



CWA – NPDES Compliance Assistance for Public Drinking Water Systems

May 13, 2020

US EPA Office of Compliance Technical Assistance Webinar Series



- Introduction: Seth Heminway, US EPA Office of Compliance (heminway.seth@epa.gov)
- Webinar series supports the national EPA and state initiative to reduce noncompliance among CWA -NPDES permitted facilities. Focus is on helping wastewater system operators return their facilities to compliance, and those interested in fine-tuning their systems.
- The webinar will be recorded and posted.
- Certificates of attendance will be sent to those who have registered.
- You will be in “listen only mode.”
- Use the chat box to ask questions and to suggest other training
- Speakers do not necessarily reflect EPA positions or policy.
- Be sure to download the Chart from Downloads Tab to follow along.
- We strive for continuous improvement. Please complete the post webinar survey.

Background



The information provided here is for informational purposes, treatment systems and environmental regulations are complex and vary based on location. You should discuss changes with an engineer familiar with your operation and the state and local regulations applicable to your system before making changes.

SDWA and CWA Terms

Safe Drinking Water Act (SDWA)	Clean Water Act (CWA)
Systems	Facilities
Water Treatment Plant (WTP)	Wastewater Treatment Plant (WWTP)
Public Water System (PWS) Community Community Water System (CWS)	Publicly Owned Treatment Works (POTW)
Contaminants	Pollutants
Maximum Contaminant Levels (MCLs)	Effluent Limits and Exceedances
National Primary Drinking Water Regulations (NPDWR)	NPDES Permits
Some general differences in the use of the terms Chronic, Acute and Toxic.	



Positive Example



Potential Concern

Significance of Wastewater Pollution from Drinking Water Treatment Systems



National Compliance Initiative: Reducing Significant Non-Compliance with National Pollutant Discharge Elimination System (NPDES) Permits

“The objective of this initiative is to improve surface water quality and reduce potential impacts on drinking water by assuring that all NPDES permittees are complying with their permits, not just industrial contributors. This NCI aims to reduce by half the national SNC baseline rate of 29.4 percent by the end of FY 2022, while assuring that the worst SNC violators are timely and appropriately addressed.”

Sources:

National Compliance Initiative: Reducing Significant Non-Compliance with National Pollutant Discharge Elimination System (NPDES) Permits
<https://www.epa.gov/enforcement/national-compliance-initiative-reducing-significant-non-compliance-national-pollutant>

