Asset Management Guidance
for
Wastewater and Stormwater Systems

What is Asset Management?

Wastewater and stormwater systems are made up of assets; some are buried assets and "invisible," while the rest are visible. These are the physical components of the system and can include: pipe, valves, tanks, pumps, outfalls, storage basins, treatment facilities, and any other components that make up the system. The assets that make up a wastewater or stormwater system lose value over time as the system ages and deteriorates. As the assets deteriorate, the level of service the utility's customers desire may become compromised, operation and maintenance (O&M) costs can increase, and the utility may be faced with excessive costs it can no longer afford.

There is an approach to managing the assets of the system that can assist the utility with making better decisions on caring for these aging assets. This approach is called asset management. The International Infrastructure Management Manual defines the goal of asset management as meeting a required level of service in the most cost-effective way through the creation, acquisition, operation, maintenance, rehabilitation, and disposal of assets to provide for present and future customers. A wastewater or stormwater utility has a responsibility to manage its assets in a cost-effective manner for several reasons:

1) these assets represent a major public investment
2) well-run utilities are important to economic development
3) proper operation and maintenance of a utility is essential for public health and safety
4) utility assets provide an essential customer service
5) asset management promotes efficiency in the operation of the system
6) properly managing the assets is the basis of self-sufficiency

The intent of asset management is to ensure the long-term sustainability of the wastewater or stormwater utility. By helping a utility manager make better decisions on when it is most appropriate to repair, replace, or rehabilitate particular assets and by developing a long-term funding strategy, the utility can ensure its ability to deliver the required level of service perpetually.

Asset management is a set of procedures to manage assets through their life cycles, based on principles of life cycle costing. These procedures, to be effective, must be implemented in a programmatic way. Properly practiced, it involves all parts of the organization and entails a living set of asset performance goals to implement asset management. An Asset Management Plan is a tool to help the utility implement its Asset Management Program.

Core Components of an Asset Management Plan

Typically there are five core components in an Asset Management Plan:

1) Asset Inventory
2) Level of Service
3) Critical Assets
4) Revenue Structure
5) Capital Improvement Project Plan

Effective asset management implementation is comprehensive. It may involve integrating a number of tools along with other existing systems (accounting, financial reporting, purchasing and stores, payroll, etc.) to create a comprehensive information system that will support an integrated Asset Management Program. An Asset Management Program will have a Mission Statement. This Mission Statement defines the program.

The following is an example of a Mission Statement:

> *We commit to improving and maintaining the public health protection and performance of our wastewater plant/stormwater system and collection/catchment utility assets, while minimizing the long-term cost of operating those assets. We strive to make the most cost-effective renewal and replacement investments and provide the highest-quality customer service possible.*

A Department of Environmental Quality (DEQ)-approved Asset Management Plan will include a Mission Statement and list Asset Management Team members. A Mission Statement should be an overarching purpose for maintaining an Asset Management Program. Consider the impacts to public health, your ability to comply with regulations, and financial stability if you do not manage utility resources. An Asset Management Plan will have short-term and long-term processes to evaluate current conditions and revise/update as needed. It will also contain an Action Plan that identifies actions needed to make improvements and meet goals.

When assembling an Asset Management Team, consider current and past municipal staff (officials, board members, clerks, accountants, and engineers), current and past utility staff (operators and other service workers), and any other stakeholders that can help in assembling the information to develop your Asset Management Plan.

Asset Inventory

The first core component of asset management is the asset inventory. This component is probably the most straightforward of all. It is also, arguably, the most important and time consuming. Questions that the utility will ask itself in this component are:

- What do I own?
- Where is it?
- What condition is it in?
- What is its remaining useful life?
- What is its value?

What do I own?

The most fundamental question a utility owner, manager, or operator can ask is, "what assets do I have?" It is absolutely critical for a utility to understand what it owns. It is difficult to manage something effectively if you don't know what that "something" is. However, this is not an easy question to answer: some assets are underground and can't be seen; assets generally are put in at different times over a long period of time; records regarding what assets have been installed may be old, incomplete, inaccurate, or missing; and staff turnover in operations and management may limit the historical knowledge of system assets. Because of these difficulties, doing a complete asset inventory on the first try may not be possible. It is important to recognize that asset inventory is an ongoing process.

