Charleston’s Aging Infrastructure

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Capital Projects Officer
www.charlestonwater.com
Our Mission

is to protect public health and enhance the environment of our service community by providing clean water services of exceptional quality and value.
Public health
Fire protection

Public health
Environmental protection
1823  City Council funds Artesian Wells

1879  Franchise to City of Charleston Water Works Co. for Public Water

1897  City plans for Edisto River as future Water Source

1904  Hanahan WTP begins delivering treated water to City of Charleston

1917  Charleston Commissioners of Public Work (CPW) formed

1923  CPW takes over Water System and builds

1937  Hanahan WTP linked to Edisto River by 22-Mile Tunnel

1971  Plum Island WWTP completed

1982  Hanahan WTP linked to Bushy Park Reservoir by 10-Mile Tunnel

1961  CPW takes over Sanitary Sewer System from City of Charleston

2010  CPW name changed to Charleston Water System

2016  115,000 Water Accounts and 53,000 Sewer Accounts
Artesian well at Meeting and Wentworth Streets.

Artesian well at Rutledge Ave. and Calhoun St.
Goose Creek Dam around 1904
Hanahan Water Treatment Plant around 1905
Construction of the Edisto Intake 1928
In 1937, a 23-mile tunnel connecting the Edisto River to the Hanahan Plant was completed. The hand-excavated tunnel took nine years to build and cost $1.36 million.
Hanahan Water Treatment Plant in the 1940's.
Covers nearly 500 square miles. Provide retail and wholesale water service for the greater Charleston area, which includes multiple municipalities as well as areas of unincorporated Charleston County, the DoD, and portions of lower Berkeley and Dorchester Counties.
Water System Stats

- 1800 miles of mains
- 9,000 fire hydrants
- 6 storage tanks
- 8 booster pump stations
- 30 miles of raw water tunnels
- 2 raw water sources
- 1 treatment plant
Water System Stats

- 115,000 retail accounts
- 7 wholesale accounts
- 2015 treated water sales $66.0 M
- 2015 water impact fees $4.6 M
- 2015 avg. treated water pumpage 58.8 MGD
- 2015 max. day treated water pumpage 79.9 MG
1,800 miles of water pipe

Boulder, CO

Charleston, SC
Water System Master Planning and Capital Improvements Program
Water System Master Plans

• Cover Treatment Plant and Distribution System
• Address infrastructure needs for growth, continued regulatory compliance, and rehabilitation
• 25-year planning period
• Phased needs implementation using cycles of approximately 5 years each
• Needs prioritized by staff and consultants
• Estimate of service area water demands based on historical data and area planning information (recently adjusted for recession period)
• Calibrated hydraulic model simulates system pressures at current and projected demands
• Master Plans updated periodically
Water Demand Projections

Notes:
1. Existing treatment capacity (110 mgd) w/one filter out of service.
2. Expanded treatment capacity (129.4 mgd) with 4 new filters assuming one filter out of service in each Stoney complex.

Historical FW Production

Maximum Day

Peak Month

Annual Average

Begin planning for treatment capacity upgrade (2016)

**Treatment capacity upgrade placed into service (2026)**

Begin planning for additional treatment capacity upgrade (2030)
Number of Water and Sewer Accounts, 2000 - 2015

- Water Accounts: 53,000 to 115,000
- Sewer Accounts: 53,000 to 115,000
Capital Improvements Program

Support of Elected Officials → CIP and Water Rates
Financing → Muni Bonds, Cash Reserves
                            GO Bonds, SRF, WIFIA, etc.
Bond Ratings → S&P, Moodys, Fitch, others
                    CWS ratings AAA, AA+
Public → Inform and Educate
“...Restoring existing water systems as they reach the end of their useful lives and expanding them to serve a growing population will cost at least $1 trillion over the next 25 years, if we are to maintain current levels of water service.”