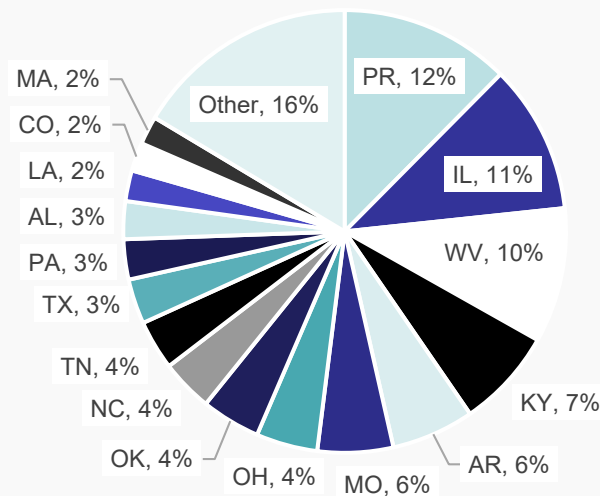
Water Supply Industry

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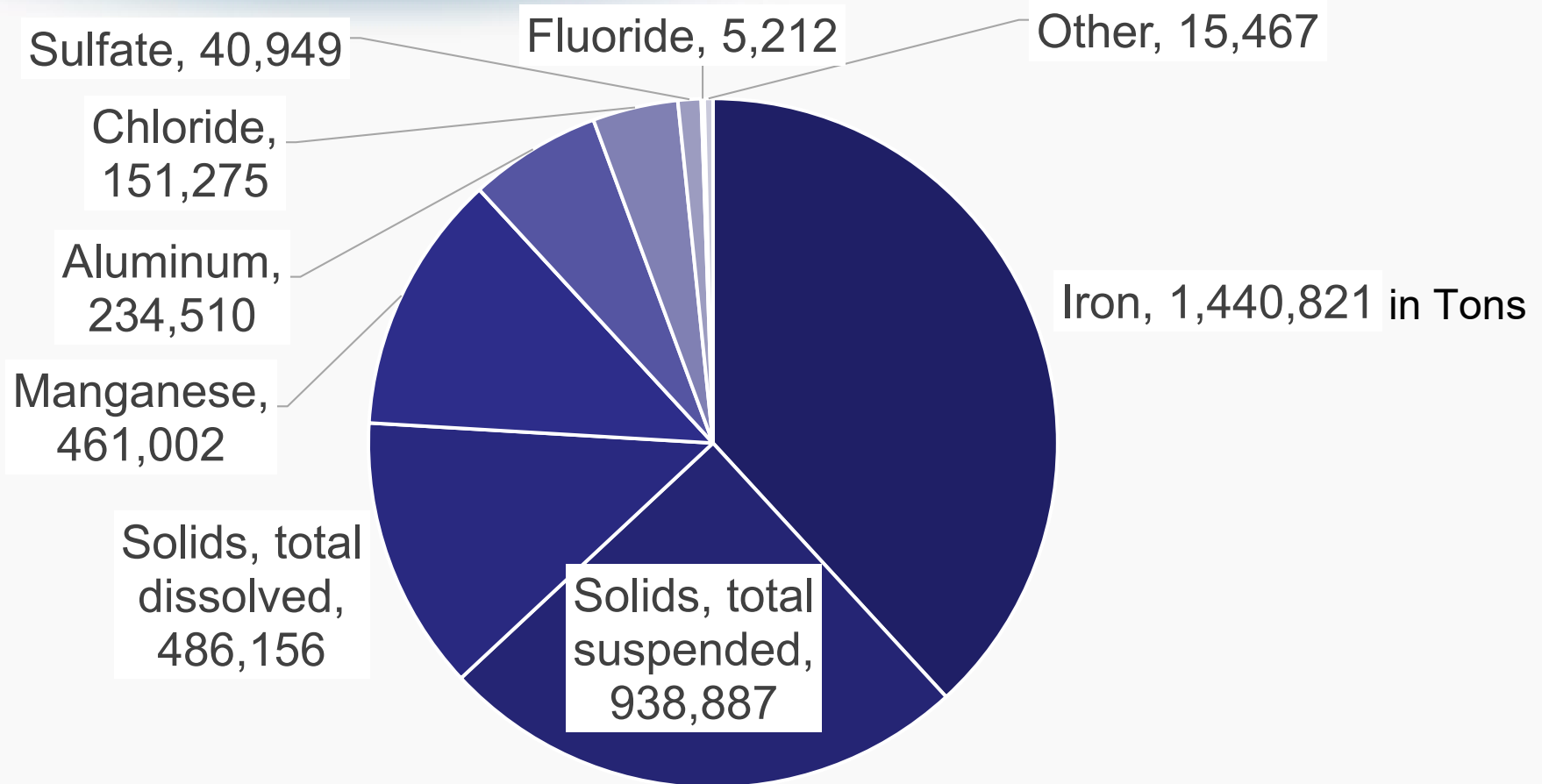


- ❑ Nationally there are more than **3,500 Water Treatment Plants with Wastewater Discharges to Surface Waters.**
- ❑ More than **30%** of Water Treatment Plants have had recent **exceedances** of the pollutant limitations in their NPDES permits.
- ❑ Approximately **10%** of Water Treatment Plants are discharging wastewater with levels of **chlorine** in excess of their NPDES permitted limits. Creating conditions that are toxic to aquatic life.

Number of Permitted Facilities by State



2019 Tons of Pollutants Reported from Drinking Water Treatment System



Source:

EPA Pollutant Loading Tool: <https://echo.epa.gov/resources/general-info/loading-tool-modernization>