To develop the initial inventory, there are a number of resources a utility can draw upon such as as-built drawings, invoices, staff knowledge, visual observation, interviews with residents and consultants. A utility should use as many approaches as it deems necessary to get the best initial inventory of assets. Information on each asset may include the manufacturer, original price, and category (i.e., collection, catchment, treatment, etc.).

Where are my assets?

Once you know what you have, it is important to know where the assets are located. This involves two steps:

1) connecting the asset in the inventory to a specific location

2) mapping the assets

The first step is to connect the asset with a location. The location could be a street name, street address, or building location such as pump house or treatment building. The addresses should be as specific as possible; that way, assets can be grouped together based on their asset type, such as all catch basins on Main Street.

Mapping will provide a visual picture of the asset locations, especially buried assets. The map can be as simple as a hand drawn map or as complex as a Geographic Information System (GIS) map.

What is the condition of my assets?

After the assets have been identified and located, it is important to know the condition of the assets. A condition assessment can be completed in many different ways, depending on the capability and resources of the utility. The simplest way is to assign a numerical ranking to each asset. This approach uses the best information available. Below is an example of a ranking system.

Condition Assessment

Condition Rating	Description
5	Unserviceable
4	Significant Deterioration
3	Moderate Deterioration
2	Minor Deterioration
1	New or Excellent Condition

If resources are available, a higher level of assessment could include televising sewer or stormwater pipes.

What is the remaining life of my assets?

All assets will eventually reach the end of their remaining useful lives. Some assets will reach this point sooner than other assets. There are many factors that will affect the useful life of an asset such as maintenance practices, type of materials, usage, and surrounding environment. Useful life will also vary over time; for example, a pump may originally have been assigned a useful life of 15 years, but with proper maintenance that useful life may extend to 20 years. Useful life should be reevaluated on a regular basis. Past experience, system knowledge, existing and future conditions, and maintenance practices will dictate ongoing changes/updates to the useful life.

What is the value of my assets?

The value of the asset is the cost to replace the asset after it has exhausted its useful life. Obtaining costs for the asset replacement is not easy. In some cases, the utility will use an estimate based on best practices; in other cases, the utility may rely on a consultant or manufacturer's catalogs and sales representatives. More reliable data can be added when available.

Organizing the Asset Inventory/Summary

There are many options regarding how to manage the asset inventory data. Included in this workbook is an Excel spreadsheet. However, there are commercial and open-source software options available as well as the opportunity for a utility to create its own database for asset inventory. The key to any asset inventory is that the data is comprehensive, accessible, and there is a means to safeguard the data. It is important to develop at least a rudimentary asset inventory with all of the characteristics discussed above. The data quality can be increased over time as the system gathers more information and the Asset Management Team becomes more comfortable with the concept of asset management.

It is critical for utilities to understand that asset inventory is an ongoing process. Over time, assets will be added and deleted from the asset inventory. Utilities should also be careful to not let themselves get "bogged down" in the asset inventory component. Asset inventory, while critical, should not be all consuming. As time goes on, a utility should consider ways in which it can make the inventory more sophisticated. As an example, a system may want to develop a GIS map and database or add radio frequency tagging of the assets for tracking purposes.

Using the Asset Inventory Tab

An Asset Inventory Tab has been included as part of the Asset Management Workbook. This Excel spreadsheet allows users to input data in each of the cells. The spreadsheet lists assets in column A and can be expanded by inserting any additional number of desired rows. More columns can be added to expand the number of asset identifiers such as serial number or date installed. Columns for Probability of Failure and Criticality of Asset perform mathematical functions to determine the Business Risk and should not be used to enter data. The forthcoming section on Critical Assets will provide information on inputting data into cells.

Level of Service

Level of Service (LOS) defines the way in which the utility stakeholders want the utility to perform over the long term. The LOS can include any technical, managerial, or financial components the utility wishes, as long as all regulatory requirements are met. The LOS will become a fundamental part of how the utility is operated.

The best way to understand LOS may be to think of a worst case scenario. Imagine a wastewater system that struggles to keep the necessary chemicals ordered, has National Pollutant Discharge Elimination System (NPDES) violations on a regular basis, has seasonal basement flooding, has inaccurate billing numbers due to water meters over 30 years old, and has no idea how to start addressing their problems. Because of these issues, the wastewater system has difficulty with compliance and receives customer complaints regularly, even though sewer rates are low. The LOS for this system would be considered low.

