GIS Needs and Assessment Plan
for
City of Manitowoc, Wisconsin

MANITOWOC
CITY OF MANITOWOC
WISCONSIN, USA

R.A. Smith National

Beyond Surveying and Engineering

September 2009

GIS Needs and Assessment Plan:

for

CITY OF MANITOWOC, WISCONSIN

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Executive Summary

The City of Manitowoc (City) and the Manitowoc Public Utilities (MPU) have undertaken a 2009 GIS Needs and Assessment Plan as part of the continued growth of Geographic Information Systems (GIS). This Plan provides a detailed view of how GIS technology should be used within the City and MPU as a means for better interaction, coordination, and efficiency between the City's departments and divisions. The Plan also outlines a five year implementation schedule for training and technology budgets.

GIS is a powerful technology that allows a virtually unlimited amount of information to be linked to a geographic location. When this information is shown on a digital map, one can see neighborhoods and areas with precise clarity, showing layer upon layer of information.

Examples of GIS information layers

- Property values
- Aerial photos
- Water main material and diameter
- Fire hydrant maintenance history
- Health of street trees
- Properties zoned commercial
- Location of building permits issued in past six months
- Location of police and fire incidences
- Additional layers can be found in section 5 – Data Assessment

GIS has the ability to use powerful analytical tools to analyze the relationships between these types of data. This information can have a significant impact on public policy.

In essence, GIS does three things: visualization, data management, and spatial analysis. First, GIS helps people visualize information in a geographic context. Second, GIS manages information by storing and organizing data in an efficient, centralized manner. Third, GIS is used to analyze and interpret spatial relationships.

The 2009 GIS Needs and Assessment Plan established the base level of GIS knowledge in the City and at MPU, and answered the following questions:

- What is GIS?
- How do various departments utilize GIS?
- What staff members use GIS and at what level of expertise?
- What software is being used to run GIS and various databases?
- Is the current GIS system being maximized and fully coordinated with an eye toward future usage and growth?
- What are our GIS program needs over the next 3-5 years?

<u>GIS in Manitowoc</u>

The City and MPU have used GIS technology for over ten years. Planning, Engineering, and MPU make extensive use of GIS technology. Several other departments, including DPW, Cemetery, Assessor, Building Inspection, Police, Fire, and Parks & Recreation also make use of GIS technology. The other departments of the City that are involved in the Plan are: Clerk, Finance, Mayor's Office, Rahr-West Art Museum, and Wastewater Treatment Plant.

During the assessment process, it was determined that the City and MPU are not using GIS technology to its full potential. Two key barriers to GIS effectiveness have been found:

- Lack of coordination
  The City and MPU can benefit from greater coordination among departments utilizing GIS technology. During the course of interviews conducted over three days, it was found that data sharing could be more efficient. While some departments share location-based data with other departments, most of this data sharing is by informal means. The exchanged data is often re-entered into a different system, or delivered via email or hard copy. Some departments are not aware of data that is collected by other departments. City and MPU staff typically see only their department's data. This is also true with multi-department workflows such as private property development and construction.

- Multiple GIS software systems
  Multiple GIS software is in use by the City. MicroStation is used by Engineering and MPU for base mapping capabilities. However, MicroStation is primarily CAD design software, and does not have the capabilities to store or analyze related attribute information. Other database software is used to store attribute information that is linked to the mapped features in MicroStation. ArcGIS software, by ESRI, is used by Planning for high quality map design and advanced location-based analysis. Conversion routines, developed years ago, translate data from MicroStation to a now obsolete ArcGIS format.

Beyond these two key barriers, loss of institutional knowledge is also a factor of effectiveness within any business setting. Knowing what staff knows about community assets and database systems, including GIS, is powerful. Sharing that information amongst other staff prevents the loss of institutional knowledge and assures information redundancy throughout departments. The implementation of this Plan can play an effective role in reducing the loss of that valuable information.

Project Methodology and Outline

A thorough assessment was conducted to determine the needs and existing GIS capabilities of the following departments: Planning, Engineering, MPU, DPW, Cemetery, Assessor, Building Inspection, Police, Fire, Parks & Recreation, Clerk, Finance, Mayor's Office, Rahr-West Art Museum, and Wastewater Treatment Plant. This assessment process occurred from January through March of 2009. The Plan is comprised of the following chapters: Interview Summary, Data Assessment, Application and Technology, Operational Procedures, Staffing Recommendation, and Implementation.

The assessment began with a GIS seminar. City and MPU employees attended one of six scheduled seminars. Questionnaires were also handed out before the seminar and asked to be filled out and returned. Interviews were conducted with City and MPU staff over three days. Twenty-two interview sessions were held with 57 City and MPU staff in attendance. Phone interviews were also conducted with the Cities of Appleton, Menasha, Neenah, Oshkosh, and Sheboygan. These interviews focused on how each respective City was using GIS, how GIS was organized, and how GIS projects were funded. The results provided R.A. Smith National, Inc. with a regional understanding in regards to GIS technology usage. Armed with this knowledge, the assessment could more easily produce valid, qualified recommendations.

R.A. Smith National, Inc. assessed the GIS data, hardware, software, procedures, and staff resources used by the City and MPU. The GIS Data Assessment began with an inventory of the datasets used by the City and MPU. Each dataset was then assessed in terms of its overall importance and how useful the dataset is in its present form (such as hard copy versus various digital formats). Specific recommendations were then made regarding how the GIS datasets are organized and maintained and for improving the datasets.

GIS hardware and software is then discussed in the Applications and Technology chapter. This chapter begins with a description of the GIS applications in use, followed by the major applications used by the City and MPU (such as the tax assessment software package and the Customer Information System used by MPU). Hardware requirements are briefly discussed. Different GIS software alternatives are discussed and analyzed. A recommendation is proposed along with the reasoning. Specific recommendations are then made for the overall GIS system design, along with improving connections between the GIS and other City and MPU applications.

The Operational Procedures chapter describes, within the context of the GIS, the existing organizational structure and existing workflows. Three alternative GIS organizational structures are shown along with a recommendation. Staffing Recommendations are then made based on the recommended software, data, and procedures while keeping in line with the City's existing organizational structure, processes, and personnel.

The Implementation chapter prepares a plan for deploying the recommendations and projects. This chapter also includes a schedule of budgetary items through 2014.

Key Barriers and Recommendations

To implement an effective GIS program in Manitowoc, this report identified key barriers and produced strategic recommendations:

Key Barriers:

- Lack of coordination
- Multiple GIS software systems

Recommendations:

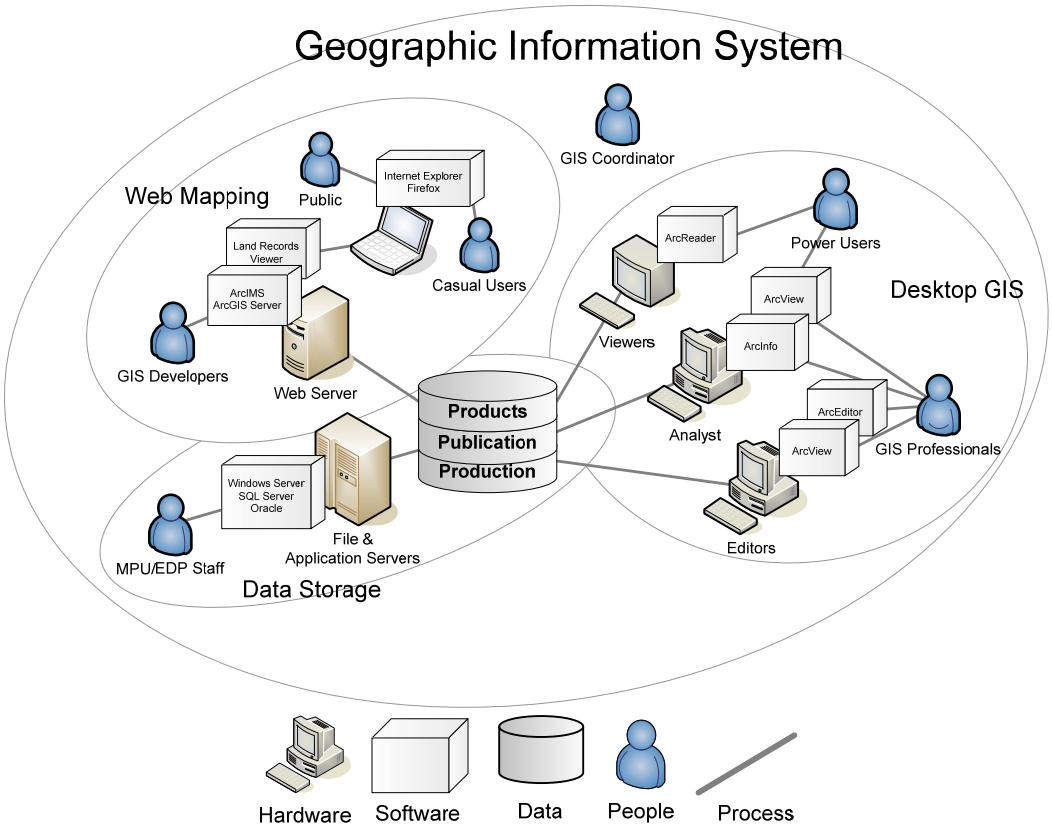
- The City and MPU should identify their core GIS datasets and who are the custodians of those datasets.[1]
- GIS data should be stored within a production/publication/product tiered system.
- The City and MPU should identify and plan for several levels of GIS users: GIS Professionals, Editors, Analysts, Power Users, and Casual Users.[2]
- The City and MPU should develop several viewing applications which are organized around multi-departmental workflows that utilize data from multiple systems.[3]
- The City and MPU should migrate to an ESRI-based GIS platform.[4]
- A GIS Coordinator position should be created.[5] The Plan recommends for this to be a new position; a secondary option would be to upgrade and change an existing job description/position.
- A centralized-weak GIS organizational structure should be implemented, where the GIS Coordinator is within the Planning Department who coordinates, but does not manage, the GIS activities of staff in other departments.
- A GIS steering committee should be formed to provide guidance in the further development of the City and MPU.[6]

Implementing these recommendations will lead to greater effectiveness in database management and improvement in the delivery of public services. Further, enhanced GIS services will translate into new products to enhance public services and information about the community. Other advantages include providing additional services that were not previously offered and the added insight GIS can provide. Together, these improvements will lead to better long term decisions for the City and MPU.

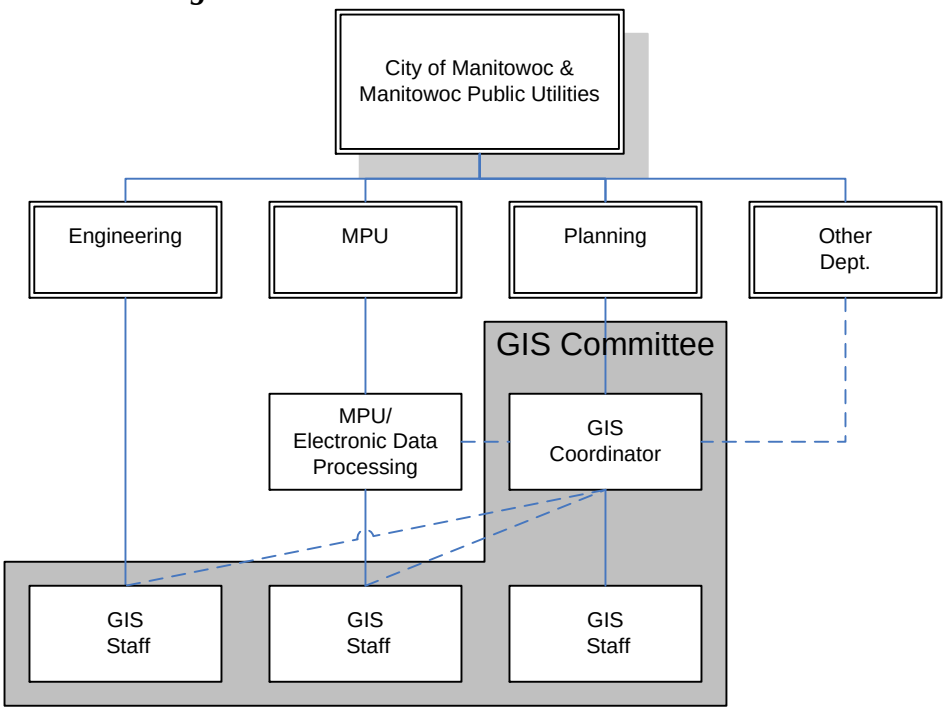
[1] Section 10 – Dataset Recommendations
[2] Section 24 – Knowledge and training
[3] Section 18.5 – Web Mapping
[4] Section 18.3 – Desktop Software
[5] Section 23 – Staffing
[6] Section 22.1 – GIS Organizational Structure

Identifying the core GIS datasets and their custodians will ensure that the critical datasets used by the City and MPU are properly maintained and improved upon. Planning for multiple users of GIS makes certain that applications fit the users and are not over or under-built. Developing applications around workflows, rather than individual departments, breaks down barriers between departments and creates opportunities for improved efficiency and coordination, leading to better decisions. Migrating to an ESRI-based platform allows the City to use advanced and mature GIS software that is used by most communities in the County and Wisconsin. Lastly, implementing a centralized-weak GIS organizational structure led by a GIS Coordinator will go a long way towards assuring that GIS will be used to its full potential in the City.

Conceptual view of the City and MPU's recommended GIS System Design



Recommended GIS Organizational Structure



Three alternatives for GIS software platforms[7] were examined: a Bentley/ESRI combination platform and a Bentley-only platform were examined in addition to the ESRI-only platform. The ESRI-only alternative was chosen because the process for maintaining both the GIS geometry and attribute data is simplified since one application is used. There are also more opportunities for data sharing with the County. The data would remain in the same format in both the production and publication data tiers. With the other alternatives, it would have to be converted from MicroStation (DGN) when it is moved into the publication data tier. Lastly, with a Bentley-only alternative, training would still have to occur since the City and MPU staff are not familiar with Bentley Map, a web mapping software product. In addition, there are few, if any, users of Bentley Map in Wisconsin. This can be difficult for informal learning opportunities.

Regarding the GIS Organizational Structure[8], three alternates were examined. Both decentralized and centralized-strong organizational structures were considered in addition to the centralized-weak structure that is recommended. The reason that the centralized-weak organizational structure was recommended is that it creates a structure to coordinate the GIS services within the City, but without the difficulty of creating a new department. This structure can be implemented soon, without significant changes in the organizational structure of the City. Critical to this structure is the creation of a GIS Coordinator position which serves as the single point for GIS, regardless of the department. The GIS Coordinator can more easily identify opportunities for data sharing and improving efficiencies within the City and MPU. Without the GIS Coordinator position, the City and MPU would continue with a decentralized organizational structure.

[7] Chapter 16 – GIS Application Assessment
[8] Chapter 21.1 – GIS Organizational Structure

Implementation

To fulfill these recommendations, several projects should be undertaken by the City and MPU over the next five years. While some projects may hold a higher level of importance, with regard to the Plan's project ratings, the chronological progression of major projects[9] is as follows: Aerial Photography, GIS Reorganization, Engineering Conversion, Viewer Development, Address Consolidation, and MPU Conversion. The City and MPU should also commence several minor data enhancement projects.

New ***Aerial Photography*** has been budgeted for by Engineering and will be acquired at cost savings in 2010 in conjunction with a statewide imagery project. Nearly every department uses aerial photography in various workflows. Aerial photography is considered Federal Geographic Data Committee (FGDC) framework data and is used for most Smart Growth Elements.

The ***GIS Reorganization*** project involves creating a new position of a GIS Coordinator to oversee GIS and the implementation of GIS projects. A GIS steering committee should be formed, made up of GIS staff from Planning, Engineering, MPU, and on an annual rotating basis, a representative from the Assessor, Building Inspection, Parks & Recreation, Police, or Fire Department. Several of the datasets used by the City and MPU would be designated as core datasets, and data custodians would be assigned. A production-publication-product data tier system would be developed and formalized. The cost for this project is the cost for a GIS Coordinator position, with an estimated wage between $50,000 and $65,000, plus another 30% for fringe benefits.

Alternatively, the job responsibilities of a GIS Coordinator could be added to one of the key GIS staff in Planning or Engineering. An evaluation of a current staff member's competencies in hardware, software, data, processes, and work experience is necessary. It is this knowledge that will provide guidance to the GIS users when training and support issues arise. Using the job responsibilities of comparable community GIS Coordinators as a standard, a new job description could be integrated within the City.

The Engineering Department's core datasets should be converted from MicroStation to the ESRI platform in the ***Engineering Conversion*** project. This involves the purchasing of additional ESRI software, staff training, geodatabase design, conversion, and on-going maintenance of the property parcels, sewer system, storm water system, and Official Mapping. The estimated cost for this is $14,300 for training and software, plus $1,500 annually for software maintenance. The conversion work could be done in-house. If a consultant is hired, the cost is estimated between $11,000 and $26,000, depending on the exact scope of the project.

The ***Viewer Development*** project is the creation of single-purpose mapping viewers (read-only) that would be used by a majority of the City and MPU employees and/or the general public. Each single-purpose mapping viewer would be built around specific workflows for the City and would incorporate data from multiple GIS datasets. For

[9] Chapter 26 – Projects

instance, a "Private Construction" viewer application would allow staff to see all the Planning applications and permits, all Building Inspection permits, and any permits that Engineering has issued within the City. The Viewer Development can be accomplished in two phases. The first phase would utilize desktop software. This would cost an estimated $2,500 for the software, plus $500 annually for software maintenance. The second phase would involve the development of web-based applications that would begin in the fifth year of this implementation plan. This cost can vary significantly based on the specific solution chosen. As technology is rapidly changing, any cost estimate could become quickly outdated. Additionally, ArcView licenses should be converted from the 'single use' to the 'floating' management structure. This will allow for a license to be drawn from a pool of available licenses and increases the utilization of the ArcView software. This would cost an estimated $6,000 for the license upgrade.

The ***Address Consolidation*** project would create a master address range and address point dataset for all addresses and would include apartment and suite locations. Addresses stored in other databases would either be populated or verified against the master address list. This project could be done in-house, or is estimated to cost up to $53,000 if consultants are utilized.

The ***MPU Conversion*** project would convert the MPU's core datasets from MicroStation to an ESRI platform. This involves the purchasing of additional ESRI software, staff training, geodatabase design, conversion, and on-going maintenance of the water and electrical system maps. The estimated cost for this is $13,300 for training and software, plus $1,500 annually for software maintenance. The conversion work could be done in-house. If a consultant is hired, the cost is estimated to be up to $30,000, depending on the exact scope of the project.

Implementation Timeline

year	2010				2011				2012				2013				2014	Beyond
quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th		
Aerial Photography																		
Aerial Photography		(a)																
Planimetrics																		
GIS Reorganization																		
GIS Coordinator	(b)																	
GIS Steering Committee																		
Core Datasets																		
Production-Publication-Product Data Tiers																		
ODBC Connections		(c)																
Data License Review																		
Engineering Conversion																		
ArcEditor Softare																		
Learning Desktop 2 Training																		
Learning Desktop 3 Training																		
Building Geodatabases Training																		
Data Production Training																		
Editing Parcels Training																		
Property Parcels Conversion																		
Sewer System Conversion																		
Stormwater System Conversion																		
Offical Map Conversion																		
Viewer Development																		
ArcView License Upgrade																		
ArcPublisher software																		
PMF Creation				(d)														
Web Mapping Viewer App. Development																		
Data Enhancements: Elevation																		
Address Consolidation																		
Convert Address to Geodatabase																		
Integrate with CLT-IAS																		
Integrate with Springbrook																		
Integrate with CIS																		
Voter Address Verification										(e)								
Common Place name data set creation																		
MPU Conversion																		
ArcEditor Software																		
Learning Desktop 2 Training																		
Learning Desktop 3 Training																		
Building Geodatabases Training																		
Data Production Training																		
Water Conversion																		
Electrical Conversion																		
Data Enhancements: Zoning																		
Data Enhancements: Buildings																		
Integrate with CLT-IAS																		
Unique IDs																		
Assign Addresses																		
Three Dimensional																		
Other Recommendations									(f)									

(a) Aerial photography and planimetrics are critically important and must proceed in 2010, regardless of the other projects.
(b) The GIS Coordinator position should be created and filled as soon as possible. Most tasks are dependent on the creation of this position.
(c) OBDC connections should be created so that the enterprise database applications can be readied for future projects.
(d) The creation of PMF (ArcReader project documents) can begin as soon as the Publisher software is purchased and data has been moved into the data tiers. The number of PMFs will gradually increase as new datasets become available.
(e) Voter verification should be tested in the 2012 primaries so that it is ready for the November 2012 presidential election.
(f) Other minor recommendations, such as improvements to non-core datasets, should be made as needed or as time allows beginning in 2012, after the conversion of the engineering datasets.

Conclusion

The 2009 GIS Needs and Assessment Plan establishes a well defined program for the future usage, growth, and development of the City's GIS capabilities. GIS can be a powerful technology to help visualize, analyze, and manage the daily challenges faced by the City and MPU. Several departments within the City and MPU have adopted GIS and have benefitted from its use. However, the lack of coordination and multiple software systems have created barriers to GIS effectiveness throughout the City. This Plan provides detailed recommendations of how GIS technology should be used as a means for better interaction, coordination, and efficiency between the City's departments and divisions. The Plan prioritizes projects to be undertaken as part of the five year implementation schedule for training and technology budgets. Implementing these GIS recommendations will lead to greater effectiveness in the delivery of public services.

Interview Summary

1. GIS Seminar

A GIS Seminar was held in the Council Chambers at the City of Manitowoc (City) on February 9, 2009. City and Manitowoc Public Utilities (MPU) employees were encouraged to attend one of the six scheduled seminars. The following email was sent to department directors:

From: Dave Less [dless@manitowoc.org]
Sent: Monday, January 26, 2009 2:29 PM
To: _City Dept Heads; _MPU_Dept_Managers
Cc: gheim; Jill Erickson; Steve Kipping; Becky Olson; Haines, David; Elizabeth Werdermann; Janet Zunker; Michelle Yanda; Paul Braun
Subject: PC49-2008: City of Manitowoc ; Geographic Information Systems (GIS) Needs Assessment
Categories: Filed by Newforma
Attachments: Interview Matrix.xls

To All Parties Receiving this E-Mail:

The City of Manitowoc is beginning a Geographic Information System (GIS) Needs and Assessment Plan that will be headed by Michelle Yanda in the Planning Department. This Plan will include Manitowoc Public Utilities, as well as other City departments located both in and outside of City Hall. The vision for the plan is to develop a detailed view of how GIS technology should be used within the City as a means for better interaction, coordination and efficiency between the City/MPU departments and divisions. The end result of this assessment will be a 5 year plan including the project priorities, technology needs, training and budgets.

David Haines, from R.A. Smith National, Inc. is our consultant that will be assisting in the development of this process. Part of the process of this plan will include input from all of your departments. Input will be gathered in two ways, thru a GIS Seminar and interviews. Via this e-mail, I'm asking for assistance from you to:

- Encourage all employees to attend a GIS Seminar on February 9th in the Council Chambers. Attendance at one of the following session is requested:
  - 8:30 to 9:30
  - 10:00 to 11:00
  - 11:30 to 12:30 (bring your lunch if you want to)
  - 2:00 to 3:00
  - 3:30 to 4:30
  - 5:00 to 6:00

  There is no need to pre-register for these sessions.
- Authorize the list of interviewees (see attached spreadsheet) to attend the GIS Seminar, and cooperate in scheduling an interview with David Haines & Michelle Yanda

More discussion will be held during a department head meeting scheduled for February 3rd. Michelle Yanda and Gary Heim are part of this project. Michelle is the project manager on the City's end, so if you have any questions, please contact her directly. The key contact for R.A. Smith is David Haines. Contact information for both Michelle and David are as follows:

Michelle Yanda
City of Manitowoc - Associate Planner
686-6930

David Haines, GISP, AICP
R.A. Smith National, Inc.
262-317-3375

This is an important project which requires everyone's input. Your assistance in making this project a success is very much appreciated.

Each seminar was approximately an hour long. About 50 minutes of the seminar was a presentation on:

- What GIS is.
- What GIS does.
- Why the City is going through the GIS Needs and Assessment process.
- How GIS is used in City Government and by department.
- Advanced GIS services.

Sixty-nine City and MPU staff came to the seminar sessions. There was opportunity for questions and comments from those attending the seminars. A few questions were asked. There was not a long discussion of possible uses of GIS. Seminar attendees were also provided a questionnaire before the seminar. They were asked to hand in the questionnaire at the end of the seminar. About 20 questionnaires were turned in before staff interviews were conducted.

1.1. Questionnaire

GIS Seminar Questionnaire

The City is starting a planning process to develop a detailed view of how GIS technology should be used within the City as a means for better interaction, coordination and efficiency between the City/MPU departments and divisions. Read through these questions, during the seminar think about how you might answer the questions as you learn more about GIS. Please turn in the questionnaire by the end of the day to David Haines or Michelle Yanda.

1. Name _____
2. Title _____
3. Department _____
4. What are some of the most common sources of information you use? (examples: as-builts, system maps, property maps, site plans, inspection files, assessment information, address maps, etc.)
   _____
   _____
   _____
   _____
5. Is the information hardcopy or digital? If it is digital, what software do you use to use view/update that information? _____
   _____
   _____
6. Do you perform tasks that require the same information over and over again? If so, what are the tasks?
   _____
   _____
   _____
7. What is your role in creating / updating data? _____
   _____
   _____
8. What data do other departments request from you? _____
   _____
   _____
9. What data do you receive from other departments? _____
   _____
   _____
10. How could sharing data between departments be made easier? _____
    _____
    _____
11. Do you collect data in the field? If yes, what data is collected and how is it stored? _____
    _____
    _____
12. Based on what you know about GIS, do you think GIS would make your job easier, or just create more work? Why? _____
    _____
    _____
13. How often do you now use GIS technology in your job?
    ☐ Every Day ☐ At Least Once a Week ☐ At Least Once a Month ☐ Don't Use it
14. How often do you use the City's online GIS mapping tool / Manitowoc's Land Record Viewer?
    ☐ Every Day ☐ At Least Once a Week ☐ At Least Once a Month ☐ Don't Use it
15. Any other comments? (use other side)

2. City and MPU Interview Summaries

Interviews were conducted with City and MPU staff from nearly each department. The primary purpose of the interviews was to obtain an understanding of how City and MPU staff use location-based information in their daily jobs. Most interviews were conducted over the course of three days from February 24 to February 26, 2009. Phone interviews were conducted on March 2 and March 4, 2009. Twenty-two interview sessions were conducted. Nearly 50 City and MPU staff participated in the interviews.

These interviews are the foundation of the Needs and Assessment process. The knowledge gained during the interviews is the primary source for the Data Assessment, Application and Technology, and Operational Procedures Chapters of the GIS Plan.

The Interview Summary Chapter discusses what each participating department does and what information is needed. This chapter is meant to provide an overview of the department and a summary of the information that they use. Only the tasks that have relevance to GIS are mentioned in the chapter. Detailed data requirements for each department are discussed in the Data Assessment Chapter. The technology and processes each department uses will be discussed in the Applications and Technology and Operational Procedures chapters. Many interviews also offered suggestions about how GIS could be used within their departments. This information is also discussed in later chapters.

2.1. Interview Schedule

Clerk and Finance .....Tuesday, February 24, 9:00am
Engineering – Mapping.....Tuesday, February 24, 9:30am
Assessor .....Tuesday, February 24, 10:30am
Wastewater Treatment Plant .....Tuesday, February 24, 11:30am
Planning ..... Tuesday, February 24, 12:00pm
Parks & Recreation ..... Tuesday, February 24, 1:00pm
Cemetery ..... Tuesday, February 24, 2:00pm
Engineering – Stormwater ..... Tuesday, February 24, 2:30pm
Building Inspection ..... Tuesday, February 24, 3:00pm
Manitowoc Public Utilities – EDP..... Wednesday, February 25, 8:00am
Manitowoc Public Utilities ..... Wednesday, February 25, 10:00am
Dept. of Public Works – Operations..... Wednesday, February 25, 1:00pm
Dept. of Public Works – Business ..... Wednesday, February 25, 2:00pm
Dept. of Public Works – Fleet..... Wednesday, February 25, 3:00pm
Dept. of Public Works – Transit ..... Wednesday, February 25, 3:30pm
Engineering – Administration.....Thursday, February 26, 8:00am
Engineering – Mapping.....Thursday, February 26, 9:00am
Police.....Thursday, February 26, 9:30am
Engineering – Mapping.....Thursday, February 26, 10:30am
Rahr-West Art Museum.....Thursday, February 26, 1:00pm
Manitowoc County.....Thursday, February 26, 1:30pm
Mayor's Office.....Monday, March 2, 2:00pm
Fire ..... Wednesday, March 4, 9:00am

2.2. Assessor's Office

Staff:
Sarah Hoppe, City Assessor
Sandi White, Property Appraiser II
Mary Wachholz, Assessment Technician
Wayne Breitenfeldt, MPU/EDP Supervisor

Interview:
Tuesday, February 24, 10:30am

Responsibilities:
Assess and value all taxable property in the City.

Relevant tasks performed:

- Answering questions from the public regarding assessed values (their own and their neighbors) and the reasons for changes in assessed values.
- Assist appraiser's request for property owner information.
- As the property lister, update owner name and address changes.
- Assign Parcel Identification Number (PIN).
- Combining multiple properties onto one tax parcel.
- On a weekly basis, the assessor receives a report from the County of all property transfers. The report lists the transfers by township, range, section or subdivision. Using this, the assessor will use the CherryLAND application to print out the documents. (CherryLAND is an online computer program that has searchable recorded documents from the County Register of Deeds Office.)
- Review building permit information to see if any adjustments to property value are required.

Information needed:

- Sketches of properties.
- Property boundaries.
- Deeds, CSM, plats, etc.
- Aerial photos.
- Zoning.
- Assessment neighborhoods.
- Site address.
- Owner information.
- TIF boundaries / other special districts.
- Building permits.
- Tax payment information.
- Special assessments.
- Property photos.

Existing uses of GIS:

- Use County/City GIS Portal Land Records Viewer.
- Use ArcView with standard MXD to create basic maps.

Other:

- CLT is the CAMA software and is on Oracle.
- Property photos are kept on Landisc.
- Property data is in the system since 2007. All pre-1999 information is hardcopy.

- When a property is split, the parent Parcel Identification Number (PIN) is kept and used on the homestead or portion of the parcel with an existing building on it and then a new PIN is given to the other portion of the parcel. In a subdivision plat, parent PINs are deactivated and new parcel numbering is assigned to the whole subdivision. When old PINs are deactivated the history in CLT is kept.
- Lot line adjustments do not create a change in parcel IDs.

2.3. Building Inspection

Staff:
Jim Muenzenmeyer, Director of Building Inspection / Facilities Manager
Lisa Mueller, Secretary

Interview:
Tuesday, February 24, 3:00pm

Responsibilities:
Conduct inspections on the safety of buildings and provide information to the public. Oversee maintenance of City buildings.

Relevant tasks performed:
- Issue building permits.
- Conduct inspections.
- Process complaints.
- Answer zoning, floodplain, and wetland questions.
- Process variance and Board of Adjustment meetings.

Information needed:
- Property and building information.
- Floor plans.
- Water, sewer, and electrical utility information.
- Easement locations.
- Building and occupancy permit history.
- Complaint history.
- Special and delayed assessment information.

Existing uses of GIS:
- Use of County/City GIS Portal Land Records Viewer.

Other:
- Switching from Banner software application to the Springbrook application for permitting.

2.4. Cemetery

Staff:
Valerie Mellon, Director of Public Works & City Engineer
Sandy Ronski, Cemetery Clerk
Daryl Kliment, MPU/EDP Programmer

Interview:
Tuesday, February 24, 2:00pm

Responsibilities:
Manage cemetery grounds and sites. Help the public with genealogy questions.

Relevant tasks performed:

- Determine who is buried at a site, owns the site, or who is allowed to be buried there.
- Find out which sites are available.
- Generate lists of sites for arrangements (such as Veterans Day) and perpetual flowers or care.
- Annual sales report.

Information needed:

- Detailed site information.
- Ground workers certifications and training.

Existing uses of GIS:

- Uses CIMS (Cemetery Information Management System) application to manage site information. CIMS is ESRI based software.

2.5. Clerk

Staff:
Jennifer Hudon, City Clerk
Deborah Neuser, Deputy Clerk
Mary Fisher, Clerk III

Interview:
Tuesday, February 24, 9:00am

Responsibilities:
Maintain council records and permanent documents. Issue various licenses.

Relevant tasks performed:

- Keep all documents. Records are indexed from the past seven years in WordPerfect. There is also a card index that is by subject. Documents are kept in WordPerfect, and staff performs text searches to find documents.
- Track special assessment changes against specific parcels of property, to calculate the assessment fees, and then send bills.
- Issue business licenses, including liquor/soda, bartenders, garbage haulers, Christmas tree sales, cabaret, circus/fair, mobile and manufactured homes, taxi, electrical contractors, weights and measures, and pawnshops. There is a quota on some licenses, but no density or geographic limits.
- Election administration.
- Coordinate special events.

Information needed:

- Maps of special assessment areas and properties.
- Election district maps.
- List of streets and ranges for voter registration.

Existing uses of GIS:

- Occasional use of County/City GIS Portal Land Records Viewer.

2.6. Department of Public Works – Business

Staff:
Valerie Mellon, Director of Public Works & City Engineer
Mike Huck, Department of Public Works Business Manager
Steve Kipping, Computer & Engineering Technician
Daryl Kliment, MPU/EDP Programmer

Interview:
Wednesday, February 25, 2:00pm

Responsibilities:
Maintain the financial information for the department including budgeting and accounting for projects. Supervise counter staff. Handle complaints from the public.

Relevant tasks performed:
- Enforce weed (yard) and sidewalk clearing ordinances.
- Track project finances.
- Budget 5-year Capital Improvement Program.

Information needed:
- Complaint (sewer, storm, weed, and snow) history.
- Photos of complaint.
- Quantify the needs for maintenance.
- Property owner information.
- Zoning Information.
- Location/timeline of MPU projects.
- Sidewalk agreements.

Existing uses of GIS:
- County/City GIS Portal Land Records Viewer.

Other:
- Some information in Springbrook.

2.7. Department of Public Works – Fleet

Staff:
Valerie Mellon, Director of Public Works & City Engineer
Kevin Glaeser, Fleet Manager
Steve Kipping, Computer & Engineering Technician
Daryl Kliment, MPU/EDP Programmer

Interview:
Wednesday, February 25, 3:00pm

Responsibilities:
Maintain fleet vehicles and motorized equipment for all departments in the City. Maintain all traffic signals and warning sirens.

Relevant tasks performed:
- Use checklist and schedule to maintain equipment.
- Monitor equipment costs, fuel, and repair.
- Track mileage or fuel costs for budgeting.
- Special events.

Information needed:

- Where equipment is located or vehicles assigned to. Clerk keeps list.
- Use hard copy map of all traffic signals by type of light.
- Where filters are installed on catch basins.

Existing uses of GIS:

- None.

Other:

- Use FASTER software by CCG Systems for fleet maintenance.

2.8. Department of Public Works – Operations

Staff:
Valerie Mellon, Director of Public Works & City Engineer
Randy Junk, Operations Manager
JoAnn Wagner, Clerk II
Steve Kipping, Computer & Engineering Technician
Daryl Kliment, MPU/EDP Programmer

Interview:
Wednesday, February 25, 1:00pm

Responsibilities:
Maintain streets and sewers so they remain in safe condition.

Relevant tasks performed:

- Street and sewer repair.
- Cleaning of sanitary sewers.
- Street sweeping.
- Snowplowing and salting.
- Street sign replacement.
- Street cut (opening) permits and inspection or repair.
- Brush and leaf collections.
- Mowing.
- Closing roads due to flooding events.
- Special events.

Information needed:

- System plans.
- Pavement type and age.
- Permit work involving road cuts.
- Routes (snowplow, salting, brush/leaf pickup).
- Flooded locations.

Existing uses of GIS:

- Hard copy system maps.

2.9. Department of Public Works – Transit

Staff:
Valerie Mellon, Director of Public Works & City Engineer
Derek Muench, Transit Manager
Steve Kipping, Computer & Engineering Technician
Daryl Kliment, MPU/EDP Programmer

Interview:
Wednesday, February 25, 3:30pm

Responsibilities:
Oversee transit system and operation.

Relevant tasks performed:
- Develop transit plan.
- Route planning.
- Estimating location of bus based on schedule.
- Answer public questions.

Information needed:
- Route maps.
- Ridership by route, day and time.
- Americans with Disabilities Act data to use for specialized program edibility.
- Street work and closures.

Existing uses of GIS:
- None.

2.10. Engineering – Administration

Staff:
Valerie Mellon, Director of Public Works & City Engineer
Greg Minikel, Deputy Director of Public Works & City Engineer
Mike Huck, DPW Business Manager
Kim Lynch, Administrative Assistant

Interview:
Thursday, February 26, 8:00am

Responsibilities:
Design and maintain Right-Of-Way (ROW) infrastructure and oversee public works projects.

Relevant tasks performed:
- Create special assessments and delayed assessments.
- Map ROW infrastructure.
- Maintain no street access agreements.
- Permit access over unimproved ROW.
- Maintain sidewalk privileges.

Information needed:
- Agreements that are in place.
- Special assessment map and letters.
- Easement information.

