

# Cutting in a 16" tee during a Water Crisis



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# Where is Salem's water source?

- The North Santiam River watershed provides Salem's drinking water.
- **Highlights of Salem's water source**
- Some key points about the North Santiam River watershed include:
- **Size:** Salem's watershed covers more than 490,000 acres of land stretching from the Cascade Mountain peaks of Mt. Jefferson and Three-Fingered Jack to the City's water intake above Stayton.
- **Management:** Approximately 80 percent of the land in the watershed is owned and managed by the United States Forest Service, Bureau of Land Management, and the Oregon Department of Forestry.
- **Uses:** The agencies manage for multiple uses including timber harvest, recreation, and water resources. Land use in the entire watershed is a combination of wilderness, lumber, recreation, agriculture, and rural residential.
- **Communities:** A few small communities are located along the river. The combined population of Gates, Idanha, Detroit, and Mill City is about 2,700.

# What is the City of Salem doing to protect the quality of our water source?

- The City of Salem Water Department ensures the highest quality water is delivered to more than 178,000 customers in the Salem area.
- In compliance with the Federal Safe Drinking Water Act, the City of Salem routinely collects and tests water quality samples for possible contaminants. Sampling and monitoring procedures occur within the distribution system (in town), at the Geren Island Water Treatment Facility, and at several locations in the North Santiam River watershed ([Salem's drinking water source](#)).
- In-Town (distribution system) monitoring
- The City of Salem collects water quality samples from 48 different locations across the water distribution system. These sample locations were chosen with the assistance of the [Oregon Health Authority Drinking Water Program](#), and are strategically located to provide monitoring in all areas of the distribution system. A bacteriological sample is collected at each site approximately once a week. Temperature, pH, turbidity, chlorine residuals, and additional water quality parameters are also collected. A summary of the water quality data collected each year is compiled in [Salem's Annual Water Quality Report](#) and published online.
- Watershed (algae) monitoring
- The City also monitors conditions in the North Santiam River and Detroit Reservoir. Algae and cyanotoxins, in addition to other water quality parameters, are monitored in the watershed. Data collected from the watershed can be used to adjust drinking water treatment processes at Geren Island, if needed. This allows us to provide high quality water to our residents and customers.

- Monitoring in the watershed typically begins in April or May and ends in September or October (algae season), depending on the weather conditions and Detroit Reservoir water levels.
- Normal watershed monitoring procedures
- Weekly samples are collected from key locations in the North Santiam River Watershed
  - Blowout Creek
  - Heater Creek
  - Log Boom
  - Packsaddle Park
- Weekly samples are collected at the Geren Island Water Treatment Facility
  - Intake
  - Slow Sand Filters
- Samples collected provide the following indicators
  - Algae type
  - Algae enumeration (count)
  - Nutrients
- Other factors monitored
  - Wind speed
  - Temperature
  - Water quality data using YSI datasonde equipment

## Treating Salem's Drinking Water

Categories:

[Environment and Natural Resources](#)[Water and Utilities](#)

Every day, North Santiam River water flows into the Geren Island Water Treatment Facility where it is filtered through slow sand filters and disinfected with chlorine. Fluoride is added as well as Soda Ash (to reduce the leaching of lead from household plumbing). Per the Federal Safe Drinking Water Act, the City of Salem routinely collects water quality samples from the Treated Finished Water as it leaves Geren Island and from within the distribution system (in-town).

### **Additional Drinking Water Treatment in Algal Season (April to October)**

Additional monitoring and water quality sampling occurs above Geren Island, in the North Santiam River watershed ([Salem's drinking water source](#)) during algal season. Based on information learned in 2018, the City can now adjust drinking water treatment processes based on watershed conditions and the [water quality data](#) received. Additional treatment processes used to remove cyanotoxins and to ensure safe drinking water include:

- Acetic Acid (added to Slow Sand Filtration)
- Increased chlorine dosage
- Powdered Activated Carbon (PAC)

In addition, the City is now investing close to \$50 million dollars for the design and construction of an ozone treatment facility on Geren Island. This new facility is anticipated to be completed in the Spring of 2021.