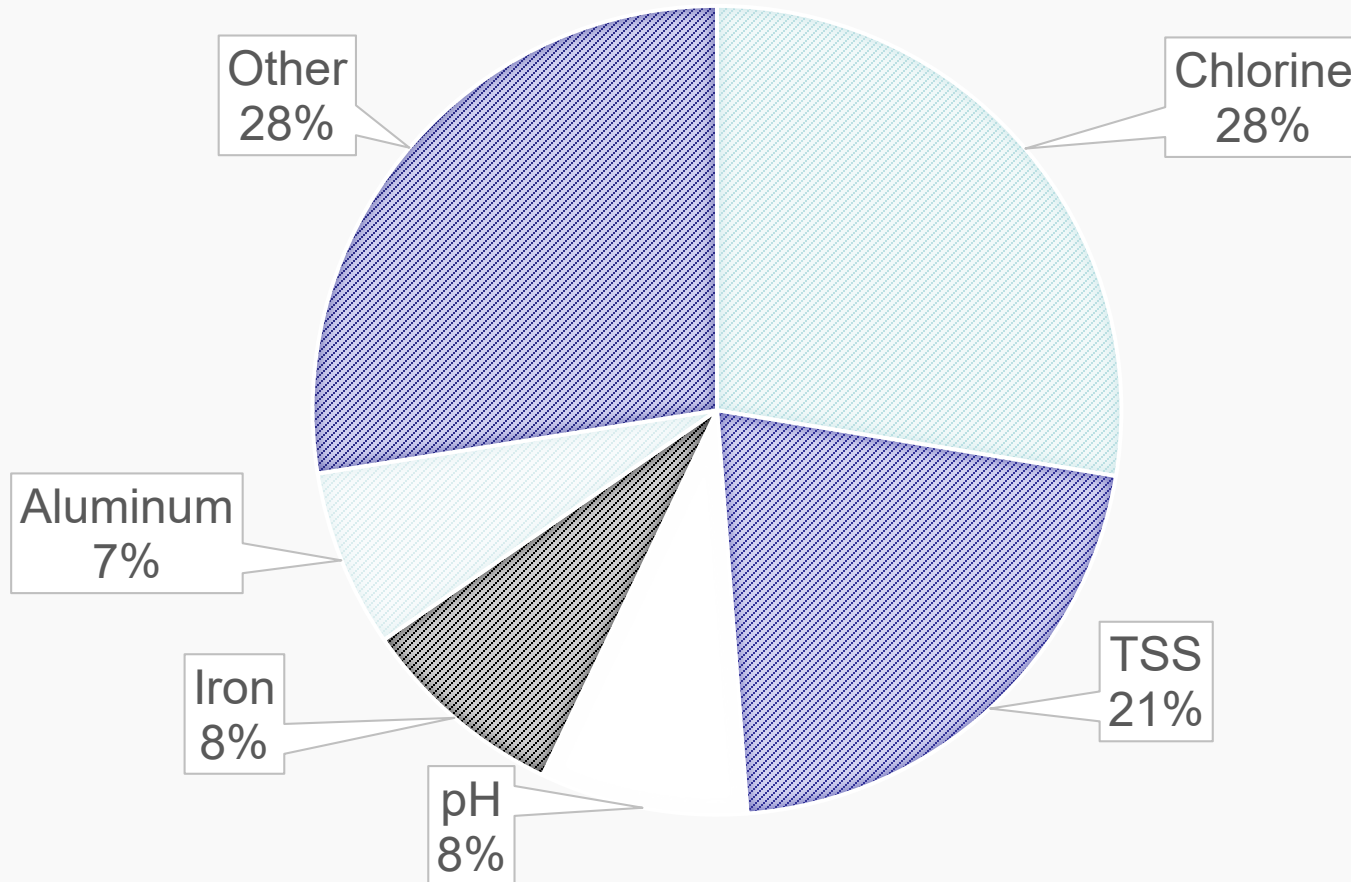
Pollution from Drinking Water Treatment



Major Drinking Water Treatment Process	Typical Wastewater Pollutants
Coagulation/Filtration	TSS, Metals, Organics, biological, radionuclides, inorganics
Precipitative Softening	TSS, Metals, Organics, biological, radionuclides,
Membrane Separation	TDS, Metals, radionuclides, nitrates, other anions
Ion Exchange	TDS, metals, hardness, nitrates, other anions
Disinfection	Chlorine, DBP

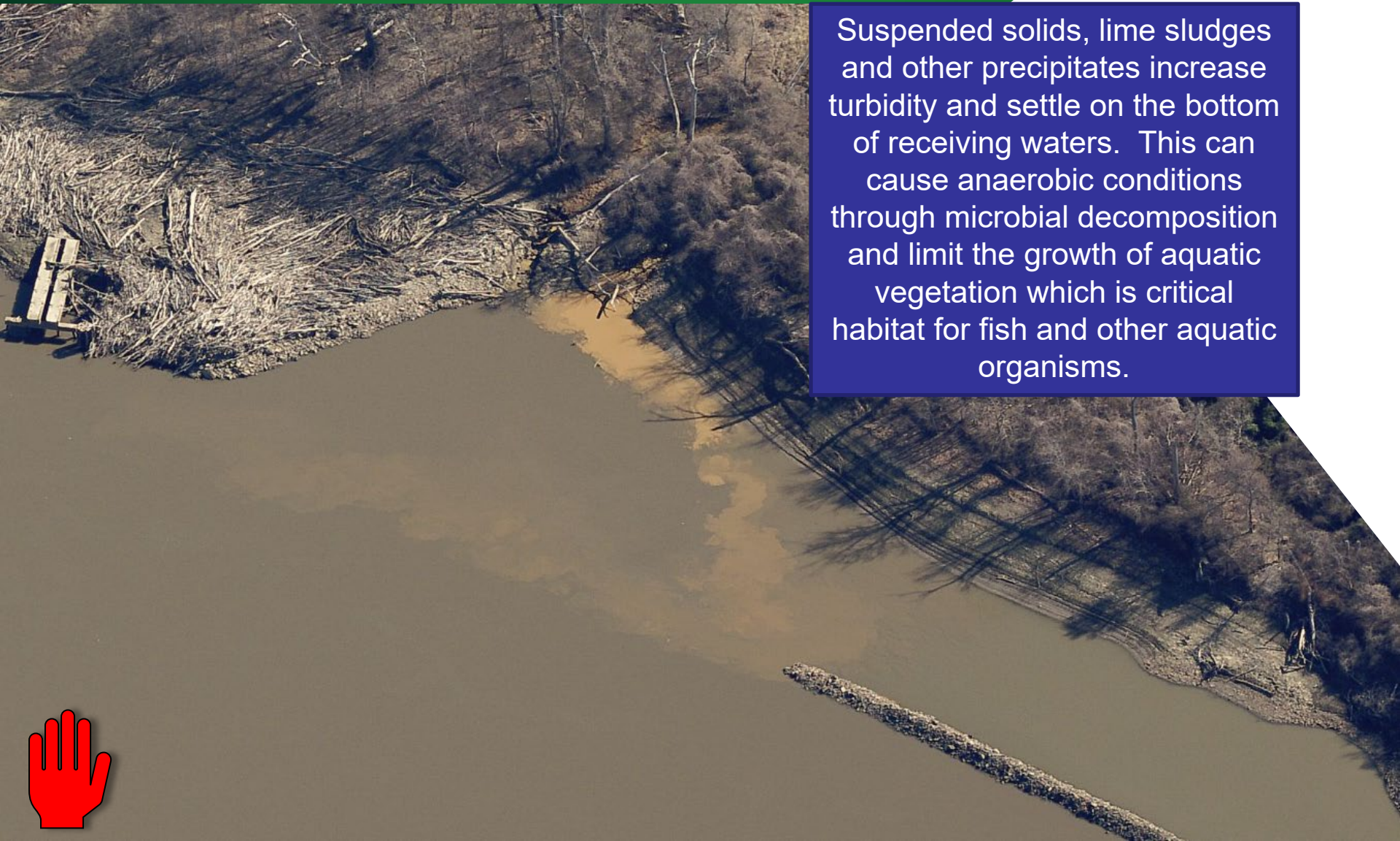
IMPORTANT NOTE
This slide is about DRINKING WATER operations that create WASTEWATER.