- ROW permits history.
- Sanitary sewer backups.
- Pavement markings.
- Stormwater pond location.
- Sealcoat map.
- Traffic counts.
- Accident data.
- Flooded areas.
- PASER/WLSR information.
- Recycling and garbage hauling customer lists.
- Past engineering studies.

Existing uses of GIS:

- Use MicroStation for most mapping and locating needs.

2.11. Engineering – Mapping

Staff:
Steve Kipping, Computer & Engineering Technician
Jill Erickson, Engineering Aide

Interview:
Tuesday, February 24, 9:00am
Thursday, February 26, 9:00am & 10:30am

Responsibilities:
Maintain cadastral, engineering maps, and related databases for the City.

Relevant tasks performed:

- Update parcel and base map on a weekly basis. Newly recorded deeds are received from the assessor and added onto base maps.
- Daily updates on the sanitary sewer and stormwater maps and Access database. Update sign inventory Access database.
- Update street opening Access database.
- Update PAvement Surface Evaluation and Rating (PASER) database.

Information needed:

- Property conveyance documents (deeds, CSM, plats, etc.).
- Assessor's parcel identifier (PIN).
- Sewer and stormwater as-built information, inspection notes.

Existing uses of GIS:

- Use MicroStation for all map maintenance and most tasks.
- Request Planning Department to perform some mapping functions.
- Use CherryLAND.

2.12. Engineering – Stormwater

Staff:
Janet Sosnosky, Storm Water Aide

Interview:
Tuesday, February 24, 2:30pm

Responsibilities:

Issue permits for erosion control. Inspect stormwater management facilities.

Relevant tasks performed:

- Issue permits for erosion control.
- Inspect stormwater management facilities and Best Management Practices – BMPs (ponds).
- Prepare, implement, and monitor maintenance agreements and verify performance.
- Comply with requirements of Municipal Separate Storm Sewer System (MS4) permit.
- Track and test outfalls.
- Document spills.
- Prepare water quality plans.
- Review proposed site plans.

Information needed:

- Location and condition of stormwater facilities.
- Ownership and maintenance records of stormwater facilities.
- Required information for water quality plans such as endangered species mapping and historical building mapping.

Existing uses of GIS:

- County/City GIS Portal Land Records Viewer.
- Requests maps from Planning.

2.13. Finance

Staff:
Tony Scherer, Assistant Finance Director

Interview:
Tuesday, February 24, 9:00am

Responsibilities:
Track and report the financials of the City.

Relevant tasks performed:

- Comprehensive Finance Report.
- Capital Improvements Plan.
- Budget.
- Assets of the City under General Accounting Standards Bureau - GASB 34
- TIF District Expenses.

Information needed:

- Budget and financial information.

- Project expenses from departments.
- Infrastructure information – type/size for cost information.
- City equipment and value.
- Land records – City owned property.

Existing uses of GIS:

- Occasionally uses County/City GIS Portal Land Records Viewer.

Other:

- Financial system from Springbrook Software.

2.14. Fire

Staff:
Gregg Kadow, Deputy Fire Chief

Interview:
Wednesday, March 4, 9:00am

Responsibilities:
Protect lives and property.

Relevant tasks performed:

- Pre-planning staging areas for larger buildings.
- Annual fire inspections for public buildings and apartments with more than 3 units.
- Special event planning including Fourth of July fireworks. Setting up traffic, exclusion zones, fire truck, and ambulance routing.
- Incidents.

Information needed:

- Aerial photos.
- Property maps and photos.
- Hydrant locations, including private hydrants.
- Utility locations including water mains and transformers /substations.
- Building occupant and contact information.
- Floor plans and mechanical locations.
- Water, gas, electrical shut-off locations.
- Knox box locations.
- Hazmat storage locations – inside and outside.
- Buildings with sprinklers.

Existing uses of GIS:

- Google Earth.

2.15. Manitowoc Public Utilities – Electronic Data Processing (MPU/EDP)

Staff:
Gary Heim, EDP Manager
Wayne Breitenfeldt, EDP Supervisor
Trace Reed, Programmer
Joe Reindl, Programmer
Daryl Kliment, Programmer

Interview:
Wednesday, February 25, 8:00am

Responsibilities:
Maintain technology infrastructure for the City and MPU.

Relevant tasks performed:
- Maintain application and database servers.
- Operate fiber network.
- Desktop and technical support.

Information needed:
- Provide departments and utility with custom reports.

2.16. Manitowoc Public Utilities

Staff:
Rob Michaelson, Water Systems Manager
Steve Bacalzo, Distribution Operations Manager (absent from interview)
Dan Salm, Customer Service Manager
Don Duenkel, Engineering Manager
Becky Olson, Engineering Technician
Wayne Breitenfeldt, EDP Supervisor

Interview:
Wednesday, February 25, 10:00am

Responsibilities:
Operate and maintain the water, electrical, steam, and broadband utility systems.

Relevant tasks performed:
- Update utility information.
- System planning.
- Outage locating.

Information needed:
- Location, specification, and condition of utility facilities and assets.
- Meter installation.
- Utility billing information.
- Utility easements.
- Consumption history.
- Inspection information.

Existing uses of GIS:
- Primarily use MicroStation.

- Attributes of electrical system are stored in an Oracle database, and converted to Access and DBF files that are used along with MicroStation DGN's in ArcView 3.1. The database is joined using the MSLINK values.

2.17. Mayor's Office

Staff:
Tina Prigge, Assistant to the Mayor

Interview:
Monday, March 2, 2:00pm
Note: A meeting with newly elected Mayor Justin Nickels occurred on May 15, 2009.

Responsibilities:
Help to resolve complaints about City services.

Relevant tasks performed:
- Determine if there is a pattern to the complaints to see if there is a wider issue.
- Determine if the caller frequently complains about the same issue.
- Special event planning.
- Needs maps, routes, and places to see for visiting organizations.

Information needed:
- Aerial photos.
- Property addresses.
- Property photos.
- Mailing lists.
- Route maps (such as snow plowing).

Existing uses of GIS:
- Use hard copy maps.

2.18. Parks & Recreation

Staff:
Joe McLafferty, Director
Randy Albright, Assistant Park Director
Denise Larson, Assistant Recreation Director
Jeremy Crees, Recreation Supervisor
Lisa Shimon, Clerk III

Interview:
Tuesday, February 24, 1:00pm

Responsibilities:
Providing and maintaining park facilities and recreational opportunities.

Relevant tasks performed:
- Maintain park facilities, including rental units. Maintenance tasks and work order management are tracked with the OPerations Software (OPS).
- Update facility calendar. Active Net software is used for scheduling of facilities and rooms, including cabin rentals.
- Seasonal maintenances tasks such as water valves, restroom access, and docks.

- Maintain tree inventory. Data and location on park and street trees are entered into StrataPoint software.
- Maintain trail system.
- Administer senior center.
- Prepare for special events.
- Operate zoo.
- Median plantings.

Information needed:

- Information on park amenities is used by Parks and Recreation staff in addition to other departments. The Police Department gets a list of groups using the facility.
- DPW requests equipment and event information.
- MPU request information for tree trimming and removal.
- Location of equipment is stored in multiple locations and is rented out.
- Whether registration/renter is a City resident because there are cheaper fees for a City resident vs. a non-resident.
- Exact location of park boundaries for security and maintenance issues.
- Aerial photos for general park layout.

Existing uses of GIS:

- Occasionally use County/City GIS Portal Land Records Viewer.
- Requests to Planning for maps.

Other:

- Software from StrataPoint is used to maintain park and street trees.
- OPS software is used for work order management. The software is an MS Access-based application that organizes facilities by park name and individual amenities within the park.
- Active Net software is used for scheduling.

2.19. Planning

Staff:

Michelle Yanda, Associate Planner
Elizabeth Werdermann, GIS Technician

Interview:

Tuesday, February 24, 12:00pm

Responsibilities:

Provide information concerning land use, housing and economic development, proposed developments, zoning, platting, and GIS.

Relevant tasks performed:

- Mapping support for City departments.
- Mapping of various City districts and features.
- Plan Commission and Community Development Authority actions.
- Address system maintenance that is maintained in hard copy format.

Information needed:

- Property boundaries and legal description.
- Address.
- Property assessment information.

- Site plans.
- Zoning.
- Special assessments.
- Official Map.
- Signage.
- Wetlands and floodplain.
- Towers.
- Various election and services districts.

Existing uses of GIS:

- Use ESRI software to maintain and create maps.
- MicroStation.

2.20. Police

Staff:
Captain Scott Luchterhand
Lieutenant Paul Schermetzler

Interview:
Thursday, February 26, 9:30am

Responsibilities:
Prevent crime and maintain order.

Relevant tasks performed:

- Trend analysis of crimes and accidents.
- Owner/tenant associated with an address (Jacket information).
- Special event planning.
- Diagramming a crime scene.

Information needed:

- Property and address maps.
- Location of common place names.
- Accident data.
- Current occupant of a building.
- Sex offender locations.
- Hazard materials information on a property.
- Building floor plans.
- Road closures.

Existing uses of GIS:

- Basic mapping available in New World system, AeGIS.
- Request maps from Planning, as needed.

Other:

- Use New World records management system.
- Dispatch is a separate organization and shared, along with the software, with the County.

2.21. Rahr-West Art Museum

Staff:
Barb Bundy Jost, Director

Interview:
Thursday, February 26, 1:00pm

Responsibilities:

Community art museum with the primary purpose to preserve, collect, exhibit, educate, and interpret the visual arts.

Relevant tasks performed:

- Plan for special events on grounds.
- Maintain information cards.

Information needed:

- Maps of grounds, coordination with other departments for special events.

Existing uses of GIS:

- None.

2.22. Wastewater Treatment Plant

Staff:
Brian Helminger, Superintendent
Mike Jaeger, Assistant Superintendent

Interview:
Tuesday, February 24, 11:30am

Responsibilities:
Operate and maintain the wastewater facility and regulate the collection system.

Relevant tasks performed:

- Prepare for storm events.
- Five-year Capital Improvement Plans.
- Identify source of improper materials entering the system (not common).
- DNR/EPA Compliance

Information needed:

- Cost projects.
- Numbers of various events or replacements for reporting requirements.

Existing uses of GIS:

- None.

Other:

- Would find maps of the system with the capacities or projects useful.

3. Manitowoc County Interview Summary

Staff:
Preston Jones, Register of Deed & Land Information Officer
Cathy DeLain, GIS Coordinator

Interview:
Thursday, February 26, 1:30pm

Relevant information:

- Maintain track index and CherryLAND system of Register of Deeds Documents.
- Oversight by Land Records Committee.
- Maintain parcels for areas outside of Cities of Manitowoc and Two Rivers.
- Share address points for City/County dispatch.

Other:

- CherryLAND is the recorded document viewer application.
- Share website with the City of Manitowoc.
- Share ESRI license agreement with City of Manitowoc.

4. Comparable Communities Interview

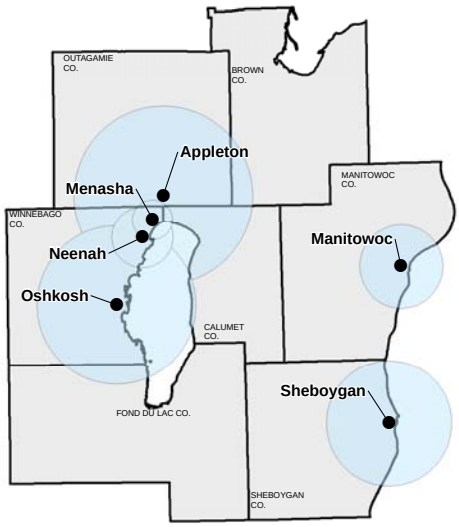
Interviews were conducted in early February 2009 with several communities that are comparable in size to Manitowoc and located within northeastern Wisconsin. These interviews focused on how each respective City was using GIS in addition to the organizational structure and funding of GIS.

4.1. Summary

City	GIS Organization	Projects	Maintenance	Training	Software	Web Mapping	Parcels	Ortho	Addressing	Water	Sewer	Storm	Buildings	Elevation
Manitowoc	Decentralized	Dept	Dept	Dept	MicroStation, ESRI	Joint City/ County	City	5 yrs	City	CAD	CAD	CAD	MPU	City
Appleton	IT	IT	IT	Dept	ESRI, AutoCAD	Intranet, County	City	2 yrs			CAD	CAD	Yes	Yes
Menasha	Engineering	Dept	IT	Dept	ESRI, AutoCAD	County only	County	Yes	County	Utility	Yes	Yes	Yes	Yes
Neenah	IT	IT	Dept		AutoCAD, ESRI	Intranet, County	County		City	Yes	Yes	Cnslt.	Yes	No
Oshkosh	Decentralized	Dept	IT	Dept	AutoCAD, ESRI	County Only	City	3 yrs	City	Yes	Yes	Yes	Yes	No
Sheboygan	Engineering	Eng	Eng		AutoCAD	Intranet, County	City	5 yr	City		Yes	Yes	Yes	Yes

Comparable Communites

Circle Size is Relative to Population



Manitowoc is similar to how the Cities of Appleton, Menasha, Neenah, Oshkosh, and Sheboygan use GIS. Like Manitowoc, Oshkosh has a decentralized GIS organizational structure; the other Cities have GIS centralized within IT or Engineering. None of the other Cities use MicroStation; they all use AutoCAD. Appleton and Menasha primarily use ESRI as their GIS software, while Neenah and Oshkosh primarily use AutoCAD for linework updates with ESRI for analysis and map making. Sheboygan exclusively uses AutoCAD software. None of the other Cities have a joint City/County web mapping site as Manitowoc does. They either have an intranet site, or rely solely on the County web mapping site. Like Manitowoc, Appleton, Oshkosh, and Sheboygan maintain their own parcels. Only Appleton maintains their sewer and stormwater data in CAD format; the other Cities are in a GIS format.

4.2. City of Appleton

Background:

Population: 70,087 (2008 est.)
Municipal Levy: $32,786,056

Person/Title:

Jay Yearwood, GIS Manager

Interview:

February 4, 2009

Organization:

GIS is centralized in IT; however, there are key users in Community Development and Public Works. Other departments will ask IT for specialized mapping needs or additional servers and layers for their intranet web mapping application.

Staffing:

One dedicated GIS person, and some departments have key users that use GIS regularly.

Funding:

Funding for GIS, including software maintenance, is under IT. Training is done by department.

Active Departments:

- Community Development and Public Works (Traffic) are the largest users of GIS.
- The Assessor, Building Inspection, Parks & Recreation, Police, Fire, and Clerk all use GIS technology, but rely on applications setup by IT or request maps from IT.

Software Platform:

Appleton uses ESRI, and most GIS tasks are done using ArcView and ArcInfo. Some edits are done using AutoCAD; however, the City is moving away from editing in CAD so that more edits will be native on the ESRI platform. The City does not use ESRI Spatial Database Engine software (ArcSDE).

Web Mapping Capabilities:

The City has an internal ArcIMS application that has capabilities for each department. The public uses the respective County website.

Data:

- The City maintains parcels.
- Six-inch color orthophotography is acquired every two years by the City.
- Both address centerlines and address points are maintained by the City.
- No water utility information is available.
- Sewer and stormwater information is in CAD format. The City will soon go through a process to convert and clean the data.
- Building structures and planimetrics are City-wide and updated as time permits using new imagery.
- The City does not have a DTM, but does have an elevation grid.

Enterprise Database Integration:

Both property record and assessment CAMA data are integrated with the parcel information. A building permit database exists, and it is linked to GIS when needed for ad-hoc mapping needs. The address information maintained by the City is imported in the dispatch CAD system.

4.3. City of Menasha

Background:
Population: 17,408 (2008 est.)
Municipal Levy: $8,516,848

Person/Title:
Tim Montour, Engineering Supervisor

Interview:
February 3, 2009

Organization:
GIS is primarily located in the Engineering Department. Engineering handles the data they receive from Winnebago County, and coverts it to AutoCAD format for the Engineering Department's uses. Engineering converts some data to shapefiles for use by the Community Development Department. The Information Technology Department (IT) handles hardware purchases and software maintenance. IT also creates a data export for use with the parcel data.

Staffing:
There is no dedicated GIS staff. Three persons within the City have GIS experience and use GIS software/data directly.

Funding:
Funding for GIS activities, including training, is by each department. Software maintenance is funded by IT.

Active Departments:
- Community Development (Planning, Building Inspection), Public Works/ Engineering.
- Police (some use).
- Clerk and Parks & Recreation will ask Engineering for GIS services.
- The GIS capabilities are not known for the Fire Department (merged with the adjacent City of Neenah) and Assessor (services are contracted).

Software Platform:
Public Works/Engineering uses AutoDesk products for all tasks. Community Development uses ESRI (ArcView).

Web Mapping Capabilities:
No City-specific web mapping capabilities. Use County websites.

Data:
- Parcels, orthophotography, and address centerlines are maintained by the County.
- Menasha Utilities (separate entity) provides some linework for water system.
- City maintains detailed sewer and stormwater information; however, some information is missing from the original mapping project.
- Building footprints are available, and City updates as information becomes available.
- Elevation is available, but old.
- Street signs, street trees, and pavement conditions are in database form, but not linked to GIS.

Enterprise Database Integration:
Property data is integrated into parcel data. No other data is integrated with GIS.

4.4. City of Neenah

Background:

Population: 25,560 (2008 est.)
Municipal Levy: $ 14,162,819

Person/Title:

Rick Meverden, GIS Operator

Interview:

February 4, 2009

Organization:

GIS is centralized in IT where they do all of the work.

Staffing:

There is one dedicated GIS person. About 20 other people use GIS products on a regular basis, but not necessarily perform GIS tasks.

Funding:

Funding for GIS projects is under IT; however, software maintenance is by individual departments as is software training. Most software training is done in-house.

Active Departments:

- Planning – Basic mapping, parcel reference, simple queries.
- Building Inspection – Site plan sketch.
- Assessor – Basic mapping and queries.
- Parks & Recreation – Mapping of parks with aerials and street tree inventory.
- Public Works – Site planning and initial design work.
- Water Utility – Uses Cartegraph.
- Police – One or two people use Arcview.
- Fire – Will ask for maps.
- Health – Will ask for maps.
- Clerk – Aldermanic maps.

Software Platform:

Maintenance of data is in Autocad. ESRI is used by end users. SDE is being considered.

Web Mapping Capabilities:

Have basic intranet ArcGIS Server website.

Data:

- County maintains parcels; the City will join parcels to assessment data.
- Maintain address points.
- Engineering maintains water and sewer data. Omni Engineering maintains water system data.
- Have building footprints.
- Do not have elevation.
- Engineering maintains PASER.
- Maps street signs.
- Some street tree mapping.

Enterprise Database Integration:

Property information and Computer Assisted Mass Appraisal (CAMA) is not integrated live – on an “I” series mainframe. Utility information is in Cartegraph. Stormwater utility billing information is linked to GIS.

4.5. City of Oshkosh

Background:

Population: 65,920 (2008 est.)
Municipal Levy: $26,601,089

Person/Title:

Jeff Nau, Associate Planner

Interview:

February 5, 2009

Organization:

GIS is decentralized. Each department is largely responsible for creating and maintaining their own layers. Several departments will go to either Community Development or Public Works as they are the primary users of GIS. IT installs and updates all software.

Staffing:

There is no dedicated GIS staff. The power GIS users within the departments all have other primary duties. GIS is a secondary duty.

Funding:

The IT Department pays for all software licenses. Any software purchases and data purchases are requested to IT and then put into IT's budget.

Active Departments:

- Community Development and Public Works are the primary data custodians.
- Building Inspection, Assessor, Police, and Fire may use GIS software, but mostly as a viewer or simple queries.
- Parks & Recreation, Transit, and Clerk will make various mapping requests.

Software Platform:

Both ESRI and Autodesk are used. Most data maintenance is done within AutoCAD and then exported out as shapefiles. Some data is edited directly within ArcView. Many departments currently use ArcView 3.3 or ArcExplorer as their viewer.

Web Mapping Capabilities:

The City has no web mapping capabilities; however, it is planned to have some by 2010.

Data:

- The City maintains the parcel layer.
- Orthophotography is flown by the City every three years. The last flight was in 2005 and was 6" color. Flights have been delayed in 2008 due to unusual conditions (weather and movie filming), and is scheduled to be flown in 2009.
- The City maintains an address point layer.
- City owned utilities, including water, sewer, stormwater, electric, and fiber are maintained.
- Building footprints and other impervious features are available and are updated through permit information and new imagery.
- PASER is integrated with GIS.
- Street trees are in the process of being mapped.
- A DTM and a street sign inventory are not available.

Enterprise Database Integration:
Both property records and assessor CAMA data are integrated with the parcels. The utility inputs data directly into the GIS layer; however, utility cards are still maintained. Building Inspection uses a software package, but it is not integrated with GIS. Address information is delivered to the County which is then delivered to dispatch.

4.6. City of Sheboygan

Background:
Population: 50,580 (2008 est.)
Municipal Levy: $ 20,701,641

Person/Title:

Tom Horness, GIS Coordinator

Interview:

February 3, 2009

Organization:
GIS is centralized in the Engineering Department. All requests for GIS services are made to Engineering. Several major systems were on the AS/400 platform which was problematic. The financial system has moved to an SQL Server.

Staffing:
There is one dedicated GIS staff person. There is not any other staff with GIS duties.

Funding:
GIS and all software are funded by Engineering. Other departments are requested to contribute for some projects, such as orthophotography.

Active Departments:

- Police, Fire, and Assessor's Office are the primary users.
- Community Development, Building Inspection, Parks, and Mayor's Office use maps that GIS creates.
- City Attorney's Office uses maps that GIS creates for court cases.

Software Platform:
Autodesk is primary GIS platform.

Web Mapping Capabilities:
There is an internal web mapping application for use by the City. A public viewer has been built, but is not yet operational.

Data:

- The City maintains parcel data.
- Three inch pixel color orthophotography on a five to ten year cycle.
- The City maintains address points, including subunits.
- Sewer and stormwater is maintained by the City.
- Water information is a separate utility.
- A DTM is available.
- Building footprints and planimetric is available and the City maintains an impervious layer. The City updates the building footprints from site plan information.
- Over 300 floor plans and tier II reports are available for public safety.

- PASER is linked to GIS.
- Databases exist for street signs and street trees, but they are not mapped.
- Zoning is mapped.

Enterprise Database Integration:

Property information is exported from the AS/400 system. CAMA information will be available when the application is switched to SQL Server. Several other databases, like utility asset management and building permits, are on City building applications, integrated with reverse 911 applications.

Data Assessment

5. Data Assessment Introduction and Purpose

The Data Assessment provides a description and evaluation of the most common datasets that are used within the City of Manitowoc (City) and Manitowoc Public Utilities (MPU). In order to carry out this task, City and MPU staff were interviewed over the course of several days. During these interviews, information about the data the department uses was discussed. General information about the interviews is available in the Interview Summary Chapter.

It is not surprising to find that the City and MPU use a wide range of datasets. Within this chapter, a dataset is defined as a collection of data layers with a common theme. These datasets are stored in a variety of formats including hard copy documents, hard copy maps, word processing documents, spreadsheets, databases, CAD files, and GIS files. Digital data is primarily stored on file servers that are organized by department. Some access has been limited, depending on the nature of the data and the department.

This chapter starts by summarizing the data documentation that is available to the City. The data license agreement is then reviewed. The datasets are then described in terms of what the dataset is, who maintains and uses it, what format it is in, and whether it is a Federal Geographic Data Committee (FGDC) framework data layer or used for comprehensive planning in Wisconsin.

FGDC has developed a framework data. The framework is a collaborative effort to create a widely available source of basic geographic data within the Federal Government. It provides the most common data themes that geographic data users needed. While this concept was developed for federal government usage, it is also applicable to local government. In general, framework data is very important for providing governmental services.

Comprehensive plans incorporate a twenty-year vision and provide information and policies that will guide future planning and community decisions. Nine elements are required to be addressed by the comprehensive plan: Issues and Opportunities, Housing, Transportation, Utilities and Community Facilities, Agricultural, Natural and Cultural Resources, Economic Development, Intergovernmental Cooperation, Land Use, and Implementation. Datasets that provide information for comprehensive plans, or are used to make decisions under comprehensive planning, need to be maintained.

The dataset is then given a numerical rating on several categories. Since a dataset may be used by multiple departments, the datasets are organized by broad subjects rather than by department. A summary of the dataset assessments are then described.

Recommendations are then made for managing the data, the data format, and data license. Specific recommendations are made for potential improvements to each of the datasets.

6. Data Documentation

Data documentation is the information about the data, how detailed that information is, and how easily it is understood. Metadata is a very structured form of data documentation that is sometimes used. Often the terms data documentation and metadata are interchanged, although data documentation can exist when there is no metadata.

The City uses a data dictionary. It includes:

- The MicroStation DGN level system for base, parcel, sanitary sewer, sanitary sewer laterals, stormwater, stormwater laterals, and Public Land Survey System (PLSS) township, section and quarter-section drawing files maintained by Engineering.
- The MicroStation DGN level system used for the 100 scale planimetric mapping that was acquired in June of 2005.
- The feature codes used in the building, control, hydro, drainage, miscplan, contours, streets, miscutil, trees, and mask Arc/Info Coverages was acquired in June 2005.

Many of the datasets were developed using Commercial-Off-The-Shelf (COTS) software applications. Examples of these applications include the Springbrook financial system and Tyler Technologies' Integrated Assessment System (CLT-IAS) application. It is assumed that, in general, these COTS software applications include a description of the type of data that is to be entered into various fields. It is also likely that much more extensive documentation exists for these systems. The City and MPU should have this documentation already, or it can be obtained by contacting the application vendor.

Several of the datasets are developed using custom, or in-house developed applications. Examples of these include the various MS Access databases used by Engineering. Some documentation may exist for these applications.

7. License Agreement

The public is able to purchase orthophotos, cadastral (including attribute data), and planimetric data from the City. A complete set of available data for the City would cost $6,200 ($200 for the complete set of cadastral design files, and $6,000 for the complete set of orthophotos and planimetrics).

The City considers the digital datasets to be copyrighted, and are thus licensed and not sold. The terms and conditions of the standard license agreement apply to the users of the purchasers of the licensed datasets. The City has developed a standard license agreement for geographic datasets. The terms of the licenses are fairly standard and include; limiting liability, explains there is no guarantee for fitness for use, the data is sold “as-is”, and is not a subscription, etc.

Several specific terms of the license deserve attention, and are further discussed in the recommendations section:

- Data obtained from the City must be returned to the City upon completion of the project (although this is usually not done).
- Reproduction or redistribution of digital datasets is prohibited.
- Reproduction or redistribution is limited to six hard copies for commercial use.
- Any modifications to the data must be clearly distinguished from the original graphics and described on the hard copy.

8. Datasets Inventory

The dataset inventory is a description of the datasets mentioned during City and MPU staff interviews that are relevant to the GIS Needs and Assessment process. Each dataset is described, the users are identified, and the format of the data is discussed. The dataset is also evaluated to determine whether it is an FGDC framework data layer, or can be used to support a Wisconsin Smart Growth planning element. In general, smart growth invests time, attention, and resources in restoring community and vitality to center cities and older suburbs. New smart growth is more town-centered, is transit and pedestrian oriented, and has a greater mix of housing, commercial, and retail uses. It also preserves open space and many other environmental amenities. Wisconsin Smart Growth planning elements include: Issues and Opportunities, Housing, Transportation, Utilities and Community Facilities, Agricultural, Natural and Cultural Resources, Economic Development, Intergovernmental Cooperation, Land Use, and Implementation.

The dataset is then rated in terms of its overall importance. Higher scores indicate more important datasets for overall City-wide operations. Please note that this does not mean that low scoring datasets are unimportant, it just means the usefulness of the dataset for other departments is not as widespread.

Datasets that are part of the FGDC framework should be rated higher as these datasets represent some of the most common and basic GIS datasets needed for governmental operations. Datasets that are needed for comprehensive planning are also given higher ratings since the long term planning decisions are based on a comprehensive plan which is in part based on data from these datasets. Datasets that support multiple elements are given the highest rating. Last, datasets that are currently used by the public are given higher ratings, as are datasets that are used by multiple departments.

The overall importance rating system is as follows:

FGDC Framework:	4 – Framework dataset 3 – Indirectly related to framework 2 – Rating not used 1 – Non-framework dataset
Smart Growth Element:	4 – More than one element 3 – One element 2 – Indirectly related to element(s) 1 – No elements
Users:	4 – Used by the public 3 – Used by multiple departments 2 – Used by one department 1 – Unused

The dataset is then rated. Higher scores indicate the dataset is more useful in its present form. The assessment rating system is as follows:

Accessibility:	4 – Available with a web browser 3 – Available through use of typical software 2 – Available through use of specialized software 1 – Available only on paper
Data Structure:	4 – Structured – Data can be processed by software 3 – Semi-Structured – Data is indexed 2 – Rating not used 1 – Unstructured
Documentation:	4 – FGDC compliant metadata or equivalent 3 – Well documented off-the-shelf software procedures 2 – Data/layer dictionary or written standards 1 – No documentation
Data Format:	4 – Fully integrated geometry and attribute data 3 – Geometry with related attribute data via key fields 2 – Geometry only or attribute data only 1 – Hard copy
Data Utility:	4 – Dataset has more information than is needed 3 – Dataset has just the information needed to do current tasks 2 – Dataset is missing minor information needed to do current tasks 1 – Dataset is missing major information needed to do current tasks

Datasets that are more accessible have higher ratings. Accessibility is rated by whether the dataset can be viewed with just a browser or common software. The data structure refers to whether the data is in an organized format that can be processed easily by computer software. Useful datasets also are well documented. The documentation may be in a structured format, such as using the FGDC metadata standard, or through application software documentation. The data format of the dataset also determines its usability. Datasets that have fully integrated geometry and attribute data have higher ratings. Datasets that have separate, or missing, attribute or geometry data have lower ratings. Data utility refers to whether the dataset could be used for purposes beyond what it was originally intended for.

8.1. Department Dataset Summary Matrix

	Assessor	Building Inspection	Clerk	Finance	Fire	Mayor's Office	Parks & Recreation	Planning	Planning/GIS	DPW/Business	DPW/Fleet & DPW/Operations	Engineering	DPW/Transit	DPW/Cemetery	Manitowoc Public Utilities	Police	Wastewater	Library/ Museum
Aerial Photos	X	X	X	X	X	X	X	X	XX	X	X	XX	X	X	X	X	X	X
Elevation		X						X	X			XX			X			
Addressing	XX	XX	XX	X	X	X	X	XX	X	X	X	XX	X		X	X	X	X
Geodetic Control									X			XX			X			
Property Parcels	X	X	X	X	X		X	X	X	X	X	XX			X	X		
Property Owner	X	X	X	X	X	X	X	X	X	X		X			X	X		
Easements	X	X	X					X	X	X		X			X			
Cemetery Lots									XX			XX		XX				
Site Plans	XX	XX			XX			XX	X			X			XX	XX		
Property Photographs	XX	X			X			X				X		X		X		
Buildings	XX	XX			X		X	X	X			XX			XX	X		
Floor Plans	X	XX			X			X	X			X				X		
City Property	XX	XX	XX	X			X	X	X	X		X						
City Trees							XX	X	X			X			X			
Water System		X		X			X	X	X			X			XX			
Electrical System		X					X	X	X			X			XX			
Sewer System		X		X			X	X	X		X	XX					X	
Stormwater System		X		X			X	X	X		X	XX						
Site Infrastructure							X		X					X			X	
Pavement Information										X	X	XX						
Traffic Signals											XX	XX						
Traffic Counts								X				XX				X		
Transit System									XX			X	XX					
Municipal Signage								X			XX							
DPW Routes					X	X		X		X	XX	XX				X		
ROW Permits											XX	X						
Project Locations				X			XX	X		XX		XX			XX		X	
DPW Agreements			X					X		XX		X			X			
Special.&Delayed Assessment	X	X	X	X				X		X		X			X			
Official Map								XX	XX			XX						
Zoning Districts	X	X						XX	XX	X		X						
Election Districts			X						XX									
Facility Scheduling					X		XX				X				X	X		
Equipment Location			X				XX				XX							
Building Permits	X	XX						X				X						
Fire Inspections					X													
Special Events			XX		X	X	X	X			X					X		X

	Assessor	Building Inspection	Clerk	Finance	Fire	Mayor's Office	Parks & Recreation	Planning	Planning/GIS	DPW/Business	DPW/Fleet & DPW/Operations	Engineering	DPW/Transit	DPW/Cemetery	Manitowoc Public Utilities	Police	Wastewater	Library/ Museum
Business Licenses			XX															
Commercial Signs		X						XX										
Recycling & Garbage										XX								
Complaints						XX				XX		X						
Accidents					X							X				XX		

XX- Maintain/edit data
X – Use and view data, but not maintain

8.2. Aerial Photos

The City and MPU have access to color aerial photography taken in April 2005 with a 3" pixel resolution. The City and MPU are currently proceeding with budgeted money for new aerial photography in 2010.

The Engineering Department is largely responsible for acquiring new aerial photography. The City and MPU have not previously collaborated with Manitowoc County on the purchase of aerial photography. Aerial photography is used by nearly all the departments interviewed, and is available on the County/City GIS Portal Land Records Viewer.

The data is also available for purchase by the public in MrSID or TIFF format.

Aerial photography is considered FGDC framework data and is used for most Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total		Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
4	4	4	**12**		4	4	4	2	3	**17**

8.3. Elevation

Elevation information provides data about terrain and has many uses. Some of the more common uses include the delineation of drainage areas and basins, cut/fill analysis, and viewshed analysis. The City elevation data was acquired with the April 2005 orthophoto flight. It is compiled for 1”=100’ National Map Accuracy Standards. Both two foot contours, breaklines, and masspoints were delivered by the vendor. A Digital Terrain Model (DTM) could be created using the breakline and masspoint data.

Although elevation data was not specifically mentioned by any departments, it is suspected that it is used within Engineering, MPU, and Planning. Two foot vertical contours are available for purchase by the public in MicroStation DGN, Shapefile or Coverages.

Aerial photography is considered FGDC framework data and is used for most Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
4	4	4	**12**	4	4	4	2	3	**17**

8.4. Addressing System

Addresses are the most commonly used method for locating places, buildings, and structures in addition to identifying endpoints for mail delivery. In GIS, addresses are maintained primarily using either address ranges or address points. An address centerline is a street centerline segment that is assigned a range of house numbers that may exist along either side of the segment. The side of the segment is identified by left/right. A point feature represents one address. The point is located on the center of the building.

The Planning Department is responsible for assigning new or modifying addresses within the City. Engineering maintains addressing text in the parcel dataset. The Assessor maintains site and mailing addresses within the CLT-IAS application. The Clerk also maintains an MS Excel list of valid address ranges for voter registration verification. The County maintains, and shares with the City, an address centerline and points data for dispatch operations. Planning will provide updates to the County as needed. Address data can be purchased by the public as attributes of the parcel layer. MPU maintains addresses in CIS for all utility customers.

All City and MPU departments use addresses in some way. Many departments maintain lists of addresses that are associated with assets or events, such as utility service locations or police calls. None of these address lists have been consistently compared to the address data maintained by the County to check for invalid addresses.

Address range data layers are often used for the labeling or annotation of street names. Both address range and address point data layers are used for the process of geocoding lists of addresses.

Address systems are an FGDC framework data layer, and can support multiple Smart Growth elements including “Transportation” (centerline segments) and “Community Facilities” (emergency dispatch, elections).

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
4	4	4	**12**	4	4	2	2	3	**15**

8.5. Cadastral System

The cadastral system is the boundary and dimensions of property and related information for the purpose of ownership and tax collection. For the purpose of this report, it includes both the geodetic control that is used for compiling land survey information, land records, and tax listings.

8.5.1. Geodetic Control

Geodetic controls (benchmarks) provide a common reference system for establishing the coordinate positions of geographic data. Engineering maintains the geodetic control network in conjunction with Manitowoc County. Engineering and MPU are the primary

users of the geodetic control network as it supports the mapping of PLSS, parcel, and utility information. Other GIS datasets are largely based on these datasets. The public also has access to the geodetic control information, although it is primarily used by land surveyors. Survey control information is stored within the MicroStation DGN base file. A PLSS Coordinated Control Map and Benchmark Map with Data are available on the City's website. Benchmarks are typically documented with dossier sheets and detailed survivor notes.

Geodetic control is an FGDC framework data layer. Geodetic control does not directly support any of the Smart Growth elements; however, all accurate GIS data is dependent on it.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
4	2	4	**10**	2	4	4	2	3	**15**

8.5.2. Property Parcels

For the purpose of this report, property parcels are real property that are listed in the tax rolls, along with additional information such as platting boundaries and related text. Engineering maintains the property parcels for all the areas within the City. Manitowoc County maintains property parcels outside of the municipal limits, including areas within the City's three-mile extraterritorial planning jurisdiction. Property parcels can be tied to many other datasets using the Parcel Identifier Number (PIN).

Nearly all departments are dependent on real property parcel information. Finance/Treasurer, Engineering, Assessor, Planning, Parks & Recreation, Building Inspection, MPU, and DPW/Business all mentioned that they specifically use property parcels. The public can also view property parcels within the County/City GIS Portal Land Records Viewer. Many other datasets are based on property parcel boundaries.

The City does not have a written manual on property parcel mapping standards; however, a data dictionary with the MicroStation level number scheme exists. Property parcels are accessible from several systems and formats, including scanned documents in CherryLAND, MicroStation DGN, Coverages, and Shapefiles. The parcel data layers include plat boundaries, parcel boundaries, non-boundary lines, PINs, dimensions, platting text, volume and page, and addresses. Some historical boundary information is tracked digitally (non-boundary lines), but these historical lots are not tied to any attribute information. Of course, all historical property parcel information is recorded in the Register of Deeds office, but not maintained digitally.

