

WATER SAVINGS SUCCESSES AT ELANCO CLINTON LABS

2021 Pollution Prevention Conference and Tradeshow

Presenter: John Batronis

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Elanco

Water Savings Successes at Elanco Clinton Laboratories

- Clinton Laboratories began looking for opportunities to save water as far back as 2008, to meet a corporate environmental goals
- Target was a reduction of water intake by 5% each year in the period 2009 – 2013.
- Key externalities influenced this goal:
 - Peer pharmaceutical companies had public water reduction goals
 - Increasing water costs
 - Possible future water intake limitations in and outside the U.S.
 - Public concerns over the environmental risks of treatment and discharge of wastewaters
 - Access to clean, inexpensive water is an issue in some areas of the world



Water Savings Successes at Elanco Clinton Laboratories

- Elanco Clinton Laboratories has had significant success in reducing groundwater withdrawal for site operations over the past twelve years.
- The primary source of this reduction was shutting down incineration operations on site and the subsequent replacement of a solids contact clarifier wastewater treatment system with a membrane bioreactor (MBR) wastewater treatment plant.
- Additional water savings have been realized through modifying the MBR operation, repairing leaking underground fire water main headers and appurtenances, improving cooling tower maintenance and chemistry control, and completing other small projects.
- Annual well water demand dropped from 2.3 billion gallons in 2008 to 1.2 billion gallons in 2020.



Water Savings Successes at Elanco Clinton Laboratories

- Site incinerator operations shutdown in the mid-2000's, reducing cooling water demand
- Smith & Loveless CLAR-I-VATOR® solids contact clarifier wastewater treatment system replaced with a GE/Zenon (now **SUEZ**) “ZeeWeed® 500” Membrane Bioreactor WWTP

CLARIFIER



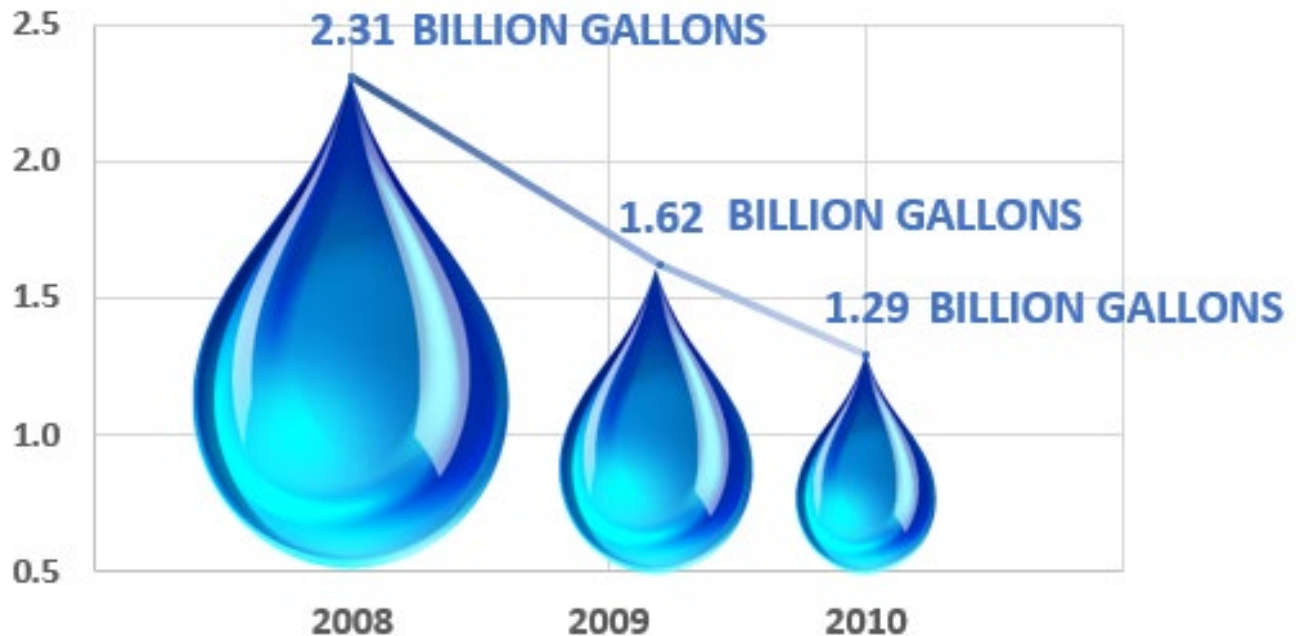
ZeeWeed 500 & BIOREACTORS



Water Savings Successes at Elanco Clinton Laboratories

- Replacement of Smith & Loveless CLAR-I-VATOR® solids contact clarifier wastewater treatment system with a GE/Zenon “ZeeWeed® 500” Membrane Bioreactor WWTP
 - System was commissioned and placed in service early in 2009
 - Combined domestic ‘sanitary’ sewage treatment with process wastewater treatment
 - Three immediate results of the new ‘combined’ wastewater treatment plant:
 - treatment of a process wastewater flow that was previously discharged from the site untreated (heavily diluted)
 - better treatment of the site’s sanitary wastewater, and
 - permanent closure of one well, and a 75%-90% reduction in operation of three of the six site groundwater wells

**WATER SAVINGS:
1,000,000,000 GALLONS/YEAR**



Water Savings Successes at Elanco Clinton Laboratories

What does **1 BILLION GALLONS** of water look like?

**DAILY IRRIGATION FOR ½ OF THE
GOLF COURSES IN THE U.S.**

It takes about 125,000 gallons per day to irrigate
a typical golf course



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*Content Source: <https://www.watersmart.com/what-does-2-billion-gallons-of-water-look-like/>

Water Savings Successes at Elanco Clinton Laboratories

What does **1 BILLION GALLONS** of water look like?



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Water Savings Successes at Elanco Clinton Laboratories

What does **1 BILLION GALLONS** of water look like?



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Water Savings Successes at Elanco Clinton Laboratories

What does **1 BILLION GALLONS** of water look like?



45

BELLAGIO FOUNTAINS

The Bellagio's 8.5-acre lake holds
22,000,000 gallons of water



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Water Savings Successes at Elanco Clinton Laboratories

What does **1 BILLION GALLONS** of water look like?



