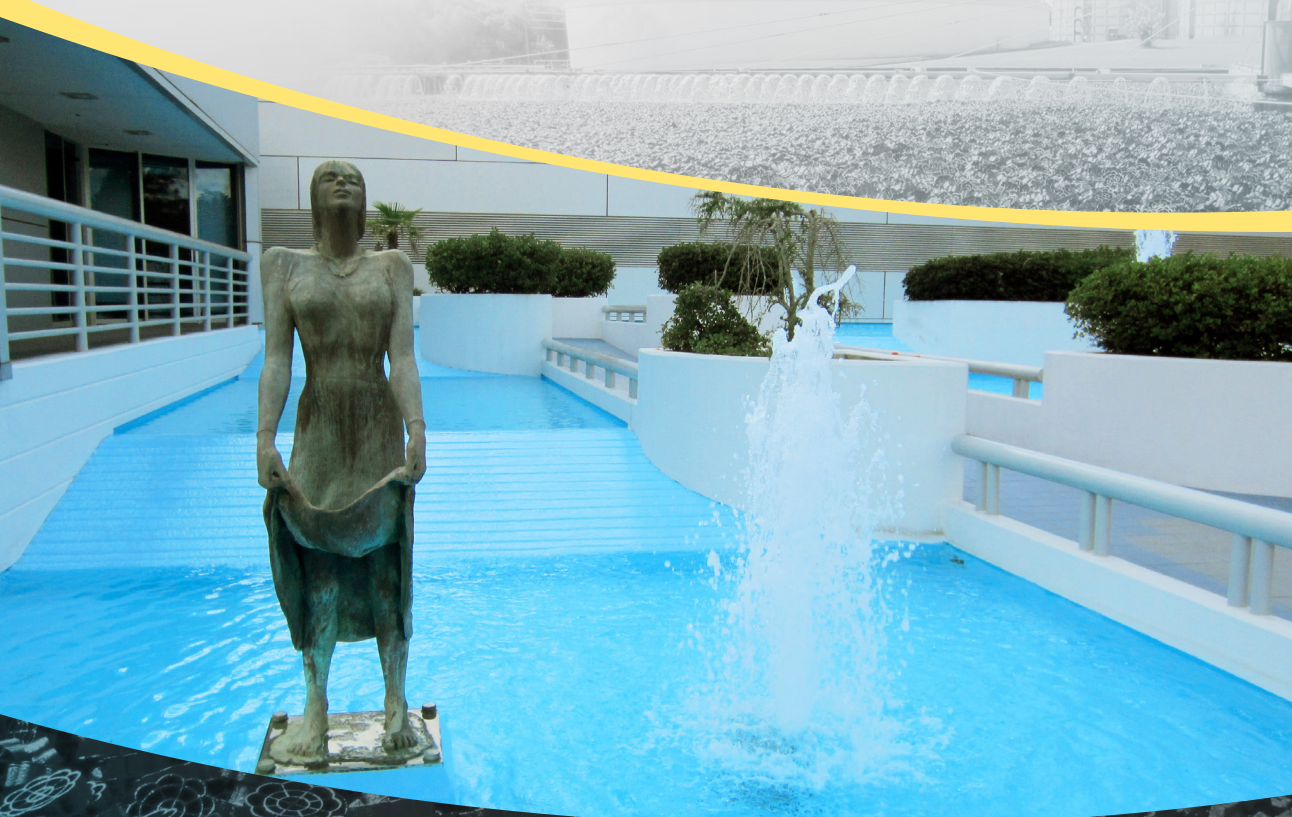
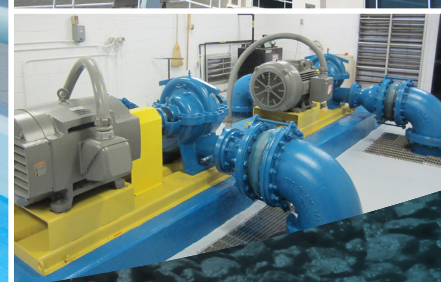
PREPARED FOR
BOARD OF WATER AND
SEWER COMMISSIONERS
OF THE CITY OF
MOBILE, ALABAMA

2013 Engineer's Annual Report/ Engineering Audit

OCTOBER 2013





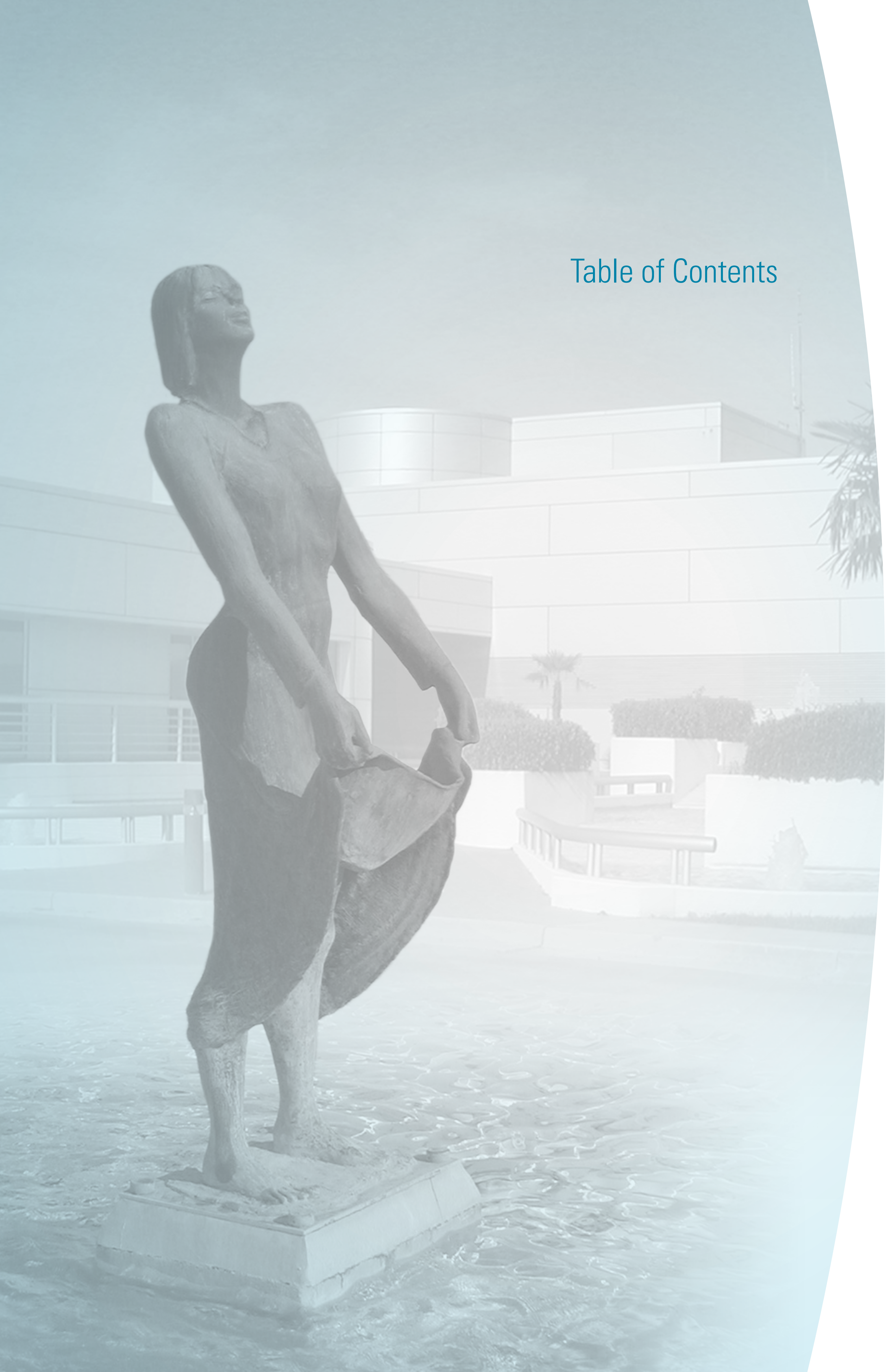
MWH®

BUILDING A BETTER WORLD

MOBILE AREA WATER AND SEWER SYSTEM

2013 Engineer's Annual Report / Engineering Audit

September 20, 2013



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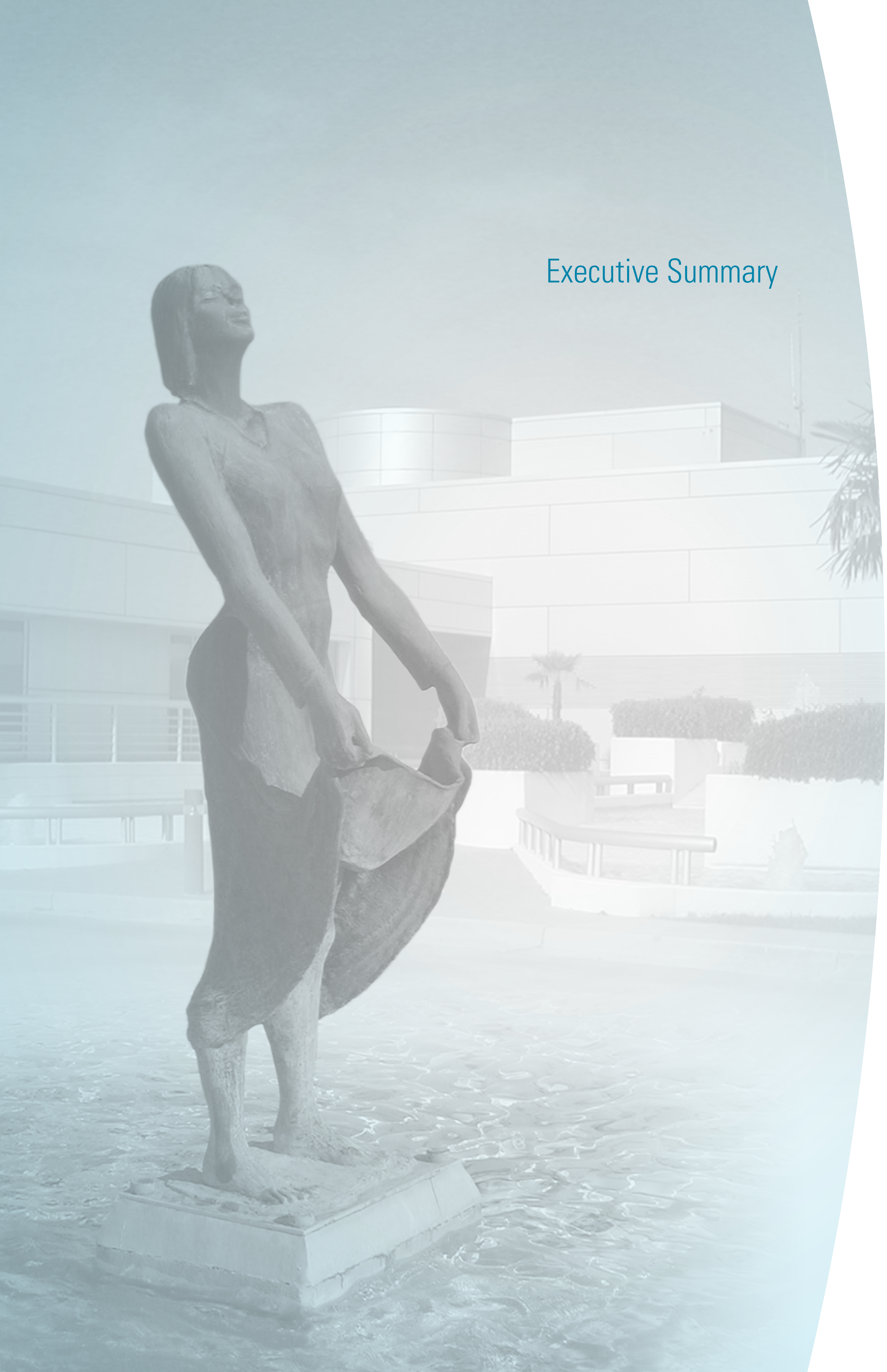


MWH

1 Executive Summary

The Executive Summary summarizes this *2013 Engineer's Annual Report/Engineering Audit* (EAR). More detailed data demonstrating compliance with the terms of the 1985 *Indenture of Trust* is included in subsequent sections.

1.1 Background

The Mobile Area Water and Sewer System (MAWSS) operates as a non-profit public water and sewer utility, governed by the Board of Water and Sewer Commissioners of the City of Mobile, Alabama (the Board). The seven commissioners who serve on the Board are appointed by the Mobile City Council for 6-year staggered terms. The Board is a separate legal entity from the City of Mobile and is not considered a component unit of the City or any other governmental agency. As a separate legal entity from the City, MAWSS does not receive tax revenue and is solely supported by revenue from its water and sewer rate structure.

MAWSS came into being on October 1, 1952, when the Board entered into a contract with the City of Mobile to purchase the water and sanitary sewer systems on behalf of the City. Raw water was purchased from the City Water Works Board from 1952 to 1968. The two Boards were merged on January 1, 1968, with the MAWSS Board taking over the raw water system from the City Water Works Board.

1.2 Objectives

MAWSS is required by the terms of the 1985 *Indenture of Trust* between the Board and the Trustee (Regions Bank) to employ an independent Consulting Engineer to carry out the duties imposed by the *Indenture of Trust*. The Board retained MWH Americas, Inc. (MWH) to fill this role and prepare the 2013 EAR.

The *Indenture of Trust* further requires that the Consulting Engineer prepare and file with the Secretary-Treasurer of the Board and with the Trustee an Engineer's Annual Report/Engineering Audit (EAR). The Consulting Engineer's EAR is to set forth the following:

> "(a) his advice and recommendations as to the proper operation and maintenance, repair and operation of the System during the ensuing Fiscal Year, and an estimate of the amounts of money necessary for such purposes,
>
> (b) his advice and recommendations as to the extensions, improvements, renewals and replacements which should be made during the ensuing Fiscal [Y]ear, and an estimate of the amounts of money necessary for such purposes,
>
> (c) his recommendations as to any necessary or advisable revisions of the Service Charges, and
>
> (d) his finding whether the properties of the System have been maintained in good repair and sound operating condition, and his estimate of the amount, if any, required to be expended to place the System in such condition and the details of such expenditures and the approximate time required therefor." [*Indenture*

of Trust Relating to Water and Sewer Revenue Bonds, November 1, 1985, §712.2, p. 68]

This report serves as the 2013 EAR.

1.3 Purview of Report

MWH assembled data required to complete this 2013 EAR through:

- Interviews with MAWSS managers, supervisors and operating personnel
- Selected field site visits to:
    - E.M. Stickney Water Treatment Plant (WTP)
    - H.E. Myers WTP
    - Mississippi Street booster pump station and water storage tank
    - C.C. Williams Wastewater Treatment Facility (WWTF)
    - Wright Smith WWTFs
    - Warehouse
    - Training Center
    - Shelton Beach Road facility construction site
    - Administrative Building at Moffett Road.
- Review of MAWSS records, including such things as:
    - Financial reports
    - Historical reports
    - Water/wastewater utility records
    - Geographic Information System (GIS) mapping and asset database information
    - Operating reports

The findings, conclusions and recommendations contained in this 2013 EAR are based solely on the information gathered by, or made available to, MWH. To the best of our knowledge and belief, the enclosed data, findings and conclusions are accurate in all material aspects and are reported in a manner to present fairly the operation and maintenance (O&M) and the repair and operation of the utility. Any recommendation or other statement regarding legal issues is not intended as legal advice, and legal counsel should be consulted prior to taking any action as a result of such statements.

Per the 1985 *Indenture of Trust* each EAR is required to be filed with the Secretary-Treasurer of the Board and with the Trustee by October 1. The current data cited in this 2013 EAR are for Calendar Year 2012 and, to the extent available, for January 1 through June 30, 2013.

1.4 Findings and Conclusions

MAWSS consistently meets, and frequently exceeds, all regulatory permit requirements at the water and wastewater treatment plants. The MAWSS collection system, like most wastewater collection systems within the United States, experiences sanitary sewer overflow (SSO) events due to such things as excessive entry of extraneous infiltration/inflow (I/I) during storms that overload the pipes, pump stations or storage facilities, to the occurrence of unpredictable pipe blockages, to the loss of power at pump stations or other mechanical problems that cause sewage to exit the system. These SSO events are considered unauthorized discharges under the Clean Water Act and as such are prohibited. The MAWSS collection system operated under a

Consent Decree related to such SSO events from 2002 until it was terminated by the U.S. Environmental Protection Agency (U.S. EPA) in 2011. MAWSS will continue to need to expend resources, and both capital and operational budgets, to continue to control and prevent SSOs within the system so that the potential for future U.S. EPA enforcement action is minimized.

MAWSS is frequently recognized by professional organizations for regulatory compliance and operational efficiency. Since 2012, MAWSS received the following recognitions:

- Alabama Department of Environmental Management (ADEM)
  - Optimized Plant Award to the H.E. Myers WTP (2013)
  - Four-Year Optimization Award to the H.E. Myers WTP (2013)
  - Best Operated Plant in Class Award to the E.M. Stickney WTP (2013)
  - H.E. Myers WTP was ineligible for this award because of the number of times the plant had won the award
- Alabama Water and Pollution Control Association (AWPCA) awards:
  - Best Operated Plant to the Wright Smith Jr. WWTP (Bio-filter/trickling filter)
  - Best Operated Plant to the E.M. Stickney (Surface Water 50.1 – 60 MGD)
  - Certificate of Recognition to the C.C. Williams WWTF (Mechanical Plant > 10 MGD)
  - Best Operated Distribution System to the MAWSS Water Distribution System
  - Bolton-Crockett-Beck Award for outstanding contributions to the field of environmental and public health protection to Wright Smith Plant Operator Roger Carlisle (2012)
- Alabama Water Environment Association (AWEA) awards:
  - Award of Excellence to the C.C. Williams WWTF (2012)
  - Special Award recognizing support of organization goals and educational efforts to Malcolm Steeves, MAWSS Director, retired
- Water Fluoridation Reporting System (WFRS)
  - Water Fluoridation Quality System Award (2013)
- Center for Diseases Control and Prevention, United States Department of Health and Human Services (DHHS) Water Fluoridation Award
  - Mobile Area Water & Sewer System
- National Association of Clean Water Agencies (NACWA) awards:
  - Platinum Peak Performance Awards for perfect regulatory compliance for five or more consecutive years to the C.C. Williams WWTF (in the 12th year of perfect regulatory compliance) and to the Wright Smith WWTF (in the 10th year of perfect regulatory compliance)
- Government Finance Officers Association of the United States and Canada (GFOA) award:
  - Certificate of Achievement for Excellence in Financial Reporting to the MAWSS *Comprehensive Annual Financial Report* for the year ended December 31, 2011 (for the 11th consecutive year)

Meeting new and revised regulatory requirements and continuing to receive peer recognitions will continue to require capital investments for both the water and the wastewater utility infrastructure.

Within the water supply system, MAWSS has selected a consultant to develop a watershed management plan for the J.B. Converse Reservoir (also known as Big Creek Lake). Completion of this management plan is planned for 2013 and is expected to further define capital needs for the drinking water reservoir.

Within the water treatment system, quarterly sampling has shown that installation of the powdered activated carbon (PAC) systems at both the H.E. Myers and the E.M. Stickney WTPs in late 2011 allowed the facilities to meet federal Stage 2 Disinfection Byproducts Rule (DBP) regulations that became effective in January 2012, but alternate methods of reducing DBPs in a more cost effective manner are still being evaluated. Additionally, there are projects in the design phase that will reduce the residence time of the drinking water in the distribution system and further reduce the formation of DBPs.

Within the wastewater treatment system, design and easement purchases have been completed for capital investment at the Wright Smith WWTF in response to more stringent ADEM effluent limitations for continued discharge to Three Mile Creek. Construction of a pump station and force main to transfer effluent from Three Mile Creek to the Mobile River has started and is projected to be completed in 2013. MAWSS has also selected a consultant to develop a master plan for the C.C. Williams WWTF. This master plan will evaluate the current treatment facilities and provide recommendations of process improvements and equipment replacements to meet expected more stringent ammonia levels in the effluent discharge. It is currently anticipated that a $20 million State Revolving Fund (SRF) loan application will be made in 2013 to fund the master plan and a portion of the capital improvements to the plant.

Additionally, a public referendum transferring the operation of the Prichard Water Works and Sewer Board (PWWSB) to the MAWSS Board passed in November 2012. The transfer of assets, liabilities and operations of the PWWSB began in February 2013, after a court decision to eliminate the Prichard Board and move operations to the MAWSS Board. As of the completion of the 2013 EAR, MAWSS has not completed a full assessment of the PWWSB facilities, thus this 2013 EAR does not include any asset related to the Prichard system or a prediction of future capital investments that may be required. It is expected that MAWSS and PWWSB financial systems will remain separate for the foreseeable future.

Overall, MAWSS has well-established operation and maintenance (O&M) practices that provide for the orderly and necessary maintenance, repair and operation of the utility. This includes the use of asset management software (Infor™) to track and produce work orders. This software is mostly used for work on the collection and distribution systems, with work orders produced by the program, filled in by hand by the crew performing the work and then entered into the system manually by dispatch personnel.

The water and wastewater treatment plants have still to implement full use of the work order system. Routine maintenance work orders are not yet being produced by the software and all work orders are filled in by hand; including work orders generated at the facility. This reduces the effectiveness of the asset management software. MAWSS should expand the use of this software to include all the facilities and fully utilize the program as a tool to track and determine the conditions of assets. This should allow MAWSS to better predict maintenance work and replacement of assets, which should reduce overall O&M costs.

Based on our review of various employee-related and O&M expenditure-related performance indicators and a brief analysis of MAWSS O&M activities conducted by MWH, we conclude that MAWSS is properly operating and maintaining the system, although improvements can be made in the areas of capital improvement spending, project prioritization and work force planning. The predicted annual renewal costs represent a “target” annual amount that MAWSS should reinvest in each asset type to maintain a sustainable infrastructure are based on an average year. As with any well run utility, renewal expenditures will vary, either up or down, from the targeted amount, but should, over a long term, be close to the targeted amounts shown. A A consistent and documented process to validate and prioritize projects will help ensure asset renewal needs are addressed along with expansion needs. MAWSS has a significant number of staff either already eligible for, or nearing eligibility for, retirement, with experience gaps between this near retirement staff and their subordinates that can, in some cases, be measured in decades. Activities to retain employees and train subordinate staff should be continued and broadened in scope to ensure experienced staff is available to fill vacant, senior positions.

To support these identified improvement area needs, MAWSS has begun an effort to assess the organization's performance against industry-accepted best practices. In 2012, MAWSS selected a consultant to conduct a capabilities assessment in collaboration with MAWSS staff. This assessment was conducted from November 2012 through April 2013 and reported in *Gap Analysis Assessment Report and Implementation Plan,* MWH, Draft April 2013. This assessment is a proactive approach to ensure key performance indicators are being established and monitored to ensure effective performance in accordance with Board-established strategic intent and planning initiatives.

As noted in Table 4.2, an annual renewal expenditure target is recommended at approximately $26.3 million in an average year. In this 2013 EAR, MWH has recommended $17.7 million in annual needs and $18.3 million per year in Priority 1 needs (which for a 2-year period covered by Priority 1 is $36.6 million). If the MAWSS Board concurs with the needs identified in this report, the year 2014 and 2015 expenditures would total $36.0 million, which exceed the annual target. The 2016 and 2017 expenditures would total $25.7 million for the on-going annual needs of $17.7 million and the currently identified Priority 2 needs of $8.0 per year ($16.0 Priority 2 total).

Annual five percent rate increases through 2016 are paving the way for the funding of the $173 million capital improvements through 2019. The adopted increases along with a recommended 4 percent rate increase from 2017 forward will provide sufficient revenues to maintain debt service coverage for the existing and proposed debt while maintaining the required fund balance reserves.

MWH projects that MAWSS will required an additional $88.3 million in bond proceeds to fully fund the capital improvements. Table 1.1 indicates strong financial performance with debt service coverage never below 1.4x and fund balances reserves growing each year to the required levels and above.

MWH is of the opinion that MAWSS has favorable credit worthiness. MAWSS has neither defaulted on any debt payment nor abrogated any covenant stipulated in the *Indenture of Trust* including debt service coverage. The projection of revenue increases is affordable.

Part of MAWSS favorable credit worthiness it's their fund balance reserve requirements and policies which produce reserve levels higher than the average "AAA" rated utility.[1] MAWSS' budgeting process is comprehensive and produces annual spending constraints that are adhered to well by MAWSS managers and staff. MAWSS financial reporting consistently earns the Certificate of Excellence from the Government Finance Officers Association. MAWSS double-A credit ratings are also excellent.

[1] Per Fitch Rating reported and calculated average cash days-on-hand.

TABLE 1.1 – Summary of Projected Finanial Information

($000s)

	Projected					
	2014	2015	2016	2017	2018	2019
Rate Adjustments	5.0%	5.0%	5.0%	4.0%	4.0%	4.0%
Operating revenue						
Total Revenues	$96,807	$100,358	$104,041	$107,902	$110,890	$113,981
Operating Expenses	58,392	60,630	62,956	65,375	67,891	70,507
Net Revenue Before Capital Activity	$38,415	$39,728	$41,085	$42,527	$42,999	$43,474
Capital Activity						
Capital Projects	$35,990	$35,990	$25,695	$25,695	$25,036	$25,036
Existing Debt Service	22,860	22,600	22,706	22,188	21,308	17,508
Debt Service Projected Issues	4,205	4,205	6,073	6,073	7,074	7,074
Total Capital Activity	$63,054	$62,794	$54,474	$53,956	$53,417	$49,618
Bond Proceeds	$43,687	$0	$28,530	$0	$15,289	$0
Net Income of Years' Operation	$19,047	($23,066)	$15,141	($11,430)	$4,871	($6,144)
Ending Fund Balance	$87,262	$64,195	$79,336	$67,906	$72,778	$66,634
Fund Balance Requirement	62,924	64,195	66,531	67,906	69,679	66,634
Surplus (Deficity) Over Requirement	$24,338	$0	$12,805	$0	$3,099	($0)
Debt Service Coverage	1.42x	1.48x	1.43x	1.50x	1.52x	1.77x

1.5 Recommendations

Leading water and wastewater utilities in the United States are moving more and more into a proactive asset management philosophy of both O&M and capital improvement planning and prioritization. Although some of the work performed last year (mostly at the Wright Smith WWTF) was due to emergencies, MAWSS is becoming a proactive asset manager.

MWH recommends the following O&M improvements at MAWSS:

- Complete the CC. Williams Master Plan and evaluate the requirements for implementation of the plan.
- Address the potential safety issue with the walls on the secondary digester at the C.C. Williams WWTF as a proactive safety measure.
- Install a redundant lime system at E.M Stickney WTP.
- Expand use of the Infor™ work order management software to manage and track O&M activities, including:
    - Greater automation such as providing supervisors with remote units for timely entry of field data
    - Utilization of linkage between the work order and GIS database information in such areas as asset condition, to identify assets requiring larger than normal O&M expenditures and may need to be replaced, and criticality, to identify assets with high potential consequences of failure, based on work order history and trends

    - Utilization of work order data to monitor and track performance measures such as the ratio of planned and unplanned work for specific asset classes to ensure O&M expenditure are being expended efficiently and effectively

- Consider a strategic planning type approach to accomplish the following:
    - Development of a process to “earmark” or dedicate O&M line item budgets to ensure proactive, preventive O&M activities are not reduced to unsustainable levels to fund emergency, reactive O&M activities
    - Development of more formalized definitions of capital versus O&M categorization of expenditures
    - Development of funded capital improvement budgets for each operation to allow for better control/distribution of funds
- Expand staff retention/recruiting activities and work force planning activities.
- Implement recommendations from the completed criticality analyses being conducted by MAWSS to ensure continued reliable operation of the infrastructure assets.

Related to the above recommendation for a more formalized distinction between expenditures that are capitalized versus being included in the O&M budget, MWH recommends the following three-step capital improvement planning and prioritization process be implemented by MAWSS. This recommendation is designed to improve the planning process and to facilitate greater work force planning efforts by involving a wider level of staff in the process and associated decision-making processes.

Step 1 – Develop a more formalized and documented capital projects needs identification and evaluation process. Applying a methodology surrounding needs identification and evaluation provides for a life cycle cost analysis for proposed capital projects. Such documentation should be based on a standard capital project request form so that MAWSS staff provides the same data on each project request to allow a consistent evaluation and review process.

Step 2 – Ensure capital project authorizations routinely meet annual asset renewal targets. MWH calculated initial target levels in 2010 for annual renewal based on a replacement cost analysis of key infrastructure asset areas. The calculated annual renewal costs from this analysis are considered a reasonable target to begin to establish a basis for sustainable infrastructure. The annual renewal targets are summarized in columns D and E of Table 4.1. Ideally, MAWSS should meet the annual renewal target each year, but these costs are based on high level asset valuation methodologies and typical useful life values. Each of these factors means that the resulting calculated values are a reasonable average over the longest lived asset, which is 100 years. In any given year, MAWSS may need to authorize capital projects that either exceed or are less than the target amount. Further, these annual calculated renewal targets are only based on renewing existing assets. Assets required for growth or to meet new regulatory requirements are not included in this analysis. As shown in Table 4.2, the actual renewal expenditure for year 2012 ranged from a low of 13 percent of the annual renewal target for the water distribution system to a high of 363 percent of the annual renewal target for wastewater treatment plants.

Step 3 – Develop a formal capital project prioritization process and follow the results of the process. MWH recommends utilizing a simplified risk based prioritization methodology that provides a quantifiable foundation for prioritization. A risk based methodology assigns a condition score, which is a measure of the potential for the asset to fail, and a criticality score, which is a measure of the consequence of failure for that asset. The two scores are then multiplied and the resulting product is the risk rating for that asset.

Implementation of a simplified risk based prioritization facilitates expenditure of limited capital funds on those assets of highest risk of failure either due to poor asset condition or the potential impact or consequence of failure associated with that asset. This type of evaluation helps ensure capital funding is directed towards the "right" assets.

In the last years, MAWSS has identified and initiated projects at various facilities based on criticality studies performed and MAWSS aspiration to provide first class services to their customers. Budgets for these identified capital projects are included in MWH's identified capital project needs as detailed in the tables in Appendix A, Identified Project Needs By Infrastructure Area. Estimated planning level cost estimates for each of the recommended projects have been incorporated into the revenue sufficiency determination detailed in Section 5, Revenue Sufficiency.

