Lessons Learned from Startup of 70 MGD Georgetown Wet Weather Treatment Station

PNW –AWWA May 3, 2024

Pedro de Arteaga, King County-Wastewater Treatment Division

Pedro.dearteaga@kingcounty.gov

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Presentation Topics

- Introduction

- What are Combined Sewer Overflows (CSOs)?

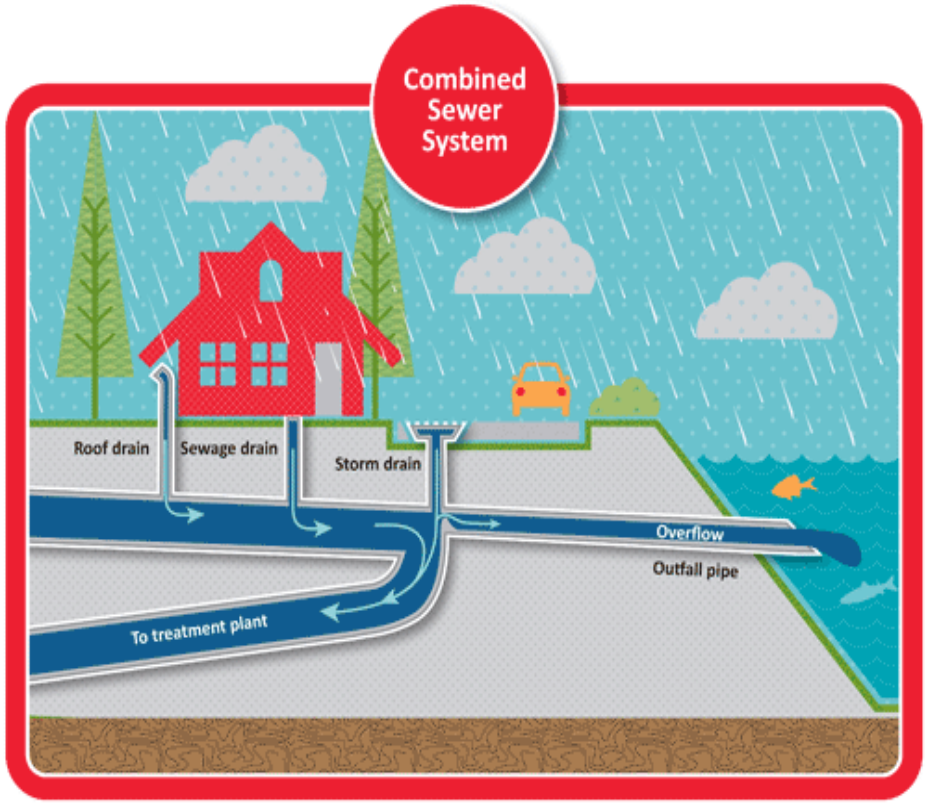
- Overview of County's CSO System

- Georgetown Wet Weather Treatment Station (GWWTS)

- Lessons on Design, Project Delivery, Startup and Commissioning
- Q & A

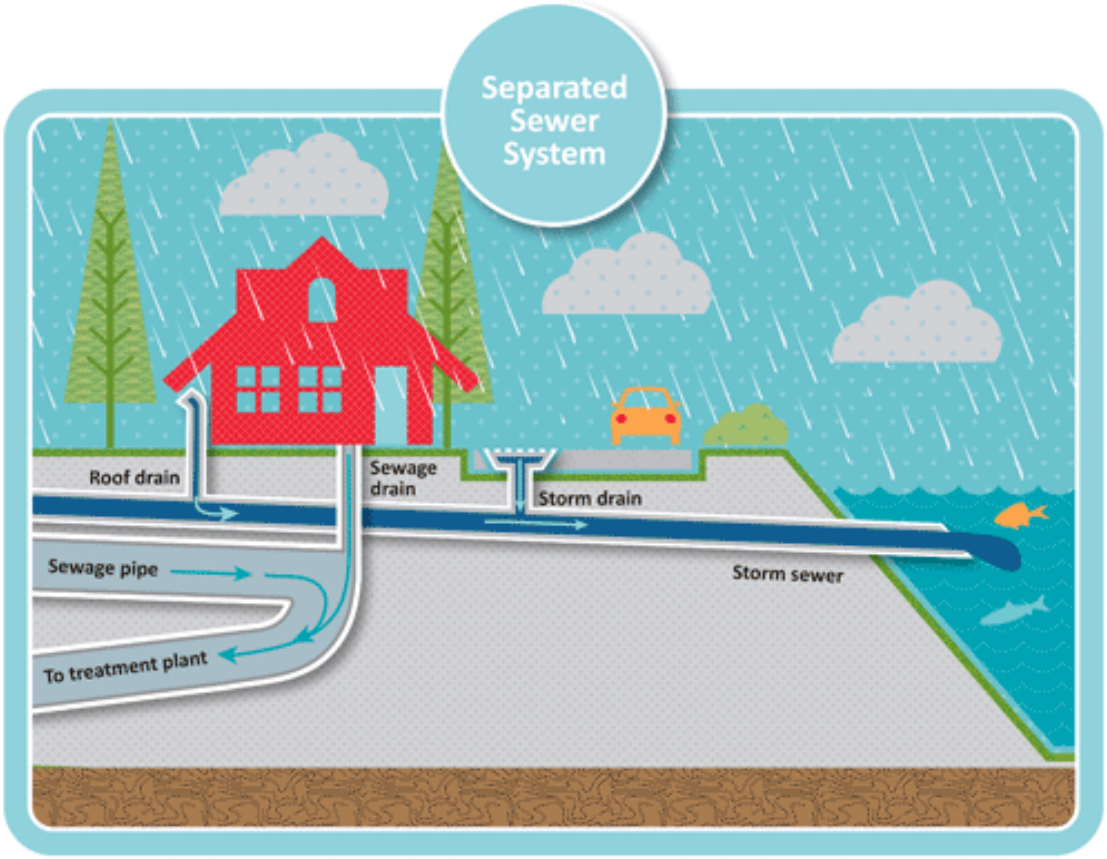
What are Combined Sewer Overflows?

- CSOs are relief points in older sewer systems that carry sewage and stormwater in the same pipe.
- When heavy rains fill the pipes, CSOs protect homes and businesses by overflowing excess sewage and stormwater into local water bodies.



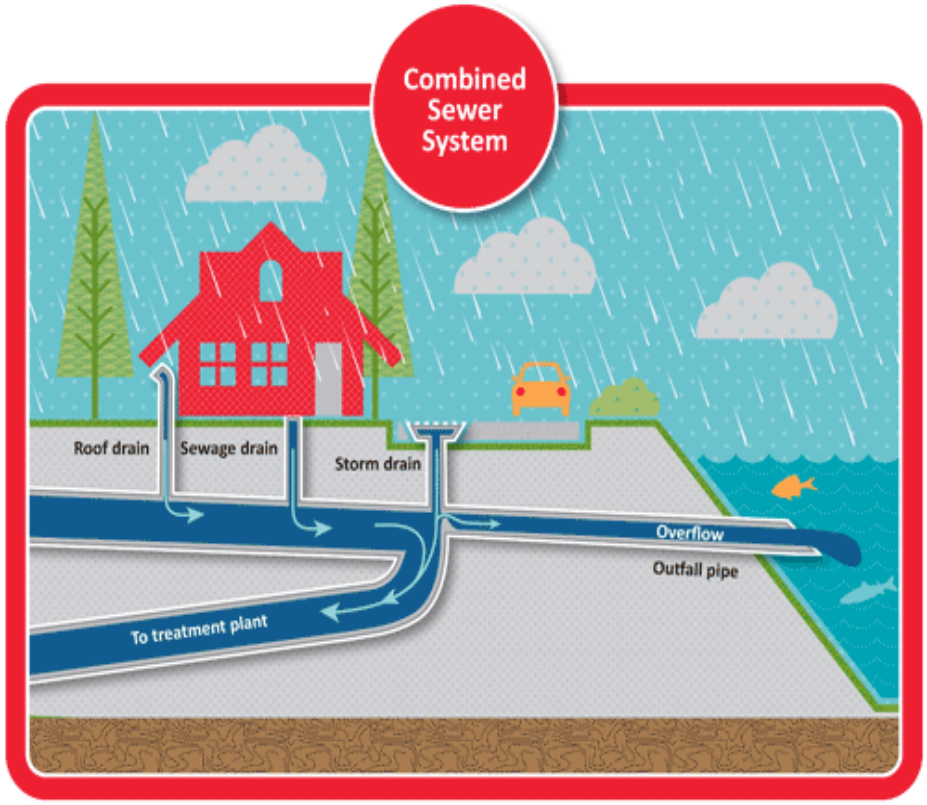
Separated sewer system

Separated sewer systems have separate pipes for sewage and stormwater.



