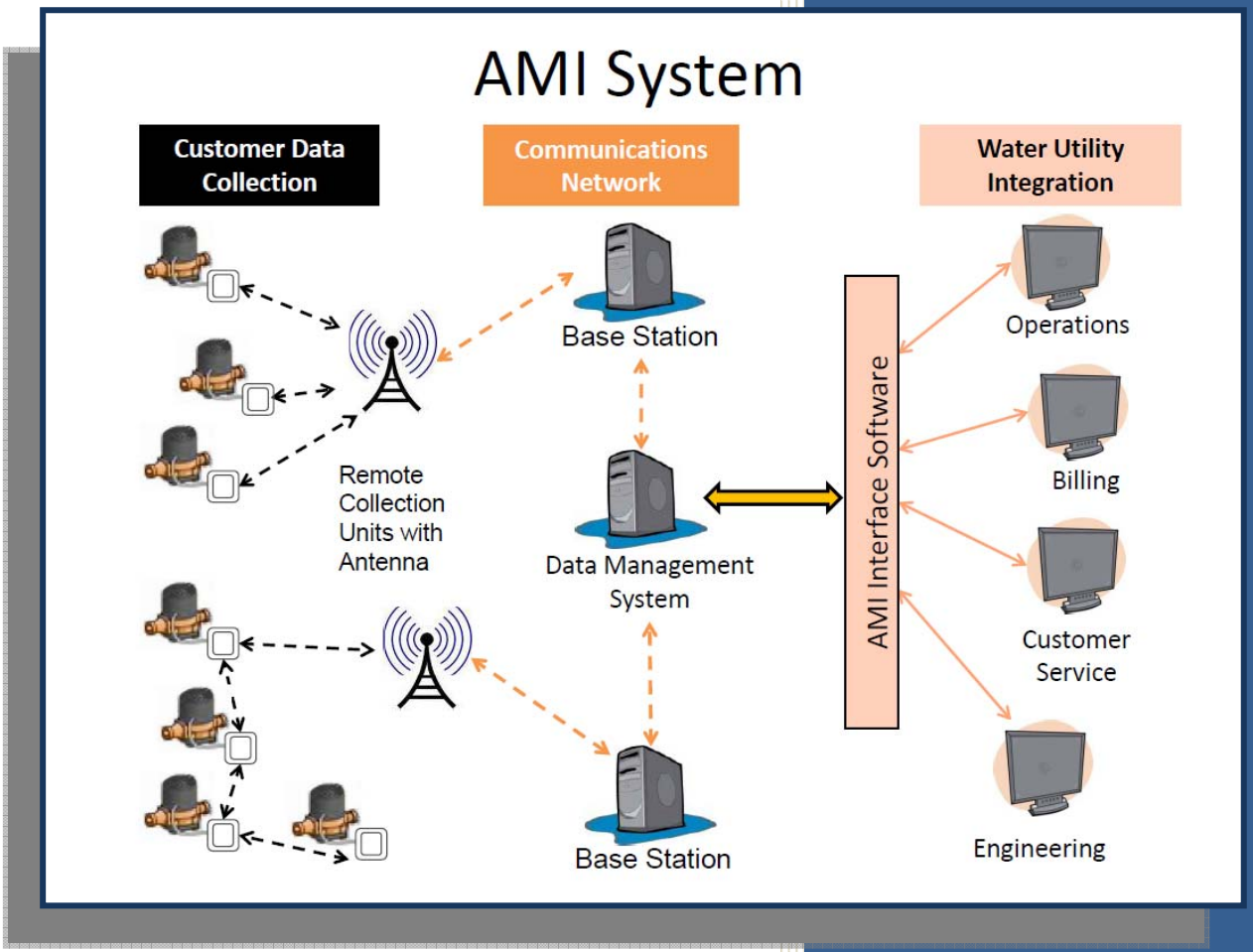
Madison Water Utility

2010

# Madison AMI Business Case

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Clark Dietz ENGINEERS

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# Executive Summary

The Madison Water Utility (MWU) is moving toward installing an advanced metering infrastructure (AMI) system. The change to a new technology will allow the utility to better serve its customers and maximize available water resources. While the current six month billing system has served the utility well in the past, mandates from the Public Service Commission and more frequent annual rate increases dictate a needed change to monthly billing. Additionally, the current meter vendor has notified MWU that it will cease production of the Read-O-Matic product line, upon which MWU relies on by May 2011.

The goals for the project are to:

- Select and implement a fixed network AMI system that will
  - Provide remotely read real time meter data that is accurate and timely
  - Detect leaking services and water mains
  - Facilitate meter readings being available to the billing system for billing and customer inquiries.
- Increase billing frequency from semi-annually to monthly by the end of 2012.
- Provide customers access to their usage data.
- Help implement new water rate structure.

The business case details the benefits to MWU from the AMI system. These include:

- Improved cash flow
- Improved customer service
- Improved planning capabilities
- Improved conservation and water accountability.

It is expected that the AMI system will be selected and implemented by the end of 2012. The project phases are sequential and will be worked with the assistance of a MWU Design Team and the MWU Management Team. The Design Team will make recommendations to the Management Team for approval. The management plan and needs assessment are part of the Business Case which also includes the economic evaluation of options for the selection of an AMI system. The management plan is based on a questionnaire completed by the Management Team to identify the priority needs and benefits for an AMI system. The needs assessment included a survey questionnaire to the Design Team as well as interviews with management and staff to identify the requirements for the AMI system and how the new system can be incorporated into the current processes for meter reading, meter billing, meter change outs, open/close accounts, new accounts and long range water system planning.

The economic evaluation of options for the selection of an AMI system includes a discussion of the assumptions on which the economic evaluation is based, a net present value (NPV) analysis for base case evaluation, a payback calculation for capital prioritization, and a cash flow break even analysis for a limit on the system price. The economic evaluation includes financial consideration of other aspects (training costs, data conversion, historical record archive and

retrieval, and legacy hardware and software interfaces) as well as a discussion of regulatory, human resources, customer relations, and water supply issues.
Several challenges have been identified during the management plan and needs assessments. These include:

- Retraining of staff to handle new jobs for changed processes
- Communications internally and externally to help transition the changes for employees and customers
- Financing the project during a time of capital shortage, and
- Staffing during the conversion process.

The business case discusses key implementation strategies to address each of these challenges.

There are four different alternatives for a monthly reading and billing system being presented to MWU that are discussed and evaluated in the business case:

- Monthly manual reads
- AMI system retrofit
- AMI system with partial meter change out (Hybrid)
- AMI system with full meter change out

After analysis of the anticipated benefits and requirements of each alternative, the business case makes the recommendation for the option of an AMI system with full meter change out. It is further recommended the vendor be involved in system conversion including installation, training, interface with information technology, and project communications. The importance of communication with multiple stakeholders both inside and outside the utility is stressed. It is recommended that a point person be assigned with responsibility for development and implementation of a project communication program.

Next steps will be the preparation and publication of an RFP. Major work phases that will follow the issuance of the RFP are:

- Pre-proposal Conference
- Proposal Evaluation
- Interviews of short-listed vendors
- Selection of 2 or 3 vendors for site visits
- Vendor selection
- AMI contract negotiations and contract development
- Initial implementation
- Project administration
- Ongoing implementation assistance.

# Management Plan

## General

The proposed AMI system for the Madison Water Utility is a key part of the information systems for the Utility and City. This system crosses many departmental and organizational data lines. All the functional areas of the Utility can be impacted by this new system: administration, finance, engineering, water quality, water supply, water conservation, customer service and operations. Therefore, input from the management of the Utility was needed to make sure this system will meet the Utility goals and objectives.

A questionnaire was prepared by Clark Dietz and was completed by the 8 members of the MWU Management Team. Team Members were:

Tom Heikkinen – General Manager

Robin Piper – Finance/Accounting Manager

Alan Larson – Principal Engineer

Joseph Grande – Water Quality Manager

Joe DeMorrett – Water Supply Manager

Gail Gawenda – Public Information Officer/Water Conservation

Ken Key – Customer Service Manager

Dan Rodefeld – Operations Manager

Development of the Management Plan was based on a collaborative process between MWU and the Clark Dietz team. Together we identified critical items and developed realistic, attainable goals for the project. Based on information provided by the Management Team, we have identified the following key areas to focus on for the implementation of an AMI system.

## AMI Project Goals

The following goals were identified by the Management Team for the AMI project:

- Select and implement a fixed network AMI system that will
  - Provide remotely read real time meter data that is accurate and timely
  - Detect leaking services and water mains
  - Facilitate meter readings being available to the billing system for billing and customer inquiries.
- Increase billing frequency from semi-annually to monthly by the end of 2012.
- Provide customers access to their usage data.

- Help implement new water rate structure.

## Features of an AMI System

Monthly billing and obtaining accurate/timely meter reads were the two most important features selected by the Management Team. Customer accesses to their usage data and timely data for planning purposes were also listed as priorities. Seamless integration with the billing system was also emphasized. Consideration of these priorities will be essential in the selection of an AMI system.

## Benefits of an AMI System

In considering the many benefits an AMI system would bring to the MWU, the Management Team ranked improved cash flow with more frequent billing as a priority along with improved water accountability. Emphasis was on a quicker rate increase implementation and conservation rates implemented with monthly billing. In addition, the availability of real time data for planning purposes and allowing the customer access to their usage data were high priorities which will all be considered when selecting an AMI system for the MWU.

## Organizational Roadblocks for Implementing an AMI System

As previously mentioned, all of the functional areas of the MWU will be impacted with a new AMI system. The biggest concern (roadblock) emphasized by the team was obtaining the capital required for a system to meet their needs. Process change and the perception that the project is not needed were also highly ranked. While personnel time to implement an AMI system was a concern, staff retraining and adequate staff levels were not a high priority.

## Timing of the Project

While the majority of the Management Team would like to see an AMI system implemented by 2012, there were some who felt anytime in the next 5 years would be adequate. Proposed project schedule and phasing can be found in Appendix A.

## Conclusion

The MWU Management Team is looking to deploy an AMI system by 2012. At a minimum, the system should provide the following features:

- Monthly Billing
- Accurate and Timely Data
- Real time Data
- Customer Access to Usage Data

Benefits to MWU from these AMI system features are detailed on the next page. The MWU Management Team sees the following as high priority benefits:

- Improved Cash Flow
- Improved Customer Service
- Improved Planning Capabilities
- Improved Conservation/Water Accountability

## Benefits to Implement an AMI System

An AMI system will provide numerous benefits, some which can be measured and some which will improve levels of service to Utility customers.

1. Reduced meter reading labor – meter reads, previously obtained by a person with a handheld Itron computer visually punched in by looking at a remote odometer on the outside of a building and connected by a wire to the actual water meter, now will be read remotely by sending a signal to the meter which will then send a signal back to the central reading computer. Currently there are approximately 3 – 4 FTE's involved in meter reading. This will be reduced to ½ FTE. Some manual reading may continue to be done for remote properties or for some buildings where the meter cannot get a radio signal. This change in labor assignments will occur over the 18 month to 2 year installation program.

