Miami Dade Water and Sewer Department
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2010 Annual Water Loss Reduction Plan Implementation Status Report

March 2011

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1. Introduction

The South Florida Water Management District (SFWMD or District) requires Miami-Dade Water and Sewer Department (MDWASD) to prepare an annual status report of its 20-year Water Loss Reduction Plan (the Plan) implementation, per Limiting Condition 49 of the Miami-Dade County Water Use Permit (WUP). MDWASD retained Malcolm Pirnie, Inc. to prepare the 2010 Annual Water Loss Reduction Plan Implementation Status Report (2010 Annual Status Report) and provide assistance with the Plan implementation in 2011. This document is the 2010 Annual Status Report, which includes water audits as required by Limiting Condition 49.

1.1. Background and Scope of Work

MDWASD's 20-year Water Loss Reduction Plan was based on an evaluation of MDWASD's water supply and demand for Fiscal Year (FY) 2005. In May 2007, the SFWMD approved the Plan and issued a 20-year WUP on November 15, 2007. The WUP was later revised in November 2010 with an expiration date of November 3, 2030. The revised WUP is included in Appendix A.

The Plan recommended real and apparent water loss mitigation approaches over the next 20 years with corresponding budget and implementation schedule recommendations. The recommended schedule of the real and apparent water loss reduction activities are presented in Tables 1-1 and 1-2. These tables are the same as Exhibits 17A and 17B of the revised WUP. The tables also provide the anticipated annual water savings and associated annual value of water savings for the water loss reduction activities.

Limiting Condition 49 of the revised WUP specifically applies to implementation of the approved Water Loss Reduction Plan. Key requirements of Limiting Condition 49 are:

- Quarterly determination of distribution system losses
- Annual reporting of distribution system losses on March 15th of each year for the previous calendar year
- Determination of losses in each water treatment plant (WTP)
- Water audits in accordance with IWA/AWWA standard methodologies
- Planned annual reporting of water loss reduction activities and expenditures, along with associated water savings for the subsequent calendar year
- Annual reporting of water loss reduction trends and changes from previous year
- Annual reporting of additional water loss reduction activities if water losses as defined by AWWA methodology exceed ten percent.

Table 1-1: Schedule of Real Water Loss Reduction Activities (Exhibit 17A)
January 2007 through December 2026

Activity	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
5.3 Recommendations for Real Loss Reduction										
5.3.1 System Design (Active Review)										
5.3.2 System Management										
5.3.2.3 Asset Maintenance or Replacement										
5.3.2.4 Reduce Maintenance Response Times										
5.3.2.5 Active Leakage Control and Sounding		**Pilot**								
5.3.2.7 Pressure Management										
5.3.2.8 Speed and Quality of Repairs										
Perform Venturi Comparative Tests-WTPs										
Perform Venturi Comparative Tests-wholesale customers										
Conduct wholesale customer unmetered connection survey										
Pilot Fixed Network AMR		**Pilot**								
Enhance GIS database										
ANNUAL WATER SAVINGS (Million Gallons)				**650**	**1300**	**1950**	**2600**	**3250**	**3900**	**4550**
ANNUAL VALUE OF WATER SAVINGS (Million $)				**$0.297**	**$0.595**	**$0.892**	**$1.189**	**$1.487**	**$1.784**	**$2.081**

Activity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
5.3 Recommendations for Real Loss Reduction										
5.3.1 System Design (Active Review)										
5.3.2 System Management										
5.3.2.3 Asset Maintenance or Replacement										
5.3.2.4 Reduce Maintenance Response Times										
5.3.2.5 Active Leakage Control and Sounding										
5.3.2.7 Pressure Management										
5.3.2.8 Speed and Quality of Repairs										
Achieve target real loss of 5 billion gallons per year	X									
Achieve target Infrastructure Leakage Index (ILI) of 3.0	X									
ANNUAL WATER SAVINGS (Million Gallons)	**5200**	**5200**	**5200**	**5200**	**5200**	**5200**	**5200**	**5200**	**5200**	**5200**
ANNUAL VALUE OF WATER SAVINGS (Million $)	**$2.378**	**$2.378**	**$2.378**	**$2.378**	**$2.378**	**$2.378**	**$2.378**	**$2.378**	**$2.378**	**$2.378**

Table 1-2: Schedule of Apparent Water Loss Reduction Activities (Exhibit 17B)
January 2007 through December 2026

Activity	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
6.3 Recommendations for Apparent Water Loss Reduction										
6.3.1 Reducing Unmetered Supplies										
6.3.2 Improved Meter Accuracy										
6.3.3 Commercial Meter Types and Sizes										
6.3.3.2.1 Compound Meters Usage Compared to Same Size Turbine Meters						Pilot				
6.3.3.3 Looking Forward (setting Economic Meter Testing Goals)										
6.3.4 Improved Calibration of Wholesale Customer Meters										
6.3.5 Wholesale Customer Unmetered Connection Analysis										
Conduct field accuracy testing of commercial meters										
Pilot AMR to improve data handling and reduce labor cost		Pilot								
Characterize residential water demand pattern										
Determine economic optimum for residential meter replacement										
ANNUAL WATER SAVINGS (Million Gallons)				400	800	1200	1600	2000	2400	2800
ANNUAL VALUE OF WATER SAVINGS (Million $)				0.788	1.576	2.364	3.152	3.94	4.728	5.516

Activity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
6.3 Recommendations for Apparent Water Loss Reduction										
6.3.1 Reducing Unmetered Supplies										
6.3.2 Improved Meter Accuracy										
6.3.3 Commercial Meter Types and Sizes										
6.3.3.2.1 Compound Meters Usage Compared to Same Size Turbine Meters										
6.3.3.3 Looking Forward (setting Economic Meter Testing Goals)										
6.3.4 Improved Calibration of Wholesale Customer Meters										
6.3.5 Wholesale Customer Unmetered Connection Analysis										
Conduct field accuracy testing of commercial meters										
Reduce Apparent Losses to 10 billion gallons per year										X
ANNUAL WATER SAVINGS (Million Gallons)	3200	3600	4000	4400	4800	5200	5600	6000	6400	6800
ANNUAL VALUE OF WATER SAVINGS (Million $)	6.304	7.092	7.88	8.668	9.456	10.244	11.032	11.82	12.608	13.396

Since 2008, Malcolm Pirnie, Inc. has been assisting MDWASD with the implementation of the 20-year Water Loss Reduction Plan to comply with applicable Limiting Conditions of the WUP. The intent of this effort is to perform water system audits and develop the 2010 Annual Status Report that is due to the South Florida Water Management District on March 15, 2011.

This report (2010 Annual Status Report) is divided into the following sections:

- Section 1 – presents the background and context of this project and the scope of work for the current status report.
- Section 2 – presents the water loss reduction activities that were performed in 2010.
- Section 3 – presents the IWA/AWWA distribution system water loss audits for calendar year (CY) 2010.
- Section 4 – presents the water loss audits for each of the MDWASD's WTP for CY 2010.
- Section 5 – presents the status of the Water Loss Reduction Plan implementation and action items for FY 2011.

2. 2010 Water Loss Reduction Plan Activities

Last year (2010) Malcolm Pirnie, Inc. assisted MDWASD with the implementation of the 20-year Water Loss Reduction Plan in order to comply with the WUP. The tasks below describe the extent of the Plan implementation in 2010. Follow-up (and deferred) activities in 2011 are indicated, where applicable.

2.1.1. Real Water Loss Reduction Plan Tasks Developed in 2010

The following are the tasks related to MDWASD distribution system real water loss reduction that were developed in 2010. Tasks 2.1.1.1 and 2.1.1.2 listed below address annual requirements and therefore need to be performed every year in accordance with WUP. The other tasks have led to follow-up activities that would be continued in the future upon the development of other tasks.

2.1.1.1. Water Audits Using IWA/AWWA Methodology

Water system audits were prepared last year using the IWA/AWWA standardized software available through AWWA for the data collected in 2009. The water audit computational approach that was used last year was different from that used in the previous years. The new approach relied on the estimate of apparent water losses to solve for real water losses while the previous approach relied on the estimate of real water losses based on leak detection surveys to solve for apparent water losses. For consistency, the water system audits for 2006 through 2008 were also updated and adjusted along with the last year water system audits. The new approach will be used for this year (2010) water loss audits, which are described in detail in Section 3.

The water audits performed last year indicated an increased trend in ILI and real water losses from 2006 through 2009.

2.1.1.2. Water Audits Using SFWMD Methodology

Last year, the water system audits were prepared using the SFWMD methodology according to which "In the event that the difference between the volume of water produced (from the treatment plant) and purchased and the sum of the metered and user sale amounts exceeds 10 percent of the treated water produced, the permittee shall include in the annual report a description of additional actions which will be implemented the following year(s) to reduce the losses to less than ten percent".

Unaccounted-for water loss estimates required by the SFWMD water audit methodology includes legitimate water uses and known system inaccuracies that are not considered real water losses. In 2010, a technical memorandum was prepared with a proposed real water loss metric, using the context of the IWA/AWWA water accounting standards that can be used to redefine the SFWMD water audit definition to account for real water losses. Consequently, the revised WUP that was issued by the SFWMD in November 2010 eliminated the water system audit requirement using

the SFWMD methodology. Instead, the water system audits will be prepared using the IWA/AWWA standard methodologies. Annual reporting of additional water loss reduction activities is required if real water losses as defined by IWA/AWWA methodology exceed ten percent.

2.1.1.3. Water Treatment Plant Audits

The individual water treatment plant water audits were prepared last year (using the data gathered for the calendar year 2009) by comparing the water flows pumped from the wells and the water flows into and out of the water treatment plants. Below is a brief description of the results of water audits that were performed last year. The results of the water audits that are performed this year are presented in Section 3.

Raw-water well meter readings were on average 7.4 percent less than the raw-water influent meter readings at the Hialeah/Preston WTP and 22 percent less than the raw-water influent meter readings at the Alexander Orr WTP. MDWASD planned to investigate and, where possible, address identified conditions (meter calibration / configuration or real losses) that contribute to the noted disparity.

Raw-water influent and finished-water effluent metered flows at the Alexander Orr WTP, in-plant water losses were estimated to be approximately 10 percent. After adjusting for “apparent” losses (meter inaccuracies), in-plant real water losses were estimated to be approximately 4.4 percent, which are within the real water loss range anticipated for a lime softening treatment process. The last year Annual Status Report indicated that correcting the apparent raw-water influent and finished-water effluent Venturi meter inaccuracies at the Alexander Orr WTP would eliminate (or reduce) the “apparent” water losses miscounted as “in-plant” water losses.

Raw-water and finished-water metered flows at the Hialeah/Preston WTP, in-plant water losses were estimated to be approximately 6 percent. Assessment of cause and a feasible remedy was previously recommended in the 2009 Annual Status Report.

2.1.1.4. Enhanced Effectiveness of Leak Detection Program

MDWASD (through Malcolm Pirnie, Inc.) evaluated analytical techniques that established an economic balance between the costs of leakage control and the benefits that accrue from real water savings and enhanced the effectiveness of the leak detection program and pipe replacement program. In 2010, an ‘Economic Analyses of Leak Detection Program and Pipe Replacement’ study was performed and documented.

Historical leak detection data and pipe replacement data, along with distribution system capital investments, were collected and historical trends were analyzed to establish an adaptive strategy based on statistical analysis of leak incidences, investments, and others. The economic levels of return were established for all MDWASD Atlas pages based on which a modified approach for leak detection and pipe replacement was developed. The economic time of replacement for

different pipe diameters based on capital costs, active leak detection cost, and water loss cost was established and recommendations were provided to align system betterment investments with economic impact assessment of leak incidences. The study recommended targeting leakage reduction based on largest volume savings per dollar spent and periodically re-evaluating economics to determine cost-effective leak mitigation approaches.

2.1.2. Apparent Water Loss Reduction Plan Tasks Developed in 2010

The following are the tasks related to MDWASD's distribution system apparent water loss reduction that were developed in 2010. Tasks 2.1.2.3 and 2.1.2.4 listed below address annual requirements and therefore need to be performed every year in accordance with WUP. The other tasks have led to follow-up activities that would be continued in the future upon the development of other tasks.

2.1.2.1. Accounting of Fire Department Water Usage

In 2010, MDWASD identified the contacts of each Fire Department that use water from MDWASD facilities. The Fire Departments were informed of MDWASD's plans to appropriately account for the fire department water usage. In 2011, a meeting will be held with the identified Fire Departments to evaluate different water usage activities. In cooperation with these Fire Departments, a methodology for appropriately accounting fire department water usage will be developed (follow up).

2.1.2.2. Meter Sizing Criteria

In 2010, MDWASD developed appropriate meter sizing criteria and protocols in accordance with anticipated water demand, water demand profile, meter location, meter setting design requirement, and service line specifications. The criteria and protocols developed were consistent with AWWA standards (as identified in AWWA Manual M22). Recommendations were provided for residential (single family and multi-unit), commercial, and industrial meters.

Currently, the meter sizing and selection decision is at the discretion of the building designer based on obtained estimated peak demand calculated through AWWA Manual M22. The 2010 meter sizing criteria report recommended an additional form based policy that requires demand be itemized in a worksheet to be approved by MDWASD based on the fixture value method. The worksheet would remove potential ambiguities in meter size and selection and minimize over-sizing or under-sizing of meters. By appropriately sizing meters, potential apparent losses caused by under-metered flows could be reduced.

In addition, the worksheet would reflect a more standardized method of meter selection and size consistent with the existing AWWA methodology. This would allow MDWASD to accomplish greater control over the meter sizing process with minimal additional effort. If appropriately exercised, revenue may increase due to improved registration of low flow. However, it was recommended that the meter sizing method be updated as better protocols become available.

2.1.2.3. Summary of Water Loss Reduction Activities

A summary table with a list of action items that were required to be developed or implemented in 2010 as per the WUP limiting conditions was prepared. The table described the status, activities that were performed, and recommended follow-up activities for each action item.

2.1.2.4. Annual Status Report

The Annual Status Report with summary and supporting data for the water loss reduction activities performed in the year 2009 was prepared to fulfill the requirement of WUP.

2.2. Highlights of the 2010 Water Loss Reduction Activities

2.2.1. AMR Implementation

MDWASD installed approximately 1,000 residential water meters (500 using Itron and 500 using Sensus) operating under fixed network Advanced Metering Infrastructure (AMI) systems that were installed in MDWASD's service area as part of the Automated Meter Reading (AMR) pilot implementation performed in 2009. In 2010, MDWASD monitored and estimated the water savings that resulted from the operation of the AMI system. It was indicated by MDWASD that 5.69 million gallons per year (MGY) of water savings were achieved with the implementation of the AMI system.

In 2010, MDWASD initiated the expansion of the AMI network. An additional 200 Sensus AMR meters were installed on large and commercial accounts. An additional 50 commercial Sensus AMR meters were installed in the Miami-Dade downtown area. A second pilot study is underway with the installation of additional residential and commercial meters. Also, 4,000 AMR meters were installed in the City of Miami Springs service area. These meters will be online by summer of 2011.

MDWASD plans to continue expanding the AMI network in future years for increased water savings and to utilize functional capabilities of AMI systems in water conservation, improved customer service, leak detection, better management of system operations and planning, and monthly billing.

2.2.2. PCCP Pipe Conditions Assessments Program

On March 2, 2010 there was a 54-inch Pre-stressed Concrete Cylinder Pipe (PCCP) break in the City of Hialeah. MDWASD initiated a PCCP condition assessment program as a result of the water main break incident. The following are the activities that were performed as part of this program:

- An initial assessment of a one mile PCCP that was isolated for initial repair revealed the following immediate needs:

  - 46 pipe segments of a total of 256 pipe segments assessed had broken pre-stressed wire, of which 17 had broken pipes throughout the pipe segment. Consequently, 24 pipe segments were recommended for immediate repair.

- A second survey of 16.3 miles of PCCP from Preston WTP to N.W. 191st Street and N.W. 18th Avenue, using a pipe diver, in order to the maintain the pipe in service, revealed the following needs:
  - 126 pipe segments of a total of 4,505 pipe segments assessed had at least 5 wire breaks of which 40 pipe segments had broken pipes throughout the pipe segment. Consequently, 49 pipe segments were recommended for immediate repair.
- Confirmatory testing using a pipe diver, robot and continuity testing, and forensic investigation was conducted on the 54-inch main:
  - The testing confirmed that the pipes were properly identified for repair.
  - Visual and sound inspections were performed to confirm the electromagnetic survey results.
  - Longitudinal cracks and audible delamination was identified on 2 of 3 of the most severely distressed pipes. Wire continuity testing was performed on the third pipe.
- A rehabilitation program using Carbon Fiber Reinforced Plastic (CFRP) system was developed:
  - As part of the rehabilitation program that was performed in 2010, 40 miles of PCCP was inspected (budgeted for $10 M). It was estimated by MDWASD that 2 to 4 mgd of water was lost in leaks through the following identified pipes:
    - 8.5 miles of 96-inch raw water main was found to have 9 bad joints.
    - 10 miles of 48-inch pipe was found to have 4 bad sections.
    - Rehabilitation work on the 96-inch and 48-inch mains in still pending.
  - As part of the future rehabilitation program 15 miles of PCCP pipe per year will be inspected using electromagnetic methods (budgeted for $1.8M per mile of pipe). All 36-inch pipe will be inspected over a 3-year period. The prioritization for the inspection will be based on risk rating with respect to:
    - Operating pressure
    - Diameter
    - Age
    - Land-use
    - Operational criticality/consequence of failure

- Repair history
- Date last inspected

2.3. Conclusions

Although the water loss reduction plan was implemented fairly recently, MDWASD has made considerable progress in initiating the implementation of the recommendations therein. In these early stages, MDWASD is focused on better quantifying the nature and extent of water losses, which will allow it to strategically target and reduce water losses in the future. Current and additional strategies to reduce water losses that are recommended or underway are described in Section 5 of this report.

