Wastewater Reuse in CT:
THE UCONN STORY

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Presentation Outline

- History of water use at the University
- Why utilize reclaimed water?
- Reclaimed Water Facility treatment process
- Water quality & use

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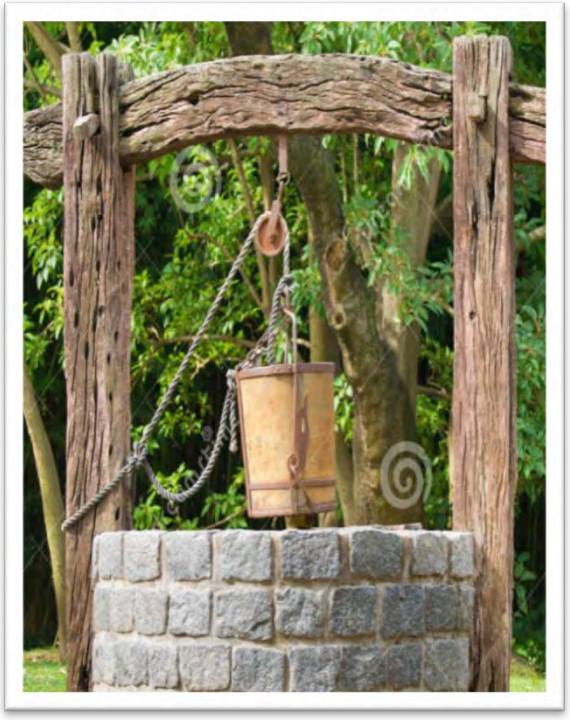
About UConn

- In 1881 CT Gov. Hobart Bigelow signs legislation accepting a gift from Charles & Augustus Storrs'
- The gift was a former orphanage on 170 acres of farmland with a few barns & $6,000
- That same year the Storrs Agricultural School was established
- Classes begin – 3 faculty members & 13 students enrolled
- One shallow-dug well is the sole water source



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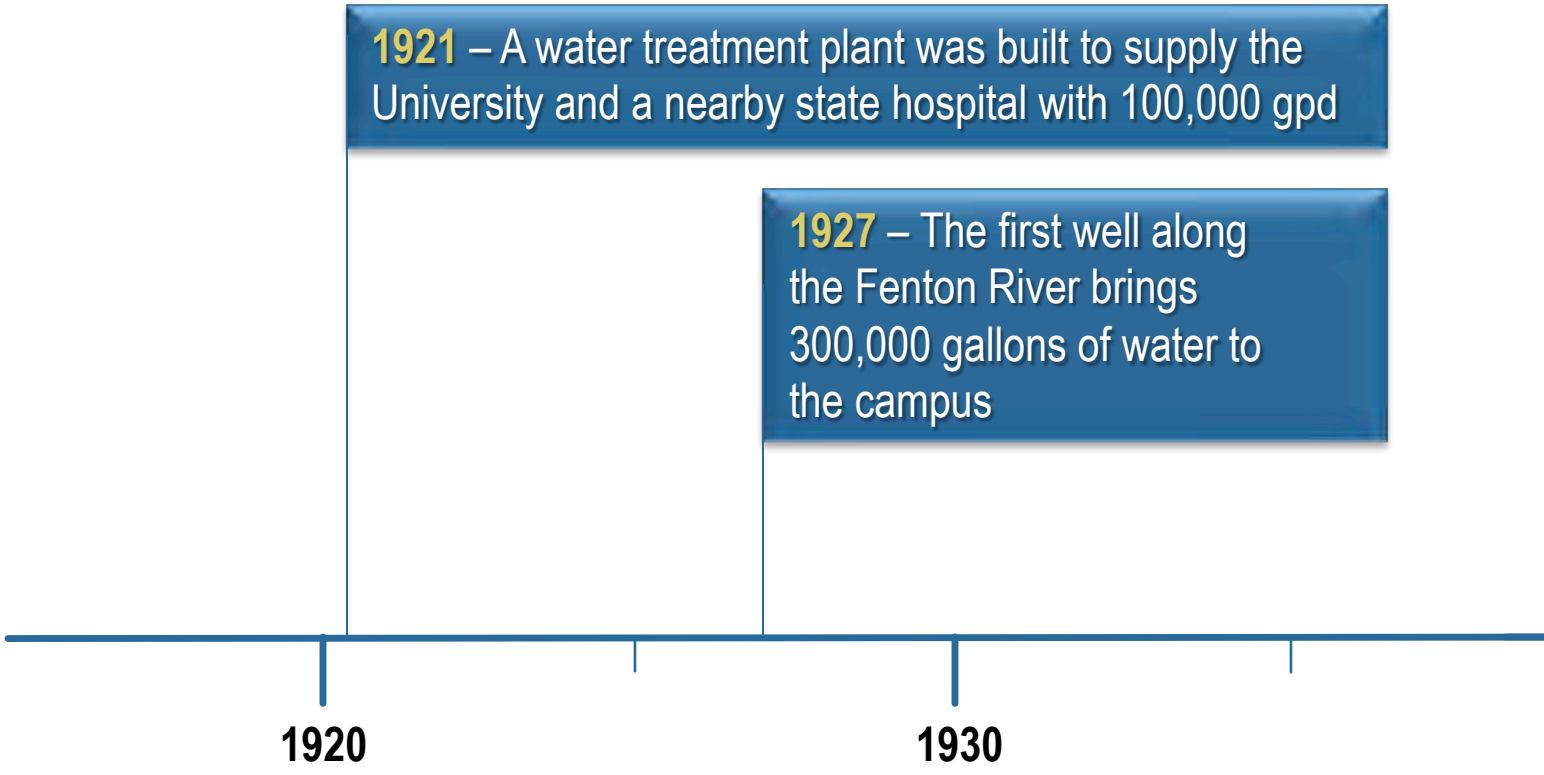
A Timeline of Water Use at UConn…



