January 11, 2012

TO: Prospective Consultants

RE: Request for Proposal (RFP) for GIS Services

The Village of Chaumont on behalf of its partnering communities (Towns of Cape Vincent, Lyme and Brownville, and Villages of Cape Vincent and Glen Park) is soliciting proposals from GIS consultants to provide the following services related to GIS implementation:

- Assist communities with developing a water database model
- Convert hardcopy water records to GIS format to support applications as identified in the GIS Needs Assessment
- Develop a custom, web-based interface to deploy GIS data over the internet to the partnering communities
- Provide on-going hosting services for the developed web-based interface and training to end users

Enclosed is the above referenced Request for Proposal (RFP). Proposals must be received no later than 2:00 p.m. Wednesday, January 25th 2012. All proposals must be e-mailed to srust@twcny.rr.com in PDF or Word format. Only proposals received electronically will be reviewed. Proposal document sizes are limited to 4MB.

All questions regarding the RFP should be directed to Valerie Rust , 315-649-2487.

Sincerely,

Valerie Rust

Valerie Rust, Mayor
Village of Chaumont

REQUEST FOR PROPOSALS FOR GIS SERVICES

1.0 Project Overview

The Village of Chaumont is requesting proposals from experienced GIS consultants to complete Phases 3 through 5 of their GIS Implementation Plan included in their GIS Needs Assessment. Funding for this project is anticipated from the New York State Archives Local Government Records Management Improvement Fund (LGRMIF). As such, the Archives' GIS development guidelines must be followed throughout the course of this project. Award of this project is contingent upon grant funding.

Reference Documents Available:

1. NYS Archives GIS Development Guidelines
   http://www.archives.nysed.gov/a/records/mr_pubGIS03_1.shtml
2. GIS Needs Assessment (attached)
3. Water records (available for inspection at municipal offices; electronic records, indicated in GIS Needs Assessment, also available upon request)
4. NYS Archives MU-1 records retention schedule
   http://www.archives.nysed.gov/a/records/mr_pub_mu1.shtml

2.0 BACKGROUND

The Village of Chaumont along with partnering communities, including the Towns of: Cape Vincent, Lyme, and Brownville, and the Villages of: Cape Vincent and Glen Park, have recognized that implementation of a GIS will better manage their water assets. The communities recently completed a GIS Needs Assessment (GIS NA) which recommended hiring a consultant to assist with conversion of hardcopy records to GIS format, development of a web-based interface, and hosting of the web-based interface. It is highly recommended that consultants review the GIS NA document for more information.

3.0 PROJECT OBJECTIVES & DELIVERABLES

The objective of this project is to implement a centralized, web-based GIS on ESRI's ArcGIS Server software for deploying GIS applications as identified in the GIS NA via the internet and on ruggedized mobile GIS systems. To meet this objective, the consultant will provide the following services:

1. Database Development
2. Conversion of hardcopy water records to GIS to populate the database
3. Development & hosting of a custom, web-based interface
4. Data Maintenance & Backup

3.1 DATABASE DEVELOPMENT

The consultant will furnish a data model in ESRI File Geodatabase Format which outlines the specifications necessary for each of the datasets in Appendix B, Master List of GIS Data in the GIS NA.

Deliverable(s): File Geodatabase and poster of data model outlining specifications

3.2 DATABASE POPULATION

Consultant will develop all datasets as outlined in Appendix B of the GIS Needs Assessment for the Village of Chaumont and all of its partnering communities. Pursuant to LGRMIF guidelines, it is important to preserve the original water records. Therefore, dataset development must be via georeferencing of hardcopy records to GIS format. These records are large format engineering drawings and billing records which exist in digital format. All records contain survey-level map data, such as parcel boundaries, street right-of-ways, building footprints, etc. allowing the record to be georeferenced.

An inventory of these records is provided in the GIS NA, see Sections 4.1 through 4.6. Quantitative data pertaining to engineering drawings are provided in the GIS NA. These data should provide consultants with enough information to determine the scope of hardcopy georeferencing necessary to populate the GIS database. Consultants are permitted to inspect hardcopy records at the Village of Chaumont and municipal offices of partnering communities. A few records, as indicated in the GIS Needs Assessment, are in electronic format; these are also available for review upon request.

Hardcopy water records must be georeferenced to the New York State Plane Central Coordinate System with unit measure of feet. Accuracy of georeferenced records is very important as GIS data will be used to locate buried infrastructure. Inaccurate data may result in infrastructure being damaged, resulting in environmental contamination or loss of service. Georeferenced data must be within 3 feet of ground truth as determined by survey or other high-accuracy positioning methodology. Consultants will be responsible for implementing quality control procedures to ensure georeferencing of >85% of the water data on hardcopy records are within three (3) feet of their true ground position.

Following georectification of hardcopy records and quality control, the consultant will develop metadata for georeferenced datasets using the Federal Geographic Data Committee (FGDC) standard. Metadata shall include an account of the accuracy of the GIS datasets and note which record(s) were georeferenced to create the dataset.

Deliverables: GIS datasets in File Geodatabase; GIS metadata in FGDC format

3.3 WEB DEPLOYMENT

Consultant will develop a custom programmed web-based user interface on ArcGIS Server software to host GIS applications & data. The partnering communities understand that ESRI's Application Development Framework (ADF) is being phased out. Therefore, interfaces based on ADF are NOT acceptable. The interface must contain a help menu and support metadata.

The interface must contain basemap data covering the extent of all participating communities. This includes roads, parcels, Town/Village boundaries, hydrography, and imagery. The imagery and data must display quickly at map scales conducive to the display of water infrastructure (less than 1:3,000 scale). The interface must provide common map exploration tools such as pan, zoom, and identify. Additionally, the interface must accommodate user-defined queries to call-up infrastructure based on parameters defined in the data model. For instance, a query to display hydrants numbered 1. Although the interface will be shared by all partnering communities, each community must have its own password-protected portal to display data it considers sensitive. The consultant will provide hosting services for a period of 1 year. Consultants are required to provide a generic hosting contract with their proposals which clearly outlines any hosting fees. Consultants will quote hosting fees for a period of 1 year.

Deliverables: ArcServer web-based interface, generic web-based hosting contract

3.4 SYSTEM MAINTENANCE & BACKUP

The consultant will provide data maintenance services under hosting contract. It is understood that data maintenance constitutes minor updates to water and wastewater records developed under this project and might include: adding new water service connections, moving a hydrant, changing database attributes, etc. Maintenance will not include adding infrastructure for newly formed water districts. The consultant should clearly outline the scope of data maintenance services they will provide in the generic hosting contract in Section 3.3 above.

The consultant will backup data and interface to ensure no data are lost in the event of a hardware or software failure. Back up routine must be compatible with the MU-1 NYS Archives retention schedule for municipal governments. Backup will be performed on a monthly basis. End-user training is also part of system maintenance. Consultants should include costs to conduct 1-2 hour training seminars on use of the web-based interface and ArcPad at each of the participating communities.

Deliverables: Written procedure documenting consultant's data backup routine

4.0 TIMELINE

If funded by the Archives' LGRMIF program, the project must be completed by June 30th, 2013. Normally, LGRMIF grants allow a twelve (12) month project timetable. However, recent grant distributions have been substantially delayed by the New York State Office of Budget. Projects cannot start until grant funding is received. As such, a six (6) month project timetable is in anticipating of LGRMIF funding delay. The LGRMIF 2012 - 2013 grant cycle is scheduled between June 25, 2012 and June 30, 2013.

5.0 PRPOSAL REQUIREMENTS

*Technical Proposal***.** The technical portion of the proposal shall include the following:

a. The proposer's understanding of the project scope and specific issues.

b. The proposer's approach to the project.

c. An organizational chart specifically identifying the members of the project team available to be assigned and committed to this project. The chart shall identify one primary point of contact.

d. Resumes for the individuals identified on the organizational chart indicating their name, title, reporting office location, project assignment, and relevant experience.

e. A listing of similar projects of this type and scope which your firm has successfully completed as prime consultant within the past five (5) years, briefly describing the project scope, owner, and total cost. A minimum of three (3) project references must be included in the proposal.

f. A timeline outlining anticipated start and completion dates for the various tasks and deliverables outlined above.

