Water Production Division

Water That is Second to None

2017 Winner of the Best Tasting Water in Kane County!
Slideshow Overview

• General City of Aurora, IL Information
• Aurora Public Water Supply History
• Description of Current Facilities & Operations
• Recent Activities
  – 2012 Drought
  – Water Conservation Ordinance – Effectiveness?
  – Internal Initiatives and Cost-Saving Measures
Aurora, IL – General Information

- 2018 Population = 200,500
- 2nd Largest City in IL
- Extends into 4 counties: Kane, DuPage, Kendall & Will
Water Production Division
Mission Statement

To provide the City of Aurora with a reliable supply of safe, high-quality water at adequate pressure for fire suppression, in a cost-effective manner, and in full compliance with regulatory requirements; and, to manage the expansion of water supply infrastructure needed to effectively support the growth and development of the City of Aurora.
History of Public Water Supply System

Late 1840’s

• Samuel McCarty constructed first system
  – Raw Water Source = Natural Springs
• Wooden water main fed downtown by gravity
History of Public Water Supply System

1880’s

- 20-foot deep channel on island in Fox River
  - Natural gravel of island filtered raw river water
- 1889 Average Day Demand = 0.8 MGD
History of Public Water Supply System

1895 thru 1929

- Fox River source abandoned in 1892
  - City drilled first deep well = 1,400 feet deep
- 1895 Average Day Demand = 1.96 MGD
- By 1929 the city had 12 deep wells
- Continued growth required long-term planning
  - Triggered 1933 Water Works Improvement Program
History of Public Water Supply System

1933 Water Works Program

- 1.5 MG Hill Ave. Water Tower (demolished in 2012)
- 9 MGD Main Pump Station constructed
- Several miles of 12”, 14”, and 16” water mains
History of Public Water Supply System

1963

- Major turning point for the growth of the city
- Construction of the East-West Tollway (now I-88)
- Lead to the 1986 Water System Master Plan
History of Public Water Supply System

1989 Water System Improvements

• Planning for expected rapid growth of city

• Major shift in way residents receive potable water

• City decided against using Lake Michigan water

• Use three raw water sources blended together
  – Fox River, Deep wells & Shallow wells

• Well Collector pipelines – transport well water to WTP

• Fox River water also pumped to WTP

• All water receives full surface water level treatment

• Two transmission mains move water to system edges
History of Public Water Supply System

1989 Water System Improvements

- 28 MGD Lime Softening Water Treatment Plant
- River Intake Pump Station – 17 MGD capacity
- Drilled Additional wells to increase well capacity
History of Public Water Supply System

2002 Water System Improvements

• WTP Capacity increased to 42 MGD
• River Intake Capacity increased to 27 MGD
• Deep and Shallow wells added to raw sources
Aurora Water Production Division
Water Treatment Plant - Current

• Current Configuration
  • Capacity = 42 MGD
  • 5 Claricones; 12 Filters; 6.3 MG Clearwell Capacity
  • 15 Deep Wells; 6 Shallow Wells; 27 MGD River Capacity
Aurora Water Production Division
Basic Facts

• Total Number of Staff = 29
• Annual Operating Expenditures = $10.6 Mill. (avg.)
• Total Facility Sites = 25
• WTP Manned 24 hours/day, 365 days/year

• Average Daily Flow = 16.7 MGD
• Summer Avg. Daily Flow = 18.3 MGD
• Fall/Winter/Spring Avg. Daily Flow = 15.5 MGD
• Raw Water Use:  55% Fox River / 45% Well Water
Water Production Division
Remote Facilities

- **Finished Water Storage**
  - Capacity = 17.5 MG
  - 4 Ground Level Tanks; 2 Standpipes; 3 Elevated Tanks

- **Wells**
  - 12 Deep Wells; Depth > 1,100 ft; Capacity = 16 MGD
  - 6 Shallow Wells; Depth < 300 ft; Capacity = 5 MGD
  - 3 Emergency/Back-up Deep Wells; Capacity = 5 MGD
WTP Flow Diagram

Process flow diagram for the Aurora Water Treatment Facility.
WTP Claricones

Claricones: 60+ foot diam.