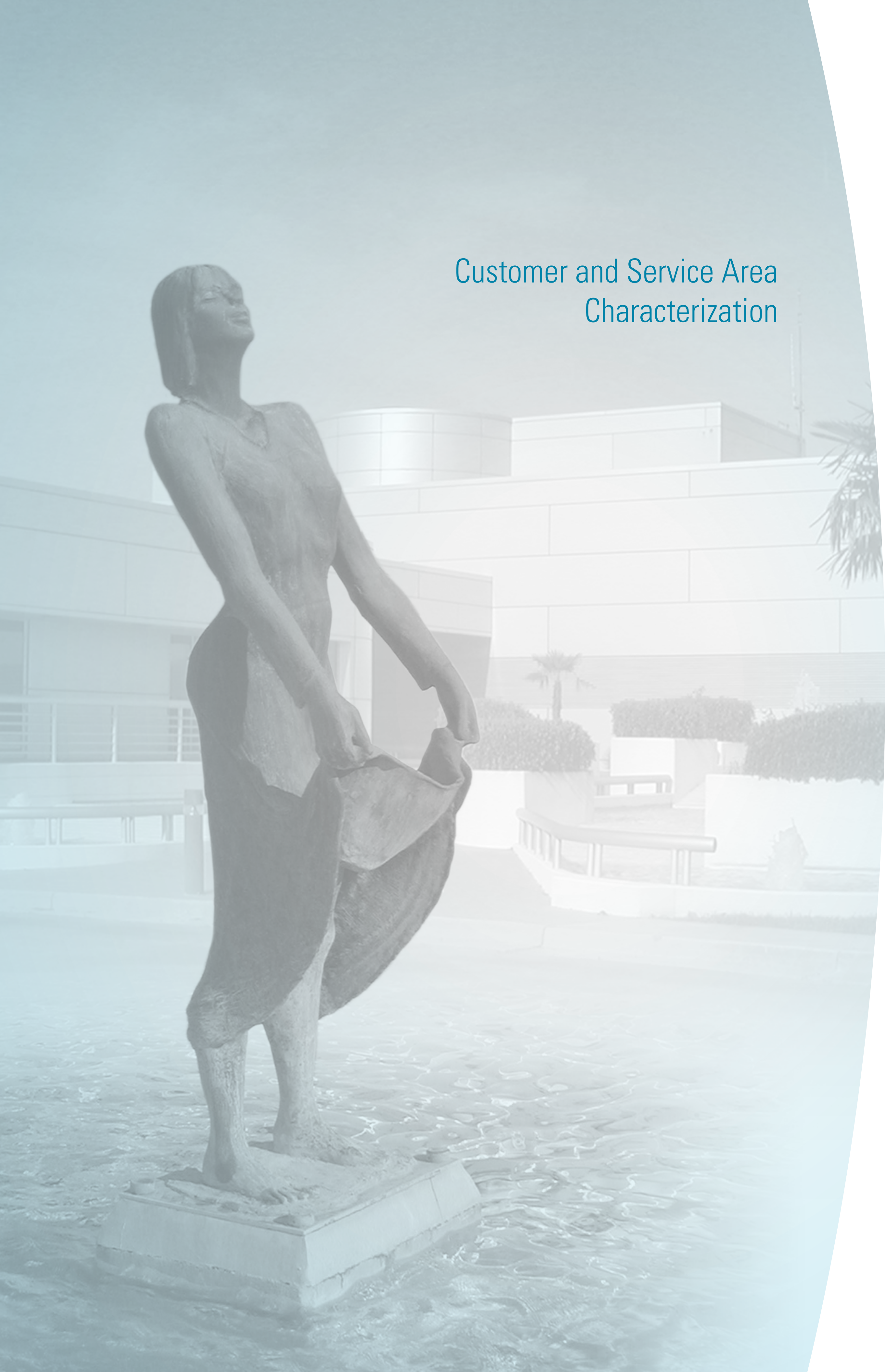
MAWSS has produced a strong history over the years of providing good service to its water and wastewater customers and at controlling/managing cost increases. As a consequence, rates charged by MAWSS to its water and wastewater customers have been low in comparison with other comparable water and sewer utilities. The projected costs of capital projects deemed to be necessary to maintain system integrity, in compliance with the *Trust Indenture*, are more than MAWSS' capability of developing capital funds internally using net revenues and reserves. As such, this EAR presents a forecast that includes additional borrowing over the next six year period, although internal pay-as-you-go revenues will be sufficient to fully fund the annually recurring component of capital requirements ($17.7 million/year) by 2017. MAWSS might borrow from the Alabama State Revolving Fund (SRF) program, as it has in the past, and/or borrow from investment banks by selling revenue bonds, as it also has in the past. Four SRF/bond borrowings are assumed, to occur in 2013, 2014, 2016 and 2018.

MWH recommends that MAWSS implement a long range financial plan framework to evaluate the impact to rates and their overall financial state of the implementation of the full capital improvement program. A long range financial plan will provide a more detailed and realistic scheduling of MAWSS' CIP.

As part of that long range financial plan MWH recommends establishing a debt service management target above the *Indenture of Trust* levels of 1.2x since maintaining coverage so close to the target could cause MAWSS do drop below the requirement due to volatility of water demand. MWH recommend setting a minimum target between 1.4x to 1.5x.

MWH recommends that MAWSS change the Distribution and Collection and Support Services cost centers so that costs are directly assigned to Water or Sewer without using standardized indexes to allocate the costs. This change, *per se*, would not necessarily entail change in management or staff personnel work assignments. It would improve the identification of actual costs of the water and sewer enterprises.

MWH recommends that MAWSS perform a cost-of-service and rate design study to review the existing rates for water and sewer, and evaluate the actual cost of providing service to the different customer classes. A rate design study will provide options to address affordability concerns to low water users. Also a full cost-of-service study can evaluate the reduction of demand experienced by MAWSS customers and isolated the portion that is caused by reactions to price.



Customer and Service Area Characterization

2 Customer and Service Area Characterization

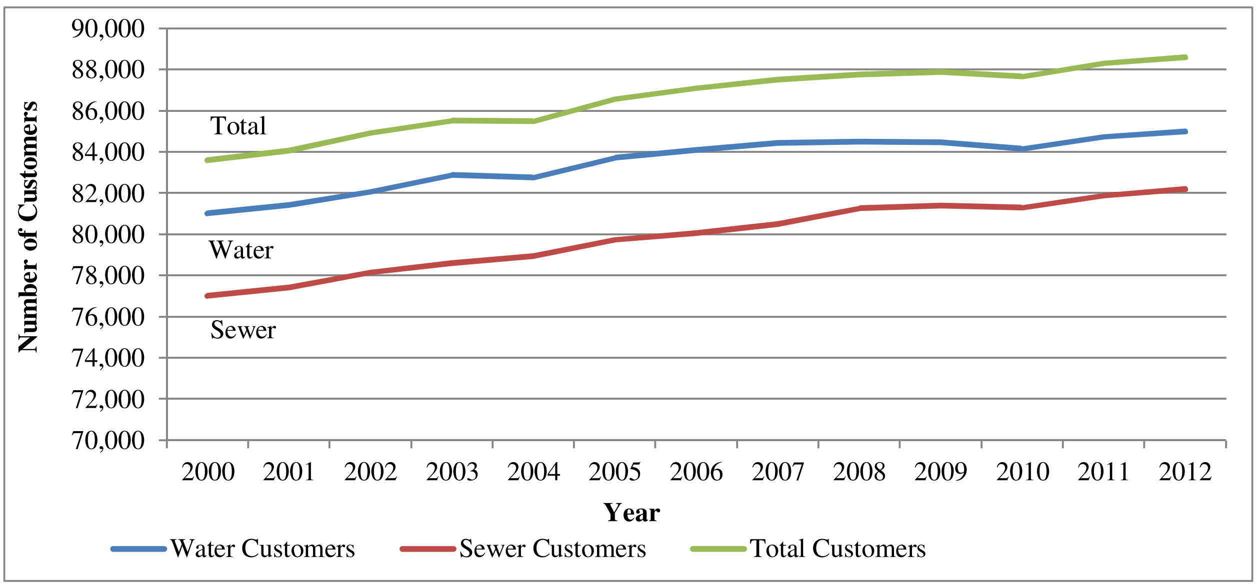
MAWSS provides water and sewer service to the City of Mobile and surrounding areas. The City of Mobile has a 2010 census population of 195,111 with Mobile County having a 2010 census population of 412,992.

The main water distribution system serves approximately 88,600 accounts within the City of Mobile and portions of the unincorporated areas of Mobile County. Outside the City of Mobile, MAWSS purchases treated water from the Saraland Water System for the College Woods Distribution System, which operates as a separate consecutive system serving the University of Mobile and one subdivision near the college. MAWSS also sells treated water to the Prichard Water Works and the Spanish Fort Water System. The sewer service area covers nearly 205 square miles includes the incorporated areas of the City of Mobile as well as portions of the unincorporated areas of Mobile County.

2.1 Customer Growth

The MAWSS *Comprehensive Annual Financial Report for the Year Ended December 31, 2012,* notes that MAWSS served 84,989 water customers, 82,203 sewer customers and 88,606 total customers in 2012. Customer growth in each category since the Year 2000 is illustrated in **Figure 2.1**.

FIGURE 2.1 – Water and Sewer Customer Growth From 2000 Through 2012



Annual water customer growth ranged from a negative 0.37 percent in 2010 to 1.19 percent in 2005 with an overall average of 0.47 percent. The MAWSS water system lost customers in both 2009 (negative 0.04 percent) and 2010 (negative 0.37 percent), but grew at 0.71 percent in 2011 and at a below average rate of 0.29 percent in 2012.

Annual sewer customer growth ranged from a negative 0.10 percent in 2010 to 1.02 percent in 2005 with an overall average of 0.62 percent. The year 2010 was the only year in which the MAWSS sewer system actually lost customers, but sewer customer growth rebounded in 2011 with the second highest growth year since 2000 at a 0.72 percent increase. The sewer customer growth rate was a below average rate of 0.34 percent in 2012.

2.2 Projected Customer Growth

MAWSS is fortunate to have an abundant water supply that includes both treated water supply and untreated, industrial water supply. Further, the existing water treatment plants each have excess treatment capacity that could be utilized to serve additional customers.

The current depressed national economy continues to adversely impact the local area, but there are a number of positive growth events indicating an economic rebound. Airbus announced plans to construct a $600 million aircraft assembly plant in Mobile. The facility is expected to break ground in the summer in 2013 with a two-year construction period. It is estimated that over 3,000 jobs will be created during this period. The facility is expected to deliver its first airplanes by 2016 and reach full capacity of 40 to 50 aircraft by 2018. The Mobile assembly line, together with associated functions, should create up to 1,000 jobs in the Mobile area.

Mobile has a total of 35 foreign companies located in the Mobile area. These include recent players BAE Systems, Austal USA and AVIC, which recently purchased Teledyne Continental Motors, Inc., an aerospace company located in Mobile since the 1960s. *fDi Magazine,* published by London's Financial Times, recently ranked Mobile as one of the top 10 cities for foreign direct investment.

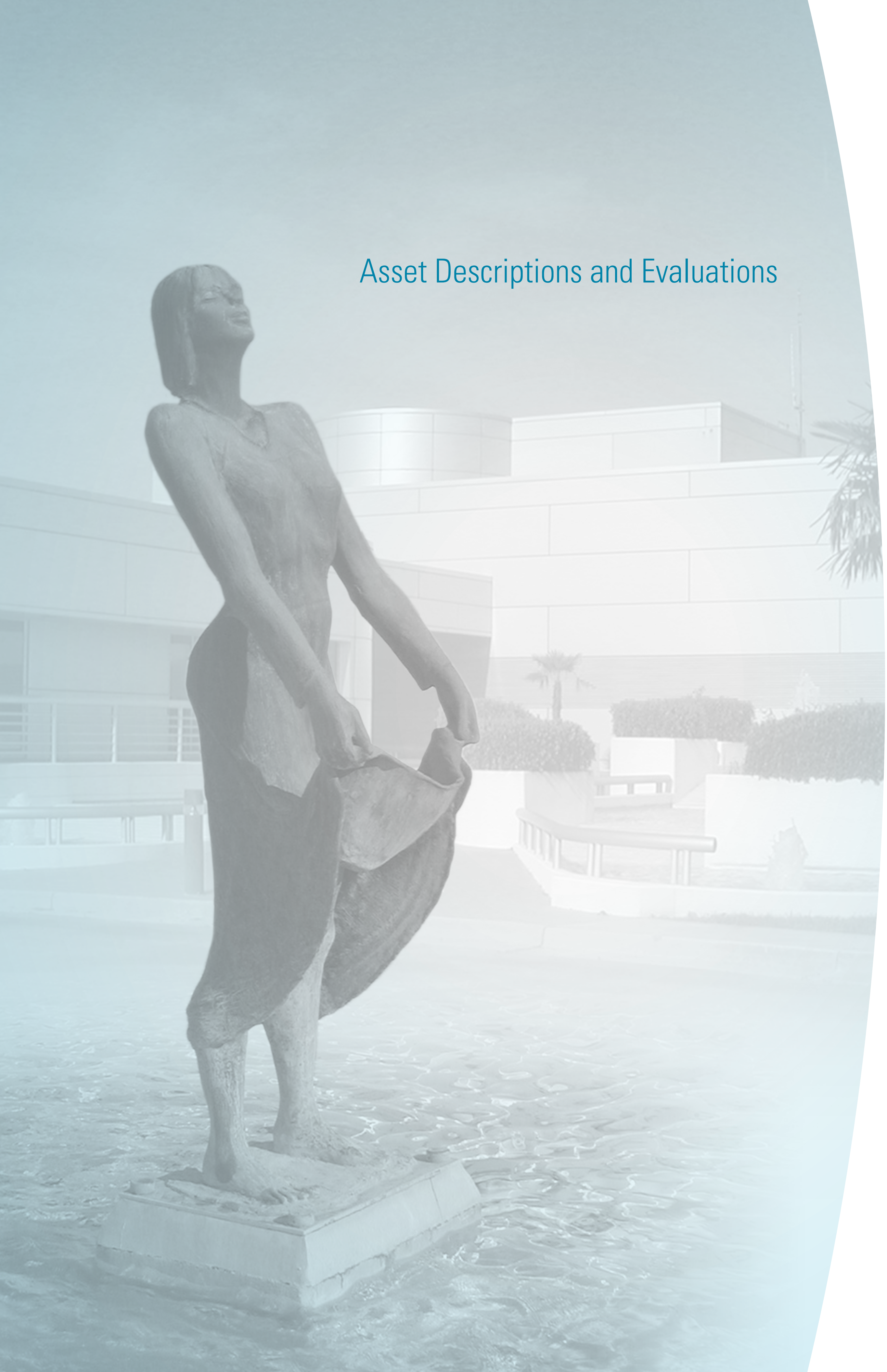
Moody's Economy.com forecast Mobile to have the fastest growing economy over the period 2008 to 2012 among American metropolitan areas. This ranking is due to Mobile's diverse industry make up, with no one industry dominating the market. Mobile was ranked among the 200 largest Metropolitan Statistical Areas (MSAs) in its *Best Places for Business Careers* during 2012.

Mobile had an average unemployment rate of 10.1 percent in 2011 and 8.7 percent in 2012 versus the state's rate of 9.0 percent in 2011 and 8.1 percent in 2012. At the end of 2012, however, Mobile's rate was at 7.2 percent compared to the state's 6.8 percent and the nation's 7.8%. U.S. economic growth in 2013 is projected to expand at a slow pace, with real Gross Domestic Production (GPD) growing by approximately 1.4 percent. Alabama's economic growth is projected to grow at 1.7 percent for 2013.

For the purposes of this 2013 EAR, it is expected that development in the Mobile area, although no longer decreasing, will not increase at least in the near future for both the water and sewer system.

Based on the public referendum that passed in November 2012, the Prichard Water Works and Sewer Board (PWWSB) have been incorporated into the MAWSS system, although the financing of the two systems will remain separate. Since the PWWSB is already one of MAWSS' larger wholesale water customers, the additional roughly 26,000 residents in the PWWSB system will have little impact on MAWSS overall water demand.

Asset Descriptions and Evaluations



3 Asset Descriptions and Evaluations

Given the limitations associated with conducting visual observation of above ground asset condition, as supplemented with historical reports and studies of selected, specific asset condition data from previous MAWSS assessments, this section provides a broad, generalized observation of overall infrastructure conditions. The subsections below details the following:

- Describes existing infrastructure facilities
- Presents an overview of infrastructure condition and criticality
- Identifies known asset deficiencies and improvement needs
- Details MWH's capital project recommendations based on previous asset replacement cost analyses used to predict annual asset budgeting needs

The 2013 EAR does not include any assets related to the Prichard Water Works and Sewer Board (PWWSB). As of the completion of this 2013 EAR, MAWSS has not completed a full assessment of the PWWSB facilities. Although a public referendum transferring the operation of PWWSB to the MAWSS Board passed in November 2012, and the transfer of assets, liabilities and operations of the PWWSB began in February 2013, court decisions are still required to eliminate the Prichard Board and move operations to the MAWSS Board.

3.1 Raw Water Supply System

MAWSS operates two raw water systems: an industrial water supply and a main water supply. The industrial water supply provides raw water for industrial use only and is operated on an intermittent basis. Industrial water is produced using the Burton S. Butler River System, and is obtained from the Mobile River. Facilities in the industrial raw water system include:

- Bucks Intake and Pumping Station
- 72-inch pipeline to Cold Creek Reservoir (Salco Lake)
- Canal and Aqueducts to Baker Road automatic bar screens
- 78-inch pipeline from Baker Road to Saraland Reservoir and Pumping Station
- Saraland Reservoir and Pumping Station
- 60-inch pipeline from Saraland to Regulator House

This water supply can also be used as an emergency supply of water that can be treated for potable use. The industrial water supply facilities currently operate at significantly less than their design capacity due to reduced consumption by the Kimberly Clark Mill and the now closed International Paper Mill. The industrial water supply is typically used on a seasonal basis to reduce the electrical costs at the Gaillard Pumping Station by eliminating the need for a fourth pump to come on during peak electrical demand, and thus high electrical cost periods.

The source of the main water supply is the J.B. Converse Reservoir (a.k.a., Big Creek Lake), which was impounded in 1952. Facilities in the main water supply system include:

- J.B Converse Reservoir (Big Creek Lake), including earthen dam
- Spillway structure, including seven Tainter type gates
- S. Palmer Gaillard Pumping Station
- Two 60-inch pipes to E.M. Stickney WTP
- Two 48-inch pipes from E.M. Stickney WTP to Regulator House

Water taken from the 3,600-acre lake at the S. Palmer Gaillard Pumping Station is delivered to both the E.M. Stickney WTP and H.E. Myers WTP.

The Big Creek watershed covers approximately 103 square miles. To facilitate source water protection within the watershed, MAWSS purchases available properties and land-use rights to control activities within the watershed that might adversely affect water quality. Currently, MAWSS owns all of the property around the perimeter of Big Creek Lake and controls public access to the lake. The only public access point is at Fox Landing at the end of Howell's Ferry Road on the east side of the lake.

MAWSS has entered into an agreement with the Sheriff's Department for the use of a parcel of land downstream of the earth embankment as a shooting range. In exchange for this, the Sheriff's Department provides a deputy assigned to the Big Creek System for 40 hours a week. The deputy patrols the lake, spillway and pump station, reducing the vulnerability of the system.

The S. Palmer Galliard Pump Station does not have a backup diesel generator for operation of the pumps in case of a power failure. The facility does have a diesel backup pump to maintain water production (at a reduced rate) during a power outage. The facility is located in proximity to two independent power grids. This allows for the flexibility of transferring the source of utility power to the facility from these two grids (albeit requiring assistance from the power company) if required, providing additional redundancy to the site. MAWSS could consider the installation of both grids to an onsite transfer station with automatic switchgear that would monitor both power sources and seamlessly switch from one to the other in case of failure. Although this would be an advantageous feature, it would require additional investigation to determine the feasibility and economic benefits of such project.

During 2012, MAWSS performed several critical improvements to the S. Palmer Gaillard Pump Station. Based on the recommendations from a criticality assessment the following improvements were completed:

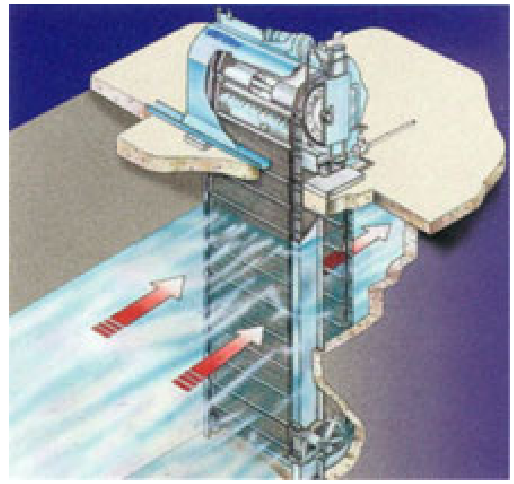
- Replaced the struts supporting the sheet pile walls in the pump channel
- Replaced shoreline sheet pile top waler beam and tieback rods
- Installed hurricane rated doors, windows and reinforce structure to meet current design standards (IBC 2009)

In addition to these improvements, several other items have been identified and are included in the proposed CIP projects as listed in Appendix A. The two primarily CIP projects are the replacement of the manual dam flood gates operators with remotely operated electrical motors and the installation of a mechanically cleaned screen at the intake structure.

The first CIP project, the installation of the remotely operated electrical motors, would allow the operation of the flood gates without requiring personnel to work on top of the dam during storm events. Given the fact that these gates are mostly operated during inclement weather, this modification would greatly enhance safety for MAWSS personnel.

The second CIP project, the mechanically cleaned screens for the intake structure, is needed to protect the pumps from damage caused by debris floating in the river. The current screens have to be manually cleaned by MAWSS personnel and require the personnel to walk a narrow walkway along the edge of the water while cleaning the screens. In addition, this location requires the material removed from the screen be carried on this walkway with buckets. During certain times of the year, this work becomes a full time effort for one to two employees. The mechanically cleaned screens, which would include a conveyor system, will eliminate the need for MAWSS personnel to expose themselves to the risks of manually cleaning the screens and allow them to be better utilized in other assignments.

Photograph 3.1 is an illustration of a mechanical screen that could be used for this application.



Photograph 3.1 – Mechanical Screen Example

3.2 Water Treatment Plants

The E.M. Stickney WTP is the older of the two treatment plants with initial operations starting in 1944. The plant has been expanded and renovated multiple times over the years and is currently permitted at 60 million gallons per day (mgd). Much of the current plant was installed during a 1976 expansion. The lime silo and slaker system were replaced in 2008 and the powdered activated carbon (PAC) system was installed in late 2010. The PAC system was required to meet federal Stage 2 Disinfection Byproducts Rule (DBP) requirements.

Most of the E.M. Stickney WTP's concrete structures are over 35 years old. As such, the condition of the concrete is critical to the operational reliability of the plant. This is especially critical for the clear well and filter backwash well. If either of these structures fails, the plant would be out of service for an extended period of time while repairs are performed. It is important that the condition of the concrete in the facility's structures is assessed and a repair/replacement plan be produced for each structure.

Photograph 3.2 – E.M. Stickney WTP PAC Silo and Lime Silo

The PAC silo and the lime silo at E.M. Stickney are shown in Photograph 3.2. The single lime silo, although replaced in 2008, constitutes a large risk to the plant's continuous operation. A second lime silo and slaker should be installed to provide redundancy to this process. Further, most of the motor control centers (MCCs) at the facility are aging and are not in a controlled environment. Replacing these MCCs with modern, more energy efficient units, as well as installing heating, ventilation and air conditioning (HVAC) systems in the rooms where the units are located should reduce operational and maintenance costs, while improving the overall reliability of the facility's systems.

MAWWS performed a criticality assessment of the E.M. Stickney WTP that identified several areas, processes and structures requiring improvements to ensure the operation of the facility. The recommendations vary from installation of tags on valves, proper signage for equipment, to taking core samples of concrete in major structures for analysis.

These recommendations, some of which were also identified in last year's EAR, are listed below

- Installation of second lime silo and slaker for redundancy
- Perform geotechnical study of retaining walls of the 20 and 50 million gallon reservoirs
- Take concrete core samples on the reservoirs and basin walls
- Perform a resistivity (Ohm) test on the pump feeders to check for degradation
- Perform full load test of the generator using load bank
- Run a camera in the piping to inspect condition of pipes and valves
- Determine the availability of replacement parts for different systems at the plant and use this information to establish requirements for procuring spare parts
- Investigate the requirement for installing HVAC in rooms with electrical gear
- Modification of emergency bypass valve to sludge drain to prevent plant shut down in case of "fail open" during bypass operation
- Modification/replacement/reconfiguration of UPS power backup to RTU, SCADA and DCU systems to prevent total plant shutdown in case of, utility power, UPS and generator failure.
- Installation of duplicate chemical injection points
- Installation of duplicate sampling points in emergency bypass line

Although identified as deficiencies, some of the items mentioned above do not require immediate attention. An example being the "*modification of emergency bypass valve to sludge drain to prevent plant shut down in case of "fail open" during bypass operation".* This bypass operation is mostly used while pigging the pipe, which occurs every 5 to 6 years. The infrequency of this mode of operation and the planning that is required beforehand make this possibility of failure unlikely.

Some of the items identified above have already been addressed by MAWSS. Examples of items already addressed are the replacement and service contract for the UPS power backup for the RTU, SCADA and DCU systems.

In addition to the recommendations listed above, MAWSS has identified the Low Head Pump Station discharge header, which is shown in Photograph 3.3, as a deficiency. The current configuration of the header requires the complete pump station to be taken out of service for repairs. The proposed modification will include isolation valves to allow 50 percent of the pumps station to remain operational while under repairs. The modification will require the installation of two 42-inch valves in the discharge header to allow for isolation of the pump station such that it can be operated as two separate units. The location and size of the header/valves further complicates this project, which will need to be carefully planned and executed to prevent a lengthy shutdown of the facility.

Photograph 3.3 – E.M. Stickney WTP Low Head Discharge Manifold

Another identified concern is the reliability of the backup generators. The current generators have regular testing schedule and maintenance contract. However, the consensus from MAWSS personnel is that the generators are prone to failure when needed the most. Given the age of the units, it is suggested that MAWSS perform an evaluation of the units to determine the most efficient course of action to improve reliability of the units and the facility.

In addition to these two projects, MAWSS has identified the location of the chlorine dioxide injection point as a possible deficiency. The current location is near a bend and failure of this injection point would be difficult to repair in the current location. MAWSS should evaluate alternative locations for this injection point and determine the placement that would allow for ease of access for maintenance and provide redundancy of the injection point.

The H.E. Myers WTP was placed in operation in 1990 and is permitted at 30 mgd. MAWSS replaced the original lime slakers in 2008 and installed a PAC system in late 2010. As with the PAC system at the E.M. Stickney WTP, the PAC system was required to meet Stage 2 DBP requirements. No other major modifications have been undertaken at the H.E. Myers WTP.

The H.E. Myers WTP is 23 years old and, although well maintained, the useful life of the mechanical and electrical components is likely nearing the end of their useful life. Planning for the replacement of the original system components should be initiated or MAWSS will experience an elevated risk of shut-downs due to equipment failures. In addition, most of the motor control centers and drives are not in temperature/humidity controlled environments; increasing the possibility of failure. These conditions accentuate the need for MAWSS to utilize their existing asset management program to evaluate the condition of these assets and determine a convenient schedule for the renewal/replacement work that both reduces the yearly capital expenditures and minimizes downtime at the facility.

Photograph 3.4 – H.E. Myers WTP Clarifiers

Since last year's EAR, the H.E. Myers WTP personnel have increased efforts to install safety signage and improve the overall appearance of the facility. The fountains in front of the building have been repainted and the tile entrance is in the process of being replaced. In addition, a program to paint the mechanical components at the facility has been completed for all outside components. These activities not only improve the appearance of the facility, but also reduce damage from corrosion and extend the service life of the equipment.

Photograph 3.4 shows the clarifiers at the facility.

The H.E. Myers WTP has redundant components to all but one of their systems, the influent reservoir. However, the reservoir can be bypassed and the facility fed at a reduced rate from the 60-inch pipeline north of the facility. The amount of solids accumulated in the facility's influent reservoir is not closely monitored and removal is performed intermittently. MAWSS has established a plan to temporarily remove the reservoir from service to allow drainage, inspection and cleaning without affecting service to its customers. MAWSS has proactively addressed the potential for industrial customers receiving raw water to see a possible increase in suspended solids. Prior to beginning the plan, these industrial customers will have an opportunity to experience the temporary service that includes additional solids. If the customers have any problems, MAWSS will proceed in a different manner.

The influent pumps are located on the east end of the reservoir with the electrical components installed in a small wood enclosure next to the pumps. The enclosure has a small wall mounted HVAC unit to control temperature and humidity.

As with the E.M. Stickney WTP, MAWSS performed a criticality assessment at the H.E. Myers WTP facility. The analysis identified possible causes of failure at the facility and the impact of these failures to the facility. As part of the study, some recommendations of projects and/or short term improvements were provided. The recommendations vary from installation of tags on valves, proper signage for equipment, to taking core samples of concrete in major structures for analysis. These recommendations, some of which were also identified in last year's EAR, are listed below:

- Perform geotechnical study of retaining walls of the reservoir
- Take concrete core samples on the reservoirs and basin walls
- Perform a resistivity (Ohm) test on the pump feeders to check for degradation
- Perform full load test of the generator using load bank
- Run a camera in the piping to inspect condition of pipes and valves
- Determine the availability of replacement parts for different systems at the plant and use this information to establish requirements for procuring spare parts
- Investigate the condition of the roof above the clear well, particularly above the high service pumps
- Install FM-200 fire suppression in the switchgear room
- Investigate the requirement for installing HVAC in rooms with electrical gear
- Modify Raw Water Pump header arrangement to allow operation of the facility with valve failure
- Improve reliability/redundancy of solids removal conveyor belt
- Install a shelter for the exposed generator

Some of these recommendations can be implemented in-house and do not require capital improvement budget. An example of this is the "*improve reliability/redundancy of solids removal conveyor belt".* This item can be easily addressed by maintaining a small number of critical spare parts (motor, belt, roller, bearings) in stock. Failure of this unit does not immediately affect the operation of the facility, which would allow for repair/replacement of the unit.

Both water treatment plants utilize a PAC assisted flocculation-sedimentation-filtration process to treat water. The solids from the E.M. Stickney WTP are transferred through a 6-inch force main to the H.E. Myers WTP for processing with solids from that plant. Processed solids from the H.E. Myers WTP are dewatered with centrifuges for transportation to a construction and demolition (C&D) landfill. The permit for discharge at the C&D landfill is a 2-year permit that expires in May 2014. The centrifuges and their control system, installed in 1990, are outdated, inefficient and require substantial interaction from plant personnel for their operation because the control panels provide no feedback/control of the unit's operation. MAWSS is in the process of acquiring a new control panel for centrifuge number 1. This panel would allow for better operation of the unit. MAWSS plans to eventually replace all three control panels. However, MAWSS should await the results of the initial replacement before ordering the remaining panels to ensure the results obtained from the new control system are worth the investment.

Similar to E.M. Stickney, MAWSS is generally dissatisfied with the reliability of their backup generators. The generators are regularly tested and MAWSS has a maintenance contract for the units to ensure operational readiness in emergencies. However, the consensus from

MAWSS personnel is that the generators are prone to failure when needed the most. It is suggested that MAWSS perform an evaluation of the units to determine the most efficient course of action to improve reliability of the units and the facility.

Both plants are able to produce treated water that meets all current regulatory requirements. The 2012 Consumer Confidence Report was distributed to customers as required by the EPA and demonstrated that MAWSS met or exceeded all federal and state regulations for drinking water.

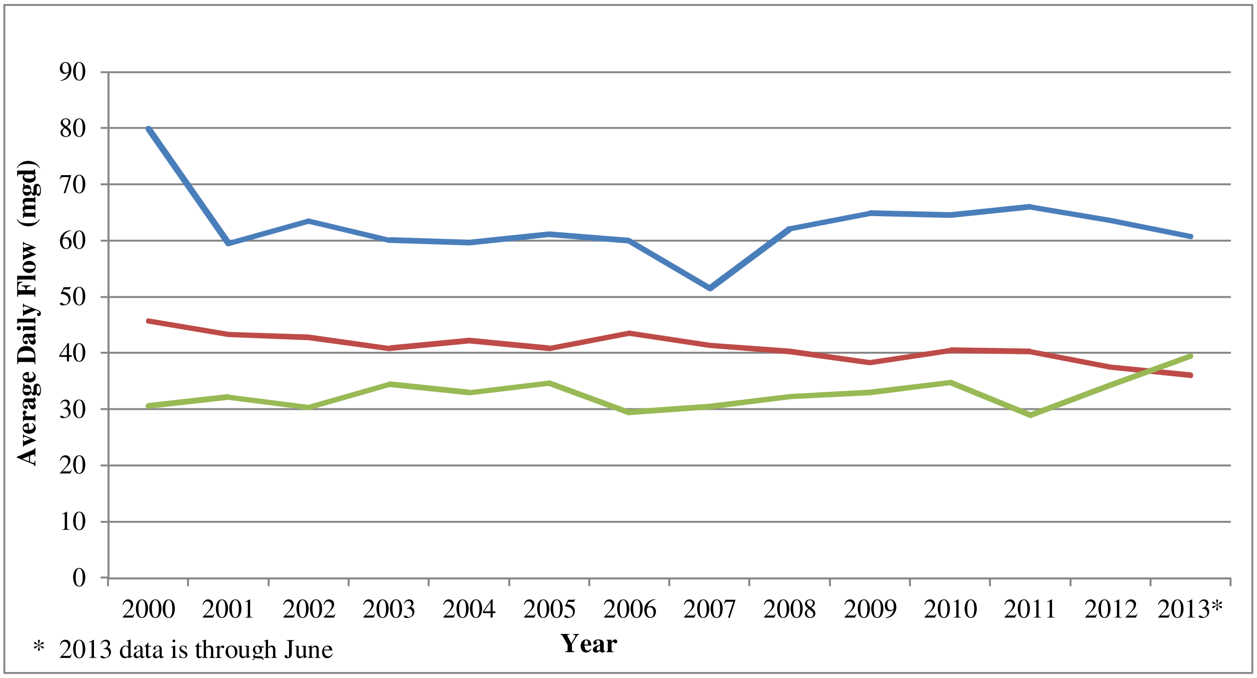
Table 3.1 lists the average monthly drinking water production rates for the E.M. Stickney and the H.E. Myers WTPs. Also shown in Table 3.1 is the peak daily water production rate for each month. Both plants are operating well below their permitted capacities.