2. Water loss reduction from better district measurements – current water loss (pumpage minus customer meters minus other unmetered water accounted for) is approximately 10% of system pumpage. This may be in meter inaccuracies (master meters or customer meters), leakage, water main breaks, water used but not accounted for, and other minor categories. Regular periodic district measurements of a distribution system are a good step to target efforts to reduce this percentage of water loss. Water system districts with higher losses can then be targeted for results oriented but more expensive water loss investigations such as subdistrict measurements, leak detections, meter maintenance/replacement, or theft investigations. In an AMI system, the customer meter readings can be obtained easier and more frequently to compare to master meters than ever before. Over time, the Madison Water Utility should also investigate and plan better master meter measurements to facilitate this effort since a few districts, like the downtown Isthmus area, are too large to focus efforts at this time. The targeted efforts after the district measurements should reduce water losses by 1 – 2 % per year.

3. Customer leak detection and water savings – This will be an immediate positive result of the AMI system. Currently, customer leaks are detected by the customer or by the Utility at the 6 month meter read cycle. The AMI system should be able to flag customer leaks on a daily basis so the customer can be notified before a leak gets too big or too

expensive. This is a positive for the customer and wiser use of a valuable resource. Currently, the Madison Water Utility gets involved in approximately 100 customer leak situations per year in the 6 month cycle. Considering the age distribution of Madison buildings and plumbing systems, there are probably 500 – 1,500 customer leaks per year that could be found sooner.

4. Improved cash flow - Currently Madison Water Utility collects about $18 million dollars per year in revenue from customer billing. Customers are billed every 6 months except a few larger customers who are billed monthly. In the new system, billing will be done monthly for all customers. Moving this cycle of billing will result in benefit valued at $250,000 at current rates. Water rate increases in the water industry and especially Madison will be steadily needed over the next 20 – 30 years to pay for replacing infrastructure, improving water quality, and improving customer service. A monthly billing cycle will improve the cash flow to the Utility from these rate increases so that in the end, the amount of percentage increases can become less.

5. Reduced vehicles – The current meter reading method requires about 3 vehicles. With AMI 1 vehicle will be required, which will reduce gas consumption and emissions.

6. Water conservation tool/ water supply management –district measurements and customer leak reduction were already discussed; however, the new AMI system will also improve the pricing signals sent to customers for wise water use. In future years, the Public Service Commission will likely encourage and perhaps require inclining block rate structures to customers, especially residential customers. Providing the customer with a regular monthly bill, data on “My Water”, and optionally via other customer devices will provide information so the customer can best manage their bill and their water use to meet the needs of our local resources.

7. Improved planning tool for engineering and facility evaluation – the Utility water main, water supply, and storage improvements are planned and designed using a hydraulic model of the water system. This model has estimated water demands placed at “nodes” in the model. A new AMI system provides better and more detailed customer demand information to input these “nodes” in the model. Therefore, over the years, this planning and engineering of facilities is improved. Additionally, this model is being used more in water quality management in the water distribution system. The more accurate customer demand information will help the Utility manage operation of the water system to improve water aging calculations and water quality management.

8. Customer toilet leak confirmation – related to the customer leak benefit, toilets will leak occasionally and are often not detected by the customer for some time. The resulting water wastage and high bills are a nuisance for the customer and the Utility. The new

system will reduce the bills, the water wasted and the inconveniences experienced by all.

9. More accurate bills, less corrected bills – Madison Water Meter Readers have an excellent track record for providing accurate readings to the billing system. Only about 100 corrected bills per year are sent out of 130,000 bills (0.07%). Additionally, there are several remote registers that fail each year. In the future, failing remote registers will be an issue because the manufacturer is discontinuing support of these devices.

10. Less handheld meter read devices needed – currently Madison Water has 4 Itron handheld meter reading devices. As the new system is phased in, these will be discontinued.

11. Easier and simpler rate adjustments – as discussed in the cash flow benefit, water rate increases will be a way of life in the water industry, as more infrastructure needs to be replaced, water quality improved, and better customer service provided. Today, those rate changes are done over the course of the 6 month billing cycle. The new system will allow changes to be made to every customer on a monthly basis providing better pricing signals and cash flow.

12. Improved customer interaction with better data available – customer leaks and toilet leaks have been mentioned as well as the improved pricing signals for water conservation. Additionally, the new system will support better customer information for any reason including customer budgeting, customer plumbing design, and troubleshooting pressure or flow issues. Since this data will be available on-line to the customer via “My Water”, or via one phone call to the Utility, customers will be able to resolve issues more quickly and efficiently.

13. Improved meter accuracy – all mechanical water meters wear with age and use generally leading to a reduction in revenue to the Utility. The accuracy reduction is small and gradual but is estimated to be about 1% of the total Utility revenue. Replacing the older meters in the system will improve accuracy and revenue (Estimated $180,000 per year for MWU and similar amounts for the sewer utility).

14. Consolidated billing – currently larger customers such as the University who have several buildings and meters must receive separate bills because of the meter reading cycles. In the new AMI system, these customers will be able to get a consolidated bill if they choose. This will help these customers in managing their water bills and water use.

15. Choice of bill payment date to customer – the new AMI system will facilitate offering a choice to customers to set their bill payment date they want in a month to match when

paychecks are received or for other purposes. This choice should only be offered infrequently.

16. Hourly consumption data available – some pressure or flow issues or billing disputes require hourly consumption investigations. The new AMI system will allow these investigations.

17. Eliminate need to convert to manual monthly reads – manual monthly reads to match a monthly billing system would require a large labor ramp up and corresponding issues at a later date when automation of this task would occur.

# Needs Assessment

## Business Strategies, Challenges, Requirements, and Expectations Confronting the Madison Water Utility

Madison Water Utility is facing challenges and expectations in numerous areas including:

- Infrastructure replacement, especially old pipes
- Rising water quality expectations
- Capital shortage and need for more revenue
- Continued growth of the community
- Need to conserve an aquifer that also supports local natural resources
- Better management of the Water Utility

A new AMI system will be part of the base strategy for Madison Water to meet these challenges, requirements, and expectations. Revenue needs to be raised to meet the infrastructure needs, water quality expectations, conservation impacts, and to improve management of the Utility. The water meter has always been considered the cash register of the Utility. Improvement of this water metering system will improve cash flows, allow for more efficient rate increases, and will provide customers quicker and easier resolution of billing related issues. A new AMI system will also improve data for water aging and water quality management. Additionally, it will improve data for planning and engineering infrastructure replacements. Growth of the community will be easier to support since the meter reading task is automated.

Most importantly, the source of supply for a community and water utility is very critical. The aquifer supplying Madison, while still plentiful, has been questioned in recent years because it is now thought to be pulling water from the lakes and wetlands rather than supplying water to the lakes and wetlands. USGS and the State Geological Survey are currently updating their model to better evaluate the aquifer.

## Existing Resources and Current Processes Relevant to AMI

### Current Meter Reading Process:

The process now used by MWU to read the water meters is illustrated in Figure 1.

The Madison Water Utility currently reads meters in 7 different cycles during the year. Each cycle contains groups of accounts and meters that are read by meter readers and then billed.

Six of the cycles (cycles number 1 through 6) are read and billed twice each year and one cycle (cycle number 7) is read and billed 12 times (monthly) each year.

Each of the 1-6 cycles contains about 11,000 meters that are used to bill 12,000 accounts. Cycle 7 contains approximately 30 meters that are used to bill Madison's 4 largest customers (UW, Oscar Meyer, Webcrafters and MG&E Construction). Some accounts have more than one meter and some accounts (e.g. storm water only accounts) have no meters.

The water use billed for the cycle 1-6 meters is for the period from the last read and billing (6 months earlier) through the current month reading (a six month period). The water used for the cycle 7 meters is for the period from the last month's reading and billing through the current month reading (a one month period).

Each month the meters from one of the cycles (1–6) and the meters from cycle 7 are read and billed. The cycle 1-6 meters are read during a 30 day period from the 11th of the previous month through the 10th of the current month. The reads taken during this period are processed and billed at the end of the current month. The cycle 7 meters are read, processed and the accounts billed within a few days at the end of each month.

The delay between use of water, billing process, and receiving payment can be seen in an example. Meters read early in the month for accounts in cycles 1-6 are held approximately 6 weeks (until the end of the following month) to bill. For example: the meters read for cycle 5 accounts begin to be read about September 10th. These reads represent use on the meter for the six-month period from March 11th through September 10th. These readings are held for billing until October 25th and the bills are mailed on November 1st. These bills are normally paid by the 20th of November. Water used in March is paid for in November (up to eight (8) months later).

Figures 2 – 5 illustrate additional existing processes that could be affected by the proposed AMI system.