3. IWA/AWWA Water Audits

This Section presents the annual IWA/AWWA water audits required by Limiting Condition 49 of the recently revised South Florida Water Management District (SFWMD) Water Use Permit (WUP).

3.1. IWA/AWWA Water Loss Audit Context

IWA/AWWA water loss audit methodology was developed as a worldwide standard for water loss accounting to provide industry-standard benchmarks and allow for comparisons of water losses across different utilities. This methodology is considered to be a best management practice for controlling water loss.

In 2007, as part of the non-revenue water (NRW) ("unaccounted-for water") loss reduction program, MDWASD conducted water loss audits using the IWA/AWWA methodology. As part of its ongoing water loss reduction plan, MDWASD has conducted "top down" IWA/AWWA water audits as a way to benchmark the effectiveness of its program over time. A top-down approach to a water loss audit relies on gathering data from records, procedures, and other information systems for which data is readily available. The top-down method can provide a preliminary assessment of water loss. The top-down audit also helps to identify components that require further validation. Ultimately, the water auditor can better validate and improve the accuracy of the water audit when it is augmented by component analysis, bottom-up field measurements, or both.

According to planned revisions to AWWA M-36, "it is recommended that water utilities, state agencies and drinking water stakeholders avoid use of the imprecise term 'unaccounted-for' water" This is because, in a properly-conducted water audit, all losses are accounted for. In the IWA/AWWA water audit, all losses are accounted for using standard, rational terms and definitions, which are presented in Table 3-1 below.

Water losses (apparent or real) occurring in a distribution system (leakage, water theft, and/or meter inaccuracy) result in a potential loss of revenue to the water utility. The higher the NRW, the more economically inefficient the water utility. The goal of the water audit using the "top-down" approach is to determine the difference between the total quantity of water produced and the amount of water billed. The difference is called NRW, previously labeled as "lost and unaccounted-for" water. A successful water audit accounts for all water losses. Therefore, there is no "unaccounted-for" water. A water audit provides the utility with detailed information about the distribution system and water users, leading towards better management of resources and, hence, an improved reliability.

Table 3-1: Components and Definitions of IWA/AWWA Water Balance

Water Balance Component	Definition
System Input Volume	The annual volume input (finished water) to the water supply system.
Authorized Consumption	The annual volume of metered and/or unmetered water taken by registered customers, the water supplier and others who are authorized to do so.
Water Losses	The difference between System Input Volume and Authorized Consumption, consisting of Apparent Losses plus Real Losses.
Apparent Losses	Includes Unauthorized Consumption, all types of customer metering inaccuracies, and data handling errors.
Real Losses	The annual volumes lost through all types of leaks, breaks and overflows on mains, service reservoirs and service connections, up to the point of customer metering.
Revenue Water (or Billed Authorized Consumption)	Those components of System Input Volume which are billed and produce revenue.
Non-Revenue Water (NRW)	The difference between System Input Volume and Billed Authorized Consumption.

Source: Draft of AWWA M36 Proposed Revisions

With the help of a water audit, the amount of various types of losses can be determined or at least reasonably estimated, and the amount of revenue lost and energy costs wasted due to water loss can be calculated. Figure 3-1 below summarizes the "Best Practice" standard water balance categories, based on the above definitions, calculated in the IWA/AWWA water loss audit. The performance indicators give a reliable assessment of water loss standing from operational, financial, and water resources management perspectives. They are effective in evaluating current standing, benchmarking with other utilities and for preliminary loss reduction target setting.

One of the performance indicators for the distribution system calculated by the IWA/AWWA Water Audit Software is the Infrastructure Leakage Index (ILI). The ILI is calculated by dividing the Calculated Average Real Losses in the distribution system by the Unavoidable Annual Real Losses (UARL). The ILI value is a sound operational benchmark for control of real water loss.

UARL is "a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied," according to the definition provided by the Version 3.0 Water Audit Software published by the AWWA Water Loss Control Committee. The UARL estimates measured frequencies, flow rates and durations of background losses, reported leaks, and unreported leaks, as well as the relationship between pressure and leakage. An equation (also provided by the Water Audit Software) to estimate this value has been developed based on the length of mains in the distribution system (Lm), number of service connections (Nc), length of private pipe (i.e. service lines) (Lp), and distribution system operating pressure (P) in a system:

$$UARL\,(\text{gal/day}) = (5.41 * Lm + 0.15 * Nc + 7.51 * Lp) * P$$

Figure 3-1: The IWA "Best Practice" Standard Water Audit

<table>
<tr><td rowspan="10">Water From Own Sources

Water Imported</td><td>Water Exported</td><td colspan="3">Billed Water Exported</td><td rowspan="2">Revenue Water</td></tr>
<tr><td rowspan="9">Water Supplied to the Retail Customers</td><td rowspan="2">Authorized Consumption</td><td>Billed Authorized Consumption</td><td>Billed Metered Consumption (Including Water Exported)</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Unmetered Consumption</td><td rowspan="7">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Metered Consumption</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflow at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections</td></tr>
</table>

The UARL is used as a benchmark to which a utility's actual real losses can be compared year-over-year, or which can be used to compare one utility's performance to another. As described above, the ratio between a utility's current real losses and the UARL is the ILI. The initial target value or range for the ILI is often established as a preliminary benchmark in the early stages of a water audit, and the target is refined as the leakage management program moves forward. The selection of ILI target ranges is generally selected based on water resources, operational, and financial considerations. ILI target ranges are generally 1.0-3.0, 3.0-5.0, and 5.0-8.0 as described in Table 3-2. Generally, estimates of the ILI become more accurate as more and better data become available. Another feature of the ILI is that it allows for comparison between different utilities.

As an initial target, one of MDWASD's internal goals is to reduce the ILI to below 3.0. In the early stages of a utility's water loss reduction program, changes in the ILI year-over-year may be significantly affected by changes in the type and quality of data collected as the program becomes established.

Table 3-2: Guidance on Target Infrastructure Leakage Index (ILI)

Target ILI Range	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 – 3.0	Available resources are very limited and/or environmentally unsound to develop	Leakage above this level requires expansion to existing infrastructure and/or new water resources	Water resources are costly to develop or purchase; ability to raise revenue(rates) is limited
3.0 – 5.0	It is believed that sufficient water resources are available for long term needs, using good leakage control	Existing water supply infrastructure capability is sufficient to meet long-term demand, with good leakage control	Water Resources can be developed or purchased at reasonable expense; rates can be increased
5.0 – 8.0	Water resources are plentiful, reliable and easily extracted	Superior reliability capacity and integrity of infrastructure	Low water purchase cost; customer affordability is not an issue

3.2. IWA/AWWA Water Loss Audit Data and Implementation

Calendar Year 2010 IWA/AWWA water loss audits were conducted using standardized software available through the AWWA. Data was collected from sources relevant to the calendar year being audited and entered into the IWA/AWWA water audit software as described in Table 3-3.

Average retail unit costs and average unit cost of water production were estimated in a manner consistent with Sections 4.5.2 and 4.5.3 of the 2007 Water Loss Reduction Plan report, except that costs were estimated on a fiscal year basis and not a calendar year basis. The calculation of these costs based on fiscal year data greatly simplified the analysis, and did not affect the estimation of the volume of water estimated to be lost through leakage.

The major difference between the data used for the 2005 audit and the data used for the subsequent audits was the distribution system pressure. In the 2005 audit, the distribution system pressure was estimated based on a single value provided by MDWASD (55 psi). For the 2006 to 2009 audits, pressure data at four points spaced throughout the distribution system were provided for the first quarter of 2008; these data were averaged and used as the average distribution system pressure for the 2006 to 2009 audits (52 psi). The UARL, which serves as the denominator for the ILI, is sensitive to average distribution system pressure.

Table 3-3 IWA/AWWA Water Loss Audit Input Data

Input Data	Definition/Source of the Data
Water Supplied	
Volume from own sources	Finished water produced by MDWASD's WTPs.
Master meter error adjustment	Estimate of MDWASD's finished water master meters innacuracy. CY 2009 accuracy testing results of the Alexander Orr WTP finished-water meters (3.25% innacuracy, 96.75% accuracy) were accounted for. Accuracy tests of the Hialeah/Preston WTP finished-water meters are pending and therefore were not accounted for.
Water imported	Finished water purchased by MDWASD from the City of North Miami Beach and Homestead.
Water exported	Finished water sold by MDWASD to its fouteen water wholesale customers.
Authorized Consumption	
Billed metered	MDWASD retail billed and metered water - including residential, commercial, industrial, and irrigation customers.
Billed unmetered consumption	MDWASD currently does not have billed unmetered consumption.
Unbilled metered consumption	Includes water supplied to MDWASD facilities and cleaning gravity mains (Obtained from MDWASD's UFW loss historical table).
Unbilled unmetered consumption	Includes Fire Dept water use and flushing (donations and distribution) obtained from MDWASD UFW loss historical tables.
Water Losses	
Unauthorized consumption	Includes unathorized water withdrawn from hydrants, illegal connections, bypasses to consumption meter or meter reading equipment tampering. Following AWWA recommendations, the overall retail unauthorized consumption was estimated as 0.25% of the volume from own sources. A suspected unmetered connection with one of WASD's wholesale customers is suspected. An estimate of approximately 5 MGD was used, consistent with previous years' assumptions for such a connection.
Customer metering inaccuracies	Apparent water losses caused by collective under-registration of customer water meters. 4.5% was used as indicated by Water Meter Periodic Testing (PT) Program Evaluation that was performed by MDWASD in November 1995.
Systematic Data Handling Errors	Apparent water losses caused by systematic data handling errors in the meter reading and billing system. Assumed to be 2.5 % of the finished water produced and purchased.
System Data	
Length of mains	Includes length of all transmission and distribution mains. 5,774 miles provided from MDWASD GIS data. Enhancements to the GIS database have recently been completed that add pipe age, length, and diameter information. This information is summarized in Appendix C.
Number of active and inactive service connections	Includes number of service connections (by FY rather than CY)
Average length of customer service line	Length of customer service line between the Utility's service connection (curbstop) and the meter. Assumed to be 12 ft as indicated in the Unaccounted Water Loss Reduction Plan (Feb 2007)
Average operating pressure	63.5 psi average pressure estimate based on data collected from different zones.
Cost Data	
Total annual cost of operating system	Includes cost of water system operations, maintenance, repayment of capital bonds for infrastucture expansion or improvement, employee salarees or benefits, materials, equipment, insurance, fees, administrative costs and other costs to sustain drinking water supply (by FY rather than CY).
Customer Retail Unit Cost	Weighted average of individual costs and number of customer accounts in each class (by FY rather than CY). Calculated as annual retail revenue divided by annual retail sales volume.
Variable Production Cost	Estimated as total production cost of water (source of supply, power and pumping, and purification) divided by total volume of water supplied to the water distribution system including the imported water (by FY rather than CY).

For the 2010 water audit, significant improvements were made to the determination of system pressure. Over the course of 2010, system pressure was recorded hourly at 25 locations throughout the MDWASD distribution system. The spatial distribution of these sensors is not uniform; more sensors are located at the extremities of the system than near the plants or at some intermediate distance. This allows MDWASD to better monitor areas that are more likely to experience low pressure issues; however, it affects the way in which a representative average system pressure is calculated. Without any sort of correction, merely averaging the pressure data from all monitoring points would be expected to give a result that is lower than the actual average. To get a better representation of the system, the pressure recorders were placed into three groups based on their proximity in relation to the WTPs (at WTP, medium distance, and far ends). The pressures for each group were averaged, and then the averages were used to calculate an overall system average pressure for 2010. The average pressure for this year, 63.5 psi, is significantly greater than previous years' estimates of 52 psi. Also, the average pressure for the locations at the ends of the system this year was 58.0 psi, which is greater than the systemwide average pressure recorded previously. A map of the locations at which pressure was monitored, along with the year average pressure data, is presented in Appendix D.

In a system as large and complex as MDWASD's, with 5,774 miles of water mains and numerous water plants, booster stations, and storage structures, obtaining an accurate representative average system pressure requires a considerable modeling and analysis effort. While the water loss audits for the current year are an improvement over the previous year due to the use of additional data, it has been recommended that MDWASD conduct more detailed system analyses and modeling to further characterize this value and, if possible, select representative points in the system to simplify analysis for future years.

The water audit computational approach of this report can be summarized into two steps: (1) subtract authorized metered and unmetered consumption from the water supplied to estimate water losses, subsequently, and (2) subtract apparent losses such as unauthorized consumption, customer metering inaccuracies, and systematic data handling errors from the water losses to estimate real water losses.

The water audits in this report for CY 2010 have been refined relative to the past 2009 Annual Status Report water audits by introducing results obtained from water loss reduction plan tasks performed in 2010 as follows:

- Estimation of better system wide average pressure monitoring data, as described above.
- Enhanced GIS database with information on water main lengths, diameters, materials, and age. The updated water main length information was used in this year's report. MDWASD is currently enhancing its GIS database to include more information on its distribution system features (pipe lengths, diameters, materials, age in service, etc.). MDWASD is close to completing this action item.

- Accounting for the five Alexander Orr finished water venturi meters inaccuracies as an apparent water loss of approximately 3.25 percent out of the Alexander Orr finished water production (i.e. 96.75 percent average Alexander Orr finished water meter accuracy). In lieu of factory re-calibration, the venturi meters at the Alexander Orr plant are currently being replaced with new units.

- Accounting for a potential unmetered connection to one of MDWASD's wholesale users as an apparent water loss. The loss was estimated based on a previous calculation for a particular wholesale customer that was suspected of receiving approximately 25 percent of the water flow supplied through an unmetered connection. Based on historical records, this percent is estimated as the ratio between 1.9 billion gallons per year (5.2 mgd) of apparent water losses and 7.7 billion gallons per year of water sold to that customer in FY 2004. It is unknown whether or not this issue has been addressed, but in CY 2010 another wholesale user was suspected to have an unmetered connection based on a comparison of its water billing data with the amount of water supplied.

It should be noted that accuracy testing results for the four wholesale meters and thirteen commercial meters tested in previous years were not incorporated in this CY 2010 water audit because the number of wholesale and commercial meters tested do not provide sufficient statistical evidence to infer a conclusion. Testing of the remaining supply, wholesale, and commercial meters, which is currently deferred as described in the overall status report, will serve in the future to improve the accuracy of this "top-down" water loss audit.

3.3. IWA/AWWA Water Loss Audits Results

The results of the water loss audits are presented for CY 2010 in Appendix B. For reference, the IWA/AWWA water loss audits for years 2006 through 2009 are also included in Appendix B**.** A summary of selected key input parameters and output results are presented in Table 3-4. It is important to note that the accuracy of the water audits is affected by the accuracy of the supply and wholesale meters, the testing of which are currently deferred as described in the status report. Consequently, the results presented in Table 3-4 may be refined in the future as the results of meter accuracy testing become available.

The CY 2010 input parameters and results are compared against the past four year (2006 through 2009) results and are presented in Table 3-4 and Figure 3-2. The total retail water supplied (finished water supplied to retail customers) decreased 6.7 percent between 2006 and 2008. In 2009, water use increased to a level approximately halfway between 2006 and 2008 levels, and has remained relatively flat in 2010. However, the year-over-year real losses appear to have increased somewhat over time from 2007 through 2010. The rate of increase appears to be higher between 2007 through 2010 than it was between 2006 to 2007. This may be partially attributable to increased distribution system pressure, particularly in 2010. Retail real water losses have increased from 18.0 percent (of the total retail water supplied) in 2006 to 23.4 percent in 2010 while non-revenue water losses have increased from 27.8 percent in 2006 to 32.8 percent in 2010.

The increase in both real losses and overall non-revenue water indicate that the water savings targets presented in Tables 1-1 and 1-2 were not met in 2010.

Two factors that most likely contributed to the real losses in 2010 include the increase in system pressure and large diameter main breaks. As was mentioned above, the pressures measured at the ends of the system in 2010 are similar to those measured systemwide in previous years. Increased pressures would increase loss through existing leaks; however, the higher pressures are desirable from a consumer standpoint. MDWASD plans to conduct a pressure management pilot study in certain areas of the system to help it further refine the balance between maximizing level of service while minimizing leakage. 2010 has been a challenging year from an infrastructure perspective, with failures of large-diameter water transmission mains occurring. The failure of the large-diameter mains resulted in a significant quantity of potable water loss.

Between 2006 and 2010, the ILI has varied between 8.9 and 10.8. The value for 2010, 9.2, is towards the lower end of this range, and an improvement over the 2009 value of 10.8. Part of the reason for the decrease in ILI between 2009 and 2010 may be due to both an increase in overall system pressure and the availability of more refined pressure data, which allowed for a more accurate average pressure to be calculated, as well as other improvements made by MDWASD. ILI is a function of several factors, including distribution system pressure and real losses. A year-over-year decrease in ILI, coupled with an increase in real losses, could be caused by two different scenarios. One possibility is that water loss reduction activities in 2010 offset the amount of additional losses that would have been expected from the increase in pressure. The other possibility is that pressures in the previous year were underestimated (due to less data being available at the time), leading to an over-estimation of ILI in the previous year.

