Rural Water and Wastewater Infrastructure Management

Moving Small Communities Forward

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1. Introduction

Rural communities in New York State are presently at a disadvantage when it comes to the maintenance and operation of aging water and wastewater infrastructure. Many of these communities control these assets, but in contrast with larger cities, they possess fewer resources to manage them. They also face the need to change an old mindset that does not recognize the value of these assets. Steve Allbee, an expert on asset management at the U.S. Environmental Protection Agency (EPA), pointed out the problem with that mindset, stating that "you cannot have a first rate community with a third rate infrastructure." Water and wastewater systems compose 30-40% of most communities' infrastructure assets, and the state of those assets greatly impacts the quality of life in those communities.

As part of a growing trend, asset management is touted as a solution to these unique challenges. Asset management allows managers to plan strategically for the use, protection, maintenance and replacement of existing water and wastewater infrastructure. This strategic plan maximizes efficiency while minimizing costs.

This report presents an evaluation of the current state of asset management, followed by asset management software evaluations and policy recommendations. All three areas are examined through the lens of developing an incremental approach to water and wastewater asset management for rural communities in New York with populations of less than 10,000 people.

Information gathered from interviews with six communities who manage their water or wastewater systems provides the background information for this report. In particular, the research team explored the existing obstacles to their implementation of asset management plans. A review of five electronic asset management systems is also contained in this report. The review was conducted using a rubric that integrates users' needs and real costs to implementing an electronic system. From its interviews and software reviews, the research team identifies broad lessons on asset management. The report concludes with recommendations for encouraging the target communities to develop asset management systems.

1.1 Methods

The research team focused its efforts on learning about the challenges of managing water and wastewater systems as well as identifying the best practices being recommended in the field. The team's approach focused on three key areas: a literature review on the state of small community asset management; interviews with the leadership and staff of six municipalities; and a review of five electronic asset management systems.

For the literature review the research team examined a range of articles, educational resources, websites and training materials. These materials identified challenges, opportunities and hurdles facing asset management in small communities. The readings spanned the history of water and wastewater system development, as well as a variety of currently recommended approaches to asset management from various government, consulting and non-profit sources. A detailed resource list can be found in the bibliography at the end of this report.

As a complement to the literature review, the research team spoke directly with communities to gain an understanding of the struggles of managing a water utility system. The goal was to get a sense for how small communities are managing their systems, identify if they are utilizing asset management principles and learn about their needs. In preparing for community interviews, the

research team realized that circumstances are different for each community. For example, they have different levels of resources, service levels, system configurations and management capabilities.

Communities varying in size from 1,700 to 9,500 residents were visited. A leader from a community with a population over 10,000 was interviewed because he had already put an asset management system in place. That interview helped identify how an incremental asset management system affects water and wastewater operations. These six interviews with community leaders, administrators, and water staff provided ground-level experiences to contrast with the literature. The process provided a sense of the issues that these communities are currently facing with regards to managing, maintaining and planning for the future of their systems.

Five asset management software packages in different stages of development were reviewed, but only two were targeted to manage the assets of communities of 10,000 people or less. The research team developed a scoring rubric and used it to compare the various software packages. It compared characteristics such as functionality, ease of use and compatibility with other systems. The rubric, software comparisons and one-page reviews of each electronic management system are contained in the appendices. The following programs were evaluated:

- CAPFinance: a financial assessment system designed specifically for small communities by the Environmental Finance Center at Boise State University;
- CartêGraph: a comprehensive asset management package which is currently being tested by the Tug Hill Commission for use in rural New York;
- Check-Up Program for Small Systems (CUPSS): the Check-Up Program for Small Systems is under development by the EPA, and its development materials were made available to the research team;
- Asset Management Spreadsheet Example: the research team examined an Excel-based spreadsheet used in the EPA training sessions;
- Total Electronic Asset Management Software (TEAMS): package developed by the Maryland Center for Environmental Training for medium sized communities.

2. Asset Management

The U.S. Environmental Protection Agency estimates that aging water and wastewater systems constitute a growing problem in the United States. Over 94% of the population receives drinking water from over 54,000 individual systems, and 16,000 systems provide wastewater service to 75% of the population.[1] Although this problem is national in scope, its is especially difficult for communities in rural New York. Their difficulties include: demands from a growing population, increasing federal regulations, escalating service costs, turnover among elected leaders, lack of information on the state of their assets and poor institutional capacity.

Asset management may help communities proactively address these challenges by building an inventory of their systems and developing preventative maintenance policies. Such systems will guide them towards making better financial decisions regarding needed repairs or replacements. Given that future regulations may require comprehensive asset management plans by utilities as a condition for loans or government grants, its importance cannot be understated.

A review of the asset management literature demonstrates that the water and wastewater community is aware of the challenges of aging infrastructure. Implicit in that wide body of asset management literature is that asset management is important, but that literature neglects to acknowledge the real costs of developing a useful asset management system. In order to provide an assessment of the usefulness of asset management software and to make policy recommendations, the research team decided to first assess the process of asset management.

This assessment begins with an overview of the costs and benefits of creating an asset management plan. The second section discusses the many impediments to creating the system. The third section is composed of a list of topics that are not covered by the water and wastewater asset management literature. All of these impediments and recommendations are the product of the interviews that the research team conducted in several communities across New York State, and an overview of those interviews is presented in this report. Finally, this section contains a brief analysis of how asset management fits together with emergency planning.

2.1 Benefits

Comprehensive asset management poses significant benefits for small communities in managing their water and wastewater systems. For many of these communities the invisibility of this infrastructure minimizes its priority both in the minds of the public and utility managers alike. Despite the critical value of water as an indispensable resource and importance of wastewater systems from a health standpoint, these utilities are often taken for granted.

Asset management allows communities to take stock of this hidden infrastructure and place it alongside other capital assets in planning, rehabilitating and financial forecasting. More specifically asset management benefits communities by:

[1] U.S. General Accounting Office. "Water Infrastructure: Comprehensive Asset Management Has Potential to Help Utilities Better Identify Needs and Plan Future Investments." Report to the Ranking Minority Member. Committee on Environment and Public Works. U.S. Senate, Washington, D.C. The U.S. General Accounting Office. March 2004. Online: http://www.gao.gov/new.items/d04461.pdf. Accessed: 05/16/2007

2.1.1 Better Information on Assets to Inform Decision Making

Collecting data on water and wastewater infrastructure can assist utility managers in making better decisions on their assets. To do so managers must first be able to catalog their assets by collecting data about the asset size, age, location and date of installation. Using this data one can project the state of the asset, cost of operation, last repairs made and its remaining useful life. Finally other calculations such as the value of the asset, rate of depreciation and cost of replacement can be inferred from this information.

2.1.2 Complying with State and Federal Regulations

Recent amendments to the Safe Water Drinking Act presently require that all community water systems serving populations of 3,300 or more assess the vulnerability of their water systems and prepare an emergency response plan addressing the vulnerability of their water systems to both natural and man made disasters. An asset management plan would include a condition assessment of critical assets and would thereby comply with this requirement. Additionally, publicly owned water and wastewater systems are required to comply with GASB 34 financial reporting standards. Under these standards utilities must report the value of infrastructure assets and the cost of deferred maintenance. Having an up to date asset management plan enables utilities to be in compliance, gain a good credit rating from auditors and have access to government loans with favorable interest rates.[2]

2.1.3 Improving Data Analysis and Forecasting

A key component of asset management is that it provides community leaders with information to make intelligent, informed decisions about their system's future. It allows managers to determine when to make needed repairs or rehabilitation to the system, which assets to prioritize given resource constraints. More importantly managers can perform criticality assessments to determine which assets are critical to system functioning based on the repercussions and costs if they are break down. Using a risk management approach managers can decide what level of risk they are willing to live with based on the service level they wish to provide. Based on this decision they can prioritize and plan accordingly.

2.1.4 Improving Financial Planning and Projections

By increasing knowledge of water and wastewater systems small communities are able to make more informed financial decisions. This is pertinent information when considering options to be in compliance with regulatory requirements or upgrading system security. Prioritizing maintenance and asset replacement schedules leads to informed decision making; it ensures that limited funds are used towards the most critical system improvements.

2.1.5 Increasing System Reliability

If utilities are collecting data on the status of their water and wastewater assets they are better able to monitor the asset's remaining life, and thus schedule needed repairs or replacements. Managers of water and wastewater systems can use their plans to determine any existing

[2] U.S. Environmental Protection Agency. Asset Management: A Handbook for Small Water Systems. September 2003. EPA-816-R-03-016. Online:
http://www.epa.gov/safewater/smallsys/pdfs/guide_smallsystems_asset_mgmnt.pdf Accessed: 05/19/2007

weaknesses in their system and plan for addressing potential concerns. The result is a reduction in system "down time" and the number of emergency repairs.

2.1.6 Justifying Rate Increases to Customers and Regulatory Bodies

When a community demonstrates that it is using its money efficiently, it can prove the need to rate increases. Customers are more likely to tolerate rate increases when there is documentation proving that those increases are necessary. A breakdown of asset value, maintenance cost, replacement and repair schedules and depreciation provides a comprehensive view of the true value of the entire water and wastewater system. This type of concrete information educates consumer about the value of this service and preempts potential dissent in the face of potential rate increases.

2.2 Costs

There are some real costs associated with implementing asset management plans. For small communities these are typically resource constraints such as technical, financial and personnel. Other less apparent costs include institutional and cultural barriers that might inhibit communities form implementing these plans. Moreover their small size means that these rural communities are often unable to spread costs over a large customer base in order to reduce unit charges.

2.2.1 Collecting Accurate and Reliable Data

Creating an asset management plan requires that asset data be assembled and integrated into one system. Data collection is an ongoing process and must become an integral part of the workflow to be sustainable. It requires that managers be consistent in gathering information as they perform system maintenance or repairs and record this systematically updating their data management system in the process. For communities with limited personnel and time this can be somewhat difficult particularly in rural communities with part-time personnel.

2.2.2 Overcoming Technological Constraints

Equipment that can support the operation of asset management such as computers and software makes asset management easier. An asset management system need not be particularly sophisticated. In fact a detailed map with the assets recorded and a detailed maintenance schedule and completed work orders can comprise an asset management system for resource challenged communities. However, the use of a computer and software to track of assets can help small communities inventory their systems and analyze funding options for rehabilitation and replacement of assets, etc.

2.2.3 Performing Data Integration

An evaluation of the state of community assets must take place before a community launches its asset management plan. If the utility used different electronic or paper-based systems to manage its activities in the past, integrating all these systems can be a challenge. Additional software or personnel may be required to facilitate data integration.

2.2.4 Providing Personnel and Other Resources

Creating an asset management plan requires time and resources. Raising sufficient funds to support requirements such as extra workload, staff, equipment, software and technical support can be difficult for small communities.

2.3 Out of Sight, Out of Mind – Impediments to Building an Asset Management System

Despite the value of asset management plans, they are uncommon in the rural communities throughout New York State. There are a number of practical constraints (real and perceived) that hinder the adoption of asset management systems for water and wastewater utilities. These include insufficient knowledge about the benefits of asset management, a lack of resources, institutional inertia, and a focus on the short-term by many small governments. In some cases these challenges are perceived to be greater than they actually are. The hurdles that appear easiest to overcome at first glance may prove to be the most difficult to overcome such as institutional inertia or short-term focus of leadership.

2.3.1 Misunderstandings About Asset Management

The most basic impediment to building a comprehensive asset management plan in rural communities is that leaders have misunderstandings about asset management as a practice. Indeed, all of the other hurdles on this list are directly related to this point. Experts on asset management from the EPA and non-profit organizations interviewed by the research team emphasized that this factor is primarily responsible for the lack of asset management systems in rural communities.[3] They explained that the other impediments facing communities can be overcome by someone who understands the importance of a solid asset management system.

Leaders see implementing an asset management system as prohibitively expensive and complicated. It appears that the practice of incremental asset management has not fully trickled down from larger utility systems to small rural communities. Reasons for this can include institutional inertia and a short-term focus by the community leadership.

One reason that leaders might perceive that asset management plans are expensive is that those plans often place an emphasis on service quality. When a water or wastewater system is run without an asset management plan, the cost of maintenance or improvements often determines the level of service. Managers ask the question "what does this cost?" rather than "what do I need this asset to do?" Asset management plans include prioritizing assets and levels of service. Thus, when an asset management plan is developed, levels of service usually become a larger priority. What leaders might not realize is that when customers are treated as quality-concerned shareholders, they will usually consent to higher rates. Once the mentality takes hold that quality of service is the primary concern, the question of cost becomes a secondary issue.

2.3.2 Time, Money, Personnel

Many small water and wastewater system supervisors list a lack of resources as the primary reason that they have not pursued an asset management system. In many cases knowledge about the water or wastewater system reside in a multitude of locations: as-built drawings, financial

[3] These experts include Steve Allbee and Walter Graf of the EPA, Mickey Dietrich from the Tug Hill Commission, Janet Jackson of McKin and Creed, and Mark Lichtenstein and Kevin Smith from the Syracuse EFC.

reports, construction contracts, equipment purchase orders, field crews, plant operators, AutoCAD drawings, GIS, or within the supervisor's memory. The cost of consolidating these resources may seem daunting to many small communities. The completeness and accuracy of the datasets varies, creating further confusion.

Once all of the datasets have been identified and assessed, the prospect of combining spreadsheets, hand drawn field maps, knowledge in someone's head, and engineering drawings seems impossible to many small towns. This is the point where many attempts to build asset management systems lose momentum. The perceived technical expertise, time and money required for this compilation is too high.

In reality, a lack of resources can be overcome by an incremental approach to asset management. Even a partial database that is being incrementally populated can provide assistance to those making decisions about the utility system.

2.3.3 Government Incentives

The government's system of grants and loans to communities with failing water and wastewater systems has created an incentive against strategic asset management. In the past, communities that mismanaged their systems were rewarded with funding to repair their critical assets. These government funds served as a subsidy, lowering the water rates. Some communities neglected the preventative maintenance necessary to prevent their systems from going into disrepair. This neglect would also have lowered short term costs, further decreasing the user charges. The end result was that communities learned to neglect their responsibilities, mistreat their assets and rely on the federal or state government to provide grants to keep their water service charges low. This reactive mindset is difficult to unseat, especially if it has been in place for many years.

In contrast, people living in communities that managed their water and wastewater systems well reaped few economic benefits under the old funding system. Their communities received fewer government subsidies, and they paid the cost of performing preventative maintenance. Although that maintenance lowered the true cost of maintaining the utility systems in the long run, it increased short term costs.

2.3.4 Institutional Inertia

One of the most significant challenges to implementing an asset management system is institutional inertia. Prior to putting a comprehensive asset management plan in place, system supervisors will have developed some method of managing their system that they may be reluctant to abandon. They might not see a reason to change their system.

In many cases utility supervisors' have rudimentary management methods. They keep general knowledge of the major assets in their head and store more detailed knowledge in a filing cabinet in the form of as-built drawings. They utilize existing rate structures without knowing how they were developed. They do not consider whether those rates meet the present and future needs of the utility.