Property parcels are an FGDC framework data layer and support several of the Smart Growth elements including “Land Use,” “Transportation,” and “Community Facilities.”

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
4	4	4	**12**	4	4	2	4	4	**18**

8.5.3. Property Owner and Assessment

The property owner and assessment information refers to the tax listing data and any related property assessment information about a property parcel. Information after 2007 is in CLT-IAS which is based in Oracle. Older information is in hard copy. Information from 1999 to 2007 is also stored in older applications. Information about the meaning of various data fields is documented with the CLT-IAS software. The property parcel data layer and the property owner and assessment database use a common PIN. Historical information is stored within the CLT-IAS system and hard copy files.

This information is maintained by the Assessor within the CLT-IAS application software. The information is used by most departments including Assessor, Finance/Treasurer, Engineering, Planning, Building Inspection, MPU, Police, and Fire. Basic property owner and assessment information is available on the City’s website, although it is not directly integrated into the County/City GIS Portal Land Records Viewer. There are links to some of the assessment information.

Property owner and assessment information is not an FGDC framework data layer, although it is closely related to the property parcel data layer. It does support the “Issues and Opportunity” Smart Growth element since a variety of accurate and recent demographic and housing data can be inferred from the information.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
3	3	4	**10**	4	4	3	4	4	**19**

8.5.4. Easements

For simplicity, easements are the right to use land that you do not own. There are many types of easements, the most common being ingress and egress easements (road and driveway) and utility-related easements.

Some public access easements is a data layer on the base.dgn file maintained by Engineering. Engineering also maintains a card index of some public access easements. MPU, Engineering, DPW/Business, Assessor, Building Inspection, and Planning all use or have expressed an interest in easement information. It is possible that the Assessor may be interested in easement information as it may affect a property’s value. MPU will

map utility easements as they are found in subdivisions, CSMs, and deed documents; however, they clearly state that it is not a complete inventory of all the easements that may exist. MPU has not typically shared easement information they have outside of their department, and Engineering has not typically published easement information.

The easement data layer by Engineering and MPU is mapped in MicroStation. There is no attribute data associated with the easement data layer. The Clerk has some easement information in a WordPerfect table and organized by township-range-section.

Easements are not an FGDC framework data layer. Easements may be used for the "Transportation and Utilities" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
2	4	4	**10**	1	3	2	2	2	**10**

8.5.5. Cemetery Lot Information

Cemetery lots are grave sites that can be, or have been, sold. They are considered part of the cadastral system since they are land records.

DPW/Cemetery is the primary user of cemetery lot information. DPW/Cemetery maintains the attributes of the cemetery lots, while Planning/GIS maintains the boundary lines.

Cemetery Information Management System (CIMS) software is a cemetery lot management application. The data associated with the cemetery lots within the CIMS application is fairly complete. Cemetery staff can query on the software to determine if a lot has been sold, to whom it was sold, the party(ies) who can be, or are buried there, and an array of information about the person who is buried there. This information is used for both cemetery management and genealogical research. Permit forms are also being scanned into CIMS. The data is primarily accessed through CIMS software, and can also be accessed through other ArcGIS software outside of the CIMS software. The public has access to cemetery lot information either on-site or via a PDF map on the City's internet website.

Cemetery lot information is not an FGDC framework data layer, but is used for the "Community Facilities" and "Cultural Resources" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	4	**9**	2	4	3	4	4	**17**

8.6. Building and Structures

For the purposes of this report, buildings are permanent structures typically having a roof and walls and intended for shelter, housing or enclosure. A structure is anything that is constructed or erected that requires location on the ground and that may or may not be occupied by people.

8.6.1. Site Plans

Site plans are scale diagrams of a property showing all the structures, parking, and storage locations. Site plans may also have addresses shown for properties that have multiple buildings such as apartment complexes. Site plans typically refer to existing site layouts, but may also refer to proposed site plans when a specific development is being reviewed by the City.

Planning maintains site plan files. Assessor, Building Inspection, Engineering, MPU, Fire Department, Police, and Planning maintain *existing* site plans to some degree:

- The Assessor may have some site plan information for properties with multiple buildings that are assessed separately to aid in identifying the correct building.
- The Building Inspector may receive some site plan information with an application for a permit.
- MPU may maintain some site plan information that shows the location of their assets on large properties.
- The Fire Department maintains site plans for buildings (businesses, offices, etc.) that have general public access. This is used for pre-planning activities, table-top exercises, inspections, and fire calls. Fire Department site plans are kept in binders in each of the trucks, and may sometimes be out of date. Typically, these site plans will depict a sketch of the property, utilities, hazards, hydrants, water mains in the area, transformers, and substations.
- Planning maintains the final site plans approved as part of the City's development review.

Some site plan information such as property boundaries and aerial photos are available on the County/City GIS Portal Land Records Viewer. Other information used for site plans such as building footprints are available from the City for purchase.

Site plan information is primarily hard copy plans. Aerial photos are often used to supplement hard copy site plan information. Some site plan information is available as part of the planimetric dataset (for example, fences, storage areas, alleys, parking areas, buildings, trees, etc.). The site plan information is largely kept within the department that maintains them and is not shared in a formal manner. Each department has its own method of maintaining the site plan information, if it is maintained regularly. Several departments also expressed an interest in specific information that can be shown on site plans:

- Building Inspection, Police, Fire and Assessor expressed an interest in maintaining the actual location of Knox boxes. Knox boxes are safes that store a building's keys or entry codes.
- Building Inspection, Police and Fire expressed an interest in maintaining the actual location of hazardous materials that are stored on a property or the general location within a building.

- Building Inspection and Fire expressed a need for the location of the utility shut-off locations for a property or structure. It is likely that MPU and DPW/Operations have this information.

Site plans are not an FGDC framework data layer. They can directly support the land use element and may also support the housing element in addition to indirectly support other Smart Growth elements, such as “Utilities,” “Community Facilities,” or “Economic Development.”

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	3	**8**	1	1	1	1	2	**6**

8.6.2. Property Photographs

Property photographs are street-level photography of a property or structure.

Property photographs are maintained and used by the Assessor. Police and Fire mentioned it would be useful to view property photographs. Other departments that typically have to visit sites may also find access to property photographs useful. DPW/Cemetery is currently adding photographs of gravesites and headstones into the CIMS system.

The photos are stored using Landisc software and can be made available to external applications. No information about where the photo was taken or pointed is stored in the digital photo file.

Property photographs are not an FGDC framework data layer. They only indirectly support several of the Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	3	**6**	2	4	3	2	4	**15**

8.6.3. Buildings

Often called building footprints or building outlines, buildings are the outline of the structure at the ground level. Building footprints have a wide variety of uses ranging from engineering applications, public safety, land use planning, and economic development.

Planning/GIS had created a building footprint data layer through the 2005 planimetric acquisition. The building footprints are periodically updated by MPU using site plan and plats of survey submitted with building permits. The Assessor maintains a separate building footprint dataset entirely within the CLT-IAS application. The Fire Department

has a building identifier for use in their Firehouse software. Many departments mentioned their use of building footprints including Engineering, MPU, Assessor, Planning, Building Inspection, and Fire. It is also likely that most other departments have some need for building footprint information. Building footprint information is not available on the public County/City GIS Portal Land Records Viewer, but is available on the employee access site.

The building layer is maintained in MicroStation, by MPU, in the bldg.dgn file. No attributes are associated with the building footprints; however, some attributes could be assumed based on the parcel in which the building is located. The Assessor's CLT-IAS and Fire's Firehouse software does identify buildings individually, but this is not tied to the building footprint layer.

Buildings are not an FGDC framework data layer. However, site plan information directly supports the land use element and may also support the housing element in addition to indirectly supporting other Smart Growth elements, such as "Utilities," "Community Facilities," or "Economic Development."

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	4	**9**	2	4	2	2	2	**12**

8.6.4. Floor Plans

Floor plans are scale diagrams of the rooms, spaces, and other major features for each level of a structure.

Building Inspection maintains floor plans of most buildings in association with a building permit. The Fire Department maintains floor plans of major public buildings that are copies, or based on the floor plans from Building Inspection. The Police Department has also expressed an interest in having better access to floor plans, but only maintains floor plans of the largest public buildings. The Assessor may also find floor plans useful.

Floor plans are stored as hard copy drawings

Floor plans are not an FGDC framework data layer, nor directly support any of the Smart Growth elements. Floor plans may indirectly support the "Economic Development" or "Community Facility" elements depending on the specific building.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	3	**6**	1	1	1	1	3	**7**

8.7. Infrastructure

Infrastructure is the structures and facilities that the City and MPU use to provide services to the City residents, businesses, and visitors.

8.7.1. City Property

City property is City-owned real estate and other fixed assets. The Clerk is responsible for maintaining all the official documents; the Assessor for the value of the land; and the Finance/Treasurer for the value of all other properties. Building Inspection is also responsible for buildings and grounds maintenance.

City property is tracked by the following offices: Clerk, Assessor, and Finance/Treasurer. City property information is also used by Engineering, DPW/Operations, Parks & Recreation, Planning, and Building Inspection.

The Clerk has a WordPerfect document index of all City property. City real estate is maintained in the same manner as property parcels within the CLT-IAS application.

City property is not an FGDC framework data layer and is used for the "Community Facilities" Smart Growth element. For the purpose of this dataset assessment, City property will primarily refer to City owned real estate, as other City property, such as equipment, is covered in other sections.

FGDC	Smart Growth	Users	Importance Total		Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	3	4	**8**		3	3	2	3	3	**14**

8.7.2. City Trees

City trees are trees located in the public right-of-way and City-owned property. Parks & Recreation has recently gone through a process where all the trees within City parks (cemetery, etc.) have been mapped, inventoried, and evaluated. City trees within the right-of-way have been evaluated and are in the process of being mapped. General tree outlines were acquired with the planimetric mapping that was performed in 2005.

Parks & Recreation is responsible for maintaining the City tree data layer. MPU and Planning have discussed the need for information on City trees.

This information is stored in the StrataPoint software application. At this time, the City tree information is only available with Parks & Recreation using the StrataPoint software. StrataPoint is an ESRI MapObjects based application, and the data is stored in Shapefile format which is readable by other GIS software. The planimetric tree data layers are stored in both DGN and Coverages. There is no link between the planimetric tree data layers and the StrataPoint trees.

City trees are not an FGDC framework data layer, but are used for the "Community Facilities" Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	3	3	**7**	2	4	3	4	3	**16**

8.7.3. Water System

The water system is the potable water system and all related assets including mains, laterals, valves, and hydrants.

MPU is responsible for maintaining water system information. The Finance/Treasurer, Planning, Engineering, Parks & Recreation, Building Inspection, and Fire Departments all use water system information.

All of the water information is assigned a unique number based on a file drawer number. The water geometry is maintained in MicroStation. Infrastructure outside the City limits is mapped. ArcView 3.x software is used to view the MicroStation DGN, which is linked via the MSlink field to dBase (DBF) files with tabular data. The DBF also is hyperlinked to scanned images related to the facility. The ArcView 3.x, DGN, and DBFs are available on laptops for field use. The DBFs are exported from an Oracle database.

MPU also maintains work order files for every water main that details the facilities on that facility. This file is in MS Excel and is not linked to the water main geometry. None of the facilities are linked to CIS (Customer Information System), which has consumption history, current owner, cross connections, inspections, meter change outs, pressure zoning, meter readings, etc. Service cards show detailed information about the location of assets.

The water system is not an FGDC framework data layer, but is used for the “Utilities” Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	3	3	**7**	2	4	3	4	3	**16**

8.7.4. Electrical System

The electrical system is the electrical distribution system maintained by MPU.

MPU is responsible for maintaining the electrical system information. Planning, Engineering, Parks & Recreation, Building Inspection, and Fire Departments also have a need for electrical system information

The information is maintained in MicroStation. The MicroStation geometry is not linked to a database; however, MPU does use MS Access to access an Oracle database with pole information. Within the database, there is a pole identifier that is used within MicroStation. There is also a location number that is based on a grid system used with the original set of hard copy maps. The pole ID is only unique when used in combination with the location number. The DGN only has the pole ID and not the location number, and therefore, is not currently linkable to the database. The database has very detailed information about the equipment that is installed on a pole.

The electrical system is not an FGDC framework data layer, but is used for the “Utilities” Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	3	3	**7**	2	4	3	3	4	**16**

8.7.5. Sewer System

The sewer system is the sanitary sewer system and related assets.

Engineering maintains the information about the sewer conveyance system, while Wastewater maintains information about the treatment plant. Finance/Treasurer, Planning, Engineering, Parks & Recreation, and Building Inspection all use sewer system information. The public has access to some sewer system information via the County/City GIS Portal Land Records Viewer.

The information is maintained in MicroStation. Maintenance history is tracked in an MS Access database and linked to the MSlink of the mainline pipe. Infrastructure outside the City limits is not mapped, which can be a problem when it is annexed into the City.

The sewer system is not an FGDC framework data layer, but is used for the “Utilities” Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	4	**7**	4	4	2	3	3	**16**

8.7.6. Stormwater System

The stormwater system is the manmade rain runoff drainage system and related assets.

Engineering maintains the information about the stormwater system. Finance/Treasurer, Engineering, DPW/Operations, Planning, Building Inspection, and Fire all use stormwater system information. The public has access to some stormwater system information via the County/City GIS Portal Land Records Viewer.

The stormwater information is maintained in MicroStation. Maintenance history is tracked in an MS Access database and linked to the MSlink of the mainline pipe. Operational information, such as whether a filter on a catch basin is still present, is not tracked. Pond locations are GPSed and maintained in a separate Shapefile.

The stormwater system is not an FGDC framework data layer, but is used for the “Utilities” and possibly the “Natural Resources” Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	3	4	**8**	4	4	2	3	3	**16**

8.7.7. Site Infrastructure

Site infrastructure refers to infrastructure located outside of the public right-of-way, but on City-owned and maintained property. Site infrastructure for smaller properties such as City Hall are relatively simple compared to larger sites with multiple buildings and structures. Infrastructure information for the zoo, cemetery, and larger developed parks may be needed from time to time.

There is no known mapping of site infrastructure within the zoo, cemetery, or within developed park property. However, there are some MicroStation design files that have park building information.

The site infrastructure is not an FGDC Framework data layer, but is used for the "Utilities" and the "Community Facilities" Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	3	3	**7**	1	1	1	1	1	**5**

8.7.8. Pavement Information

Pavement information is information about the roadway's pavement and drainage system such as pavement type, age, and curb and gutter.

This information is maintained by Engineering. It is also used by both Engineering and DPW/Operations.

This information is maintained in the PAvement Surface Evaluation and Rating (PASER) and Wisconsin Information System for Local Roads (WISLR) applications. PASER is an MS Access based application. A variety of information is stored in PASER such as condition, type, and thickness. However, information about pavement markings is not included. Some of this information is difficult to display visually, and a sealcoat date map is still maintained in hard copy. This information is not linked to any road centerline dataset.

Pavement information is not an FGDC framework data layer, but is used for the "Transportation" Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	2	**5**	2	4	3	2	4	**15**

8.7.9. Traffic Signals

Traffic signal information is the location, type, and timings of traffic control lights, including the location of the control box. This information is maintained by DPW/Operations on a hard copy map and MicroStation (intersection layout and timings) by Engineering.

Traffic signals is not an FGDC framework data layer, but is used for the "Transportation" Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	2	**5**	1	1	1	1	3	**7**

8.7.10. Traffic Counts

Traffic counts are the volume of traffic on a particular segment of public right-of-way.

Engineering maintains this information on hard copy maps and a spreadsheet of counts by street. Planning also uses traffic count information in conjunction with Police.

The public has access to traffic count information from scanned intersection summary sheets on the City's website as well as WisDOT's website.

Traffic counts is not an FGDC framework data layer, but is used for the "Transportation" and "Economic Development" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	4	**9**	4	3	2	1	3	**13**

8.7.11. Transit System

Transit system information is the routes, stops, and ridership volumes of the public transit system

This information is maintained by DPW/Transit. The public uses information from hard copy route maps and schedule lists for transit information. The hard copy route maps can be found, in digital form, on the City's website and GIS portal page. Planning/GIS does have routes and stops in Shapefile format.

The location of routes and stops are maintained on a hard copy map. Daily ridership is stored in a spreadsheet by route and day. Individual stop volume is not tracked. A more detailed spreadsheet is used to estimate the location of a bus at any time throughout the day, but real-time location information is not available, which can be problematic during bad weather. DPW/Transit also has some additional information on Americans with Disabilities Act populations for specialized program eligibility.

The transit system is not an FGDC framework data layer, but is used for the "Transportation" and "Economic Development" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
3	3	4	**10**	4	1	1	1	3	**10**

8.7.12. Municipal Signage

Municipal signage is information about the location and type of City signage for such purposes as traffic, parking control, street systems, and way-finding.

DPW/Operations maintains the municipal signage information. Municipal signage information is used by DPW/Operations, Engineering, and Planning.

Information about municipal signage is stored within an MS Access database. The MS Access database is used on laptops in the field. The location of a sign is described in the database, and exact coordinates of the sign are not available.

Municipal signage is not an FGDC framework data layer, but is used for the "Transportation" Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	3	**6**	2	4	2	2	3	**13**

8.7.13. Public Works Routes

Public Works routes are the travel patterns of various DPW/Operations such as snowplowing, salting, and leaf/brush collection. For snowplow routing, each truck is assigned a specific route. As a route is completed, they are called in, and the time is recorded on a hard copy map. The truck may then be assigned to help complete another route. Some private streets are snowplowed, which are paid for by special assessment. Salting is not tracked and is often assigned when complaints are called in by the public or police. Leaf and brush collection is by area of the City and done on a weekly basis. The quantity of leaf/brush picked up is tracked by truck. Street sweeping is tracked by the number of miles swept. The weed crew (right-of-way mowing) routes are also assigned.

This information is primarily maintained by DPW/Operations. Engineering, Planning, Police, Fire, and the Mayor's Office also use public works route information.

The public works routing information is largely kept on hard copy maps and files.

Public works routes are not an FGDC framework data layer, but they are used for the "Community Facilities" Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	3	**6**	1	1	1	1	3	**7**

8.7.14. ROW Permits

Right-of-way permits are permits for ***private*** work that is performed in the public right-of-way. This also includes permits where a road cut is required.

Engineering uses an MS Access application for tracking street openings; this is exported to an Excel list that DPW/Operations uses.

Right-of-way permits are not an FGDC framework data layer and are not used for any Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	1	2	**4**	3	4	2	2	3	**14**

8.7.15. Project Locations

Project locations are the location of various ***public*** work by MPU, Engineering, DPW/Operations, or Parks & Recreation.

The location of projects is maintained by the respective department doing the work. Finance/Treasurer and Planning use information about project locations.

The location of Capital Improvement Program (CIP) for logistics and budget purposes is tracked on hard copy. The Springbrook application software will have a work order application that DPW/Operations will use.

Project locations are not an FGDC framework data layer, but may be if it concerns a new transportation route. It is also used for the "Community Facilities," "Utilities," and "Transportation" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	3	**8**	2	1	1	1	2	**7**

8.7.16. DPW Agreements

DPW agreement information concerns the approval granted to a property owner to use part of the right-of-way. Typically, this is for access over unimproved right-of-way such as walkway steps that extend into the right-of-way, or canopy or signs that cross over the right-of-way boundary. This also includes declaration of restrictions that may prohibit utilities to be placed within the improved street within a specific time frame, or agreements prohibiting street access. Insurance documentation may also be kept with the agreements.

Information is largely maintained by DPW/Business. This information is also used by Planning.

There is no index of agreements, but all agreements are filed by the Clerk by Common Council date.

DPW agreements are not an FGDC framework data layer and are not used for any Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	1	3	**5**	3	3	1	2	2	**11**

8.7.17. Special and Delayed Assessments

Special assessments are used for utility and road improvements that are paid by the property owner fronting or benefiting from the improvement. Delayed assessments are special assessments that are paid by the property owner of an unimproved property when the property fronting the improvement is developed years later.

Engineering, Finance/Treasurer, Clerk, Planning, and Building Inspection are all involved in the special and delayed assessment process.

The Clerk has a WordPerfect document of all special assessments. Engineering maintains a hard copy color-coded map of special assessments kept in the Clerks backroom. Copies of the agreements are attached to the map. Infrastructure outside the City limits is not mapped, which can be a problem when such lands are annexed into the City, and a delayed assessment is in place.

Special and delayed assessments are not an FGDC framework data layer and are not used for any Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	1	4	**6**	2	3	1	2	2	**10**

8.7.18. Other Infrastructure Systems

From time to time, Engineering will commission or conduct an engineering study. A general index or map of the completed studies does not exist.

MPU also maintains steam, hot water, and fiber utility systems. This information is largely mapped in MicroStation. Some database information may also exist, but not to the extent of the water or electrical utility. No other departments mentioned a need for information on these utility systems; however, Planning may need it for economic

development and comprehensive planning purposes, and Police and Fire may need steam and hot water utility information for major incidents.

The location and specifications of warning sirens are also maintained by Fire on hard copy.

8.8. Districts

Districts refer to the administrative and regulatory districts used by the City and MPU.

8.8.1. Official Map

The Official Map is the planned width and location of City streets, parkways, erosion hazard areas, waterways and future City facilities.

This information is used by both Engineering and Planning. Official Map information is available on the County/City GIS Portal Land Records Viewer.

The Official Map data layer information is maintained by Engineering and Planning in MicroStation. It is also converted into Shapefiles by Planning. There are no attributes associated with the official map data layer.

The Official Map is not an FGDC framework data layer, but is used for the "Transportation," "Community Facilities," "Land Use," and "Implementation" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	4	**9**	4	4	2	2	3	**15**

8.8.2. Zoning Districts

The City's comprehensive zoning map identifies zoning districts, erosion hazard areas and Planned Unit Development (PUD).

This is maintained in an ESRI file geodatabase by Planning/GIS. Engineering, Assessor, and Building Inspection also use zoning district information. Zoning information is available on the County/City GIS Portal Land Records Viewer.

Rezoning petitions and past zoning information is not tracked.

Zoning districts are not an FGDC framework data layer, but are used for the "Land Use" and "Implementation" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	4	**9**	4	4	2	4	3	**17**

8.8.3. Election Districts

Election districts refer to the election wards and Aldermanic district boundaries.

The Clerk is responsible for elections, and Planning/GIS creates the district maps. County Supervisor districts are available on the County/City GIS Portal Land Records Viewer, and City Aldermanic and Wards are available on a PDF on the City's website. The districts are maintained in Shapefile format.

Election districts are not an FGDC framework data layer and are not used for any Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	1	4	**6**	4	4	2	4	3	**17**

8.8.4. Other Districts

The boundaries of other districts are largely kept in MicroStation or shapefiles. These district maps may be used by multiple departments:

- Official City Boundaries - MicroStation
- Extraterritorial Jurisdictional Limits – shapefile
- TIF and other specialty districts - shapefile
- Assessor's Neighborhoods – CLT database linked with PIN to parcel
- McGruff and Neighborhood Watch Districts - shapefile
- Annexation summary – file geodatabase

8.9. Facilities and Equipment

8.9.1. Facilities Scheduling

Facilities scheduling refers to the location of and reservations for various Parks & Recreation facilities. This information is maintained by Parks & Recreation. Police, Fire, DPW/Operations, and MPU all have a need for facility scheduling information. The public is able to schedule Parks & Recreation facilities online.

ActiveNet software (was ClassNet) from ActiveCommunities is used to schedule facilities. This application is based on the Oracle platform. Within the software application, the facilities are all named and numbered, such as “Tennis Court 2” or “North Basketball Court.” There is no map of facility names.

Facility scheduling information is not an FGDC framework data layer and can be used for the “Community Facilities” Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	3	4	**8**	4	4	3	2	4	**17**

8.9.2. Equipment Location

Equipment location refers to the specification and present location of various City equipment (both motorized and non-motorized). DPW/Operations is responsible for all motorized equipment (vehicles, mowers, power washers, chainsaws, etc.). Parks & Recreation and DPW/Operations also have additional non-motorized equipment (barricades, benches, tents, chairs, etc.). All DPW/Operations equipment is stored at the DPW building, while Parks & Recreation equipment is kept in various places around the City and is transported to the needed location depending on what activity/event is scheduled.

The Clerk maintains a list of all City-owned equipment. Parks & Recreation and DPW/Operations also maintain lists of their equipment.

OPerations Software (OPS) is used by Parks & Recreation and DPW/Operations to track maintenance schedules and operational costs for all motorized equipment. OPS is an MS Access based application.

Equipment location information is not an FGDC framework data layer and may only be indirectly related to several Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	3	**6**	2	4	3	2	3	**14**

8.10. Uses and Events

Uses and events refer to permits and activities that take place within the City.

8.10.1. Building and Occupancy Permits

Building and occupancy permits refer to the various permits issued for construction or modification of a structure and the occupation of a structure.

Building Inspection maintains building and occupancy permit information. Engineering and the Assessor use building and occupancy permit information. The public will also request permit history for a property.

Permit information is currently within the Banner software application and is in the process of migrating to the Springbrook software application.

Building and occupancy permit information is not an FGDC framework data layer and may only be indirectly related to "Housing" and "Economic Development" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	3	**6**	2	4	3	2	4	**15**

8.10.2. Fire Inspections

Fire inspections are the annual inspections performed by the Fire Department for all public buildings and apartments with more than three units. There are about 1,600 inspections done annually.

Firehouse application software is used to manage the inspection information. Most of the information is tracked by address and each building is assigned an ID number. The information within the Firehouse software may be useful for Building Inspection and the Police.

Fire inspection information is not an FGDC framework data layer and is not used for the Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	1	3	**5**	2	4	3	2	4	**15**

8.10.3. Special Events

Special events refer to the location and nature of special events, such as the farmers' market, parades, and fireworks. This includes the location and nature of various activities within the special event area, as well as ancillary issues such as traffic control, parking,

restrooms, tents, tables, chairs, etc. Parks & Recreation will host 30 to 45 special events in a year.

The Clerk is primarily responsible for the routing of special event information. Planning, Parks & Recreation, Mayor's Office, DPW/Operations, Police, and Fire may all be involved in the planning, risk control, and carrying out of special events.

There is no centralized dataset of special event information. Aerial photos and building and structure information are used during the planning of larger events. Parks & Recreation may use their facility scheduling application for smaller events.

Special event information is not an FGDC framework data layer and can be used for the "Cultural Resources" and "Economic Development" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	3	**8**	2	1	1	1	3	**8**

8.10.4. Business Licenses

Business licenses refer to the various business licenses issued by the Clerk and includes liquor/soda, bartenders, garbage haulers, Christmas tree sales, cabaret, circus/fair, mobile and manufactured homes, taxi, electrical contractors, weights and measures, and pawnshops.

This information is maintained by the Clerk.

Business license information is kept in hard copy and digital WordPerfect documents. There is a subject index card file kept by the Clerk.

Business license information is not an FGDC framework data layer and may be used for the "Economic Development" Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	2	**7**	3	1	1	2	3	**10**

8.10.5. Commercial Signs

Commercial signs include the location and information about billboards and other business signage.

This information is maintained by Planning. It is also used by Building Inspection.

Commercial sign information is stored in hard copy files. Animated sign information is in shapefile format.

Commercial sign information is not an FGDC framework data layer and may be used for the “Economic Development” Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	4	3	**8**	1	3	1	1	3	**9**

8.10.6. Recycling and Garbage Information

Recycling and garbage information is the list that recycling and garbage hauler companies use to identify City residents and businesses uses. These lists are used to see which recycling and garbage hauler companies residents are using to make sure the City is not being billed for non-resident customers.

DPW/Business receives the lists and performs the comparison.

The lists are received on hard copy prints from the recycling and garbage hauler companies. The comparison is largely done manually.

Recycling and garbage information is not an FGDC framework data layer and is not used for any of the Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	1	2	**4**	1	3	1	1	3	**9**

8.10.7. Complaint Information

Complaints from the public about City services or nuisance properties are typically received by the Mayor’s Office or DPW/Business for public works related operations.

The Mayor’s Office receives a wide variety of complaints. DPW/Business will typically receive complaints about unshoveled sidewalks or uncut lawns.

The Mayor’s Office does not track complaints. DPW/Business related complaint information is tracked in MS Access. Digital photos are taken of DPW/Business complaints. Engineering tracks sidewalk complaints in MS Access. Complaints are going to be tracked with a future module in Springbrook.

Complaint information is not an FGDC framework data layer and may indirectly be used for the "Transportation," "Utilities," and "Community Facilities" Smart Growth elements.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	2	3	**6**	1	1	1	1	4	**8**
1	2	3	**6**	3	4	1	2	3	**13**

Note - top line is for the Mayor's Office, and the bottom line is for DPW/Business.

8.10.8. Accident Information

Accident information is the location and events surrounding Police investigated vehicle accidents. The Fire department also participates in the investigation if a fire was involved.

Accident information is also used by Engineering.

This information is maintained by the Police in the records management system. Engineering receives hard copy reports from the Police.

Accident information is not an FGDC framework data layer and may be used for the "Transportation" Smart Growth element.

FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
1	3	2	**6**	2	4	3	2	4	**15**

8.10.9. Other Uses and Events

The location of other uses and events are kept in a variety of formats including hard copy files, lists, maps, spreadsheets, and databases. This information is largely attribute information and location information that could be linked up via an address or PIN:

- Neighborhood information with maps
- Community living arrangements
- Crime mapping
- Dog licenses
- Downtown businesses – Main Street Program
- Economic development
- Fire events – Assessor, Building Inspection
- Occupant of a building
- Other permits
- Park amenities – Planning
- Parking

- Plan Commission graphics
- Sex offenders
- Frequently flooded areas
- Spill events for stormwater and sewer
- Towers and antennas
- Utility consumption

9. Dataset Assessment

9.1. Assessment Summary

A total of 43 datasets have been ranked by importance and assessment.
Importance of the datasets:

- Only a few (five) of the City and MPU datasets are FGDC framework layers, most are not. This is not unexpected since the FGDC framework layers are the most basic datasets needed at the federal level. Local data has more detailed data needs.
- A majority (thirty-seven) of the City and MPU datasets are related to at least one of the Wisconsin Smart Growth Elements. This means that a majority of these datasets can be used to support comprehensive planning for the City.
- A majority (thirty-seven) of the City and MPU datasets are used by multiple departments. Many (nineteen) datasets are used by the public.

Assessment of the datasets:

- Most datasets are at least available through specialized software. Only a few datasets are available using standard software or through a web browser.
- Most datasets are made up of information that can be processed by software.
- Most datasets have basic documentation either through a data dictionary or through Commercial-Off-The-Shelf (COTS) software. Only a few have metadata-level documentation or no documentation.
- Most datasets are geometry-only or attribute-only datasets. Only a few datasets have integrated geometry and attribute data.
- Most datasets have just the information that is needed to do the current task. While this is somewhat a subjected rating, it is also reflective on the breadth of information associated with the dataset.

Ranking Summary by Importance

Dataset	FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
Addressing	4	4	4	**12**	4	4	2	2	3	**15**
Aerial Photos	4	4	4	**12**	4	4	4	2	3	**17**
Elevation	4	4	4	**12**	4	4	4	2	3	**17**
Property Parcels	4	4	4	**12**	4	4	2	4	4	**18**
Easements	2	4	4	**10**	1	3	2	2	2	**10**
Geodetic Control	4	2	4	**10**	2	4	4	2	3	**15**
Property Owner	3	3	4	**10**	4	4	3	4	4	**19**
Transit System	3	3	4	**10**	4	1	1	1	3	**10**
Buildings	1	4	4	**9**	2	4	2	2	2	**12**
Cemetery Lots	1	4	4	**9**	2	4	3	4	4	**17**
Official Map	1	4	4	**9**	4	4	2	2	3	**15**
Traffic Counts	1	4	4	**9**	4	3	2	1	3	**13**
Zoning Districts	1	4	4	**9**	4	4	2	4	3	**17**
City Property	1	3	4	**8**	3	3	2	3	3	**14**
Commercial Signs	1	4	3	**8**	1	3	1	1	3	**9**
Facility Scheduling	1	3	4	**8**	4	4	3	2	4	**17**
Project Locations	1	4	3	**8**	2	1	1	1	2	**7**
Site Plans	1	4	3	**8**	1	1	1	1	2	**6**
Special Events	1	4	3	**8**	2	1	1	1	3	**8**
Stormwater System	1	3	4	**8**	4	4	2	3	3	**16**
Business Licenses	1	4	2	**7**	3	1	1	2	3	**10**
City Trees	1	3	3	**7**	2	4	3	4	3	**16**
Electrical System	1	3	3	**7**	2	4	3	3	4	**16**
Sewer System	1	2	4	**7**	4	4	2	3	3	**16**
Site Infrastructure	1	3	3	**7**	1	1	1	1	1	**5**
Water System	1	3	3	**7**	2	4	3	4	3	**16**
Building Permits	1	2	3	**6**	2	4	3	2	4	**15**
Complaints – DPW	1	2	3	**6**	3	4	1	2	3	**13**
Complaints – Mayor	1	2	3	**6**	1	1	1	1	4	**8**
Accidents	1	3	2	**6**	2	4	3	2	4	**15**
Election Districts	1	1	4	**6**	4	4	2	3	3	**16**
Equipment Location	1	2	3	**6**	2	4	3	2	3	**14**
Floor plans	1	2	3	**6**	1	1	1	1	3	**7**
Municipal Signage	1	2	3	**6**	2	4	2	2	3	**13**
Property Photographs	1	2	3	**6**	2	4	3	2	4	**15**
DPW Routes	1	2	3	**6**	1	1	1	1	3	**7**
Special & Delayed Assessment	1	1	4	**6**	2	3	1	2	2	**10**
DPW Agreements	1	1	3	**5**	3	3	1	2	2	**11**
Fire Inspections	1	1	3	**5**	2	4	3	2	4	**15**
Pavement Information	1	2	2	**5**	2	4	3	2	4	**15**
Traffic Signals	1	2	2	**5**	1	1	1	1	3	**7**
Recycling & Garbage	1	1	2	**4**	1	3	1	1	3	**9**
ROW Permits	1	1	2	**4**	3	4	2	2	3	**14**

Ranking Summary by Assessment

Dataset	FGDC	Smart Growth	Users	Importance Total	Accessibility	Structure	Documentation	Data Format	Utility	Assessment Total
Property Owner	3	3	4	**10**	4	4	3	4	4	**19**
Property Parcels	4	4	4	**12**	4	4	2	4	4	**18**
Aerial Photos	4	4	4	**12**	4	4	4	2	3	**17**
Cemetery Lots	1	4	4	**9**	2	4	3	4	4	**17**
Elevation	4	4	4	**12**	4	4	4	2	3	**17**
Facility Scheduling	1	3	4	**8**	4	4	3	2	4	**17**
Zoning Districts	1	4	4	**9**	4	4	2	4	3	**17**
City Trees	1	3	3	**7**	2	4	3	4	3	**16**
Election Districts	1	1	4	**6**	4	4	2	3	3	**16**
Electrical System	1	3	3	**7**	2	4	3	3	4	**16**
Sewer System	1	2	4	**7**	4	4	2	3	3	**16**
Stormwater System	1	3	4	**8**	4	4	2	3	3	**16**
Water System	1	3	3	**7**	2	4	3	4	3	**16**
Addressing	4	4	4	**12**	4	4	2	2	3	**15**
Building Permits	1	2	3	**6**	2	4	3	2	4	**15**
Accidents	1	3	2	**6**	2	4	3	2	4	**15**
Fire Inspections	1	1	3	**5**	2	4	3	2	4	**15**
Geodetic Control	4	2	4	**10**	2	4	4	2	3	**15**
Official Map	1	4	4	**9**	4	4	2	2	3	**15**
Pavement Information	1	2	2	**5**	2	4	3	2	4	**15**
Property Photographs	1	2	3	**6**	2	4	3	2	4	**15**
City Property	1	3	4	**8**	3	3	2	3	3	**14**
Equipment Location	1	2	3	**6**	2	4	3	2	3	**14**
ROW Permits	1	1	2	**4**	3	4	2	2	3	**14**
Complaints – DPW	1	2	3	**6**	3	4	1	2	3	**13**
Municipal Signage	1	2	3	**6**	2	4	2	2	3	**13**
Traffic Counts	1	4	4	**9**	4	3	2	1	3	**13**
Buildings	1	4	4	**9**	2	4	2	2	2	**12**
DPW Agreements	1	1	3	**5**	3	3	1	2	2	**11**
Business Licenses	1	4	2	**7**	3	1	1	2	3	**10**
Easements	2	4	4	**10**	1	3	2	2	2	**10**
Special & Delayed Assessment	1	1	4	**6**	2	3	1	2	2	**10**
Transit System	3	3	4	**10**	4	1	1	1	3	**10**
Commercial Signs	1	4	3	**8**	1	3	1	1	3	**9**
Recycling & Garbage	1	1	2	**4**	1	3	1	1	3	**9**
Complaints – Mayor	1	2	3	**6**	1	1	1	1	4	**8**
Special Events	1	4	3	**8**	2	1	1	1	3	**8**
Floor plans	1	2	3	**6**	1	1	1	1	3	**7**
Project Locations	1	4	3	**8**	2	1	1	1	2	**7**
DPW Routes	1	2	3	**6**	1	1	1	1	3	**7**
Traffic Signals	1	2	2	**5**	1	1	1	1	3	**7**
Site Plans	1	4	3	**8**	1	1	1	1	2	**6**
Site Infrastructure	1	3	3	**7**	1	1	1	1	1	**5**

9.2. Assessment Analysis

The following datasets are rated with high importance (7 and up) and high assessment (13 and up). These datasets are in high value and quality and would be the easiest to make more effective. Thus, they should be the highest priority:

- Addressing
- Aerial Photos
- Cemetery Lots
- City Property
- City Trees
- Electrical System
- Elevation
- Facility Scheduling
- Geodetic Control
- Official Map
- Property Owner
- Property Parcels
- Sewer System
- Stormwater System
- Traffic Counts
- Water System
- Zoning Districts

The following datasets are rated with low importance (6 and lower) and high assessment (13 and up). These are high quality datasets that may be underutilized. Additional uses for these datasets should be investigated, since they may be underutilized because the information they hold is not known by most users. They are the second highest priority since extensive data conversion may not be needed to improve their effectiveness:

- Building Permits
- Fire Inspections
- Complaints – Received by DPW/Business
- Accidents
- Election Districts
- Equipment Location
- Municipal Signage
- Pavement Information
- Property Photographs
- Right-of-way Permits

The following datasets are rated with high importance (7 and up) and low assessment (12 and lower). These datasets are in need of improvement to better serve the City and MPU. It may be more difficult to make these datasets more effective as they may require a substantial amount of effort to improve their effectiveness. Even so, these datasets have a lot of potential. Thus, they are the third highest priority:

- Buildings
- Business Licenses
- Commercial Signs
- Easements
- Project Locations
- Site Infrastructure
- Site Plans
- Special Events
- Transit System

The following datasets are rated with low importance (6 and lower) and low assessment (12 and lower). These datasets can be more difficult to improve and have fewer uses. These datasets may require substantial effort to improve them and once improved, the data may be used in relatively few departments. These datasets are the lowest priority:

- Complaints – Received by Mayor's Office
- DPW Agreements
- Floor Plans
- Public Works Routes
- Recycling and Garbage
- Special and Delayed Assessments*
- Traffic Signals

* Special and Delayed Assessments, while being ranked lower in importance and assessment, should be considered a higher priority because they are a significant source of revenue for the City.