Capital Improvements Program
Proportion of Water Systems Built by Decade: South

Buried No Longer: Confronting America’s Water Infrastructure Challenge
### 2006-2015 Water Utility CIP

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Amount:</td>
<td>$246,145,800</td>
<td></td>
</tr>
<tr>
<td>Infrastructure R&amp;R Allocation:</td>
<td>$145,494,800</td>
<td>59%</td>
</tr>
<tr>
<td>Distribution System R&amp;R Allocation:</td>
<td>$49,145,800</td>
<td>20%</td>
</tr>
<tr>
<td>Plant R&amp;R Allocation:</td>
<td>$96,349,000</td>
<td>39%</td>
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</tbody>
</table>
## 2015 System Renewal Worksheet

<table>
<thead>
<tr>
<th>System Information¹</th>
<th>Target Needs</th>
<th>Actual (Current Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Total System Replacement Cost</strong></td>
<td><strong>Lifecycle (yrs.)</strong></td>
</tr>
<tr>
<td><strong>Water System</strong></td>
<td>Mains</td>
<td>$830,379,000</td>
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<tr>
<td></td>
<td>Valves</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydrants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Services</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td>$2,032,917</td>
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<tr>
<td><strong>Water Plant</strong></td>
<td>Plant</td>
<td>$307,119,084</td>
</tr>
<tr>
<td></td>
<td>Tunnels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage Tanks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reservoirs</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td>$9,808,943</td>
</tr>
</tbody>
</table>

¹ System Information
² Annual Renewal Target Rate
³ Renewal Rate
Capital Improvements Program

2015 Rehab and Renewal Rate

<table>
<thead>
<tr>
<th>Key Process</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Treatment</td>
<td>125</td>
</tr>
<tr>
<td>Water Distribution</td>
<td>25</td>
</tr>
<tr>
<td>Wastewater Collection</td>
<td>75</td>
</tr>
<tr>
<td>Wastewater Treatment</td>
<td>50</td>
</tr>
</tbody>
</table>
Capital Improvements Program

Investment for Replacement & Growth
South Large

Household Cost of Needed Investment for Replacement Plus Growth*
South Large

*This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.

Buried No Longer: Confronting America’s Water Infrastructure Challenge
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Water System
Rehabilitation/Renewal
High-Rate Plate Settler Basins
1.5 MG Elevated Storage Tank
Pressure Equalization and Filter Wash Water
New Nassau Street 3.5 MG Storage Tank
Contracted Fire Hydrant Maintenance
Water main replacement
America Street, downtown Charleston
Water Main Replacement
Queen Street, downtown Charleston
Water Main Cleaning and Lining
Bogart Street, downtown Charleston
Lead Service Line Replacement
Numerous Competing Issues / Challenges:

• Growth
• New Water Regulations
• DOT / County / City Road Improvements
Future Planning
Asset Management Program

- Comprehensive (Operations, IT, Accounting, Finance, Engineering)
- Enterprise asset inventory registry (EI) connects financial and various operational databases
- Asset accounting and depreciation (AD)
- Asset settlement (AS) bridges EI and AD
- Decision support (DS) incorporates tools for long-range planning for risk management and budget forecasting
- Capital planning (CP) incorporates tools for CIP development
Asset Management Program

Data Warehouse

- SCADA
  - Asset Registry
  - Condition
  - Maintenance frequency
  - Maintenance costs

- PLANTS
  - CMMS
  - Maintenance frequency
  - Maintenance costs

- Asset Settlement
- Asset Depreciation
- Capital Planning and Decision Support
- Prioritization
- Asset Lifecycle Forecasting
- Budgeting

- OPERATIONS
  - CMMS
  - Condition
  - Maintenance frequency
  - Maintenance costs

- GIS
  - Asset Registry

- CCTV
  - Valve Exercising
  - UDF
Integration of data sources enables data-driven decisions

- Installation of Assets (new and rehabilitation)
- Operations – O&M Costs, Optimization
- Rehabilitation and Replacement Strategy
- Capacity Management
- Resource Management
- Risk Management - Criticality
- Capital Planning
- Rate Planning
- Financial Forecasting – Management
- Analysis and Decision Making
“When the well is dry, we learn the worth of water.”

-Benjamin Franklin