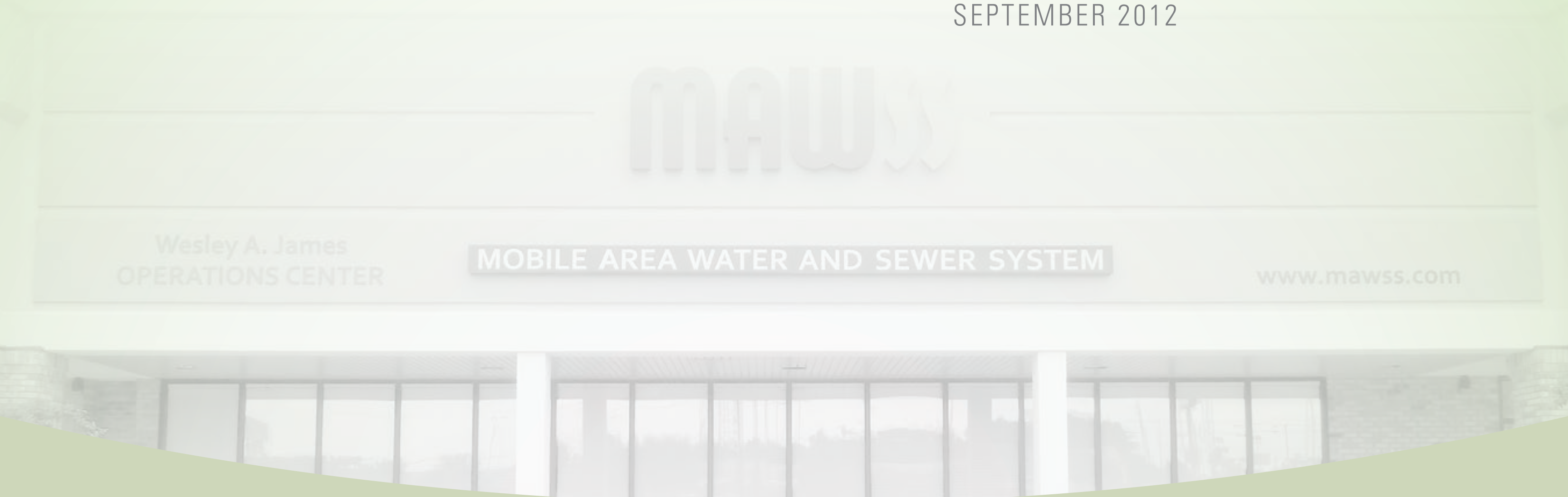
PREPARED FOR
BOARD OF WATER AND SEWER COMMISSIONERS OF THE CITY OF MOBILE, ALABAMA

2012 Engineer's Annual Report/ Engineering Audit

SEPTEMBER 2012



MWH®

BUILDING A BETTER WORLD

MOBILE AREA WATER AND SEWER SYSTEM

2012 Engineer's Annual Report / Engineering Audit

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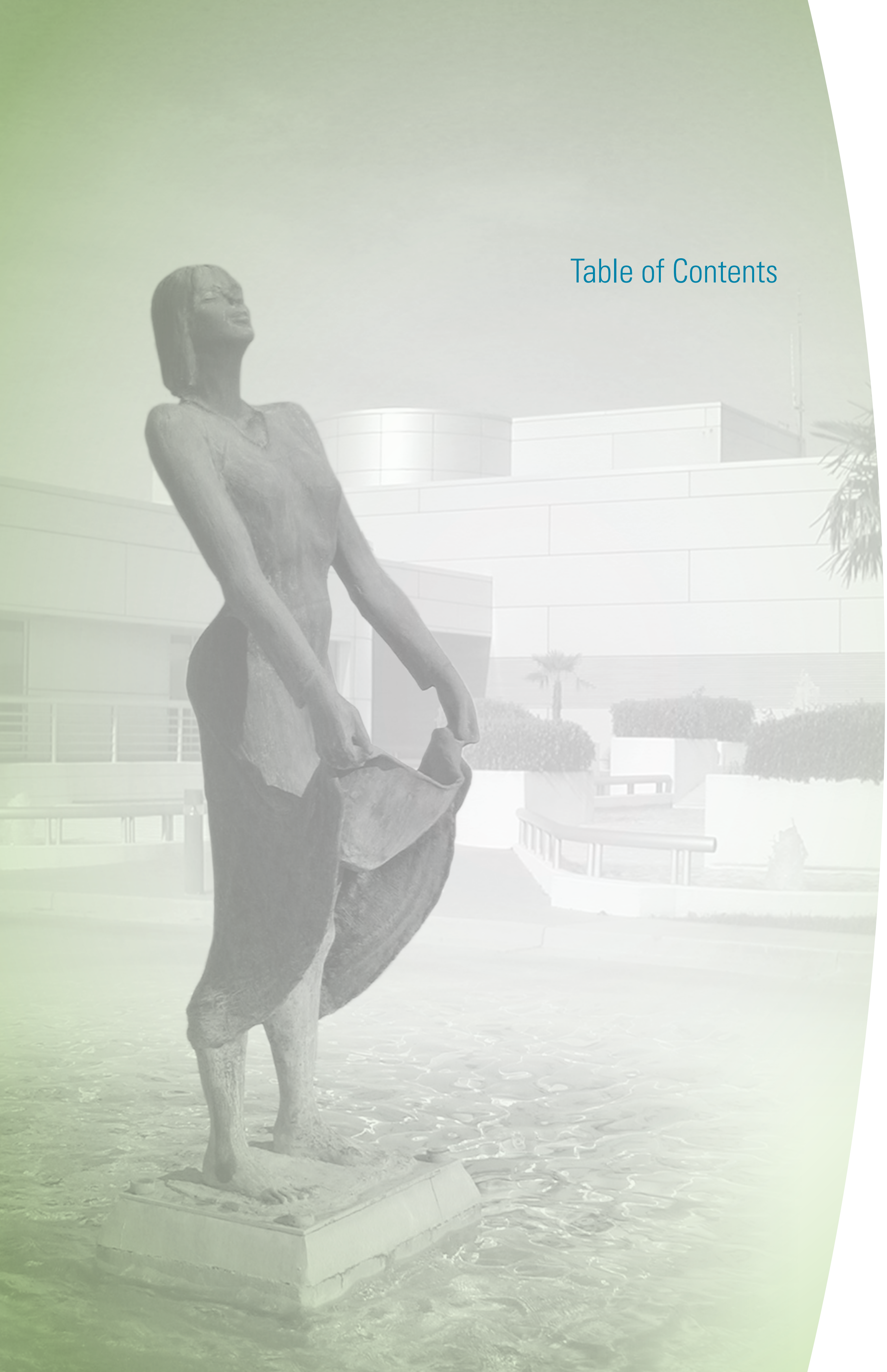

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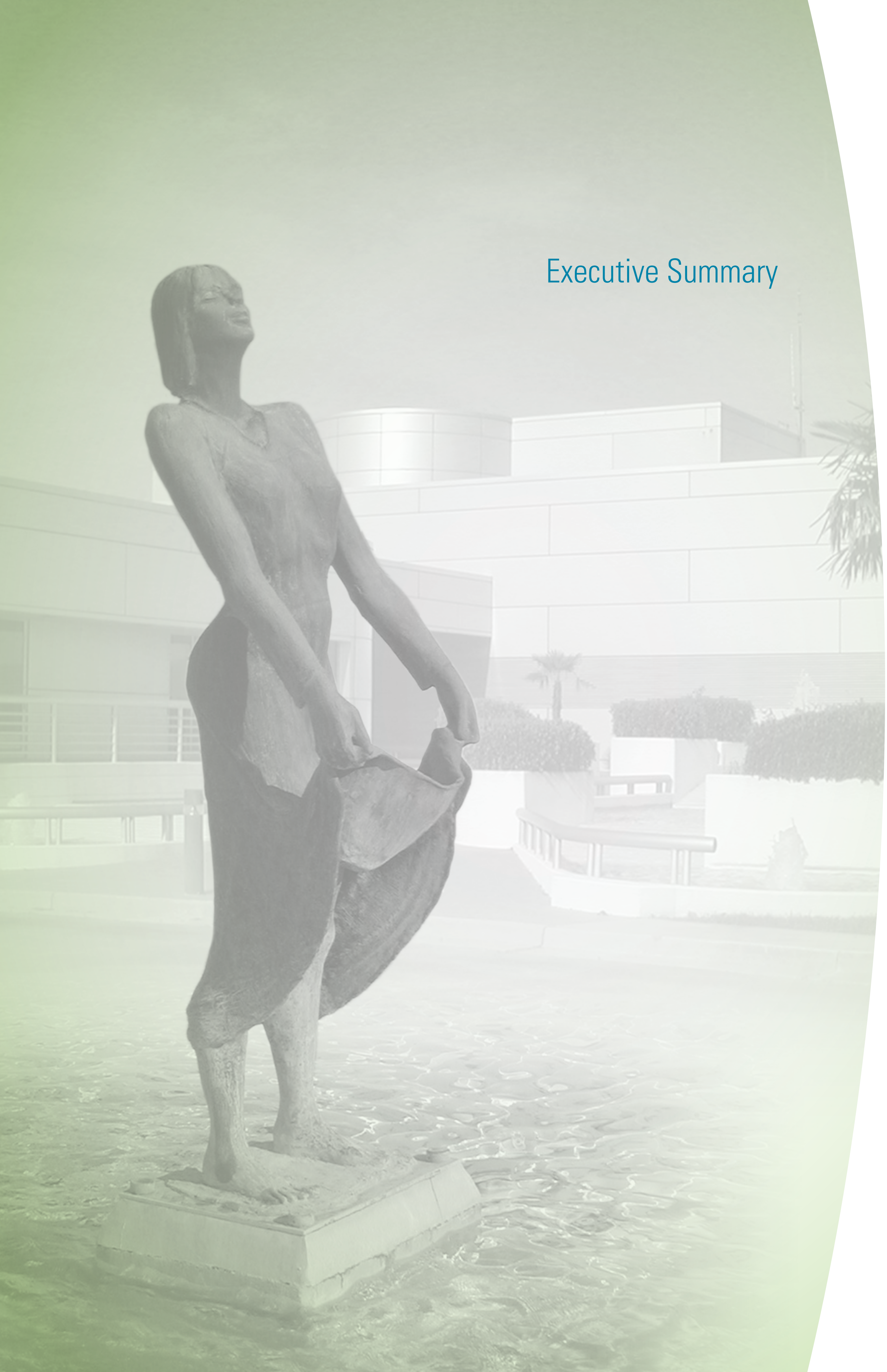


Executive Summary

MWH

1 Executive Summary

The Executive Summary summarizes this *2012 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 2012 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 de-

> tails 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 2012 EAR.

1.3 Purview of Report

MWH assembled data required to complete this 2012 EAR through:

- Interviews with MAWSS managers, supervisors and operating personnel
- Selected field site visits to the raw water facilities at Big Creek Lake, including the dam and spillway structures; the E.M. Stickney and H.E. Myers Water Treatment Plants (WTPs); the Moffett Road booster pump station; the C.C. Williams and Wright Smith Wastewater Treatment Facilities (WWTFs); the Eight Mile, Perch Creek, Virginia Street and Halls Mill lift/pump stations; the Warehouse; the Training Center and the Administrative Building at Moffett Road.
- Review of MAWSS financial reports, historical reports, water/wastewater utility records, Geographic Information System (GIS) mapping and asset database information, and operating reports

The findings, conclusions and recommendations contained in this 2012 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 2012 EAR are for Calendar Year 2011, and to the extent available, for January 1 through June 30, 2012.

1.4 Findings and Conclusions

MAWSS consistently meets, and frequently exceeds, all regulatory permit requirements at the water and wastewater treatment plants. During 2011 there was an isolated regulatory excursion related to a late submittal of volatile organic compound (VOC) monitoring results. Similarly, the water distribution system meets all regulatory permit requirements as evidenced by the annual Consumer Confidence Reports provided to customers.

However, 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 U.S. Environmental Protection Agency (U.S. EPA), the State of Alabama Department of Environmental Management (ADEM) and the Mobile Baywatch (now Mobile Baykeeper) joined to consolidate legal actions related to SSO events against the Board in a U.S. District Court for the Southern District of Alabama Southern District-approved Consent Decree. MAWSS has operated its wastewater facilities under the terms of the Consent Decree since 2002, but in October 2011, the U.S. EPA terminated the Consent Decree. MAWSS will continue to need to expend resources, and both capital and operational budgets, to control and prevent SSOs within the system, but U.S. EPA is no longer dictating specific improvement measures and activities and MAWSS is no longer required to submit quarterly and annual reports to the regulatory agencies. MAWSS continues to report SSOs to ADEM, Mobile Baykeeper, Mobile County Health Department and the media as SSOs occur.

MAWSS is frequently recognized by professional organizations for regulatory compliance and operational efficiency. MAWSS received the following recognitions in 2011:

- Alabama Department of Environmental Management (ADEM)
    - Four Year Optimized Plant Award to the H.E. Myers WTP
- Alabama Water and Pollution Control Association (AWPCA) awards:
    - Best Operated Plant Awards to the H.E. Myers WTP
    - Three Year Award for Best Operated Plant to the H.E. Myers WTP
    - Best Operated Mechanical Wastewater Treatment Facility > 10 mgd to the C.C. Williams WWTF
    - Best Operated Plant Award to the E.M. Stickney WTP
    - Best Operated Distribution System Award to the MAWSS water distribution system
- Water Fluoridation Reporting System (WFRS)
    - Water Fluoridation Quality Award to the H.E. Myers WTP
- 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 11th year of perfect regulatory compliance) and to the Wright Smith WWTF (in the 9th 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 for satisfying both generally accepted account principles and applicable legal requirements in an easily readable and efficiently organized report format to the MAWSS *Comprehensive Annual Financial Report* for the year ended December 31, 2010 (for the 10th consecutive year)

No additional significant permit compliance capital funding needs are currently anticipated at the water treatment plants. MAWSS is conducting pilot studies on an air stripping option that may be viable to reduce the O&M-intensive expenditures associated with the powdered activated carbon (PAC) processes that were installed at both water treatment plants to meet federal Stage 2 Disinfection Byproducts Rule (DBP) regulations. However, the installation of the more capital-intensive air stripping facilities must be weighed against the predicted reduction in O&M expenditures before any decisions on additional capital expenditures to continue to meet DBP regulations are made.

The latest NPDES permit for the C.C. Williams WWTF was issued with an effective date of December 1, 2011. The effluent limits were changed from a biochemical oxygen demand (BOD) to a carbonaceous biochemical oxygen demand ($CBOD_5$) limit of 25 mg/l and an ammonia nitrogen (NH_3N) limit of 30 mg/l was added. While the plant is currently meeting these limitations, MAWSS has commissioned a wastewater master plan to evaluate needed improvements in a holistic manner. The master plan is designed to address the entire McDuffie Island site, which also includes the Fleet Maintenance facility that will be relocated, as well as the C.C. Williams WWTF plant itself. This proactive approach will allow MAWSS to determine the most appropriate plant improvements to address both efficiency and reliability issues along with measures that may be needed to ensure continued regulatory compliance with the new permit limitations.

The Wright Smith WWTF is continuing to operate under the 2004 through 2009 permit for discharge to Three Mile Creek while waiting for ADEM to issue a new draft permit. The Wright Smith WWTF cannot currently achieve the anticipated more stringent effluent limitations for discharge to Three Mile Creek. Consequently, MAWSS has initiated projects to install a 30 mgd effluent pump station and force main to discharge to the Mobile River rather than to Three Mile Creek. This project is being funded by the most recent State Revolving Fund (SRF) loan that closed in August 2012. While the construction of the new effluent discharge facilities is being completed, 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.

Additionally, future capital expenditures may arise from system growth. A public referendum is scheduled for November 2012 related to the water and sewer systems serving the City of Pritchard. The referendum will determine if the Prichard Water Works and Sewer Board (PWWSB) will be dissolved. If dissolved, the systems will be incorporated into the MAWSS system. Inclusion of the PWWSB facilities could require future capital investment to upgrade the facilities and properly operate the consolidated systems. However, all funds needed to operate, maintain and rehabilitate the Prichard system will come from Prichard customers. Separate accounting books will be kept to demonstrate this separation.

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. A potential safety issue was noted during the site inspections associated with failing brick veneer on the digesters at the C.C. Williams WWTF. Portions of the veneer have fallen and could pose a safety hazard to personnel walking around the digesters should more veneer fail. This is likely a low potential risk, but one that should be addressed as soon as possible to either repair or remove the veneer.

Datastream/Infor™ (Infor™) is used to track O&M activities and produce work orders. This software is mostly used for work on the collection and distribution systems while the water and wastewater treatment plants have still to implement full use of the work order system. Even with the collection and distribution systems, work orders produced by the program are filled in by hand by the crew performing the work and then entered into the system manually by either dispatch personnel or, in the case of the lift stations, the office assistant. This reduces the effectiveness of the software. Productivity and accuracy could be improved by providing field supervisors with portable data entry units to facilitate timely completion of work order data entry. MAWSS should also consider expanding the use of this software to fully utilize the program as a tool to track and determine the condition of assets. Linking work orders and the GIS asset database can provide additional capability in analyzing work order trends and asset correlations. Full work order utilization, combined with GIS capabilities should allow MAWSS to better predict maintenance work and replacement of assets, which in turn should reduce overall O&M costs.

Additionally, MAWSS is beginning an effort to assess the organization's performance against industry-accepted best practices. This 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. The Infor™ work order data can provide crucial data required to monitor and track performance measures evaluate O&M effectiveness.

One issue that should be addressed by the MAWSS Board and management is the lack of "earmarked" O&M budgets amounts for proactive, preventive O&M activities. Although emergency situation funding, if over $1,000 and over two years of useful life expectancy, is taken from capital budgets, the cost of emergency response, repair, rehabilitation or replacement is higher than the cost of conducting preventive O&M to extend the useful life of assets. A higher level of maintenance might have prevented the issue from becoming a capital matter. This does not mean that there will not be emergencies even at the most proactive utility, but an institutional focus on short term cost reduction, and postponement of revenue increase requirements, leads to higher costs in the longer run associated with premature asset replacement. Examples of preventive O&M activities that have faced reduced budgets are noted in Chapter 3 of this EAR.

The inclusion of Annual Project Authorization Priority projects in the 2010 EAR and in this 2012 EAR is designed to address the need to fund certain projects on an annual basis. At this point, only the most significant annual projects are included in the CIP project listing in Appendix A. MAWSS should consider either expanding this type of project or developing a more formalized process for diverting O&M funds from approved line item budgets to other uses. This type of issue is likely best resolved in a strategic planning type environment with close coordination between Board members, upper management and perhaps supervisory personnel.

MAWSS has already taken steps to retain employees and is beginning to address succession planning by preparing detailed written Standard Operating Procedures (SOPs). Employee retention and succession planning are needed because of the significant number of staff either already eligible, or nearing eligibility, for retirement. These activities should be continued and broadened in scope.

1.5 Recommendations

MWH recommends the following O&M improvements at MAWSS:

- Address the potential safety issue with the brick veneer failure on the digester at the C.C. Williams WWTF as a proactive safety measure.
- Continue use of the Infor™ work order management software to manage and track O&M activities and consider expansion in the following areas:
    - 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 expenditure
- Continue staff retention activities and expand succession 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 succession 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 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 2011 ranged from a low of 16 percent of the annual renewal target for the water distribution system to a high of 89 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.