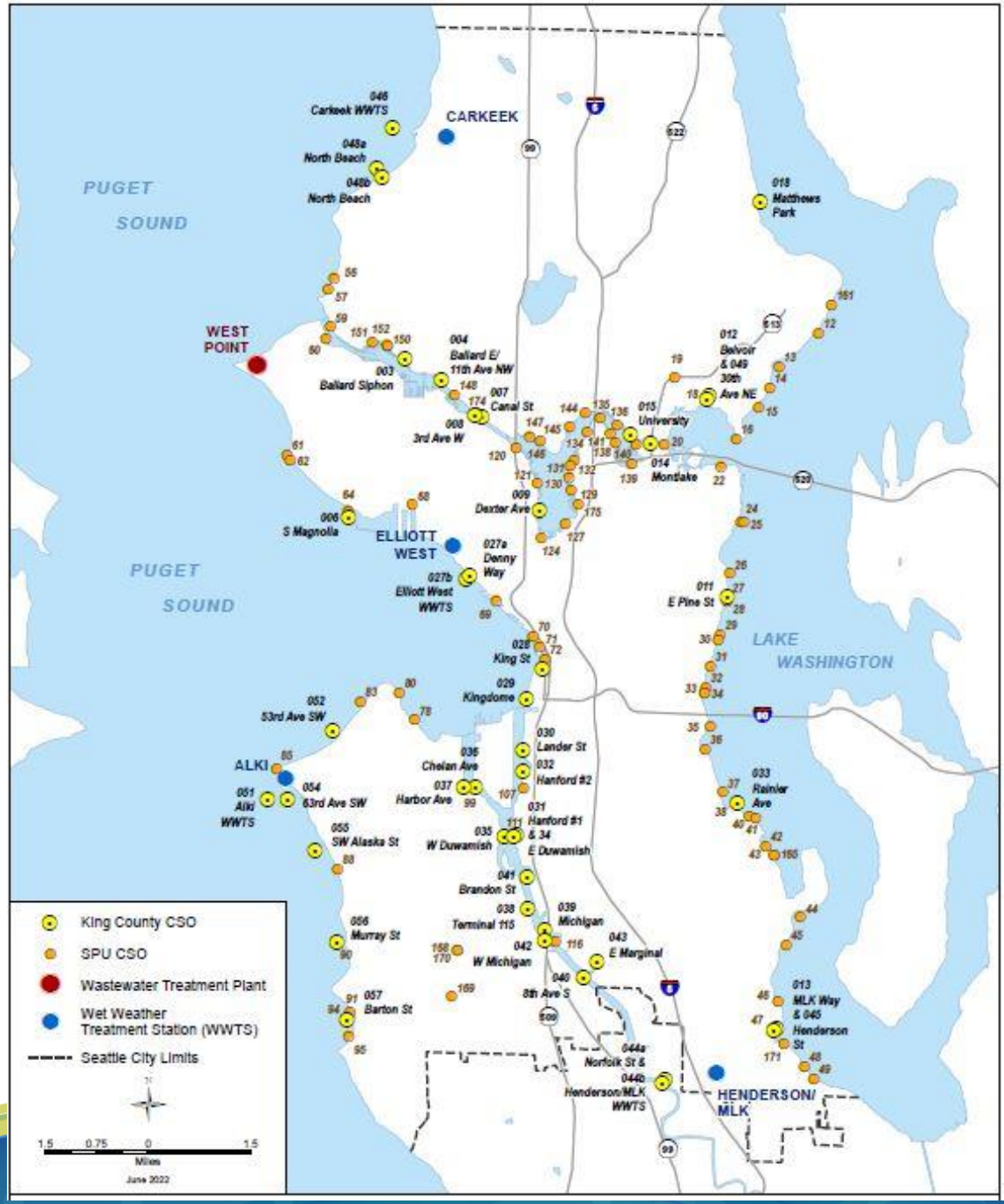
Why is CSO Control important?

- CSOs are a recognized source of water pollution and public health concerns.
- CSOs are regulated under the Federal Clean Water Act
- Washington State requires the “greatest reasonable reduction of combined sewer overflows at the earliest possible date.” (RCW90.48.480)
- Outfalls must be controlled so that no more than one untreated discharge occurs per year on average. (WAC 173-245-20)



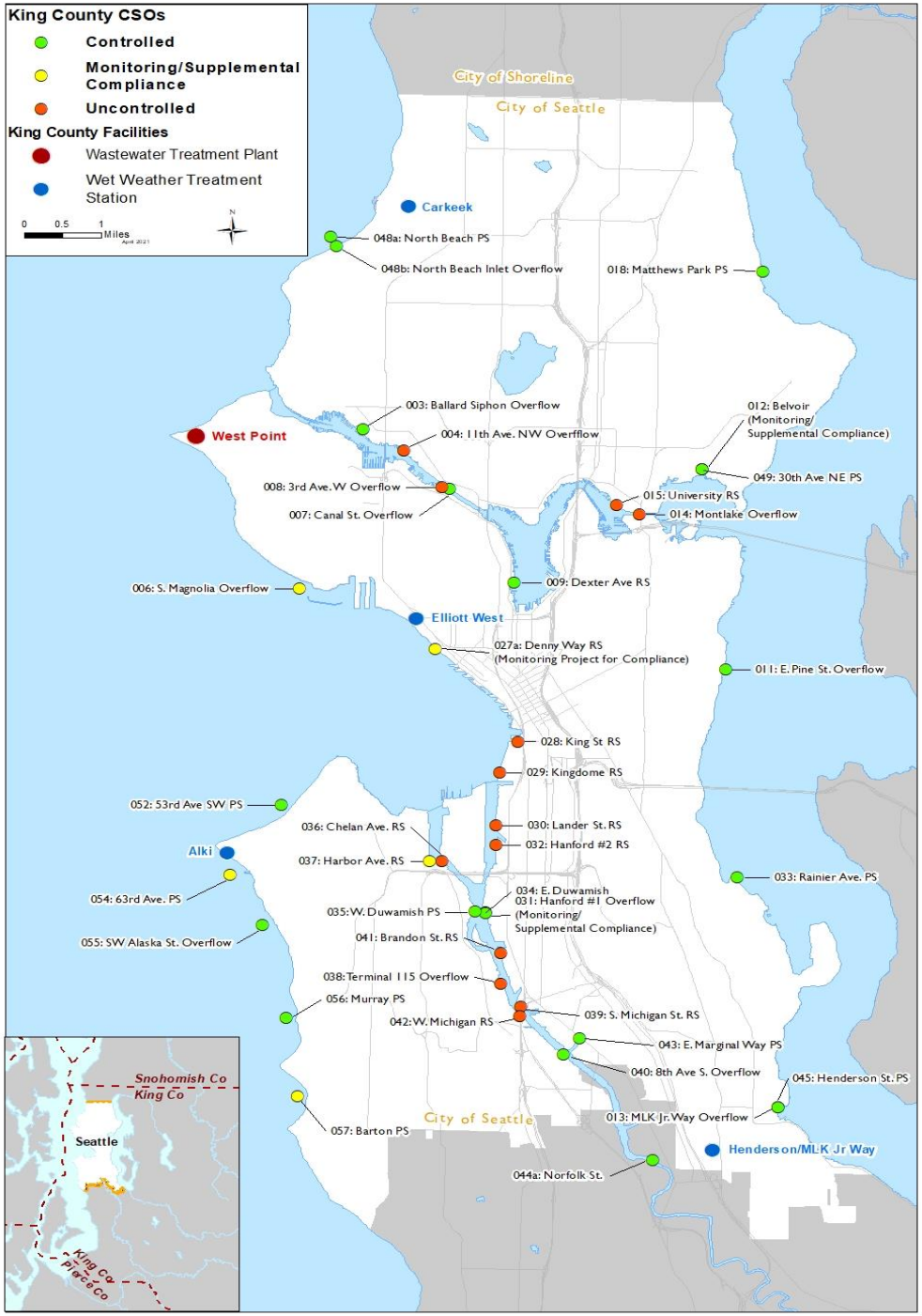
King County and Seattle each manage their own CSO systems

- King County has 39 CSO outfalls, Seattle has 82 CSO outfalls.
- King County and Seattle are obligated to control their CSOs to meet the state standard of one untreated discharge per year on average.