TABLE 3.1 – Monthly Drinking Water Production Rates, Jan 2011 through Jun 2012

	E. M. Stickney WTP		H. E. Myers WTP	
Month	Average Daily Production	Peak Daily Production	Average Daily Production	Peak Daily Production
January 2011	26.90	32.88	9.94	10.96
February 2011	27.15	30.90	9.53	9.97
March 2011	28.79	32.19	9.59	10.16
April 2011	28.85	34.47	11.07	15.04
May 2011	29.95	37.44	15.67	17.23
June 2011	32.78	37.33	15.37	17.62
July 2011	28.98	36.79	13.18	17.14
August 2011	31.25	38.33	11.37	16.64
September 2011	29.40	35.94	11.55	12.15
October 2011	30.11	42.27	10.50	12.38
November 2011	25.22	29.09	11.39	11.99
December 2011	23.46	28.09	11.14	11.41
January 2012	23.71	28.20	11.21	13.10
February 2012	23.72	27.90	11.06	11.32
March 2012	24.21	28.16	10.98	11.27
April 2012	27.09	35.30	10.74	11.72
May 2012	27.72	32.89	13.72	16.50
June 2012	28.28	33.28	12.91	17.67
July 2012	27.14	33.44	12.50	17.36
August 2012	26.20	31.80	11.45	13.30
September 2012	28.36	33.29	11.14	11.62
October 2012	27.75	32.92	11.00	11.33
November 2012	26.51	28.92	10.72	11.27
December 2012	24.72	28.68	10.36	10.80
January 2013	23.15	28.82	10.91	11.57
February 2013	21.09	26.36	11.22	11.38
March 2013	21.93	26.59	12.82	15.93
April 2013	22.74	28.20	13.01	16.30
May 2013	26.73	32.22	12.51	17.05
June 2013	28.60	33.43	11.91	16.60

Figure 3.1 compares annual average daily flows for pumped water supply, treated water produced and treated wastewater flows since 2000. The pumped water supply includes water to the two treatment plants and industrial water. The treated water produced includes water treated by both the E.M. Stickney WTP and the H.E. Myers WTP. The treated wastewater flows includes wastewater treated by both the C.C. Williams WWTF and the Wright Smith WWTF, but not the three decentralized treatment plants due to the low flows treated by the decentralized plants.

FIGURE 3.1 – Average Daily Flows for Water Supply Pumped, Treated Drinking Water Produced and Wastewater Treated for 2000 through June 2013



3.3 Water Distribution System

The main distribution system totals approximately 1,500 miles of water distribution and transmission mains. In addition to the main distribution system, MAWSS operates the 3.6-mile College Woods distribution system as a separate system connected to the Saraland Water System. Treated water supplied to these customers is purchased from the Saraland Water System. The College Woods system serves the University of Mobile and one subdivision near the college for a total of just over 160 customers.

The main distribution system is connected to the City of Prichard and the Spanish Fort Water Systems, both of which, until the recent consolidation of the PWWSB with MAWSS, purchase treated water from MAWSS. There are also emergency connections to the Mobile County and the South Alabama Water Systems.

Table 3.2 summarizes the water distribution and transmission system by size. Roughly three-quarters of the system are 8-inch and smaller pipes with approximately 44 percent being 6-inch mains and nearly 20 percent 8-inch pipes. The largest pipe in the distribution system is a 60-inch pipe.

TABLE 3.2 – Water Main Distribution By Size

Size [1] (inches)	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	631	1.09%	24,317	4.6	0.30%	0.30%
0.75	78	0.13%	5,702	1.9	0.07%	0.37%
1.00	371	0.64%	19,570	3.7	0.24%	0.60%
1.25	74	0.13%	8,281	1.6	0.10%	0.71%
1.50	263	0.45%	15,702	3.0	0.19%	0.90%
2.00	3,920	6.75%	505,392	95.7	6.16%	7.05%
2.50	28	0.05%	1,960	0.4	0.02%	7.08%
3	301	0.52%	20,851	4.0	0.25%	7.33%
4	2,262	3.90%	311,869	59.1	3.80%	11.13%
6	27,864	47.98%	3,636,838	688.8	44.32%	55.45%
8	12,118	20.87%	1,601,285	303.3	19.51%	74.96%
10	2,461	4.24%	388,284	73.5	4.73%	79.69%
12	4,007	6.90%	669,866	126.9	8.16%	87.86%
14	12	0.02%	1,765	0.3	0.02%	87.88%
16	2,045	3.52%	429,513	81.4	5.23%	93.11%
18	42	0.07%	11,820	2.2	0.14%	93.26%
20	419	0.72%	97,247	18.4	1.19%	94.44%
24	575	0.99%	166,263	31.5	2.03%	96.47%
30	133	0.23%	55,805	10.6	0.68%	97.15%
36	349	0.60%	175,390	33.2	2.14%	99.28%
48	108	0.19%	57,797	11.0	0.70%	99.99%
60	11	0.02%	949	0.2	0.01%	100.00%
Totals	**58,072**	**100%**	**8,206,465**	**1,554**	**100%**	

[1] MAWSS GIS database query, July 2013. Data includes both the main distribution system and the College Woods distribution system.

Table 3.3 summarizes the water distribution and transmission mains by material. However, roughly 84 percent of the system does not have pipe material recorded in the GIS database, making the material distribution data of limited usefulness.

TABLE 3.3 – Water Main Distribution By Material

Material [1, 2]	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
C900	1,184	2.04%	175,110	33.16	2.13%	2.13%
CI	272	0.47%	56,360	10.67	0.69%	2.82%
CONC	473	0.81%	254,092	48.12	3.10%	5.92%
DI	4,314	7.43%	494,419	93.64	6.02%	11.94%
GALV	20	0.03%	3,012	0.57	0.04%	11.98%
HDPE	152	0.26%	31,800	6.02	0.39%	12.37%
PVC	2,530	4.36%	348,249	66.096	4.24%	16.61%
STEEL	2	0.00%	1,010	0.19	0.19%	16.62%
UNK	49,125	84.59%	6,842,413	1,295.91	83.38%	100.00%
Totals	**58,072**	**100%**	**8,206,465**	**1,554.25**	**100%**	

1 MAWSS GIS database query, July 2013. Data includes both the main distribution system and the College Woods distribution system.

2 The pipe material categories are: C900 = Class 900 PVC; CI = cast iron; CONC = concrete; DI = ductile iron; GALV = galvanized; HDPE = high density polyethylene; and PVC = polyvinyl chloride.

Table 3.4 summarizes the water distribution and transmission mains by age. Nearly 80 percent of the water distribution mains do not have an age recorded in the GIS, which limits the usefulness of the age distribution data. It is presumed that many of these mains are the older pipes in the system. Based on staff knowledge of the system, approximately 400 of these miles of these mains are in excess of 40 years old. The newest mains are located in the western part of the service area.

TABLE 3.4 – Water Main Distribution By Age

Age Range	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	44,883	77.29%	6,503,287	1,231.68	79.25%	79.25%
≤ 10 Years	3,357	5.78%	437,853	82.93	5.34%	84.58%
11 to ≤ 20 Years	6,697	11.53%	772,298	146.27	9.41%	93.99%
21 to ≤ 30 Years	2,688	4.63%	408,029	77.28	4.97%	98.96%
31 to ≤ 40 Years	363	0.63%	70,782	13.41	0.86%	99.83%
41 to ≤ 50 Years	77	0.13%	12,000	2.27	0.15%	99.97%
Over 50 Years	7	0.01%	2,216	0.42	0.03%	100.00%
Totals	**58,072**	**100%**	**8,206,465**	**1,554.25**	**100%**	

1 MAWSS GIS database query, July 2013. Data includes both the main distribution system and the College Woods distribution system.

Water storage facilities within the distribution system include:

- Six reservoirs
    - Bienville Reservoir – 10 mg earthen
    - East Reservoirs – two 5 mg each concrete
    - Springhill Reservoir – 10 mg earthen
    - Hillcrest Reservoirs – two 5 mg each concrete
- Nine storage tanks
    - Mississippi Street – 0.5 mg
    - Moffett-Schillinger – 0.5 mg
    - Fairground – 1 mg
    - Adobe Ridge – 1 mg
    - Johnson Road – 0.5 mg
    - Cottage Hill – 0.5 mg
    - Springhill – 2 mg
    - Grelot Road – 2 mg
    - Island Road – 1 mg
- Thirteen booster pump stations
    - Moffett Road
    - Mississippi Street
    - Old Shell Road
    - Springhill
    - Cottage Hill Road
    - Hillcrest Road
    - Grelot Booster Station
    - Snow Road
    - Airport Snow Road
    - Johnson Road
    - Island Road
    - Bear Fork Road
    - Schillinger Road

Photograph 3.5 – Mississippi Street Storage Tank

Photograph 3.5 shows the Mississippi Street Storage Tank.

The storage facilities and booster stations are monitored by a two-person crew, which visits every installation weekly. More detailed inspections are performed on a monthly basis, and include testing of the generators, automated equipment, valves, etc. Most of the work done to these assets is covered under the CIP annual budgets for booster pumps station rehabilitation and water tank renovation budget. However, other projects have been identified that do not fit under the current budgets. An example is the replacement of the backup generator for the Airport Snow Road booster station. These projects need to be identified separately from the annual allowance to prevent compromising the quality of the annual work due to insufficient budget.

MAWSS has funded three projects identified in last year's EAR (conversion 48-inch raw water main/30-inch connector, water main improvements at Craft Highway/Springhill area and abandoning the Springhill Reservoir) to reduce the water age in the system and further improve water quality within the distribution system. Because these projects are already funded, they have been removed from the CIP list. However, MAWSS has identified new projects aimed to improve capacity reliability and level of service which have been added to the CIP list.

Some of these newly added projects are:

- Second phase of Spanish Fort deep causeway water main installation
- 12-inch Snow Road connection
- Hinson Avenue Extension/Booster station (part of the Pritchard initiative)

The CIP project listing in Appendix A of this EAR also includes a number of capitalized projects with an "annual" project authorization priority. These annual CIP projects are included in the EAR to emphasize the need for on-going asset rehabilitation or replacement, particularly for those "out-of-sight" and "out-of-mind" underground assets. Rehabilitation and renewal, collectively termed renewal, is needed to maximize the effective life of infrastructure assets. As explained in more detail in Section 4 of this EAR, annual renewal "targets" have been calculated based on asset valuation calculations (in capital dollars required to replace each asset) and predicted asset life (in years for each type of asset category). It is important for utilities to continually renew assets to maximize the useful life of those assets. Failure to fund annual renewal can result in premature or catastrophic asset failure. Not only do such failures disrupt service to customers those failures are typically more expensive to address in an emergency, reactive manner than to have addressed the problem prior to failure.

In reality, the annual renewal costs for each type of asset category will vary from year-to-year depending on which assets are renewed. If a particular asset renewal is more expensive than the average asset in that category, such as when a large elevated storage tank is repainted, a specific CIP project is generally defined for that year rather than expend the entire annual renewal budget on one project.

3.4 Wastewater Treatment Plants

MAWSS operates two main wastewater treatment facilities, the C.C. Williams WWTF and the Wright Smith WWTF, and three decentralized wastewater treatment facilities, the Copeland Island, Hutchens and Snow Road Decentralized Wastewater Treatment Facilities (DWWTFs). The decentralized plants discharge effluent using subsurface irrigation or underground injection facilities rather than discharging effluent to receiving streams as used in conventional treatment facilities such as the C.C. Williams and Wright Smith WWTFs.

Table 3.5 summarizes the key features for each treatment plant.

TABLE 3.5 – Wastewater Treatment Plant Summary

Parameter [1]	C.C. Williams	Wright Smith	Copeland Island	Hutchens	Snow Road
Permit	AL0023086	AL0023094	Class V Under-ground Injection	Class V Under-ground Injection	Class V Under-ground Injection
Original Construction Year	1957	1947	2000	2000	2002
ADF Permit Capacity (mgd)	28	12.8	0.170	0.030	0.120
Constructed Capacity (mgd)	28 [2]	12.8	0.050	0.050 [3]	0.020
CY 2012 ADF [4] (mgd)	22.79	10.58	0.042	0.028	0.005
Maximum Daily Flow Rate for CY 2012 [4] (mgd)	71.99 [45]	37.61 [6]	0.069	0.070	0.017
Disposal Method	Mobile River	Three Mile Creek [7]	Rock Infiltration Beds	Drain Field Lines	Vegetated Rock Beds
Effluent Permit Limits	30 mg/l BOD_5 30 mg/l TSS 30 mg/l NH_3N	20 mg/l BOD_5 30 mg/l TSS 5 mg/l NH_3N 5 mg/l DO	No surface dis-charge	No surface dis-charge	No surface dis-charge

1 ADF = Average Daily Flow; BOD = Biochemical Oxygen Demand; TSS = Total Suspended Solids; NH_3N = Ammonia Nitrogen; DO = Dissolved Oxygen; mg/l = milligrams per liter.

2 Primary clarifiers limiting process at approximately 16 mgd; however, other plant processes are able to compensate for the under-performing primary clarifiers and process much larger peak flows as long as those larger peaks are not sustained period peaks.

3 Constructed treatment capacity. The installed disposal system capacity remained at 0.030 mgd.

4 Values shown are for effluent flows.

5 June 10, 2012

6 March 12, 2012.

7 The Wright Smith WWTF cannot achieve the more stringent effluent limitations at the Three Mile Creek discharge point, which are carbonaceous biochemical oxygen demand ($CBOD_5$) limit of 1.75 mg/l summer and 1.40 mg/l winter and an ammonia nitrogen limit of 0.22 mg/l summer and 0.18 mg/l winter. Efforts to complete the 30 mgd effluent pump station and force main to the Mobile River should be complete by the end of the year. This new discharge location will change the effluent permit limits for the facility.

The C.C. Williams WWTF is high purity oxygen (HPO) activated sludge treatment plant located on McDuffie Island. The plant treats approximately 70 percent of the centralized collection system flow. Most of the flow to the plant comes through the Halls Mill/Eslava Creek Force Main, which joins the Virginia Street Force Main at the plant site. A summary of conditions at the C.C. Williams WWTF based on findings from the 2013 EAR are included in Subsection 3.4.1 below.

The Wright Smith WWTF is the second of the centralized wastewater treatment plants operated by MAWSS. The facility, originally constructed in 1947, with expansion/renovation/improvement work done in 1986, currently discharges to the Three Mile Creek. The plant treats approximately 30 percent of the centralized collection system flow. A summary of conditions at the Wright Smith WWTF based on findings from the 2013 EAR are included in Subsection 3.4.2 below.

Even though both centralized plants treat wet weather flows at rates exceeding permitted capacity for limited periods of time, each plant has been able to achieve treatment levels that meet or exceed effluent permit limitations for a number of years. The C.C. Williams WWTF is in the 11^{th} year of continuous compliance and the Wright Smith WWTF is in the 9^{th} year of continuous compliance.

The C.C. Williams WWTF is currently operating under the conditions of the 2011 NPDES permit that does not expire until November 30, 2015. As part of the improvements plans and to ensure service to their customers, MAWSS commissioned a master plan for the C.C. Williams WWTF to determine possible treatment options for the future 25-year planning horizon for the facility. The master plan will include a process capacity evaluation, a hydraulic capacity evaluation, a condition assessment to identify capacity deficiencies, and subsequent recommendations for rehabilitation projects. The master plan will provide a recommended alternative, split into multiple projects as reasonable, to stage the treatment plant modification/expansion projects based on plant influent flow and loading triggers anticipated within the 25-year planning horizon.

This master plan will not be completed in time for its results to be included in this report. A preliminary budget for the replacement of the headworks, primary clarifiers and other items identified by the master plan are included in the CIP list in Appendix A of this 2013 EAR. Future EARs should adjust the CIP list and associated budget based on the results and recommendations of the C.C. Williams WWTF master planning activities.

The Wright Smith WWTF has yet to be issued a new permit from ADEM. However, the draft permit included a carbonaceous biochemical oxygen demand ($CBOD_5$) limit of 1.75 mg/l summer and 1.40 mg/l winter and an ammonia nitrogen limit of 0.22 mg/l summer and 0.18 mg/l winter for continued discharge to Three Mile Creek. The Wright Smith WWTF cannot achieve these more stringent effluent limitations. Because of this, MAWSS decided to build a pump station to transfer the effluent discharge point from the Three Mile Creek to the Mobile River. The construction of the Wright Smith WWTF effluent pump station and pipeline is currently expected to be completed by the end of this year. This pump station will allow for the discharge of the treated wastewater to the Mobile River, which has less stringent effluent discharge permit.

ADEM is allowing the Wright Smith WWTF to operate under the previous permit effluent discharge limits and is continuing to allow discharge to Three Mile Creek while the new pump station is under construction.

In addition to the two centralized plants, MAWSS operates three decentralized wastewater treatment facilities (DWWTFs). In recent years, improvements to the facilities and flow diversion have continued the record of meeting the regulatory requirements for effluent discharge. These plants are discussed in more detail in Section 3.5 below.

3.4.1 C.C. Williams WWTF Condition

The C.C. Williams WWTF continues to operate and meet regulatory requirements for effluent discharge, with improvements to some of the auxiliary equipment/processes and expected deterioration to others. The odor control system for the headworks structure that had not been operating during the 2012 EAR site visit was operational for the 2013 EAR site visit. The bar screens at the headworks continue operation with uneven spacing of the vertical bars, reducing their effectiveness. The corrosion of concrete by gas release from the wastewater is distinct and has not shown any improvements from the 2012 site visit. The grit facility's classifier/washer units show several signs of corrosion and the current configuration (with the motor and units hanging from the side of the structure) will be difficult to repair.

The concrete structure shows significant (in some cases extensive) corrosion and concerns of structural failure are mounting. Some of the concrete beams between channels have lost significant amount of material and appear to be unsafe. The primary clarifiers, installed in 1957, are rated for 16 mgd, which is 57 percent of the permitted plant capacity. Therefore, these units are overloaded and their effectiveness limited. The units include a pre-aeration chamber and two rectangular chain and flight solids removal units. Air is provided by redundant blowers, which are both in operation. The chain and flight sludge removal units show significant corrosion and require significant maintenance work to be kept in service. The motors and gear boxes for these units have been recently painted in an effort to limit the damage by corrosion to the units. The corrosion damage to the concrete in the primary clarifiers, as illustrated in Photograph 3.6, is likely the number one concern on the daily operation of the plant.

Photograph 3.6 – Primary Clarifiers at C.C. Williams WWTF

The four HPO reactors, including the two oxygen generators, appear to be in good condition, although there is one mixer (out of 4) out of service in reactor #4. At higher flows, the facility requires all four units in service in order to treat the wastewater, so no redundancy is available. A single oxygen generator has enough capacity to provide high purity oxygen to two reactors. Therefore, liquid oxygen is kept onsite as a redundancy. Scheduled inspections of the HPOs have allowed MAWSS to schedule repairs in a more proactive manner, thus minimizing failures and controlling the maintenance costs. In recent months one of the two air compressors (compressor #2) that allow the operation of pneumatic control valves for the oxygen generation systems had a catastrophic failure and will need to be replaced. The compressor had surpassed the expected useful life and current plans are to purchase a new compressor from a manufacturer that would allow the unit to be returned if the compressor cannot be utilized in the facility proposed in the master plan. The intermediate pumping station (five pumps total), although not typical of wastewater facilities of this size, operates consistently. The plant's standard maintenance schedule includes removal and repair of one pump each year. There is a significant amount of foaming in this structure, but no issues have been reported by MAWSS personnel.

The four secondary clarifiers are in good condition. MAWSS has replaced the sludge baffles on three clarifiers to improve effluent quality. During the site visit, there was concrete corrosion visible on the effluent launders. This is not typical of wastewater facilities and is a concern. Initial conversations with MAWSS attributed this corrosion to the coal dust from the nearby port. This item should be discussed in the master plan to determine a course of corrective action.

Disinfection of the treated wastewater is provided in two chlorine contact chambers. These chambers sufficient retention time for treatment and multiple injection points allow for significant redundancy if a unit needs to be placed offline.

The residual sludge from the biological process is treated onsite using two thickening centrifuges, three primary and two secondary anaerobic digesters, and two dewatering centrifuges plus a dewatering screw press that was installed in 2011. The Class B sludge produced by the facility is land applied by a third party. At the time of the site visits, one thickening and one dewatering centrifuge were out of service. MAWSS personnel indicated that this is typical due to the amount of sand in the wastewater that causes excessive abrasion wear on the scroll and bowl.

Photograph 3.7 – Digester Wall at C.C. Williams WWTF

The 2012 EAR noted deterioration of the brick veneer, including a large section which fell off of primary digester P3. In addition, the steel roof for the secondary digester S2 showed significant corrosion damage. MAWSS hired a demolition contractor to remove the brick veneer of all the primary clarifiers. The project was completed shortly before the site visits for this 2013 EAR. A cursory inspection of the clarifier walls showed several of what appear to be cold joints and in some areas, liquid is leaking from the walls. The leakage should be further evaluated to determine the source of this liquid and ensure that the digesters are sound. In addition, MAWSS was in the process of removing the steel roof for digester S2 to determine the extent of the corrosion damage. Photograph 3.7 shows some of the digester wall damage.

Gas production from the anaerobic digesters is significantly lower than expected from a plant of this size. Therefore, the produced gas is only used for mixing the digesters and no power is generated from the digester gas. Determining the reason for the lack of gas production can result in significant savings to the operation of the facility.

The electrical systems at the C.C. Williams WWTF show significant deterioration. Most of the electrical control centers are in buildings without a controlled environment, exposing them to high humidity, temperatures and the overall harsh environment of a wastewater plant. Arc flashing incidents in 2011 and 2012 exemplifies these conditions. The list of projects in the 2013 EAR for the C.C. Williams WWTF does not include projects that may be recommended by the on-going Master Plan beyond previously identified projects. The final report will include a more detailed list of projects that should be included in the 2014 EAR report.

3.4.2 Wright Smith WWTF Condition

The Wright Smith WWTF had significant repairs during the last year. Tornado damage required the replacement of the roof in the control building. The denitirification filter distribution arms required emergency replacement. In addition, portions of the underdrain for the trickling filters had to be replaced. The trickling filters are shown in Photograph 3.8.

Photograph 3.8 – Wright Smith WWTF Trickling Filters

The failure of these two unit processes caused three excursions of the plant effluent permit. These excursions were promptly reported to ADEM and the agency determined that MAWSS had acted promptly and did not assign any fines or violations. This is a prime example of the need to prioritize the capital projects for MAWSS. Both the denitrification filter arms and the trickling filter underdrains were identified in the 2012 EAR project needs list (the denitrification filter arms were classified as a Priority 1), but were not included in the capital improvements project budget.

The Wright Smith facility has two 15-mgd capacity climber screens (½- inch openings). From the screens the wastewater enters a pre-aeration tank with three blowers. From this tank, the wastewater enters the influent pump station, which includes four dry pit pumps and a fifth pump, with the motor located above on the top floor of the structure (along with the electrical junction boxes for the other four pumps) in case of flooding. The flow is directed to one of four primary clarifiers. The supernatant from the primary clarifiers flows by gravity to one of two trickling filters.

From the trickling filters, the water flows to one of two secondary clarifiers. The supernatant from the clarifiers is pumped using a secondary pump station to one of two denitrification filters (including four recirculation pumps). There is corrosion in the conduits for the secondary pumps, including two conduits with openings large enough to allow water to enter the electrical system. These conduits should be repaired to prevent a malfunction of the intermediate pumps. The filtered water enters a post aeration tank with two redundant blowers before entering one of two chlorine contact chambers for final disinfection.

The residuals from the facility are directed to two primary anaerobic digesters or a single secondary anaerobic digester. As with the C.C Williams WWTF, the digester gas is used for mixing and no energy is generated. Gas leakage was observed on the roof of one of the digesters during the site visit. The residuals from the digesters are directed to a gravity thickener, where the Class B is concentrated to about 4 to 5 percent solids before being disposed offsite via land application.

The Wright Smith WWTF plant is in considerably better condition than the C.C. Williams WWTF. The major concern with the Wright Smith WWTF is the age of some of the concrete structures. The structures built in the original facility are nearing 65 years of age. As such, careful inspection of these structures should be scheduled. Because of the emergency work done the past year addressed most of the deficiencies identified at the facility, compliance with the effluent permit is the major concern for the facility. However, the completion of the effluent pump station and force main should ease these concerns.

MAWSS operates a grease treatment facility at the Wright Smith WWTF as shown in Photograph 3.9. The $2 million facility processes grease trap waste from restaurants. The facility has been in operation consistently since February 10, 2012, but has been unable to treat the volume necessary to meet demand, nor operate within the revenue generated by tipping fees. MAWSS commissioned a study to evaluate the facility, (configuration and operation), survey the practices of other facilities using similar technology, investigate the practices and trends within the broader municipal wastewater industry, and to provide recommendations on how to improve the operation of the fa-

Photograph 3.9 – Grease Facility Storage Tanks

cility. The resulting report, *Review of the Wright Smith WWTF Grease Treatment Facility,* GreenPoint Engineering, January 2013, concluded that the facility does not meet MAWSS' capacity and cost requirements and its current operating costs, although varying greatly, are higher than its tipping costs. Recommended improvements to the facility, which included lime addition and mixing system improvements, had a conceptual-level, capital cost of $784,000. With municipal wastewater treatment industry trends toward utilizing anaerobically digestion of grease trap waste at a lower conceptual cost estimate of $353,000, the recommended alternative in the report was to implement anaerobic digestion of grease trap waste.

To further reduce operational costs at the Wright Smith Facility, MAWSS should evaluate the conversion of the area currently utilized for the grease facility to a dewatering facility, which would considerably reduce the amount of residuals disposed of via land application.

3.4.3 Biosolids Facilities

Biosolids from the two centralized plants are treated to meet EPA's Class B land application requirements rather than to the more stringent Class A requirements. Class B biosolids have more regulatory restrictions on final disposal since the biosolids have potentially higher pathogen content. Biosolids from the C.C. Williams WWTF are land applied as a cake. Biosolids from the Wright Smith WWTF are land applied as a liquid. Contract vendors are used for the biosolids transportation and land application activities. The land application sites are privately-owned farm fields in Mobile County.

MAWSS is still in litigation, along with a land owner and the residuals disposal company, regarding the application of the Class B biosolids. Resolution of this lawsuit could have implications for the costs associated with future land disposal and could require MAWSS to convert to dispose of their residuals via landfill application or Class A biosolids processing options. Conversion to Class A biosolids would require a substantial CIP investment that could exceed $10 million. This expenditure is not included in the CIP projects in Appendix A for the 2013 EAR.

3.5 Decentralized Wastewater Treatment Facilities

The MAWSS decentralized facilities, the Copeland Island DWWTF, the Hutchens DWWTF and the Snow Road DWWTF, treat wastewater from small systems not connected to the main sewer collection system. Effluent from decentralized facilities is disposed of using Class V underground injection wells. Each DWWTF has an independent collection system for each area served, serving a small number of costumers. Recent capital improvement projects at the three decentralized plants have improved treatment capabilities at each of the three plants. The DWWTFs are all now operating well below permitted capacity and are meeting permit requirements.

The Copeland Island DWWTF serves the Copeland Island Subdivision located west of Grand Bay-Wilmer Road on Tom Gaston Road. The facility has been modified several times to replace filtration beds, and biological process systems. The latest modification was completed in May of 2012, when treatment pods similar to those installed at Snow Road DWWTF were installed in Copeland Island in order to utilize a more consistent system for the decentralized facilities. The existing permit for Copeland Island DWWTF is for 170,000 gallons per day (gpd) and expires January 8, 2017. As previously noted in Table 3.5, the plant has a treatment capacity of 50,000 gpd and is treating a 2011 average of 42,000 gpd with a maximum daily flow of 69,000 gpd. The Copeland Island DWWTF is currently meeting permit requirements, but the flow is approaching installed treatment capacity. An evaluation of expanding the facility's capacity should be performed to better understand growth in the service area and establish a plan of action for expansion of the facility or diversion of the flows to another facility.

The Hutchens DWWTF has provided service for the Nora Mae Hutchens Elementary School since the year 2000. New wastewater treatment pods were installed by MAWSS crews in 2009 to increase the design treatment capacity to 50,000 gpd, but the disposal system continues to utilize an array of field lines with a capacity of 30,000 gpd. The current permitted capacity is 30,000 gpd and expires on January 8, 2017. A force main completed in 2009 diverted a portion of the service area flow away from Hutchens to reduce the average daily flows (ADFs) to less than 30,000 gpd. As noted in Table 3.5, the 2011 flow was 28,000 gpd with a maximum daily flow of 70,000 gpd. The Hutchens DWWTF is currently meeting permit requirements. Expansion of the disposal field at the Hutchens DWWTF would allow use of the full capacity of the facility.

Photograph 3.10 – Snow Road DWWTF

The Snow Road DWWTF, as shown in Photograph 3.10, is the newest of the three facilities. Originally constructed in 2002, it serves the Elsie Collier Elementary School. The Snow Road DWWTF has fiberglass pods filled with an engineered textile filter material. The on-site disposal system at Snow Road consists of vegetated rock beds. The constructed capacity is 20,000 gpd with a 2011 ADF of 5,000 gpd and a maximum daily flow of 17,000 gpd as noted in Table 3.5. No upgrades have been performed to this facility. The current permitted capacity is 120,000 gpd and the permit expires August 1, 2016. An effluent permit excursion for nitrogen was reported in February of 2013 at the Snow Road facility. No fine or violation was assigned by ADEM.

3.6 <u>Sewer Collection System</u>

The MAWSS sewer collection system extends over approximately 205 square miles and consists of approximately 1,250 miles of sewer lines serving the centralized plants. The service areas serving the decentralized plants tend to be small with only a limited number of customers connected to each decentralized plant.

Table 3.6 summarizes the gravity sewers by size. Roughly 83 percent of the system is 8-inch diameter pipe and the largest sewer in the system is 54-inch diameter pipe. With so much of the system being 8-inch or smaller diameter pipe, there is a limited amount of excess capacity available to convey peak flows during wet weather events.