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About UConn

- 1995 rapid growth of the University begins
- The state general assembly adopts the "UCONN 2000 Project"
  - 10-year, $1 billion plan to rebuild, renew & enhance the University

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About UConn

- Further Growth of the University in 2002
- Building on the success of UCONN 2000 the State legislature passes “21st Century UConn”
  - $1.3 Billion improvement plan

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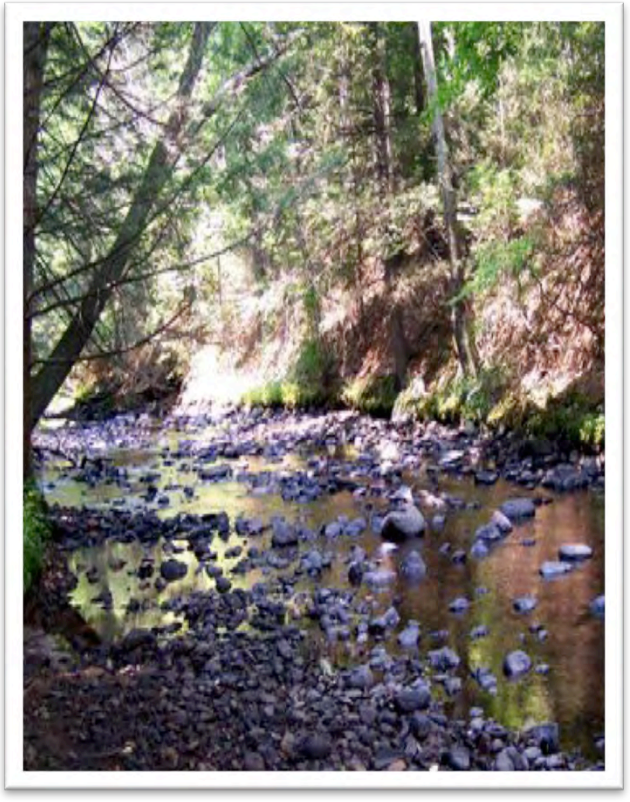
A Watershed Event….

- September 2005 – a segment of the Fenton River along the UConn well field is desiccated
- As a result of this environmental concern UConn reacts very proactively:
  - Strong investment in their water infrastructure
  - Greater outreach promoting water conservation
  - Development of Sustainable Design Guidelines for any new on-campus construction
  - Reductions in the Fenton River well field withdrawal rates based on streamflow



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The State Reaction…

State mandates UConn reduce water withdrawal rates within the existing permitted water supply by 1/3 (1 MGD):

Alternatives considered:

- **Water Conservation**
  - While there was room for more conservation measures, it was unlikely to meet the State mandate
- **Additional wells in the existing well fields**
  - These would be too close to the other wells to prevent streamflow impacts
- **New well fields**
  - This would require a complicated & lengthy diversion permitting process

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Why Water Reuse?