Following the 2010 EAR, MAWSS initiated criticality projects at various facilities to conduct a more formalized identification and assessment of critical assets at the facility being investigated. When applicable, a capital project was defined to replace or rehabilitate critical assets. 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. The capital needs in Appendix A also includes allowances for criticality project needs yet to be identified. Estimated planning level cost estimates for each of the recommended projects have been incorporated into the revenue sufficiency determination detailed in Section 6, Revenue Sufficiency.

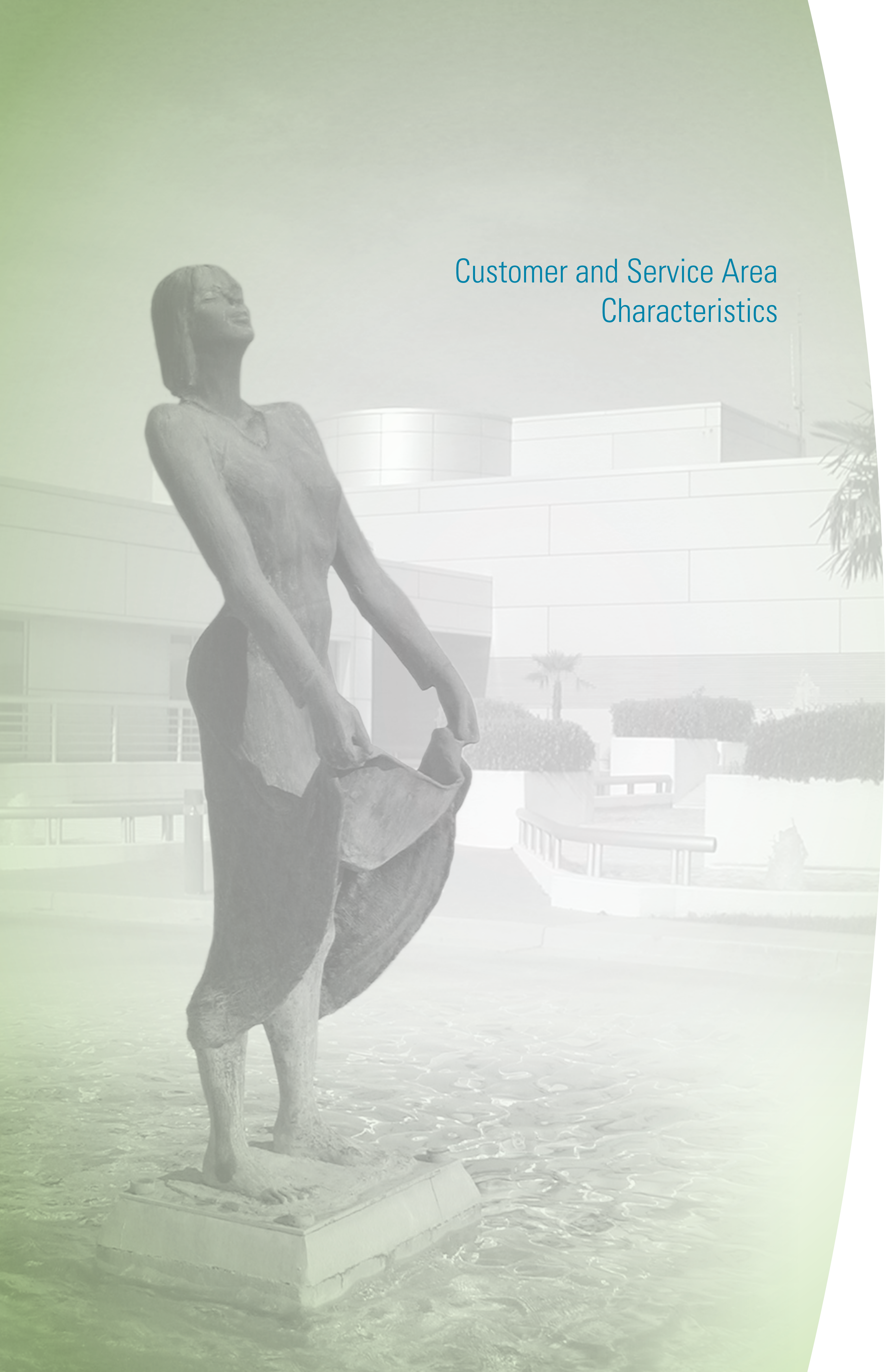
MAWSS has produced a strong history over the years of providing good service to its water and wastewater customers and at controlling/managing cost increases. As a consequence, rates charged by MAWSS to its water and wastewater customers have been low in comparison with other comparable water and sewer 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 ($20.7 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. Three SRF/bond borrowings are assumed, to occur in 2013, 2015 and 2017.

Table 1.1 is a summary of projected results of financial operations. The rate increases are shown on the second line of information. The annual costs of the new borrowings are shown on the “New debt service” row. Debt service on funds borrowed does not commence until the year following the borrowing, as indicated. At the bottom of the table, projected debt service coverage is shown. The *Trust Indenture* requires at its Section 714.2 [p.70] that that service charges provide sufficient net revenue to cover costs to “maintain, preserve and keep the System in good repair, working order and condition” and to produce 120 percent of annual debt service. The debt service coverage requirement is met in these projected results.

TABLE 1.1 – Summary of Projected Financial Information

($000s)

	2013	2014	2015	2016	2017	2018
Revenues						
Operating and non-op	$ 94,355	$ 99,033	$ 103,944	$ 109,102	$ 113,434	$ 117,939
Rate adjustment	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%
Expenses, total	57,680	59,410	61,190	63,020	64,910	66,860
Net income avail for coverage	$ 36,675	$ 39,623	$ 42,754	$ 46,082	$ 48,524	$ 51,079
Capital activity						
Pay-as-you-go project cost	$ 13,500	$ 15,000	$ 18,000	$ 20,000	$ 21,000	$ 21,000
Debt service						
Outstanding debt serv.	$ 22,911	$ 22,885	$ 22,618	$ 22,725	$ 22,203	$ 22,268
New debt service	0	1,327	1,327	2,408	2,408	4,490
Total debt service	$ 22,911	$ 24,212	$ 23,945	$ 25,133	$ 24,611	$ 26,758
Total capital activity	36,411	39,212	41,945	45,133	45,611	47,758
Net income of years' operations	$ 264	$ 411	$ 809	$ 949	$ 2,913	$ 3,321
Debt service coverage	1.60 x	1.64 x	1.79 x	1.83 x	1.97 x	1.91 x



Customer and Service Area Characteristics

2 Customer and Service Area Characterization

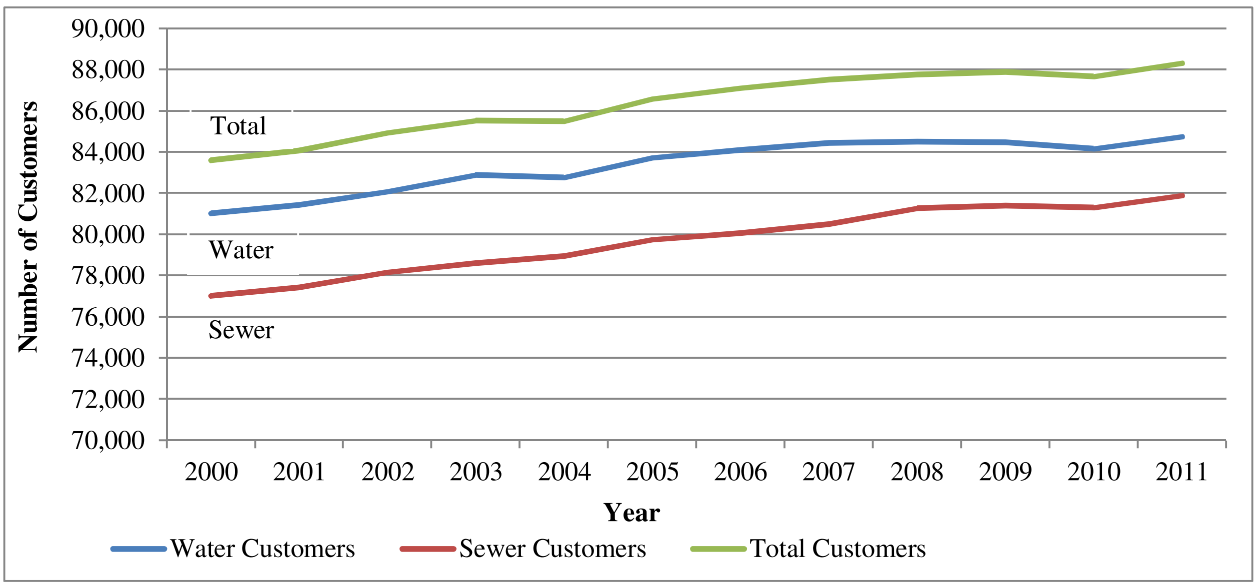
MAWSS provides water and sewer service to the City of Mobile and surrounding areas. The City of Mobile has a 2010 census population of 195,111 with Mobile County having a 2010 census population of 412,992.

The main water distribution system serves approximately 88,300 customers 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 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, 2011,* notes that MAWSS served 84,747 water customers, 81,889 sewer customers and 88,306 total customers in 2011. 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 2011



Annual water customer growth ranged from a negative 0.37 percent in 2010 to 1.19 percent in 2005 with an overall average of 0.41 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.

Annual sewer customer growth ranged from a negative 0.10 percent in 2010 to 1.02 percent in 2005 with an overall average of 0.56 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.

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.

However, much of the water service area is built out with limited areas for significant customer growth. The sewer service area has somewhat more potential for future new customer growth associated with possible expansion in the area to the west of the current service area.

The City of Mobile, like the nation, has experienced a period of economic recession and very slow growth over the past several years. City sales tax continued to decline during 2011. Lack of new development, Carnival Cruise Lines' withdrawal from Mobile (after only operating out of the Port of Mobile for a limited period of time), high unemployment and the reduction in consumer spending has had a negative impact. But, as shown by the apparent end of declining customer levels within MAWSS, positive things are beginning to happen. Austal USA has obtained a $369 million contract to build the fourth U.S. Navy littoral combat ship. The GulfQuest Maritime Museum is expected to open in late 2012 and will be the first gulf coast maritime museum and only the third interactive maritime museum in the world. Two companies, Steel Warehouse Co., LLC, and Heidtman Steel Products, Inc., recently committed to co-locate on ThyssenKrupp's site. Together these companies will create a total of 108 new jobs and invest $3.5 million. Additionally, in July 2012 Airbus announced plans to construct a $600 million aircraft assembly plant in Mobile. The facility is expected to break ground in the summer of 2013 with a 2-year construction period. It is estimated that over 3,000 jobs will be created during this period. The facility is expected to reach full capacity by 2018 at which time it will employ 1,000 people. The facility is also expected to attract various parts suppliers and other related businesses.

Fortunately Mobile is beginning to compare more favorably with the State of Alabama in unemployment rates. Mobile had an average unemployment rate of 10.8 percent in 2010 and 10.1 percent in 2011 versus the state's rate of 9.5 percent in 2010 and 9.0 percent in 2011. At the end of 2011, however, Mobile's rate was at 8.4 percent compared to the state's 8.1 percent and both were below the national rate of 8.5 percent.

For the purposes of the 2012 EAR, it is expected that development in the Mobile area, although no longer decreasing, will continue to be slower than previous, higher growth years, at least in the near future. Consequently, it is expected that customer growth in both the water and the sewer systems will continue in near future at rates similar to the average customer growth rates seen during the previous decade, or roughly 0.5 percent per year for both the water and the sewer systems.

2.3 Regionalization Initiatives

There is a potential for an influx of water and sewer customers based on the outcome of a scheduled November 2012 public referendum on dissolution of the Prichard Water Works and Sewer Board (PWWSB). If dissolved and incorporated into the MAWSS system, the City of Prichard's approximately 26,000 residents could become retail water and sewer customers rather than the PWWSB being one of MAWSS' larger wholesale water customers. Assuming roughly 2.2 persons per household from 2010 census data for the City of Mobile, Prichard would add roughly 12,000 customers.

The PWWSB's facilities are currently under a 5-year public/private partnership with Severn Trent Services. Under the agreement, Severn Trent is responsible for the complete operation, maintenance and management of the City of Prichard's water and wastewater facilities, collection and distribution system, meter reading, billing and customer service functions.

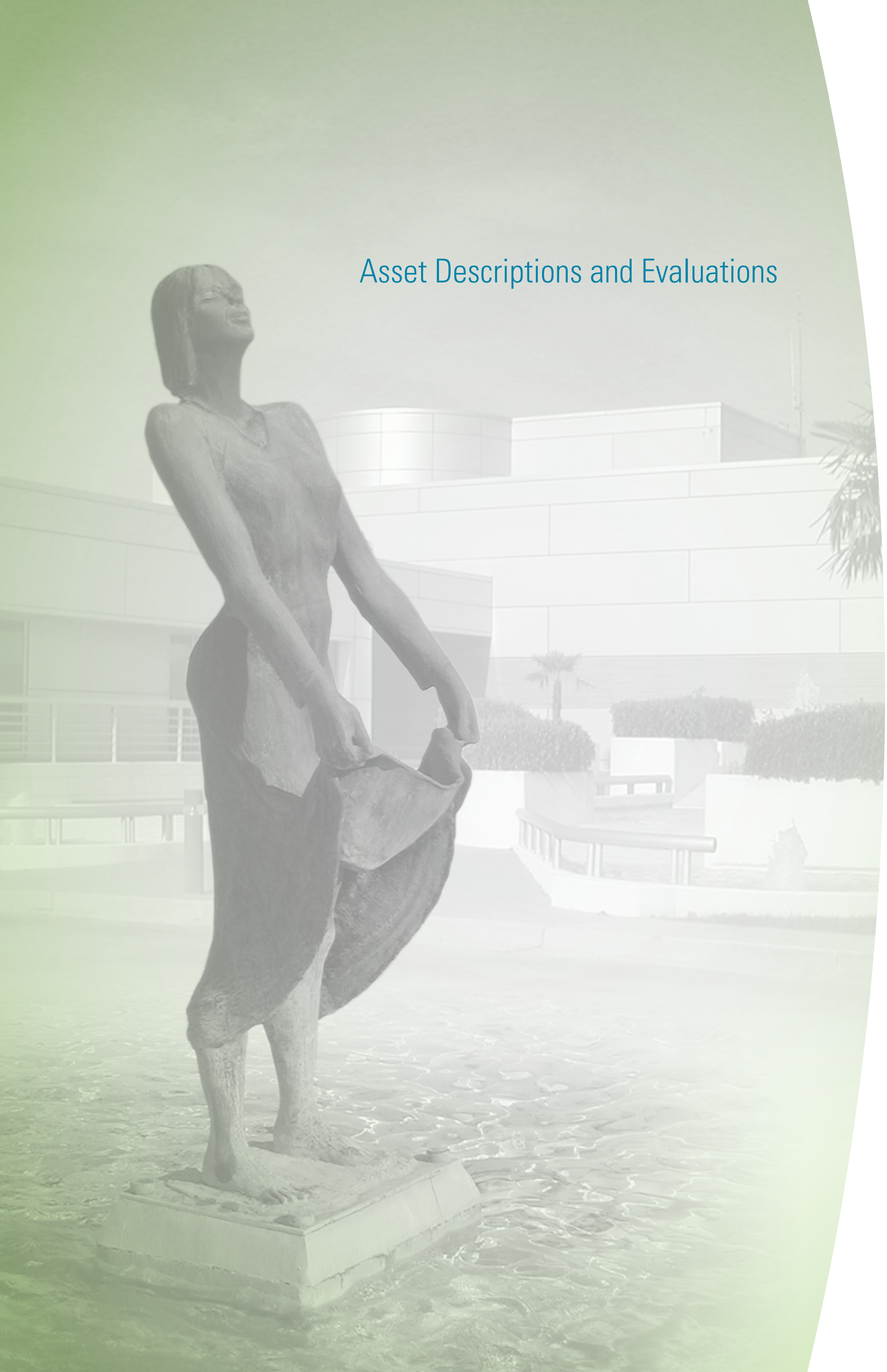
MAWSS had been working with other area sewer utilities to evaluate alternative long term solutions for wastewater treatment and disposal. The Alabama Gulf Coast Regional Sewer Supply District (District) was formed in the fall of 2007 to be a mechanism through which various sewer utilities could partner. During 2009, a Regional Wastewater Development Agreement was developed between MAWSS Board and the City of Chickasaw to become the first two participants of the District. However, additional regional partners failed to materialize and MAWSS subsequently withdrew from the District. The District has now been dissolved.

During the Regional Wastewater effort, the Alcoa site, a bauxite sludge disposal site, was identified as the best location for a future regional wastewater plant. The site is approximately 100 acres with dikes at elevations 35 to 40 feet mean sea level and is located on the east side of the Mobile River. Currently the site is owned by the Alabama State Port Authority (ASPA) and the ASPA treats the high pH leachate from the site. MAWSS has offered to take ownership of the site, accept responsibility for meeting the NPDES discharge permit requirements and, as funds became available, prepare the site for future construction of a regional wastewater treatment plant.

At one time it was thought that the U.S. Army Corps of Engineers (the Corps) would find it desirable to fill the site with excess dredge spoil material from the Mobile River Channel maintenance dredging. Discussions with the Corps have been promising, but they would like to be paid for the spoil materials. Currently, efforts to obtain the site are at a near standstill.

Development of either a regional wastewater plant or a MAWSS-only wastewater plant at the site, if pursued at all, will be a long range planning activity that will be beyond the scope of the projects evaluated in this EAR.

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

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.

Recent repairs to the Bucks Pumping Station as well as maintenance work in the canals and flumes have extended the assets' service life as well as operational characteristics. Scheduled inspection and maintenance of the assets should improve MAWSS capability of predicting and scheduling renewal and replacement work.

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. The only public access point is at Fox Landing at the end of Howell's Ferry Road on the east side of the lake, which is also controlled by MAWSS.

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 deputy is also available to investigate other incidents such as vandalism or theft at other MAWSS locations.

Based on the recommendations from the 2010 EAR, MAWSS performed a criticality assessment for the S. Palmer Gillard Pumping Station. The assessment, completed in 2012, recommended several critical and various non-critical improvements to the facility. The critical improvements include:

- Replace the struts supporting the sheet pile walls in the pump channel
- Replace shoreline sheet pile top waler beam and tieback rods
- Coat sheet piling in the pump channel between elevation 110 and 96

The non-critical improvements include:

- Improve redundancy of power source onsite
- Evaluate the installation of a more robust, automatically cleaned screen
- Install hurricane rated doors, windows and reinforce structure to meet current design standards (IBC 2009)

MAWSS has already commenced planning and, in some cases, work to implement the improvements recommended by the criticality assessment. Hurricane windows have been installed in the control room and the electrical room of the pump station. An alternative to the replacement of the struts supporting the sheet piles in the pump channel has been defined. The replacement of the shoreline sheet piles top waler beam and tieback rods has been rated a priority. These projects are included in the CIP project listing in Appendix A of this report.

Additionally, MAWSS is developing a comprehensive watershed management plan to address the uses and issues around the J.B. Converse Reservoir (Big Creek Lake). This plan is included in the CIP project listing in Appendix A of this report along with an allowance amount to implement subsequent recommendations.

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. A lime silo and slaker 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.

PHOTOGRAPH 3.1 –
E.M. Stickney Water Treatment Plant

Most of the E.M. Stickney WTP 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. If this structure 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. The single lime silo, although replaced in 2008, constitutes a large risk to the plant's continuous operation. A second lime silo and pump 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.