**83,333,333
HUMAN BEINGS**

**A 150 lb person consists of about 100 lbs
of water or nearly 12 gallons**



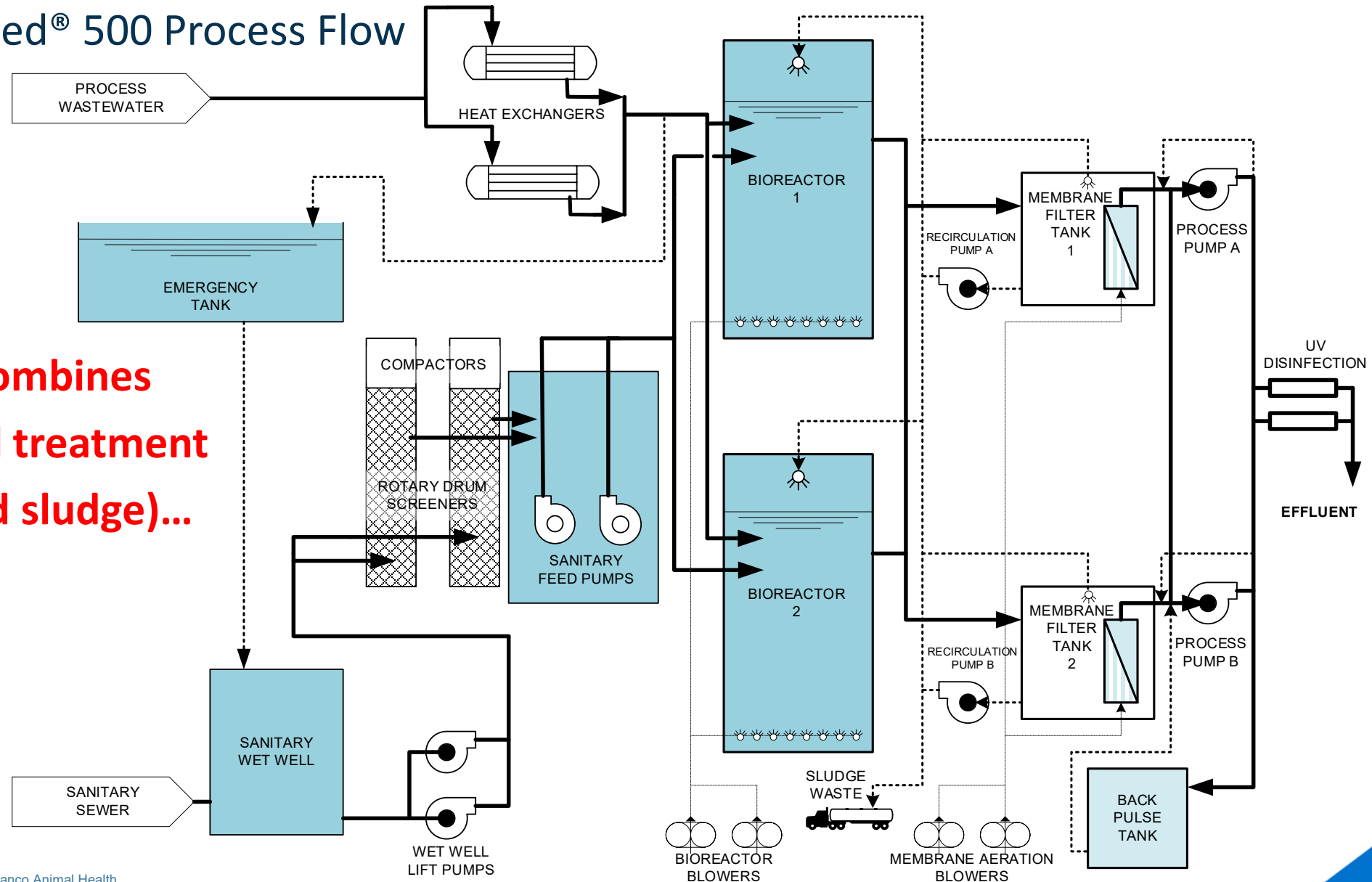
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Water Savings Successes at Elanco Clinton Laboratories

- ZeeWeed® 500 Process Flow

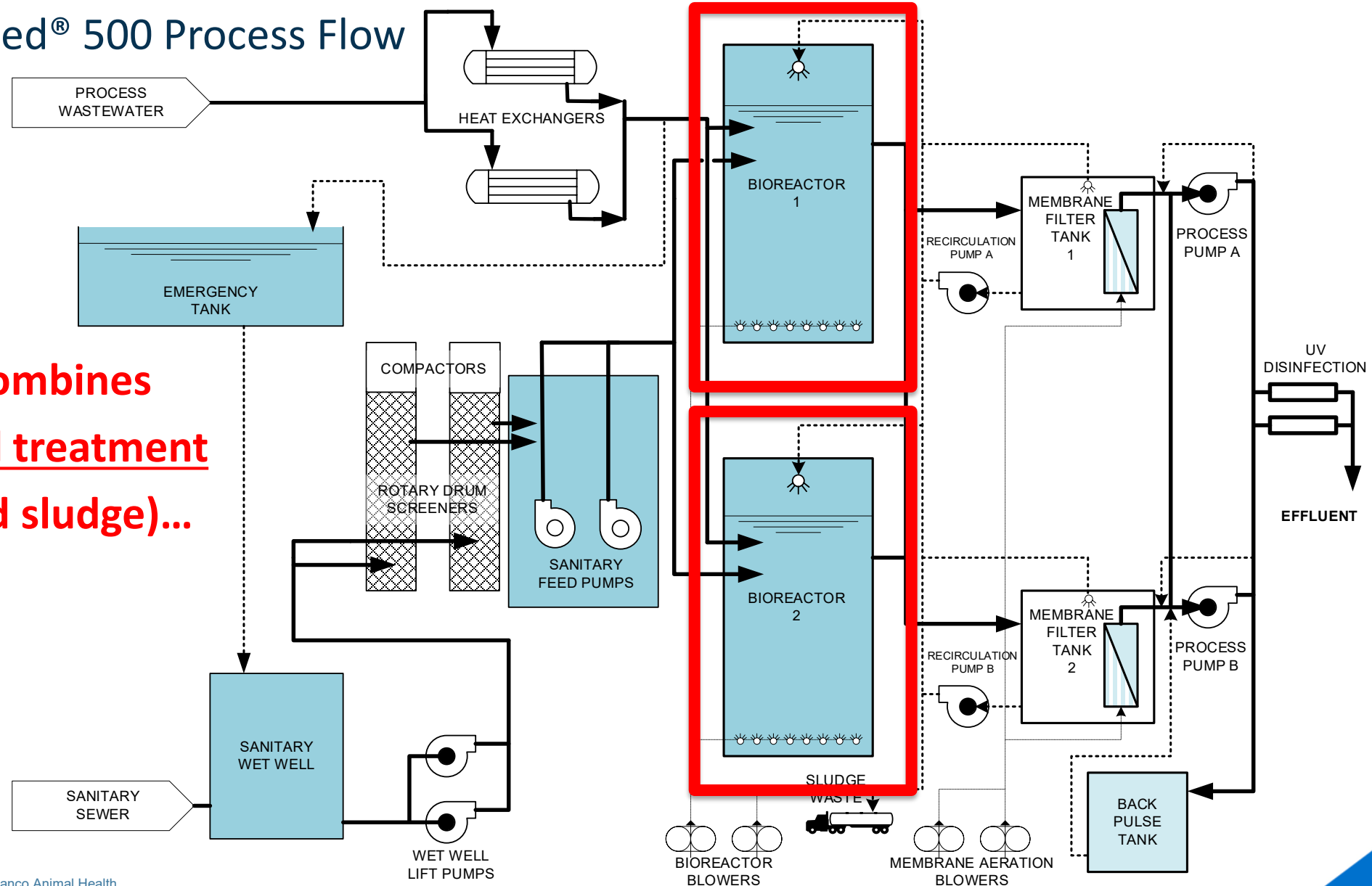
**System combines
biological treatment
(activated sludge)...**