Common Pollutants from Drinking Water Treatment Facilities Based on # of Exceedances



Source:

EPA Enforcement and Compliance History Online Facility Search – Water: <https://echo.epa.gov/tools/web-services/facility-search-water>



Suspended solids, lime sludges and other precipitates increase turbidity and settle on the bottom of receiving waters. This can cause anaerobic conditions through microbial decomposition and limit the growth of aquatic vegetation which is critical habitat for fish and other aquatic organisms.



Clean Water Act - Discharge Prohibition



33 U.S.C 1311,

Clean Water Act Section 301 “Discharge Prohibition”

“Section 301 (a) Except as in compliance with this section and sections 302, 306, 307, 318, 402 and 404 of this Act, the discharge of any pollutant by any person shall be unlawful.”

Section 402 –

*National Pollutant Discharge Elimination System (NPDES),
Includes permits for the discharge of pollutants.*

Sources:

Summary of the Clean Water Act- <https://www.epa.gov/laws-regulations/summary-clean-water-act>

NPDES Permit Basics



- Issued by States that have obtained EPA Approval or EPA Regions
- May contain:
 - Technology Based Effluent Limits, also known as Categorical or Industrial Effluent Guidelines
 - Water Quality Based Effluent Limits
 - Other Operational and Management Requirements

Sources:

NPDES Permit Basics- <https://www.epa.gov/npdes/npdes-permit-basics>

Effluent Limits



Technology Based:

- Based on available treatment technology.
- Results of a multi year technical and financial review.
- Drinking Water Treatment Plant Residuals Management Technical Report, September 2011

IMPORTANT NOTE

There is no federal industrial effluent standard for the drinking water industry

Water-Quality Based:

- Based on the surface water receiving the discharge.
- Function of the quality of the receiving water, the applicable Water Quality Standards and the quantity of waste discharged.
- Total Residual Chlorine limits are one common example of an effluent limit based on a Water Quality Standard.

Sources:

NPDES Permit Limits <https://www.epa.gov/npdes/npdes-permit-limits>

National Recommended Water Quality Criteria - Aquatic Life Criteria Table



Pollutant	CAS Number	Freshwater CMC ¹ (acute) (µg/L)	Freshwater CCC ² (chronic) (µg/L)	Saltwater CMC ¹ (acute) (µg/L)	Saltwater CCC ² (chronic) (µg/L)	Publication Year	Notes
			⋮				
Chlorine	7782505	19	11	13	7.5	1986	
Iron	7439896	—	1000	—	—	1986	

Notes:

- 1 - CMC: Criterion Maximum Concentration
- 2 - CCC: Criterion Continuous Concentration

19 ug/L is 0.019 mg/L

Aluminum Criteria

2018 Criteria (vary as a function of a site's pH, total hardness, and DOC)

Freshwater Acute (1 hour, total recoverable aluminum)	Freshwater Chronic (4-day, total recoverable aluminum)
1 - 4,800 µg/L	0.63 - 3,200 µg/L

Sources:

National Recommended Water Quality Criteria - Aquatic Life Criteria Table - <https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table>

2018 Final Aquatic Life Criteria for Aluminum in Freshwater

<https://www.epa.gov/wqc/2018-final-aquatic-life-criteria-aluminum-freshwater>

Other NPDES Requirements



In addition to the numeric effluent limits, NPDES permits typically contain:

- narrative standards, sometime called “free from” conditions for objectionable surface water conditions such as excessive solids, unnatural colors, and nuisance odors.
- Standard Conditions with requirements like:
 - Proper Operation and Maintenance
 - Duty to mitigate adverse impacts to the environment
 - Timely reporting of wastewater treatment plant by-passes

Sources:

Drinking Water Treatment Residuals Management - <https://www.epa.gov/eg/drinking-water-treatment-residuals-management>

Potential Violation of Narrative Conditions



Sources:
Region 5 EPA

Source Controls



Reduce the Volume of Waste and Wastewater to be treated:

- Returning certain potential wastewater sources to the WTP headworks. Filter backwash and filter-to-waste are good examples of residuals suitable for reuse.
- Recovery and reuse of treatment chemicals such as lime, alum and other coagulants.
- Substituting certain treatment additives to reduce pollutants in the discharge. For example, aluminum is an active ingredient in aluminum based coagulants.
- Transition, as appropriate, to alternative chemicals such as ozone and permanganate. This is limited by the need to maintain residual chlorine concentrations.