6.0 FEE PROPOSAL

The fee portion of the proposal shall include the following:

a. A fixed fee for the project shall be provided for each task. The basis of the fee shall be specified and shall include labor, direct expenses, etc. The labor breakdown shall include budgeted hours to perform each task and the staff assigned. A description of the cost of all reimbursable direct expenses and the amount of markup, if any, shall also be included.

b. Consultant will provide separate database population costs for each community.

c. It is anticipated that database development and population will be quoted as fixed, not to exceed costs. Two costs should be provided with web development: 1) fixed cost for developing the interface; and 2) fixed cost for hosting and system maintenance for a period of 1 year; these costs must be broken out for each of the communities. Consultant should outline the system maintenance conditions (i.e. frequency of updates, etc.) in their generic hosting contract.

7.0 EVALUATION

In selecting a consultant for this project, the Village of Chaumont and the partnering communities will consider the following:

a. Understanding of project requirements
b. Qualifications of personnel/project team
   - Related project and general experience of team
   - Experience of key project team members
c. Records of past performance
   - Projects of similar scope
   - Ability to meet aggressive time schedules
   - Recognition of excellence
   - Working relationships
d. Fee proposal as it reflects the activities and requirements of this project

The Village of Chaumont will evaluate the proposals using the above criteria and reserve the right to negotiate costs with one or more of the top ranked proposers. Final selection will NOT be made solely on the basis of cost and the Village of Chaumont reserves the right to award to other than the lowest submitted proposal, or to reject all proposals. Web-based hosting, database development & population, and web-based interface development may be awarded separately.

WESTERN JEFFERSON COUNTY REGIONAL WATER

GIS NEEDS ASSESSMENT

PARTICIPATING COMMUNITIES:

VILLAGE OF CHAUMONT

VILLAGE OF CAPE VINCENT

VILLAGE OF GLEN PARK

TOWN OF CAPE VINCENT

TOWN OF LYME

TOWN OF BROWNVILLE

PREPARED BY THE:

Development Authority of the North Country

JANUARY 2012

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1.0 EXECUTIVE SUMMARY

Proactive asset management is often hindered by a lack of knowledge pertaining to the location, condition, and extent of a community's water infrastructure by board members, municipal staff, and the public. Generally, there are only a handful of individuals in each community who have a comprehensive knowledge of the municipality's water assets. Communities are increasingly at risk of losing this intellectual knowledge as their operators leave the municipal workforce in search of other job opportunities or due to retirement. Hardcopy records are usually the only alternative to operator knowledge, but are difficult to use for asset management.

The Village of Chaumont along with the Towns of Cape Vincent, Lyme, and Brownville and the Villages of Cape Vincent and Glen Park have recognized implementation of a Geographic Information System (GIS) as a way to better manage their water assets. An inter-municipal relationship exists between these communities. They are all connected via the Western Jefferson County Regional Waterline (WJCRWL), a 22-mile water transmission main, constructed in 1996 (see Figure 1). It serves six Town water districts and four Villages between Cape Vincent and the Village of Glen Park and is owned and maintained by the Development Authority of the North Country (Authority). The WJCRWL has already been mapped in GIS, see Appendix C.

The communities participated in this GIS Needs Assessment to identify GIS applications that will enhance each municipality's capability to better manage their water infrastructure, by converting hardcopy records to digital format and integrating them into a GIS. Implementing a GIS will help the communities increase awareness as to the extent, location, and condition of these assets so that proactive maintenance programs can be put in place to repair and ultimately replace this infrastructure, as assets reach the end of their life.

Record inventories were conducted for each community to identify hardcopy water drawings and customer billing records to support GIS development. The communities do not currently possess the resources to convert hardcopy records to GIS format or develop and host a web-based GIS. Therefore, it is recommended that a consultant be hired to assist with records conversion and development and hosting of the web-based GIS. Costs to hire a consultant to covert hardcopy records and develop a web-based GIS are estimated at a combined cost of $60,000 for all communities. Rough estimates for on-going consultant costs to host the web-based GIS are estimated at $150 - $300 per month for each community. Basis for cost are discussed in Section 6.6.

A GIS will be a valuable resource to these communities, allowing them to better manage water infrastructure. This will ensure the municipalities will be able to provide safe, reliable, and affordable services to customers over the long term. Although water asset management is the focus of this Needs Assessment, the proposed web-based & mobile GIS is scalable and can support other municipal uses as identified by communities in the future.

2.0 INTRODUCTION

Management of municipal water infrastructure is a challenging task. Across the country, public water facilities are aging and maintenance costs are increasing. Proactive asset management is often thwarted by a lack of awareness pertaining to location, condition, and extent of a community's water infrastructure by board members, municipal staff, and the general public. This is understandable as these assets are buried out of sight and, consequently, out of mind. Generally, infrastructure details are only completely known by limited staff, typically the municipality's longest standing Department of Public Works (DPW) employees. In small Towns and Villages the staff knowing the location of buried infrastructure may only be one person. Communities are increasingly at risk of losing this comprehensive intellectual knowledge as the existing municipal workforce retires or leaves public service for better employment opportunities[1].

Hardcopy records are usually the only alternative to a senior operator's intellectual knowledge. Unfortunately, these records are highly technical and not conducive to conveying the details of water infrastructure without careful study. Using these records for asset management is cumbersome. The starting point of water records for most communities are drawings issued by engineering firms and lateral tie-books provided by contractors for large capital projects, encompassing whole system construction or major rehabilitations.

As infrastructure ages, it is upgraded in pieces and new engineering drawings and tie-sheets are issued, superseding the original record; however, there is one caveat. Only the portion of the original record corresponding to the extent of the upgrade is superseded; the remainder of the original drawings still contains the latest information. Compounding this issue are infrastructure upgrades that are performed in-house by municipal staff. Drawings are not issued for these projects. Instead, these changes are usually captured as separate, handwritten records or mark-ups to the original records. It is often necessary to consult several sets of records to get the 'big picture' of a community's water system. Accessing multiple records is cumbersome, resulting in inefficient operations and ultimately higher costs for each community to maintain water infrastructure. A GIS will rectify this issue by combining all the records into an easy to access digital format, increasing operations efficiency, saving the communities money.

Geographic Information Systems (GIS) is a mapping technology implemented by public and private utilities to better manage infrastructure assets. When deployed correctly, a GIS can integrate the details contained in drawings with operator knowledge, resulting in a sustainable, progressive asset management model enhancing information access, capability to update infrastructure details, and ensuring the long-term integrity of water records.

[1] Boepple-Swider, T.M. (2008). A regulator's perspective on workforce issues: Water and wastewater operators. *American Water Works Association.* August 2008, pp. 132 – 135.

The Villages of Chaumont, Cape Vincent, and Glen Park and the Towns of Cape Vincent, Lyme, and Brownville see the application of GIS as a solution to better manage their water assets. Being aware of the high cost of GIS implementation, the communities elected to partner for this GIS Needs Assessment. Recognizing the Authority as a regional champion of asset management, deployment of GIS for municipal water systems, and steward of the WJCRWL, the partners commissioned the Authority to conduct this Assessment.

Members of the partnership are aware of several uses of GIS for municipal government. However, the partnership elected to concentrate on water since efficient management of these assets is a common problem shared by all participating communities. Furthermore, the partnering communities' municipal water systems are all interconnected via the WJCRWL.