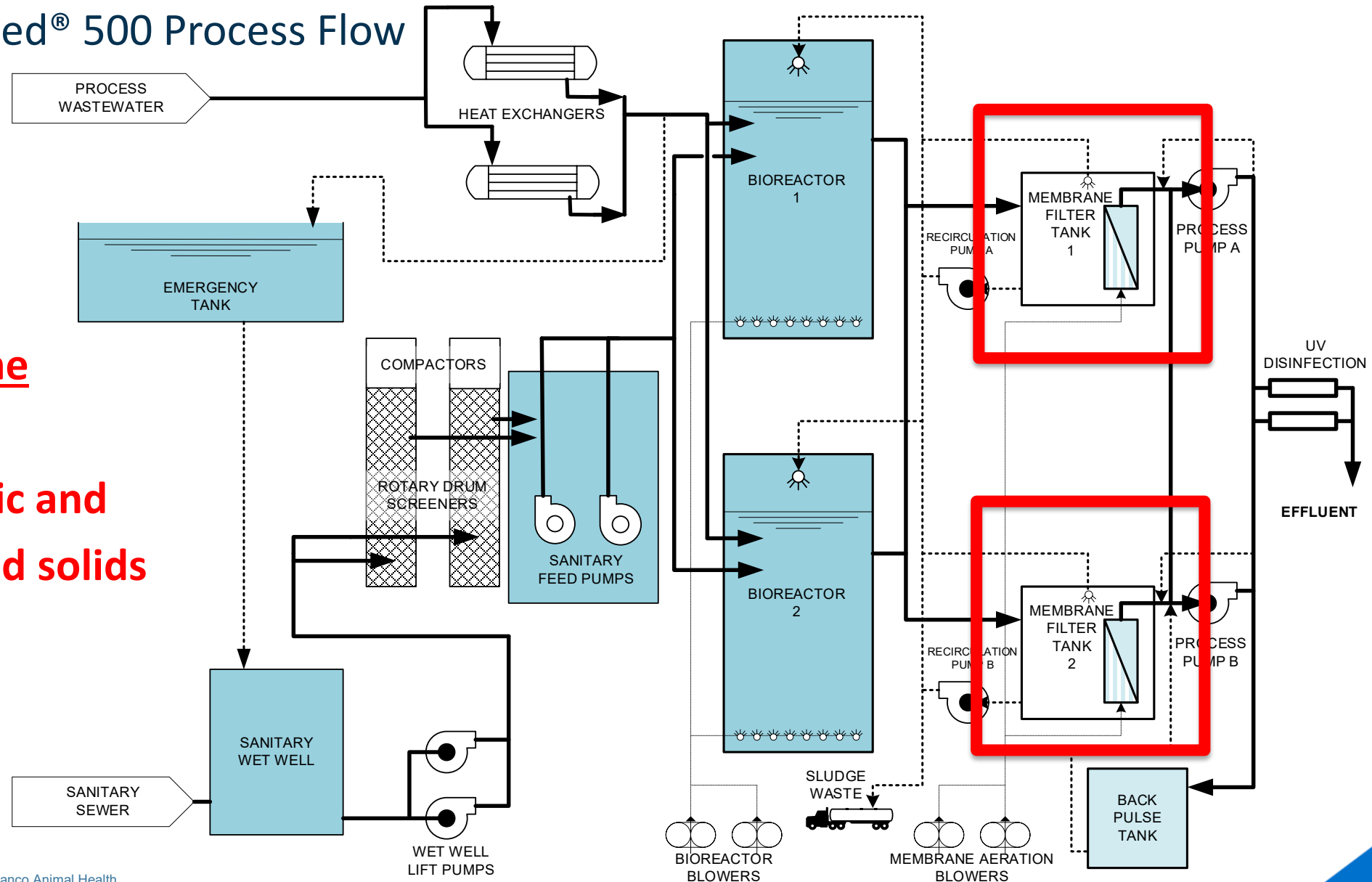
Water Savings Successes at Elanco Clinton Laboratories

- ZeeWeed® 500 Process Flow

**System combines
biological treatment
(activated sludge)...**



- ...with
membrane
filtration
for organic and
suspended solids
removal.



Water Savings Successes at Elanco Clinton Laboratories

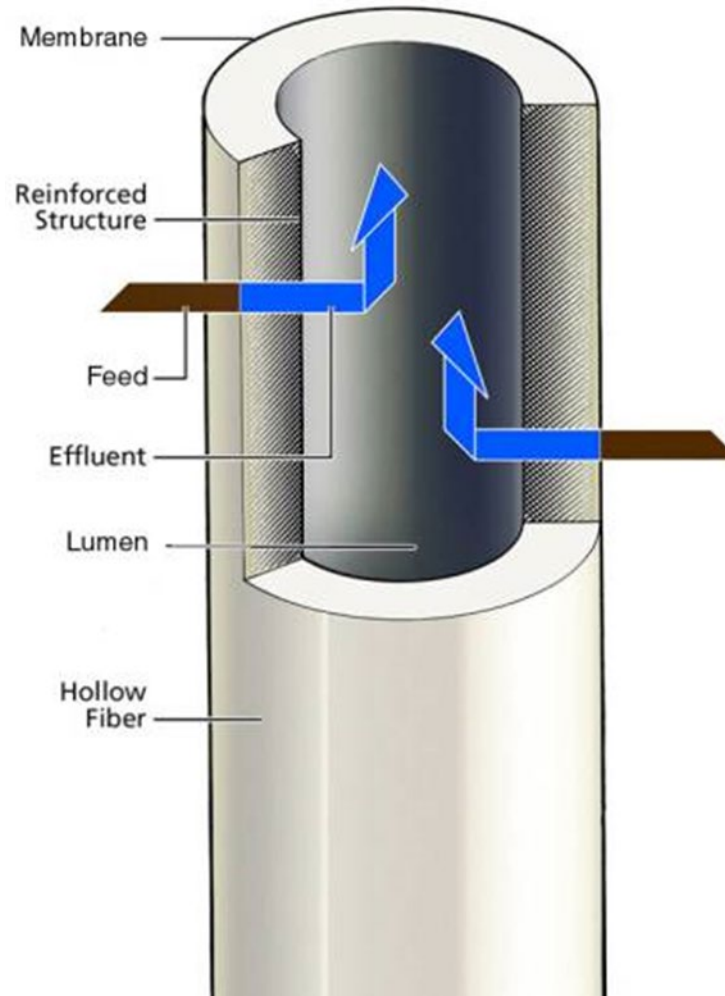
- ZeeWeed® membranes are “outside-in” hollow fiber membranes



