TACWA

November 15, 2019

Wet Weather Peak Flow Management at ROCRWS Treatment Plant

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Trinity River Authority of Texas
Red Oak Creek Regional Wastewater System
Peak Flow Management

TACWA Meeting

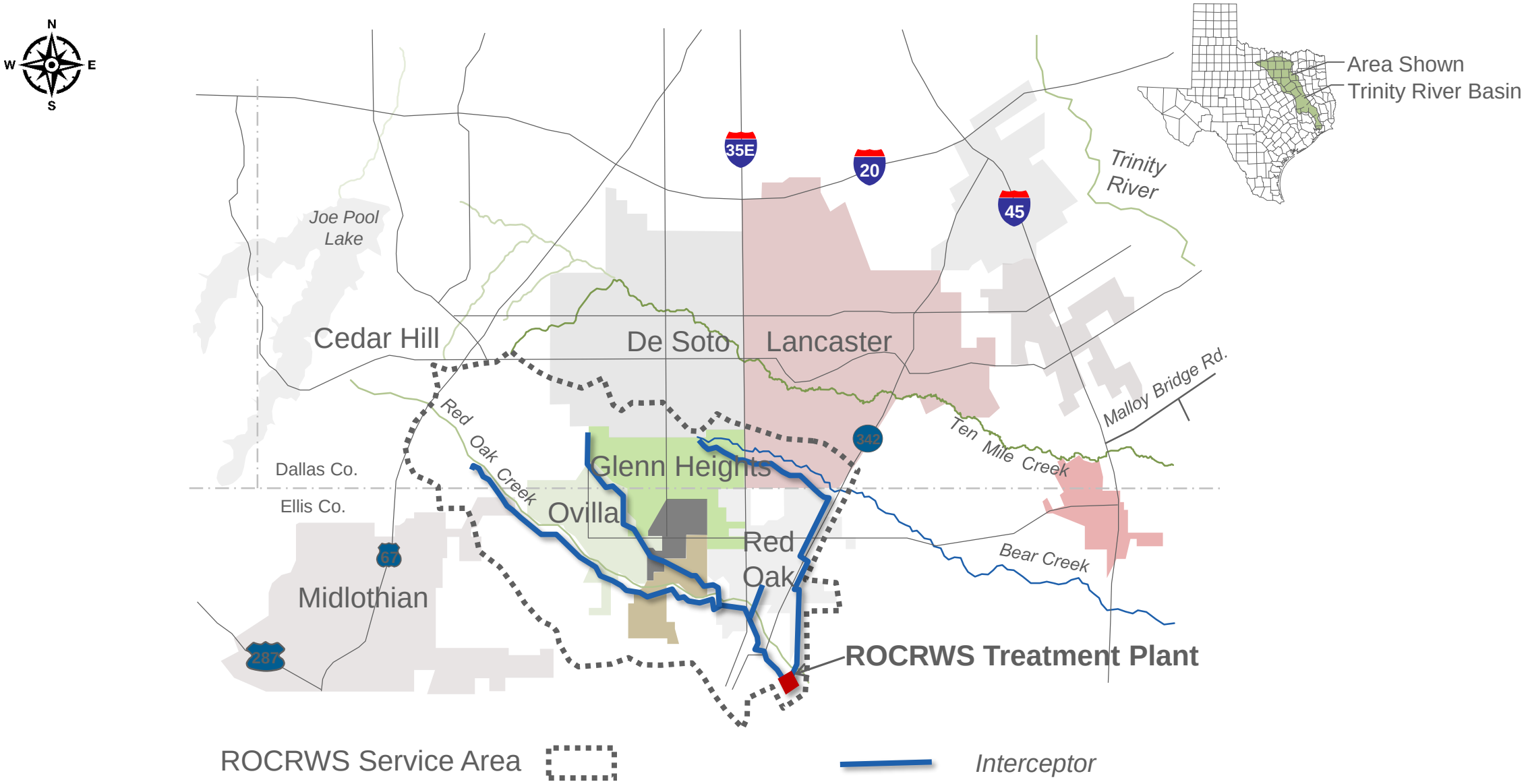
November 15, 2019

Outline

- TRA and ROCRWS Introduction
- Plant Overview
- Project Drivers/Goals
- Peak Flow Storage Sizing
- Siting and Limitations
- Peak Flow Storage Alternatives Evaluation
- Proposed System
- System Components
- Project Costs
- Next Steps

TRA Northern Region Facilities

ROCRWS Service Area



ROCRWS Treatment Plant Quick Facts

- Constructed in early 1990's as 3.5 MGD regional facility
- Expanded in 2009 to 6 MGD
- Consist of preliminary treatment (fine screens and grit removal), activated sludge, secondary clarifiers, tertiary filters and UV disinfection
- Solids processing facilities consist of sludge holding tank and centrifuge – Class B biosolids (landfill disposal)

Project Drivers/Goals

ROCRWS Treatment Capacity

- AADF – 6 MGD
- Permitted Peak 2-Hour Flow – 15 MGD

Current Peak 2-Hour Flow Exceed 15 MGD

- Population growth
- Flow Contribution from I/I source
- Wet weather events
- Expansion of gravity interceptors
- More industrial contributions

Project Drivers

- To accommodate the excess peak flow
- To delay the ROCRWS Treatment plant expansion
- **Construction of a peak flow storage system is required**

Additional Benefits of Peak Flow Storage

- Allow the plant to handle wastewater treatment under a reduced peaking factor through the plant's treatment processes
- Emergency storage for construction shutdowns and plant process upsets to allow permit compliance

Peak Flow Management Strategies

Conventional Treatment

- Effective in treating all the flows
- Costly investment in infrastructure (additional treatment units)
- Most treatment processes are only partially utilized for majority of the time
- Bringing up some treatment processes after long periods of inactivity can be challenging