TABLE 3.6 – Gravity Sewer Distribution By Size

Size [1] (inches)	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	90	0.30%	10,804	2.1	0.16%	0.16%
4	5	0.02%	397	0.1	0.01%	0.17%
6	492	1.64%	64,795	12.3	0.98%	1.15%
7	1	0.00%	71	0.0	0.00%	1.15%
8	25,015	83.37%	5,492,656	1,040.3	83.10%	84.25%
10	1,342	4.47%	305,710	57.9	4.63%	88.87%
11	1	0.00%	7	0.0	0.00%	88.87%
12	823	2.74%	188,610	35.7	2.85%	91.73%
14	23	0.08%	8,690	1.7	0.13%	91.86%
15	467	1.56%	108,054	20.5	1.63%	93.49%
16	119	0.40%	25,514	4.8	0.39%	93.88%
18	649	2.16%	152,376	28.9	2.31%	96.18%
20	40	0.13%	11,258	2.1	0.17%	96.35%
21	8	0.03%	2,145	0.4	0.03%	96.39%
24	332	1.11%	84,331	16.0	1.28%	97.66%
26	2	0.01%	329	0.1	0.00%	97.67%
27	11	0.04%	2,756	0.5	0.04%	97.71%
29	1	0.00%	154	0.0	0.00%	97.71%
30	163	0.54%	40,958	7.8	0.62%	98.33%
36	247	0.82%	60,937	11.5	0.92%	99.25%
42	78	0.26%	23,530	4.5	0.36%	99.61%
48	81	0.27%	22,480	4.3	0.34%	99.95%
54	15	0.05%	3,327	0.6	0.05%	100.00%
Totals	**30,005**	**100%**	**6,609,889**	**1,252**	**100%**	

[1] MAWSS GIS database query, July 2013.

Table 3.7 summarizes the gravity sewers by material. As noted in Table 3.7, the largest amount of pipe material, at approximately 56 percent, is vitrified clay pipe. The next largest pipe types are cured-in-place and PVC pipe at 17 and15 percent, respectively. Cured-in-place pipe is indicative of pipe that has been rehabilitated to extend the useful life of the originally installed pipe material. PVC pipe was first installed in about the 1970s and has become increasingly popular due to the ease of installation and resistance to corrosion.

TABLE 3.7 – Gravity Sewer Distribution By Material

Material [1]	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	10	0.03%	945	0.2	0.01%	0.01%
Cast Iron	112	0.37%	17,007	3.2	0.26%	0.27%
Cured In Place Pipe	4,550	15.16%	1,113,360	210.9	16.85%	17.12%
Concrete	309	1.03%	75,099	14.2	1.14%	18.25%
Ductile Iron	2,818	9.39%	516,680	97.9	7.82%	26.07%
Fiberglass Reinforced Pipe	16	0.05%	5,890	1.1	0.09%	26.16%
High Density Polyethylene	171	0.57%	50,048	9.5	0.76%	26.92%
Iron	13	0.04%	2,101	0.4	0.03%	26.95%
Polyvinyl Chloride	4,752	15.84%	1,020,771	193.3	15.45%	42.40%
Reinforced Concrete Pipe	6	0.02%	1,751	0.3	0.03%	42.42%
Steel	2	0.01%	185	0.0	0.00%	42.42%
T-Lock	116	0.39%	30,479	5.8	0.46%	42.89%
Various Materials	315	1.05%	82,345	15.6	1.25%	44.13%
Vitrified Clay Pipe	16,815	56.04%	3,693,229	699.5	55.88%	100.01%
Totals	**30,006**	**100%**	**6,610,155**	**1,252**	**100%**	

[1] MAWSS GIS database query, July 2013.

Concrete pipe is susceptible to failure due to hydrogen sulfide corrosion. Much of the existing concrete pipe is in a deteriorated state and needs rehabilitation.

The cost to install a cured-in-place-pipe (CIPP) lining on 16-inch and larger diameter concrete pipe is about $24.2 million at today's costs. At $1.5 million per year, it will take nearly 16 years to line the pipe.

The cost to install CIPP linings on 15-inch and smaller diameter concrete pipe is about $800,000 at today's costs. Typically, four percent or less of the small diameter pipe rehabilitation budget of $1 million is spent on rehabilitating small diameter concrete pipe each year. At this rate, it will take 20 years to CIPP all small diameter concrete pipe.

At these rehabilitation rates, there is an increased risk of concrete pipe failing before it can be rehabilitated. Accelerated funding is needed for both large and small diameter concrete pipe to ensure continued useful life of the existing concrete pipe.

Table 3.8 summarizes the gravity sewers by age. There is a significant amount, roughly 44 percent by length, of sewers of unknown age, which limits the usefulness of the age distribution data. Virtually none of the system is known to be in the 31 to 40 year category and none is shown any older than 40 years, but it is suspected that at least 50 percent of the system is at least 40 years of age.

TABLE 3.8 – Gravity Sewer Distribution By Age

Age Range [1]	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	23,752	79.16%	5,263,894	997	44.26%	44.26%
≥ 40 Years	555	1.85%	5,410,583	1025	45.49%	89.75%
31 to ≤ 40 Years	489	1.63%	98,562	19	0.83%	90.58%
21 to ≤ 30 Years	915	3.05%	196,511	37	1.65%	92.23%
11 to ≤ 20 Years	3,043	10.14%	675,081	128	5.68%	97.91%
≤ 10 Years	1,251	4.17%	248,832	47	2.09%	100.00%
Totals	**30,005**	**100%**	**11,893,462**	**2,253**	**100%**	

1 MAWSS GIS database query, July 2013.

Although not shown in table format in this EAR, MAWSS also tracks gravity sewers located in easements in the GIS database. Approximately 85 percent of the gravity sewers are located in street rights-of-way and 15 percent are located in easements.

The MAWSS sewer collection system also includes 188 lift stations, two SWAT tanks and chemical treatment facilities to transport wastewater within the service area. Of the 188 lift stations, 42 have auxiliary power by generators and 40 have diesel backup pumps. Nine of the lift stations include chemical treatment to reduce odors and corrosion in the pipeline. Lift Stations 031, Dog River Drive, and 074, Riviera Du Chien, are shown in Photographs 3.11[2] and 3.12[3], respectively.

Photograph 3.11 – LS031 Dog River Drive

Photograph 3.12 – LS074 Riviera Du Chien

During last year's EAR, it was identified the MAWSS had targeted all lift stations with connected horsepower above 15-hp to be retrofitted with emergency backup, being either a generator or diesel pump. This program was completed during 2012-2013.

As part of the goal to be a world class utility, MAWSS personnel are identifying what are con-

2 Photograph courtesy of Terrence Herman, MAWSS.

3 Photograph courtesy of Terrance Herman, MAWSS

sidered “critical” lift stations below the 15-hp threshold for retrofit with backup capabilities (generator or diesel pump). A modest budget of $60,000 has been established for this program. However, it is conceivable that after these lift stations have been identified; the budget would be increased to accommodate the work required in a timely manner.

In 2002 MAWSS initiated a phased lift station rehabilitation program to improve the operation, ease of maintenance and operational efficiency of the lift stations. Approximately 50 lift stations were renovated by external contractors under this program between 2009 and 2010, when it was postponed due to budget constraints. A phased lift station rehabilitation program has been in place since to 2011 to improve the operation, ease of maintenance and operational efficiency of the lift stations. Under this program, MAWSS has rehabilitated 20 lift stations with “in-house” forces.

Recently, MAWSS received the final technical memorandum on an investigation of the Belsaw collection area to determine the cause sanitary sewer overflows and surcharged conditions in this area. The report determined that the connection between the Belsaw area gravity sewer main and the Three Mile Creek interceptor, as well as the shallow slopes in the area (due to flat terrain) “significantly limit’s the transport capacity of the Belsaw Area Sewer”. The memorandum recommended the installation of a new lift station in this area to replace the depressed gravity sewer from Belsaw Area Sewer to the Three Mile Creek Interceptor. This cost for this project has been identified and is included in Appendix A-10.

The force mains associated with the MAWSS lift stations are summarized by size in **Table 3.9**. As noted in Table 3.9, there is a considerable portion, approximately 37 percent, of the force main system 4-inches or less in diameter. Smaller diameter force mains can be difficult to maintain.

TABLE 3.9 – Force Main Distribution By Size

Size [1] (inches)	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	60	2.82%	27,043	5.1	2.39%	2.39%
1.25	18	0.85%	3,790	0.7	0.34%	2.73%
1.50	16	0.75%	3,722	0.7	0.33%	3.06%
2	319	15.00%	98,259	18.6	8.70%	11.76%
2.50	63	2.96%	22,376	4.2	1.98%	13.74%
3	349	16.41%	124,493	23.6	11.02%	24.76%
4	423	19.89%	169,714	32.1	15.02%	39.78%
6	426	20.03%	307,810	58.3	27.25%	67.02%
8	177	8.32%	139,663	26.5	12.36%	79.39%
10	43	2.02%	55,692	10.6	4.93%	84.32%
12	21	0.99%	25,530	4.8	2.26%	86.57%
16	34	1.60%	23,932	4.5	2.12%	88.69%
18	116	5.45%	77,915	14.8	6.90%	95.59%
36	42	1.97%	23,630	4.5	2.09%	97.68%
48	20	0.94%	26,196	5.0	2.32%	100.00%
Totals	**2,127**	**100%**	**1,129,7655**	**214.0**	**100%**	

[1] MAWSS GIS database query, July 2013.

Table 3.10 summarizes the force mains by material. The most common force main material, at 44 percent, is PVC pipe. It is suspected that the two segments of vitrified clay pipe shown in the GIS to be force main was a data error and is actually gravity sewer pipe rather than force main pipe.

TABLE 3.10 – Force Main Distribution By Material

Material [1]	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	266	12.51%	179,259	34.0	15.87%	15.87%
C900	32	1.50%	35,304	6.7	3.12%	18.99%
Cast Iron	35	1.65%	70,713	13.4	6.26%	25.25%
Concrete	24	1.13%	33,967	6.4	3.01%	28.26%
Ductile Iron	348	16.36%	140,006	26.5	12.39%	40.65%
High Density Polyethylene	411	19.32%	196,164	37.2	17.36%	58.01%
Polyvinyl Chloride	981	46.12%	466,395	88.3	41.28%	99.30%
SCHD 40	26	1.22%	4,739	0.9	0.42%	99.72%
Various	2	0.09%	320	0.1	0.03%	99.74%
Vitrified Clay Pipe	2	0.09%	2,896	0.6	0.26%	100.00%
Totals	**2,127**	**100%**	**1,129,763**	**214**	**100%**	

1 MAWSS GIS database query, July 2013.

Table 3.11 summarizes the force mains by age. The majority of the force main system is 10 years old or less. However, a significant amount, nearly 15 percent, has an unknown age. Further, the force main summaries in Tables 3.9 through 3.11 combines low pressure force mains with lift station force mains. Especially for the age distribution analysis, this combination results in a skewed analysis. Removing the low pressure force mains from the age analysis indicated approximately 51 percent of the lift station force mains are older than 30 years.

TABLE 3.11 – Force Main Distribution By Age

Age Range	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	305	14.3%	387,353	73.4	34.3%	34.3%
> 30 Years	28	1.3%	27,474	5.2	2.4%	36.7%
21 to 30 Years	63	3.0%	40,636	7.7	3.6%	40.3%
11 to 20 Years	595	28.0%	271,594	51.4	24.0%	64.4%
< 10 Years	1,136	53.4%	402,705	76.3	35.6%	100.0%
Totals	**2,127**	**100%**	**1,129,763**	**214.0**	**100.0%**	

1 MAWSS GIS database query, July 2013.

Table 3.12 provides the force main age distribution for only the lift station force mains excluding the low pressure force mains.

TABLE 3.12 – Force Main Distribution By Age for Lift Station Force Mains Only

Age Range	Segment Count	Count (%)	Length (feet)	Length (miles)	Length (%)	Cumulative Length (%)
Not Listed in GIS	221	22.6	363,122	68.8	49.7	49.7
> 30 Years	8	0.8	14,817	2.8	2.0	51.7
21 to 30 Years	50	5.1	33,266	6.3	4.6	56.3
11 to 20 Years	346	35.4	168,956	32.0	23.1	79.4
< 10 Years	351	36.0	150,352	28.5	20.6	100.0
Totals	**2,127**	**100%**	**1,129,763**	**214.0**	**100.0%**	

[1] MAWSS GIS database query, July 2013.

Two of the major lift stations in the collection system, the Halls Mill Creek and the Eslava Lift Stations, utilize Price Brothers prestressed concrete cylinder pipe (PCCP) force mains. Some utilities have experienced problems with PCCP manufactured by either Price Brothers or other PCCP manufacturers. Those problems are generally in installations that experience partially full pipe flow. The Halls Mill Creek/Eslava Creek Force main developed its latest leak in February 2012 at a location approximately 7,000 feet downstream of the Eslava Lift Station force main connection. The leak occurred in the crown of 48 inch diameter PCCP. Hydrogen sulfide gas corrosion caused the crown of the pipe to collapse and leak. Approximately 500 feet of the 48-inch pipe was replaced in an emergency project at a cost of nearly $1.5 million.

In an effort to better understand the condition of this pipeline, MAWSS forces potholed the 8.5-mile force main to get elevation data on the top of the pipe to create an accurate elevation profile. The profile data is being used by consulting engineers to study transient surges in the pipeline. The study will identify how the force main can be operated to reduce both high pressures created by transient surges and gas pocket formation. In addition, the Board has approved and MAWSS has contracted with Pure Technologies, Inc., to perform an inspection of the pipe using electronic devices that will travel inside the force main while the force main is in service. The final report for the Pure Technologies inspection findings will be provided during the first quarter of 2014. Once the inspection is completed, the integrity of the pipe wall will be checked at locations where deterioration is suspected. Rehabilitation or pipe replacement will be performed at locations where deterioration is confirmed. The goal of the aforementioned work is to create a plan that reduces the risk of the pipeline failing and extends the useful life of the force main.

The MAWSS sewer collection system had been operating under an April 10, 2002, Consent Decree based on allegations of Federal Clean Water Act and Alabama Water Pollution Control Act violations associated with sanitary sewer overflows (SSOs) from the system. The Consent Decree was terminated in October 2011. However, the MAWSS Board and Mobile Baykeeper (formerly Mobile Bay Watch and an original party to the environmental suit associated with the Consent Decree) have independently continued an agreement between the two whereby MAWSS pays a penalty for each sewer system unpermitted discharge meeting agreed upon criteria for an additional 5-year period.

3.7 Common Facilities

MAWSS operates a number of administrative and support facilities as part of utility operations. The facilities are briefly summarized below.

Wesley A. James Operations Center. In 2011 MAWSS completed work on the Wesley A. James Operations Center, located in the Park Forest Plaza on Moffett Road. Approximately 140 employees in over 13 departments now operate out of this facility. The location was chosen to provide easier access for customers as well as providing a better location for post-hurricane or tropical storm response. MAWSS Board meetings have been relocated from the Administration Building to this location's state-of-the-art meeting room. There are plans for MAWSS to modify the rest of the Park Forest Plaza and relocate the Business Operation, Human Resources and Training Departments to the Operations Center. As part of this work, it has been determined that an extensive reconfiguration of the parking lot will be required. The reconfiguration needs to allow for access to the adjacent bank, access for the public visiting the operations center, while creating a secure employee only parking area. This project will require fencing, a new guard house and video monitoring of the parking lot, beyond what was originally planned. An estimated cost for this effort is included in the CIP project list contained in Appendix A of this 2013 EAR.

Photograph 3.13 – Construction Work at Sheldon Beach Road Facility

Shelton Beach Road Facility. Construction for the new Shelton Beach Rd facility, as illustrated in Photograph 3.13, started earlier this year. The facility was expanded from its initial scope to include facilities for Fleet Maintenance, Field Operations, Lift Station Operations, Warehouse Operations, as well as bulk material storage, pipe laydown areas, fueling and washing stations. Construction of the facility is expected to be completed in April 2014 with operations from this location starting in June 2014.

This facility eliminates the access issues faced by the current automotive shop located at the C.C. Williams WWTF while allowing MAWWS to consolidate operations in a central location to improve service to their clients as well as providing a better location for post-hurricane or tropical storm response.

Warehouse Facility. Most of the utility's spare parts and supplies are stored in the Warehouse facility. Minimum and maximum inventory levels have been established for each stored item. A pipe lay down area is also located near the Warehouse to maintain a sufficient inventory of pipe materials and sizes. This building also houses the Field Operations Center dispatch for the collection and distribution system repair/emergency crews. Work orders generated by MAWSS' asset management program are assigned at this location. All completed work orders (scheduled, emergency, automated or manual) are returned to this location for manual entry into the asset management system. MAWSS' work order management tool is not being fully utilized and should be expanded to track asset condition. Tracking asset condition should allow MAWSS the data to better predict maintenance work needs as well as forecast asset rehabilitation/replacement needs, which should in turn reduce overall O&M costs. The Warehouse operation is expected to move to the new Shelton Beach Road Facility in 2014.

Training Center. MAWSS operates a Training Center in the same building as the Warehouse facility. This provides conveniently located training rooms for in-house training courses. This facilitates staff efforts to acquire the minimum number of professional development hours required by their particular license or registration. Current plans are to relocate the Training Center facilities to Park Forest Plaza. However, a target date has yet to be determined. Once both the Warehouse Facility and Training Center have been relocated, MAWSS may investigate sale of the existing Training Center/Warehouse property.

Fleet Services. Fleet Services operates out of the Automotive Shop at the C.C. Williams WWTF site. This location can have access problems when traffic is active on the rail lines that cross the main access road into the site or when traffic volume associated with the adjacent State Port facilities is heavy. The area can also be flooded during Category 3 hurricanes. The access problems associated with the C.C. Williams WWTF site will be eliminated when MAWSS relocates Fleet Services to the Shelton Beach Road Facility in 2014. As part of their effort to better serve their customers, MAWSS is currently implementing changes to the Fleet Services operations to reduce operational costs. These changes include increasing the period between vehicle oil changes to 5,000 miles, switching the automatic replacement of non-commercial vehicles after five years with a more evaluative approach including mileage, condition of vehicle, use, etc. In addition, the annual fund for vehicle replacement includes a contingency for replacement of large commercial vehicles. This contingency accumulates yearly to lessen the impact of a large commercial vehicle replacement.

Administrative Building. The Administration Building currently houses the customer service facilities and MAWSS management staff. MAWSS intends to relocate these personnel to the Wesley A. James Operations Center. However, a date for this transition has not been determined as of the completion of this report.

In addition to the facilities mentioned above, MAWSS utilizes support staff and technologies that encompass several of their operations, and as such are included in the “Common Facilities” group. This includes, but is not limited to GIS and IT departments.

Anticipated projects for these groups include:

- Contribution combined fund for new GIS aerial pictures (to be used in GIS base maps)
- Automated Inventory Tracking System
- Location and inclusion of residential water meters for the GIS system
- AMI/AMR/DMD meter conversion for commercial users
- Security upgrades at various facilities
- Develop a Technology Implementation Master Plan for the utility

In 2009, MAWSS in coordination with the Department of Homeland Security (DHS) used the Cyber Security Evaluation Tool system (CSET) to perform a self-evaluation of the utility and identify gaps in our Cyber Security. This evaluation identified several areas that need improvement. However, no projects have been identified or implemented from this report, even though MAWSS has set aside funds for the last several years to implement security improvement projects. Support technologies projects have to be carefully evaluated to determine the overall benefit of these alternatives to the day-to-day operations of MAWSS.

A business plan is being developed by MAWSS to evaluate all issues related to the conversion of residential water meters to automated meter reading. The plan should be designed to ensure that MAWSS is fully prepared for implementation to eliminate the issues other utilities have experienced, including inaccurate customer bills and unanticipated project expenses. While automated meter readings offer desirable benefits and can improve efficiency of both water meter reading and billing, if the utility is not ready for the implementation and some of the problems mentioned above arise, it could diminish and in the worst case, eliminate the benefits to MAWSS. This conversion is expected to require an extended period (approximately 10 years) complete the project. The EAR capital improvement project list currently shows the cost for this project on its initial year. Once this project begins implementation, the costs should be transferred to an annual authorization until completed.

3.8 Management, Operations and Maintenance

MAWSS' operations are overseen by the Board of Water and Sewer Commissioners for the City of Mobile. **Figure 3.2** on the following page illustrates the current organization chart for the system.

Table 3.13 summarizes the total number of full-time equivalent staff, by category, for each year since 2000.

TABLE 3.13 – MAWSS Full-Time Equivalent Staff Summary From 2000 Through 2012

Year [1]	Water	Wastewater	Support Services	Administration	Totals
2000 [2]	61	68.5	161	115	**405.5**
2001	41	56	187	96	**380**
2002	42	61	188	95	**389**
2003	34	61	181	95	**371**
2004	26	54	184	101	**365**
2005	25	52	178	105	**360**
2006	25	52	179	113	**369**
2007	26	54	183	109	**372**
2008	30	53	192	111	**386**
2009	30	55	186	109	**380**
2010	31	56	187	114	**388**
2011	31	56	188	114	**389**
2012	30	57	184	115	**386**

[1] MAWSS, *Comprehensive Annual Financial Report for the Year Ended December 31, 2012*.

[2] Year 2000 staff breakdown was not available from previous MAWSS CARFs, but was provided by MAWSS from internal records.

It is important to notice the reduction in water and wastewater personnel from the levels in the year 2000. Although a portion of this reduction can be attributed to reorganization and operational improvements, it does not account for the attrition in these two categories. The number of employees in these two categories has increased slightly from the lowest registered number in 2005 and 2006; MAWSS should continue efforts to increase the number of personnel in these categories. As mentioned in last year's EAR, many of MAWSS personnel will be eligible for retirement in the next five years and an aggressive succession plan should be implemented to ensure the appropriate level of expertise is available at all levels of operation.

FIGURE 3.2 – MAWSS Organization Chart

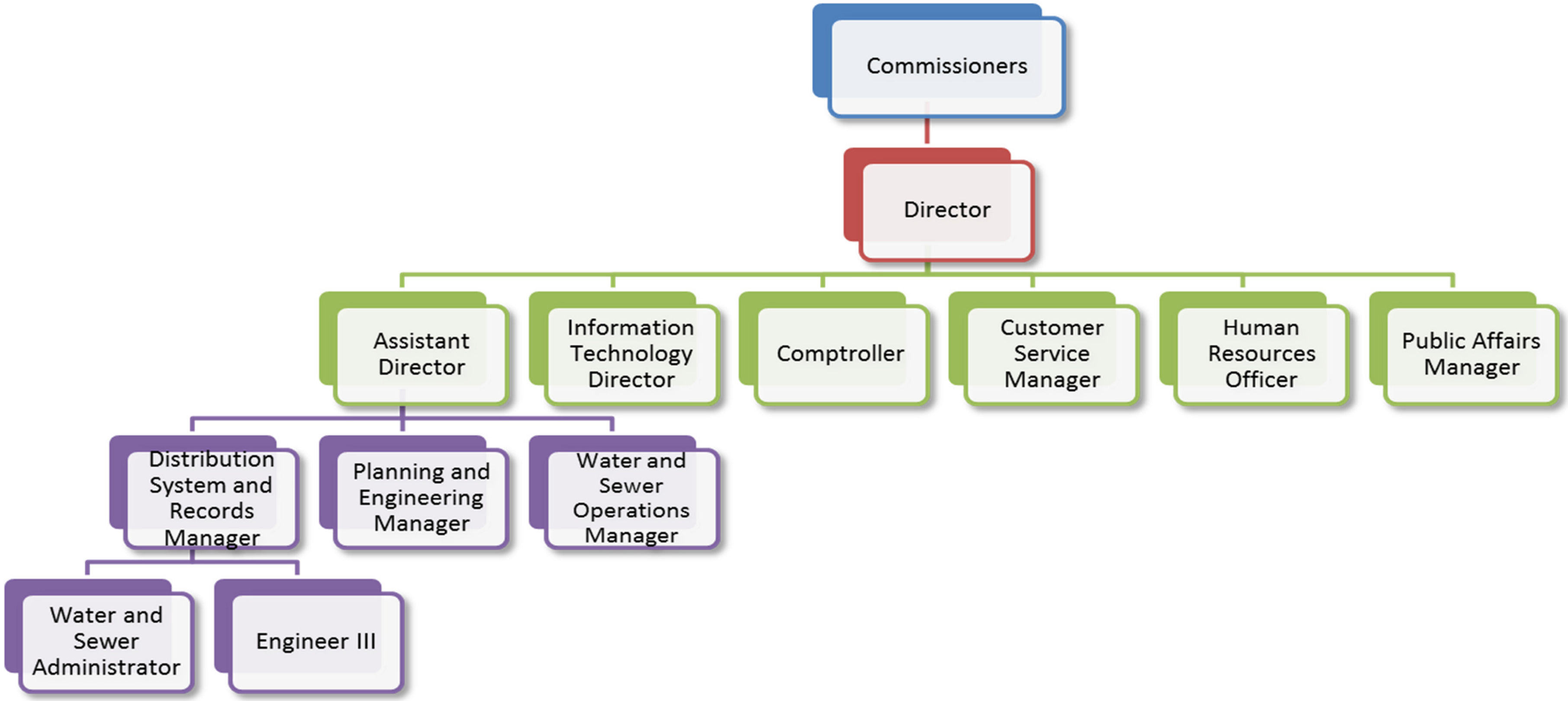
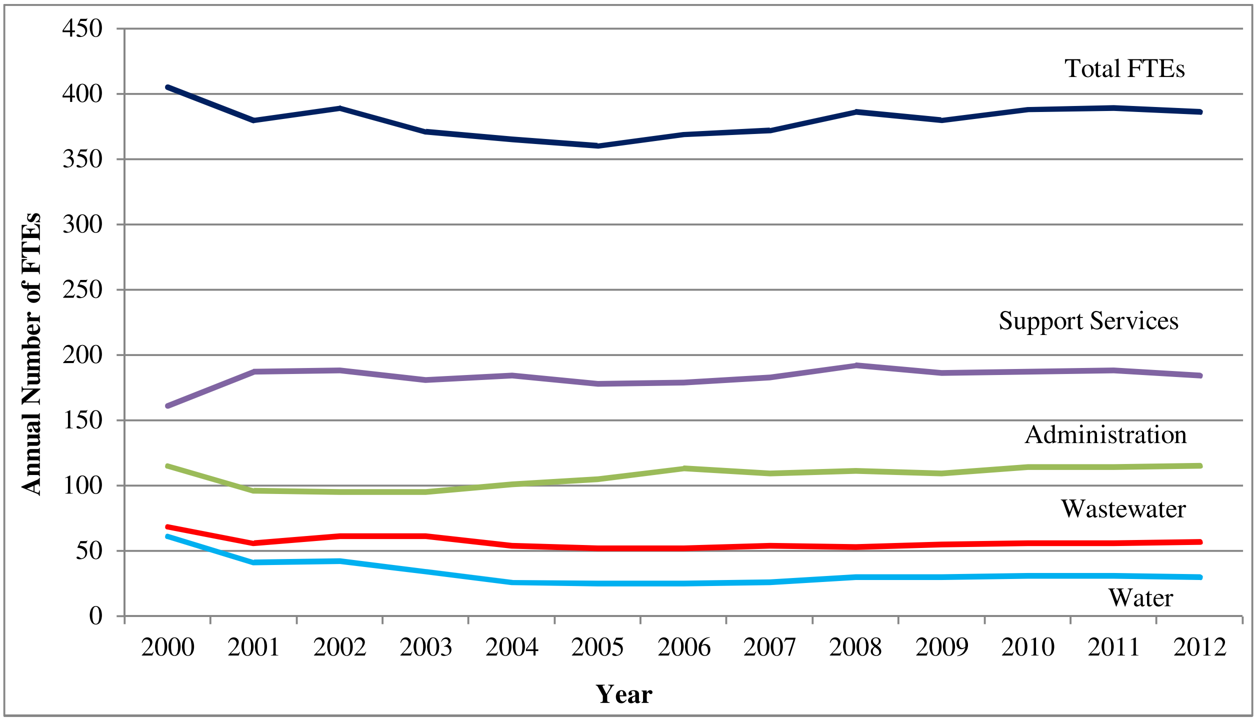


Figure 3.3 graphically compares the number of MAWSS staff in water, wastewater, administrative, support services and total based on the data from Table 3.13.

FIGURE 3.3 – MAWSS Full-Time Equivalent Staff for 2000 Through 2012



Despite the reduction in personnel in the water and wastewater operations categories, MAWSS has been able to consistently meet, and frequently exceed, all regulatory permit requirements at the water treatment plants and the water distribution system and regulatory permit requirements at the wastewater treatment plants, with the exception of the occurrence of unpermitted discharges from the sewer collection system. As with most wastewater utilities, the MAWSS sewer collection system experiences unpermitted discharges in the form of sanitary sewer overflows. It is a rare utility that can consistently achieve the U.S. EPA's goal of "zero SSOs."

MAWSS is frequently recognized by professional organizations for regulatory compliance and operational efficiency. The most recent MAWSS awards and recognitions are listed below:

- Alabama Department of Environmental Management (ADEM)
  - Optimized Plant Award to the H.E. Myers WTP (2013)
  - Four-Year Optimization Award to the H.E. Myers WTP (2013)
  - Best Operated Plant in Class Award to the E.M. Stickney WTP (2013)
  - H.E. Myers WTP was ineligible for this award because of the number of times the plant had won the award
- Alabama Water and Pollution Control Association (AWPCA) awards:
  - Best Operated Plant to the Wright Smith Jr. WWTP (Bio-filter/trickling filter)
  - Best Operated Plant to the E.M. Stickney (Surface Water 50.1 – 60 MGD)
  - Certificate of Recognition to the C.C. Williams WWTF (Mechanical Plant > 10 MGD)

- Best Operated Distribution System to the MAWSS Water Distribution System
- Bolton-Crockett-Beck Award for outstanding contributions to the field of environmental and public health protection to Wright Smith Plant Operator Roger Carlisle (2012)

- Alabama Water Environment Association (AWEA) awards:
  - Award of Excellence to the C.C. Williams WWTF (2012)
  - Special Award recognizing support of organization goals and educational efforts to Malcolm Steeves, MAWSS Director, retired
- Water Fluoridation Reporting System (WFRS)
  - Water Fluoridation Quality System Award (2013)
- Center for Diseases Control and Prevention, United States Department of Health and Human Services (DHHS) Water Fluoridation Award
  - Mobile Area Water & Sewer System
- National Association of Clean Water Agencies (NACWA) awards:
  - Platinum Peak Performance Awards for perfect regulatory compliance for five or more consecutive years to the C.C. Williams WWTF (in the 12th year of perfect regulatory compliance) and to the Wright Smith WWTF (in the 10th year of perfect regulatory compliance)
- Government Finance Officers Association of the United States and Canada (GFOA) award:
  - Certificate of Achievement for Excellence in Financial Reporting to the MAWSS *Comprehensive Annual Financial Report* for the year ended December 31, 2011 (for the 11th consecutive year)

The largest area of non-compliance for the MAWSS system is the number of unpermitted discharges, or SSOs, in the sewer collection system. In part because the sewer collection system had been operating under the terms of a Consent Decree until 2011, MAWSS has expended significant resources and effort to control those SSO events. Even though the Consent Decree is no longer in operation, MAWSS must continue to address the challenge of minimizing the potential for SSO occurrences associated with aging collection system infrastructure.

In accordance with MAWSS desire to continue to improve utility operations, MAWSS conducted a capabilities assessment from November 2012 to April 2013. MWH assisted MAWSS in this effort by identifying and documenting the capabilities of the utility's business performance practices with respect to industry "best practice" management attributes. The results of the capabilities assessment was presented in a *Gap Analysis Assessment Report and Implementation Plan* report. The framework for the assessment was rooted in the *Ten Attributes of Effectively Managed Water Sector Utilities*.

Based on the results of the capabilities assessment, the following priorities were defined by the utility leadership:

- Strategy
  - Planning and budgeting must differentiate and balance between operations and capital.
  - Establish funded capital improvement budgets for each operation to improve controls of expenditures.
  - Ensure Board and utility staff strategy and priorities are aligned.

    - Financial philosophy altered to reflect changing priorities.
- People and Organization
    - Place the right people in the right positions with realignment or through up-skilling.
    - Succession and stakeholder engagement planning.
    - Develop leadership and capability within the staff.
- Process
    - Internal communication and reporting between utility and Board must be regular, concise and provide both quantitative and qualitative indicators.
    - Budgeting and capital planning must be aligned.
    - Staff hiring, training and evaluation streamlined.
- Information and Data
    - Concise and clear financial reporting.
    - Turn data into information and make it available for decision making.
    - Implement customer and employee surveys to identify possible improvement actions.
- Tools and Technology
    - Keep an open mind, but avoid over-extension.
    - Analyze the past in order to drive insight into the future.
    - Grow and rely on IT to find efficiencies and drive cost effectiveness.
- Results
    - Relate to the expected outcomes of customers and employees.
    - Measure and demonstrate.
    - Satisfy the customers.