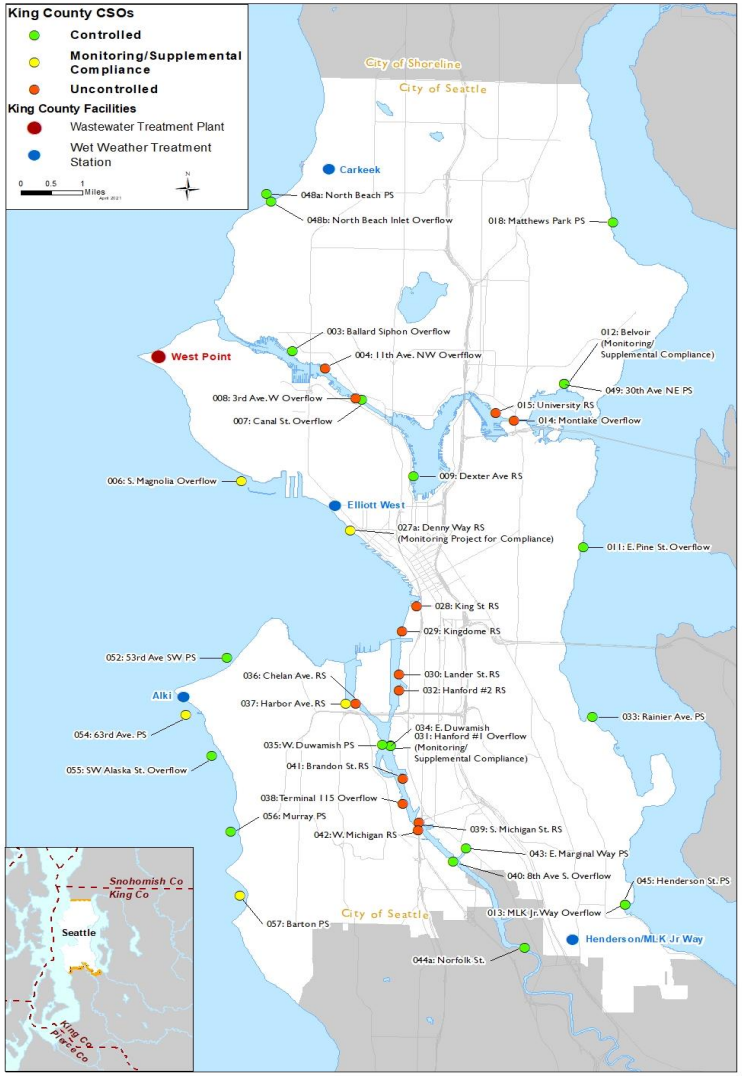
King County CSO Outfalls

- 39 CSO outfalls
  - 19 controlled
  - 7 monitoring /supplemental compliance
  - 13 uncontrolled



King County CSO Consent Decree (CD)

- In 2013, the County signed a legal agreement with the state and federal governments to control all CSO outfalls by 2030.
- The County is in negotiations to modify the agreement.
- GWWTS project implementation, completion and operating dates are all requirements in the CD



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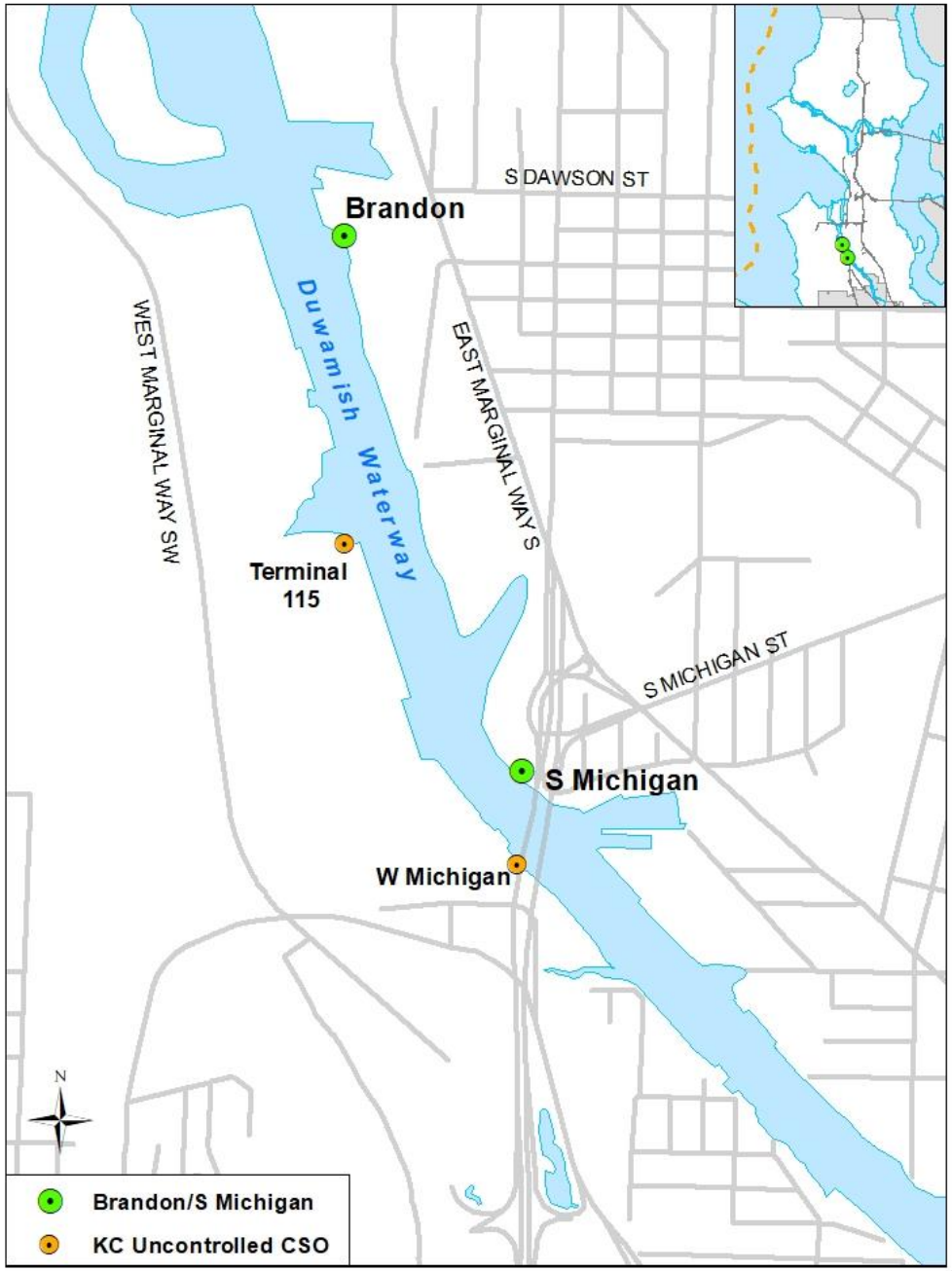

Georgetown Wet Weather Treatment Station (Brandon, S. Michigan)

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Georgetown Wet Weather Treatment Station (Brandon, S. Michigan)

Facility can treat up to 70 million gallons of combined rain and wastewater per day

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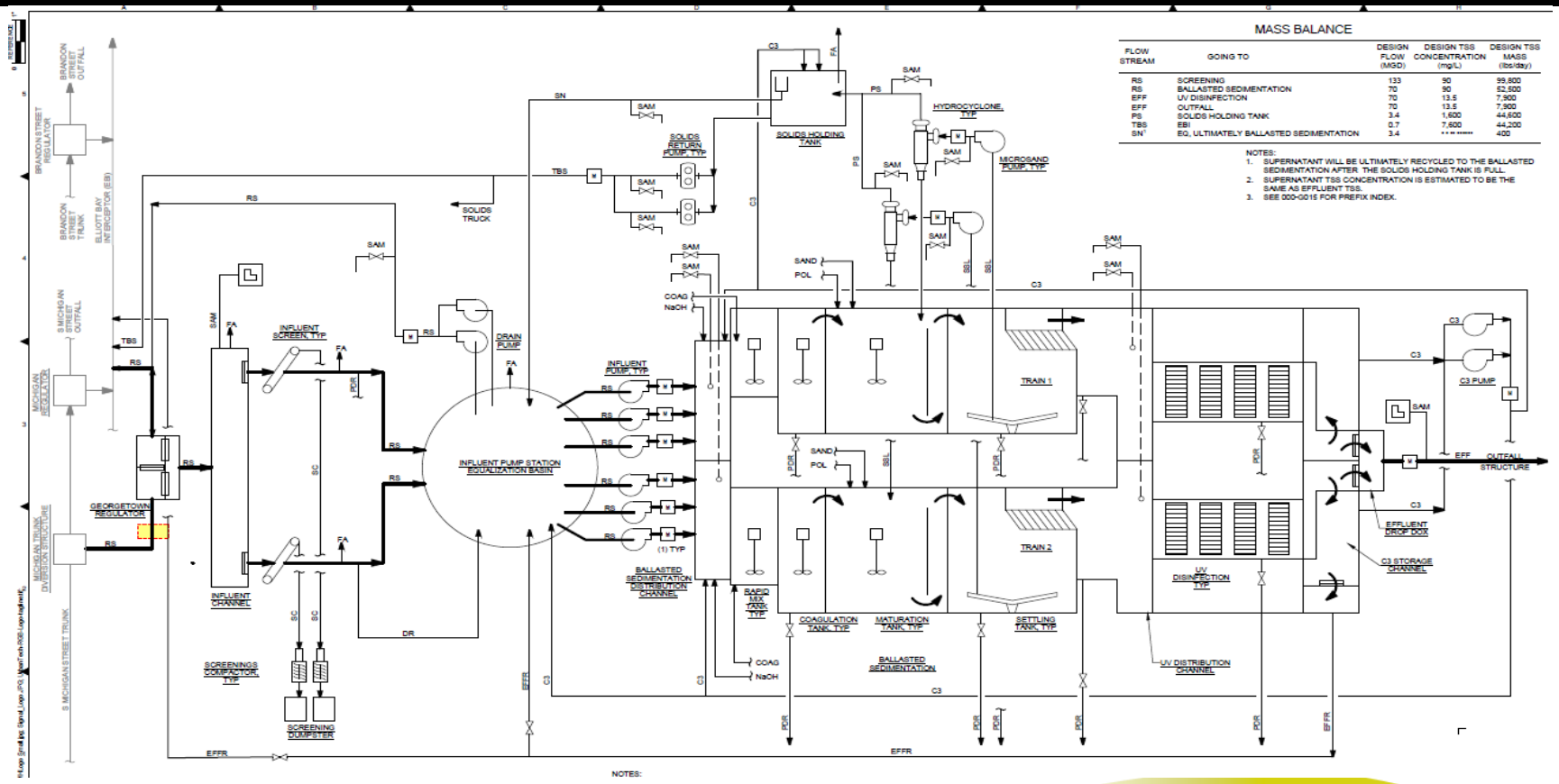
Georgetown Wet Weather Treatment Station Process Flow Diagram