**Figure 1**
**Current Process – Meter Reading**

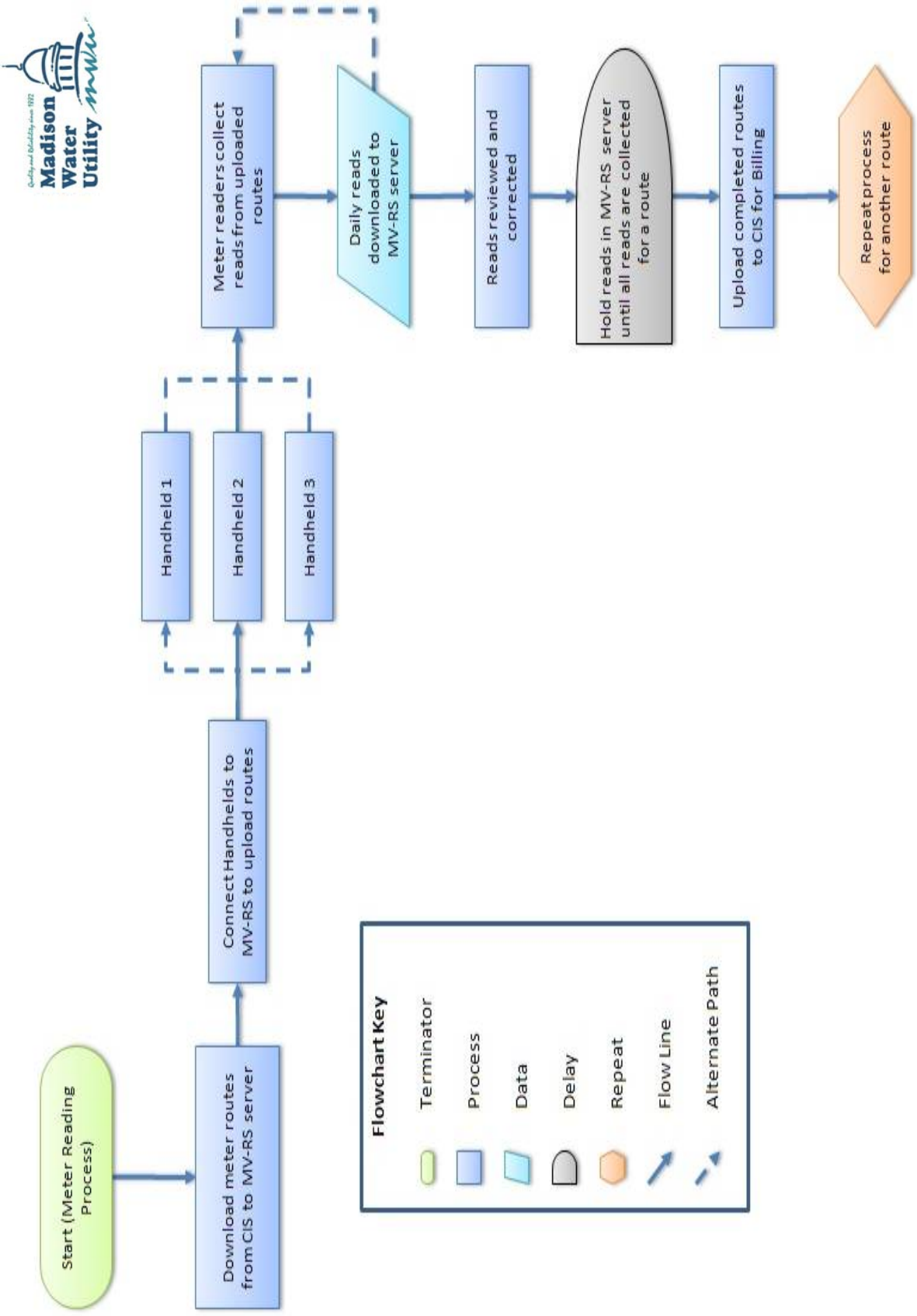


**Figure 2**
**Current Process – Billing**

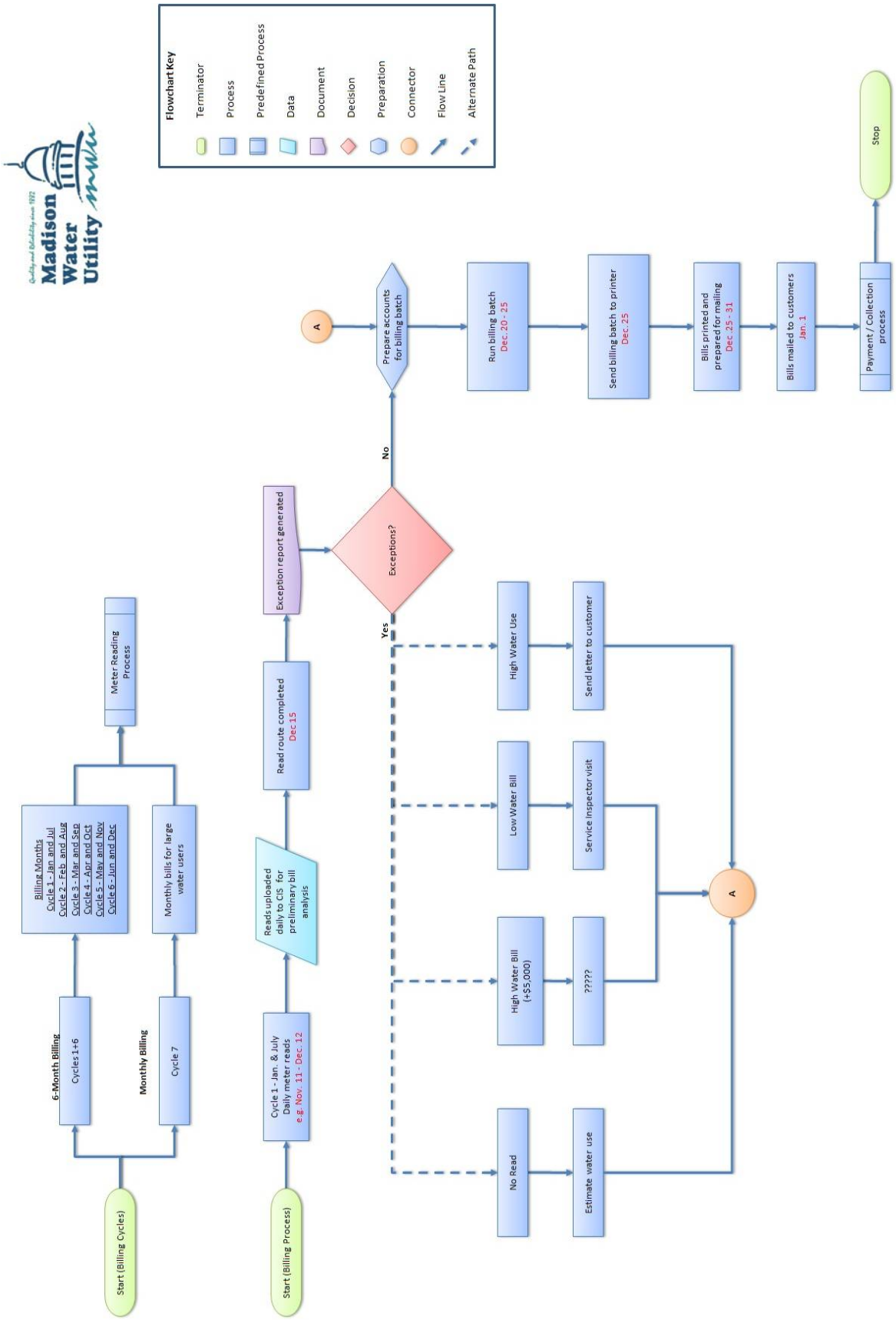


**Figure 3**
**Current Process – Meter Change Outs**

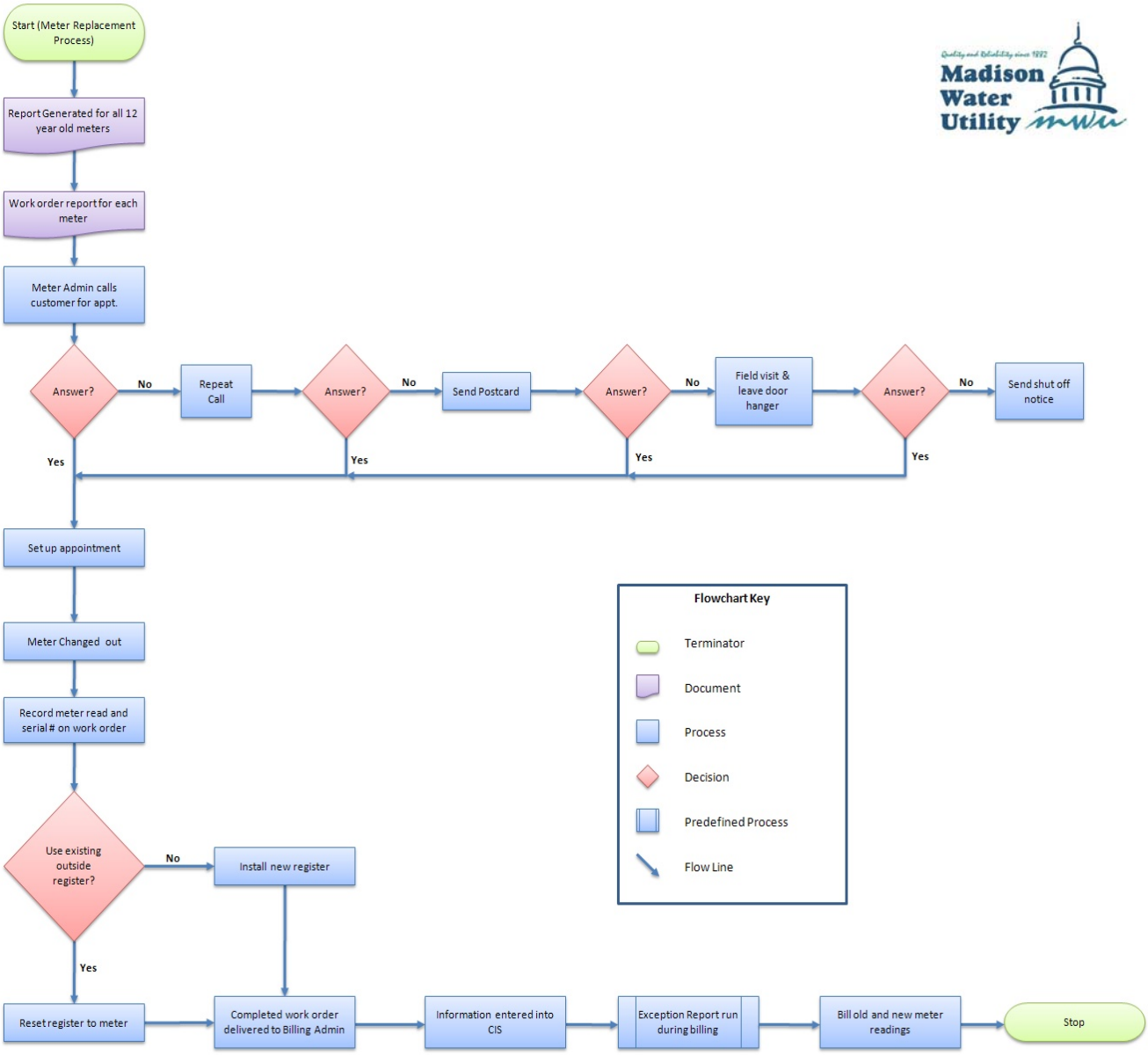


**Figure 4**
**Current Process – Open/Close Accounts**

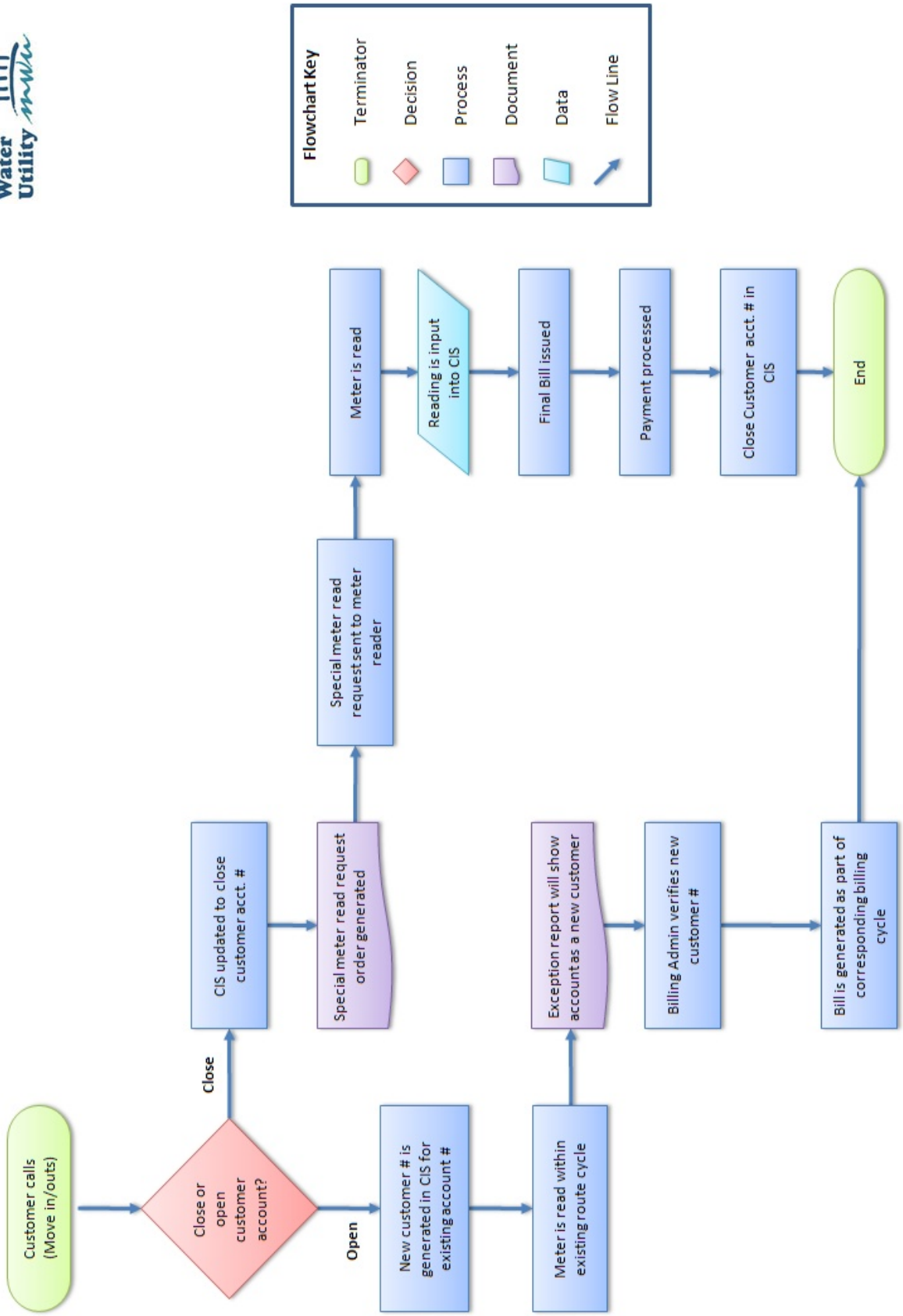
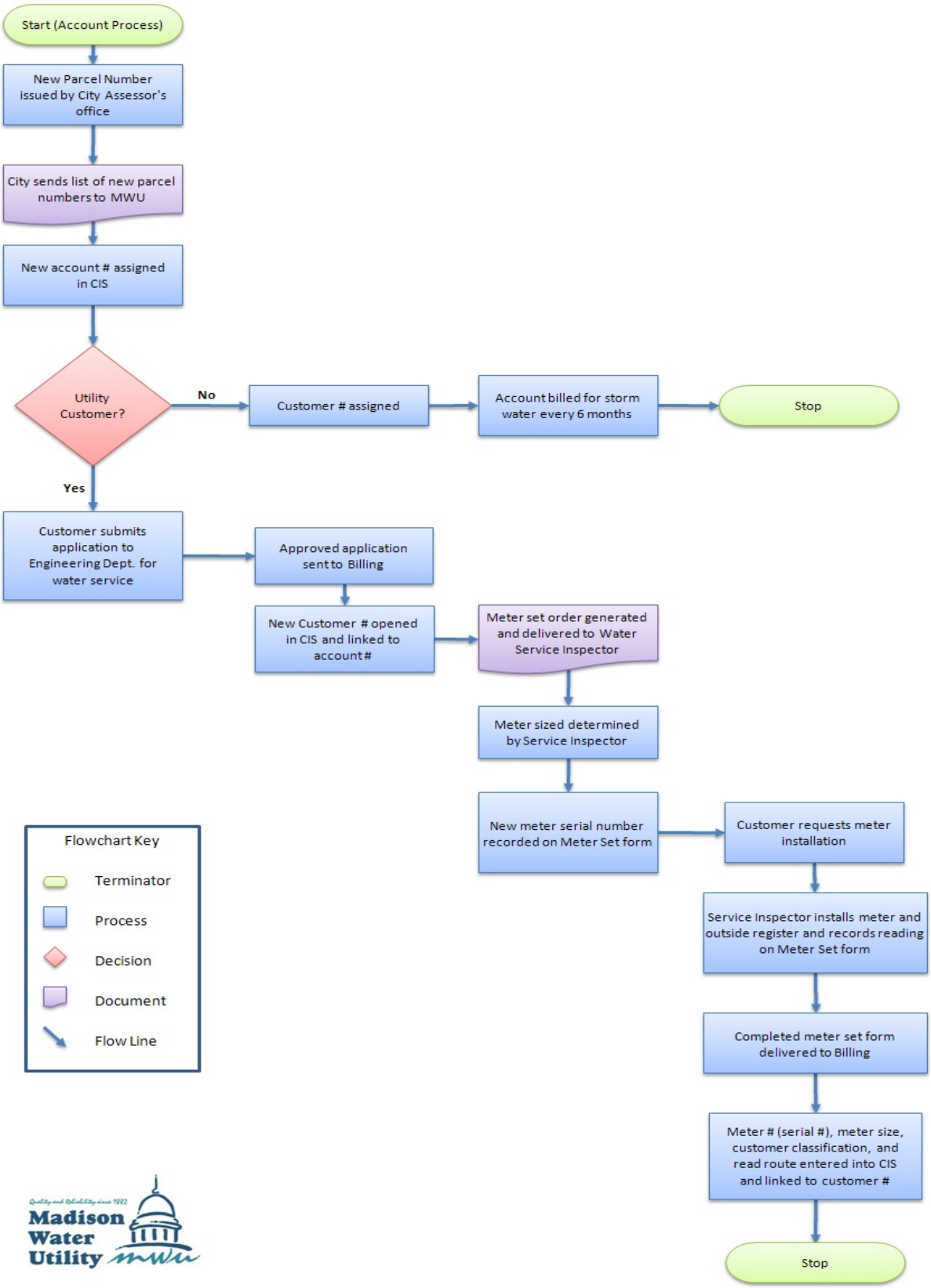


**Figure 5**
**Current Processes – New Account**



# Proposed AMI Process

## Meter Reading and Billing

With the implementation of an AMI system the manual meter reading is replaced with a communications network between the meter and the billing system and Utility office. Meters are read automatically through the network multiple times each day. This may be hourly or more often. The proposed process flow chart for reading meters in an AMI system is illustrated in Figure 6.

The reads are reviewed by the system, stored during transit and archived. Each day, the last read of the day (usually from just before midnight) is sent to MWU and could be uploaded to the Utility's CIS. The daily reads are edited as they are received for trouble conditions (leaks, high use, low use, etc) and are available for billing as needed. These reads can be used for normal (monthly) bills or for customers going off-service (moving out) or on-service (moving in). The operational goal will be to issue customer bills within a day of their meter reading. The proposed AMI process flow diagram for billing is illustrated in Figure 7 and the proposed collection process is shown in Figure 8.

## Cash Flow

The AMI process will eliminate as much as six months from the period between using the water and the customer paying their bill. In comparison to the previous example of water used in May being billed and paid in January, with AMI, water used in May will be billed within a day and paid in June.

## Rate Change Implementation

With the current manual meter reading process, any rate increase approved by the PSC is prorated over the first 9 months before achieving the full rate increase. This is due to the time delay for billing the water used after the effective rate change date. By changing to monthly billing a new rate increase will be prorated for only the first month after the effective rate change date. For example, a rate change effective January 1st could appear on bills issued January 2nd. Bills issued during the month of January will have a water rate that is prorated for the December/January water consumption. Bills issued starting on February 1 will have the full rate increase implemented.

