



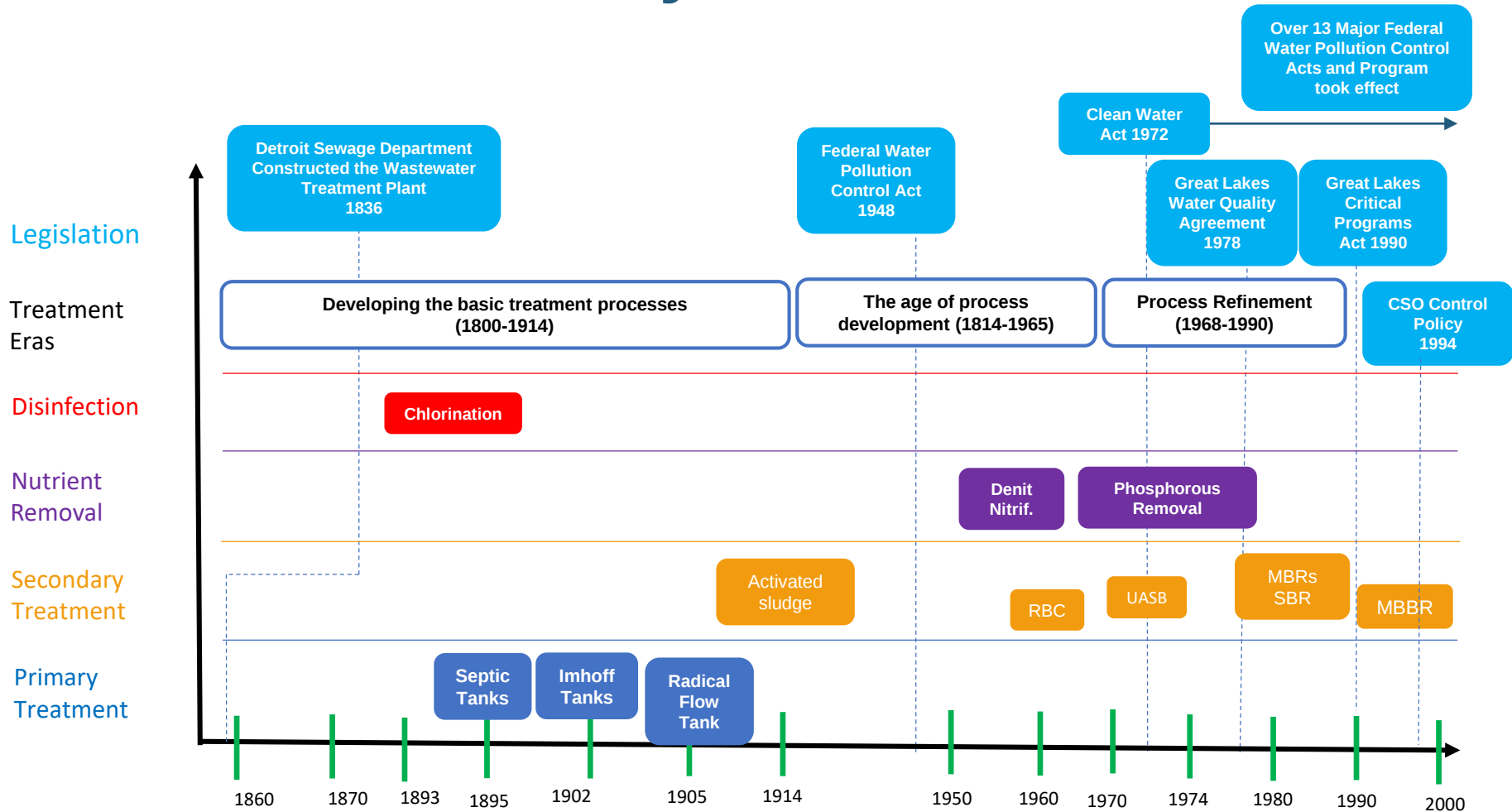
Wastewater Treatment

August 26, 2020

Navid Mehram P.E.



