WASD SANITARY SEWER SYSTEM PERFORMANCE & ASSET MANAGEMENT

Biscayne Bay Task Force
January 27, 2020

Miami-Dade Water and Sewer Department
OVERVIEW

1. Wastewater System
2. Miami-Dade Beach Advisories & Sanitary Sewer System Performance
3. O&M Programs
4. Critical Asset Prioritization
5. Septic Systems
WASTEWATER SYSTEM

Conveyance System

South District WWTP
AADF: 112.5 mgd

Central District WWTP
AADF: 143 mgd

North District WWTP
AADF: 120 mgd

PUMP STATIONS
1,050

FORCE MAINS
1,000 miles ~

Gravity Mains & Laterals
5,000 miles ~

Effluent Flow

To Injection Well

To Ocean Outfall

To Ocean Outfall & Injection Well

AADF:
Annual Average Daily Flow
mgd:
million gallons per day
WWTP:
Wastewater Treatment Plant
WASTEWATER BY THE NUMBERS

- WASD is the largest water/wastewater utility in the Southeast United States.
- The Department conveys over 300 million gallons per day through pipeline infrastructure each day.
- Over 110 billion gallons of wastewater collected, conveyed, and treated each year.
- 42,000 gallons per year per resident
### WASD Capital Program

<table>
<thead>
<tr>
<th></th>
<th>Spent to Date (Prior: FY 2020)</th>
<th>Future Budget</th>
<th>Total Project Cost</th>
<th>% Spent</th>
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<tbody>
<tr>
<td>Consent Decree</td>
<td>$530 M</td>
<td>$1,287 M</td>
<td>$1,817 M</td>
<td>29%</td>
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<tr>
<td>Pump Stations &amp; Flow Reduction</td>
<td>85</td>
<td>304</td>
<td>389</td>
<td>22%</td>
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<tr>
<td>WASD Capital Projects</td>
<td>443</td>
<td>2,698</td>
<td>3,141</td>
<td>14%</td>
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<tr>
<td>Ocean Outfall</td>
<td>125</td>
<td>2,052</td>
<td>2,177</td>
<td>6%</td>
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<tr>
<td><strong>Totals</strong></td>
<td><strong>$1,183 M</strong></td>
<td><strong>$6,341 M</strong></td>
<td><strong>$7,524 M</strong></td>
<td><strong>16%</strong></td>
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Miami-Dade has experienced an evolution in water demands/wastewater generation over the past decade.

Various factors have led to progressively lower water demands:
- Water conservation program yielding reduced per capita water consumption
- Deceleration of population growth
- Florida Building Department Code changes requiring high efficiency fixtures for new construction
- Evolving trends in housing demographics (apartments development versus single family homes), and water use practices.
- Inflow/Infiltration reduction efforts
Actual & Projected Annual Average Daily Flow (AADF) vs. Permitted & Proposed Treatment Capacity

NOTES:
1. Current Regional Treatment Capacity - 375.5 MGD
2. South District WWTP - 165 MGD Expansion - 394 MGD
3. Projections account for estimates in climate change, sea level rise, and reductions in flow due to LID efforts.
WASD CAPITAL PROGRAM

• Evolution of water demands have led to a reduction of over $5 billion in unnecessary capacity enhancement projects.

• As a result, WASD is orienting its CIP towards reinvestment of resources to improve existing assets, operation and maintenance, optimize water resources, and other environmental initiatives.

• The Department has engaged key stakeholders (RER-DERM, SFWMD, FDEP, etc.) to develop and coordinate strategy.
Key Objectives of O&M Programs

- $400 Million + in annual operations and maintenance investments
- Improve Quality of Service and Safety
- Improve Response Time
- Better Able to Meet Customer Needs
- Optimize Capital and O&M Investments
- Build Staff Awareness and Training
- More Reliable Systems and Services
- Sustainable Long-Term Funding Plan
- Greater Accountability
MIAMI-DADE BEACH ADVISORIES & SANITARY SEWER SYSTEM PERFORMANCE
FLORIDA HEALTHY BEACHES PROGRAM

• The Florida Department of Health administers the “Florida Healthy Beaches Program”
• FDOH monitors 16 public beaches in Miami-Dade County.
• If a public beach exhibits bacteriological indicators above standards for two consecutive days an advisory is used.
• FDOH utilizes a standard of 70 sp. Enterococci per 100 ml of marine water.
• Multiple factors can cause Beach Advisories:
  • Runoff from precipitation events
  • Animal waste
  • Seaweed decomposition
  • Sanitary sewer systems
  • Other sources
• Beach advisories have increased significantly in recent years.

