

City of Astoria

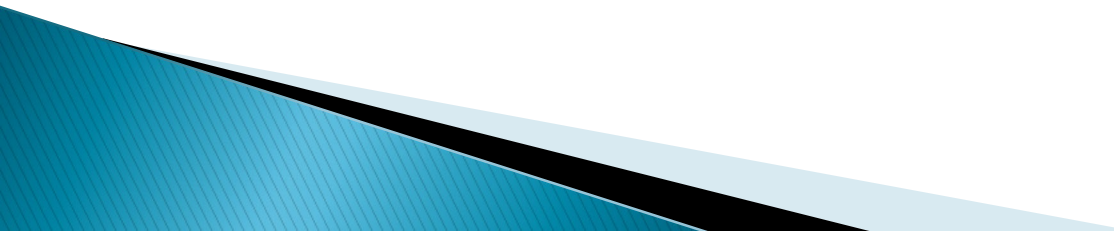
Source Water Protection

Benefits & Challenges of a Municipally-
Owned Watershed for Drinking Water

December 12, 2018





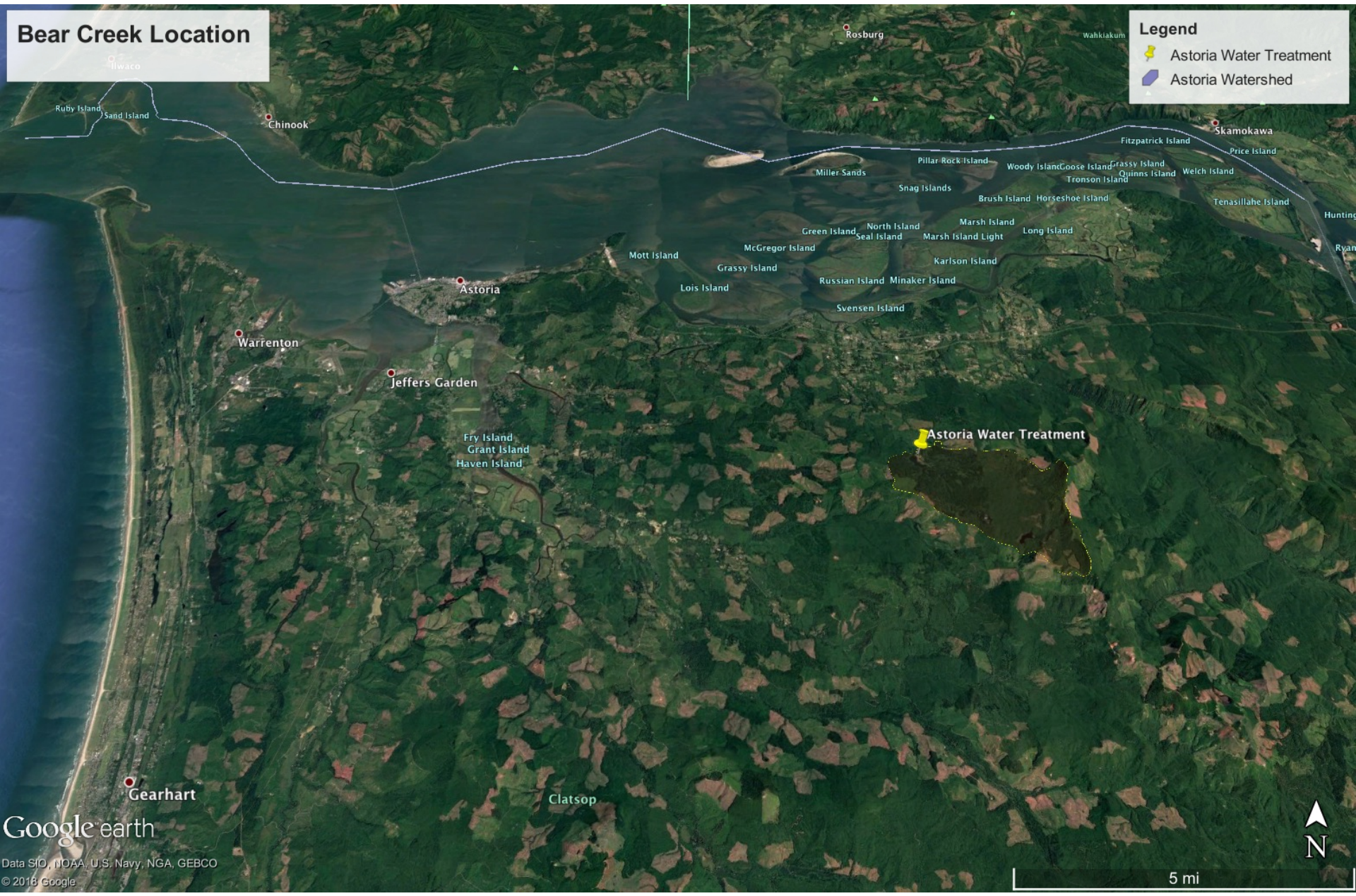
Astoria's Water System Features