Sanitation History Timeline



RBC- Rotating biological reactors; UASB- Upward-flow anaerobic sludge blanket, MBRs-Membrane Biological Reactor, SBR- Sequent Batch Reactors

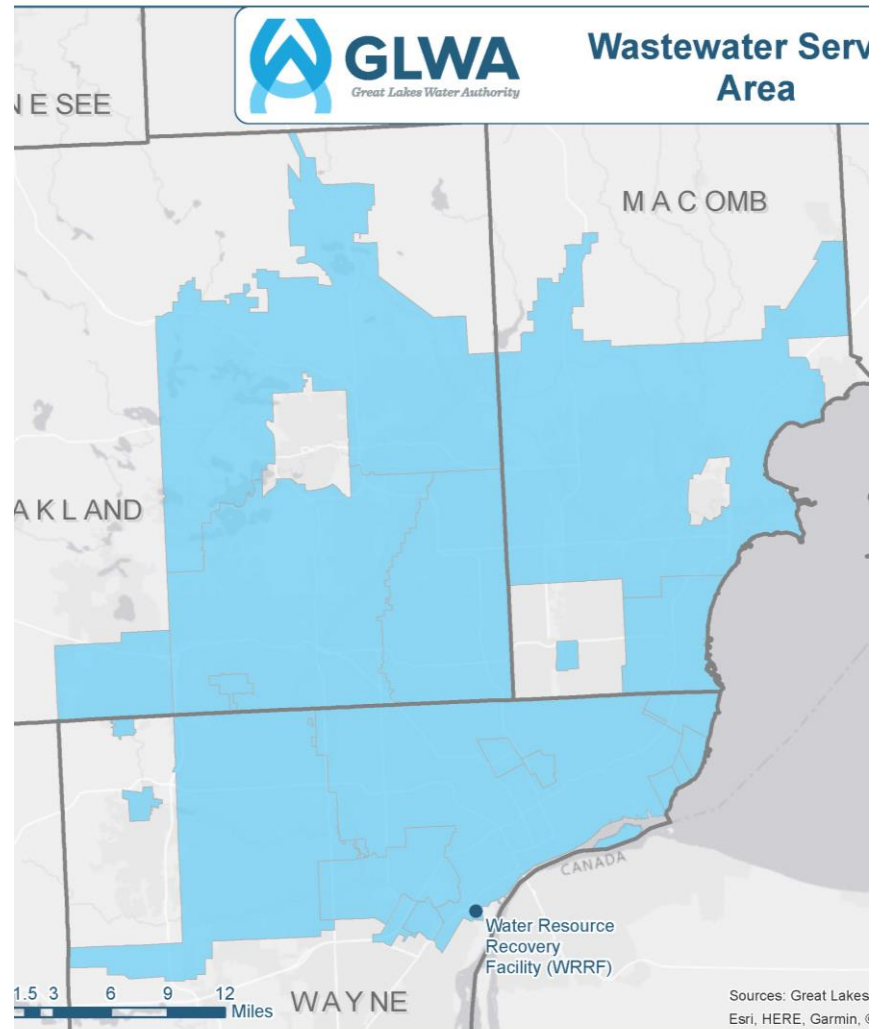
GLWA Sewer System

We are experienced in managing flows containing infectious agents

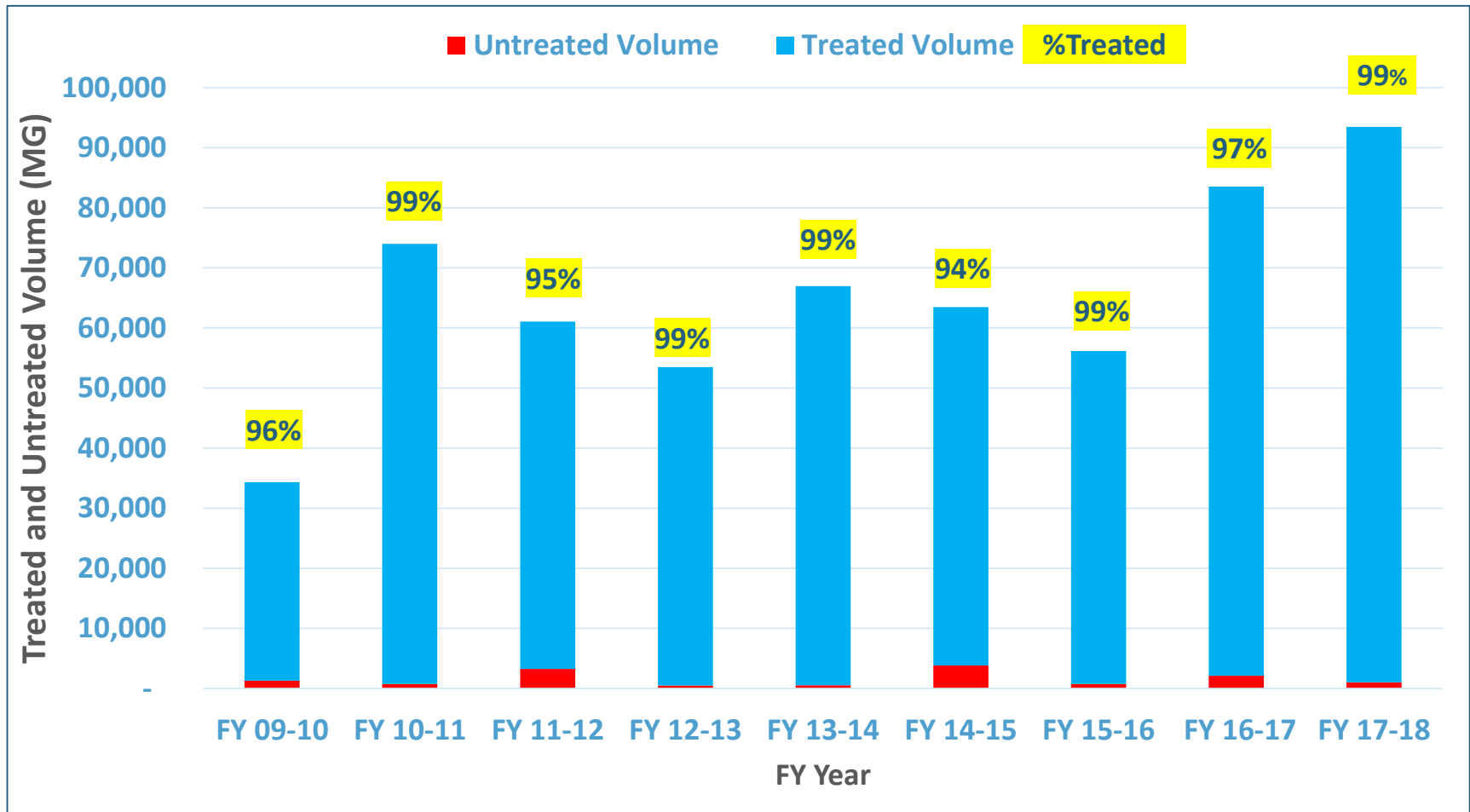


Sewer System