A two phase criticality assessment was performed at the E.M Stickney WTP. The first phase of the assessment identified possible failures for each of the facility's systems and evaluated the impact to the system's capacity, time period for impact to affect operations, criticality and possibility of a failure. Using this analysis, the second phase of this assessment prioritized the work required, generated a scope of work for further investigation and provided recommendations on work to be performed. Recommendations vary from replacing switch board labels to taking core samples of concrete in major structures for analysis.

The recommendations identified in the criticality assessment as requiring additional examination are summarized below:

- 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

The CIP project listing in Appendix A of this EAR includes line items for those of the above projects where cost estimates have been developed. An allowance line item has been provided for the remaining items. The allowance line item amount will likely require adjustment as detailed project cost estimates become available.

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.

PHOTOGRAPH 3.2 –
H.E. Myers Water Treatment Plant

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 is in the planning stages of a capital project to split the reservoir into two reservoirs, each capable of feeding the influent pumps. This would allow half of the reservoir to be fully drained for cleaning/repairs while the plant continues operation. 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.

The H.E. Myers WTP is 22 year old and, although well maintained, the useful lives of the mechanical and electrical components are likely nearing the end. Replacement of the original system components should likely begin or MAWSS will need to accept an elevated risk of shutdowns 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. This was evident during an incident that occurred during routine maintenance of a filter. During a filter cleaning, the standard operating procedure is to manually lock the filter valve open to prevent any contaminants from the filter cleaning to enter the system. During this work the coil for this valve failed, which caused a power loss to all the filter valves. The filter influent valves are a "Fail Open" type valve and therefore opened on the loss of power. This caused flooding of the filter pipe gallery, which damaged all the controls for the filter effluent. These conditions accentuate the need for MAWSS to utilize their existing asset management program to evaluate the condition of their assets and determine a convenient, but appropriate, schedule for the renewal/replacement work that both reduces the yearly capital expenditures and minimizes downtime at the facility.

Based on the recommendations from the 2010 EAR, MAWSS performed the first phase of the criticality assessment for the H.E. Myers WTP. The critical findings (rated 7 or above) for this phase were mostly related to the electrical and chemical injection systems. However, since the Phase Two of the assessment has not yet been performed, the recommendations identified as requiring additional examination were similar to those from the E.M. Stickney WTP. The following summarizes the first phase criticality assessment recommendations:

- 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

The CIP project listing in Appendix A of this EAR includes line items for those of the above projects where cost estimates have been developed. Some of the items will be funded as an O&M expense. However, any CIP allowance line item has been provided in the CIP project listing in Appendix A for any remaining items. The allowance line item amount will likely require adjustment as detailed project cost estimates become available.

Both water treatment plants utilize a powdered activated carbon (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, which was renewed this year, is on a 5-year renewal cycle. The centrifuges and their control system, installed in 1990, are outdated, inefficient and require substantial interaction from plant personnel for their operation. New units with integrated controls would provide a more energy efficient, reliable operation, with reduced personnel interaction. The reduced personnel interaction would allow for the operator currently assigned to the dewatering operation to be relocated within the facility to better assist with other plant processes.

Both plants are able to produce treated water that meets all current regulatory requirements, including the federal Stage 2 Disinfection Byproducts Rule (DBP) requirements. However, MAWSS recognizes that their PAC assisted process has limited total organic compound (TOC) removal capabilities, which could restrict the plants' ability to meet DBP requirements in certain situations. Further, the PAC facilities, while installed at a relatively low capital cost, are expensive to operate. Therefore, MAWSS conducted an initial air scrubbing pilot study aimed at reducing the levels of TOC in the water entering the water treatment facilities. Conversion to air stripping could allow MAWSS to meet DBP effluent requirements with reduced PAC consumption thus lowering the annual operating costs. The pilot study program was conducted with a majority of MAWSS internal resources. The initial results from the study were not satisfactory for raw water treatment, but were encouraging for treated water. MAWSS is evaluating a second phase of the pilot study to evaluate air stripping at a distribution system location rather than at the plants. If the second phase of the air stripping pilot study determines the distribution system location is feasible, MAWSS should conduct a financial feasibility evaluation to determine whether or not it is cost-effective to implement the air stripping option.

This project is an example of where a more formalized and documented capital projects needs identification process, including a life cycle cost analysis, for proposed capital projects would be useful. Although initially limited by the schedule required under the federal DBP Rule and by the time-consuming need to pilot various options for complying with the DBP requirements, these constraints no longer prohibit taking the necessary time to conduct a full cost analysis of the proposed air stripping option. The recommended life cycle cost analysis should include projected capital costs and annual O&M costs for both PAC and air stripping processes in order to make a full comparison of the alternative processes.

The 2011 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.

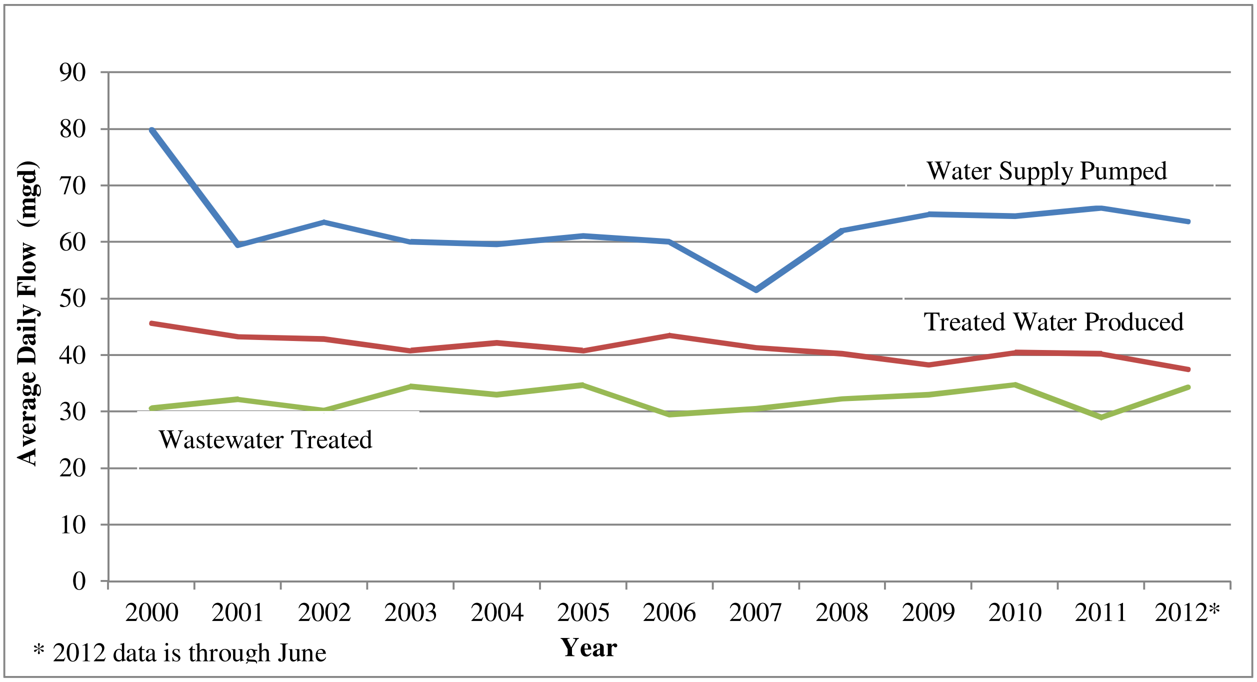
Table 3.1 lists the average monthly drinking water production rates for the E.M. Stickney and the H.E. Myers WTPs. Also shown in Table 3.1 is the peak daily water production rate for each month. Both plants are operating well below their permitted capacities.

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	37.22	15.37	17.62
July 2011	28.98	36.79	13.18	17.14
August 2011	31.25	38.33	11.37	16.63
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

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 2012



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 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. The segment count column in the table is based on how the GIS database defines a length of water main.

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	611	1.1%	21,913	4	0.3%	0.3%
0.75	78	0.1%	5,702	1	0.1%	0.3%
1.00	371	0.6%	19,570	4	0.2%	0.6%
1.25	74	0.1%	8,281	2	0.1%	0.7%
1.50	263	0.5%	15,702	3	0.2%	0.9%
2.00	3,944	6.8%	508,849	96	6.2%	7.1%
2.50	28	0.0%	1,960	0	0.0%	7.1%
3	303	0.5%	21,597	4	0.3%	7.4%
4	2,268	3.9%	312,633	59	3.8%	11.2%
6	27,706	47.9%	3,620,150	686	44.2%	55.4%
8	12,109	20.9%	1,603,623	304	19.6%	75.0%
10	2,458	4.2%	388,295	74	4.7%	79.7%
12	4,015	6.9%	673,779	128	8.2%	87.9%
14	12	0.0%	1,765	0	0.0%	88.0%
16	2,014	3.5%	423,388	80	5.2%	93.1%
18	42	0.1%	11,820	2	0.1%	93.3%
20	414	0.7%	95,325	18	1.2%	94.4%
24	575	1.0%	166,263	32	2.0%	96.5%
30	133	0.2%	55,867	11	0.7%	97.1%
36	349	0.6%	175,390	33	2.1%	99.3%
48	108	0.2%	57,797	11	0.7%	100.0%
60	11	0.0%	949	0	0.0%	100.0%
Totals	**57,886**	**100%**	**8,190,618**	**1,552.0**	**100%**	

[1] MAWSS GIS database query, July 2012. 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 (miles)	Length (feet)	Length (%)	Cumulative Length (%)
Not Listed in GIS	49,117	84.5%	1,297	6,846,367	83.6%	83.6%
C900	1,183	2.0%	33	175,114	2.1%	85.7%
CI	272	0.5%	11	56,360	0.7%	86.4%
CONC	473	0.8%	48	254,092	3.1%	89.5%
DI	4,240	7.3%	93	492,047	6.0%	95.5%
GALV	20	0.0%	1	3,012	0.0%	95.6%
HDPE	146	0.3%	6	29,431	0.4%	95.9%
PVC	2,431	4.2%	63	332,830	4.1%	100.0%
Totals	**57,884**	**100%**	**1,551**	**8,190,263**	**100%**	

1 MAWSS GIS database query, July 2012. 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 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 [1]	Segment Count	Count (%)	Length (miles)	Length (feet)	Length (%)	Cumulative Length (%)
Not Listed in GIS	44,998	77.7%	1,235	6,523,192	79.0%	79.0%
≤ 10 Years	3,171	5.5%	92	485,595	5.9%	84.9%
11 to ≤ 20 Years	6,628	11.5%	145	765,474	9.3%	94.1%
21 to ≤ 30 Years	2,669	4.6%	77	405,115	4.9%	99.1%
31 to ≤ 40 Years	403	0.7%	14	75,115	0.9%	100.0%
41 to ≤ 50 Years	13	0.0%	1	3,134	0.0%	100.0%
Totals	**57,882**	**100%**	**1,564**	**8,257,625**	**100%**	

1 MAWSS GIS database query, July 2012. Data includes both the main distribution system and the College Woods distribution system.

The limited material and age distribution data makes it difficult for MAWSS to predict future replacement needs and the associated timing of those replacement needs. This lack of data can be somewhat offset by tracking work order history associated with main leaks and breaks. The work order tracking can help identify areas within the system that are starting to see an increase in pipe failures and allow MAWSS managers to plan preventive rehabilitation activities to reduce the amount of emergency repairs required.

Water storage facilities within the distribution system include:

- Six reservoirs
    - Bienville Reservoir – 10 mg earthen
    - East Reservoirs – two at 5 mg each concrete
    - Springhill Reservoir – 10 mg earthen
    - Hillcrest Reservoirs – two at 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
    - Snow Road
    - Airport Snow Road
    - Johnson Road
    - Island Road
    - Bear Fork Road
    - Schillinger Road
    - Grelot

PHOTOGRAPH 3.3 –
Moffett Road Booster Pump Station

To further improve water quality within the distribution system, MAWSS is evaluating conversion of one of the parallel 48-inch raw water mains to a potable water main. By utilizing this main as a distribution main, and making additional connections to existing mains within the distribution system, the Springhill reservoir could be removed from service. These improvements would reduce the water age within the distribution system. Costs for these improvements are included in the CIP project listing in Appendix A of this EAR.

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.

The annual projects included in the CIP project listing in Appendix A are the initially recommended projects to move MAWSS into more of a proactive and preventive mode of operation.

Table 4.2 compares the actual year 2011 renewal expenditures to the calculated annual renewal targets that had been developed in the 2010 EAR.

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.

One of the CIP projects included in Appendix A of this EAR that should be carefully evaluated on a life cycle cost basis is the water meter conversion to automated meter reading. This EAR includes only an initial $2.8 million line item that could be diverted to water main replacement rather than the suggested $20 million. While a larger $20 million automated meter reading project can be beneficial and could improve efficiency of both water meter reading and billing, utilities have had problems implementing this type of large scale project. The technology interface between the meter reading and the billing systems needs to be carefully handled to ensure accuracy. Some utilities have had problems where the first billing cycle under the automated systems was wrong and the bills had to be rescinded. Such problems cause a great deal of customer confusion and mistrust issues. Other utilities have found the conversion to be more expensive than anticipated or budgeted. Therefore, this project should be carefully evaluated prior to initiation of such an ambitious $20 million 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 Underground Injection	Class V Underground Injection	Class V Underground 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 2011 ADF [4] (mgd)	20.59	9.83	0.042	0.028	0.005
Maximum Daily Flow Rate for CY 2011 [4] (mgd)	58.91 [45]	25.23 [5]	0.069	0.070	0.017
Disposal Method	Mobile River	Three Mile Creek [6]	Rock Infiltration Beds	Drain Field Lines	Vegetated Rock Beds
Effluent Permit Limits	25 mg/l $CBOD_5$ 30 mg/l TSS 20 mg/l NH_3N	20 mg/l BOD_5 30 mg/l TSS 5 mg/l NH_3N 5 mg/l DO	No surface discharge	No surface discharge	No surface discharge

1 ADF = Average Daily Flow; BOD = Biochemical Oxygen Demand; CBOD = carbonaceous BOD; 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 These values occurred during September 3 through 5, 2011.

6 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 are underway to install a 30 mgd effluent pump station and force main to move the effluent discharge point to the Mobile River.

The C.C. Williams WWTF is a 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 2012 EAR are included in Subsection 3.4.1 below.

PHOTOGRAPH 3.4 –
C.C. Williams Wastewater Treatment Facility

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 2012 EAR are included in Subsection 3.4.2 below.

PHOTOGRAPH 3.5 –
Wright Smith Wastewater Treatment Facility

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 11th year of continuous compliance and the Wright Smith WWTF is in the 9th year of continuous compliance.

The C.C. Williams WWTF is currently operating under a new NPDES permit, which was received in 2011 and expires on November 30, 2015. As noted above, the new permit changed the BOD_5 limit to a CBOD limit and added an NH_3N limit. As previously noted, ADEM is allowing the Wright Smith WWTF to continue to discharge to Three Mile Creek while projects are underway to relocate the effluent discharge to the Mobile River. These projects include installation of a 30 mgd effluent pump station and force main that are being funded by an August 2012 State Revolving Fund (SRF) loan.

In addition to the two centralized plants, MAWSS operates three decentralized wastewater treatment facilities (DWWTFs). In recent years, all three DWWTFs have either had flow diverted or had facilities replaced to enable all three plants to meet regulatory requirements. These plants are discussed in more detail in Section 3.5 below.

3.4.1 C.C. Williams WWTF Condition

During the site visits for the 2010 EAR, significant corrosion to the concrete structures of the headworks and primary clarifiers was observed. The configuration of the influent structure at the headworks unit increases the release of gases from the wastewater, including H_2S which is corrosive to concrete structures. The headworks unit is equipped with an ozone odor control system to reduce H_2S concentration and limit corrosion. MAWSS has applied corrosion resistant coating to the concrete in the headworks structure, but this is a temporary solution and a new headworks structure will likely be needed. The twin climber screens (1/2" openings) used to remove large debris from the influent stream appears to be in relatively good overall condition, a compliment to the plant personnel's maintenance work. However, several of the screen vertical bars on both screens have separated from the welds to the horizontal members, producing openings larger than intended, making the screens ineffective and increasing the possibility of a failure. These vertical members have been repaired, but continue to separate requiring repeated repairs. The C.C. Williams WWTF would benefit from new screens, as current industry standards for screens include smaller openings (1/4") and different screen configurations (e.g., step screens, perforated plates, etc.) to improve debris removal from the influent stream.

The grit system is composed of two "Pista" type vortex units. The units are ineffective at removing the finer grit particles in the influent stream, resulting in accumulation of solids in the downstream structures, effectively reducing treatment capacity. In addition, plant personnel are concerned with the configuration of the piping to the grit pumping/washing system. The piping for unit #2 is installed in such a way that a failure would likely require the whole headworks structure to be placed offline, and substantial demolition work may be required to repair the piping. It is apparent that a new grit system is required for the facility. Improvements in grit removal technologies have increased the efficiency of these units substantially from the units currently installed at the C.C. Williams WWTF. A new grit system would provide better solids removal from the influent stream and reduce the possibility of a catastrophic failure of the headworks structure. The headworks structure can be bypassed and all the wastewater directed to the primary clarifiers in case of emergency. However, this allows for significant amount of debris and solids to enter the facility.

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 concrete structure shows significant (in some cases extensive) corrosion and concerns of structural failure are significant. The units include a pre-aeration chamber and two rectangular chain and flight solids removal units. Air is provided by redundant blowers. The chain and flight sludge removal units show significant corrosion and require significant maintenance work to be kept in service. The primary clarifier can be bypassed if required to allow repairs of the units.

The pretreated wastewater exits the primary clarifiers and enters a concrete structure, where it is mixed with return activated sludge. From this structure, the mixed liquor is directed to the four HPOs via three sluice gates. The structure does not allow for even hydraulic loading of the reactors, which hinders their treatment capacity. A reconfiguration of this structure to include flow control weirs would improve the flow distribution and improve treatment.

The four HPO reactors, including the two oxygen generators, have been recently reconditioned and are in good condition. 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.

The intermediate pumping station (five pumps total), although not typical of wastewater facilities of this size, operates continuously. The plant's standard maintenance schedule includes removal and repair of one pump each year. The four secondary clarifiers are in good condition. MAWSS is in the process of replacing the scum baffles on three clarifiers to improve effluent quality. Two chlorine contact chambers at the facility provide 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 gravity thickeners for the primary clarifier sludge, thickening centrifuges for waste activated sludge. There are 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. The primary digesters are showing deterioration of the brick veneer, including a large section which fell off of primary digester P3. This damage does not appear to have compromised the structural integrity of the digester. However, the digester should be emptied and inspected and the veneer repaired or removed as soon as possible to prevent further damage and to provide a safe work environment for operators walking around the digester. This EAR assumes the veneer removal cost can be included in the O&M budget.

Secondary clarifier S2 shows significant corrosion to the steel roof. This should also be repaired as soon as possible to prevent a roof collapse. 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. An arc flashing incident in early 2011 (no injuries occurred) exemplifies these conditions. An overall evaluation of the electrical system is needed to determine the best path to improve the condition of the electrical systems.

MAWSS commissioned a study to determine process alternatives for the C.C. Williams plant to meet the anticipated permit limits for nutrients, in particular ammonia, on a consistent basis. The alternatives presented to MAWSS were:

- Conversion of the existing pure oxygen generators to biological nutrient reactors
- Break point chlorination
- Centrate side stream treatment

The report provided to MAWSS recommended the treatment of the centrate side stream as the most viable alternative. This alternative would require new sequential batch reactors (SBRs) for the treatment of the centrate side stream. During our site visits, MAWSS personnel expressed a preference for the conversion of the existing pure oxygen reactors into nitrifying biological reactor rather than treating the centrate side stream.