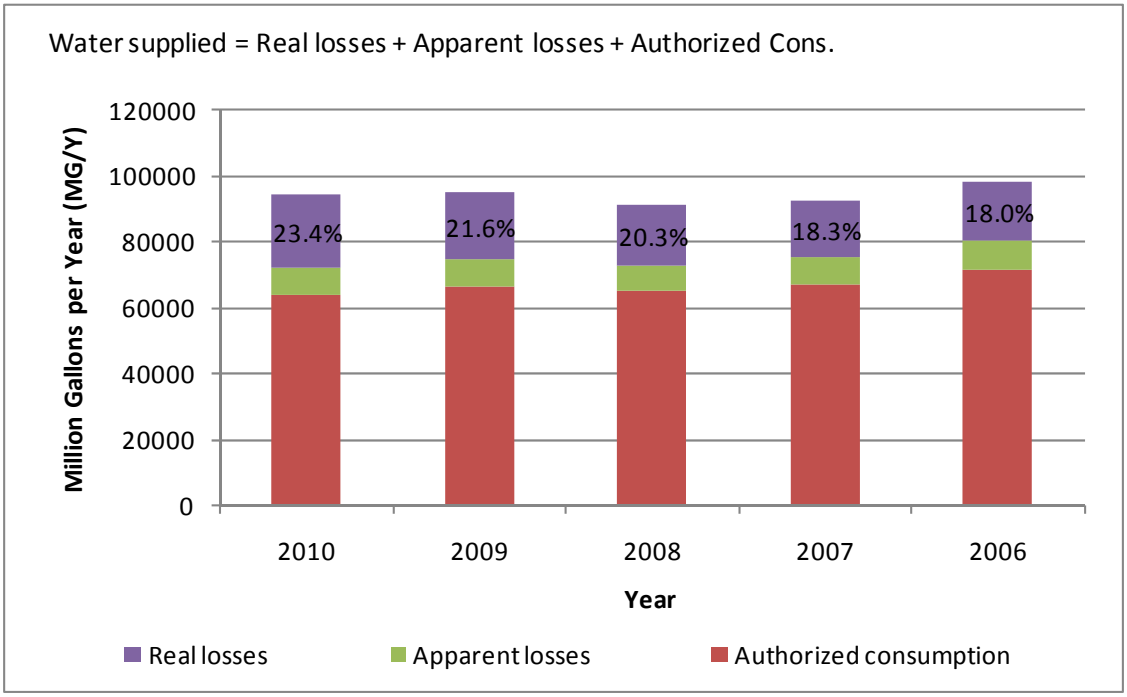
Table 3-4: IWA/AWWA Water Audit Key Input Parameters and Output Results

Retail Parameters	2010	2009	2008	2007	2006
Water Supplied (MG/Y)	94,552	94,950	91,515	92,240	98,115
Authorized consumption (MG/Y)	63,875	66,181	65,274	67,062	71,538
Apparent losses (MG/Y)	8,502	8,271	7,623	8,307	8,883
Real losses (MG/Y)	22,144	20,498	18,618	16,872	17,694
Water losses (apparent plus real)	30,647	28,769	26,241	25,179	26,577
Non-revenue water (MG/Y)	30,971	29,007	26,513	25,747	27,266
Performance indicators	**2010**	**2009**	**2008**	**2007**	**2006**
Infrastructure Leakage Index (ILI)	9.2	10.8	9.8	8.9	9.4
Real water loss percentage	23.4%	21.6%	20.3%	18.3%	18.0%
Non-revenue water percentage	32.8%	30.6%	29.0%	27.9%	27.8%

In 2008, increases in the ILI were thought to be due to two large (48-inch) main breaks that occurred in the final quarter of that year. MDWASD staff report that major, ground-breaking

leaks are relatively rare, so the occurrence of these leaks caused a disproportionate amount of real water loss, which increased the ILI for 2008. In 2009, the pressure used for the water audit was based on data that had been collected previously in 2008. The actual average system pressure may have been higher, which would cause the ILI to be overestimated for that year. More investigation would be needed to identify other potential causes of increased ILI.

Figure 3-2: IWA/AWWA Water Audit Results



One more potential factor affecting the ILI's representation of actual system conditions is that the inaccuracies of the plant finished water and wholesale meters have not yet been fully quantified, although the testing and replacement program is underway as described in the status report. Quantification of, and accounting for, inaccuracies in supply and wholesale meters is critical to obtaining a meaningful ILI. ILI is very sensitive to supply meter inaccuracies – for example, if the finished water and wholesale customers under-registered (or over-registered) by an average of approximately 5 percent, the ILI would reduce (or increase) by approximately 33 percent. This difference is enough to move a utility into a higher or lower ILI range that is not truly representative of its performance.

Increases in ILI and real losses from 2006 to 2010, while possibly indicative of an issue and worthy of additional investigation, must be interpreted in the context of the available data, the additional quantification of supply/wholesale meter accuracy and average system pressures that remains to be accomplished, and the fact that the final quarter of 2010 has not yet been audited and therefore all water sales may not yet be accounted for. Also, MDWASD experienced breaks in large-diameter water mains in 2010.

Although the unaccounted-for water loss reduction plan was implemented fairly recently, MDWASD has made considerable progress initiating the implementation of the recommendations therein. In these early stages, MDWASD is focused on better quantifying the nature and extent of water losses, which will allow it to strategically target and reduce water losses in the future. Current and additional strategies to reduce water losses that are recommended or underway are described in a later section of this report.

4. SFWMD Water Treatment Plant Audit

The purpose of this section is to meet the requirements of Limiting Condition 49 of the Water Use Permit (WUP) by comparing metered raw water well flows, metered raw water influent, and finished water effluent at MDWASD's three main water treatment plants (WTPs). WTP audits for the South Dade treatment facilities are not part of this report.

4.1. Introduction

The majority of MDWASD's service area is supplied by three water treatment plants: (1) Alexander Orr, Jr. (Orr) WTP, (2) John E. Preston (Preston) WTP, and (3) Hialeah WTP.

All three WTPs treat raw water from Biscayne aquifer wellfields. Table 4-1 presents the list of wellfields that supply the three WTPs. The raw water transmission mains from the wellfields that supply Hialeah and Preston WTPs are interconnected such that any of the wellfields can supply either or both WTPs. Wellfields supplying the Hialeah/Preston plants are not interconnected with those that supply the Orr plant. Raw water flows are metered individually by well meters at the wellfield and metered in aggregate by inflow meters at each water treatment plant.

Table 4-1: Biscayne Aquifer Wellfields that Supply MDWASD's Major WTPs

Well Field	Number of Raw Water Wells
Hialeah/Preston WTPs	
Hialeah Wellfield	3
John E. Preston Wellfield	7
Miami Springs Wellfield	20
Medley Wellfield	4
Northwest Wellfield	15
Orr WTP	
Alexander Orr Wellfield	10
Snapper Creek Wellfield	4
Southwest Wellfield	17
West Wellfield	3
Total Number of Wells	**83**

Source: MDWASD staff

In addition to the wellfields listed in Table 4-1, MDWASD also draws water from five wellfields that supply the South Dade water treatment facilities, which account for approximately 10 percent of the raw water supply. A total number of 95 raw water wells (including the South Dade treatment facilities) supply the MDWASD's WTPs.

MDWASD's three major WTPs use an enhanced lime softening treatment process in which water is treated with lime (to remove hardness) and activated silica (a flocculant aid). At the Hialeah/Preston WTPs ferric sulfate is also added to enhance the removal of color and natural organic matter. The Hialeah/Preston WTPs are interconnected prior to the high service distribution pumping system and essentially function as a single plant. Waste solids from the softening process are either recycled through a recalcination process that converts the calcium carbonate solids back to lime, or disposed of in sludge lagoons. Prior to disposal, solids are thickened/dewatered and the water recovered from the thickening process is returned to the head of the plant. Remaining moisture in the solids prior to disposal or recycling represents the net water loss in the solids handling process.

Typically, the "real" water loss in a conventional treatment process is approximately 3 to 5 percent of raw water supplied. As mentioned above, solids produced by MDWASD plants are either recycled or pumped into a lagoon. Prior to recalcination, some of the water is extracted from the solids via centrifugation and returned to the treatment process. Water vaporized during the heating of the solids during recalcination is not recovered. Additionally, solids that are not recalcinated are pumped in a slurry (2 to 4 percent solids) to large lagoons, where excess water either percolates back into the Biscayne aquifer or evaporates. Small amounts of water are also used (lost) for monitoring plant performance. Water may also be lost via undetected leaks in water treatment plant structures and piping.

In addition to real losses, apparent water loss may also occur as a result of errors in the individual well meters, raw water supply Venturi meters, and finished water effluent meter readings. Metered raw water flows and finished water flows for the plants are analyzed in the following sub-sections to quantify the overall water losses at the Orr and Hialeah/Preston WTPs.

4.2. Relevant Investigations in 2009

Two relevant investigations pertaining to the water accounting and meter accuracy of the raw water wellhead meters and the raw water and finished water Venturi meters at the plant were completed in 2009 and documented in the following reports:

1. Supply Meter Inspection and Testing Report completed by Malcolm Pirnie, Inc. in August 2009.

2. Water Use Accounting Update Report on Limiting Condition 48 completed by CDM in September 2009.

The following findings, originally presented in the 2009 Annual Status Report, are presented again below because of their relevance to this year's report:

1. Raw water influent meters (four total) at the Alexander Orr WTP were tested using a Pitot tube in March 2009. The extended test results indicated that the three oldest raw water influent Venturi meters (#1 48-inch meter, #2 54-inch meter, and #3 72-inch meter) could over register typical flow conditions by 6 percent. On the other hand, the fourth 72-inch raw water influent Venturi meter had better accuracy with less than 0.5 percent over registration. Given the flow distribution across the meters during the extended test, the combined raw water influent Venturi meter accuracy at the Orr WTP was 103.2 percent (3.2 percent over registration).

2. Over a 3-month period (April 2009 through June 2009), the cumulative total of all well flows were on average 17.2 percent less than the raw water influent meter readings at the Alexander Orr WTP (adjusted for no SCADA data based on daily pump run hours). Similarly, the cumulative total of raw water well meter readings were on average 15.2 percent less than the raw water influent meter readings at the Hialeah/Preston WTP. That is, at both Preston/Hialeah and Orr plants, it appears that more water is arriving than is being pumped from the wells. In reality, it is far more likely that this represents a meter accuracy issue rather than a physical gain of water between the wells and the plants. At the Orr plant, the apparent gain in water is significantly greater than the known error in the raw water venturi measurements. Because both the individual well flow meters and the plant venturi meters have some inherent error, differences in the summed wellfield total and the raw water venturis would be expected; however, the magnitude of the difference observed indicates there may be arrangement/accuracy issues that need to be addressed.

3. Finished water effluent meters (five total) at the Alexander Orr WTP were tested using a Pitot tube in March 2009. The extended test results indicated that three of the finished water effluent Venturi meters (#1 48-inch meter, #2 60-inch meter, and #4 72-inch meter) were collectively under-registering 6.44 percent while the other two finished water effluent Venturi meters (#3 72-inch and #5 72-inch) were collectively over-registering 3.5 percent. Given the flow distribution across the meters during the extended test, the combined finished water effluent Venturi meter accuracy at the Orr WTP was 97.6 percent (2.4 percent under-registration).

4. Based on raw water influent and finished water effluent metered flows (April – June 2009) at the Alexander Orr WTP, in-plant water losses are approximately 10 percent. However, because raw water influent Venturi meters are over-registering 3.2 percent and finished water effluent Venturi meters are under-registering 2.4 percent (See two previous items), "apparent" in-plant water losses of approximately 5.6 percent can be anticipated to be miscounted in the difference of raw water and finished water metered

flows. Therefore, after adjusting for "apparent" losses, in-plant real water losses are approximately 4.4 percent, which are within the real water loss range anticipated for a lime softening treatment process.

5. Raw water influent meters (two total) and finished water effluent meters (three total) at the Hialeah/Preston WTP are not currently testable and most have constrained meter settings for setting up test taps.

6. Based on raw water and finished water metered flows (April – June 2009) at the Hialeah/Preston WTP, in-plant water losses are approximately 6 percent.

7. Raw water flow through the booster pump station installed in 2004 at the John E. Preston WTP is not currently counted in the Monthly Operating Reports (MORs). MORs from 2004 to present only account for the raw water being recorded through the raw water Venturi meters. After adjusting for the booster pump raw water flows, the Hialeah/Preston in-plant water losses are approximately 11 percent.

4.3. Relevant Investigations in 2010

Significant efforts are being made by MDWASD to assess the accuracy of influent and effluent flow meters at the Orr, Hialeah, and Preston WTPs. At the Orr WTP, accuracy testing results indicated that the influent venturi meters are over-registering flow by approximately 3.2 percent, while the effluent venturi meters are over-registering by approximately 2.4 percent. MDWASD has taken action to address these inaccuracies in 2010 by assessing the possibility of recalibrating the meters in a laboratory versus replacement of the meters, and has elected to replace the flow meters. Replacement of the meters is currently underway and is anticipated to be completed in CY 2012. Influent and effluent meters in the Hialeah/Preston plant have remained unable to be tested due to physical constraints that constrain MDWASD's ability to test them.

4.4. Raw Water Flows Metered at Wells vs. WTP Venturi Meters

Tables 4-2 and 4-3 compare (a) the raw water flows metered at the wellfields and (b) the raw water influent flow metered at the WTPs. Individual flow meters on MDWASD's raw water wells were installed in 2008 and since then MDWASD has reported monthly raw water well flows based on data generated by these meters. In the tables, positive values indicate net decreases (quantity loss) in water flow, while negative values indicate net increases (quantity gains). This convention was selected because water loss is expected to occur, rather than "apparent" water gain, in a pressurized pipeline. Negative losses in Tables 4-2 and 4-3 indicate "apparent" water gains that may be due to raw water well meter under-registration.

Table 4-2: Hialeah/Preston Raw Water Flows from Wells vs. WTP Venturi Meters

Month	Sum of Individual Well Flows (MG)	Raw Water Plant Venturi Flows (MG)	Volume Difference (MG)	Percent Difference
Jan-10	4018.1	4726.5	-708.3	-15.0%
Feb-10	3521.4	4063.5	-542.1	-13.3%
Mar-10	3813.4	4512.4	-699.0	-15.5%
Apr-10	3714.2	4340.7	-626.5	-14.4%
May-10	3946.3	4668.3	-722.0	-15.5%
Jun-10	3613.1	4207.6	-594.5	-14.1%
Jul-10	3777.6	4374.2	-596.6	-13.6%
Aug-10	3648.4	4330.3	-681.9	-15.7%
Sep-10	3449.4	4099.9	-650.5	-15.9%
Oct-10	3788.2	4473.7	-685.5	-15.3%
Nov-10	3472.5	4135.6	-663.2	-16.0%
Dec-10	3503.2	4193.1	-689.9	-16.5%
Average	*3688.8*	*4343.8*	*-655.0*	*-15.1%*

Source: Monthly totalized well and plant meter flows for CY 2010

Table 4-3: Orr WTP Raw Water Flows from Wells vs. WTP Venturi Meters

Month	Sum of Individual Well Flows (MG)	Raw Water Plant Venturi Flows (MG)	Volume Difference (MG)	Percent Difference	Corrected Volume Difference (MG)*	Corrected Percent Difference*
Jan-10	4342.7	4749.4	-563.8	-11.5%	-406.8	-8.6%
Feb-10	4159.5	4613.1	-606.2	-12.7%	-453.6	-9.8%
Mar-10	4524.1	4939.4	-578.6	-11.3%	-415.3	-8.4%
Apr-10	4534.5	4914.5	-542.5	-10.7%	-380.0	-7.7%
May-10	4717.0	5079.4	-530.3	-10.1%	-362.4	-7.1%
Jun-10	4896.1	5320.0	-599.7	-10.9%	-423.8	-8.0%
Jul-10	4998.1	5595.4	-782.3	-13.5%	-597.4	-10.7%
Aug-10	4870.0	5523.9	-836.5	-14.7%	-653.9	-11.8%
Sep-10	4627.5	5351.6	-901.0	-16.3%	-724.1	-13.5%
Oct-10	4624.1	5406.0	-933.6	-16.7%	-754.9	-14.0%
Nov-10	4671.7	5382.4	-888.7	-16.0%	-710.8	-13.2%
Dec-10	4724.8	5664.2	-1126.6	-19.3%	-939.3	-16.6%
Average	*4643.1*	*5383.9*	*-740.8*	-13.6%	*-568.5*	*-10.8%*

Source: Monthly totalized well and plant meter flows for CY 2010.

** Includes known raw venturi over-registration of 3.2 percent and finished water under-registration of 2.4 percent*

In 2010, the combined sum of the raw water well meter readings were on average 15.1 percent less than the raw water influent meter readings at the Hialeah/Preston WTP. That is, more water appears to have entered the plant than was pumped by the wells, which is unlikely to have actually occurred. This is greater than the 2009 results (presented in the 2009 Annual Status Report), which showed 7.4 percent difference. However, according to MDWASD, it is consistent with the result presented on page 4-3 of the 2009 Water Use Accounting Update Report (15.2 percent gain, uncorrected basis). The 2009 Annual Status Report also indicated that there is a raw water booster pump station at the Preston WTP whose flow is not accounted for at the Venturi meters. It is recommended that MDWASD take actions to remedy this, which will allow for more accurate estimates of the raw and finished water losses to be estimated for subsequent years.