10. Dataset Recommendations

The following are recommendations concerning GIS data for the City and MPU:

10.1. Core GIS Datasets

Often GIS organizations have identified a core set of GIS data. The federal government has identified seven themes (orthoimagery, governmental units, transportation, cadastral, geometric control, hydrography, and elevation/bathymetry) of geographic data that are used by many organizations; they call these themes framework data. Wisconsin has required counties in the preparation of their land records modernization plans to identify foundational elements. Many of these foundational elements are specific datasets that need to be maintained by the County.

Likewise, the City and MPU should identify a core set of GIS data. The characteristics of the core GIS datasets are:

- Maintained by the City or MPU
- Used by multiple departments
- Needed for comprehensive planning
- Used to locate attribute data
- Used as a base in creating additional datasets

Based on these characteristics, the following datasets should be considered core GIS datasets for the City and MPU:

- **Addressing***
- **Aerial Photography**
- **Property Parcels**
- Buildings
- Electrical System
- Elevation
- Official Map
- Sewer System
- Stormwater System
- Water System
- Zoning Districts

The first three proposed core GIS datasets, addressing, aerial photography, and property parcels are critically important. Nearly all the City departments and MPU have a need for this information. In addition, many events are stored in attribute datasets that can be located using addresses or PINs. By linking these datasets to the address or parcel datasets, it is possible to map out those events. Aerial photography is useful for background information, in addition to locating visible features that have not previously been mapped.

*The centerline and point addressing dataset is maintained by the County, but updates are provided by Planning.

The other proposed core GIS datasets can all be used by multiple departments and are useful for municipal planning purposes. Several of the datasets already have a wealth of attribute data that can be associated with the data layer.

A custodian department for the core GIS datasets should also be specifically assigned. This is to avoid duplication of efforts between departments. At this time, the following custodians are proposed for the core datasets:

- **Addressing – Planning**
- **Aerial Photography – Planning/GIS** (currently Engineering)
- **Property Parcels – Engineering**
- Buildings – Engineering proposed (currently MPU)
- Electrical System – MPU
- Elevation – Planning/GIS (currently Engineering)
- Official Map – Planning
- Sewer System – Engineering
- Stormwater System – Engineering
- Water System – MPU
- Zoning Districts – Planning/GIS

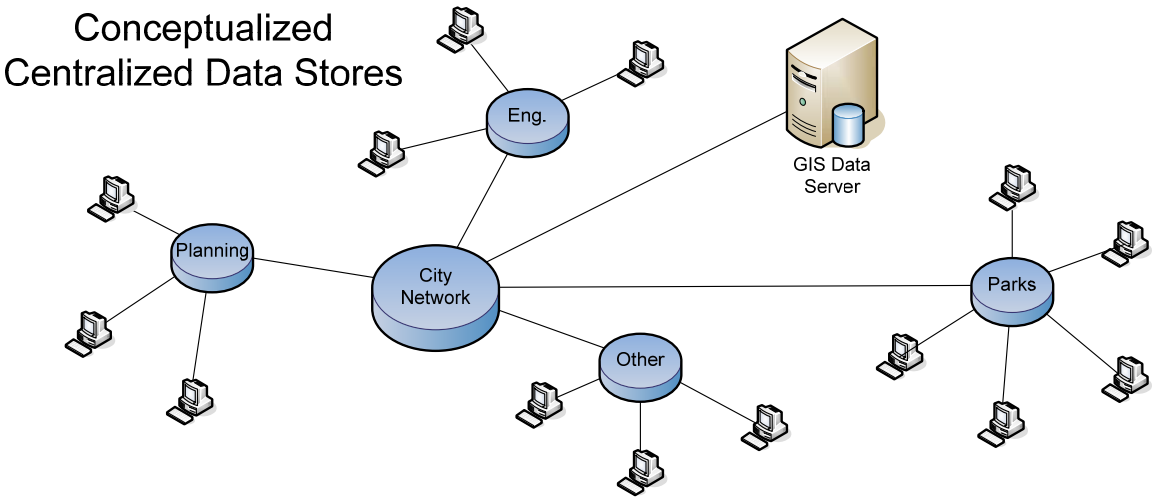
Specific recommendations for the core GIS datasets are made in the dataset recommendation section of this chapter.

10.2. Data Management

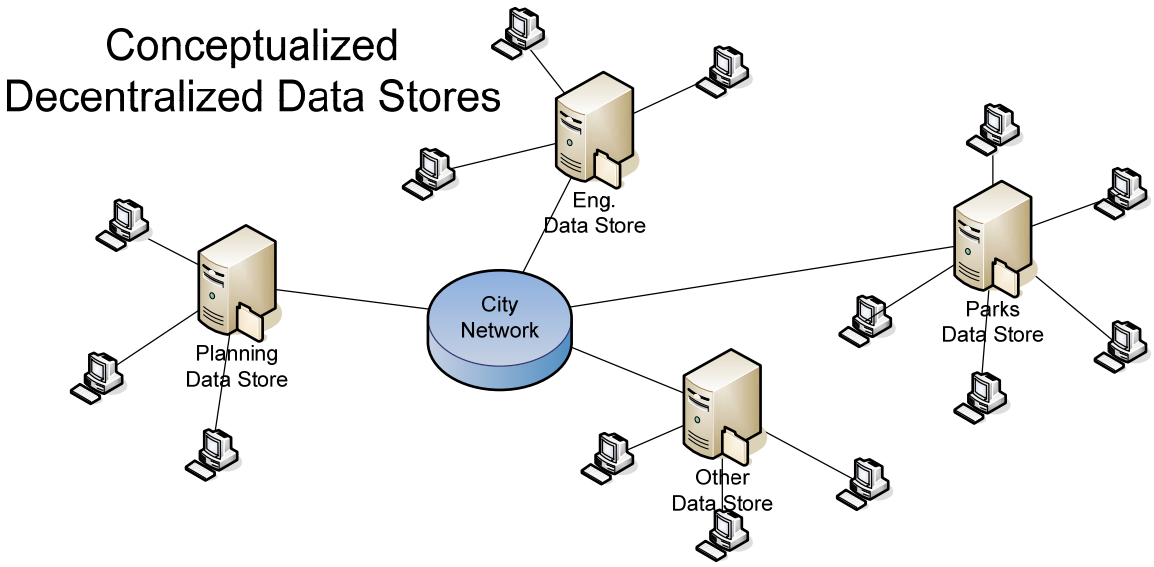
10.2.1. Data Stores Organization

In the most abstract sense, GIS data storage can be either centralized or decentralized. In a centralized system, all departments access the same data source whether they maintain or just use the data. In a decentralized system, the departments have their own data source containing data they use and maintain.

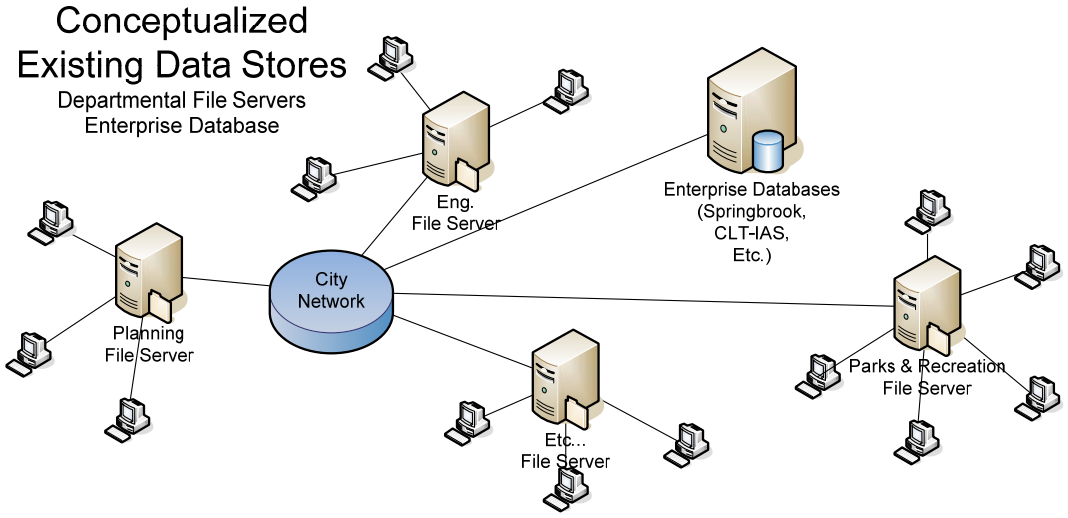
The primary benefits of a centralized data store is a reduction in hardware costs, lower administration costs, more integrated operations, and improved access to data.



The primary benefits of a decentralized data store organization is that it mimics the organizational structure, increases confidence in data stores, increases physical security of data, and is useful when the technical networking capabilities are limited.



With the City and MPU, generally each department has its own file server. The individual department file servers may be located on the same physical server, but security, drive partitions, and folder structure effectively creates individual departmental file servers. Word processing documents, spreadsheets, CAD design files, shapefiles, coverages, and MS Access databases are all stored on the file servers. Enterprise databases applications, such as Springbrook, CLT-IAS, are stored in MS SQL Server or Oracle databases that are run on servers by MPU/EDP. A conceptualized diagram of the existing situation is below:



Within the City and MPU, GIS geometry data – DGNs, Shapefiles, and Coverages – are stored in a decentralized system. Generally, each department stores their geometry data on their department file servers. When another department needs to use it, a copy or conversion is made of the data, and it is placed on the department's file server. GIS attribute data is slightly different. Enterprise-level database applications are obviously stored in a centralized database. However, other attribute data – such as MS Excel and MS Access files – are stored on individual departmental servers and shared in a similar manner as the GIS geometry data.

10.2.2. Data Management Tiers

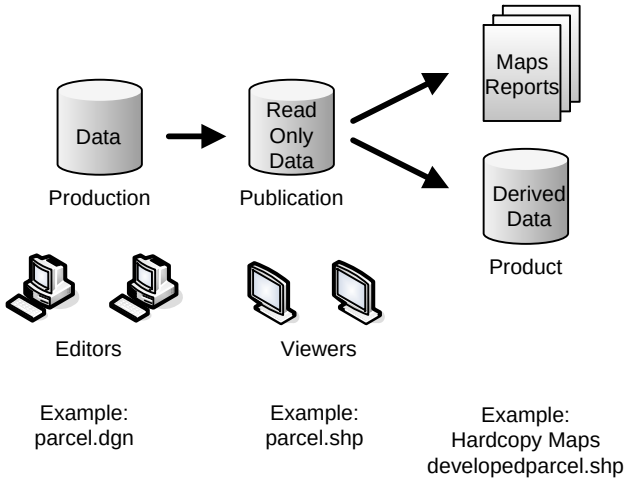
A growing trend is to compartmentalize GIS data into three management tiers: Production, Publication, and Product.

The production tier is where data is maintained and edited. In this tier, the GIS data is in a constant state of change. Both the geometry and attributes can change on a real-time basis. As an example, the parcels.dgn file would be considered part of the production tier since updates are performed on that file.

The publication tier is for users that view the data, but do not change it. The publication data is a copy of the production data. The copies are made on a regular basis, but not in real-time. Continuing our example, the parcel coverages and shapefiles created by Planning would be considered part of the publication tier, since this data is not edited and is a copy (or more correctly, a reformatted copy) of the production data.

The product tier is the data, reports, and maps produced from the publication tier. These are usually the result of a project using GIS data performing a specific task. In our example, a hard copy map showing the parcel data would be considered part of the product tier. Shapefiles created from parcel data that were clipped out of the publication data for specific analysis would also be considered part of the product tier – a derived product of the parcel data.

Data Management Tiers



10.2.3. Data Management Recommendations

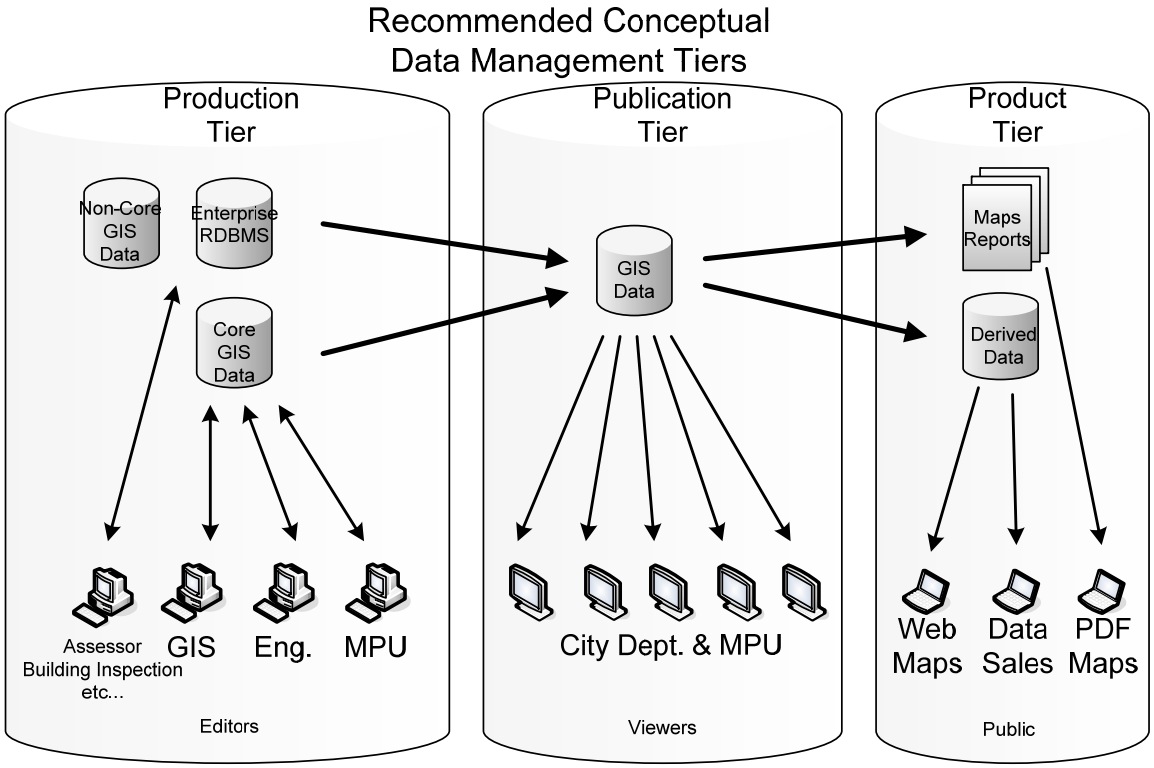
The City and MPU should consider a more structured production-publication-product approach to data management.

Within the production tier, Planning/GIS, Planning, Engineering, and MPU will be responsible for maintaining the core GIS datasets. The other City departments and MPU will continue to be responsible for maintaining their respective non-core GIS datasets and related databases.

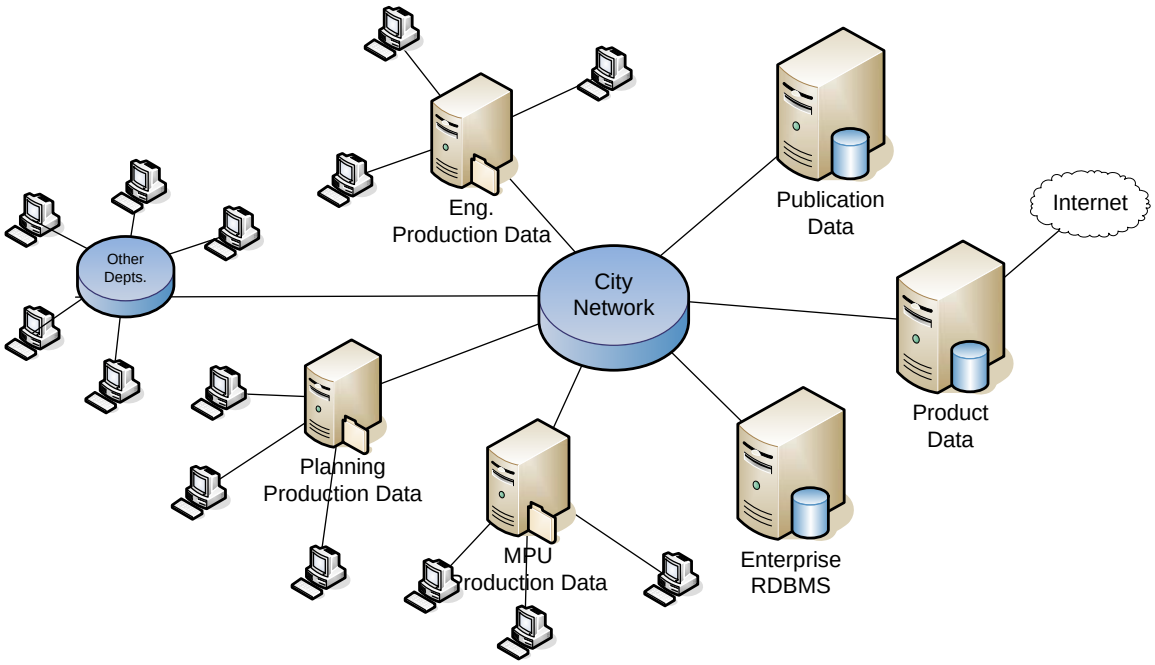
At regular intervals, weekly or monthly, the core GIS datasets, non-core GIS datasets, and related databases will be published to a centralized, generally accessible location on the City network. This publication GIS data will be available to any staff with the

appropriate level of access and software. It is also recommended that the internal County/City GIS Portal Land Records Viewer access the publication tier datasets.

As needed, GIS users will view, analyze, and derive datasets from the publication tier GIS data. These files will be stored on their respective departmental file server on the product tier. PDF versions of hard copy maps will also be stored in the same manner, and as applicable, made available on the City website. For internet security reasons, a copy of publication tier GIS datasets are made and placed on the web server for use by the public County/City GIS Portal Land Records Viewer.



Conceptualized Recommended Data Stores



The following example will help to describe how data moves from production to publication and to the product tiers:

> *Let us first assume that parcels are a core dataset maintained by Engineering. As new plats, splits, and combines are recorded, Engineering will update the parcel map in the Engineering production data tier within the file server that they use. The Assessor maintains the tax listing and assessment data associated with all the parcels. When Planning/GIS finishes the parcel update task, the parcel data is copied to the publication data server along with some of the frequently needed tax listing assessment data such as owner's name, land, and improvement value.*
>
> *Planning maintains the zoning map which is also a core layer. The zoning district boundaries mostly follow parcel boundaries, so when the zoning map is updated, Planning staff use the parcel data layer on the publication server for reference when updating the zoning map. The zoning data layer is maintained on the Planning production data server. When the zoning data layer update task is completed, it too is copied to the publication data server in its final form.*
>
> *As a special request, the former Mayor had requested putting a map on the City's website that promotes underdeveloped commercial and industrial property within the City. To do this, the parcel, assessment, and zoning information is needed. The first step would be to query for all the properties where the assessed improvement value is less than the assessed land value using the parcel information on the publication data server. The next step is to just include those properties that are zoned industrial or commercial, again using the zoning*

information on the publication data server. The project files (such as the MXD map documents and project Shapefiles) are stored in the product data tier, and the final map is put on the City's website as a PDF map.

10.3. Data Formats Recommendations

It is recommended that the core datasets and most of the other datasets be converted to or developed in file geodatabase format. File geodatabases are designed to support the full information model of the geodatabase. This includes topologies, raster catalogs, network datasets, terrain datasets, address locators, in addition to regular feature datasets and feature classes. File geodatabases are designed to be edited by a single user; however, with a file geodatabase, it is possible to have more than one editor at the same time providing they are editing in different feature datasets, standalone feature classes, or tables. Last, file geodatabases are available at all licensing levels (ArcView, ArcEditor and ArcInfo), able to handle very large datasets, perform very well, and can be scaled up to ArcSDE technology very easily.

See the Data Storage Recommendation section of the Applications and Technology chapter for additional information.

10.4. Data Licensing Recommendations

There are several recommendations concerning specific requirements of the existing data license agreement. These recommendations are meant to be discussed in terms of how the data license agreement can be more practical and enforceable.

First, the data license agreement requires the data obtained from the City to be returned to the City upon completion of the project. Since GIS data is by nature digital, and often transmitted electronically, the "return" of digital data seems to be impracticable. For instance, if a company purchases the parcel layer and the City emails it to the company, how would the company return it? An archive of the parcel layer will likely be kept of both the file server and of the email messages. Even if the parcel was mailed on CDROM, an archive copy of the parcel layer will still likely exist from when the parcel layer was stored on the company's servers. Thus, the physical action of returning the CDROM really does not do anything. Depending on the intent of this requirement, a better solution would be to prevent the company from using the data after a certain time period or for a specified use. This would be along the lines of *"Licensee is permitted to use said Licensed Data Sets for a term of one year from the date of this agreement."*

Second, the data license seems to only allow the reproduction or redistribution of GIS data in hard copy form, and that is limited to six hard copies. In the case of development projects, more than six hard copy plan sets are often required for the various approval processes. Thus, in the strictest sense, the data must be repurchased when more than six hard copy plan sets are required. The restriction to hard copy form itself seems too restricted. For instance, the developer may want to provide a site plan on a website to promote the project or for public outreach. Yet, if any of the data was derived under the license agreement, it would be prohibited. If the intent of this restriction is to prohibit the wholesale reselling of GIS data, the data license should specifically state that, rather than limit the number of copies or format.

Third, the license agreement requires that any modifications to the data must be clearly distinguished from the original graphics and described on the hard copy. While this requirement may be practical on plan sets, it is not practical on all of the hard copy maps that may be created using data derived from the GIS data. Likewise, it seems the intent of this is to distance the City from any modifications to the data, but this is already done in the indemnification, disclaimer, and liability sections of the license agreement.

Last, there seems to be a trend away from restrictive license agreements for providing GIS data. Recently, the Wisconsin Supreme Court WIREdata vs. Village of Sussex case brings about questions regarding the copyrighting of government data, and the California Santa Clara County case regarding open records. It would be prudent to discuss the license agreement in light of these cases with the City Attorney.

10.5. Datasets Recommendations

The following are recommendations that the City and MPU should consider to improve the effectiveness of GIS-related datasets. The core datasets are discussed first, followed by the non-core datasets.

10.5.1. Core Datasets

10.5.1.1. Addressing System

As previously discussed, the addressing system is critically important as addresses are the most common way to locate places and things. While the City does have access to the County dispatch address centerline and address points, these layers do not seem to be in use other than within Planning.

- The Planning Department should be assigned the custodian of the addressing system as they assign new addresses. The Assessor should still be responsible for maintaining the mailing addresses of property owners.
- Consolidate the "official" address record, as both the Assessor and Planning (through the County) maintain site addresses. The City should work to identify conflicts between the two inventories and synchronize the systems, so that site addresses are populated through the point address layer. The Clerk also keeps a spreadsheet of valid ranges for voter registration; this too should also be consolidated into the addressing system.
- The various address lists used by City departments and MPU should be periodically updated against the address centerline and points, to determine if the address system mapping can be improved and to discover errors within the address lists.
- The address centerline should be used to standardize street naming, spelling, and abbreviations in the various address lists used by City departments and MPU.
- A list of common place names should be built into the addressing system. One source for place names can be the Parks & Recreation's facility database which describes locations such as "North Tennis Court." This information can be useful not only in dispatching operations, but also future mapping of City services.
- Submit address changes, updates, and corrections to NAVTEQ and TeleAtlas. The public is becoming much more reliant on this information, and having accurate address information on the consumer side is critically important. TeleAtlas: http://mapinsight.teleatlas.com/mapfeedback/index.php

NAVTEQ: http://mapreporter.navteq.com/dur-web-external/secured/submitDur.do

- The data should be converted from Shapefiles and DGNs to an ESRI file geodatabase.

10.5.1.2. Aerial Photography

Aerial photography is arguably the most versatile data layer and is a critical data layer.

- Planning/GIS should be assigned the role as the custodian for aerial photography.
- Funding for the aerial photos would be out of an Engineering line item, rather than contributions by the City departments and MPU, provided the Common Council understands that the aerial photography is used by all the departments and MPU.
- The City should plan and budget for a minimum flight cycle of at least every five years, while a three-year cycle is recommended. The last two flights were digital orthophotography, flown in 2005 and 2000. All prior flights were not in digital file format.
- Every effort should be made to cooperate with Manitowoc County and the surrounding municipalities to reduce the cost of aerial photography.
- The City should be keeping abreast to changes in the cost of aerial photography to determine if it is practical to acquire wavelengths, such as infrared, and other natural color for future applications.
- Oblique photography such as that offered by Pictometry should be considered, but only as a supplement to orthophotography.
- Like address information, the public is using aerial imagery more than ever in consumer mapping sites. The City should consider submitting historical and/or current aerial photography to Google and Microsoft. While some internet traffic may be diverted from the City web mapping tools, it is likely many more users will be able to see high resolution imagery if it is available on the major consumer web mapping sites.
  Google:
  http://earth.google.com/support/bin/request.py?contact_type=government
  Microsoft: Contact: GoVE@microsoft.com

10.5.1.3. Property Parcels

The property parcels are the foundation of many of the data layers and have been well maintained by the City.

- The City should continue updating the property parcel data layers. A property parcel mapping standards manual should be developed.
- The City and County should work together to develop a common data schema that will incorporate the needs of both. This will help to address parcel maintenance and display issues in the extraterritorial jurisdiction of the City. These issues arise as the City has some jurisdictional control over areas outside the City, but property parcels are maintained by the County. Mapping these areas can be problematic as two data formats are used.

- Since the property parcels are used by many departments, a published parcel data layer with commonly needed attribute data should be placed in a publication tier server that is accessible in a read-only manner by nearly all the City departments and MPU.
- A historical "snapshot" archive of the parcel layer that corresponds to the tax file should be kept for historical tracking and potential trend analysis projects.
- The data should be converted and maintained in an ESRI file geodatabase.

10.5.1.4. Buildings

- Ideally, the building footprints should be updated by Building Inspection since they are the department that has the most knowledge concerning changes to the building outline. However, given the technology constraints found in most Building Inspection departments, either Engineering or MPU (who currently maintains) should be identified as the custodian of the building data layer.
- Two building footprint layers are maintained by both MPU and the Assessor and stored in different systems. The City should investigate whether it is practical and efficient to create a process to export the building outlines into the format used by the CAMA system. This will help to eliminate duplicate data entry.
- The City should consider assigning ID numbers to individual buildings and structures. The CAMA system should be investigated as a starting point for this. The Firehouse ID can also be used. The address point data layer may be useful for developing a cross-reference between the systems.
- Each building should also have an address assigned to it. This should be closely integrated with the address point data layer in the addressing system.
- The City should pursue creating three-dimensional buildings with accurate heights, rooflines, and architectural projections. This should be done with the largest buildings and worked down to the smaller buildings. LIght Detection and Ranging (LIDAR) may be able to assist in the creation; however, once created, it should be updated in a manner similar to the building footprint workflow.
- The data should be converted from DGNs and maintained in an ESRI file geodatabase.

10.5.1.5. Electrical System

The electrical system is well maintained by MPU and this should continue.

- MPU should investigate better integration of the GIS and work order system with the electrical system data layers.
- MPU should begin to create a copy of the system with general attribute information that is placed in a publication tier server that is accessible in a read-only manner by nearly all the City departments and MPU.
- The data should be converted from DGNs and maintained in an ESRI file geodatabase.

10.5.1.6. Elevation

The elevation data layers that the City has are suitable for most general municipal applications. While elevation datasets do not change frequently, there are situations when the topography is changed, or when more detailed information is needed.

- Planning/GIS or Engineering should be the custodian of the elevation dataset and perform all the updates to the dataset.

- When grading has been performed, such as during a development project or a road project, the elevation information should be updated using the grading plan.
- When more detailed elevation surveys are conducted, this information should be converted to a format similar to the general City elevation information so that it can be incorporated with other elevation surveys for future needs.
- As needed, other elevation layers should be collected. Potential layers include tree canopy heights, river beds, harbor depths, groundwater table, etc.
- The data should be converted from DGNs and maintained in an ESRI file geodatabase as both line and DTM feature classes.

10.5.1.7. Official Map (62.23(6) Wis. Stats.)

- Planning/GIS should be the custodian of the Official Map and perform all the updates.
- Other Official Map items besides planned right-of-ways should be added if they are part of the adopted Official Map, items such as erosion hazard areas and parkways.
- The data should be converted from DGN and maintained in an ESRI file geodatabase including all attribute data.

10.5.1.8. Sewer System

The sewer system is well maintained by Engineering and this should continue.

- Engineering should investigate a more direct integration between the sewer system geometry and the attribute data stored in MS Access. This would involve storing all the attributes, in addition to the geometry, within the ESRI file geodatabase rather than within a separate database.
- Engineering should begin to create a copy of the system with general attribute information that is placed in a publication tier server that is accessible in a read-only manner by nearly all the City departments and MPU.
- The City should investigate mapping of the sewer system that is within the extraterritorial jurisdiction of the City.
- The data should be converted from DGN and MS Access and maintained in an ESRI file geodatabase including all attribute data.

10.5.1.9. Stormwater System

The stormwater system is well maintained by Engineering and this should continue.

- Engineering should investigate a more direct integration between the stormwater system geometry and the attribute data stored in MS Access. This would involve storing all the attributes, in addition to the geometry, within the ESRI file geodatabase rather than within a separate database.
- Engineering should begin to create a copy of the system with general attribute information that is placed in a publication tier server that is accessible in a read-only manner by nearly all the City departments and MPU.
- The City should investigate mapping of the stormwater system that is within the extraterritorial jurisdiction of the City.
- The data should be converted from DGN and MS Access and maintained in an ESRI file geodatabase including all attribute data.

10.5.1.10. Water System

The water system is well maintained by MPU and this should continue.

- MPU should investigate the integration of the GIS and work order system with the water system data layers.
- MPU should begin to create a copy of the system with general attribute information that is placed in a publication tier server that is accessible in a read-only manner by nearly all the City departments and MPU.
- The data should be converted from DGNs and maintained in an ESRI file geodatabase including all attribute data.

10.5.1.11. Zoning Districts

- Additional information such as approval dates, links to meeting minutes, and the zoning ordinance should be considered for addition to the zoning district dataset.
- At minimum, a yearly historical "snapshot" archive of the zoning district layer should be kept for historical tracking and potential trend analysis projects.
- Planning should begin to create a copy of the zoning district that is placed in a publication tier server that is accessible in a read-only manner by nearly all the City departments and MPU.
- The data is now in an ESRI file geodatabase.

10.5.2. Other Datasets

The non-core datasets that have been identified are very important for City operations. In general, these datasets should be maintained by the data custodian within the department's file server. When updates are made, or at regular intervals, the data should be placed in the publication tier server that is accessible in a read-only manner by nearly all the City departments and MPU.

Priority	Dataset	Custodian	Comments & Recommendations
Highest	Geodetic Control	Eng.	While the County Higway Commission is responsible for maintaining the geodetic control, Engineering should maintain the GIS data layers of the PLSS sections and other benchmarks.
Highest	Property Owner	Assessor	Common property owner information should be incorporated into the publication tier parcel data. Site address information should be synchronized with the addressing system maintained by Planning.
Highest	Cemetery Lots	Cemetery	Maintain the system and conduct general technology upgrades. Use of the Landisc software for linking gravestone photos to cemetery lots should be investigated.
Highest	City Property	GIS	GIS would create this layer based on existing data sources.
Highest	City Trees	Parks & Rec.	Expand to include all trees on City-owned property.
Highest	Traffic Counts	Eng.	Add traffic count information to the road centerline file. Segments could be linked to the scanned count diagrams.

Priority	Dataset	Custodian	Comments & Recommendations
Highest	Facility Scheduling	Various	Using information from the City Property and Building datasets, a specialized dataset with City facilities could be created. This layer should be linked to the OPS (OPerations Software) used by DPW/Business and Parks & Recreation so that facility scheduling can be viewed geographically.
High	Property Photographs	Assessor	Investigate the exporting of property photo information so that it is linked to the property parcel and made available on the publication data tier.
High	Pavement Information	Eng.	Create a road centerline file that can be linked to the PASER database. This can be done using the segment ID numbers within the PASER database, or by creating a linear referencing system.
High	Municipal Signage	Eng.	Create a municipal signage layer that is linked to the signage database.
High	ROW Permits	Eng.	Automate a process that geocodes the right-of-way permit files from the existing database and places the point file on the publication tier data server.
High	Election Districts	GIS	Working with the Clerk, prepare for the 2010 Census redistricting process.
High	Equipment Location	Various	Using the Clerk and the list of City equipment as a basis, a data table could be created so that the equipment is associated with a storage location (again derived from City Property and Buildings datasets). However, since this information is not currently tracked digitally, a database will need to be created and updated by the City departments and MPU. This database would then be tied to the storage location data layer.
High	Building Permits	Building Inspection	Link the building permit to the property parcels via the PIN. Common building permit information should be incorporated into to the publication tier parcel data.
High	Fire Inspections	Fire	The data within the Firehouse software should be investigated to see if it can be linked to the parcel or building. If this is possible, a specialized parcel/building layer may be created that details the hazards found on the property for use by the Police, Fire, and Building Inspection staff.
High	Complaints – DPW	DPW/ Business	Locate the complaint database using the PIN. This process can be automated so that a point file is placed on the publication tier data server.
High	Accidents	Police	Investigate how accident information from the records management system can be exported and mapped.

Priority	Dataset	Custodian	Comments & Recommendations
Medium	Easements	Eng., MPU	Eng. and MPU should make a concentrated effort to map their respective easements for the sewer, stormwater, electric, and water utilities.
Medium	Site Plans	GIS	A map series or atlas should be created that incorporates existing GIS datasets into the creation of site plan information for larger properties. Additional site information data layers (such as knox boxes) should also be created and maintained by GIS. This map series will be available on the product data tier, but not made available to the public.
Medium	Site Infra-structure	Eng.	Begin the process of mapping City infrastructure on City property in the same manner as City infrastructure within ROW.
Medium	Transit System	DPW/ Transit	Digitize the route and stop information. Consider publishing this data to Google using the Transit Feed. http://code.google.com/transit/spec/transit_feed_specification.html
Medium	Project Locations	GIS	Because multiple departments are involved, GIS would maintain the project location file. On a regular basis, GIS would require departments to provide information about the location and specifics of major projects. GIS would update this data layer that would be available on the publication tier and possibly the product tier for public information.
Medium	Special Events	Various	Locate geographically the data with ActiveNet software by geocoding to the place name (address dataset) information. This process can be automated so that a point file is placed on the publication tier data server.
Medium	Business Licenses	Clerk	Create a database that stores business license information. This information would then be located by linking it to a location using the PIN, address and/or building ID. This process can be automated so that a point file is placed on the publication tier data server.
Medium	Commercial Signs	Planning	Create a data layer with the relevant commercial sign information.
Low	Floor plans	GIS	The floor plan dataset is rated as a low priority due to the amount of effort that would need to be accomplished to make this an effective dataset. That said, it is recommended to begin the process of scanning floor plan sets and linking the floor plans to the PIN, address, and/or building ID. While GIS would initially be the custodian of this dataset, it would be more efficient if Building Inspection would become the custodian once regular maintenance begins after the initial conversion has been completed.
Low	Traffic Signals	Eng.	Create a traffic signal data layer.