## Consolidated Billing

The daily reads can also be used to bill services from various areas of the city in one account. This can provide chain accounts (restaurants, gas stations, realty accounts, etc) with consolidated bills for ease in processing and payment. The current monthly bills (cycle 7) can also be consolidated in this manner.

### Customer Leaks

The daily editing of readings can also provide customers with "alerts" for leaks or sudden high use conditions (a garden hose left on or broken basement pipe). The messages can be standard post card or mail notifications, or with the expansion and promotion of the *My Water*web interface, the AMI system can provide customer notifications via e-mail or other personal messaging. With AMI it will be possible to alert customers to these conditions within days (or hours) of the leak rather than several months later.

### Customer Service

The AMI system could provide customers, and MWU Customer Service representatives, immediate access to daily readings and water usage as well as historical access to archived hourly use information. An immense amount of water use information will be available to promote conservation, handle customer requests more quickly and resolve bill issues more efficiently.

### System Leak Detection

The AMI reads from selected areas can be combined on a daily (weekly, monthly) basis. This information can be used to conduct district measurements and identify areas of the City to concentrate leak detection efforts or conduct sub-district measurements. Acoustical listen devices can also be installed in front of a meter to help identify system leaks. Acoustical listening devices can be place at strategic locations throughout the distribution system on meters and valves and the AMI system will alert MWU staff when a potential leak has been identified.

### Planning

With AMI the water used throughout the entire MWU system can be provided to the engineering model. The water use can be totaled by daily, weekly or monthly use as well as by geographic areas. The modelers will be able to optimize future plans for water mains, pumping stations, storage needs and new well considerations much more effectively than today's data allows.

### Unbilled Revenue

In utility accounting systems, the amount of water used by customers from the time of their last bill through the date of quarterly financial statements is an estimated amount. The amount is included in the Utility's Financial Statements as "unbilled revenue". The data now used by MWU to calculate unbilled revenue is based on projections of water use six or more months old. With daily meter reads available, the total use in the system can be calculated accurately providing a correct unbilled revenue amount and more accurate Financial Statements.