The goals of this Needs Assessment are to:

A. Identify water records within each community
B. Identify potential GIS applications
C. Identify any existing hardware or software to support GIS
D. Provide a master list of data required to run applications
E. Recommend a sustainable GIS model for water asset management
F. Provide recommendations of a GIS conceptual design for deployment
G. Provide an implementation plan for GIS with rough budgetary estimates

3.0 METHODOLOGY

3.1 PROJECT INTRODUCTION

A project information meeting between the Authority and partnering communities was conducted on December 22, 2011. This meeting served as an opportunity for the Authority to introduce the project to community stakeholders. The following items were covered at the meeting:

- Introduction of the Authority project team
- Overview of what a GIS is and its potential uses
- Discussion of the purpose of a GIS Needs Assessment

3.2 RECORDS INVENTORY & ASSESSMENT

In order to implement the GIS, records at each participating municipality will need to be converted to digital format. The first task in assessing the level of effort for records conversion is a thorough inventory of each community's records. Record inventories were conducted by Authority staff at municipal offices between December 29th, 2011 and January 5, 2012. The inventory included recording the following details of engineering drawings:

- Title
- Number of Pages
- Design engineer's name & project number

- Revision number & date of revision
- Drawing type[2]
- Whether records exist as hardcopy, electronic, or both

Potential water GIS applications were identified by municipal staff during project introduction and records inventory meetings. Ancillary information was also recorded pertaining to water records management issues, and workflows. This information was gathered to ensure the GIS applications (outlined in Appendix A) will be useable by the communities.

3.3 CONCEPTUAL DESIGN

The conceptual design provides the municipalities with a useful GIS implementation model which addresses needs in a cost-effective manner, keeping end-user technical requirements to a minimum. The design acknowledges that the GIS will require long-term support. Since it will serve as the communities' official water record, the GIS will need to be continuously updated. The following concepts are explored in the conceptual design:

- Components of a GIS
- Methodologies for converting hardcopy records to GIS format
- Structuring of GIS data
- Outline of GIS deployment platforms
- Recommended GIS deployment, taking into account the needs of the partnering communities, existing resources, and cost.

3.4 IMPLEMENTATION PLAN

This plan outlines the objectives that must be completed in order to implement a GIS. The plan is much more than acquiring hardware software and converting records to GIS format. It also includes administrative items which ensure the GIS is useful to the communities and will be sustainable in the future. The plan includes the following phases:

- Phase 1 - Designate GIS Coordinator & Committee
- Phase 2 – Define Standards
- Phase 3 – Data Development & Web Deployment
- Phase 4 – System Maintenance & Backup
- Phase 5 – System Expansion

A timeline for each phase is not provided. The time necessary to complete each phase is variable. It is dependent on personnel and budgetary resources.

[2] There are two types of engineer drawings: As-built and Contract drawings. Contract drawings are issued by design firms prior to construction. As-built drawings are issued after construction. Distinguishing between different drawing types is important as details contained in Contract drawings may not necessarily be what were actually constructed.

4.0 ASSESSMENT

Each community has the same mission and responsibilities relative to management of water assets: provide safe, reliable services at an affordable cost to their customers. Therefore, GIS needs for each community are the same. Applications identified by one community are equally pertinent to other communities. Sections 3.1 through 3.7 contain community profiles and discussion of the water records. To clarify, water records encompass: hardcopy engineering drawings, operator notes, and customer billing records. Since the communities intend to maintain their partnership for GIS implementation, hardware, software, and data resources are discussed together in Section 3.8.

GIS applications are outlined in Appendix A. Each application contains a purpose, written description, frequency of use, data requirements, and type of application. GIS application functionality types are outlined in Table 1 below. Note that only water applications are outlined in Appendix A. Although other community departments may benefit from a GIS, the partnership agreed to focus on water GIS applications at this time. Identification of GIS applications for other municipal departments is beyond the scope of this Assessment, but could be addressed in a future phase of project deployment. However, the recommendations made in this Needs Assessment will be flexible enough to allow communities to include additional, non-water datasets in the future.

TABLE 1 – GIS APPLICATION FUNCTIONALITY

Name	Description
Simple Display	Basic application that allows the end users to display and navigate GIS datasets, measure, find addresses, and turn layers on or off.
Query & Display	Allows end users to select or identify feature based on a specific criteria (e.g. lines that are 12 inches in diameter). Results can be displayed and/or printed.
Map Analysis	Allows end-user to analyze features based on spatial relationships. For example, locating all water laterals on a specific parcel.
Edit/Update	Allows end-users the ability to update and maintain dataset specifications (see Section 4.1). For example, updating a length of a specific span of water pipe from 100 feet to 200 feet.
Reports	Allows end-users to generate reports which summarize GIS data from query and/or map analysis. For example, generating a table or printing a map with all of the hydrants which need to be painted.

4.1 VILLAGE OF CHAUMONT

Chaumont is located at the midpoint of the WJCRWL. There are 300 water connections in the Village of Chaumont. The Village is home to several small businesses, including local restaurants, convenience stores, school, a bank, and Marina. Given its proximity to Lake Ontario, Chaumont is a popular tourist destination in the summer. The Village's water distribution system dates back to 1959. Originally, it sourced its own potable water from a treatment plan on Chaumont Bay, south of the Village. This plant has

since been decommissioned; Chaumont has received all of its water through the WJCRWL since its construction in 1996.

3.1.2 RECORDS

Chaumont's hardcopy water records are mostly original. These records are worn and contain several handwritten notes by operators who periodically update the drawings. Although these drawings are old, they are detailed and show curbstops, hydrants, and valves as well as water mains. Ancillary records include a new water lateral installation for a bank, and a drawing depicting the location of the former water transmission line between the water treatment plant and Village. This transmission line is still utilized to serve outside customers in the Town of Lyme. Wastewater drawings from 2002 are included in the inventory as they show the locations of existing water infrastructure in the Village. All of these records are hardcopy only. Lastly, Chaumont keeps electronic billing records for water customers on a computer located in the municipal building.

TABLE 2 – VILLAGE OF CHAUMONT WATER RECORDS

Title	Design Engineer	Rev # (Date)	Pages	Drawing Type
Wastewater Collection System	Bernier Carr & Associates	6 (12/02)	75	As-Built
Water Transmission System	Cook Engineering	N/A (1/60)	5	Unknown
Water Distribution System	Cook Engineering	N/A (9/59)	3	Unknown
Watertown Savings Bank Chaumont	Aubertine & Currier	2 (2/07)	1	Unknown

4.2 TOWN OF LYME

The Town of Lyme has five water districts and includes the Hamlet of Three Mile Bay. The Town has a population of 1,561 as of the 2010 census[3]. The Town of Lyme has 250 water connections in 5 districts. 185 EDUs are served potable water from the Town's 5 districts. All of these districts source their water from the WJCRWL.

3.2.1 RECORDS

Compared to the Village of Chaumont, Lyme's drawings are relatively new. As a general rule there is one drawing per water district. There are no drawings for Water District (WD) # 3 since it encompasses only one customer, a golf course. The WD # 3 connection to the WJCRWL is available in GIS format from the Authority. Only one of the records contains handwritten updates by operators. One of the records has been scanned and is available in electronic format; the rest are hardcopy only. Lyme stores electronic billing records for water customers in a computer at the municipal office.

[3] Population number does not include the Village of Chaumont.

TABLE 3 – TOWN OF LYME WATER RECORDS

Title	Design Engineer	Rev # (Date)	Pages	Drawing Type
WD #1 hand drawings	Village DPW	NA	6	Hand Drawings
WD #1	Bernier, Carr and Associates	3 (7/02)	9	As-Built
WD #2 Ext Ashland Rd. and WD # 1 water lateral connections	Bernier, Carr and Associates	1 (11/04)	8	As-Built *Electronic Copy*
Hamlet of 3 Mile Bay WD # 2	Bernier Carr and Associates	3 (10/99)	14	As-Built
Cheever Rd WD #4	Bernier, Carr and Associates	3 (11/05)	14	As-Built
WD #5 Water Distribution System	Bernier, Carr and Associates	3 (6/10)	13	As-Built

4.3 TOWN OF CAPE VINCENT

The Town of Cape Vincent has a population of 2,051[4] and encompasses the small Hamlets of: Rosiere, St. Lawrence, Sunnybank, and Warren Settlement. There are 750 water connections in 5 districts. Cape Vincent Correctional Facility is serviced via WD # 1. This facility houses 815 inmates[5]. The Town of Cape Vincent serves water to the greatest number of users of all the partnering communities. Cape Vincent's districts are generally interconnected with the Village of Cape Vincent. However, Water District # 2, a discontinuous district, sources its water from the WJCRWL.

