Capacity Assurance in Charlotte’s Central Business District

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Charlotte Water Facts

- Provides Water and Sanitary Sewer Service to Mecklenburg County
- 5 WWTPs
- 123 MGD of Wastewater Treatment Capacity
- 4,300 Miles of sewer
- 82 sanitary sewer pump stations
Charlotte Water’s Sanitary Sewer Capacity Assurance Program (CAP)

- Program Information
  - EPA approved program
  - Started in 2008
  - Targets projects requesting 1.5-inch or larger water tap
  - Ensures adequate sanitary sewer conveyance and treatment capacity
  - Over 1,000 applicants since implementation
Tools for Analysis

- **System wide GIS**
  - Over 1.5 million assets cataloged

- **Temporary and Permanent Flow Monitoring**
  - 58 Permanent
  - 78 Temporary in 2017

- **Basin Studies**

- **Hydraulic Models**
  - Manning’s – Basic Analysis
  - InfoWorks ICM – Advanced Analysis
Central Business District is One of the Fastest Growing Areas in the City of Charlotte

- More than 100 known developments expected between 2016 and 2020
- Additional development anticipated
Central Business District Hydraulic Modeling Project Goals

- Develop a Planning Tool to Support the Capacity Assurance Program
- Consolidate Flow Projection Information into one Platform to Develop Long Term Improvements
- Determine Flow Triggers for Capacity Upgrades
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All Pipe Hydraulic Model Created for the Central Business District Area

- InfoWorks ICM model created of 66 miles of pipe in CBD network
- Network based on existing model, GIS and survey
Flow Monitoring Conducted to Determine Existing Flows

- 40 flow monitors installed for 10 weeks to determine dry and wet weather flows
Hydrograph Decomposition to Determine Dry and Wet Weather Flow Components

Sugar 1 Meter
February 22, 2016 Storm Event
2.44-inch Total Rainfall

Date
Flow (mgd)
Rainfall (in)

Average Dry Weather Flow
I/I

Flow Rate
Weekday ADWF
Rainfall
Dry and Wet Weather Flows Loaded On a Parcel Basis
Dry Weather Flows Allocated to Parcels Based on Water Billing Data
All Pipe Model Calibrated to Existing Dry and Wet Weather Flows
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Multiple Sources of Flow Projection Data Consolidated into the Parcel Based Hydraulic Model

- Existing 2016 flow - 6.4 mgd
  - Flow monitoring
- Future 2020 flow – 9.8 mgd
  - ~100 Planned Developments
- Future conditions - 2025, 2030, 2040
- Run the Hydraulic model for each planning period and identify trigger points for capacity limitations
### Traffic Analysis Zone Data Projects Population and Employees from 2010 – 2040 (Buildout)

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>TAZ Estimates</th>
<th>Flow Factor (gpd)</th>
<th>Estimated Flow (mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 Population</td>
<td>22,457</td>
<td>55</td>
<td>1.24</td>
</tr>
<tr>
<td>2016 Employee</td>
<td>102,397</td>
<td>30</td>
<td>3.07</td>
</tr>
<tr>
<td><strong>Total TAZ Estimated 2015 Flow</strong></td>
<td><strong>4.31</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Base Flow From Flow Monitoring</strong></td>
<td><strong>4.17</strong></td>
<td></td>
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</table>
## Future Flows Allocated on a Parcel Basis Within Each TAZ

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Planned Improvement Flow (gpd)</th>
<th>TAZ Flow (gpd)</th>
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</thead>
<tbody>
<tr>
<td>2020</td>
<td>10,000</td>
<td>5,000</td>
</tr>
<tr>
<td>2025</td>
<td>--</td>
<td>22,800</td>
</tr>
<tr>
<td>2035</td>
<td>--</td>
<td>24,400</td>
</tr>
<tr>
<td>2040</td>
<td>--</td>
<td>6,200</td>
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</table>
Wastewater Flow Projected to Increase Significantly in the Central Business District Due to Redevelopment

Wastewater Flows for the Central Business District Area

<table>
<thead>
<tr>
<th>Year</th>
<th>Flow (mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>6.4</td>
</tr>
<tr>
<td>2015</td>
<td>9.8</td>
</tr>
<tr>
<td>2020</td>
<td>11.6</td>
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<tr>
<td>2025</td>
<td>14.4</td>
</tr>
<tr>
<td>2030</td>
<td>15.1</td>
</tr>
<tr>
<td>2035</td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td></td>
</tr>
<tr>
<td>2045</td>
<td></td>
</tr>
</tbody>
</table>

Legend
Future Allocated Flow (gpd)
1 - 5,000
5,000 - 10,000
10,000 - 20,000
20,000 - 50,000
50,000 - 100,000
100,000 - 480,000
Capacity Analysis to Determine Impacts of Future Flows on the Collection System

Pipe Full Capacity (d/D)

- 0 - 25 %
- 26 - 50 %
- 51 - 75 %
- 76 - 99 %
- >= 100%

Manhole Full Within 1.5 Feet of the Rim
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Hydraulic Modeling Shows Significant Capacity Restrictions by 2030

<table>
<thead>
<tr>
<th>Planning Year</th>
<th>Projected Dry Weather Flow (gpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>120,000</td>
</tr>
<tr>
<td>2025</td>
<td>60,000</td>
</tr>
<tr>
<td>2030</td>
<td>2,310,000</td>
</tr>
<tr>
<td>2040</td>
<td>50,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,540,000</strong></td>
</tr>
</tbody>
</table>
Pipe Replacement Recommended by 2030

North Tryon Street to Parkwood Avenue

Parkwood Avenue

Parkwood Avenue to Eveningside Drive
Hydraulic Modeling To Determine Flow that Triggers Improvements
Identify Flow Triggers and be Proactive With Improvements

- An additional 260,000 gpd triggers significant surcharging in the interceptor
- Confirm model set up
  - Flows
  - Pipe slope
- Initiate capacity improvements as needed
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