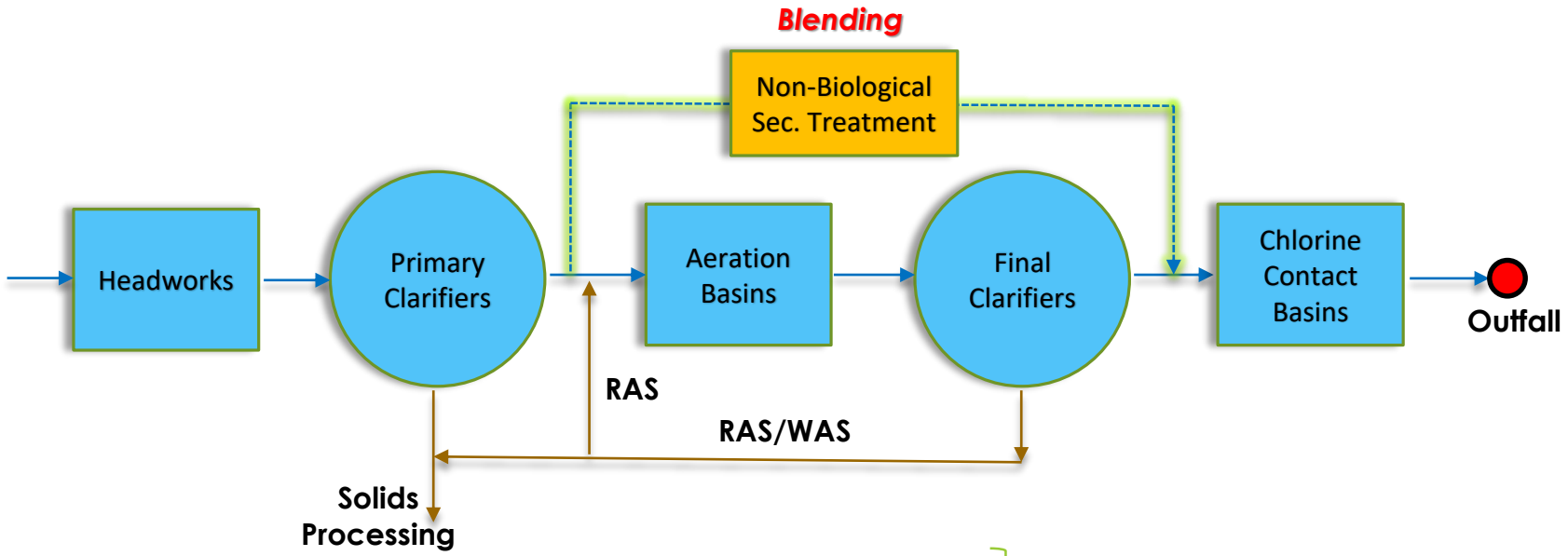
Peak Flow Management Strategies

Blending

- Definition: Channeling a portion of the "peak wet weather flows" through non-biological unit and re-combining with flow from biological secondary treatment before disinfection and discharging.

Bypass (40 CFR Section 122.41(m))

- Definition: Intentional ***diversion*** of waste streams from any portion of treatment facility
- Bypass is ***Prohibited*** unless unavoidable to prevent loss of life, personal injury, severe property damage, or no other feasible alternative



Blending = Prohibited Bypass } In Separate Sanitary Sewer Systems

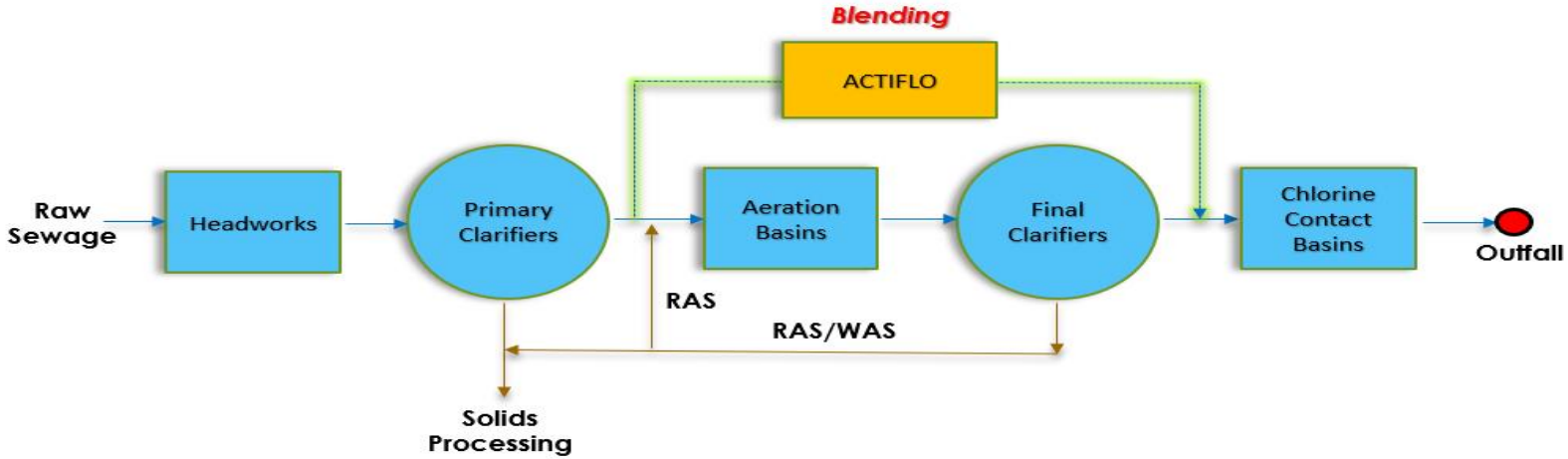
Peak Flow Management Strategies

Blending

US 8th Circuit Court Ruling on Blending (2013)

- Exceeds statutory authority under Clean Water Act (CWA)
- Violates Administrative Procedures Act (APA)
- Blending ≠ Prohibited Bypass
- Use of non-biological secondary treatment of peak flow is legal

Ruling Applies Only in US 8th Circuit States: Arkansas, Iowa, Minnesota, Missouri, Nebraska, North Dakota, South Dakota



Where we are now?

- April 2018: EPA announces new rulemaking for wet-weather management
- Fall 2019: Proposed draft rule on blending
- Fall 2020: Final rule on blending