• In the 15 years from 2001-2016 FDOH averaged approximately 8 advisories per year.

• Since 2017 beach advisories have increased to approximately 25 per year.

• Approximately 50% of beach advisories in Miami-Dade occur at Dog Beach and Key Biscayne Beaches (Crandon South, Crandon North, Key Biscayne Beach, etc.)

• Approximately 50 % of beach advisories occur in the months of August – October
WASD SANITARY SEWER OVERFLOW (SSO) INCIDENTS – 15 YEAR HISTORY
BEACH ADVISORIES VS. SSO EVENTS

The chart shows the number of beach advisories and WASD surface water SSO's from 2012 to 2020. The number of beach advisories appears to be declining, while the number of WASD surface water SSO's is increasing significantly in recent years.
Beach advisory data indicates that approximately 50% of all advisories are proximate to Key Biscayne.

In 2019, the Village of Key Biscayne engaged the University of Miami to undertake an independent water quality study to identify sources of “Fecal Indicator Bacteria”.

Preliminary results of data sampled in the summer months indicated the “main source of bacteria appears to be sand and seaweed”. The study is ongoing, and final results are anticipated in 2020.

The analysis of WASD operations at the CDWWTP have not identified a connection between the issues observed at the beaches and facility operations.
The Central District Treatment Plant removes bacteria through disinfection processes to levels that exceed bacteriological water quality requirements.

Data indicates that in the period from 2017-2019, the plant achieved an average enterococci value of 14 mpn/100 ml, exceeding beach standard of 70 mpn/100 ml.

Water quality data from Virginia Key Beach, nearest to the CDWWTP, indicate that Beach Advisories occur seldomly, at a rate of less than 0.25 advisories per year.

Meanwhile, advisories at nearby Dog Beach are more than 5 times as frequent at approximately 1.5 advisories per year, due to drivers such as animal waste.
• The public beach nearest to the Central District WWTP, exhibits *among the lowest bacteriological concentrations in the area*, and has only experienced 4 beach advisories since 2001.

• *Other nearby beaches, such as Dog Beach, Crandon Park, etc., with higher human and animal activity exhibit much higher concentrations and higher frequency of beach closures.*

<table>
<thead>
<tr>
<th>Public Beach</th>
<th>Virginia Key Beach</th>
<th>Dog Beach</th>
<th>Crandon Park North Beach</th>
<th>Crandon Park South Beach</th>
<th>Key Biscayne Beach</th>
<th>CDWWTP Treated Effluent*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Enterococci Concentration</td>
<td>9</td>
<td>30</td>
<td>31</td>
<td>26</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Beach Advisories since 2001</td>
<td>4</td>
<td>27</td>
<td>10</td>
<td>21</td>
<td>8</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Data: 2016-2018*
Beach water quality studies performed in Miami-Dade and utility data correlate to indicate that primary drivers of beach advisories are stormwater runoff, wildlife, and human activity.

The National Resource Defense Council quantifies the causes of beach advisories and reports that less than 10% of advisories are due to sanitary sewer, with the majority resulting from other sources.

Additional monitoring is required to further quantify the impacts and appropriate mitigation measures to address stormwater runoff, agricultural runoff, beachgoers, wildlife, human waste, etc.

FDOH monitors water quality in public beaches within 34 counties in the State of Florida and over 250 beaches.

In the period from 2000 through 2019, FDOH has issued approximately 9,000 beach advisories in the State of Florida, representing a 4.0% rate of occurrence.

Miami-Dade beach water quality has been sampled over 15,000 times in the past 20 years, with only approximately 200 advisories issued during the period, or approximately a 1.5% rate of occurrence.