Abundant supply of treated wastewater was available at the UConn WPCF outfall that could be redirected to a Reclaimed Water Facility for advanced treatment & reuse

3.0 MGD Secondary Wastewater Treatment Facility

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The UConn Reclaimed Water Facility

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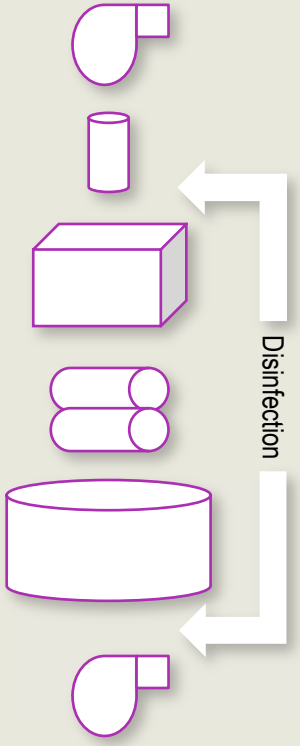
Reclaimed Water Facility Technology

Reclaimed Facility Process Flow



Three redundant process trains:

- Each train has the ability to process 500,000 gpd
- Facility is designed for an average daily production of 1 MGD

Consisting of the following components:

- Vertical Turbine Pump attached to a VFD
- 500 Micron Auto-strainer
- 0.1 Micron Microfiltration Membranes
- A two pass Trojan UV Fit Sterilization unit
- Processed water is stored in a 1 MG storage tank

UConn Reclaimed Water Facility

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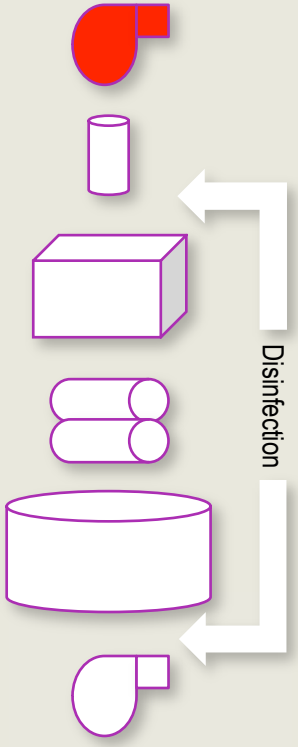
Reclaimed Water Facility Technology

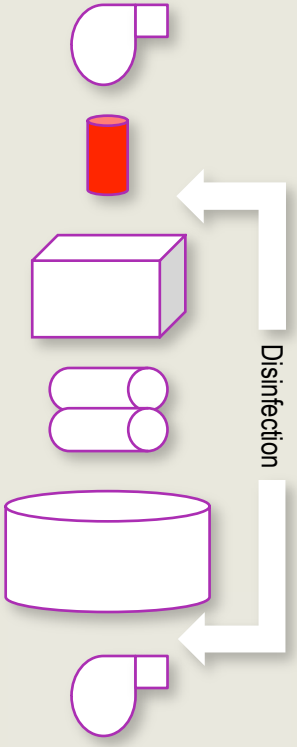
VERTICAL TURBINE FEED PUMP



- Each pump can operate at a rate of 480 gpm
- Pump regulated with Variable Frequency Drive (VFD)

Reclaimed Water Facility Technology

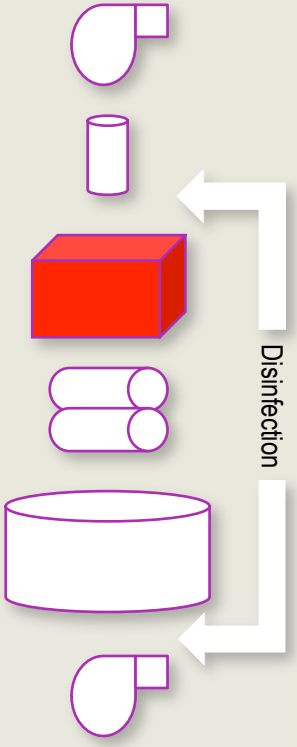
AUTO STRAINERS



- 500 µm (0.5 mm)
- Self cleaning every 2 hours OR when a differential pressure of 2 PSI is reached
- Cleaning cycle duration is ~ 2 minutes