Peak Flow Management Strategies

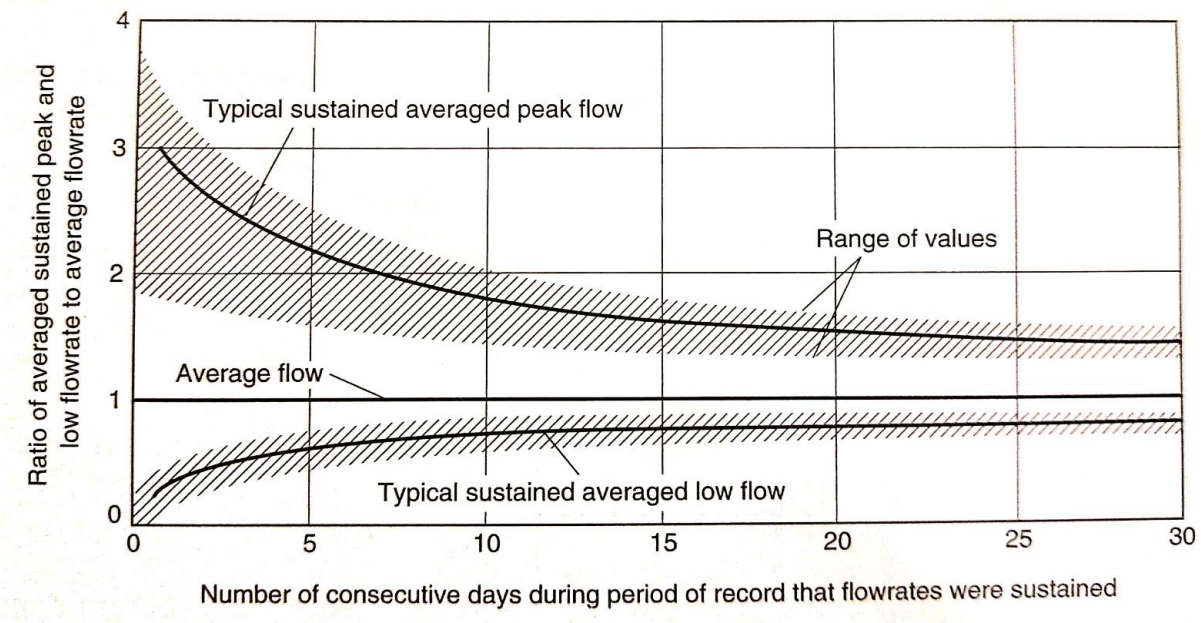
Storage

- Proven wet weather management technique that allows offloading flows in excess of the WWTP's treatment capacity for temporary storage
- All stored peak flows are treated through the entire treatment process once peak flows subside
- Simple flow management process with minimal to no treatment components
- Can be used for non-peak flow plant emergencies and construction shutdowns
- Cost effective strategy for managing peak flows
- Requires large area of land to contain peak flow volumes

Peak Flow Storage Sizing

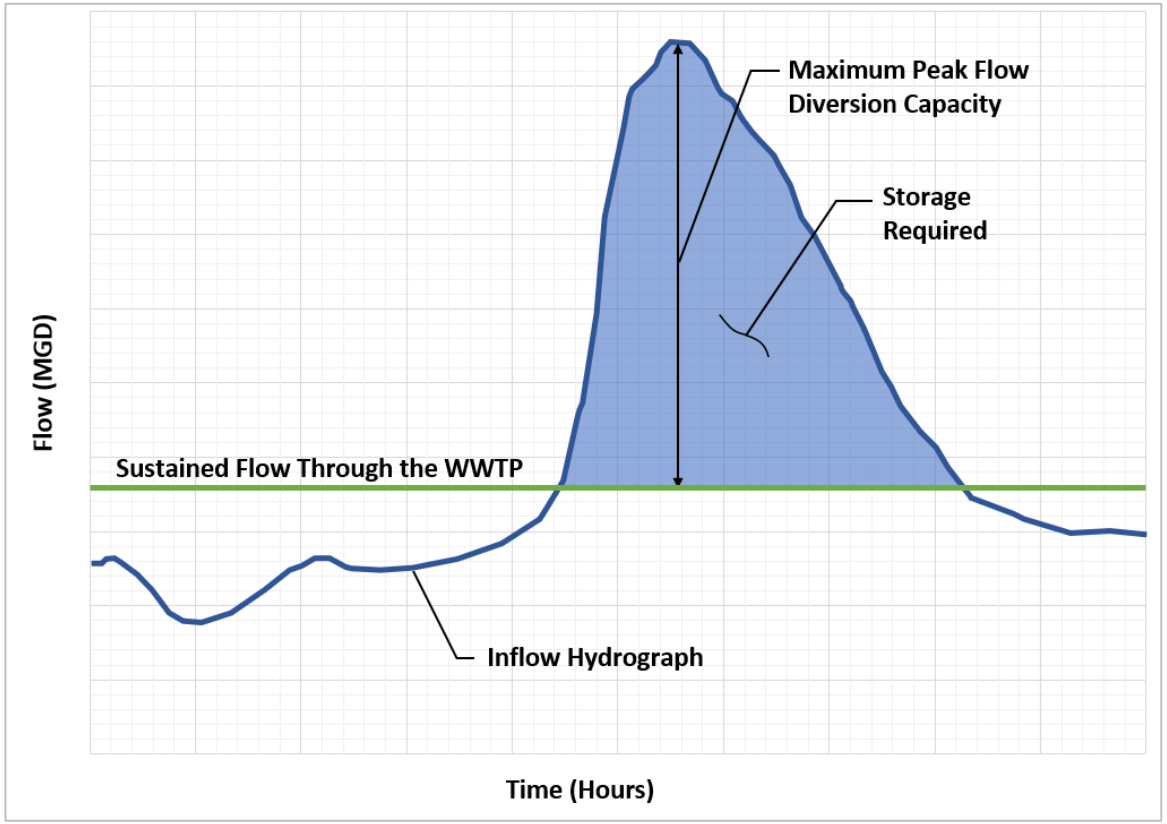
Critical parameters

1. Design Storm:
   - Minimum criteria: (TCEQ, 217.34. (1). (C)) = 2-year, 24-hour storm
   - 3.97-inch precipitation using NOAA Atlas 14
2. Sustained Treatment Capacity:
   - Threshold capacity for a facility to treat wastewater without washing out MLSS (responsible for the biological treatment) from the aeration basins, thus continuing to meet effluent permit requirements.



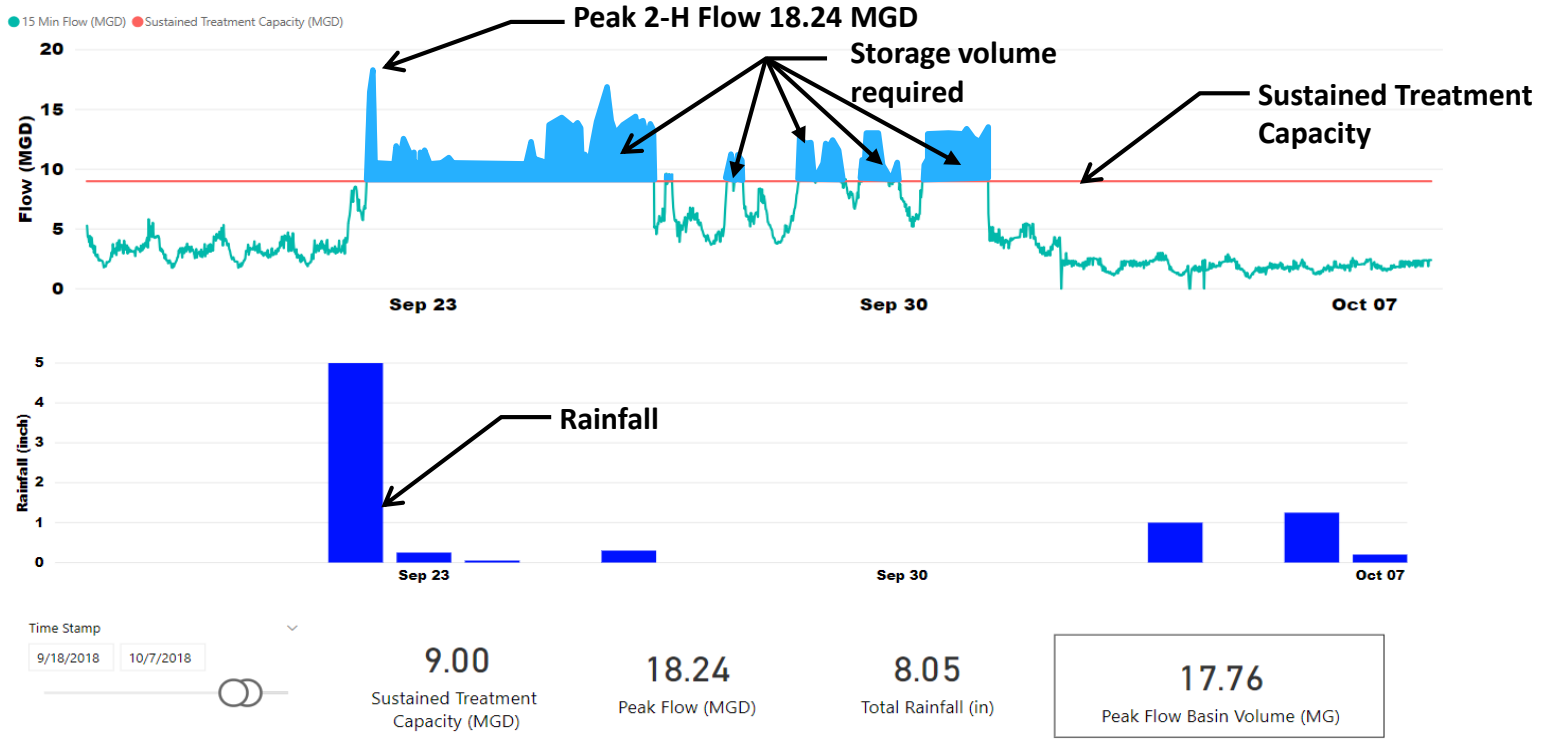
Metcalf and Eddy. (2004). *Wastewater Engineering – Treatment and Reuse*. 4th edition