**Figure 6**
**Proposed Process – Meter Reading**

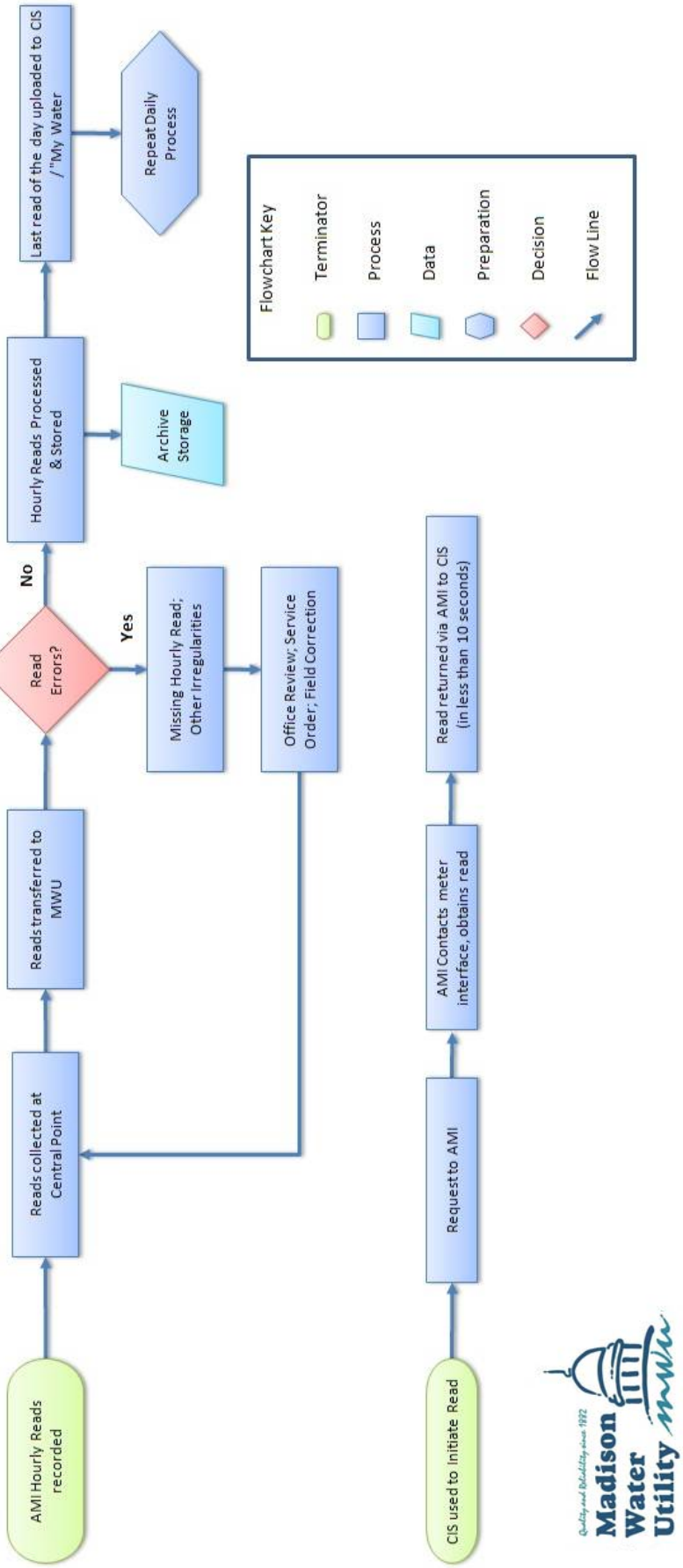


**Figure 7**
**Proposed Process – Billing**

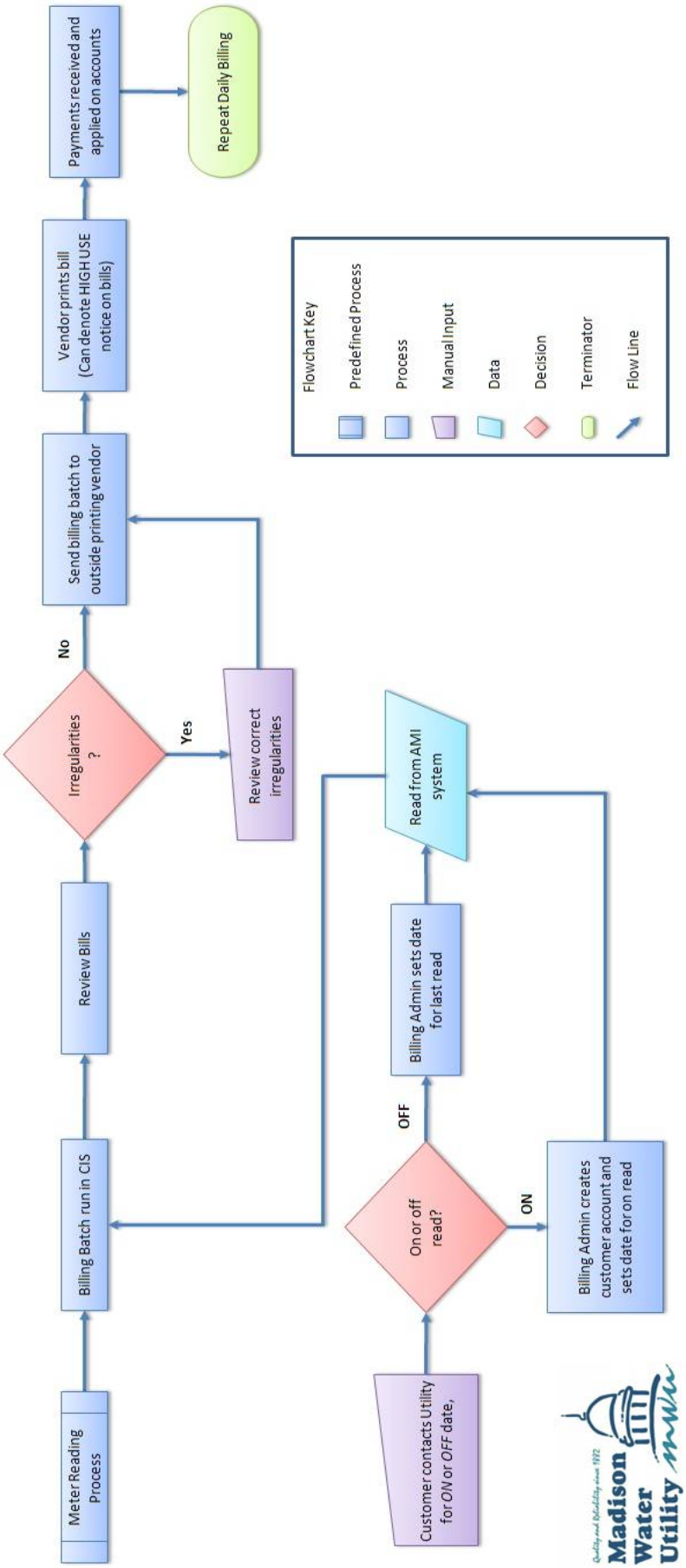
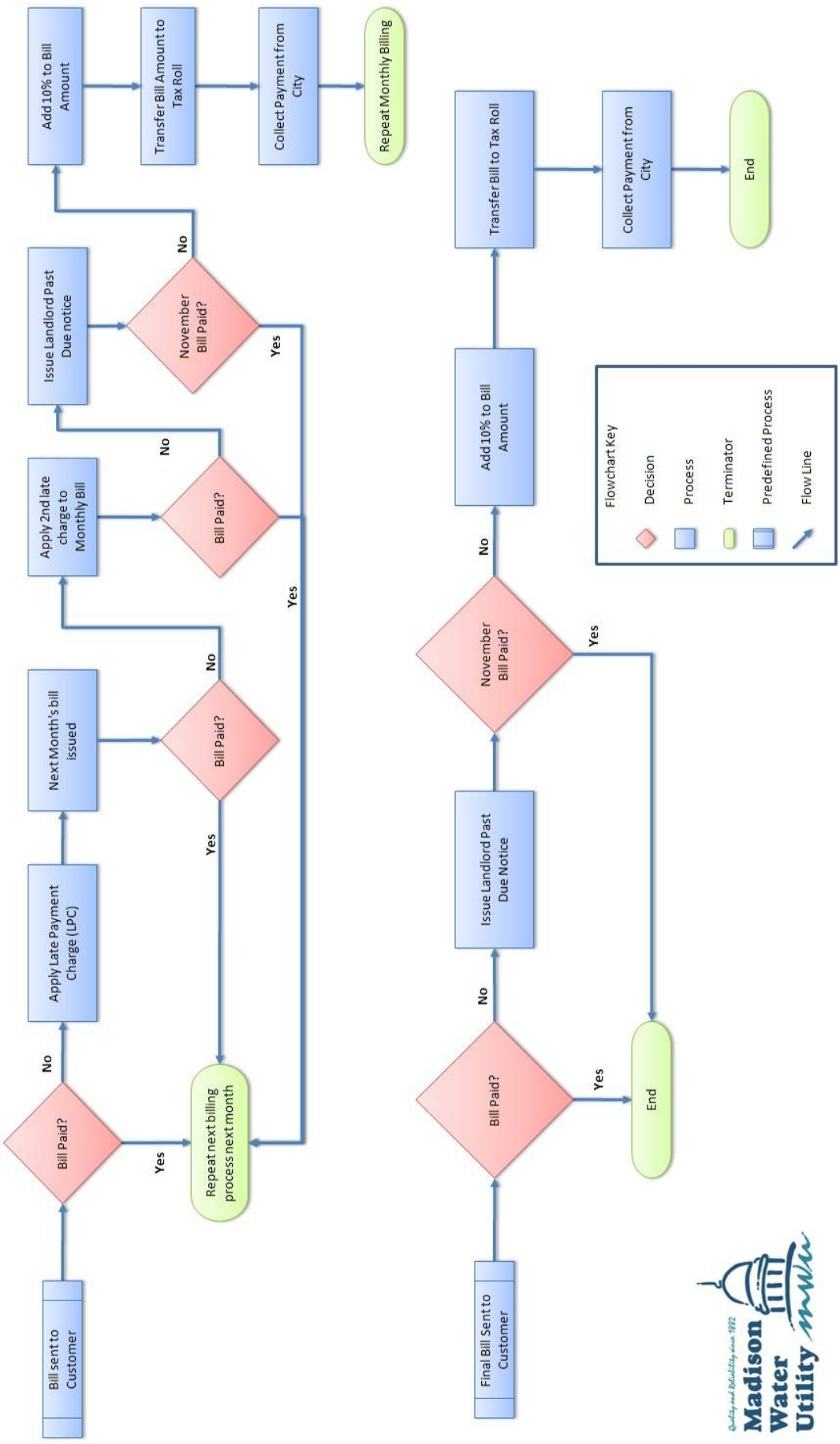


**Figure 8**
**Proposed Process – Monthly Payment and Collection**



## Conversion - Present Operations to AMI

With the present system, accounts are billed once every six months and billing is done once a month at the end of the month. With the AMI system, accounts will be billed every month and billing will be done daily. The conversion requires careful planning, control and constant monitoring.

During the conversion period additional temporary CIS staff may be needed to:

- Assist in scheduling and implementing AMI change orders
- Process AMI meter change and module installation orders
- Monitor new AMI cycle billing operations
- Review and process initial AMI bills
- Handle initial customer calls and questions concerning AMI and monthly billing

The AMI implementation schedule calls for all 66,000 MWU meters to be converted over a two year timeframe. That averages out to 2750 meters per month or 130 meters per day.

The conversion can be done continuing to use the cycle billing concept. Currently, two cycles are billed at the end of each month – cycle 7 customers and one cycle from customers in cycles1. New monthly billing cycles can be set up to bill on each workday of the month. For example: Cycle numbers 11, 12, through 31 can be used to provide 20 workday billing cycles. Cycle 11 will bill on the 1$^{st}$ workday, cycle 12 on the second workday, etc. Using 20 cycles will leave workdays available at the end of the month to bill customers in the existing billing cycles who are still waiting to be converted to the monthly billing.

There will be a number of steps required when meters are converted to AMI. Conversion will not take place until communications of the meter readings are received and the daily read data being accumulated and accessible by CIS. Field records will be required to record the new meter ID, meter module ID remove and install reads, etc. When the communications with the meter are accepted, the account cycle will be changed from a six-month cycle (1-6) to a monthly cycle (11-31). The initial AMI bills will be for the period from the last six-month bill meter reading. It will include the billing from the previous bill to the meter change date/reading and from the new AMI meter install reading to the previous days AMI reading. This will provide immediate revenue advancement and will begin the routine of producing a small, manageable number of bills each workday. This will also initiate the daily bill print and mailing operations. As meters are converted to AMI, they can be added to the AMI cycles and the number of bills produced from these cycles will continue to increase until all meters are converted to AMI.

Initially, some of the non-metered accounts (storm water only, or fire protection only) can be converted to an AMI cycle to allow for monthly billing if desired. If storm water only accounts

will continue to be billed on a six month basis, a separate billing cycle could be developed to handle these accounts.

## Operating and Management Information and Functionality Needed From AMI System

### Information Needed

The primary information needed from the AMI system is the Customer meter reads. The minimum read frequency for effective interaction with the customer and to fulfill the needs of the AMI functionality is hourly. With some systems, more frequent readings are possible, which is good, but at least one meter read every hour is required. Frequent reads throughout the day and night are used for alerts (internal leaks), emergencies (pressure loss, backflow, main breaks) and daily use pattern comparisons. In addition to (or as part of) the more frequent reads, a daily read of every meter on the system at or shortly before midnight each day is also required. The daily reads become the basis for most billings (particularly rate change bills) and consumption comparisons.

Other information required from the AMI system includes “alerts”. These are warnings provided to MWU and the customer to conditions that may be dangerous, expensive or simply a concern. The customer notification should make use of basic on-line presentations as well as e-mail and the other personal messaging systems available. Leak detection within the customer premises is the primary alert the system must provide. Leaks can be detected through mechanical devices and/or usage pattern recognition software. Pattern recognition can also be used to detect, provide alerts, and to discuss bills in situations like a faucet or outside hose left on overnight. Meter tampering or attempted meter tampering are also alert conditions to be detected and reported.