These communities typically plan to use their aging infrastructure until it breaks down, at which time they appeal to the federal government for funds to repair their failed assets. This "firefighting" approach patches problems as they arise and may include plans for a major capital improvement project in the future. It lacks a comprehensive management strategy.

The firefighting approach does not take into account that maintenance or system alterations might render capital improvement projects unnecessary. When a water or wastewater system is at the beginning of its life, it requires fewer repairs, making it possible for communities to neglect preventative maintenance. Although such a plan is logistically easier than comprehensive planning, it is much more expensive to communities in the long run.

2.3.5 Short-Term Focus

As water and wastewater utility systems age, needed repairs are more frequent and costs increase. Attempting to keep costs down, water system supervisors avoid paying minor, reoccurring costs throughout the life of the system by investing in preventative maintenance.

Viewing asset management as an investment rather than a cost is difficult when a seemingly less expensive management plan has been in place for years. This type of investment does not bring a visible return to the organization, rather it saves money on repair and replacement costs in the future. Even if this is recognized by the utility supervisor, it can be difficult to convince elected officials and the public that this type of investment is worthwhile.

Moving to an asset management system involves a shift from the short-term focus predominant among elected officials to a focus on long-term strategic planning. Mayors and town board members are elected to short terms and therefore focus on how their government is going to perform during that timeframe. The greatest benefits of asset management lie in the future: for example, increased life cycles of equipment and better financial planning to deal with system upgrades. The community and expert interviews brought out that town leaders hesitate to initiate projects that do not show immediate benefits. According to Kevin Smith, most projects take four years and most leaders turn over every two years. The hesitant mentality of town leaders, coupled with the timeframe of improvement projects, is one explanation for why many systems are in poor or failing condition.

2.3.6 Associated Rate Increases

Another common misperception that inhibits the adoption of a comprehensive asset management plan is that asset management will lead to increased water and wastewater charges for the community. Many system managers assume that the rates they set are at the bounds of the customer's ability or willingness to pay. In reality, a well organized and executed asset management plan should reduce real water and wastewater rates in the long-term. This is accomplished by increasing the useful life of assets and utilizing assets in the most efficient manner.

2.4 Body of Knowledge –What Is Not Being Said

The literature on asset management is replete with detailed examples of diverse benefits to water and wastewater system planning. Utilities report that comprehensive asset management allows for more informed decision-making on pricing, cost allocation, rehabilitation and governance of these systems.

This report examines prominent resources focused on asset management for water utilities. Included among them were specific documents targeting small water and wastewater systems such as the EPA's, "Taking Stock of Your Water System: A Simple Asset Inventory for Very Small Drinking Water Systems." The brochure is among a growing body of reports dedicated to

small systems, detailing how a user can begin an incremental asset inventory as a first step towards establishing an asset management plan. What this brochure and others like it lacks is an explanation of how to get communities to complete the checklists it contains. Following the materials' advice will help communities develop an asset management plan, but nothing out there focuses on *how* to convince communities that the process is worthwhile.

Given the sheer number of water utilities run by small communities, there is a need for an increase of resources and studies specifically targeting their asset management needs. Such studies should focus on the needs and real costs, both apparent and unseen, which are preventing communities from implementing comprehensive asset management plans. By examining these communities in more detail, it is possible to better identify and create resources for addressing their asset management needs. Such studies could increase the speed with which small communities adopt asset management systems.

Often ignored is the potential edge that smaller communities may have over larger ones in implementing incremental asset management systems. Resource constraints aside, most rural communities have fewer assets to manage, thereby lessening the potential time required to inventory and map those assets. In theory, proximity and shared staff should facilitate coordination between stakeholder agencies such as transportation, health and disaster preparedness agencies in a town or village setting.

2.5 What Towns are Doing

The interviews conducted by the research team spanned communities with different populations, needs, and levels of asset management. The communities have various approaches to managing their systems, which included a firefighting mentality, an incremental asset management plan as well as contracting out their management needs.

2.5.1 Firefighting Mentality

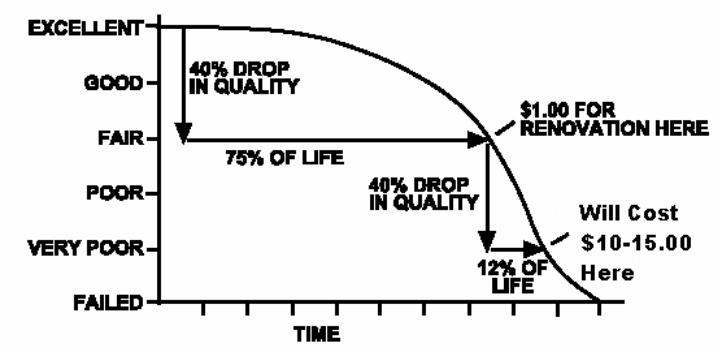
Five of the six communities interviewed by the research team did not have an asset management plan. When asked how they maintain their water and wastewater systems, they indicated that they followed a "firefighting approach." This approach does not require assets to be prioritized, but instead focuses on fixing assets when they break. Four different factors help explain this approach: past experiences, not knowing about the need for asset management, misunderstanding the impact of asset management, and misplacing focus.

Past experience is a key component of this approach. Many of the assets critical to communities' water and wastewater systems are located underground. Assets such as mainlines have a service life of 60 to 80 years, and they might have been installed before current community leaders were born. When those assets were relative new, this methodology was sufficient to manage the system, as the critical assets did not require maintenance. Short-lived assets such as the pipes connecting homes to distribution lines were not critical to the system, and so using this reactive approach to maintaining them made sense.

Water supervisors and town leaders might draw some incorrect conclusions from their past experiences. The durability of the old mainlines and distribution lines can create the perception that preventative maintenance is unnecessary, whether or not that is actually the case. For example, in the Village of Ilion, which has 11 full-time staff in its water department, a long-time employee could only recall replacing two or three blocks of pipes in the last twenty years.

Another example demonstrates that Ilion's policy might be unwise. Imagine a 60-year-old sewage distribution line that has never broken but is not necessarily in good condition. If it has not been renewed through preventative maintenance, then it is waiting to burst. Once it breaks, it will lower the quality of life in the community until it is fixed. To exacerbate the problem, fixing the line may be more expensive than maintenance would have been. The bottom line is that although a firefighting mentality may be accessible for small pipes that service a few customers, it is a poor approach to maintaining critical assets.

The diagram below from the Army Corp of Engineers demonstrates the cost of maintenance over an asset's useful life.[4] Asset quality drops slowly after an asset is installed, and while the asset remains in good condition, performing maintenance is fairly inexpensive. However, once an asset's condition drops to a poor or very poor level, the cost of maintenance increases quickly. In the diagram below, the cost of maintenance increases tenfold. Performing preventative maintenance on an asset is much more cost effective than replacing an asset when it has deteriorated to a poor, very poor, or failed condition.



Not knowing about the need for asset management is the second reason why communities adopt an approach of only fixing assets when they break. For example, one town clerk expressed that if asset management were necessary, her water maintenance personnel would learn about it at training sessions or conferences. She also said that community leaders were opposed to any change in management procedures, and only a targeted education campaign might be able to convince them otherwise.

Misunderstandings about the impact of developing an asset management plan also contribute to communities following a firefighting approach to system maintenance. The first misunderstanding is over water rates. Kevin Smith, formerly an employee of the Tug Hill Commission, indicated that many rural communities avoid asset management plans because they believe that those plans will cause them to raise rates, which would provide a hardship to their constituents. Unable to increase rates, the communities continue to run their system in a reactive manner, addressing problems as they arise. Raising additional revenue from the available tax base is seen as a political non-starter in those communities, and town leaders, often elected every two years, do not have the political will to move rate changes forward.

The second misunderstanding is about the strain an asset management plan will place on a community's staff. Communities such as Floyd, Central Square and Manchester have one or two

[4] The CartêGraph sales team included this diagram in their systems presentation. They gave the research team permission to include the diagram in the report. Their GIS Webinar Power Point presentation to the research team was on May 31, 2007.

full-time employees dedicated to running their systems, and those staffers have many duties. In Manchester, the Highway Superintendent has two-part time employees that help him perform work on the water system over the weekend.

The final factor contributing to the firefighting approach was misplaced focus. Creating an asset management plan that focuses on service levels rather than costs leads to a better functioning utility. At first glance, it would seem that lack of knowledge about asset management is secondary to the problem of limited funds. It is the research team's assessment that limited funding is a reason to adopt an asset management plan rather than a reason to resist one.

Communities might not realize that insufficient water rates result in other tax dollars being used to pay for the water or wastewater system. A change in management culture that places an emphasis on preventative maintenance and long-term strategic planning would leverage existing funds.

2.5.2 Incremental Asset Management Plan: Case Study of the City of Oneida

A change in management culture can be the catalyst for the development of an asset management plan. Of the communities visited by the research team, only one community had an incremental asset management plan in place. The plan was developed by the Water Superintendent of the City of Oneida, beginning in the early nineties when he electronically catalogued the fire hydrants in Oneida. His asset management system has all the facets necessary for a successful plan: comprehensive maps, inventories, maintenance plans, and financial assessments.

Comprehensive maps are useful in assessing and maintaining the system. In Oneida, every maintenance person has a binder with copies of the most up-to-date maps. When maintenance is performed, the maps are changed and redistributed. Maps of the system are vital in identifying problem areas in the water system, and they can also be used to identify solutions to difficulties such as system capacity issues.

The City of Oneida's inventories were begun by taking an annual inventory of all unused parts and equipment, and also included assessments of the state of all system assets. System assets were assessed each time a crew performed maintenance, and the information was stored in an Excel spreadsheet. These inventories were used to guide annual purchases of parts and equipment, and the maintenance schedule depended on these records as well.

The strength of Oneida's asset management plan is that it included routine maintenance plans. A replacement plan dating back to 1968 stipulates that main lines in the system are examined and replaced when road work is being performed on a street. Due to this plan, the bulk of Oneida's underground assets are thirty years old or newer. The Oneida Water Department determined that the optimum age of replacement of water meters is 19 years, so maintenance personnel replace water meters of that age during the winter (when they cannot perform maintenance on main lines). Oneida also has a plan that calls for replacing 300 fire hydrants a year, and it has replaced 75% of lead pipes in the city.

This maintenance schedule significantly reduces the amount of "firefighting" that the water department must perform. Further, the long-standing success of these maintenance plans in meeting federal and state standards proves to city leaders that the asset management plan is worthwhile. Those leaders respond by allowing the Oneida Water Department to manage its own budget.

Financial assessment is the final component of the Oneida Water Department's asset management system. Oneida's Water Superintendent has institutionalized record-keeping, and those records have enabled him to accurately appraise the value of the city's drinking water system. He has used those records to forecast annual costs. By predicting costs, he is able to justify the need for an 8% capital asset replacement fee, which funds all but the largest capital improvements. Through shrewd management and proper pricing of the service, Oneida's water department has built a cash reserve of over $2 million – up from $200,000 when the Water Superintendent took over the system in the early 1990s. Interest from that reserve is reinvested in the system. The Water Department's preventative maintenance, sound financial policies, and culture of record keeping has been a success; Oneida's real water rates are at a historical low.

2.5.3 Contracting Out

Oneida has built upon its success by extending its water system to surrounding communities. Many of the other communities interviewed by the research team were on the other end of the spectrum, choosing to have nearby cities or water districts run their systems. The Village of Central Square contracts with Onondaga County Water Authority (OCWA) to maintain and run its drinking water system; Ilion contracted with a regional authority for its waste water; and Manchester is seeking a contract with a nearby town to operate and maintain its drinking water system.

Contracting out to larger water authorities or cities can lower billing and maintenance costs. OCWA uses RF technology to read water meters located in Central Square. The cost of such a system is prohibitive for rural communities but is affordable for large water districts. The efficiency provided by such equipment lowers costs for consumers and saves headaches for local officials. Additionally, some small communities cannot afford full-time work crews to maintain their water and waste-water systems, and they would not need full time crews even if they could afford them. Having a larger water authority provide that service saves the communities the expense of having to hire a contractor to perform maintenance on their system.

2.6 Disaster Planning

One area where asset management plans are especially advantageous is in disaster planning and preparedness. A comprehensive asset management plan provides a centralized system that documents the location of critical assets, assesses the status of vulnerable assets and it is updated on a regular basis.

The United States Safe Drinking Water Act (SDWA) defines the standards that need to be followed by all water utilities to ensure the safety of all consumers. Recent amendments to the Safe Water Drinking Act require all community water systems serving populations of 3,300 or more to prepare an emergency response plan addressing the vulnerability of the systems to both natural and man made disasters. An asset management plan would include a condition assessment of critical assets and could therefore be made to comply with this requirement. Although water systems serving populations of less than 3,300 are not required to have an emergency response plan, the research team recommends that these small municipalities produce one anyway.

Emergency response and disaster preparedness plans can be used to build asset management plans or vice versa. Emergency response plans for water systems include a summary of the

system including locations of pertinent documents (leases, service agreements, etc.), maps identifying the location of key components and an inventory of supplies available to repair particular problems. Both the vulnerability assessment and the emergency response plan can be valuable for identifying what resources communities possess. Those documents are also helpful for creating a supply inventory and a list of important contacts. The plans should be integrated wherever possible to build a comprehensive asset management inventory as the basis of the plan.

3. Evaluating Asset Management Software Needs

The management of any group of assets typically involves creating an information system that stores data in a central repository. Creating a long-term strategic asset management plan for water and wastewater utilities is no different—the volume of data involved in utility management is difficult to manage. Implementing an electronic data management system is the logical way to efficiently organize system information. Even in the absence of a formal asset management plan, managers often use common database programs such as Microsoft Excel or Access to organize information about their systems.

Software programs available for asset management of water and wastewater systems vary significantly in complexity and price. Some are designed specifically for water and wastewater, while others can be used for other assets as well. Most of them have been developed with medium to large municipalities in mind, and they manage assets on a scale that is often inappropriate for small utility systems. They can be prohibitively expensive and require significant training. Utility managers in rural communities need software that is easy to use, yet comprehensive enough to meet their needs.

Federal agencies and universities have begun to provide low cost software options for asset management of water and wastewater utilities for rural municipalities such as TEAMS, CAPFinance and CUPSS. Yet the lack of technical expertise can remain a problem. These rural communities sometimes suffer from a 'brain drain' when technologically skilled workers leave the communities for relatively urbanized municipalities. This impairs a rural community's ability to implement technologically complex software systems.

The research team reviewed CAPFinance, CartêGraph, CUPSS, TEAMS and an example Asset Management Spreadsheet based on EPA trainings. Complete reviews appear in Appendix 5.6. The research team determined that regardless of the software chosen, there are certain functions that are essential to creating a comprehensive asset management plan. These functions should include an ability to inventory assets and assess their condition, map critical assets, prioritize repairs and replacements, and produce financial projections. In addition, the software should provide concise, intuitive reports that aid in the development of strategic planning. All five electronic asset management systems were measured against these functions.

3.1 Full-Service Asset Management

In many rural municipalities, a single staff member may be responsible for managing several of the community's assets. In these cases it makes sense for the adoption of a single software platform that supports the management of multiple types of assets. A single system for managing all of a municipality's assets would streamline workflow processes, reduce redundancy, and aid with long-term decision making by storing all information in a single location.