Peak Flow Storage Sizing



- Evaluated 2014, 2015, 2016, 2017, and 2018 wet weather seasons
- Identified 23 wet weather events – Only 9 met TCEQ criteria
- Evaluated 9 MGD, 10 MGD, 11 MGD and 12 MGD sustained flow through the WWTP
- Selected September 22 – October 1, 2018 as Design Event
- Selected 11 MGD as the Sustained Flow Through the WWTP

Peak Flow Storage Sizing



Rainfall Events	Total Rainfall (inches)	Date	Storage Volume Required (MG)			
			9 MGD	10 MGD	11 MGD	12 MGD
2018d	7	9/18/2018 – 10/17/2018	17.76	12.11	6.81	3.70

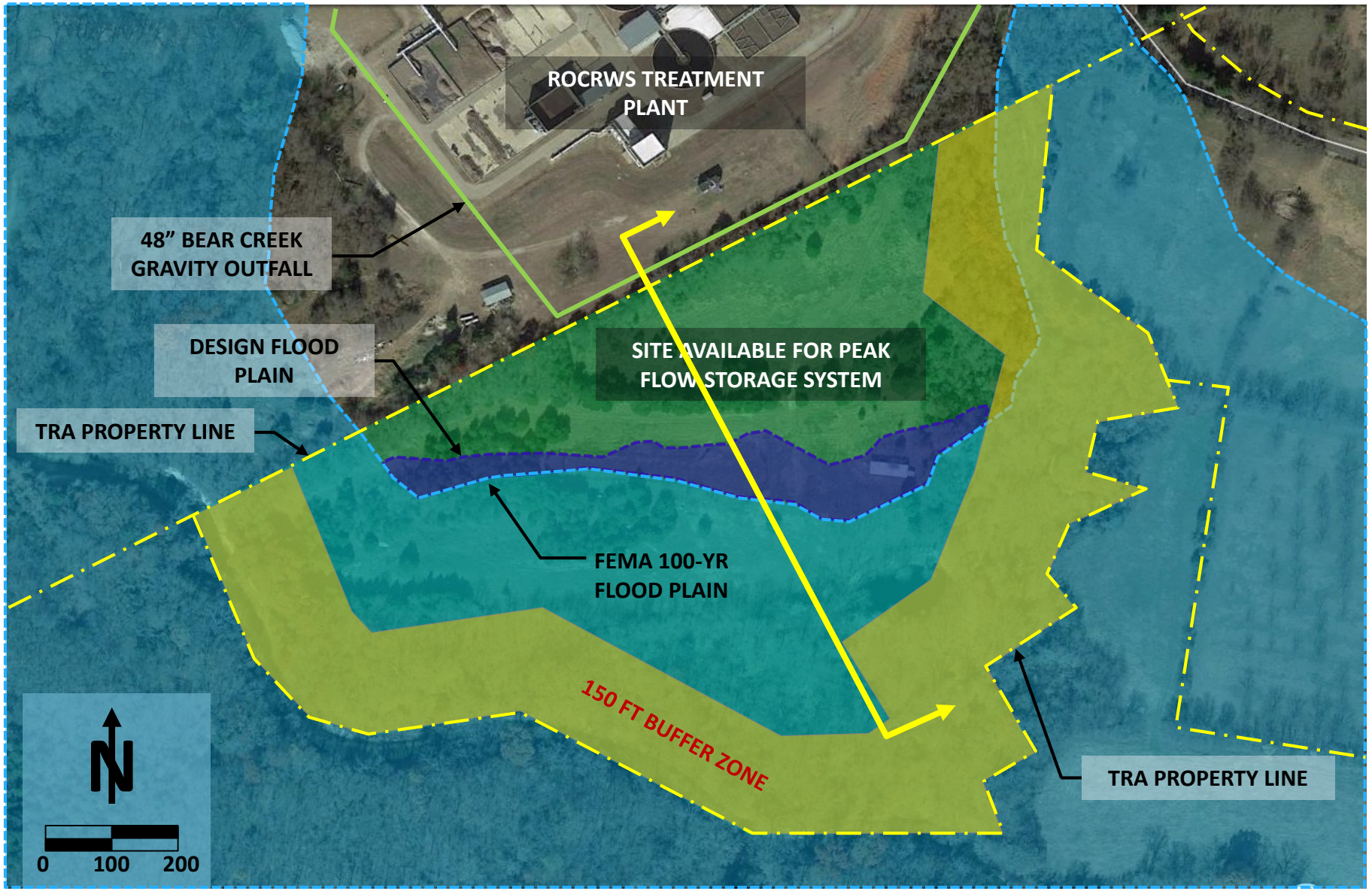
- Recommended initial construction storage = 7 MG
- Required flow diversion to Peak Flow Storage Tank = 7.24 MGD
- Estimated ultimate storage needs = 23.5 MG (Based on current vs. projected flow and storage ratios)