Other basic information provided and needed for an AMI system includes high, low and average use histories by day, week and month (perhaps seasonal or quarterly). This data needs to be readily available to the customer to assist in water conservation programs, making decisions on water use (when to water) and to encourage water use awareness.

The AMI system must also provide MWU and customers with basic information to assist them in monitoring their use and encouraging conservation. Comparative information can be most effectively presented in graphic formats. A line chart of the use by day for the current billing month compared to last month and to the same month last year provides recognition of conservation efforts and encourages new efforts. Other similar comparisons such as the customers use compared to groups of other customers (same rate class, same area of the city and same general use level) can all be presented electronically through systems now available.

Providing the customer with use data is also an AMI requirement. The current use data is information on the amount of water that has been used since the last bill was issued. The basic total use since the last bill can be augmented with the daily average use. Comparative charts and an interactive bill calculator the customer can use to project their next bill based on their own use expectations.

The interconnection of an AMI system with other MWU systems allows additional customer service opportunities. The interface between the customers on the AMI system and MWU's mapping, SCADA, and work order system , should allow customer notifications of possible water interruptions, bad odor or bad taste resulting from service work in defined geographic areas. This may be planned service work where advanced notices can be sent out via mail (and/or electronically) or emergency work where the electronic notices could be sent. With advanced AMI *in-home read ou*t devices (such as the "refrigerator magnet" meter read replicator) this type of notice could be sent directly to the home over the AMI system.

The AMI system must also provide information concerning the MWU service system. Monitoring points throughout the distribution system will provide water pressure and water quality information that could be used to help control and maintain optimum use of the Utility's water resources. Water flow data can be associated to geographical locations, and linked to individual mains to help optimize distribution system operations. Water flow data can also be used to detect small leaks and other system problems before they cause major outages.

## Functionality Needed

The ability to communicate the basic meter reading information from the meter to the MWU and to the customer in a timely and efficient manner is the prime function of the AMI system. These readings and the use they represent will need to be stored, archived and made available through a comprehensive Meter Data Management System (MDMS). The MDMS will need to interface with all the major computer systems of the City of Madison.

The primary MDMS functions will be:

- Provide reading and comparative use information to billing system for monthly bills
- Provide information for Customer Service reps for answering calls, taking orders and interfacing with the customer
- Provide information to operating groups for distribution system operations

The MDMS will be interfaced to the following Utility departments:

- Customer Service - *My Water* web link to allow the customer information and functionality needed to fully implement a wide range of customer self service opportunities;
- City Finance - monitor expected revenue and project unbilled revenues
- Engineering – link to GIS, hydraulic model, and SCADA systems to help optimize engineering, planning, and construction related activities.

Providing the ability for the Customer Service to contact the meter and receive an immediate current meter reading while in a discussion with the customer is also a requirement of the AMI system. This functionality will also be used in the *My Water* to enhance the customer self-service capabilities.

The AMI system will need to be able to monitor alert sensors and use information to provide appropriate alerts to MWU and the customers in a timely manner. The communications will be done through CIS, e-mail, personal messaging, social networking, or other method available.

The functionality to communicate operating data from system sensor/metering points to the operating groups is also a requirement. The data, obtained through the AMI system, will be communicated to the operating people through MWU internal networks.

The AMI system will have the ability to recognize a new (or replaced) meter installed on a building or facility within the system when it becomes operational. The readings from that meter will be obtained, transmitted, archived and presented to MWU for installation in the MWU CIS. The system will also report meters no longer communicating and provide last read, date and time information to MWU.

## Expected Life Cycle of AMI System

The life cycle of an AMI system is composed of five major segments – the meters with encoded head, the meter interface units, battery life, communications and system programs (software). Each of these segments has a different life cycle and is affected by different factors. To meet the needs of the MWU, the vendor and technology selected will have the greatest impact on the life of the AMI system.

The meter is a basic unit that has a well known life expectancy of well over 20 years. The meter life is determined largely by water quality and technological innovations. New state of the art meters have no moving parts but will need to be tested to ensure accuracy in accordance with state regulations. It is expected that with the deployment of new meters for the AMI system, the current meter-testing program for meters smaller than 1.5” in diameter will not be needed until the last few years of the AMI lifecycle. The encoded head on the new technology meters operates with the use of a battery. The expected battery life for the encoded head is approximately 20 years. The encoded head has a low battery warning signal that can alert the Utility of an unexpected battery failure prior to the end of the 20 year lifecycle.

The meter interface unit (MIU) provides an encoded meter read from the meter to the AMI communications system is an electronic device with an expected life of 20 years. Implementation of MIU’s may have initial failures and isolated failures will occur over the life of the system. A mass change out program will be required beginning approximately 18 years.

Since a change-out of the MUI requires a visit to the meter a combination of MIU replacement and selected meter-testing program could be implemented.

With current technology a battery is required to provide communications from the meter via the MIU. The battery life of the MIU varies greatly with the AMI vendor and system installed. The expected lifecycle for a MIU battery is approximately 20 years. The standard warranty from the vendors is the first 10 years guaranteed for full replacement cost and a prorated guarantee for years 10-20.

The communications network can be expected to have a life time in excess of 20 years. However, communications technology is changing rapidly. The installed system may be evaluated and replaced and/or expanded with new and improved capabilities, and/or less expensive technologies. The replacement or expansion will be based on financial evaluations and revenue opportunities that develop over the life of the system.

The system software as installed can be expected to exceed 20 years. However, like communications, the continual evolution of software can be expected. To enhance customer self-service and access to data; enhance presentation capabilities (Facebook, YouTube, Twitter, etc) and to make use of technology developments (e.g. “cloud computing”), the system software will need to be re-evaluated and possibly upgraded every few years during the life of the system.

# Economic Evaluation

An important aspect to any business case for a new utility investment is the economic evaluation. In the following sections, we present our key assumptions, evaluation results, and sensitivity analysis. More detailed information on the economic evaluation is contained in Appendix B.

## Key Assumptions

Key assumptions for the economic evaluation came from the management plan, needs assessment, industry resources, and consultant experience. Key assumptions are:

- Change from bi-annual to monthly billing
- End of year 2012 implementation deadline will require contractor installation with supervision by Utility staff
- Existing billing/CIS system can handle the increased volume
- 20 year life cycle
- Cost of capital = 4%
- Meter population = 66,000 with 0.67% annual growth rate
- 2.75% inflation rate
- Water rates - 7% annual rate increases between years 2-12 and inflationary increases for following years
- Sewer rates – 5% annual rate increase
- Daily billing of approximately 3,000 meters (20 billing days in a month)
- Total amount of monthly bills per year is 798,000 and increases annual by 0.8%
- 60% of billing clerk's time is spent on billing and 40% on customer service
- Average days for carrying the cost of water is 149 (time of use to time bill is paid)
- Cost of City for treasurer office would be the same for all options and is not part of the analysis

## Evaluation Results

Net Present Value for Base Case Evaluation

Net Present Value is an economic tool to compare alternatives over a life cycle when there are a variety of expenditures from initial capital investments to annual operation and maintenance expenditures. We used this tool to compare using the existing manual reading system to AMI systems with varying degree of water meter change-outs. Given the assumptions and cost estimates used for this analysis, we feel alternatives within 15 percent of each other for total Net Present Value should be considered equivalent cost and not significant difference. Table summarizes this Net Present Value comparison of alternatives.

**Table 1**
**Net Present Worth Analysis**

| Expenses | Option 1 Existing system | Option 2 Retro-fit only | Option 3 Hybrid | Option 5 Full change out |
|---|---|---|---|---|
| Capital Cost / AMI System | $ 354,327 | $ 13,522,312 | $ 13,628,114 | $ 18,083,613 |
| Meter Reading | $ 26,229,694 | $ 420,585 | $ 420,585 | $ 420,585 |
| Billing | $ 10,487,861 | $ 6,643,302 | $ 6,643,302 | $ 6,643,302 |
| Customer Service | $ 5,582,790 | $ 3,172,571 | $ 3,172,571 | $ 3,172,571 |
| Meter Operations | $ 11,869,845 | $ 8,746,368 | $ 7,575,809 | $ 36,207 |
| Carry Cost | $ 2,765,178 | $ 2,897,149 | $ 2,897,149 | $ 2,897,149 |
| Lost Water | $ - | $ (2,920,702) | $ (2,920,702) | $ (2,920,702) |
| Total Expenses | $ 57,289,695 | $ 32,481,586 | $ 31,416,829 | $ 28,332,725 |
| Increase in Revenue | $ (2,733,085) | $ (2,028,719) | $ (3,059,479) | $ (13,389,041) |
| **Total NPV** | **$ 54,556,610** | **$ 30,452,867** | **$ 28,357,350** | **$ 14,943,685** |

The Net Present Value tool shows that it is clearly a cost savings to change from the manual meter reading method to any of the AMI alternatives. Additionally, the analysis shows that changing meters in the first two years of the project has a clear beneficial impact on utility economics. The best alternative from the analysis is a full meter change-out with AMI. We also feel this is a practical choice in the Requests for Proposals to allow the most room for response by vendors and partnering options.

## Payback of Investment Calculation to Prioritize Capital Spending

A payback analysis was conducted for each of the AMI alternatives. The annual cost savings was determined for each alternative, and compared to the total present Value of the capital costs for each alternative. Table 2 illustrates a very solid payback period for an expenditure for a metering system.

**Table 2**
**Pay Back Analysis**

| Alternative | Capital Costs | Pay Back Period |
|---|---|---|
| Option 2 - Retro- fit meters | $ 13,902,000 | 5.9 years |
| Option 3 – Hybrid | $14,015,000 | 5.6 years |
| Option 4 – Full meter change out | $ 18,777,000 | 6.1 years |

## Cash Flow Break Even Analysis for Limit on System Price

In some cases, a cash flow break even analysis can be helpful to evaluate future vendor proposals. A simple cash flow analysis compares the overall NPV of the manual read option to the overall NPV of each AMI option. The analysis indicates the Utility could invest approximately $25 to $50 million (depending on the option selected) in an AMI system and still break even in the cash flow analysis.

## Sensitivity Analysis

A sensitivity analysis and discussion of key economic factors are provided to guide Madison Water Utility in decisions during this project.

### Implementation Period

If MWU were to spread the implementation of the AMI system over a longer period of time costs would rise due to the reduced benefit of meter accuracy, water loss control, and the duplication of manual reading/AMI reading for a longer period. For example if the implementation period were extended to 5 years instead of 2 years, the Net Present Value cost would increase from $18 million to over $23 million. Our experience with other conversions also has shown that the number of billing mistakes and confusion increases the longer that dual systems are in place. On the other hand if the implementation were accelerated from 2 years to 1 year, the Net Present Value cost would decrease by less than $ 1 million and the change impacts on MWU staff and customers would be very difficult to manage. Some vendors may also be eliminated with such an increase in implementation which could affect price proposals.

### Cost of Capital

If the interest rate assumed for capital is changed to 4.5% from 4.0%, the Net Present Value of the project increases by approximately $450,000.

## Other Important Aspects of Business Case

### Training costs

Significant changes will be occurring in meter reading, meter shop, billing, customer service, IT, distribution, water supply, management, and engineering as processes change, new software and hardware is acquired, and much more data is available. Training will be wanted and needed to incorporate these changes.

The vendor costs for this training will be included in the contract pricing for AMI. However, there will be staff time costs and perhaps some other skills training for certain individuals as they move to new jobs.