Rapid Mix, Coagulation, Flocculation, Clarification & Softening in Same Vessel

Rated Capacity:
4 @ 7 MGD each
1 @ 8.5 MGD
WTP Claricones

Helical Upflow Solids Contact Clarifier
WTP Recarbonation Tanks

Recarb Tanks:
- Stabilizes Water
- Stops Softening Rxns
- CO₂ Addition - Acidic
- Reduces pH to 9.0
- Convert OH⁻ → HCO₃⁻

Rated Capacity:
3 @ 14 MGD each
WTP Filters with GAC

8 - Conventional Gravity Filters
4 - Decelerating Gravity Filters

Filtration Media:
60” GAC
24” Filter Sand
Support Media

Individual Filter Turbidity Goals:
≤ 0.10 NTU

Conventional Filter in Backwash

Decelerating Filter

Capacity:
12 @ 5 gpm/sq.ft.
WTP Disinfection Clearwells

Purpose:
Surface Water Treatment Disinfection Requirements

- Use Sodium Hypochlorite
- Log Inactivation Values
  - Giardia & Viruses

Capacity:
1 @ 4 MG (Baffled)
2 @ 1.13 MG (Ribbon-Flow)
WTP Pump Station

Chloramination:
Ammonia Added to Convert Free Chlorine to Chloramines

Two Pressure Systems
High & Normal

Vertical Turbine Pumps

3 Filter Backwash Pumps – 100hp

Capacity:
6 NPS pumps – 200hp = 24 MGD
3 HPS pumps – 100hp = 5 MGD
SCADA System

- System Upgrade in 2010
- Monitor WTP & System
- Security System
- Video Monitoring of sites
- Flow-Pacing of Chemicals
- Automatic Reports

Continue to Leverage Hardware for Increased Capabilities
WTP Microbiology Laboratory

- IDPH Certified Lab since 2005
- IEPA State Contract Lab - 2013
- 300 monthly samples

Fox River Monitoring
- Algal Blooms & Toxins
Distribution System Monitoring
- Routine Sampling
- Daily Bench Chemistry
  - Over 15 parameters
  - Collect regulatory samples

- Surface Water Monitoring
  - Raw Fox River water
  - Increases reaction time
WTP By-Product
Lime Sludge

- 5 Onsite Dewatering Lagoons
- Daily Management by staff
- Filling Time: 15 to 60 days
- Recent Year Data:
  - 38,000 Wet Tons per Year
  - Disposal: $1.38 Million per yr
Land Application of Lime Sludge

- Water Treatment Plant by-product used as agricultural soil amendment
- Land application in 2012 was first time in City’s history

Annual Lime Residual Disposal and Expenditures

- 2012 = 42% Land App = $205,000
- 2013 = 53% Land App = $147,000
- 2014 = 43% Land App = $114,000
- 2015 = 43% Land App = $115,000
- 2016 = 34% Land App = $104,000
- 2017 = 46% Land App = $145,000
- 2018 = 32% Land App = $106,000

Land Application Total Saved = $936,000
Partnership for Safe Water

• Voluntary optimization program
  – Perform better than federal drinking water regs.
  – Received Presidents Award for 2014 thru 2017
• Received Directors Award from 2010 through 2017
  – Achieved PSW standards through 2012 drought
2012 Drought

- Total Water Pumped to Residents:
  - July 2012 – 2nd Highest Month in City’s History
  - 4-Month Period of May through August 2012
- 2nd Highest 4-month period in City’s History
### Basic Comparison of 2012 Drought to 2005 Drought