3.3.1 RECORDS

Like Lyme, the Town of Cape Vincent's records are less than 15 years old and are in good condition. Generally, there is one drawing per district. There are no drawings for WD # 2 as it sources water directly from the WJCRWL. All WD # 2 connections are in GIS format and are available from the Authority. Two of the records have been scanned and are available in electronic format; the rest are hardcopy only. The Town uses electronic billing for water customers.

TABLE 4 –TOWN OF CAPE VINCENT WATER RECORDS

Title	Design Engineer	Rev # (Date)	Pages	Drawing Type
WD # 1 Water Distribution Construction Project	Bernier, Carr and Associates	1 (3/96)	58	As-Built *Electronic Copy*
WD # 3 Rosiere Water Distribution Construction Project	Bernier, Carr and Associates	1 (8/00)	22	As-Built

[4] Number per the 2010 census; does not include the Village of Cape Vincent.
[5] Prison population from Watertown Daily Times article: http://www.wwnytv.com/news/local/Inmate-Dies-At-Cape-Vincent-Correctional-Facility-126021843.html

Title	Design Engineer	Rev # (Date)	Pages	Drawing Type
WD # 4 Mud Bay Water Project	Bernier, Carr and Associates	2 (10/08)	65	As-Built *Electronic Copy*
WD # 4 Mud Bay Joint Water Project Ext	Bernier, Carr and Associates	1 (2/08)	7	As-Built
WD # 5 St. Lawrence Corners	Bernier, Carr and Associates	NA (1/05)	22	As-Built

4.4 VILLAGE OF CAPE VINCENT

Situated at the south bank of the St. Lawrence River, the Village of Cape Vincent is a popular summer tourist destination. The Village is renowned for its French heritage and annual French Festival. Cape Vincent has its own surface water treatment plant and there are 505 water connections inside the Village. The Village also sells water to the Town of Cape Vincent and the Authority to service the WJCRWL.

3.4.1 RECORDS

Original records for the Village are not available. In an effort to replace original records, the Village's DPW has created hand drawings showing the location of the original water distribution system. This is a small-scale drawing and therefore does not contain enough detail to show curbstops or valves. Given missing originals, the Village's records are incomplete. Many of the other drawings depict infrastructure extensions, upgrades to the water filtration plant and individual water connections for various municipal facilities. The Village uses electronic billing to manage its water customer accounts.

TABLE 5 – VILLAGE OF CAPE VINCENT DRAWINGS

Title	Design Engineer	Rev # (Date)	Pages	Drawing Type
Water System hand drawing	Village DPW	DPW staff makes updates	1	Hand Drawing on Village Map
Water Supply Improvement Filtration	Bernier, Carr and Associates	1 (10/94)	34	As-Built
Water Supply Improvement Low Lift Pump Station – Raw Water Intake	Bernier, Carr and Associates	1 (1/01)	13	As-Built
Water Supply Improvements Filtration Plant	Bernier, Carr and Associates	1 (5/97)	3	As-Built
Site Plan and Profile Intake Main	Bernier, Carr and Associates	NA (10/82)	3	As-Built

Title	Design Engineer	Rev # (Date)	Pages	Drawing Type
The River Parishes St. Johns Episcopal Church, Cape Vincent NY	Michael Aubertine	NA (4/00)	1	Survey
St Johns Episcopal Church	LaFave, White & McGivern	1 (6/00)	1	Surveyor
Proposed Subdivision Johnston Development Corps	Bernier, Carr and Associates	1 (9/89)	2	As-Built
Bay St water and sewer extensions	Bernier Carr & Associates	1 (4/07)	6	Contract Drawings
Municipal Law Enforcement Facility	Aubertine and Currier	NA (6/03)	1	Construction
Garden Wall Drive Sanitary Sewer Extension	Bernier, Carr and Associates	NA (8/09)	5	Construction
Real St Sewer Extension Project	Bernier, Carr and Associates	1 (1/04)	4	As-Built
Water Department Fire Hydrants	Village DPW	2010 Updated annually	4	Hand drawing

4.5 TOWN OF BROWNVILLE

The Town of Brownville has a population of 3,590[6] as of the 2010 Census and includes the Villages of Brownville and Dexter and several hamlets. There are 215 water connections in the Town of Brownville. There is one water district in the Town of Brownville; it generally runs parallel to the WJCRWL.

3.5.1 RECORDS

The Town's sole water record is an original, is less than 10 years old, and is in good condition. It includes a high level of detail showing curbstops, hydrants, valves, and water mains/laterals. Several customers in WD # 1 get their water directly from the WJCRWL. The WJCRWL does exist in GIS format and is available from the Authority. The Town utilizes a customer database to manage it water billing.

TABLE 6 – TOWN OF BROWNVILLE WATER RECORDS

Title	Design Engineer	Rev # (Date)	Pages	Drawing Type
Town of Brownville Water District 1 (large drawings)	Bernier, Carr and Associates	1 (10/04)	15	As-Built

[6] Town of Brownville population excludes population in Villages of: Brownville, Glen Park & Dexter.

4.6 VILLAGE OF GLEN PARK

Glen Park is a small Village situated between the Towns of Brownville and Pamelia. It is immediately northwest of the City of Watertown, the population center of Jefferson County. The Village provides potable water to 185 connections[7].

3.6.1 RECORDS

The Village of Glen Park's records are in good condition and are relatively new. They are detailed and show the location of curbstops, hydrants, and valves in the Village. All of Glen Park's drawings are hardcopy only. Electronic billing is used to track water customer accounts.

TABLE 7 – VILLAGE OF GLEN PARK ENGINEERING DRAWINGS

Title	Design Engineer	Rev # (Date)	Pages	Drawing Type
Water System Laterals and Meters Project	Bernier Carr & Associates	1 (1/99)	9	As-built
Water system Improvements/Phase III	Bernier Carr & Associates	1 (1/00)	8	As-built
Upper Utilities Water Distribution and Storage Project	Bernier Carr & Associates	1 (7/05)	16	As-built

4.7 GIS RESOURCES

All communities in the partnership have computers, high-speed internet service, and printers. Microsoft Office is used in each community for word processing and spreadsheets. Each community maintains a customer database for water billing. None of the communities has personnel or technology resources to support a cooperative GIS program.

5.0 CONCEPTUAL DESIGN

The conceptual design provides a framework of how the partnership's GIS will be developed. Section 4.1 provides a summary of the components of a GIS; this information is provided as a high-level overview. Section 4.2 discusses different GIS deployment platforms and Section 4.3 outlines recommendations for the conceptual design to support the partnership's GIS.

5.1 GIS COMPONENTS

5.1.1 Data

A GIS is a computerized system used to store, analyze, retrieve, and manipulate spatial data. Data are displayed in both a database and a map which are

[7] Number of connections from Village Clerk.

dynamically linked. Data are the driving force behind a GIS. Many state and federal datasets are available for free. These datasets are used by many different GIS applications and are termed 'basemap' datasets. In the case of the partnership, the New York State Geographic Information Systems Clearinghouse and Jefferson County Real Property Office can provide a significant amount of free basemap data including:

- Roads
- Town/Village Boundaries
- Parcels
- Lakes, Rivers & Streams
- Aerial Imagery

Water data are not considered basemap datasets and will have to be developed by the partnership. Data development is an occasional procedure. However, data maintenance is ongoing and will be the responsibility of the municipal partners. It is important to note that GIS data depicting water infrastructure are subject to the same legal requirements as hardcopy records for retention and disposition under NYS Local Government Law mandates of the *Arts and Cultural Affairs Law* (Section 57.25) and the *Official Compilation of Codes, Rules, and Regulations of the State of New York* (Part 185, Title 8).

5.1.2 Software

GIS software provides the tools to manage, access, and store GIS data. Software packages vary in terms of how they provide access to data. There are a handful of companies offering GIS software solutions. However, Environmental Systems Research Institute (ESRI) is considered the industry standard. It is highly recommended that any GIS conceptual model standardize on ESRI products.
There are three (3) software systems for deploying GIS:

1. Desktop systems
2. Web-based systems
3. Mobile systems

Desktop - are stand-alone systems wherein the GIS data and software reside on one computer. These systems are meant for highly technical users who manipulate data and perform advanced analyses.