Out of the software programs encountered by the research team, CartêGraph was unique in its ability to manage multiple types of assets. The company marketed the software in a way that highlighted its ability to customize the program to manage any type of asset that a community would need to manage. This customization focused on changing the graphical interface to provide easy access to tools and reporting options specific to certain types of asset groups. Although the ability of the software to manage multiple types of assets is a bonus, the focus of

this study was to examine software packages for the management of water and wastewater utilities.

3.2 Mapping

The ability to map assets has been identified as critical for the successful management of water and wastewater systems. An overall system map brings into view underground utilities, which often lie out of sight and therefore out of mind. A system map can bring a wealth of easily interpreted information to key decision-makers, help coordinate maintenance schedules for field crews, and aid in acquiring approval by citizens for rate increases.

Similar to asset management software as a whole, the level of mapping attempted by a municipality will depend on its resources. Water system managers may be reluctant to initiate a system mapping project due to the apparent difficulty of compiling the data or the perceived lack of data sources. Managers might also hesitate because in many cases, the personnel that work in the field have the greatest knowledge of the water system, and managers do not want to lose face in front of community leaders by deferring to their field personnel. Mapping options can be subdivided into three categories: paper maps, simple digital mapping, and geographic information systems (GIS).

3.2.1 Mapping on Paper

In the most basic form, an overall system map could be created by hand-drawing critical assets on a street map of the local area. Many of the benefits of a full-blown GIS could be gained by a rural municipality by hanging an overall system map in their water manager's office. Simply creating a visual depiction of what the municipality owns will aid in the management of those assets.

County mapping departments are a good place for communities to begin their mapping efforts. GIS data sets covering the entire state of New York exist that can establish a base map on which water assets can be mapped, so in many cases counties will have access to street centerlines, tax parcels, aerial photography, and other datasets that can jump start the mapping effort. Once a paper copy of these maps has been acquired, critical assets can be hand-drawn in their approximate location and notes regarding important characteristics can be written next to these assets.

3.2.2 Simple Digital Mapping

Many communities use or are familiar with AutoCAD through planning and engineering operations. AutoCAD provides a step up from paper mapping in that it is digital. Digital maps are easier to change and duplicate than paper maps, can be stored in multiple locations, and are easy to transmit via email. However, for asset management purposes AutoCAD maps are similar to paper maps in that there is no dynamic link between the feature and its attribute information; a line is simply a line and a point is simply a point. In most cases relevant information is written next to the feature to identify it and possibly indicate a relevant characteristic (install date or pipe material). A more efficient way to store more data could be to record a unique identification tag next to each feature. That unique ID could then be used in any problem reports, work orders, or financial planning so that these workflows refer to features in a standard manner.

If communities seek a simpler digital mapping option, free online services such as Google Maps[5] or Microsoft Virtual Earth[6] allow users to view base mapping layers (aerial photography, streets, etc.). Increasingly, these services allow users to interact with the maps by adding points of interest and loading data collected with global positioning systems (GPS). Virtual Earth, for example, allows users to digitize points, line, or polygons on top of the base map and store this information by signing up for a free account. The digitized features can be attributed in a comments field that could store information such as install date, pipe diameter, or a unique identifier. The community could update the maps as needed by logging back in to the account or print the maps out and update a master paper copy. However, these maps are unable to interact with other software and lack the depth of GIS-produced maps.

3.2.3 Geographic Information Systems (GIS)

A more comprehensive mapping solution is to create a geographic information system (GIS) of the water and wastewater utilities. GIS links a digitized feature to a database that can store any number of relevant attributes. In this manner, a line that is digitized on screen becomes a 12" ductile iron pipe installed in 1991 rather than just a line. The Environmental Systems Research Institute (ESRI) ArcGIS software package is the industry standard GIS software. It is designed to store data in spatially enabled Microsoft Access databases (geodatabases) which is a data format utilized by all of the evaluated software packages. Surprisingly, none of these software programs provided the ability to store data in a format that could be easily imported into ArcGIS. This functionality could be added by including x and y coordinate fields in the asset inventory portion of the software programs and by modifying the structure of the database itself.

Two commercial software packages are fully compatible with ArcGIS: Azteca Citiworks and CartêGraph. An evaluation of CartêGraph showed full integration with ArcGIS at every stage of the asset management system: from receiving customer calls, to issuing work orders, to prioritizing asset replacement. All of the functions in CartêGraph link back to the original GIS data through a relational database structure. In practice this means that any information about a single pipe is readily accessible at any point in the asset management system and updating any information about that pipe will result in updates throughout the system.

Geographic information systems have not had widespread success in asset management because of the high cost and high level of technical expertise required to operate the software. CartêGraph has highly customized graphical interfaces that allow non-GIS experts to utilize a full range of relevant capabilities while incorporating tools that are specific to asset management (maintenance histories, work orders, financial planning, etc). Starting at $7,600, the financial cost of the software may be prohibitive to some rural communities but as the software becomes more widely utilized costs will decrease or free alternatives (such as Microsoft Virtual Earth) will become available.

3.3 Inventory/Maintenance Management

Any attempt to manage assets must begin with an inventory of the assets. To facilitate this inventory, software programs should have the ability to maintain a detailed database showing assets and key information about them (such as date installed or assessed condition). The data

[5] http://earth.google.com/
[6] http://maps.live.com/

entry should be as streamlined as possible. In assessing the software packages, points were awarded for having the ability to enter data in three mouse clicks or less.

The prospect of compiling all of the many data sources about a water or wastewater system can be daunting, but the process of entering it into a database should not be. The data entry for CAPFinance for example, had a simple data entry process that led the user to the category of feature being added and let the user enter as much information as they knew regarding that feature. The drawback of this particular software is that it severely limited the information that could be recorded about a given feature, not allowing the user to add new fields for data entry. There should be balance between requiring too much information and limiting the amount of information that could be stored.

Most municipalities do not have detailed information about all assets in their system. With many asset inventory projects, an incremental approach is best. There needs to be the ability to add a few key assets initially and then, over time, fill in the holes.

Data about a water or wastewater system is typically stored in many locations; as-built drawings, a supervisors' head, financial records, maintenance reports or even photographs. Asset management software needs to have the ability to store information from all of these different formats. Hyperlinks to photographs, record drawings, or video condition assessments are a function lacking from many asset management software programs. They would provide a means to incorporate a greater number of datasets into the management system. These many datasets will generally have various accuracy and completeness levels. Compiling these datasets can be extremely difficult if data sources conflict significantly. In this case, software that includes mapping capabilities can be very helpful. Displaying the system features on a map prevents the entry of duplicate features into the asset database. It can also highlight holes in data collection that can be targeted by field crews.

3.4 Financial Management

The field specialists interviewed by the research team often mentioned that rural communities do not assess sufficient charges for their water and wastewater service. They should be encouraged to move from subsidizing their water systems through low water rates to a system based on full-cost pricing. If a water department does not charge enough for its services, then the remaining costs must be coming from some other source of revenue, such as property taxes or deferred maintenance.

Municipalities often lack the skills to determine the real cost of operating and maintaining those systems. Any useful asset management software package will assist communities in developing a financial plan that is guided by financial realities rather than "best-guesses". The software must be able to assist in performing system appraisals and determining full-cost pricing.

3.4.1 System Appraisals

Appraising the value and remaining life of system assets is an important step in developing appropriate rate structures. The precision of the remaining life estimates depends on the knowledge of the person who created the software and the accuracy of the data entered by the user.

The accuracy of the knowledge and assumptions used to create the asset management software is a potential cause of concern. Misinformation generated by the software could do more harm than good if the system's faulty recommendations are followed. However, all the electronic asset management systems reviewed by the research team were created by agencies or companies that have credentials in asset management, and the upcoming CUPSS software is being developed by EPA experts.

In all four cases, the system appraisals are generated by determining the remaining useful life of assets, and then forecasting the present value of required repairs or replacements. Some of the software, such as the example spreadsheet from the EPA trainings, only include assets with less than twenty years of useful life in those estimates. Once the remaining life of an asset is determined, the software generates scenarios such as how much should be saved if a municipality wants to replace an asset using cash. The software can also determine lending requirements and the cost of repaying those loans.

CAPFinance was created specifically with system appraisal and financing requirements in mind. It generates system repair scenarios that are "paid now" or "paid later." The other software can also create similar scenarios, but CAPFinance is the easiest to use for this function.[7]

Where all the reviewed software fell short was in assessing the accuracy of the data entered into the system. Human error is always a danger, especially when the user is unfamiliar with the software. Tax software such as TurboTax has "error checking" functions that check the data against that for similar users. It then uses those comparisons to identify potential errors in the tax data entered by the user. All of these systems would benefit from a similar function that compares the user's rural community with verified benchmark estimates from similar communities. Such benchmark comparisons would not be perfect, but they could catch obvious errors that a new user might overlook.

3.4.2 Full-cost Pricing and Rate Setting

A full-cost pricing system would charge consumers enough to ensure that the water systems are self-sustaining and prepared to handle disasters rather than relying on subsidized service. CartêGraph, TEAMS and an add-on to CAPFinance called RateCheck-up all provide this service.

CAPFinance's add-on is the easiest to use for full-cost pricing assistance. The software leads the user through the creation of a three-year budget using the data in CAPFinance. The software provides the option of having multiple customer groups, with different base charges and volume rates.

Similar to the system appraisal, the rate suggested by the rate-creating software will only be as good as the data entered into the system. Inaccurate data will create inaccurate results. For that reason, USDA should continue to suggest that communities request assistance from organizations such as the Tug Hill Commission that have the expertise to check the results provided by rate-checking software.

[7] Please note that the research team did not get to evaluate these functions for CartêGraph, and it probably has functions similar to CAPFinance.

3.5 Strategic Planning

The mapping, inventory/maintenance, and financial management functions described above are all part of the strategic planning process, and combining them into one package can significantly increase the value of an asset management system. Using full-cost pricing in conjunction with long-term asset replacement policies has the potential to reduce water rates in the long run. The City of Oneida's real charges for drinking water are at an all-time low due to those two factors, and other communities could benefit from implementing similar policies. Computer software cannot create the necessary policies, although the data and reports generated by the software can assist in policy creation. Asset management software can support strategic planning by identifying break-even points and predicting upcoming expenses. Users can then use this information to strategize how best to fund their water and wastewater systems.

3.5.1 Identifying Break-Even Points

One significant contribution that asset management software can provides communities' water and wastewater systems is identification of break-even points for replacing aging assets. For example, the Water Supervisor of Oneida used Excel spreadsheets to determine when water meters should be replaced. He has determined that replacing water meters every 19 years saves money by more accurately measuring water usage.

Only CartêGraph explicitly claims to perform this type of analysis, although savvy users could probably determine break-even points on their own. If USDA were to assist in the creation of a new asset management software package, having a feature that calculates break-even costs for all assets would be extremely helpful in guiding maintenance policies. Often maintenance is viewed as a nuisance and a cost, but performing maintenance when an asset reaches its break-even point actually saves money.

Using break-even analysis, communities can also create preventative maintenance schedules for more expensive assets such as mainlines and pumps. The Army Corp of Engineers' costing graph in the first section of this report illustrates the benefits of preventative maintenance, demonstrating that replacing or repairing assets when they reach their break-even point is a responsible preventative maintenance policy.

3.5.2 Predicting Upcoming Expenses

Forecasting upcoming expenses and creating strategies for funding them are the bread and butter of asset management. All four systems evaluated by the research team were able to perform this function, and none stood out as superior in this regard. They all predicted expenses into the future, ranging from 20 years to 60 years. These predictions include an estimate of the present value of performing those repairs, which tells a community how much money they would need to set aside today in order to pay for the repairs in full.

The forecasts generated by the software systems are useful in creating the full-cost pricing previously mentioned. Furthermore, forecasting costs allows communities to explore funding options in advance, increasing the chance that a community will make the most logical choice for funding.

The research team's community interviews identified leadership buy-in as one of the largest hurdles standing in the way of creating asset management plans. Strategic planning is of little use

if leaders do not accept the plan. Well documented reports are one tool for garnering support of leadership. CAPFinance and CartêGraph both stood out because they generate useful reports that could be shown to community decision makers. CAPFinance's reports are easy to generate but are limited in number. Whereas, CartêGraph's reports are slightly more difficult to generate but have a larger degree of customizability. CartêGraph's biggest advantage over CAPFinance is its ability to include maps with the reports. Kevin Smith, formerly of the Tug Hill Commission, mentioned that maps are one of the best tools for securing community buy-in. However, either software package would be useful in educating community leaders about future work for water and wastewater systems.

3.6 Electronic System Management

In addition to the specific features mentioned above, the look and feel of the asset management software is also an important concern. In communities that lack technical support and employ personnel with little experience with advanced computer software, how a program operates will determine the extent to which it is used. For software to be adopted widely it should be easy to install, update and back-up; it should have intuitive graphical interfaces; and it should include clear help files and accessible technical support.

3.6.1 Installation, Updates and Back-up

Installation and updates are an essential concern for communities with small staff and no technical support department. Of the relatively inexpensive software reviewed, CAPFinance was the easiest to install. However, all three inexpensive programs reviewed require Microsoft Office (which must be installed on the computer) and manual updates. Any difficulties encountered while using those systems must be solved by the user. For those inexperienced with Microsoft Excel or Access, trouble-shooting these programs would be problematic. Since these communities probably lack their own server, the programs would be run off a local machine. In such a situation, it is likely that the data would not be backed-up, and so a system failure could result in the community losing all its electronic records.

The commercial program CartêGraph is installed and maintained by the vendor. In essence, the vendor becomes the technical support department for the municipality that purchases the software. The vendor provides live support over the phone or via fax, and they are responsible for keeping the software up-to-date. Similar to the inexpensive software, the system must be run off an individual machine if the municipality does not possess a server. Therefore, CartêGraph has the same problems with back-ups and potential data loss as the less expensive programs.

The ideal solution to address these installation and update concerns is for a government agency or vendor to develop a web-based asset management system. Such a system could be run off a secured server, could be backed up daily, and would always be up-to-date. The Head Start Bureau has assisted in the development of web-based child management software for its grantees called Promis.[8] A similar web-based asset-management system would be useful for rural communities that lack technical support or servers.

Rural communities with limited staff have little time to follow changes in government environmental and safety regulations governing water and wastewater systems. Web-based systems have the advantage of being housed in one central location, allowing the system to be

[8] http://promisinfo.cleverex.com/Intro/WhatIsPROMIS.asp

updated quickly when regulations are created or modified. By being up-to-date with current regulations, the system would ensure that a community's purchases and repairs meet current standards.

3.6.2 Intuitive Graphical Interfaces

Many of the communities served by USDA possess limited technical capabilities, and their staff may be uncomfortable operating in a Microsoft Access environment. Many times, people that are uncomfortable with computers experience apprehension at the thought that they will break a system or enter data in the wrong place. Easy-to-interpret graphical interfaces can make even complicated computer software such as Access less intimidating, reducing the anxiety experienced by less tech-savvy users. Those menus make complicated database software accessible to those with limited experience with computers.