All utilities must operate within the state and federal regulations and requirements. These regulations are generally specified in the Clean Water Act for wastewater and stormwater systems, but there are additional rules and regulations at the local, state, and federal level. Although the local, state, and federal regulations may set bare minimum standards of operation in the LOS, these standards may not adequately address all areas of operation and should not be the sole factor of the LOS. Utilities should include many other factors to delineate important areas of the utility's operation.

Within the range of the minimum (regulations) and maximum (absolute capabilities of assets), there are numerous items a utility could include within its LOS. Items may be included so the utility can communicate its intentions with its customers, measure its performance, and determine critical assets. Understanding what LOS to choose will help in developing an Asset Management Plan that truly captures the utility's performance and how to accomplish future goals.

It is important for the utility to communicate with its customers to avoid confusion, bad feelings, accusations of improper operation, and to make clear what the customer's expectations should be. This need for communication is particularly important for smaller, rural systems, but it is important for all systems. The Asset Management Team should develop a LOS Statement to help focus efforts on what an Asset Management Plan should accomplish and how to be most cost effective while meeting customer expectations and complying with local, state, and federal regulations. The LOS Statement should address the service areas, identify any deficiencies, and set goals for improvement.

Defining the LOS sets the goals for the utility. These goals allow the operations staff to have a better understanding of what is desired from them, and the management has a better understanding of how to use staff and other resources more efficiently and effectively. Reviewing how the utility is meeting LOS also allows the management to shift resources if needed from one task to another to meet all the goals most effectively. Understanding the desired LOS will help to prioritize and characterize the system's assets, as well as how to manage finances to reach the LOS goals.

There is a direct link between the LOS provided and the cost to the customer. When a higher LOS is provided, costs to provide that higher level will likely increase. This direct link demands that the utility have an open dialogue with its customers regarding the LOS desired and the amount the customers are willing to pay for this LOS or increased services.

Ideally, the public or customers of the utility would be actively involved in the development of the LOS. Similar to the overall Asset Management Plan that will change and adjust over time, the LOS may need to be adjusted from time to time. This adjustment may be required because the system may discover that it is too costly to operate the system at the levels previously defined. Or the adjustment may be necessary due to new rules or regulations that require a change in operation. Additionally, the customers may feel that they desire a different level of service. As with all components of asset management, LOS is an ongoing process and determining and detailing the level of service that the system is going to provide is a key step in asset management.

Typical questions to consider when developing the LOS for the system:

1) What is the LOS goal for health, safety, and security?
2) How often is the system out of compliance with regulations?
3) Are the operators properly certified?
4) How does the utility stay aware of and prepare for new regulations?
5) Do you share your LOS statement with your customers?
6) How do you track and respond to customer needs/complaints?
7) Can the current process be improved?
8) How quickly does the utility respond to customer issues?
9) Is maintenance being deferred to save money?
10) How much will the improvements cost and how will they be funded?
11) Are assets being properly maintained to insure they are in reliable working condition?
12) What areas within the system are most important to insure the best LOS possible?
13) When considering a preferred LOS, are asset age and life cycles, asset conditions, funding availability, etc. being factored in?
14) How often will the LOS statement be reviewed in order to capture changes such as funding availability (growth and decline), regulatory requirements, demand of customers (increases/decreases in customers), and physical deterioration of assets (addressing maintenance)?
15) Are O&M activities being maximized to meet the LOS goals?

Critical Assets

Not all assets are equally important to the utility's operation. Some assets are highly critical to operations and others are not critical at all. Certain assets or types of assets may be critical in one location, but not critical in another. For example, a pump station serving the downtown area may be deemed more critical than a pump station servicing an industrial park under construction. A utility must examine its assets very carefully to determine which assets are critical and why.

Determining Criticality

In determining criticality, two questions are important. The first is how likely is it that the asset will fail; and second, what is the consequence of failure. Determining an asset's criticality will allow a utility to manage its risk and aid in determining where to spend operation and maintenance dollars and plan capital expenditures.

To determine the probability of failure a utility needs to look at a number of factors: asset age, condition of asset, failure history, historical knowledge, experiences with that type of asset in general, maintenance records, and knowledge regarding how that type of asset is likely to fail. Below is an example of a ranking system for probability of failure.