Priority	Dataset	Custodian	Comments & Recommendations
Low	Public Works Routes	DPW/ Busines	The public works routes dataset is rated low due to most of the data is in hard copy form and would have to be digitized. The effectiveness once digitized would also be limited until additional attribute data and real-time location could be added. That said, it is recommended to add public works routing information to the road centerline file.
Low	DPW Agreements	Eng.	Create and maintain a data layer with all the known agreements.
Low	Special and Delayed Assessments	Eng.	This dataset is rated low because there is no set workflow in place for managing special and delayed assessments. While being ranked lower in importance and assessment, this dataset should be considered a higher priority because they are a significant source of revenue for the City. This is further discussed in the Operational Procedures Chapter. Once a workflow is in place, a data layer with all the known assessments and necessary data will need to be created.
Low	Recycling and Garbage	DPW/ Business	Geocode the lists from the haulers to determine whether a customer is receiving garbage pickup and following City ordinance.
Low	Complaints – Mayor	Mayor's Office	Create a database that stores complaint information received. This information would then be located by linking it to a location using the PIN, address, and/or building ID. This process can be automated so that a point file is placed on the publication tier data server.

Applications and Technology

11. Applications and Technology Introduction and Purpose

The GIS software applications will be assessed and discussed. Non-GIS applications are discussed in terms of how they could better integrate with GIS. It is beyond the scope of this project to assess or evaluate the non-GIS applications outside of how they might be better integrated with GIS technology. For example, it is not the purpose of this document to discuss whether the Firehouse software is the best fire records management software for the City. However, it is within the scope of this project to discuss how Firehouse software can be integrated with GIS technology.

The software and applications used by the City and MPU are described in terms of what they do and which departments use them. The GIS applications are discussed first, followed by the related non-GIS applications. Computer hardware (specifically servers, desktops and network connectivity) are then described.

A GIS application assessment follows. This describes three alternative GIS platform architectures that could be used by the City and MPU. Desktop GIS software, data storage, and web mapping software are discussed for each GIS platform. Methods for spatially enabling the related applications are then discussed.

Recommendations are presented for the GIS software platform, followed by the recommendations for the desktop GIS software, data storage, and web mapping. Recommendations for spatially enabling the related applications are presented.

12. GIS Applications

There are three GIS applications used by the City and MPU: ArcGIS Desktop, MicroStation, and commercial mapping websites. These applications are used for data visualization, management, and analysis.

12.1. Bentley MicroStation

MicroStation is a CAD software product for design and drafting, developed and sold by Bentley Systems. Engineering, MPU, and Planning use MicroStation for both design and mapping functions. Engineering uses MicroStation to maintain several City datasets including the property parcels, sanitary sewer, stormwater, and PLSS. MPU uses MicroStation to maintain the electrical and water utility datasets.

MicroStation is primarily a CAD product; however, it does have some capabilities associated with GIS software. The primary limiting factor with MicroStation is the inability to store complex attribute information within a DGN file. Attribute support is made by using the MSlink (an internally generated object identifier) that holds related data in a separate database. This set also limits the ability to perform attribute-based queries within the MicroStation software itself. Spatial analysis is also limited as it is more difficult to perform queries such as finding the length of sewer mains upstream from a particular manhole. However, some overlay analysis, area, length and volume calculations are easily performed.

12.2. ESRI ArcGIS Desktop

ESRI is the software company that produces ArcGIS Desktop. ArcGIS Desktop provides data and tools to create, edit, import, map, query, analyze, and publish geographic information. ArcGIS Desktop products include ArcInfo, ArcView and the ArcGIS Desktop extensions.

The City currently holds two licenses for ArcInfo. One license is dedicated to the GIS Technician; the other one is shared between Planning and Engineering. The City also has four licenses for ArcView. These are single-seat licenses (not floating/concurrent) used by Planning, Engineering, and the Assessor's office. The City also has one license for ArcPad. Software maintenance fees are shared with the County, resulting in cost savings for the City. MPU stated that they use ArcView 3.x (also known as ArcView GIS) for viewing data on laptops in the field.

ESRI has the largest share of the GIS software market. The ArcGIS Desktop software has most matured in the past few years, as there have not been any major changes in functionally and software design since the release of Version 9 in 2004. ESRI has started issuing more regular service packs for the software. As such, the software has stabilized and is less prone to crashes. ArcGIS Desktop supports a wide variety of GIS formats. Extensions for specific uses can also be purchased separately to increase the functionality of the software.

12.3. County/City GIS Portal Land Records Viewer

The County/City GIS Portal Land Records Viewer application is used by City departments, MPU, and the public to view some of the GIS data layers and associated attribute information. As its name implies, it is a joint effort between the City and County. The application is based on ArcIMS, which is an ESRI software product.

12.4. Commercial Mapping

Commercial mapping is roughly defined as a mapping system that the public uses. The most common examples are Google Maps, MapQuest and Microsoft Visual Earth.

Several departments stated that they do use commercial mapping services for information such as aerial photos or finding an address.

Commercial mapping websites are not GIS. They do not support complex data editing requirements or advanced analysis tools; however, they do offer a simple and effective way to view geographic information.

13. Related Applications

The City and MPU use many different software applications. The following applications are used, or could be used, in combination with GIS technology for geographical-based visualization and analysis capabilities.

13.1. ActiveNet

ActiveNet, from The Active Network, is a software application for scheduling activities and facilities. The software was previously known as ClassNet. The software describes the facility by a specific name and has various attributes about the facility. The software is used solely by Parks & Recreation. It is based on the Oracle platform.

There is no mapping component within the software, and the only locational information is by place name ("Tennis Court 3"). It is likely that if the various facility locations were mapped, they could be linked by using the place name or an ID within the ActiveNet software. Once the link is established, the scheduling of the activities and facility could be viewed geographically.

13.2. CherryLAND

CherryLAND from CherryLAN systems is a land records index and retrieval application implemented by Manitowoc County Register of Deeds. Assessor, Planning, Engineering, and Building Inspection are able to access the system for various recorded documents.

13.3. Cemetery Information Management System

Cemetery Information Management System (CIMS) is a cemetery records management application from Ramaker & Associates. Cemetery uses CIMS to map and record information for each cemetery lot. The software is based on ESRI technology and can be accessed using ESRI software outside of the CIMS application.

13.4. CLT-IAS

CLT-IAS (CLT is Cole Layer Trumble) from Tyler Technologies is the Computer Aided Mass Appraisal (CAMA) system used by the Assessor's office. It is based on the Oracle platform. On a weekly basis, building inspection permit information is imported automatically into the system.

There is no mapping component within the software. However, since it makes use of a PIN, most of the data within the CLT-IAS can be mapped by using the parcel data layer. Some of the tables may need to be summarized so that there is only one record for each PIN (a one-to-one or many-to-one join).

13.5. Customer Information System

Customer Information System (CIS) is the application used by MPU for utility billing and work orders. It is based on the Oracle platform.

The water data is exported to tables joined with the water system data layers within ArcView to provide detailed information in the field.

13.6. Engineering Databases

Engineering has created several MS Access based applications. These are used for tracking permits and utility asset information. The utility information is linked to the MicroStation DGN files by the MSlink field. It might be possible to map the permit information by geocoding the addresses.

13.7. Firehouse

Firehouse from Affiliated Computer Services is the records management system used by the Fire Department. The Fire Department uses this software to track and report on incidents and for inspection information.

There are some basic mapping capabilities with the Firehouse software. This seems to be done through geocoding although a latitude-longitude can be entered. It is likely that incident and inspection information can be exported and geocoded using street addresses.

13.8. Landisc

Landisc by CLT is an image management system used by the Assessor to manage property photos. The property photos are indexed within the database and stored by the PIN. This application is integrated with CLT-IAS.

Since the property photos are associated with PINs, they can be geolocated and mapped even though the photos themselves do not store any location information within the photo EXIF header.

13.9. New World

New World System's Aegis application software is used by the Police Department in cooperation with Manitowoc County for records management and joint dispatch operations.

There are some basic mapping capabilities with the New World software. This seems to be done through geocoding although a latitude-longitude can be entered. It is likely that incident information can be exported and geocoded using street addresses.

13.10. OPS

OPS (OPerations Software) is a software application used by Parks & Recreation, DPW/Business, and Wastewater for job and maintenance tracking.

There is no mapping component within the software, and the only locational information is by place name (Park Shelter 4). It is likely that if the various facility locations were mapped, they could be linked by using the place name or an ID within the OPS. Once the link is established, the maintenance history for the facility/equipment could be viewed geographically.

13.11. PASER

PASER (PAvement Surface Evaluation and Rating) is a software application originally developed by UW-Madison for evaluating the conditions of roadways. It has since been replaced by WISLR (Wisconsin Information System for Local Roads). However, PASER is still in use by many municipalities including Manitowoc. Engineering is also using WISLR.

The PASER application itself does not have a mapping component. Other municipalities have linked the PASER database to road centerlines by assigning the PASER ID to the centerline segment. Issues can develop when a segment needs to be split, or when the pavement condition varies by the side of the road.

13.12. Springbrook

The City is transitioning to the Springbrook software application as its major municipal software application. Most City departments will use Springbrook software for financial information. Treasurer and Finance will make heavy use of the financial applications. Building Inspection will rely on Springbrook for permit management. DPW will utilize Springbrook for work orders and customer information. The software uses a Progress Database which has Open DataBase Connectivity (ODBC) interfaces.

Springbrook does not have mapping capabilities. It is likely that data within Springbrook can either be located and mapped using a PIN or addresses.

13.13. StrataPoint

StrataPoint application software is used by the Parks & Recreation department to manage the City's park tree and shortly, street tree inventory. The software uses ESRI technology and has mapping capabilities. The location of the trees can be placed using aerial photos or by entering a coordinate. The tree data can be exported as a shapefile and be accessed using ESRI software outside of the StrataPoint application.

14. Department Application Summary Matrix

	Assessor	Building Inspection	Clerk	Finance	Fire	Mayor's Office	Parks & Recreation	Planning	Planning/GIS	DPW/Business	DPW/Fleet and DPW/Operations	Engineering	DPW/Transit	DPW/Cemetery	Manitowoc Public Utilities	Police	Wastewater	Library/ Museum
GIS Applications																		
Bentley MicroStation								X	X			X			X			
ESRI ArcGIS Desktop	X							X	X			X			X			
Related Applications																		
ActiveNet							X											
CherryLAND	X	X						X				X						
CIMS														X				
Land Rec. Viewer	X	X				X	X	X	X	X	X	X			X	X	X	
CLT-IAS	X	X																
CIS															X			
DPW Databases									X	X	X	X						
Firehouse					X													
Landisc	X																	
New World																X		
OPS							X				X						X	
PASER												X						
Springbrook	X	X	X	X	X		X	X		X		X			X			
StrataPoint							X		X									

15. Servers, Desktops and Connectivity

MPU/EDP is responsible for the servers used by the City and MPU. The City uses both UNIX and Windows-based servers. The UNIX server is used for applications built on Oracle, while Windows servers are used for applications built on a SQL Server. Servers are located at each of the City and MPU buildings. MPU/EDP does make use of virtual servers.

In general, there is no database preference (Oracle verse SQL Server). Custom databases are developed using SQL Server.

Desktop PCs are generally on a four-year replacement schedule for both the City and MPU. Most desktops are Windows XP. Windows Vista is avoided. Most users get the standard MS Office suite, while some high end users receive MS Office Professional. Infrequent word-processing and spreadsheet users receive Open Office instead of MS Office. Power users will get higher end workstations, but most users receive a standard PC.

MPU maintains a fiber optic network system that is used by the City and MPU, in addition to a few customers. The network connects MPU, City Hall, Public Safety Building, Library, all fire stations, the DPW building, and the County Courthouse building.

16. GIS Application Assessment

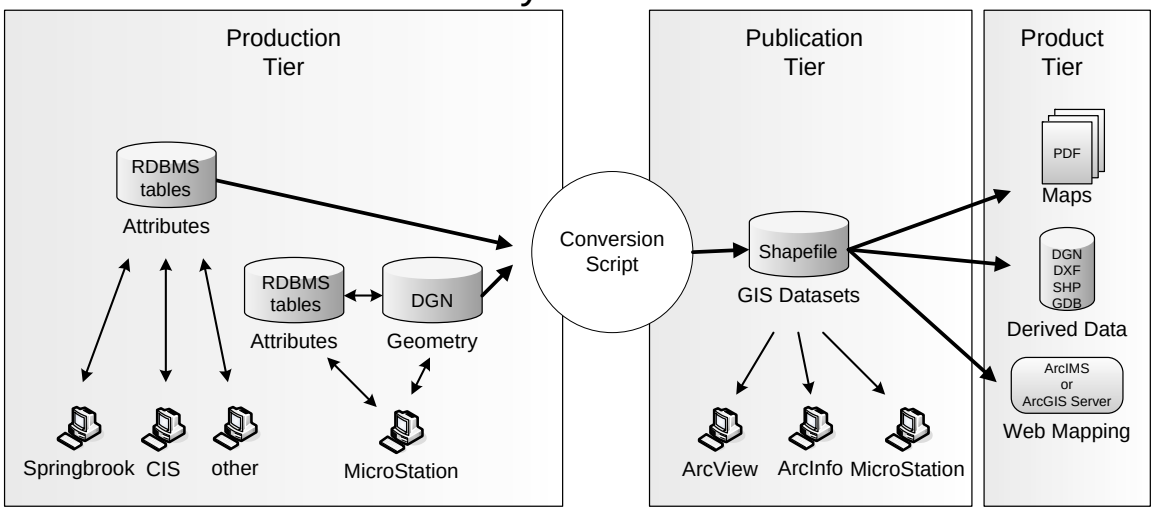
As a starting point, three alternative GIS software platforms will be discussed and evaluated. The three alternatives are:

- Bentley / ESRI Mix
- Bentley-Only
- ESRI-Only

16.1. Bentley / ESRI Mix

The Bentley / ESRI Mix alternative is essentially maintaining the current GIS technology architecture at the City and MPU. Desktop GIS software, data storage, and web mapping systems with the City and MPU are discussed in this alternative, followed by an example process.

Bentley / ESRI Mix



Advantages

The advantages to this alternative are that it preserves much of the existing structure currently found in the City and MPU. Several staff within the City and MPU are already accustomed to working with MicroStation, and they will continue to be able to use MicroStation to maintain the dataset's geometry. With this alternative, no additional software would need to be purchased.

Disadvantages

The disadvantages to this alternative are that the dataset attribute data will need to be stored in a separate database. A conversion script would need to be created that merges the DGN geometry and database attributes into a Shapefile. ESRI software would then be used for map making and analysis since this cannot be done in MicroStation. Only a few people would be knowledgeable in ESRI software and would be relied upon for analysis and map making.

16.1.1. Desktop GIS

MicroStation, ArcInfo, and ArcView would be used as desktop GIS software. MicroStation would be used to edit the geometry data (linework). Attributes would be maintained separately in a database and edited using another application. ArcInfo and

ArcView would be used to view the GIS data and perform the analysis. They would also be used to create hard copy maps and PDFs, derive data, and to prepare data for web mapping.

MicroStation is a CAD software by Bentley Systems. It also serves as the foundation for other extensions and capabilities by Bentley.

ArcView is the base licensing level of ESRI's ArcGIS Desktop software. Its focus is on data viewing, mapping, and analysis.

ArcInfo is the highest level of licensing and functionality of ESRI's ArcGIS Desktop software. It adds advanced editing and analysis capabilities.

16.1.2. Data Storage

Within the production tier, Bentley MicroStation is used for maintaining most of the City and MPU GIS dataset geometry. MicroStation DGN files would store the geometry. Dataset attributes would be stored in separate databases. A process to publish this data in shapefile format would be used to join the MicroStation geometry to the attribute datasets using the MSlink field. The process can be automated as needed. A similar process is already done with the parcel datasets, and further scripts could be created to automate the other core GIS datasets.

The data would be stored in the publication tier using the ESRI Shapefile format since both the geometry and attributes are stored together. ESRI software would primarily be used to view and analyze the data. Bentley MicroStation and other software have the ability to convert ESRI Shapefile data if some departments need to use it in non-ESRI software. ESRI geodatabases are not recommended since few non-ESRI software read the format directly. Bentley does offer a separate product that allows the ESRI SDE geodatabase to be used with MicroStation, but the City is not currently using SDE.

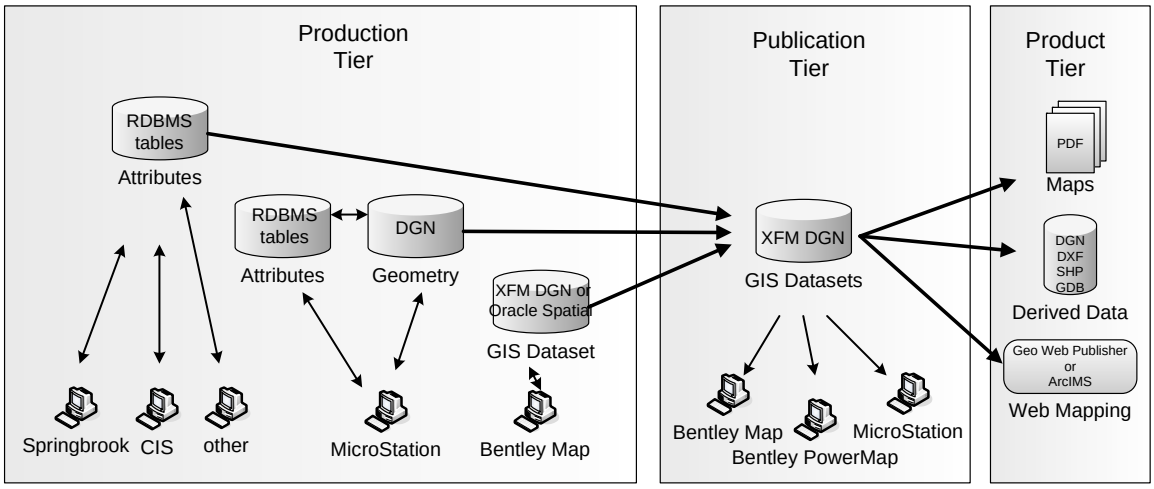
16.1.3. Web Mapping

The current County/City GIS Portal Land Records Viewer uses ArcIMS. The City and MPU can use ArcIMS to serve the published shapefiles on the web. The City and/or County may also choose to move to the ArcGIS Server web mapping platform which can also serve the published shapefiles.

16.2. Bentley-Only

In the Bentley-Only alternative, Bentley software would only be used to perform GIS tasks. Desktop GIS software, data storage, and web mapping systems within the City and MPU are discussed in this alternative, followed by an example process.

Bentley Only



Advantages

The advantage to this alternative is that only Bentley software is used. This should lower software maintenance costs within the City and MPU by bundling the software

Disadvantages

The disadvantages to this alternative are that there are few users of Bentley Map or Bentley Power Map within the area. An email was sent out to the Wisconsin Land Information Officer's internet listserv asking if anyone used Bentley Map/Power Map. There were no responses. Sales representatives from Bentley were also contacted to find out what municipalities in the Midwest were using Bentley Map/Power Map, and no response was received.

City and MPU staff would need to be trained in Bentley Map/Power Map as no one within the City has any experience with this software.

16.2.1. Desktop GIS

Since MicroStation by itself does not have the ability to store attributes, another software package from Bentley would be needed. Bentley Map and Bentley PowerMap are software products specifically designed for GIS tasks. They both enhance underlying MicroStation capabilities with the ability to store attribute data and perform traditional GIS-type analysis.

MicroStation is used to create geometry data in the production tier. Dataset attributes would be stored in separate databases. Bentley Map or PowerMap would then be used to create both geometry and attribute data. The geometry and attribute data can be stored as XFM-DGN or within Oracle Spatial. Within the publication tier, Bentley Map or PowerMap could be used to access the XFM-DGN files, join with the non-spatial enterprise databases, and perform other GIS based tasks. MicroStation would also be able to access the data layers stored in the publication tier.

MicroStation is a CAD software by Bentley Systems. It also serves as the foundation for other extensions and capabilities by Bentley.

Bentley Map adds GIS capabilities to MicroStation. It allows for editing, mapping, and analysis of GIS datasets.

Bentley PowerMap offers similar functionality to Bentley Map; however, it does not require MicroStation. It allows for editing, mapping, and analysis of GIS datasets.

16.2.2. Data Storage

As stated before, by itself MicroStation DGNs do not hold attribute data. A separate database that is linked to the DGN MSlink field would need to be maintained.

Otherwise, Bentley Map can use either Oracle Spatial or XFM-DGNs to store geometry and attribute data. The XFM-DGN format is analogous to an ESRI geodatabase. Bentley describes the XFM-DGN as:

> *"With XFM, geospatial data can also be created and maintained without connecting to an RDBMS. XML configuration files (metadata), called the XFM project, reside in the folder structure of a XFM project and are managed by the Bentley Geospatial Administrator. When a disconnected working environment is desired, property tables are replaced by XML fragments and stored in the DGN file, directly linked to the graphical elements as geographic objects. These "XFM DGN" can be edited by Bentley Map disconnected from an RDBMS."*

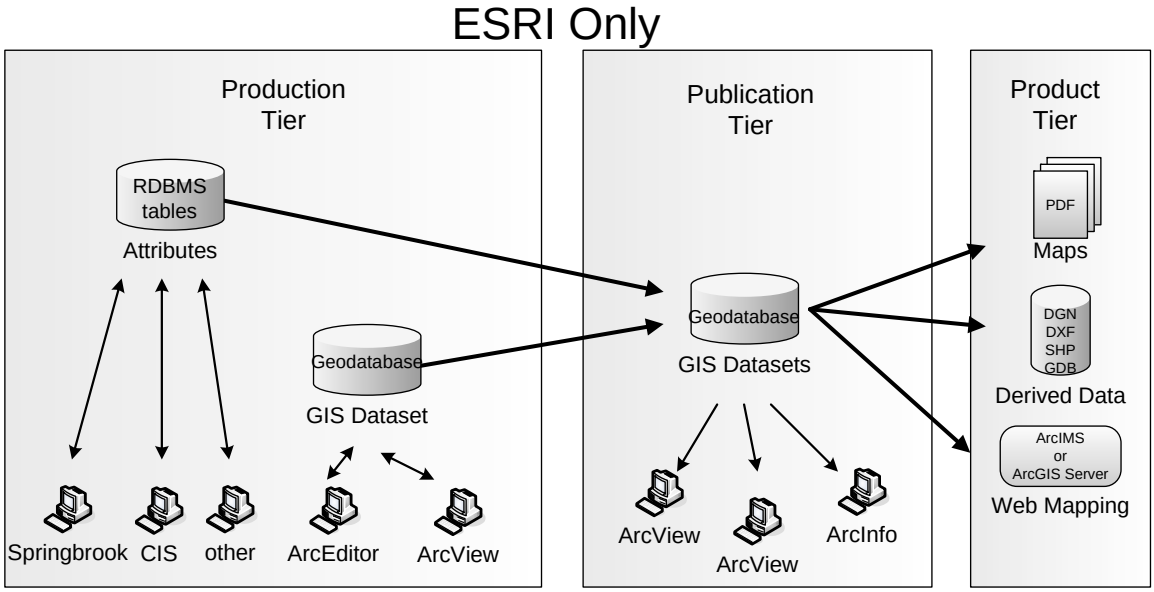
16.2.3. Web Mapping

The current County/City GIS Portal Land Records Viewer uses ArcIMS. The City and MPU can continue to use ArcIMS to serve the DGNs on the web. ArcMap Image Server would have to be used and ArcView is needed to create the MXD file that reads the DGNs. The County currently maintains the MXD and this would continue.

Bentley also offers Geo Web Publisher which is similar to the capabilities in ArcIMS.

16.3. ESRI-Only

In the ESRI-Only alternative, ESRI software would only be used to perform GIS tasks.



Advantages

The process for maintaining both the GIS geometry and attribute data is simplified since one application is used. There are also more opportunities for data sharing with the County. The data would remain in the same format in both the production and publication data tiers. Informal learning opportunities are possible due to the state-wide use of this software.

Disadvantages

The disadvantages to this alternative are that new software will need to be purchased, which can be expensive. Datasets will need to be converted from MicroStation to ESRI. Staff will need to be trained in maintaining their designated GIS datasets. An export routine will need to be developed to produce a formatted DGN file.

16.3.1. Desktop GIS

In most cases, either ArcEditor or ArcView licenses would be used within the production tier to maintain the data. Staff using the publication data would be connecting to geodatabases, and in most cases, using either ArcInfo or ArcView licenses[10].

ArcView is the base licensing level of ESRI's ArcGIS Desktop software. Its focus is on data viewing, mapping, and analysis.

ArcEditor is the middle level of ESRI's ArcGIS Desktop software. It adds additional editing functionality. All of the ***editing*** capabilities, incluing COGO (COordinate GeOmetry), that is available in ArcInfo, is available in ArcEditor.

ArcInfo is the highest level of licensing and functionality of ESRI's ArcGIS Desktop software. It adds advanced geoprocessing ***analysis*** capabilities.

[10] A matrix of the functionality available at each licensing level is available at: http://www.esri.com/library/brochures/pdfs/arcgis931-functionality-matrix.pdf

16.3.2. Data Storage

There are several types of ESRI geodatabases. File geodatabases are recommended to be used, but personal geodatabases (MS Access based) or desktop geodatabases (included with ArcInfo, SQL Server Express based) could also be used. Shapefiles are not recommended due to their lack of ability to store annotation.

16.3.3. Web Mapping

The current County/City GIS Portal Land Records Viewer uses ArcIMS. The City and MPU can continue to use ArcIMS to serve the geodatabase on the web. The City and County can also migrate to ArcGIS Server Standard which has web mapping capabilities.

16.4. Hypothetical Examples

In the data assessment chapter, an example was used to describe how data moves from the production to the publication tier. Based on that example, a hypothetical process is examined to see the difference in each of the three alternatives. This is helpful to understand how the workflows may be different depending on the alternative chosen.

Example of Bentley / ESRI Mix Alternative

Parcels are a core dataset maintained by Engineering. The parcels are stored as a DGN and maintained using MicroStation. As new plats, splits, and combines are recorded, Engineering will update the parcel map accordingly. The Assessor maintains the tax listing and assessment data associated with all the parcels. When Engineering finishes the parcel update task, a script is run (either manually or automatically) that converts the DGN to a Shapefile and adds the tax listing assessment data such as owner's name, land, and improvement value as additional fields.

Planning maintains the zoning map. The zoning district boundaries tend to follow parcel boundaries, so when the zoning map is updated, Planning staff use the parcel data layer on the publication server for reference when updating the zoning map. The parcel Shapefile on the publication tier server is imported for reference when adjusting the zoning boundaries. When the zoning data layer update task is completed, it is exported as a Shapefile and placed on the publication data server.

As a special request, the former Mayor had suggested putting a map on the City's website that promotes underdeveloped commercial and industrial property within the City. Using ESRI software, a map of all the properties that meet the specified criteria would be created using the parcel and zoning Shapefile data on the publication server.

Example of Bentley-Only Alternative

Parcels are a core dataset maintained by Engineering. The parcels are stored as DGNs and maintained using MicroStation. As new plats, splits, and combines are recorded, Engineering will update the parcel map accordingly. The Assessor maintains the tax listing and assessment data associated with all the parcels. When Engineering finishes the parcel update task, the DGN is copied to the publication tier server and a map is created that merges the DGN linework and combines the tax listing assessment data such as owner's name, land, and improvement value to a XFM-DGN.

Planning maintains the zoning map. The zoning district boundaries tend to follow parcel boundaries, so when the zoning map is updated, Planning staff use the parcel data layer on the publication server for reference when updating the zoning map. The zoning data layer is stored and maintained using the Bentley Map in XFM DGN format. The parcel DGN on the publication tier server is loaded into the Bentley Map for reference when adjusting the zoning boundaries. When the zoning data layer update task is completed, it is copied onto the publication data server.

As a special request, the former Mayor had suggested putting a map on the City's website that promotes underdeveloped commercial and industrial property within the City. Using Bentley PowerMap, a map of all the properties that meet the specified criteria would be created using the parcel and zoning XFM DGN data on the publication server.

Example of ESRI-Only Alternative

Parcels are a core dataset maintained by Engineering. The parcels are stored as a file geodatabase and maintained using ArcEditor. As new plats, splits, and combines are recorded, Engineering will update the parcel map accordingly. The Assessor maintains the tax listing and assessment data associated with all the parcels. When Engineering finishes the parcel update task, the geodatabase is copied to the publication tier server.

Planning maintains the zoning map. The zoning district boundaries tend to follow parcel boundaries, so when the zoning map is updated, planning staff use the parcel data layer on the publication server for reference when updating the zoning map. The zoning data layer is stored in geodatabase format and edited using ArcEditor. The parcel feature class on the publication tier server is loaded into ArcEditor for reference when adjusting the zoning boundaries. When the zoning data layer update task is completed, the feature class is copied onto the publication data server.

As a special request, the former Mayor had suggested putting a map on the City's website that promotes underdeveloped commercial and industrial property within the City. Using ArcView, a map of all the properties that meet the criteria would be created using the parcel and zoning feature class data on the publication server.

16.5. Data Storage Systems

There are two basic ways to physically store GIS data on a server: (i)as a collection of files; (ii)within a Relational DataBase Management System (RDBMS). File-based data is stored as a collection of folders and/or files on a file server. This is similar to how spreadsheets and word processing documents are stored on a network drive. RDBMS-based data is stored as a collection of tables containing structured fields and records.

For instance, a department may want to store a list of names and addresses. One way is to type up these addresses in MS Word. The individual would then save the MS Word document as a .doc file on a file server, or you could type it up in MS Excel so that the name and address are in separate spreadsheet cells. Once done, it would be saved as a .xls file on a file server. These are two examples of storing data as a file. To store it in a RDBMS, the file would need an application that was specifically designed to store addresses. The department entering the information would then start that application and type in the addresses. When finished, they would have the application save the data. The data itself is stored within a database on the database server that was set up by the database administrator.

16.5.1. File-Based

File-based GIS formats are ideal for individual projects and small workgroups. Their primary benefit is that a user can create and modify the GIS data as needed with no involvement needed from system administrators. The drawback is that it places heavier loads on the file server and network system resulting in slower refresh times. This is because, in essence, the entire file must be read on the server and transferred to the desktop computer. In addition, only one person may be editing the file at a time, and a user viewing the GIS file may lock out another user from editing it.

There are a number of file-based GIS formats used by ESRI. They include file geodatabase, personal geodatabase, shapefiles, and coverages. ESRI is currently recommending that users migrate to file geodatabases due to their performance and capabilities over the other format types.

Bentley Systems also supports a number of file-based formats. They include DGN and XFM-DGN. DGN is both a 2D and 3D format that primarily supports geometry only. XFM-DGN stores geometry in addition to attributes. It also provides a means for users to maintain standards, use tools such as property-based annotation and symbology, and encapsulating them with the feature definition and placement tools.

16.5.2. RDBMS Based

RDBMS-based GIS formats are ideal for larger organizations. Their benefit is, for any number of users, they allow for versioning, multi-user editing, and higher performance over networks. Their drawback is that the RDBMS must be set up before and usually by a system administrator. By definition, they are also reliant on a RDBMS, which can increase the cost and complexity since it is a separate system.

ESRI allows for geodatabases to be created in both MS SQL Server and Oracle, in addition to a few other enterprise class databases. This is done through ArcSDE technology that is purchased with ArcGIS Server.

Bentley System allows for the direct access to Oracle Spatial databases in addition to ArcSDE geodatabases.

16.6. GIS Software Platform Matrix

To provide an overview of the GIS software, the other components of GIS (hardware, software, skills/people, and procedures) are examined to determine how they would be affected by a change in the software platform. There are no significant hardware differences between the three alternatives so hardware is not shown in the matrix below.

	Procedures	**Data**	**Skills**
Bentley / ESRI Mix	Geometry data would be maintained in MicroStation. A process would be developed to merge the DGNs with attribute data stored in an RDBMS.	Data would be stored in DGNs in the production tier and Shapefiles in the publication tier.	**Editors** would need to know MicroStation and RDBMS applications. **GIS staff** would need to know MicroStation, ArcGIS Desktop, and RDBMS applications. **Power users** would need to know ArcGIS Desktop. **Casual users** would need to know the web mapping application.
Bentley-Only	Geometry data would be maintained in MicroStation. Bentley Map would be used to merge the DGNs with the RDBMS attribute data to create XFM-DGNs.	Data would be stored in DGNs, and RDBMS in the production tier, and XFM-DGNs in the publication tier.	**Editors** would need to know MicroStation and RDBMS applications. **GIS staff** would need to know MicroStation, Bentley Map, and RDBMS applications. **Power users** would need to know Bentley Map. **Casual users** would need to know the web mapping application.
ESRI-Only	Geometry data and most attributes would be maintained in the geodatabase. ArcGIS Desktop geoprocessing tools would be used to generate the publication copies.	Data would be stored as geodatabase in both the production and publication tiers.	**Editors** would need to know ArcGIS Desktop and RDBMS applications. **GIS staff** would need to know ArcGIS Desktop, and RDBMS applications. **Power users** would need to know ArcGIS Desktop. **Casual users** would need to know the web mapping application.

16.7. Other GIS Platforms

There are many other GIS platforms. This includes other CAD-orientated products such as AutoCAD; GIS software from MapInfo or Manifold; or open-source GIS software such as GRASS or Quantum GIS. These options are not discussed since they are not viable options for the City and MPU. Migrating to these platforms would require substantially more resources (software and training) than the three alternatives already presented, and thus not viable alternatives.

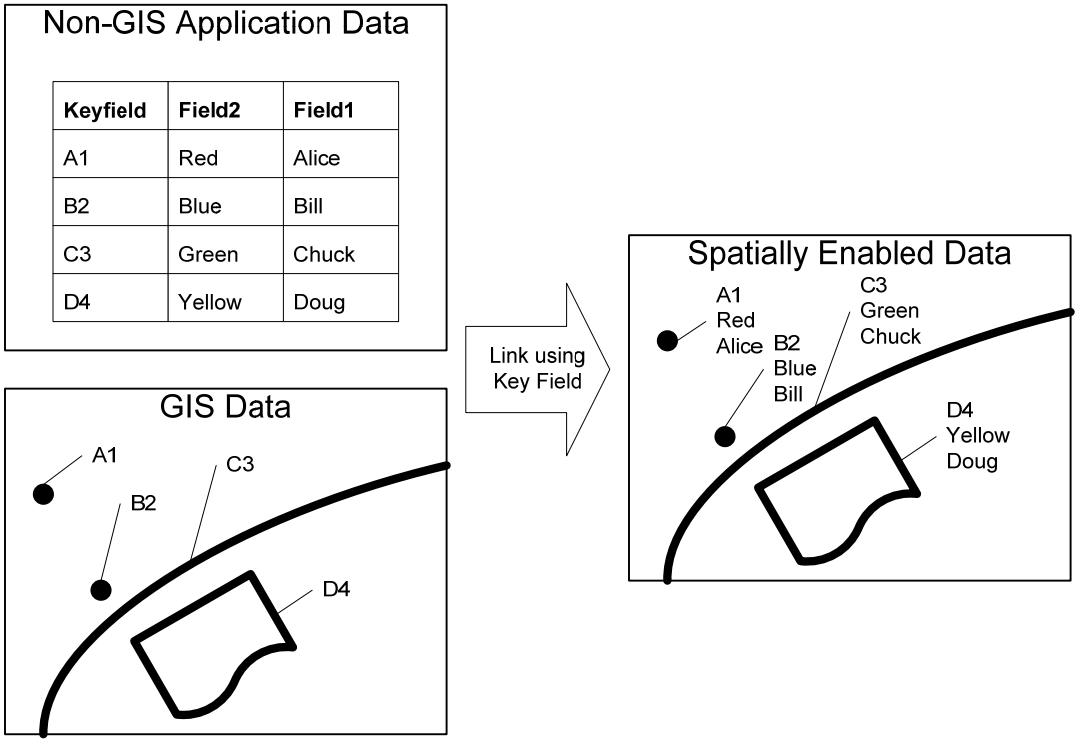
17. Related Applications Assessment

Since this is a GIS Needs and Assessment, the non-GIS applications are not assessed or evaluated on functionality. They are only discussed in terms of how they might be better integrated with GIS technology.

The County/City GIS Portal Land Records Viewer application is used by most departments. This is not surprising, as the Land Record Viewer application is designed to be a tool for general use by City and MPU staff in addition to the public. Other applications that are used by multiple departments include CherryLAND, CLT-IAS, OPS, and Springbrook. These applications should be integrated with GIS technology and spatially enabled.

The other applications generally serve one department. This is not to say that they are unimportant (it is quite the opposite), as it is likely they are critically important for that department. Means to make the data more accessible within these applications through GIS technology should be sought out. These applications should be spatially enabled.

In general, the simplest method to spatially enable non-GIS applications without heavy modification of the application is to directly link the records to mapped features using a key field. The key field is usually a PIN or asset ID number.



If a key field is not available, but the application uses street addresses, geocoding can be used to map the data in the application. The x, y coordinate of the record can then be stored within the application itself so that the same records are not geocoded repeatedly.

Non-GIS Application Data

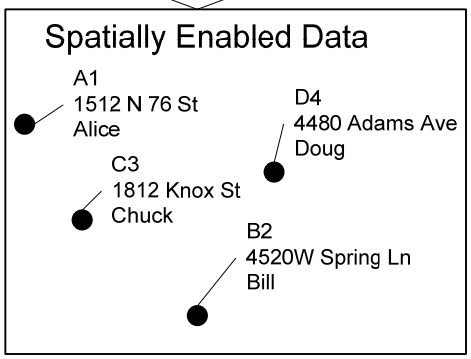
Keyfield	Address	Field1
A1	1512 N 76 St	Alice
B2	4520 W Spring Ln	Bill
C3	1812 Knox St	Chuck
D4	4480 Adams Ave	Doug

Geocode

Non-GIS Application Data with Coordinates

Keyfield	Address	Field1	Lat	Long
A1	1512 N 76 St	Alice	44.253	-88.315
B2	4520 W Spring Ln	Bill	44.281	-87.952
C3	1812 Knox St	Chuck	44.260	-88.265
D4	4480 Adams Ave	Doug	44.543	-88.159

Mapped



Once the data is spatially enabled, it can be used with GIS software, or it can be made available with web mapping software. A few non-GIS applications do have some mapping capabilities which might also be used once the data is mapped.