Sources:

[Technology Transfer Handbook Management of Water Treatment Plant Residuals, April 1996, EPA/625/R-95/008](#)

Wastewater Treatment Systems



Possible Wastewater Treatment Systems:

- EQ Basins
- Lagoons
- Chemical Precipitation
- pH Adjustment/Neutralization
- Settling/Clarification
- Sand Filters
- De-chlorination
- Membranes
- Aeration

Sources:

[Technology Transfer Handbook Management of Water Treatment Plant Residuals, April 1996, EPA/625/R-95/008](#)

Applicability of Wastewater Treatment Systems for Treating Specific Pollutants

- Typical Treatment
- Possible Pollutant Reduction

Wastewater Treatment Method		EQ Basins	Lagoons	Chemical Precipitation	pH Adjustment / Neutralization	Settling / Clarification	Sand Filters	Dechlorination	Membranes	Aeration
Pollutant	Chlorine	○	○					●		○
	Total Suspended Solids (TSS)	○	●	●		●	●		○	
	pH				●					
	Iron	○	○	●	●	●/○	●/○		○	○
	Aluminum		○	●	●				○	
	Flow	●	●							
	BOD		●							●
	Chloride								●	
	Phosphorous		○	●					○	
	Manganese		○	●	●				○	
	Metals		○	●	●				○	
	Dissolved Oxygen		●							●

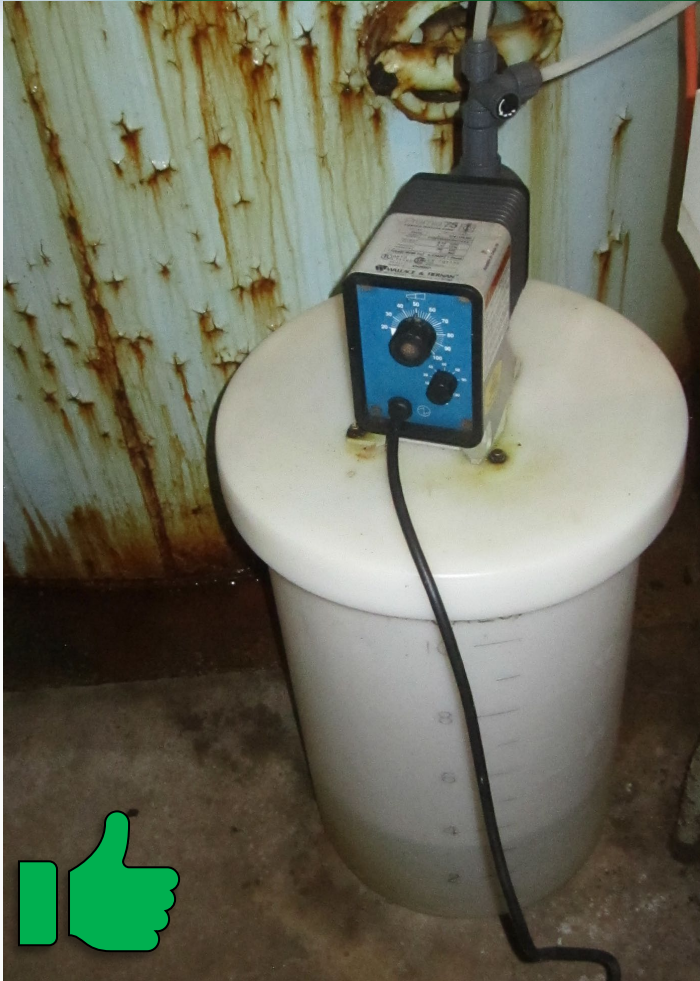
De-chlorination



Potential de-chlorination chemicals:

- sulfur dioxide,
- sodium sulfite,
- sodium bisulfite,
- sodium metabisulfite,
- sodium thiosulfate, and
- hydrogen peroxide.

The photos shows a simple chemical feed for a de-chlorination system.



Sand Filters



Slow Sand Filter at a small (population < 500) drinking water system.

Effluent from this filter was not meeting the NPDES limits.

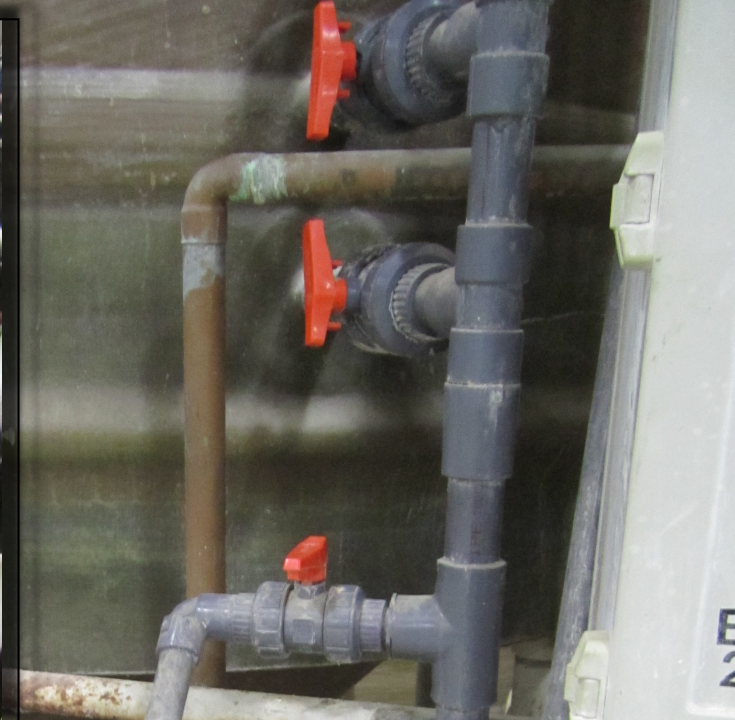
Lagoons and EQ Basins



- Can be used in combination with chemical additions for precipitation and dichlorination.
- Requires periodic maintenance to remove accumulated materials.
- Note that too much sediment in the lagoon can impair performance in both the settling functions and with reducing the retention time.