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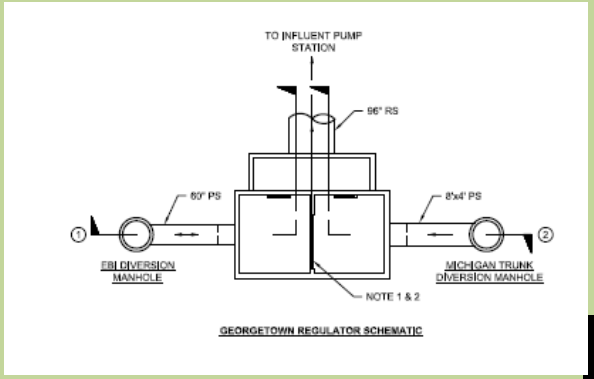
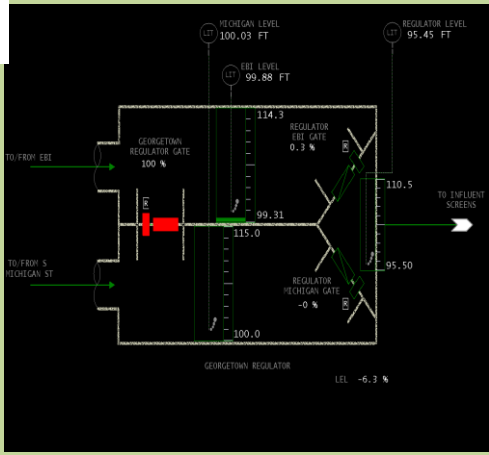
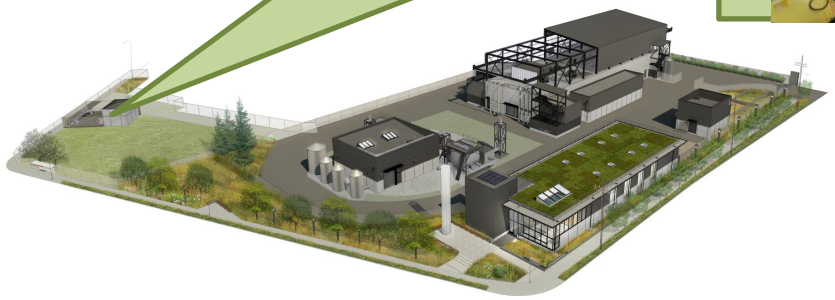
Georgetown Wet Weather Treatment Station

Regulator

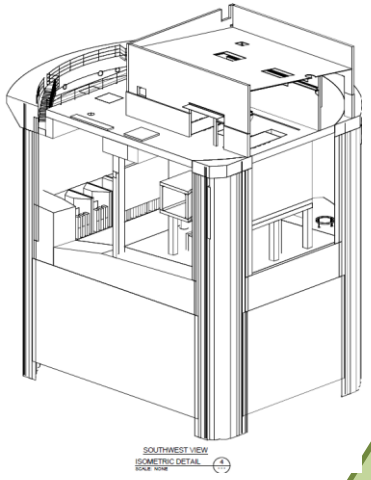


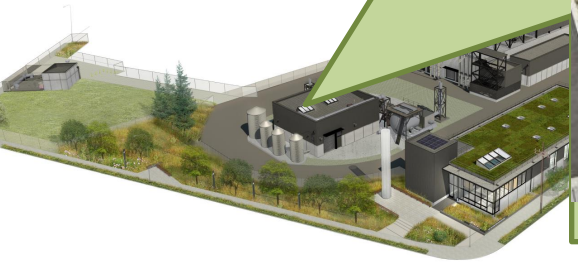


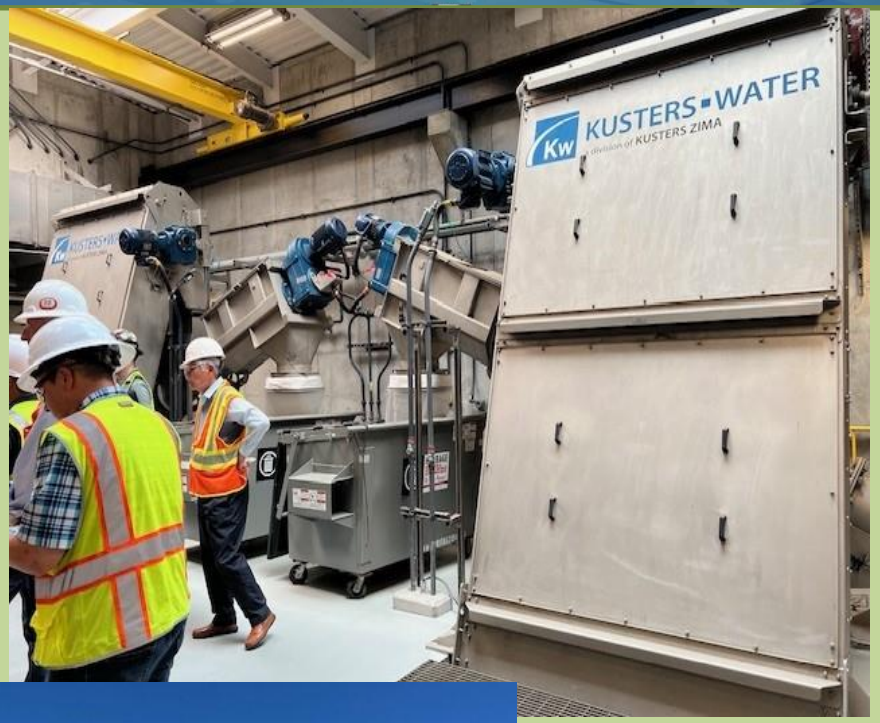


GWWTS

Odor Control, Influent Sampling and *Screens*

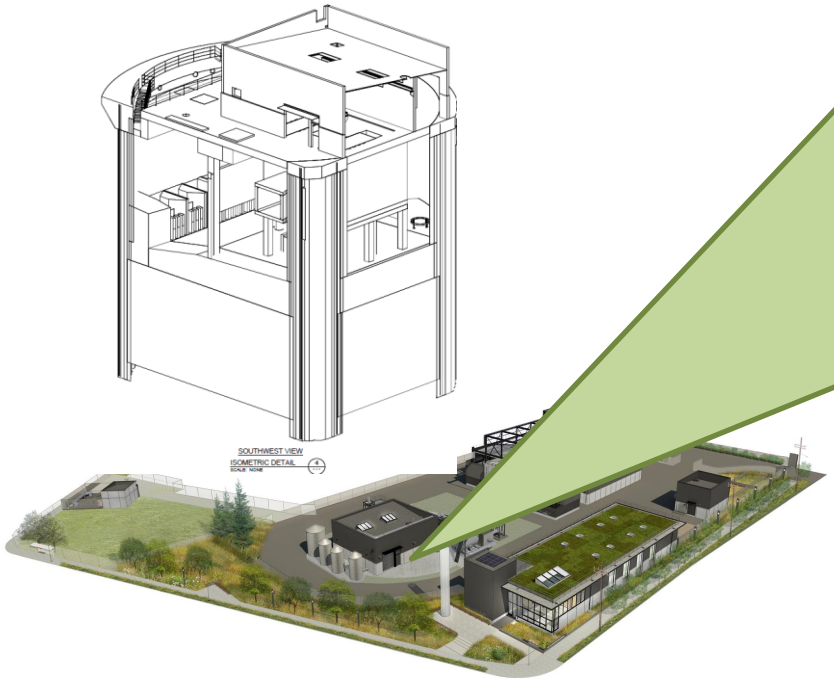






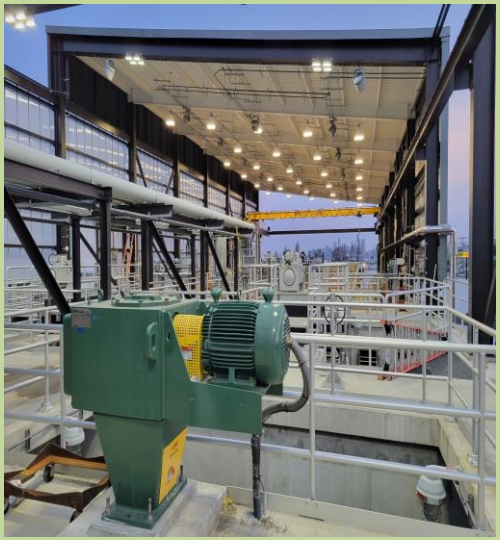
Georgetown Wet Weather Treatment Station