SOURCE: GE/Zenon Training Materials



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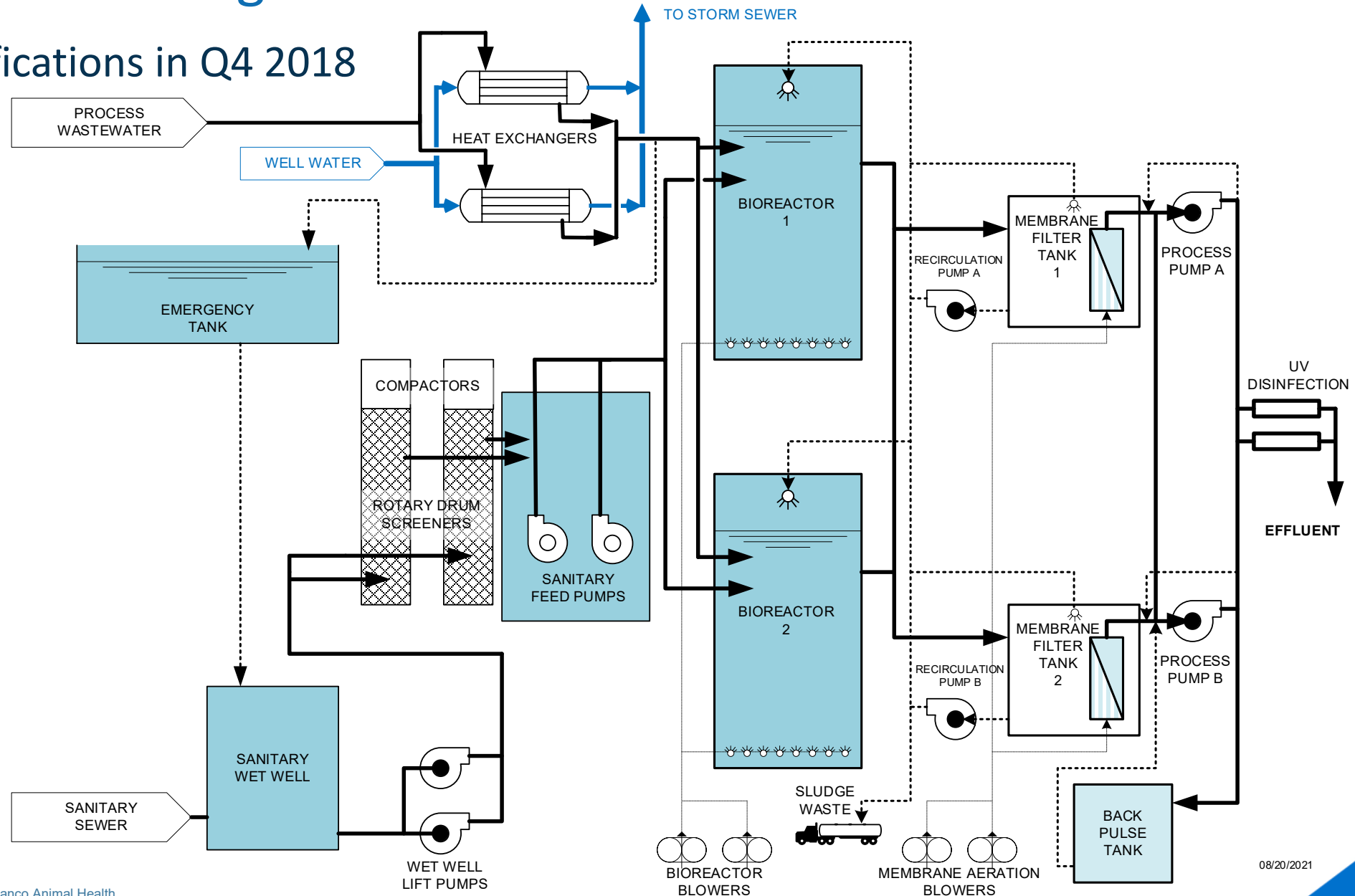
Hollow strands of porous plastic fibers with billions of microscopic pores on the surface

The pores are thousands of times smaller in diameter than a human hair

Clean water is drawn to the inside of fiber by a gentle suction

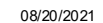
Water Savings Successes at Elanco Clinton Laboratories