Circular Clarifier for Settling at an inorganic treatment process





Thickeners used at industrial facilities with inorganic wastewaters



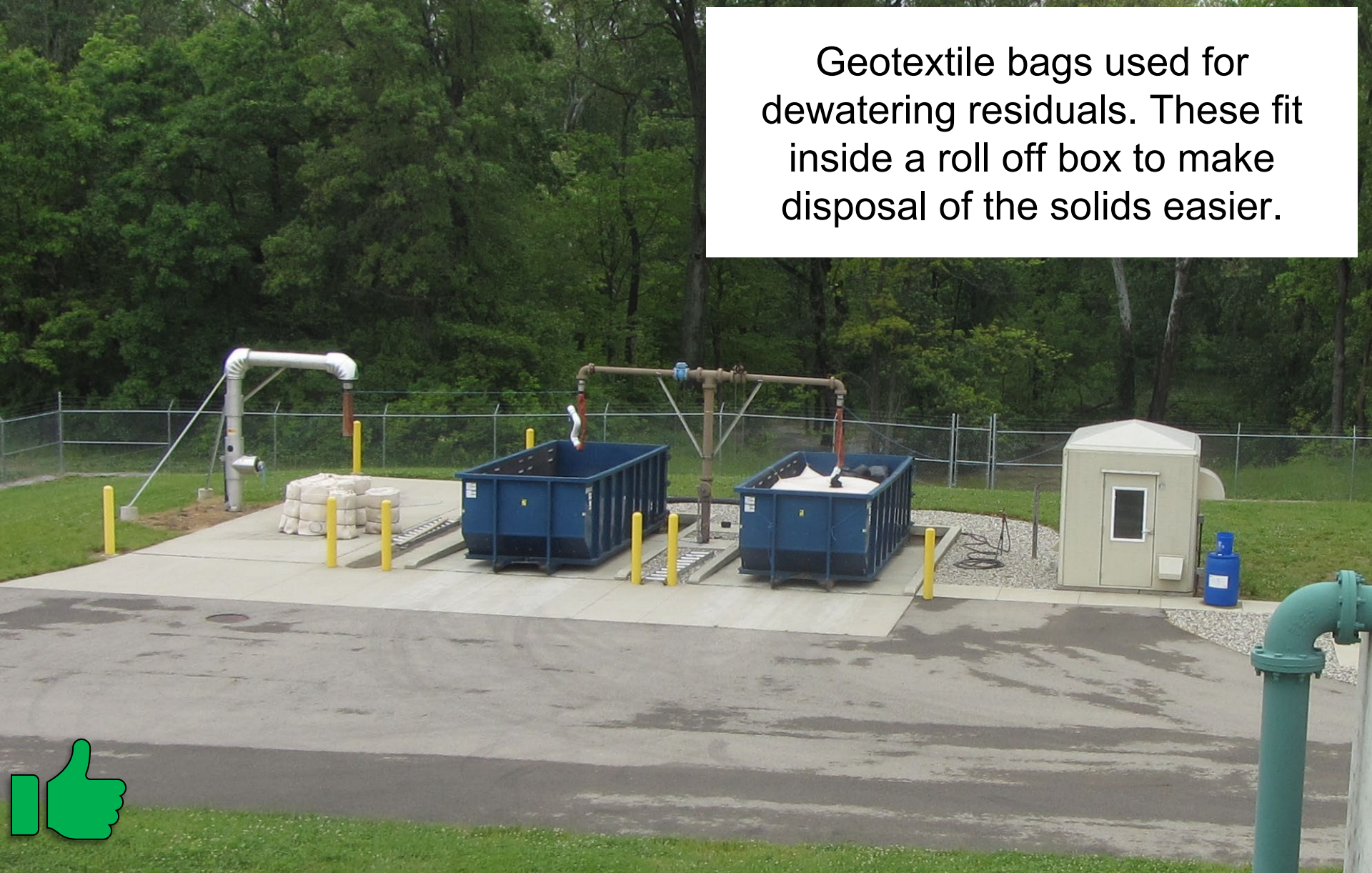


Wastewater EQ Basin. These basins are not designed to remove solids material

Plate Filter Press



Geotextile bags used for dewatering residuals. These fit inside a roll off box to make disposal of the solids easier.





Repurposed Filter at a Drinking Water Treatment Plant. This filter is now used in the wastewater treatment process.

Some Wastewater Treatment Units can themselves generate a wastewater waste stream. This includes membranes and some filters. This particular filter was being used as a slow sand filter, but regularly overflowed.