### Data Conversion

Data conversion to the new meter reading system from CIS and the Itron hand held meter reading system (MV-RS) will be included as part of the AMI contract so no additional cost is estimated.

### Historical Record Archive and Retrieval

As conversion proceeds to the new meter reading and billing schedules, appropriate archive records must be maintained according to PSC codes so old billing and meter reading data can be accessed to answer customer questions. This will likely be done in the existing CIS system so no additional cost is estimated.

### Legacy Hardware and Software Interfaces

The CIS system, the GIS system, My Water, the work order system, the engineering computer model, and the MV-RS software will also need to have data moved to or from the new AMI system. Interfaces will be requested from the AMI supplier. There will be small amounts of time required from MWU staff to assist the vendor with this effort.

### Regulatory

A Certificate of Authority to purchase the AMI system will be needed from Wisconsin Public Service Commission because of the size of the purchase. We do not anticipate this will be a problem because PSC has been supportive of the move to monthly billing and the reading systems that support this move. The monthly billing and more data for the customer will help conserve water which is strongly encouraged by PSC.

> There are no requirements from DNR for an AMI system. However, an AMI system will provide plentiful data, help achieve water conservation, supply better data for computer modeling and planning which are all things encouraged by DNR.

### Human Resources

An AMI system is a powerful tool for management and utility workers. Properly implemented it will help people perform their jobs better for the customer and utility. Overall, an AMI system will provide a positive impact on human resources. However, it also represents substantial change and not every employee will understand or embrace that change.

### Customer Relations

Customer relations will be enhanced with an AMI system because:

- Regular monthly billing to facilitate household budgets
- Accurate bills (reduced outside register issues)
- Water conservation options
- Faster confirmation and notification of plumbing leaks
- Offer of budget billing

- More and better information on My Water

## Water Supply

Madison Water Utility's water supply from the sandstone aquifer is plentiful and reasonable quality. The US Geological Survey and the State Geological Survey have been modeling the aquifer and are currently examining the impact of pumping the aquifer on local surface water sources. There is some concern that pumping the aquifer has resulted in a change in groundwater flow direction. Formerly, the aquifer supplied the local lakes and wetlands. Now it is thought that the lakes and wetlands help supply the aquifer. If this is true, impacts on the local lakes and wetlands will occur and the area may be classified as a Groundwater Management Area.

An AMI system will provide an excellent tool for Madison Water Utility to use for water conservation measures including:

- Customer leak notification
- District measurements
- Acoustic leak detection
- Water conservation rate structures
- Feedback to consumers on their use
- Better information to the Utility for conservation measures

# Key Implementation Strategies

## Challenges

Challenges identified so far during the Management Plan and Needs Assessment include:

- Retraining of staff to handle new jobs for changed processes
- Communications internally and externally to help transition the changes for employees and customers
- Financing this project during a time of capital shortage
- Staffing during the conversion process

## Staff Retraining

A commitment has been made by Madison Water Utility to keep all current staff. However, the types of jobs will change as AMI is implemented. Manual meter reading will be reduced from about 3.0 FTE to less than 0.5 FTE. Meter shop personnel will be very busy during the conversion process but will have very few meters to change and test once the meters are replaced. New residential meters are not expected to need much work for the next 20 years except for new installs, some customer complaint testing, and customer moves. Residential meters make up approximately 94 percent of the system meter population. Billing and office customer service staff will have six times the number of bills to produce. Payment processing will increase similarly. Technical and software related work will increase to handle the data produced by the AMI system. Table 3 illustrates the staffing levels before, during, and after conversion of an AMI system.

We recommend that the selected AMI vendor be contracted to provide training as much as possible because they will be motivated to make sure their system works. Additionally, training from CIS, GIS, and other existing software providers should be sought.

Process changes should be documented and incorporated in the Utility standard operating procedures. The City's Human Resources department should be enlisted to help provide training as much as possible as well as Design Team members and Management.

**Table 3**
**Staffing Levels**

| Position | Current | Conversion | Future |
|---|---|---|---|
| **Manager** | **1** | **1** | **1** |
| **Meter Mechanic Lead** | **1** | **1** | **1** |
| **Meter Mechanic Field** | **1** | **1** | **0** |
| **Meter Mechanic 3** | **1** | **1** | **1** |
| **Meter Mechanic 2** | **3** | **3 (2 assign to install)** | **1** |
| **Meter Mechanic 1** | **1** | **1** | **1** |
| **Service Inspector** | **3** | **3** | **3** |
| **Meter Reader** | **3** | **3** | **0** |
| **Finance Lead** | **1** | **1** | **1** |
| **Admin Clerk-Shop** | **2** | **2 (1 assign to install)** | **1** |
| **Admin Clerk-Billing** | **3** | **3** | **2** |

## Communications

Rapid change will be occurring for employees and customers during the conversion to AMI. Communications are critical to keep people on the same page working in similar directions. An internal person should be assigned specifically to monitor communications effectiveness, to help produce communications, and to be a point of contact for the project. All design team members and management team members should continue to be deputized to assist in communications. The selected AMI vendor should also be tapped for communications assistance.

## Finance

Cash flow and capital are at a premium right now for Madison Water Utility. Infrastructure projects need to continue and rate increases are needed to help fund the projects. The Utility should maximize the use of low cost capital as much as possible. This generally means use of City general obligation borrowing where possible.

If City financing is not possible, Utility financing may need to be sought and/or financing from vendors providing the equipment and service. It may be possible to seek performance contracting capital investment.

## Staffing During Conversion

Converting to the new AMI system as quickly as possible will reduce confusion to customers and employees about running two parallel systems. However, a quick conversion also presents its own challenges for temporary staffing, management, and control of the conversion process.

Existing employees should be involved as much as possible during the conversion to learn about the new system and impacts on customers and the utility. However, installation vendors are readily available to help Madison Water Utility with this conversion. Especially during this economic environment, installation vendors should be able to obtain a reasonable quality temporary work force to perform installations. The installation vendors are also proficient in training this work force as well as the existing work force.

**Table 4**
**Summary of Challenges and Strategies**

| Issue | Challenge | Strategy |
|---|---|---|
| Training | Many job changes<br>New Technology | Involve vendor/installer<br>Involve existing software providers<br>Write policy manual<br>Involve City HR |
| Communications | Rapid changes for employees and customers | Assign project communications specialist<br>Involve vendor/installer |
| Data Conversion | Formatting and consistency of much data conversion | Involve vendor and existing software providers |
| Legacy Hardware/Software Interfaces | Numerous databases to maintain and variety of vendors | Involve AMI vendor and existing software providers |
| Regulatory | Certificate of Authority<br>Ongoing rate cases | Involve in AMI process |
| Water Supply | Water Conservation goals | Assign AMI project manager and charge with meeting these goals |
| Finance | Capital shortage and cash flow issues | Involve City, Sewer Utility<br>Investigate vendor financing |
| System Conversion | Large ramp up of labor and data | Involve vendor/installer |