At this point, no specific projects have been defined based on the findings from the Gap Analysis report for inclusion in the CIP improvements contained in Appendix A of this report. As the MAWSS Board and staff begin to identify projects and operational improvements needed to implement the strategic goals listed above, funding sources will need to be defined and those projects added to the CIP project list as appropriate.

One example of how MAWSS is beginning to implement some of the above-listed strategic goals is the current master planning activities associated with the C.C. Williams WWTF. The resulting master plan will provide a more comprehensive evaluation of the facility to allow recommended improvements be implemented in accordance with a sound, asset-management focused long term plan for the facility.

Similarly, MAWSS is initiating a master planning process to address wet weather SSO abatement in the Eslava and Three Mile Creek Basins.

Specific CIP improvements for this 2013 EAR are listed below.

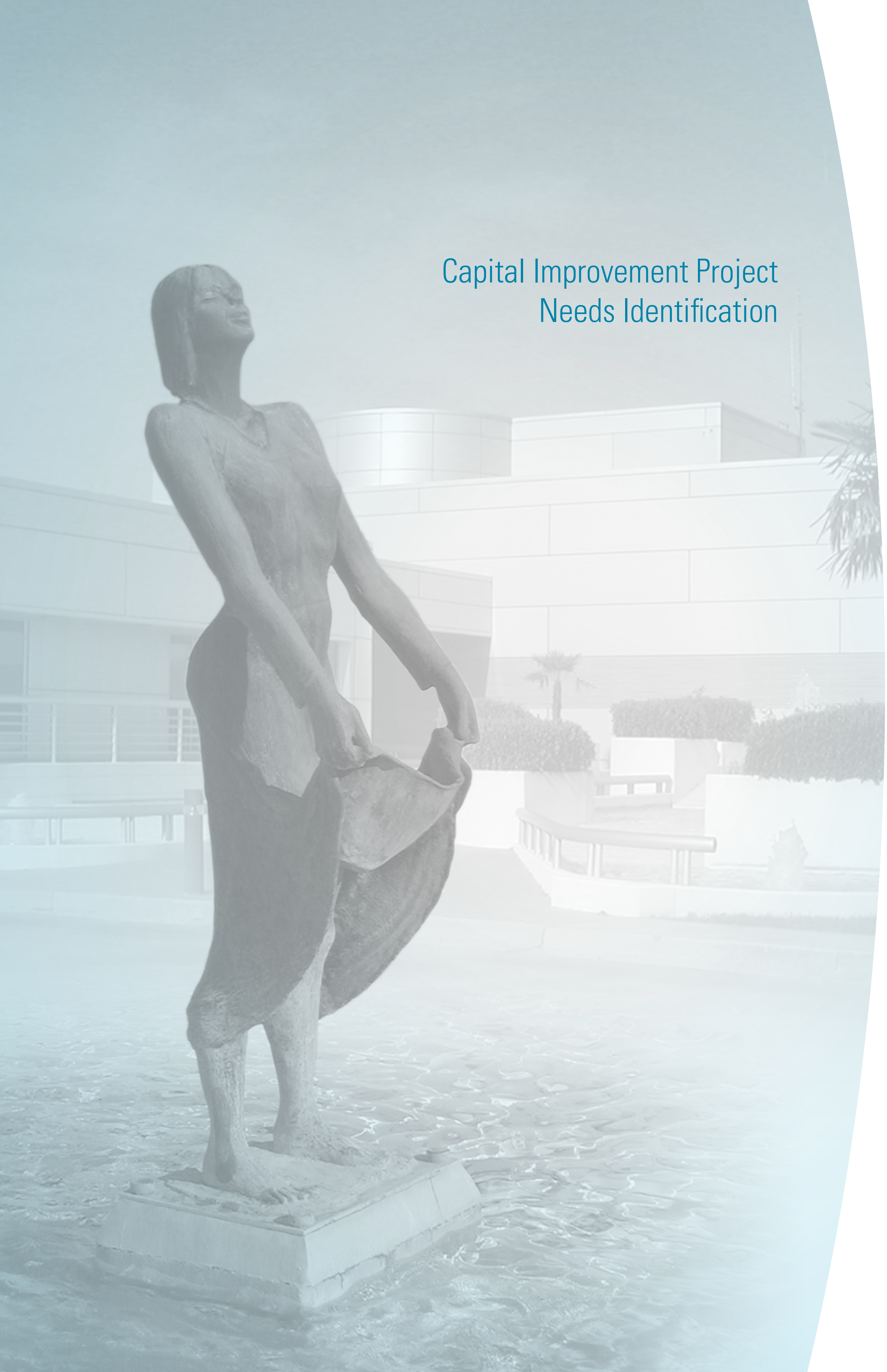
- Addition of self-cleaning screens and automatic gates at the Big Creek Dam. Screen cleaning and gate operation are labor-intensive and manual gate effort can be dangerous in inclement weather. Currently the gates are hoisted using a chain mechanism that is mounted on a rail system running along the top edge of the dam. The mechanism is rolled to the gate to be opened or closed, the chains attached and then the gate position is adjusted as needed. Two people are required to move the rolling mechanism and hoist the gates.

- Installation of more efficient feed and mixing capabilities. There may be some opportunities to reduce chemical usage and thus reduce costs at the plants. The slaker runs 2 to 3 times a day and there is a noticeable dip in pH levels following batch mixing. More efficient feed and mixing could reduce chemical usage.
- Installation of a second lime silo and slaker system at the E.M. Stickney WTP. The single silo configuration exposes the facility, the major water producer for MAWSS, to a shutdown if any of several pieces of equipment in the lime system fails. The second silo would significantly reduce this risk.
- Installation of isolation valves in the E.M. Stickney WTP low head pump station discharge manifold. This will allow for operation of 50 percent of the pump station while performing repairs at the lift station. Modification of the H.E. Myers WTP raw water piping to allow for operation while replacing isolation valves.
- Repairs to the secondary digester walls at CC. Williams WWTF. The removal of the brick veneer for these digesters revealed issues with the concrete walls of these units. Further evaluation and possible repair work is recommended.
- Evaluate the conversion of the grease treatment facility at Wright Smith WWTF to a dewatering facility.
- Add a lift station in the Belsaw area to relieve the Belsaw area gravity sewer main and the Three Mile Creek interceptor, as well as the shallow slopes in the area (due to flat terrain), which has significantly limited the transport capacity of wastewater from the Belsaw area and caused sanitary sewer overflows and surcharged conditions in area sewers.

Additional O&M concerns that MAWSS may need to address include:

- Significant number of O&M staff eligible to retire in the coming years will require a knowledge retention and knowledge transfer effort.
- Completion of the backflow preventer survey for commercial customers. Many of the commercial customers need to be surveyed or inspected to verify compliance with the 2006 Alabama backflow preventer law or be directed to so comply.
- Completion of open work orders on a timely basis. As a best management practice, O&M supervisors should review open work orders for timely completion and ensure MAWSS managers are informed of conditions that may be contributing to or preventing the completion of work orders in a timely manner so that these conditions can be resolved.
- Need for reduced reliance on manual input of work orders in the DataStream/Infor CMMS. MAWSS currently inputs every completed work order by hand into the system. This process is time consuming and inefficient. This method can also lead to inaccuracies in the data, as the personnel importing the data might not completely understand the nature of the work and therefore misinterpret notes or other details in the work orders. MAWSS should begin the process of allowing of work order data input at the point of source to reduce the possibilities of data entry errors.
- Evaluating digester gas production at the C.C. Williams WWTF. Gas production at the digesters is low for a plant the size of the C.C. Williams WWTF (about 35,000 cubic feet

per day rather than the roughly 200,000 cubic feet per day that could be expected). If gas production can be increased, energy reuse options may become viable at the plant and thus reduce the amount of purchased energy.



Capital Improvement Project Needs Identification

Capital Improvement Project Needs Identification

4 Capital Improvement Project Needs Identification

Capital improvement plan (CIP) project needs have been identified based on asset condition evaluations performed by MAWSS O&M and engineering staff and supplemented by various consultant condition evaluations and inspections. In addition to these specific asset improvement needs, the 2010 EAR completed asset valuation and renewal cost calculations to evaluate the appropriate level of funding required for infrastructure renewal to ensure a sustainable water and wastewater infrastructure.

These calculations were not repeated in this 2013 EAR, however, Section 4.2 compares MAWSS' CIP budgets and O&M expenditures related to infrastructure improvements to the previously predicted funding needs from the asset valuation and renewal cost calculations. Section 4.3 then presents CIP recommendations based on this 2013 EAR evaluation.

4.1 Asset Valuation and Renewal Cost Calculation Needs Summary

During the 2010 EAR infrastructure asset values were estimated for the key water and wastewater infrastructure facilities including: water mains, water booster pump stations, water storage tanks, water treatment plants, sewer mains, wastewater lift stations, wastewater force mains and wastewater treatment plants. The infrastructure asset values were based on estimated replacement cost for those facilities in 2010 dollars. MWH did not complete a detailed replacement cost analysis for each asset, but rather used typical unit costs to replace the assets with assets of the same capacity. Specific assumptions for each asset type are noted below.

Unit costs in dollars per foot were estimated for water main replacement based on MWH experience with average water pipe installations in the south. These estimates included a unit cost for water pipe installation as well as for pavement restoration for typical pipe sizes. Where we did not have a unit cost for a non-typical pipe size, for example in the case of 14-inch pipe, we used the unit cost for next largest pipe size, in this case the 16-inch pipe. Further, our average water pipe installation experience has limited numbers of small pipes less than 8-inch diameter, so we estimated a reduced pipe installation unit cost for water mains from ¾- inch to 6-inch in size. We did not, however, reduce the pavement restoration unit costs for small pipe since the excavation trench for small pipe installation will not be reduced significantly. For water mains in the MAWSS GIS database that did not have a pipe size recorded, we assumed an 8-inch pipe size and 8-inch unit costs.

The MAWSS GIS database does not track which water mains are in easements and which are in street rights-of-way (ROW), but this data is tracked for gravity sewer mains. Consequently, MWH applied the total distribution of 15 percent of sewers in easements and 85 percent of sewers in street ROWs to the water main data. Further, since trenchless technology can be used to rehabilitate and replace water pipelines in some cases, we also assumed a percentage of water mains would be replaced with these techniques rather than with open-cut excavation. Thus pavement restoration costs were only applied to a percentage of each pipe size. Generally, the larger diameter pipes assumed a smaller percentage of pavement restoration and the smaller diameter pipes assumed a larger percentage of pavement restoration.

The unit costs for replacement water mains are based on new installations. As such the unit costs include land acquisition for easements. The easement acquisition costs would not be incurred during a replacement project so the full asset valuation was reduced by an assumed 10 percent factor. The resulting replacement asset valuation was used in the annual renewal calculations.

For the annual asset renewal allowance, MWH assumed an average useful life of 100 years for the water mains. To replace all of the pipes within a 100-year period, approximately $1/100^{th}$, or 1.0 percent, of system would need to be replaced each year. Thus, we calculated an annual renewal cost of 1.0 percent of the replacement cost asset valuation for each water main pipe size.

Asset values for water booster pump stations were based on unit costs for station capacity ranges. The unit costs for each capacity range were estimated at 70 percent of the cost of the corresponding wastewater lift station capacity range. The booster pump station unit costs ranged from a low of $525,000 for the smallest stations between 1 and 3 mgd to a high of $1.4 million for stations over 5 mgd. Full asset valuations were reduced by 15 percent for land acquisition costs. Renewal rates were based on an average useful life of 40 years, meaning 2.5 percent of the stations would be replaced each year.

Water storage tank replacement costs were estimated based on typical unit costs ranging from $1.00 to $2.00 per gallon per day (gpd) with an average of $1.73 per gpd. The total capacity of each of MAWSS' 15 water storage tanks, which range from 0.5 million gallons to 10 million gallons each, was then multiplied by the appropriate unit cost to estimate the asset value for each tank. The full asset valuations were reduced by 70 percent for earthen reservoirs with large land acquisition costs, by 50 percent for concrete reservoirs with moderate land acquisition costs and by 15 percent for elevated tanks with smaller land acquisition costs. The renewal rates were based on a range of useful lives from 70 to 100 year, with an average useful life of 77 years, or 1.3 percent replacement per year.

As with the water storage tank replacement costs, the water treatment plant replacement costs were estimated based on a typical unit cost in terms of gallons per day capacity. For the water treatment plants a unit cost of $3.50 per gallon per day was estimated. The total capacity of each of MAWSS' two water treatment plants was then multiplied by $3.50 per gpd to estimate the asset value for each plant. The full asset valuation cost was reduced by 20 percent for land acquisition costs. The renewal rates were based on an average useful life of 80 years, or 1.3 percent per year.

Unit costs in dollars per foot were estimated for sewer main replacement based on MWH experience with average sewer pipe installations in the south. These estimates included a unit cost for sewer pipe installation as well as for pavement restoration for typical pipe sizes. Where we did not have a unit cost for a non-typical pipe size, for example in the case of 11-inch pipe, we used the unit cost for next largest pipe size, in this case the 12-inch pipe. Further, where our average sewer pipe installation experience has limited numbers of small pipes less than 8-inch diameter, we used 8-inch pipe costs for the 4-inch and 6-inch sewer mains. For sewer mains in the MAWSS GIS database that did not have a pipe size recorded, we assumed an 8-inch pipe size and 8-inch unit costs.

The MAWSS GIS database tracks which sewers are in easement areas rather than inside of street ROW. Using this data, we calculated the percent of each sewer pipe size that was located in street ROWs. This percentage varied depending on the pipe size category, but overall, 85 percent of the sewer system is located in street ROW and 15 percent is located in easements. We also assumed that trenchless technology would be used for rehabilitation and replacement of many of the gravity sewer lines, particularly for the larger diameter sewers with few or no lateral connections that would require open-cut excavation. This assumption reduced the pavement restoration costs for that percentage of pipes. Overall, we assumed that 28 percent of the replacement sewers would require pavement restoration.

The full asset valuation was reduced by 15 percent for easement acquisition. A value of 15 percent was used rather than the 10 percent reduction applied to water mains because sewers can be somewhat harder to site than water mains. As with the water mains, we assumed an average useful life of 100 years, or 1.0 percent per year, for the sewer mains.

Asset values for wastewater lift/pump stations were based on unit costs for station capacity ranges. The unit costs for each capacity range are based on MWH experience in the south. The unit costs ranged from $100,000 for relatively small grinder pump stations to $9 million for stations over 30 mgd. The full asset valuations were reduced by 15 percent for land acquisition costs. Renewal rates were based on an average useful life of 40 years, or 2.5 percent per year.

Pipe installation unit costs were based on 50 percent of the gravity sewer main pipe installation costs. Similarly, pavement restoration unit costs for water mains were based on 50 percent of the gravity sewer main pavement restoration costs. The MAWSS GIS database does not track force mains in easements versus street ROW. However, the small force mains are generally located in street ROWs and the large force mains are generally located in easements. It was assumed an average of 52 percent of the force mains would require pavement restoration. The full asset valuation was reduced by 15 percent for land acquisition costs. The renewal rates were based on an average useful life of 100 years, or 1.0 percent per year.

As with the water treatment plant replacement costs, the wastewater treatment plant replacement costs were estimated based on typical unit cost in terms of gallons per day capacity. The larger main wastewater treatment plants were estimated at $4.00 per gallon per day while the small, decentralized wastewater treatment plants were estimated at a higher unit cost of $4.50 gallons per day. The total capacity of each of MAWSS' five wastewater treatment plants was then multiplied by the applicable unit cost to estimate the asset value for each plant. The full acquisition cost was reduced by 20 percent for land acquisition costs. The renewal rates were based on an average useful life of 74 years, or 1.4 percent.

No attempt was made to calculate asset values or renewal costs for the raw water supply or the common facilities. The raw water supply and the common are comprised of specialized assets that tend to be specifically design and constructed for particular locations. Specialized assets such as these are not amenable to cost estimates based on typical unit costs. Estimated replacement costs for these specialized facilities would have to be done on a case-by-case basis and is outside the scope of this EAR.

Similarly, no attempt was made to calculate asset values or renewal costs for the biosolids handling and disposal assets. MAWSS utilizes contract vendors for the handling and land application disposal operations and does not have an extensive asset base associated with these operations. The only significant biosolids handling and disposal assets owned by MAWSS are the sludge and solids handling assets within each of the treatment plants. These assets are included as part of the typical unit costs used for wastewater treatment facilities.

Table 4.1 summarizes the estimated asset values and annual renewal costs in 2010 dollars. Because the estimated renewal costs are only being used to estimate target values for annual replacement budgets and because construction-related inflation has been relatively flat in recent years, no attempt was made to update the cost basis to 2012 dollars for this 2013. However, the asset valuations from 2010 should be reviewed each year and periodically re-estimated as needed to update the target renewal values from in the Year 2010 dollar basis used for the Table 4.1 calculations.

TABLE 4.1 – Asset Valuations and Annual Renewal Costs from 2010 EAR

Infrastructure Area Column A	Estimated Full Asset Valuation ($) Column B	Estimated Full Asset Valuation Subtotals ($) Column C	Predicted Annual Renewal Cost ($) Column D	Predicted Annual Renewal Subtotals ($) Column E
Water Mains	823,981,000		7,416,000	
Water Booster Pump Stations	8,750,000		186,000	
Water Storage Tanks	68,000,000		466,000	
Water Distribution Subtotals		*900,731,000*		*8,068,000*
E.M. Stickney WTP	210,000,000		2,100,000	
H.E. Myers WTP	105,000,000		1,050,000	
Water Treatment Plant Subtotals		*315,000,000*		*3,150,000*
Water System Subtotals		***1,215,731,000***		***11,218,000***
Sewer Mains	1,326,113,000		11,272,000	
Wastewater Lift Stations	62,000,000		1,318,000	
Force Mains	96,450,000		820,000	
Sewer Collection Subtotals		*1,484,563,000*		*13,410,000*
C.C. Williams WWTF	112,000,000		1,120,000	
Wright Smith WWTF	51,200,000		512,000	
Decentralized WWTFs	2,385,000		27,000	
Wastewater Treatment Plant Subtotals		*165,585,000*		*1,659,000*
Wastewater System Subtotals		***1,650,148,000***		***15,069,000***
Water & Wastewater System Totals		**2,865,879,000**		**26,287,000**

[1] Values are Year 2010 dollars.

The predicted annual renewal costs listed in Columns D and E represent a “target” annual amount that MAWSS should reinvest in each asset type to maintain a sustainable infrastructure are based on an average year. As with any well run utility, renewal expenditures will vary, either up or down, from the targeted amount, but should, over a long term, be close to the targeted amounts shown. Periodically, the asset valuation should be re-estimated and new target values calculated to offset changes in the Year 2010 dollar basis used for the calculations summarized in Table 4.1.

Further, the annual renewal targets represent expenditures that should be made to fund either replacement assets or the rehabilitation of existing assets to extend their useful life. Expenditures for assets that are required for growth or to expand or extend the system are not considered renewal expenditures. Similarly, expenditures for assets that are required to meet new regulatory compliance initiatives are not considered renewal expenditures.

For the Year 2012, MAWSS renewal expenditures for the key water and wastewater system assets versus the corresponding annual renewal targets for the respective asset type are shown in **Table 4.2**.

TABLE 4.2 – 2012 Major Capital Asset Expenditures Versus Annual Renewal Targets

Infrastructure Area	Annual Renewal Target [1] ($)	Capital Renewal Expenditures in 2012 [2] ($)	Year 2012 Expenditure As A Percent of Annual Renewal Target (%)
Water Treatment Plants	3,150,000	1,887,056	59.9%
Water Distribution System	8,068,000	1,084,087	13.4%
Wastewater Treatment Plants	1,659,000	6,020,584 [3]	362.9%
Sewer Collection System	13,410,000	7,207,909	53.8%
Totals	**26,287,000**	**16,199,636**	

1 Values are Year 2010 dollars.

2 See the "Capital Asset and Debt Administration" summary in the *Comprehensive Annual Financial Report for the Year Ended December 31, 2012*. In the 2012 CAFR this summary appears on p.8. Some of these improvements may have been completed in multiple years, but were capitalized in 2012.

3 Includes $237,700 for decentralized system improvements.

While it is premature to draw any conclusions from the data shown in Table 4.2, the asset renewal expenditures are all lower than the target. This could be because continuing impacts of the national economic problems are affecting MAWSS operations and, as with most water and wastewater utilities, asset renewal budgets are among the first budgets to be cut during tight economic times.

The water distribution system annual renewal expenditures shown in Table 4.2 appear to be significantly lower than the annual target amount. The annual renewal expenditure target amounts for this asset category are impacted by the number of large water storage facilities that tend to be renovated and repaired on a longer term period such as every decade. These types of large tank painting or reservoir repair projects cause the range of annual renewal expenditures to be quite broad. Consequently, the actual renewal expenditures can vary significantly from the "average" renewal amount in any given year. It could be that 2012 had fewer water storage facility expenditures than other years.

However, it is also possible that the emphasis on completing sewer collection system and wastewater treatment plant expenditures to comply with the now expired consent decree and the NPDES permit requirements has "unbalanced" asset renewal funding between the water and the wastewater systems. While water and wastewater are funded by separate rates and the revenues are dedicated to those systems, utilities can find themselves in the position that sewer rates have to be increased to the point where the combined water and sewer bill has reached its "limit" of political acceptability and customer affordability. In those situations, the utility is unable to increase water rates even though the water system requires additional revenue to adequately maintain water asset sustainability. This can mean that water assets are neglected and left in a run-to-failure mode.

4.2 2013 EAR CIP Improvement Project Recommendations

Appendix A contains a listing of identified CIP project needs based on the evaluations completed as part of this 2013 EAR development. The CIP project needs were defined for each of the infrastructure areas: raw water supply, E.M. Stickney WTP, H.E. Myers WTP, water distribution system, C.C. Williams WWTF, Wright Smith WWTF, decentralized treatment facilities, solids handling and disposal, sewer collection system and common facilities. The summary table, Table A-12, lists the total estimated costs by project authorization priority and by infrastructure area. The project authorization priority and need category definitions are described below and are listed in Table A.1.

The identified CIP project needs were prioritized according to the following authorization priority definitions:

- **Annual.** Projects that need to be authorized on an annual basis to meet on-going capital renewal needs. These authorizations, combined with specific renewal projects in any given year, should match the targeted annual renewal needs previously shown in the predictions in Table 4.1.
- **Priority 1.** Projects that need to be authorized within the next two years or, in this case, in 2014 or 2015. These are largely based on defined projects having a detailed cost estimate.
- **Priority 2.** Projects that need to be authorized within the following two years or, in this case, in 2016 or 2017. While some of these projects are defined projects having detailed cost estimates, some of the projects are still in the planning stage and are based only on currently available information that is subject to change in the future.
- **Priority 3.** Projects that need to be authorized within the subsequent two years or, in this case, 2018 or 2019. Many of these projects are still in the planning stage and are based on currently available information that is subject to change in the future.
- **Priority 4.** Projects that are desirable, but are beyond the sole funding capability of the Board, and which must wait to be authorized until other funding sources such as grants or participating partner funds becomes available. Many of these projects are still in the planning stage and are based on currently available information that is subject to change in the future.
- **Priority 5.** Projects that are anticipated to be needed when development or additional growth begins to occur to make the capacity or other improvement projects cost effective. Many of these projects are still in the planning stage and are based on currently available information that is subject to change.

In addition to assigning an authorization priority to each of the identified CIP projects, each project was assigned a category to identify the primary project need that is being addressed by the particular project. The following are the category definitions used in this 2013 EAR.

- **Capacity.** Required to maintain permitted or minimum customer service level of asset service for future growth.
- **Efficiency.** Required to optimize energy or chemical usage, generally justified by life cycle cost analyses.
- **Functionality.** Required for ease of O&M, safety or security issues.
- **Hazard Mitigation.** Required to reduce potential for future damage/loss of service during extreme events.
- **Level of Service.** Required to provide higher than minimum level of service of asset service for customers.
- **Redundancy.** Required to maintain serviceability when other assets require repair or preventive maintenance.
- **Regulatory Compliance.** Required to maintain permitted level of asset service.

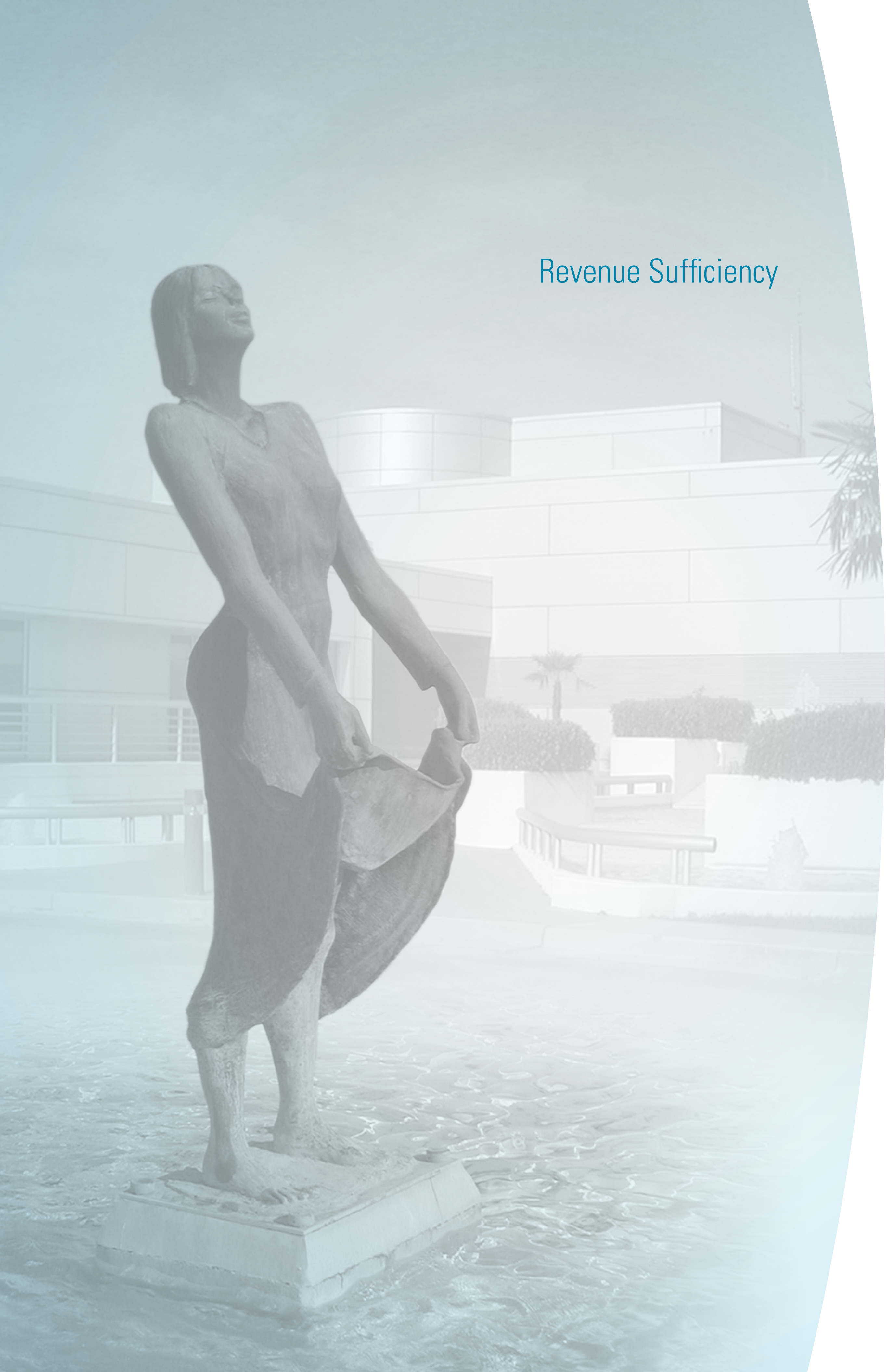
- **Reliability.** Required to maintain minimum level of service of asset service for customers.
- **Relocation.** Required relocation due to meeting other entity needs (e.g., ALDOT, City of Mobile, etc.)

Table 4.3 summarizes the recommended CIP expenditures by asset category for the annual, Priority 1 and Priority 2 needs.

TABLE 4.3 – Recommended CIP Budget Expenditures by Asset Category

Infrastructure Area	Estimated Project Authorization for Annual Needs ($)	Estimated Project Authorization for Priority 1 Needs ($)	Estimated Project Authorization for Priority 2 Needs ($)	Estimated Project Authorization for Annual, Priority 1 & 2 Needs ($)
Raw Water Supply	0	$1,850,000	$200,000	$2,050,000
E.M. Stickney WTP	0	$1,650,000	$250,000	$1,900,000
H.E. Myers WTP	0	$1,115,000	$930,000	$2,045,000
Water Distribution System	$2,550,000	$2,534,000	$7,980,000	$13,064,000
C.C. Williams WWTF	0	$20,000,000	$1,500,000	$21,500,000
Wright Smith WWTF	0	0	$350,000	$350,000
Decentralized Treatment Facilities	0	$50,000	$85,000	$135,000
Solids Handling & Disposal	0	$100,000	$75,000	$175,000
Sewer Collection System	$12,825,000	$3,760,000	$1,430,000	$18,015,000
Common Facilities	$2,320,000	$5,530,000	$3,200,000	$11,050,000
Totals	**$17,695,000**	**$36,589,000**	**$16,000,000**	**$70,284,000**

Revenue Sufficiency



Revenue Sufficiency

5 Revenue Sufficiency

The *Indenture of Trust* states that the Consulting Engineer's Annual Report must, among other requirements, include:

> "(c) recommendations as to any necessary or advisable revisions of the Service Charges."

The steps undertaken to derive such recommendations are as follows:

- Evaluate the costs and schedule of capital projects needed by MAWSS over the forthcoming six year period
- Review of MAWSS financial plans, policies and procedures
- Identify options for producing capital to fund the necessary major construction projects
- Prepare a near term financing plan for planning purposes including identification of sources and uses of capital funds, incorporating MAWSS' existing debt service on outstanding bonds
- Review the recent history of revenues and expenses to manage, operate and maintain the water and wastewater systems
- Project six years of revenues, expenses, debt service and debt service coverage
- Draw conclusions with respect to revision of service charges as indicated by conservatively projected revenue requirements

5.1 Capital Requirements

To serve a direct constituency of nearly 200,000 population and associated businesses, MAWSS requires large and extensive water and sewer systems, as previous sections of this report have described. Much of the systems are underground and all parts of the systems have significant value. Total net assets at the end of 2012[4] were nearly $600 million. MWH has approximated the replacement cost of key water and wastewater infrastructure to be nearly $2.9 billion. Moving forward, additional capital will be required for replacing facility assets due to wear and tear from years of use, economic obsolescence (such as technologies that are no longer allowed by regulation), functional obsolescence (such as technologies no longer supported by the marketplace), risk of catastrophic loss or other reasons.

These factors and others have been taken into account in previous sections of this report. **Table 5.1** shows the estimated costs of the projects, organized by project priority. The priorities and cost estimates included in Table 5.1 are identical to the information included in the Appendix A summary table, Table A.12.

[4] The MAWSS fiscal year is the calendar year, January 1 through December 31.

TABLE 5.1 – Capital Project Costs and Schedule

($000s)

Project Priority	Project Cost	2014	2015	2016	2017	2018	2019
Annual Needs	$17,695	$17,695	$17,695	$17,695	$17,695	$17,695	$17,695
Priority 1 Projects	36,589	18,295	18,295				
Priority 2 Projects	16,000			8,000	8,000		
Priority 3 Projects	14,681					7,341	7,341
Priority 4 Projects	8,350						
Priority 5 Projects	7,045						
Totals*	$173,440	$35,990	$35,990	$25,695	$25,695	$25,036	$25,036

* Total of $173M is the total of the six years, not of the items listed above in same column.