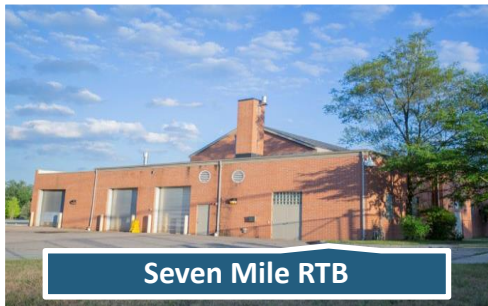
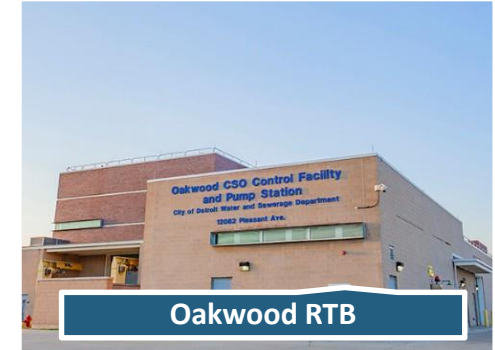
- 988 Square miles of service area
 - 76% Separated Sewer
 - 24% Combined Sewer
- Water Resource Recovery Facility
- 6 Combined Sewer Overflow facilities
- 3 screening and disinfection facilities
- 17 In system Storage dams
- 39 Outfalls along Detroit River
- 17 Outfalls along the Rouge River