To evaluate possible improvements in a holistic manner, MAWSS initiated an on-going procurement process to complete a master plan for the C.C. Williams WWTF, as well as the other McDuffie Island facilities, so that the entire plant processes and the plant site facilities can be evaluated to ensure the phased design and construction is appropriate. In addition to the centrate side stream treatment issues, the treatment plant portion of the master plan will evaluate replacement of the headworks and the primary clarifier.

The master plan is not yet awarded, but a preliminary cost allowance of $1 million is included in the CIP project listing in Appendix A of this EAR. Additional specific previously identified CIP projects have been retained in the CIP project listing in Appendix A, including such things as the cost of installing new headworks and primary clarifier improvements. These projects may be replaced, revised or superseded during subsequent EARs as the full scope of the recommendations from the master plan is made known.

3.4.2 Wright Smith WWTF Condition

The Wright Smith facility has two 15-mgd capacity climber screens (1/2" 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. Trickling filter No.2 had shown signs of collapsed underdrains. MAWSS removed the media and repaired approximately 40 percent of the filter underdrain. No signs of failure have been seen since.

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 would allow water to enter the electrical system. These conduits should be repaired to prevent a malfunction of the intermediate pumps. The chlorinated 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. 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.

In 2011 a new state-of-the-art facility to handle grease trap waste was opened at the Wright Smith WWTF. The $2 million facility was designed as an "eco-friendly" process to convert grease trap waste from restaurants into a reusable product. This new treatment process screens, stores and dewaters the grease trap waste, but has not yet been able to produce a renewable product. Consequently, the grease product is being disposed of in a landfill and is not being beneficially reused. MAWSS has identified a prospective end product user, but the grease product must consistently meet certain heat content quality specifications before the user will agree to use the product.

A fundamental problem associated with this facility is that it cannot be expected to recover its cost of operations in the foreseeable future. The cost to operate is approximately $0.22 per gallon while MAWSS charges $0.09 per gallon. It may be difficult to increase the disposal charge for competitive reasons. A private company, Integra Water, LLC, operates a wastewater treatment facility in northern Mobile County that accepts grease trap and septage waste for $0.09 and $0.07 per gallon, respectively.

MAWSS may be able to improve operation of the facility by such things as improved mixing in the two day tanks, by converting to a lower cost media or by instituting established grease delivery schedules. However, continued operation of this facility should be critically evaluated before any significant additional capital expenditures are made due to the on-going O&M-related financial deficit. A $10,000 allowance to evaluate the facility is included in the CIP project list in Appendix A, but even this relatively minor expenditure should be critically considered.

The Wright Smith WWTF plant is in considerably better condition that 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.

The CIP project listing included in Appendix A of this EAR includes the various projects listed above.

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 currently being sued, 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 Class A biosolids processing or move to a landfilling option. A full analysis of biosolids processing options should be initiated as part of a biosolids management planning effort. For purposes of this 2012 EAR, a CIP project is included to conduct a biosolids management plan. An allowance of $10 million for a potential future capital cost has also been included in the capital project needs in Appendix A.

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. Except for the Hutchens DWWTF, which is operating near capacity, the DWWTFs are 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. Additionally, the disposal bed was expanded to provide subsurface infiltration for 50 percent of the total permitted capacity, or 85,000 gpd. The existing permit for Copeland Island DWWTF is for 170,000 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.

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. No expansion work is expected in the near future unless MAWSS should determine a need exists to return the diverted flow back to the Hutchens DWWTF.

The Snow Road DWWTF 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. No expansion work is expected in the near future.

The CIP project listing in Appendix A of this EAR includes a project to assess the risk of the decentralized plants and disposal systems to improve CIP project prioritization and an allowance for the implementation of projects that could be recommended based on this assessment. The CIP project listing also includes future project needs associated with hazard mitigation and future growth.

3.6 Sewer Collection System

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 (miles)	Length (feet)	Length (%)	Cumulative Length (%)
Not Listed in GIS	132	0.4%	3	15,899	0.2%	0.2%
4	3	0.0%	0	285	0.0%	0.2%
6	495	1.6%	12	64,621	1.0%	1.2%
7	1	0.0%	0	71	0.0%	1.2%
8	25,013	83.3%	1,041	5,496,679	83.3%	84.3%
10	1,338	4.5%	58	304,998	4.6%	88.9%
11	1	0.0%	0	7	0.0%	88.9%
12	821	2.7%	36	188,953	2.9%	91.7%
14	23	0.1%	2	8,690	0.1%	91.8%
15	470	1.6%	21	108,558	1.6%	93.5%
16	116	0.4%	5	24,759	0.4%	93.9%
18	651	2.2%	29	153,084	2.3%	96.2%
20	41	0.1%	2	11,597	0.2%	96.3%
21	8	0.0%	0	2,145	0.0%	96.4%
24	332	1.1%	16	84,482	1.3%	97.7%
26	2	0.0%	0	329	0.0%	97.7%
27	11	0.0%	1	2,756	0.0%	97.7%
29	1	0.0%	0	154	0.0%	97.7%
30	163	0.5%	8	40,956	0.6%	98.3%
36	245	0.8%	11	60,335	0.9%	99.2%
42	79	0.3%	5	24,223	0.4%	99.6%
48	81	0.3%	4	23,019	0.3%	99.9%
54	15	0.3%	1	3,327	0.1%	100.0%
Totals	**30,042**	**100%**	**1,255**	**6,619,927**	**1.002%**	

[1] MAWSS GIS database query, July 2012.

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 “various materials,” which includes a variety of types. The next largest pipe types are cured-in-place pipe at 16 percent and PVC pipe at 15 percent. 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. MAWSS has instituted a program to line concrete pipe 15-inch and smaller that is greater than 15 years of age. Concrete pipe is susceptible to corrosion along the top of the sewer where corrosive gases cause deterioration of the concrete. The cost to line 15-inch and smaller pipe is approximately $0.6 million. At the current budget recommended in Appendix A of this EAR of $2 million per year, it is projected, if funded, to require 13 years to complete the lining installations. The risk associated with this relatively slow pace is that the top of the pipe may lose structural strength to the point that the pipe needs to be replaced rather than lined or, in some situations, the pipe can collapse before the liner can be installed. MAWSS should further evaluate the concrete pipe lining program to determine if more aggressive funding is required to shorten the completion schedule.

TABLE 3.7 – Gravity Sewer Distribution By Material

Material [1]	Segment Count	Count (%)	Length (miles)	Length (feet)	Length (%)	Cumulative Length (%)
Not Listed in GIS	340	1.1%	9	45,171	0.7%	0.7%
Cast Iron	122	0.4%	4	19,109	0.3%	1.0%
Cured In Place Pipe	4,368	14.4%	203	1,071,853	16.1%	17.0%
Concrete	309	1.0%	14	72,434	1.1%	18.1%
Ductile Iron	2,766	9.1%	98	515,319	7.7%	25.9%
Fiberglass Reinforced Pipe	16	0.1%	1	5,890	0.1%	26.0%
High Density Polyethylene	169	0.6%	9	49,760	0.7%	26.7%
Iron	13	0.0%	0	2,101	0.0%	26.7%
Polyvinyl Chloride	4,635	15.3%	189	999,752	15.0%	41.7%
Reinforced Concrete Pipe	6	0.0%	0	1,751	0.0%	41.8%
Spirolite	2	0.0%	0	185	0.0%	41.8%
Steel	118	0.4%	6	31,301	0.5%	42.2%
T-Lock	320	1.1%	16	84,668	1.3%	43.%%
Various Materials	16,856	55.5%	705	3,720,590	55.8%	99.3%
Vitrified Clay Pipe	340	1.1%	9	45,171	0.7%	100.0%
Totals	**30,380**	**1.001%**	**1,263**	**6,665,055**	**100%**	

[1] MAWSS GIS database query, July 2012.

Table 3.8 summarizes the gravity sewers by age. There is a significant amount, nearly 84 percent, 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 (miles)	Length (feet)	Length (%)	Cumulative Length (%)
Not Listed in GIS	25,060	83.4%	1,050	5,546,008	83.8%	83.8%
$\leq$ 10 years	1,209	4.0%	46	241,388	3.6%	87.4%
11 to $\leq$ 20 years	3,305	11.0%	137	725,634	11.0%	98.4%
21 to $\leq$ 30 years	445	1.5%	19	102,536	1.5%	99.9%
31 to $\leq$ 40 years	22	0.1%	1	4,261	0.1%	100.0%
Totals	**30,041**	**1%**	**1,253**	**6,619,827**	**100%**	

[1] MAWSS GIS database query, July 2012.

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 187 lift stations used to transport wastewater within the service area. 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. When reinitiating the program in 2011, MAWSS determined that it would be more cost effective to perform most of the rehabilitation work “in-house” when feasible and only contract out work when economical. Under the in-house program, 14 additional lift stations have been rehabilitated, with an additional 35 identified for rehabilitation work.

In addition, MAWSS has established requirements for providing redundant pumping systems in their lift stations. Using these requirements, 3 lift stations have had backup diesel pumps installed. MAWSS has determined that another 123 lift stations (out of 173 duplex stations) will need redundant pumping systems via the preferred option of backup diesel pumps or of onsite generators providing emergency power. A $1 million project for 15 horsepower (hp) lift station backup diesel generators is included in the CIP project listing in Appendix A in this EAR. Additional projects may need to be added in subsequent EARs to address the remaining lift stations.

Eighty-nine of the 173 duplex stations have also had telemetry upgrades. Of the 187 lift stations, 15 are not on a Supervisory Control and Data Acquisition (SCADA) network. No CIP project has currently been defined for installation of additional SCADA systems.

As part of the rehabilitation program and the regular maintenance work on the lift stations, MAWSS personnel have identified several deficiencies at lift stations that will require a capital project to correct. The capital projects currently identified are:

- The Eight Mile Lift Station (LS164) serves eight additional lift stations and associated gravity systems, making its operation critical to the collection system. Identified improvements at the Eight Mile Lift Station include a rag and debris removal system (similar to Halls Mills) and a diesel operated backup pump. These improvements would improve the operation of the lift station, while reducing debris buildup-related repairs.
- The Halls Mill Creek (LS154) and Eslava Creek (LS156) Lift Stations have been identified as requiring a fourth variable frequency drive (VFD) to improve operational efficiency and distribute pump operational hours more evenly.
- The Perch Creek Lift Station (LS044) has experienced vibration issues when operating all pumps during periods of high flows and the debris grinding system requires more maintenance than other systems installed in other lift stations. The vibration caused a pump failure at this lift station, when a pump motor separated from the volute, causing the lift station to flood. An analysis of the lift station should be performed to prevent any additional failures and reduce maintenance work on the grinder system.

The project costs for these improvements are included in the CIP project listing in Appendix A of this EAR, although the Halls Mill Creek and Eslava Creek Lift Station VFD projects are considered Priority 5, growth projects. This prioritization may need to be re-evaluated.

PHOTOGRAPH 3.6 –
Perch Creek Lift Station

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 (miles)	Length (feet)	Length (%)	Cumulative Length (%)
Not Listed in GIS	60	2.9%	5.2	27,382	2.4%	2.4%
1.25	18	0.9%	0.7	3,790	0.3%	2.7%
1.5	16	0.8%	0.7	3,722	0.3%	3.1%
2	315	15.0%	18.4	97,372	8.5%	11.6%
2.5	663	3.0%	4.2	22,376	2.0%	13.6%
3	349	16.7%	23.6	124,493	10.9%	24.5%
4	393	18.8%	33.0	174,356	15.3%	39.8%
6	422	20.1%	57.8	305,071	26.8%	66.6%
8	179	8.5%	26.4	139,181	12.2%	78.8%
10	43	2.1%	10.5	55,687	4.9%	83.7%
12	27	1.3%	5.0	26,255	2.3%	86.0%
14	1	0.0%	1.4	7,650	0.7%	86.7%
16	34	1.6%	4.5	23,825	2.1%	88.8%
18	116	5.5%	14.8	77,906	6.8%	95.6%
36	38	1.8%	4.5	23,777	2.1%	97.7%
48	21	1.0%	5.0	26,218	2.3%	100.0
Totals	**2,695**	**1%**	**215.7**	**1,139,061**	**0.999%**	

1 MAWSS GIS database query, July 2012.

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 (miles)	Length (feet)	Length (%)	Cumulative Length (%)
Not Listed in GIS	294	14.0%	37.8	199,514	17.5%	17.5%
Cast Iron	36	1.7%	12.3	65,198	5.7%	23.2%
Concrete	14	0.7%	6.5	34,156	3.0%	26.2%
Ductile Iron	323	15.4%	27.6	145,917	12.8%	39.0%
High Density Polyethylene	397	18.9%	35.5	187,623	16.5%	55.5%
Polyvinyl Chloride [2]	1,029	49.1%	95.4	503,756	44.2%	99.7%
Vitrified Clay Pipe	2	0.1%	0.5	2,896	0.3%	100.0%
Totals	**2,095**	**0.999%**	**215.6**	**1,139,060**	**1%**	

1 MAWSS GIS database query, July 2012.

2 Includes C900 and Schedule 40 pipe.

Table 3.11 summarizes the force mains by age. Most of the force main system, at approximately 40 percent, is 10 years old or less. However, a significant amount, nearly 35 percent, has an unknown age. It is suspected that a large amount of the unknown age force mains are the older pipes in the system.

TABLE 3.11 – Force Main Distribution By Age

Age Range [1]	Segment Count	Count (%)	Length (miles)	Length (feet)	Length (%)	Cumulative Length (%)
Not Listed in GIS	313	14.9%	76.3	402,914	35.4%	35.4%
≤ 10 years	1,179	56.3%	85.8	452,912	39.8%	75.1%
11 to ≤ 20 years	557	26.6%	43.1	227,400	20.0%	95.1%
21 to ≤ 30 years	46	2.2%	10.6	55,833	4.9%	100.0%
Totals	**2,095**	**1.0%^**	**215.8**	**1,139,059**	**1.0%**	

[1] MAWSS GIS database query, July 2012.

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. Up until recently MAWSS had only two catastrophic failures, one due to a defective joint and one due to corrosion, with PCCP force main. However, recently one large section of the Halls Mill Creek/Eslava Creek force main was discovered to have deteriorated to the point of allowing wastewater to exit the system. MAWSS personnel were able to correct the problem with a minimum of contamination to surrounding areas with minimal disruption to surrounding infrastructure.

The Halls Mill Creek/Eslava Creek PCCP force mains are of particular concern due to the large amount of flow transported in the two force mains. The Halls Mill Creek force main, which was constructed in 1977 (approximately 35 years old), consists of approximately 17,700 linear feet of 36-inch diameter PCCP. The Halls Mill Creek force main manifolds with the 48-inch diameter PCCP Eslava Creek force main, which was constructed in 1972 (approximately 40 years old), near the intersection of Parkway Drive and Dog River Drive. The combined force main then continues approximately 28,300 linear feet to the C.C. Williams WWTF. A 36-inch diameter force main from the Virginia Street Lift Station also manifolds with the Eslava Creek force main approximately 50 feet from its discharge into the inlet tower at the WWTF. The condition of the PCCP force main was evaluated in 2002 (MWH and McFadden Engineering, *Halls Mill and Eslava Creek Force Main Evaluation*, October 2002). The evaluation included a HydroWorks® hydraulic model analysis, a visual inspection of the air release valves (ARVs) on the force main, and retrieval of four coupons (extracted pieces of the pipe material). None of the coupons showed any visible sign of corrosion on the steel liner, concrete core or interior coating. Prior to the recent discovery of exfiltration from the Halls Mill/Eslava Creek force main, a small leak had occurred shortly after the completion of the 2002 evaluation, which had been attributed to joint damage that had likely occurred during original installation into an encasement pipe. In addition to repairing this leak, MAWSS installed additional ARVs and implemented a routine preventive maintenance schedule for ARV inspection.

The MAWSS sewer collection system had been operating under a Consent Decree since April 10, 2002, 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. The Board and Mobile Baykeeper (formerly Mobile Baywatch and an original party to the environmental suit that was involved with the entry of the Consent Decree) have independently continued an agreement between the two whereby the Board agrees to pay a penalty for each sewer system unpermitted discharge meeting agreed criteria for an additional 5-year period.

The CIP project listing for the sewer collection system projects has a number of projects assigned to the annual project authorization priority. The annual priority was previously described in Section 3.6 on water distribution systems. As noted in that section, 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. As further 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). Table 4.2 compares the actual year 2011 renewal expenditures to the calculated annual renewal targets that had been developed in the 2010 EAR.

The annual projects in the sewer collection portion of the CIP project listing are more extensive that the initial list developed for the water distribution system primarily because of the recently closed consent decree requirements that caused more emphasis in sewer, lift station and force main renewal expenditures.

3.7 <u>Common Facilities</u>

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 remainder of the Forest Park Plaza facility and relocate the Business Operation, Human Resources and Training Departments to the Operations Center.

Shelton Beach Road Facility. Design for a new MAWSS facility to house Fleet Maintenance, the Lift Station & Easement Maintenance Department, the Warehouse, the Field Operations Center and Fueling/Wash Station was completed earlier this year. Construction of the facility is expected to be completed in late 2013 with operations from this location starting in early 2014. The Shelton Beach Road Facility will eliminate the access issues faced by the current automotive shop located at the C.C. Williams WWTF, while allowing MAWSS to consolidate operations at a central location and improve service to users. The cost of this construction is included in the CIP project list contained in Appendix A of this 2012 EAR.

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 Operations Communications Department that dispatches 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 to its full capabilities and use should be expanded to track asset condition. Tracking asset condition should allow MAWSS the data with which 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. Once the Lift Station Department moves into their new location at the Shelton Beach Road Facility in 2014 and the rest of the Park Forest Plaza Facility is built out, the Operations Communications Department will be moved to the Park Forest Plaza Facility. The date of the Park Forest Plaza Facility build out has not yet been determined.

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 number of professional development hours required by their particular license or registration. The Training Center operations will also be relocated to the Shelton Beach Road Facility when the Administrative Building moves.

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.

Administrative Building. The Administration Building houses the customer service facilities and MAWSS management staff. Discussions are underway to potentially relocating additional Administrative Building functions to the Shelton Beach Road Facility.

The CIP project listing in Appendix A of this EAR contains those projects for which cost estimates have been defined. As with the water distribution and sewer collection asset categories, projects assigned to the annual project authorization priority are also defined for fleet maintenance, roof repair/replacement, heating ventilation and air conditioning (HVAC) repair/replacement, cost center repair/replacement, engineering studies and thermal expansion protection loans

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.