- Modifications in Q4 2018



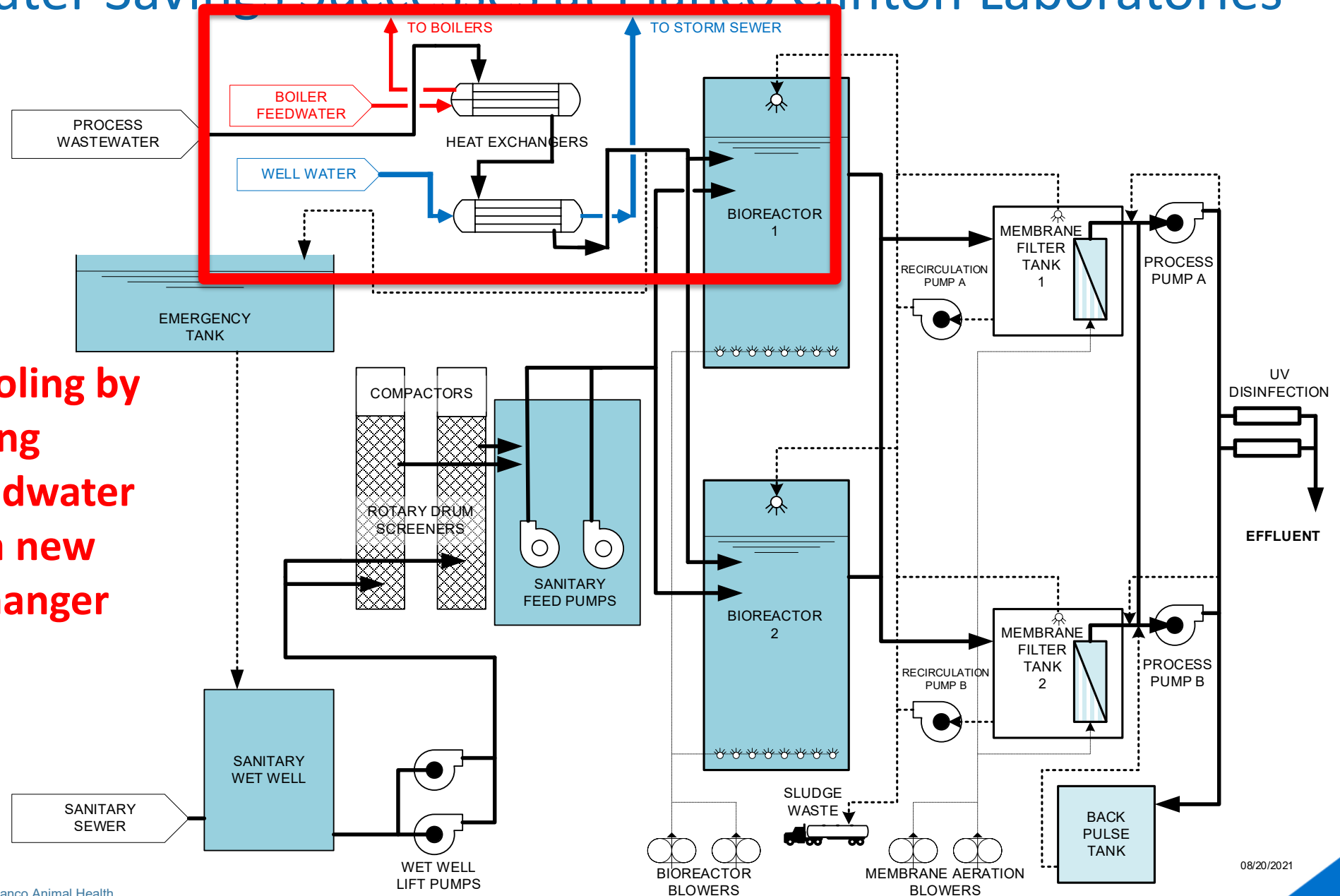
The diagram illustrates a wastewater treatment process with heat recovery. Wastewater enters from the left and passes through a set of heat exchangers. A side stream of 'WELL WATER' is injected into the flow between the heat exchangers. The cooled wastewater then enters 'BIOREACTOR 1'. The heated effluent from the bioreactor is sent 'TO STORM SEWER'. A dashed line indicates a return path from the storm sewer back to the well water source.

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Water Savings Successes at Flanco Clinton Laboratories

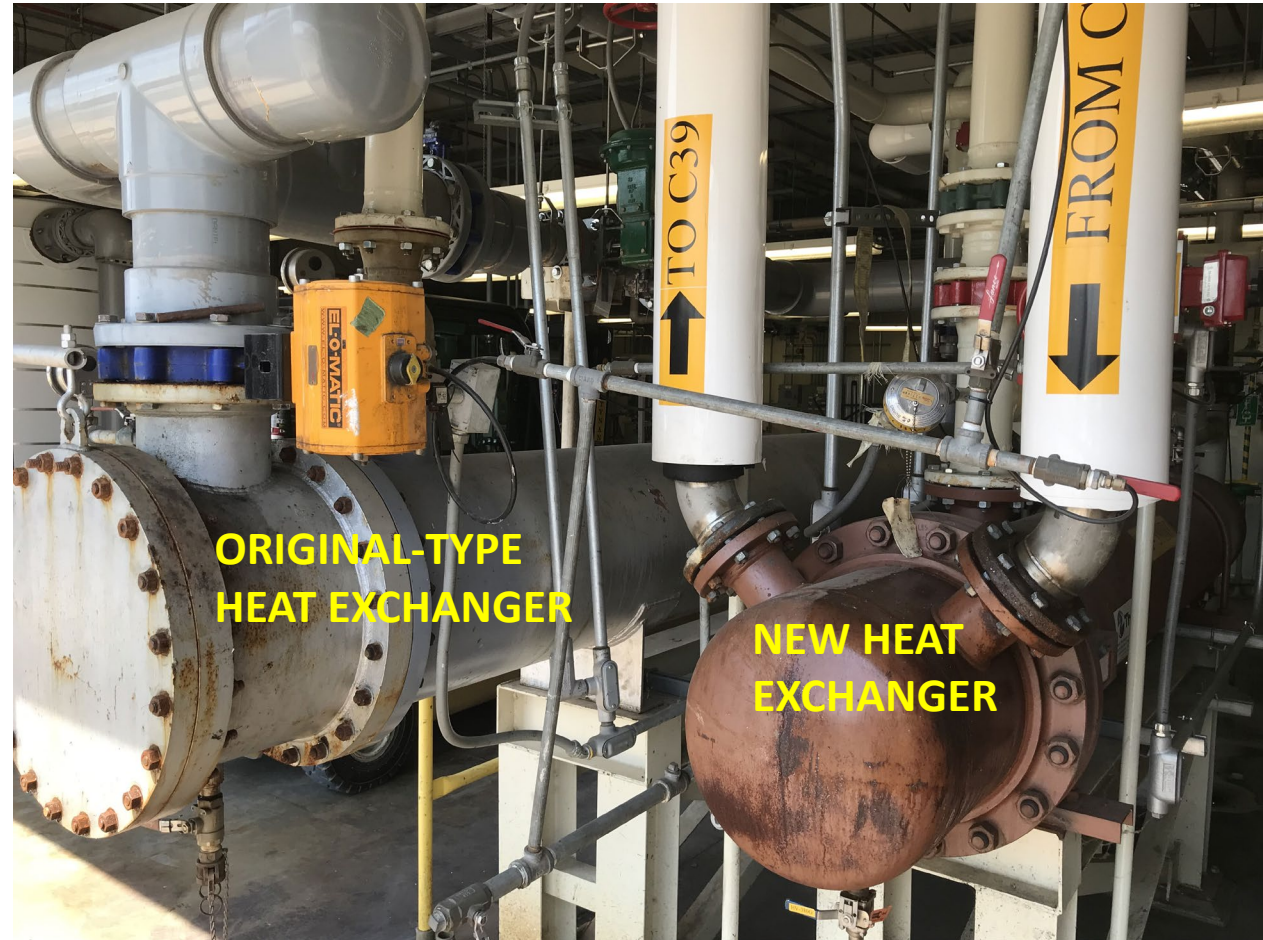
...with cooling by
pre-heating
boiler feedwater
through a new
heat exchanger



Water Savings Successes at Elanco Clinton Laboratories

- Boiler Feedwater Pre-Heating
 - Waste heat recovery and water savings through preheating boiler feedwater
 - Boiler feedwater replaces 300 GPM of Well Water cooling
 - Boiler feedwater preheated with wastewater
 - Wastewater further cooled by passing through second heat exchanger in series