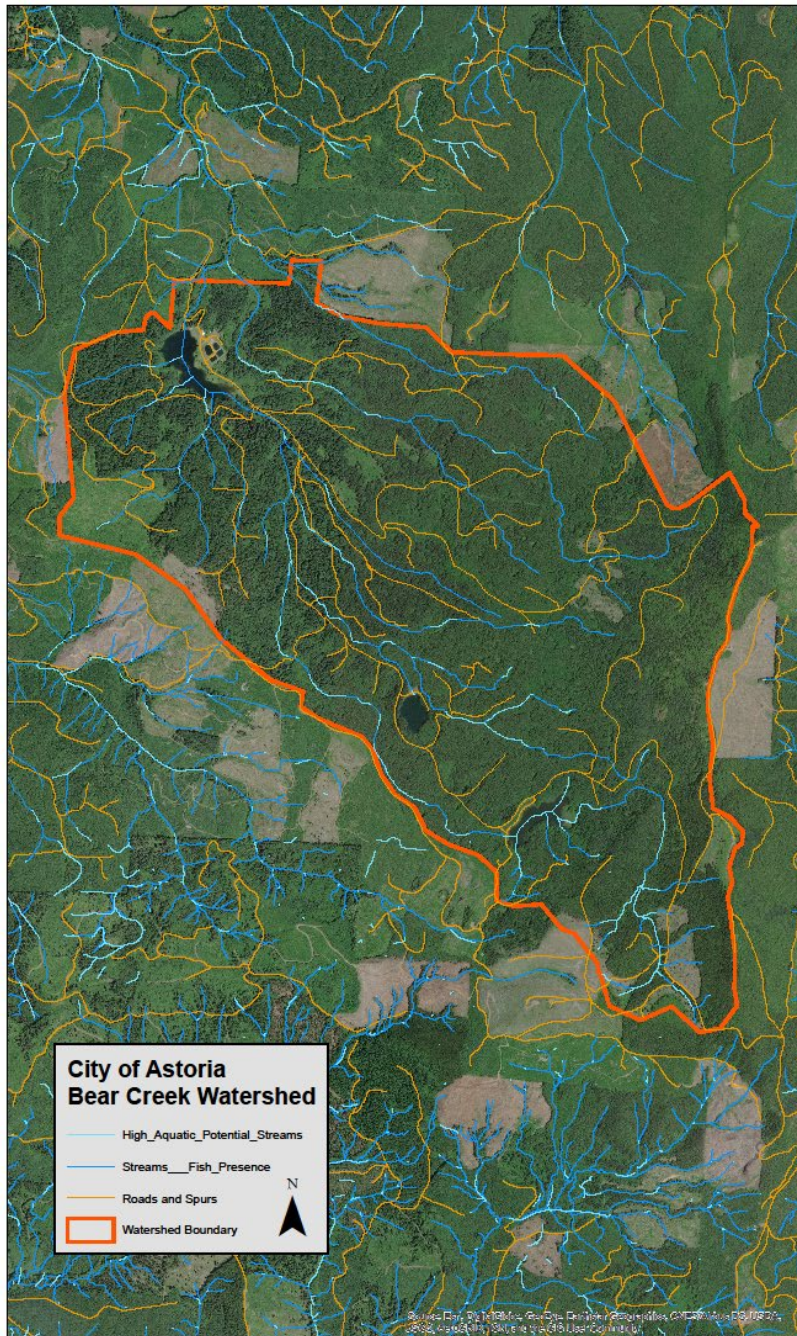
- ▶ Watershed
 - ▶ Watershed Reservoirs & Dams
 - ▶ Water Treatment Facility
 - ▶ Water Transmission Main
 - ▶ In-town Reservoirs
 - ▶ Water Distribution System
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Bear Creek Location