In 2010, raw water well meter readings were on average 13.6 percent less (or 10.8 percent less, taking into account the known raw water venturi meter inaccuracy) than the raw water influent meter readings at the Alexander Orr WTP. This is an improvement over both the result reported in the 2009 Annual Status Report (22 percent gain) and the 2009 Water Use Accounting Update Report (17.2 percent gain). However, the difference between the combined well flows and the raw water venturi meters still need to be further investigated.

According to AWWA Manual M33, a typical range of error for an ultrasonic-type flow meter is ±2.5 percent. An estimation of the maximum amount of the water "gain" that can be attributed to meter error can be made by assuming all the well flow meters are under-registering to the limit of their stated tolerance, and adding that to the known average over-registration of the plant's raw water venturi meters. At the Orr plant, the raw water meters are known to over-register by 3.2 percent, on average. Assuming all well flow meters are under-registering by the maximum value allowed (2.5 percent), the maximum difference that would be expected between the meters at the wells and the meters at the plant would be approximately 5.7 percent. Since the observed difference at the Orr plant was approximately 13.6 percent for 2010, this indicates that additional steps need to be taken to acquire accurate well flow measurements.

In general, the raw water discrepancies between the wellfield flow meters and the plant flow meters have been reduced at the Orr plant. At the Hialeah/Preston plant, the losses have stayed the same compared to the 2009 Water Use Accounting Update Report, but increased compared to the data presented in last year's version of this report.

MDWASD plans to investigate, and where possible, improve the calibration, selection, and/or configuration of the raw water well meters. Due to the large number of raw water well meters (one at each of 95 wells) and the configuration of the wellfield piping, the testing and calibration process is very time-intensive and labor-intensive.

4.5. WTP Metered Inflows vs. Outflows

Hialeah/Preston and Alexander Orr WTPs influent and effluent flows are Venturi metered. Tables 4-4 and 4-5 compare raw water and finished water flows at the Hialeah/Preston and Alexander Orr WTPs, respectively.

The water losses at the Hialeah/Preston plant averaged 7.7 percent in 2010. This is an increase compared to the 2009 value of approximately 6 to 7 percent. It is also higher than the six percent losses observed, according to MDWASD, in the 2009 Water Use Accounting Update Report (measured April-June). The losses in the last three months of 2010 in particular appeared to average around two percent higher than previous months. The causes of this increase should be investigated and eliminated, if possible. These calculations do not include an adjustment for meter accuracy, for reasons discussed previously. Also, they do not include the effect of the raw water booster pump station discussed in the 2009 Water Use Accounting Update Report.

The water losses at the Alexander Orr plant were 6.4 percent before taking into account known inaccuracies in the raw and finished water venturi meters, and less than one percent after correction. This is an improvement over the previous year's estimates of approximately 10 percent on a corrected basis, and approximately 4.4 percent after correction. Replacement of the Orr plant flow meters will be done over the next two years, according to MDWASD, and will help to further enhance the accuracy of water loss measurements at this facility.

Table 4-4: Hialeah/Preston WTPs Raw Water and Finished Water Flows

Month	Raw Water Flows (MG)	Finished Water Flows (MG)	Volume Difference (MG)	Percent Difference
Jan-10	4726.5	4413.8	312.6	7.1%
Feb-10	4063.5	3776.7	286.8	7.6%
Mar-10	4512.4	4201.1	311.3	7.4%
Apr-10	4340.7	4037.6	303.1	7.5%
May-10	4668.3	4373.1	295.1	6.7%
Jun-10	4207.6	3913.1	294.5	7.5%
Jul-10	4374.2	4095.9	278.3	6.8%
Aug-10	4330.3	4050.1	280.1	6.9%
Sep-10	4099.9	3825.5	274.4	7.2%
Oct-10	4473.7	4091.2	382.5	9.3%
Nov-10	4135.6	3785.3	350.4	9.3%
Dec-10	4193.1	3829.2	363.9	9.5%
Average	*4343.8*	*4032.7*	*311.1*	*7.7%*

Source: Monthly totalized well and plant meter flows for CY 2010

Table 4-5: Orr WTP Raw Water and Finished Water Flows

Month	Raw Water Flows (MG)	Finished Water Flows (MG)	Volume Difference (MG)	Percent Difference	Corrected Volume Difference (MG)*	Corrected Percent Difference*
Jan-10	4906.4	4613.5	293.0	6.4%	25.2	0.5%
Feb-10	4765.7	4555.4	210.2	4.6%	-51.6	-1.1%
Mar-10	5102.7	4829.1	273.6	5.7%	-5.6	-0.1%
Apr-10	5077.0	4760.7	316.3	6.6%	39.6	0.8%
May-10	5247.3	4921.0	326.3	6.6%	40.3	0.8%
Jun-10	5495.8	5144.4	351.5	6.8%	52.1	1.0%
Jul-10	5780.4	5412.7	367.7	6.8%	52.8	1.0%
Aug-10	5706.5	5426.6	279.9	5.2%	-32.9	-0.6%
Sep-10	5528.5	5260.4	268.2	5.1%	-35.0	-0.6%
Oct-10	5584.7	5186.2	398.5	7.7%	95.4	1.8%
Nov-10	5560.4	5146.7	413.7	8.0%	112.2	2.1%
Dec-10	5851.4	5479.9	371.5	6.8%	52.7	0.9%
Average	*5383.9*	*5061.4*	*322.5*	*6.4%*	*28.8*	*0.5%*

Source: Monthly totalized well and plant meter flows for CY 2010.

** Includes known raw venturi over-registration of 3.2 percent and finished water under-registration of 2.4 percent*

Although large quantities of water are used in the process for backwashing filters, feeding chemicals, etc., the great majority of this water is recycled back into the treatment process. Since all large process recycle streams occur internal to the plant – that is, downstream of the raw water influent meters and upstream of the finished water effluent meters – recycling these flows does not result in any amount of water being counted twice by plant meters.

4.6. Recommendations

Because the results of these water treatment plant audits are generally consistent with the findings of the past year (2009) investigations, their recommendations (which still apply) are summarized below with others derived in this Section:

- Identify and remedy the cause of the apparent increases of treatment losses at the Hialeah/Preston plants that appears to have occurred in the final quarter of 2010.

- While raw water well meters can provide useful data from an operational and well maintenance standpoint, well meter data should not be used to represent water withdrawals. Instead, raw water flows metered by influent Venturi meters at the WTPs may be used as proxy figures of water withdrawal and adjusted by adding an estimate of raw water transmission losses (steps should be taken to quantify, where practical).

- Correcting the raw water influent and finished water effluent Venturi meter inaccuracies at the Alexander Orr WTP would eliminate (or reduce) the 5.6-percent "apparent" water losses miscounted in the current "in-plant" water loss estimates. According to MDWASD staff, the meters will be replaced over the next two years.

- Because major hurdles to testing the accuracy of the Venturi meters at the Hialeah/Preston WTPs exist, MDWASD may consider alternative strategies that can be feasibly developed and implemented.

5. Water Loss Reduction Activities Status and Action Items

MDWASD has made progress in initiating the implementation of the recommendations of the 2007 Water Loss Reduction Plan. Currently, MDWASD is focused on better quantifying the nature and extent of water losses, which will allow it to strategically target and reduce water losses in the future. Current and additional strategies of MDWASD to reduce water losses are described in this Section.

Table 5-1 lists the action items to be implemented or developed under Exhibits 17A and 17B of the revised WUP, as listed in Tables 1-1 and 1-2, along with additional activities undertaken by MDWASD. The table describes the current status and provides recommended follow-up activities for each of the action items.

MIAMI-DADE WATER AND SEWER DEPARTMENT
Table 5-1 STATUS OF WATER LOSS REDUCTION ACTIVITIES (Based on Exhibits 17A and 17B of WUP)

Line Item	Activity No.	Action Item	Status	Recommended Follow-Up Activities
1	5.3.1	*System Design*	Completed	None
2	5.3.2.3	*Asset Maintenance or Replacement* MDWASD initiated efforts to evaluate and improve the distribution pipe replacements.	In 2010, MDWASD performed an 'Economic Analyses of Leak Detection Program and Pipe Replacement' study, which evaluated historical trends to establish an adaptive strategy for pipe replacement and leak detection programs based on statistical analysis of leak incidences, investments, and economic levels of return. The study proposed a modified approach to align system betterment investments with economic impact assessment of leak incidences. MDWASD is currently updating distribution system data base with pipe age and pipe material to better correlate pipe breaks with pipe rehabilitation/replacement efforts.	- Implement the modified approach for leak detection and pipe replacement as recommended by the study. - While collecting leak detection data, record the information that integrates the interconnectivity of the system and the relation to other sets of data, such as underground pipe material, size, age, and environment (i.e. soil type, soil corrosivity, etc.) that can help document the basis for pipe failure/causes of leak.
3	5.3.2.4	*Reduce Maintenance Response times* MDWASD initiated efforts to reduce the time it takes for its maintenance crews to respond to leaks and to improve the speed and quality of its repairs.	MDWASD has increased the sensitivity of its leak detection program by reducing the distance between noise loggers and reducing the length of main surveyed at one time by leak detection crews, thereby reducing leak duration by reducing the time between leak initiation and detection. MDWASD is also in the process of incorporating leak detection data into the Maintenance Management System (MMS) to keep track of leak response time and inventory repairs (i.e. new and repatches).	Perform a sample leak program, similar to that conducted in the Fall of 2008, every 2 years as a way to gauge the overall field effectiveness of the in-house program and provide oversight.
4	5.3.2.5	*Active Leakage Control and Sounding* MDWASD initiated an active leakage control and sounding program, including both unmanned (noise logger) and manned leak surveys.	MDWASD has increased the sensitivity of its leak detection program by reducing the distance between noise loggers and reducing the length of main surveyed at one time by leak detection crews, thereby reducing leak duration by reducing the time between leak initiation and detection. In 2010, MDWASD performed an 'Economic Analyses of Leak Detection Program and Pipe Replacement' study, which evaluated historical trends to establish an adaptive strategy for pipe replacement and leak detection programs based on statistical analysis of leak incidences, investments, and economic levels of return. The study proposed a modified approach to align system betterment investments with economic impact assessment of leak incidences. MDWASD is also in the process of incorporating leak detection data into the Maintenance Management System (MMS) to keep track of leak response time and inventory repairs (i.e. new and repatches).	- Implement the modified approach for leak detection and pipe replacement as recommended by the study. - Update the distribution system data base with pipe age and pipe material to better correlate pipe breaks with pipe rehabilitation/replacement efforts. - While collecting leak detection data, record the information that integrates the interconnectivity of the system and the relation to other sets of data, such as underground pipe material, size, age, and environment (i.e. soil type, soil corrosivity, etc.) that can help document the basis for pipe failure/causes of leak.
5	5.3.2.7	*Pressure Managment* As part of this, MDWASD plans to complete a Zone Management Pilot.	MDWASD is in the process of developing a pilot study for Pressure and Zone Management that will assess a strategy for timely reducing system-wide real water losses (and attendant non-revenue water) without compromising level of service.	Develop pilot study.

Line Item	Activity No.	Action Item	Status	Recommended Follow-Up Activities
6	5.3.2.8	*Speed and Quality of Repairs* MDWASD initiated efforts to improve the speed and quality of its repairs.	MDWASD has increased the sensitivity of its leak detection program by reducing the distance between noise loggers and reducing the length of main surveyed at one time by leak detection crews, thereby reducing leak duration by reducing the time between leak initiation and detection. In 2010, MDWASD performed an 'Economic Analyses of Leak Detection Program and Pipe Replacement' study, which evaluated historical trends to establish an adaptive strategy for pipe replacement and leak detection programs based on statistical analysis of leak incidences, investments, and economic levels of return. The study proposed a modified approach to align system betterment investments with economic impact assessment of leak incidences. MDWASD is also in the process of incorporating leak detection data into the Maintenance Management System (MMS) to keep track of leak response time and inventory repairs (i.e. new and repatches).	- Implement the modified approach for leak detection and pipe replacement as recommended by the study. - Update the distribution system data base with pipe age and pipe material to better correlate pipe breaks with pipe rehabilitation/replacement efforts. - While collecting leak detection data, record the information that integrates the interconnectivity of the system and the relation to other sets of data, such as underground pipe material, size, age, and environment (i.e. soil type, soil corrosivity, etc.) that can help document the basis for pipe failure/causes of leak.
7	-	*Perform Venturi Comparative Tests - WTPs* MDWASD is currently performing comparative accuracy testing on the combined raw and finished water meters at its water treatment plants.	Testing was conducted at the Alexander Orr Plant for four raw water Venturi Meters and five finished water meters. Replacment of Alexander Orr Venturi meters is currently underway and is anticipated to be completed by 2012. Testing for the raw and finished Venturi water meters at the Preston and Hialeah plants cannot be performed until test taps are installed. Unable to install test taps needed to validate the level of metering accuracy at the Preston/Hialeah plants due to configuration issues.	- Further assess feasibility of achieving testing goals and devise an alternate approach. - Identify any capital projects that may be required to support meter testing.
8	-	*Perform Venturi Comparative Tests - Wholesale Customers* MDWASD is currently performing comparative accuracy testing on its wholesale customer venturi, turbine, and positive displacement meters.	Venturi Meter Sites: In 2010, steps were taken to connect these meters to SCADA. However, the meter readings are unavaialable. Test tap installations that are required for accuracy testing are pending. Turbine Meter Sites: In 2010, these meters were all connected to the AMR system. Evaluation of other wholesale meters is pending upon installation of additional test taps.	Plan Capital Improvement Program required for testing inaccessible meters.
9	-	*Pilot Fixed Network AMR* MDWASD is currently expanding the AMR network.	MDWASD performed an Automated Meter Reading (AMR) Residential Pilot Program with fixed network Advanced Metering Infrastructure (AMI) systems from two manufacturers: Itron, Inc. and Sensus Metering Systems, Inc. As part of the pilot, 1,000 AMR meters were installed in MDWASD's service area. In 2010, MDWASD initiated expanding the AMR network with the installation of additional AMR meters from Sensus Metering Systems, Inc. To date, an additional 250 AMRs in the MDWASD service area and 4,000+ AMRs in the Miami Springs service area have been installed.	Continue to expand AMR network in the MDWASD service area.
10	-	*Enhance GIS Database* MDWASD is currently enhancing its GIS database.	MDWASD is currently enhancing its GIS database to include more information on its distribution system features (pipe lengths, diameters, materials, age in service, etc.). MDWASD is close to completing this action item.	Plan integrated use of expanded capabilities in asset management program.
11	6.3.1	*Reducing Unmetered Supplies* MDWASD initiated efforts to reduce unmetered water supplies.	Fire fighting and main flushing are the largest unmetered uses in MDWASD's system. Although not metered, main flushing volumes are estimated using industry-accepted protocol and are consistently recorded. Usage by fire departments is currently neither estimated nor recorded. In 2010, Fire Departments that receive water from MDWASD were identified and contacted to request their cooperation in developing a methodology to better account for their water usage.	- Conduct a meeting with the identified Fire Departments to evaluate their water usage. - Based on the feedback from the Fire Departments, develop a methodology for appropriately accounting for Fire Department water use.

Line Item	Activity No.	Action Item	Status	Recommended Follow-Up Activities
14	6.3.2	*Improved Meter Accuracy* *MDWASD is conducting field accuracy testing of commercial meters to begin improving meter accuracy.*	Turbine Meter Sites: Testing of 9 commercial customer sites where two different sized meters were used in a "compound" setting has been completed in the past and results are available in a report. Some commercial meter sites have proved to be challenging to test, not because of the sites, but because of circumstances such as Jackson Hospital's inability to shut down an entire line for testing purposes. In 2010, a dedicated testing site was installed to test 4-inch meters and compare them to the 4-inch by 2-inch compound meters. In 2011, two new technologies (ultra sound and electromagnetic meters) are being tested.	- Perform recurring testing of commercial meters to cover entire inventory over time. Determine testing frequency by meter configuration based on economical and statistical analyses of commercial meter samples. - Install test taps at locations that have been evaluated and inspected where displacement meters and turbine meters were being used in a compound setting.
15	6.3.3.2.1	*Compound Meter Usage Compared to Same Size Turbine Meters* MDWASD initiated efforts to compare compound meter usage to similarly-sized turbine meter settings.	MDWASD has obtained a few new style "Omni" meters from Sensus for evaluation that acts as compound meters. These have been installed by MDWASD and are currently operating. The initial evaluation appeared to be promising concerning measurement of ultra low flows with a full range of high flows. The testing of these Omni meters is currently underway for about 3 to 4 years.	- Document the initial evaluation of "Omni" meters, - Develop a data base with testing data results.
16	6.3.3.3	*Looking Forward (Setting Economic Meter Testing Goal)*	Completed	None
17	6.3.4	*Improved Calibration of Wholesale Customer Meters* MDWASD is currently performing comparative accuracy testing on its wholesale customer venturi, turbine, and positive displacement meters.	Venturi Meter Sites: In 2010, steps were taken to connect these meters to SCADA. However, the meter readings ae unavailable. Test tap installations that are required for accuracy testing are pending. Turbine Meter Sites: In 2010, these meters were all connected to the AMR system. Evaluation of other wholesale meters is pending upon installation of additional test taps.	Plan Capital Improvement Program required for testing inaccessible meters.
18	6.3.5	*Wholesale Customer Unmetered Connection Analysis* MDWASD initiated unmetered wholesale customer connection survey and analysis.	In 2009, MDWASD found a wholesale meter by-pass that was open allowing unmetered water delivery to the wholesale customer. All by-pass meters have now been locked and evaluation of metering or connection to SCADA will be undertaken in 2011.	Complete the evaluation of metering and connection to SCADA of the wholesale meters
19	-	*Determine economic optimum for residential meter replacment:* This item requires that MDWASD characterize residential water demand patterns and determine economic optimum for residential meter replacement.	"Meter Master" loggers have been deployed to characterize residential demand since October 2008 and have been rotated through a representative set of meters on a weekly basis. Residential demand data, along with age and meter testing data, will be used to establish an economic optimum for meter replacement. Data collection has been completed. Sensus SR model meters is an old meter design that comprises most of the MDWASD's meter inventory. In 2010, MDWASD investigated different meter models and is considering new meters such as Sensus iPERL.	- Continue logging data from new-model meters installed in the system to update the assessment of the economic optimum replacement. - Initiate the replacement of residential meters with the new meters being considered.