**WATER SAVINGS:
157,680,000 GALLONS/YEAR**



Water Savings Successes at Elanco Clinton Laboratories

- Additional Projects:
 - Repairing leaking underground fire water main headers and appurtenances
 - Improving cooling tower maintenance and chemistry control
 - Miscellaneous “*small*” projects
 - Variable Frequency Drives installed on Well Pump Motors with Distributed Control System
 - Instrument Air Compressor Cooling Water from once-through well water to cooling tower water
 - Reduction in Irrigation for Front Lawn
 - Shutdown of the site’s coal-fired boiler



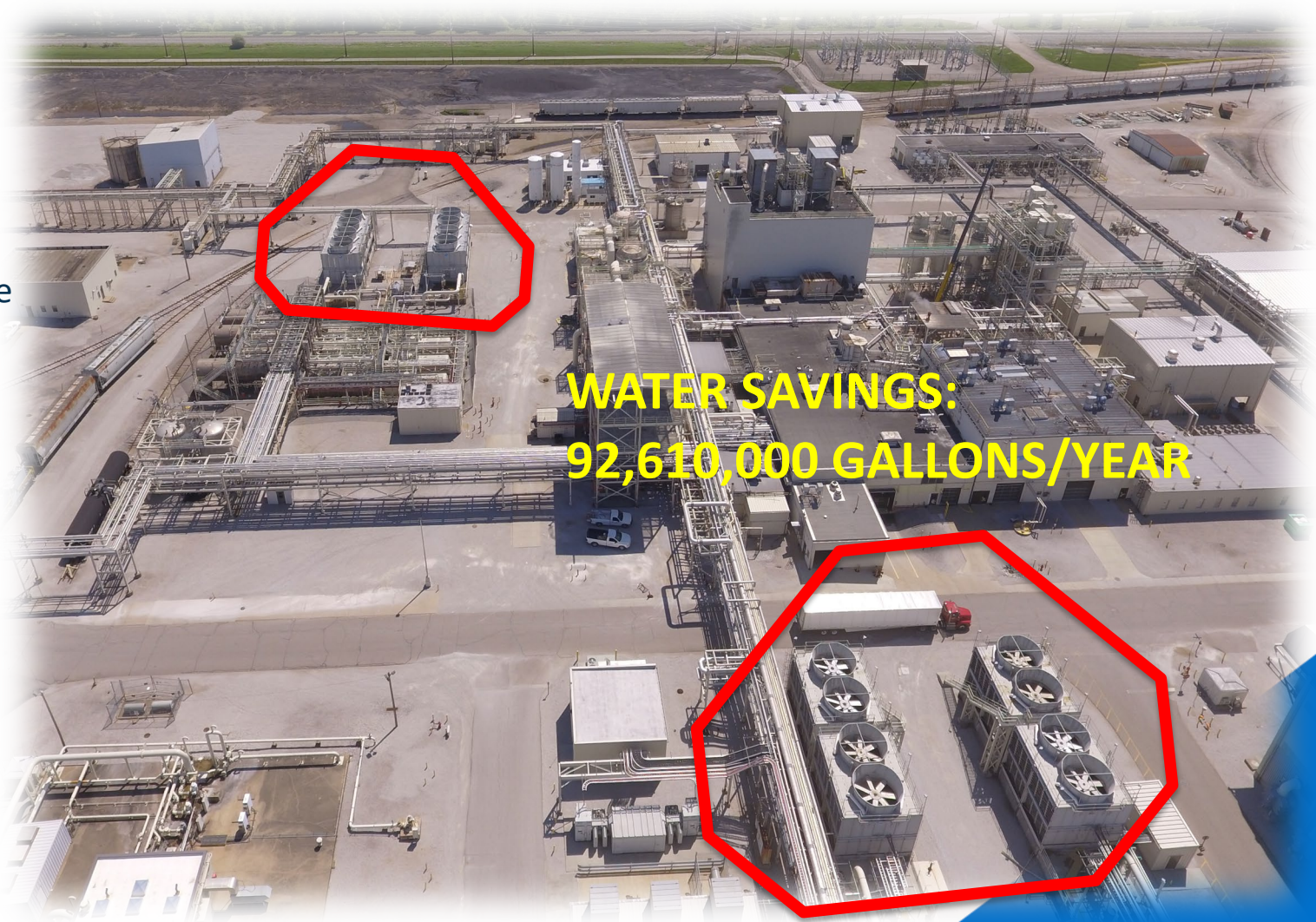
Water Savings Successes at Elanco Clinton Laboratories

- Repairing leaking underground fire water main headers and appurtenances
 - Extensive repairs in Q3-Q4 2018
 - Jockey Pump run times reduced by 75%; from cycling every 2 minutes, to cycling every 9 minutes



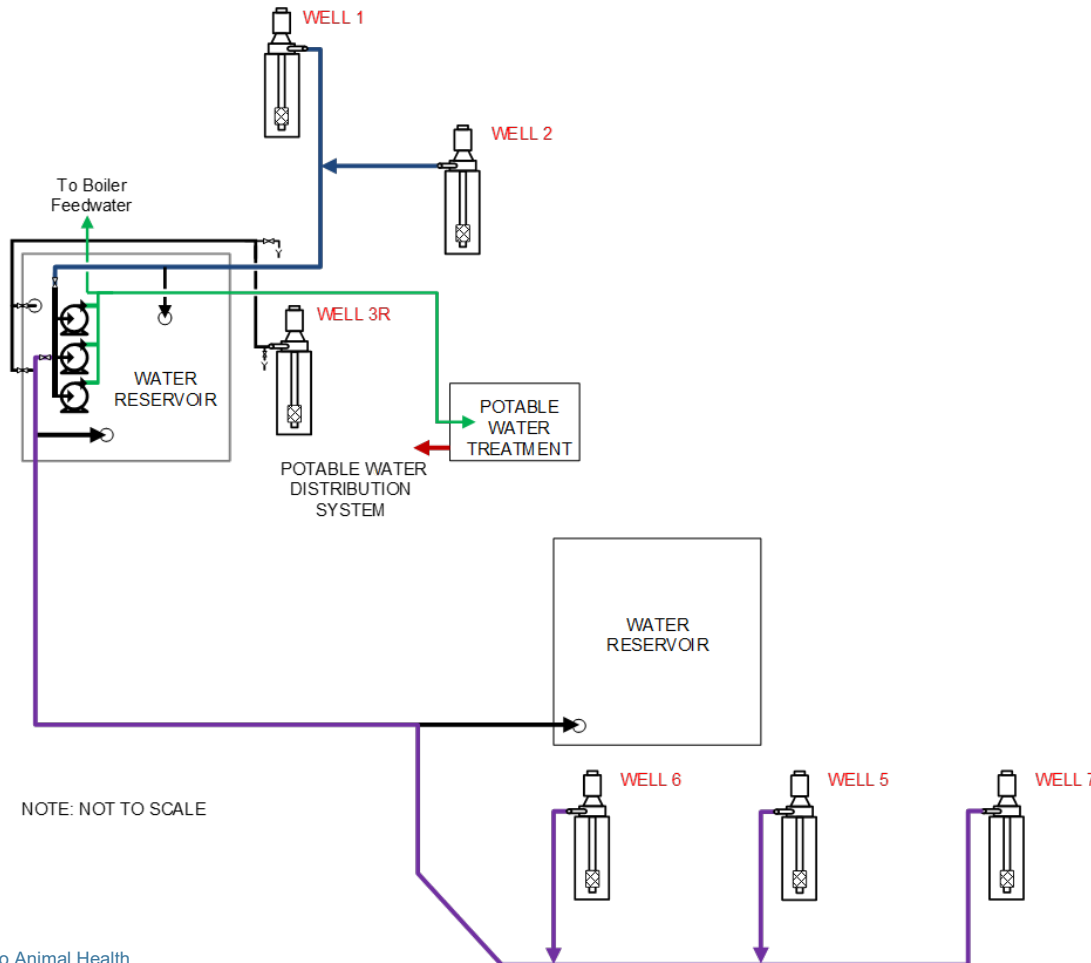
Water Savings Successes at Elanco Clinton Laboratories