Legend

-  Astoria Water Treatment
-  Astoria Watershed





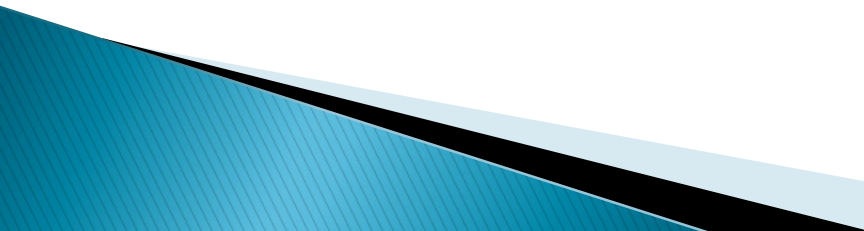
Watershed Facts

- Approximately 3,700 acres
- Located about 12 miles east of Astoria, near Svensen
- Original 500 acres purchased in 1891 along with water system from Columbia Water Company (Private)
- Remaining 3,200 acres purchased from Crown Zellerbach between 1936 and 1954
- Current forest volume is 100 million board feet (MMBF)
- Current annual growth rate is 4 percent
- Current annual harvest rate is approximately 1 percent
- Forest has been FSC (Forest Stewardship Council) certified since 2003
- In 2016 & 2017 the City sold approximately \$2 million in Carbon Credits

Drinking Water Treatment System



Drinking Water Slow Sand Filter Treatment System

- ▶ Slow Sand Filter System Built in 1993
 - ▶ Economical method to treat drinking water
 - ▶ Must meet state testing standards
 - ▶ Need to re-sand filters every 5–6 years
 - ▶ Currently at capacity of 4 million gallons per day in peak demand season which is summer fish processing season
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Bear Creek Dam 1895



Bear Creek Dam Today

Built in 1911 (75') & raised in 1953 (15')