Water quality data indicates that Miami-Dade public beaches are significantly less likely to experience advisories than other beaches in the State of Florida.
BEACH ADVISORIES IN FLORIDA

Beach Advisories per Public Beach Monitored (2000-2018)

Data Source: Florida Department of Health Florida Healthy Beaches Program

(1) The chart above reflects all advisories within the State of Florida based on FDOH data set. No adjustments have been made to control for changes in scope of monitoring program (number of beaches) or updates to water quality standards for advisories over the period.

(2) Data could not be normalized to account for differences in the number of samples (days) above bacteriological standard that various Counties utilize as basis for issuing advisories.
• In Miami-Dade there has been an average of less than one (1) beach advisory issued each year for every beach monitored by the Florida Department of Health in the period from 2000-2018.

• The average number of advisories in the State of Florida per beach monitored, is approximately **3 times that of Miami-Dade**.

• Other trends indicate that beach advisories throughout Florida are more prevalent in the summer months, consistent with heavy rainfall, higher temperatures, and human activity.
In 2018, WASD achieved a 15-year low in Sanitary Sewer Overflows, at an equivalent rate of less than 1 gallon per resident served, or 0.0025% of the 42,000 gallons generated per resident annually.

In the same year, beach advisories reached a historical high.

In 2012 when no beach advisories were issued, WASD experienced 139 SSO’s representing a volume of over 2 million gallons.

Data indicates that there is not a correlation between WASD SSO’s and Beach Advisories.
HOW DO WE COMPARE TO THE REST OF FLORIDA?

• Reporting by the Florida Department of Environmental Protection (FDEP) indicates that the Southeast District has experienced significantly less spills than other regions in Florida.

• The data reflects utility performance over the past decade (2009-2018).

• The region represents approximately 32% of the State’s population, however, contributes to only 5.8% of all sanitary sewer overflows.

Note: Spills include partially treated, reclaimed, treated and untreated wastewater.

SOURCE: Florida Department of Environmental Protection
HOW DOES WASD COMPARE OTHER MAJOR FLORIDA UTILITIES?

- Miami-Dade County Reported 51 of approximately 1,250 sanitary sewer overflow incidents reported within Florida in 2018.

- WASD serves approximately 15% of the State of Florida’s population on sanitary sewer, but contributed only approximately 4% of spills over 1,000 gallons.

- Miami-Dade’s SSO incident totals were lower than any other County with a population greater than 1,000,000 and among the lowest per-capita in Florida.

<table>
<thead>
<tr>
<th>County</th>
<th>SSO Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>114</td>
</tr>
<tr>
<td>Pinellas</td>
<td>85</td>
</tr>
<tr>
<td>Hillsborough</td>
<td>74</td>
</tr>
<tr>
<td>Broward</td>
<td>64</td>
</tr>
<tr>
<td>Palm Beach</td>
<td>59</td>
</tr>
<tr>
<td>Duval</td>
<td>58</td>
</tr>
<tr>
<td>Miami-Dade</td>
<td>51</td>
</tr>
</tbody>
</table>

2018 SSO Incidents Reported to State Watch Office/FDEP

Data Source: FDEP Public Pollution Notice Database - https://floridadep.gov/pollutionnotice
Reporting of SSOs in excess of 1,000 gallons per F.S. Chapter 403, and FAC 62.620/62-604
HOW DOES WASD COMPARE TO THE REST OF FLORIDA?

WASD 5 Year SSO Rate < 1 gallon per resident per year (0.0025% of annual flow)
### WASD WASTEWATER EFFLUENT QUALITY