A comparison of TEAMS and CartêGraph demonstrates this point. Both are Microsoft Access-driven asset management programs. They are built on complicated relational databases that transform data entered by the user into a useful asset management plan. Both programs are flexible in allowing users to determine what data should be saved. They can generate forms, reports, graphs and financial statements. In other words, they are capable of doing the same things and of producing the same outputs for users managing a wastewater system.

CartêGraph is easier to use than TEAMS because its developers have created a graphical interface that hides the background database. It uses pictures instead of words to guide users in navigating the software. The CartêGraph interface makes learning and remembering how to operate the software much easier. Its menus simplify the process of data entry, ensuring that the user can enter the required information in three clicks or less. In contrast, TEAMS' complicated workflow may make remembering how to operate the system more difficult for someone who only uses the program every few months.

CAPFinance also provides a simplified interface for entering data into an Access database. However, it lacks the versatility of CartêGraph, as its fields and reports cannot be altered by the user. CAPFinance's text-based menus are relatively easy to use because they are simple. CartêGraph's menus are not simple, but because they are graphically based, they are easy navigate. CAPFinance's simplicity makes it a good starting point for community who are creating a new asset management system, but those communities might find that they quickly outgrow the system. CartêGraph's interface allows the user to increase the amount of data recorded as their asset management system matures.

3.6.3 Simple Help Files and Technical Support

Extensive and complicated "help" materials can also intimidate users. Ideally a system for rural communities without technical support should not require extensive explanatory materials. A system that can be understood by using a "getting started guide" of ten pages or less would be ideal for these communities.

Databases that run out of Excel and Access can also confuse users using the "help" menu, because files available in that menu are for Excel or Access. In general, less tech-savvy users might not realize that the Microsoft "help" files do not contain any materials explaining the operation of specific asset management spreadsheets or databases. Thus users might give up on the spreadsheet or database when they cannot find any information clarifying their pressing

questions. TEAMS and the spreadsheet attached to the example Asset Management Spreadsheet training both suffer from this problem.

Sometimes help files are insufficient to answer questions about operating computer software. When communities begin adopting complicated asset management software, they are likely to need live technical support. Providing live support is expensive, and the providers of the inexpensive software do not have the capacity to provide large-scale support. CartêGraph's annual renewal fees pay for this support, and it is unlikely that anyone but a commercial vendor could provide such a service. USDA could train its ground-level employees on popular asset management software to provide that support, and other groups such as the Tug Hill Commission could also give technical software support if given proper resources. However, at the end of the day, hiring private vendors to supply technical support might be the most cost-effective option.

3.7 Findings

None of the software reviewed by the research team was perfect, receiving a full endorsement. The example Asset Management Spreadsheet has extremely limited functionally, but does provide a good template for a community that is listing and appraising its critical assets. TEAMS is comprehensive but too complicated for most rural communities, and it only provides information on wastewater systems. In contrast, CAPFinance is simple but has limited functionality. It would be a good place for a community to start in appraising its system, but a community could quickly grow out of its functionality. CartêGraph is the most complete software package, but it is much more expensive then the other software reviewed. If a community had the funding to implement CartêGraph for all their public works asset management needs, it would probably be very pleased with the results. However, CartêGraph is probably too expensive and extensive for many of the rural communities in New York State.

CUPSS, which is currently in development by the EPA, has the potential to greatly assist rural communities in developing an electronic asset management system. For it to surpass commercial software such as CartêGraph, it should have at least some mapping features and intuitive graphical interfaces. The EPA might want to consider offering access to the system free of charge from a secured government server. Such a system would eliminate problems related to installation, update and back-ups that affect the other currently available software programs.

4. Recommendations

4.1Recommendations for Small Communities:

4.1.1 Introduction

There are several models for starting an asset management plan. However, there is no single model that applies to all types of communities. Each individual community faces different challenges when it comes to water and wastewater system management. However, the lack of resources seems to be the common problem that communities identified when asked about asset management planning. Within the category of resources, the most frequent complaints refer to personnel, technology and funds. Lack of one or all of those resources leads community officials to perceive there to be a very high cost for developing an asset management plan. In most cases they do not consider it a necessary cost.

When exploring recommendations for this report, the research team took into consideration these perceived (and real) costs and took care to limit the financial, personnel, and technological costs as much as possible. An asset management plan need not be prohibitively expensive if it is incrementally created. Additionally, the team suggests that any asset management plan should be linked to communities' disaster preparedness plans in order to maximize its benefits.

The importance of water and wastewater assets to quality of life and the need to secure these vital resources guarantees an increasing need for asset management. According to Steve Allbee of the U.S. EPA, there is a strong likelihood that in the next 5-10 years communities will be unable to access resources without comprehensive asset management plans. The need for greater accountability for these diminishing federal funds means communities must demonstrate capacity to manage these funds appropriately. In light of this trend, this report provides a list of recommendations organized into the following sections: community implementation modules, stakeholder organizations, county, state and USDARD.

The research team suggests that communities start with a few critical steps and incrementally build on this model until it becomes a self-sustainable asset management plan. Three modules have been created in order to clarify the process of establishing an asset management plan.[9]

4.1.2 Module 1 – First Steps For a Community

Goals and Objectives:

1. Create an inventory of assets
2. Map assets
3. Criticality: Prioritizing assets

[9] The underlying questions for the modules were confirmed during a conference call on June 4, 2007, with Steve Allbee, an EPA expert on asset management. His questions were:

1. What are the applicable assets and what condition are they in? Where are they located? How long will those assets last?
2. Determine what is expected to be done with those assets.
3. Criticality: what are the risks and consequences if those assets fail?
4. How do you plan to respond to the problems identified by questions one through three? What is the best, most cost-effective way to address those problems?
5. How does the response to question four translate into economic terms?

4. Appraise assets
5. Engage decision makers in this process

1. Create an Inventory of Assets

The first step in developing a successful asset management plan is to inventory and categorize the community's five to ten most critical assets. Creating a comprehensive inventory may seem overwhelming for some communities, but listing just those assets critical to operating the system will be a less daunting task. Pumps, distribution mainlines, and any other assets that are critical to system operations should be included on this list.

Rural communities have an advantage over large communities in this regard. For example, Orange County's Sanitation district manages between 110,000-120,000 listed assets and has about one million customers.[10] In contrast, rural communities typically only need to manage 100 assets or less.

By beginning the asset management plan at a modest scale, a community can overcome the perceived problems of time, money and personnel constraints. Steve Allbee, an EPA expert on asset management, echoed that communities must learn to "walk before they run." In other words, they do not have to start all processes at once but rather may gradually populate their asset inventory over time.

An example checklist is available in Appendix 5.7.1.

2. Map Assets

After identifying community assets, it is essential to map them in some fashion. Building a map of assets can be done in several ways, ranging from very simple techniques to technologically advanced methods. The simplest approach is to use a map of the community, such as can be printed using Google Earth, and identify the assets on the map with a magic marker. More complicated techniques include using GPS units that can be used as well as special software programs that create maps.

Maps are very useful for showing decision makers exactly where their assets are located. They are also an important educational tool for communicating to community members what they own and where their assets are located.

After developing a map, communities can post it on the entrance hall of the Office of Water and Wastewater Management, Office of Public Works, or any other appropriate office. The map will make the public more aware of the system in place.

3. Criticality: Prioritizing Assets

After the assets have been identified and mapped, the next step is to prioritize those assets. Not all assets are created equal, and they should not be treated that way. The process should be guided by the questions "What am I expected to do with these assets?" and "What are the risks and consequences of these assets failing?" The asset that is most essential to meeting the goals of the system and that has the greatest cost if it fails should be categorized as the largest priority.

[10]From conversation with Steve Allbee, EPA. June 4, 2007.

Some examples of such assets are mainlines, water purifiers and pumps.

The assets can then be placed into one of three groups:

a. Assets that warrant monitoring
b. Assets that warrant intervention
c. Assets that are so critical that failure is unacceptable

4. Appraise Assets

Water systems encompass several types of assets with varying life spans. Over time, assets depreciate as a result of physical and chemical processes and need to be replaced. It is crucial to know when each replacement needs to occur. An asset management plan addresses this problem and can identify, prior to an asset's failure, with relative accuracy when replacement is necessary.

When assessing the remaining asset life, it is important to pay attention to the current physical condition of the asset and how this condition changes as the asset ages. Assets should also be examined to determine if they are performing at the level of service required by the customers. If not, they will need to be repaired or replaced. A preventative maintenance plan is needed to slow the depreciation process and keep the assets in a desired condition. Such a plan should focus on the nature, rate and cost of depreciation.

5. Engage Decision Makers in this Process

For an asset management plan to be successfully implemented, decision makers must buy into the process. Keeping tax payers and decision makers informed about the state of the system and giving them input into the asset management plan will ensure that funding decisions are consistent with the system's needs. If a major decision like increasing water rates is necessary, decision makers must approve the decision and an asset management plan will provide them with the information needed to make the wisest choice.

4.1.3 Module 2 – Filling in the Gaps: Moving to an Electronic Management System

Goals and Objectives:

- Filling in the inventory beyond major assets;
- Incrementally building an electronic asset management database;
- Designing and implementing policies and procedures to populate and manage this system;
- Building a comprehensive, updated system map;

Many communities will need to begin their asset management system by completing module one but some communities will have already gone through these activities on their own. Building upon that foundation, Module 2 is intended to move communities beyond a basic plan, to fill in the gaps of the management plan, and to put them on the path to managing their plans with a proactive system. This can all be accomplished by incrementally building a management system in an electronic format.

Communities have varying levels of resources and expertise available for asset management. The goal of this module is to move beyond the largest assets and to incrementally record the location and condition of all system assets. This is particularly important for communities that are geographically dispersed. For example, many communities with under 10,000 residents have several miles of pipeline and numerous non-critical assets such as meters, hydrants, and valves. Another main initiative of Module 2 is for communities to begin designing policies and procedures to gather and manage this information in light of their time and resource constraints.

As a plan becomes more sophisticated and robust, electronic data management becomes more important. For instance, disaster planning requires an up-to-date community asset inventory to allow for more rapid replacement. The research team's interviews revealed that a great deal of system information resides in one person's memory or on paper maps which are subject to loss. Backing up this information is critical, as losing it would decrease the community's ability to manage the system.

Increased efficiency will also result from implementing Module 2. As the system ages, the community will be able to proactively manage system components. While large assets are much easier to track and monitor, a community with a larger number of households will have many more assets to track.

Finally, creating an asset management plan will increase a community's knowledge of the current state of its assets. Paper as-built drawings are a good starting point for a system plan. However, they are not normally up to date, nor do they usually have the current condition of the asset. They also do not tell a community how much useful life an asset has left.

Regardless of the software system a community chooses, some of the basic tools are common across systems. These include easily tracking assets and calculating the estimated useful remaining lives of assets. The most important element of Module 2 is that a community is incrementally building its database of information and is en route to better planning and management.

Another recommended component of Module 2 is to work towards a comprehensive updated map of the entire system. One option for communities with more resources is to hire a consultant to map the system and to build an asset database. This also may be an option for those seeking funding for system component replacement; perhaps adding the additional funding request to a grant or loan application.

However, using existing staff and resources to build the database is more beneficial for communities in the long run. Communities can begin by tracking and entering information from work orders into the system via tear-sheets. An example of a tear-sheet is included in Appendix 5.7.2. For example, whenever someone in the community calls about a problem such as an open hydrant, maintenance personnel should note the location, condition and any repair done on the asset. That information should be promptly recorded into the asset management system. Repairs or replacements performed on critical assets should be noted on the system maps as well.

The City of Oneida provides an example of such a system in action. The Water Supervisor maps the system with Autocad uses Excel spreadsheets to store system data. Using this system, he performs useful life and replacement calculations. The city maintenance workers refer to copies

of Autocad maps when performing repairs, and the maps are updates after changes are made to the water system.

The goal of these procedures is to integrate the asset management system into maintenance workers' normal job functions. By incorporating these recommendations into standard operating procedures, these workers will get into the habit of looking at the water system assets and recording information as they go about their daily duties. An example of this is having meter readers take an extra moment to note the age and condition of the water meters when they perform their regularly scheduled readings.

Efforts should also be made to collaborate with the highway department and/or department of public works as they make road repairs. Roads tend to be paved more often than underground pipes are replaced, since the water department can take advantage of the streets being replaced. They can coordinate with the highway department to prioritize road replacements as they relate to replacing water and wastewater underground infrastructure. Further, GPS, geocoding or a simple notation of hydrant and valve location can be recorded during roadwork. In this manner, the asset management database can be built over time.

This incremental approach makes asset management processes routine parts of employees' job duties. The system is constantly updated and maintained. Even if a consultant is hired to populate the system initially, the changes to these work processes must still be made to ensure up-to-date records.

One option for populating the asset information database more quickly is to set aside a portion of time to map. For example, the water department can commit to mapping one block weekly. This may be a useful approach if an individual with significant institutional knowledge is at or near retirement and time is of the essence. Another economical approach to build the system more quickly is to hire a college student with engineering or GIS experience part-time.

4.1.4 Module 3 – Active Planning and System Management

Goals and Objectives:

- Ongoing asset management system updates;
- Proactive water and wastewater system maintenance;
- Active budget forecasting for replacement;
- Continued public education and engagement related to system performance and any related rate changes.

Module 3 is intended to get communities to focus on active strategic planning and management. Once utility managers have enacted the policy and procedures in Module 2, populating the asset management system with information on assets should be an ongoing process.

Using the data entered into the system, reports can be generated to prioritize assets based on whether they are critical or non-critical to system integrity. Costs of maintaining versus replacing these assets should be weighed to estimate the level of funding required for needed replacements.

Utilities should also begin developing long-term preventative maintenance plans and policies. These plans should project into the future in five-year intervals, and they should indicate when the community will need to replace assets. Much of the existing asset management software

allows for this type of long range planning. Specific fields allow the user to enter data on existing assets. The software can subsequently determine the useful life and cost of replacing or renovating each asset, based on industry standards. Utilities should formalize their plans and update them on at least an annual basis to indicate any recent upgrades or other changes to the system.

Utilities should revisit their water rates annually to determine whether the rates cover the operating and capital improvement costs of the water or wastewater systems. This annual review should remain consistent with the full-cost pricing for water and wastewater services. If a rate increase is necessary, it can be substantiated with adequate documentation generated from a formal and public asset management plan rather than arbitrary figures.

The potential for political fallout might discourage local leaders from adopting a rate increase. However, examples of towns that have utilized their plans to garner support for rate increases show that rate increases are politically feasible. Further, those plans can lead to lower rates over time. In the City of Oneida, customers are presently being charged based on their water usage and services. Because of a regular maintenance schedule and planned replacement of assets over time, the water charges to customers in Oneida are at a historic low.

Finally, utilities should make their plans public, including information about projected expenditures. By engaging the community through each Module, community leaders will foster greater transparency and will be better positioned to counteract opposition to necessary rate increases.