Probability of Failure Levels

Description	Performance Rating	Failure of Individual Item	Type of Failure
Imminent	5	Likely to occur in the life of the item	Continuously experienced
Probable	4	Will occur several times in the life of an item	Will occur frequently
Occasional	3	Likely to occur sometime in the life of an item	Will occur a few times
Remote	2	Unlikely but possible to occur in the life of an item	Unlikely, but can reasonably be expected to occur
Improbable	1	So unlikely, it can be assumed occurrence may not be experienced	Unlikely to occur, but possible

To determine the consequence of failure, it is important to consider all of the possible costs of failure. These costs include: cost of repair; social cost associated with the loss of the asset; repair/replacement costs related to collateral damage caused by the failure; legal costs related to additional damage caused by the failure; environmental costs created by the failure; loss of business revenue to the community; and any other associated costs or asset losses. The consequence of failure can be high if any one of these costs are significant or the accumulation of several costs occur with a failure. Below is an example of a ranking system for the consequence of failure.

Consequence of Failure Levels

Description	Level	
Catastrophic disruption	5	Massive system failure, severe health affect, persistent and extensive damage
Major disruption	4	Major effect, major loss of system capacity, major health effects, major costs, important LOS compromised
Moderate disruption	3	Moderate effect, moderate loss of system capacity, moderate health effects, moderate costs, important LOS still achieved
Minor disruption	2	Minor effect, minor loss of system capacity, minor health effects, minor costs
Insignificant disruption	1	Slight effect, slight loss of system capacity, slight health effects

Assessing Criticality

Assessing criticality requires an examination of the probability of failure and the consequence of failure as discussed above. The assets that have the greatest probability of failure and the greatest consequences associated with the failure will be the assets that are the most critical. The table below is an example of assessing criticality.

An analysis of different assets will reveal which asset has the highest criticality factor and, therefore, which asset would require the most attention either for repair or replacement.

Assessing Criticality

Multiplied			Low	**Consequence (Cost) of Failure**			High
			1	**2**	**3**	**4**	**5**
	Low	**1**	1	2	3	4	5
Probability of Failure		**2**	2	4	6	8	10
		3	3	6	9	12	15
		4	4	8	12	16	20
	High	**5**	5	10	15	20	25

To use this table, estimate the probability of failure from 1 to 5, with 5 being very high probability of failure and 1 being a very low probability of failure. Then assess the consequence of failure from 1 to 5 in the same manner. Using the number for probability of failure, move across the row until the column associated with the number for consequence of failure is reached. Alternatively, move down the column for the consequence of failure until the row for probability of failure is reached. Locate the number that is in the box where the row and column intersect. That is the criticality number for the asset.

As an example in a wastewater system:

Asset: Pine Street Pump Station; constructed in 1950

Service History: One service repair in the past 5 years

Probability of failure: 4 – pump is old, but when repaired it was still in reasonable condition

Consequence of failure: 2 – The pump station services a now abandoned industrial park. The city wants to maintain service, but presently services no customers. The station has easy access, so repair is relatively easy and timely.

Probability of failure * Consequence of failure = Criticality factor

4 * 2 = 8.

Criticality Factor: 8 – An 8 would not be considered a critical rating. Typically an asset falling in the criticality range of 1 to 8 will not be considered critical. An asset falling in the criticality range of 9 to 16 will be important, but not critical. An asset above 16 in the criticality range will be considered critical.

Redundancy

When determining the criticality factor of an asset, one more element is considered – that of redundancy. Redundancy can significantly reduce risk. If one part of a system fails and there is not another part for redundancy and/or backup to immediately take its place, then risk is increased. Lack of redundancy in any system is not good.

Redundancy refers to whether there are other assets that are able to provide the same service if failure occurs. For example, a large-diameter pipe responsible for gathering and conveying all the sewage for an entire city to the wastewater treatment plant is a critical asset because there is no alternative – the probability of failure may not be great, but the consequence of failure is catastrophic. Does the utility have any other asset, system, or approach that will completely fulfill the function of the critical asset if it fails? Does the utility have any other asset, system, or approach to partially fulfill the function of the critical asset if it fails? If an asset is determined to be critical, then redundancy is critical. Risk should be managed in any decision-making process. The utility should analyze and document acceptable risk tolerance for all critical assets.