EQ Basin and Influent Pump Station (IPS)



Ballasted Sedimentation

- chemical storage and feed
- sand addition
- floc formation maturation and settlin

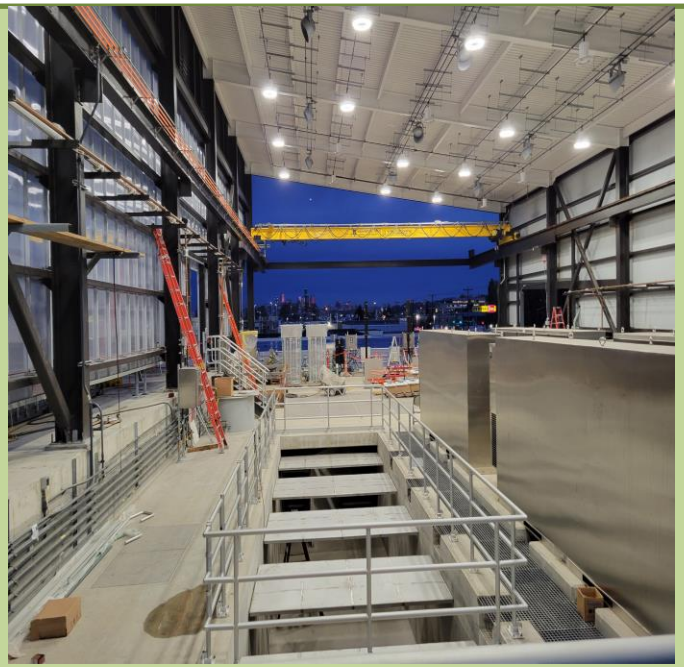


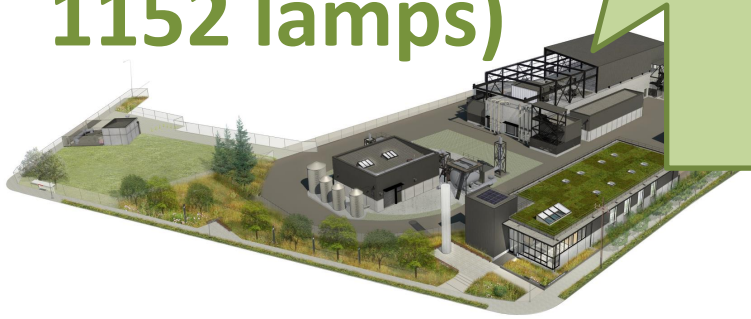
Other
- Defoamer
- solids handling and storage (return to conveyance post event)

GWWTS

Ultraviolet Disinfection

- Dedicated UV channel with the BS train
- 4 banks per channel (total 1152 lamps)

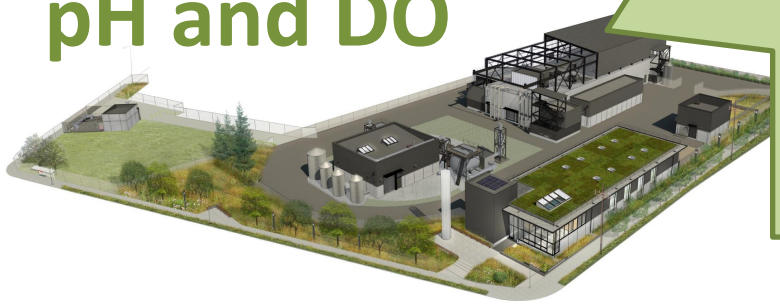




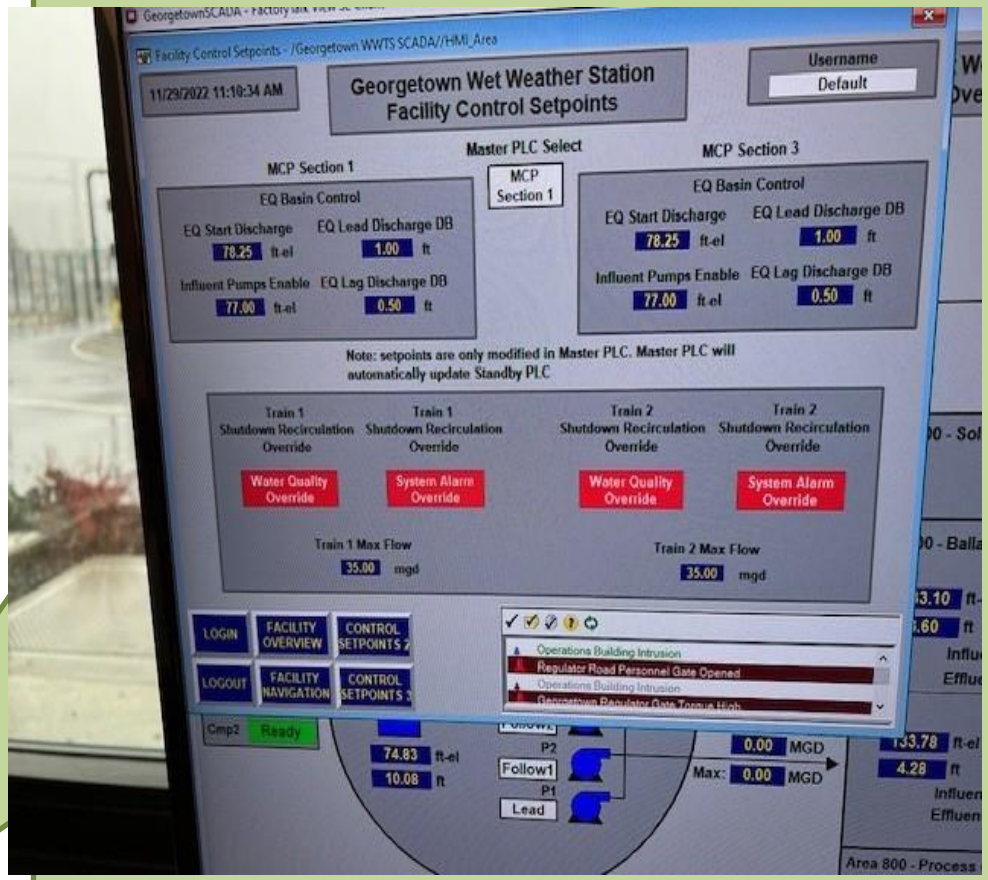
GWWTS

Final Effluent

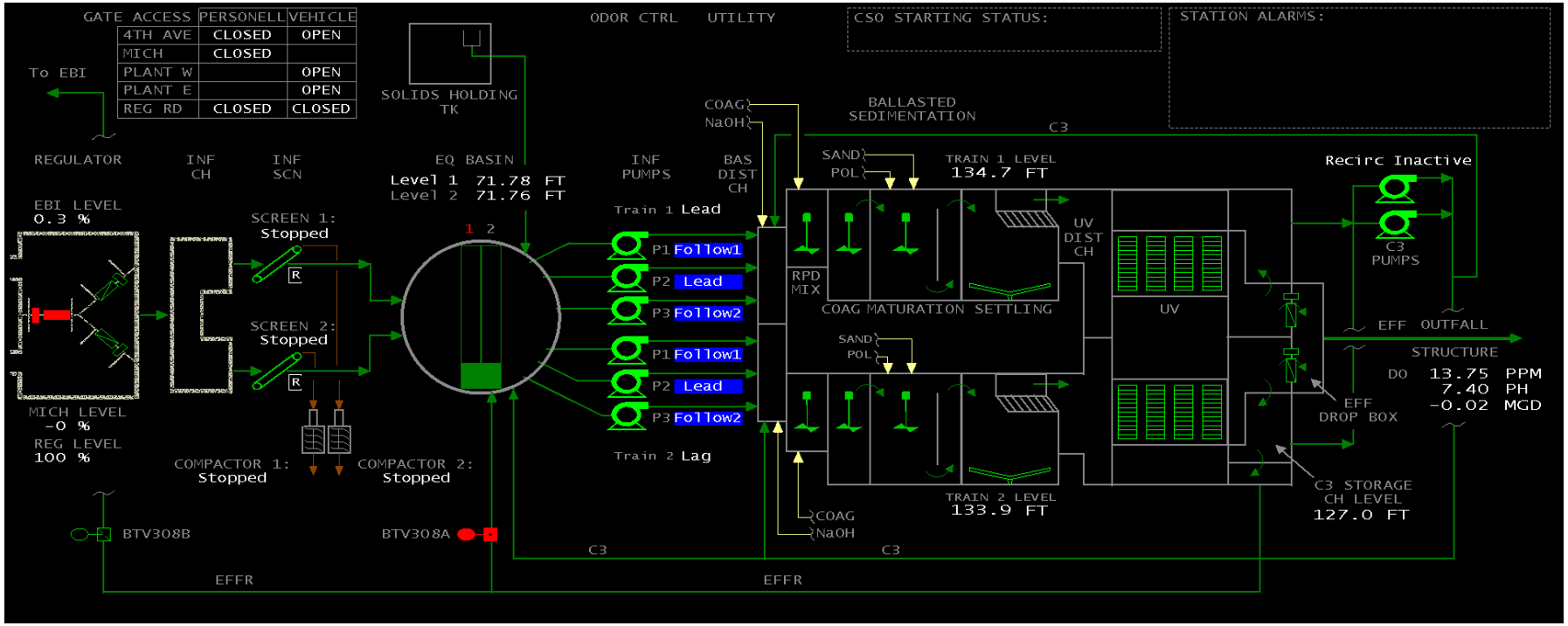
- Treated flows to C3 storage
- FE gates to effluent pipe
- Effluent sampling and inline instrumentation pH and DO