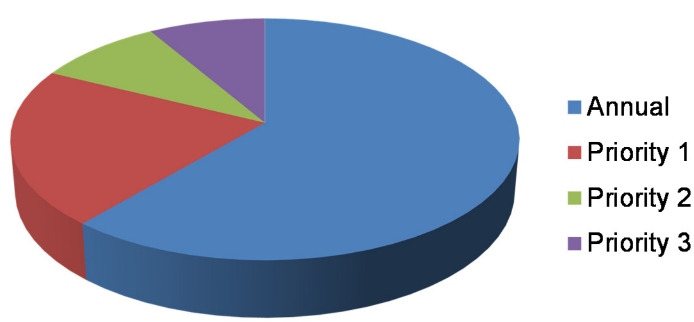
Table 5.1 shows the project infrastructure areas grouped by priority. Annual Needs infrastructure projects are indicated first, followed by project infrastructure areas classified as Priorities 1 through 5.

The total cost of $173.4 million shown at the bottom line of Table 5.1 includes six years of Annual needs project cost ($17.7 million per year totaling $106.2 million over six years) as well as the identified separate project costs of Priorities 1 through 3 ($67.2 million). Of the $173.4 million of identified projects, Annual needs represent 61 percent. Priority 1 projects account for 21 percent. Priority 2 account for 9 percent and Priority 3 projects account for 8 percent. Priorities 1 through 3 are summarized in **Figure 5.1**.

The MAWSS Capital Improvement Program (CIP) also includes $15.4 million of projects of Priority 4 and Priority 5 as indicated in Table 5.1. Priority 4 projects would be implemented if state or federal grants-in-aid become available and Priority 5 projects would be built to satisfy the infrastructure needs of growth.

None of the projects included in Table 5.1 are driven by growth to provide additional capacity to the water and sewer systems. As such, none of the projects, when implemented for service, will directly cause any significant increase or decrease in revenue.

FIGURE 5.1 – 6-Year CIP Priority Summary



The financial planning discussion that follows uses the data in Table 5.1 to indicate the approximate amounts and timing of capital formation needed to pay the construction and ancillary capital costs of the projects contained in the six year CIP.

Is important to note that additional to the capital requirements described above, as of the end of 2012 MAWSS had $44 million in capital projects that were scheduled in previous years and that are committed as carry over for 2013 and forward.

5.2 Financial Planning

Financial planning for long term programs involves several steps, including identification of possible capital sources and financial constraints. Once a reasonable slate of capital sources is configured, then financial analytics are used to compute effects of these forms of financing on financial position and revenue required to be produced by service charges and other revenue sources.

It should be noted that the financial planning information in this EAR is not Board-approved for implementation. It is merely offered as a reasonable financing solution for planning purposes to implement the capital requirements identified in Section 4. It is understood that MAWSS may proceed with a different financing and revenue production alternative than as set forth here. If that alternative produces sufficient revenues to provide the water and wastewater service to customers and the proper management of the facility assets as envisioned and prescribed in the *Indenture of Trust*, then that alternative should be acceptable.

5.2.1 Capital Sources

For the MAWSS EAR, MWH assumes that the principal instruments of capital formation to be utilized over the next six years will conform with the methods previously and currently used, namely internally generated funds produced as annual net revenues of the water and sewer businesses, water and sewer revenue bonds, and loans from the Alabama State Revolving Fund (SRF). Other capital resources may also present themselves to MAWSS, but the sources mentioned above are sufficient for the purposes of this EAR.

5.2.1.1 Water and Sewer Revenue Bonds

MAWSS is authorized by state law to issue water and sewer revenue bonds. The authorization is constrained by the *Indenture of Trust* [5] between MAWSS and its trust bank. During 2012, MAWSS produced $20 million in SRF borrowing. Additionally on January 2, 2013, MAWSS refunded $21.4 million of their 2004B bonds saving $3.4 million in interest expense over the life of the issue. MAWSS credit has been rated by Standard & Poor's Corp. as "AA"[6]. These ratings are "underlying" ratings meaning that the bonds were sold on the basis of MAWSS' credit alone, without bond insurance. MAWSS has never defaulted on any bond covenant (promise) or repayment obligation.

Figure 5.2 provides a comparison of credit ratings. MAWSS' credit was judged by two rating agencies to be of "High Grade". In layman's terms these ratings are excellent.

5 The "*Indenture of Trust*" as used in this report refers to the 1985 trust document plus all supplemental indentures of trust now in effect.

6 The last rating made by Standard & Poor's was made in August 2013.

FIGURE 5.2 – Comparison of Credit Ratings

Moody's		S&P		Fitch		
Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	
Aaa	P-1	AAA	A-1+	AAA	F1+	Prime
Aa1		AA+		AA+		High grade
Aa2		AA		AA		
Aa3		AA-		AA-		
A1		A+	A-1	A+	F1	Upper medium grade
A2		A		A		
A3	P-2	A-	A-2	A-	F2	
Baa1		BBB+		BBB+		Lower medium grade
Baa2	P-3	BBB	A-3	BBB	F3	
Baa3		BBB-		BBB-		
Ba1	Not prime	BB+	B	BB+	B	Non-investment grade speculative
Ba2		BB		BB		
Ba3		BB-		BB-		
B1		B+		B+		Highly speculative
B2		B		B		
B3		B-		B-		
Caa1		CCC+	C	CCC	C	Substantial risks
Caa2		CCC				Extremely speculative
Caa3		CCC-				In default with little prospect for recovery
Ca		CC				
		C				
C		D	/	DDD	/	In default
/				DD		
/				D		

There is no financial relationship or responsibility of the City of Mobile, Mobile County or any other state, regional or local government to step up for debt service payments on MAWSS debt.

The MAWSS *Indenture of Trust* requires MAWSS to produce net revenues (revenues less expenses) equal to 120 percent of annual debt service amounts.[7] This amount of net revenues greater than debt service is termed "debt service coverage" and is typically abbreviated as "1.20x" to represent coverage of 120 percent of debt service after paying for operations and maintenance. The purpose of the coverage is to assure bond buyers/holders/investors that in the event that actual revenue may be less than budgeted or expected revenue, there should still be sufficient revenue to satisfy full payment obligations. MAWSS is appropriately conservative in its practice of computing debt service coverage of all debt (senior lien parity bonds as well as junior lien subordinated SRF loans), although the *Indenture of Trust* may require only the parity bonds be covered at 1.20x.

[7] The debt service coverage requirement appears at §714(c) on p.70 of the *Indenture of Trust*.

In addition to debt service coverage revenue, MAWSS has encumbered debt service reserve funds available to service debt. MAWSS covenants to keep (at its trust bank) reserve funds equal to or greater than the greatest annual debt payment of its outstanding bond portfolio.

MAWSS currently has about $184 million of outstanding revenue bond debt principal. (This does not include SRF loans.)

5.2.1.2 State Revolving Loan Funds

MAWSS has an active history of borrowing from the SRF, with three loans made over the period of 2006 through 2012. SRF loans sometimes have more attractive financing terms than revenue bonds because the loans enjoy the benefit of statewide credit. Although SRF borrowings can have lower interest rates than bonds, they also typically have shorter repayment periods and interest during the construction period cannot be capitalized as proper ancillary costs of the projects being financed. An SRF loan for $20 million, mentioned above, closed on August 15, 2012. MAWSS applied for an additional $20 million of SRF loans for 2013 but as of the date of this report that loan has not been granted.

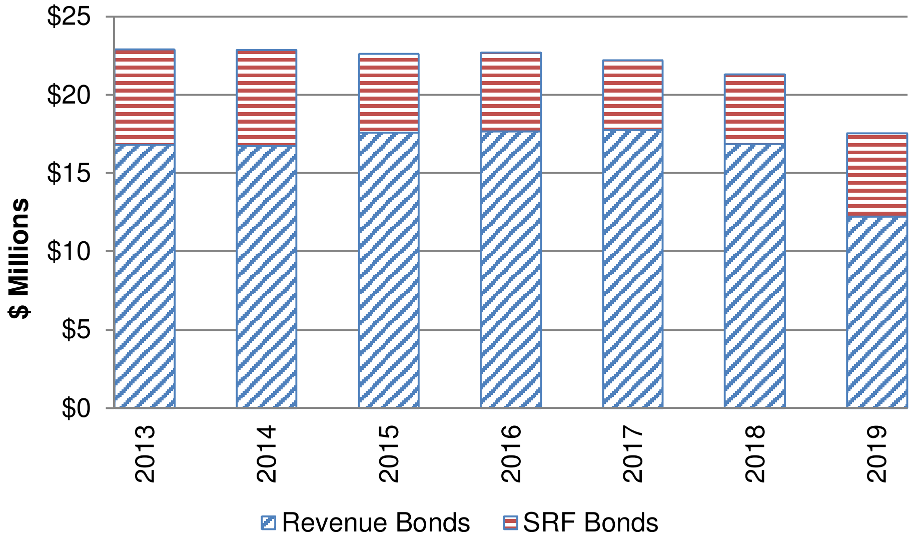
Table 5.2 is a summary of the repayment obligations on the MAWSS outstanding revenue bond and SRF loan debt over the next six years. **Figure 5.3** shows the annual debt service, principal and interest, of outstanding MAWSS bonds and loans, including the 2012 SRF borrowing, through the six year planning period.

TABLE 5.2 – MAWSS Outstanding Long-Term Debt Service

($000s)

Issue	Maturity	2013	2014	2015	2016	2017	2018	2019
Water and Sewer Rev. Bonds								
1999 Bank Bond	2018	$1,034	$1,066	$1,100	$1,136	$1,177	$1,200	$0
2001 Bank Bond	2021	1,400	1,353	1,306	1,260	1,213	1,166	1,119
2006 Series	2035	5,234	5,234	5,234	5,234	5,234	5,234	5,234
2010 Compass bond	2021	5,901	5,875	5,858	5,848	5,835	5,845	5,851
2012 Refunding of 2004B Series	2018	3,208	3,199	4,067	4,184	4,279	3,399	-
Subtotal, revenue bonds		16,777	16,728	17,566	17,662	17,737	16,843	12,204
SRF Subordinated Bonds								
2006/1996A Series (Refunded)	2019	$800	$802	$804	$810	$0	$0	$0
2004A Series (Refunded)	2014	1,106	1,116	-	-	-	-	-
2004 Series	2024	696	696	696	695	699	698	695
2005 CW Series	2025	801	800	799	798	992	990	1,822
2005 DW Series	2025	350	352	354	351	353	354	351
2010 CW Series (Refunded)	2030	1,039	1,048	1,061	1,073	1,090	1,105	1,119
2012 Series	2032	1,319	1,317	1,319	1,316	1,317	1,317	1,317
Subtotal, SRF bonds		6,110	6,132	5,034	5,044	4,451	4,464	5,304
Total, revenue and SRF bonds		$22,887	$22,860	$22,600	$22,706	$22,188	$21,308	$17,508

FIGURE 5.3 – MAWSS Outstanding Bond and Loan Repayment Requirements



5.2.1.3 Internally Generated Funds

Internally generated funds are consistently used to pay for capital construction. MAWSS has characteristically budgeted $12 to $14 million per year of user charge revenue for this Pay-As-You-Go capital funding purpose. Capital charges assessed to new connectors to the systems are used to fund capital projects and are considered internally generated funds, or “Pay Go” funds.

5.3 <u>Sources and Uses of Funds</u>

Sources and uses of capital funds for the next six years are shown in **Table 5.3**. The first line indicates the total capital needed for the CIP projects in each year. The data are the totals shown in Table 5.1. For example, the 2014 year the total in Table 5.1 is $35,990,000, as shown in Table 5.3. As in Table 5.1, the total six-year use of funds shown in Table 5.3 is $173.4 million.

The second band of data includes sources of funds. The three sources mentioned above are included. Pay go revenues scale up to $19.7 million in 2019. $19.7 million pay go revenue would be sufficient to fully fund the $17.7 million of recurring annual capital expenditures indicated in Table 5.1, above. The amount of pay go annual revenue shown in the table for each year was determined by our financial forecasting tool. A six year total of $89.0 million of pay go revenue is shown in Table 5.3, representing about 51 percent of the total capital requirement. Additionally, capital generated by the sale of bonds and undertaking SRF loans is included in Table 5.3. Prospective bond and SRF financings will account for the other 49 percent of capital requirement. Of the amount to be debt financed, 60 percent is indicated to be produced from the proceeds of bond sales and 40 percent from SRF loans. Although SRF funding typically is less expensive than revenue bonds, SRF funding is not always available in the amounts and times needed, so assuming a larger percentage of bonds than loans for capital production is more conservative for financial planning purposes.

TABLE 5.3 – Sources of Uses of Capital Funds

($000s)

	2014	2015	2016	2017	2018	2019	Total
Uses of funds							
CIP projects	$35,990	$35,990	$25,695	$25,695	$25,036	$25,036	$173,440
Sources of Funds							
Pay as you go revenues	$12,132	$13,705	$13,087	$15,047	$15,399	$19,673	
New revenue bond proceeds	25,281	0	16,510	0	8,848	0	
New SRF subordinated bonds	16,854	0	11,006	0	5,899	0	
	$54,266	$13,705	$40,604	$15,047	$30,145	$19,673	$173,440

5.3.1 Assumed Financings

MWH assumes that MAWSS will always choose the financing vehicle that will provide the best set of benefits to MAWSS' management, administration and constituency. As indicated above, if sufficient SRF funds are available, it may be that MAWSS will optimize utilization of that capital source. In some cases it may be preferable to sell parity revenue bonds in lieu of subordinated SRF bonds. Table 5.3 shows a reasonable prognosis for the purposes of this EAR planning.

Funds borrowed from the SRF are accomplished by the issuance of SRF subordinated bonds. Subordinated means that the lien of the subordinated bonds on net revenues of the MAWSS enterprise is junior to the lien on net revenues associated with parity (regular) revenue bonds. Parity bonds all have equal lien on net revenues while subordinated bonds have junior lien priority of payment from net revenues in the event of payment default.

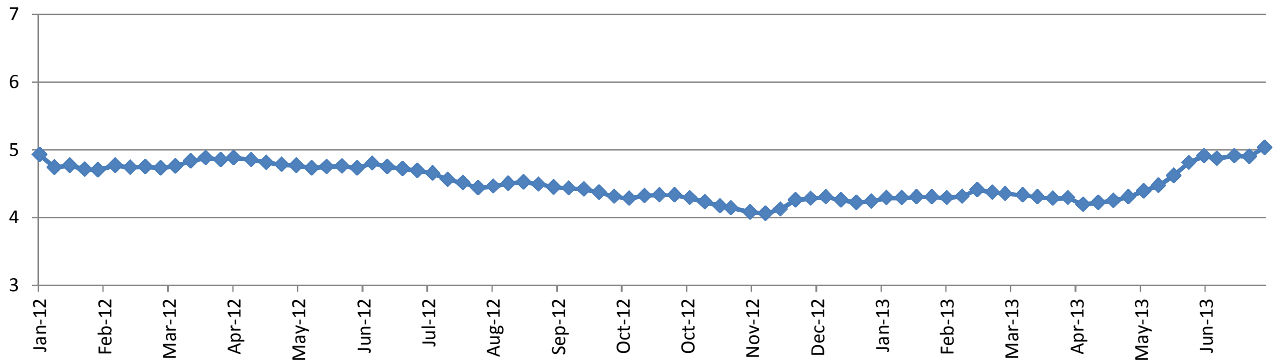
Table 5.4 shows the assumptions for the two forms of financings. Revenue bonds typically have longer maturities, meaning longer time to repay the debt. SRF borrowings have lower interest cost. Interest rates are characteristically lower with SRF loans than with bonds. One year of capitalized interest is shown to provide debt relief on the prospective cash flows. One year of debt service reserve is assumed to be capitalized into the bond sale. No debt service reserve is necessary for the SRF loans. The two year frequency is consistent with the timing of issues as indicated in Table 5.3.

TABLE 5.4 – New Money Financing Assumptions

	Bonds	SRFs
Capitalization		
Revenue Bonds	60%	
SRF		40%
Interest	4.5%	3.5%
Maturity, Years	30	20
Capitalized Cost of Inssurance	1.0%	1.0%
Capitalized Interest, Years	0	0
Debt Service Reserve, Years	1	0
2-year Frequency		

Figure 5.4 shows the most recent 1½ years of the Revenue Bond Index published by the Bond Buyer newspaper every Thursday. The index indicates yield, meaning that the effective interest rate on a bond sale will be more than the listed par rate to account for capitalized costs that do not convert to bond proceeds for capital construction purposes. The graph indicates the bond interest rate assumption shown in Table 5.4 is reasonable.

FIGURE 5.4 – Bond Buyer Revenue Bond Index, January 2011 – August 2012



5.4 SRF Loan and Revenue Bond Repayments

Table 5.3, above, indicates the timing and quantities of loan and bond transactions for the six year period. **Table 5.5**, below, indicates the annual principal and interest payments required to repay the loans, computed using the financial terms indicated in Table 5.4. Debt service coverage is not included in these figures.

TABLE 5.5 – New Money Bond and Loan Repayment Schedule

($000s)

	2014		2016		2018	
	Bonds	SRFs	Bonds	SRFs	Bonds	SRFs
Proceeds Required	$25,281	$16,854	$16,510	$11,006	$8,848	$5,899
Financing Costs	253	169	165	110	88	59
Debt service reserve	1,552	0	1,014	0	543	0
Bond sale/loan amount	$27,086	$17,022	$17,688	$11,117	$9,479	$5,957
Annual Debt Service/Loan Repay	$1,663	$1,198	$1,086	$782	$582	$419

		2014	2015	2016	2017	2018	2019
2013 Borrowings							
	SRF	$1,344	$1,344	$1,344	$1,344	$1,344	$1,344
2014 Borrowings							
	Bonds	$1,663	$1,663	$1,663	$1,663	$1,663	$1,663
	SRF	1,198	1,198	1,198	1,198	1,198	1,198
2016 Borrowings							
	Bonds			$1,086	$1,086	$1,086	$1,086
	SRF			782	782	782	782
2018 Borrowings							
	Bonds					$582	$582
	SRF					419	419
Total new money D/S L/P		$4,205	$4,205	$6,073	$6,073	$7,074	$7,074

The Table 5.6 title includes "New Money" to indicate that the data represent repayment of prospective "new money" loan and bond sales. The table does not include debt service associated with outstanding bonds and loans and does not reflect any future refinancing activity.

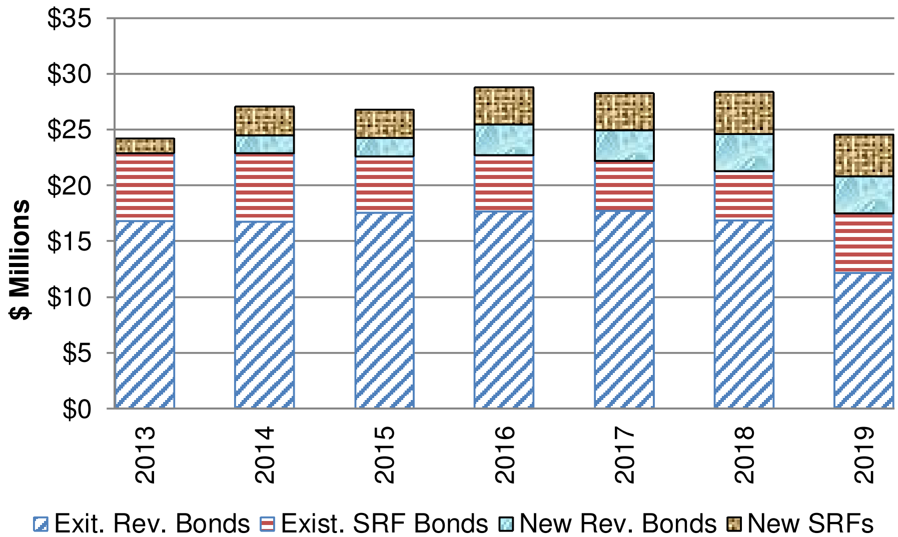
The top half of Table 5.5 indicates the computation of annual debt service. For planning purposes, the debt service is computed as equal-annual payments of principal and interest.

Four financings are indicated, to be undertaken in 2013, 2014, 2016 and 2018. The "bonds" columns include capitalized (funded with the bond sales) debt service reserve amounts equal to the computed annual debt service.

Debt service payments are assumed to commence fully in the year of the revenue bond sale and SRF loan transactions, as indicated in the lower half of Table 5.3.

Figure 5.5 shows combined debt service of the new money financings indicated in Table 5.6 and outstanding MAWSS bonds and loans debt service as indicated on Table 5.2 and Figure 5.3.

FIGURE 5.5 – Combined Debt Service Projection



5.5 Historical Revenues and Expenses

Four years of revenues and expenses were reviewed and are included in **Table 5.6**. In addition to the four years of actual data, three columns of trend data are shown. Two of those columns compare 2012 to 2011.

In some years with hotter/drought conditions, consumption increases and thus so do MAWSS operating revenues. In years that have above average precipitation and cooler temperatures, consumption weakens and thus MAWSS operating revenues may be less. Due to the somewhat cyclic, but unpredictable, nature of climatic conditions, MWH recommends that MAWSS consider encumbering weather-driven increased (above budget) revenues in an operating reserve fund for use in subsequent years when revenues may be less than budget. If the fund stabilizes at a high level, some of the fund resources might be used for rate stabilization (*i.e.*, to forestall or lessen planned rate increases) or to defease outstanding debt.

Table 5.6 also includes 2013 revenue and expense budget data for comparison with recent history.

TABLE 5.6 – Historical Revenues and Expenses

($000s)

	2009	2010	2011	2012		Trends: 12 over '11 ($000s)	Trends: 12 over '11 (%)	Trends: 3-yr avg. annual	2013 Budget
Revenues									
Operating revenue									
Water sales	$31,892	$35,719	$37,630	$37,558	42%	($72)	-0.2%	$920	$38,555
Sewer sales	50,270	50,782	50,964	52,826	58%	1,862	3.7%	1,022	54,425
Subtotal, operating rev	$82,163	$86,501	$88,594	$90,384	100%				$92,980
Non-operating revenue									
Investment earnings	$737	$430	$384	$208		($177)	-45.9%	($111)	$600
Grants	227	7	0	0		0	0.0%	(4)	0
Miscellaneous	582	589	677	668		(8)	-1.2%	39	400
Subtotal, non-op rev	$1,547	$1,027	$1,061	$876					$1,000
Total revenues	$83,709	$87,528	$89,655	$91,260					$93,980
Expenses									
Operating Expenses									
Water supply	$1,634	$1,565	$1,720	$1,615	3%	($105)	-6.1%	$25	$1,600
Water treatment	5,042	5,091	5,486	6,533	12%	1,048	19.1%	721	6,711
Wastewater treatment	6,360	6,527	7,589	7,432	14%	(157)	-2.1%	452	7,460
Transmission and collection	15,826	15,650	15,751	15,989	30%	239	1.5%	170	18,279
Support services	3,510	3,510	3,943	3,954	7%	11	0.3%	222	4,060
Supervision and gen. exp.	16,823	17,270	17,214	18,318	34%	1,104	6.4%	524	18,490
Total	$49,195	$49,613	$51,702	$53,842	100%				$56,600

It is noted that the $56.6 million Expenses budgeted for 2013 is more than five percent greater than the $53.8 million expended in 2012. The reason for this increase is because MAWSS capitalize a portion of their O&M expenses. In 2011 MWASS capitalized $1.4 million of their operating expenses. The 2013 budget include the total operating expenses including the portion that will be capitalized. When the capitalized operating costs are included the 2013 budget represent a projected increase of less than 1 percent.

Table 5.7 shows a summary of 2013 expense budget data both in terms of Cost Objects and Cost Functions.[8] Looking at the distribution of cost objects, more than half of the annual budget is for labor costs. This ratio is typical for large utility organizations. It is interesting that the cost functions of Support and General Expenses together comprise about 40 percent of the budget.

8 Cost objects are the recipients of payments. Cost functions are the reasons payments are made.

TABLE 5.7 – Expense Budget Data for 2013

($000s)

	Budget Cost Functions							
Budget Cost Objects	Water Supply	Water Treatment	Wastewater Treatment	Transmission & Collection	Support Services	Supervision and General Expenses	Total	
Labor Costs	$258	$2,066	$3,060	$9,379	$3,151	$13,437	$31,351	55.4%
Contractual SVcs	1,220	1,307	3,137	5,798	590	3,579	15,631	27.6%
Op. Supplies & Materials	121	3,339	1,262	3,101	320	1,474	9,617	17.0%
Total	$1,600	$6,711	$7,460	$18,279	$4,060	$18,490	$56,600	100.0%
	2.8%	11.9%	13.2%	32.3%	7.2%	32.7%	100.0%	

Table 5.7 shows the budgeted expense data in cost object terms of the following cost objects:

- Labor
- Contractual Services
- Operating Supplies/Materials

As shown in Table 5.7, the budget contains sufficient information so that the same data may be configured to indicate cost functions of:

- Water Supply
- Water Treatment
- Wastewater Treatment
- Transmission and Collection
- Support Services
- Supervision and General Expense

The sums of cost objects and cost functions properly equate.

It is important to note that previous budgets were presented with different cost functions that the historical costs presented in the CAFR. In previous EARs, MWH recommended the consolidation of the cost functions for both reporting documents. MAWSS implemented this change in the 2013 budget.

Table 5.8 shows a simplified version of the current structure of cost buckets. The data in the Accounting Units was provided by MAWSS in the 2013 budget. MWH created the Function columns with the purpose of providing an example of how the buckets might be altered so that the basic utility cost functions of water and sewer are recognizable. In the table, “Water” and “Sewer” are obvious basic functional descriptions. “Common” means that the services accounted in these buckets are typically not directed at water or sewer affairs. For water and sewer cost accounting, the common costs may be allocated by standard distribution or pro rata following the direct cost behaviors at the end of the fiscal periods. “Attributable” is intended to indicate that costs in these accounting units typically (not always) could be attributed to the water or sewer basic cost functions.

It is noted that of all six accounting units in Support Services might be attributable to water and/or sewer. On simple review, MWH noted only two of the seventeen accounting units in the Administration category appear other than common characteristic. On the face of it, MWH questions why a sewer function is labeled “Distribution Sys & Rec Mgr” as this word generally is associated with water not sewer.

The Williams WWTF Laboratory (Lab) is indicated as “Attributable” because the laboratory located at the Williams WWTF provides water and wastewater laboratory services.

TABLE 5.8 – Partial Chart of Accounts

Acctg Unit	Description	Function	Acctg Unit	Description	Function
Water Supply			Support Services		
1	S Palmer Gaillard Pumping Sys	Water	24	C.C. Williams WWTF Lab	Attributable
2	Burton S Gutler Pumping Sys	Water	21	Construction Inspection	Attributable
			26	Central Services	Attributable
Water Treatment			27	Garage	Attributable
8	H.E. Myers Sludge Facility	Water	28	Easement Maintenance	Attributable
9	H.E. Myers WTP	Water	15	Treatment Plant Instrumentation	Attributable
12	E.M. Stickney WTP	Water			
			Administration		
Wastewater Treatment			30	Board of Commissioners	Common
18	C,C. Williams WWTF	Sewer	31	Director	Common
19	Wright Smith WWTF	Sewer	32	Accountiung/Purchasing	Common
25	Pretreatment	Sewer	33	Customer Service	Common
150	Grease Treatment Facility	Sewer	34	Accounts Receivable/Billing	Common
101	Decentralized Cluster Systems	Sewer	35	Installations/Disconnections	Common
			36	Facilities Management	Common
Distribution and Collection			37	General Administration	Common
13	Booster Stations	Water	38	Distribution Sys & Rec Mgr	Sewer
14	Hydrant Maintenance	Water	40	Planning & Engineering Mgr	Common
17	Wastewater Lift Statinos	Sewer	41	Assistant Director	Common
22	Infiltration and Inflow	Sewer	43	Information Services	Common
44	Video Investigation	Sewer	45	Human Resources	Common
111	W&S Installations/Repairs	Attributable	47	Mapping and Connections/GIS	Common
107	Material Hauling & Restoration	Attributable	48	Meter Reading	Common
129	Corss Conn Control & Meters	Water	23	Collection Systems Manager	Sewer
144	Sewer Cleaning	Sewer	49	Operations Communications	Common
128	ROW Paving Adjustments	Attributable			

5.5.1 Capital Budgeting

MAWSS managers have been diligent at identifying capital needs to keep the water and sewer systems operational in a highly regulated business environment. MAWSS managers meet weekly to discuss, among other things, the status of various aspects of the water and sewer systems capital facilities.

MWH has mentioned in a previous EAR that capital budgeting at MAWSS does not, to our knowledge, include project justification documentation background information. This does not indicate in any way that MAWSS has not invested in good, necessary projects. We understand that MAWSS looked into a Project Control Plan process, but did not implement the project. MWH suggests MAWSS re-investigate the potential benefits of such protocol.

5.6 Projected Results of Operations

The previous section has discussed capital project costs and capital funding, as well as historical and budgeted revenues and expenses. The next step is to forecast revenues and expenses and combine these with projected debt service for new and outstanding debt obligations to determine the debt service coverage for revenue bonds and SRF loans. Including the cash reserve balance and capital activity will provide a forecast of the cash position for MAWSS.

5.6.1 Revenue and Expense Projections

Table 5.9 indicates a conservative forecast of revenues for water and sewer services for the six year planning period. Revenues were projected based on the Board's approved schedule of rate adjustment through 2016 and projected inflationary increases after that. MAWSS has experience a reduction in demand due to the rate increases causing the increase in revenues to be less than the approved rate adjustments. This is a common effect caused by price elasticity of demand. Our revenue projections assume that the approved and projected rate increases will have a lower effect on revenue of 1 percentage point less. Other water and sewer revenues not subject to the rate adjustments were assumed to stay at the same levels as the 2013 budget. The Investment earnings were projected based on MWH's financial forecast tool assuming a conservative 0.5 percent interest on average cash balances.

TABLE 5.9 – Projected Revenues

		Projected					
	2013 Budget	2014	2015	2016	2017	2018	2019
Propose Revenue Adjustment	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%	4.0%
Operating revenue							
Water sales							
At 2012 Rates	$32,190	$33,800	$35,152	$36,558	$38,020	$39,541	$40,727
Actual Revenue Adjustment	5.0%	4.0%	4.0%	4.0%	4.0%	3.0%	3.0%
Dollar Value	1,610	1,352	1,406	1,462	1,521	1,186	1,222
Resulting Revenues	$33,800	$35,152	$36,558	$38,020	$39,541	$40,727	$41,949
Other Water Operating Revenues	4,755	4,500	4,500	4,500	4,500	4,500	4,500
Total Water Revenues	$38,555	$39,652	$41,058	$42,520	$44,041	$45,227	$46,449
Sewer Sales							
At 2012 Rates	$49,333	$51,800	$53,872	$56,027	$58,268	$60,599	$62,417
Actual Revenue Adjustment	5.0%	4.0%	4.0%	4.0%	4.0%	3.0%	3.0%
Dollar Value	2,467	2,072	2,155	2,241	2,331	1,818	1,872
Resulting Revenues	$51,800	$53,872	$56,027	$58,268	$60,599	$62,417	$64,289
Other Water Operating Revenues	2,625	2,475	2,475	2,475	2,475	2,475	2,475
Total Sewer Revenues	$54,425	$56,347	$58,502	$60,743	$63,074	$64,892	$66,764
Total Operating Revenues	$92,980	$95,999	$99,560	$103,263	$107,115	$110,119	$113,213
Non Operating Revenues							
Investment Earnings	$600	$388	$378	$358	$367	$351	$348
Grants	0	0	0	0	0	0	0
Miscellaneous	400	420	420	420	420	420	420
Total non operating Revenues	$1,000	$808	$798	$778	$787	$771	$768
Total Revenues	$93,980	$96,807	$100,358	$104,041	$107,902	$110,890	$113,981

Projections of revenues assume the application of the 5 percent adjustment to go into effect in January 2013. Additional revenue includes the subsequent 5 percent rate increases already approved by the MAWSS Board for Water and for Sewer through 2016. In 2017 through 2019 the rate increases are reduced to 4 percent for each of those years. Four percent is sufficient for producing debt service coverage above the target.