Reclaimed Water Facility Technology

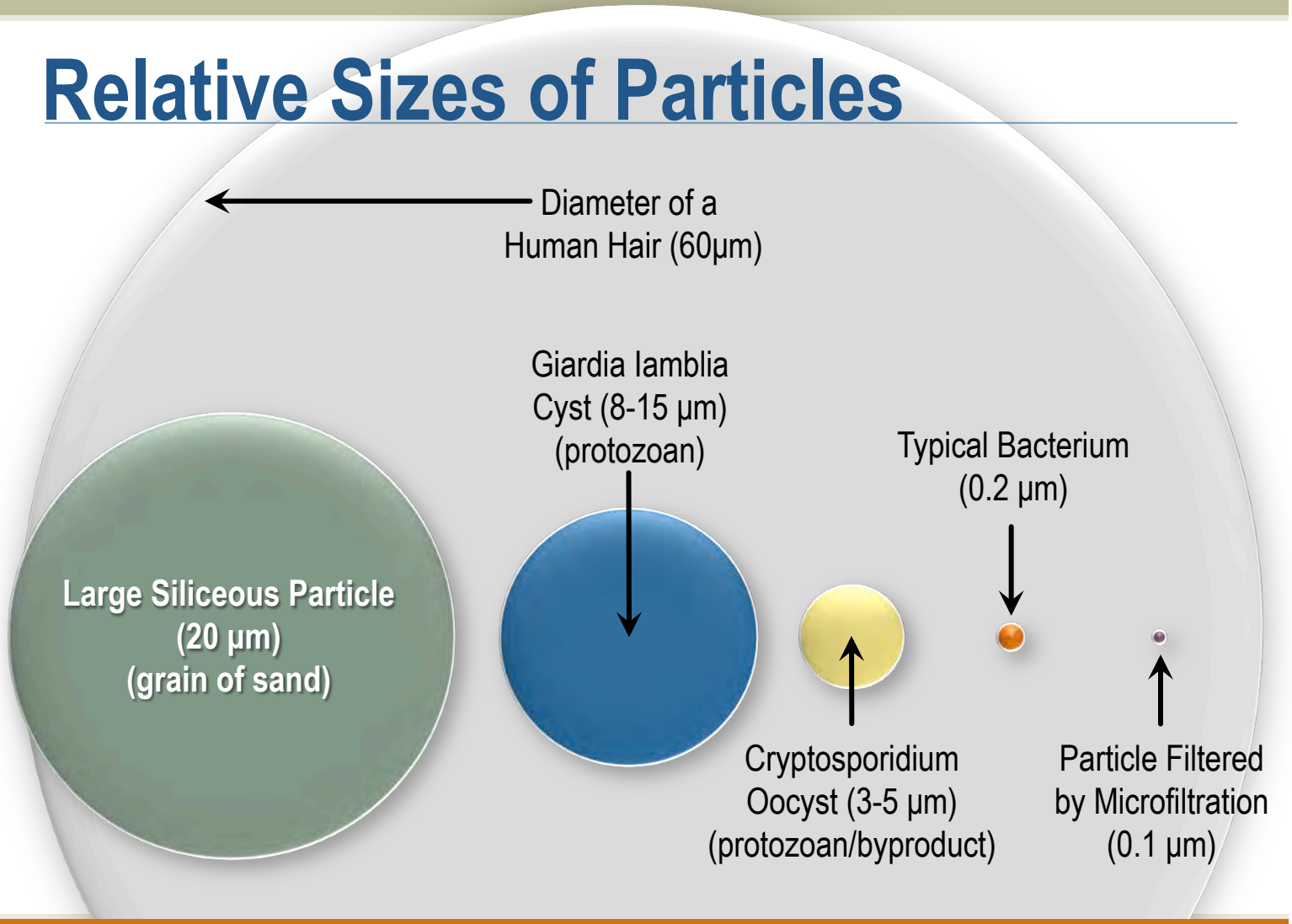
PALL MEMBRANES



- 34 modules per unit
- 6,350 Fibers per module
- 538 square feet of surface area per module
- Filters to 0.1 micron