18. Applications and Technology Recommendations

18.1. GIS Software Platform

In the GIS Application Assessment section, three alternative GIS software platforms were described.

- Bentley / ESRI Mix
- Bentley-Only
- ESRI-Only

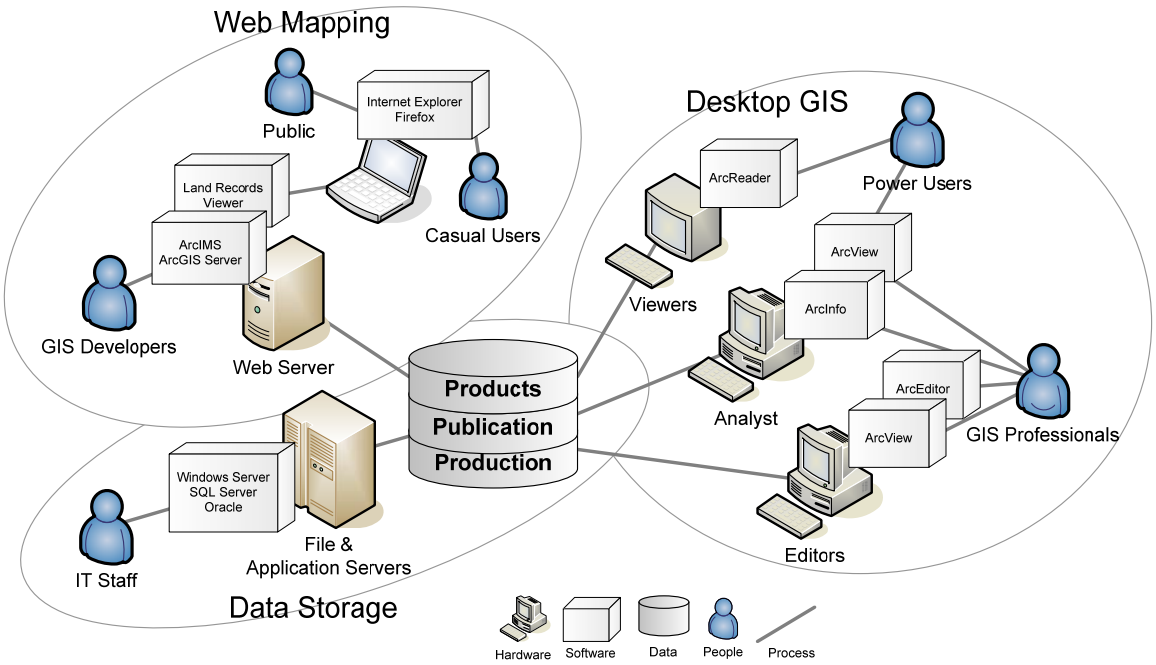
It is recommended that the City and MPU proceed with migrating towards the ESRI-Only alternative. The reasons for this recommendation are:

- **Process:** One application can be used to maintain both GIS geometry and attribute data. This simplifies the process of maintaining the GIS data. In addition, the process for moving data from the production data tier into the publication data tier is relatively simple in the ESRI-Only alternative. There are also increased opportunities for coordination with the County in data sharing and software fees.
- **Data:** The data would remain in the same format, geodatabase, in both the production and publication data tiers. With the Bentley / ESRI Mix or Bentley-Only alternatives, the data would have to be converted from one format to another. While proper data conversion will not induce errors, it does involve a more complex system. A less-complex system is usually the better solution.
- **Skills:** Training for non-ESRI users would be needed; however, since all users would be using the same software, there are more "train-the-trainer" opportunities. There is also a strong base of ESRI users within Wisconsin municipalities. With the Bentley / ESRI Mix alternatives, multiple skills sets are needed. The GIS staff would need to have training in both systems. There would also be less opportunity for cross training, as the maintenance staff would not be able to assist power users and vice versa. With the Bentley-Only alternative, none of the present City or MPU staff have experience with Bentley Map, and thus would have to be trained on the software. Also, there are no known users of Bentley Map within Wisconsin which limits informal user support opportunities.

To clarify, this is not recommending that the City abandon MicroStation completely. MicroStation should still be used by the City and MPU for design tasks. The ESRI-Only alternative is applicable to the GIS tasks involving data management, geographic visualization, and spatial analysis.

18.2. System Design Overview

For the purpose of the Applications and Technology chapter, GIS is divided into three groups: (i)Desktop GIS; (ii)data storage; and (iii)web mapping. Each of these groups is comprised of hardware and software components which are discussed in this chapter. Data, procedures, and staff roles are discussed in more detail in other chapters.



18.3. Desktop GIS

Desktop GIS is software that is installed on individual users' desktop computers and used by GIS Professionals and Power Users. Within the City and MPU, it is recommended that three levels of Desktop GIS are planned for: (i)Editors; (ii)Analysts; and (iii)Viewers.

The editor level is for GIS Professionals who are editing GIS data on the production data tier. Their computer hardware is high performance PCs. These should be at least a step above the standard PC offered to City and MPU staff, such as a Desktop PC to a Workstation PC. The replacement schedule should also be reduced from four to three years for these PCs. The editor level PCs will typically be running either ArcGIS Desktop ArcView or ArcEditor software. ArcView is recommended; however, it may be necessary to have at least one ArcEditor license so that more advanced editing tools for COGO (COordinate GeOmetry) and utility networks are available.

The analyst level is for GIS Professionals and some Power Users who are performing GIS-based analysis and creating maps. This level has the same computer hardware requirements as the editor level. The PCs will be running either ArcGIS Desktop ArcView or ArcInfo software. ArcView is recommended, but some advanced analysis tools in addition to editing operations available in ArcInfo may be needed.

The Viewers level is for Power Users who just need to view premade maps and perform simple queries. No data would be edited or created at this level. The hardware would be a standard computer issued to City and MPU staff and on the regular replacement schedule. ArcReader software would be used to view the premade maps.

18.4. Data Storage

ESRI recommends that file geodatabases are used as the primary GIS data format for non-SDE data, due to their performance and capabilities over the other format types. File geodatabases are created on file servers. Since file geodatabases are platform neutral, they could be installed on any file server regardless of operating system as long as they are accessible to Windows desktops. However, it is recommended, for simplicity, that the file servers be Windows-based. The physical file servers, folder structure, and security would be set up by MPU/EDP staff. Once the basic foundation is set up, the file geodatabase and naming conventions of subfolders would be set up by GIS staff.

It is likely that the City and MPU will not need to utilize ArcSDE technology during the timeframe of this plan. ArcSDE technology is most beneficial when there is a need for multi-user editing, spatial views, or distributed databases (disconnected editing), or when low-speed network connections are used between different locations. Although it is likely that City and MPU staff will be editing data simultaneously, it will be in completely different datasets such as electrical, sewer, or water. These datasets would most logically be put into separate file geodatabases, which would not cause any editing issues, since only one person would be editing that dataset at a particular time. Although the City and MPU could utilize spatial views, they are not a requirement for any application; nor were any needs for distributed databases identified during the course of the interviews. Last, the City is well connected by a fiber network, thus it is unlikely that the speed of sharing file geodatabases across the network will be impacted enough to justify SDE technology.

GIS-related attribute data stored for other applications, such as CLT-IAS and Springbrook, would continue to be installed in their existing SQL Server and Oracle databases. MPU/EDP staff would set up ODBC connections that GIS staff would use to create database connections.

18.5. Web Mapping

The primary component of the Web Mapping group is the County/City GIS Portal Land Records Viewer. The Land Records Viewer is typical of many municipal and county web mapping sites. The site is very functional and responsive, and the following user interface recommendations are to help increase the ease of use:

- A growing trend in web mapping is the move away from a “one size fits all” type application toward having several single-purpose web mapping sites. The public and non-technical staff have difficulty with some of the functionality found in municipal websites; visible layers, active layers, and selected features. This is why Google, Microsoft, and MapQuest all have just a few layers available – Streets, Aerial Photos, and Traffic. The County/City should consider developing multiple web mapping sites with very specific purposes. Possible separate web mapping sites include, but are not limited to, property, zoning, utilities, environmental, parks & recreation, and election information.

- Each web mapping site should be seamlessly linked to their respective databases as much as possible, so that both geometry and detailed attribute information is available to the user. For instance, if a Parks & Recreation mapping site is created, its extensive information from the ActiveNet database should be available on the site.
- The navigation tools should be upgraded so that they are similar to the tools used by Google/Microsoft/MapQuest. The scroll button should also be used to allow the user to zoom in and out. The map image should utilize tiles so the site is more dynamic when panning (aka "slippy maps").
- Provide the ability to share maps by proving a URL that can be used to retrieve the same view shown.
- The use of pop-up windows should be eliminated.

The County/City Portal Land Records Viewer is currently based on ArcIMS. Although ArcIMS 9.3 is fully supported by ESRI, it is likely that support for ArcIMS will decrease as ESRI has shifted toward ArcGIS Server Standard as the primary product for web mapping. With this in mind, any significant changes to the Land Records Viewer or similar site should trigger the migration to the ArcGIS Server Standard product.

The Land Records Viewer is currently hosted by the County using County hardware. It is recommended that the City and MPU continue this relationship.

MS Internet Explorer and Firefox are the top two most used web browsers. It is recommended that the Land Records Viewer fully support both browsers. Support for other browsers, such as Safari or Chrome, should be considered if they become more popular.

Last, the City and MPU should also consider converting and posting some of the datasets as KML files that users can download and access in commercial mapping sites and globes. In addition, Google index KML files will display complete user generated KML files in search results. So, if the City puts a zoning KML file on the website, it is likely that it will be returned in the search results if someone searches for zoning while viewing Manitowoc in Google Maps.

18.6. Related Applications

As stated before, since this is a GIS Needs and Assessment, the recommendations primarily involve GIS applications. Non-GIS applications are discussed in terms of how they could be better integrated with GIS.

Recommendations for each of the related non-GIS applications are prioritized. The recommendations for applications with a high priority should be considered first, followed by applications with a medium priority.

18.6.1. CherryLAND

Priority: High

CherryLAND is not a City or MPU application, as it is run and maintained by the County. However, it is noted in this document, because it plays an important role within the City and MPU's GIS.

Documents can be retrieved from CherryLAND by using:

- Platted description (subdivisions and CSM)
- Unplatted description (township, range, section, quarter-quarter)
- Volume and page
- Document number
- Names
- Document type
- Dates

It is possible that some of the documents could be tied to GIS datasets, and thus retrieved geographically:

- To retrieve by platted description, the property parcel dataset must have a data layer that contains the platted description that could be used as a key field. This could be by a separate platted layer consisting of all the subdivisions and CSMs, as a field within the parcel layer containing the subdivision/CSM name, or as a cross-reference table that matches PINs to the subdivision/CSM.
- To retrieve by unplatted description, the PLSS data layer would have to be set up to use key field(s) consisting of the township, range, section, and quarter-quarter (TRSQQ). An alternative to this set up field within the parcel layer containing the TRSQQ, or as a cross-reference table that matches PINs to the TRSQQ.
- It may be possible to link property parcels to the document volume/page or document number if this data is currently stored within the CLT-IAS system. If the volume/page or document number is in the CLT-IAS system in a way that it can be used as a key field, it is likely that data is tied to a PIN. Thus, it would be possible to go from the parcel dataset to CLT-IAS to CherryLAND.
- It is doubtful that retrieving documents geographically by name, document type, or date could be done in a useful manner.

Once the links between the key fields are established, it would be possible to click on a location, and retrieve documents that are near that location. However, this is all based on the ability that images within the CherryLAND system can be retrieved outside of the CherryLAND application itself or passed through by a URL. CherryLAN Systems Inc.

and the County have not allowed the City to have the raw database to try to link the fields.

18.6.2. CLT-IAS

Priority: High

The CLT-IAS CAMA system contains a wealth of information that is valuable to City and MPU staff. Nearly all of this information can be spatially enabled by linking this data to the parcel dataset through the PIN. Other data can also be spatially enabled as discussed in the Data Assessment chapter.

Essential fields within the application should be identified and appended to the parcel datasets in the publication data tier. The zoning and address datasets should also be integrated so that when that data is updated, it is also automatically updated within CLT-IAS.

The CLT-IAS web access should also be integrated with the County/City GIS Portal Land Records Viewer or similar web mapping application. The integration should be both ways so that when a user is viewing the Land Records Viewer, the property record information is viewable without having to use a different application. Likewise, when viewing the property record information, a map of the property based on the parcel data layer is viewable without having to leave the property record application.

18.6.3. Springbrook

Priority: High

Most of the non-financial data within the Springbrook application is likely tied to a PIN or address. As previously discussed, this information can be spatially enabled by linking this data to the parcel dataset through the PIN or through the geocoding process.

Essential fields within the application should be identified and appended to the parcel datasets in the publication data tier. It is likely the essential fields will be related to building permits and DPW/Operations work orders.

The building permit information should be made available online and integrated with the Land Records Viewer or similar web mapping application.

18.6.4. ActiveNet

Priority: Medium

The place names within ActiveNet should be mapped so they can be linked by using the place name or an ID. Once the link is established, a website or an ArcReader-based document can be created that shows the scheduling of the activities and facilities. Hyperlinks to the ActiveNet website scheduling should also be developed.

18.6.5. Customer Information System

Priority: Medium

The Customer Information System (CIS) of MPU should be more closely integrated with GIS. As the data is converted from DGN to geodatabases, the IDs used within CIS should be added so that links between the geodatabase and the CIS are established.

18.6.6. Engineering Databases

Priority: Medium
The assets management function of the Engineering Database should be converted to a geodatabase that is integrated with the sewer and stormwater datasets. The work order capabilities should be migrated to the Springbrook application.

18.6.7. Firehouse

Priority: Medium
The mapping capabilities of the Firehouse software should be investigated by GIS staff. It is likely a process that can be developed that will allow for the events to be located so that they can be viewed within the software. For more detail analysis and visualization, the export capabilities should be investigated by GIS staff.

18.6.8. Landisc

Priority: Medium
The Landisc property photos should be integrated with the County/City GIS Portal Land Records Viewer and related applications so that they can be easily viewed by the Public and Casual Users.

18.6.9. New World

Priority: Medium
GIS staff should work with the Police Department to investigate the mapping capabilities within the New World software. It is likely that GIS staff and the Police Department can develop a process that will locate the events and view them on a map within the software. GIS staff should investigate the export capabilities of Aegis so that more detail analysis and visualization can be done.

18.6.10. PASER

Priority: Medium
Ideally, PASER would be fully migrated over to the WISLR system. If this is not possible, a centerline datalayer with segment IDs that match the PASER system should be developed so that the PASER software is more integrated with GIS.

18.6.11. StrataPoint

Priority: Medium
The StrataPoint datalayers should be copied to the publication tier so that they are available to additional users beyond Parks & Recreation.

18.6.12. CIMS

Priority: Low
Online access to CIMS information should be considered.

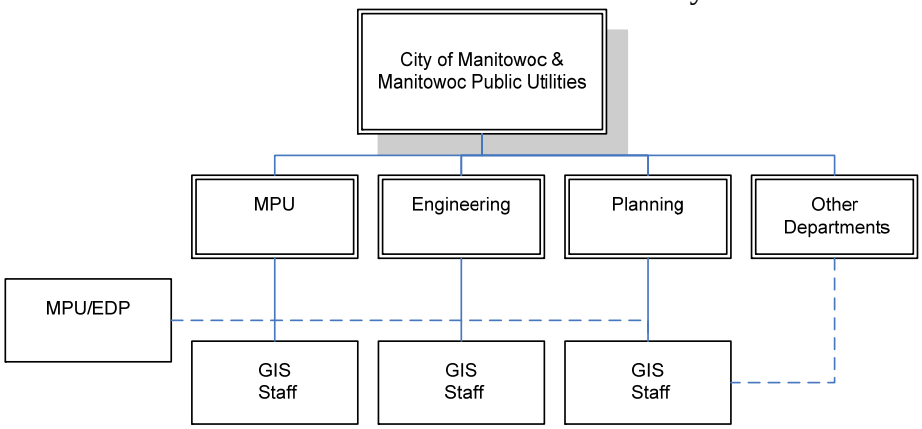
18.6.13. OPS

Priority: Low
The features within the OPS should be mapped so that a key field can be created between the OPS database and geographic location. Once the link is established, a website or an ArcReader-based document can be created that shows the scheduling of the maintenance activities.

Operational Procedures

19. Existing GIS Organizational Structure

The structure of the GIS staff is either centralized or decentralized. The GIS staffing structure usually mirrors the data stores structure (see Data Stores Organization section of the Data Assessment Chapter). This is true of the City and MPU. The data stores are decentralized and so is GIS staff in the City and MPU. The following organizational chart shows how GIS staff is structured within the City and MPU.



Within the City and MPU, there are three departments with staff that are responsible for roles in maintaining GIS data layers using GIS software applications. Those departments are the Planning, Engineering, and MPU. Other City departments are reliant on Planning to fulfill their GIS needs. In addition, MPU/EDP supports the general technology needs of the GIS staff. Within MPU, Becky Olson, Engineering Technician, fills the role as GIS staff. This position is responsible for maintaining, within MicroStation, MPU's water and electrical mapping systems, including the key fields that relate to the CIS application. Within Engineering, Steve Kipping, Computer & Engineering Technician, and Jill Erickson, Engineering Aide, fill the role as GIS staff. They are responsible for maintaining, within MicroStation, the City's base (right-of-way, street names, railroad, and road infrastructure), parcel datasets, sewer, stormwater, and benchmark GIS datasets. Within Planning, Michelle Yanda, Associate Planner, and Elizabeth Werdermann, GIS Technician, fill the role as GIS staff. They are responsible for the ESRI software applications, data used for the County/City GIS Portal Land Records Viewer application, conversion from MicroStation to ESRI formats, addressing datasets, and other planning and municipal data layers. They will also perform the mapping and geographic analysis as requested by other City departments.

20. Existing Workflows

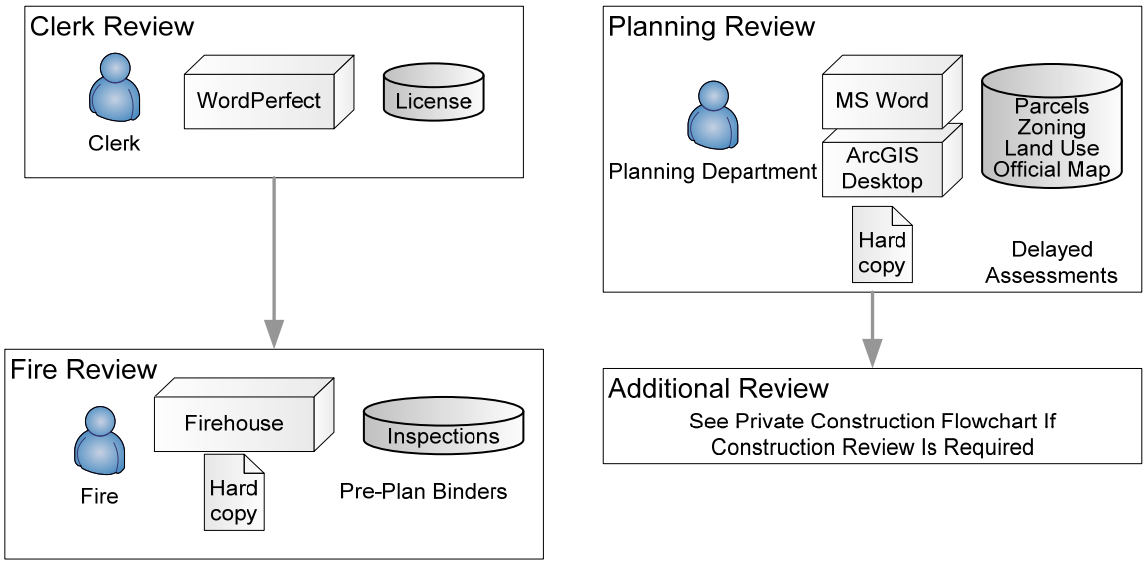
Several of the multi-department and multi-division workflows are examined in terms of the departments that are involved, the applications they use, and the datasets that are needed. Single department workflows were not examined because the applications themselves are typically built around a specific workflow. For instance the CLT-IAS application is built for the tax assessment process. Thus, examining the tax assessment workflow is mostly self-contained within the CLT-IAS application.

20.1. New Businesses

When a new business opens in the City, the business may have to work with multiple departments for various licenses and permits. The Clerk issues business licenses for various types of business and, depending on the business, the Planning Department may require a zoning or conditional use permit. Often Building Inspection will require various building permits and inspections for minor remodeling work. Engineering and MPU may also be involved if new or expanded service connections are needed. The Fire Department may also require annual inspections if the business is a public place.

Examples:

- A business moves into a vacant building
- A business changes owners
- A temporary business (i.e. Christmas tree sales) applies for a license



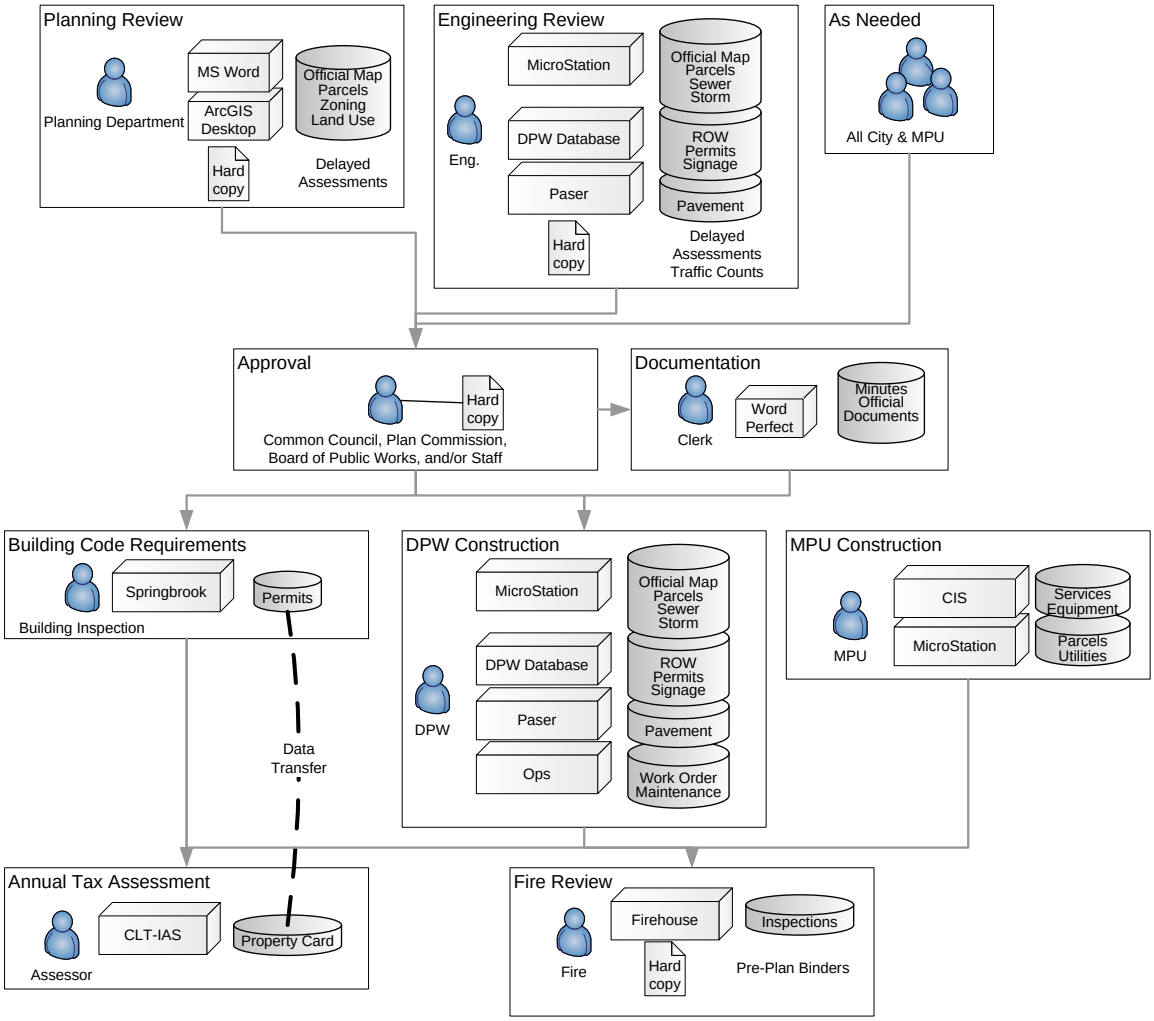
During the course of the interviews with the City and MPU staff, there was no mention of technology being used to help route license/permit applications or provide notice that a new business was being opened. While it is likely that email is being used, there is no application technology (such as Springbrook) that is being used to process license or permits for new businesses. While Building Inspection will be using Springbrook in the winter of 2009/2010 and the Fire Department uses Firehouse applications to track the individual permit and inspection information, there will be no direct link between the two applications.

20.2. Private Construction

Private construction involves new construction, redevelopment, or remodeling done by private individuals or businesses. Often private construction is in conjunction with new businesses and may also include existing businesses and residential structures.

Examples:

- A new residential subdivision is proposed, then constructed
- A new apartment building is constructed
- A new retail store is proposed, then constructed
- An existing warehouse is converted into retail space
- An existing house is converted into office space



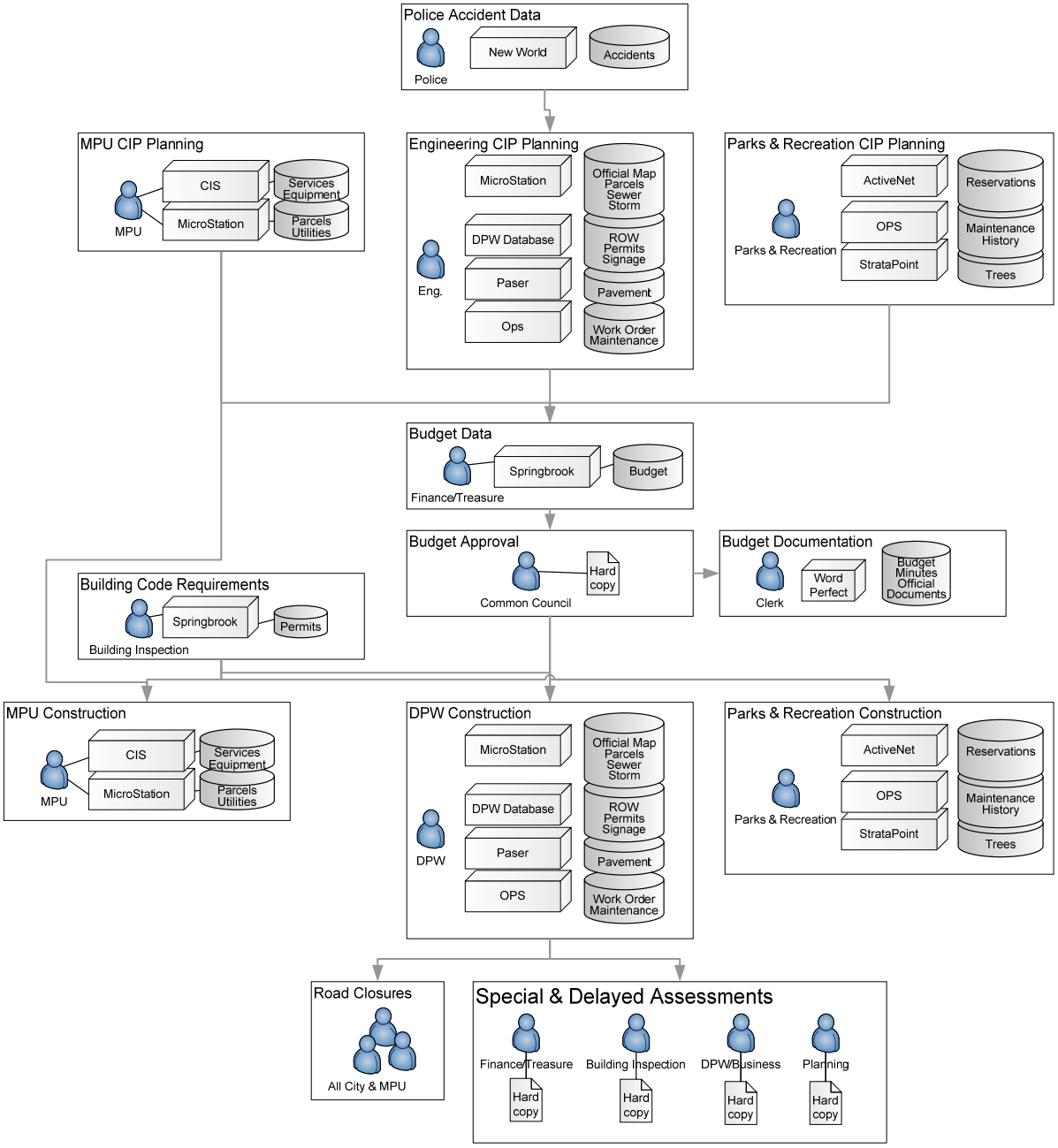
The Planning Department may be involved as approval is needed for platting and construction. Engineering may be involved in the review of the new construction and would be involved if public infrastructure is to be constructed. MPU is usually involved if new or upgrades to services are needed for private construction or if existing services need to be re-routed. Building Inspection requires various building permits and inspections during the course of the construction. The Fire Department will also observe

the construction to see the layout of the building and where mechanicals are located. They may also require annual inspections if the business is a public place. The Assessor would also assess the value of the property.

During the course of the interviews with the City and MPU staff, there was no mention of technology being used as an overall information system concerning private construction projects. While it is likely that email is being used for communication between departments, there is no overall information application for private construction projects; however, building inspection information in Springbrook is transferred over to the CLT-IAS database.

20.3. Public Capital Projects

Public capital projects are those major infrastructure projects undertaken by the City and MPU. These projects are first planned and budgeted, then designed and constructed.



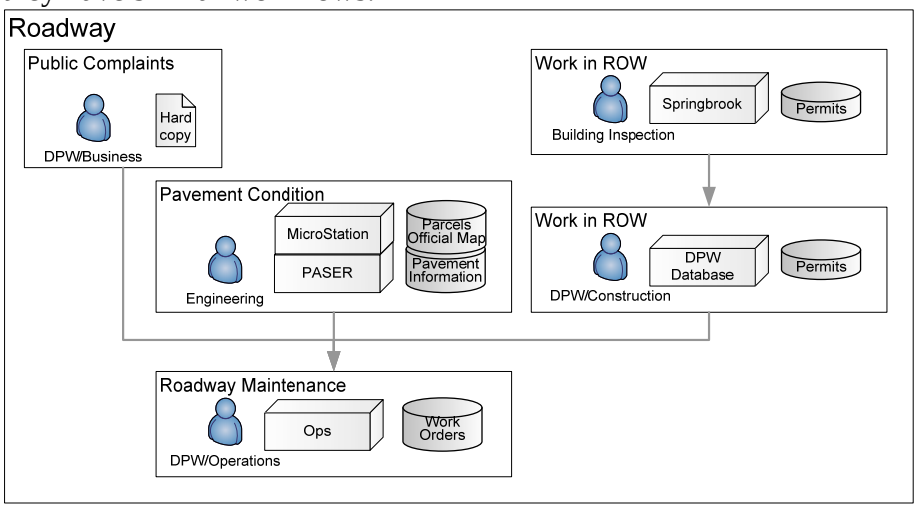
Engineering, MPU, and Parks & Recreation typically undertake capital projects. Other departments may undertake capital projects, but not on a regular basis. The Finance/Treasurer Department is involved in the budgeting and financing of the projects.

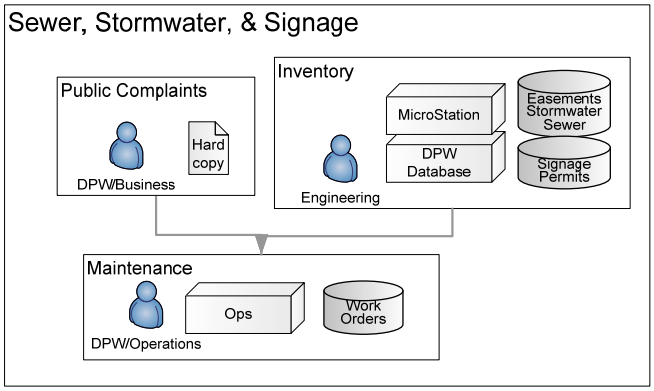
Springbrook was mentioned as the application used by all departments to track the budget and construction costs associated with the capital project. Email is also being used for communication between departments. There is no geographic overview of capital projects.

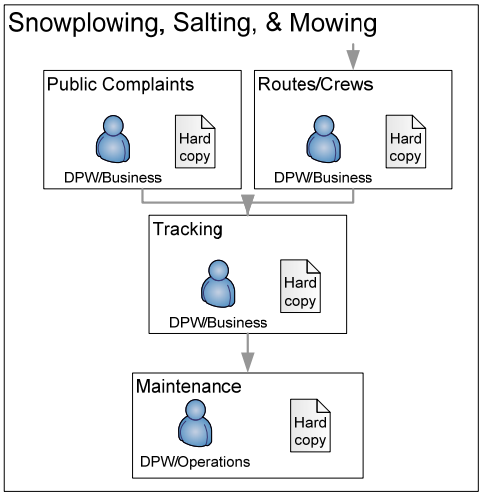
Many capital projects are funded by special assessments. Special assessments are used to pay for the capital project based on the property owner fronting or benefiting from the improvement. Delayed assessments are special assessments that are paid by the property owner of an unimproved property when the property fronting the improvement is developed years later. Several departments are involved in special and delayed assessments. The Clerk stores the original documents approving the assessment by the Council. Engineering and DPW/Business track the location and calculate the amount of the special assessment. Finance/Treasurer track what portion of the special assessment has been collected and performs accounting functions. Planning is involved when a property is developed or annexed which would trigger payment of a delayed assessment. Building Inspection is involved as the issuance of a building permit will trigger the collection of a delayed assessment. The City does not use a software application to manage special and delayed assessments for capital projects.

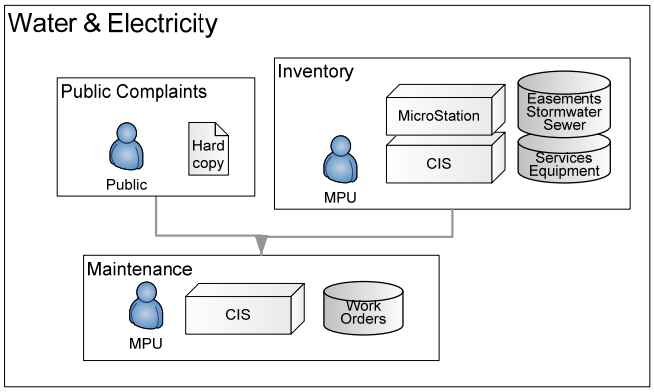
20.4. Infrastructure Maintenance

For the purpose of this chapter, infrastructure maintenance is divided up into four categories: roadway; sewer, stormwater, and signage; snowplowing, salting, and mowing; and water and electricity. These categories are grouped in this manner because they have similar workflows.









Roadway maintenance involves minor work to the surface of the roadway, such as pothole filling and cut repair. In general, work is initiated through several possible channels. One way might be from complaints from the public or other City departments.

Another may be from street opening permits that have been granted. Or last, it may be part of minor regular maintenance such as crack repair based on the pavement condition.

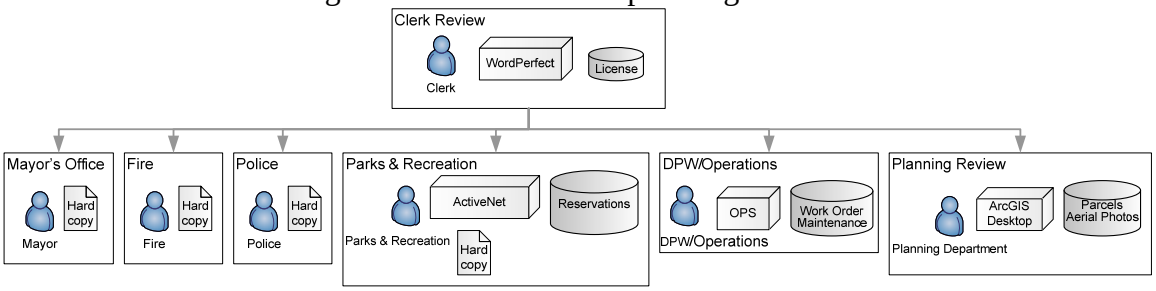
Snowplowing, salting, and mowing are self explanatory. Regular routes have been designated. As the work progresses, it is tracked and crews reassigned as needed. Complaints from the public and other City departments are also taken into consideration in tracking the conditions.

Sewer, stormwater, and signage maintenance are generally done on regular intervals based on the utility asset inventory. Complaints (missing signs, broken lines, clogged culverts, etc.) are also processed as received and maintenance performed as needed.

A similar process is performed by MPU for the water and electrical utilities. Maintenance is generally done on regular intervals based on the utility asset inventory. Complaints (broken mains, outages, downed lines, etc.) are also processed as received and maintenance performed as needed.

