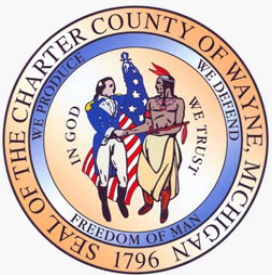


Updating a CSO Facility with New Technology and No Interruption in Service

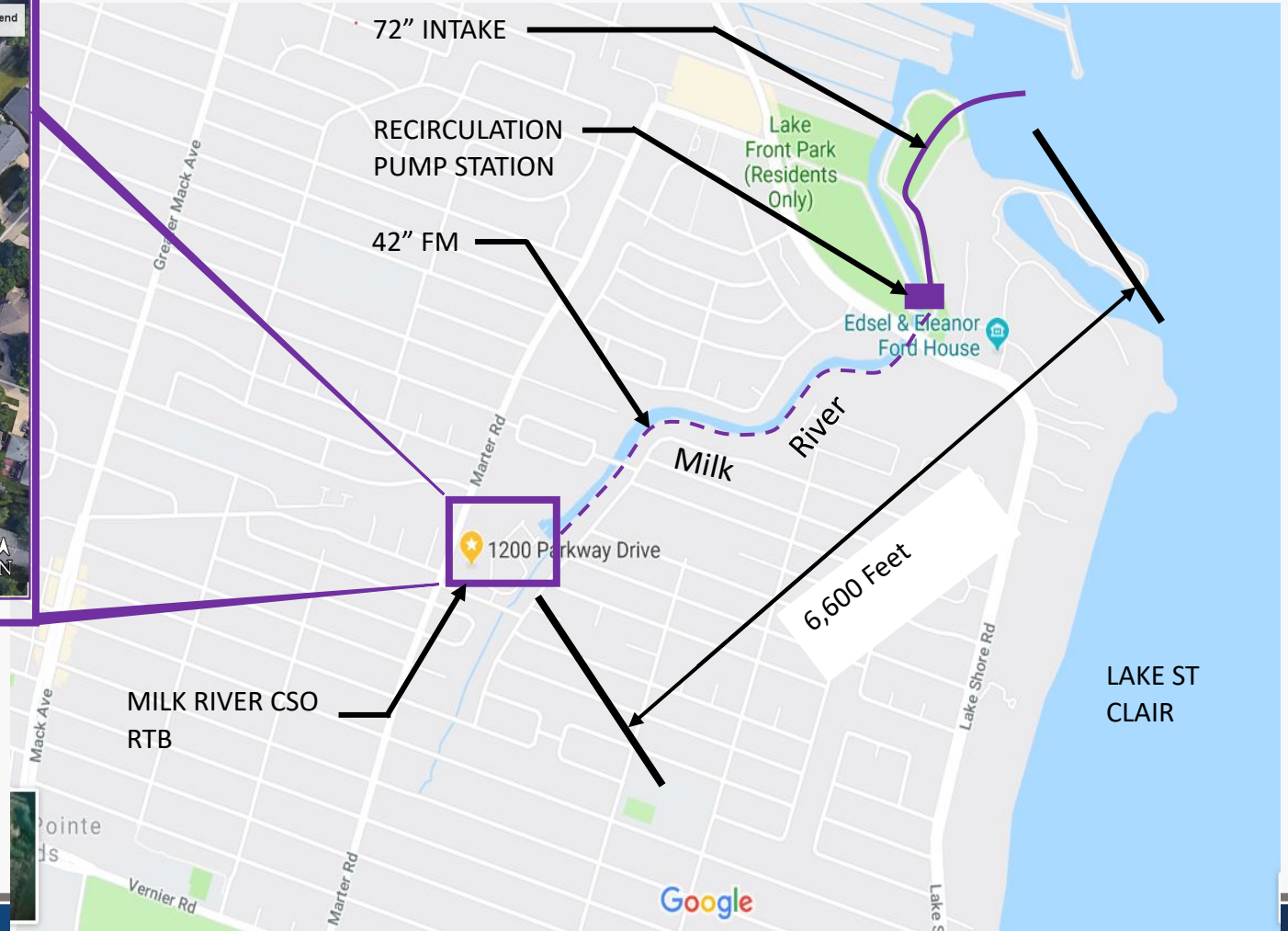
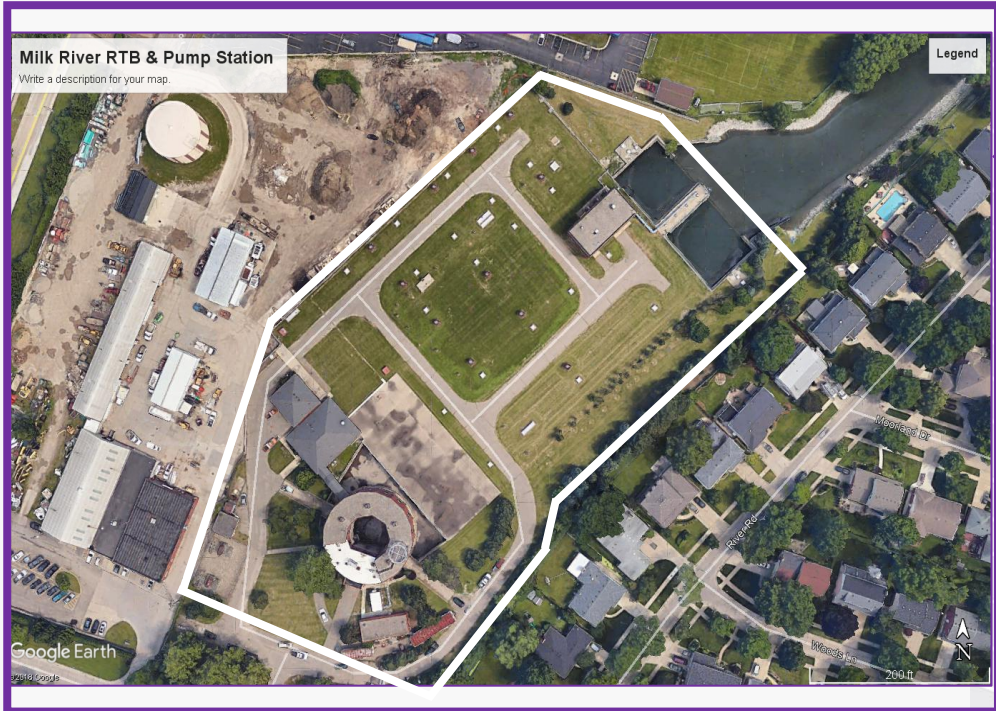
Milk River CSO Facility

Roger Kaliman, PE; Carol Hufnagel, PE

June 5, 2019



Milk River RTB Facility Overview







Milk River Historical Time Line

- Basin and pump station originally constructed: 1958
 - Original basin size: 3.5 MG
- Upgrade #1: 1994
 - Replace tankage
 - Increase basin size to 19 MG
 - Install treatment systems (disinfection, aeration, revise river recirculation)
- Upgrade #2: current
 - Major upgrades to facilities

Milk River Fast Facts

Aspect	
Service Area	3,700 Acres
Pumping Capacity <ul style="list-style-type: none">- Sanitary Pump Station (dry weather flow)- Storm Pump Station (wet weather flow)	10,000 gpm (14.4 MGD) 1,512 MGD (installed); 1,241 MGD (firm)
Storage	19 MG (7 MG in first flush tank, 12 MG in flow through tank)
Treatment Capabilities	Screening, settling, disinfection, aeration
Primary water quality concerns	Dissolved oxygen, bacteria
Milk River Characteristics	<ul style="list-style-type: none">- Approximately one mile in length- Treated CSO discharge + 660 stormwater acres
Unique feature	River recirculation system (up to 28 MGD)