Appendix A

Revised Water Use Permit

FORM #0229
Rev. 07/09

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
WATER USE PERMIT NO. RE-ISSUE 13-00017-W
NON-ASSIGNABLE

Date Issued: November 1, 2010 **Expiration Date:** November 3, 2030

Authorizing: THE CONTINUATION OF AN EXISTING USE OF GROUNDWATER FROM THE BISCAYNE AQUIFER AND UPPER FLORIDAN AQUIFER FOR PUBLIC WATER SUPPLY AND AQUIFER STORAGE AND RECOVERY USE WITH AN ANNUAL ALLOCATION OF 149106 MILLION GALLONS.

Located In: Miami-Dade County, S-/T53S/R39E (See attached for additional
S-/T53S/R40E Sections, Townships and Ranges)

Issued To: MIAMI-DADE WATER AND SEWER DEPARTMENT
(MIAMI-DADE CONSOLIDATED P W S)
ATTN: UTILITY DIRECTOR,3071 SW 38TH AVENUE
MIAMI, FL 33146

This is to notify you of the District's agency action concerning Permit Application No. 091228-14, dated December 28, 2009. This action is taken pursuant to the provisions of Chapter 373, Part II, Florida Statutes (F.S.), Rule 40E-1.603 and Chapter 40E-2, Florida Administrative Code (F.A.C.). Based on the information provided, District rules have been adhered to and a Water Use Permit is in effect for this project subject to:

1. Not receiving a filed request for an administrative hearing pursuant to Section 120.5 and Section 120.569, or request a judicial review pursuant Section 120.68, Florida Statutes.
2. The attached 52 Limiting Conditions.
3. The attached 37 exhibits.

Permittee agrees to hold and save the South Florida Water Management District and its successors harmless from any and all damages, claims or liabilities which may arise by reason of the construction, maintenance or use of activities authorized by this permit. Said application, including all plan and specifications attached thereto, is by reference made a part hereof.Upon written notice to permittee, this permit may be temporarily modified, or restricted under a Declaration of Water Shortage or a Declaration of Emergency due to Water Shortage in accordance with provisions of Chapter 373, Fla. Statutes, and applicable rules and regulations of the South Florida Water Management District. This Permit may be permanently or temporarily revoked, in whole or in part, for the violation of the conditions of the permit or for the violation of any provision of the Water Resources Act and regulations thereunder. This Permit does not convey to the permittee any property rights nor any privileges other than those specified herein, nor relieve the permittee from complying with any law, regulation, or requirement affecting the rights of other bodies or agencies.

Should you object to these conditions, please refer to the attached "Notice of Rights" which addresses the procedures to be followed if you desire a public hearing or other review of the proposed agency action. Should you wish to object to the proposed agency action or file a petition or request, please provide written objections, petitions, requests and/or waivers to:

Elizabeth Veguilla, Deputy Clerk, MSC2440
South Florida Water Management District
Post Office Box 24680
West Palm Beach, FL 33416-4680

Please contact this office if you have any questions concerning this matter. If we do not hear from you in accordance with the "Notice of Rights", we will assume that you concur with the District's action.

CERTIFICATION OF SERVICE

I HEREBY CERTIFY that the Staff Report, Conditions and Notice of Rights have been mailed to the Permittee (and the persons listed on the attached staff report distribution list) no later than 5:00 p.m. on this 2nd day of November, 2010, in accordance with Section 120.60(3), Florida Statutes, and a copy has been filed and acknowledged with the Deputy District Clerk.

ORIGINAL SIGNED BY
By **ELIZABETH VEGUILLA**
DEPUTY CLERK
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Attachments
CERTIFIED MAIL# 70050390000598223083

LIMITING CONDITIONS

1. This permit shall expire on November 3, 2030.

2. Application for a permit modification may be made at any time.

3. Water use classification:

   Public water supply
   Aquifer storage and Recovery

4. Source classification is:

   Ground Water from:
   Biscayne Aquifer
   Upper Floridan Aquifer

   Reclaimed Water from:
   MDWASD South District WWTP
   MDWASD West District Water Reclamation Plant

5. Annual allocation shall not exceed 149106 MG.

   Maximum monthly allocation shall not exceed 13047 MG.

   The following limitations to the average annual withdrawals from specific sources are applicable through December 31, 2015:
   Biscayne aquifer: 125,458 MG
   Floridan aquifer: 4,855 MG
   The following limitations to the average annual withdrawals from specific sources are applicable from January 1, 2016 through December 31, 2020:
   Biscayne aquifer: 131,645 MG
   Floridan aquifer: 4,855 MG
   Reuse offset: 6,796 MG (South Miami Heights recharge)
   The following limitations to the average annual withdrawals from specific sources are applicable from January 1, 2021 through December 31, 2025:
   Biscayne aquifer: 137,010 MG
   Floridan aquifer: 4,855 MG
   Reuse offset: 12,753 MG (South Miami Heights & SWWF recharge)
   The following limitations to the average annual withdrawals from specific sources are applicable from January 1, 2026 through December 31, 2030:
   Biscayne aquifer: 141,824 MG
   Floridan aquifer: 7,282 MG
   Reuse offset: 17,630 MG (So. Miami Heights & SWWF recharge)
   The allocations above are further constrained by the wellfield operational plan described in Limiting Condition 27. The offset reuse allocations do not include the reuse projects outlined in Limiting Condition 39 that are in addition to the wellfield recharge projects.

6. Pursuant to Rule 40E-1.6105, F.A.C., Notification of Transfer of Interest in Real Property, within 30 days of any transfer of interest or control of the real property at which any permitted facility, system, consumptive use, or activity is located, the permittee must notify the District, in writing, of the transfer giving the name and address of the new owner or person in control and providing a copy of the instrument effectuating the transfer, as set forth in Rule 40E-1.6107, F.A.C.

Pursuant to Rule 40E-1.6107 (4), until transfer is approved by the District, the permittee shall be liable for compliance with the permit. The permittee transferring the permit shall remain liable for all actions that are required as well as all violations of the permit which occurred prior to the transfer of the permit.

Failure to comply with this or any other condition of this permit constitutes a violation and pursuant to Rule 40E-1.609, Suspension, Revocation and Modification of Permits, the District may suspend or revoke the permit.

This Permit is issued to:

Miami-Dade Water and Sewer Department
3071 Sw 38th Ave
Miami, FL 33146
Attn: Utility Director

7. Withdrawal Facilities:

Ground Water - Proposed:

13 - 17" X 1490' X 1400 GPM Wells Cased To 1080 Feet
1 - 24" X 50' X 2800 GPM Well Cased To 45 Feet
2 - 24" X 50' X 1042 GPM Wells Cased To 45 Feet
9 - 24" X 50' X 1400 GPM Wells Cased To 45 Feet

Ground Water - Existing:

6 - 20" X 100' X 4900 GPM Wells Cased To 40 Feet
2 - 24" X 70' X 6945 GPM Wells Cased To 35 Feet
4 - 40" X 100' X 10420 GPM Wells Cased To 57 Feet
1 - 42" X 68' X 10000 GPM Well Cased To 60 Feet
1 - 6" X 30' X 400 GPM Well Cased To 25 Feet
1 - 30" X 1210' X 3500 GPM Well Cased To 835 Feet
1 - 24" X 70' X 3470 GPM Well Cased To 35 Feet
10 - 48" X 80' X 10420 GPM Wells Cased To 46 Feet
1 - 42" X 68' X 8500 GPM Well Cased To 60 Feet
1 - 30" X 1300' X 3500 GPM Well Cased To 850 Feet
2 - 12" X 40' X 1600 GPM Wells Cased To 35 Feet
1 - 14" X 115' X 3800 GPM Well Cased To 80 Feet
1 - 18" X 55' X 500 GPM Well Cased To 42 Feet
2 - 24" X 100' X 7500 GPM Wells Cased To 50 Feet
1 - 42" X 107' X 7000 GPM Well Cased To 69 Feet
1 - 16" X 50' X 1600 GPM Well Cased To 40 Feet
1 - 30" X 1200' X 3500 GPM Well Cased To 760 Feet
4 - 24" X 104' X 6940 GPM Wells Cased To 54 Feet
1 - 30" X 115' X 4170 GPM Well Cased To 80 Feet
1 - 42" X 68' X 8500 GPM Well Cased To 54 Feet
1 - 17" X 1490' X 1400 GPM Well Cased To 1150 Feet
1 - 16" X 100' X 7500 GPM Well Cased To 40 Feet
1 - 30" X 1250' X 3500 GPM Well Cased To 845 Feet
1 - 12" X 35' X 1200 GPM Well Cased To 30 Feet
1 - 12" X 35' X 800 GPM Well Cased To 30 Feet
1 - 12" X 40' X 800 GPM Well Cased To 35 Feet
7 - 16" X 100' X 4170 GPM Wells Cased To 40 Feet
4 - 24" X 100' X 4900 GPM Wells Cased To 35 Feet
6 - 42" X 107' X 7000 GPM Wells Cased To 66 Feet

1 - 48" X 80' X 10416.67 GPM Well Cased To 46 Feet
20 - 14" X 115' X 2500 GPM Wells Cased To 80 Feet
1 - 18" X 55' X 1500 GPM Well Cased To 45 Feet
4 - 24" X 108' X 8300 GPM Wells Cased To 50 Feet
1 - 18" X 50' X 500 GPM Well Cased To 40 Feet
1 - 30" X 115' X 2500 GPM Well Cased To 80 Feet
1 - 30" X 1200' X 3500 GPM Well Cased To 765 Feet
3 - 48" X 88' X 7500 GPM Wells Cased To 33 Feet
1 - 18" X 66' X 1500 GPM Well Cased To 53 Feet
1 - 18" X 65' X 1500 GPM Well Cased To 50 Feet
1 - 42" X 68' X 10000 GPM Well Cased To 54 Feet

Reclaimed Water - Proposed:

1 - " x HP X 12000 GPM Pump
2 - " x HP X 10000 GPM Pumps

8. Permittee shall mitigate interference with existing legal uses that was caused in whole or in part by the permittee's withdrawals, consistent with the approved mitigation plan. As necessary to offset the interference, mitigation will include pumpage reduction, replacement of the impacted individual's equipment, relocation of wells, change in withdrawal source, or other means.

   Interference to an existing legal use is defined as an impact that occurs under hydrologic conditions equal to or less severe than a 1 in 10 year drought event that results in the:

   (1) Inability to withdraw water consistent with provisions of the permit, such as when remedial structural or operational actions not materially authorized by existing permits must be taken to address the interference; or

   (2) Change in the quality of water pursuant to primary State Drinking Water Standards to the extent that the water can no longer be used for its authorized purpose, or such change is imminent.

9. Permittee shall mitigate harm to existing off-site land uses caused by the permittee's withdrawals, as determined through reference to the conditions for permit issuance. When harm occurs, or is imminent, the District will require the permittee to modify withdrawal rates or mitigate the harm. Harm caused by withdrawals, as determined through reference to the conditions for permit issuance, includes:

   (1) Significant reduction in water levels on the property to the extent that the designed function of the water body and related surface water management improvements are damaged, not including aesthetic values. The designed function of a water body is identified in the original permit or other governmental authorization issued for the construction of the water body. In cases where a permit was not required, the designed function shall be determined based on the purpose for the original construction of the water body (e.g. fill for construction, mining, drainage canal, etc.)

   (2) Damage to agriculture, including damage resulting from reduction in soil moisture resulting from consumptive use; or

   (3) Land collapse or subsidence caused by reduction in water levels associated with consumptive use.

10. Permittee shall mitigate harm to the natural resources caused by the permittee's withdrawals, as determined through reference to the conditions for permit issuance. When harm occurs, or is imminent, the District will require the permittee to modify withdrawal rates or mitigate the harm. Harm, as determined through reference to the conditions for permit issuance includes:

    (1) Reduction in ground or surface water levels that results in harmful lateral movement of the fresh water/salt water interface,

(2) Reduction in water levels that harm the hydroperiod of wetlands,

(3) Significant reduction in water levels or hydroperiod in a naturally occurring water body such as a lake or pond,

(4) Harmful movement of contaminants in violation of state water quality standards, or

(5) Harm to the natural system including damage to habitat for rare or endangered species.

11. If any condition of the permit is violated, the permit shall be subject to review and possible modification, enforcement action, or revocation.

12. Authorized representatives of the District shall be permitted to enter, inspect, and observe the permitted system to determine compliance with special conditions.

13. The Permittee is advised that this permit does not relieve any person from the requirement to obtain all necessary federal, state, local and special district authorizations.

14. The permit does not convey any property right to the Permittee, nor any rights and privileges other than those specified in the Permit and Chapter 40E-2, Florida Administrative Code.

15. Permittee shall submit all data as required by the implementation schedule for each of the limiting conditions to: SFWMD, P.O. Box 24680, West Palm Beach, FL 33416-4680.

16. In the event of a declared water shortage, water withdrawal reductions will be ordered by the District in accordance with the Water Shortage Plan, Chapter 40E-21, F.A.C. The Permittee is advised that during a water shortage, pumpage reports shall be submitted as required by Chapter 40E-21, F.A.C.

17. Prior to the use of any proposed water withdrawal facility authorized under this permit, unless otherwise specified, the Permittee shall equip each facility with a District-approved operating water use accounting system and submit a report of calibration to the District, pursuant to Section 4.1, Basis of Review for Water Use Permit Applications.

    In addition, the Permittee shall submit a report of recalibration for the water use accounting system for each water withdrawal facility (existing and proposed) authorized under this permit every five years from each previous calibration, continuing at five-year increments.

18. Monthly withdrawals for each withdrawal facility shall be submitted to the District quarterly. The water accounting method and means of calibration shall be stated on each report.
    The permittee shall report injection/withdrawals from the ASR wells in the following manner:

    Biscayne Aquifer water injected
    Biscayne Aquifer water recovered
    Floridan Aquifer withdrawal

19. The Permittee shall provide annual status reports to the District that summarize the ASR cycle testing activities. The first report shall be submitted by:
    March 15, 2011

20. The Permittee shall notify the District within 30 days of any change in service area boundary. If the Permittee will not serve a new demand within the service area for which the annual allocation was calculated, the annual allocation may then be subject to modification and reduction.

21. The Permittee shall submit to the District an updated Well Description Table (Table A) within one month of completion of the proposed wells identifying the actual total and cased depths, pump manufacturer and model numbers, pump types, intake depths and type of meters.

22. Permittee shall secure a well construction permit prior to construction, repair, or abandonment of all wells, as described in Chapters 40E-3 and 40E-30, Florida Administrative Code.

23. Every ten years from the date of permit issuance, the permittee shall submit a water use compliance report for review and approval by District Staff, which addresses the following:

    1. The results of a water conservation audit that documents the efficiency of water use on the project site using data produced from an onsite evaluation conducted. In the event that the audit indicates additional water conservation is appropriate or the per capita use rate authorized in the permit is exceeded, the permittee shall propose and implement specific actions to reduce the water use to acceptable levels within timeframes proposed by the permittee and approved by the District.

    2. A comparison of the permitted allocation and the allocation that would apply to the project based on current District allocation rules and updated population and per capita use rates. In the event the permit allocation is greater than the allocation provided for under District rule, the permittee shall apply for a letter modification to reduce the allocation consistent with District rules and the updated population and per capita use rates to the extent they are considered by the District to be indicative of long term trends in the population and per capita use rates over the permit duration. In the event that the permit allocation is less than allowable under District rule, the permittee shall apply for a modification of the permit to increase the allocation if the permittee intends to utilize an additional allocation, or modify its operation to comply with the existing conditions of the permit.

    3. Summary of the current and previous nine years progress reports for implementation of the Alternative Water Supply Plan and any modifications necessary to continue to meet the Plan requirements and conditions for issuance.

    4. Information demonstrating that the conditions for issuance of the permit are being complied with, pursuant to Limiting Condition # 51 and Section 373.236, F.S.

    5. Updates or amendments to the County's reuse plan.

24. In order to promote use of alternative water supplies, pumpage from Floridan aquifer wells and from those Biscayne aquifer wells whose use is offset by reclaimed water will be conducted on a priority basis, referred to as a "first on, last off" priority. Changes to wellfield operations must be approved via modification of the approved Wellfield Operation Plan by District staff prior to implementation.

25. The permittee shall operate surface water control structure known as the Mid-canal structure and bridge in accordance with the approved operational plan included in Exhibit 22. In addition, whenever this structure is opened for the purpose of raising water in the Wellfield Protection Canal down stream of the structure, the upstream structure that delivers water from the L-30 canal shall be opened in a manner to deliver equal volumes to those passed through the Mid-canal structure and bridge. The permittee shall submit operation and flow data logs regarding both structures to the District quarterly.

26. The Permittee is authorized to exercise the emergency wells at the Medley Wellfield for a total of two hours per month as needed for bacterial clearance and pump maintenance. Operation of the emergency wells at the Medley Wellfield for more than this amount shall require prior approval from SFWMD. Pumpage data shall be collected and report in accordance with Limiting Condition 18.