### **Slow sand filtration**

The slow sand filtration system at Geren Island is one of the largest in the country and has provided effective treatment of Salem's drinking water for more than 80 years. Salem has been able to use this system due to the consistent high quality water we receive from the North Santiam River.

Raw water enters Geren Island through an intake screening structure on the North Santiam River. From there it flows down a constructed channel to one of six slow sand filter ponds. As water passes through the first 1/4" of the filter, small organisms that occur naturally in the river begin treating and filtering the raw river water. Organisms, such as amoeba and vorticella, "eat" algae and masses of small debris at the surface layer of the filter. This biological surface layer is called the Schmutzdecke layer. When the water reaches 8" down in the sand filter, E. coli bacteria is 99.5 percent filtered out of the water, and by 14", 98% of viruses and other bacteria are filtered out. Filters are 3 feet when newly sanded. Once the filtered water reaches the perforated pipe at the bottom of the slow sand filter, the water is piped to the west side of the facility via gravity where it is then treated with chlorine to disinfect any bacteria or pathogens that may have passed through the filter. In general, processing water at Salem's drinking water facility requires little chemical and electricity or energy.

### **Preparation for algae season**

#### **Acetic acid**

In May 2018, for the first time, cyanotoxins from the die off of a certain type of blue-green algae made their way through the slow sand filters and were detected at Aldersgate, the entrance to our distribution system. As the algal season progressed, the City began to add Acetic Acid (vinegar) to the water as it flowed into the slow sand filters. This helped the biological surface layer to grow, and boosted the ability of the Schmutzdecke to remove cyanotoxins from the water. As a result, and in preparation for the coming algal season, the City will begin to add acetic acid to the slow sand filters in April.

#### **Increased chlorine dose**

The Environmental Protection Agency requires that chlorine be added to drinking water treatment processes for disinfection when surface waters (streams, rivers, lakes, etc.) are the source. For this reason, chlorine is always used at Geren Island as final step in the treatment process.

If [cyanotoxins](#) are detected at the Intake sampling site, staff will add more chlorine to our treatment process. If toxin levels persist, staff will continue to increase chlorine levels slowly, never exceeding the maximum level allowed by Oregon Health Authority drinking water standards. This treatment method is proven to reduce cyanotoxins at increased levels.

If chlorine is increased above normal levels it will be followed by a dechlorination process to reduce chlorine levels to within the normal operating range before the Finished Water reaches the distribution system.

### **Powdered Activated Carbon (PAC)**

#### **How PAC works**

When needed, the City of Salem can pre-treat drinking water at the Geren Island Water Treatment Facility to minimize the presence of cyanotoxins. Cyanotoxins are caused by the die-off of a specific type of blue-green algae in Detroit Lake. This pre-treatment process uses powdered activated carbon (PAC) to reduce cyanotoxins that may still be present in the untreated water as it enters the water treatment facility. After the water passes through the new pre-treatment process, it continues through the normal filter processes.

## Step 1

Water from the North Santiam River flows into the Geren Island Water Treatment Facility near Stayton. The raw water enters the facility through a quarter-mile-long intake channel.

## Step 2

Powdered activated carbon (PAC) may be added to the water as it passes through the intake channel.



## Step 3

In the intake channel, the small particles of PAC are mixed and kept suspended in the water through constant agitation using four large mixers called “Gridbees©.”



## Step 4

If the water contains harmful cyanotoxins caused by the blue-green algae, the toxins will stick to the powdered activated carbon in a process called adsorption



## Step 5

The bottom layer, or settled floc, is eventually removed, but the clean water at the top flows off to the next step, which consists of a large pond with a layer of sand called a roughing filter. The roughing filter helps to remove any remaining carbon particles before water is further filtered in Salem's normal slow sand filtration system.



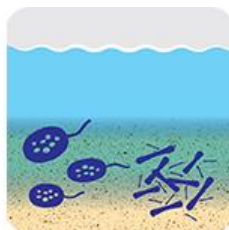
## Step 6

After the water passes through the roughing filter, a small amount of acetic acid is added to provide a source "food" for the good microorganisms that help process the water in the next treatment step — slow sand filters. Slow sand filtration is one of the oldest and most reliable surface water treatment technologies in the world, and works best when used to treat water from pristine watersheds like the North Santiam River. In slow sand filtration, the good microorganisms form the schmutzdecke to remove the contaminants of concern, including pathogens. The addition of acetic acid is a temporary measure, and is necessary because the added PAC not only removes the algal toxins, but also a portion of the food in the water that the good microorganisms need to stay healthy.