FIGURE 3.2 – MAWSS Organization Chart

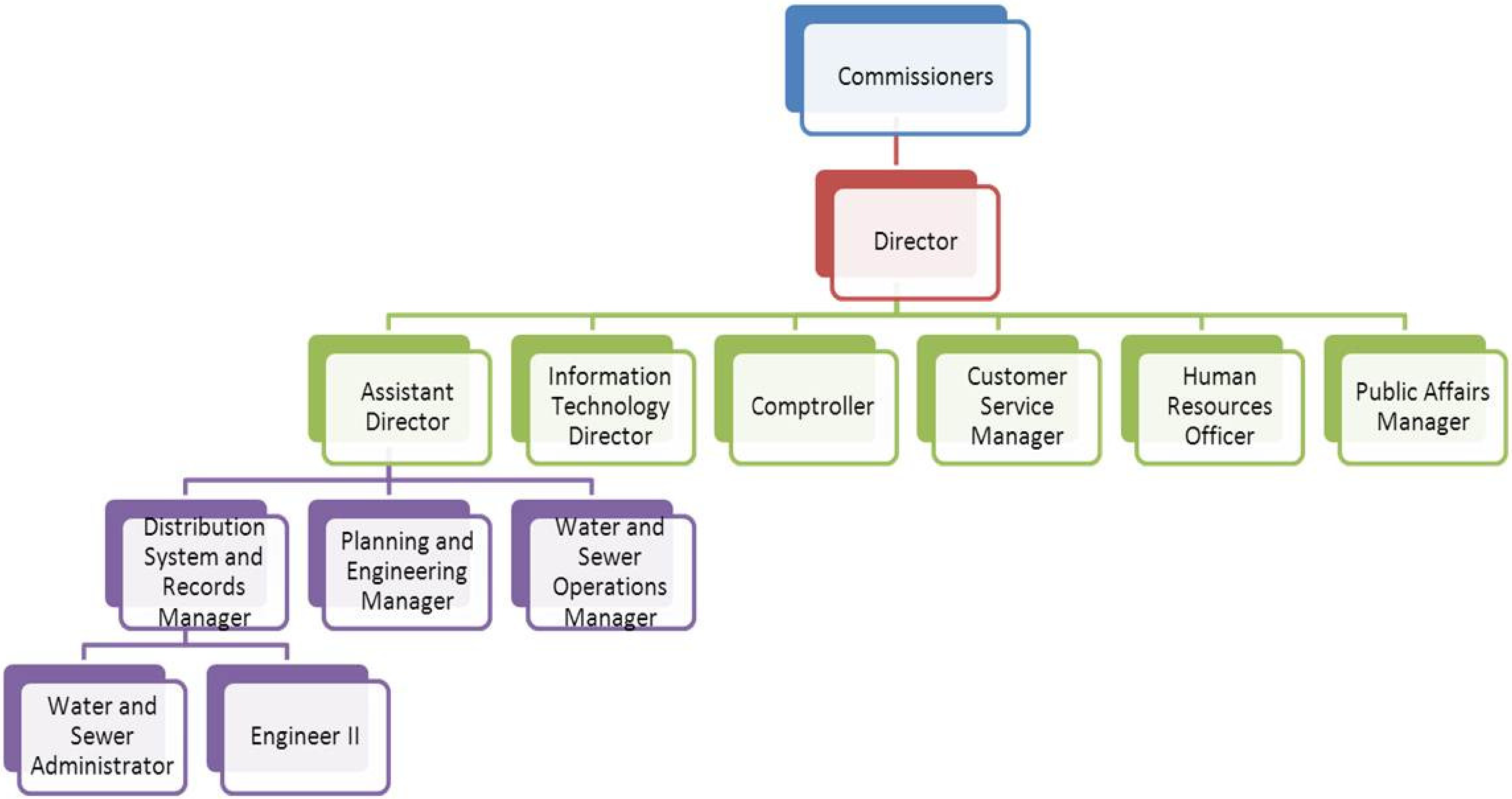


Table 3.12 summarizes the total number of full-time equivalent staff, by category, for each year since 2000.

TABLE 3.12 – MAWSS Full-Time Equivalent Staff Summary From 2000 Through 2011

Year [1]	Water	Wastewater	Support Services	Administra-tion	Totals
2000 [2]	61	68.5	161	115	**405.5**
2001	41	56	187	96	**380**
2002	42	61	188	98	**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**

1 MAWSS, *Comprehensive Annual Financial Report for the Year Ended December 31, 2011*.

2 Year 2000 staff breakdown was not available from the MAWSS, *Comprehensive Annual Financial Report for the Year Ended December 31, 2011*, but was provided from MAWSS internal records.

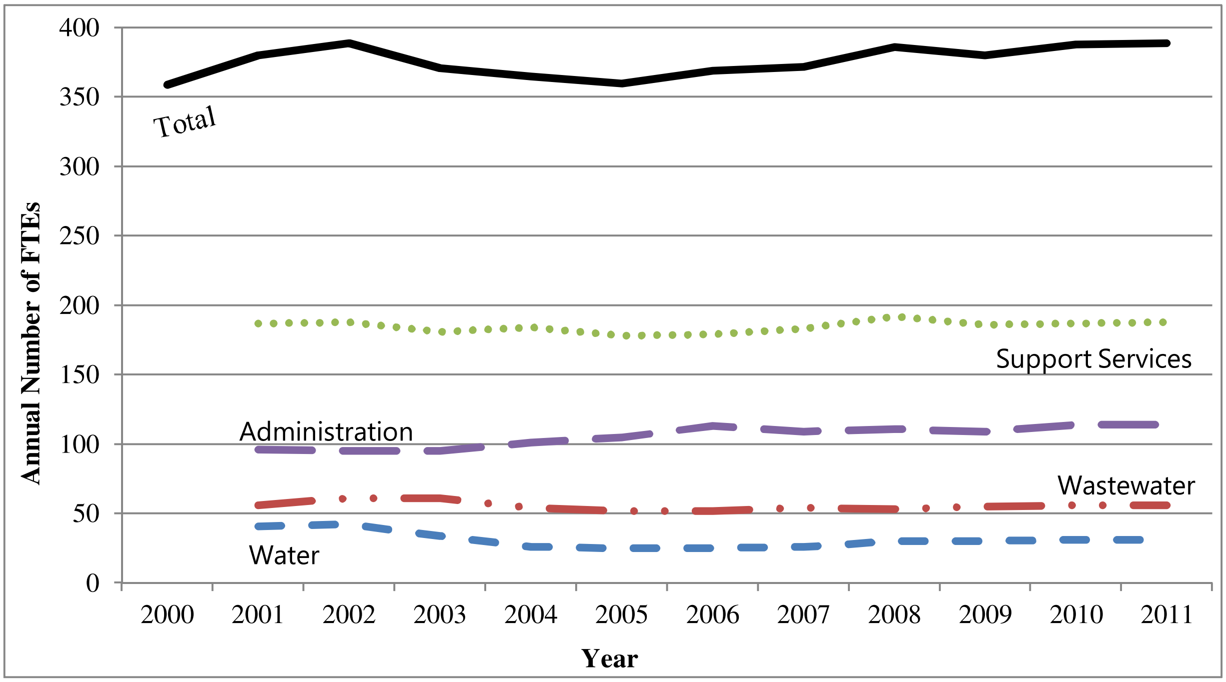
Table 3.13 provides additional detail on how MAWSS classifies staff into the four categories listed in Table 3.12.

TABLE 3.13 – Types of Job Functions By Category

Water	Wastewater	Support Services	Administrative Staff
Raw Water Supply O&M	Decentralized Wastewater Treatment Plant O&M	C.C. Williams WWTF Laboratory Analyses	Director
Water Treatment Plant O&M	Centralized Wastewater Treatment Plant O&M	Construction Inspection	Accounting and Purchasing
Water Storage Facility O&M	Lift Station O&M	Central Services Support Functions	Customer Service
Booster Pump Station O&M	Force Main O&M	Garage Maintenance	Accounts Receivable and Billing
Water Main O&M	Sewer Main O&M	Easement Maintenance	Installations and Disconnections
Sludge Disposal O&M	Sludge Disposal O&M	Treatment Plant Instrumentation O&M	Facilities Management
Hydrant Maintenance	Industrial Pretreatment Program Inspection		General Administration
Water Installation and Repair	I/I Investigation and Analysis		Distribution System and Receiving Manager
Material Hauling and Restoration	Video Investigation		Assistant Director
Cross Connection Control and Meters	Sewer Installation and Repair		Information Services
Right-of-Way Paving Adjustments	Material Hauling and Restoration		Human Resources
	Sewer Cleaning		Mapping, Connections and GIS
	Right-of-Way Paving Adjustments		Meter Reading
			Collection Systems Manager
			Operations Communications

Figure 3.3 graphically compares the number of MAWSS staff in water, wastewater, administrative, support services and total based on the data from Table 3.12.

FIGURE 3.3 – MAWSS Full-Time Equivalent Staff for 2000 Through 2011



As noted in Section 1, Executive Summary, MAWSS consistently meets, and frequently exceeds, all regulatory permit requirements at the water treatment plants and the water distribution system and most regulatory permit requirements at the wastewater treatment plants. The sewer collection system continues to experience unpermitted discharges in the form of sanitary sewer overflows, but it is a rare utility that can consistently achieve the U.S. EPA's goal of "zero SSOs."

MAWSS received the following performance awards and recognitions in 2011:

- Alabama Department of Environmental Management (ADEM)
    - Four Year Optimized Plant Award to the H.E. Myers WTP
- Alabama Water and Pollution Control Association (AWPCA) awards:
    - Best Operated Plant Awards to the H.E. Myers WTP
    - Three Year Award for Best Operated Plant to the H.E. Myers WTP
    - Best Operated Mechanical Wastewater Treatment Facility > 10 mgd to the C.C. Williams WWTF
    - Best Operated Plant Award to the E.M. Stickney WTP
    - Best Operated Distribution System Award to the MAWSS water distribution system
- Water Fluoridation Reporting System (WFRS)
    - Water Fluoridation Quality Award to the H.E. Myers WTP
- 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 11th year of perfect regulatory compliance) and to the Wright Smith WWTF (in the 9th year of perfect regulatory compliance)

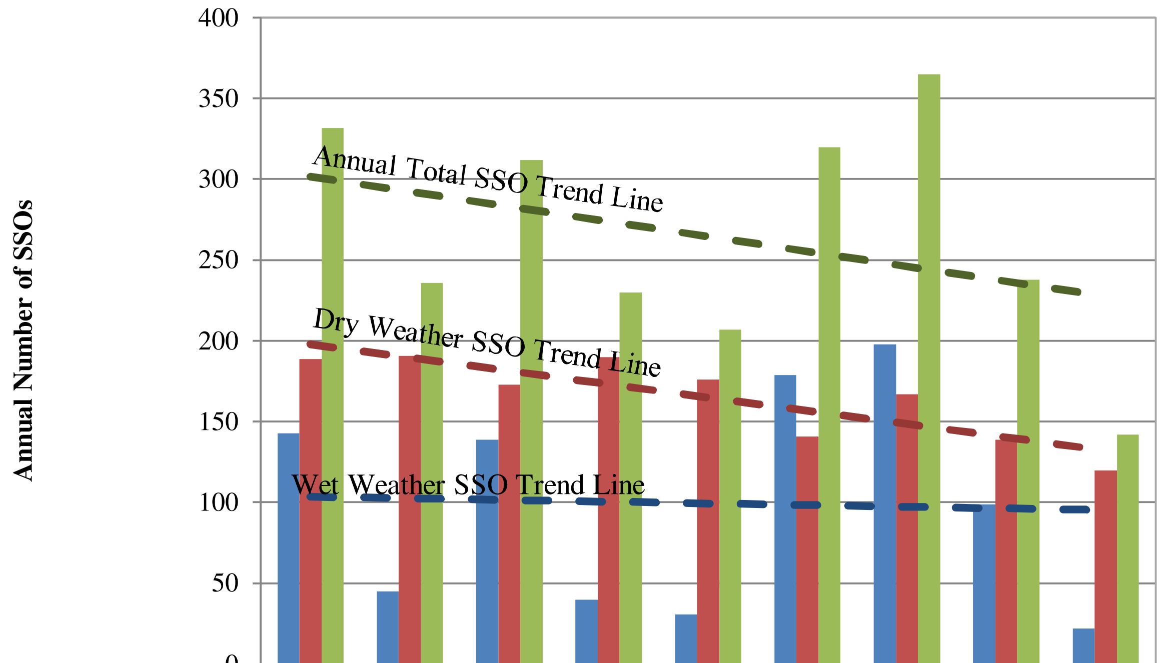
- Government Finance Officers Association of the United States and Canada (GFOA) award:
    - Certificate of Achievement for Excellence in Financial Reporting for satisfying both generally accepted account principles and applicable legal requirements in an easily readable and efficiently organized report format to the MAWSS *Comprehensive Annual Financial Report* for the year ended December 31, 2010 (for the 10th 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 since 2002, MAWSS has expended significant resources and effort to control those SSO events. The original sewer construction was challenging due to the difficulty of properly bedding the pipe in sandy soils. Over the years, more rigid pipe tends to crack and joints open as the sandy soils in the bedding material shift and settle unevenly. Joints are particularly troublesome with pre-1958 clay pipe before flexible jointing materials began to come into more widespread use. Clay pipe is also manufactured in relatively short lengths and thus has a large number of joints. There are a number of factors more specific to the Mobile area that has contributed to making SSO control even more challenging for collection system operators. These factors include:

- Significant rainfall in the service area that causes high peak flows in the collection system
- A significant corrosion problem due to H_2S generation typical of relatively flat coastal area sewers with low flows and warm temperatures experienced in a southern U.S. climate
- A prior history of inadequate investment in sewer rehabilitation and replacement due to an “out-of-sight-out-of-mind” mentality typical of most systems prior to the 1990s
- Difficulties in coordinating and prioritizing sewer projects in conjunction with City-controlled street improvement projects
- A large number of lift stations (187) due to the generally flat terrain within the service area
- Previous design practices such as manholes with inverted “dish-type” tops that require the entire top of the manhole to be replaced to raise the cover during street paving operations (MAWSS is currently cataloging these manholes to determine the extent of the repair/replacement project and determine the appropriate budget and timing needs required to complete these repairs. This project is being accomplished under the O&M budget and an example of an activity that would benefit from an increase in dedicated funding of Annual Needs for preventive replacement of these manhole tops.)
- Construction of unusual and atypical “double fall” manholes (222) within the system that make it difficult to accurately model flow conditions with standard hydraulic modeling software and cause challenging flow meter results that are difficult to analyze
- A significant amount (179) of “depressed sewers” such as siphons across streams or other underground utilities that tend to collect sediment and grit (MAWSS is currently cataloging the configuration of these depressed sewers to facilitate the scheduling of a more proactive maintenance and cleaning program and to determine the appropriate budget and timing needs required to complete these repairs. This is be another example of where “earmarked” preventive O&M funding could be useful.)
- A significant amount of I/I migration when extraneous storm flow can no longer enter repaired pipes or manholes, but instead follows the sewer trench and enters the next rehabilitated section of pipe or manhole entry location

Due to the significant efforts taken to control SSOs, the U.S. EPA ended the Consent Decree in October 2011. MAWSS' success in controlling SSOs is shown graphically in **Figure 3.4.** As shown on Figure 3.4, both the annual total SSO trend line and the dry weather-related SSO trend line are going down. The wet weather-related trend line is relatively unchanged, but varies significantly from year to year, depending largely on weather patterns and conditions. Despite the removal of the Consent Decree requirements, MAWSS will continue to need to expend resources, CIP budgets and O&M budgets to control and to prevent both dry and wet weather-related SSOs.

FIGURE 3.4 – 2003 Through 2011 SSO Trends



	2003	2004	2005	2006	2007	2008	2009	2010	2011
Wet Weather SSOs	143	45	139	40	31	179	198	99	22
Dry Weather SSOs	189	191	173	190	176	141	167	139	120
Total SSOs	332	236	312	230	207	320	365	238	142

Based on MWH's overview of system operations, the system O&M can generally be characterized as:

- Has established preventive maintenance (PM) schedule for key facilities
- Utilizes Infor™ Computerized Maintenance Management System (CMMS) work order management systems to track work orders (in most areas, but not completely integrated at the water or wastewater plants)
- Utilizes written standard operating procedures (SOPs)
- Includes security measures to limit public access to key facilities (including a Sheriff's Office deputy patrol for the Big Creek facilities, use of the deputy to investigate instances of vandalism or theft at other MAWSS locations and utilization of remotely monitored security cameras at selected locations)
- Provides operation and maintenance staff at the water and the wastewater treatment plants, except for the decentralized facilities, on a continuous basis

- Incorporates SCADA facilities at the intake pump station, the water treatment plants, the wastewater treatment plants, except for the decentralized facilities, selected water storage tanks, all booster pump stations, and 186 of the 197 wastewater lift stations

MAWSS is beginning to move more into a proactive O&M program. The following actions are to be commended:

- Proactive billing for cost reimbursement when facilities are damaged by others (*e.g.,* fire hydrants hit by vehicles)
- Resolution of chronic water quality complaint areas by either installing additional main lines to form loops for dead end lines or by replacing service lines
- Provision of a low income funding program to help defray the cost of installing thermal expansion protection devices when MAWSS installs dual check valves under the 2006 Alabama law requiring backflow preventers
- Utilization of Dispatch Center staff with the ability to visually locate crew locations on a map display in the Dispatch Center so that crews can be promptly and efficiently assigned to respond to customer complaint calls
- Ability of wastewater plant operators to adequately treat wastewater at rates that exceed the design flows to many of the treatment processes when required during wet weather events
- Success in reducing and controlling dry and wet weather-related SSOs
- Continuation of lift station rehabilitation activities with in-house capabilities when budget constraints affected the ability to utilize outside contractors
- Provision of a private lateral replacement funding program to help defray the cost of replacing defective sewer lateral service lines

Potential O&M improvements that may be considered are listed below. This EAR assumes these costs will be capitalized and are included in the CIP project listing in Appendix A.