Treated and Untreated Discharge Volume for FY 10 through FY 18



CSO Facilities



Five RTBs, Three
S&DFs, but
One WRRF

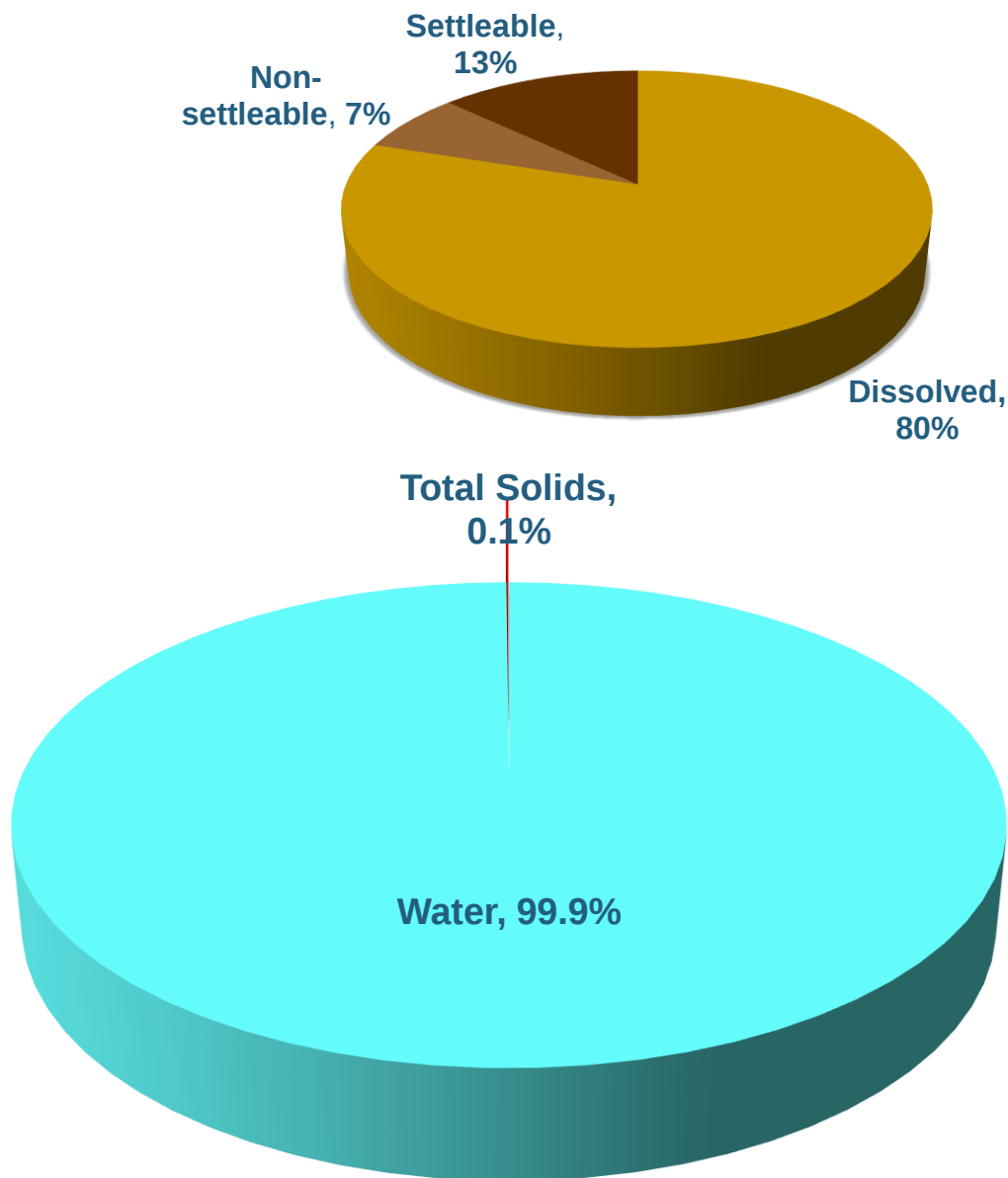


Wastewater Resource Recovery Facility (WRRF)