Various Particle Sizes

Relative Sizes of Particles



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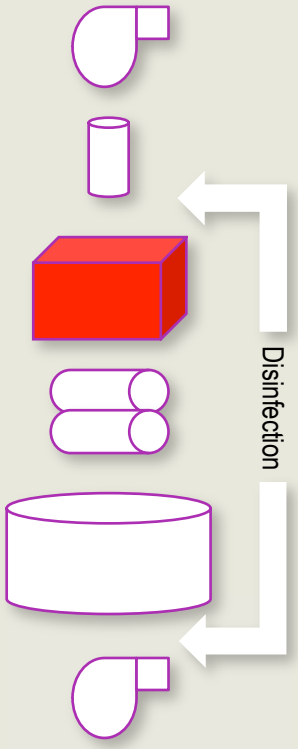
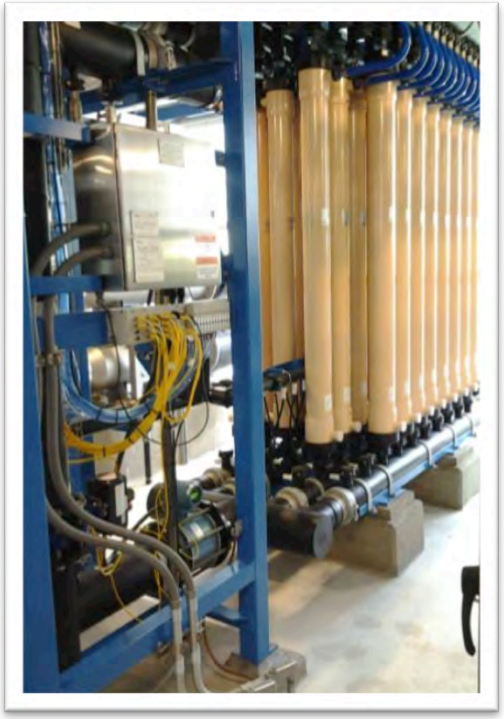
Operational Considerations

TO MAINTAIN MEMBRANE INTEGRITY

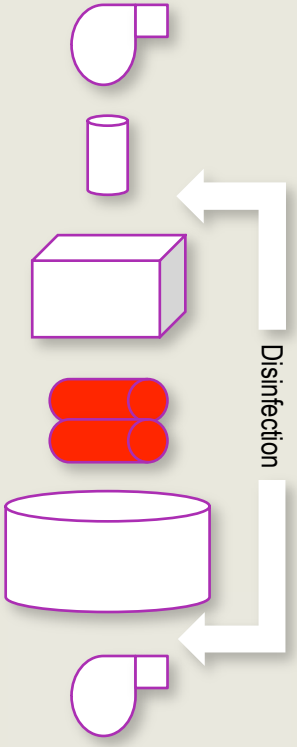


- Pressure test performed weekly
  - To assure no breach in the membrane strands
- Reverse flush (every 9,000 gallons)
- Lead train rotated (every 5 hours)
- Enhanced Flux Maintenance
  - Every 500,000 gallons
  - Removes organic fouling
  - Low-dose chemical cleaning (NaOCl)
- Clean-in-Place
  - Every 30-60 days
  - High dose chemical cleaning (extended)
  - Performed to remove organic and inorganic fouling



Reclaimed Water Facility Technology

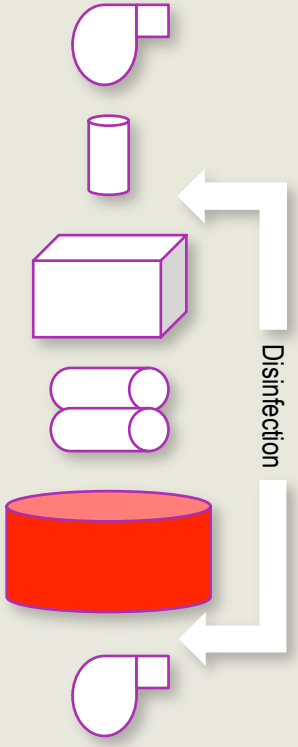
TROJAN UV FIT STERILIZATION UNIT



- 2 reactors per unit
- 18 bulbs per unit, 36 bulbs total
- 280 nm is the wavelength of light
- Quartz sleeves around bulbs w/ wipers
- Sterilizes by altering the DNA of the bacteria