**Central District Wastewater Treatment Plant**

**Average Monthly Operating Conditions**

<table>
<thead>
<tr>
<th>MONTH</th>
<th>CBOD5</th>
<th>TSS</th>
<th>Coliform, Fecal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Influent (mg/L)</td>
<td>Effluent (mg/L)</td>
<td>% REMOVAL</td>
</tr>
<tr>
<td>Jan-18</td>
<td>166</td>
<td>10.0</td>
<td>94.0</td>
</tr>
<tr>
<td>Feb-18</td>
<td>159</td>
<td>7.5</td>
<td>95.3</td>
</tr>
<tr>
<td>Mar-18</td>
<td>148</td>
<td>6.2</td>
<td>95.8</td>
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<tr>
<td>Apr-18</td>
<td>134</td>
<td>6.3</td>
<td>95.3</td>
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<tr>
<td>May-18</td>
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<tr>
<td>Jun-18</td>
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<tr>
<td>Jul-18</td>
<td>124</td>
<td>4.8</td>
<td>96.1</td>
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<tr>
<td>Aug-18</td>
<td>124</td>
<td>5.9</td>
<td>95.0</td>
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<tr>
<td>Sep-18</td>
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<td>Oct-18</td>
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<td>Nov-18</td>
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<tr>
<td>Dec-18</td>
<td>133</td>
<td>6.4</td>
<td>95.0</td>
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WASD WASTEWATER EFFLUENT QUALITY

NORTH DISTRICT WASTEWATER TREATMENT PLANT
AVERAGE MONTHLY OPERATING CONDITIONS

MONTH YEAR

<table>
<thead>
<tr>
<th>MONTH</th>
<th>BOD5s (mg/L)</th>
<th>TSS (mg/L)</th>
<th>Coliform, Fecal (cu/100 mL)</th>
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<tr>
<td></td>
<td>Influent</td>
<td>Effluent</td>
<td>% REMOVAL</td>
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<tr>
<td>Jan-18</td>
<td>176</td>
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<tr>
<td>Feb-18</td>
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<td>May-18</td>
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<td>Jun-18</td>
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<td>Aug-18</td>
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<tr>
<td>Sep-18</td>
<td>127</td>
<td>6.3</td>
<td>95</td>
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<tr>
<td>Oct-18</td>
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<td>Nov-18</td>
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<td>7.6</td>
<td>94</td>
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<tr>
<td>Dec-18</td>
<td>126</td>
<td>6.4</td>
<td>95</td>
</tr>
</tbody>
</table>

DATE

- INFLUENT MG/L
- EFFLUENT MG/L
- 12 MONTH ROLLING AVG
- CBOD Limit
- PERCENT REMOVAL
WASD WASTEWATER EFFLUENT QUALITY

SOUTH DISTRICT WASTEWATER TREATMENT PLANT
AVERAGE MONTHLY OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>MONTH</th>
<th>BodC5 Influent (mg/L)</th>
<th>BodC5 Effluent (mg/L)</th>
<th>% REMOVAL</th>
<th>Fecal Influent (mg/L)</th>
<th>Fecal Effluent (mg/L)</th>
<th>% REMOVAL (cu/100 mL)</th>
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<td>1.74</td>
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<td>273</td>
<td>2.55</td>
<td>99.1</td>
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<tr>
<td>Mar-18</td>
<td>216</td>
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<td>Jul-18</td>
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<td>3.00</td>
<td>98.25</td>
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<td>1.50</td>
<td>98.9</td>
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<td>2.40</td>
<td>98.51</td>
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<tr>
<td>Dec-18</td>
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<td>3.50</td>
<td>97.8</td>
<td>185</td>
<td>2.30</td>
<td>98.76</td>
</tr>
</tbody>
</table>
NUMEROUS WATER & SEWER UTILITIES OPERATE ADJACENT TO PUBLIC BEACHES

- Several coastal communities own and operate sanitary sewer systems. These include:
  - Bal Harbour
  - Bay Harbor Islands
  - Coral Gables
  - Indian Creek
  - Miami-Beach
  - North Bay Village
  - North Miami
  - Surfside
- Additionally, these communities manage stormwater utilities, and other systems that interact with the environment.
• It is unknown at this time the leading causes of beach advisories in Miami-Dade County.
• However, data and independent analyses indicate that recent increases in advisories appear to be unrelated to sanitary sewer overflows.
• As sanitary sewer system performance has improved, beach advisories have increased.
• Additionally, advisories are seasonal (high propensity August – October) while sewer system performance is not.
• Further study of other drivers (runoff, seaweed, animal contributions) is necessary.
OPERATION AND MAINTENANCE PROGRAMS
CMOM Programs

Objectives

• Asset Management
  • Condition of Existing Assets
  • Identify the “Right Project at the Right Time”
  • Reduce / Prevent Sanitary Sewer Overflows (SSOs)