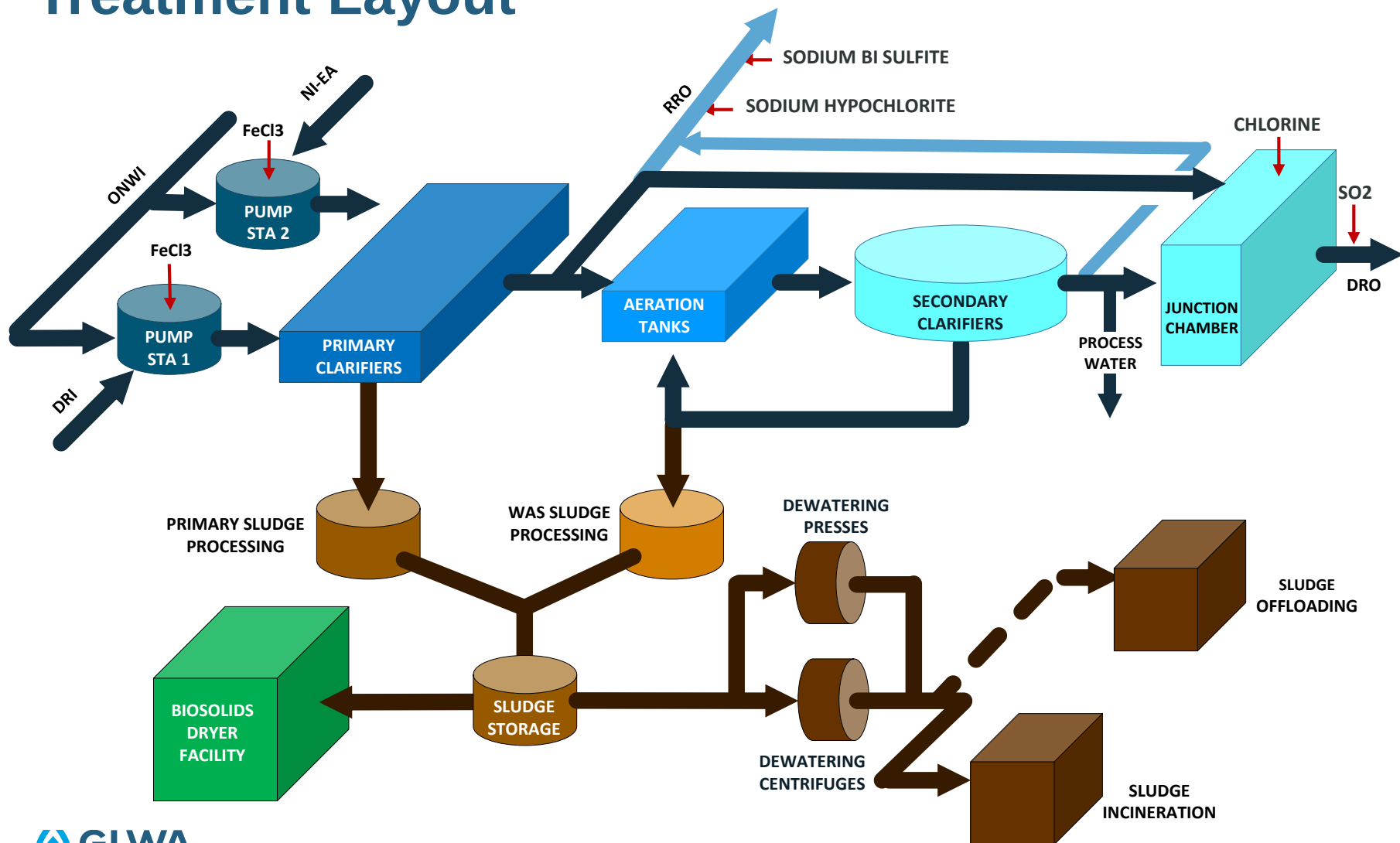


What's in Wastewater

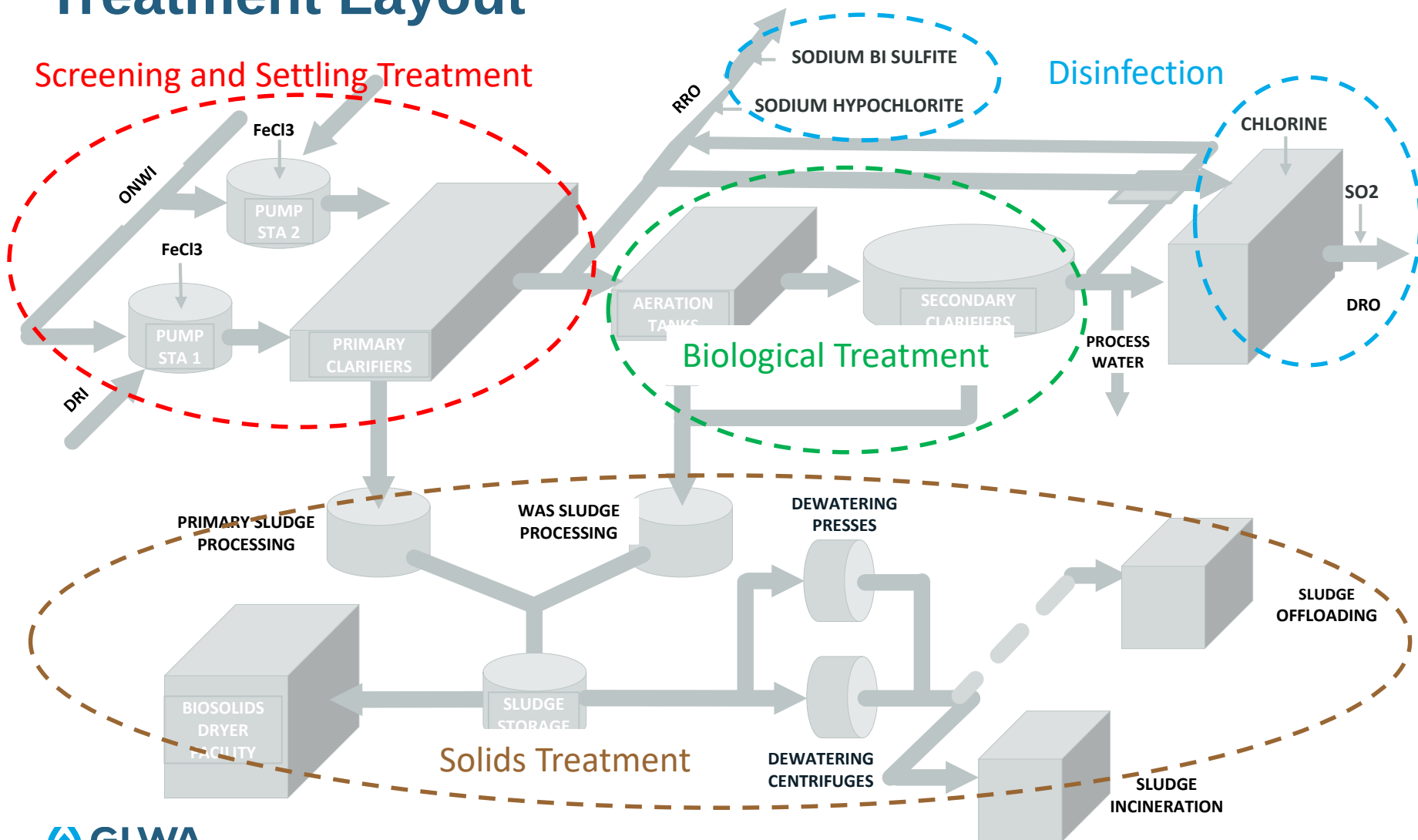
- Organic solids increase bacterial populations and lead to oxygen depletion
- Phosphorous and nitrogen increase algae and lead to eutrophication
- Sludge and scum clog waterways and usually contain organic solids
- Pathogenic organisms cause disease



Water Resource Recovery Facility Treatment Layout



