Lewes, DE

Water System Upgrade: Improve Reliability and Yield Operational Efficiencies

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PA AWWA CONFERENCE
Hershey, PA
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Discussion Topics

- Former Water Treatment Facility
- Alternatives Analysis
- New Water Treatment Facility
- System Enhancement
Background of Former Water Treatment Plant

- Constructed in 1940’s - Rated Capacity: 1.6 MGD
- Water was Pumped Twice. Wells pumped two miles to WTP prior to aeration in 75,000 gallon in-ground “storage tank”
- Influent Water Quality

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5.76</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>11.4 mg/l as CaCO₃</td>
</tr>
<tr>
<td>Hardness</td>
<td>24.8 mg/l as CaCO₃</td>
</tr>
</tbody>
</table>
Former Water Treatment Facility
Former Water Treatment Process Train

Aerator to Strip CO₂ and raise pH

75,000 gallon “Storage Tank”

8,000 ft Transmission Mains

12” DIP and 16” DIP Transmission Mains

100 hp High Service Pumps

Lime  NaF  Cl₂

Distribution

Wells
Former Water Treatment Processes and Equipment

- Aerator and In-Ground Storage Reservoir
- Lime
- Sodium Fluoride
Former Water Treatment Processes and Equipment

- High Service Pumps
- Controls
- Cl$_2$
- Chemical Injection Vault
Former WTP “Issues”

- Air Stripping requires water to be pumped twice adding to intricacies of treatment system
- Well Field is 8,000 ft from Water Treatment Plant
- Intricate combination of pumps, controllers, and equipment.
- Age of components exacerbating reliability
- *WTP rated capacity of 1.6 MGD* will not be sufficient for future estimated demand of 2.2 MGD
- No interconnection with neighboring water utility for emergency needs
Alternatives Analysis

Primary Goals

- Provide Reliable Water Supply at All Times
- Operations must be straightforward and manageable
- The System must be Safe
- Cost Effective
- Capable of meeting future growth needs
Alternatives

- Five Original Alternatives
  - Alternative #2 – Redundant 12” Raw Water Line part of distribution system with WTP upgrades
  - Alternative #3 – Move WTP to Well Field with continued use of an aeration tank
  - Alternative #4 – Moves WTP to Well Field with a Water Tower constructed on-site with in-line blower to “strip” CO₂ from water and increase pH
  - Alternative #5 – Moves WTP to Well Field with a Water Tower constructed on-site with pH adjustment with NaOH.
Alternative #3

FIGURE 2

CITY of LEWES
BOARD of PUBLIC WORKS

ALTERNATIVE # 3a & 3b
WTP AND AT-GRADE TANK
AT WELL SITE W/ AIR STRIPPER
Alternative #4
Alternative #5

NEW TREATMENT BUILDING

NEW WELL PUMPS

NaOH, HCl, Fe

EXISTING TOWER

EXISTING DISTRIBUTION SYSTEM

NEW ELEVATED WATER TANK (800,000 GALS.)

CONTROL VALVE

TO TIDEWATER

VALVE 3

METER

FIGURE 4

CITY of LEWES
BOARD of PUBLIC WORKS

ALTERNATIVE #5
NEW TOWER W/O
AIR STRIPPING

AECOM
Steps in the Upgrade Process

1. Alternative Analysis
2. Selection of treatment processes
3. Completion of final design
4. Obtain permits & funding
5. Bidding
6. Construction
Lewes, DE WTP Location
Water Treatment Process Train

Lewes Water System Flows

<table>
<thead>
<tr>
<th>Season</th>
<th>Average Daily Flow (MGD)</th>
<th>Peak Daily Flow (MGD)</th>
<th>Peak Hour Flow (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>0.35</td>
<td>1.30</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>520.83</td>
<td>937.5</td>
<td>2,033.5</td>
</tr>
<tr>
<td>Summer</td>
<td>1.60</td>
<td>2.80</td>
<td>8,450</td>
</tr>
<tr>
<td></td>
<td>1,111.1</td>
<td>2,200</td>
<td>4,443.44</td>
</tr>
</tbody>
</table>

Flow and Material Balance

- Sodium Fluoride
  - Q (gpd) = 160.70
  - Conc (mg/L) = 319.35

- Chlorine
  - Chlorine mass flow (lb/d of Cl₂) = 13.35 lb/d

- Raw Water
  - pH = 5.76
  - Avg Day Q (gpm) = 1,111.1
  - Avg Day Q (MGD) = 1.60
  - Max Day Q (gpm) = 2,000
  - Max Day Q (MGD) = 2.88

- Finished Water
  - pH = 7.60
  - pH (mg/L) = 1.00
  - Flue (mg/L) = 0.70
  - Avg Day Q (gpm) = 1,111.1
  - Avg Day Q (MGD) = 1.60
  - Max Day Q (gpm) = 2,000
  - Max Day Q (MGD) = 2.88

AECOM
New Water Treatment Facility
## Enhancements in WTP

<table>
<thead>
<tr>
<th>Redundant Operational Controls</th>
</tr>
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<tbody>
<tr>
<td>Increased Water Treatment Capacity – 2.88 MGD</td>
</tr>
<tr>
<td>Chlorine Gas Scrubber</td>
</tr>
<tr>
<td>Piping and Control Valving to Complete Interconnect with Tidewater Utilities Inc.</td>
</tr>
<tr>
<td>Piping and Control Valving for Possibility of Future Elevated Storage Tank</td>
</tr>
<tr>
<td>Well Upgrades and Generator</td>
</tr>
</tbody>
</table>
Operational Controls

- **Wells**

- **Water System**
Conclusions

- New System Exceeds Future Water Demands
- Provides Continuous Reliable Water Production
- Provides Measures for Future Interconnect
- Provides Measure for Future Water Storage
- Provides Safety Measures for Gaseous Chlorine Use
- Unit Treatment Operations are Straightforward
Acknowledgements
Lewes Board of Public Works
Questions & Comments?

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