• Operations & Maintenance
  • Extend Useful Life of Existing Assets
  • Resource Management
  • Reduce / Prevent SSOs

• Technology
  • Data Reliability & Integration
  • Data Driven Analytics
  • Dynamic and Adaptive Performance Management

Components

• Gravity Sewer
• Pump Stations
• Force Main Network
• Treatment Plants
CMOM PROGRAMS

Historic Programs

Adequate Pumping, Transmission, & Treatment Capacity
- The County shall insure adequate transmission and treatment capacity
- NAPOT

Pump Station Remote Monitoring
- Develop and implement SCADA Program
- 100% of PS

Wastewater Collection and Transmission System Model
- Develop and implement a computerized collection and transmission system model
- InfoWorks

Spare Parts
- Develop and implement an inventory management program for spare parts
- Infor EAM

Volume Sewer Customer Ordinance
- Develop and implement a Volume Sewer Customer Program to eliminate or otherwise control overflows
- WASD considered VSC

RER-DERM
Benefits of Capacity, Management, Operations and Maintenance Programs:

- Improved Quality of Service and Safety
- Improve Response Time
- Better Able to Meet Customer Needs
- Optimize Capital and O&M Investments
- Build Staff Awareness and Training
- More Reliable Systems and Services
- Sustainable Long-Term Funding Plan
- Greater Accountability
The purpose of the SORP is to establish and document standardized processes and procedures to protect public health and the environment by reducing the effects of SSOs, to provide a coordinated response to SSOs, and to improve communication at all levels including external communication with other agencies, property owners, and the media.

Major Implementation Activities

- SSO Event Notification Form
- Building Backup Notification Form
- SSO Consolidated Database
- Building Backup Database
- Performance Measure Tracking
- Training (Preparedness, AASIS Process, Contractor Outreach)
- Low Manhole Identification
The purpose of GSSOMP is to establish processes and procedures to address SSOs, particularly those caused by FOG, roots and/or debris obstructions related to the Gravity System. To achieve the goal of reducing, minimize, prevent, or otherwise control SSOs, the WWCTLD plans to transition focus from predominately code compliance and reactive to scheduled preventative O&M activities.
PUMP STATION OPERATIONS & PREVENTATIVE MAINTENANCE PROGRAM (PSOPMP)

PROGRAM DESCRIPTION

The purpose of the PSOPMP is to establish and document processes and procedures to operate and maintain WASD’s pump stations, in a manner that ensures the pump stations operate as designed by trained, well qualified staff, provide uninterrupted service to customers, extend the useful life of assets and optimize operational and capital replacement expenditure to maintain affordable customer rates.

Major Implementation Activities

- Asset Management
  - Technical specification data
  - Asset inventory
  - Condition assessments
  - Critical assets
- Inventory management system
- EAMS enhancements
  - Warranty tracking
  - Barcoding system
- Maintenance program
  - Preventative, predictive, & corrective
  - Review business processes, requirements, & manufacturers’ recommendations
  - Schedules & SOP
- Pump Station Operations & Instrumentation
Major Implementation Activities

- Criticality assessment and prioritization
- Assessment program
- Rehabilitation / replacement program
- Easement inspection and prioritization
- Maintenance Scheduling
- EAMS enhancements
- Inventory management system
- Corrosion control
  - Evaluation of options
  - Monitoring of the industrial discharge
  - Written specifications

The purpose of the FMOPMARP is to establish and document processes and procedures to operate and maintain WASD’s force main transmission system in a manner that ensures force mains operate as designed by trained, well-qualified staff; provide uninterrupted service to customers; reduce, prevent or control SSOs; extend the useful life of assets; and optimize expenditures to maintain affordable customer rates.
The purpose of the WWTPOMP is to establish and document processes and procedures to operate, maintain and renew equipment at the WASD's treatment plants in a manner that ensures that the plants continue to provide effluent quality that meets permit requirements; operate the facilities as designed by trained, well-qualified staff, to provide uninterrupted treatment; extend the useful life of assets and minimize expenditures to maintain affordable customer rates.