Other Waste Disposal Methods

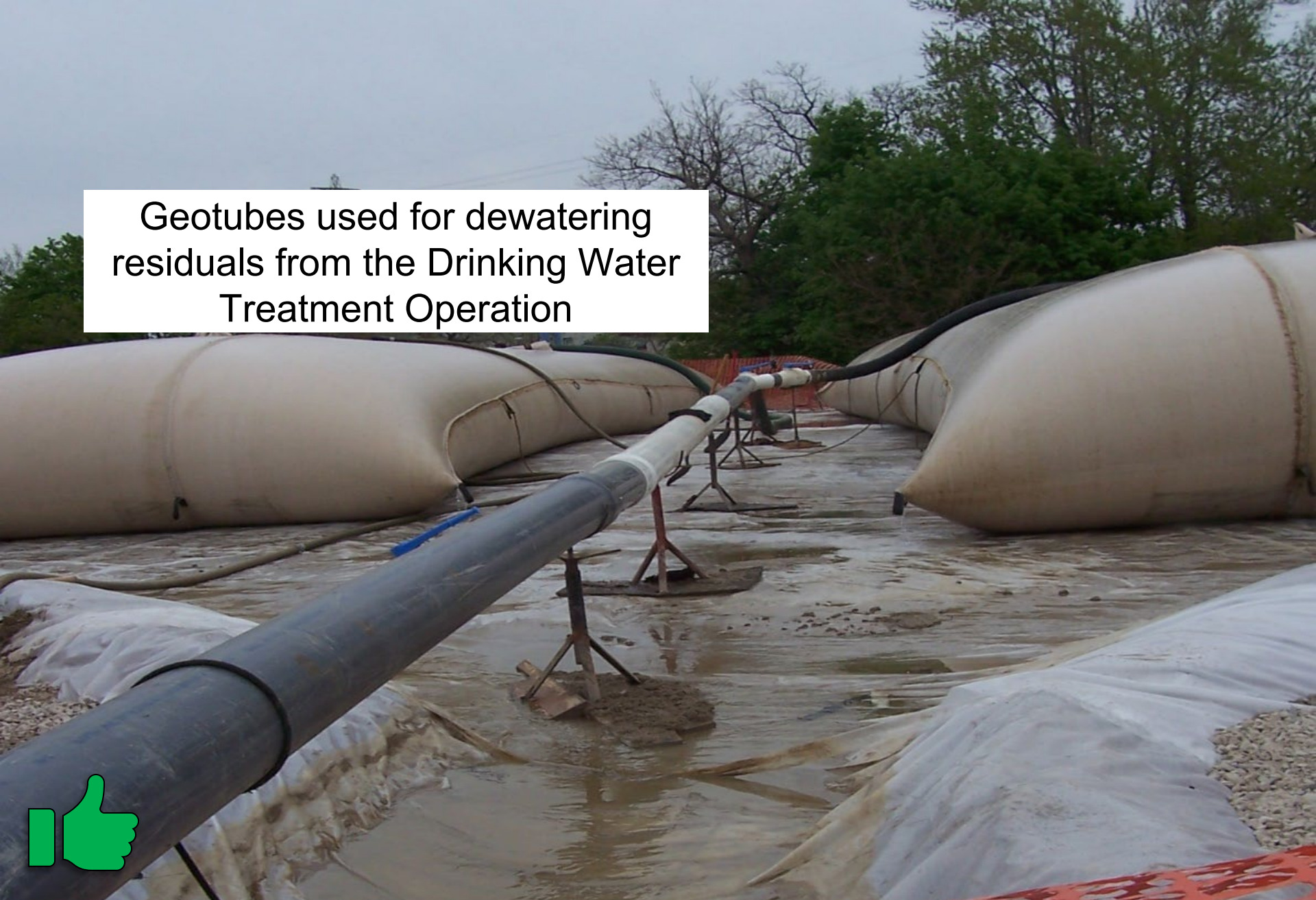


- Pretreatment or Indirect Discharges
 - Piped or Hauled to a Publicly Owned Treatment Works (POTW) or sewage treatment plant.
 - Requires approval by appropriate state and local authorities.
 - Permit limits are often less stringent than NPDES Effluent Limits.
- Underground Injection Wells
 - Wastewater with high concentrations of dissolved solids such as brine water from membrane and ion exchange systems.
 - See the *2006 EPA Drinking Water Treatment Residual Injection Wells Technical Recommendations*.
- Reuse

Sources:

Drinking Water Treatment Residuals Injection Wells -https://www.epa.gov/sites/production/files/2015-08/documents/dwtr_final_report_01-19-07.pdf