Reclaimed Water Facility

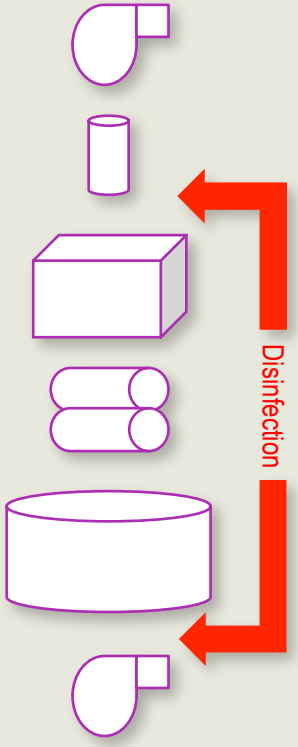
WATER STORAGE TANK



- Storage tank capacity
  - 1 Million Gallons
- Provisions for recirculation
  - Prevents tank from going stagnant during low-flow demands
- Chlorination option
  - Prevents and/ or controls bacterial growth

Reclaimed Water Disinfection

CHLORAMINATION



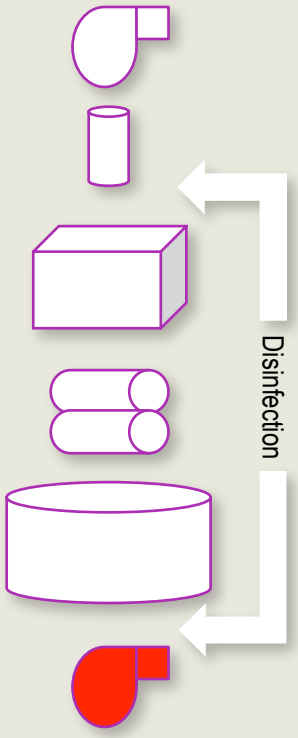
A process where a significant percentage of pathogenic (disease causing) organisms are killed or controlled

- Wastewater effluent is chlorinated seasonally from April 1 to October 31
- Provisions for chlorination or chloramine injection prior to the membrane feed
- Ultraviolet Sterilization prior to entering the water storage tank
- Provisions for chlorination or chloramine injection prior to being sent into the distribution system

The most common indicator organism for wastewater evaluation is fecal coliform

Reclaimed Water Facility Technology

DISTRIBUTION SYSTEM



- Water comes back into building from storage tank to the Distribution pumps
- 2 jockey pumps
  - 0-300 GPM
- 3 large pumps
  - 300-800 GPM
- Distribution system maintain an operating pressure of 75 psi

Reclaimed Water Facility Results

HIGH WATER QUALITY

Water Quality Results (July 2013 to Date)

- **Fecal Coliform Test Results** - 0.00 Colonies per 100 mL
- **Biochemical Oxygen Demand** - Average 0.70 mg/L
- **Total Suspended Solids** - Average 0.88 mg/L

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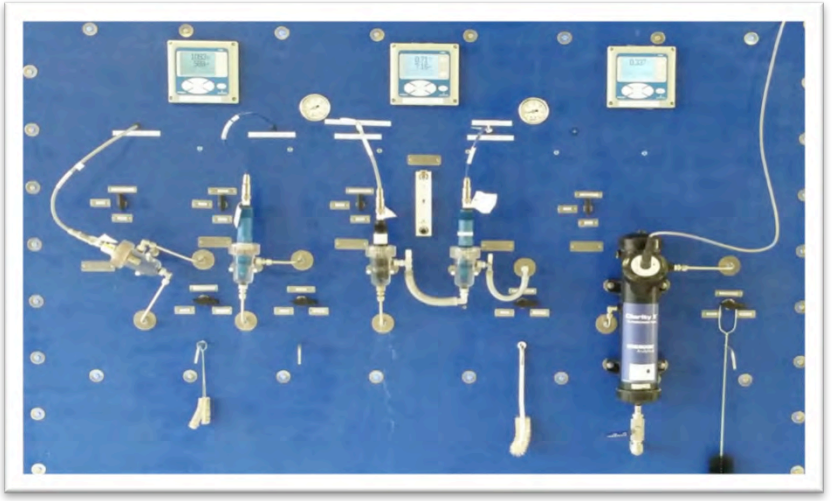
Reclaimed Water Quality

IN-LINE MONITORING STATIONS

- Location
  - Reclaimed Water Facility Influent
  - Membrane Effluent
  - Distribution System Influent



- All information is recorded in a accessible historian system
- Monitoring boards are verified daily for accuracy

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Reclaimed Water Facility

RECLAIMED WATER USAGE

- Processed water goes to the UCONN Central Utility Plant (CUP) for steam generation and cooling tower operations
- Currently reviewing additional uses for reclaimed water
- Water reuse for new construction is being considered (sustainable design guidelines initiative)

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THANK YOU

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