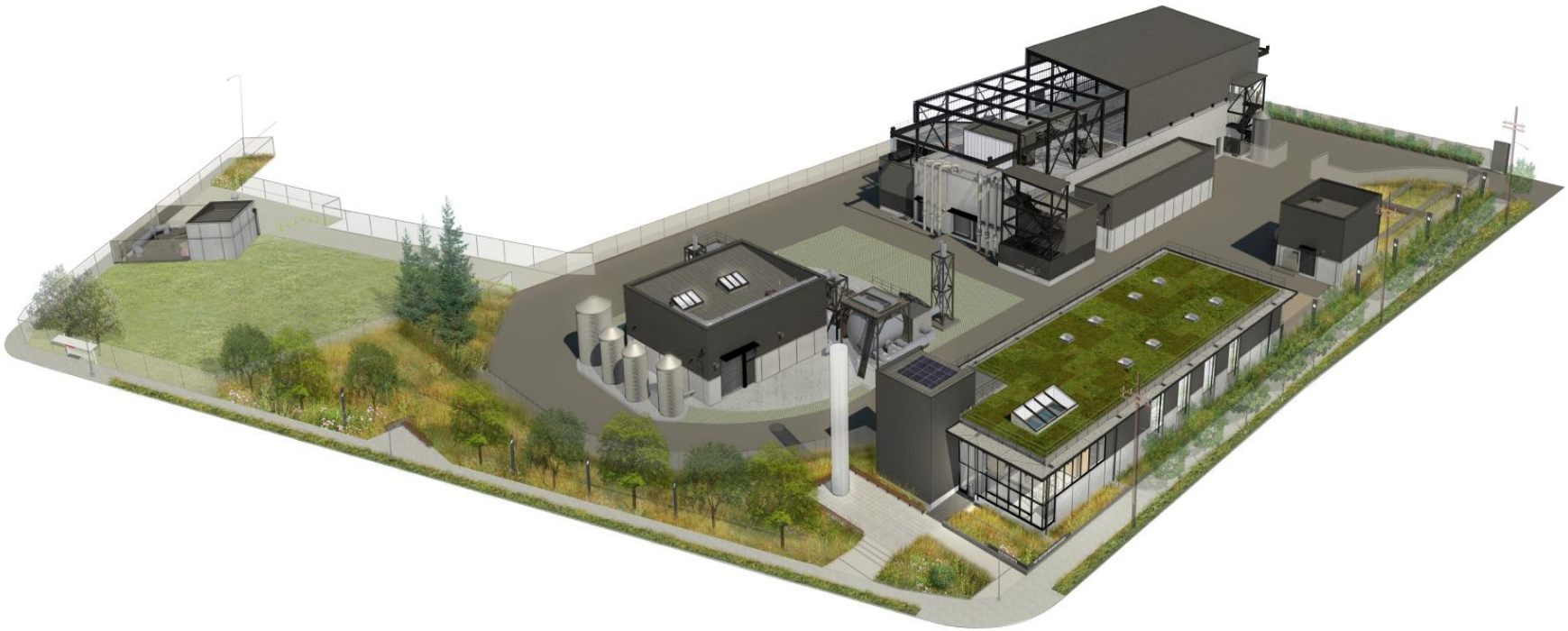
Process And Compliance Monitoring
- Controls and Instrumentation
- SCADA



GWWTS Within System Wide SCADA



Questions on the treatment station before moving on?



GWWTS Lessons Learned

- **Project Delivery and Deadlines**
  - Regulatory – e.g. Consent Decree
  - Other project schedule requirements- Local/regional councils and funding agencies, etc.
  - Timelines for commissioning and startup
  - Potential Delays
    - Force Majeure; e.g. COVID Pandemic, critical supply chain, other…

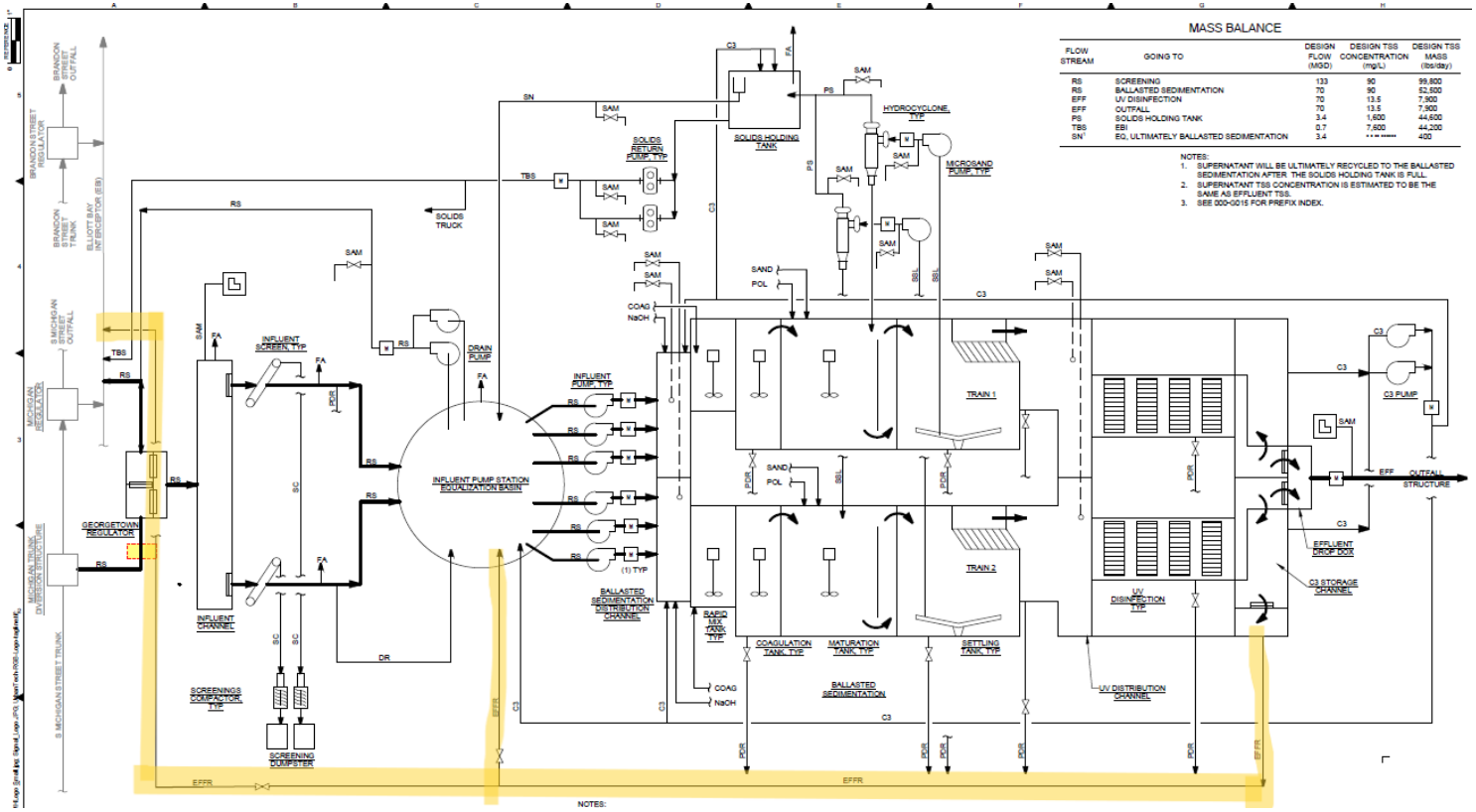
GWWTS

- **Lessons Learned**
  - Recirculation for testing and operator training
  - Grit
  - Compliance and Process Sampling
  - Equipment and instrumentation
  - Control Room, SCADA and Operator Interfaces
    - Tie in with vendor packages, e.g. BS, UV and Screenings
  - Data acquisition - performance operational and compliance data
  - Chemical Systems; application location, chemical storage, chemical metering pumps and lines