Web-based– these systems provide data access to the masses through the internet without having to install software on each user's computer. A highly customized web interface provides GIS functionality in an environment with a low technical learning curve. Web-based systems access a centrally-managed database ensuring data consistency. However, web-based systems rely on expensive hosting servers and software customization.

Mobile– mobile systems encompass handheld or ruggedized laptop devices that integrate GIS with Global Positioning Systems (GPS). These devices support the dynamic nature of infrastructure data, allowing operators to update GIS data in the field. Since they are GPS enabled, operators can use them to locate buried infrastructure. Mobile platforms can also be configured to support specific projects such as manhole inspections. When infrastructure GIS data is edited with the mobile platform, it must be synced back to master copy of GIS data residing on either the desktop or web-based platform.

5.1.3 Hardware

Beyond meeting the minimum system requirements for GIS software, the most important considerations when determining hardware needs for a GIS are the capacities of the Hard Disk Drive (HDD) and Random Access Memory (RAM). The speeds of the Central Processing Unit (CPU) and graphics card are less important as the specifications of these components in the vast majority of PCs are more than adequate. Choosing the correct RAM and HDD size can mean the difference between optimal system performance, and slow, unreliable functioning and recurrent software crashes. As a general rule, GIS hardware should have a minimum of 1 gigabyte (GB) of RAM. HDD size is dependent on the type and volume of data being stored. For instance, imagery data are very large and can take up HDD space quickly, whereas points, lines, and polygons (referred to as vector data) are comparatively small and require minimal storage capacity. GIS applications that require large volumes of raster imagery, perhaps covering an entire county, will require lots of HDD space on the magnitude of hundreds of GBs.

5.1.4 People

For many organizations, GIS is a complex, multi-year program that requires careful planning and budget attention. These initiatives are best tasked to a GIS Committee comprised of stakeholders. Stakeholders develop procedures and provide oversight to the GIS program including data development, budget planning, etc. The GIS Committee is headed by a Coordinator who acts as the primary point of contact for GIS in the organization. One thing successful GIS programs have in common is that the Coordinator is a staff member whose acts as the primary point of contact for the organization's GIS.

GIS data development and management is highly technical. Proficiency in GIS typically requires training and typically a formal education from a 2-year or 4-year college program. The term GIS professional encompasses a wide range of titles including: GIS Analyst, Specialist, Coordinator, Technician, Developer, etc. Typical yearly salaries for these positions range between $30,000 and $80,000[8] depending on job title, experience, and location. Due to the high level of

[8] Salary figures from US Bureau of Labor Statistics.

technical expertise and yearly salary requirements for, it is very common for smaller organizations to outsource GIS by hiring a consultant. If an organization outsources for a GIS Professional, they should still designate a GIS Coordinator to collaborate with the consultant to ensure their organization's interests are represented.

5.2 GIS DEPLOYMENT PLATFORMS

There are three (3) possible GIS deployment models the partnership could use to implement its GIS program (mobile systems can integrate with any platform):

A. Decentralized desktop platform
B. Centralized desktop platform
C. Centralized, web-based platform

5.2.1 Decentralized Desktop Platform

In a decentralized desktop platform, desktop GIS software would need to be installed on multiple computers at each of the partnering communities. All of these machines would need to meet the minimum system requirements for desktop GIS software. It should be noted that free or low cost GIS software is available from ESRI and other vendors. However, it is very limited in terms of functionality. Regardless of whether low-cost or full suite GIS software is used, the decentralized platform has many shortcomings including a high technical learning curve, data redundancy and will result in multiple versions of data.

A decentralized, desktop platform would require that GIS data necessary for the applications be stored at each of the partnering communities. This approach will be very costly as each full suite GIS software license would cost approximately $2,000. Moreover, each community would either have to hire a GIS professional or obtain the training necessary to use ESRI desktop GIS software to run the applications. This approach would require that each community store the same datasets on their computers. This will lead to multiple versions of the datasets as data are edited.

5.2.2 Centralized Desktop Platform

A centralized desktop platform would still require that desktop GIS software be purchased and installed on one computer at each of the communities. However, GIS data needed to run applications would be stored in a shared server which would centralize all of the GIS data necessary to run applications. This approach would require a networked intranet between the communities, which does not currently exist. Having a central database stored on a networked drive would solve the problem of multiple dataset versions; however, it would still require a large investment in GIS software and training. Additionally, the added complexities of establishing an intranet would require additional resources for intranet maintenance, troubleshooting, etc. None of the communities have IT staff to manage a shared intranet.

5.2.3 Centralized Web-based Platform

A centralized web-based platform requires a server and special GIS software to "host" GIS applications for access via the internet. The system can be setup in one of two ways: 1) as a Software as a Service (SaaS) or 2) On-premise application. An On-premise application would be owned, hosted, and maintained by the communities. The cost for an On-premise GIS is high and would require the communities to purchase hardware, software and hire a consultant to develop an interface. SaaS, on the other hand, involves a consultant owning the hardware, software, and interface and providing hosting services for the community's datasets. The SaaS bypasses the high cost of hardware and software and much of the cost associated with developing an interface. It allows the communities to access the GIS as a service over the internet

5.3 RECOMMENDATIONS

Based on interviews and an inventory of existing GIS resources and water records, it is recommended that the partnership contract with a consultant for a SaaS web-based GIS with a mobile GIS/GPS component for deploying the various GIS applications outlined in Appendix A. A SaaS, web-based GIS would provide the functionality necessary to satisfy all of the identified applications at a considerable cost savings over other alternatives. Moreover, the mobile component would support updates to infrastructure and maintain the results of converting hardcopy water records to GIS format. This SaaS, web-based, tandem mobile approach would provide the greatest benefit to the largest number of end-users within each of the communities. It is further recommended that the partnership standardize on the ESRI ArcGIS software suite. ArcGIS Server is the appropriate ESRI software package for the centralized, web-based and mobile systems.

Given the partnership's limited IT and GIS resources, it is recommended that a consultant be used for converting hardcopy water records to GIS and development of the web-based interface to support web-based GIS deployment. Many of the applications identified in Appendix A require the same datasets. Prioritization of applications is, therefore, not necessary. The partnership's consultant should develop all datasets identified in Appendix B to support applications at once. The GIS consultant should be retained by the partnership to provide hosting services and update data on the web-based system with changes as provided by the communities through use of their mobile GIS/GPS systems.

There are several GIS consultants that could perform conversion of hardcopy records to GIS. However, there are fewer consultants that offer SaaS hosting services. In some instances, county governments host GIS data for communities.

It is recommended that the partnership obtain pricing and scope of services proposals from consultants for hardcopy records conversion, web-based GIS services and data development services, mobile systems, and training. The best way to do this is through a formal Request for Proposals (RFP) process. Proposals and costs should be evaluated on a qualitative and quantitative basis to ensure an objective decision is made that will best meet the needs of the partnership.

6.0 IMPLEMENTATION PLAN

This GIS Needs Assessment provides an overview of the partnership's current structure and its functions, highlighting their needs with respect to obtaining a desired level of GIS functionality. An implementation plan works in tandem with a Needs Assessment by outlining the deployment of a GIS into logical steps that have a manageable and finite completion timetable. This implementation plan provides an *initial* roadmap for the partnership on how to develop a GIS. It is highly recommended that this plan be updated as goals are completed, new objectives defined, or when new needs are realized. A summary of the plan is provided in Figure 1 below.