27. Permittee shall implement the wellfield operating plan described in District staff report prepared in support of recommendation for permit issuance.
    See Exhibit 10

28. No more than 15 MGD shall be withdrawn from the West Biscayne aquifer Wellfield on any given day.

29. No more than 25,550 MGY shall be withdrawn during any 12 month consecutive period from the combined Hialeah, Preston and Miami Springs Biscayne aquifer wellfields

30. No more than 8,065 MGY shall be withdrawn during any 12 month consecutive period from the Snapper Creek Wellfield unless reclaimed water recharge is implemented in locations and amounts necessary to offset the impact of the increase to Everglades water bodies per limiting conditions 39 and 41.

31. No more than 31,353 MGY shall be withdrawn during any 12 month consecutive period from the Southwest Biscayne aquifer Wellfield unless reclaimed water recharge is implemented in locations and amounts necessary to offset the impact of the increase to Everglades water bodies per limiting conditions 39 and 41.

32. No more than 67,343 MGY shall be withdrawn during any 12 month consecutive period from the combined West, Southwest Snapper Creek and Alexander Orr Biscayne aquifer wellfields unless reclaimed water recharge is implemented in locations and amounts necessary to offset the impact of the increase to Everglades water bodies per limiting conditions 39 and 41.

33. No more than 1,825 MGY shall be withdrawn during any 12 month consecutive period from the South Miami Heights Wellfield unless reclaimed water recharge is implemented in locations and amounts necessary to offset the impact of the increase to Everglades water bodies per limiting conditions 39 and 41.

34. No more than 1,497 MGY shall be withdrawn during any 12 month consecutive period from the combined Everglades Labor Camp and Newton wellfields.

35. No more than 1,745 MGY shall be withdrawn during any 12 month consecutive period from the combined Elevated Tank, Leisure City and Naranja wellfields.

36. The Permittee shall continue to submit monitoring data in accordance with the approved water level monitoring program for this project.
The existing monitoring program is described in Exhibits 30 and 32.

37. The Permittee shall continue to submit monitoring data in accordance with the approved saline water intrusion monitoring program for this project.
See exhibit 28C for a schedule of completion of the USGS project to update the salt front delineation and monitoring network.
The permittee shall submit annual Monitoring Program summary reports. The annual report will summarize the status of the project to update the salt front and install new monitor wells.

38. Within six months, an executed large user water agreement with the City of Hialeah shall be submitted to the District. In the event that the final agreement is for volumes less than those used in the formulation of the allocations in this permit, the allocations shall be reduced through a letter modification.

39. The permittee shall implement a minimum of 170 MGD of reuse projects as set forth in Projects 1-8 of Exhibit 30 on or before the deadlines provided therein. The exact volume of reclaimed water applied will depend on the treatement losses resulting from the process that are implemented. In the event any of these projects do not require or allow as much reuse as anticipated, the County shall identify and implement other reuse projects that will provide provide beneficial reuse of water by the deadlines set forth in Exhibit 30. Any changes to Exhibit 30 must be reviewed and approved by the District in consultation with the Department of Environmental Protection (DEP) in accordance with Parts

I & II of Chapter 373, Florida Statutes, and District rules governing consumptive uses of water in Chapter 40E-2, F.A.C., and DEP rules governing the treatment and use of reclaimed water in Chapter 62-610, F.A.C.

40.

The permittee will develop alternative water supplies in accordance with the schedules described in Exhibit 13.
The permittee will provide annual updates of the status of all alternative water supply projects (per the timeframes contained in Limiting Condition 50). The status report shall include work completed to date, expenditures and any anticipated changes in the timelines.

41.

In the event that a milestone specified in the alternative water supply schedule and plan contained in Exhibit 13 is going to be missed, the permittee shall notify the Executive Director of the District in writing explaining the nature of the delay, actions taken to bring the project back on schedule and an assessment of the impact the delay would have on the rates of withdrawals from the Everglades water bodies and associated canals as defined in SFWMD consumptive use permitting rules. The District will evaluate the situation and take actions as appropriate which could include: a.) granting an extension of time to complete the project (if the delay is minor and doesn't affect the Everglades Waterbodies or otherwise violates permit conditions), b.) take enforcement actions including consent orders and penalties, c.) modify allocations contained in this permit from the Biscayne aquifer including capping withdrawal rates until the alternative water supply project(s) are completed (in cases where the delay would result in violations of permit conditions) or d.) working with the Department of Community Affairs to limit increase demands for water until the alternative water supply project is completed.

42.

The Permittee shall provide the District with annual updates by March 15th each year describing the activities associated with the implementation of their approved reuse feasibility plan including the following information: (1) the status of distribution system construction, including location and capacity of a) existing reuse lines b) proposed reuse lines to be constructed in the next five years; (2) a summary of uncommitted supplies for the next five years; (3) the status of reuse plan implementation including status of pilot projects, plan design construction, volume of reuse available, volume of wastewater disposed of; and (4) the status/copies of any ordinances related to reuse (5) any proposed changes to the reuse plan set forth in Exhibit 30. The first annual update is due March 15, 2011.

43.

Reuse Project numbers 4, 6, and 7 in Exhibit 14 for wellfield recharge must be in place and operating prior to any additional withdrawals from the wellfield over the base condition water use as identified in Exhibit 10D.

44.

By November 15, 2012, the Permittee shall submit a report for District review and approval identifying the location, treatment, timing and volume for Reuse Projects 6 & 7 on Exhibit 14 which provide groundwater recharge for the Southwest Wellfield. The report shall demonstrate that the proposed recharge sites and operations shall at a minimum prevent increased withdrawals from the C-4, C-2 and eastward groundwater seepage from Everglades National Park over the base condition water use and is otherwise a beneficial reuse of water per Chapter 62-610, F.A.C.

45.

For Reuse Project number 5 of Exhibit 14 for rehydration of Biscayne Coastal Wetlands, the Permittee shall develop and complete a pilot testing program in consultation with the District, the Florida Department of Environmental Protection (DEP) and Biscayne Bay National Park. A preliminary report on the testing program shall be submitted by January 15, 2011. Following completion of the pilot testing program, the parties shall agree on the water quality treatment required and the feasibility, as defined in Section 3.2.3.2 of the Basis of Review for Water Use, of this project on or before January 15, 2012. Extension of this deadline may be issued in writing by the District upon demonstration of good cause such as events beyond the control of the permittee or after consideration of the results/data collected, the District determines that additional testing is necessary. In determining the water quality needed, the parties will consider State and Federal water quality discharge standards, the volume and timing of water to be delivered to Biscayne Bay and the location of delivery. In the event the parties do not reach agreement on the feasibility by January 15, 2012, the Permittee shall begin development of an alternate reuse project from the South District wastewater facility and shall provide the District with a proposal for an alternate project including a conceptual design and schedule for

implementation on or before December 15, 2012.

46.

The permittee may request temporary authorization from the District to capture and store stormwater via withdrawals from the permitted Biscayne aquifer production wells, for storage within the Floridan aquifer system consistent with their Department of Environmental Protection (DEP) issued Underground Injection Control permits.The District will consider the availability of stormwater that is not otherwise needed for environmental protection or enhancement and is in no way bound to authorize such requests. All such requests shall be made in writing to the Director of Water Use Regulation.

47. Permittee shall maintain an accurate flow meter at the intake of the water treatment plant for the purpose of measuring daily inflow of water.
Permittee shall maintain a calibrated flow meter(s) at the intake (raw water) and discharge (treated water) points within the Hialeah/Preston, Alexander Orr, and proposed Hialeah RO and South Miami Heights water treatment plants for the purpose of measuring treatment losses and shall submit monthly data quarterly as required pursuant to Limited Condition # 18.

48. The Water Conservation Plan required by Section 2.6.1 of the Basis of Review for Water Use Permit Applications within the South Florida Water Management District, must be implemented in accordance with the approved implementation schedule.
The Water Conservation Plan is contained in Exhibit 18. The permittee shall submit an annual report covering water conservation activities during the prior calendar year by March 15 of each year describing water conservation activities for the year including expenditures, projects undertaken and estimated water savings.

49.

Permittee shall determine unaccounted-for distribution system losses on a quarterly basis and report the findings on an annual basis. The losses shall be determined for the entire system and for each of the water treatment plants (comparing water pumped from the wells compared to the volume into and out of the treatment plant), utilizing the most recent, approved water accounting and IWA/AWWA water audit methodologies. The permittee shall verify the IWA/AWWA water audit methods to be used with the District for the subsequent year in each annual report. The annual report shall cover activities during the prior calendar year and be submitted on March 15 of each year. In addition to the unaccounted-for loss data, the report shall include the status of the activities (actions and expenditures along with the associated water savings) completed during the year to implement the approved water loss reduction plan (Exhibit 17). In the event that the water losses, as defined by the AWWA method (Exhibit 16B), exceed 10 percent, the permittee shall include in the annual report a description of additional actions which will be implemented the following year(s) to reduce the losses to less than ten percent. If the District concludes that the progress towards achieving losses of less than 10 percent as identified in the unaccounted for losses plan is inconsistent with the plan schedule, the Permittee shall be required to revise the plan, to be approved by the District.

50.

All annual reports required in these limiting conditions shall address activities that occurred during a calendar year and shall be submitted to Water Use Compliance on or before March 15th of the following year.

51.

If it is determined that the conditions for permit issuance are no longer met for the 20 year permit duration, the permittee shall obtain a modification of the Permit from the District as necessary to come into compliance with the conditions for permit issuance. Such conditions for permit issuance include minimum flows and levels, water reservations, and other conditions ensuring the use does not cause water resource harm and is consistent with the objectives of the District, including implementation of the Comprehensive Everglades Restoration Plan.

52.

The permittee shall operate the West Wellfield in accordance with the Memorandum of Understanding between the U.S. Department of the Interior, the Governor of the State of Florida, Miami Dade County and the District incorporated in Exhibit 35.

Application No. 091228-14

(Miami-Dade Consolidated P W S)

Location: Miami-Dade County, S-/T53S/R41E
S-/T54S/R39E
S-/T54S/R40E
S-/T54S/R41E
S-/T54S/R42E
S-/T55S/R39E
S-/T55S/R40E
S-/T56S/R38E
S-/T56S/R39E
S-/T57S/R38E
S-/T57S/R39E
S-/T57S/R40E

Appendix B

CY 2010 IWA/AWWA Audit

AWWA Water Loss Control Committee (WLCC) Free Water Audit Software v4.1

WAS v4.1

PURPOSE: This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

USE: The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons on the left below. Descriptions of each sheet are also given below.

THE FOLLOWING KEY APPLIES THROUGHOUT:

	Value can be entered by user
	Value calculated based on input data
	These cells contain recommended default values

Please begin by providing the following information, then proceed through each sheet in the workbook:

NAME OF CITY OR UTILITY:	MIAMI DADE WATER & SEWER DEPARTMENT			COUNTRY:	USA
REPORTING YEAR:	2010	START DATE(MM/YYYY):	01/2010	END DATE(MM/YYYY):	12/2010
NAME OF CONTACT PERSON:	DONNA FRIES	E-MAIL:	FRIESD@miamidade.gov	TELEPHONE:	786-552-8972
				Ext.	

PLEASE SELECT PREFERRED REPORTING UNITS FOR WATER VOLUME: Million gallons (US)

Click to advance to sheet… Click here: ? for help about units and conversions

Instructions	The current sheet
Reporting Worksheet	Enter the required data on this worksheet to calculate the water balance
Water Balance	The values entered in the Reporting Worksheet are used to populate the water balance
Grading Matrix	Depending on the confidence of audit inputs, a grading is assigned to the audit score
Service Connections	Diagrams depicting possible customer service connection configurations
Definitions	Use this sheet to understand terms used in the audit process
Loss Control Planning	Use this sheet to interpret the results of the audit validity score and performance indicators

Comments:

Add comments here to track additional supporting information, sources or names of participants

If you have questions or comments regarding the software please contact us at: wlc@awwa.org

AWWA WLCC Free Water Audit Software: Reporting Worksheet

WAS v4.1

Back to Instructions

? Click to access definition

Water Audit Report for: MIAMI DADE WATER & SEWER DEPARTMENT
Reporting Year: 2010 (1/2010 - 12/2010)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

<< Enter grading in column 'E'

Volume from own sources:	9	113,587.361	Million gallons (US)/yr (MG/Yr)	
Master meter error adjustment (enter positive value):	5	1,973.078	under-registered	MG/Yr
Water imported:	8	163.805	MG/Yr	
Water exported:	8	21,202.241	MG/Yr	
WATER SUPPLIED:		94,522.003	MG/Yr	

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

			Pcnt:	Value:
Billed metered:	9	63,551.415	MG/Yr	
Billed unmetered:	n/a	0.000	MG/Yr	
Unbilled metered:	7	8.802	MG/Yr	
Unbilled unmetered:	7	314.801	MG/Yr	314.801
AUTHORIZED CONSUMPTION:		63,875.018	MG/Yr	

Use buttons to select percentage of water supplied OR value

WATER LOSSES (Water Supplied - Authorized Consumption)

30,646.985 MG/Yr

Apparent Losses

			Pcnt:	Value:
Unauthorized consumption:	4	1,825.000	MG/Yr	1,825.000
Customer metering inaccuracies:	7	3,833.618	MG/Yr	3,833.618
Systematic data handling errors:	5	2,843.779	MG/Yr	
Apparent Losses:		8,502.397		

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses:	22,144.588	MG/Yr
WATER LOSSES:	30,646.985	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER:	30,970.588	MG/Yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	8	5,774.0	miles	
Number of active AND inactive service connections:	8	434,127		
Connection density:		75	conn./mile main	
Average length of customer service line:	5	12.0	ft	(pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	6	63.5	psi	

COST DATA

Total annual cost of operating water system:	7	$133,179,457	$/Year
Customer retail unit cost (applied to Apparent Losses):	7	$3.05	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	7	$659.53	$/Million gallons

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume of Water Supplied:	32.8%
Non-revenue water as percent by cost of operating system:	30.6%
Annual cost of Apparent Losses:	$25,932,311
Annual cost of Real Losses:	$14,605,020

Operational Efficiency Indicators

Apparent Losses per service connection per day:	53.66	gallons/connection/day
Real Losses per service connection per day*:	139.75	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	2.20	gallons/connection/day/psi
Unavoidable Annual Real Losses (UARL):	2,404.81	million gallons/year
From Above, Real Losses = Current Annual Real Losses (CARL):	22,144.59	million gallons/year
Infrastructure Leakage Index (ILI) [CARL/UARL]:	9.21	

* only the most applicable of these two indicators will be calculated

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 74 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Master meter error adjustment
2: Unauthorized consumption
3: Volume from own sources

For more information, click here to see the Grading Matrix worksheet

AWWA WLCC Free Water Audit Software: Water Balance

WAS v4.1

Water Audit Report For:	Report Yr:
DEPARTMENT	2010

<table>
<tr><td rowspan="10">Own Sources
(Adjusted for known errors)
115,560.439</td><td rowspan="10">Water Exported
21,202.241

Water Supplied
94,522.003</td><td colspan="4">Billed Water Exported</td></tr>
<tr><td rowspan="2">Authorized Consumption
63,875.018</td><td rowspan="2">Billed Authorized Consumption
63,551.415</td><td>Billed Metered Consumption (inc. water exported)
63,551.415</td><td rowspan="2">Revenue Water
63,551.415</td></tr>
<tr><td>Billed Unmetered Consumption
0.000</td></tr>
<tr><td rowspan="3">Unbilled Authorized Consumption
323.603</td><td>Unbilled Metered Consumption
8.802</td><td rowspan="8">Non-Revenue Water (NRW)
30,970.588</td></tr>
<tr><td>Unbilled Unmetered Consumption
314.801</td></tr>
<tr><td rowspan="4">Water Losses
30,646.985</td><td rowspan="4">Apparent Losses
8,502.397</td><td>Unauthorized Consumption
1,825.000</td></tr>
<tr><td>Customer Metering Inaccuracies
3,833.618</td></tr>
<tr><td>Systematic Data Handling Errors
2,843.779</td></tr>
<tr><td rowspan="3">Water Imported
163.805</td><td rowspan="3">Real Losses
22,144.588</td><td>Leakage on Transmission and/or Distribution Mains
Not broken down</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks
Not broken down</td></tr>
<tr><td>Leakage on Service Connections
Not broken down</td></tr>
</table>

AWWA Water Loss Control Committee (WLCC) Free Water Audit Software v4.1

WAS v4.1

PURPOSE: This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

USE: The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons on the left below. Descriptions of each sheet are also given below.

THE FOLLOWING KEY APPLIES THROUGHOUT:

	Value can be entered by user
	Value calculated based on input data
	These cells contain recommended default values

Please begin by providing the following information, then proceed through each sheet in the workbook:

NAME OF CITY OR UTILITY: MIAMI DADE WATER & SEWER DEPARTMENT COUNTRY: USA

REPORTING YEAR: 2009 START DATE(MM/YYYY): 01/2009 END DATE(MM/YYYY): 12/2009

NAME OF CONTACT PERSON: DONNA FRIES E-MAIL: FRIESD@miamidade.gov TELEPHONE: 786-552-8972 Ext.