Table 5.10 indicates a conservative forecast of expenses, not including debt service, for the six year planning period. The table includes the 2013 budget data that also appear in Table 5.6, above. Based on the historical trends and the 2013 budget, figures were selected as representative of end of year cost estimates for 2013. Expenses were projected assuming an average annual 4.5 percent inflation factor for labor costs and 3 percent for all other costs.

TABLE 5.10 – Projected Expenses

($000s)

	2013 Budget	Projected 2014	2015	2016	2017	2018	2019
Expenses							
Operating Expenses							
Water supply	$1,600	$1,648	$1,702	$1,757	$1,814	$1,873	$1,934
Water treatment	6,711	6,919	7,158	7,407	7,664	7,930	8,206
Wastewater treatment	7,460	7,693	7,971	8,260	8,559	8,870	9,193
Transmission and collection	18,279	18,856	19,567	20,306	21,073	21,872	22,701
Support services	4,060	4,191	4,366	4,548	4,738	4,935	5,142
Supervision and gen. exp.	18,490	19,085	19,866	20,679	21,527	22,410	23,331
Total	$56,600	$58,392	$60,630	$62,956	$65,375	$67,891	$70,507

MWH assumes *for revenue and cost projections* that there will be no significant customer growth over the next six years. We recognize that revenue production has a documented history of variance, which MAWSS management attributes mostly to weather, and especially to rainfall. The conservative approach is to not predict any change in revenue resulting from growth.

5.6.2 Debt Service Coverage Calculation

Once the revenues and expenses are projected for the study period we can proceed to calculate the revenue sufficiency to meet debt service coverage. **Table 5.11** indicates the projected debt service coverage based on projections of revenues, expenses and total debt service (existing and proposed).

TABLE 5.11 – Projected Debt Service Coverage

($000s)

	2013 Budget	Projected 2014	2015	2016	2017	2018	2019
Operating revenue							
Total Water Revenues	$38,555	$39,652	$41,058	$42,520	$43,661	$44,836	$46,046
Total Sewer Revenues	54,425	56,347	58,502	60,743	62,491	64,291	66,146
Total Operating Revenues	$92,980	$95,999	$99,560	$103,263	$106,152	$109,127	$112,192
Total non operating Revenues	$1,000	$804	$794	$778	$787	$772	$769
Total Revenues	$93,980	$96,803	$100,354	$104,042	$106,939	$109,899	$112,961
Operating Expenses	$56,600	$58,392	$60,630	$62,956	$65,375	$67,891	$70,507
Net Income for Coverage	$37,380	$38,411	$39,724	$41,086	$41,564	$42,008	$42,454
Debt Service (parity and Subordinate)	$24,231	$26,893	$26,633	$28,602	$28,084	$28,324	$24,524
Coverage	1.54x	1.43x	1.49x	1.44x	1.48x	1.48x	1.73x

At the bottom of Table 5.11 the debt service coverage is calculated and although in every year coverage exceeds the *Indenture of Trust* covenant amount of 1.20x, MWH is of the opinion that MAWSS should maintain a management target above the minimum established by the *Indenture of Trust*. Based on experience with other utilities, MWH recommends maintaining a debt service target of 1.4x to 1.5x.

5.6.3 Fund Balance Projections

As of December 31, 2012 MAWSS had a total of $80.1 million in cash and investments based on the 2012 CAFR. Of this $55.4 million were restricted. In order to project MAWSS revenue sufficiency, new bonds, revenue adjustments, MWH modeled MAWSS' different reserves requirements and made sure that all the requirements are made throughout the six year forecast period. Table 5.12 presents a summary of the reserves requirements assumed for the revenue sufficiency analysis with the example of the requirements for 2013.

TABLE 5.12 – Summary of Reserve Requirements

($000s)

Reserve	Basis	2013
Operating Reserve	25% of Operating Costs	$14,150
R&R Reserve	$3M	3,000
General Reserve	20% of Revenues	18,521
GASB 45	Post Employment Benefits	4,500
Customer Account Refund		2,399
Bond Reserve Account	Highest annual debt service for Revenue Bonds	17,691
		$60,261

The *Indenture of Trust* requires MAWSS to deposit and reserve each month 1/12 of the total annual debt service for that year. We did not include this in our analysis since that reserve is temporary requirement that only exists until the payment of the debt service. The *Indenture of Trust* requires only a general reserve of 5 percent of revenues, but MAWSS board adopted a policy of 20 percent of revenues. The $4.5 million in post-employment benefit will not be a reserve requirement, but a trust to pay for MAWSS post-employment costs.

Table 5.13 presents the projected results of operations with the ending fund balances for the six year forecast period as well as the fund balance reserve requirements for each year.

TABLE 5.13 – Results of Operations

($000s)

	2013 Budget	Projected 2014	2015	2016	2017	2018	2019
Operating revenue							
Total Water Revenues	$38,555	$39,652	$41,058	$42,520	$44,041	$45,227	$46,449
Total Sewer Revenues	54,425	56,347	58,502	60,743	63,074	64,892	66,764
Total Operating Revenues	$92,980	$95,999	$99,560	$103,263	$107,115	$110,119	$113,213
Total non operating Revenues	$1,000	$808	$798	$778	$787	$771	$768
Total Revenues	$93,980	$96,807	$100,358	$104,041	$107,902	$110,890	$113,981
Operating Expenses	$56,600	$58,392	$60,630	$62,956	$65,375	$67,891	$70,507
Net Revenue Before Capital Activity	$37,380	$38,415	$39,728	$41,085	$42,527	$42,999	$43,474
Capital Activity							
Capital Projects	$60,035	$35,990	$35,990	$25,695	$25,695	$25,036	$25,036
Existing Debt Service	22,887	22,860	22,600	22,706	22,188	21,308	17,508
Debt Service Projected Issues	1,344	4,205	4,205	6,073	6,073	7,074	7,074
Total Capital Activity	$84,266	$63,054	$62,794	$54,474	$53,956	$53,417	$49,618
Bond Proceeds	$19,802	$43,687	$0	$28,530	$0	$15,289	$0
Net Income of Years' Operation	($27,084)	$19,047	($23,066)	$15,141	($11,430)	$4,871	($6,144)
Beginning Fund Balance	$95,299	$68,215	$87,262	$64,195	$79,336	$67,906	$72,778
Net Income	(27,084)	19,047	(23,066)	15,141	(11,430)	4,871	(6,144)
Ending Fund Balance	$68,215	$87,262	$64,195	$79,336	$67,906	$72,778	$66,634
Fund Balance Requirement	60,261	62,924	64,195	66,531	67,906	69,679	66,634
Surplus (Deficity) Over Requirement	$7,954	$24,338	$0	$12,805	$0	$3,099	($0)

MWH revenue forecast proposes revenue adjustments and new debt in such a way that the projected ending fund balances meet all the reserve requirements. As presented on Table 5.13 the reserve requirements are dynamic because they change with the proposed revenue increases as well as the proposed revenue bonds. The beginning fund balance for 2013 includes $17 million in SRF proceeds that were not disbursed as of December 2012.

5.7 Affordability

MAWSS customers had an average 28 percent rate increase in 2009 and 3 percent rate increases in 2010 and 2011. Most recently, there was a 5 percent increase in 2012 and 2013. At the same time the Board approved the 2012 rate increase, the Board approved a total of 5 years of 5 percent per year water and sewer rate increases through 2016. Table 5.9 indicates that pursuant to the planning assumptions incorporated in the analyses of this EAR, additional revenue adjustments are:

- 5 percent in 2013
- 5 percent in 2014
- 5 percent in 2015

- 5 percent in 2016
- 4 percent in 2017
- 4 percent in 2018
- 4 percent in 2019

The citizens and businesses served by MAWSS have endured some hardship in recent years. Per the US Census Bureau, MAWSS economic factors compared with the State of Alabama and the USA as shown in **Table 5.14**. In two of the three statistical categories shown, Mobile has poorer values. Just the unemployment rate as of April 2013 has a lower than the US.

TABLE 5.14 – Socioeconomic Information

	City of Mobile	State of Alabama	United States
Data			
Population (2012 estimate)	194,822	4,822,023	313,914,040
Median Household Income (2007-11 average)	38,240	42,934	52,762
Unemployment	7.2%	6.9%	7.5%
Below Poverty Level	21.6%	17.6%	14.3%
Percent of USA			
Median Household Income	72.5%	81.4%	100.0%
Unemployment (% above USA)	-0.3%	-0.6%	7.5%
Poverty Level (% above USA)	7.3%	3.3%	0.0%

Yet, MAWSS customers do not pay high water and sewer charges in comparison with other utilities. For example, in May 2010 MAWSS made a presentation to the credit rating agencies with respect to the 2010 refunding bond sale. In that presentation, MAWSS identified that the current MAWSS water rates were ninth lowest (35th percentile) out of the 26 water utilities. On the sewer side, MAWSS presented data that MAWSS sewer rates were 17th lowest (65th percentile) of the 26 utilities.

While unemployment conditions may be worse in other communities, MAWSS customers are sensitive about utility rate increases.

The EPA considers median household income (MHI) an appropriate indicator of affordability of water and wastewater system costs to households. The EPA Guidance for Combined Sewer Overflow (CSO) Control Financial Capability Assessments indicates that costs per household that equal or exceed 2.0 percent of MHI are "High Burden," there being no higher criterion or value of financial incapability and that is for costs of CSO and wastewater treatment only.

MAWSS' records indicate that in 2011, total consumption of 5/8-inch meter services was 4,558,828 billing units (1,000 gallons is a billing unit). The total number of accounts in that year of that meter size averaged 81,954 accounts. Dividing one by the other, the average annual consumption[9] of the accounts using 5/8-inch meters in 2011 was 55.6 billing units, or 4.6 per month. Most, but not all, residential accounts use 5/8-inch meter services and most, but not all,

[9] Median household consumption is not available at this time. Median is the value where half the statistical population is above and half below. Mean is the arithmetic average. Given that we discuss only 5/8" meter data, the distinction between median and mean may be small.

5/8-inch meters serve residential accounts. Therefore it is reasonable, and typically assumed, that the average 5/8-inch meter data is representative of residential customers.

The current MAWSS rates for 5/8-inch meter services using up to 500 billing units per month are $2.68 per billing unit of water and $6.27 per billing unit of wastewater, for a total commodity charge of $8.95 per billing unit. Additionally, MAWSS charges $4 per account per month ($2 for water and $2 for sewer). The rate for consumption in excess of 500 billing units per month is slightly less. Applying these rates to the average annual residential consumption of 5,000[10] gallons yields an annual water and sewer cost of $48.75 per month or $585.00 per year. This cost for water and sewer service is 63 percent of the EPA affordability criterion ($63.73 per month).

Table 5.15 shows a brief analysis of residential average projection and affordability measurement. The top row of Table 5.15 contains the annual water and sewer approved and proposed revenue adjustments shown in Table 5.13. The computation of annual changes in revenue requirement is not necessarily equitable to changes in water and sewer rates. The 5 percent increase approved by the Board applies only to the bulling unit portion, but not to the $4.00 account charge. The proposed increases after that assume an increase on all the rates.

The second row of Table 5.15 shows the indicated projected charges per month for the average residential customer using a 5/8-inch meter service. The 2013 value is the charge number computed above for the average account. The subsequent data in the second row show the projected average bill by the percentages shown in the first row. Thus, the $48.75 service charge in 2013 would increase to an indicated value of approximately $62.77 in 2019 under this planning scenario.

TABLE 5.15 – MAWSS Residential Rate Indication and Affordability Assessment

(Monthly water and sewer charges to average residential customers)

	2013	2014	2015	2016	2017	2018	2019
Rate Adjustments	*(basis)*	5.0%	5.0%	5.0%	4.0%	4.0%	4.0%
Projected Charges/month average resid. Acct. (5,000 gallons)	$48.75	$50.99	$53.34	$55.80	$58.04	$60.36	$62.77
Percent of MHI	1.5%	1.6%	1.7%	1.8%	1.8%	1.9%	2.0%

Projected average residential monthly costs are shown in the second row of data in Table 5.15. The third row indicates the ratio of annual cost (twelve times monthly) to MHI. The ratio increases from 1.5 percent of MHI in 2013 to 2.0 percent in 2019.

Relying on this affordability assessment and our experience at other large regional water/sewer utilities, MWH is of the opinion that although the projection of the average residential bill as a percentage of MHI remains below the EPA affordability threshold, it is important for MAWSS to review its existing rate structure and evaluate the possibility of improving affordability for low income water and sewer customers.

5.8 Reserves Policies Comparison

As part of our scope of work for the 2013 EAR MWH compared MAWSS existing reserve policies and practices with the ones of three other southern coastal utilities. MWH used for the comparison the City of New Orleans, Louisiana (Sewerage and Water Board of New Orleans); the City of Pensacola, Florida (Emerald Coast Utilities Authority) and the City of Biloxi, Mississippi water and wastewater utility.

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[10] The 2012 average usage for 5/8" meter was 4,600 gallons. For simplicity, we rounded to 5,000 gallons.

Reserve levels are one of the most important factors along with the operating margin in determining a Utility debt rating and the interest rates that will pay on new bond issues.

Comparing the level of reserves might not be appropriate since each utility have different characteristics. In order to better compare the level of reserves between utilities, MWH used the cash-day-on-hand ratio using the Fitch rating definition, which is calculated by dividing the total restricted and unrestricted cash and investments by the daily operating costs. This ratio represents the number of days a utility can cover its operating costs. Different rating agencies have slightly different methodologies of how the financial ratios are calculated. The Fitch rating includes all the cash reserves including restricted cash whereas other rating agencies do not. Table 5.16 presents a comparison of the level of reserve for each utility and the day-cash-on-hand of each one of them.

TABLE 5.16 – Comparison of Reserve Levels as of December 31, 2012

($000s)

	MAWSS	Sewerage and Water Board of New Orleans	Emerald Coast Utilities Authority (City of Pensacola)	City of Biloxi Water and Wastewater Utilities
Total Restricted and Unrestricted Reserves	$80,174	$120,325	$98,932	$4,674
Total Operating Costs	$53,842	$138,038	$63,054	$12,948
Days-Cash-on-Hand*	544	318	573	132
Average Days-Cash-on-Hand				
"A" Rated Utility	285			
"AA" Rated Utilities	418			
"AAA" Rated Utilities	427			

** Per Fitch Rating Calculation*

As of the end of 2012 MAWSS had 544 days-of-cash-on-hand. This is higher than the average for a AAA rated utilities as shown in Table 5.16. MAWSS reserve requirements policies are summarized on Table 5.12 as of December 31, 2012, the requirements amounted to $60.2 million. This represents about 75 percent of the total reserves.

The Sewerage and Water Board of New Orleans had 318 days-cash-on-hand as of the end of 2012. The board has a policy of maintaining 180 days of reserve as well as a covenant requirement of one year of debt service of their uninsured debt (93 days).

Emerald Coast Utility Authority of Pensacola had 573 days-cash-on-hand as of the end of 2012. The authority has a policy of maintaining about $3.5M in case of hurricane emergency repairs, a debt covenant requirement of 5 percent of the net book value for renewal and replacement reserve, and a $4.9 million for self-insurance coverage.

The City of Biloxi Utilities had 132 days-cash-on-hand as of the end of 2012. The City has a policy of maintaining at least 90 days-cash-on-hand and no additional requirements.

5.9 Findings and Conclusions

The principal finding with respect to the financial sufficiency analysis is that MAWSS should be commended for its step to adopt annual five percent rate increases. Table 5.11 indicates strong financial performance with debt service coverage never below 1.4x and fund balances reserves growing each year to the required levels and above.

The *Indenture of Trust* stipulates that the focus of analysis included in the EAR be the next following year, or in this case the 2014 year. In order to evaluate revenue sufficiency for the 2014 year, it is necessary to consider 2014 in a financial planning context that includes a number of years. This section of the EAR addresses the six year period of 2014 through 2019.

MWH recommends that MAWSS implement a long range financial plan framework to evaluate the impact to rates and their financials of the implementation of the full capital improvement program.

5.9.1 2014 Year

The capital requirement for 2014 includes beginning work on Priority 1 projects as well as annually recurring projects.

While revenues are not projected to increase without rate and fee adjustments, expenses are indeed projected to increase due to regular effects of cost escalation. Although MAWSS management will continue efforts to contain costs, it is conservative to assume that some cost escalation will continue.

MAWSS has implemented a rate increase package of annual 5 percent adjustments. Although this EAR indicates that the rate increases can be lowered to 4 percent in 2017 and 2018, specific decisions on future rate adjustments should be made in the future.

MWH recommends that MAWSS change the Distribution and Collection and Support Services cost centers so that costs are directly assigned to Water or Sewer without using standardized indexes to allocate the costs. This change, *per se*, would not necessarily entail change in management or staff personnel work assignments. It would improve the identification of actual costs of the water and sewer enterprises.

5.9.2 Subsequent Years

Due to increasing revenue requirements to satisfy net costs of O&M plus capital outlay, the planning information indicates that rate increases should continue over the near term:

2014 .... 5.00%

2015 .... 5.00%

2016 .... 5.00%

2017 .... 4.00%

2018 .... 4.00%

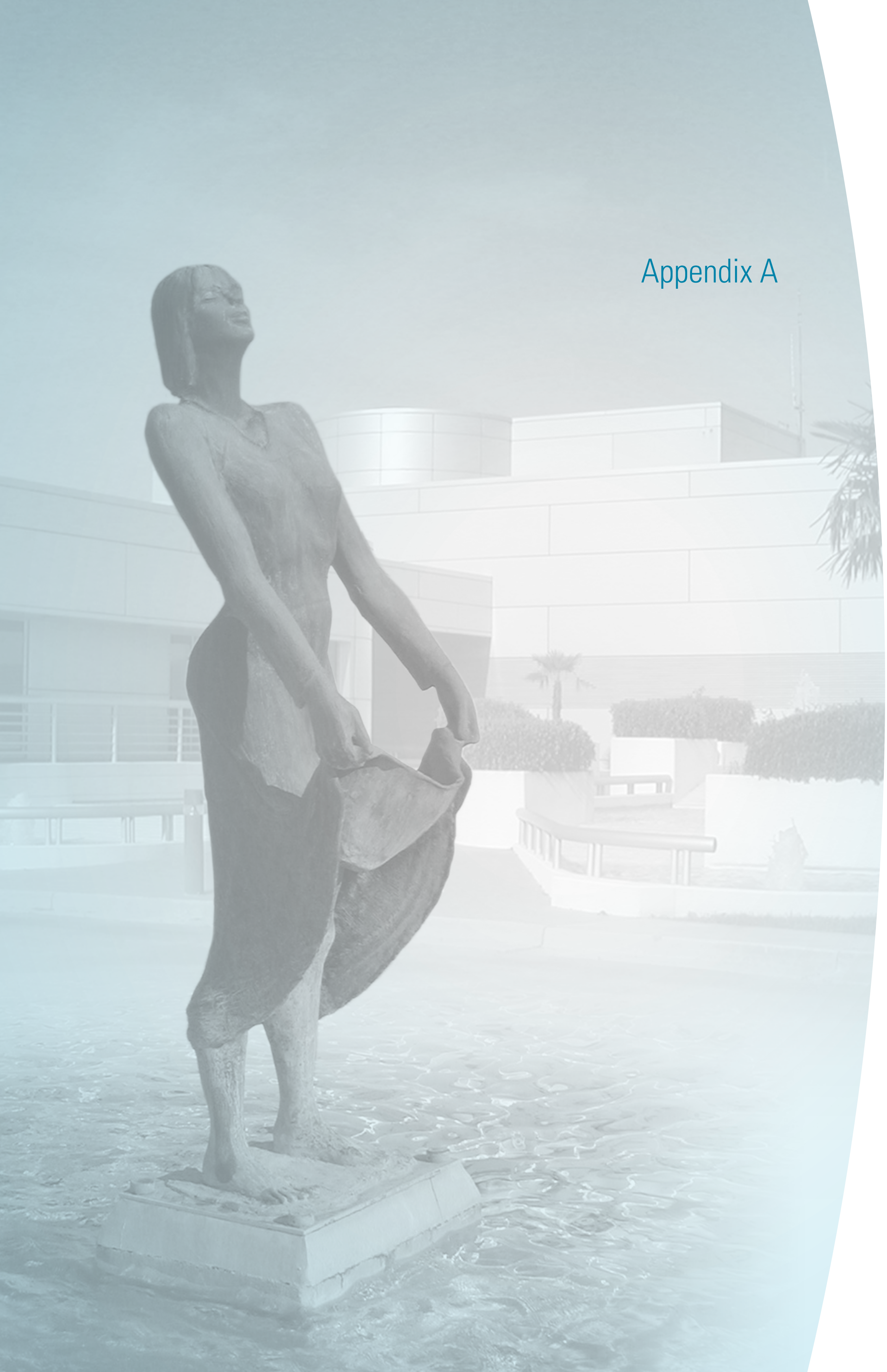
2019 .... 4.00%

To produce sufficient capital in the amounts and times needed, the planning information contemplates biennial issues of revenue bonds and SRF borrowings funds (subordinated bonds).

MWH is of the opinion that MAWSS has favorable credit worthiness. MAWSS has neither defaulted on any debt payment nor abrogated any covenant stipulated in the *Indenture of Trust* including debt service coverage. The projection of revenue increases is affordable.

MAWSS' budgeting process is comprehensive and produces annual spending constraints that are adhered to well by MAWSS managers and staff. MAWSS financial reporting consistently earns the Certificate of Excellence from the Government Finance Officers Association. MAWSS double-A credit ratings are also excellent.

Appendix A



APPENDIX A

Identified Project Needs

By Infrastructure Area

TABLE A.1 - EAR 2013 Project Authorization Priority and Project Type Definitions

Project Authorization Priority	Project Type	Definition
Annual		To be authorized each year
1		To be authorized in next two years (Years 1 & 2)
2		To be authorized in subsequent two years (Years 3 & 4)
3		To be authorized in final two years of this 6-year projection
4		To be authorized when, or if, grant funding materializes
5		To be authorized when, or if, growth materializes
	Capacity	Required to maintain permitted or minimum customer service level of asset service for future growth
	Efficiency	Required to optimize energy or chemical usage, generally justified by life cycle cost analysis
	Functionality	Required for ease of O&M, safety or security issues
	Hazard Mitigation	Required to reduce potential for future damage/loss of service during extreme events
	Level of Service	Required to provide higher than minimum level of service of asset service for customers
	Redundancy	Required to maintain serviceability when other assets require repair or preventive maintenance
	Regulatory Compliance	Required to maintain permitted level of asset service
	Reliability	Required to maintain minimum level of service of asset service for customers
	Relocation	Required relocation due to meet other entity needs (*e.g.,* ALDOT, City of Mobile, etc.)

TABLE A.2 - Raw Water Supply Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
1	Functionality	Install automatic screens at the Big Creek intake structure	$ 1,750,000	
1	Hazard Mitigation	Evaluate requirements to replace Big Creek Lake Dam flood gates with electric motor-driven system	$ 50,000	
1	Functionality	Evaluate replacement of cone valves with slow open/close swing check valves	$ 50,000	$ 1,850,000
2	Functionality	Implement recommendations from the Watershed Management Plan (annual allowance)	$ 200,000	$ 200,000
3	Hazard Mitigation	Install booming at the Big Creek intake structure	$ 400,000	
3	Functionality	Conduct a scheduled trial of pumping river water to E.M. Stickney WTP	$ 25,000	
3	Efficiency	Study alternatives for energy optimization of raw water pumping	$ 50,000	
3	Functionality	Replace cone valves with slow-open/slow-close swing check valves	$ 400,000	
3	Functionality	Modify the Bucks intake structure to enable isolation from Mobile River	$ 300,000	$ 1,175,000
4	Efficiency	Investigate installation of HVAC in the pump room to extend pump motor life	$ 50,000	
4	Hazard Mitigation	Replace Big Creek Lake dam flood gate operating system with electric motor-driven system	$ 400,000	$ 450,000
		TOTAL	**$ 3,675,000**	**$ 3,675,000**

TABLE A.3 - E.M. Stickney WTP Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
1	Redundancy	E.M. Stickney redundant lime silo and slacker system	$ 650,000	
1	Reliability	Sludge removal from E.M. Stickney WTP reservoir	$ 500,000	
1	Functionality	Install isolation valves on low head discharge manifold	$ 200,000	
1	Reliability	Evaluation of emergency backup generators to improve reliability	$ 50,000	
1	Hazard Mitigation	Evaluate concrete structure conditions, especially the critical clearwell	$ 250,000	$ 1,650,000
2	Reliability	Evaluation of relocation of chlorine dioxide injection point to improve ease of maintenance and reliability	$ 50,000	
2	Efficiency	Evaluate energy efficient MCC replacement equipment and installation of HVAC in MCC rooms	$ 200,000	$ 250,000
		TOTAL	**$ 1,900,000**	**$ 1,900,000**

TABLE A.4 - H.E. Myers WTP Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
1	Reliability	Sludge removal from H.E. Myers WTP reservoir	$ 500,000	
1	Efficiency	Improvements for centrifuge control panel #1	$ 115,000	
1	Functionality	Raw water pumps/valves - reconfigure header to allow operation of the facility in Reservoir Bypass mode with valve failure	$ 500,000	$ 1,115,000
2	Efficiency	Provide a lime grit removal system	$ 150,000	
2	Functionality	Provide a shelter for the exposed generator	$ 50,000	
2	Functionality	Modify Raw Water piping to allow for operation of the facility while replacing isolation valves	$ 500,000	
2	Efficiency	Improvements for centrifuge control panel # 2 & 3	$ 230,000	$ 930,000
3	Reliability	Replace centrifuges with energy efficient, automated units	$ 3,000,000	
3	Functionality	Evaluate installation of HVAC in MCC rooms	$ 75,000	$ 3,075,000
		TOTAL	**$ 5,120,000**	**$ 5,120,000**

TABLE A.5 - Water Distribution System Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
Annual	Reliability	Priority water main upgrades & relocations, including for fire capacity and critical valve routine replacement (annual allowance)	$ 500,000	
Annual	Reliability	Paint, and renovate as needed, water tanks (annual allowance)	$ 1,500,000	
Annual	Relocation	Utility water relocations (annual allowance)	$ 450,000	
Annual	Reliability	Routine booster pump station rehabilitation/replacement (annual allowance)	$ 100,000	$ 2,550,000
1	Reliability	In-house CIP work (as needed)	$ 420,000	
1	Reliability	Restraints on water main joints (Chin St. Swamp)	$ 150,000	
1	Reliability	Anchor 12" water main at creek crossing (Soille Rd.)	$ 50,000	
1	Reliability	Tennessee St. water main	$ 1,500,000	
1	Reliability	Replace generator at Snow Rd./Airport Lift Station	$ 200,000	
1	Reliability	Blair Avenue water main replacement	$ 214,000	$ 2,534,000
2	Reliability	Conduct risk analysis study on distribution mains, booster stations and storage tanks to improve CIP prioritization	$ 180,000	
2	Reliability	24" water main replacement (Railroad from Springhill Ave. to Houston St.)	$ 2,500,000	
2	Capacity	2nd phase of Spanish Fort deep causeway water main	$ 1,300,000	
2	Capacity	Increase capacity in Theodore industrial area	$ 2,000,000	
2	Level of Service	Henson St. extension/booster station	$ 1,500,000	
2	Functionality	Complete water distribution system model	$ 500,000	$ 7,980,000
3	Reliability	12" Snow Rd connection	$ 450,000	$ 450,000
4	Hazard Mitigation	Install redundant deep causeway water main (Spanish Fort)	$ 3,500,000	$ 3,500,000
		TOTAL	**$ 17,014,000**	**$ 17,014,000**

TABLE A.6 - C.C. Williams WWTF Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
1	Reliability	Repair primary clarifiers and new splitter box	$ 9,800,000	
1	Functionality	Install new headworks structure at C.C. Williams WWTF	$ 7,600,000	
1	Functionality	Allowance for critical issues identified in the C.C. Williams WWTF Master Plan	$ 2,300,000	
1	Functionality	Modify the primary effluent distribution facilities	$ 300,000	$ 20,000,000
2	Functionality	Coating for final clarifiers internal walls	$ 250,000	
2	Hazard Mitigation	Repairs to secondary digester walls	$ 1,250,000	$ 1,500,000
3	Functionality	Air scrubber evaluation for chlorine building	$ 25,000	
3	Reliability	Replace molecular sieve at oxygen generators	$ 100,000	$ 125,000
4	Hazard Mitigation	Enhancement at main blower building	$ 350,000	
4	Hazard Mitigation	Enhancement at the primary treatment electrical building & MCC	$ 450,000	
4	Hazard Mitigation	Enhancement at the secondary digester control center	$ 100,000	$ 900,000
		TOTAL	**$ 22,525,000**	**$ 22,525,000**

TABLE A.7 - Wright Smith WWTF Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
2	Functionality	Evaluate additional flows from Grover St.	$ 100,000	
2	Reliability	Install additional pump at intermediate pump station	$ 250,000	$ 350,000
3	Reliability	Criticality assessment recommended projects (allowance)	$ 200,000	
3	Functionality	Evaluate condition of digesters	$ 50,000	$ 250,000
		TOTAL	**$ 600,000**	**$ 600,000**

TABLE A.8 - Decentralized Treatment Facilities Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
1	Capacity	Study disposal options for Copeland Island DWWTF	$ 50,000	$ 50,000
2	Capacity	Expand disposal field at Hutchens DWWTF	$ 85,000	$ 85,000
3	Capacity	Evaluate Copeland Island DWWTF expansion needs	$ 75,000	$ 75,000
5	Capacity	Copeland island Decentralized System Expansion	$ 500,000	
5	Capacity	Hutchens DWWTP Rehab	$ 500,000	
5	Capacity	Monitor Development and Install Capacity at the Snow Road DWWTF	$ 500,000	$ 1,500,000
		TOTAL	**$ 1,710,000**	**$ 1,710,000**

TABLE A.9 - Solids Handling and Disposal Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
1	Reliability	Evaluate dewatering/disposal of residual alternatives for Wright Smith WWTF	$ 100,000	$ 100,000
2	Efficiency	Digester gas utilization evaluation at CC Williams WWTF	$ 50,000	
2	Efficiency	Evaluate Biosolids Class A	$ 25,000	$ 75,000
3	Efficiency	Construct Solids Dewatering Facility at Wright Smith WWTF	$ 1,300,000	$ 1,300,000
		TOTAL	**$ 1,475,000**	**$ 1,475,000**

TABLE A.10 - Sewer Collection System Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
Annual	Relocation	Continue replacing old MH castings (annual allowance)	$ 150,000	
Annual	Relocation	Utility sewer relocation (annual allowance)	$ 450,000	
Annual	Regulatory Compliance	Sewer creek crossing stabilization (annual allowance)	$ 400,000	
Annual	Reliability	Concrete sewer lining, large diameter piping (annual allowance)	$ 2,000,000	
Annual	Regulatory Compliance	Lift Station renovations (annual allowance)	$ 1,300,000	
Annual	Regulatory Compliance	Sewer rehabilitation (annual allowance)	$ 2,650,000	
Annual	Regulatory Compliance	Private lateral loans (annual allowance)	$ 75,000	
Annual	Regulatory Compliance	Cured-in-place-pipe sewer rehabilitation contract, small diameter pipe (annual allowance)	$ 1,100,000	
Annual	Regulatory Compliance	Manhole and wetwell rehabilitation and maintenance (annual allowance)	$ 500,000	
Annual	Regulatory Compliance	Sewer renewal in I/I priority areas (annual allowance)	$ 1,000,000	
Annual	Regulatory Compliance	Improvement to access roads for sewers, lift stations, force mains (annual allowance)	$ 2,000,000	
Annual	Regulatory Compliance	Lateral rehabilitation/replacement lining (annual allowance)	$ 250,000	
Annual	Reliability	Manhole frame and cover rehabilitation (annual allowance)	$ 150,000	
Annual	Reliability	Force main renewal (annual allowance)	$ 800,000	$ 12,825,000
1	Reliability	In-house CIP work (as needed)	$ 1,200,000	
1	Regulatory Compliance	Diesel backup (generator or pump) for strategic lift stations	$ 60,000	
1	Regulatory Compliance	Brizzel and Pecan Relief Sewer and lift station	$ 1,500,000	
1	Reliability	Sewer Collection System in-house CIP work	$ 1,000,000	$ 3,760,000
2	Reliability	Sage Avenue at Old Shell Road relay sewer	$ 425,000	
2	Reliability	Conduct risk analysis study on lift stations and force mains to improve electrical reliability	$ 180,000	

Table A.10 continues on next page.