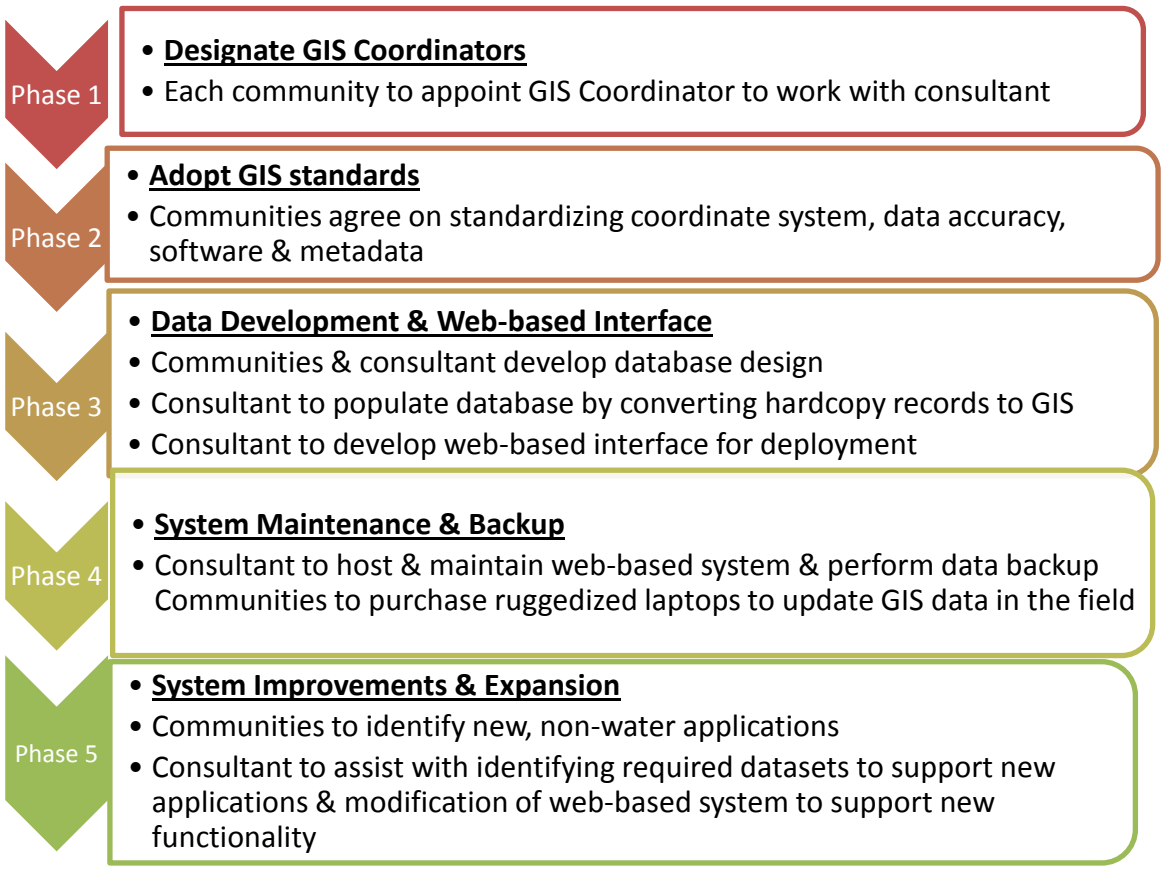


FIGURE 1 – SUMMARY OF GIS IMPLEMENTATION PLAN

6.1 PHASE 1 - DESIGNATE GIS COORDINATORS

Each community should designate one (1) primary point of contact for the GIS, known as the GIS Coordinator. Coordinators will serve as the community liaison to the GIS partnership and communicate with the GIS consultant.

6.2 PHASE 2 - DEFINE STANDARDS

Before any data are developed, it is important that the partnership establish certain standards. For instance, what type of software will be used? What coordinate system will the GIS data be in? How will information about datasets be documented? What is an acceptable level of data accuracy? This section provides a list of recommended data standards.

6.2.1 Software Standards

The partnership should standardize on ESRI's ArcGIS suite of software as it is the industry standard. ArcGIS can read GIS data in a variety of different formats. Moreover, free GIS data provided by New York State Clearinghouse is available in ESRI Geodatabase format, which is proprietary. Increasingly, GIS professionals are using the File Geodatabase format to store GIS data for their applications. This format provides a superior level of data storage capability and access speed. The partnering communities should adopt the File Geodatabase as their standard file format.

6.2.2 Coordinate System Standards

There are several different coordinate systems used for GIS data. Universal Transverse Mercator (UTM), State Plane, and Latitude and Longitude are the most commonly employed horizontal coordinate systems. It is recommended that the partnering communities establish the New York State Plane Central Coordinate System referenced to the North American Datum of 1983 (NAD 83) with unit of measure in feet as their horizontal coordinate system standard. This coordinate system is appropriate for Jefferson County. A vertical coordinate system standard of North American Vertical Datum of 1988 (NAVD 88) should be adopted as the vertical coordinate system standard if features will contain elevation data. NAVD 88 is the most widely used vertical coordinate system by engineers who furnish as-built drawings.

6.2.3 Accuracy Standards

Accuracy standards are very important to define upfront. Conversion of hardcopy records to GIS format will not be very useful if they cannot be accurately located in the field with mobile GIS. Therefore, accuracy should be a high priority. As indicated in Appendix A, several GIS applications will be used to

locate buried infrastructure. It is important that the position of these features be accurate, otherwise infrastructure could be inadvertently damaged resulting in environmental contamination or loss of service. It is recommended that the partnering communities adopt a positional standard of < 3 feet for water infrastructure.

6.2.4 Metadata Standards

Simply put, metadata is data about data; it gives GIS datasets a context. Metadata information includes how current the data are, how the original dataset was developed, spatial coordinate system information, access constraints, changes that have been made to the original dataset, definitions for specification entries in a feature's database, contact information for the data originator, and most importantly data accuracy. Metadata is vital when sharing data.

Metadata is the single most important document for managing GIS data because it protects the monetary and time investments afforded to collect data by creating a record of its accuracy and origin. There are many metadata standards available for use in the ArcGIS software suite. The most commonly used format is the Federal Geographic Data Committee (FGDC) standard and should be adopted by the partnership.

6.3 PHASE 3 – DATA DEVELOPMENT & WEB DEPLOYMENT

Data development is the next logical step in GIS implementation as datasets are necessary to implement the applications identified in Appendix A. Some of the GIS datasets necessary to run applications are freely available from the New York State Clearinghouse free of charge. However, all of the water infrastructure datasets will need to be developed. It is recommended that data development and deployment be broken into the following steps as outlined below.

6.3.1 Database Development

Database development involves furnishing a data model. A data model is a document that outlines all of the datasets for development and their database specifications. Half of the data model work has already been completed as all of the datasets necessary for the identified applications are listed in Appendix B. The partnership's next step is to identify the different specifications for each dataset. For instance, a sewer line should have 'diameter' and 'material' specifications to identify different pipe diameters and materials.

A list of specifications for the data model should be adapted from an existing water data model. Data models should be constructed in a File Geodatabase using ArcGIS desktop software. Data modeling will require a dual effort between the partnering communities and GIS consultant to identify and define specifications.

6.3.2 Database Population

Database population entails adding data, features[9] and their specifications[10], to the model. Data development will require specialized software. The cost and level of training necessary to become proficient with data development is beyond the means of the partnering communities. Therefore, it is recommended that data development be outsourced to a consultant. Since it is important that the details contained in the original records are preserved and accurate, the consultant should work closely with municipal staff to identify potential inaccuracies in the records. Three (3) procedures should be followed for populating the database:

1. Digitization
2. Georectification/Tracing
3. Accuracy Quality-Control

Digitization – All records identified as part of the record inventories should be scanned at a high resolution (± 300 dpi[11]) into an imagery format compatible with GIS software (TIFF, or JPEG).

Georectification –Entails aligning the digitized records to a coordinate system. This is done by matching features contained in drawings to corresponding objects already in GIS format (called control points), such as parcels, building footprints, street right-of-ways, etc. Control points on the engineering drawing pages and lateral tiesheets should be identified and field collected with high-accuracy GPS. This will enhance the accuracy of the record georectification process. Once pages/sheets are georectified, GIS data can be traced off of engineering drawings and tie-sheets. At this time, specifications for the infrastructure (manhole numbers, pipe diameters, etc.) can be input into the data model.