**Time Period:** May 1st thru July 10th

<table>
<thead>
<tr>
<th></th>
<th>2005 Drought</th>
<th>2012 Drought</th>
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<tbody>
<tr>
<td>Precipitation Total</td>
<td>3.50 inches</td>
<td>3.64 inches</td>
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<tr>
<td>Avg. Daily Ambient Temp</td>
<td>78.5 F</td>
<td>81.9 F</td>
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<tr>
<td>Baseline Flows (Jan - Apr)</td>
<td>15.1 MGD</td>
<td>15.3 MGD</td>
</tr>
<tr>
<td>Avg. Daily Flows</td>
<td>20.9 MGD</td>
<td>21.1 MGD</td>
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<tr>
<td>Maximum One-Day Flow</td>
<td>28.6 MGD</td>
<td>27.3 MGD</td>
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<tr>
<td>Days with Flows &gt;25MGD</td>
<td>15</td>
<td>7</td>
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<tr>
<td>City Population (est.)</td>
<td>168,181</td>
<td>197,899</td>
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</tbody>
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- **17.7% population INCREASE between 2005 and 2012**
National Plumbing Fixture Regulations

Per Capita Analysis

Usage Per Capita (gpepd)

- Maximum Day Usage Per Capita
- Average Day Usage Per Capita

New Plumbing Regulations
Current Ordinance: - Sect. 48-31

- Revised in 2013
- Even / Odd style based on home address
- Watering permitted 6-9am and 6-9pm on day
- Sod installation prohibited in July and August
  - Special sod watering permit allowed rest of year
- Permanently installed systems follow same times
- Watering NOT permitted on July 31st and August 31st
Reduced peak summer-time demand by 20 gallons per person per day
Northwest Water Planning Alliance

Goal: Provide a sustainable water supply for the NWPA region in a manner that is both economically and environmentally sound

- Formed by IGA in September 2010
- Groundwater and inland surface water communities
- 79 Communities; 5 Counties; 1.4 million people
- Executive Comm.: 14 Public Officials (COG’s & Counties)
- Technical Advisory Comm.: Water Professionals
NWPA – Regional Ordinance

• Why?
  – Communities withdraw water from same resources
    • Resources do not follow municipal boundaries; Competition
  – Inconsistencies between NWPA member’s ordinances
    • Residents on opposite sides of street follow different guidelines
  – Studied actual water needs of Midwestern lawns
    • Exterior use of water is discretionary
- Reduces electricity consumption and conserves sensitive deep aquifer
- Estimated annual savings of $200,000 compared to baseline in 2007
Fox River Taste & Odor Events

- Natural algae byproducts in Fox River
- Completely safe to drink; only aesthetic quality issue
- Treatment methods remove compounds
  - Additional chemicals used increase treatment costs
- June/July 2016
  - 2-Methylisoborneol (MIB)
  - Earthy, musty taste
- Sept/Oct 2017
  - Geosmin
  - Dirt, muddy taste
Most efficient wells are used most often; Reduces electrical consumption

Estimated annual savings of $100,000 compared to baseline in 2009

<table>
<thead>
<tr>
<th>Well Number</th>
<th>First ON / Last OFF</th>
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<tr>
<td>28</td>
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</tr>
<tr>
<td>29</td>
<td>(most efficient)</td>
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<tr>
<td>20</td>
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<td>21</td>
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<tr>
<td>17</td>
<td>(least efficient)</td>
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<tr>
<td>19</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Last ON / First OFF</td>
</tr>
</tbody>
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Water-Source Heat Pump System

- Raw well water used as heat-source or heat-sink thru heat exchanger for HVAC system
- Water then treated & used for potable supply (original purpose)

- Most economical alternative over life expectancy of units
- Carbon emissions reduced – no natural gas combustion
- IL Chapter ASHRAE – Excellence in Engineering Award
Best Tasting Water Awards

- **Kane County Water Association:**

- **IL Section – American Water Works Association:**
Aurora Water Production Division