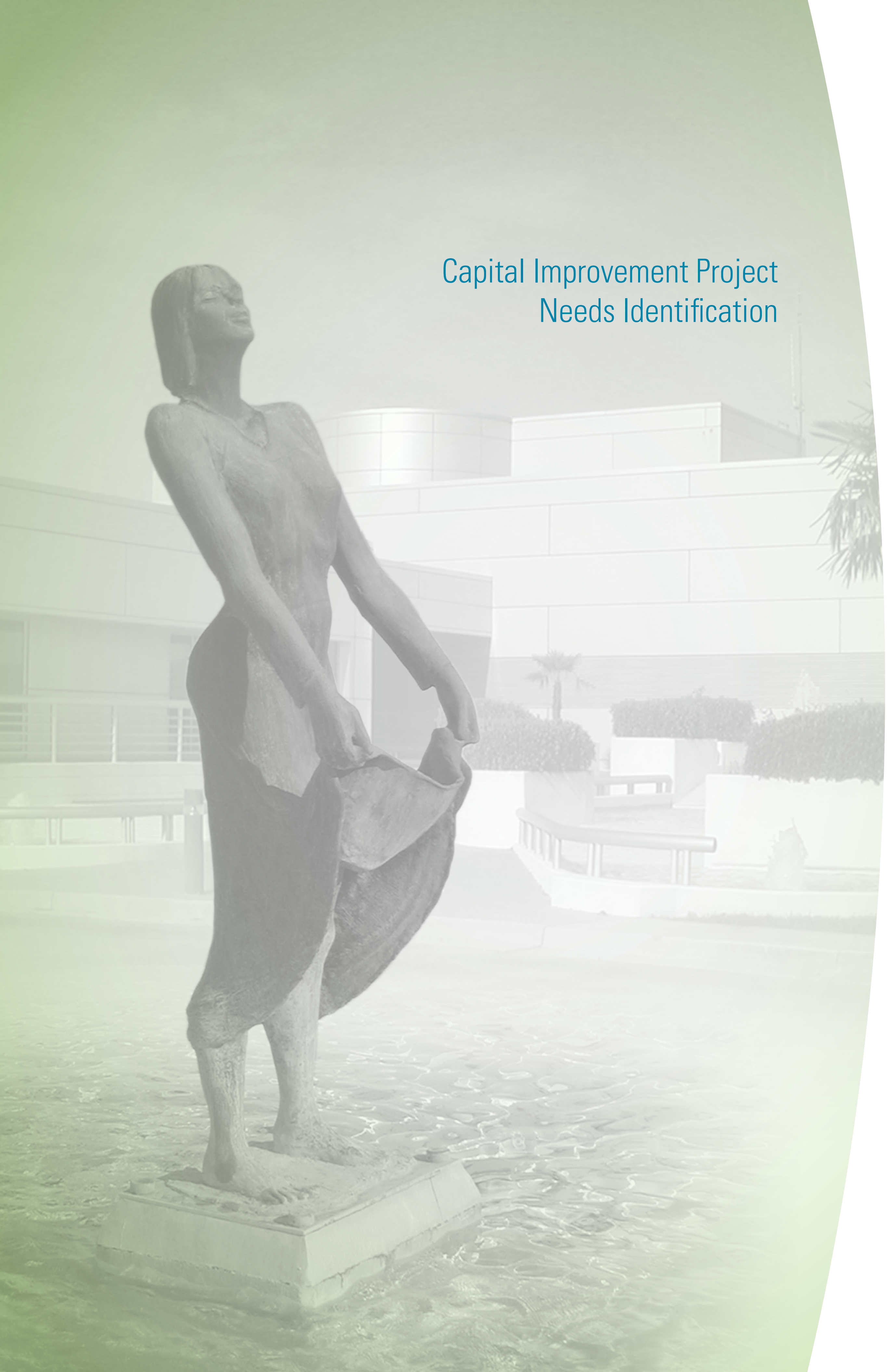
- Addition of self-cleaning screens and automatic gates at the Big Creek Dam. Screen cleaning and gate operation are labor-intensive and manual gate effort can be dangerous in inclement weather. Currently the gates are hoisted using a chain mechanism that is mounted on a rail system running along the 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.
- Addressing grit removal until the headworks structure of the C.C. Williams WWTF is replaced. Grit that is not removed at the headworks can cause additional O&M problems as it travels through the plant. The grit tends to abrade and damage downstream mechanical equipment thus causing additional maintenance on downstream facilities.
- Addressing flow split control to the oxygen reactors at the C.C. Williams WWTF. Existing isolation gates do not provide precise flow split control to the oxygen reactors.
- Installation of guide rails in the remaining 49 lift stations without such facilities. The lift station personnel are currently constrained when entering any lift station without a guide rail system. These stations are considered confined spaces that require a 3-person O&M

team for entry. Stations with guide rails only require a 2-person O&M team since entry into the station is not required when the pumps can be raised using the guide rail system.

Potential 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 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.
- Need to expand use of the Infor™ work order data for analysis purposes (*e.g.,* performance measures to gage effectiveness, breakage or repair trends to predict the need for asset replacement, etc.).

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 2012 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 2012 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 1/100th, 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 with an average of $1.73 per gallon. 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.

The water treatment plant replacement costs were estimated based on a typical unit cost in terms of gallons per day (gpd) of 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 average unit cost for the 196 lift stations was $2.39 million. 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 of 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 2012. 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 2011, 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 – 2011 Major Capital Asset Expenditures Versus Annual Renewal Targets

Infrastructure Area	Annual Renewal Target [1] ($)	Capital Renewal Expenditures in 2011 [2] ($)	Year 2011 Expenditure As A Percent of Annual Renewal Target (%)
Water Treatment Plants	3,150,000	1,531,500	48.6%
Water Distribution System	8,068,000	1,323,611	16.4%
Wastewater Treatment Plants	1,659,000	1,474,135 [3]	88.9%
Sewer Collection System	13,410,000	8,394,722	62.6%
Totals	**26,287,000**	**8,394,722**	

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, 2011*. In the 2011 CAFR this summary appears on p.8.

3 Centralized plants only.

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 of 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 renewal expenditures in particular appear to be significantly lower than desirable. This expenditure area is 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 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 from the "average" renewal amount in any given year. It could be that 2011 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 <u>2012 EAR CIP Improvement Project Recommendations</u>

Appendix A contains a listing of identified CIP project needs based on the evaluations completed as part of this 2012 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 2013 or 2014. 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 2015 or 2016. 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, 2017 or 2018. 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 2012 EAR.

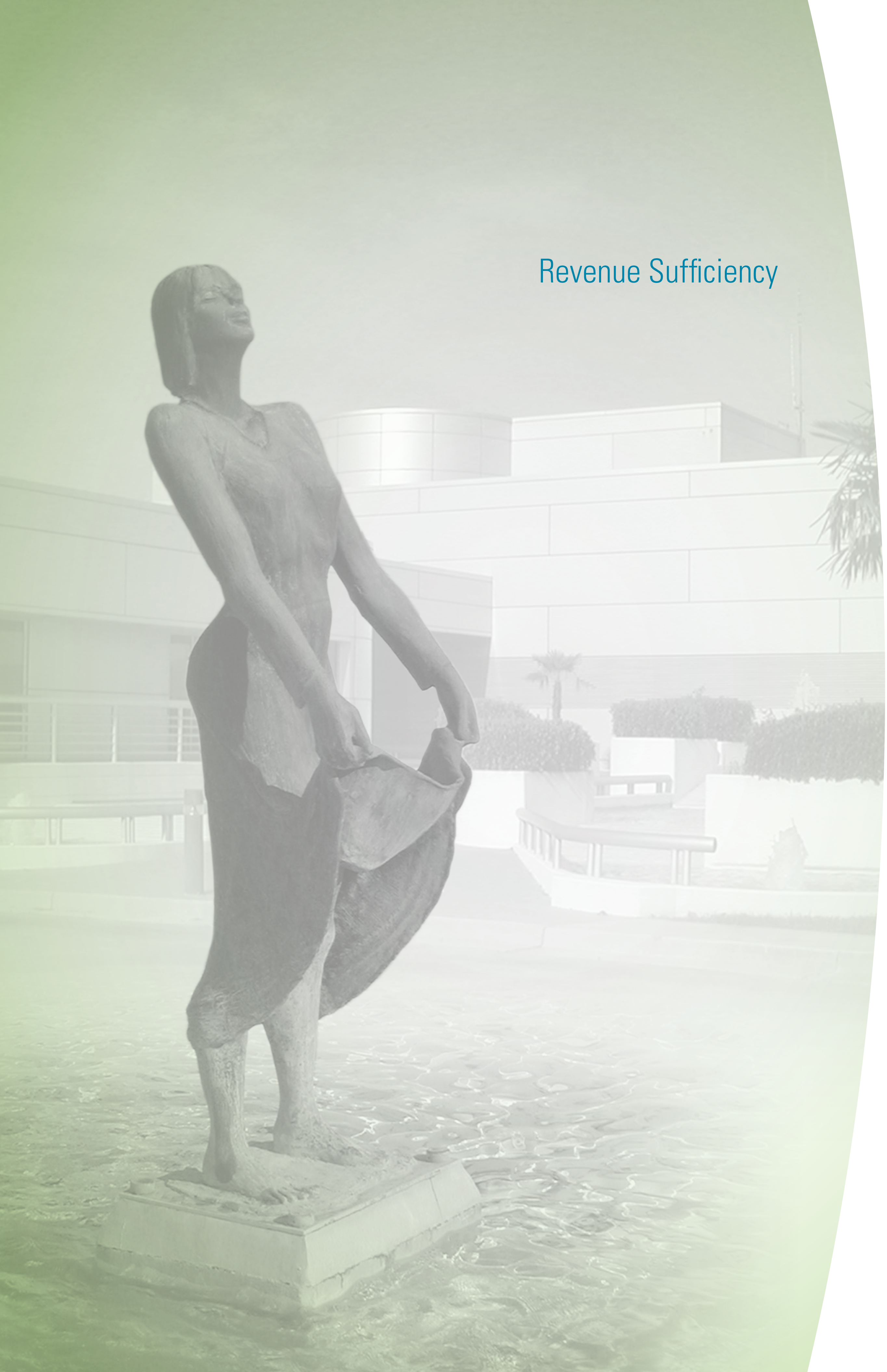
- **Capacity.** Required to maintain permitted or minimum customer service level of asset service for future growth.
- **Efficiency.** Required to optimize energy or chemical usage, generally justified by life cycle cost analyses.
- **Functionality.** Required for ease of O&M, safety or security issues.
- **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	100,000	275,000	375,000
E.M. Stickney WTP	0	2,100,000	45,000	2,145,000
H.E. Myers WTP	0	520,000	50,000	570,000
Water Distribution System	2,150,000	1,594,000	7,575,000	11,319,000
C.C. Williams WWTF	0	0	1,000,000	1,000,000
Wright Smith WWTF	0	610,000	250,000	860,000
Decentralized Treatment Facilities	0	150,000	200,000	350,000
Solids Handling & Disposal	0	0	500,000	500,000
Sewer Collection System	16,475,000	1,850,000	1,455,000	19,780,000
Common Facilities	1,915,000	761,000	2,000,000	4,676,000
Totals	**20,540,000**	**7,685,000**	**13,350,000**	**41,575,000**

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 2011[1] were nearly $580 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 catastrophe 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, and in Table 4.3, above.

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[1] 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	2013	2014	2015	2016	2017	2018
Annual needs	$ 20,715	$ 20,715	$ 20,715	$ 20,715	$ 20,715	$ 20,715	$ 20,715
Priority 1 projects	7,685	3,843	3,842				
Priority 2 projects	13,350			6,675	6,675		
Priority 3 projects	32,916					16,458	16,458
Priority 4 projects	15,735						
Priority 5 projects	22,515						
Totals*	$ 178,241	$ 24,558	$ 24,557	$ 27,390	$ 27,390	$ 37,173	$ 37,173

* Total of $178M 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 Project infrastructure projects are indicated first, followed by project infrastructure areas classified as Priorities 1 through 5.

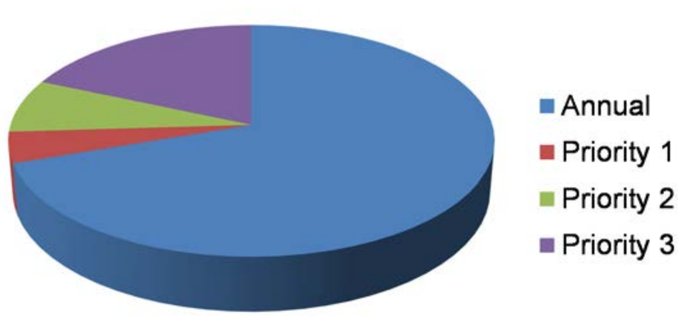
The total cost of $178 million shown at the bottom line of Table 5.1 includes six years of Annual needs project cost ($20.7 million per year totally $124.3 million over six years) as well as the identified separate project costs of Priorities 1 through 3 ($54 million). Of the $178 million of identified projects, Annual needs represent 70 percent. Priority 1 projects account for 4 percent. Priority 2 projects amount to 7 percent and Priorities 1 through 3 are summarized in **Figure 5.1**.

The MAWSS Capital Improvement Program (CIP) also includes $38.3 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 shows that the recurring Annual Needs comprise about 70 percent of the six year CIP, and Priority 1 projects account for an additional 4 percent. Priorities 2 and 3 represent 7 and 18 percent, respectively.

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.

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 as addressed 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 *Trust Indenture*, 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 business, 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* [2] between MAWSS and its trust bank. On August 15, 2012, MAWSS sold revenue bonds to support its 2012 SRF borrowing of $20 million. The bond sale was not rated. Moodys Investors Service rated the MAWSS bonds sold in 2010 at “Aa3” and Standard & Poors Corp. rated the MAWSS bonds at “AA-“. These ratings are “underlying” ratings meaning that the bonds were sold on the basis of MAWSS’ credit alone, without the benefit of 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.

[2] The “*Indenture of Trust*” as used in this report refers to the 1985 trust document plus all supplemental indentures of trust now in effect.

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.[3] 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 *Trust Indenture* may require only the parity bonds be covered at 1.20x.

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.

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

MAWSS currently has about$193 million of outstanding revenue bond debt principal.

5.2.1.2 State Revolving Loan Funds

MAWSS has an active history of borrowing from the SRF, with seven loans made over the period of 1989 through 2008 and an additional borrowing in 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 can capitalize interest on SRF borrowing, but has chosen not to do so.

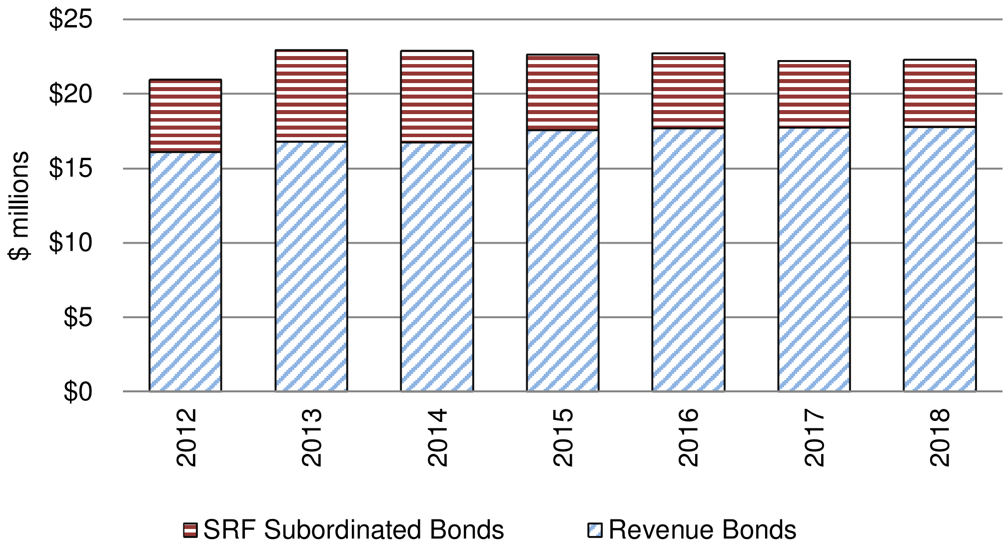
Table 5.2 is a summary of the repayment obligations on the MAWSS outstanding revenue bond and SRF loan debt over the next six years. **Figure 5.3**, below Table 5.2, shows the annual debt service, principal and interest, of outstanding MAWSS bonds and loans, including the 2012 SRF borrowing, through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

TABLE 5.2 – MAWSS Outstanding Long-Term Debt

($000s)

Issue	Maturity	2012	2013	2014	2015	2016	2017	2018
Water and Sewer Rev. Bonds								
1999 Bank Bond	2018	496	1,034	1,066	1,100	1,136	1,177	1,200
2001 Bank Bond	2021	718	1,400	1,353	1,306	1,260	1,213	1,166
2004 Series	2012	2,725	0	0	0	0	0	0
2004B Series	2019	1,000	3,225	3,215	4,080	4,193	4,284	4,350
2006 Series	2035	5,234	5,234	5,234	5,234	5,234	5,234	5,233
2010 Compass bond	2021	5,918	5,901	5,875	5,858	5,848	5,834	5,845
Subtotals, revenue bonds		16,091	16,794	16,743	17,578	17,671	17,742	17,794
SRF Subordinated Bonds								
2006/1996A Series	2019	738	799	802	803	810	0	0
2004A Series	2014	1,055	1,106	1,116	0	0	0	0
2004 Series	2024	583	696	696	696	696	699	698
2005 CW Series	2025	483	801	800	799	798	992	990
2005 DW Series	2025	288	350	352	355	351	353	354
2010 CW Series refunded	2030	917	1,039	1,048	1,061	1,073	1,090	1,105
2012 Series (cash flows)	2032	781	1,326	1,328	1,326	1,326	1,327	1,327
Subtotals, SRF bonds		4,845	6,117	6,142	5,040	5,054	4,461	4,474
Totals, revenue and SRF bonds		20,936	22,911	22,885	22,618	22,725	22,203	22,268

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 $8 to $10 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 Sources and Uses of Funds

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 2013 year the total in Table 5.1 is $24,558,000, as shown in Table 5.5. As in Table 5.1, the total six-year uses of funds shown in Table 5.3 is $178 million.

The second band of data includes sources of funds. The three sources mentioned above are included. Pay go revenues scale up to $21 million per year, reaching that level in 2017. $21 million pay go revenue would be sufficient to fully fund the $20.7 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 an iterative process wherein $21 million was estimated for each of the six years included and then adjusted down to ensure that estimated net income of each year remain positive. A six year total of $108.5 million of pay go revenue is shown in Table 5.3, representing about 61 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 39 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)

	2013	2014	2015	2016	2017	2018	Total
Uses of funds							
CIP projects	$ 24,558	$ 24,557	$ 27,390	$ 27,390	$ 37,173	$ 37,173	$178,241
Sources of funds							
Pay as you go revenues	$ 13,500	$ 15,000	$ 18,000	$ 20,000	$ 21,000	$ 21,000	
New revenue bond proceeds	12,369		10,068		19,408		
New SRF subordinated bonds	8,246		6,712		12,938		
	$ 34,115	$ 15,000	$ 34,780	$ 20,000	$ 53,346	$ 21,000	$178,241

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.

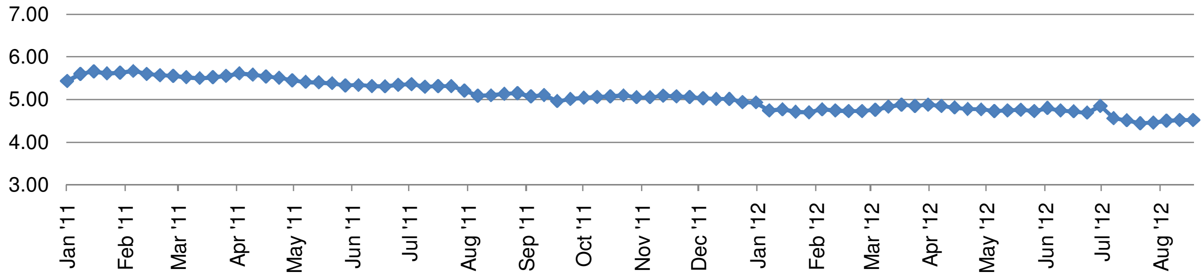
Table 5.4 shows the assumptions for the two forms of financings. Revenue bonds typically have longer maturities, meaning longer time to repay the debt. SRF borrowings have lower interest cost. Interest rates are characteristically lower with SRF loans than with bonds. One year of capitalized interest 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	60.0%	
SRF		40.0%
Maturity, years	30	20
Interest rate, percent	4.0%	3.0%
Capitalized costs of issuance	1.0%	1.0%
Capitalized interest, years	0.0	0.0
Debt service reserve, years	1.0	0.0
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 <u>SRF Loan and Revenue Bond Repayments</u>

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)

	2013		2015		2017	
	Bonds	SRFs	Bonds	SRFs	Bonds	SRFs
Proceeds required	$ 12,369	$ 8,246	$ 10,068	$ 6,712	$ 19,408	$ 12,938
Financing costs	133	83	108	68	208	131
Debt service reserve	767	0	625	0	1,204	0
Bond sale/loan amount	$ 13,269	$ 8,329	$ 10,801	$ 6,780	$ 20,820	$ 13,069
Annual debt service / loan payment	$ 767	$ 560	$ 625	$ 456	$ 1,204	$ 878

		2013	2014	2015	2016	2017	2018
2013 borrowings							
	Bonds		$ 767	$ 767	$ 767	$ 767	$ 767
	SRF		560	560	560	560	560
2015 borrowings							
	Bonds				$ 625	$ 625	$ 625
	SRF				456	456	456
2017 borrowings							
	Bonds						$ 1,204
	SRF						878
Total new money D/S L/P		$ 0	$ 1,327	$ 1,327	$ 2,408	$ 2,408	$ 4,490

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.