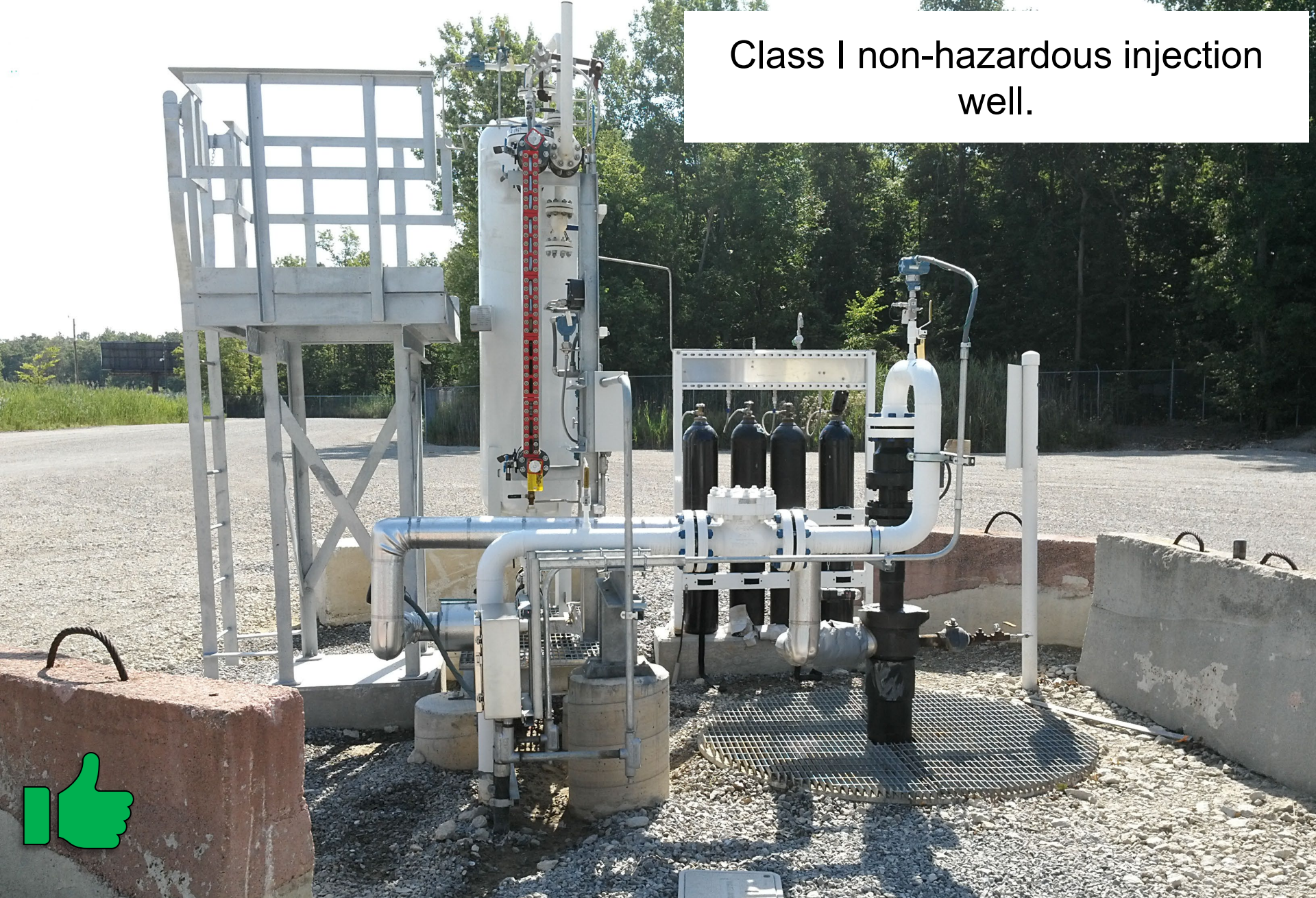
Geotubes used for dewatering residuals from the Drinking Water Treatment Operation



This is the same operation from the previous slide but ten year later. This does not mean they are the same bags.



Class I non-hazardous injection well.



Additional Resources



Compliance Assistance Resources	Possible Funding Sources
EPA Ground Water and Drinking Water Website https://www.epa.gov/ground-water-and-drinking-water	Clean Water State Revolving Fund – Focused on Clean Water Act objectives including treatment of wastewater from Drinking Water Treatment Residuals. https://www.epa.gov/cwsrf
EPA National Pollutant Discharge Elimination System Website https://www.epa.gov/npdes	Drinking Water State Revolving Fund https://www.epa.gov/drinkingwatersrf
Water Infrastructure and Resiliency Finance Center https://www.epa.gov/waterfinancecenter	EPA Water Infrastructure Financing and Innovation Act (WIFIA) https://www.epa.gov/wifia
Rural Community Assistance Partnership Website https://rcap.org/	USDA Water and Wastewater Loan and Grant Program (for system serving <10,000 persons) https://www.rd.usda.gov/programs-services/all-programs/water-environmental-programs
Local Government Environmental Assistance Network – Drinking Water/Wastewater https://www.lgean.net/water/water.php	

Contacts and References



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References:

National Recommended Water Quality Criteria - Aquatic Life Criteria Table

(<https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table>)

(<https://www.federalregister.gov/documents/2018/12/21/2018-27745/aquatic-life-ambient-water-quality-criteria-for-aluminum-in-freshwater>)

U.S. EPA, 1996, *Technology Transfer Handbook*, (EPA/625/R-95/008). Office of Water, Washington, DC (https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=115424)

U.S. EPA, 2000, *Wastewater Technology Fact Sheet Dechlorination*, (EPA 832-F-00-022). Office of Water, Washington, DC (<https://www3.epa.gov/npdes/pubs/dechlorination.pdf>)

U.S. EPA, 2006, *Drinking Water Treatment Residual Injection Wells Technical Recommendations*. (https://www.epa.gov/sites/production/files/2015-08/documents/dwtr_final_report_01-19-07.pdf)

U.S. EPA, 2011, *Drinking Water Treatment Plant Residuals Management Technical Report*, (EPA 820-R-11-003). Office of Water, Washington, DC (<https://www.epa.gov/sites/production/files/2015-11/documents/dw-treatment-residuals-mgmt-tech-report-sept-2011.pdf>)

Wisconsin Department of Natural Resources, 2016, *Basic Disinfection Study Guide*. Bureau of Science Services, Madison, WI. (<https://dnr.wi.gov/regulations/opcert/documents/StudyGuideDisinfection.pdf>)