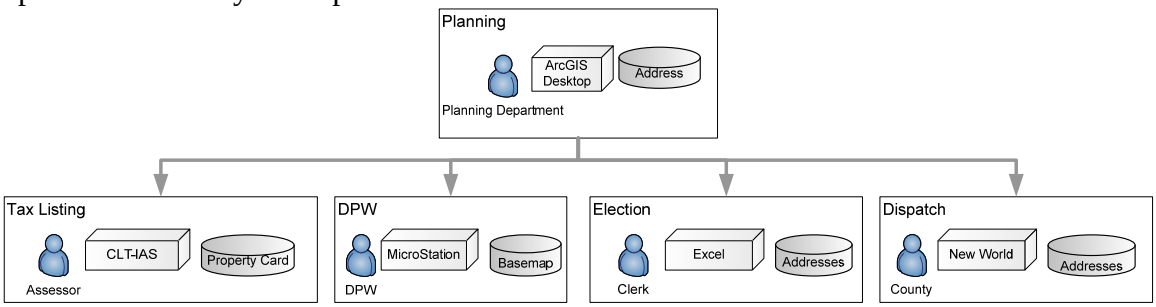
20.5. Special Events

Special events within the City are processed by the Clerk. Depending on the event, the Mayor's Office, Fire Department, Police Department, Parks & Recreation, DPW/Operations, or Planning may be involved in the planning and preparation for the special event. Most planning and preparation work is done by hard copy. The databases that are used are for background information for planning the event.



20.6. Addressing

The process for addresses starts with the Planning Department. The Planning Department is responsible for assigning new or changed addresses. Once a new address has been assigned or an existing address changed, it is modified in Planning's hard copy address book. Notice of the new address is then sent to the Assessor, Engineering, Building Inspection, MPU, Clerk, Fire, Police, and County GIS Coordinator. These offices update the addresses in their respective databases. The County GIS Coordinator updates the County E911 point addresses.



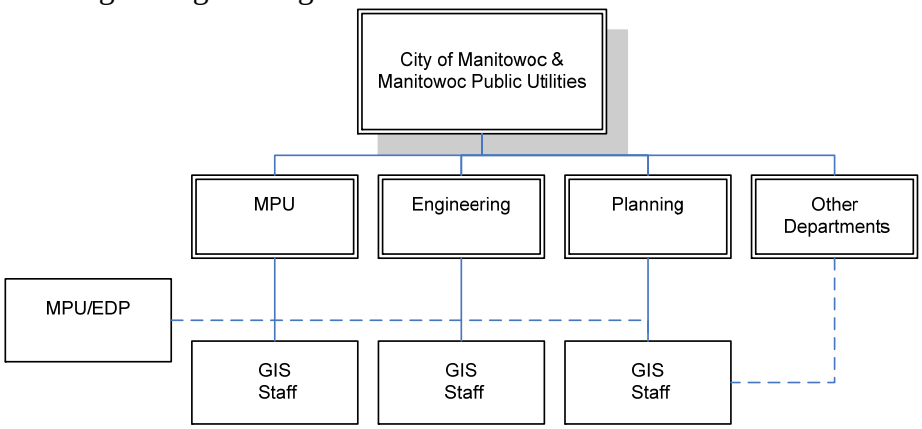
21. Analysis

21.1. GIS Organizational Structure

The City and MPU have three basic ways to organize their GIS staff: a decentralized structure (as currently exists), a centralized-weak structure, or a centralized-strong structure.

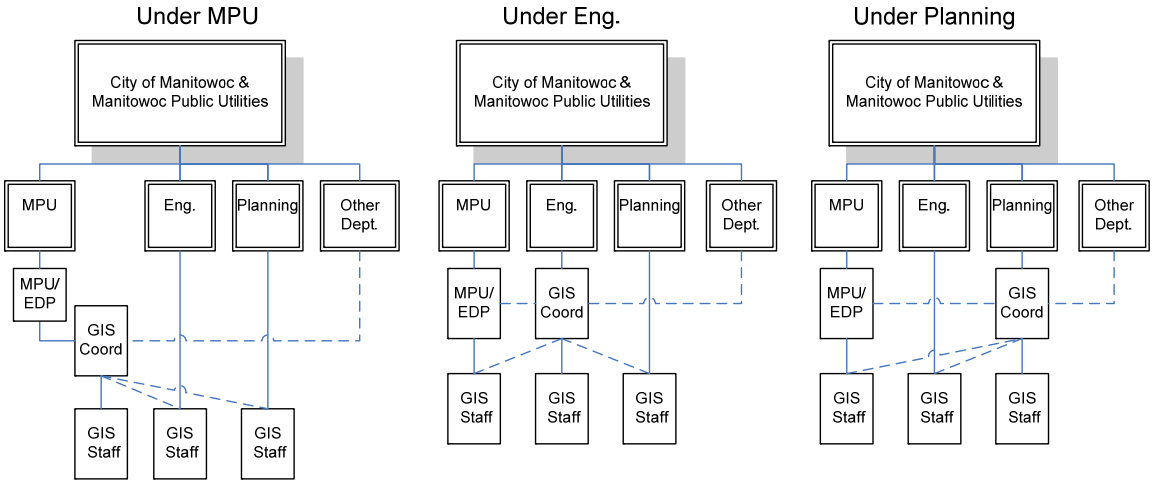
21.1.1. Decentralized

Under a decentralized system, the present GIS organizational structure would remain unchanged. While MPU/EDP has general authority over the use of technology in the City and MPU, there is no centralized GIS structure. GIS staff in one department would have no more authority than GIS staff in another department. Conflicts over resources would need to be resolved at the department head level or higher. Departments without GIS staff would be reliant on one of the three departments with GIS staff – most likely Planning or Engineering.



21.1.2. Centralized-Weak

With the centralized-weak system, a GIS Coordinator would be responsible for coordinating the GIS activities of the City and MPU. The GIS Coordinator would have GIS staff within its own department, but would only be coordinating, not managing, the activities of GIS staff in other departments. The GIS Coordinator could be under MPU, Engineering, or Planning. Each of the three options is shown below.



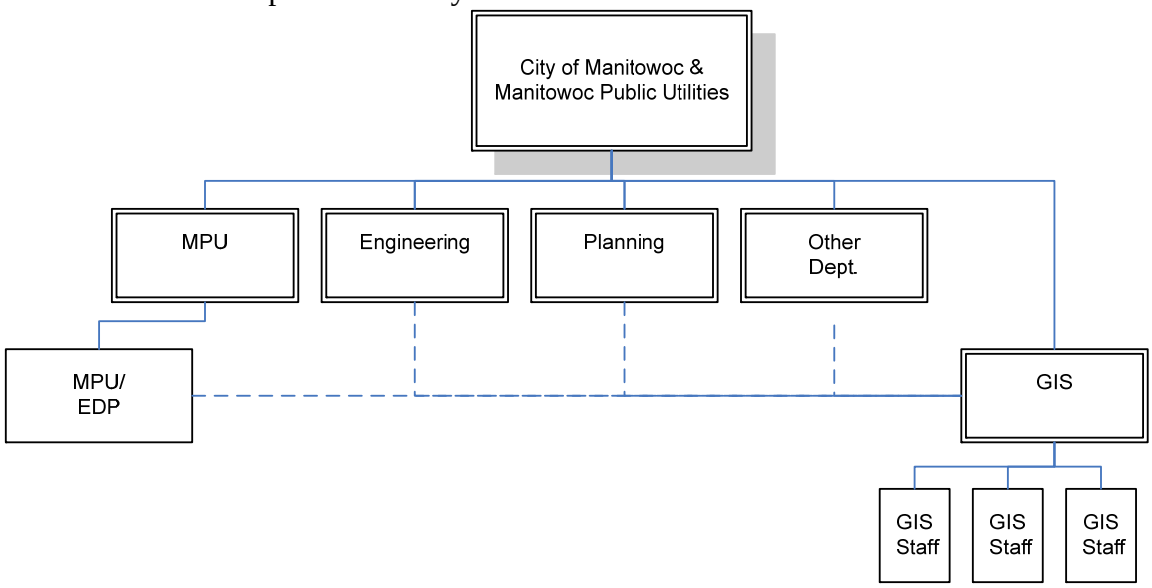
When the GIS Coordinator is within MPU, it would most likely be within MPU/EDP. GIS staff within MPU would be directly reporting to the GIS Coordinator. The GIS Coordinator would be actively working with GIS staff in Engineering and Planning, but their GIS staff would not be the GIS Coordinator's employees. Other departments would go through the GIS Coordinator for their GIS needs.

When the GIS Coordinator is within Engineering, the GIS staff within Engineering would be directly reporting to the GIS Coordinator. The GIS Coordinator would be actively working with GIS staff in MPU and Planning, but their GIS staff would not be the GIS Coordinator's employees. The GIS Coordinator would also have to work closely with MPU/EDP concerning overall technology needs. Other departments would go through the GIS Coordinator for their GIS needs.

When the GIS Coordinator is within Planning, it is the same overall structure as when it is within Engineering, except for when the GIS Coordinator is in the Planning Department. The GIS staff within Planning would be reporting directly to the GIS Coordinator. The GIS Coordinator would also be working with GIS staff in MPU and Engineering and coordinating the overall technology needs with MPU/EDP. Other departments would go through the GIS Coordinator for their GIS needs.

21.1.3. Centralized-Strong

Using the central-strong organization, GIS would essentially be its own department. However, it would take its general direction for the combined input of all the departments and MPU. All GIS staff would be reporting directly to the GIS Coordinator. The GIS Coordinatorwould report to the Mayor.



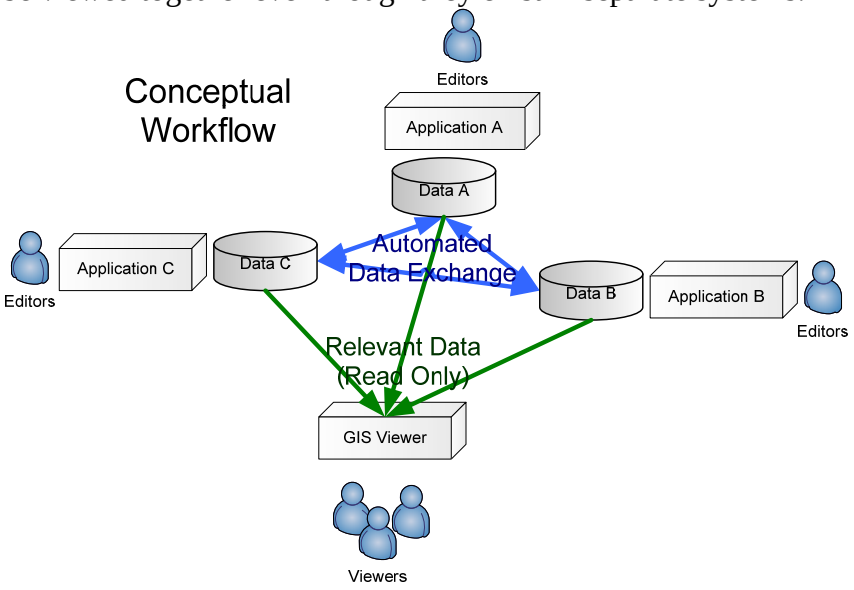
21.2. Workflow

Within the existing workflows, most of the communication between the steps is by email or hard copy. There are very few automated transfers of data between systems. The one exception to this is the data transfer when building permit information in Springbrook is automatically populated within the CLT-IAS CAMA system.

This situation creates data silos. The data that is exchanged between the different systems is done mostly using unstructured methods. Often re-entry of the same information has to be performed for each system. This creates inefficient processes and creates additional potential for error and missing information.

As discussed in the Data Assessment and Applications and Technology chapters, there are possibilities for linking the systems using key fields such as the PIN or an address. These key fields could help to facilitate automatic data exchange between systems, so that data does not have to be re-entered. While this would be very helpful and improve efficiencies in the workflows, it does not provide the City and MPU staff a complete picture of the situation.

GIS can be used to create a more complete link between all the systems. It would allow staff to see the complete picture of the status of the workflow. Spatially enabling the systems would allow staff to see relationships between the data in the systems even where key fields do not link the datasets. This would ***not*** involve creating a new data warehouse where all the relevant data is imported into another database. The existing spatially-enabled databases would be accessed directly by the GIS and would be able to be viewed together even though they exist in separate systems.



In the Applications and Technology chapter, it was discussed that simple one-purpose applications are usually the best solutions. With this in mind, it would be best to create one-purpose applications for each of the major workflows.

22. Recommendations

22.1. GIS Organizational Structure

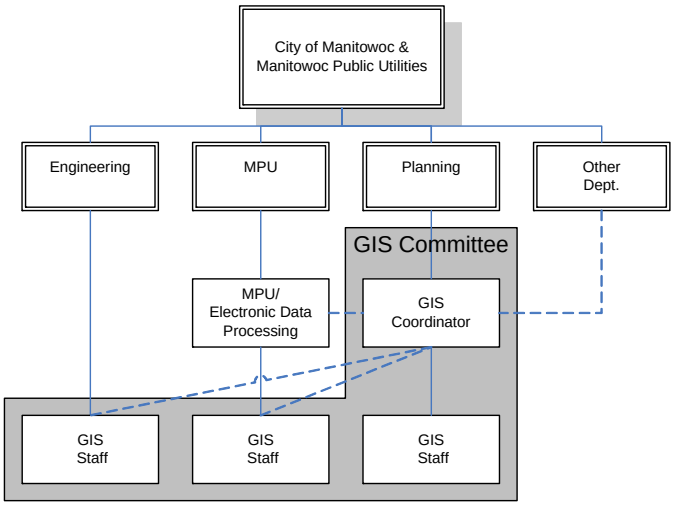
It is recommended that the City and MPU implement a centralized-weak GIS organizational structure. The reason for this is that it creates a structure to coordinate the GIS services within the City, but without the difficulty of creating a new department. This structure can be implemented soon without significant changes in the organizational structure of the City. It is beneficial as it creates a GIS Coordinator, a single point for GIS regardless of the department. The GIS Coordinator can more easily identify opportunities for data sharing and improving efficiencies within the City and MPU. The drawback is that the GIS Coordinator would only be coordinating, not managing, the activities of GIS staff in other departments.

It is recommended that the GIS Coordinator be a new position. However, a secondary option would be to upgrade and change an existing job position.

It is recommended that the GIS Coordinator be under the Planning Department. There are two reasons for this. First, departments without GIS staff already communicate with Planning's GIS staff for their needs. This shows an existing process that can be preserved. Second, and more importantly, within the Applications and Technology chapter, it is recommended that the City and MPU migrate toward an ESRI-only GIS platform. A conversion routine will be developed to export GIS datasets to MicroStation, the output of which would be similar to the current DGN level scheme in use. GIS staff within Planning are the most familiar with ESRI software. It would seem to be logical that the department that is already using the ESRI platform lead the rest of the City and MPU toward the ESRI platform.

One method used in centralized-weak GIS organizational structures is a GIS Steering Committee. This committee can be very formal or informal. The committee is used to oversee GIS-related issues within their organizations. It is recommended that the City and MPU create an informal GIS Steering Committee. This committee would be made up of GIS staff from MPU, Engineering, Planning, and a representative from another department on a rotating basis. The representative would be from the Assessor, Building Inspection, Clerk, Fire, Parks & Recreation, or Police department. The representative should have some experience with GIS technology in use by the City and MPU. The committee would be led by the GIS Coordinator. At the meetings, data standards, data sharing, and general support issues would be discussed. Future direction for GIS within the City and MPU should also be discussed so that participants can report back to

Recommended GIS Organizational Structure



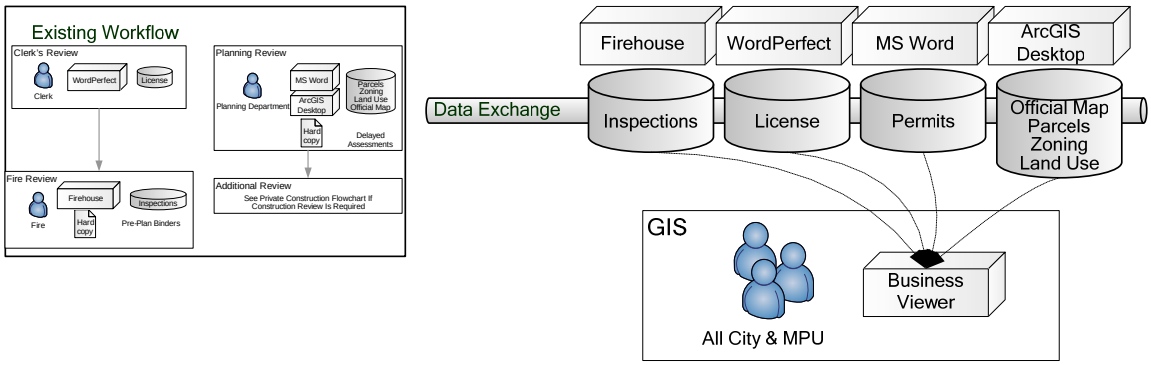
their respective departments a coordinated approach to GIS for budgeting and policy decisions.

22.2. Workflow Recommendations

With two major exceptions, the existing workflows do not change significantly. First, there would be extensive data exchanges between the databases. Often data within one database is identical to data within another database. This duplicate data would be identified. Using the custodians for the data layers as described in the data assessment chapter, one database would be assigned as the master database for a specific data field. This data would then be used to populate related fields in the other datasets. When the data is unstructured, such as word processing documents, spreadsheets, or scanned hard copy, hyperlinks would be created within databases so that the data can be linked as needed.

Second, individual viewer applications would be created for each of the workflows. These applications would be available to most City and MPU staff through a GIS based viewer. Staff would be able to locate a property parcel or utility feature and identify all the applicable documents and data for that feature, regardless of what application was used to enter the data or what database it is stored in.

An example of a business viewer application is provided below. This application would allow business data from Fire, Clerk, and Planning departments to be viewed in a location based context.



This could lead to greater efficiencies within the process since everyone would have access to the ***same information*** at the ***same time***. It would not matter if they are not familiar with a particular system, or whether that data was not created within their department.

As these applications are created, the workflows will evolve. The workflows will become more centered around the viewing applications and less departmental. Departments which may have not been involved may become more involved within the process since they will have access to information they did not have previously. Departments that are actively involved in the process will become more efficient as resources are removed from data entry to review and analysis functions.

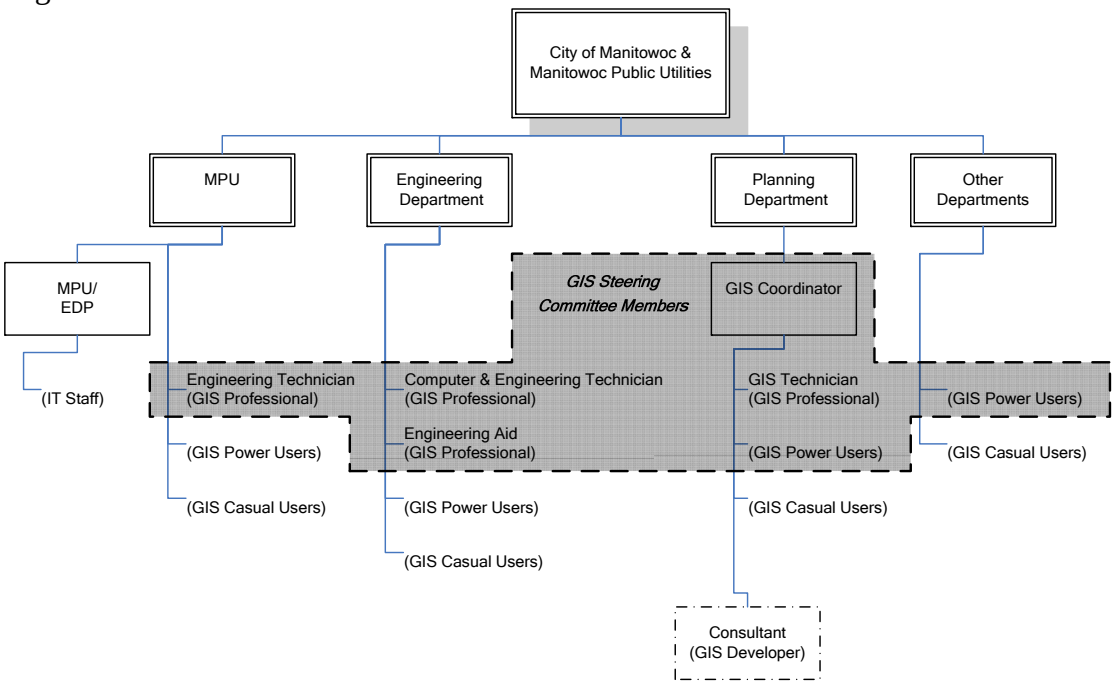
Staffing Recommendations

23. Staffing

The purpose of this chapter is to describe the staffing and skills needed to support the City and MPU's GIS. A centralized-weak GIS organizational structure under Planning was recommended in the Operational Procedures chapter. Using this organizational structure, the staffing breakdown would be as follows:

Department	Role	Title
Planning	GIS Coordinator	GIS Coordinator (new)
Planning	GIS Professional (Editor and Analyst)	GIS Technician
Engineering	GIS Professional (Editor)	Computer & Engineering Technician
Engineering	GIS Professional (Editor)	Engineering Aid
MPU	GIS Professional (Editor)	Engineering Technician
MPU/EDP	IT Staff	Various
All Departments	Power Users	Various
All Departments	Casual Users	Various
General Public	Casual Users	NA
Consultant	GIS Developers	NA

Organizational Chart:



The positions are listed with both their role as described in this document and their actual job title used within the City. The only new position would be the GIS Coordinator. The other positions are existing. It is not expected that job descriptions would need major changes for any of the existing positions; however, some minor job description updates may be needed to include knowledge of ESRI GIS software products. In the event of upgrading an existing position to the GIS Coordinator, a major job description change would occur. The following pages contain the information necessary to update job descriptions for the roles of GIS Coordinator and GIS Professional.

24. Knowledge and Training

24.1. GIS Coordinator

As discussed in the Operational Procedures chapter, the GIS Coordinator is a new position that is primarily responsible for coordinating all the GIS activities within the City and MPU. This position will be closely involved with every aspect of the GIS, from highly technical database configurations to cartographic design for the general public. Establishing a position that can provide guidance and governance to the projects of this plan are paramount to the successful use and proliferation of GIS throughout the City of Manitowoc. If a new GIS Coordinator position would not be created, the secondary option would be to upgrade and change an existing job description. The roles listed below should be used as a guide to updating a job description. There would also be the necessity to have a pay scale adjustment for the additional knowledge and skills.

This role will need to:

- Coordinate the GIS functions of all City and MPU departments.
- Lead and monitor GIS implementation and maintenance activities.
- Interact regularly with GIS and non-GIS staff from other departments to ensure that all GIS needs are being met.
- Coordinate the GIS activities regarding spatial analysis, data modeling, development and management of databases, metadata, digital mapping, and GIS data standards and quality assurance procedures.
- Manage GIS data development and conversion projects.
- Provide technical expertise, assistance, and training to users.
- Act as highest-level technical expert, addressing issues of standards, strategy, technical requirements, and long-term administration and maintenance.
- Provide expertise on GIS development technologies.
- Perform on-going objective evaluation of GIS effectiveness; recommend and implement changes necessary to meet the goals.
- Assist in the development and administration of the GIS budget, and work closely with user departments, consultants, vendors, external users, and the general public in the coordination and utilization of GIS services.

GIS Software Used

- ArcGIS Desktop – ArcInfo (for advanced Analysts)
- ArcIMS and/or ArcGIS Server

The GIS Coordinator will be using an ArcInfo license most of the time since their work will often involve a wide range of GIS tasks from database maintenance, editing, and analysis. Since they are also responsible for the web mapping component of the GIS, they will also be familiar with the running and maintaining of an ArcIMS and/or ArcGIS

Server based web mapping site. However, they are not expected to be actually writing software code in the process of developing the web mapping site.

Recommended Knowledge and Training

The following ESRI training courses are used as a guide in describing the practical knowledge the GIS Coordinator should already have.

ArcGIS Desktop II: Tools and Functionality

- List common GIS tasks and identify which ArcGIS Desktop application is used for each task.
- Understand what the geodatabase offers for GIS data storage.
- Create and edit geodatabase features.
- Control the appearance and display of data layers in ArcMap.
- Classify and symbolize map data.
- Label map features.
- Change the coordinate system and map projection used to display a dataset.
- Access feature information in tables and control table display properties.
- Query and analyze GIS data.
- Create presentation-quality maps and graphs.
- Geocoding

ArcGIS Desktop III: GIS Workflows and Analysis

- Add data from different sources to a geodatabase.
- Work with subtypes to edit data.
- Edit and validate feature geometry and attributes using geodatabase topology.
- Run analysis tools using dialog boxes and models.
- Build a complex model using ModelBuilder.

Building Geodatabases

- Understand the geodatabase structure.
- Load vector and raster data into a geodatabase.
- Create and apply attribute domains, subtypes and relationship classes.
- Edit data using attribute domains, subtypes and relationship classes.
- Create and edit geodatabase annotation.
- Create geodatabase topology and apply topology rules.
- Edit topological data.

- Perform geometric network editing and tracing.

Geodatabase Design Concepts

- Understand the structure and features of a geodatabase.
- Define a project and conduct a geodatabase needs assessment.
- Understand the geodatabase design process.
- Create a conceptual model for a geodatabase.
- Build a logical data model for a geodatabase.
- Build a geodatabase schema.
- Test the model and deliver a geodatabase.

Learning ArcIMS

- Understand the components of an ArcIMS web site.
- Create ArcIMS services.
- Manage ArcIMS services, servers, folders, and site configuration.

Introduction to ArcGIS Server

- Describe the types of ArcGIS Server services available and the options related to each.
- Author and publish map services and geoprocessing tasks that are optimized for performance.
- Publish a geodata service for data replication and extraction.
- Access services using a variety of clients (ArcMap, ArcGIS Explorer and web applications).
- Build web mapping applications that use GIS services.

24.2. GIS Professionals

GIS Professionals are the day-to-day users of GIS software. While their job is not fully dedicated to only GIS tasks, their jobs are heavily dependant on GIS technology and performing GIS-based tasks. GIS Professionals are categorized either as “Editors” or “Analysts.”

24.2.1. Editors

GIS Professionals who are “Editors” are primarily concerned with creating and maintaining GIS data layers and associated attribute information. On a regular basis, they populate and maintain GIS applications and databases. Their work involves the:

- Conversion or digitizing of various datasets such as property parcels or municipal utilities.
- Manipulation of detailed and spatially accurate data.

- Execution of attribute and spatial queries to support maintenance operations.
- Data conversion projects.
- Data and process documentation.
- Troubleshooting problems associated with existing GIS data.

GIS Software Used

- ArcGIS Desktop – ArcEditor
- ArcGIS Desktop – ArcView

Editors who want to use advanced COGO tools, modify features with topology or geometric networks will need to use an ArcEditor license. Unlike the old ArcInfo Workstation software, COGO capabilities do not require an extension and come with ArcInfo and ArcEditor. All other Editors would be able to use an ArcView license. The advanced COGO tools would be very useful for maintaining property parcels; however, distance/bearing coordinates can be edited and maintained in ArcView through other means. Geometric networks are used in utility networks to determine flow direction and loops. Topology allows features to be spatially related to other features. This is useful for both utility and parcel mapping.

Recommended Knowledge and Training

The following ESRI training courses are used as a guide in describing the practical knowledge the staff should have and what additional knowledge may be needed.

ArcGIS Desktop II: Tools and Functionality

- List common GIS tasks, and identify which ArcGIS Desktop application is used for each task.
- Understand what the geodatabase offers for GIS data storage.
- Create and edit geodatabase features.
- Control the appearance and display of data layers in ArcMap.
- Classify and symbolize map data.
- Label map features.
- Change the coordinate system and map projection used to display a dataset.
- Access feature information in tables and control table display properties.
- Query and analyze GIS data.
- Create presentation-quality maps and graphs.
- Geocoding.

ArcGIS Desktop III: GIS Workflows and Analysis

- Add data from different sources to a geodatabase.
- Work with subtypes to edit data.

- Edit and validate feature geometry and attributes using geodatabase topology.
- Run analysis tools using dialog boxes and models.
- Build a complex model using ModelBuilder.

Building Geodatabases

- Understand the geodatabase structure.
- Understand advantages of geodatabase validation rules.
- Load vector and raster data into a geodatabase.
- Create and apply attribute domains, subtypes and relationship classes.
- Edit data using attribute domains, subtypes and relationship classes.
- Create and edit geodatabase annotation.
- Create geodatabase topology and apply topology rules.
- Edit topological data.
- Perform geometric network editing and tracing.

Data Production and Editing Techniques

- Convert data stored in different formats to the geodatabase format.
- Use a data workflow and editing process in ArcGIS.
- Solve common coordinate system problems.
- Create and modify features using ArcMap sketch and edit tools.
- Create and edit feature attributes and tables.
- Maintain data integrity with geodatabase rules.
- Create metadata to document datasets.

Creating and Editing Parcels with ArcGIS Desktop

- Understand the structure and capabilities of a geodatabase.
- Symbolize cadastral data.
- Create layer files.
- Set up the ArcMap editing environment.
- Create new features using COGO bearing and distance measurements.
- Adjust traverses to fit into an existing parcel framework.
- Use geodatabase topology to ensure data integrity.
- Use many of the ArcMap editing and drawing tools.
- Create and modify annotation including lot dimensions.

- Enter subdivisions.

24.2.2. Analysts

GIS Professionals who are "Analysts" are primarily concerned with analyzing existing GIS data layers and associate attribute information. On a regular basis they perform both spatial and attribute queries. While some datasets may be created during the course of an analysis, they do not regularly update or maintain data. They also use cartographic techniques to create high quality maps of the analysis output. Their work involves:

- Execution of complex location analysis using GIS software tools and techniques.
- Providing geographic information analysis for other departments.
- Map design.

GIS Software Used

- ArcGIS Desktop – ArcInfo (for advanced Analysts)
- ArcGIS Desktop – ArcView (for most Analysts)

Recommended Knowledge and Training

The following ESRI training courses are used as a guide in describing the practical knowledge the staff should have and what additional knowledge may be needed.

ArcGIS Desktop II: Tools and Functionality

- Identify which ArcGIS Desktop application is used for each task.
- Understand what the geodatabase offers for GIS data storage.
- Create and edit geodatabase features.
- Control the appearance and display of data layers in ArcMap.
- Classify and symbolize map data.
- Label map features.
- Change the coordinate system and map projection used to display a dataset.
- Access feature information in tables and control table display properties.
- Query and analyze GIS data.
- Create presentation-quality maps and graphs.
- Geocoding

ArcGIS Desktop III: GIS Workflows and Analysis

- Add data from different sources to a geodatabase.
- Work with subtypes to edit data.
- Edit and validate feature geometry and attributes using geodatabase topology.
- Run analysis tools using dialog boxes and models.

- Build a complex model using ModelBuilder.

Advanced Analysis with ArcGIS

- Understand the analytical process and reasons for performing analysis.
- Understand the ArcGIS geoprocessing framework including ModelBuilder, the command line, tools and scripts.
- Find and apply a variety of geoprocessing tools.
- Create models and document workflows with ModelBuilder.

Geoprocessing with ArcGIS Desktop

- Set up and modify the geoprocessing environment.
- Find and run the appropriate geoprocessing tools for a variety of tasks.
- Prepare data for analysis.
- Use geoprocessing tools to create, modify, and analyze spatial data.
- Create custom geoprocessing tools and models.
- Model workflows using geoprocessing tools and ModelBuilder.
- Automate and refine geoprocesses using scripting.
- Document geoprocessing methods for reusability and sharing.

Cartographic Design Using ArcGIS 9

- Understand fundamental cartographic principles.
- Design maps for different purposes and audiences.
- Export maps to different formats.
- Create and modify map text.
- Create special text effects such as callouts, shadows, and halos.
- Understand principles of color theory and how they affect map symbolization.
- Choose appropriate symbols for point, line and polygon features.
- Create custom symbols and color schemes.
- Create custom map legends.

24.3. Power Users

GIS "Power Users" are those who use GIS software from time to time, but not on a daily basis. They will typically use GIS for viewing capabilities, simple queries, and basic location analysis. They are not involved directly in the updating of any GIS data layers. The GIS resources they use will largely be predefined, and they will not often be adding any new data layers to them.

GIS Software Used

- ArcGIS Desktop – ArcView
- ArcReader (for most Power Users)
- ArcExplorer

Recommended Knowledge and Training

The following ESRI training course is used as a guide in describing the practical knowledge the staff should have and what additional knowledge may be needed.

ArcGIS Desktop II: Tools and Functionality

- List common GIS tasks and identify which ArcGIS Desktop application is used for each task.
- Understand what the geodatabase offers for GIS data storage.
- Create and edit geodatabase features.
- Control the appearance and display of data layers in ArcMap.
- Classify and symbolize map data.
- Label map features.
- Change the coordinate system and map projection used to display a dataset.
- Access feature information in tables and control table display properties.
- Query and analyze GIS data.
- Create presentation-quality maps and graphs.

24.4. Casual Users

"Casual Users" use GIS technology in a browser-based format. The GIS technology itself will largely be hidden from the user. There would be no editing capability and predefined query and analysis capabilities.

GIS Software Used

- County/City GIS Portal Land Records Viewer

Recommended Knowledge and Training

The County/City GIS Portal Land Records Viewer should be designed so that no formal training is needed. Online help should be very easy to access and intuitive to use.

24.5. General Public

The general public is nearly identically to the Casual Users except that no training is provided. The capabilities may also be further restricted for privacy reasons.

GIS Software Used

- County/City GIS Portal Land Records Viewer

Recommended Knowledge and Training

The County/City GIS Portal Land Records Viewer should be designed so that no formal training is needed. Online help should be very easy to access and intuitive to use.

24.6. GIS Developers

GIS "Developers" are involved in all aspects of GIS application development, including design, analysis, programming, testing, documentation, training, and user support. This primarily includes the creation and maintenance of the GIS mapping websites. The GIS Developer may be a combination of both City and MPU staff and software development consultants. The work is primarily project-based and involves:

- Create software specifications and estimates.
- Write and document GIS application code.
- Write technical user documentation for application products.
- Maintain and update existing applications used by clients.
- Assist GIS technical staff with general programming support.
- Troubleshoot application problems.
- Providing GIS software and programming expertise.

GIS Software Used

- ArcIMS
- ArcGIS Server - Standard
- ArcGIS Desktop - ArcInfo

Recommended Knowledge and Training

The following ESRI training courses are used as a guide in describing the practical knowledge the staff should have and what additional knowledge may be needed.

Introduction to ArcGIS Server

- Describe the types of ArcGIS Server services available and the options related to each.
- Author and publish map services and geoprocessing tasks that are optimized for performance.
- Publish a geodata service for data replication and extraction.
- Access services using a variety of clients (ArcMap, ArcGIS Explorer, and Web applications).
- Build Web mapping applications that use GIS services.

Developing Applications with ArcGIS Server Using the Microsoft .NET Framework

- Understand the components of the ArcGIS Server Web ADF.

- Work with the Web Mapping Application template.
- Use the Web ADF to develop custom Web applications.
- Work with the AJAX frameworks.
- Develop custom applications using the ArcGIS Server APIs.
- Build custom Web tasks using the task framework.

ArcGIS Server: Web Administration Using the Microsoft .NET Framework

- Work with ArcGIS Server administration applications for service and server management tasks.
- Manage data used by ArcGIS Server.
- Understand how geographic analysis is conducted on the GIS server.
- Optimize dynamic data transfer between the client and server.
- Implement cached services to optimize performance.
- Implement security for web applications and services.
- Deploy web applications and services using a reverse proxy configuration.

24.7. IT Staff

The IT staff is the staff of the MPU/EDP Unit. In terms of the GIS, they are responsible for administration and maintenance of the file and database servers used by the GIS. They may also be involved in geodatabase design and development, and may assist implementation, installation, and support of GIS software and applications.

GIS Software Used

- None

Recommended Knowledge and Training

IT staff should have knowledge concerning system architecture design. A general understanding of the hardware capacity requirements that are unique to GIS is helpful. The System Design Strategies technical reference document by ESRI may be useful to IT staff. It is available at http://www.esri.com/systemdesign.

Implementation Plan

25. Recommendations Overview

Based on the interviews with City and MPU staff and subsequent evaluation, the following recommendations have been developed to assist the City and MPU in moving forward with the development of GIS. A summary of the data, applications and technology, operational procedures, and training recommendations follows.

25.1. Data

- Designate core GIS datasets used by the City and MPU, and identify custodians for the core GIS datasets. Addressing, Aerial Photography and Property Parcels are the most important core GIS datasets. Buildings, Electrical System, Water System, Elevation, Sewer System, Stormwater System, Official Map, and Zoning Districts are also considered the core GIS datasets.
- Implement a production-publication-product tier approach to data management.
- Convert all core GIS data to file geodatabase, and maintain data in file geodatabases.
- Review data licensing agreement and policy.
- Consolidate and address management to a single source.
- Acquire new aerial photography in cooperation with other jurisdictions every three to five years, with 2010 being the next flight.
- Continue to maintain property parcels and keep annual archives.
- Maintain the building data layer and develop unique IDs for buildings that can be tied to other application databases.
- Integrate the electrical system dataset with the CIS application database.
- Develop procedures for updating the elevation datasets.
- Convert the Official Map to file geodatabase datasets.
- Convert the sewer system datasets and attribute database to a file geodatabase.
- Convert the stormwater system datasets and attribute database to a file geodatabase.
- Integrate the water system dataset with the CIS application database.
- Add detailed attribute information to the zoning datasets.
- Continue to develop the other non-core GIS datasets.