# Appendix A

## Proposed Project Schedule

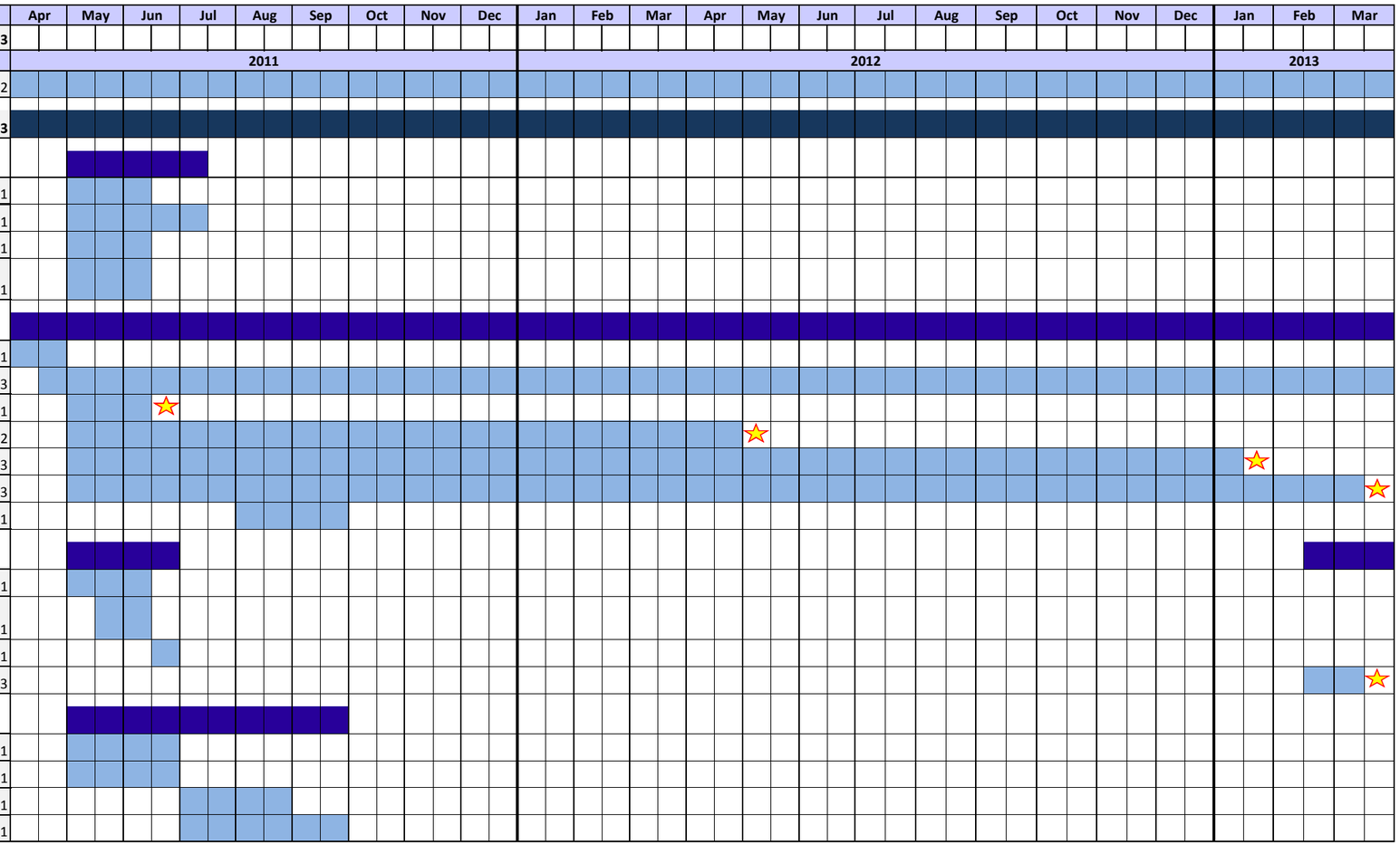
# Madison AMI Project Schedule

| Task | Project Name | Owner | Days | Start | End | May | June | July | August | September | October | November | December | January | February | March | April |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Madison AMI Acquisition** | | **330** | **3-Apr** | **27-Feb** | Project start to Vender selection | | | | | | | | | | | |
| 1 | **Project Mgnt Plan** | | 30 | **1-May** | **31-May** | | | | | | | | | | | | |
| | Form Madison AMI Team | Rau | 7 | 1-May | 8-May | | | | | | | | | | | | |
| | Questionnaire & interviews | Engelhardt | 7 | 1-May | 8-May | | | | | | | | | | | | |
| | Mgnt Plan & Tech Plan Mtgs | Engelhardt | 17 | 1-May | 18-May | | | | | | | | | | | | |
| | Report | Rau | 14 | 15-May | 29-May | | | | | | | | | | | | |
| | Report Presentation Meeting | Rau | | | | | ★ | | | | | | | | | | |
| 2 | **Needs Assessment** | | 28 | **18-May** | **15-Jun** | | | | | | | | | | | | |
| | Questionnaire & interviews | Engelhardt | 14 | 18-May | 1-Jun | | | | | | | | | | | | |
| | Technology Plan Training | Voelker | 14 | 25-May | 8-Jun | | | | | | | | | | | | |
| | Data Gathering | Gorton | 28 | 18-May | 15-Jun | | | | | | | | | | | | |
| | Process Flow Charts | Gorton | 28 | 18-May | 15-Jun | | | | | | | | | | | | |
| | Needs Assessment Report | Rau | 14 | 4-Jun | 18-Jun | | | ★ | | | | | | | | | |
| 3 | **Business Case** | | **64** | **4-Jun** | **7-Aug** | | | | | | | | | | | | |
| | Economic Analysis | Nennig | 14 | 18-Jun | 2-Jul | | | | | | | | | | | | |
| | Business Strategy Development | Rau | 14 | 18-Jun | 2-Jul | | | | | | | | | | | | |
| | Process Revisions | Gorton | 28 | 4-Jun | 2-Jul | | | | | | | | | | | | |
| | Alternatives | Gorton | 10 | 18-Jun | 28-Jun | | | | | | | | | | | | |
| | Business Case Report | Rau | 28 | 18-Jun | 16-Jul | | | | | | | | | | | | |
| | Business Case Meetings | Engelhardt | 10 | 15-Jul | 25-Jul | | | | | | | | | | | | |
| | Report Modifications | Rau | 7 | 1-Aug | 8-Aug | | | | | | | | | | | | |
| | Report Presentation w/Board | Rau | 1 | 24-Aug | 25-Aug | | | | | ★ | | | | | | | |
| | Report Presentation w/Common Council | Rau | 1 | 21-Sep | 22-Sep | | | | | | ★ | | | | | | |
| 4 | **RFP Development and Vendor Selection** | | **165** | **15-Sep** | **27-Feb** | | | | | | | | | | | | |
| | Specification Development | Nennig | 75 | 15-Sep | 29-Nov | | | | | | | | | | | | |
| | RFP Development | Rau | 40 | 15-Nov | 25-Dec | | | | | | | | | | | | |
| | Proposal Administration | Engelhardt | 24 | 10-Dec | 3-Jan | | | | | | | | | | | | |
| | Proposal Evaluation | Rau | 22 | 3-Jan | 25-Jan | | | | | | | | | | | | |
| | Vendor Interviews | Engelhardt | 18 | 20-Jan | 7-Feb | | | | | | | | | | | | |
| | Site Visits | Engelhardt | 22 | 5-Feb | 27-Feb | | | | | | | | | | | | |
| 5 | **AMI Contract Negotiation and Contract Development** | | **38** | **21-Feb** | **31-Mar** | | | | | | | | | | | | |
| | Draft contract | Rau | 21 | 21-Feb | 14-Mar | | | | | | | | | | | | |
| | City Approval | Rau | 21 | 10-Mar | 31-Mar | | | | | | | | | | | | |
| 6 | **Initial Implementation** | | **71** | **5-Apr** | **15-Jun** | | | | | | | | | | | | |
| | Installation training | Nennig | 30 | 5-Apr | 5-May | | | | | | | | | | | | |
| | Billing system revision | Rau | 30 | 5-May | 4-Jun | | | | | | | | | | | | |
| | Meter Reading training | Nennig | 21 | 5-Apr | 26-Apr | | | | | | | | | | | | |
| | Implementation Plan | Rau | 60 | 1-Apr | 31-May | | | | | | | | | | | | |
| 7 | **Project Administration** | **Rau** | **740** | **1-Mar** | **10-Mar** | | | | | | | | | | | | Through 2013 |
| 8 | **Ongoing Implementation Assistance** | **Rau** | **740** | **1-Mar** | **10-Mar** | | | | | | | | | | | | Through 2013 |

Revision date: 09-17-10

# Madison AMI Project Schedule

| Task | Project Name | Owner | Days | Start | End |
|---|---|---|---|---|---|
| | **Madison AMI Acquisition** | | **1368** | **3-Apr-10** | **31-Dec-13** |
| | | | | | |
| | **Customer Communications** | | 800 | 1-Sep-10 | 9-Nov-12 |
| | | | | | |
| **8** | **Ongoing Implementation Assistance** | **Rau** | **730** | **1-Apr-11** | **31-Mar-13** |
| | **Collection System Installaion** | | | | |
| | Radio Signal Survey & Modeling | | 45 | 1-May-11 | 15-Jun-11 |
| | Collector Installation & Testing | | 60 | 1-May-11 | 30-Jun-11 |
| | Utility Office Control Station Installation | | 45 | 1-May-11 | 15-Jun-11 |
| | Meter Reading Software Installation & Training | | 45 | 1-May-11 | 15-Jun-11 |
| | **Meter Reading System Installaion** | | | | |
| | Installation training for system installs | | 21 | 1-Apr-11 | 22-Apr-11 |
| | Installation Appointments | | 740 | 22-Mar-11 | 31-Mar-13 |
| | 5% Install Complete | | 54 | 1-May-11 | 24-Jun-11 |
| | 50% Install Complete | | 365 | 1-May-11 | 30-Apr-12 |
| | 90% Install Complete | | 630 | 1-May-11 | 20-Jan-13 |
| | 100% Install Complete | | 695 | 1-May-11 | 26-Mar-13 |
| | Pilot of Accoustic Leak Sensors | | 60 | 1-Aug-11 | 30-Sep-11 |
| | **Billing System Installaion** | | | | |
| | CIS Interface Installation | | 30 | 1-May-11 | 31-May-11 |
| | Data Management Software Installation & Training | | 30 | 15-May-11 | 14-Jun-11 |
| | Start of Transition to New Billing | | 10 | 15-Jun-11 | 25-Jun-11 |
| | End of Transition to New Billing | | 30 | 1-Feb-13 | 3-Mar-13 |
| | **Utility Interface and Training** | | | | |
| | Hiring of New Customer Center Staff | | 30 | 1-Feb-11 | 3-Mar-11 |
| | Coustomer Center Staff Training | | 30 | 1-Feb-11 | 3-Mar-11 |
| | Scada Interface Installation | | 60 | 1-Apr-11 | 31-May-11 |
| | GIS Interface Installation | | 90 | 1-Apr-11 | 30-Jun-11 |




Revision date: 09-17-10

# Appendix B

## Economic Evaluation

### Option 1 – Existing operation

Stay with existing meter reading technology

Capital costs include : additional hand held units – vehicles – work stations and office equipment

Move to monthly meter reading and daily generation of monthly bills during year 1 with full implementation in year 2

Amount of specialty reads and inspection reads continue (increase reads annually by 0.05%)

All work would be completed by MWU staff

- Addition of meter reading staff – 18 full time meter readers
- Addition of billing administrative staff – 12 billing clerks

In first 5 years change out approximately 6,100 meters to met a 15 year change out program. Then average 3,500 change outs from year 6-15. For new meters installed move to 20 year change out program.

Meter testing would continue at an average of 500 meters per year

Current expenses reduced through:

- Reduced amount of money to carry over between billing cycles
- Reduced amount of unbilled water

Increased revenue through:

- No more prorated rate increases and delay in collecting monies owed
- 0.5% avg. increase for more accurate meters

## Option 2 – Retro-fit only

Install AMI technology for all meters.

Reto-fit all meters with AMI technology

MWU staff will continue with meter change out program. In first 5 years change out approximately 6,100 meters to met a 15 year change out program. Then average 3,500 change outs from year 6-15. For new meters installed move to 20 year change out program.

Capital costs include – AMI system - leak detection devices

Move to monthly meter reading and daily generation of monthly bills during year 1 (30% complete) and full implementation at the end of year 2

Specialty reads continue with an annual increase of 0.5% but with AMI system the reads will be completed by the billing clerk

Inspection reads are cut by 50% over option 1 and are completed by meter mechanic

Meter testing would continue for only large meters. No testing on meters smaller than 1 ½".

Rate increase in year 2 would be subjected to a prorated implementation (similar to today) since not every customer will be changed over to the AMI system until the end of year 2.

Current expenses reduced through:

- Staff reductions in meter reading
- Special reads
- Reduced amount of money to carry over between billing cycles
- Reduced amount of water pumped due to interior plumbing leaks detected by AMI system

Increased revenue through:

- No more prorated rate increases after year 2 is complete.
- 0.5% reduction in lost water due to acoustical leak detection equipment and a reduced cost to treat water if it were entering the sanitary sewer.

## Option 3 – Hybrid (13%of meters changed out)

Install AMI technology for all meters.

Use MWU staff to change out meters that were installed between years 1995-1998 (approximately 13% of all the meters in the system) as part of AMI conversion project.

Best available metes installed and change to a 20 year meter change program

Meter change outs will begin again in year 10 and continue through year 20. Meter change outs completed with MWU staff.

Capital costs include – AMI system - leak detection devices

Annual O&M cost of $30,000 for AMI system

Move to monthly meter reading and daily generation of monthly bills during year 1 (30% complete) and full implementation at the end of year 2

Inspection reads are cut by 50% over option 1 and are completed by meter mechanic

Meter testing would continue for large meters (greater than 1 ½" per PSC requirements). There would be reduced testing on residential meters.

Rate increase in year 2 would be subjected to a prorated implementation (similar to today) since not every customer will be changed over to the AMI system until the end of year 2.

Current expenses reduced through:

- Staff reductions in meter reading and meter shop
- Reduced amount of money to carry over between billing cycles
- Reduced amount of unbilled, and lost water

Increased revenue through:

- No more prorated rate increases after year 2 is complete.
- 0.42% avg. increase per year in water, and sewer revenues for more accurate meters
- 0.25% reduction in lost water due to acoustical leak detection equipment and a reduced cost to treat water if it were entering the sanitary sewer.

## Option 4 – Full meter change out

Install AMI technology for all meters.

Use combination of vendor supplied contractor and MWU staff to change out all meters as part of AMI conversion project

No meter change outs during 20 year life cycle

Capital costs include – AMI system - leak detection devices

Annual O&M cost of $30,000 for AMI system

Move to monthly meter reading and daily generation of monthly bills during year 1 (30% complete) and full implementation at the end of year 2

Inspection reads are cut by 50% over option 1 and are completed by meter mechanic

Meter testing would continue for large meters (greater than 1 ½" per PSC requirements). Testing on residential meters would begin in year 15.

Rate increase in year 2 would be subjected to a prorated implementation (similar to today) since not every customer will be changed over to the AMI system until the end of year 2.

Current expenses reduced through:

- Staff reductions in meter reading and meter shop
- Reduced amount of money to carry over between billing cycles
- Reduced amount of pumped, unbilled, and lost water

Increased revenue through:

- No more prorated rate increases after year 2 is complete.
- 1.0% avg. increase per year in water, and sewer revenues for more accurate meters
- 0.25% reduction in lost water due to acoustical leak detection equipment and a reduced cost to treat water if it were entering the sanitary sewer.