Improving Capacity and Reliability of Brunswick County’s Northwest Water Treatment Plant
High Service Pump Station
Eric Williams – HDR
01 Background
Current Water Treatment Facilities

- **Northwest Water Treatment Plant**
  - Constructed in 1984
  - Surface water treatment - receives raw water from the Cape Fear River behind Lock and Dam No. 1
  - Capacity: 24 mgd

- **211 Water Treatment Plant**
  - Constructed in 1975
  - Groundwater treatment
  - Capacity: 6 mgd
Background

- **Customer Base**
  - 40,371 Residential accounts
  - 44 Industrial accounts
  - 10 Wholesale accounts

- **Water Usage**
  - Northwest WTP peak day in 2016: 20.754 mgd
  - Northwest WTP peak day in 2017: 21.232 mgd
02 Project Objectives
Project Objectives

- Replace existing High Service Pump Station
  - Existing design would not enable use of full volume of clearwell
  - Needed additional capacity

- Expand administration building space
  - Additional staff needs

- Replace filter underdrains and media
  - New equipment
  - Concrete rehabilitation
  - Add air scour
03 Future Needs
Future Needs

- Treatment expansion to 36 mgd
- New High Service Pump Station
- Flow measurement capability
- Maintain chloramination
- Additional Administration Building space
- Additional electrical needs
Basis of Design

High Service Pump Station

- Vertical turbine pumps in cans
- Total capacity: 45 mgd
- Number of pumps: 7
- Variable frequency drives
- Desired low flow: 3 mgd

Filter Improvements

- Concrete surface repair with cementitious product
- Concrete crack repair with an epoxy filler material
- Underdrain replacement with Leopold underdrain system
Basis of Design
Administration Building Expansion

- Handicap accessibility
- Additional staff needed for future expansion
  - 2 new operators
  - 1 new full time maintenance staff member
  - 1 new lab technician
- 1,700 SF additional space needed
Design
Design
High Service Pump Station

- Provide flexibility for clearwell usage
- Multiple feed points for chlorine and ammonia feed for chloramination
- Hydraulic surge protection
- New flow measurement
- Minimal headloss in suction piping
- Ability to remove pumps through roof of building
- Consideration of future improvements
Flexibility for Clearwell Usage

- Options
  - Clearwell 1 only
  - Clearwell 2 only
  - Clearwell 1 and 2 in tandem
- Chlorine and ammonia feeds available for all options
Future Improvements

- Danford Road Interconnect and Pressure Sustaining Valve
- 36-inch Parallel Transmission Main from the Northwest WTP to the Leland Tank
- 30-inch Parallel Transmission Main from the Leland Tank to the Bell Swamp Pump Station
Pumping Units

- Five 9 mgd pumps
- One 4.5 mgd pump
- Variable Frequency Drives
- 24 mgd WTP capacity
- Existing transmission system
- New high service pump station
- Three large pumps running
- Needed capacity – 28 mgd
- Delivery capacity – 28.1 mgd @ 190 ft TDH
- 36 mgd WTP capacity
- Transmission system with improvements
- New high service pump station
- Six pumps running
- Needed capacity – 45 mgd
- Delivery capacity – 46.1 mgd @ 210 ft TDH
06 Capacity and Reliability Improvements
Capacity and Reliability Improvements

- Existing High Service Pump Station
  - Peak hour peaking factor: 1.25
  - 2017 Peak day: 21.232 mgd
  - Peak capacity needed: 26.54 mgd
  - Peak capacity available: 23.7 mgd
  - Deficit: (2.84) mgd

- New High Service Pump Station
  - Peak capacity available: 38.2 mgd

- Conclusion
  - New High Service Pump Station provides adequate capacity and reliability
Capacity and Reliability Improvements

- Firm capacity
  - Existing pumping capacity: 23.7 mgd
  - New pumping capacity with existing transmission system: 38.2 mgd
  - New pumping capacity with improved transmission system: 45.4 mgd
Construction Challenges
Construction Challenges

- Concrete rehabilitation
  - Sealing existing concrete wall cracks
  - Correct concrete rehabilitation product
- Weather
- Seasonal flow increase
- Existing transmission piping
- Protecting existing older clearwell
- Plant shutdowns for electrical improvements
08 Schedule and Construction Costs
## Schedule

<table>
<thead>
<tr>
<th>Project Activity</th>
<th>Date of Activity</th>
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<tbody>
<tr>
<td>Begin project</td>
<td>July 5, 2015</td>
</tr>
<tr>
<td>All filters must be back in service</td>
<td>March 31, 2016</td>
</tr>
<tr>
<td>Substantial completion date</td>
<td>July 7, 2016</td>
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<tr>
<td>Final completion date</td>
<td>November 15, 2016</td>
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## Final Construction Costs

<table>
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<tr>
<th>Project item</th>
<th>Construction cost</th>
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<tr>
<td>High Service Pump Station</td>
<td>$6,275,566</td>
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<tr>
<td>Administration building</td>
<td>$850,000</td>
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<td>Filter improvements</td>
<td>$635,000</td>
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<td>Other items</td>
<td>$865,434</td>
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<td>Net change by Change Orders</td>
<td>($22,677.71)</td>
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<td><strong>Total</strong></td>
<td><strong>$8,603,322.29</strong></td>
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Acknowledgements

- Brunswick County
  - John Nichols – Public Utilities Director
  - Glenn Walker – Water Treatment Plant Superintendent
- State Utility Contractors
Questions?

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