Major Implementation Activities

- Maintenance work management guideline
  - Asset register management plan
  - Inventory management plan
- Knowledge capture plan
- Maintenance program
  - Preventative, predictive, & corrective
- Asset Management
  - Asset inventory
  - Condition assessments
- Hauled waste program
- SCADA master plan
- EAMS enhancements
Major Implementation Activities

- Asset management framework
  - Level of service definition / statement
- Implementation of asset management activities in other programs
  - Inventory
  - Condition assessment
  - Identification of critical assets
- Life cycle costing
- Future long term projections and funding plan
- Capital planning process
- EAMS enhancement / technology and software procurement & deployment
- Establish training programs

The purpose of SSAMP is to provide an asset management framework to define the expected level of service WASD intends to provide customers, develop data and technology framework such that asset condition and asset criticality is documented and maintained to be considered in asset operation, maintenance, rehabilitation, and replacement decisions and in achieving the level of service, develop minimum life cycle costs to project future funding requirements.
The purpose of the IMS program is to develop tools to support the management, operations and maintenance information needs. The goal being to provide a management tool to gather, aggregate, and evaluate data from multiple input systems to report performance measures, an operational tool to standardize data collection, data retention, and compliance reporting, and a maintenance tool to streamline tracking and reporting of activities to allow for increased efficiency.

Major Implementation Activities

- Management Component
  - IMS dashboards
  - Management IMS repository
- Operations Component
  - MORS functionality enhancements
  - SCADA Master Plan
- Maintenance Component
  - EAMS functionality enhancements
- Standard forms and reports
- Records retention and disposal policy
- Construction contracts management project closeout business practices (E-Builder)
- GIS Program
Gravity Sewer System Activities include

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Inspections</th>
<th>Lining</th>
<th>Repairs and Replacement</th>
</tr>
</thead>
</table>

Completed in the last 5-years:

| 76 Smart Covers Installed | 1,512 miles of pipe inspected | 119 miles of pipes lined | 12,270 Pipeline Repairs |
- Sensors used to monitor sewer levels in critical manholes to prevent SSO's (due to FOG and debris).
- 76 Units deployed throughout the County
- Personnel response once system provides alerts
- In 2018, WASD averted 21 SSOs related to FOG and debris
- Smart Covers installed in Key Biscayne with objective of monitoring water levels– results indicated adequate performance of sewer system.
ONGOING O&M ACTIVITIES

Manhole Inspection

- Condition Assessment for the Manhole Structures

Manhole Grout

- Infiltration

Manhole Rehabilitation

- Corrosion into the structure due to H2S Gases
  - Bricks Manholes
  - Infiltration
ONGOING O&M ACTIVITIES

Pipeline Replacement
- Collapsed pipelines
- Heavy infiltration due to defects

Lateral Replacement
- Interruption of service
- Roots intrusion
- Offset joins and belly

Point Repair
- Broken by third party
- Infiltration
- Defects

Pipeline Grout
- Infiltration
FORCEMAIN O&M PROGRAM

Forcemain System Activities include:

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Inspections</th>
<th>Lining</th>
<th>Repairs and Replacement</th>
</tr>
</thead>
</table>

Completed in the last 5-years:

| 100% system evaluated via FMCA | 52 miles of Pipeline Inspected | 115 miles of Pipeline Lined | 30 miles of Pipeline Replaced |
CRITICAL ASSET PRIORITIZATION
**WHERE DO SSO’s COME FROM?**

- Sanitary sewer overflows occur throughout WASD’s asset types.

- In 2018, contractor damage to WASD infrastructure accounted for 60% of sanitary sewer overflow volumes.

- Only 16% of SSO’s were related to pipe failures.

### WHERE DO SSO’s COME FROM?

<table>
<thead>
<tr>
<th>Source</th>
<th>Pump Stations &amp; Gravity Mains</th>
<th>Force Mains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Outage</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>Electrical Failure</td>
<td>75%</td>
<td>20%</td>
</tr>
<tr>
<td>Piping Failure</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Mechanical Failure</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>External Contractor</td>
<td>75%</td>
<td>60%</td>
</tr>
<tr>
<td>Corrosion</td>
<td>20%</td>
<td>16%</td>
</tr>
<tr>
<td>Pipe Bedding/Other</td>
<td>4%</td>
<td>14%</td>
</tr>
<tr>
<td>Air Release Valve</td>
<td>1%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Source: 5 Years of SSO Data (2014-2018) – WASD Consent Decree Reports to USEPA
In 2018 WASD experienced 94 Sanitary Sewer Overflow (SSO’s) incidents in its wastewater collection/transmission system.

