.0 FTE	4.0 FTE	2.0 FTE	$170,000	Operating Budget Options IT Business Analyst/GIS Application Specialist (1), GIS Specialist/Business Analyst (1)
4	Database & GIS Hardware/Software Support	1.0 FTE	1.0 FTE	1.0 FTE	$95,000	Operation Budget Option GIS System and Database Administrator (1)
	TOTAL		-	4.3 FTE*	$399,000*	

* Note: Council Budget Option requests will be for 3.0 FTEs totaling $265,000.

Conclusion

GIS provides a way for the City to manage, integrate, visualize and analyze data and derive new information.

Utilizing GIS, the corporation will benefit from decision making improvements enabled by access to more and better data, from efficiencies resulting from the elimination of duplicate data sets, from improved communication with citizens as a result of web based GIS applications and from improved co-ordination among departments as a result of data sharing opportunities.

The City has made significant advances in building the foundation for GIS in recent years. To capitalize on these investments, and achieve the inherent efficiencies of this technology, the establishment of a corporate GIS based on this foundation is recommended.