- Improving cooling tower maintenance and chemistry control
- From 2017 to 2020, average tower makeup has dropped from 677 GPM to 501 GPM
 - Reduced blowdown/losses
 - Improves cycles in the towers
 - SAVES WATER!!!
 - Conserves chemicals
 - Lowers costs
 - Improves NPDES permit compliance
 - Improves heat transfer
 - Lowers maintenance costs
 - Less fouling of C.T. packing
 - Less fouling of heat exchangers
 - Lowers energy costs
 - Less scale on heat transfer surfaces
 - Less well water pumping required



Water Savings Successes at Elanco Clinton Laboratories

- Variable Frequency Drives Installed on Well Pump Motors
 - **Before Project:** Well flow manually throttled with discharge valves; reservoirs overflow periodically
 - **After Project:** DSC controls start/stop and VFD controls pump speed to maintain reservoir levels

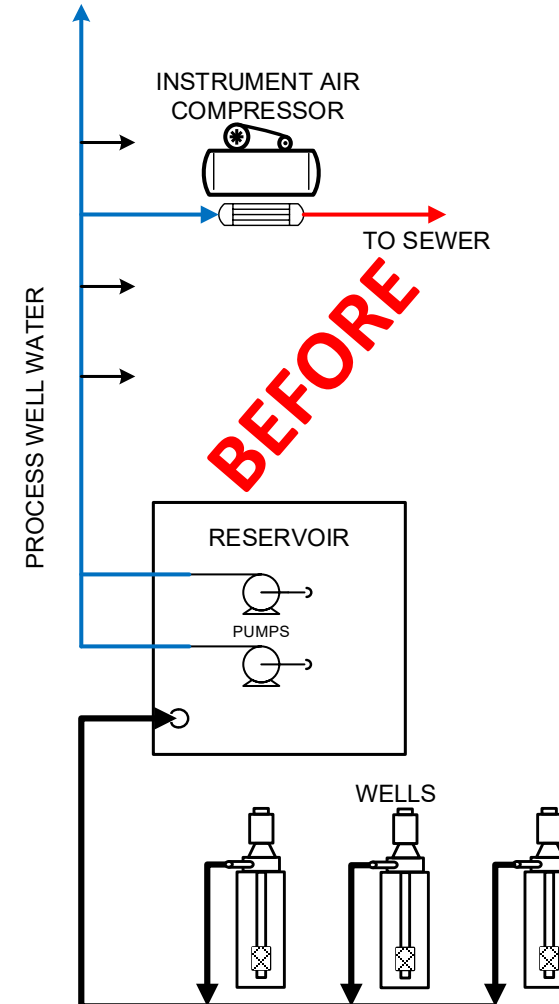


**WATER SAVINGS:
500,000 GALLONS/YEAR**



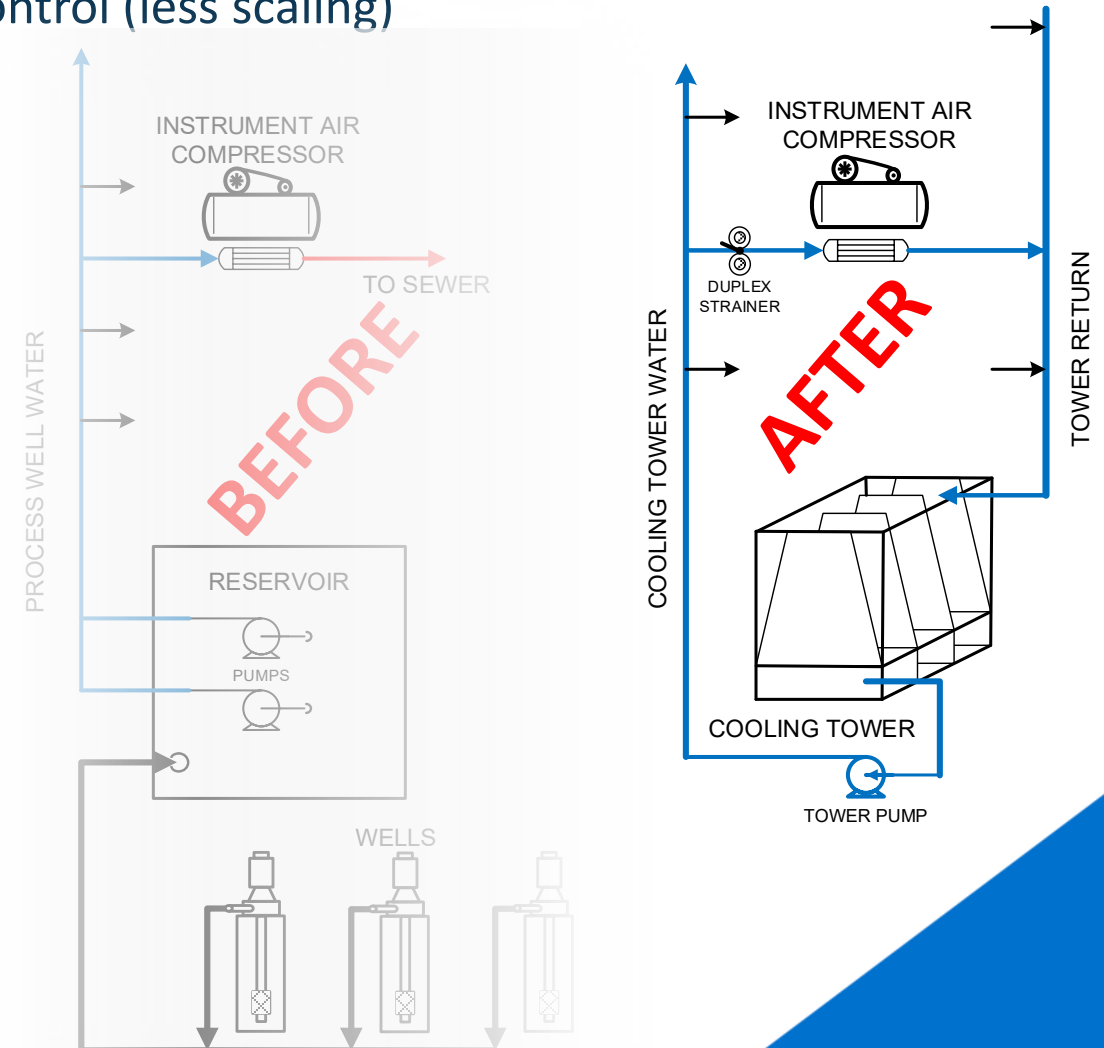
Water Savings Successes at Elanco Clinton Laboratories