4.2 Other Stakeholders

Rural communities sometimes face the choice between operating their own water and wastewater system and contracting out the service. If they choose the former, they face higher initial financial outlays. If they join with a water district or neighboring community for water and wastewater service, the cost is distributed among many communities, allowing them to benefit from economies of scale. Options for local collaboration include initiating Intermunicipal Agreements (IMAs) and joining water districts. Peer to peer networking also has the potential to provide local leaders with models of successful asset management.

4.2.1 Intermunicipal Agreements

One of the mechanisms through which rural communities can share resources are IMAs. An IMA is a cooperative or contractual arrangement between two or more municipalities. Under the Home Rule laws, local governments are specifically authorized to enter into IMAs to adopt compatible comprehensive plans and ordinances. Many of the communities interviewed already utilize IMAs for trash, snow removal or road repairs. Communities can utilize IMAs as a way of keeping cost low while implementing asset management systems. Any local administrative agency that handles water issues can be established as a joint board with one or more nearby communities. Communities entering into IMAs may also receive the added benefit of qualifying for incentives and funding that would not otherwise be available.

There are some considerations for communities entering into IMAs. One potential snag in these arrangements is that it may be hard to determine which community will have control of jointly hired personnel or shared equipment. Another consideration is that communities choosing to contract out their water and wastewater services can be beholden to the outside provider. If that

provider decides to raise rates, there is little the communities can do other than pay the higher cost. Trust is certainly a key factor in entering into an IMA. Keeping this in mind, the report recommends that rural communities consider the benefits of cooperation through IMAs or by joining water districts, but they should try to secure long-term deals as an incentive to collaboration and relationship-building.

4.2.2 Water Districts

In addition to IMA's, rural communities might also have the option of joining water districts such as Onondaga County Water Authority (OCWA) or of contracting service in conjunction with nearby towns. The Village of Central Square has a long-term lease with OCWA that allows the Water Authority to keep revenue generated by the system in return for performing maintenance and billing. However, these agreements can also have a cost. In order to entice OCWA to take over maintenance of its system, Central Square performed a $1.2 million upgrade to its drinking water system. The Village of Ilion has a similar arrangement, but for its wastewater system. Unfortunately, the ability of towns and villages to join water and wastewater districts is largely dependent upon whether one is situated nearby.

4.2.3 Peer Networking

Other communities may serve as models for best practices in the field and can be a resource for other neighboring communities in New York State. One example is the City of Oneida, which has implemented a rather sophisticated asset management system. Communities such as these and others should be highlighted as regional models and should be given the resources to extend their expertise to others in the area.

Peers understand the challenges rural communities face and can brainstorm how to overcome these hurdles in light of resource constraints. Successful communities are a source of regional pride and something for other communities to aspire to in order to achieve a sense of accomplishment.

It should not be assumed that networking will occur without a catalyst. Organizations such as the Tug Hill Commission and the Environmental Finance Center serve a vital role not only in providing technical assistance but in facilitating networking and information sharing among rural communities.

4.3 County

Counties are a critical unit of governance at the local level, and the research team proposes that counties play a more active role in water and wastewater system asset management. Strong home rule traditions mean that many communities would prefer to work with the county as little as possible to retain their autonomy. However, the USDA and other government agencies should provide incentives for connections between town and county governments. Counties provide the benefits of proximity, accessibility, and financial resources. These benefits make them the logical entity to provide mapping, technical, and emergency planning support to rural communities that are developing asset management plans.

Moreover, for national security and emergency planning reasons, county governments should have water and wastewater system inventories and maps for every municipality in the county. Responses to floods, ice-storms, sabotage or any other emergency often begin at the county

level, and so all communities should be required by the state to deliver maps of their critical assets to the county for emergency planning purposes. Precise mapping assistance is demanded at the county level because towns and villages do not have the resources for this sort of planning. Emergency planning assistance is also essential. For instance, it is crucial to make sure that connections between community's drinking water systems can be shut off in the event of contamination or that emergency connections can be opened to provide clean drinking water if one community's water supply becomes unavailable.

Another consideration is that counties are likely to have GIS-capable systems. Therefore, community staff could be required to provide digital maps of the assets to the county. Once the county has these maps, it will be able to more effectively plan for disasters. Rural communities can use the maps to determine problem areas in their water and wastewater infrastructure. Those digital maps would serve as a foundation for communities as they begin developing an incremental asset management system.

In the event that asset management is mandated by the state or federal government, counties will provide an invaluable source of technical knowledge for rural towns and villages. With their larger talent pool and capital resources, counties would be a great vehicle for providing technical assistance and support. For example, software such as CartêGraph could be purchased at the county level, and then licenses could be doled out as needed. This would create network externalities and ensure that data is compatible for all municipalities in the county. Such a solution would also make it easier for the county to back-up data, ensuring that rural communities that lack servers and sophisticated technical support do not lose years worth of data due to a systems failure.

4.4 New York State

New York State could provide leadership in the area of asset management by formulating a statewide asset prioritization plan. Such a plan would create a panoramic view for the state as it investigates and communicates with the counties and communities. The plan would need to take into account all capital assets, and it could also be used to prioritize the financial resources available to rehabilitate and replace aging systems.

An asset prioritization plan could also include the state's view of counties' and municipalities' roles in asset management. It would reconcile the roles of the different levels of government, by including stipulations on data collection and reporting standards. Standardized data and systems would make creating a state-wide, interactive asset map a possibility; that map would be invaluable for emergency planning and responses. New York would not be the first state to take the lead on this important issue. Idaho has already started a plan, which is useful in demonstrating to communities which assets should be prioritized.

New York State should also purchase or create an electronic asset management system that can be adopted statewide. That system should be available to all communities and updated in real-time. Key asset inventories should be recorded for future analysis, and the system could be used to identify redundancies in inventories. The state could use its purchasing power to secure a good deal on a comprehensive, powerful software package such as CartêGraph.

4.5 USDARD

The USDARD's role builds upon the work needed by the county and state in helping communities establish an asset management system. The research team has developed recommendations for the USDARD, recognizing that some of these recommendations may already be used in some fashion by the agency.

4.5.1 Education

Impediments for communities include institutional inertia and the related lack of experience with asset management methodologies. Education is one of the ways to overcome this challenge. Technical assistance specific to asset management is one aspect of educating communities. Although the EPA and other entities have produced numerous asset management guides, those resources are difficult to find. Moreover, many modules, workshops and other resources are too complicated. Reading those materials is time consuming, which is particularly problematic for communities with part-time staff lacking asset management experience.

Streamlining the available information into one "getting started" guide would solve this problem. It could be based on the modules in this report and other EPA documents. Ideally, the guide should be short enough to be read in one afternoon, and it could also list detailed resources to be used as systems become more sophisticated.

USDARD may want to adopt a "push" strategy rather than a "pull" strategy in order to publicize asset management. Communities often do not seek out this information until something goes wrong with their water or wastewater infrastructure.

USDARD staff could spearhead the incorporation of asset management into small water organizations by getting materials out proactively. Alternatively, they could encourage other groups such as the Tug Hill Commission to adopt this outreach approach.

4.5.2 Incentives

Historically, government agencies have given priority to communities with the greatest need, creating incentives for communities to let their infrastructure degrade to the point that they would be eligible for federal assistance. The incentives for communities to maintain the system can be increased by giving funding priority to communities that have developed a water and wastewater plan. For example a point system could be established and, as communities complete the three modules developed by the research team, they would earn points that increase their eligibility for USDARD financial assistance.

Creating an asset management plan should be a requirement for all communities receiving USDARD funds. Making funding contingent upon adoption of asset management principles would ensure that USDARD's limited funds are used well.

4.5.3 Rate Structure Comparisons

USDARD can provide addition support to rural communities by providing examples of their peers' rate structures. A list of communities with full-cost rate structures could be distributed to give community leadership a range of rates for comparison purposes. This list should contain examples of total water or wastewater budgets that includes a calculation of tax subsidies.

Examples of communities that suffered significant rate increases due to poor management could also be made available. Finally, there should be examples of communities that have seen their rates change over time. For example, Oneida's rates have gone down over time after an initial increase. All these examples would educate leadership and citizenry about how their rate structure effects their level of service, and how those rates will change over time if the water and wastewater utilities are well managed.

4.5.4 Recognize Asset Management "Champions"

Implementing an asset management plan is difficult without a "champion" that takes responsibility for implementing the system. USDA's ground-level staffers should be encouraged to keep their eyes out for potential champions, who are probably town clerks or young supervisors. Champions work for the organization, see the real benefits of creating an asset management system, and push other people in the organization to implement the system. They take ownership of the system, and they make sure that it does not fade away over time. Often, the champion will be a town clerk or community supervisor that sees how the system will make their work easier.

4.5.5 Software Development

USDARD might benefit from communicating with the EPA team developing CUPSS. Integrating USDARD's ground-level experience into CUPSS would enhance the system's usefulness to rural communities. Further, USDARD might want to emphasize the need for mapping functionality. That function is lacking in all the free systems reviewed by the research team.

Developing a server-based asset management system hosted by USDA might be the best way to support rural communities in implementing an electronic system. Communities could access the system over the internet through a secure login. Such a system would exploit economies of scale and also generate large network externalities if it were widely adopted.

5. Appendices:

5.1: Sample Community Interview Questions

The following questions provided an overarching framework for generating discussion during the community interviews:

1.) What resources are involved in the management of your water system?
e.g. How many staff / budget / charges (flat vs by use) / etc.
2.) Do you have a water / waste-water asset management plan? Is it a formal plan? Who has expertise about the system?

If NO, Do you have any management systems currently in place? (e.g. payroll, tax, bills, property assessment, infrastructure, etc.)

3.) What are your biggest headaches in managing your current system? How would you want to manage your system if resources were not an issue? What would that provide your organization?
4.) What factors are keeping you from adopting a plan?
5.) What is your next large project and how was it planned? Paid For? Do you have any other large expenditures that took place recently?
6.) Have you considered integrating your system with other nearby municipalities? Why or why not? (If in a water district, what are the benefits and drawbacks).

5.2: Comparison Chart for Communities

Issues	Village/Town Name – Population					
	Central Square (V) 1,700	**Champion (T) 3,800**	**Floyd (T) 3,900**	**Ilion (V) 8,600**	**Manchester (T) 9,300**	**Oneida (C) +10,000**
Have Asset Management Plan	**No**	**No**	**No**	**No**	**No**	**Yes**
Leadership						
• Elected Leadership lacks experience	Yes	Yes	No	No	No	Yes
• Lack plans for future	Yes	Yes	Yes	Yes	No	No
• Lack Asset Management "Champion"	Yes	No	Yes	No	Yes	No
• Content with Status Quo	No	No	Yes	Yes	No	Yes
Personnel						
• Open to training or new processes	Yes	Yes	Yes	Yes	No	Yes
• Technical Capacity	Limited	Limited	Limited	Limited	Limited	High
Resources						
• Current charges sufficient to fund system	No	No	No	No	Yes	Yes
• Number of Staff	6	1	1.5	10	2	16
Awareness of Asset Management	No	Yes	No	No	No	Yes
Water Assets						
• Near Capacity						
o Wastewater	No	No	No	N/A	No	Unknown
o Drinking Water	No	No	No	Yes	No	Yes

5.3: Community Interview Summaries

5.3.1: Central Square

Village of Central Square

Asset Management Plan: None
System Studied: Wastewater
Population: 1,658
Customers Served: 630 units
Size of Staff: 6 for wastewater

Community Overview:

The Village of Central Square is located in southern Oswego County, just north of Syracuse New York. It is approximately 3 miles north of the outlet of Oneida Lake at the Oneida River. It is situated at the intersection of U.S. Route 11 and Country Route 49. Median household income is around $31,900 for a family of four and the median home value is $81,000. The water system was built in 1929 and was replaced in 1998. A village sewer system was established in 1964 and was upgraded by consent order in 1996.

Asset Management Strengths:

- Water system is managed by Onondaga County Water Authority (OCWA).
- Existence of as builts with information on water and wastewater systems.
- City clerk strongly endorsed asset management and may be a potential champion.
- Wastewater Superintendent has been there for over 20 years and knows the system.
- The Village serves an area with a 5 mile radius, thus documenting the system could be done relatively quickly due to the dense infrastructure.

Asset Management Hurdles:

- Management of water and wastewater systems is very low on village priorities.
- Institutional knowledge exists only in as builts and in the DPW Superintendent's head.
- Leadership and staff are unaware of benefits or asset management methods.
- Wastewater staff not tech savvy so any asset management system must be user friendly.
- Personnel costs may be high to compile data on existing assets and to begin creating a system.
- Institutionalizing a culture of proactive management of wastewater assets.
- High turnover of elected leaders inhibits long range planning.

Narrative:

The Village of Central Square does appear to place management of wastewater assets high on its list of priorities and needs. A 2004 SWOT analysis exercise facilitated by the Tug Hill Commission did not list this as either a threat or weakness for the village in upcoming years. The lack of visibility of these assets and ignorance of Asset Management were cited as contributing factors. As Central Square faces economic development of its commercial district, stresses on these systems and cost pricing become important in effectively managing these assets in the long term. Although the village's residential growth appears to have capped, commercial growth such as the arrival of a Wal-Mart, stresses the existing system. Projected maintenance issues and reassessing costs are important considerations in extending the life of these assets. The ideal system would be one where the county managed both wastewater and drinking water systems.

5.3.2: Champion

Town of Champion

Asset Management Plan: None
System Studied: Water
Population: 4534
Customers Served: 350 households
Size of Staff: 1 full-time clerk

Community Overview:

On Tuesday May 22nd, the research team interviewed the clerk of the Town of Champion. She is the only full-time town clerk who keeps all the water records for the town. Wastewater is contracted out. Since the water system was built about 10 years ago, long-term infrastructure planning does not seem to be an issue yet. Additionally, its main water source is Ft. Drum, which can provide plenty of water for the 350 water district customers, so capacity of the system is not a concern at this point either. However, if the population continues to grow, the town may reach a limit to its production capacity and the absence of an effective asset management plan may eventually result in water issues for the town of Champion.

Asset Management Strengths:

- New infrastructure: the oldest water district in the town is only 10 years old.
- The town clerk has been a town official for the longest time, so she has a great deal of institutional knowledge on the subject of water and wastewater for the community.
- The town clerk tries to keep extremely detailed records of updates to the system in the office archive room.

Asset Management Hurdles:

- Plans are in paper form, e.g. there are multiple pages of maps of the infrastructure on paper.
- Capacity may eventually be a problem for the water source, since Ft. Drum's capacity may eventually be an issue as it continues to grow itself.
- May need to diversify its sources of water.
- Connecting to the water infrastructure is free for people in existing households. New constructions require a hook-up fee, which raises the cost of building new homes.

Narrative:

Champion's next large infrastructure project involves Sewer District No.2. This district historically served the high school, middle school, and elementary school. The town is taking it over because there is a 90 household subdivision going in and they need to hook the subdivision up to the schools' pipeline. Otherwise, all of the water and sewer districts are less than ten years old so there are currently no projects planned to upgrade the system. There are a lot of brand new homes being built on the army base, but since it is federal property they can't collect property tax. So despite the increase in use of roadways and other services, the town isn't getting any increased revenue. Additionally, the fact that new houses have to pay for the hook up is a big burden for developers.