PLEASE SELECT PREFERRED REPORTING UNITS FOR WATER VOLUME: Million gallons (US)

Click to advance to sheet… Click here: ? for help about units and conversions

Instructions	The current sheet
Reporting Worksheet	Enter the required data on this worksheet to calculate the water balance
Water Balance	The values entered in the Reporting Worksheet are used to populate the water balance
Grading Matrix	Depending on the confidence of audit inputs, a grading is assigned to the audit score
Service Connections	Diagrams depicting possible customer service connection configurations
Definitions	Use this sheet to understand terms used in the audit process
Loss Control Planning	Use this sheet to interpret the results of the audit validity score and performance indicators

Comments:

Add comments here to track additional supporting information, sources or names of participants

If you have questions or comments regarding the software please contact us at: wlc@awwa.org

AWWA WLCC Free Water Audit Software: Reporting Worksheet

WAS v4.1

Back to Instructions

? Click to access definition

Water Audit Report for: MIAMI DADE WATER & SEWER DEPARTMENT

Reporting Year: 2009 (1/2009 - 12/2009)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

<< Enter grading in column 'E'

Volume from own sources:	9	114,052.000	Million gallons (US)/yr (MG/Yr)	
Master meter error adjustment (enter positive value):	5	1,915.098	under-registered	MG/Yr
Water imported:	8	174.410	MG/Yr	
Water exported:	9	21,191.140	MG/Yr	
WATER SUPPLIED:		94,950.368	MG/Yr	

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:
Billed metered:	9	65,942.930	MG/Yr		
Billed unmetered:	n/a	0.000	MG/Yr		
Unbilled metered:	7	6.691	MG/Yr		
Unbilled unmetered:	7	231.443	MG/Yr		231.443
AUTHORIZED CONSUMPTION:		66,181.064	MG/Yr		

Use buttons to select percentage of water supplied **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption)

28,769.304 MG/Yr

Apparent Losses

				Pcnt:	Value:
Unauthorized consumption:	6	2,308.026	MG/Yr		2,308.026
Customer metering inaccuracies:	7	3,107.574	MG/Yr	4.50%	
Systematic data handling errors:	5	2,855.668	MG/Yr		
Apparent Losses:		8,271.267			

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 20,498.037 MG/Yr

WATER LOSSES: 28,769.304 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 29,007.438 MG/Yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	8	5,622.0	miles	
Number of active AND inactive service connections:	8	417,983		
Connection density:		74	conn./mile main	
Average length of customer service line:	8	12.0	ft	(pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	7	52.0	psi	

COST DATA

Total annual cost of operating water system:	7	$167,864,883	$/Year
Customer retail unit cost (applied to Apparent Losses):	7	$2.57	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	7	$708.47	$/Million gallons

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume of Water Supplied:	30.6%
Non-revenue water as percent by cost of operating system:	21.4%
Annual cost of Apparent Losses:	$21,257,157
Annual cost of Real Losses:	$14,522,244

Operational Efficiency Indicators

Apparent Losses per service connection per day:	54.22	gallons/connection/day
Real Losses per service connection per day*:	134.36	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	2.58	gallons/connection/day/psi
Unavoidable Annual Real Losses (UARL):	1,902.50	million gallons/year
From Above, Real Losses = Current Annual Real Losses (CARL):	20,498.04	million gallons/year
Infrastructure Leakage Index (ILI) [CARL/UARL]:	10.77	

* only the most applicable of these two indicators will be calculated

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 76 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Master meter error adjustment

2: Volume from own sources

3: Systematic data handling errors

For more information, click here to see the Grading Matrix worksheet

AWWA WLCC Free Water Audit Software: Water Balance

WAS v4.1

Water Audit Report For:	Report Yr:
DEPARTMENT	2009

	Water Exported 21,191.140	Billed Water Exported			
Own Sources (Adjusted for known errors) 115,967.098	Water Supplied 94,950.368	Authorized Consumption 66,181.064	Billed Authorized Consumption 65,942.930	Billed Metered Consumption (inc. water exported) 65,942.930	Revenue Water 65,942.930
				Billed Unmetered Consumption 0.000	
			Unbilled Authorized Consumption 238.134	Unbilled Metered Consumption 6.691	Non-Revenue Water (NRW) 29,007.438
				Unbilled Unmetered Consumption 231.443	
		Water Losses 28,769.304	Apparent Losses 8,271.267	Unauthorized Consumption 2,308.026	
				Customer Metering Inaccuracies 3,107.574	
				Systematic Data Handling Errors 2,855.668	
Water Imported 174.410			Real Losses 20,498.037	Leakage on Transmission and/or Distribution Mains Not broken down	
				Leakage and Overflows at Utility's Storage Tanks Not broken down	
				Leakage on Service Connections Not broken down	

AWWA Water Loss Control Committee (WLCC) Water Audit Software v3.0

WASv3.0

PURPOSE: This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery

USE: The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons on the left below. Descriptions of each sheet are also given below.

THE FOLLOWING KEY APPLIES THROUGHOUT:

- Value must be entered by user
- Value may be entered by user
- Value calculated based on input data
- These cells contain recommended default values

Please begin by providing the following information, then proceed through each sheet in the workbook:

NAME OF CITY OR UTILITY: Miami-Dade Water and Sewer Department COUNTRY: United States

REPORTING YEAR: 2008 START DATE(MM/YYYY): Jan-08 END DATE(MM/YYYY): Dec-08

NAME OF CONTACT PERSON: Maribel Balbin E-MAIL: Balbin@miamidade.gov TELEPHONE: 786-552-8149 Ext.

PLEASE SELECT PREFERED REPORTING UNITS FOR WATER VOLUME: Million gallons (US)

Click to advance to sheet… Click here: ? for help about units and conversions

Instructions	The current sheet
Reporting Worksheet	Enter the required data on this worksheet to calculate the water balance
Water Balance	The values entered in the Reporting Worksheet are used to populate the water balance
Definitions	Use this sheet to understand terms used in the audit process
Water Loss Standing	Use this sheet to help interpret the results of the performance indicators

If you have questions or comments regarding the software please contact us at: wlc@awwa.org

AWWA WLCC Water Audit Software: Reporting Worksheet

WASv3.0

Back to Instructions

? Click to access definition

Water Audit Report for: Miami-Dade Water and Sewer Department
Reporting Year: 2008

Please enter data in the white cells below. Where possible, metered values should be used; if metered values are unavailable please estimate a value. Indicate this by selecting a choice from the gray box to the left, where M = measured (or accurately known value) and E = estimated.

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

Volume from own sources:	M	112,326.000	Million gallons (US)/yr (MG/Yr)	
Master meter error adjustment:	E	1,430.571	under-registered	MG/Yr
Water imported:	M	777.077	MG/Yr	
Water exported:	M	23,018.746	MG/Yr	
WATER SUPPLIED:		91,514.902	MG/Yr	

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:
Billed metered:	M	65,002.084	MG/Yr		
Billed unmetered:	E	0.000	MG/Yr		
Unbilled metered:	M	10.065	MG/Yr		
Unbilled unmetered:	E	261.354	MG/Yr		261.354
AUTHORIZED CONSUMPTION:		65,273.503	MG/Yr		

Use buttons to select percentage **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption)

26,241.399 MG/Yr

Apparent Losses

				Pcnt:	Value:
Unauthorized consumption:	E	1,732.404	MG/Yr		1732.404
Customer metering inaccuracies:	E	3,063.400	MG/Yr	4.50%	
Systematic data handling errors:	E	2,827.577	MG/Yr		
Apparent Losses:		7,623.381	MG/Yr		

Real Losses

Real Losses = (Water Losses - Apparent Losses):		18,618.018	MG/Yr
WATER LOSSES:		26,241.399	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 26,512.818 MG/Yr

SYSTEM DATA

Length of mains:	M	5,622.0	miles	
Number of active AND inactive service connections:	M	418,258		
Connection density:		74	conn./mile main	
Average length of customer service line:	E	12.0	ft	(pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	E	52.0	psi	

COST DATA

Total annual cost of operating water system:	M	$148,172,696	$/Year
Customer retail unit cost (applied to Apparent Losses):	E	$2.38	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	E	$660.94	$/Million gallons

DATA REVIEW - Please review the following information and make changes above if necessary:

- Input values should be indicated as either measured or estimated. You have entered:
  - **8 as measured values**
  - **10 as estimated values**
  - **0 as default values**
  - **0 without specifying measured, estimated or default**
- Water Supplied Data: No problems identified
- Unbilled unmetered consumption: No problems identified
- Unauthorized consumption: No problems identified
- It is important to accurately measure the master meter - you have entered the measurement type as: measured
- Cost Data: No problems identified

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume:	29.0%
Non-revenue water as percent by cost:	20.7%
Annual cost of Apparent Losses:	$18,143,647
Annual cost of Real Losses:	$12,305,393

Operational Efficiency Indicators

Apparent Losses per service connection per day:	49.94	gallons/connection/day
Real Losses per service connection per day*:	121.95	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	2.35	gallons/connection/day/psi
? Unavoidable Annual Real Losses (UARL):	1,903.37	million gallons/year
? Infrastructure Leakage Index (ILI) [Real Losses/UARL]:	9.78	

* only the most applicable of these two indicators will be calculated

AWWA WLCC Water Audit Software: Water Balance

WASv3.0

Water Audit Report For:	Report Yr:
Department	2008

Own Sources (Adjusted for known errors): 113,756.571

Water Imported: 777.077

Water Exported: 23,018.746

Water Supplied: 91,514.902

Authorized Consumption: 65,273.503

- Billed Authorized Consumption: 65,002.084
  - Billed Metered Consumption (inc. water exported): 65,002.084
  - Billed Unmetered Consumption: 0.000
- Unbilled Authorized Consumption: 271.419
  - Unbilled Metered Consumption: 10.065
  - Unbilled Unmetered Consumption: 261.354

Water Losses: 26,241.399

- Apparent Losses: 7,623.381
  - Unauthorized Consumption: 1,732.404
  - Customer Metering Inaccuracies: 3,063.400
  - Systematic Data Handling Errors: 2,827.577
- Real Losses: 18,618.018
  - Leakage on Transmission and/or Distribution Mains: Not broken down
  - Leakage and Overflows at Utility's Storage Tanks: Not broken down
  - Leakage on Service Connections: Not broken down

Billed Water Exported

Revenue Water: 65,002.084

Non-Revenue Water (NRW): 26,512.818

AWWA Water Loss Control Committee (WLCC) Water Audit Software v3.0

WASv3.0

PURPOSE: This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery

USE: The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons on the left below. Descriptions of each sheet are also given below.

THE FOLLOWING KEY APPLIES THROUGHOUT:

- Value must be entered by user
- Value may be entered by user
- Value calculated based on input data
- These cells contain recommended default values

Please begin by providing the following information, then proceed through each sheet in the workbook:

NAME OF CITY OR UTILITY: Miami-Dade Water and Sewer Department COUNTRY: United States

REPORTING YEAR: 2007 START DATE(MM/YYYY): Jan-07 END DATE(MM/YYYY): Dec-07

NAME OF CONTACT PERSON: Maribel Balbin E-MAIL: Balbin@miamidade.gov TELEPHONE: 786-552-8149 Ext.

PLEASE SELECT PREFERED REPORTING UNITS FOR WATER VOLUME: Million gallons (US)

Click to advance to sheet… Click here: ? for help about units and conversions

Instructions	The current sheet
Reporting Worksheet	Enter the required data on this worksheet to calculate the water balance
Water Balance	The values entered in the Reporting Worksheet are used to populate the water balance
Definitions	Use this sheet to understand terms used in the audit process
Water Loss Standing	Use this sheet to help interpret the results of the performance indicators

If you have questions or comments regarding the software please contact us at: wlc@awwa.org

AWWA WLCC Water Audit Software: Reporting Worksheet

WASv3.0

Back to Instructions

? Click to access definition

Water Audit Report for: Miami-Dade Water and Sewer Department
Reporting Year: 2007

Please enter data in the white cells below. Where possible, metered values should be used; if metered values are unavailable please estimate a value. Indicate this by selecting a choice from the gray box to the left, where M = measured (or accurately known value) and E = estimated.

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

Volume from own sources:	M	115,206.600	Million gallons (US)/yr (MG/Yr)	
Master meter error adjustment:	E	2,002.873	under-registered	MG/Yr
Water imported:	M	546.710	MG/Yr	
Water exported:	M	25,515.692	MG/Yr	
WATER SUPPLIED:		92,240.491	MG/Yr	

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:
Billed metered:	M	66,493.534	MG/Yr		
Billed unmetered:	E	0.000	MG/Yr		
Unbilled metered:	M	10.632	MG/Yr		
Unbilled unmetered:	E	557.620	MG/Yr		557.620
AUTHORIZED CONSUMPTION:		67,061.786	MG/Yr		

Use buttons to select percentage OR value

WATER LOSSES (Water Supplied - Authorized Consumption)

25,178.705 MG/Yr

Apparent Losses

				Pcnt:	Value:
Unauthorized consumption:	E	2,279.514	MG/Yr		2279.514
Customer metering inaccuracies:	E	3,133.704	MG/Yr	4.50%	
Systematic data handling errors:	E	2,893.833	MG/Yr		
Apparent Losses:		8,307.051	MG/Yr		

Real Losses

Real Losses = (Water Losses - Apparent Losses):		16,871.654	MG/Yr
WATER LOSSES:		25,178.705	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 25,746.957 MG/Yr

SYSTEM DATA

Length of mains:	M	5,622.0	miles	
Number of active AND inactive service connections:	M	416,620		
Connection density:		74	conn./mile main	
Average length of customer service line:	E	12.0	ft	(pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	E	52.0	psi	

COST DATA

Total annual cost of operating water system:	M	$139,582,152	$/Year
Customer retail unit cost (applied to Apparent Losses):	E	$2.24	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	E	$551.84	$/Million gallons

DATA REVIEW - Please review the following information and make changes above if necessary:

- Input values should be indicated as either measured or estimated. You have entered:
  - **8 as measured values**
  - **10 as estimated values**
  - **0 as default values**
  - **0 without specifying measured, estimated or default**
- Water Supplied Data: No problems identified
- Unbilled unmetered consumption: No problems identified
- Unauthorized consumption: No problems identified
- It is important to accurately measure the master meter - you have entered the measurement type as: measured
- Cost Data: No problems identified

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume:	27.9%
Non-revenue water as percent by cost:	20.2%
Annual cost of Apparent Losses:	$18,607,795
Annual cost of Real Losses:	$9,310,454

Operational Efficiency Indicators

Apparent Losses per service connection per day:	54.63	gallons/connection/day
Real Losses per service connection per day*:	110.95	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	2.13	gallons/connection/day/psi
? Unavoidable Annual Real Losses (UARL):	1,898.18	million gallons/year
? Infrastructure Leakage Index (ILI) [Real Losses/UARL]:	8.89	

* only the most applicable of these two indicators will be calculated

AWWA WLCC Water Audit Software: Water Balance

WASv3.0

Water Audit Report For:	Report Yr:
Department	2007

Own Sources (Adjusted for known errors): 117,209.473

Water Imported: 546.710

Water Supplied: 92,240.491

Water Exported: 25,515.692

Billed Water Exported

Authorized Consumption: 67,061.786

- Billed Authorized Consumption: 66,493.534
  - Billed Metered Consumption (inc. water exported): 66,493.534
  - Billed Unmetered Consumption: 0.000
- Unbilled Authorized Consumption: 568.252
  - Unbilled Metered Consumption: 10.632
  - Unbilled Unmetered Consumption: 557.620

Water Losses: 25,178.705

- Apparent Losses: 8,307.051
  - Unauthorized Consumption: 2,279.514
  - Customer Metering Inaccuracies: 3,133.704
  - Systematic Data Handling Errors: 2,893.833
- Real Losses: 16,871.654
  - Leakage on Transmission and/or Distribution Mains: Not broken down
  - Leakage and Overflows at Utility's Storage Tanks: Not broken down
  - Leakage on Service Connections: Not broken down

Revenue Water: 66,493.534

Non-Revenue Water (NRW): 25,746.957

AWWA Water Loss Control Committee (WLCC) Water Audit Software v3.0

WASv3.0

PURPOSE: This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery

USE: The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons on the left below. Descriptions of each sheet are also given below.

THE FOLLOWING KEY APPLIES THROUGHOUT:

- Value must be entered by user
- Value may be entered by user
- Value calculated based on input data
- These cells contain recommended default values

Please begin by providing the following information, then proceed through each sheet in the workbook:

NAME OF CITY OR UTILITY: Miami-Dade Water and Sewer Department COUNTRY: United States

REPORTING YEAR: 2006 START DATE(MM/YYYY): Jan-06 END DATE(MM/YYYY): Dec-06

NAME OF CONTACT PERSON: Maribel Balbin E-MAIL: Balbin@miamidade.gov TELEPHONE: 786-552-8149 Ext.

PLEASE SELECT PREFERED REPORTING UNITS FOR WATER VOLUME: Million gallons (US)

Click to advance to sheet… Click here: ? for help about units and conversions

Instructions	The current sheet
Reporting Worksheet	Enter the required data on this worksheet to calculate the water balance
Water Balance	The values entered in the Reporting Worksheet are used to populate the water balance
Definitions	Use this sheet to understand terms used in the audit process
Water Loss Standing	Use this sheet to help interpret the results of the performance indicators

If you have questions or comments regarding the software please contact us at: wlc@awwa.org

AWWA WLCC Water Audit Software: Reporting Worksheet

WASv3.0

Back to Instructions

? Click to access definition

Water Audit Report for: Miami-Dade Water and Sewer Department
Reporting Year: 2006

Please enter data in the white cells below. Where possible, metered values should be used; if metered values are unavailable please estimate a value. Indicate this by selecting a choice from the gray box to the left, where M = measured (or accurately known value) and E = estimated.