25.2. Applications and Technology

- Migrate to an ESRI-based GIS platform.
- Identify and plan for three types of desktop GIS useage: Editors, analysts, and viewers. Editors would require ArcView or ArcEditor licenses. Analysts would require ArcView or ArcInfo licenses. Viewers would use ArcReader software.
- Continue to maintain file servers and network infrastructure necessary to support file geodatabases.
- Provide connections to application databases, such as CLT-IAS and Springbrook that can be used by GIS staff.
- Build upon the County/City GIS Portal Land Records Viewer by moving away from the one-size-fits-all model of web mapping. Develop one-purpose mapping websites that are linked to application databases.
- Change the navigation tools on the Land Records Viewer to match the styles used by commercial mapping applications and implement tiling capabilities[11].
- Eliminate the use of pop-up windows on the Land Records Viewer.
- Provide the ability to share Land Records Viewer maps by URLs.
- Continue the City-County shared relationship on the Land Records Viewer.
- Consider converting all datasets that the general public may want to use to KML and posting them on the website. This would include all the layers found on the Land Records Viewer.
- Investigate methods to tie GIS datasets to CherryLAND.
- Link assessment information in CLT-IAS to the property parcel layer.
- Populate zoning and address information from CLT-IAS from other datasets.
- Spatially enable the Springbrook application by linking parcel PINs or addresses.
- Spatially enable the CLT-IAS, Springbrook, ActiveNet, CIS, Firehouse, Landisc, New World, PASER, StrataPoint, CIMS, and OPS City and MPU applications.

[11] Also known as “slippy maps” which is type of web-browser based map client that allows a user to dynamically pan the map simply by grabbing and sliding the map image in any direction without requiring a page reload.

25.3. Operational Procedures

- Implement a centralized-weak GIS organizational structure.
- Create a GIS Coordinator position within Planning to better organize GIS services within the City and MPU.
- Form a GIS steering committee that includes GIS staff from Planning, MPU, Engineering, and a representative from the Assessor, Building Inspection, Fire, Parks & Recreation, or Police department on a rotating basis, to be led by the GIS Coordinator.
- Create data exchanges between application databases to reduce duplicate data entry.
- Create individual viewer applications for workflows so that the data becomes independent of the application in which it was created. City and MPU staff would have access to the same information at the same time.

25.4. Staffing and Training Recommendations

- The GIS Coordinator should be fully fluent in the ArcGIS Desktop suite and geodatabase concepts.
- The GIS Coordinator should understand how to administer (but not necessarily develop) ArcIMS and/or ArcGIS Server websites.
- GIS Professionals who focus on editing should be focused on the advanced editing capabilities of the ArcGIS Desktop suite.
- Train GIS Professionals who focus on analysis to become proficient in the ArcGIS Desktop suite, especially in analysis techniques and map design.
- Train some Power Users in the basics of ArcGIS Desktop or allow others to learn by using ArcReader.
- No training should be necessary for Casual Users or the general public.
- Consider hiring consultants as GIS Developers. The consultants should have advanced knowledge of developing ArcGIS Server applications.
- No additional training is needed for MPU/EDP staff; however they should be kept informed of hardware and network requirements by the GIS Coordinator.

26. Projects

Using the recommendations as a foundation, a series of projects have been created to fulfill the recommendations. A single project may meet the objectives of a number of recommendations. Each project is then ranked and prioritized based on a number of criteria.

26.1. GIS Reorganization

The GIS Reorganization project is designed to meet several of the recommendations regarding how the GIS is structured within the City and MPU. The first task is to create the new position of a GIS Coordinator. The GIS Coordinator would oversee this project as well as the implementation of other projects. A GIS Steering Committee would be formed, made up of GIS staff from Planning, Engineering, MPU, and another department. Several of the datasets used by the City and MPU would be designated as core datasets and data custodians would be assigned. A production-publication-product data tier system would be developed and formalized. Along with this, ODBC connections would be made with several of the major application database (such as Springbrook and CLT-IAS) so data within these databases can be linked to the geographic data when a dataset is placed on the publication data tier. Last, the GIS Coordinator would review and possibly update the data license agreement.

Tasks, Timeframe and Costs

GIS Coordinator	Three months to create position	Annually, $50,000 to $65,000 + Fringe
GIS Steering Committee	Monthly meetings	Staff time only
Core Datasets	One month	Staff time only
Production-Publication-Product Data Tiers	One month to develop publication schema	Staff time only
ODBC Connections	One month	Staff time only
Data License review	Two months	Staff time only

Does the project help to fulfill a mandate or legal requirement?

Somewhat, although the GIS Reorganization project does not directly fulfill a mandate or legal requirement, it does indirectly support the fulfillment of City and MPU obligations. The data license review task should also be conducted in light of recent state and national court cases.

Rating (Yes=5, No =1): 4

Will the project improve customer service?

Somewhat. The public will not directly be affected by the reorganization; however, they will be directly affected by the results of the reorganization and the subsequent projects that are undertaken. Customer service may improve through modification of the data license agreement by making more data available.

Rating (Yes=5, No =1): 4

Does the project streamline government processes?

Yes. GIS within the City and MPU will be more coordinated allowing for greater effectiveness and improved efficiency. Staff within the City and MPU will clearly know who is responsible for GIS and the GIS related data. Staff will be clearly able to get GIS data for their own applications, and that data will be more useful since it is tied in with existing databases.

Rating (Yes=5, No =1): 5

Will many departments / staff benefit from the project?

Yes. Nearly all of the departments in the City and MPU will benefit from the reorganization. Departments that have not used GIS significantly in the past will likely see more benefits as a result of greater coordination between the departments and improved access to data.

Rating (Yes=5, No =1): 5

Is the project low cost or fundable?

Somewhat. The creation of a new position is a significant long-term investment, especially for departments such as Planning where most of the budget costs are personnel. However, the long term gains in efficiency and the benefits seen through greater coordination should make this project more fundable. The other tasks are largely done through existing staff time and involved no extra budget funding.

Rating (Yes=5, No =1): 3

Is the project easy (not risky, not likely to fail)?

Yes. The tasks, other than the creation of the new position, are easy to implement. A GIS Coordinator position is not uncommon for cities the size of Manitowoc. The tasks proposed are considered best practices and therefore not likely to fail.

Rating (Yes=5, No =1): 5

26.2. Engineering Conversion

This project includes the conversion of the Engineering Department's core datasets from MicroStation to the ESRI platform. This will involve the purchasing of additional ESRI software, staff training, geodatabase design, conversion, and on-going maintenance of the property parcels, sewer system, stormwater system, and Official Mapping. The training may be used for either Engineering or GIS staff.

Tasks, Timeframe and Costs

ArcEditor License (1)	Prior to start of data conversion	$6,300 to purchase $1,500 annual maintenance
ArcGIS Desktop II: Tools and Functionality training (2)	Prior to start of data conversion	$3,000 total ($1500 each class)
ArcGIS Desktop III: GIS Workflows and Analysis training (1)	Prior to start of data conversion	$1,000
Building Geodatabases (1)	During data conversion	$1,500
Data Production and Editing Techniques training (1)	After data conversion	$1,500
Creating and Editing Parcels with ArcGIS (1)	After data conversion	$1,000
Property Parcel Conversion	Three to Six months	Staff time only or up to $5,000 to $10,000 for consultant
Sewer System Conversion	Three to Six months	Staff time only or up to $3,000 to $8,000 for consultant
Stormwater System Conversion	Three to Six months	Staff time only or up to $3,000 to $8,000 for consultant
Official Map Conversion	One month	Staff time only

Does the project help to fulfill a mandate or legal requirement?

Yes. The City is required to have sewer, stormwater, and Official Mapping. Although the City is not required to maintain property maps, the County relies on the City to map parcels within the corporate limits.

Rating (Yes=5, No =1): 5

Will the project improve customer service?

Somewhat. The public currently has access to property parcels, water, sewer and Official Mapping through the County/City GIS Portal Land Records Viewer. Through the engineering conversion process, it is expected that the attribute information will be more detailed.

Rating (Yes=5, No =1): 4

Does the project streamline government processes?

Yes. Although it will slow at first during training, maintaining property parcels, water, sewer, and Official Mapping within a geodatabase, is more efficient than maintaining them in separate geometry and attribute files.

Rating (Yes=5, No =1): 4

Will many departments / staff benefit from the project?

Somewhat. This will help MPU, Building Inspection and Planning,

Rating (Yes=5, No =1): 4

Is the project low cost or fundable?

Somewhat. There are some significant costs involved in the purchasing of software, training, and the actual data conversion, if a consultant is hired. It should be recognized that all the costs involved are an investment, and will be paid out over time in improved efficiencies.

Rating (Yes=5, No =1): 3

Is the project easy (not risky, not likely to fail)?

Yes. Many communities have gone through the process of converting their engineering system maps to ESRI geodatabases. Although the process will be new to the City, it has been done many times before, and the City can learn from other experiences.

Rating (Yes=5, No =1): 5

26.3. MPU Conversion

The MPU Conversion project will convert the Utilities core datasets from MicroStation to an ESRI platform. This involves the purchasing of additional ESRI software, staff training, geodatabase design, conversion, and on-going maintenance of the water and electrical system maps.

Tasks, Timeframe and Costs

ArcEditor License (1)	Prior to start of data conversion	$6,300 to purchase $1,500 annual maintenance
ArcGIS Desktop II: Tools and Functionality training (2)	Prior to start of data conversion	$3,000 total ($1500 each class)
ArcGIS Desktop III: GIS Workflows and Analysis training (1)	Prior to start of data conversion	$1,000
Building Geodatabases (1)	During data conversion	$1,500
Data Production and Editing Techniques training (1)	After data conversion	$1,500
Water system conversion and integration with CIS	Three to Six months	Staff time only or up to $10,000 to $15,000 for consultant
Electrical system conversion and integration with CIS	Three to Six months	Staff time only or up to $10,000 to $15,000 for consultant

Does the project help to fulfill a mandate or legal requirement?

Yes. MPU is required to maintain water and electrical system mapping.

Rating (Yes=5, No =1): 4

Will the project improve customer service?

Somewhat. Improved customer services are likely through efficiencies gained in streamlining the processes.

Rating (Yes=5, No =1): 3

Does the project streamline government processes?

Yes. Although it will be slow at first, maintaining the water and electrical systems within a geodatabase is more efficient than within a CAD system. Since the CIS will be more integrated, it is expected that staff will be able to find information faster.

Rating (Yes=5, No =1): 4

Will many departments / staff benefit from the project?

No. Other departments will not be directly affected by this project, although more data sharing with other departments may occur.

Rating (Yes=5, No =1): 2

Is the project low cost or fundable?

Somewhat. There are some significant costs involved in the purchasing of software, training, and the actual data conversion, if a consultant is hired. It should be recognized that all the costs involved are an investment and will be paid out over time in improved efficiencies.

Rating (Yes=5, No =1): 3

Is the project easy (not risky, not likely to fail)?

Yes. Many communities have gone through the process of converting their water systems to ESRI geodatabases. Not as many electrical utilities have converted their system maps, but the overall trend is to move in that direction.

Rating (Yes=5, No =1): 3

26.4. Viewer Development

The Viewer Development project is the creation of single-purpose mapping viewers (read-only) for Casual Users or Power Users. These viewer applications would be used by nearly all departments in the City. For Clerk, Finance, Assessor, Wastewater, Parks & Recreation, Engineering, Police, Fire, and Mayor's Office, the viewer applications would be how they often use GIS technology. Each single-purpose mapping viewer would be built around specific workflows for the City and incorporate data from multiple GIS datasets. For instance, a "Private Construction" viewer application would allow staff to see all the Planning applications and approvals, all the Building Inspection permits, and any permits that Engineering has issued within the City. The Viewer Development can be accomplished in two phases. The first phase will involve the creation of ArcReader-based applications. This would be for the more basic Power Users, who are somewhat comfortable with concepts such as turning data layers on and off. The second phase involves the development of web-based applications. These are for the Casual Users (intranet applications) and the general public (internet applications) that are designed to be highly intuitive and usable with no training. Additionally, ArcView licenses should be converted from the 'single use' to the 'floating' management structure. This will allow for a license to be drawn from a pool of available licenses and increases the utilization of the ArcView software. A single use license permits a single authorized end user to install and use the software. In a floating management environment the software may be installed on a network, but the number of simultaneous users may not exceed the number of licenses acquired.

Tasks, Timeframe and Costs – Upgrade Phase

ArcView License Upgrade		$6,000 to upgrade

Tasks, Timeframe and Costs – ArcReader Phase

ArcPublisher Extension (for creating ArcReader files)		$2,500 to purchase $500 annual maintenance
Creation of PMF files	Upon purchase of software	Staff time only

Tasks, Timeframe and Costs – Web Mapping Phase

Creation of Web Mapping Sites	Note: Costs for the creation of web mapping sites can vary significantly based on the functionality desired. The websites can be developed in-house, helper third-party design software can be purchased, a consultant solution can be purchased, or a consultant can be hired for a custom solution. The Web Mapping sites should leverage the County/City web server architecture as a foundation for internal/external usage.

Does the project help to fulfill a mandate or legal requirement?

No. While this project will help to streamline functions, it is not a requirement.

Rating (Yes=5, No =1): 1

Will the project improve customer service?

Yes. It is expected that some of the viewer applications will be made available to the general public. Additional viewer applications and functionality will be available to City

and MPU staff, and will thus help to improve the speed and completeness of the information provided to the public.

Rating (Yes=5, No =1): 4

Does the project streamline government processes?

Yes. This project will help to consolidate information in multiple departments from multiple sources. It will provide a single-view of various workflows in the City allowing for greater efficiencies.

Rating (Yes=5, No =1): 5

Will many departments / staff benefit from the project?

Yes. These applications would be available to nearly all City and MPU staff.

Rating (Yes=5, No =1): 5

Is the project low cost or fundable?

Somewhat. The development of ArcReader projects is relatively low considering the amount of information that will be opened up. Although some staff time will be needed to develop the applications, it is relatively easy to do so. The development of web mapping sites can have a much higher investment depending on the specific solutions taken. However, this would also allow the public to view the information.

Rating (Yes=5, No =1): 3

Is the project easy (not risky, not likely to fail)?

Somewhat. ArcReader projects are relatively easy to setup. Web mapping sites are more difficult, but are very commonplace.

Rating (Yes=5, No =1): 4

26.5. Address Consolidation

The Address Consolidation project will create a master address range and address point dataset for all addresses (including subunits). Addresses stored in other databases will be either populated or verified against the master address list.

Tasks, Timeframe and Costs

Convert Addresses to Geodatabase	Three to six months	Staff time only or up to $3,000 to $8,000 for consultant
Integrate with CLT-IAS	Three to six months	Staff time only or up to $10,000 for consultant
Integrate with Springbrook	Three to six months	Staff time only or up to $10,000 for consultant
Integrate with CIS	Three to six months	Staff time only or up to $10,000 for consultant
Voter Address Verification	Three to six months	Staff time only or up to $5,000 for consultant
Common Place Name data set creation	Six months	Staff time only or up to $10,000 for consultant

Does the project help to fulfill a mandate or legal requirement?

Somewhat. Verifying voter registration is a requirement. However, the other aspects are not a direct requirement, but do significantly support required municipal, public safety, and utility functions that need addresses.

Rating (Yes=5, No =1): 4

Will the project improve customer service?

Yes. Address related issues should be minimized.

Rating (Yes=5, No =1): 5

Does the project streamline government processes?

Yes. Inaccurate and conflicting address information will be minimized which should streamline processes. This will be especially helpful in the assignment of new addresses and changed addresses. Double-entry of address information should be significantly reduced, if not eliminated entirely.

Rating (Yes=5, No =1): 5

Will many departments / staff benefit from the project?

Yes. Nearly every department is reliant on addresses.

Rating (Yes=5, No =1): 5

Is the project low cost or fundable?

Yes. This project can be done largely in-house with existing GIS and MPU/EDP staff. As an alternative, a consultant can be hired to complete the tasks, or portions of the task.

Rating (Yes=5, No =1): 4

Is the project easy (not risky, not likely to fail)?

Somewhat. Consolidating this many systems is difficult. Given the wide range of applications and platforms (ESRI, SQL Server, Oracle), it is likely that some technical difficulties will arise. There can also be staff change and management issues as the project is progressing.

Rating (Yes=5, No =1): 2

26.6. Aerial Photography

Aerial photography should be purchased every three to five years. It is also recommended planimetrics be acquired with the aerial photography. New aerial photography has been budgeted for and will be acquired at cost savings in 2010 in conjunction with a statewide imagery project.

Tasks, Timeframe and Costs

Aerial Photography	Delivery is usually six to twelve months after the flight	TBD
Planimetrics	Delivery is usually nine to eighteen months after the flight	TBD

Does the project help to fulfill a mandate or legal requirement?

Somewhat. Aerial photography supports many required processes.

Rating (Yes=5, No =1): 4

Will the project improve customer service?

Yes. It can be confusing for the public if aerial photography is out-of-date.

Rating (Yes=5, No =1): 5

Does the project streamline government processes?

Yes. Nearly every department uses aerial photography in various workflows.

Rating (Yes=5, No =1): 5

Will many departments / staff benefit from the project?

Yes. Nearly every department uses aerial photography.

Rating (Yes=5, No =1): 5

Is the project low cost or fundable?

Yes. While aerial photography is becoming more affordable and the public and elected officials better understand the value of it, planimetric data is still costly and the value is not easily understood by the public.

Rating (Yes=5, No =1): 4

Is the project easy (not risky, not likely to fail)?

Yes. This has been done before and is usually very successful.

Rating (Yes=5, No =1): 5

26.7. Data Enhancements

The Data Enhancement project is really a series of smaller projects. Each project is largely self-contained and designed to improve the core GIS datasets not already discussed.

26.7.1. Buildings

This project involves converting the building footprints from DGN to a file geodatabase; identify either MPU or Engineering as the data custodian for the building footprints; assigning unique ID numbers to individual buildings that are linked to the Assessor's CAMA data; and begin the process of creating three dimensional buildings rather than just building footprints.

Tasks, Timeframe and Costs

Integrate building layer with CLT-IAS	Unknown	Unknown
Assign unique IDs to buildings	Three to Six months	Staff time only or up to $8,000 for consultant
Integrate buildings with addressing dataset	One to Three months	Staff time only
Create three dimensional buildings	Unknown	Unknown

Does the project help to fulfill a mandate or legal requirement?

No.

Rating (Yes=5, No =1): 1

Will the project improve customer service?

Somewhat. The project will help staff understand the location and features of a building.

Rating (Yes=5, No =1): 3

Does the project streamline government processes?

Somewhat. Wide-ranging information about a building can be queried and displayed. This allows for more detail for visualization and analysis at the sub-parcel level.

Rating (Yes=5, No =1): 3

Will many departments / staff benefit from the project?

Yes. Many departments would be interested in specific information on buildings.

Rating (Yes=5, No =1): 4

Is the project low cost or fundable?

Somewhat. Some of the work can be done by staff. It is not known what is involved in integrating the building information into CLT-IAS or creating 3D city models.

Rating (Yes=5, No =1): 2

Is the project easy (not risky, not likely to fail)?

Somewhat. Assigning addresses and unique IDs to buildings is straightforward. Integrating with CLT-IAS and 3D City models are projects that are subject to more unknowns.

Rating (Yes=5, No =1): 3

26.7.2. Elevation

Improvements to the elevation dataset were discussed in section 10.5.1.6. This project involves developing procedures to update the elevation layer when grading plans are approved.

Tasks, Timeframe and Costs

Data updates	As needed	Staff time only

Does the project help to fulfill a mandate or legal requirement?

Yes. Elevation information is needed for proper stormwater management.

Rating (Yes=5, No =1): 5

Will the project improve customer service?

Somewhat. Updated topography is a frequent request, and having updated information is important to avoid confusion.

Rating (Yes=5, No =1): 3

Does the project streamline government processes?

Somewhat. Having an accurate updated elevation model will allow for less frequent topographic updates. It also provides City and MPU staff with more accurate information.

Rating (Yes=5, No =1): 4

Will many departments / staff benefit from the project?

Somewhat. Mostly Engineering and MPU will benefit from this project.

Rating (Yes=5, No =1): 3

Is the project low cost or fundable?

Yes.

Rating (Yes=5, No =1): 5

Is the project easy (not risky, not likely to fail)?

Yes. Although updating elevation data is not commonly done, it is not difficult to do.

Rating (Yes=5, No =1): 4

26.7.3. Zoning

This project involves adding to the existing file geodatabase, information such as approval dates, links to meeting minutes, and the zoning ordinance should be considered to be added to the zoning district dataset. In addition, a yearly historical "snapshot" archive of the zoning district layer should be kept for historical tracking and potential trend analysis projects.

Tasks, Timeframe and Costs

Additional information	One to two months	Staff time only

Does the project help to fulfill a mandate or legal requirement?

Somewhat. The City is required to maintain a zoning map; however it is not required to link it to additional information.

Rating (Yes=5, No =1): 2

Will the project improve customer service?

Yes. Staff will be able to provide more detailed information about a parcel or an area's zoning history.

Rating (Yes=5, No =1): 4

Does the project streamline government processes?

Yes. Staff will have more convenient access to zoning background information.

Rating (Yes=5, No =1): 4

Will many departments / staff benefit from the project?

No. The Planning Department will be the primary beneficiaries of this project.

Rating (Yes=5, No =1): 1

Is the project low cost or fundable?

Yes.

Rating (Yes=5, No =1): 5

Is the project easy (not risky, not likely to fail)?

Yes. This project is technically easy to do, but researching the history of zoning changes and linking to past documents is slow and time consuming.

Rating (Yes=5, No =1): 2

26.8. Project Ratings

The following table is a summary of the criteria rankings for each of the projects:

Project	Required	Improve Customer Service	Streamline Processes	Multi-Dept. Benefits	Fundable	Easy	**Total**
Aerial Photography	4	5	5	5	4	5	**28**
GIS Reorganization	4	4	5	5	3	5	**26**
Address Consolidation	4	5	5	5	4	2	**25**
Engineering Conversion	5	4	4	4	3	5	**25**
Data Enhancement: Elevation	5	3	4	3	5	4	**24**
Viewer Development	1	4	5	5	3	4	**22**
MPU Conversion	4	3	4	2	3	3	**19**
Data Enhancement: Zoning	2	4	4	1	5	2	**18**
Data Enhancement: Buildings	1	3	3	4	2	3	**16**

Aerial photography has the best overall ranking (highest total), followed by the GIS reorganization and address consolidation. This is not surprising given how important aerial photography is for municipal GIS. It also shows how critical the GIS reorganization is for the City to undertake. These rankings should be considered the priority for funding. While some projects may hold a higher level of importance the chronological progression of major projects is as follows: Aerial Photography, GIS Reorganization, Engineering Conversion, Viewer Development, Address Consolidation, and MPU Conversion.

26.9. Unscheduled Projects

Not all of the recommendations made throughout this plan are addressed in the above projects. These are often relatively smaller or minor projects that can be done as needed or as time allows. These projects should be able to be done using existing staff time without the need for specific funding. A majority of these projects would involve the recommendations on improving the non-core datasets. Other projects involve working with the other database applications to spatially enable them.

27. Implementation Plan

27.1. Software License Summary

The following table summarizes the software license recommendations. It is also recommended that three of the single use ArcView licenses be converted to floating licenses. With floating licenses, the software can be installed on an unlimited number of PCs; however, only so many people can be using the software at the same time based on the number of licenses purchased. With a standard or single use license, one license is installed on a single computer. Through the use of floating licenses, as staff becomes more familiar with GIS – through the use of ArcReader – they can advance to ArcView without the need for additional licenses to be purchased. One license can remain as single use for use on a laptop or server.

	ArcInfo	**ArcEditor**	**ArcView**	**ArcReader (Publisher Ext.)**	**Total Cost**
Existing	2 – Floating	0	4 – Single Use	0	
Planned	2 – Floating	2 – Floating	3 – Floating 1 – Single Use	1	
Purchase Cost	$0	$6,300 each **Total $12,600**	$2,000 each to upgrade from single use to floating. **Total $6,000**	Publisher Extension **Total $2,500** (ArcReader is free)	**$21,100**
Annual Maintenance Cost (Following the year purchased)	$3,000 (first) $1,200 (second) **Total $4,200**	$1500 (first) $1200 (second) **Total $2,700**	$700 (first) $500 (2 to 4) **Total $1,200**	Publisher Extension **Total $500**	**$8,600**
Role	GIS Coordinator GIS Professional	GIS Professional	Power User	Power User Casual User	
Departments	Planning (2) Engineering (1)	Engineering (1) MPU (1)	Planning (2) Engineering (3)	Assessor (3) Building Inspection Others as needed	
Planned / Future Users	GIS Coordinator GIS Technician GIS Server	Engineering Aide Engineering Technician	Associate Planner Stormwater Aide Deputy City Planner Computer & Engineering Technician City Surveyor	Laptops (2) City Assessor Property Appraiser II Assessment Technician	

In addition, the City currently shares a license of ArcIMS with Manitowoc County. At the 9.2 version, users of ArcIMS that are current with maintenance also were upgraded to ArcGIS Server Standard Workgroup edition, which includes both web mapping and ArcSDE technology. Assuming that the relationship with the County continues, no additional software is needed to develop web mapping sites using ArcGIS Server

technology. The hardware the County maintains, the County/City GIS Portal Land Records Viewer, should be capable of hosting these web mapping sites.
Given City and MPU's existing IT hardware infrastructure, it is not expected that these improvements will have any substantial impact on the existing hardware structure. This is based on the assumption that individual PCs will be on consistent replacement schedules and storage space on servers is regularly expanded. Depending on how the web mapping viewer applications are deployed, an additional server (physical or virtual) may be needed.

27.2. Implementation Schedule

Using the project ratings, an implementation schedule has been developed to put into practice the recommendations made in this plan. The schedule covers the next five years.

year	2010				2011				2012				2013				2014	Beyond
quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th		
Aerial Photography																		
Aerial Photography		(a)																
Planimetrics																		
GIS Reorganization																		
GIS Coordinator	(b)																	
GIS Steering Committee																		
Core Datasets																		
Production-Publication-Product Data Tiers																		
ODBC Connections		(c)																
Data License Review																		
Engineering Conversion																		
ArcEditor Softare																		
Learning Desktop 2 Training																		
Learning Desktop 3 Training																		
Building Geodatabases Training																		
Data Production Training																		
Editing Parcels Training																		
Property Parcels Conversion																		
Sewer System Conversion																		
Stormwater System Conversion																		
Offical Map Conversion																		
Viewer Development																		
ArcView License Upgrade																		
ArcPublisher software																		
PMF Creation				(d)														
Web Mapping Viewer App. Development																		
Data Enhancements: Elevation																		
Address Consolidation																		
Convert Address to Geodatabase																		
Integrate with CLT-IAS																		
Integrate with Springbrook																		
Integrate with CIS																		
Voter Address Verification										(e)								
Common Place name data set creation																		
MPU Conversion																		
ArcEditor Software																		
Learning Desktop 2 Training																		
Learning Desktop 3 Training																		
Building Geodatabases Training																		
Data Production Training																		
Water Conversion																		
Electrical Conversion																		
Data Enhancements: Zoning																		
Data Enhancements: Buildings																		
Integrate with CLT-IAS																		
Unique IDs																		
Assign Addresses																		
Three Dimensional																		
Other Recommendations									(f)									

(a) Aerial photography and planimetrics are critically important and can proceed before the GIS Coordinator position is filled. The project is likely to spill over into 2011 depending on the vendor chosen.
(b) The GIS Coordinator position should be filled as soon as possible. Most tasks are dependent on this position.
(c) OBDC connections should be created so that the enterprise database applications can be readied for future projects.
(d) The creation of PMF (ArcReader project documents) can begin as soon as the Publisher software is purchased and data has been moved into the data tiers. The number of PMFs will gradually increase as new datasets become available.
(e) Voter verification should be tested in the 2012 presidential primary election, so that it is ready for the November 2012 presidential election.
(f) Other "un-scheduled" recommendations, such as improvements to non-core datasets, should be made as needed, or as time allows beginning in 2012, after the conversion of the Engineering datasets.

27.3. Year 2010 Budget Items

Initiatives in 2010 focus on creating the GIS Coordinator position and reorganizing GIS within the City and MPU. The Engineering Department will invest significantly in training on ESRI software and convert the property parcels to geodatabases. GIS will reach deeper into the City with the development of ArcReader PMF that can be distributed freely to City and MPU parties that are connected to the network.

Task	*Department*	*2010 Budget*
Aerial Photography		
Aerial Photography	Planning/GIS	(a)
Planimetrics	Engineering	(a)
GIS Reorganization		
GIS Coordinator	Planning/GIS	(b)
GIS Steering Committee	NA	None
Core Data Sets	Planning/GIS	None
Production-Publication-Product Tiers	Planning/GIS	None
ODBC Connections	MPU/EDP	None
Data License Review	Planning/GIS	None
Engineering Conversion		
ArcEditor Software	Engineering	$6,300
Desktop 2 Training (2 staff)	Eng. or Plan.	$3,000
Desktop 3 Training (1 staff)	Eng. or Plan.	$1,000 (c)
Building Geodatabases Training (1 staff)	Eng. or Plan.	$1,500 (c)
Data Production Training (1 staff)	Eng. or Plan.	$1,500 (c)
Editing Parcels Training (1 staff)	Eng. or Plan.	$1,000 (c)
Property Parcels	Engineering	$10,000 (d)
Official Map	Engineering	None
GIS export to DGN procedure	Engineering	None
Viewer Development		
ArcView License Upgrade	Eng. and Plan.	$6,000
ArcPublisher Software	Planning/GIS	$2,500
ArcReader PMF Creation	Planning/GIS	None
Totals	Engineering	$27,300
	Planning/GIS	$5,500
	Grand Total	**$32,800**

(a) The costs for aerial photography and planimetrics will depend on the exact specifications prepared by the City and whether it is in conjunction with other jurisdictions.
(b) The costs for the position are dependent on the City's HR policies. A general salary range is $50,000 to $65,000 plus fringe. A PC will need to be provided to this person if this is a new position.
(c) These are recommended, but optional courses. Internet-based training may be available at substantially lower costs, in addition to on-the-job training and utilization of free tutorials and webinars.
(d) This is an estimated budget amount if a consultant is hired. Exact amount will depend on the scope of services requested. Amount can be substantially lower depending on the amount of work done in-house.

27.4. Year 2011 Budget Items

Year 2011 initiatives are centered around the conversion of Engineering's sewer and stormwater systems. Additional ArcReader PMF as new datasets are brought into place.

Task	*Department*	*2011 Budget*
Aerial Photography		
Aerial Photography	Planning/GIS	(a)
Planimetrics	Engineering	(a)
Engineering Conversion		
Sewer System	Engineering	$8,000 (b)
Stormwater System	Engineering	$8,000 (b)
Training	Engineering	(c)
Viewer Development		
ArcView License Upgrade	Eng. and Plan.	(d)
ArcReader PMF Creation	Planning/GIS	None
Software Maintenance	Eng. and Plan.	$7,400
Totals	Engineering	$19,700
	Planning/GIS	$3,700
	Grand Total	**$23,400**

(a) Any costs that are carried over from 2010.
(b) This is an estimated budget amount if a consultant is hired. Exact amount will depend on the scope of services requested. Amount can be substantially lower depending on the amount of work done in-house.
(c) Recommended training courses not taken in 2010 should be budgeted for in 2011.
(d) Licenses not converted in 2010 should be budgeted for in 2011.

27.5. Year 2012 Budget Items

Year 2012 initiatives are centered around the address consolidation. This will be particularly important for election address verification since this is a presidential election year. Planning/GIS will also be able to further develop non-core GIS datasets now that the Engineering datasets are converted.

Task	*Department*	*2012 Budget*
Data Enhancements		
Elevation	Engineering	none
Buildings – Assign Addresses	Planning/GIS	none
Address Consolidation		
Convert Address to Geodatabase	Planning/GIS	$8,000 (a)
Integrate with CLT-IAS	GIS & MPU/EDP	$10,000 (a)
Integrate with Springbrook	GIS & MPU/EDP	$10,000 (a)
Voter Address Verification	Clerk, GIS, MPU/EDP	$5,000 (a)
Common Place name data set creation	GIS & MPU/EDP	$10,000 (a)
Viewer Development		
ArcReader PMF Creation	Planning/GIS	None
Unscheduled Projects (b)	Planning/GIS	None
Software Maintenance	Eng. and Plan.	$7,400
Totals	Planning/GIS	$28,300
	MPU/EDP	$16,700
	Engineering	$3,700
	Clerk	$1,700
	Grand Total	**$50,400**

(a) This is an estimated budget amount if a consultant is hired. Exact amount will depend on the scope of services requested. Amount can be sustainably lower depending on the amount of work done in-house.
(b) These are relatively smaller or minor projects that fulfill the other recommendations made in this plan can be done as needed, or as time allows.

27.6. Year 2013 Budget Items

Year 2013 is the year MPU implements GIS. The year involves purchasing software, training, and data conversion of MPU's datasets.

Task	*Department*	*2013 Budget*
Viewer Development		
ArcReader PMF Creation	Planning/GIS	None
MPU Conversion		
ArcEditor Software	MPU	$6,300
Desktop 2 Training (1 staff)	MPU	$3,000
Desktop 3 Training (1 staff)	MPU	$1,000 (a)
Building Geodatabases Training (1 staff)	MPU	$1,500 (a)
Data Production Training (1 staff)	MPU	$1,500 (a)
Water System Conversion	MPU	$15,000 (b)
Electrical System Conversion	MPU	$15,000 (b)
Address Consolidation		
Integrate Addresses with CIS	GIS & MPU/EDP	$10,000 (b)
Unscheduled Projects (c)	Planning/GIS	None
Software Maintenance	Eng., Plan. and MPU	$7,400
Totals	MPU	$48,300
	Planning/GIS	$8,700
	Engineering	$3,700
	Grand Total	**$60,700**

(a) These are recommended, but optional courses. Internet-based training may be available at sustainably lower costs, in addition to on-the-job training and utilization of free tutorials and webinars.
(b) This is an estimated budget amount if a consultant is hired. Exact amount will depend on the scope of services requested. Amount can be substantially lower depending on the amount of work done in-house.
(c) These are relatively smaller or minor projects that fulfill the other recommendations made in this plan can be done as needed, or as time allows.

27.7. Year 2014 Budget Items

Assuming that all of the core GIS datasets are within the ESRI platform, intensive web-mapping development should occur. This is when the City shifts from building datasets to increasing accessibility to the datasets.

Task	*Department*	*2014 Budget*
Viewer Development		
Web Mapping Viewer Applications	Planning/GIS	TBD (a)
Data Enhancements		
Buildings – Assign Unique IDs	Planning/GIS	$8,000 (b)
Other Recommendations (c)	Planning/GIS	None
Software Maintenance	Eng., Plan. and MPU	$8,600
Totals		
	Engineering	$3,700
	Planning/GIS	$11,700
	MPU	$1,200
	Grand Total	**$16,600**

(a) It is difficult to estimate this far into the future given the fast changing nature of web-based map viewers. The number and functionality of the viewer applications would also greatly affect the cost.
(b) This is an estimated budget amount if a consultant is hired. Exact amount will depend on the scope of services requested. Amount can be substantially lower depending on the amount of work done in-house.
(c) These are relatively smaller or minor projects that fulfill the other recommendations made in this plan can be done as needed, or as time allows.

27.8. Budget Summary

	Software	Training	Data Conversion	Total
Year 2010	$14,800	$8,000	$10,000	$32,800
Year 2011	$7,400		$16,000	$23,400
Year 2012	$7,400		$43,000	$50,400
Year 2013	$13,700	$7,000	$40,000	$60,700
Year 2014	$8,600		$8,000	$16,600
Total Costs	**$51,900**	**$15,000**	**$117,000**	**$183,900**

28. Acronym Glossary

Acronym	Description
ADA	Americans with Disabilities Act
AeGIS	Dispatch Mapping Software
BMP	Best Management Practice
CAD	Computer Aided Drafting
CAMA	Computer Aided Mass Assessment
CIMS	Cemetery Information Management System
CIP	Capitol Improvement Program
CIS	Customer Inforamation System
CLT-IAS	Tyler Technologies' Integrated Assessment System
COGO	COordinate GeOmetry
COTS	Commercial-Off-The-Shelf
CSM	Certified Survey Map
DBF	dBase file format
DGN	MicroStation Design file format
DNR	Department of Natural Resources
DTM	Digital Terrain Model
EDP	Electronic Data Processing
EPA	United States Environmental Protection Agency
ESRI	Environmental Systems Research Institute
FASTER	Fleet management software
FGDC	Federal Geographic Data Committee
GASB	General Accounting Standards Bureau
GDB	ESRI Geodatabase format
GIS	Geographic Information System
GPS	Global Positioning System
IT	Information Technology
KML	Keyhole Markup Language
LIDAR	LIght Detection and Ranging
MPU	Manitowoc Public Utilities
MS	MicroSoft
ODBC	Open DataBase Connectivity
OPS	Operations Software
PASER	PAvement Surface Evaluation and Rating
PIN	Parcel Identification Number
PLSS	Public Land Survey System
PUD	Planned Unit Development
RDBMS	Relational DataBase Management System
ROW	Right-Of-Way
SDE	Spatial Database Engine

TIF	Tax Increment Financing
TRSQQ	Township, Range, Section, Quarter Section, Quarter-quarter Section
WISLR	Wisconsin Information System for Local Roads
XFM	XML Feature Modeling
XML	Extensible Markup Language