## Step 7

As water passes through slow sand filters, the good bacteria, consisting of harmless bacteria, fungi, protozoa, and other components, remove particles, organic material, and other contaminants. After passing through the Schmutzdecke, the water infiltrates through the supporting sand layer. The filtration process is relatively slow compared to other surface water filtration processes, thus the name slow sand filtration.





## Step 8

After passing through the slow sand filters, as part of our normal drinking water treatment routine, chlorine is used to further treat the drinking water, disinfecting the final product and providing a chlorine residual that maintains the quality water between the water treatment facility and your home. Soda ash compound is also added, as necessary, to maintain the proper pH balance, successfully minimizing the presence of contaminants such as lead and copper.



## Step 9

Finished drinking water travels through our transmission lines to our residents and drinking water customers. Throughout the process, water quality samples are taken to ensure safe drinking water is delivered to our customers.



May 29, 2018....City of Salem issues do not drink water advisory for infants, young children, and other vulnerable individuals

- City staff start manning water stations throughout the City
- City staff had already planned a project in South Salem to cut in a new tee as part of a development project and new pressure reducing vault
- City staff attempt to reduce cyanotoxin in source water
- City staff work long hours to provide water to residents via water stations and try to maintain customer confidence in quality of water

- City staff with the help of Oregon National Guard, Marion County, City of Keizer, City of Turner, City of Albany, and CERT volunteers open seven water stations to serve the public and commercial customers potable water provided by the City of Keizer.
- City staff work with various local and state agencies to maintain public confidence and explain the science of cyanotoxins.
- City Administrative and Public Works Staff work with local and state political officials
- Distribution staff continue planning on project for new pressure connection in south Salem

# Why was this tee needed, or what is the point of the project?

The project involved cutting in a 16" tee with two 16" gate valves in preparation for a new development project, a future connection point to a City maintained private water district and a new distribution pressure zone to help increase and improve the current fire flow for the private water district which sits at a higher elevation.

The current area is lacking fire flow pressures that serve a very exclusive area of homes in South Salem, as well as the development in the area is such that the increased fire flow and distribution capacity is needed.

A new pressure reducing station (vault) was installed to help stabilize the pressure in the lower elevation area and another project prior allowed the City to switch the existing distribution line feeding the upper area homes to a higher pressure zone. A future project will tie the City system into the private water district at which time the City will retain ownership to the private water district.

- City Staff work with Public Works Officials to maintain schedule for already planned project to continue in South Salem (*Public Works Director approves work to go on*)
- May 31, 2018, with residents already notified via email and letters provided in person staff go ahead with the planned water outage scheduled from 9am-2pm
- Water is turned on by 12:45 pm after flushing and purging air from the high point of the project. All water services turned back on and sample taken at three different locations within the project.

# “The Tee”





Project location (future pressure reducing valve vault location and new distribution pressure zone connection)









Private water district fed by Salem with about 45 service connections



Private pump station and current metered  
connected to City of Salem. (to be eliminated with a future  
project)