Typical Performance

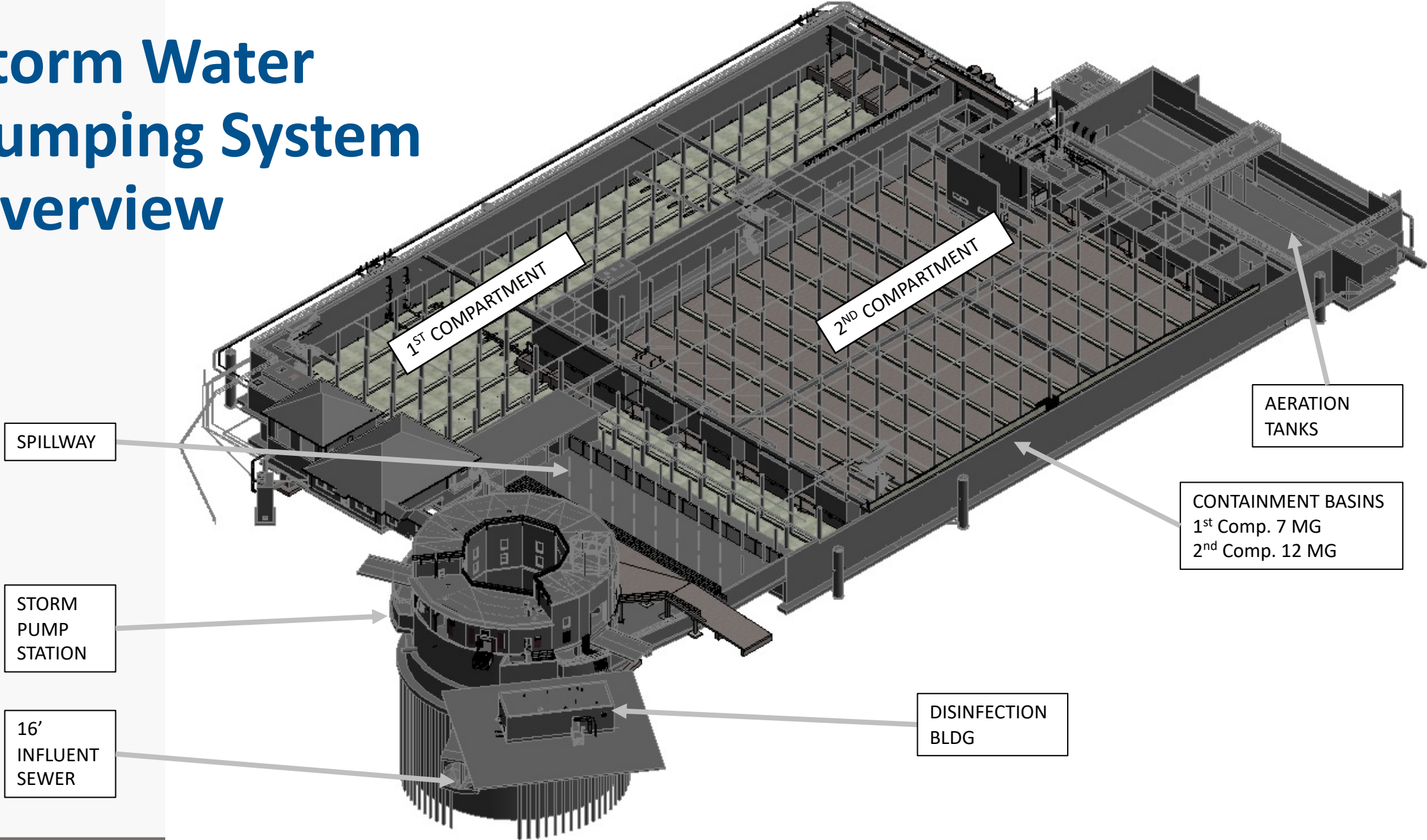
Flow Characteristics		
Annual wet weather flow in collection system	1460 MG	
System capture of wet weather flow	1000 MG	68%
Flow captured and dewatered from basin	300 MG	20%
Treated discharge	160 MG	12%

Pollutant Characteristics (flow weighted)	
First Flush Influent	CBOD – 67 mg/l; TSS – 210 mg/l; TP – 1.7 mg/l; NH ₃ – 2.1 mg/l
Tank 2 Influent	CBOD – 48 mg/l; TSS – 115 mg/l; TP – 1.5 mg/l; NH ₃ – 1.1 mg/l
Influent during discharge	CBOD – 19 mg/l; TSS – 60 mg/l; TP – 0.5 mg/l; NH ₃ – 0.8 mg/l
Treated discharge	CBOD – 11 mg/l; TSS – 75 mg/l; TP – 0.5 mg/l; NH ₃ – 0.5 mg/l

Facility Upgrades (Current)

- Clean/Repair Recirculation Intake FM
- Add Zebra Mussel Control System at Recirculation PS
- Drain Milk River and Repair 42” Forcemain
- Refurbish Storm Pumps
- Replace/Modify Sanitary, Flushing, Dewatering, Grit & Ground Water PS’s
- Rehab Disinfection Facility
- Various Structural and Architectural Improvements
- Rework the Electrical Power Distribution System
- Improve Basin Cleaning
- Extensive SCADA Upgrades