Siting Limitations

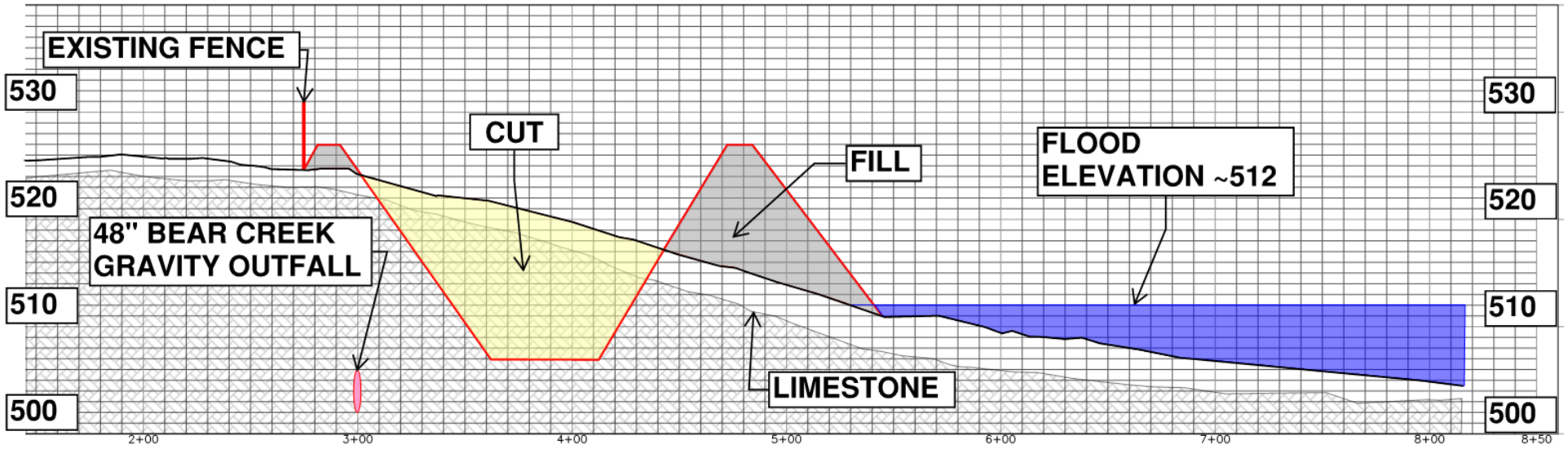
Critical parameters

1. Buffer Zone:
   - (TCEQ, 309.13) = maintain 150-feet buffer zone from the nearest property line
   - Nuisance Odor Report = variance
2. Flood Plain:
   - Avoid impacts to the 100-year floodplain
   - Avoid flood inundation of the peak flow storage
   - Maintain access during 100-year flood event
3. Existing Utilities:
   - Avoid construction over existing utilities
4. Site Geology
   - Consider existing soil conditions on the design of facilities
5. Site Topography
   - Consider site elevations on the basin development (cut/fill volumes)