TABLE A.10 - Sewer Collection System Project Needs List Continued

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
2	Reliability	Outley Drive sewer replacement	$ 825,000	$ 1,430,000
3	Reliability	Stockton and Gimon relay sewer	$ 705,000	
3	Reliability	Japonica Avenue relay sewer	$ 706,000	
3	Reliability	Audubon Place relay sewer	$ 874,000	
3	Reliability	Benedict Place relay sewer	$ 741,000	
3	Reliability	Carondolet DEPSEW (lower 36" outfall in manhole)	$ 65,000	
3	Reliability	Parkmont Sewer (relay line segment, reset manhole)	$ 50,000	
3	Reliability	Ann Street/Taylor Plaza (relay 100-ft sag in line)	$ 40,000	
3	Reliability	Briley Street relay sewer	$ 750,000	
3	Reliability	Eslava basin upgrade	$ 1,500,000	
3	Reliability	Blair Avenue relay sewer	$ 150,000	
3	Reliability	Vista Ridge relay sewer replacement	$ 825,000	
3	Reliability	Levene Road and Mackie Avenue new lift station	$ 1,000,000	$ 8,231,000
4	Efficiency	Install 4th VFD at Halls Mill Lift Station (LS154)	$ 100,000	
4	Efficiency	Install 4th VFD at Eslava Creek Lift Station (LS156)	$ 100,000	$ 200,000
5	Capacity	Increase collection system capacity	$ 4,000,000	
5	Capacity	New service, unidentified projects, contributions to developers	$ 145,000	
5	Capacity	Extend Halls Mill trunk sewer	$ 1,400,000	$ 5,545,000
		TOTAL	**$ 31,166,000**	**$ 31,991,000**

TABLE A.11 - Common Facilities Project Needs List

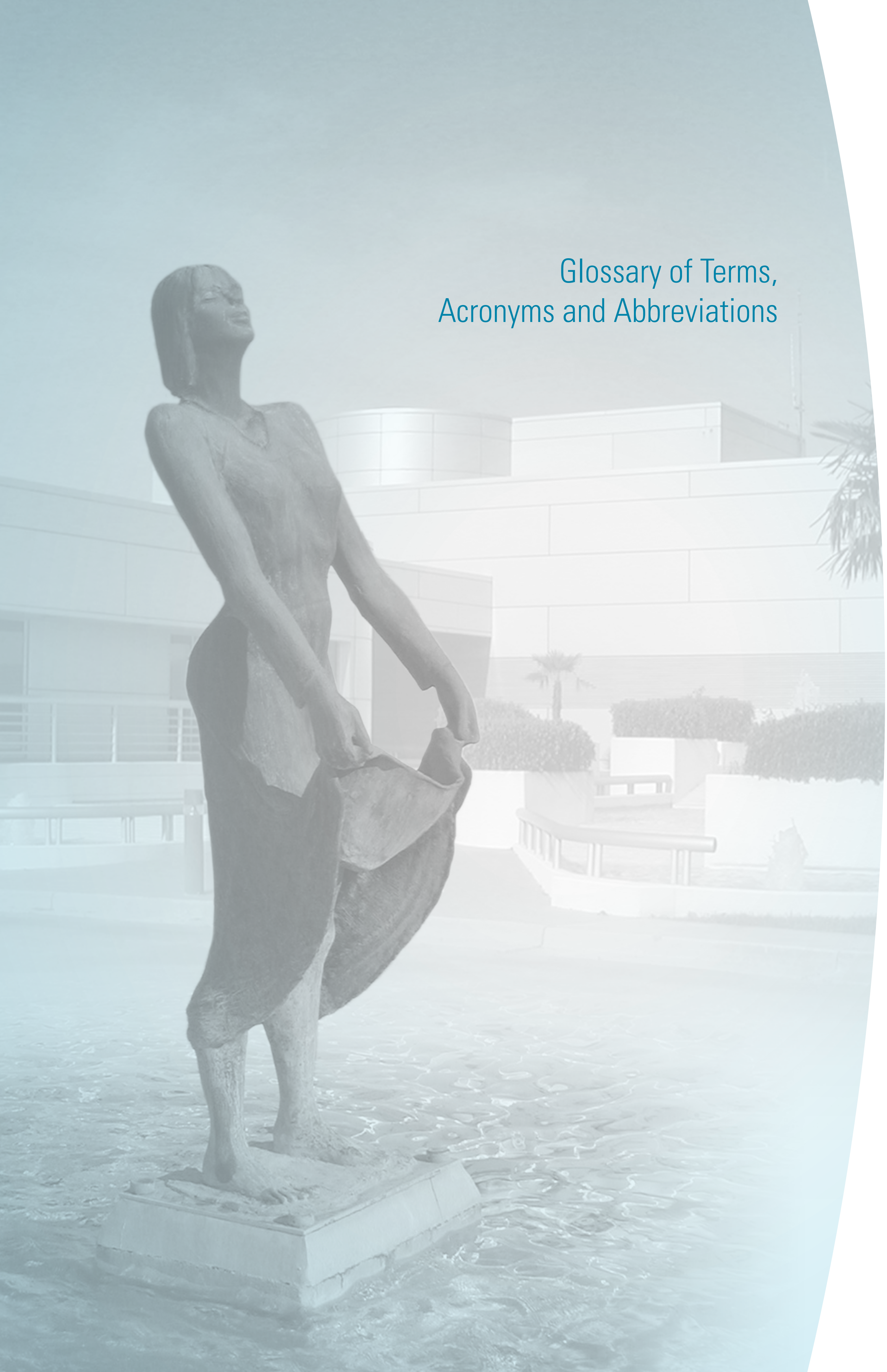
Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
Annual	Reliability	Fleet replacement (annual allowance)	$ 500,000	
Annual	Functionality	Roof repair/replacement (company-wide, annual allowance)	$ 100,000	
Annual	Functionality	HVAC repair/replacement (company-wide, annual allowance)	$ 100,000	
Annual	Functionality	Cost center repair/replacement (annual allowance)	$ 1,500,000	
Annual	Efficiency	Engineering studies (miscellaneous, annual allowance)	$ 100,000	
Annual	Reliability	New thermal expansion protection loans for dual check installations (annual allowance)	$ 5,000	
Annual	Efficiency	GIS application development/upgrades (annual allowance)	$ 15,000	$ 2,320,000
1	Functionality	Upgrade security at various facilities	$ 200,000	
1	Efficiency	Shelton Beach Rd Facility (Shop, Lift Station Department and Repair Crews relocation)	$ 2,350,000	
1	Efficiency	New GIS aerial photograph for base maps	$ 130,000	
1	Efficiency	Automated meter conversion AMI/AMR/MDM - commercial clients	$ 2,500,000	
1	Efficiency	Technology integration master plan (Company wide)	$ 250,000	
1	Functionality	Update standard engineering specifications	$ 100,000	$ 5,530,000
2	Efficiency	GIS location of residential meters	$ 800,000	
2	Level of Service	Renovations of remainder of Park Forest Plaza facility	$ 2,000,000	
2	Functionality	Park Forest facility parking lot reconfiguration and repairs (includes fencing, security upgrades)	$ 400,000	$ 3,200,000
4	Hazard Mitigation	Demolish Ziebach WWTF	$ 500,000	
4	Hazard Mitigation	Eliminate Pinto Island bulkhead	$ 750,000	
4	Hazard Mitigation	Demolish storage tank and abandon wells at Kali-Oka Road	$ 50,000	
4	Efficiency	AMI/AMR/MDM Automated water meter conversion (1st year only of a 10-year project; future years TBD after business plan completed)	$ 2,000,000	$ 3,300,000
		TOTAL	**$ 14,350,000**	**$ 14,350,000**

TABLE A.12 - Summary of Project Needs List By Infrastructure Area

Infrastructure Area	Estimated Project Authorization for Annual Needs	Estimated Project Authorization for Priority 1 Needs	Estimated Project Authorization for Priority 2 Needs	Estimated Project Authorization for Priority 3 Needs	Estimated Project Authorization for Priority 4 Needs	Estimated Project Authorization for Priority 5 Needs	Estimated Project Authorization for All Priority Needs
Raw Water Supply	$ -	$ 1,850,000	$ 200,000	$ 1,175,000	$ 450,000	$ -	$ 3,675,000
E.M. Stickney WTP	$ -	$ 1,650,000	$ 250,000	$ -	$ -	$ -	$ 1,900,000
H.E. Myers WTP	$ -	$ 1,115,000	$ 930,000	$ 3,075,000	$ -	$ -	$ 5,120,000
Water Distribution System	$ 2,550,000	$ 2,534,000	$ 7,980,000	$ 450,000	$ 3,500,000	$ -	$ 17,014,000
C.C. Williams WWTF	$ -	$ 20,000,000	$ 1,500,000	$ 125,000	$ 900,000	$ -	$ 22,525,000
Wright Smith WWTF	$ -	$ -	$ 350,000	$ 250,000	$ -	$ -	$ 600,000
Decentralized Treatment Facilities	$ -	$ 50,000	$ 85,000	$ 75,000	$ -	$ 1,500,000	$ 1,710,000
Solids Handling and Disposal	$ -	$ 100,000	$ 75,000	$ 1,300,000	$ -	$ -	$ 1,475,000
Sewer Collection System	$ 12,825,000	$ 3,760,000	$ 1,430,000	$ 8,231,000	$ 200,000	$ 5,545,000	$ 31,991,000
Common Facilities	$ 2,320,000	$ 5,530,000	$ 3,200,000	$ -	$ 3,300,000	$ -	$ 14,350,000
Totals	**$ 17,695,000**	**$ 36,589,000**	**$ 16,000,000**	**$ 14,681,000**	**$ 8,350,000**	**$ 7,045,000**	**$ 100,360,000**

NOTE: Priority 1 and Priority 2 needs are largely based on defined projects. However, Priority 3 needs are only projects based on currently available information and are subject to change in future EARs. Priority 4 and Priority 5 needs are anticipated only if grant funding or growth, respectively, materializes. If grant funding or growth does materialize, some or all of those identified needs may be funded in earlier years. As illustrated below, Priority 1 needs are authorized in Years 1 and 2 and Priority 2 needs are authorized in Years 3 and 4. Projects, particularly large projects, will actually be scheduled for longer than two years.

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Future Years**
Annual Priority Needs	$ 17,695,000	$ 17,695,000	$ 17,695,000	$ 17,695,000	$ 17,695,000	$ 17,695,000	$ 17,695,000
Priority 1 Needs	$ 18,294,500	$ 18,294,500					TBD
Priority2 Needs			$ 8,000,000	$ 8,000,000			TBD
Priority 3 Needs					$ 7,340,500	$ 7,340,500	TBD
Priority 4 Needs							if grants obtained
Priority 5 Needs							if growth occurs



Glossary of Terms, Acronyms and Abbreviations

GLOSSARY OF TERMS, ACROYNMS AND ABBREVIATIONS

ARV: Air release valve (used in force mains to vent, or discharge, air and corrosive gas that tends to collect at the top of the pipe especially at high points along the route).

ADEM: Alabama Department of Environmental Management.

ASPA: Alabama State Port Authority.

AWPCA: Alabama Water and Pollution Control Association.

Annual Average Daily Flow or Annual Average Daily Demand: The average quantity of water demand, which may be either historical or projected, over a 12 month period. Flows are typically expressed in terms of million gallons per day, abbreviated “mgd”.

Annual Needs: Annual Project Authorization Priority defined in this EAR and designed to address the need to fund certain projects, especially those projects required to extend the useful life of an asset by rehabilitation, repair or replacement, on an annual basis.

Asset Management: The process whereby an organization collects and maintains a comprehensive network of infrastructure assets. The term is relatively new to water and wastewater utilities in the United States and as such is poorly understood and many mean different things to different people. However, many high performing utilities are adopting asset management principles as a technique to extend the useful life of assets and to more effectively and efficiently management utility operations.

AMWA: Association of Metropolitan Water Agencies.

AWWA: American Water Works Association.

ADF: Average daily flow. NPDES effluent permits frequently limit the capacity of a wastewater treatment plant to the average daily flow occurring over the monthly reporting time frames.

Best Management Practices (BMPs): A collection of either O&M measures or capital facilities designed for pollution prevention. BMPs were first applied by EPA in stormwater regulations, but are now also applied in the wastewater and water areas. EPA, in partnership with various professional organizations, publicizes data to provide scientifically sound information to improve the design, selection and performance of BMPs on an on-going basis.

Biochemical Oxygen Demand (BOD): The oxygen required by aerobic organisms, as those in sewage, for metabolism. BOD is a measure of the organic pollution of water. BOD levels in treatment plant effluent discharges are typically monitored in terms of the amount of oxygen, in milligrams per liter of water, absorbed by a sample kept at 20˚C for 5 days, or BOD_5.

Biosolids: The heavier materials that are settled out and removed by the wastewater treatment processes (a.k.a., sludge).

CY Calendar Year.

Capital Improvement Program (CIP): A formal, prioritized listing of identified capital projects whether funded or unfunded.

Carbonaceous Biochemical Oxygen Demand (CBOD): A specific type of BOD measurement of the organic pollution of water.

Chlorine: An element added to water generally to disinfect and kill harmful germs and bacteria. As a gas, pure chlorine has a greenish-yellow color. Chemical formula is Cl_2.

City: The City of Mobile, Alabama.

Closed Circuit Television Inspection (CCTV): Internal inspection technique to determine the internal condition of pipes, particularly sewer mains and water mains, but also where access is possible for private lateral lines and for force mains.

CAFR: Comprehensive Annual Financial Report.

Cleanout: The connection point between the building plumbing and the lateral pipe that allows access for cleaning the lateral pipe. Many utilities also require a cleanout to be installed between the upper and the lower laterals, which is at or near the street right-of-way (or easement) line, to facilitate cleaning and to allow collection system operators to determine whether or not a pipe blockage is located on the private “upper lateral” or the public “lower lateral”.

Clean Water Act (CWA): The Clean Water Act governs stormwater and wastewater discharges to receiving waters in the United States by issuing National Pollutant Discharge Elimination Permits for such discharges.

Coagulation: The addition of an electrolyte usually in the form of aluminum or iron salts for the purpose of precipitating suspended solids, which is generally used to remove turbidity.

Collection System: An interconnecting system of pipes through which sanitary waste, and in the case of combined systems, stormwater, is collected and delivered to the wastewater treatment plant.

Combined Sewer System: Wastewater collection systems were historically designed as combined systems where the same pipe was used to convey both stormwater and sanitary waste. Standard design practice subsequently changed and combined sewers are no longer installed in new developments, but many older urban areas continue to rely at least partially on combined sewer systems.

Combined Sewer Overflow (CSO): Initially the combined sewer pipes discharged directly to adjacent streams and creeks. When wastewater treatment plants were installed, many of these direct discharges were collected by interceptor sewer pipes and the flow diverted to the treatment plant. The EPA regulates the remaining CSO locations under the Clean Water Act, which requires such things as BMPs to reduce the amount of pollution entering combined sewers through the stormwater connection points, end of pipe screening or other control measure to prevent trash and some pollutants from entering the receiving water and, in some cases, separation of the combined sewers by eliminating the stormwater connection points.

Computerized Maintenance Management System (CMMS): An automated system for scheduling and tracking work orders. MAWSS uses Datastream/Infor™ software as the adopted CMMS for both the water and the wastewater systems. Also see Infor™.

C&D: Construction and demolition landfill.

Condition Score: A numeric score assigned to the relative physical condition of a particular infrastructure asset. Many asset management programs incorporate a standardized quantitative measure of asset condition such as the defect numbering systems from 1 (best) to 5 (worst) for sewers, manholes and laterals issued by NASSCO. Also see Risk Based Methodology.

Consequence of Failure (or Criticality) Score: A numeric score assigned to the relative impact of failure of a particular infrastructure asset. Many asset management programs incorporate a quantitative measure of the consequence of failure. There are no commonly accepted, standardized consequence of failure measures. Utilities that have adopted consequence of failure scoring systems have customized scoring definitions to what criteria is important to that utility. For example, some utilities determine that a high cost of failure is a more important criticality factor while other utilities determine that an adverse impact to receiving water is a more important criticality factor. Most utilities adopt a number of factors and either sum individual factor scores or use a weighted importance scoring system. Scales may be as simplified 1 (low) to 3 (high) or as complex as 1 (low) to 100 (high). Since consequence of failure scores tend to be more subjective than condition scores, a complex system of scoring can be more difficult to justify to constituents. Also see Risk Based Methodology.

Cost Functions: The reasons payments are made.

Cost Objects: The recipients of payments.

Criticality Analysis: The assessments made by MAWSS to identify critical assets, which are defined by MAWSS to mean those assets whose failure could disrupt normal infrastructure asset operation. Criticality assessments are more commonly defined as evaluating the severity of the consequence of asset failure.

Debt Service Coverage: The amount of net revenues greater than debt service, which the MAWSS *Indenture of Trust* is required to be 1.20x.

Debt Service Reserve (DSR): Encumbered debt service reserve funds that are equal to, or greater than, the greatest annual debt payment of a utilities' outstanding bond portfolio and that are kept at the utilities trust bank.

DWWTF: Decentralized wastewater treatment facilities.

Demand: The quantity of water required by the consumers of a water system at any given time.

DBP: Stage 2 Disinfectants/Disinfection By-Products Rule.

Disinfection: The addition of a chemical agent such as chlorine to drinking water for the purpose of destroying harmful microorganisms.

Dissolved Oxygen (DO): The amount of dissolved oxygen in a stream or creek. DO is an indicator of the health of the water body and its ability to support life in the water body.

Distribution Main: Smaller diameter water conduits (usually 16-inches and smaller) which convey water from the supply main to the service connection.

Distribution System: An interconnecting network of pipes through which water is delivered to consumers.

EAR: Engineer's Annual Report, as required for MAWSS under the terms of the *Trust Indenture* for an annual "engineer's annual report/engineering audit".

EPA: United States Environmental Protection Agency.

Fats, Oils and Grease (FOG): Pollutants frequently discharged into the collection system that tend to clog pipes and thus cause sewage within the pipe to back up, potentially overflowing from manholes, cleanouts or building plumbing fixtures.

Fats, Roots, Oils and Grease (FROG): Pollutants frequently found in the collection system that tend to clog pipes and thus cause sewage within the pipe to back up, potentially overflowing from manholes, cleanouts or building plumbing fixtures.

Filtration: The removal of small impurities from water by allowing it to pass through granular material, such as fine sand.

Firm Capacity: Firm capacity is the capacity available at a waterworks facility when the largest single unit is out of use, and is a frequently employed measure for reliable service rating.

Fiscal Year (FY): The accounting year defined by the agency, which for MAWSS is January 1 through December 31.

Flocculation: Water treatment process that agglomerates suspended solids by gently mixing water and coagulants so that the solids may be more readily removed by settling.

Fluoridation: The addition of a fluoride compound to municipal water supplies to help prevent dental cavities in children.

Force Main: A pressurized pipe carrying water, sewage and other materials.

GIS: Geographical information systems, a data tool that combines mapping with field located features and improvements such as roads, pipelines, buildings and structures, equipment, etc.

GFOA: Government Finance Officers Association of the United States and Canada.

Governmental Accounting Standards Board (GASB): The professional agency responsible for issuing accounting guidance for governmental entities.

GPD or gpd: Gallons per day.

GPM or gpm: Gallons per minute.

High Purity Oxygen (HPO): A type of wastewater treatment process for activated sludge type facilities.

Illicit Connections: A term used, usually by EPA, to characterize illegal stormwater connections to a separate sewer system.

Inflow and Infiltration (I/I): Extraneous clear water that enters the collection system through direct connections, generally referred to as inflow sources, or through leaks or cracks, generally referred to as infiltration sources.

Infor™: A software tool developed by Datastream that is used as a computerized maintenance management system to track O&M activities and produce work orders. Also see computerized maintenance management systems.

Intake: The structure and pipeline which conveys raw water from the source of supply to the first step of treatment.

Interim ESWTR: Interim Enhanced Surface Water Treatment Rule.

Laterals: The pipe connecting the building plumbing to the sewer main. Definitions of ownership of the lateral pipe vary between utilities. Generally the utility owns and maintains the “lower lateral” between the sewer main connection point and the edge of the street right-of-way (or easement) line. Generally the property owner owns and maintains the “upper lateral” between the street right-of-way (or easement) line and the building.

Life Cycle Assessment: The investigation and valuation of the environmental impacts of a given project, product or service. Life cycle costs typically include construction costs, operation and maintenance costs, taxes (if applicable), financing, replacement and renovation. A whole life cost is the total cost of ownership over the life of an asset and may be referred to as “cradle to grave” costs.

Lift Station: A pump station that “lifts” or pumps sanitary waste from one location within the collection system to another location or to the wastewater treatment plant.

LT-2-ESWTR: Long-term 2 Enhanced Surface Water Treatment Rule.

Main: For water systems, a pipe that serves as a primary route for delivering water to and through the water service areas. For sewer systems a pipe that serves as a primary route for collecting sanitary waste from and through the sewer service area.

Manhole: An access structure for the entry of cleaning or inspection equipment to the gravity sewers in the collection system, typically required every 400 feet and at all changes in grade (i.e., slope) or direction.

Maximum Contaminant Level (MCL): The maximum concentration of a substance classified by regulatory agencies as a contaminant that is allowed in finished potable water.

Maximum Contaminant Level Goal (MCLG): The maximum contaminant level goal may be defined as the contaminant level the regulatory agency desires to attain through treatment techniques. The intent is to substitute a "goal" contaminant level which is the lowest possible level practically attainable for that contaminant through use of treatment techniques. It is a goal rather than a fixed number or concentration represented by an MCL.

Maximum Day Demand or Peak Day Demand: The maximum amount of water demand during a continuous 24-hour period. Water supply and treatment plants are typically designed and rated based on maximum day requirements. One criterion for a water distribution system is that it be capable of meeting maximum day demand plus fire flow requirements; the other criterion is that it be capable of meeting peak hour requirements. The greater of the two criteria governs. For wastewater treatment systems, the NPDES permit frequently limits the maximum daily flow during a continuous 24-hour period that occurs each month during the permitting period.

Maximum Monthly Flow or Demand, or Peak Monthly Flow or Demand: The maximum amount of water demand during any monthly period, typically a calendar month.

Median Household Income (MHI): The median, which is the value where half of the statistical population is above and half below, income for a household as determined by the U.S. Census Bureau. EPA uses MHI as a measure of affordability for combined sewer overflow and wastewater treatment plant costs.

MCF: Thousands of cubic feet, a measurement of metered water sold to water customers.

MGD or mgd: Million gallons per day.

MCC: Motor control centers.

Municipal Separate Storm Sewer System (MS4) Permits: EPA refers to stormwater permits issued to municipalities under the Clean Water Act as MS4 Permits. Municipalities may also be covered under NPDES General Permits or NPDES Multi-Sector Permits that cover stormwater discharges from "industrial" sites. Those "industrial" sites include municipal facilities such as wastewater treatment plants, fleet maintenance facilities and transportation hubs.

µg/L: Micrograms per liter.

MWH: MWH Americas, Inc., formerly known as Montgomery Watson Harza.

NACWA: National Association of Clean Water Agencies.

NASSCO: National Association of Sewer Service Companies.

Nitrogen Cycle: The nitrogen cycle is the process by which nitrogen is converted between its various chemical forms by such processes as fixation, mineralization, nitrification and denitrification. Nitrogen availability can affect the rate of key ecosystem processes, including primary production and decomposition. The release of nitrogen in wastewater has affected the global nitrogen cycle and is being regulated more stringently under the NPDES permitting programs throughout the United States. NPDES effluent limitations usually use the ammonia nitrogen (NH_3N) chemical form to evaluate effluent discharges.

NPDES: National Pollutant Discharge Elimination System permits issued under the Clean Water Act.

NPDWR: National Primary Drinking Water Regulations.

NSDWR: National Secondary Drinking Water Regulations.

NTU: Nephelometric turbidity units.

O&M: Operations and non-capitalized maintenance.

Parity Bonds: Revenue bonds with a senior lien on revenue. Also see Revenue Bonds and Subordinated Debt.

Pay-As-You-Go, or "Pay Go": Capital charges assessed to new connections to the systems that are used to fund capital projects and are considered internally generated funds.

Peak Hour Demand or Peak Hour Flow: The maximum amount of water demand over any one-hour period. Water transmission and distribution systems must be capable of meeting peak hour demands or flows.

Permitted Capacity: The firm capacity of water or wastewater treatment plants, pump stations or lift stations.

PCCP: Prestressed concrete cylinder pipe. This pipe is particularly susceptible to failure because, in addition to the deterioration to the concrete caused by corrosive gases, some PCCP was manufactured with defective wire. (Wire is added during the manufacturing process to add strength.)

Potable Water: Water that is free from objectionable contaminants and minerals and is considered to be safe for domestic consumption. Also referred to as either treated water or finished water.

PAC: Powdered activated carbon.

Pretreatment Program: NPDES permittees are required to establish and maintain an industrial pretreatment program to regulate wastewater discharges from industrial customers, particularly Significant Industrial Users and Categorical Dischargers (e.g., those industries discharging specifically listed pollutants).

PWWSB: Prichard Water Works and Sewer Board.

Publically Owned Treatment Works (POTW): A term used by the EPA to refer to wastewater treatment plants that have been issued NPDES permits. This term includes plants that are owned both by municipal or other governmental agencies and by private companies.

Pump Station: A facility containing relatively large pumps, valves, piping and electrical equipment used to pump water. Generally, pump stations for the potable water system are referred to as Booster Pump Stations when the pumps are designed to increase pressure within the distribution system being served. Generally, pump stations for the sewer collection system, and which pump sanitary wastewater or sewage, are referred to as Lift Stations because they frequently "lift" the flow from a lower elevation in the collection system to a higher elevation.

Rated Capacity: The firm capacity of water treatment plants, historically based on two gallons per square foot per minute filter loading.

Raw Water: Untreated water conveyed from the supply source before it is treated in a water treatment plant.

Rehabilitation: A comprehensive repair of an asset or asset component designed to extend the useful life of the asset.

Repair: A partial repair of an asset or an asset component designed to extend the useful life of the asset.

Renewal: A collective term for rehabilitation, repair and replacement, designed to extend the useful life of an asset.

Replacement: New assets that are installed to replace an existing asset.

Revenue Bonds: A revenue bonds is a special type of municipal bond distinguished by its guarantee of repayment solely from revenues generated by a specified revenue-generating entity associated with the purpose of the bonds, rather than from a tax. Also see Parity Bond and Subordinated Bond.

Risk Based Methodology: Procedures used to prioritize either capital projects or O&M activities based on calculation of a numeric risk rating. The risk rating is defined at the product (multiplication) of a condition score that is a measure of the probability of asset failure times a consequence of failure (or criticality) score that is a measure of the impact of that failure. Also see Condition Score and Consequence of Failure Score.

Safe Drinking Water Act: The Safe Drinking Water Act regulates potable water safety in the United States.

Sanitary Sewer Overflow (SSO): Sewage escaping from the collection system or the treatment plant. EPA considers SSOs to be an unpermitted discharge and thus a violation of the Clean Water Act.

Separate Sewer System: Wastewater collection system constructed as a separate network of pipes designed solely to collect sanitary waste (a.k.a., sewage or wastewater).

Sequencing Batch Reactor (SBR): Industrial processing tanks for the treatment of wastewater by bubbling oxygen through the wastewater to reduce BOD and COD.

Service Connections: In the water system, the pipes that carry water from the distribution mains to individual buildings and other outlets. In the sewer system, the laterals that convey sanitary waste from the individual buildings to the sewer main. Some utilities use the term service connection to refer to only the upper lateral pipe.

Settling: The process by which suspended solids formed during flocculation are removed from water by gravity. In wastewater treatment plants, settling is usually divided into primary settling and secondary settling stages.

Severe Weather Attenuation Tanks (SWATs): Storage tanks installed by MAWSS to store excess wet weather flows during or subsequent to storm events that were not able to be conveyed or treated at the wastewater treatment plant due to the high volume of water being conveyed or treated.

Sewer System Evaluation Surveys (SSES): The collection of activities that are implemented to investigate the condition of the collection system. Most SSES projects are designed to detect, and thus subsequently eliminate, the source of I/I entering the collection system. Activities may include such things as CCTV, smoke testing, dyed water flood testing, manhole inspection, cleanout inspection and lateral testing.

Significant Industrial User (SIU): A sewer system customer discharging either a high volume of waste or wastewater with significant pollutant contributions as defined by EPA pretreatment program regulations.

Stage-2-D/DBPR: Stage 2 of the D/DBPR.

SRF: State Revolving Fund, a state fund designed to loan money for infrastructure loans under federal regulations.

SOP: Standard Operating Procedures.

Storage Facilities: A structure used to impound water for use as needed. Examples include reservoirs, ground level storage tanks and elevated water towers.

Subordinated Debt: Debt that ranks after other debts or should an entity fall into liquidation or bankruptcy. Also referred to as “junior debt”. Also see Revenue Bonds and Parity Debt.

Supervisory Control and Data Acquisition (SCADA): An industrial control computer system that monitors and controls infrastructure. Infrastructure processes may be public or private, and include water treatment and distribution, wastewater collection and treatment, large communication systems, etc.

Supply Main: Large diameter water conduits (usually 20-inches and larger) which convey major supplies of water from the treatment plant to a distribution system. Also referred to as trunk mains or transmission mains.

Total Capital Activity: The total of the Pay-As-You-Go projects, Outstanding debt service (parity and subordinated) and Prospective (parity and subordinated).

Total Residual Chlorine (TRC): The amount of chlorine in the wastewater treatment plant's effluent discharge following chlorination.

Total Suspended Solids (TSS): The amount of suspended solids pollution in either the incoming sewage or the wastewater treatment plant's effluent discharge following treatment.

Trihalomethanes: A family of chemical byproducts resulting from the disinfection of raw water containing humic or fulvic acids using chlorine. This family of chemicals comprises methane (CH4), in which halogen ions have been substituted for up to three of the four hydrogen ions. The most common halogens substituting for the hydrogen include chlorine and bromine.

Turbidity: Suspended solids imparting a visible haze or cloudiness to water. Turbidity is removed, or reduced, by water treatment.

Unmetered Water: The amount of water lost in a system, as measured by the difference between total metered water input into the system and the aggregate usage of water as measured by end use customers' meters. The causes of unmetered water may include: unmetered uses, including main flushing and fire suppression; leakage in the pipes; slowed or stopped customer meters; and clandestine withdrawals.

VFD: Variable frequency drives.

VOCs: Volatile organic chemicals.

WFRS: Water Fluoridation Reporting System.

Water Treatment Plant: A complete water production facility which treats raw water to make it safe and ready for use as potable water.

Wastewater Treatment Facilities, or Wastewater Treatment Plant: A complete wastewater treatment facility which treats sanitary waste (e.g., sewage) to remove pollutants prior to discharging the effluent to the receiving water body (i.e., the stream, creek or other water body receiving the effluent discharge).

x: The measure of debt service coverage ratio. "2.0x" means net revenues are 2.0 times debt service.

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