Storm Water Pumping System Overview



SPILLWAY

STORM
PUMP
STATION

16'
INFLUENT
SEWER

1ST COMPARTMENT

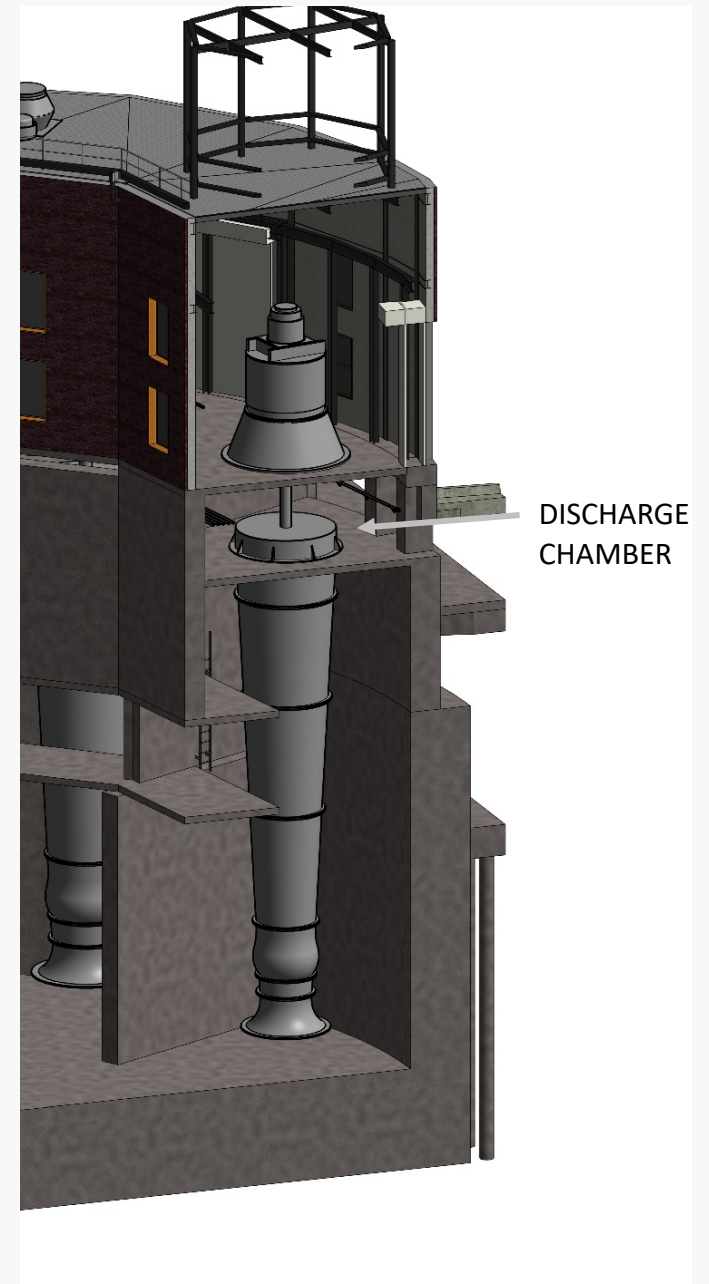
2ND COMPARTMENT

DISINFECTION
BLDG

AERATION
TANKS

CONTAINMENT BASINS
1st Comp. 7 MG
2nd Comp. 12 MG

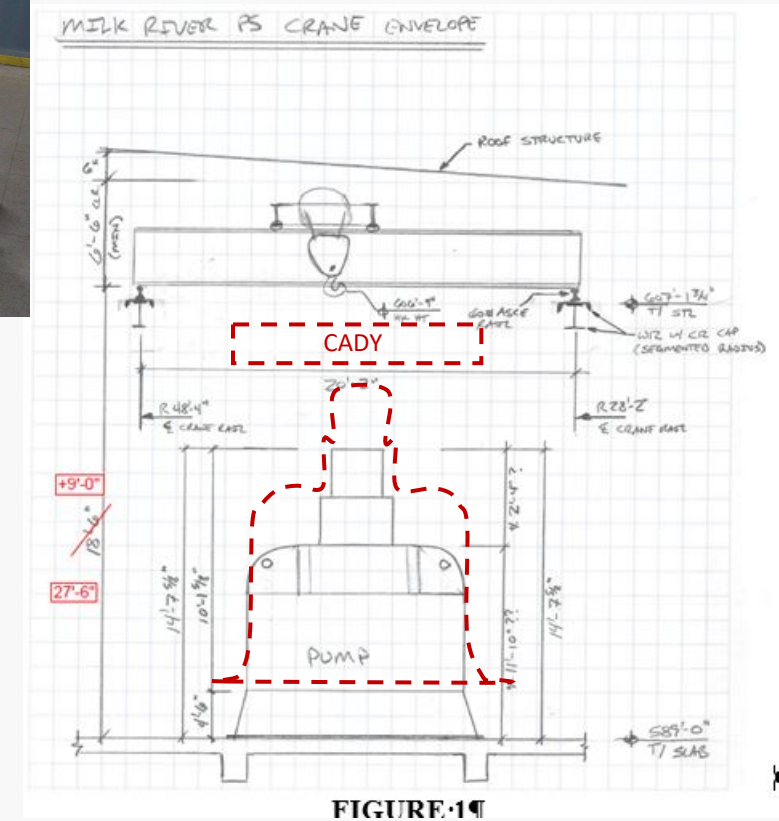
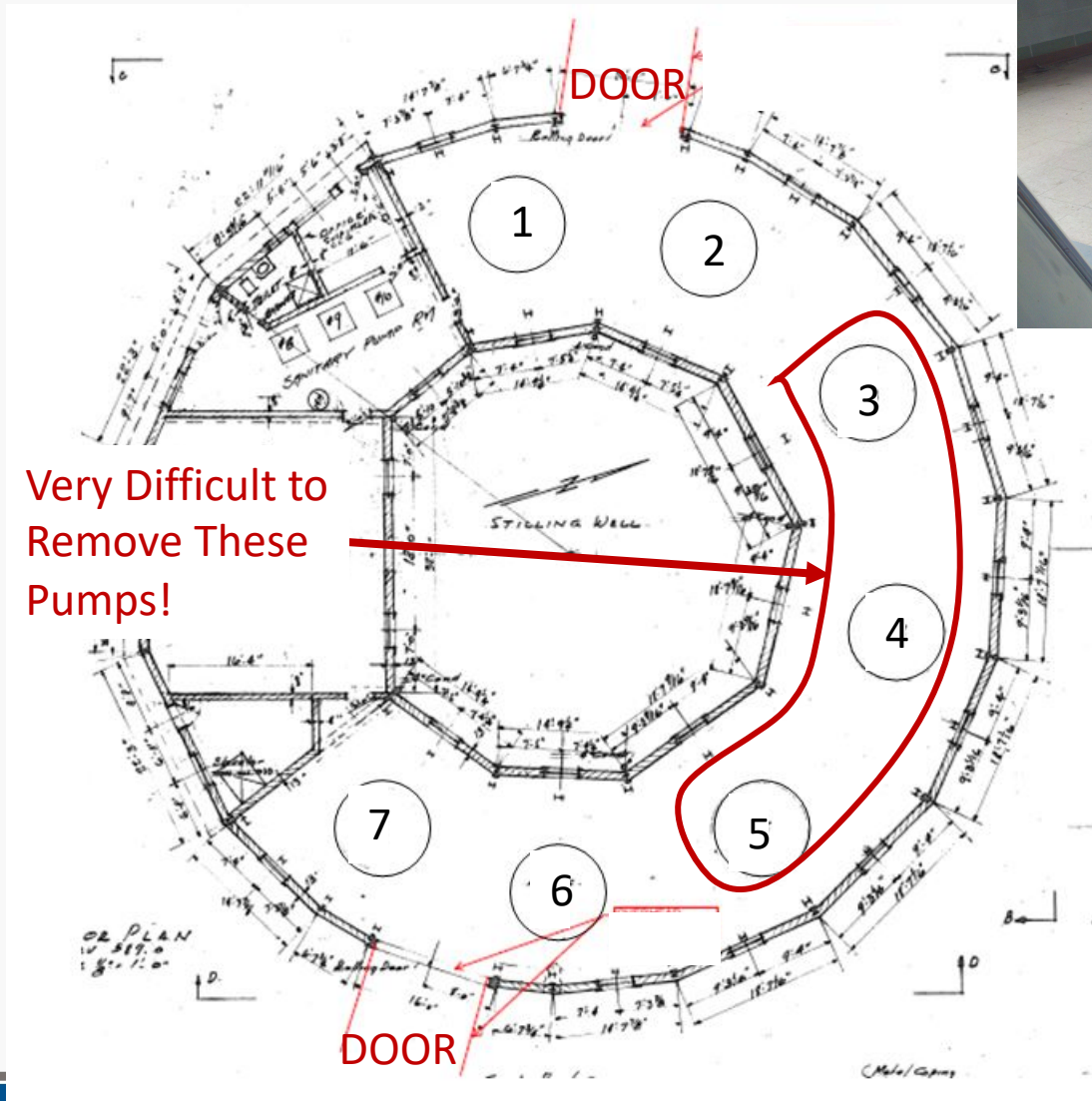
Storm Water Pumping System Overview