5.3.3: Floyd

Town of Floyd

Asset Management Plan: None
System Studied: Water
Population: 3,952
Customers Served: 850 residences
Size of Staff: 2 (1 FT and 1 PT)

Community Overview:
The Town of Floyd is located in Oneida County and the City of Rome. The nearby Griffiss Air Force Base was built in 1941, and it was responsible for contaminating the drinking water system. The government paid for upgrading the system in 1991 to address this contamination. Floyd does not have a wastewater system.

Asset Management Strengths:

- Entire water system is in documented in well organized and detailed as builts.
- Water system is relatively new, since they replaced it in 1991.
- They have no wastewater system to include in asset management.
- The town engineer previously worked for the original water system contractor.
- Management appears familiar with concept of asset management.

Asset Management Hurdles:

- Although the supervisor and others are familiar with the concept of asset management, changing their system of management does not appear to be a priority for them at this point.
- Limited technological capacity, such as comfort with computers.
- Weakest problem is checking valves—difficult to assess if valves are functioning properly without shutting down portions of the system.
- Present staff do not have the time to implement a system.

Narrative:
The town gets its water from Rome, NY. Much of the water is gravity fed, which presents a problem with residences at higher elevation, which lose chlorine and must be re-chlorinated. Presently they do not perform scheduled system maintenance but fix things as they break. Their system uses 200,000 gallons of water per day. The town charges water customers through the use of water meters. Leaders feel that the system runs smoothly and they have had few problems because the system is only about 10 years old. If resources were abundant, the supervisor would hire an additional full-time person in the field to assist with maintaining the system. Such activities would include cranking valves, draining off excess water and ensuring compliance with OSHA safety requirements. They currently have no development plans in the works aside from finishing adding region D of the town water service. It appears there is a great deal of collaboration between the public health, public works and water division, which could be even more beneficial for all parties through effective asset management. Presently if there are road repairs or development projects, the water supervisor is often called in, but does not use the opportunity to check or document the system, unless there is a reported problem such as a broken main.

5.3.4: Ilion

Village of Ilion, NY

Asset Management Plan: None
Population: 8,330
System Studied: Water
Customers Served: Approx. 3,000
Size of Staff: 11 full-time

Community Overview:
The original water system was built in 1893- and while the Village has grown since then, there has been little overhaul of the system over the years. The original (1893) pump house was replaced just two years ago, and one employee indicated that only two to three blocks of water pipes have been replaced in the 20 years that he has been working there. Like many other villages and towns interviewed, the mode of operation is that when something breaks, they fix it. The Village's wastewater is treated by a regional authority based in neighboring Herkimer.

Asset Management Strengths:

- **Records.** They have detailed "as-built" drawings representing the entire system, which have been updated regularly as modifications have been made.
- Whether it is due to the nature of the staff, or the recent malfunctioning of system components and subsequent need for funding/replacement, there is an enthusiasm for exploring asset management and generally, better ways of managing their systems.
- **Leadership.** The new mayor is pushing for change in the way all Village services are managed, and the Village Treasurer could be a great asset management "champion" if the water management team buys in.
- **Computer Literacy.** The Village has a relatively large municipal staff, with ubiquitous Internet access and computer systems on each municipal desktop- helpful for the underpinnings of a digitally managed system.
- **Personnel.** The water department has a staff of 11 which appears to have maintained the water system well for years. This is noteworthy since this experience would assist them in creating and maintaining an asset management system with some training and guidance.

Asset Management Hurdles:

- **Money.** The Village is currently seeking funds for multi-million dollar system replacement.
- **Status Quo.** While the system is well-maintained, employees in the water department seem to be satisfied with the current paper-based management system. The focus is on maintenance, not planning.
- **Unwillingness to raise user fees**. Community Leaders seem to think that additional water fee increases are not feasible and will not be well received by residents.

Narrative:
The largest difficulty for this community's water system overall is that system components are at the end of their useful life. Aside from the current need for an expensive filter bed replacement, there seems to be few headaches or water system management problems. Pipes break relatively infrequently and cause little frustration for the water department staff. It seems as though an asset management system would best help alleviate pain of the Village Treasurer, who is in part responsible for helping find ways to pay for upgrades.

5.3.5: Manchester

Town of Manchester

Asset Management Plan: None
System Studied: Water
Population: 9,234
Customers Served: ~300 households
Size of Staff: 5

Community Overview:
The Town of Manchester encompasses three villages (Clifton Springs, Manchester, and Shortsville) that operate their own water systems and a population of roughly 3,500 that is outside of these villages. They do not possess a comprehensive asset management plan. The Town Supervisor has presided over, and is responsible for, the growth of nearly the entire water system and most knowledge of the system resides with him.

Asset Management Strengths:
- Strong consistent leadership in the form of the Town Supervisor (28 years in the current position).
- Political capital and spirit of cooperation have fostered many IMAs that diversify water supply options through five intermunicipal connections. They also share meter reading and billing services with the Town of Farmington.
- Fairly new system allows focus to remain on expansion rather than repairs.

Asset Management Hurdles:
- No overall system map or inventory exists.
- Contentment with status quo. The system has grown from 58 to over 400 customers with the latest round of expansion, yet there is no observable change in management processes.
- Leadership is unaware of benefits of comprehensive asset management plan.
- No preventative maintenance schedule for the water system.
- Overarching goal is to provide water to un-serviced areas rather than on preventative maintenance of the current infrastructure.

Narrative:
This town recognizes that the many small water systems operating in the area would be less costly and more efficient if they were consolidated. One stated goal was to explore transferring operations and maintenance to a larger system operator in the near future. The system manager is aware that most knowledge about the system resides with him and that it should be documented before he retires, although this documentation has not begun. A comprehensive system map and process for determining billing in new water districts were areas that the town leaders seemed interested in. In regards to the system map, the benefit was seen as going to the fire districts rather than to the water department itself.

5.3.6: Oneida

City of Oneida

Asset Management Plan: Yes
System Studied: Water
Population: 10,923
Customers Served: 20,000 customers
Size of Staff: 16.5

Community Overview:
The City of Oneida has a successful incremental asset management plan that has been a work-in-progress since 1990, when the current Water Superintendent took over the department. The system catalogues and maps city resources, which requires an emphasis on record-keeping and communication between the managers and the maintenance crews. The community has a pipe replacement plan dating back to 1968, and it also has policies in place that manage the replacement of water meters and fire hydrants.

Asset Management Strengths:
- All assets and inventory are appraised annually.
- Cash reserves from an 8% surcharge for capital improvements pays for asset maintenance and repairs. Only large expenditures, such as new reservoirs, require borrowing.
- Department has a culture of record keeping; all maintenance, purchases, and replacements are recorded electronically.
- Long-term policies dictate when and where maintenance is done. Due to this preventative maintenance, most of Oneida's system is newer than 30 years old.
- The Water Superintendent has the proper level of staff illustrating this by saying that he has five guys up at the water treatment plant to run the system; any less and they would be riding the system.
- System is mapped in AutoCad and ArcGIS, and those maps are constantly updated.
- The water department has accumulated a cash reserve of over $2 million and has brought the real rates paid by consumers down to a historic low.

Asset Management Hurdles:
- Elected leaders do not support the department's long-term priorities, but instead focus on minor details like late fees (which constitute less than 1% of department revenue).

Narrative:
Oneida's asset management system might overwhelm communities that consider adopting an incremental asset management system if those communities do not realize that the asset management system has been built over 17 years. The system began by typing up a list of fire hydrants and making a map of the system.

Oneida also demonstrates the benefits that asset management brings by providing information that aids in identifying upcoming problems. The asset management plan has played a pivotal role in determining that the system is nearing capacity and in exploring options for expanding the system. The detailed system maps were used to determine options for increasing capacity. Six different options have been identified so far; by identifying expansion options well in advance of reaching a crisis point, city and water department leaders can take their time to choose the most cost effective option for Oneida.

5.4: Software Rubric

Area	Sub-Area	Score			
		0.25	0.5	0.75	1
Use	Ease of Use*	A. Strait forward menus	B. Get started quickly	C. Clear workflow	D. Graphical interface
	Interoperability (import and export data)	None (0)	Must modify program	Must download extension	Fully compatible out of box
	Software Compatibility*	A. GIS	B. Office	C. Modeling Software	D. Format not proprietary
	Simplified Inputs*	A. One place to enter data	B. Enter data in 3 clicks or less	C. Obvious where data should be entered	D. Graphical interface
	Simplified Outputs*	A. Pre-formatted	B. Multiple formats (paper, .xls, .pdf, .txt, .dbf, .shp)	C. Generates graphs and charts	D. Obvious where to go to generate output
	Software Independence	Requires other programs & web download	Requires other programs, get on CD	Independent file, download off internet	Independent file, get on CD
	Training	Available from contractor			None required
Support	Help Files	None (0)	Few paper documents	Few electronic documents	Extensive electronic documents and FAQs
Usefulness	Ability to verify accuracy of data*	A. "Audit" functionality to group/check data	B. Record when data was updated	C. Record when data was revised	
	Document Institutional Knowledge*	A. Inventory Assets	B. System Assessment	C. Track Maintenance and Repairs	D. Map Assets
	Incrementality	must fill all fields immediately	must fill some fields immediately	few required fields	require only key assets (3-5 assets)
	Mapping Coordinates (for asset locations)	None (0)	yes, but cannot export	Yes, export in tabular format	yes, export as GIS files
	Reliability	Hard-drive based	CD back-up	Server back-up	Server based
	Versatility*	A. Water Management	B. WW management	C. W finance	D. WW finance
	Other Uses (schools, roads, etc.)	No			Yes
Implementation		Manual Installation, format files	Manual Installation, save file		Automated installation
Cost	Real Price† Software Price† Recurring Price:				

† In these rows, just insert the requested information

* Each space is worth .25 points

5.5: Comparison Chart for Software

Area	Sub-Area	Software			
		Asset Management spreadsheet	TEAMS	CAPFinance	CartêGraph
Use	Ease of Use*	B, C	0	A, B, C, D	A, B, D
	Interoperability (import and export data)	Must modify program	Must modify program	Fully compatible out of box	Fully compatible out of box
	Software Compatibility*	A, B, C, D	B	B	A, B, D
	Simplified Inputs*	A, B, C	A, B	A, B, C, D	C, D
	Simplified Outputs*	C	A, B, D	A, B, C, D	A, B, C, D
	Software Independence	Requires other programs, web download	Requires other programs, get on CD	Requires other programs, get on CD	Software installed by consultant
	Training	None required	None available	None required	Available from Contractor
Support	Help Files	None	Few electronic documents	Few paper documents	Extensive electronic documents and FAQs
Usefulness	Ability to verify accuracy of data*	0	A, B	0	A, B, C
	Document Institutional Knowledge*	A, B	A, B, C	A	A, B, C, D
	Incrementality	Requires only key assets	Must fill some fields immediately	Requires only key assets	Must fill some fields immediately
	Mapping Coordinates (for asset locations)	No	No	No	Yes, interacts with GIS
	Reliability	Hard-drive based	Hard-drive or server based	Hard-drive based	Hard-drive or server based
	Versatility*	C, D	B, D	C, D	A, B, C, D
	Other Uses (schools, roads, etc.)	Yes	No	No	Yes
Implementation		Manual installation, save file	Manual installation, format file	Automated installation	Automated installation
Cost	Real Software Price	Excel	Access	$50 plus Access	$7,600
	Software Price	$0	$0	$50	$7,600
	Recurring Price	$0	$0	$0	$1,800
Score	This score is based on equal weighting of all four areas	4	5	6.5	9

5.6: Software Reviews

5.6.1: CAPFinance

Release Date: 2002
Cost: $50 from EFC at Boise State University
Upgrade/Support Costs: None
Required Software: Microsoft Access
Systems Managed: Drinking Water, Wastewater
GIS Capabilities: None
Website:
http://sspa.boisestate.edu/efc/Tools_Services/CAPFinance.htm

Software Overview:
The CAPFinance is an easy to use tool that focuses on long-term financial planning for water and wastewater systems. It includes functions for inventorying assets, examining revenues and expenses, and planning for future financial needs. The software was developed by the Environmental Finance Center at Boise State University and is available for a cost of $50.

Strengths:

- Straightforward and easy to understand menus allow the user to get started quickly.
- User guide presents clear and helpful instructions on how to use the application.
- Data entry is very simple, as is creating reports and graphs.
- Focus of the software is on long-term financial planning.
- Ability to 'model' scenarios through duplicating and then modifying existing datasets. For example, copying the current water system and then introduce a new storage tank and its associated debt into long-term financial horizon.

Hurdles:

- Is not compatible with mapping software and cannot store coordinates for features.
- Limited functionality prevents adding custom fields to store data or creating custom reports and graphs.
- No way to view the utility system in its entirety. It can be difficult to gain a sense of the overall condition of the system.
- No capacity for storing geographic information or integrating database with mapping software.

Editorial:
The easy to follow menus and instructive user manual make CAPFinance a good beginning software for a small rural water or wastewater system manager. It provides sufficient functionality to get started however the inability to create additional fields in the data entry screen or modify the reports and graphs can be constrictive. The software focuses on the long-term financial planning aspect of asset management which is a significant strength.

The water and wastewater tools are in completely separate applications which allows the user to deal with one set of tools if they manage only one system but at the same time prevents any planning that would involve both systems.