These SSO’s led to the discharge of approximately 1,169,000 gallons.

• 254,000 gallons to surface waters
• 915,000 gallons to ground

Historical low for the Department, and the majority of incidents remained external to WASD operations.
• WASD has significantly decreased the number of SSO’s over the past 15 Years
• <1 gallon has been spilled of over 42,000 gallons conveyed annually per county resident over the past 5 years.
• <1 gallon for every 100,000 gallons conveyed in 2018.
• Improvements are attributable to capital and operational investments

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>15 Year Annual Average</th>
<th>5 Year Annual Average</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSO Incidents</td>
<td>163</td>
<td>118</td>
<td>94</td>
</tr>
<tr>
<td>SSO Incidents – Surface Water</td>
<td>11</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>SSO - Volume (gal)</td>
<td>6,249,479</td>
<td>2,611,165</td>
<td>1,168,765</td>
</tr>
<tr>
<td>SSO - Surface Water Volumes (gal)</td>
<td>2,448,142</td>
<td>942,950</td>
<td>254,050</td>
</tr>
</tbody>
</table>

Of the 2018 SSO volumes, over 60% were attributed to contractor damage to WASD infrastructure, less than 500,000 gallons were related to WASD operations.
Gravity Mains and Pump Stations:

- **Power Outage**
  - Emergency Generators: 200 on-site units (18% of pump stations)
  - Portable Generators: Over 60 units available

- **Electrical Failure**
  - On-going panel upgrades program to enhance reliability (approximately 10 per year)

- **Pipe Failure:**
  - Monitoring
    - 76 Smart Covers Installed
  - Inspections
    - 1,512 miles of pipelines inspected
  - Pipeline Repair and Replacement
    - 12,270 pipeline repairs performed
  - Pipeline Lining
    - 119 miles of pipelines lined

- **Mechanical Failure**
  - Historical deferment of maintenance needs to be addressed through asset management

**HOW ARE WE FURTHER REDUCING SSO’s?**
HOW ARE WE FURTHER REDUCING SSO’s?

**Force Mains:**

- **External Contractor Damage**
  - 100,000 location tickets each year, with a damage ratio of less than 0.5%

- **Corrosion**
  - Developed force main criticality assessment for prioritization
  - Planning field condition assessments to drive capital program

- **Pipe Bedding**
  - Added inspection staff to further ensure proper installation

- **Air Release Valves**
  - Developing preventative maintenance practices and schedules
IDENTIFYING POTENTIAL FAILURES

- Data indicates that the majority of WASD pipeline failures are not directly correlated to age of pipe.
- Risk is driven by multiple factors including:
  - Material
  - Environment
  - Installation Quality
  - Location and external loads
  - Age
- WASD is applying best available science to inform its CIP and maximize investments.

<table>
<thead>
<tr>
<th>Force Main Material</th>
<th>Number of Segments</th>
<th>Segment Experiencing Failure – 5 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metallic</td>
<td>198,104</td>
<td>&lt;180</td>
</tr>
<tr>
<td>Concrete</td>
<td>46,779</td>
<td>&lt;40</td>
</tr>
<tr>
<td>Plastic</td>
<td>8,715</td>
<td>&lt;30</td>
</tr>
<tr>
<td>Total</td>
<td>253,598</td>
<td>&lt;250 (0.1%)</td>
</tr>
</tbody>
</table>
RISKED-BASED APPROACH

Probability of Failure (Likelihood) \times Consequence of Failure (Criticality) = Business Risk Exposure

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Insignificant</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost Certain</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Likely</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Possible</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Extreme</td>
</tr>
<tr>
<td>Unlikely</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Rare</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
### Probability of Failure
- Remaining Useful Life
- Material
- Installation Date
- Corrosion Threats
  - Material
  - Coastal / Salt Intrusion
  - Industrial Discharges
- Reported Failures & Wire Breaks
- Operating Pressure