PUMP No. 5
IN OPERATION



Storm Pumps – Motor and Pump Removal/Reinstallation



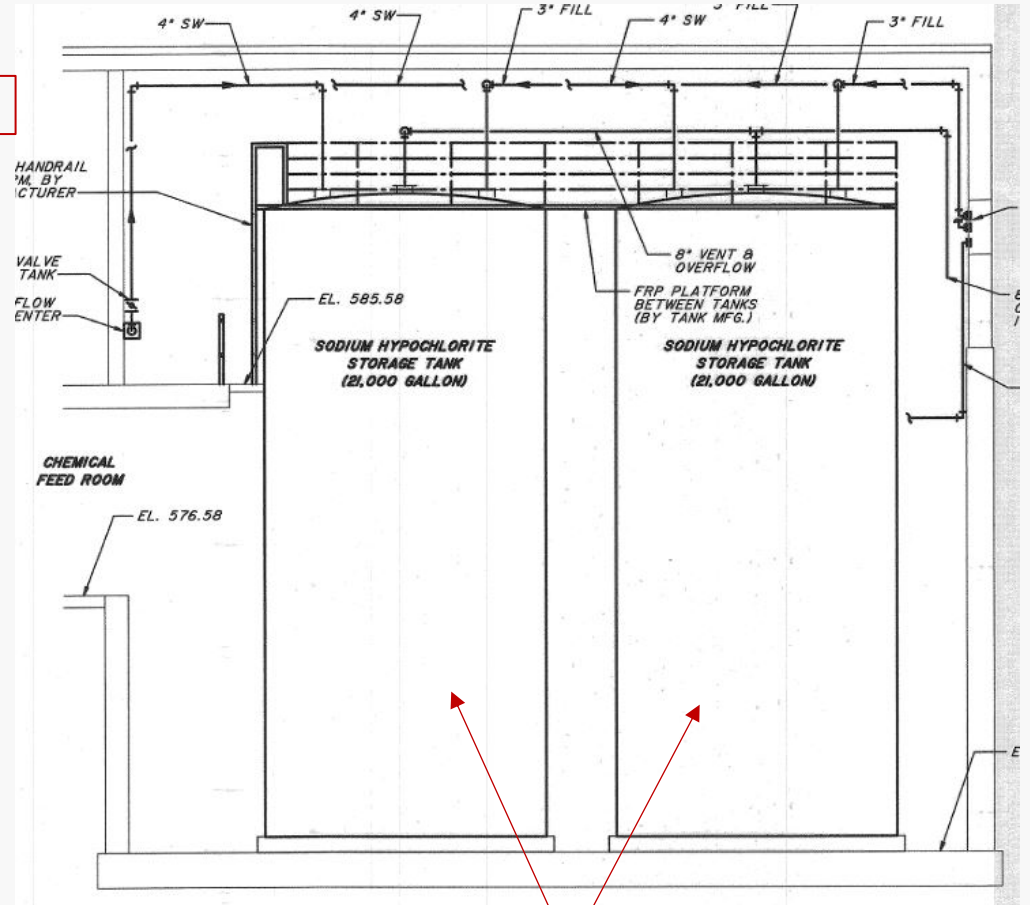
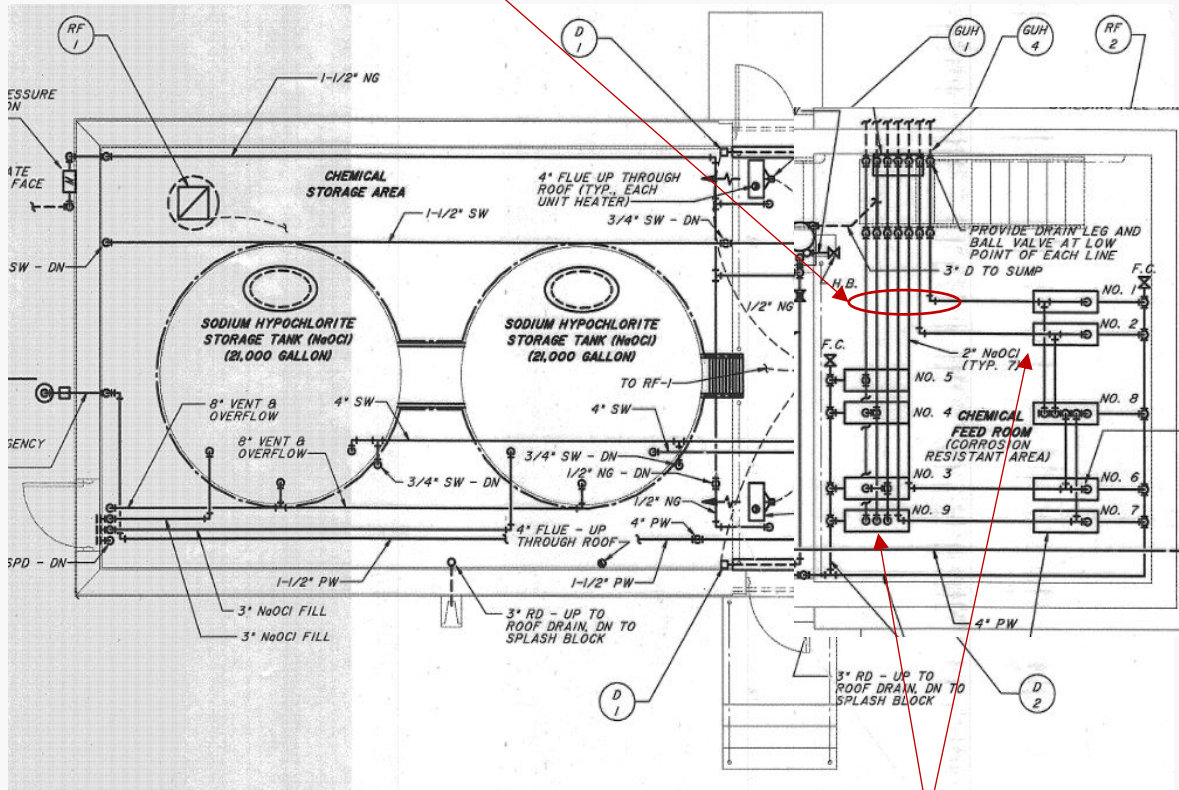
Storm Pumps – Wet Weather Surprise