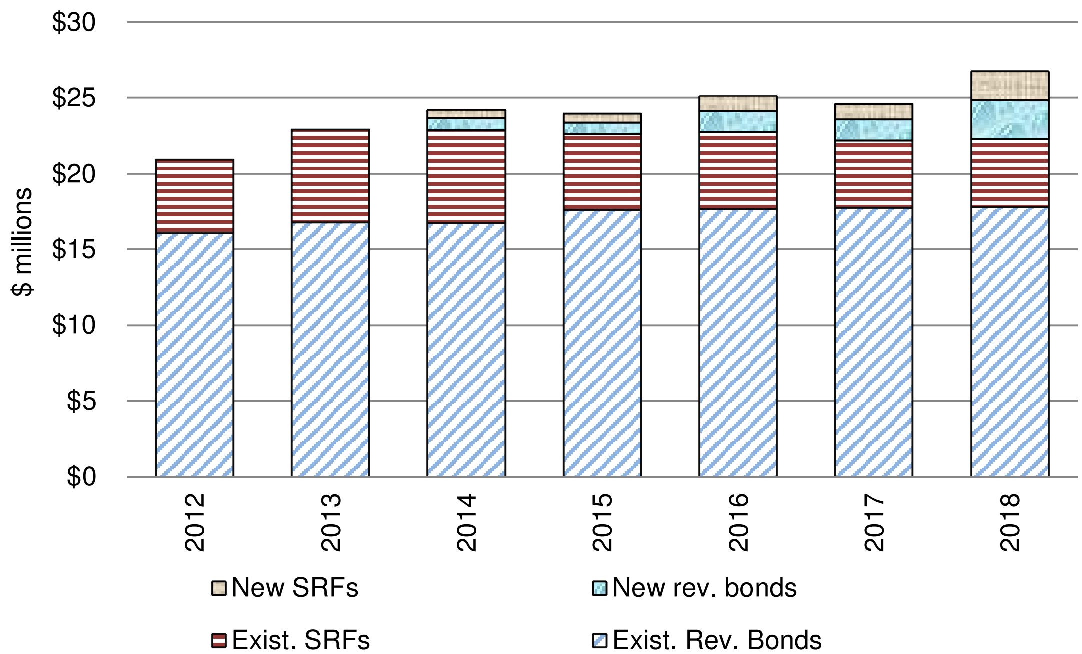
The top half of Table 5.5 indicates the computation of annual debt service. For planning purposes, the debt service is computed as equal-annual payments of principal and interest.

Three financings are indicated, to be undertaken in 2013, 2015 and 2017. 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 first year following the year of 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 5.2.

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 2011 to 2010.

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 2012 revenue and expense budget data for comparison with recent history.

Mid-year 2012 data indicate that the year may finish with revenues below budget, more akin to 2011 year results. Expenses in 2012, however, may finish close to budgeted estimates.

TABLE 5.6 – Historical Revenues and Expenses

($000s)

						Trends			
						'11 over '10		3-yr avg.	2012
	2008	2009	2010	2011		($000s)	(%)	annual	Budget
Revenues									
Operating revenue									
Water sales	$ 28,206	$ 31,892	$ 35,719	$ 37,630	42%	$ 1,911	5.4%	$ 2,869	$ 38,186
Sewer charges	41,378	50,271	50,782	50,964	58%	182	0.4%	347	53,128
Subtotal, operating rev	$ 69,584	$ 82,163	$ 86,501	$ 88,594	100%				$ 91,314
Non-operating revenue									
Investment earnings	$ 2,962	$ 737	$ 431	$ 384		$ (47)	(10.9%)	$ (177)	$ 500
Grants	67	227	7	0		(7)	(100%)	(114)	0
Miscellaneous	645	582	589	677		88	14.9%	48	420
Subtotal, non-op rev	$ 3,675	$ 1,546	$ 1,027	$ 1,061					$ 920
Total revenues	$ 73,259	$ 83,709	$ 87,528	$ 89,655					$ 92,234
Expenses									
Operating expenses									
Water supply	$ 1,711	$ 1,634	$ 1,565	$ 1,720	3%	$ 155	9.9%	$ 43	
Water treatment	4,677	5,042	5,091	5,486	11%	395	7.8%	222	
Wastewater treatment	6,648	6,360	6,527	7,589	15%	1,062	16.3%	615	
Transmission and collection	14,617	15,826	15,650	15,751	30%	101	0.6%	(38)	
Support services	3,807	3,510	3,510	3,943	8%	432	12.3%	217	
Supervision and gen'l exp.	16,634	16,823	17,270	17,214	33%	(56)	(0.3%)	196	
Total expenses	$ 48,093	$ 49,194	$ 49,612	$ 51,702	100%				$ 56,000

It is noted that the $56 million budgeted for 2012 is more than eight percent greater than the $51.7 million expended in 2011. The 2012 budget is reflective of historical cost behaviors and may or may not include budget increases to cover additional preventative/proactive maintenance activity. If it does not, future budgets should take this function into consideration 2012 O&M Budget Data.

Table 5.7 shows a summary of 2012 expense budget data both in terms of Cost Objects and Cost Functions.[4] 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 Administration together comprise over 65 percent of the budget.

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

TABLE 5.7 – Expense Budget Data for 2012

($000s)

Budget Cost Objects	Budget Cost Functions: Water	Waste water	Support	Admin	Reserved	Total	
Labor Costs	$ 2,334	$ 4,338	$ 12,600	$ 11,068	$ 0	$ 30,340	54.2%
Contractual Svcs	3,161	4,600	5,507	3,351	0	16,620	29.7%
Op.Supplies&Materials	2,774	2,129	2,853	1,239	0	8,995	16.1%
reserved (unallocated)	0	0	0	0	45	45	0.1%
Total	$ 8,270	$ 11,067	$ 20,960	$ 15,658	$ 45	$ 56,000	100.0%
	14.8%	19.8%	37.4%	28.0%	0.1%	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
- Wastewater
- Support
- Administration

The sums of cost objects and cost functions properly equate.

It is noted that historical operating expenses shown previously in Table 5.6 are shown in six cost function categories:

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

MWH understands that the six categories included in the financial statements and the four categories in the budget relate as follows:

Budget =	Financial Statements*
Water =	Water Supply + Water Treatment
Wastewater =	Wastewater Treatment
Support =	Transmission and Collection + Support Services
Administration =	Supervision and General Expense

* See p.13 of Financial Section of CAFR for 2011

The above equations allow a reader to combine information presented in financial statements to indicate information in budgets. But it is not readily possible to disaggregate budget information into the categories shown in financial statements. Budgets are the roadmaps that managers and employees use to measure progress and to redirect resources if it appears the results will not meet budgeted expectations. MWH is totally supportive of the business concepts that financial reports be comprehensive and understandable and that budgets be useful for planning and managing operations and capital aspects of utility organizations. We find that it is relatively common in large water and sewer utilities to have cost categories in budgets that more closely if not identically echo the cost categories produced in financial reports. We recommend MAWSS adjust its budget cost categories to more closely represent its financial reporting cost categories, or find some way to provide easy to read linkage between financial reporting (historical and current information) and budget reporting (prospective information) to facilitate performance measurement.

As an example, disaggregation of the Transmission and Collection cost category into a Water Transmission cost category plus a Sewer Collection cost category (irrespective of common management structure) would be an improvement for budgeting and financial reporting as well as for the cost allocation process used in rate structure computation. With Transmission and Collection combined, total direct costs of water and wastewater must be estimated by assumed allocation rather than by use of actual cost data. It is noted that partition of the line functions into a water component and wastewater component would not necessarily require additional management expense as the same management structure would handle both components. Further, as MWH understands the operations, many if not most of the work force and equipment in the Transmission and Collection cost center already are dedicated to water or wastewater O&M functions.

Table 5.8 shows a simplified version of the current structure of cost buckets. The data in the Accounting Units and Descriptions columns were provided by MAWSS at MWH's verbal request. 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, also known as Cost Centers, 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…" as this word generally is associated with water not sewer. Further, MWH understands that an engineering manager position has been created so that titles are not overly restrictive as in the case of "Distribution…" as shown.

The Williams WWTF Laboratory (Lab) is indicated as "Attributable" because the lab 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

This 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 capital outlays for Pay Go projects and debt service for new and outstanding debt obligations.

Table 5.9 indicates a conservative forecast of revenues and expenses, not including debt service, for the six year planning period. The table includes the 2012 budget data that also appear in Table 5.6, above. Based on the historical trends and the 2012 budget, figures were selected as representative of end of year cost estimates for 2012. Moving forward, the annual non-operating revenues and expenses are forecast using the factors in the "Assumed Annual Change" column. These data are based partly on the historical data, information included in the 2008 MAWSS Rate Study, and MWH professional judgment.

TABLE 5.9 – Projected Revenues and Expenses

($000s)

	2012 Budget	Assumed Basis 2012	Assumed Annual Change	2013	2014	2015	2016	2017	2018
Revenues									
Operating revenue									
Water sales	$ 38,186	$ 38,000	$ 0						
Sewer charges	53,128	52,000	0						
Subtotal, operating rev	$ 91,314	$ 90,000							
Non-operating revenue									
Investment earnings	$ 500	$ 400	$ 0	$ 400	$ 400	$ 400	$ 400	$ 400	$ 400
Grants	0	0	0	0	0	0	0	0	0
Miscellaneous	420	400	0	400	400	400	400	400	400
Subtotal, non-op rev	$ 920	$ 800		$ 800	$ 800	$ 800	$ 800	$ 800	$ 800
Total revenues	$ 92,234	$ 90,800		$ 800	$ 800	$ 800	$ 800	$ 800	$ 800
Expenses									
Operating expenses									
Water supply		$ 2,000	3.0%	$ 2,060	$ 2,120	$ 2,180	$ 2,250	$ 2,320	$ 2,390
Water treatment		6,300	3.0%	6,490	6,680	6,880	7,090	7,300	7,520
Wastewater treatment		11,100	3.0%	11,430	11,770	12,120	12,480	12,850	13,240
Transmission and collection		16,500	3.0%	17,000	17,510	18,040	18,580	19,140	19,710
Support services		4,400	3.0%	4,530	4,670	4,810	4,950	5,100	5,250
Supervision and gen'l exp.		15,700	3.0%	16,170	16,660	17,160	17,670	18,200	18,750
Total expenses	$ 56,000	$ 56,000		$ 57,680	$ 59,410	$ 61,190	$ 63,020	$ 64,910	$ 66,860

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.

Table 5.10 is a table of projected results of operations incorporating projected revenues, expenses and capital activity.

TABLE 5.10 – Projected Results of Operations

($000s)

	2013	2014	2015	2016	2017	2018
Revenues						
Operating revenues						
Water sales						
At 2012 rates	$ 38,000					
Revenue adjustments						
Percentage	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%
Dollar value	1,900	1,995	2,095	2,199	1,848	1,921
Resulting revenue	$ 39,900	$ 41,895	$ 43,990	$ 46,189	$ 48,037	$ 49,958
Sewer charges						
At 2012 rates	$ 52,000					
Revenue adjustments						
Percentage	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%
Dollar value	2,600	2,730	2,867	3,010	2,528	2,629
Resulting revenue	$ 54,600	$ 57,330	$ 60,197	$ 63,206	$ 65,735	$ 68,364
Subtotal, operating rev	$ 94,500	$ 99,225	$ 104,186	$ 109,396	$ 113,771	$ 118,322
Non-operating revenue						
Budget identified	$ 800	$ 800	$ 800	$ 800	$ 800	$ 800
Rev. conting. allowance						
Percentage	(1.0%)	(1.0%)	(1.0%)	(1.0%)	(1.0%)	(1.0%)
Dollar value	(945)	(992)	(1,042)	(1,094)	(1,138)	(1,183)
Total revenues	$ 94,355	$ 99,033	$ 103,944	$ 109,102	$ 113,434	$ 117,939
Expenses	$ 57,680	$ 59,410	$ 61,190	$ 63,020	$ 64,910	$ 66,860
Net revenue before capital activity	$ 36,675	$ 39,623	$ 42,754	$ 46,082	$ 48,524	$ 51,079
Capital activity						
Pay-as-you-go projects	$ 13,500	$ 15,000	$ 18,000	$ 20,000	$ 21,000	$ 21,000
Debt service						
Outstanding debt service						
Parity	$ 16,794	$ 16,743	$ 17,578	$ 17,671	$ 17,742	$ 17,794
Subordinated	6,117	6,142	5,040	5,054	4,461	4,474
Total, outstanding	$ 22,911	$ 22,885	$ 22,618	$ 22,725	$ 22,203	$ 22,268
Prospective debt service						
Parity	$ 0	$ 767	$ 767	$ 1,392	$ 1,392	$ 2,596
Subordinated	0	560	560	1,016	1,016	1,894
Total, prospective	0	1,327	1,327	2,408	2,408	4,490
Total, debt service	$ 22,911	$ 24,212	$ 23,945	$ 25,133	$ 24,611	$ 26,758
Total, capital activity	$ 36,411	$ 39,212	$ 41,945	$ 45,133	$ 45,611	$ 47,758
Net income of years' operations	$ 264	$ 411	$ 809	$ 949	$ 2,913	$ 3,321
Fund balance	$ 35,264	$ 35,675	$ 36,484	$ 37,433	$ 40,346	$ 43,667
Debt service coverage						
Net inc. for coverage	$ 36,675	$ 39,623	$ 42,754	$ 46,082	$ 48,524	$ 51,079
Debt serv. (parity and subord'd)	$ 22,911	$ 24,212	$ 23,945	$ 25,133	$ 24,611	$ 26,758
Coverage	1.60 x	1.64 x	1.79 x	1.83 x	1.97 x	1.91 x

Projections of revenues and expenses are at the top half of the table. Revenues start at the figure shown in the "Assumed Basis 2012" column of Table 5.9, with 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. In 2017 and 2018 the rate increases are reduced to 4 percent for each of those years. Four percent should be sufficient for producing acceptable debt service coverage and fund balances (cash reserves) assuming MAWSS contains costs at or about the 3 percent escalation rates indicated in Table 5.9.

In Table 5.9, following the delineation of operating and non-operating revenues for Water and Sewer, a "Revenue Contingency Allowance" is included. The annual allowance is negative one percent of Operating Revenue. The purpose of this contingency is to reflect that revenues do not increase as rates increase partly because some revenue sources are derived independently from sales of water and sewer service, many customers pay only the minimum charge, plus there can be negative consumption associated with price elasticity associated with rate increases, and reduced consumption associated with the economic impacts. MWH selected a contingency value of -1 percent based partly on year 2012 year to date revenue generation following the initial 5 percent rate adjustment. Below the Net Revenue row, the capital activities are shown including Pay Go projects funded from net revenues, outstanding debt service and prospective debt service.

At the bottom of Table 5.10 are debt service coverage computations and fund balance indications. In every year coverage exceeds the Trust Indenture covenant amount of 1.20x. Fund balances (called cash reserves) are shown to increase from about $35 million to more than $40 million over the six years shown. As time marches forward, MAWSS may find that the need for 4-percent prospective rate adjustments shown for 2017 and 2018 may be less. Smaller rate adjustments, everything else being the same, would result in lower net income of years' operations and thus lower fund balances for those two years.

It should be noted that the fund balance is more than a bucket for translating net income into retained earnings. Because the money is not encumbered for specific purposes, it may be used to augment following years' resources for Pay Go projects or for other lawful purposes. Table 5.10 is intended as a representative computation of revenue sufficiency, and is not a specific operational or capital budget recommendation. Therefore, MAWSS would not be advised to increase Pay Go resources to indicate zero net income of years' operations based solely on the information presented here. That would not be consistent with the conservative or prudent fiscal management MAWSS is accustomed to practice.

Expenses included in Table 5.10 include only the summary of expenses from Table 5.9.

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. 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. Table 5.10 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

The citizens and businesses served by MAWSS have endured some hardship in recent years. As of the 2010 Census, MAWSS economic factors compared with the State of Alabama and the USA as shown in **Table 5.11**. In each of the three statistical categories shown, Mobile has poorer values.

TABLE 5.11 – 2010 Census Information

Data	City of Mobile	State of Alabama	United States
Population	195,111	4,785,298	309,349,689
Median household income	$37,438	$40,474	$50,046
Unemployment	14.6%	11.8%	10.8%
Below poverty level	21.9%	19.0%	15.3%
Percent of USA			
Median household income	74.8%	80.9%	100.0%
Unemploy (% above USA)	3.8%	1.0%	0.0%
Poverty level (% above USA)	6.6%	3.7%	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 (35 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 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 4,800,429 billing units (1,000 gallons is a billing unit). The total number of accounts in that year of that meter size was 82,659 accounts. Dividing one by the other, the average annual consumption[5] of the accounts using 5/8-inch meters in 2011 was 58.1 billing units, or 4.9 per month. Most, but not all, residential accounts use 5/8-inch meter services and most, but not all, 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 $2.55 per billing unit of water and $5.97 per billing unit of wastewater, for a total commodity charge of $8.52 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 yields an water

[5] 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.

and sewer cost of $559.20 per year or $46.60 per month. This cost for water and sewer service is 60 percent of the EPA affordability criterion ($78.00 per month).

Table 5.12 shows a brief analysis of revenue projection and affordability measurement. The top row of Table 5.12 contains the annual water and sewer revenue adjustments shown in Table 5.10, the table of Projected Results of Operations. As mentioned earlier, the computation of annual changes in revenue requirement is not necessarily equitable to changes in water and sewer rates (partly because MAWSS receives revenue other than from rates and also because the water rates are actually block rates where customers using more than 500 billing units of water per month are charged different rates per billing unit). Notwithstanding, it is reasonable to approximate annual changes in rates for 5/8-inch meter service residential customers by using the annual revenue increase. The second row of Table 5.12 shows the indicated projected charges per month for the average residential customer using a 5/8-inch meter service. The 2012 value is the charge number computed above for the average account. The subsequent data in the second row show how the 2012 datum is increased each year by the percentages shown in the first row. Thus, the $46.60 service charge in 2012 would increase to an indicated value of approximately $61.26 in 2018 under this planning scenario.

TABLE 5.12 – MAWSS Residential Rate Indication and Affordability Assessment

(Monthly water and sewer charges to average residential customers)

	2012	2013	2014	2015	2016	2017	2018
Revenue adjustments	*(basis)*	5.00%	5.00%	5.00%	5.00%	4.00%	4.00%
Projected charges / month, average resid. acct	*$ 46.60*	$ 48.93	$ 51.38	$ 53.95	$ 56.64	$ 58.91	$ 61.26
Percent of MHI	*1.49%*	*1.57%*	*1.65%*	*1.73%*	*1.82%*	*1.89%*	*1.96%*

Projected average residential monthly costs are shown in the second row of data in Table 5.12. The third row indicates the ratio of annual cost (twelve times monthly) to MHI. The ratio increases from 1.45 percent of MHI in 2012 to 1.90 percent in 2018.

Relying on this affordability assessment and our experience at other large regional water/sewer utilities, MWH is of the opinion that the projection of revenue requirements and annual adjustments over the six year time frame is implementable under the assumptions noted.

5.8 Findings and Conclusions

The principal finding with respect to financial affairs is that MAWSS should be commended for its step to adopt annual five percent rate increases. Table 5.10 indicates very strong financial performance with debt service coverage never below 1.6x and unencumbered fund balances growing each year to an estimated $44 million in 2018, a 25 percent increase over the six year period of time.