- Instrument Air Compressor Cooling Water Source
 - **Before Project:** once-through well water at 60 GPM
 - **After Project:** cooling tower water with chemistry control (less scaling)



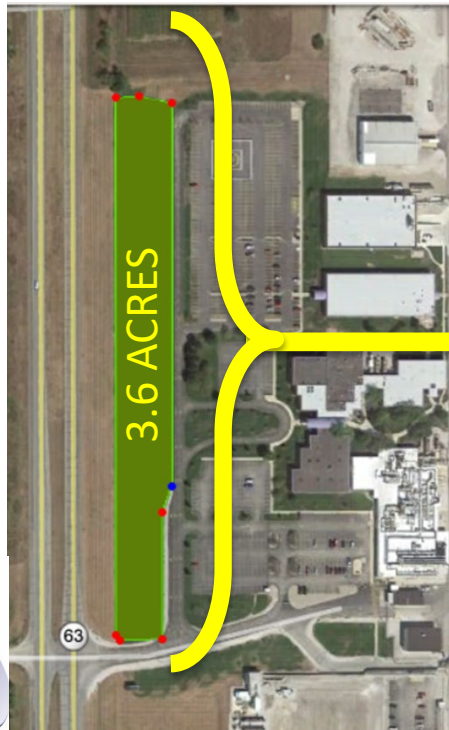
Water Savings Successes at Elanco Clinton Laboratories

- Instrument Air Compressor Cooling Water Source
 - Before Project:** once-through well water at 60 GPM
 - After Project:** cooling tower water with chemistry control (less scaling)



Water Savings Successes at Elanco Clinton Laboratories

- Reduction in Irrigation for Front Lawn
 - **Before Project:** 3.6 Acres of grass was watered and mowed along Indiana SR 63 in front of the site
 - **After Project:** a native habitat area was planted with a native prairie seed mix
 - In addition, over 500 White Pines were planted as a screen along the highway, along with several 'tree islands' consisting of Bald Cypress, Bur Oak, Sycamore, and River Birch trees



Water Savings Successes at Elanco Clinton Laboratories



Water Savings Successes at Elanco Clinton Laboratories



Water Savings Successes at Elanco Clinton Laboratories



Water Savings Successes at Elanco Clinton Laboratories



Water Savings Successes at Elanco Clinton Laboratories



NOVEMBER 2019



JANUARY 2020



MAY 2020



APRIL 2021



AUGUST 2021

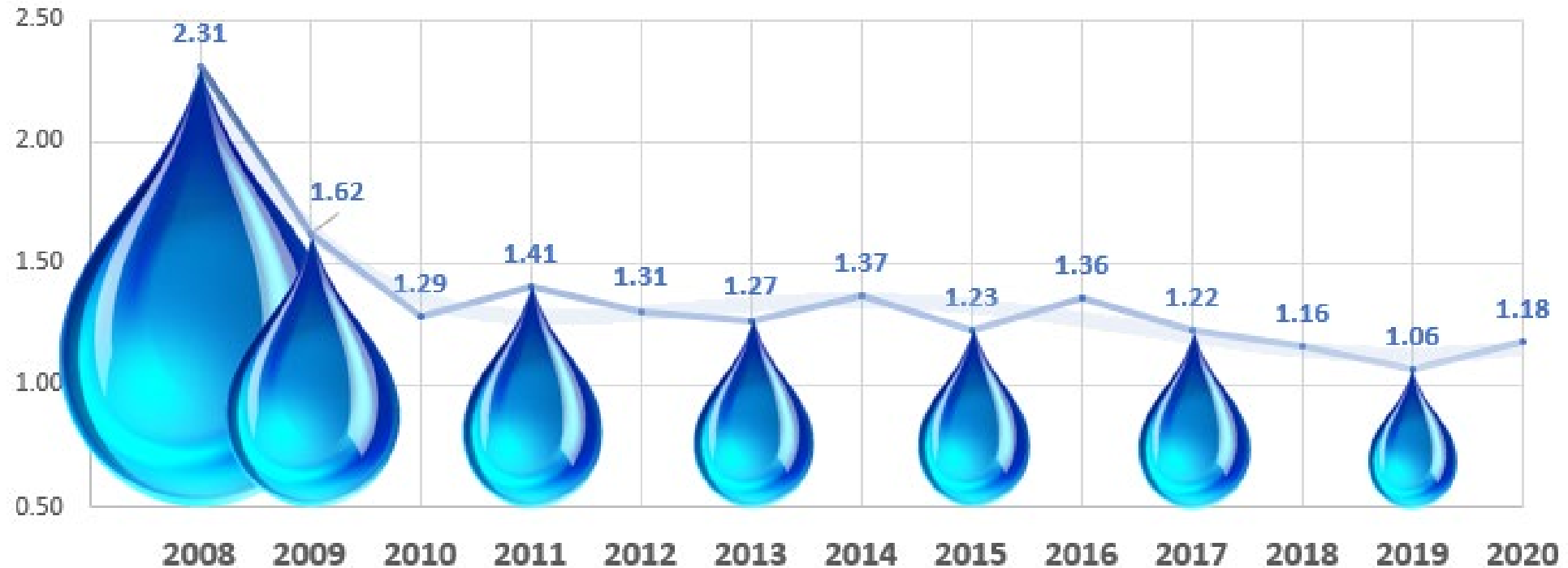
Water Savings Successes at Elanco Clinton Laboratories

- Shutdown of the site's coal-fired boiler
 - **Before Project:** significant cooling water demand (500 GPM) for feedwater pumps, fans, and water seals
 - **After Project:** site steam demand supplied by natural gas-fired boilers with less auxiliary cooling water demands



Water Savings Successes at Elanco Clinton Laboratories

- Cumulative Results:



- Questions?