Sodium Hypochlorite System Overview

PIPE AND EQUIPMENT FLUSHING

CONTROLS



FEED PUMPS

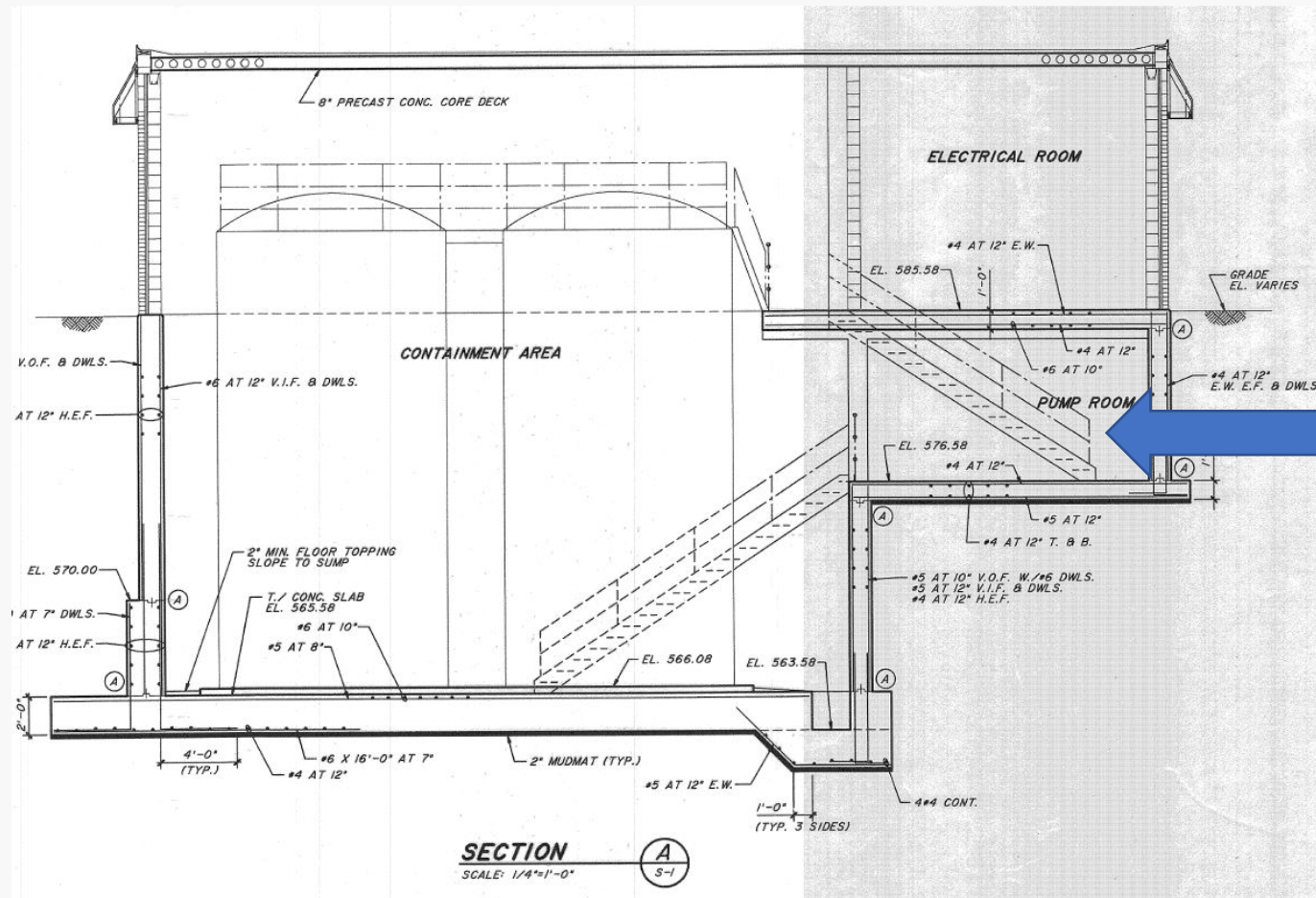
STORAGE TANKS

Sodium Hypochlorite System – Replace Feed Pumps

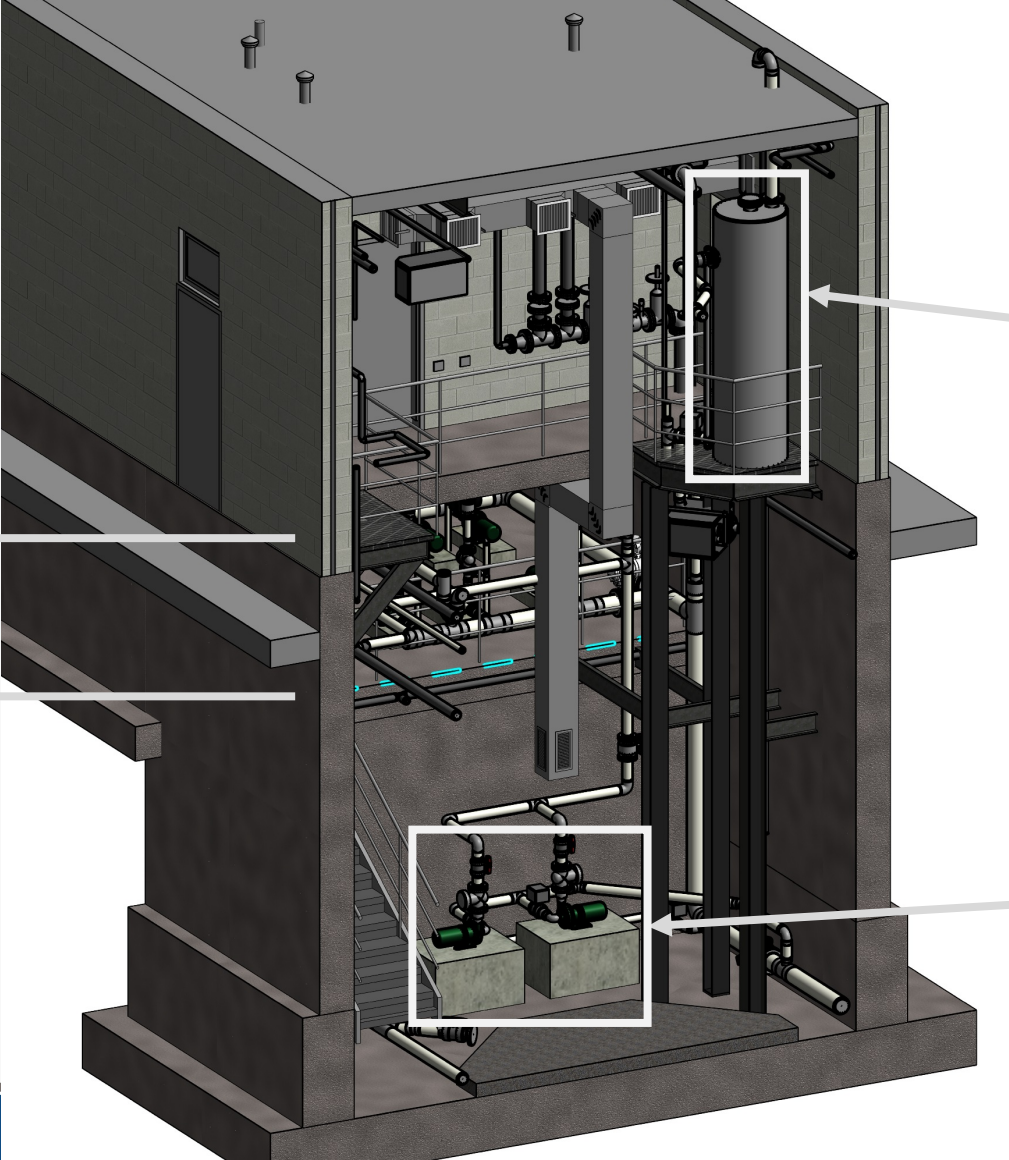
- End of Useful Life
- Pump Types Reviewed
 - Diaphragm
 - Peristaltic
 - Progressive Cavity
 - Self Priming Centrifugal
- Self-Priming Centrifugal Selected
 - Low Maintenance
 - Fit in Space
 - Operators Familiarity
 - Casing – Ductile Iron Lined with ETFE
 - Magnetic Drive
 - Impeller - ETFE with Carbon Fiber