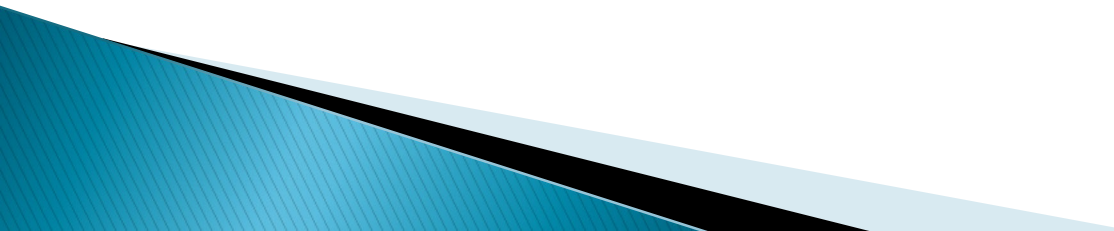


Source Water Storage Details

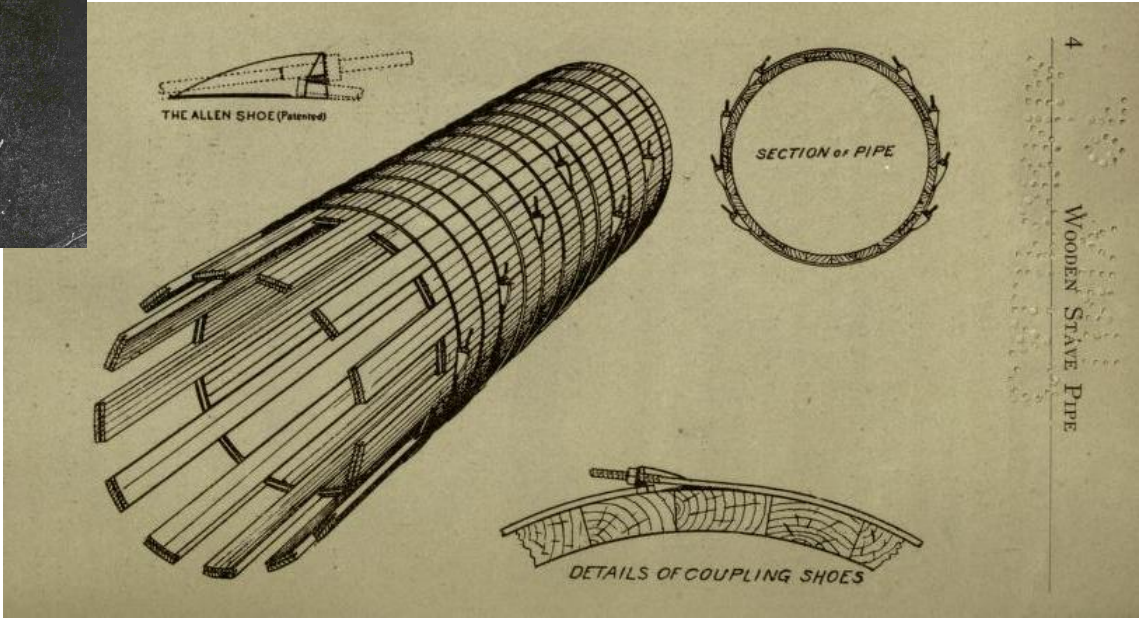
- ▶ **Bear Creek Dam (Main Lake)**
 - Storage capacity of 200 million gallons
 - Water must be pumped from lake to slow sand filter system
 - Completed seismic stability evaluation in 2016
- ▶ **Middle Lake Dam & Reservoir**
 - Storage capacity of 52 million gallons
 - Gravity feeds to system
- ▶ **Wickiup Lake Dam & Reservoir**
 - Storage capacity of 59 million gallons
 - Gravity feeds to system

Total of approximately 80–150 day supply

Drinking Water Transmission Main

- ▶ Delivers drinking water to city limits and multiple other wholesale water systems
 - ▶ Last built in 1963 (4th generation pipe)
 - ▶ 12 miles from Bear Creek Watershed to City
 - ▶ Enters at Reservoir 3
 - ▶ Recent resiliency study performed to identify vulnerable areas consisting of landslides and erosion hot spots
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Wood Stave Pipe



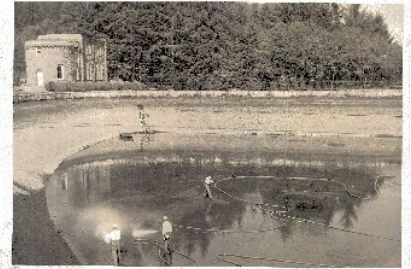


	Reservoir No. 2	Reservoir No. 3
Volume (gal)	6 million	20 million
Year Built	1895	1919
Depth (ft)	17.3	25.5
Construction Type	Brick	Concrete
Lining Date	1980's	1970's