Criticality Analysis Over Time

The condition of the asset will change over time as will the consequences related to failure. Therefore, it will be necessary to periodically review the criticality analysis and make adjustments to account for changes in the probability of failure and the consequence of failure. As with all the components of the Asset Management Plan, the criticality analysis is an on-going process.

Using the Asset Inventory Tab

The Asset Inventory Spreadsheet, which is part of the workbook, has cell inputs for Probability of Failure and Consequence of Failure and then calculates the Criticality Factor. Use the Asset Description Tab to determine the numerical rating for Probability and Consequence for each asset. The Asset Inventory Spreadsheet will then calculate a Criticality Factor. If the Criticality Factor is greater than 18, the number will be bolded and the cell will be highlighted in red. This indicates that the asset and its failure is significant and should be added to the Capital Improvement Project Plan Tab.

Revenue Structure

The rate methodology is a tool to determine rates and charges that will provide sufficient revenues to cover operation, maintenance, replacement, capital improvement projects, and debt costs. A billable flow methodology will generate revenue through a commodity rate based on usage. A readiness to serve or fixed charge methodology will generate revenues through a fixed unit such as a residential equivalent unit or meter equivalent unit. A fixed and variable methodology is a combined methodology and will generate revenues for fixed expenses through a fixed unit and generate revenues for variable expenses through a commodity rate. The fixed unit generates a fixed revenue stream, which is used to recover those costs that are incurred regardless of flow, such as insurance and debt payments. The variable rate generates revenue based on flow, which is used to recover those costs incurred due to usage, such as chemicals and power.

The budget should consist of the actual budget line items as required by the State of Michigan Chart of Accounts and other accounting statutes, rules, regulations, and requirements applicable to municipal entities. Only those costs related to the wastewater or stormwater system should be listed in the wastewater or stormwater budget. Accurate budgeting will help track and control spending, ensure accountability, and improve the ability to anticipate expenses.

Once total expenses have been identified, rates and charges can be reviewed to determine which will provide sufficient revenues to cover expenses. If subsidies occur, then the users of the system are not paying for the true cost of service – someone else is making up the difference. While temporary subsidies are sometimes necessary to cover unexpected costs, continued use of subsidies will result in either significant rate increases in the future or a problematic deficit in the wastewater or stormwater budget.

Replacement

The rate methodology should also include a replacement breakdown. This breakdown will identify items owned by the utility. These operating pieces of equipment generally have a useful life of 20 years or less with values of more than $500, contain moving parts, and would include such things as vehicles, generators, pumps, motors, and computers. Replacement items will also appear in the asset inventory, but usually have a dedicated funding source due to their limited useful life and importance to the operation of the system. On an annual basis, replacement funds are set aside in a dedicated “Replacement Fund” and build up until needed. The purpose of the Replacement Fund is to set aside money on an annual basis for items that will need to be replaced during the normal course of operating the system. Once a particular item fails, money is drawn from the Replacement Fund to replace the item in question without disrupting the existing budget.

Using the Replacement Tab

A Replacement Tab is developed that lists operating assets that will be replaced within the next 20 years that will be funded out of system revenues. The Replacement Tab will contain assets identified as replacement items. For each item, a remaining useful life and replacement cost is identified. The replacement cost is the cost to replace the item at failure or replacement time. The replacement cost is divided by the remaining useful life to calculate an annual contribution to the Replacement Fund for each item. The annual total amount for replacement will then be included in the budget as a line item. These items will be funded out of system revenues, so they must be accounted for in the annual budget and in the rates and charges.

Capital Improvement Project Plan

A long-term Capital Improvement Plan (CIP) should look at the utility's needs for the future. Ideally, the planning period would be at least 20 years, with a minimum of 5 years. It is understood that the specific expenditures and needs of the utility in the latter years, say 15 to 20 years, are more speculative than the needs for the first 5 to 10 years, particularly the first 5 years. However, the inclusion of the needs for this longer time period will provide a better opportunity for the wastewater or stormwater system to plan for its capital needs. Capital improvement projects are projects that the utility has an extended period of time to plan for and are projects that usually cover high cost, non-recurring items.

There are several categories of capital improvements that must be considered. The categories are listed below.