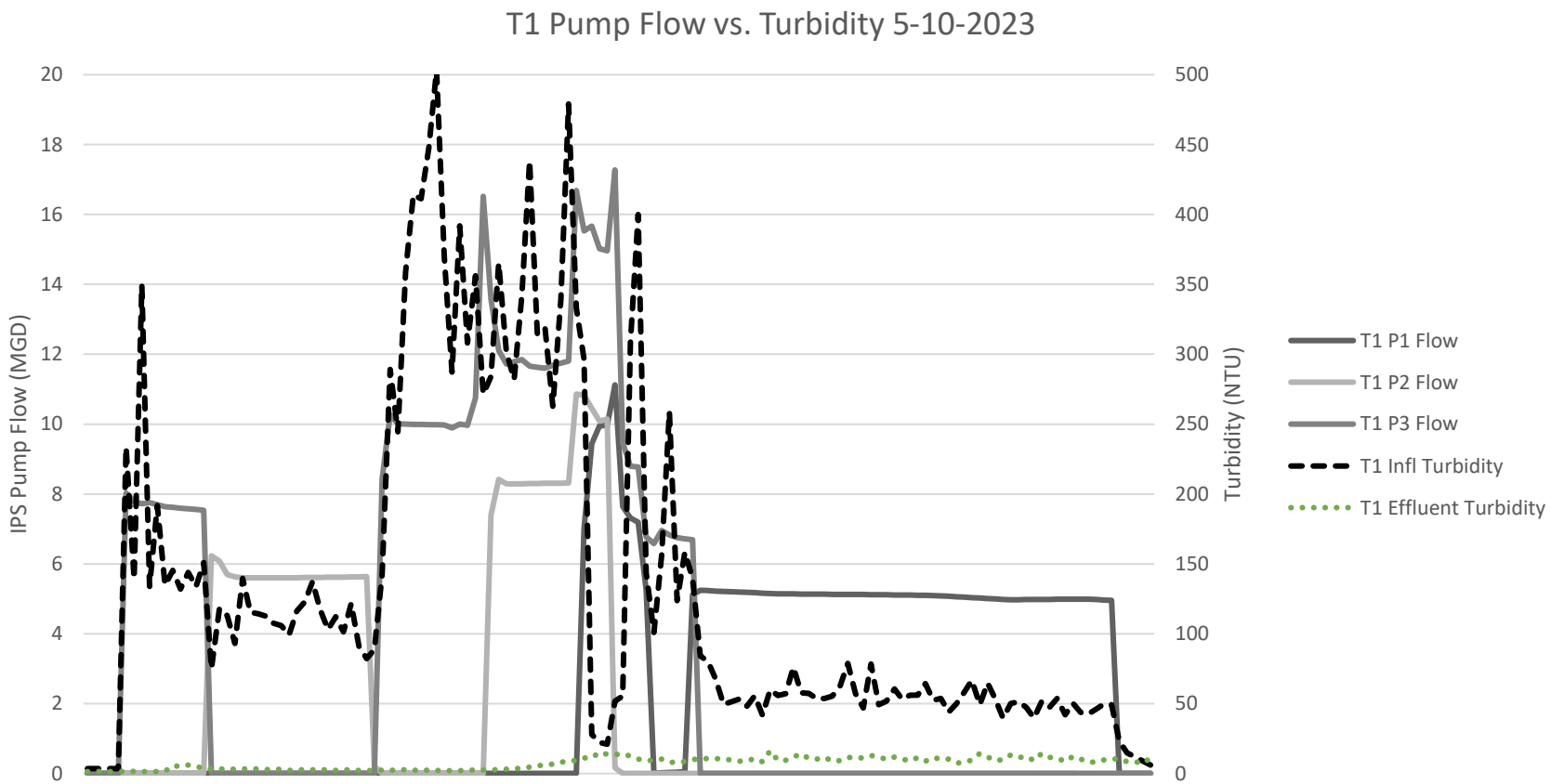
GWWTS Lessons Learned

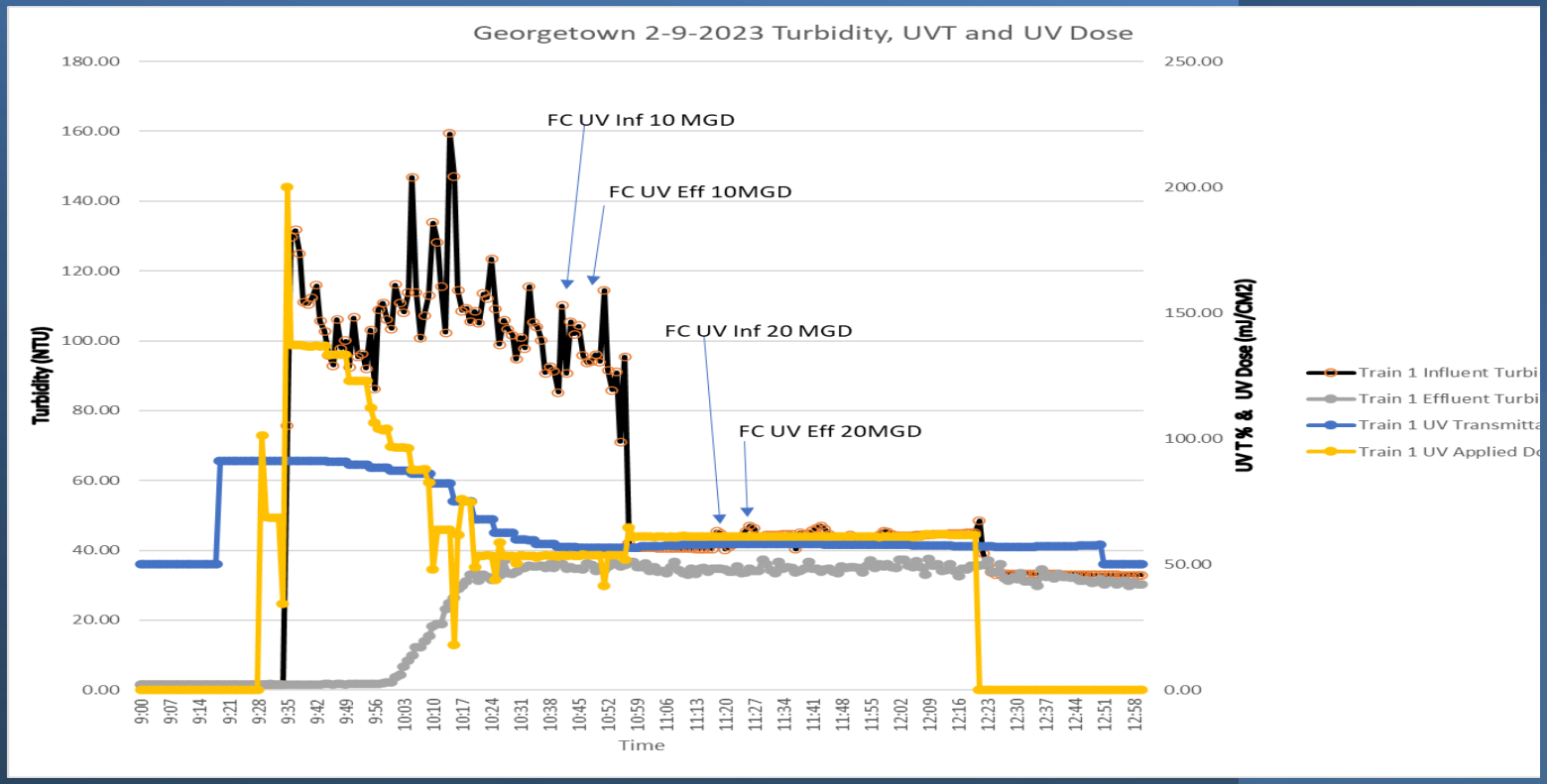
- **Design**
  - Recirculation back to the EQ basin or into the conveyance
    - Use during the start of treatment for the first 15 minutes as the process generates quality treated flows (into EQ).
    - Operator training, equipment testing, performance and optimization test runs

Recirculation Line



Test Run Pump Flow vs Influent Turbidity





FC FC MPN/100 mls			
BS Effluent		UV Effluent	
10 MGD	20 MGD	10 MGD	20 MGD
2,300,000	1,700,000	490	790
		~3.5 log rem	<3 log rem
TSS/VSS	TSS (mg/L)	VSS (mg/L)	% TSS Rem
BS FE 20mgd 1120	71	57	5%
BS FE 10mgd 1014	47	35	73%
BS Inf 20mgd 1121 40.79	75	56	
BS Inf 10mgd 1048 92.83	174	143	
Note: : grab sample			
	Lab Turbi NTU	% Turb Rem	Online Turb NTU
BS FE 20mgd 1120	30.5	4%	
BS FE 10mgd 1014	19.35	76%	
BS Inf 20mgd 1121 40.79	31.65		40.8
BS Inf 10mgd 1048 92.83	82		92.8

Grit impacts

- Large amount of grit was not anticipated.
- Impacted influent sampling pumps.
- Required several cleanouts by vactoring of the influent channel after inflow events.
- Modified influent channel at sampling pump intake.
- Unknown impact to EQ basin- ongoing investigation

GWWTS Lessons Learned

- **Design**
  - Compliance sampling
    - Influent sampling required modifications- large amounts grit caused the sample pumps to clog and trip out.
    - Effluent sampling directly tapped into the effluent pipe; no sample pump required.
    - Installed dual channel flow- paced auto-composite samplers to accommodate wide range of flows.
  - Process sampling points
    - Process basins, near inline instrumentation (spot checks for troubleshooting, verifications or calibrations).