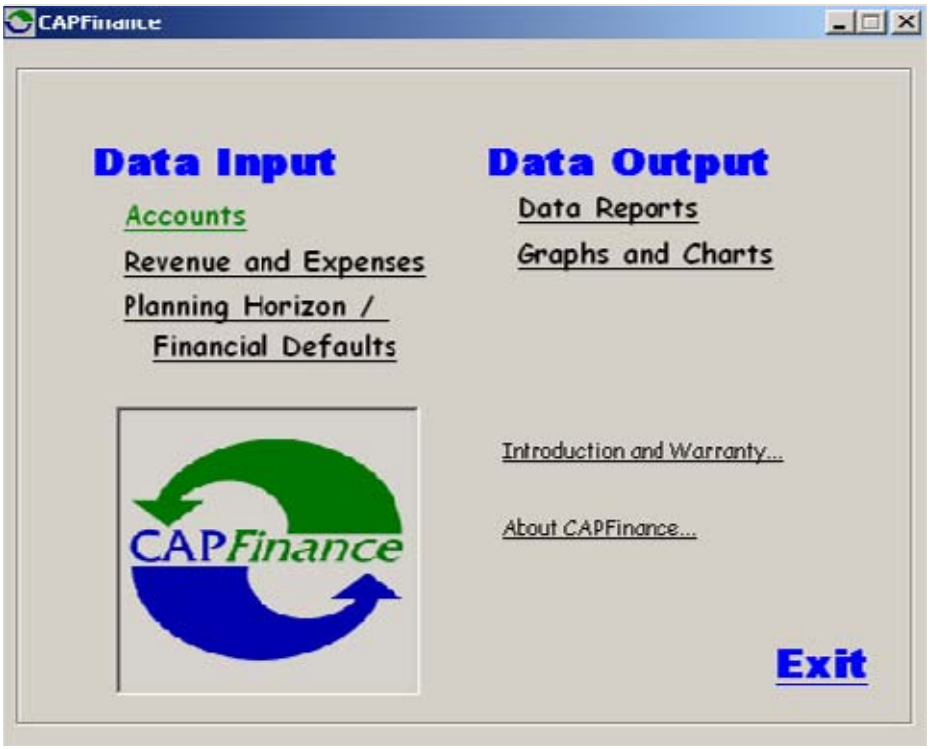


Figure 5.6.1.1: Data inputs and outputs are clearly labeled with simple menus

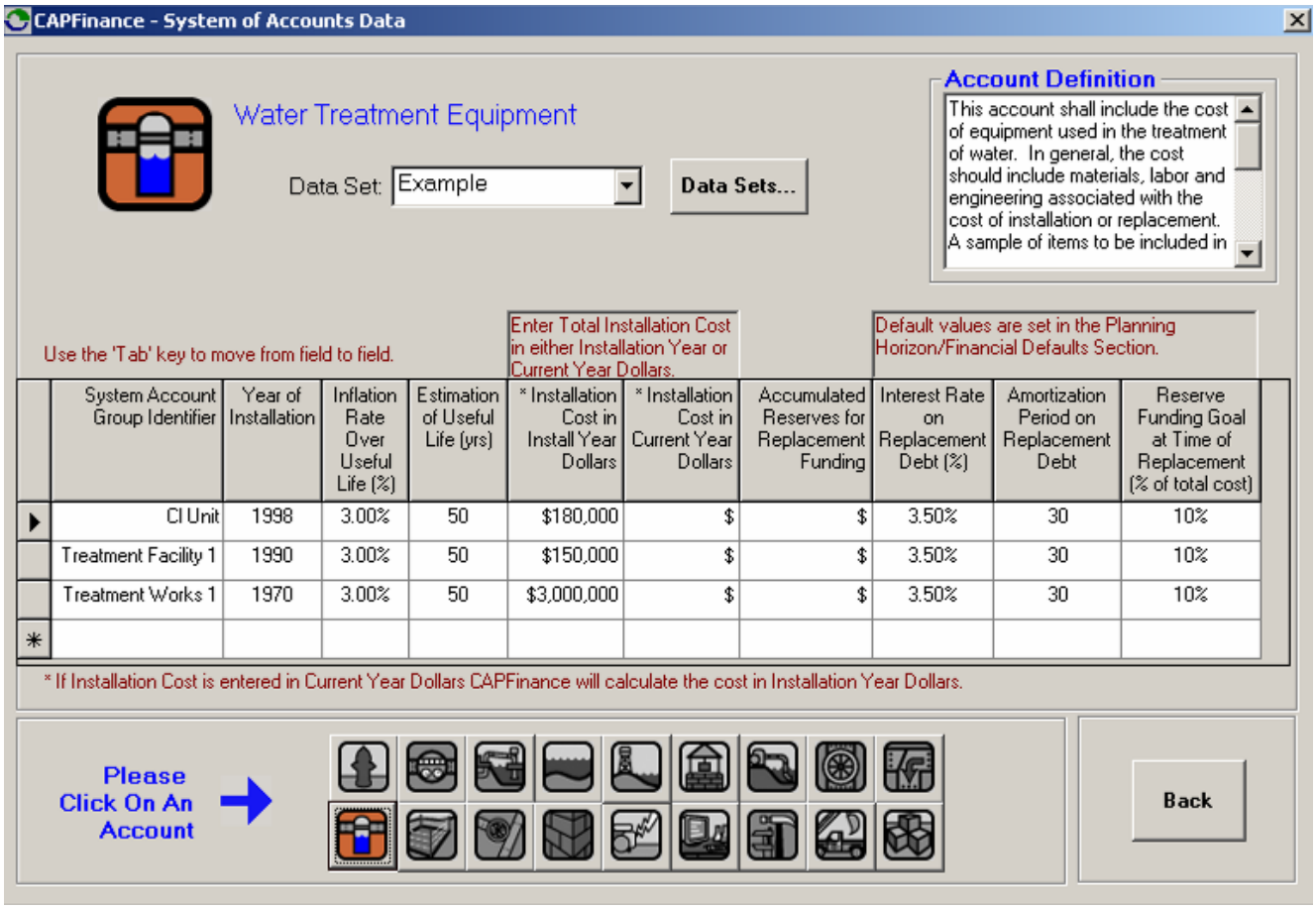


Figure 5.6.1.2: Incremental and straightforward data entry

5.6.2: Cartêgraph

CartêGraph Management Suite

Release Date: 1994
Cost: $7,600 for installation, 3 licenses, 1 yr service
Upgrade/Support Costs: $1,800 per year
Required Software: ESRI ArcGIS
Systems Managed: All
GIS Capabilities: Fully compatible
Website: http://www.cartegraph.com/

Software Overview:
CartêGraph provides a full suite of asset management software for all of a municipal entity's assets (utilities and any other assets). The software is fully integrated with ESRI ArcGIS and Microsoft Office software. They have a client base of 1,200 with most of those clients serving a population between 25,000 – 250,000 persons.

Strengths:
- Full service asset management – includes every aspect from work order requests, to system inventory and mapping, to long-term asset prioritization
- Customization – focus on customizing forms and tools in the software to match the clients needs
- Incremental approach – ability to start simple and add complexity (in software and data) along the way
- Centralized database – prevents duplication of assets and ensures that all instances of a feature are always up-to-date

Hurdles:
- Potentially prohibitive cost – $7,600 to begin and $1,800 annual maintenance
- High level of technical expertise – proficiency with ArcGIS, Microsoft Access, Visual Basic programming language
- Institutional inertia – implementing this type of system would radically change workflow processes throughout the organization

Editorial:
With this software an incremental approach is strongly advocated. CartêGraph encourages utilizing existing GIS datasets (such as orthophotography and planimetric data from county governments or other sources) to begin, then mapping the system assets, then filling in more advanced information as it becomes available (for example, when citizen work requests are processed). When this approach is followed, the software becomes much less daunting. A full range of financial management and reporting tools are easily accessible and customizable. Processes can be established that allow for data in many formats to be included in the system (work order requests, maintenance history, condition assessments, engineering drawings, GIS datasets, video and photographic assessments, etc.). All of the functions link to centralized databases ensuring that duplication of assets in the system is avoided. Anytime a feature is modified in any portion of the software, all instances of it are updated. Overall this is a very comprehensive asset management tool.

5.6.3: CUPSS

The Check-Up Program for Small Systems (CUPSS)

Release Date: 12/2007 (tentative)
Cost: $0 from EPA
Upgrade/Support Costs: None
Required Software: None
Systems Managed: Drinking Water
GIS Capabilities: Unknown
Website: under development

Software Overview:
The Check-Up Program for Small Systems (CUPSS) is currently in development at the EPA to help "improve the sustainability of small drinking water utilities serving fewer than 3,300 customers."[11] The system is currently in its design stage, and it is scheduled to be finalized in December 2007. The system is designed to assist small utilities in creating and managing an asset management plan. At launch, the program will just manage drinking water systems, but a module to manage waste-water systems will be developed later. The system is being built around a ten-step workflow process, which is diagramed in figure 1 below. Since the program is a work in progress, figure 1 is a draft and might change before the software is released.

Strengths:
- Being designed with small communities in mind.
- Modular design should be less intimidating to communities that have yet to develop an asset management plan.
- Improve communication between utility managers and community leaders.
- Encourage small drinking water utilities to establish and maintain an agreed upon level of service in partnership with its customers.
- Emphasis on long-term, strategic planning will help communities best utilize their very limited resources.

Hurdles: Since CUPSS is in development, these hurdles are being written as questions.
- Will CUPSS give communities the ability to interactively map their assets?
- Will CUPSS data be saved in a format compatible with Microsoft Office (Excel) and other popular software?
- Will CUPSS technical support be widely available to these communities?

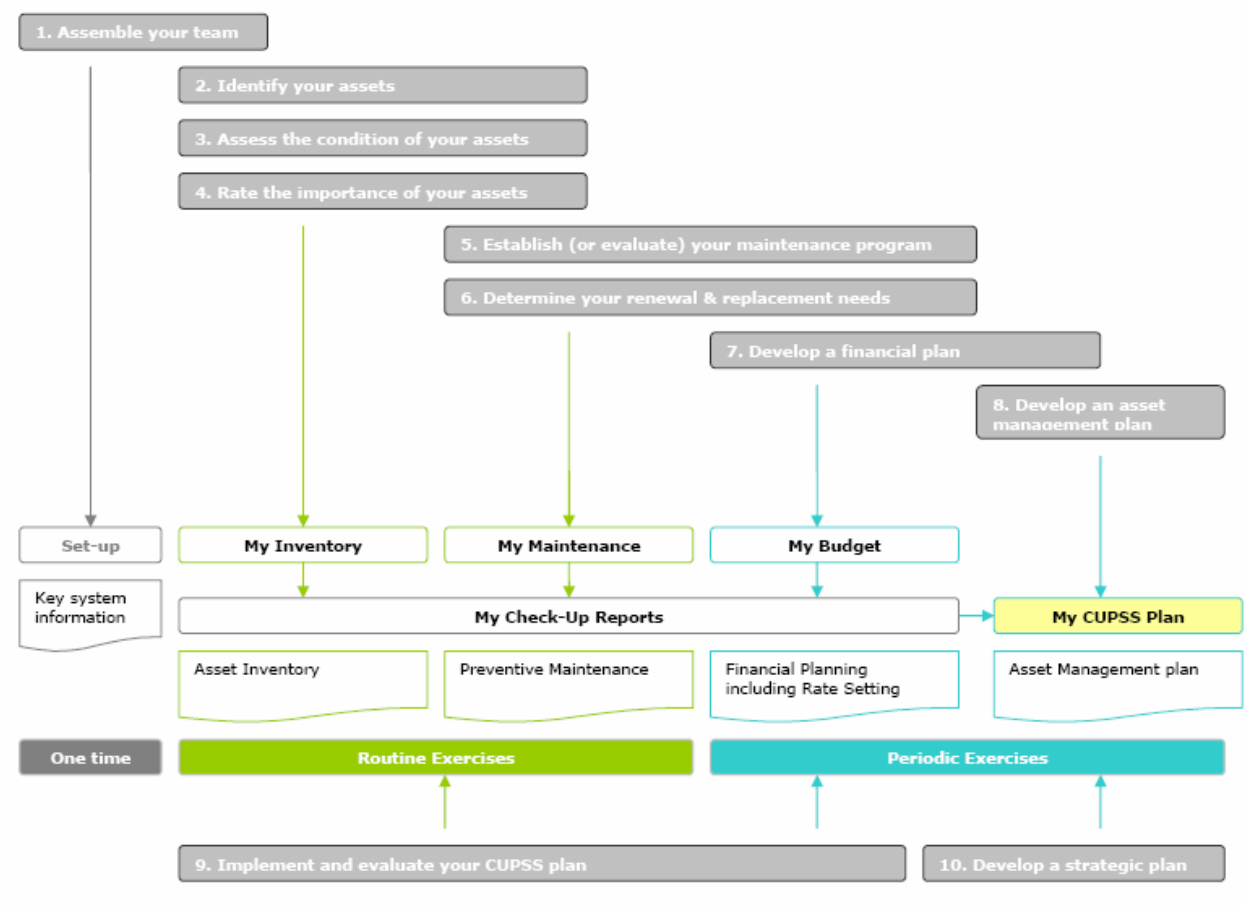
Editorial:
Since CUPSS is still being developed, this review is based on materials provided by the CUPSS development team. That team includes members that were involved in previous projects, including TEAMS, and they seem to have a handle on the needs of small communities. The CUPSS goals and workflow align well with the needs of communities, and this software should be welcomed by people working to bring asset management to rural communities.

CUPSS has the potential to surpass the software that is currently available if it meets the goal of being simple and modular. Small, rural communities with limited staffing might only use the software three or four times a year, and a simple interface would ensure that staff remember how

[11] CUPSS development team. 2006.Goals of CUPPS. This document was provided to the CAPSTONE Project Team by the CUPSS development team.

to use the program even after months have gone by. The development materials do not indicate if CUPSS will include mapping functionality; our interviews with the Tug Hill Commission indicate that mapping is central to the assistance they provide communities in creating local buy-in for an asset management plan. Perhaps CUPSS could incorporate one of the freeware GIS programs in order to provide this service. Communities also face issues of storage and back-ups; creating a secure, web-based version of the software that can be accessed remotely using internet browsers would solve this issue.

Figure 5.6.3.1: A potential work-flow draft provided to the research team by the CUPSS development team.



5.6.4: TEAMS

Total Electronic Asset Management System (TEAMS)

Release Date: 09/2006
Cost: $0 from University of Southern Maryland
Upgrade/Support Costs: None
Required Software: Microsoft Office Suite
Systems Managed: Wastewater
GIS Capabilities: None
Website:
http://www.mcet.org/Technical/environment/teamsAM.html

Software Overview:
The Total Electronic Asset Management System (TEAMS) provides users with a tool to begin a waste-water asset management plan. The program is run using Microsoft Access, which rural communities should possess; its features include inventory functions and operation, criticality assessments, condition and valuation assessments, maintenance management, asset rehabilitation and management, and financial planning. Figure 5.6.4.1 below displays the system's start-up page.