# Existing connection to private water district





# Protecting properties!





# Improving Fire Protection



# Subdivision of about 150 homes







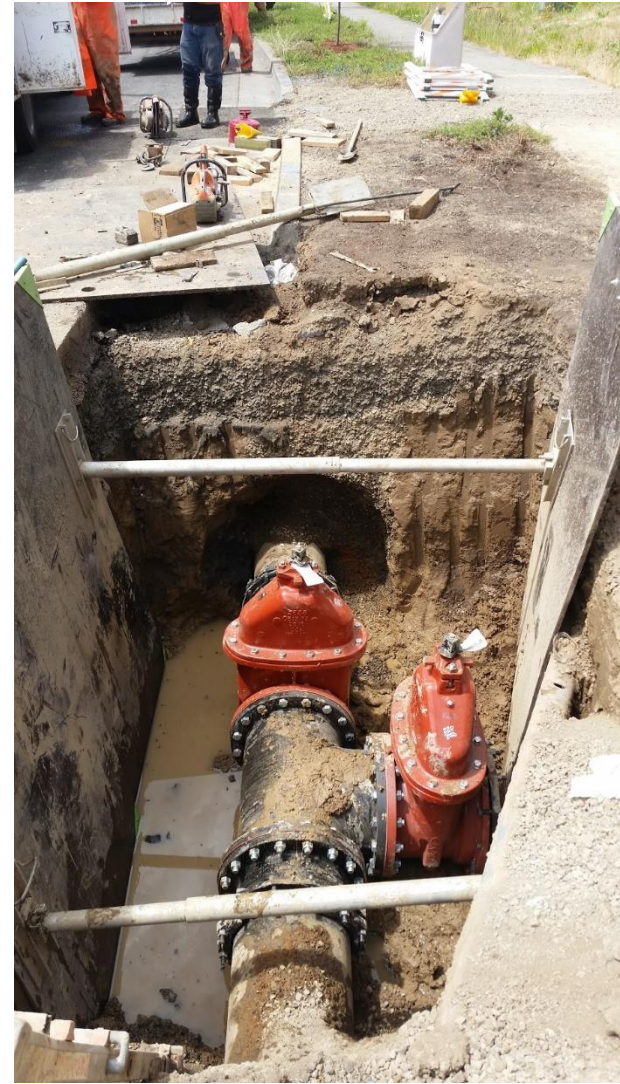






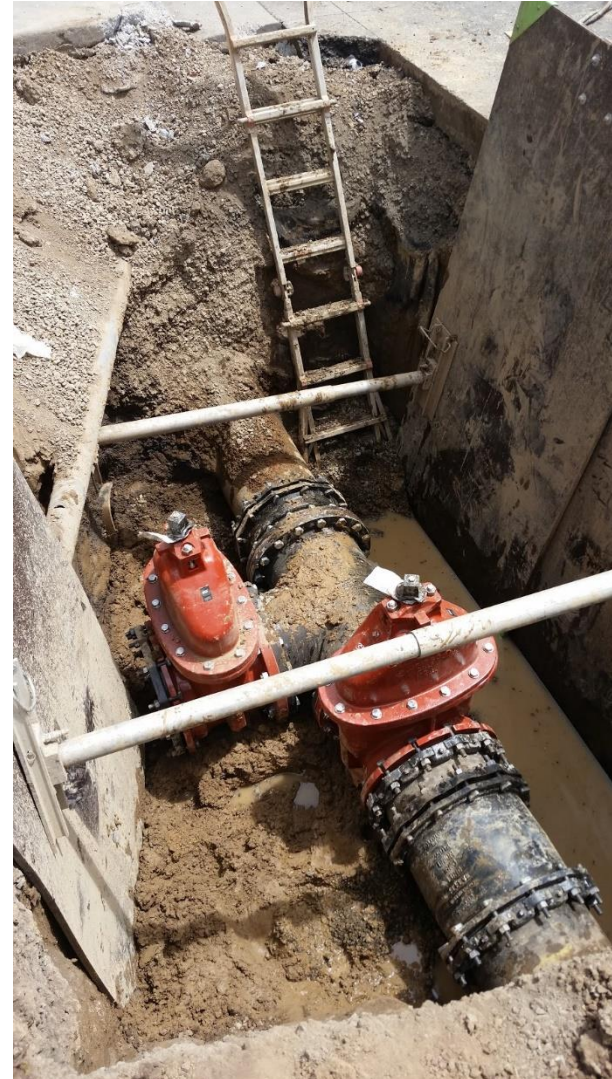




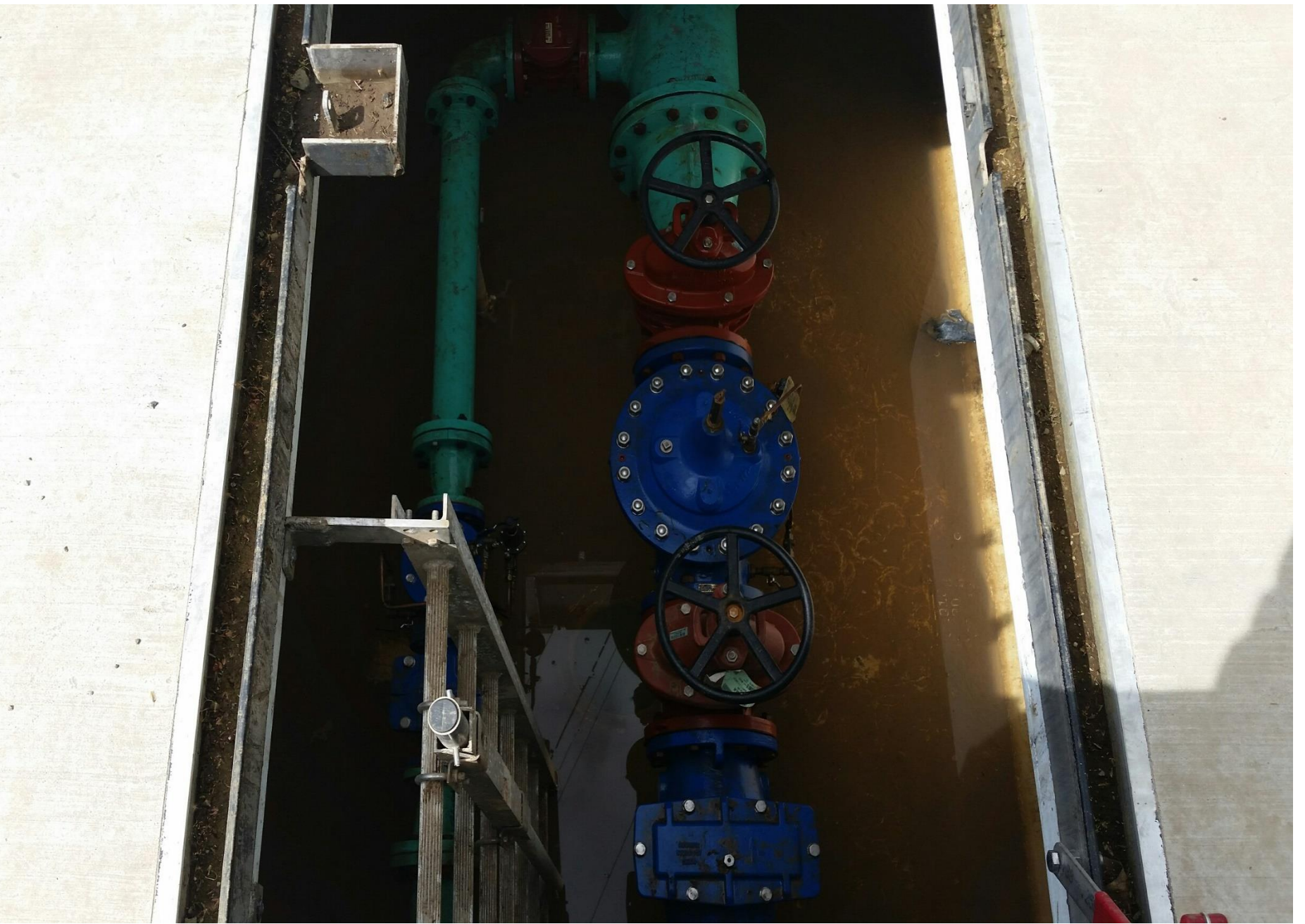




Project completed within time constraints given to residents and only one complaint comes in from residents where a water service wasn't restored or turned back on.













- Less than three months later the contractor completes the new distribution pipeline and new pressure reducing vault installation. The pipeline is chlorinated and is now in service feeding the new subdivision (pressure zone) and provides the link to a future connection to loop the private water district, which at that time the City of Salem will become the owners of the water system through a prior Intergovernmental Agreement (IGA)



# Be Safe Out There





Salem, our water is safe to drink!!!!



# Cutting in a 16" Tee During a Water Advisory

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- Questions?