S-5200 Dual Measuring Chambers

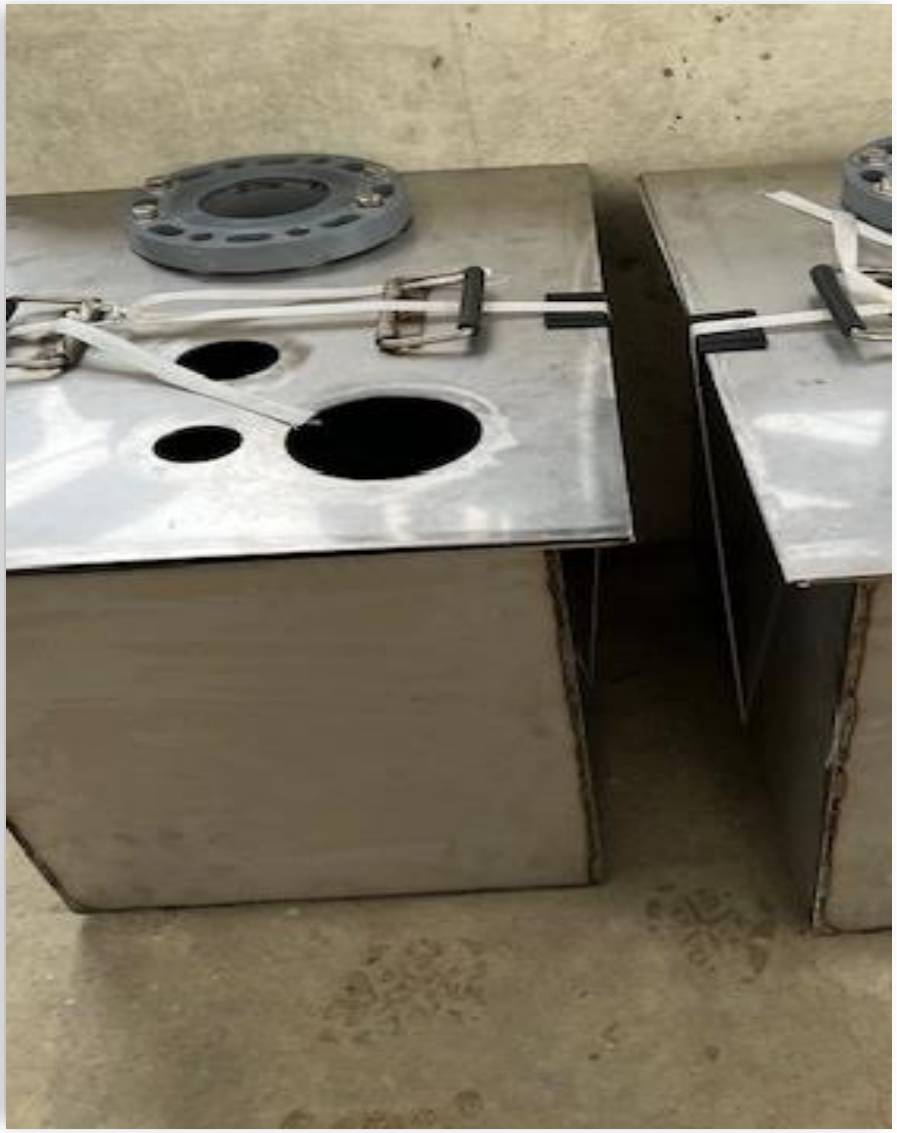
Compliance and Process Sampling

Instrumentation

- **Location- representative of the flow**
  - Compliance point vs. control point
  - Control point: BS influent pH measurements impacted by the chemical feed (coagulant ACH and caustic). Influent turbidity measurements (BS influent flow box)
  - Model of the instrument for the application
    - UV percent transmittance (UVT) probes – model for drinking water vs. wastewater treatment
- **Digital vs. analog**
  - pH probes comes in both types

Instrumentation

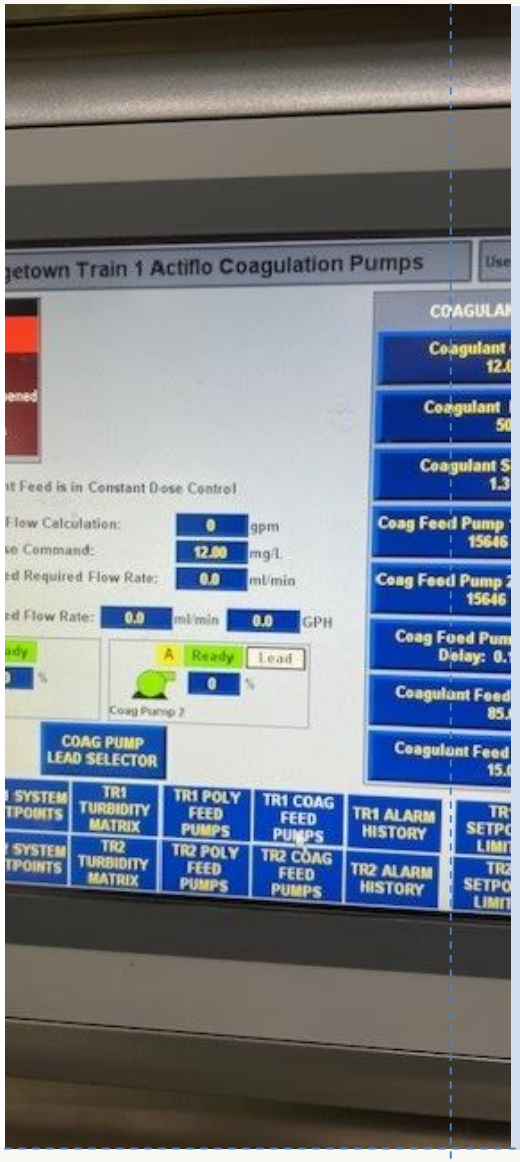
Ballasted Sedimentation Influent Flow Boxes



GWWTS Lessons Learned

Control Room, SCADA and data access and acquisition

- King County decided to use Operator Interface Terminals through out the treatment station for control vs centralized control
- Control Room with Station SCADA as read only no control
- Software to acquire data into databases or spreadsheets



Project Elements

- **Confirm and verify during component and systems testing**
  - Installed instrumentation and equipment
  - Data acquisition/gathering (develop data tags)
  - Freeze protection -heat tracing

Heat Trace?

Chemical Systems

- **Chemical feed**
  - Ability to recirculate chemical back to storage or to waste for pump exercise PMs and flushing chemical lines
  - Location of chemical addition and mixing
    - Coag and caustic
    - Defoamer location- added sprayer and moved application upstream to BS effluent weir

- **Chemical Storage**
  - Design in the ability to rotate inventory
    - change out depleted chemicals

O & M Considerations for Intermittently Operated Facility (Station Readiness All Times!)

- **Equipment PM schedules**
  - May need to evaluate PM schedules; O&E manual PM schedule based on run time vs. a seasonal schedule
- **Instrumentation calibration and PM schedules**
- **Odor and nuisance insects during dry-weather season**
  - Keeping process basins with water may lead to odors
- **Chemical storage and chemical feed pumps and lines**

Conclusion

- **Design team should include O & M inputs and review.**
- **Facility should include ability to recirculate flows back to storage or conveyance for testing and training runs.**
- **Design chemical systems with ability to exercise pumps and rotate out/waste expired chemicals. And flush feed lines to waste not into the process basins.**
- **Project schedule includes enough time for effective commissioning and startup activities.**
  - Prior to commissioning and any performance testing **data online gathering/acquisition must be in place**
  - **Include O & M staff for commissioning and startup**
  - For wet weather treatment stations, ideal to include wet-weather season to the commissioning period

Questions and Comments?

Acknowledgements

- Jeff Lundt, King County Engineer (retired)
- Bob Bucher, King County Engineer Technology Assessment -
- Liz Rendel and Trenton Holmberg and other operators and maintenance staff at King County –WTD Offsite crew
- John Carter, King County Process Engineer
- Jacobs design team Tina Hastings and Ryan Dunne

Pedro de Arteaga
pedro.dearteaga@kingcounty.gov