Water Resource Recovery Facility Treatment Layout



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Disinfection Treatment



Disinfection Technology deployed by GLWA

Disinfection

Gaseous Chlorine, Cl_2 (Gas) (SE) - Contact time 10 Minutes

Sodium Hypochlorite (PE) - Contact time 15 Minutes

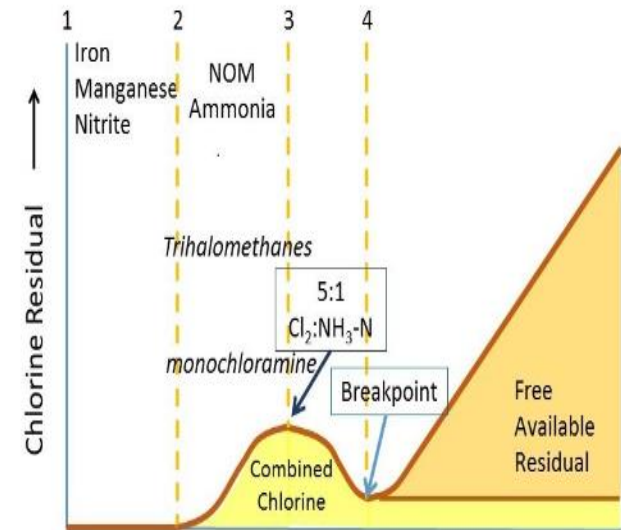
- Fecal Coliform Inactivation
- Monitor Chlorine Residual