Reservoir #2 Liner and Cover



Fred Korki, Art Piddie and Louis Tenny washing down Reservoir #2 floor - side walls have been cleaned and sterilized. May 1959



Fred, Art, & Louis washing down two lengths of 3" hose with a yoke to 1 1/2" hose was used 1 length of 3" and 4 lengths of 1 1/2" are needed for job with 1 1/2" nozzles. May 1959-Reservoir #2



Clearing Res. #2 May 1959

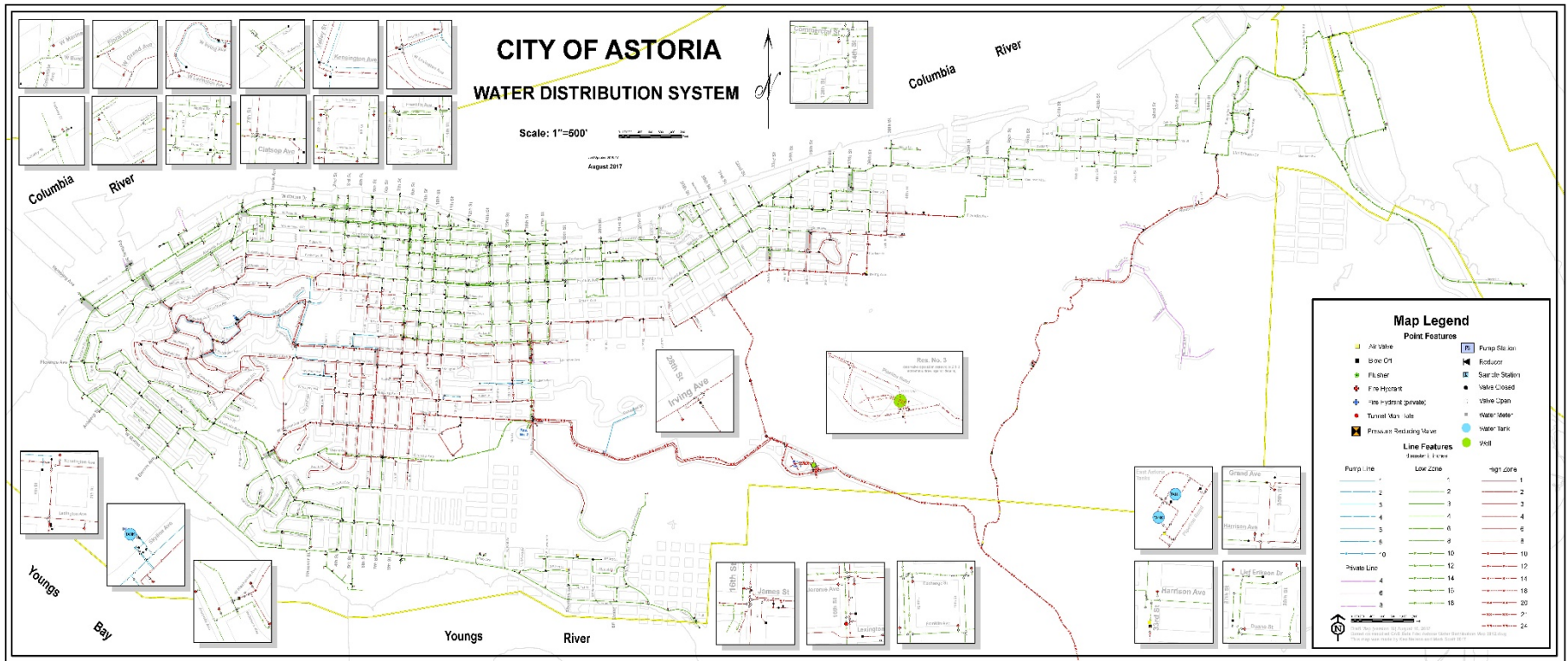
Reservoir 2 - Before and After



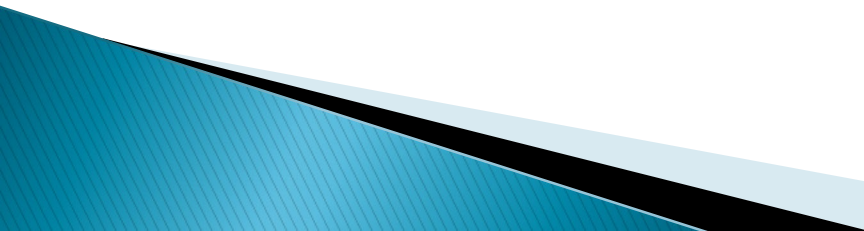
Reservoir #3 Liner and Cover



Water Distribution System



Water Distribution System Features

- ▶ Approximately 80 miles of water line
 - ▶ 4 booster pump station and a 131,000 gallon tank to serve higher elevations of city
 - ▶ Some pipes as old as 1895 (1883 pipes all replaced)
 - ▶ 3,900 water meters
 - ▶ 448 fire hydrants
 - ▶ Over a thousand control valves in system
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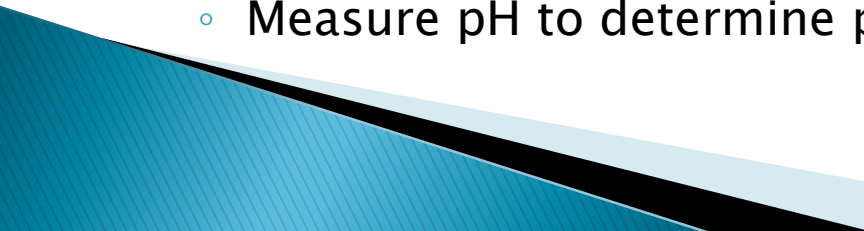
Practices for Assuring Safe Drinking Water

- ▶ Protect drinking water source
- ▶ Practice effective water treatment
- ▶ Conduct regular monitoring for contaminants
- ▶ Protect distribution piping system & finished water storage
- ▶ Practice competent water system operation, maintenance and construction

Implementation of Practices

- ▶ **Protect drinking water source**
 - No public access
 - Dams are inspected annually
 - Well planned timber harvest projects
 - Proactive erosion control measures during projects
 - Proactive road maintenance program

 - ▶ **Practice effective water treatment**
 - Manage water circulation & draw from 5 sources to optimize water quality
 - Optimization efforts examined periodically
 - Strict slow sand filter cleaning process