The *Indenture of Trust* stipulates that the focus of analysis included in the EAR be the next following year, or in this case the 2013 year. In order to evaluate revenue sufficiency for the 2013 year, it is necessary to consider 2013 in a financial planning context that includes a number of years. This section of the EAR addresses the six year period of 2013 through 2018.

5.8.1 2013 Year

The capital requirement for 2013 includes beginning work on Priority 1 projects as well as annually recurring projects.

The financings to undertaken in 2013 are assumed to not take effect on net revenues until 2015, under the planning assumptions mentioned above. 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 adjust its charts of accounts for budgeting and financial reporting such that direct expense budget categories match direct expense financial results categories. MWH also 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.

5.8.2 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%

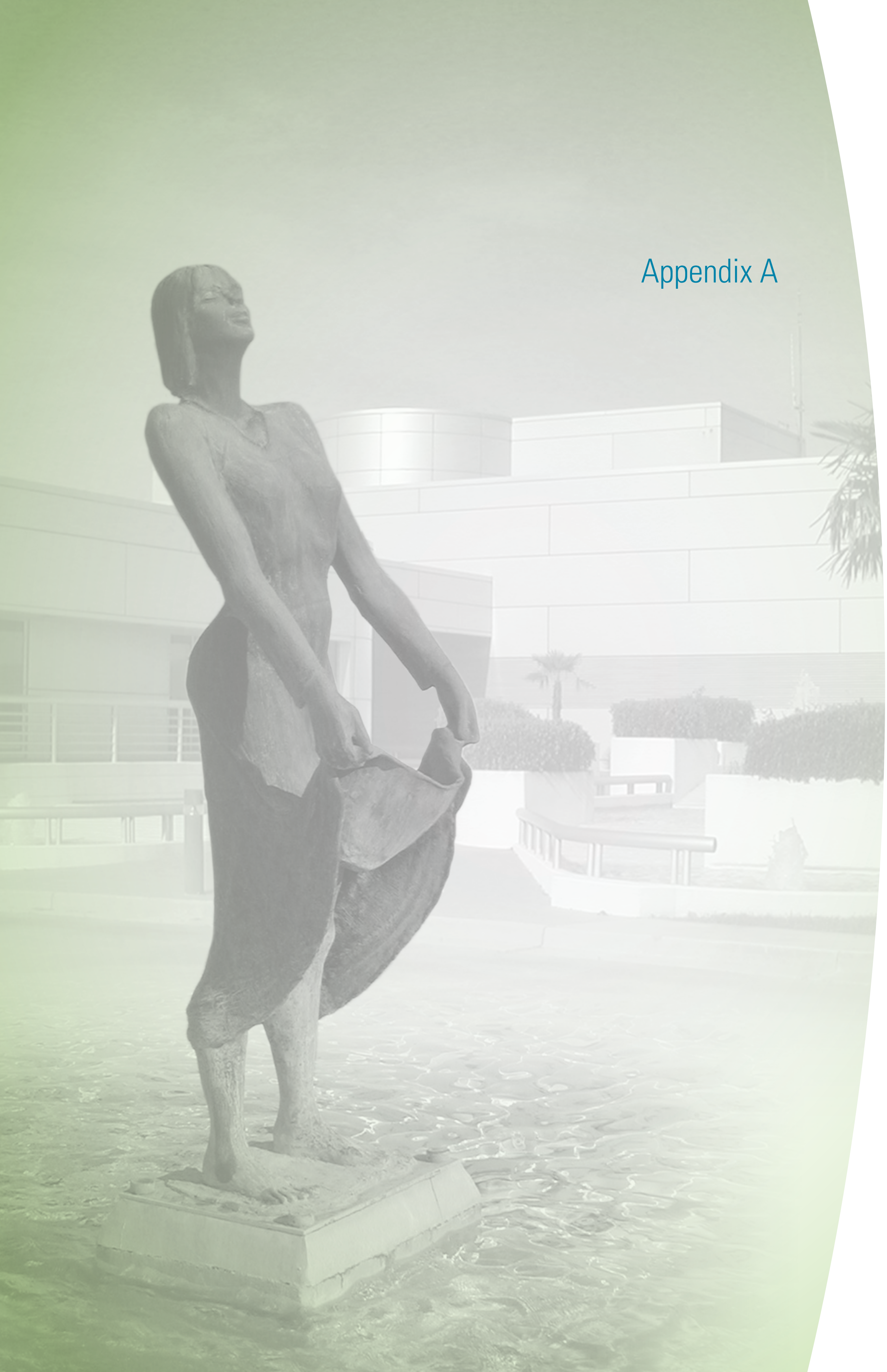
2017 .... 4.00%

2018 .... 4.00%

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 2012 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
	Reliabiity	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	Continued development of Big Creek Lake Tortoise Reserve	$ 50,000	
1	Efficiency	Optimize energy costs associated with pumping raw water	$ 50,000	$ 100,000
2	Functionality	Implement recommendations from the criticality assessment	$ 250,000	
2	Functionality	Conduct a scheduled trial of pumping river water to E.M. Stickney WTP	$ 25,000	$ 275,000
3	Hazard Mitigation	Install booming at the Big Creek intake structure	$ 400,000	
3	Efficiency	Investigate installation of HVAC in the pump room to extend pump motor life	$ 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	
3	Functionality	Implement recommendations from the Watershed Management Plan (allowance)	$ 700,000	$ 1,850,000
4	Functionality	Install automatic screens at the Big Creek intake structure	$ 1,000,000	
4	Hazard Mitigation	Replace Big Creek Lake dam flood gate operating system with electric motor-driven system	$ 200,000	
4	Hazard Mitigation	Rehabilitate Saraland Pumping Station	$ 100,000	
4	Hazard Mitigation	Rehabilitate Bucks Pumping Station	$ 100,000	
4	Hazard Mitigation	Rehabilitate Regulator House Pumping Station	$ 650,000	$ 2,050,000
		TOTAL	**$ 4,275,000**	**$ 4,275,000**

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

Project Authorization Priority	Project Type		MAWSS Cost Estimate	Subtotal By Priority
1	Redundancy	E.M. Stickney redundant lime silo	$ 650,000	
1	Reliability	Sludge removal from E.M. Stickney WTP reservoir	$ 500,000	
1	Reliability	Criticality assessment recommended projects (allowance)	$ 200,000	
1	Functionality	Separate E.M. Stickney WTP storm drain from plant recyle (allowance)	$ 500,000	
1	Hazard Mitigation	Evaluate concrete structure conditions, especially the critical clear well	$ 250,000	$ 2,100,000
2	Efficiency	Monitor buildup of solids in reservoir	$ 20,000	
2	Efficiency	Evaluate flocculation/sedimentation forebay solids buildup	$ 25,000	$ 45,000
3	Efficiency	Evaluate energy efficient MCC replacement equipment and installation of HVAC in MCC rooms	$ 200,000	$ 200,000
4	Functionality	Online TOC meter	$ 35,000	$ 35,000
		TOTAL	**$ 2,380,000**	**$ 2,380,000**

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	Reliability	Criticality assessment recommended projects	$ 20,000	$ 520,000
2	Functionality	Provide a shelter for the exposed generator	$ 50,000	$ 50,000
3	Reliability	Replace centrifuges with energy efficient, automated units	$ 3,000,000	
3	Efficiency	Provide a lime grit removal system	$ 150,000	
3	Functionality	Evaluate installation of HVAC in MCC rooms	$ 75,000	
3	Functionality	Online TOC meter	$ 35,000	
3	Reliability	Divide H.E. Myers WTP reservoir into two separate sections	$ 1,100,000	$ 4,360,000
		TOTAL	**$ 4,930,000**	**$ 4,930,000**

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)	$ 800,000	
Annual	Reliability	Paint, and renovate as needed, water tanks (annual allowance)	$ 900,000	
Annual	Relocation	Utility water relocations (annual allowance)	$ 250,000	
Annual	Reliability	Routine booster pump station rehabiliation/replacement (annual allowance)	$ 200,000	$ 2,150,000
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 (continuation)	$ 1,000,000	
1	Reliability	Blair Avenue water main replacement	$ 214,000	
1	Reliability	Conduct risk analysis study on distribution mains, booster stations and storage tanks to improve CIP prioritization	$ 180,000	$ 1,594,000
2	Reliability	24" water main replacement (Railroad from Springhill Ave. to Houston St.)	$ 2,500,000	
2	Level of Service	48" raw water main conversion to potable water main and 30" connector installation (to reduce water age)	$ 1,950,000	
2	Level of Service	Water main improvement Craft Hwy/Springhill Area (to reduce water age)	$ 600,000	
2	Level of Service	Abandon Springhill Reservoir to reduce water age	$ 300,000	
2	Efficiency	GIS water meter conversion, Phase 1 - 10 (AMI/AMR/MDM)	$ 1,500,000	
2	Functionality	Water distribution system model	$ 500,000	
2	Reliability	Monitor cathodic protection system on 20" main across Mobile River	$ 25,000	
2	Reliability	Evaluate cathodic protection system for 16" main across Dog River	$ 25,000	
2	Reliability	Install pressure regulating/sustaining valve at Hillcrest Road & Cottage Hill	$ 75,000	
2	Reliability	Perform hydraulic transient analysis of large diameter transmission pipelines	$ 100,000	$ 7,575,000
3	Reliability	Criticality assessment recommended projects (initial allowance)	$ 200,000	$ 200,000

Table A.5 continues on next page.

TABLE A.5 - Water Distribution System Project Needs List Continued

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
4	Efficiency	GIS water meter conversion, complete residential meter conversion (AMI/AMR/MDM)	$ 2,800,000	
4	Hazard Mitigation	Install redundant deep causeway water main (Spanish Fort)	$ 2,800,000	$ 5,600,000
5	Capacity	Evaluate Hillcrest Road from Airport Blvd. to Grelot Rd. 16" main extension	$ 25,000	$ 25,000
		TOTAL	**$ 17,144,000**	**$ 17,144,000**

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

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
2	Regulatory Compliance	Master plan recommendations for immediate improvement (initial allowance)	$ 1,000,000	$ 1,000,000
3	Functionality	Install new headworks structure at C.C. Williams WWTF	$ 7,600,000	
3	Reliability	Primary clarifier modifications or replacement	$ 9,800,000	
3	Functionality	Modify the primary effluent distribution facilities	$ 300,000	
3	Functionality	Digester S2 new lid	$ 400,000	
3	Functionality	Air scrubber evaluation for chlorine building	$ 25,000	
3	Reliability	Replace molecular sieve at oxygen generators	$ 25,000	
3	Efficiency	Digester gas utilization evaluation	$ 25,000	
3	Functionality	Facility wide odor assessment	$ 25,000	
3	Functionality	Evaluate installation of HVAC in MCC rooms	$ 75,000	$ 18,275,000
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	**$ 20,175,000**	**$ 20,175,000**

TABLE A.7 - Wright Smith WWTF Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
1	Efficiency	Evaluate operational improvement options for grease treatment facilities	$ 10,000	
1	Functionality	Denitrification filters center column and arms replacement	$ 600,000	$ 610,000
2	Reliability	Install additional pump at intermediate pump station	$ 250,000	$ 250,000
3	Reliability	Criticality assessment recommended projects (allowance)	$ 200,000	
3	Reliability	Evaluate condition of trickling filter underdrain system for #1	$ 50,000	
3	Reliability	Evaluate solids dewatering facilities	$ 100,000	$ 350,000
		TOTAL	**$ 1,210,000**	**$ 1,210,000**

TABLE A.8 - Decentralized Treatment Facilities Project Needs List

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
1	Reliability	Conduct risk analysis study on decentralized plants and disposal systems to improve CIP prioritization	$ 150,000	$ 150,000
3	Reliability	Criticality assessment recommended projects (initial allowance)	$ 200,000	$ 200,000
4	Hazard Mitigation	Enhancement at DWWTFs	$ 250,000	$ 250,000
5	Capacity	Evaluate Copeland Island DWWTF expansion needs	$ 75,000	
5	Capacity	Evaluate returning diverted flow to Hutchins DWWTF in conjunction with additional growth	$ 75,000	
5	Capacity	Additional decentralized facilities to accommodate growth	$ 2,000,000	$ 2,150,000
		TOTAL	**$ 2,750,000**	**$ 2,750,000**

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

Project Authorization Priority	Project Type	Project Need	MAWSS Cost Estimate	Subtotal By Priority
2	Reliability	Complete biosolids master plan to evaluate disposal options	$ 500,000	$ 500,000
5	Reliability	Convert from Class B land application based on chosen disposal option (allowance)	$ 10,000,000	$ 10,000,000
		TOTAL	**$ 10,500,000**	**$ 10,500,000**

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 (annual allowance)	$ 2,000,000	
Annual	Regulatory Compliance	Lift Station renovations (annual allowance)	$ 1,500,000	
Annual	Regulatory Compliance	Sewer rehabilitation (annual allowance)	$ 6,000,000	
Annual	Regulatory Compliance	Cured-in-place-pipe sewer rehabiliation contract (annual allowance)	$ 1,500,000	
Annual	Regulatory Compliance	Manhole rehabilitation and maintenance (annual allowance)	$ 450,000	
Annual	Regulatory Compliance	Sewer renewal in I/I priority areas (annual allowance)	$ 1,000,000	
Annual	Regulatory Compliance	Access roads for depressed sewers (annual allowance)	$ 1,200,000	
Annual	Regulatory Compliance	Lateral rehabilitation/replacement lining (annual allowance)	$ 1,000,000	
Annual	Reliability	Force main renewal (annual allowance)	$ 1,000,000	$ 16,650,000
1	Regulatory Compliance	Diesel backup (generator or pump) for 15 hp lift stations	$ 1,000,000	
1	Regulatory Compliance	Upgrade Eight M+D24ile Lift Station (LS164)	$ 750,000	
1	Functionality	Upgrade Virginia Street Lift Station (LS044) electrical	$ 100,000	$ 1,850,000
2	Functionality	Investigate vibration issues at Perch Creek Lift Station (LS044)	$ 75,000	
2	Reliability	Conduct risk analysis study on lift stations and force mains to improve CIP prioritization	$ 180,000	
2	Reliability	Enhancement of off-road sanitary sewer/force main easements	$ 1,200,000	$ 1,455,000
3	Reliability	Stockton and Gimon relay sewer	$ 705,000	
3	Reliability	Japonica Avenue relay sewer	$ 706,000	
3	Reliability	Aubudon Place relay sewer	$ 874,000	

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
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 segement, 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	Williams Street DIP sewer relay	$ 100,000	
3	Reliability	Blair Avenue relay sewer	$ 150,000	
3	Reliability	Sage Avenue at Old Shell Road relay sewer	$ 425,000	
3	Reliability	Brizzel and Pecan Relief Sewer	$ 1,000,000	
3	Reliability	Vista Ridge relay sewer replacement	$ 825,000	
3	Reliability	Levene Road and Mackie Avenue new lift station	$ 1,000,000	$ 7,431,000
5	Efficiency	Install 4th VFD at Halls Mill Lift Creek Station (LS154)	$ 500,000	
5	Efficiency	Install 4th VFD at Eslava Creek Lift Station (LS156)	$ 500,000	
5	Efficiency	Modify RTU signals to reduce SCADA lag	$ 40,000	
5	Capacity	Increase collection system capacity	$ 4,000,000	
5	Capacity	New service, unidentified projects, contributions to developers	$ 1,000,000	
5	Capacity	Increase collection system capacity	$ 4,000,000	
5	Capacity	New service, unidentified projects, contributions to developers	$ 1,000,000	
5	Capacity	Extend Halls Mill trunk sewer	$ 1,400,000	$ 12,440,000
		TOTAL	**$ 39,826,000**	**$ 39,826,000**

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)	$ 1,000,000	
Annual	Functionality	Roof repair/replacement (company-wide, annual allowance)	$ 200,000	
Annual	Functionality	HVAC repair/replacement (company-wide, annual alloance)	$ 100,000	
Annual	Functionality	Cost center repair/replacement (annual allowance)	$ 460,000	
Annual	Efficiency	Engineering studies (miscellaneous, annual allowance)	$ 150,000	
Annual	Reliability	New thermal expansion protection loans for dual check installations (annual allowance)	$ 5,000	$ 1,915,000
1	Functionality	Upgrade security at various facilities (allowance)	$ 636,000	
1	Efficiency	Conduct risk analysis study for emergency locations	$ 25,000	
1	Functionality	Update standard specifications	$ 100,000	$ 761,000
2	Functionality	Establish a central SCADA system coordinator	cost neutral	
2	Level of Service	Renovation of remainder of Park Forest Plaza Facility	$ 2,000,000	$ 2,000,000
4	Hazard Mitigation	Shop and Lift Station Dept. relocation to Shelton Beach Road Facility	$ 3,700,000	
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	$ 5,000,000
5	Capacity	Cost center expansion, new purchases	$ 50,000	$ 50,000
		TOTAL	**$ 9,726,000**	**$ 9,726,000**

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	$ -	$ 100,000	$ 275,000	$ 1,850,000	$ 2,050,000	$ -	$ 4,275,000
E.M. Stickney WTP	$ -	$ 2,100,000	$ 45,000	$ 200,000	$ 35,000	$ -	$ 2,380,000
H.E. Myers WTP	$ -	$ 520,000	$ 50,000	$ 4,360,000	$ -	$ -	$ 4,930,000
Water Distribution System	$ 2,150,000	$ 1,594,000	$ 7,575,000	$ 200,000	$ 5,600,000	$ 25,000	$ 17,144,000
C.C. Williams WWTF	$ -	$ -	$ 1,000,000	$ 18,275,000	$ 900,000	$ -	$ 20,175,000
Wright Smith WWTF	$ -	$ 610,000	$ 250,000	$ 350,000	$ -	$ -	$ 1,210,000
Decentralized Treatment Facilities	$ -	$ 150,000	$ 200,000	$ 250,000	$ 2,150,000	$ -	$ 2,750,000
Solids Handling and Disposal	$ -	$ -	$ 500,000	$ -	$ -	$ 10,000,000	$ 10,500,000
Sewer Collection System	$ 16,650,000	$ 1,850,000	$ 1,455,000	$ 7,431,000	$ -	$ 12,440,000	$ 39,826,000
Common Facilities	$ 1,915,000	$ 761,000	$ 2,000,000	$ -	$ 5,000,000	$ 50,000	$ 9,726,000
Totals	**$ 20,715,000**	**$ 7,685,000**	**$ 13,350,000**	**$ 32,916,000**	**$ 15,735,000**	**$ 22,515,000**	**$ 112,916,000**

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	$ 20,715,000	$ 20,715,000	$ 20,715,000	$ 20,715,000	$ 20,715,000	$ 20,715,000	$ 20,715,000
Priority 1 Needs	$ 3,842,500	$ 3,842,500					$ 7,685,000
Priority 2 Needs			$ 6,675,000	$ 6,675,000			$ 13,350,000
Priority 3 Needs					$ 16,458,000	$ 16,458,000	$ 32,916,000
Priority 4 Needs							if grants obtained
Priority 5 Needs							if growth occurs
Totals	**$ 24,557,500**	**$ 24,557,500**	**$ 27,390,000**	**$ 27,390,000**	**$ 37,173,000**	**$ 37,173,000**	**$ 74,666,000**

Glossary

GLOSSARY OF TERMS, ACRONYMS 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.

City: The City of Mobile, Alabama.

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.

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”: Internally generated funds used to fund capital projects.

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.

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.

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

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.

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.)

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.

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 as 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. The resulting risk rating highlights failure modes with relatively high probability and severity of consequences, allowing remedial effort to be directed where it will produce the greatest value.

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 (CH_4), 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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