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

Volume from own sources:	M	124,507.500	Million gallons (US)/yr (MG/Yr)	
Master meter error adjustment:	E	2,148.426	under-registered	MG/Yr
Water imported:	M	514.072	MG/Yr	
Water exported:	M	29,054.682	MG/Yr	
WATER SUPPLIED:		98,115.316	MG/Yr	

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:
Billed metered:	M	70,849.015	MG/Yr		
Billed unmetered:	E	0.000	MG/Yr		
Unbilled metered:	M	18.638	MG/Yr		
Unbilled unmetered:	E	670.779	MG/Yr		670.779
AUTHORIZED CONSUMPTION:		71,538.432	MG/Yr		

Use buttons to select percentage OR value

				Pcnt:	Value:
WATER LOSSES (Water Supplied - Authorized Consumption)		26,576.884	MG/Yr		
Apparent Losses					
Unauthorized consumption:	E	2,418.394	MG/Yr		2418.394
Customer metering inaccuracies:	E	3,339.313	MG/Yr	4.50%	
Systematic data handling errors:	E	3,125.539	MG/Yr		
Apparent Losses:		8,883.247	MG/Yr		
Real Losses					
Real Losses = (Water Losses - Apparent Losses):		17,693.636	MG/Yr		
WATER LOSSES:		26,576.884	MG/Yr		

NON-REVENUE WATER

NON-REVENUE WATER:	27,266.301	MG/Yr	

SYSTEM DATA

Length of mains:	M	5,622.0	miles	
Number of active AND inactive service connections:	M	412,121		
Connection density:		73	conn./mile main	
Average length of customer service line:	E	12.0	ft	(pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	E	52.0	psi	

COST DATA

Total annual cost of operating water system:	M	$133,012,384	$/Year
Customer retail unit cost (applied to Apparent Losses):	M	$2.20	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	M	$516.19	$/Million gallons

DATA REVIEW - Please review the following information and make changes above if necessary:

- Input values should be indicated as either measured or estimated. You have entered:
  - **10 as measured values**
  - **8 as estimated values**
  - **0 as default values**
  - **0 without specifying measured, estimated or default**
- Water Supplied Data: No problems identified
- Unbilled unmetered consumption: No problems identified
- Unauthorized consumption: No problems identified
- It is important to accurately measure the master meter - you have entered the measurement type as: measured
- Cost Data: No problems identified

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume:	27.8%
Non-revenue water as percent by cost:	21.8%
Annual cost of Apparent Losses:	$19,543,144
Annual cost of Real Losses:	$9,133,278

Operational Efficiency Indicators

Apparent Losses per service connection per day:	59.05	gallons/connection/day
Real Losses per service connection per day*:	117.62	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	2.26	gallons/connection/day/psi
? Unavoidable Annual Real Losses (UARL):	1,883.92	million gallons/year
? Infrastructure Leakage Index (ILI) [Real Losses/UARL]:	9.39	

* only the most applicable of these two indicators will be calculated

AWWA WLCC Water Audit Software: Water Balance

WASv3.0

Water Audit Report For:	Report Yr:
Department	2006

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<tr><td rowspan="8">Own Sources
(Adjusted for known errors)
126,655.926</td><td rowspan="8">Water Exported
29,054.682</td><td colspan="4">Billed Water Exported</td></tr>
<tr><td rowspan="4">Authorized Consumption
71,538.432</td><td rowspan="2">Billed Authorized Consumption
70,849.015</td><td>Billed Metered Consumption (inc. water exported)
70,849.015</td><td rowspan="2">Revenue Water
70,849.015</td></tr>
<tr><td>Billed Unmetered Consumption
0.000</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption
689.417</td><td>Unbilled Metered Consumption
18.638</td><td rowspan="4">Non-Revenue Water (NRW)
27,266.301</td></tr>
<tr><td>Unbilled Unmetered Consumption
670.779</td></tr>
<tr><td rowspan="4">Water Losses
26,576.884</td><td rowspan="3">Apparent Losses
8,883.247</td><td>Unauthorized Consumption
2,418.394</td></tr>
<tr><td>Customer Metering Inaccuracies
3,339.313</td></tr>
<tr><td>Systematic Data Handling Errors
3,125.539</td></tr>
<tr><td>Water Imported
514.072</td><td rowspan="3">Real Losses
17,693.636</td><td>Leakage on Transmission and/or Distribution Mains
Not broken down</td></tr>
<tr><td colspan="2">Water Supplied
98,115.316</td><td>Leakage and Overflows at Utility's Storage Tanks
Not broken down</td></tr>
<tr><td colspan="2"></td><td>Leakage on Service Connections
Not broken down</td></tr>
</table>

Appendix C

Pipe Length Details

(from enhanced GIS database)

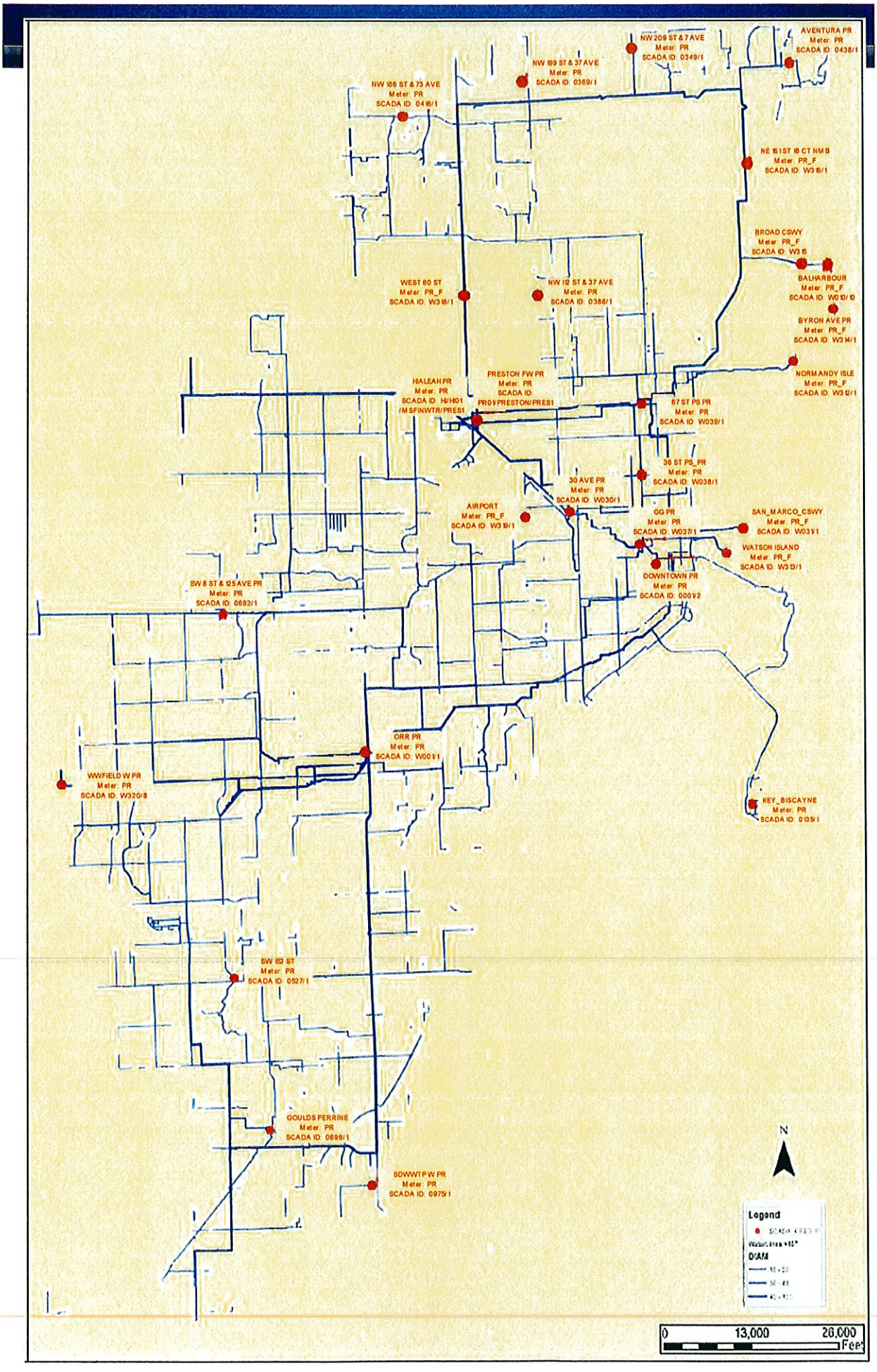
DIAMETER	ASSETDESC	LENGTH	MILES
0.12	Distribution	87.89	0.02
1.25	Distribution	6,121.00	1.16
2.50	Distribution	10,868.55	2.06
3.00	Distribution	53,617.73	10.15
7.00	Distribution	36.27	0.01
12.00	Distribution	122.59	0.02
14.00	Distribution	2,632.54	0.50
18.00	Distribution	6,733.46	1.28
		Distribution Total	**15.19**
10.00	FireServicd	118,114.88	22.37
		FireServicd Total	**22.37**
66.00	RawWater	1,294.18	0.25
72.00	RawWater	6,277.81	1.19
96.00	RawWater	47,960.52	9.08
		RawWater Total	**10.52**
0.00	ServiceLine	37,986.72	7.19
0.75	ServiceLine	1,188.74	0.23
1.00	ServiceLine	7,537.11	1.43
1.50	ServiceLine	14,862.04	2.81
2.00	ServiceLine	508,579.26	96.32
4.00	ServiceLine	462,468.55	87.59
		ServiceLine Total	**195.57**
6.00	Transmission	1,546,718.88	292.94
8.00	Transmission	5,118,188.15	969.35
12.00	Transmission	2,505,178.36	474.47
16.00	Transmission	836,371.66	158.40
20.00	Transmission	224,075.84	42.44
21.00	Transmission	34.70	0.01
24.00	Transmission	267,505.46	50.66
26.00	Transmission	84.28	0.02
30.00	Transmission	70,858.25	13.42
36.00	Transmission	134,875.14	25.54
42.00	Transmission	6,243.97	1.18
48.00	Transmission	145,588.00	27.57
49.00	Transmission	6.74	0.00
54.00	Transmission	50,539.05	9.57
60.00	Transmission	17,027.18	3.22
80.00	Transmission	17.96	0.00
84.00	Transmission	7,390.69	1.40
		Transmission Total	**2,070.21**
		Grand Total	**2,313.86**

DIAMETER	ASSETDESC	LENGTH	MILES
0.75	Distribution	1,578.37	0.30
1.00	Distribution	12,364.12	2.34
1.25	Distribution	22,464.05	4.25
1.50	Distribution	55,949.51	10.60
2.50	Distribution	44,225.01	8.38
3.00	Distribution	105,533.76	19.99
5.00	Distribution	165.29	0.03
8.00	Distribution	8.16	0.00
10.00	Distribution	108,912.85	20.63
14.00	Distribution	1,087.67	0.21
16.00	Distribution	122,126.87	23.13
		Distribution Total	**89.85**
0.00	HydrantLine	715.25	0.14
4.00	HydrantLine	1,069,295.49	202.52
		HydrantLine Total	**202.65**
12.00	RawWater	512,576.47	97.08
18.00	RawWater	5,770.21	1.09
66.00	RawWater	952.86	0.18
		RawWater Total	**98.35**
2.00	ServiceLine	1,375,357.30	260.48
		ServiceLine Total	**260.48**
8.00	SlugLine	1,237,242.39	234.33
		SlugLine Total	**234.33**
20.00	Transmission	65,335.74	12.37
24.00	Transmission	66,552.55	12.60
30.00	Transmission	75,414.20	14.28
36.00	Transmission	66,710.20	12.63
42.00	Transmission	39,008.35	7.39
48.00	Transmission	75,560.42	14.31
54.00	Transmission	3,335.79	0.63
60.00	Transmission	15,860.98	3.00
72.00	Transmission	860.74	0.16
		Transmission Total	**77.39**
6.00	Unknown	2,148,554.76	406.92
		Unknown Total	**406.92**
		Grand Total	**1,369.98**

DIAMETER	ASSETDESC	LENGTH	MILES
1.25	Distribution	5,842.75	1.11
1.50	Distribution	15,111.84	2.86
14.00	Distribution	255.15	0.05
		Distribution Total	**4.02**
2.50	FireServicd	12,694.68	2.40
3.00	FireServicd	25,409.77	4.81
		FireServicd Total	**7.22**
18.00	RawWater	4,852.36	0.92
		RawWater Total	**0.92**
0.75	ServiceLine	871.89	0.17
1.00	ServiceLine	11,565.40	2.19
		ServiceLine Total	**2.36**
12.00	SlugLine	1,764,751.73	334.23
2.00	SlugLine	895,324.84	169.57
		SlugLine Total	**503.80**
10.00	Transmission	71,349.19	13.51
120.00	Transmission	202.20	0.04
16.00	Transmission	616,475.28	116.76
20.00	Transmission	161,120.60	30.52
24.00	Transmission	166,345.74	31.50
30.00	Transmission	98,053.65	18.57
36.00	Transmission	89,390.56	16.93
42.00	Transmission	21,944.06	4.16
48.00	Transmission	142,213.66	26.93
54.00	Transmission	42,729.04	8.09
6.00	Transmission	2,376,510.15	450.10
60.00	Transmission	24,529.48	4.65
72.00	Transmission	4,974.90	0.94
8.00	Transmission	4,401,933.81	833.70
84.00	Transmission	1,169.01	0.22
96.00	Transmission	45,184.16	8.56
		Transmission Total	**1,565.18**
0.00	Unknown	41,135.71	7.79
4.00	Unknown	694,788.87	131.59
		Unknown Total	**139.38**
		Grand Total	**2,222.87**

Appendix D

Distribution System Pressure Data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Meter: PR
SCADA ID: 0349/1
NW 199 ST & 37 AVE
Meter: PR
SCADA ID: 0369/1
NW 186 ST & 73 AVE
Meter: PR
SCADA ID: 0416/1
NE 151ST 18 CT NMB
Meter: PR_F
SCADA ID: W315/1
BROAD CSWY
Meter: PR_F
SCADA ID: W315
BALHARBOUR
Meter: PR_F
SCADA ID: W010/0
BYRON AVE PR
Meter: PR_F
SCADA ID: W314/1
NORMANDY ISLE
Meter: PR_F
SCADA ID: W312/1
WEST 60 ST
Meter: PR_F
SCADA ID: W318/1
NW 112 ST & 37 AVE
Meter: PR
SCADA ID: 0368/1
HIALEAH PR
Meter: PR
SCADA ID: HIHD1
/MSFINWTR/PRES1
PRESTON FW PR
Meter: PR
SCADA ID:
PR01PRESTON/PRES1
67 ST PS PR
Meter: PR
SCADA ID: W039/1
36 ST PS_PR
Meter: PR
SCADA ID: W038/1
30 AVE PR
Meter: PR
SCADA ID: W030/1
AIRPORT
Meter: PR_F
SCADA ID: W319/1
GG PR
Meter: PR
SCADA ID: W037/1
SAN_MARCO_CSWY
Meter: PR_F
SCADA ID: W031/1
WATSON ISLAND
Meter: PR_F
SCADA ID: W313/1
DOWNTOWN PR
Meter: PR
SCADA ID: 0001/2
SW 8 ST & 125 AVE PR
Meter: PR
SCADA ID: 0682/1
ORR PR
Meter: PR
SCADA ID: W001/1
WWFIELD W PR
Meter: PR
SCADA ID: W320/8
KEY_BISCAYNE
Meter: PR
SCADA ID: 0135/1
SW 152 ST
Meter: PR
SCADA ID: 0527/1
GOULDS PERRINE
Meter: PR
SCADA ID: 0698/1
SDWWTP W PR
Meter: PR
SCADA ID: 0975/1
N
Legend
DIAM
0
13,000
26,000
Feet

Annual Average Pressure (psi)

WTP	
A. Orr	69.85
Preston	70.46
Hialeah	72.25
AVG	70.9
Median	70.5

Middle	
67 ST RPS	62.86
36 St RPS	61.63
GG	65.17
30 Ave	62.94
Downtown	63.23
W60 St	56.66
NW 112&37 Ave	63.77
Airport	61.09
SW8&125	63.4
SW152St	56.42
	61.7
	62.9

Far	
Key B	58.97
NW209St&7Ave	57.89
NW199St&37Crt	57.23
NW186St&73Ave	56.09
Aventura	54.36
Goulds P	
SDWWTP	54.45
Bal H	60.13
San Marco	56.96
Normandy I	52.92
Watson I	62.35
Broad Cswy	65.61
NE 161 St	58.7
	58.0
	57.6

Combined Average 63.5

Annual Average Max Pressure (psi)

WTP	
A. Orr	72.81
Preston	73.59
Hialeah	75.51
AVG	74.0
Median	73.6

Middle	
67 ST RPS	65.71
36 St RPS	64.55
GG	67.88
30 Ave	66.27
Downtown	65.95
W60 St	59.41
NW 112&37 Ave	66.92
Airport	64.24
SW8&125	66.4
SW152St	59.73
	64.7
	65.8

Far	
Key B	62.28
NW209St&7Ave	61.12
NW199St&37Crt	60.39
NW186St&73Ave	59.22
Aventura	57.39
Goulds P	
SDWWTP	57.16
Bal H	63.3
San Marco	60.09
Normandy I	55.73
Watson I	65.47
Broad Cswy	68.8
NE 161 St	61.68
	61.1
	60.8

Combined Average 66.6