 - ▶ **Conduct regular monitoring for contaminants**
 - Testing program taken very seriously
 - Proactive testing to avoid future issues
 - Use of UV254 instrument to check for organic compounds indicating potential DBP generation after filtering
 - Measure pH to determine potential for biological growth
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Implementation of Practices Cont'd

- ▶ **Protect distribution piping system & finished water storage**
 - Finished water reservoir covers (built 9 years ago)
 - Proactive inspection and cleaning of reservoirs
 - Periodic inspections of susceptible areas
- ▶ **Practice competent water system operation, maintenance and construction**
 - Total Coliform and E. coli testing weekly
 - Full time Water Source Operator living on-site
 - Operations procedures are reviewed and discussed often
 - No pesticides or herbicides use in watershed
 - Maintenance is a priority over the many other pressing needs in our small underfunded system
 - Construction projects are well planned between engineering and operations staff

Benefits and Challenges

- ▶ Benefits of drinking water source ownership
 - Less worries about other land owners – need to have good relationships and communication with neighbors
 - Minimal public education since the public is not allowed in our watershed – controlled access
 - No pollution generators to deal with
 - Minimal spill response concerns – contractors use vegetable based hydraulic fluids
 - No land use zoning issues – except our own activities that sometimes require county permits
- ▶ Challenges of a Municipally Owned Watershed
 - There is no one to blame but yourself if something goes wrong
 - Trespassing especially during hunting season

Questions?