- Capital Needs Related to Future/Upcoming Regulations
- Capital Needs Related to Major Asset Replacement
- Capital Needs Related to System Expansion
- Capital Needs Related to System Consolidation or Regionalization
- Capital Needs Related to Improved Technology

In order to fund any short or long-term project, the utility must first identify the desired project and its anticipated cost. Once costs have been identified, the utility can begin to set money aside to fund future projects. The Capital Improvement Fund is funded on an annual basis and the accumulated Capital Improvement Fund monies can be used to supplement bonding for the particular project, act as a down payment or cover the entire cost of the project as determined by the utility.

Funding for Capital Improvement Projects

The utility determines the estimated cost of each identified project and the intended date for project initiation. The clear identification of the project, its cost, and the intended timeframe provides the utility with a defensible presentation for setting aside and safeguarding funds for projects.

The following information is helpful when prioritizing and gaining support for a capital improvement project:

- Description of the project
- Brief statement regarding the need for the project
- Year project needed
- Is the year needed flexible or absolute
- Estimate of project cost
- How costs were estimated
- Funding source(s) considered/available for this type of project

- Changes in overall operations that may occur as a result of the project (include operator requirements, additional O&M costs, regulatory changes, any efficiencies that may be gained, etc.)
- Impact of the project on LOS

As stated previously, the CIP should cover a 20-year period. It should be updated each year so that it always shows 20 years of needs. If there are no needs in a particular year, the CIP can reflect this. Annual review of the project list may reveal that some projects can safely be pushed back for several years or may not be needed due to changing conditions. The projects are planned several years in advance, so conditions may have changed, eliminating or reducing the need for an identified project. Alternatively, some projects may now need to be addressed sooner than anticipated and the CIP will need to be adjusted accordingly.

Some of the expenses related to capital improvements may be funded out of the system's revenues rather than solely outside sources. If system revenues are to be used either to offset costs or as a debt repayment stream, the budgets and rates must reflect the costs.

Using the Capital Improvement Project Tab

A Capital Improvement Project Tab lists those projects that are planned for in the next 20 years. The spreadsheet will identify the projects, the anticipated timeframe in which the project will occur, the anticipated cost of the project, and the annual contribution to the Capital Improvement Fund for the item. The annual total amount for Capital Improvement Fund will then be included in the budget as a line item. These items will be funded out of system revenues, so they must be accounted for in the annual budget and in the rates.

Conclusion

Asset management is a systematic process of operating, maintaining, and upgrading assets cost-effectively. It is an active, on-going process that provides information to managers in order to make sound decisions about their capital assets and allows decision makers to better identify and manage needed investments in their utility's infrastructure.

As the concept of asset management has grown in recent years, an extensive body of resources is now available to help develop and expand our knowledge and practice of asset management. This includes resources for utilities, such as software and guidebooks, as well as resources to help local officials understand and support asset management efforts. Asset management has been a major focus of the Environmental Protection Agency (EPA). The EPA has a dedicated website to asset management with numerous guidebooks for communities, which also offers on-line training and regional seminars on the subject. In addition, the EPA has also developed asset management software called Check Up Program for Small Systems (CUPSS), which is targeted for small communities. Furthermore, the DEQ has developed the asset management workbook described in this guide which is one of many tools a community can use for asset management.

Beginning in 2013, the DEQ will be including an asset management program requirement when reissuing NPDES permits for major municipal wastewater treatment plant permits that expire on October 1, 2012, and thereafter. In addition, evolving stormwater regulations are driving improved operation and maintenance of stormwater systems. With more and more focus on asset management, it is important for your community to begin asset management planning and seek out the resources that will provide for current and long-term sustainability of your wastewater and stormwater systems.

Appendix A

Useful Resources

Asset Management Tools

Cartegraph - Public Works and Utilities Software

http://www.cartegraph.com/

Check Up Program for Small Systems (CUPSS) – EPA Asset Management Software
http://water.epa.gov/infrastructure/drinkingwater/pws/cupss/index.cfm

Cityworks - Public Asset and Work Management Solutions for Infrastructure

http://www.cityworks.com/products/software/the-cityworks-suite/

eRPortal - Asset and Maintenance Management Software

http://www.erportalsoftware.com/products/enterprise-asset-management-software.asp

Plan-It – Capital Improvement Plan Software

http://www.cipsoftware.com/

GIS

Ersi/ArcGIS

http://www.esri.com/

MapInfo – Mapping Application

http://www.pb.com/software/Location-Intelligence/MapInfo-Suite/MapInfo-Professional.shtml