Accuracy Quality Control – Lastly, a geographically dispersed sample of water, infrastructure should be located in the field with GPS to ensure the accuracy of the georectification procedure. This will ensure that data meet the minimum accuracy requirements.

6.3.3 Web Integration

Web Integration entails integrating communities' water datasets into consultant's SaaS web-based GIS. This will likely require the consultant to customize their interface to accept the water datasets and provide the level of functionality as outlined in GIS Applications (Appendix A). The interface must be

[9] Features are points, lines, and polygons which have physical coordinates.
[10] Specifications are attributes noted on engineering drawings or tie-sheets such as the diameter of a pipe.
[11] dpi stands for dots per inch

able to support the GIS applications identified in this Needs Assessment and the appropriate level of precision[12] to display water infrastructure. Web integration will be the responsibility of a GIS consultant. The partnering communities will have to enter into a web-based hosting agreement with a consultant to host and provide updates to their data.

6.4 PHASE 4 – SYSTEM MAINTENANCE & BACKUP

In order for the GIS system to be useful, GIS data converted from hardcopy records will need to be updated and maintained. Most GIS hosting agreements include provisions for consultant time to perform updates to data within the web-based GIS system with information provided by the contracting party. This is something the partnership will want to look for in a hosting agreement.

It is recommended that the partnership acquire ruggedized, mobile GIS/GPS systems for use in the field to perform updates to the data and collect asset condition information as outlined in GIS applications. This information can then be passed to the hosting consultant who will update GIS data within the web-based GIS.

Data backup is necessary to ensure data is not lost in the event of a software or hardware failure and to comply with state retention and disposition guidelines. Since the data and web interface will be hosted by a consultant, the consultant should also be responsible for data backup. The partnership should clearly communicate the retention and disposition schedules of the various datasets used in the applications to the GIS hosting consultant to ensure the backup routine is in-line with these schedules.

6.5 PHASE 5 – SYSTEM IMPROVEMENTS & EXPANSION

System improvements and expansion are anticipated after the web-based GIS is deployed. Improvements to the web based interface are highly likely given the rapid advances in ArcGIS software functionality and releases. System expansions are anticipated as new, non-water applications are identified by the communities. These new applications will likely require new datasets which will have to be developed. Although it is beyond the scope of this Needs Assessment, the web-based interface could be expanded to include applications identified for other non-water community departments such as Town/Village Assessors, Police, etc. However, these needs would have to be assessed to identify applications and required datasets.

6.6 BUDGET

Estimated costs for Phases 2 – 4 of the Implementation Plan are below in Table 8.

TABLE 8 – COST ESTIMATES

Task/Item	Cost
Database Development & Records Conversion	$40,000

[12] The web-based interface must be able to display data at very large scales. Large scale viewing is particularly necessary for viewing laterals and water curbstops.

Task/Item	Cost
Integration into Consultant's SaaS Web-based Interface & Training	$10,000
Ruggedized Laptops & GPS Equipment & Mobile Software	$8,000
Training	$2,000
Total Upfront Costs→	$60,000

- Consultant costs for database development and records conversion are based on an hourly rate of $75 for consultant work.
- Cost to integrate the communities' GIS data into a consultant's SaaS, web-based interface are estimated at $10,000. This includes consultant-lead training on the interface for the communities.
- Costs to acquire 1 ruggedized laptop computers with GPS and mobile software are estimated at $8,000.
- The communities should anticipate on-going monthly hosting costs of $150-$300 per community for web-based hosting and updates to GIS datasets.

GIS APPLICATION DESCRIPTIONS

Application Identification: Partnership # 1

Application Name: General Query/Display Tool

Description & Purpose:
General application that allows user to display all GIS datasets, allowing end-users navigation with pan, zoom, and identify, query and print capabilities. Application would also allow user to display and query databases associated with GIS datasets. Application could be shared with contractors to provide them with infrastructure details.

Additional Information:
As identified during hardcopy records inventory, there are several documents that need to be referenced to determine the location, extent, and condition of water infrastructure in the communities. All details contained in the records (invert elevations, diameter, material, year constructed, etc.) can be integrated into the GIS so users can visually see location of the water systems and easily access infrastructure asset details.

Frequency of Use: 5 times/day (usage is per partnership)

Required Datasets

- District Boundaries
- Hydrography
- Orthoimagery
- Parcels
- Roads
- Water Curbstops
- Water Lines/Laterals
- Water Isolation Valves
- Water Storage Tanks
- Hydrants
- Village/Town Boundaries

Type of Application

Simple Display	Query & Display	Map Analysis	Edit/Update	Reports
X	X	X		X

Application Identification: Partnership # 2

Application Name: Development Mapping

Description & Purpose:
Specific application designed for identifying areas of potential residential development. Application would be used to zoom to and identify vacant areas of potential residential development. This would allow the user to identify any existing water facilities in the area allowing them to provide developers with estimates for extensions if necessary for development.

Additional Information:
This application would allow users to identify any existing facilities in the area, measure distance from tentative development to existing facilities and provide cost estimates for line extensions or upgrades necessary to accommodate new developments.

Frequency of Use: 2 times/ month

Required Datasets

- District Boundaries
- Hydrography
- Orthoimagery
- Parcels
- Roads
- Water Curbstops
- Water Lines/Laterals
- Water Isolation Valves
- Hydrants
- Village/Town Boundaries

Type of Application

Simple Display	Query & Display	Map Analysis	Edit/Update	Reports
X	X	X		

Application Identification: Partnership # 3

Application Name: Residential Service Locator

Description & Purpose:
Specific application used to identify the location of water shutoffs on customer's property. Application would provide spatial selection functionality allowing user to enter owner's last name, street address, or parcel number to see a map of laterals and shutoffs on a specific property.

Additional Information:
Periodically, residential laterals require servicing or a water shutoff for non-payment. Laterals and curbstops are particularly difficult for operators to locate. Application could be utilized on mobile system to allow operators to locate services in the field with GPS. Mobile application could also be used to note repairs needed to assets, particularly curbstops which frequently lose their caps or are bent by snow plows.

Frequency of Use: 2 time/week

Required Datasets

- Orthoimagery
- Parcels
- Roads
- Water Lines/Laterals
- Water Isolation Valves
- Water Curbstops
- Village/Town Boundaries

Type of Application

Simple Display	Query & Display	Map Analysis	Edit/Update	Reports
X	X	X	X	

Application Identification: Partnership # 4

Application Name: Hydrant Flushing

Description & Purpose:
Specific application designed to identify hydrants and record maintenance information. All communities could use the application to generate reports noting condition of hydrants and recommended repairs.

Additional Information:
Most communities perform hydrant flushing on an annual basis. Hydrant flushing is a spatial operation as hydrants closest to the water storage tanks are typically flushed first and hydrants at line dead-ends are flushed last. This operation hydraulically moves debris to the water system's outer extremities where it is flushed out of the system. During flushing, operators note any repairs that are necessary for the hydrant (leaky bonnet, painting required, etc.). If the hydrant needs to be shutoff to perform maintenance, it is important for the operators to know if the hydrant has its own isolation valve. In these cases, water main lines have to be isolated to perform service on hydrants, disrupting service to nearby residents. Having hydrant information on a mobile device would allow operators to know which hydrants have been flushed and note any repair information. GIS is also useful to determine which customers will be affected by maintenance so they can be notified.

Frequency of Use: Difficult to quantify. High use anticipated in summer months.

Required Datasets

- Orthoimagery
- Parcels
- Roads
- Hydrants
- Water Isolation valves
- Water Lines/Laterals
- Water Storage Tanks
- Village/Town Boundaries

Type of Application

Simple Display	Query & Display	Map Analysis	Edit/Update	Reports
X	X	X	X	X

Application Identification: Partnership # 5

Application Name: Valve Exercising/Information

Description & Purpose:
Valve exercising is performed periodically by the communities to ensure reliable operation. There may be instances where valves are inoperable. In the case of a mainline break, operators need to know which valves are operable to quickly isolate the broken line.

Additional Information:
Valve assets can be managed in the GIS by symbolizing inoperable valves with a specific color or special note. Communities can use the query functionality of the GIS to identify the diameter and location of inoperable valves to determine cost for replacement. Valve information can be captured on the mobile GIS system and displayed on the web-based GIS.