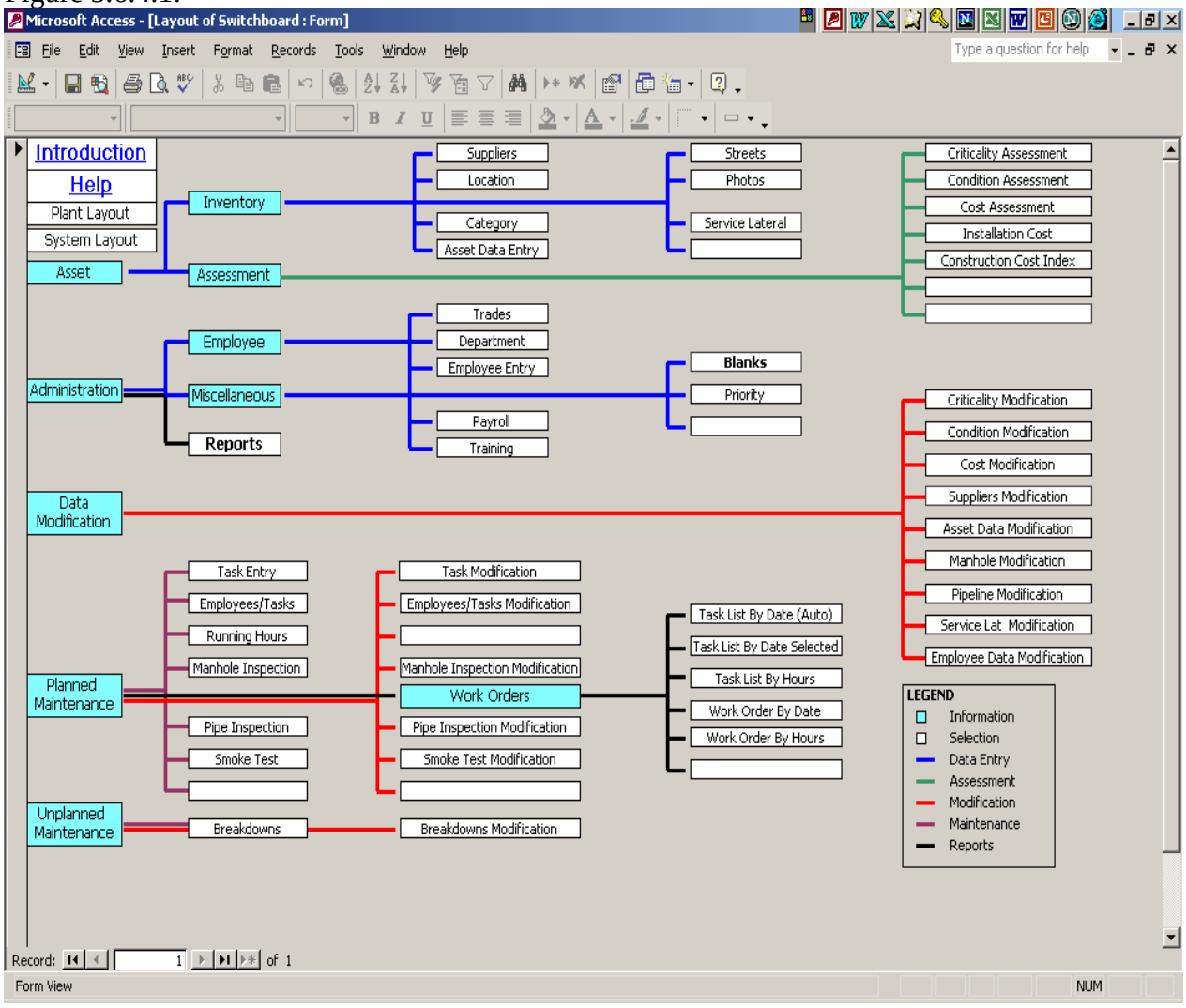
Strengths:
- Comprehensive design and forms should be more then sufficient for most rural communities' waste-water system management needs.
- Relational database is convenient once system has been populated, and the database's organizations structure should reduce errors.
- Included "Train the Trainer" materials contain good information on asset management principals and benefits.

Hurdles:
- Database installation and set-up is quite complicated. Would be difficult to install without technical support staff's assistance.
- Length and number of training materials is overwhelming. Needs a quick-start guide that allows user to install and begin using program that is 10 pages or less.
- Does not include interactive mapping software and lacks geocoding features.

Editorial:
TEAMS is very comprehensive, and it would probably be useful for a waste-water department with a medium to large sized staff level. For the communities interviewed by this research team, this software would be excessive. Those communities lack technical support staff to install the software, and their staff probably does not have a high comfort level with Microsoft Access, the environment in which TEAMS is run. The system is overly complicated for those communities needs, and even if it was implemented, it would probably go unused.

TEAMS also suffers from a lack of mapping functionality. Creating fields with data that could be used to geocoded assets would make this system more useful, although additional fields would probably make this software even more complicated.

Figure 5.6.4.1:


Microsoft Access - [Layout of Switchboard : Form]
File Edit View Insert Format Records Tools Window Help
Type a question for help
Introduction
Help
Plant Layout
System Layout
Asset
Inventory
Assessment
Suppliers
Location
Category
Asset Data Entry
Streets
Photos
Service Lateral
Criticality Assessment
Condition Assessment
Cost Assessment
Installation Cost
Construction Cost Index
Administration
Employee
Miscellaneous
Reports
Trades
Department
Employee Entry
Payroll
Training
Blanks
Priority
Data Modification
Criticality Modification
Condition Modification
Cost Modification
Suppliers Modification
Asset Data Modification
Manhole Modification
Pipeline Modification
Service Lat Modification
Employee Data Modification
Planned Maintenance
Task Entry
Employees/Tasks
Running Hours
Manhole Inspection
Pipe Inspection
Smoke Test
Task Modification
Employees/Tasks Modification
Manhole Inspection Modification
Work Orders
Pipe Inspection Modification
Smoke Test Modification
Task List By Date (Auto)
Task List By Date Selected
Task List By Hours
Work Order By Date
Work Order By Hours
Unplanned Maintenance
Breakdowns
Breakdowns Modification
LEGEND
Information
Selection
Data Entry
Assessment
Modification
Maintenance
Reports
Record: 1 of 1
Form View
NUM

5.6.5: Example Asset Management Spreadsheet (Excel)

Asset Management Spreadsheet Template

Available Now
Cost: $0
Upgrade/Support Costs: None
Required Software: Microsoft Excel
Systems Managed: Drinking Water & Wastewater
GIS Capabilities: Possible
Website: http://www.epa.gov/OW-OWM.html/assetmanage/assets_training.htm

Software Overview:
The Asset Management Spreadsheet Template is an Excel-based asset management spreadsheet tool developed by Australian consulting and engineering firm GHD. It is utilized in asset management training sessions by the Environmental Protection Agency. It is intended to be incorporated with the GHD/EPA 2-day ("how-to") training workshop on asset management. The tool is designed to be used as an asset inventory system for both water and wastewater system components. The tool is somewhat modular in nature, in that any asset can be entered as time and resources permit.

Strengths:
- Runs on Microsoft Excel, so anyone who can use Excel can use this.
- Large potential network externalities. Excel is more common than Access (which is used by the other programs), and it is also easier to use.
- Modifiable.
- Modular design allows communities to enter most important assets first and enter lower tier assets later as resources and time permit.
- Formulaic calculations help allow communities to establish estimated remaining useful lives of assets, allowing them to being planning for replacement costs.
- Good first or second step in getting communities to think about strategic planning and inevitable system component replacement.

Hurdles:
- No mapping features.
- Requires explanation and training.
- Unsure of its ability to track all lower level assets (valves, hydrants, etc. could total over 1,000 entries in one spreadsheet).

Editorial:
This spreadsheet with a two or three page direction guide would be a great starting place for communities working to create an incremental asset management plan. It allows for entry of various water and wastewater system components and their attributes, such as year installed, asset condition, etc. It can be modified to meet any specific community needs. However, there are many columns and data entry requirements that could prove daunting to communities beginning an asset management plan. Additionally, the 500 slide training component is not effective as a stand-alone explanation of how the spreadsheet should be utilized. A two or three page guide would be more useful.

Figure 5.6.5.1:

USEPA GHD Asset Management Training Workshops 2006

Asset Register and Hierarchy					What is the State of My Assets?												
					Installed Date	Asset Class	Original Cost	Estimated Effective Life	Condition Rating	Effect Life Adjust Factor	Calc Residual Physical Life	Judgment Resid Life	% Asset Consumed (Physical)	Annual Dep	Accum Dep	Current Performance	Current Reliability
Current Year 2006					Year		$	Years	1 to 10				%	$	$		
Level 1	Level 2	Level 3	Level 4	Level 5	Act or Est	Tab A	Act or Est	Calculated	Tab A	Tab B	Calculated		Calculated	Calculated	Calculated	Tab A	Tab A
Sanitation System																	
	Disposal System																
	Treatment Plants																
	Collection Systems																
		Sewer Mains															
		Pump Station															
			Incoming Sewer														
				Pipes	1963	3	$ 1,725	100	4	0%	57		43%	$ 17	$ 742	1	1
				Manhole	1963	3	$ 340	100	3	0%	57		43%	$ 3	$ 146	1	1
				Influent Gate Valve	1986	5	$ 442	30	5	0%	10		67%	$ 15	$ 295	1	1
			Incoming Power														
				Pole & Transformer	2006	4	$ -	40	1	0%	40		0%	$ -	$ -	4	2
				Connection	2006	7	$ -	35	1	0%	35		0%	$ -	$ -	1	1
			Control system														
				Incoming Telephone	1985	8	$ 85	25	4	0%	4		84%	$ 3	$ 71	1	1
				PLC	1983	8	$ 8,600	25	4	0%	2		92%	$ 344	$ 7,912	1	1
				Manual controls	1978	8	$ 425	25	3	20%	2		92%	$ 17	$ 476	1	1
			Land & Improvemnts.														
				Land	1950	10	$ 630	300	1	0%	244		19%	$ 2	$ 118	1	1
				Access Road	1963	1	$ 12,500	75	5	0%	32		57%	$ 167	$ 7,167	1	1
				Landscaping	2000	1	$ 595	75	4	0%	69		8%	$ 8	$ 48	1	1
				Security fence	1963	1	$ 1,360	75	4	0%	32		57%	$ 18	$ 780	1	1
			Sub Structure														
				Cassion Outer	1963	1	$ 30,600	75	3	0%	32		57%	$ 408	$ 17,544	1	1
				Upper Floor	1963	1	$ 4,250	75	3	0%	32		57%	$ 57	$ 2,437	1	1
				Dry well	1963	1	$ 6,800	75	3	0%	32		57%	$ 91	$ 3,899	1	1
				Landings and Stairs	1963	9	$ 4,250	60	3	0%	17		72%	$ 71	$ 3,046	2	2
				Wet Well	1963	1	$ 5,100	75	2	0%	32		57%	$ 68	$ 2,924	1	1
				Shaped floor	1963	1	$ 850	75	3	0%	32		57%	$ 11	$ 487	1	1
				Sump pump	1963	4	$ 595	40	3	0%	-3	1	98%	$ 15	$ 640	3	3
			Pumps														
				Drive shafts	2006	6	$ 12,560	35	1	0%	35		0%	$ 359	$ -	2	1
				Pumps	2006	4	$ 29,750	40	1	0%	40		0%	$ 744	$ -	3	3
				Motors	2006	6	$ 32,500	35	1	0%	35		0%	$ 929	$ -	4	5
			Electrics														
				Meters & Breakers	1963	7	$ 1,275	35	4	0%	-8	1	97%	$ 36	$ 1,566	2	2
				Switchboard	1963	7	$ 2,705	35	4	0%	-8	1	97%	$ 77	$ 3,323	2	2
				Pump Starters	1963	7	$ 1,445	35	5	0%	-8	1	97%	$ 41	$ 1,775	2	2
				Emergency connect.	2006	7	$ 765	35	0	0%	35		0%	$ 22	$ -	2	2
				Alarms / General L& P.	1963	7	$ 595	35	4	0%	-8	1	97%	$ 17	$ 731	2	2
			Force Main														
				Pipes	1963	2	$ 2,380	60	4	0%	17		72%	$ 40	$ 1,706	1	1
				Valves(check& gate)	1978	5	$ 1,105	30	5	-10%	-1	1	97%	$ 37	$ 1,031	1	1
			Superstructure														
				Walls	1963	9	$ 3,400	60	3	0%	17		72%	$ 57	$ 2,437	2	2
				Roof	1963	9	$ 1,445	60	5	0%	17		72%	$ 24	$ 1,036	2	2
				Roller door	1963	9	$ 408	60	4	0%	17		72%	$ 7	$ 292	2	2
				Gantry Crane	1963	9	$ 2,040	60	4	0%	17		72%	$ 34	$ 1,462	2	2
							$ 171,520							$ 3,736	$ 63,972		

5.7: Module Checklists for Communities

5.7.1: Module 1

Checklist of assets

#	Asset Name	Criticality[12]	Remaining useful life (years)[13]	Cost to replace	Location of asset
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

[12] For Criticality column, rank according to these 4 categories:

- Necessary to operate system
- Warrants intervention (must ensure that it continues operating)
- Warrants monitoring(nuisance if broken)
- Replace when worn-out

[13] Page 12 of the EPA's handbook "Asset Management: Handbook for Small Water Systems" has a checklist to determine the remaining useful life of system assets. (http://www.epa.gov/safewater/smallsys/pdfs/guide_smallsystems_asset_mgmnt.pdf)

5.7.2: Module 2

Village of Millersville, NY
WORK ORDER and CONDITION ASSESSMENT

Address:

Water Department
221 East Pond Drive
Millersville, NY 12134

Phone: 555-555-5555
Fax: 555-555-5555

Return a Copy to:

Betty Smith
Village Clerk's Office
15 Park Street
Millersville, NY 12134

Phone: 555-555-5555
Fax: 555-555-5555

Problem Description:

Main Street flooded at intersection of Overlook Drive.

Source: Jim Baker called 9:20am Date: 02/26/07

Employee Name: Floyd Smith

Problem Assessment

Problem(s) Found	Location	Action Taken	Problem Fixed (Y/N)
Hydrant at Overlook Drive & Park Missing, water flooding intersection	Northeast Corner of Park Ave and Overlook	Valve closed, new hydrant installed	N
			Y

Employee Signature_____ Date:_____

Approved By_____ Date:_____

Asset Inventory and Condition Assessment

Asset	Location	Condition	Future Action Required
Hydrant	Northeast Corner of Park Ave, Overlook	New-just replaced	No
Hydrant valve	6 feet in front of above hydrant	Difficult to turn, rusty	Replace soon
Main valve	20 feet in front of #90 Park Ave	Good	No

Notes/Other:

Evidence of impact (car or truck must have run over it), hydrant not found. Luckily no pipe damage and able to replace easily.

5.8: Bibliography

5.8.1: Useful Resources

In reviewing the literature the research team came across a number of resources for communities interested in implementing asset management plans. The U.S. Environmental Protection Agency's website provides a clearinghouse of information, some of which is listed below. Various non-profits, consulting firms and university-based organizations provided resources as well. The research team found the following four resources most useful in developing an understanding water and wastewater systems asset management.

1. National Environmental Services Center, *A Guide To Asset Management For Small Water Systems.* August 2005. Online: http://www.nesc.wvu.edu/netcsc/pdf/AMG05web.pdf.

Provides a comprehensive overview of existing resources on asset management for water and wastewater systems. Includes a brief description on each resource including websites, software and technical assistance.

2. U.S. Environmental Protection Agency. *Asset Management: A Handbook for Small Water Systems.* September 2003. EPA-816-R-03-016. Online: http://www.epa.gov/safewater/smallsys/pdfs/guide_smallsystems_asset_mgmnt.pdf.

Provides a step-by-step template for conducting incremental asset management. Includes sample work plans and templates that will be useful for small systems starting to implement asset management plans.

3 U.S. Environmental Protection Agency. *Taking Stock of Your Water System: A Simple Asset Inventory for Very Small Drinking Water System.* 2004. Online: http://www.epa.gov/ogwdw/smallsys/pdfs/final_asset_inventory_for_small_systems.pdf.

Basic steps for conducting a comprehensive system inventory. It provides concrete examples that will be useful for utilities beginning their asset management plans.

4. U.S. General Accounting Office. "Water Infrastructure: Comprehensive Asset Management Has Potential to Help Utilities Better Identify Needs and Plan Future Investments." Report to the Ranking Minority Member. Committee on Environment and Public Works. U.S. Senate, Washington, D.C. The U.S. General Accounting Office. March 2004. Online: http://www.gao.gov/new.items/d04461.pdf.

Provides a general overview of water infrastructure, and it examines the costs and benefits of asset management. Although it not dedicated to smaller systems, its comprehensive perspective is useful.

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