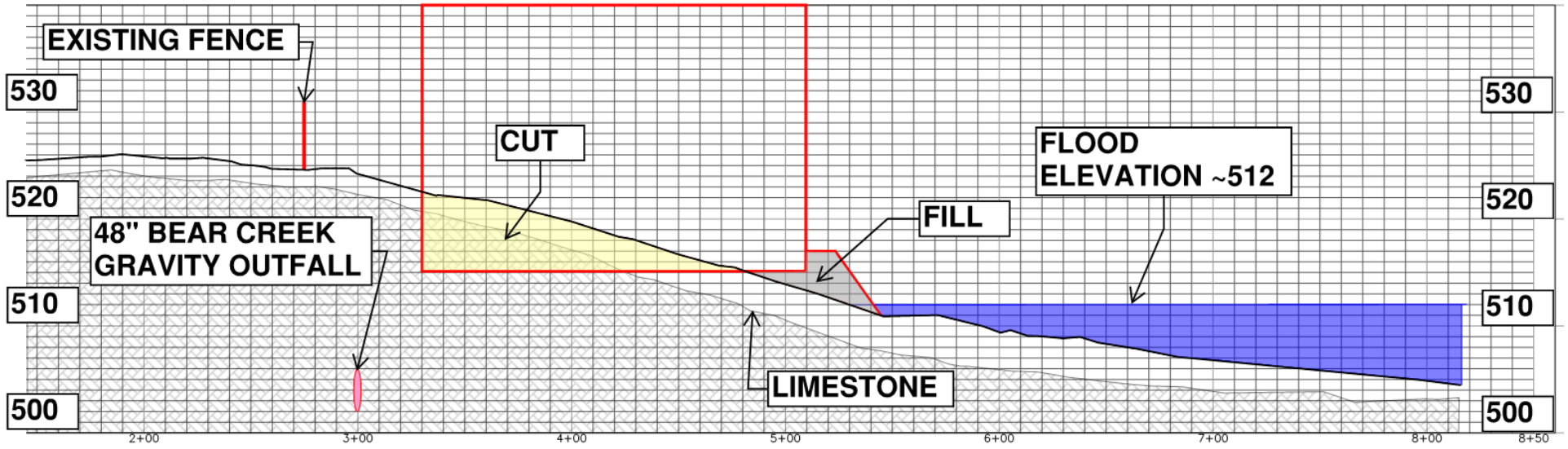
Siting and Limitations



Siting and Limitations



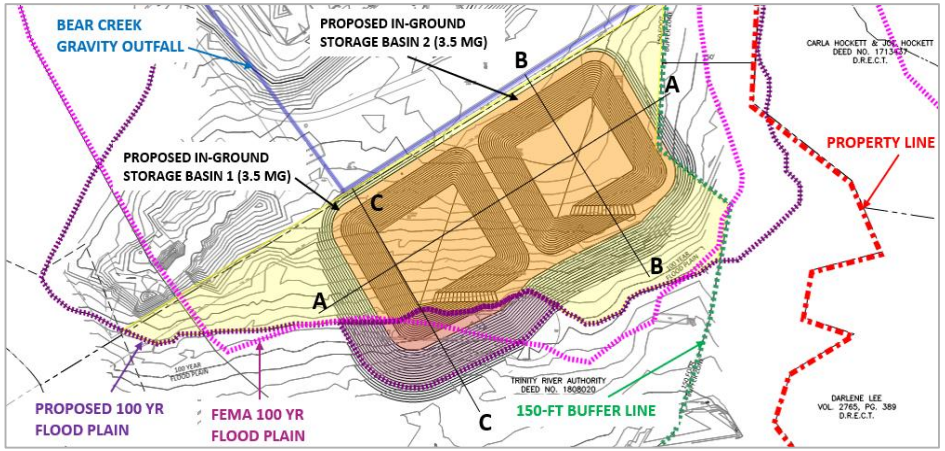
IN-GROUND BASIN



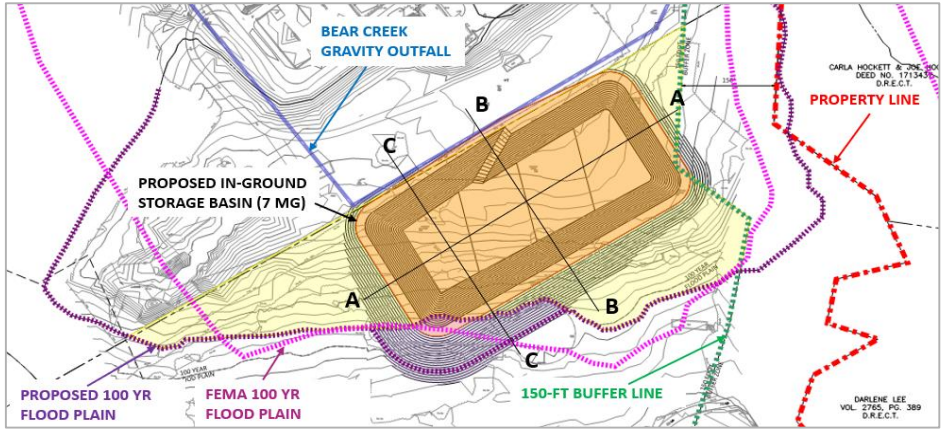
PRESTRESSED CONCRETE TANK

Peak Flow Storage Alternatives

In-ground basins

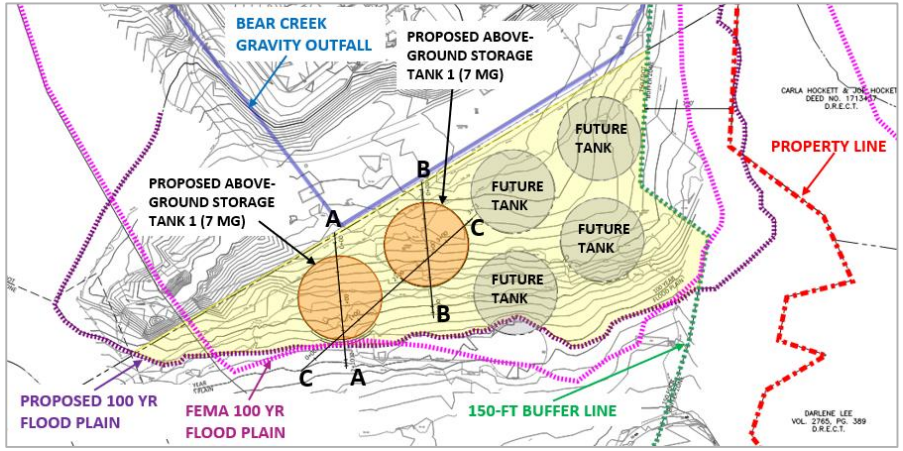


Alternative 1 - 2 x 3.5 MG

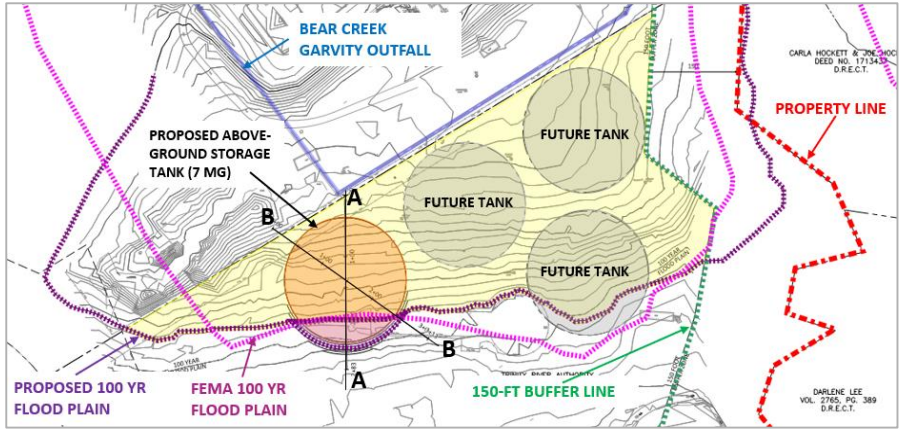


Alternative 2 - 1 x 7 MG

Above-ground basins



Alternative 3 - 2 x 3.5 MG



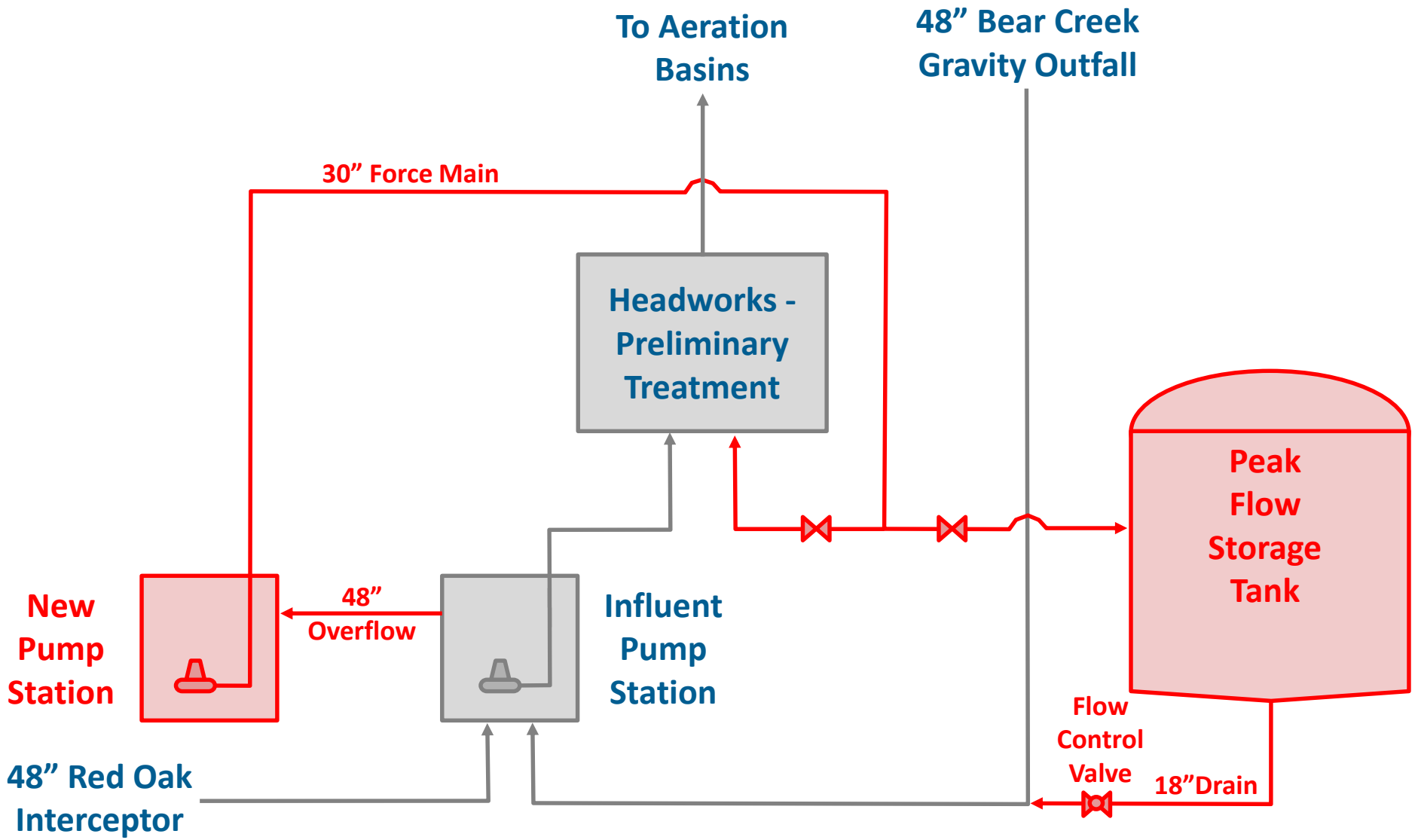