Sodium Hypochlorite System – Pump Priming



Sodium Hypochlorite System – Priming Tank Added



Priming Tank

Feed Pumps
on This Level

Recirculation Pumps

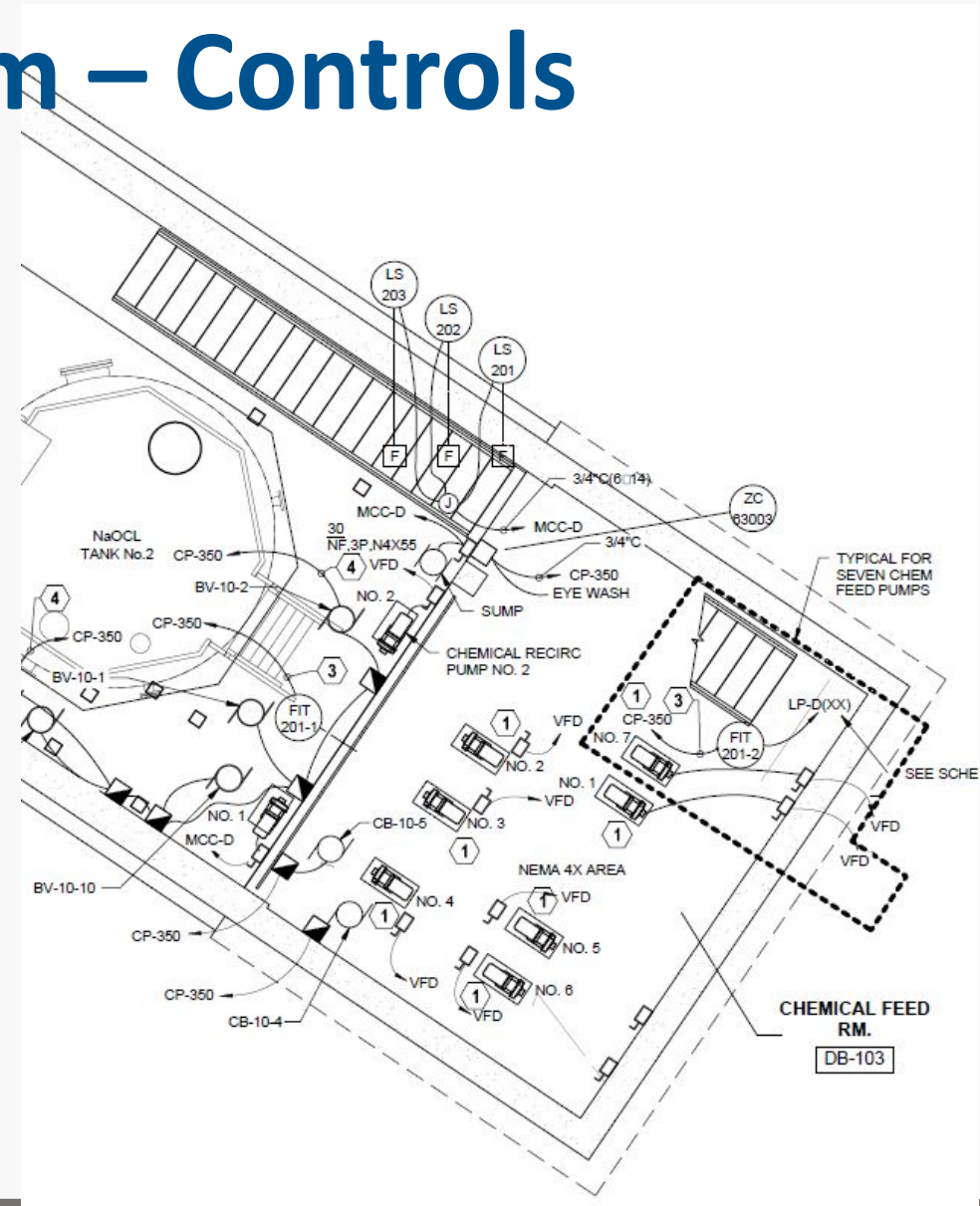
Sodium Hypochlorite System – Tank Lining

- Tanks 20 years old and lining deteriorating
 - Install PVC Liner > 20 Year Life and Lowest Cost

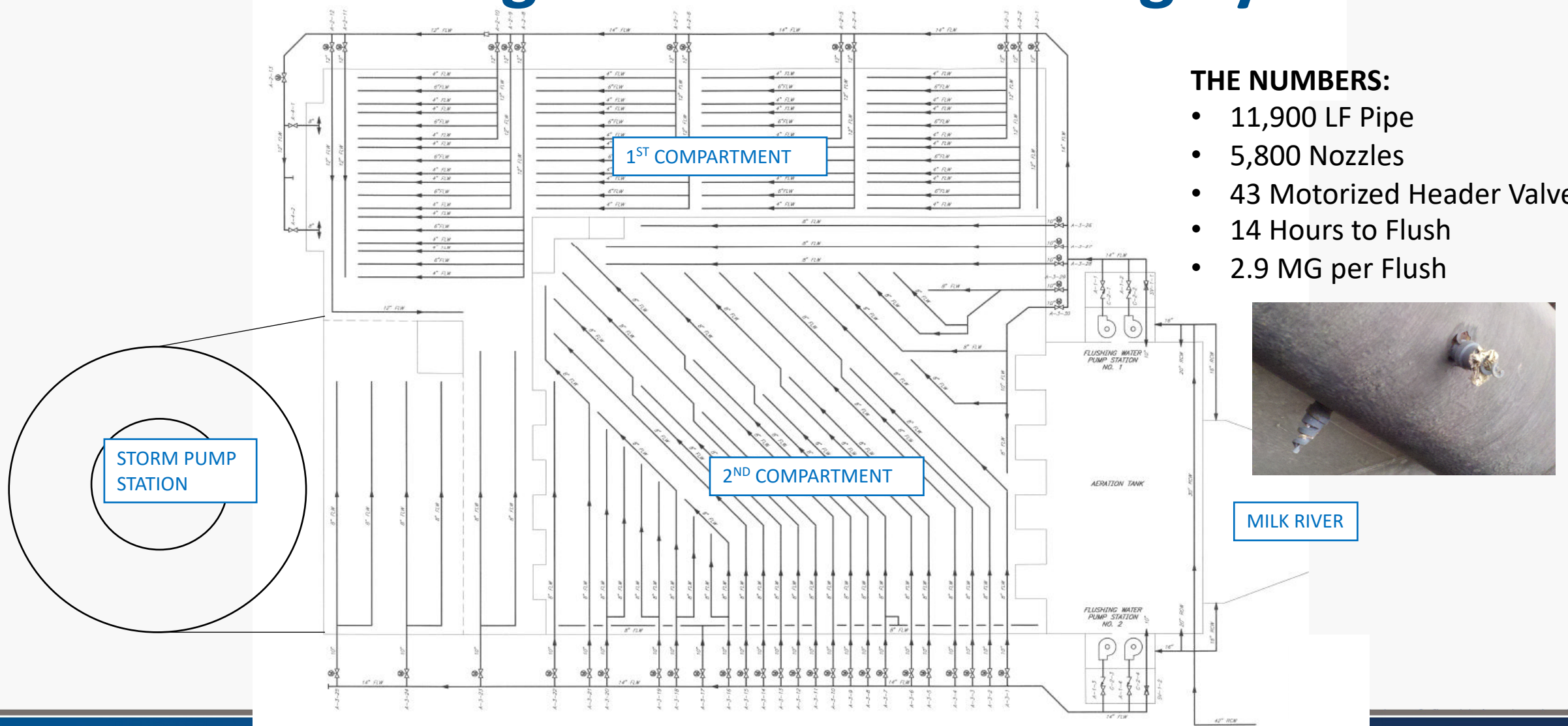


Sodium Hypochlorite System – Controls

- AUTOMATED DOSING CONTROL
 - Accomplished with Meters, VFD
 - First Flush and Normal Dosing
 - Control Logic
- EASY WAY TO FLUSH PIPING AND PUMPS
 - Hard Piped Service Water Connections
 - Motorized Valves
 - Time Delays
 - Additional Commissioning Steps



Basin Cleaning Overview – Existing System



THE NUMBERS:

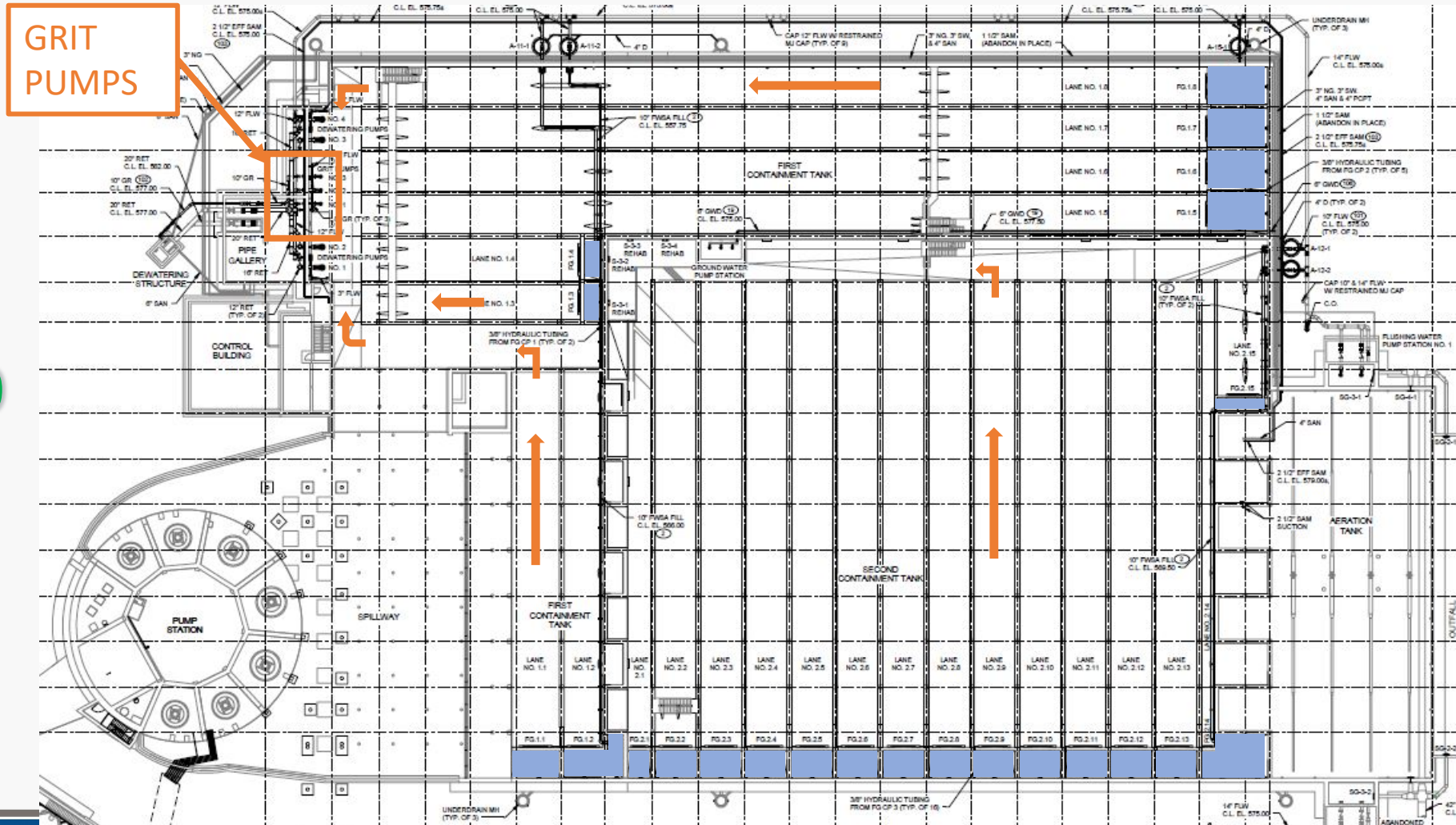
- 11,900 LF Pipe
- 5,800 Nozzles
- 43 Motorized Header Valves
- 14 Hours to Flush
- 2.9 MG per Flush