Dechlorination

Gaseous Sulfur Dioxide, SO_2 (Gas)- 30 Second

Sodium Bisulfite (SBS) - 30 Second

- Protect Fish and Aquatic life



Wastewater Disinfection Technology

Chlorine/Sodium Hypochlorite (Cl_2)

- Well-established Technology
- Kills infectious bacteria, viruses, and protozoan cysts by destroying cellular material
- Require Dechlorination is required
- Oxidizing certain organic and inorganic compounds
- Eliminate noxious odors

Ultraviolet Radiation (UV)

- Destroys the cells ability to reproduce
- Use medium pressure lamps
- Shorter Contact time
- Energy intensive
- Turbidity and total suspended solids (TSS) requirement
- Chance for organism repair and reverse of destructive effects

Ozone (O_3)

- Generated on site
- Kills infectious bacteria, viruses, and protozoan cysts by destroying cellular material
- Operations and maintenance intensive
- No harmful residuals need to be removed
- Complex technology require complicated equipment

Summary

Oxygen-Demanding Substances Eliminate

- Organic matter and ammonia are “oxygen-demanding” substances.
- Dissolved Oxygen (DO) is a key element of water quality to support Aquatic Life.
- We achieve this through our pure oxygen Activated sludge process.

Pathogens Eliminate

- Waterborne diseases, infectious micro-organisms are present in wastewater.
- Contact time and chemical treatment is necessary protect human health and Aquatic life.
- We achieve this through Disinfection of Wastewater and chlorination of drinking water.

Nutrients- Reduction/Recover

- Carbon, nitrogen and phosphorus are essential nutrients present in natural water and large amount are present in wastewater.
- Chemical addition and biological treatment
- We Achieve this through recovery of our biosolids into nutrient rich fertilizer.

Coronavirus is a Virus

*We are experienced in
managing flows containing
infectious agents*



Infectious Agents present in Untreated Domestic Wastewater

Organism	Disease Caused
Bacteria Escherichia coli (enterotoxigenic) Leptospira (spp.) Salmonella typhi Salmonella (=2100 serotypes) Shigella (4 spp.) Vibrio cholerae	Gastroenteritis Leptospirosis Typhoid fever Salmonellosis Shigellosis (bacillary dysentery) Cholera
Protozoa Balantidium coli Cryptosporidium parvum Entamoeba histolytica Giardia lamblia	Balantidiasis Cryptosporidiosis Amebiasis (amoebic dysentery) Giardiasis
Helminths Ascaris lumbricoides T. solium Trichuris trichiura	Ascariasis Taeniasis Trichuriasis
Viruses Enteroviruses (72 types, e.g. polio, echo, and coxsackie viruses) Hepatitis A virus Norwalk agent Rotavirus	Gastroenteritis, heart anomalies, meningitis Infectious hepatitis Gastroenteritis Gastroenteritis

United States Environmental Protection Agency (EPA)

Should wastewater workers take extra precautions to protect themselves from the COVID-19 virus?

- “Wastewater treatment plant operations should ensure workers follow routine practices to prevent exposure to wastewater. These include using engineering and administrative controls, safe work practices, and personal protective equipment normally required for work tasks when handling untreated wastewater. No additional COVID-19–specific protections are recommended for employees involved in wastewater management operations, including those at wastewater treatment facilities.”

Do wastewater treatment plants treat COVID-19?

- “Yes, wastewater treatment plants treat viruses and other pathogens. Coronavirus, which causes COVID-19, is a type of virus that is particularly susceptible to disinfection. Standard treatment and disinfectant processes at wastewater treatment plants are expected to be effective.”

<https://www.epa.gov/coronavirus/frequent-questions-about-wastewater-and-septic-systems-and-coronavirus-covid-19>

Occupational Safety and Health Administration

Generally, management of waste that is suspected or known to contain or be contaminated with COVID-19 does not require special precautions beyond those already used to protect workers from the hazards they encounter during their routine job tasks in solid waste and wastewater management

Coronaviruses are susceptible to the same disinfection conditions in the healthcare setting as other viruses, so current disinfection conditions in wastewater treatment facilities are expected to be sufficient. This includes conditions for practices such as oxidation with hypochlorite (i.e., chlorine bleach) and peracetic acid, as well as inactivation through the use of ultraviolet irradiation.

<https://www.osha.gov/SLTC/covid-19/solid-waste-wastewater-mgmt.html>

THANK YOU!



GLWA

Great Lakes Water Authority

One Water. One Team.