Alternative 4 - 1 x 7 MG

Peak Flow Storage Alternatives

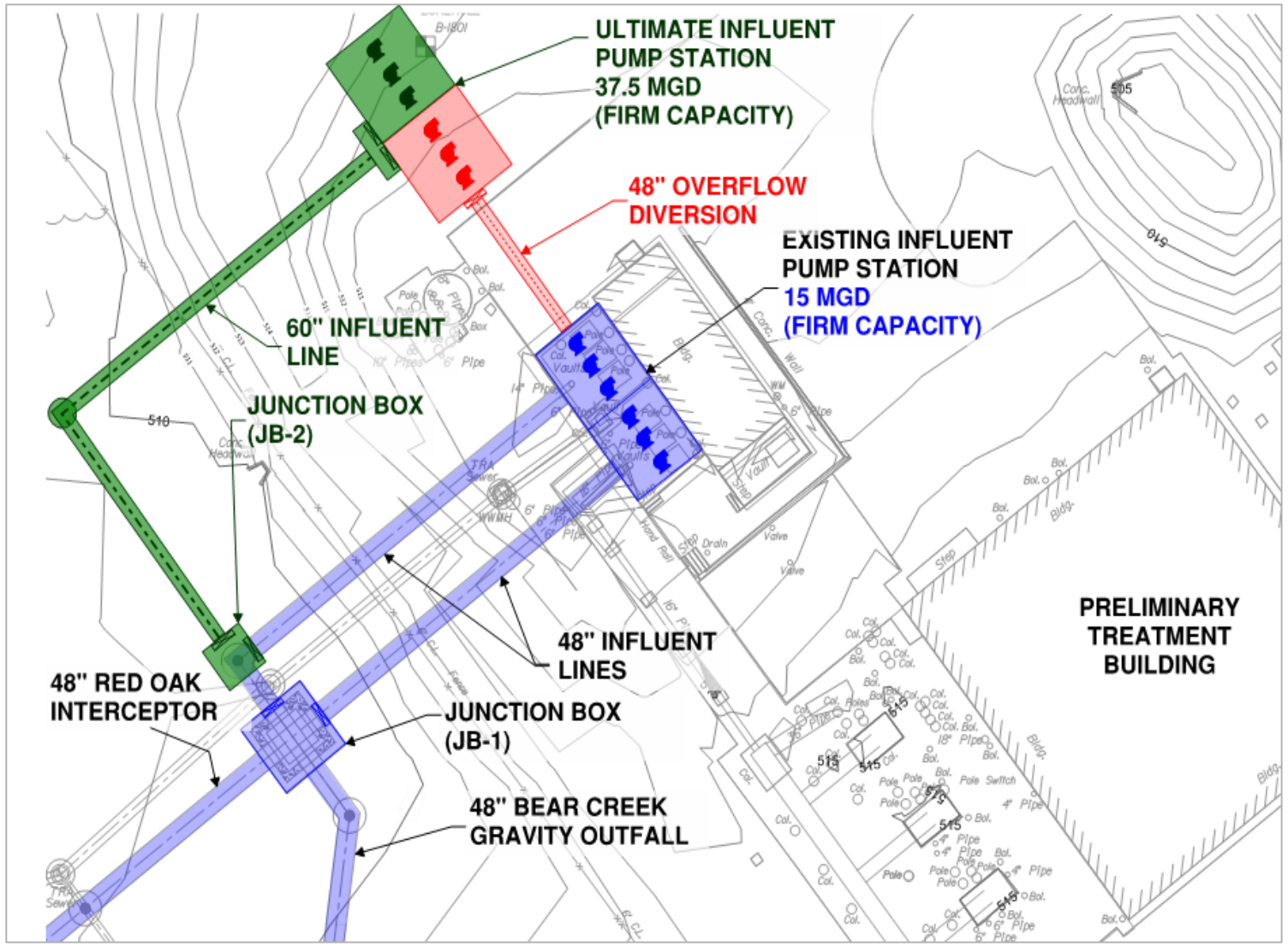
Alternative No.	Alternative Name	Proposed Capacity (MG)	Ultimate Storage Capacity (MG)	Raw Cost
1	Single Cell 7 MG Peak Flow Storage Basin with 3:1 Slope	7	7	$3,510,000
2	Double Cell 3.5 MG Peak Flow Storage Basin with 3:1 slope	7	7	$3,830,000
3	***7 MG Single Prestressed Concrete Tank***	***7***	***28***	***$3,500,000***
4	3.5 MG Double Prestressed Concrete Tank	7	21	$4,370,000