MILK RIVER

Basin Cleaning – SOLUTION

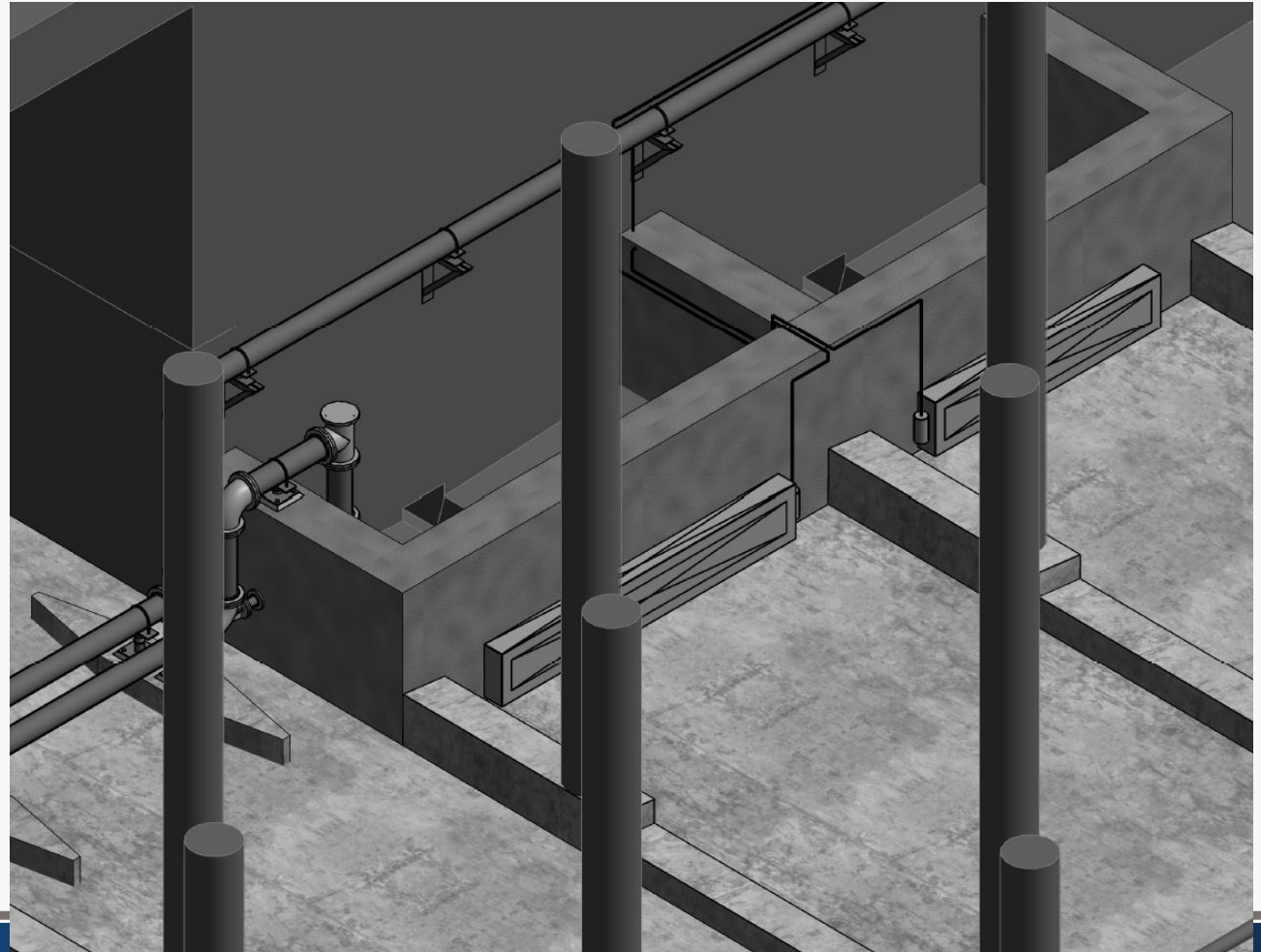
Flushing Gates



Basin Cleaning – SOLUTION

Flushing Gates

Reconfigure Basin Floors
Construct New Grit Pump



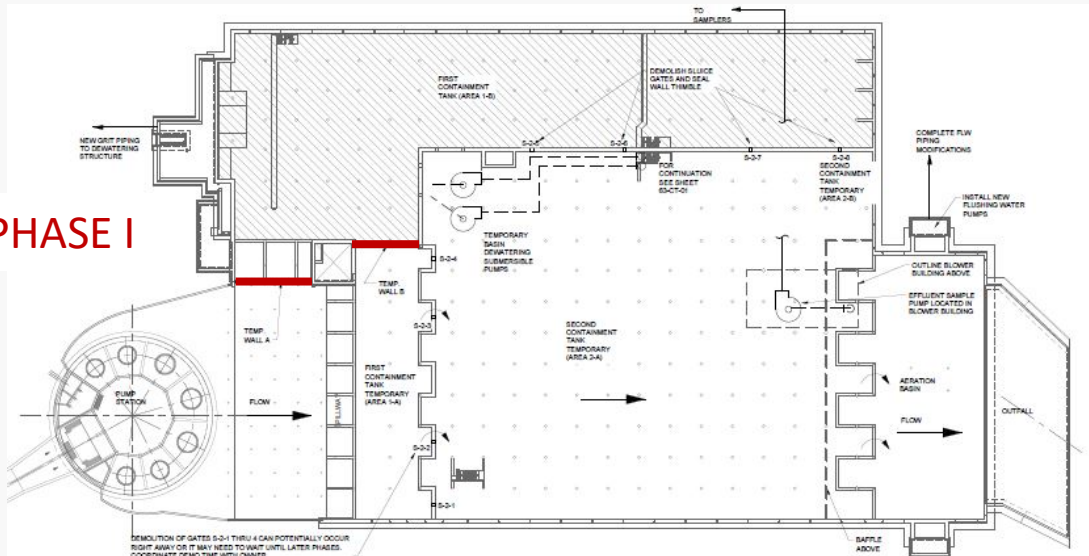
Basin Cleaning – SOLUTION

Flushing Gates

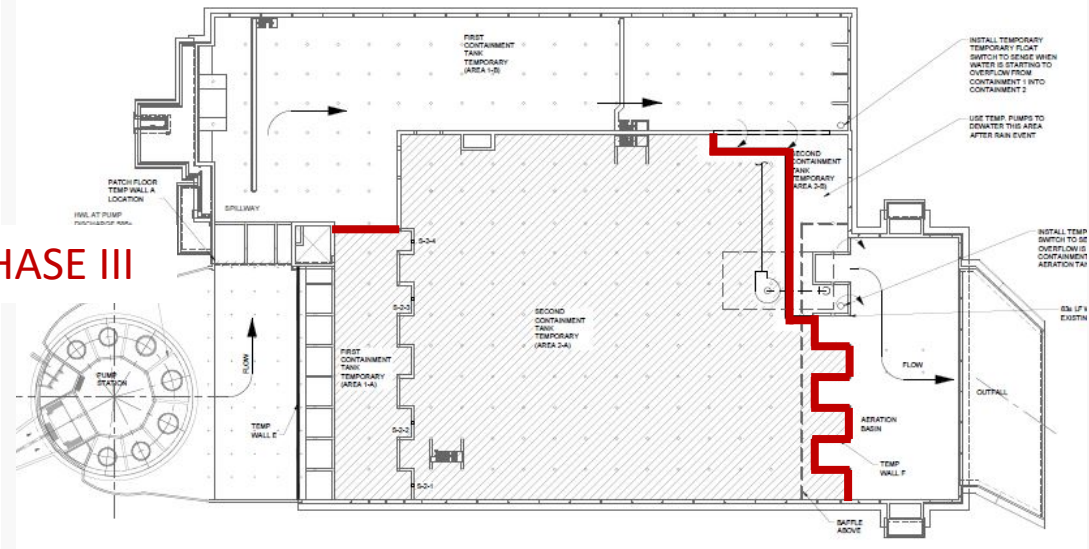


Construction Sequencing

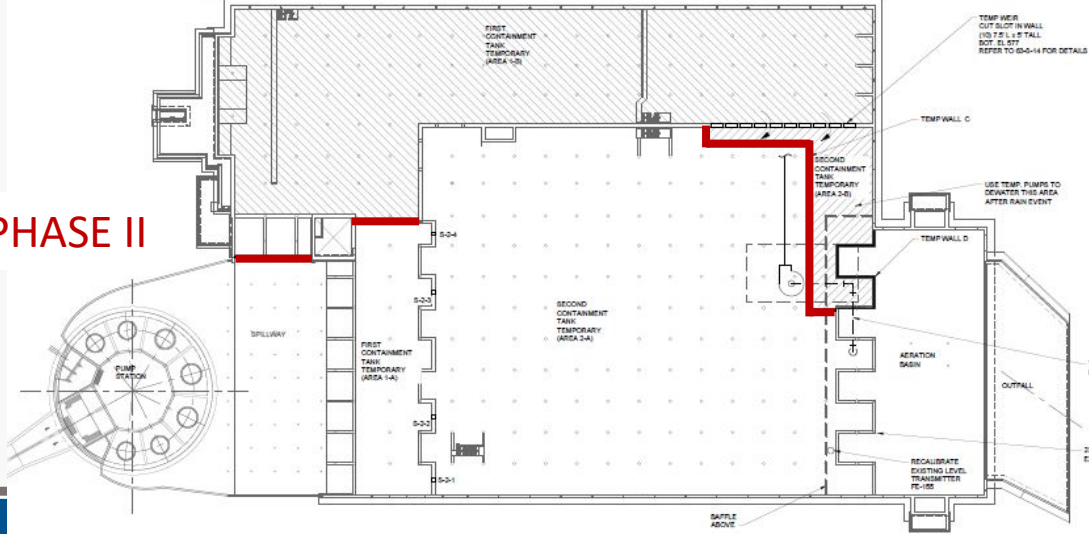
PHASE I



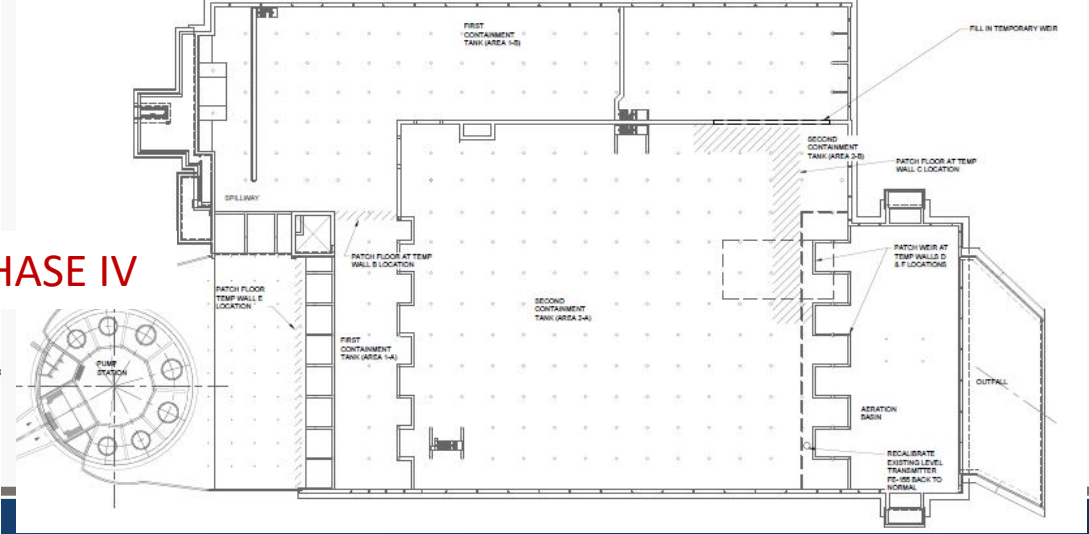
PHASE III



PHASE II



PHASE IV





QUESTIONS?

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Roger.Kaliman@tetratech.com