### Consequence of Failure
- Triple Bottom Line Principles
- Economic Impact
  - Diameter
- Human Impact
  - Customer
- Environmental Impact
  - Proximity to Body of Water
RISK MANAGEMENT

• The majority of WASD Force Main assets that experience failures (>80%) have more than 50% of their anticipated useful life remaining.
• Age and material are not accurate predictors of asset performance/failure.
• WASD has performed a comprehensive force main criticality assessment.
• The Department is undertaking a force main condition assessment program to better inform decision making and capital improvement programs.
• Replacements will focus on critical assets to reduce risk - but cannot eliminate all incidents.
• Risk based capital program to be presented to the BCC.
• 120,000 Septic Tanks County-Wide
  • Of these septic tanks, approximately 5,000 and 12,000 are estimated to be outside of the Urban Development Boundary or within Volume Sewer Customer areas, respectively.
• 103,000 Septic Tanks within WASD Retail Service Area
  • Of the septic tanks within WASD’s service area, it is estimated that approximately 12,000 are currently abutting sanitary sewer systems with feasible connection.

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Parcels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Total Parcels on Septic Tank in Miami Dade County</td>
<td>120,000</td>
</tr>
<tr>
<td>-Estimated Parcels on Septic Tank Outside UDB</td>
<td>5,000</td>
</tr>
<tr>
<td>-Estimated Number of Parcels on Septic Tanks within Volume Sewer Customer Areas</td>
<td>12,000</td>
</tr>
<tr>
<td>Estimated Number of Parcels on Septic Tanks within WASD Service Area</td>
<td>103,000</td>
</tr>
<tr>
<td>-Estimated Number of Parcels on Septic Tanks which currently abut Sanitary Sewer Systems</td>
<td>12,000</td>
</tr>
<tr>
<td>Estimated Number of Parcels on Septic Tanks without immediate access to sanitary sewer infrastructure</td>
<td>91,000</td>
</tr>
</tbody>
</table>
Parcels currently lacking access to water system
Within WASD Service Area: 3,700 Parcels

Parcels currently lacking access to sewer system
Within WASD Service Area: 90,000 Parcels
Areas currently lacking access to sewer system:

Sewer: Approximately 3,900 Parcels
COST OF EXPANDING SERVICE

- **Residential:**
  - Expansion of Water Infrastructure
    - $250-300 Million
  - Expansion of Sewer Infrastructure
    - $3.3 – 3.7 Billion

- **Commercial**
  - Expansion of Sewer Infrastructure
    - $230-280 Million

**Total:** $3.8 – $4.3 Billion

Sources:
1. Miami-Dade Water and Sewer Department Identification, Cost Estimates, and Funding Options for Residential Pockets Without Water and/or Sewer Services – Tetra Tech, December 2016
2. Sewer Infrastructure Improvements to Commercial Corridors – Black and Veatch, 2015
3. Cost Estimate to Connect Residential and Commercial Properties to the County’s Water and Sewer System Miami-Dade - MDWASD, April 2013
• Board of County Commissioners Resolution 537-14 allocated **$126 million** in GOB funds for sewering of commercial corridors.

• WASD is currently undertaking the identified projects, including the Green Tech Corridor.

• Projects anticipated to be completed by 2023

• WASD is also upgrading existing water service in these areas, for a total investment of over $200 million.
SEPTIC TANK PLAN OF ACTION

• Miami-Dade County (RER and WASD) is actively evaluating the impact of septic tanks to the environment.

• Septic Systems Vulnerable to Sea Level Rise Report was submitted to Board of County Commissioners in December 2018 in response to Resolution R-911-16

• A Plan of Action Report developed by multi-department working group to be presented to BCC.

• The report identifies and recommends actions through a risk-based approach intended to yield the most resource-effective and impactful outcomes for the environment and human health.
WASD’s Sanitary Sewer System is performing at a high level, with SSO’s decreasing significantly over the past 15 years.

Data indicate that recent increases in advisories appear to be unrelated to sanitary sewer overflows.

The Department is enhancing its capital and O&M programs to further improve system performance through risk-based asset management targeting critical assets.

WASD CIP's will be oriented towards reinvestment of resources to improve existing assets, optimize water resources, and other environmental initiatives.
QUESTIONS?
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