Frequency of Use: 1 time/month

Required Datasets

- Hydrography
- Orthoimagery
- Parcels
- Roads
- Water Lines/Laterals
- Water Isolation Valves
- Village/Town Boundaries

Type of Application

Simple Display	Query & Display	Map Analysis	Edit/Update	Reports
X	X	X	X	X

Application Identification: Partnership # 6

Application Name: Incidents

Description & Purpose:
Application would allow users to track location and frequency of water line breaks.

Additional Information:
Currently, no records are kept noting location and frequency of repairs to water lines. Capturing incidents with the mobile GIS system and displaying it in the web-based interface would allow communities to identify areas frequently requiring repairs. This would allow users to identify areas where a capital upgrade is warranted based on frequency of repair.

Frequency of Use: 1 time/week

Required Datasets

- Incident Points
- District Boundaries
- Hydrography
- Orthoimagery
- Parcels
- Roads
- Water Curbstops
- Water Lines/Laterals
- Water Isolation Valves
- Hydrants
- Village/Town Boundaries

Type of Application

Simple Display	Query & Display	Map Analysis	Edit/Update	Reports
X	X	X	X	X

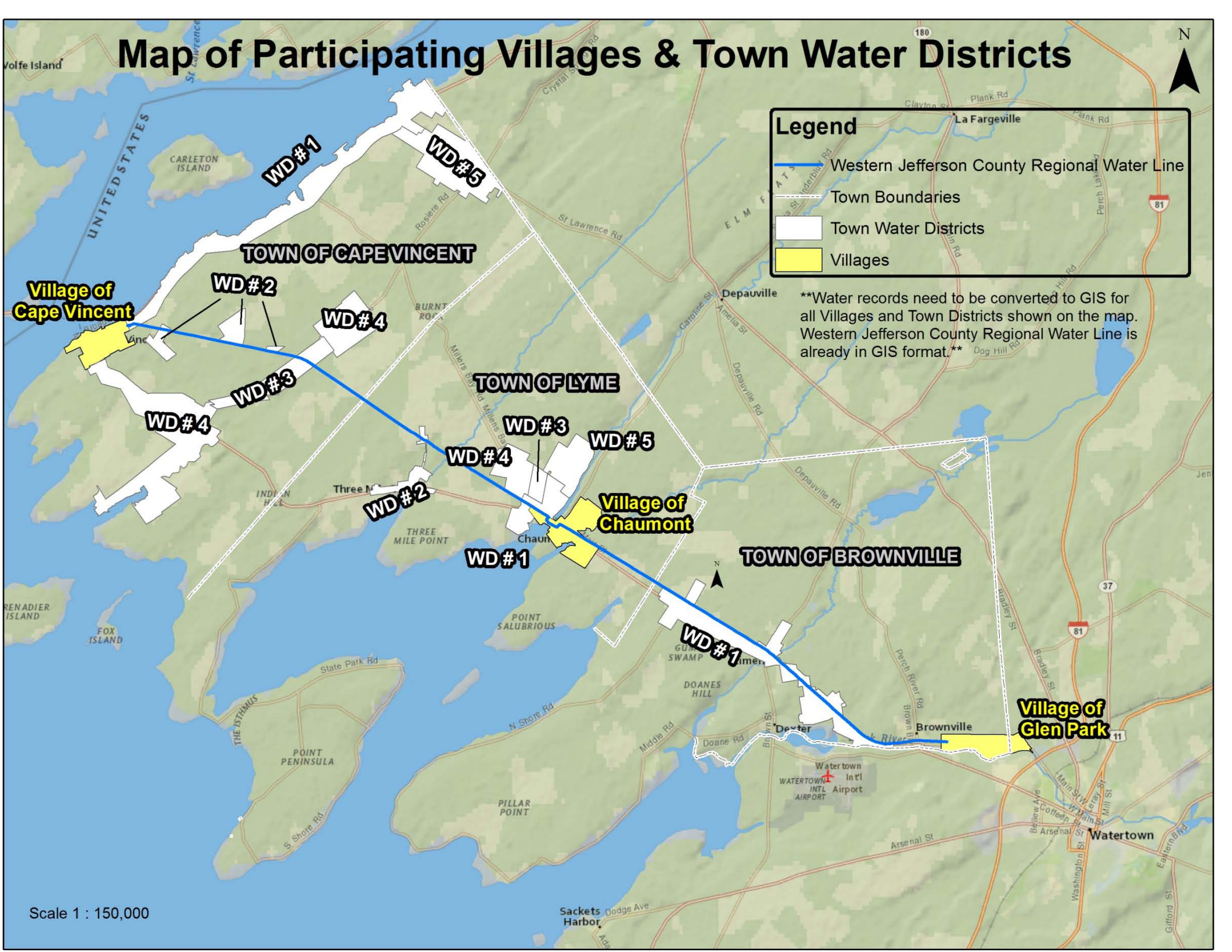
APPENDIX B
MASTER LIST OF REQUIRED DATASETS

Dataset Name	Data Type	Comments
Hydrography	Polygon	Areas covered by bodies of water (either lakes or streams)
Incident Points	Point	Incidents as identified by communities
Orthoimagery	Raster	High resolution aerial, color imagery showing ground conditions on date it was flown.
Parcels	Polygon	County parcels and parcel comprising water customers as derived from billing records
Roads	Line	Road centerlines
District Boundaries	Polygon	Physical boundary of community's water district
Water Curbstops	Point	Points at which customer water service can be cutoff
Hydrants	Point	Points corresponding to water hydrants
Water Lines/Laterals	Lines	Water lines & laterals distributing water from WTP to customers. Only extent of community-owned lines
Water Valves	Point	Locations where water mains are isolated
Water Storage Tanks	Point	Location of elevated or ground water storage tanks
Town/Village Boundaries	Polygon	Physical extent of Village or Town

Dataset Name	Number of Applications Requiring Dataset	Estimated Level of Effort[13] to Develop Dataset
District Boundaries	3	2
Hydrography	4	1
Incident Points	1	2
Orthoimagery	6	1
Parcels - county	6	1
Parcels – water customers	6	3
Roads	6	1
District Boundaries	7	2
Water Curbstops	4	3
Hydrants	4	2
Water Lines/Laterals	6	3
Water Isolation Valves	6	3
Water Storage Tanks	2	2
Town/Village Boundaries	6	1

[13] Estimated level of effort is rated on a scale of 1-3:
1 – Dataset is freely available from Clearinghouse or other data source, no edits or conversion necessary
2 – Dataset is unavailable and requires a moderate level of effort to develop
3 – Dataset is unavailable, requires significant amount of data processing to develop

APPENDIX B MASTER LIST OF REQUIRED DATA


Map of Participating Villages & Town Water Districts
N
Legend
Western Jefferson County Regional Water Line
Town Boundaries
Town Water Districts
Villages
Water records need to be converted to GIS for all Villages and Town Districts shown on the map. Western Jefferson County Regional Water Line is already in GIS format.
TOWN OF CAPE VINCENT
WD #1
WD #2
WD #3
WD #4
WD #5
Village of Cape Vincent
TOWN OF LYME
WD #1
WD #2
WD #3
WD #4
WD #5
Village of Chaumont
TOWN OF BROWNVILLE
WD #1
Village of Glen Park
UNITED STATES
CARLETON ISLAND
FOX ISLAND
POINT PENINSULA
THE ISTHMUS
THREE MILE POINT
POINT SALUBRIOUS
DOANES HILL
PILLAR POINT
La Fargeville
Depauville
Dexter
Brownville
Watertown
Watertown Int'l Airport
Sackets Harbor
St Lawrence Rd
Plank Rd
Depauville Rd
Dog Hill Rd
Perch River Rd
Bradley St
Arsenal St
Coffeen St
Main St
Mill St
Washington St
Eastern Blvd
Gifford St
N Shore Rd
S Shore Rd
State Park Rd
Middle Rd
Doane Rd
Dodge Ave
Scale 1 : 150,000