Recommendation: 7 MG Single Prestressed Concrete Tank

Proposed System



System Components:
Influent Pump Station



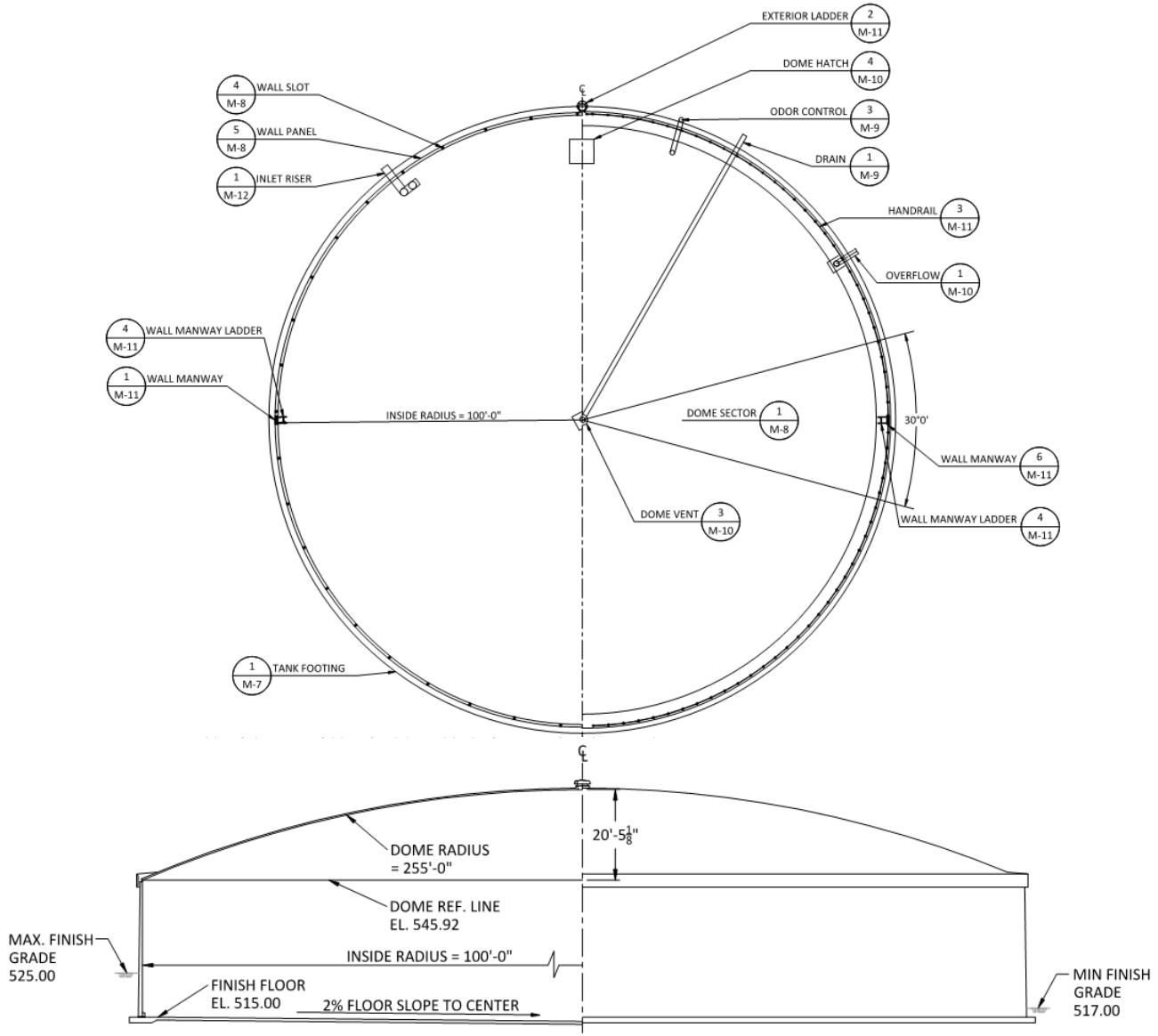
Design Considerations

- 3-Bay Submersible Wet Well
- 2 x 7.5 MGD Pumps on VFDs
- Appurtenances for the Third Pump
- Space for Expansion for Future Wet Well
- 37.5 MGD Ultimate Firm Capacity
- Electrical Building
- Backup Diesel Generator

Pumping Capabilities

- To Peak Flow Storage Tank
- To Existing Headworks
- To Future Parallel Treatment Trains

System Components:
Peak Flow Storage Tank



Design Considerations

- Volume = 7 MG (prestressed concrete tank)
- Maximum Side Water Depth = 30’
- Tank Inside Diameter = 200’
- Height of Dome Center = 51.5’±
- Floor Slope = 2%
- 30” Influent Line
- 18” Drain Line
- 30” Overflow Line

Tank Filling and Draining

- Influent Flow – Pumping from proposed influent pump station
- Draining – Gravitational Flow and return to existing influent pump station

System Components:
Storage Tank Washdown System

Gravity Options

- Does not cover side wall
- Not recommended

Tipping Buckets

Center Bucket

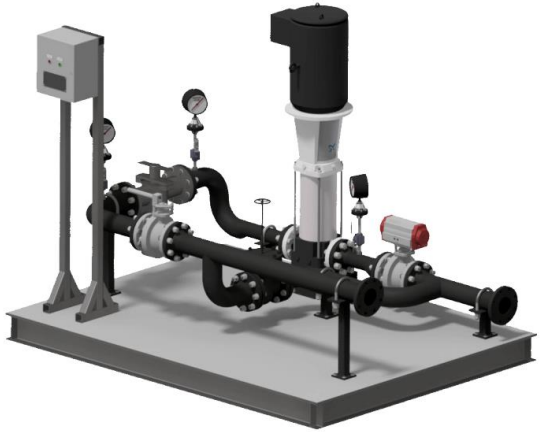
High Pressure Spray Nozzle

- **High-pressure nozzle system is recommended**
- Pressure at nozzle inlet = 126 psi
- Nozzle capacity = 146 gpm

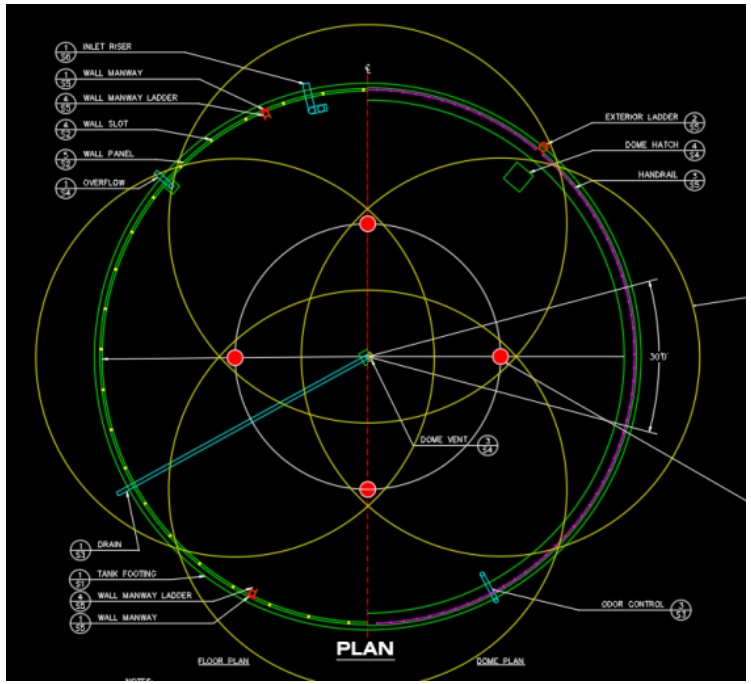
- Full tank coverage (floors and walls)
- High pressure wash-down system = full area of influence
- Constant wash and return rate = no pulsation
- Programmable and adjustable
- Low maintenance
- Requires booster pump station and control valves

System Components:
Storage Tank Washdown System

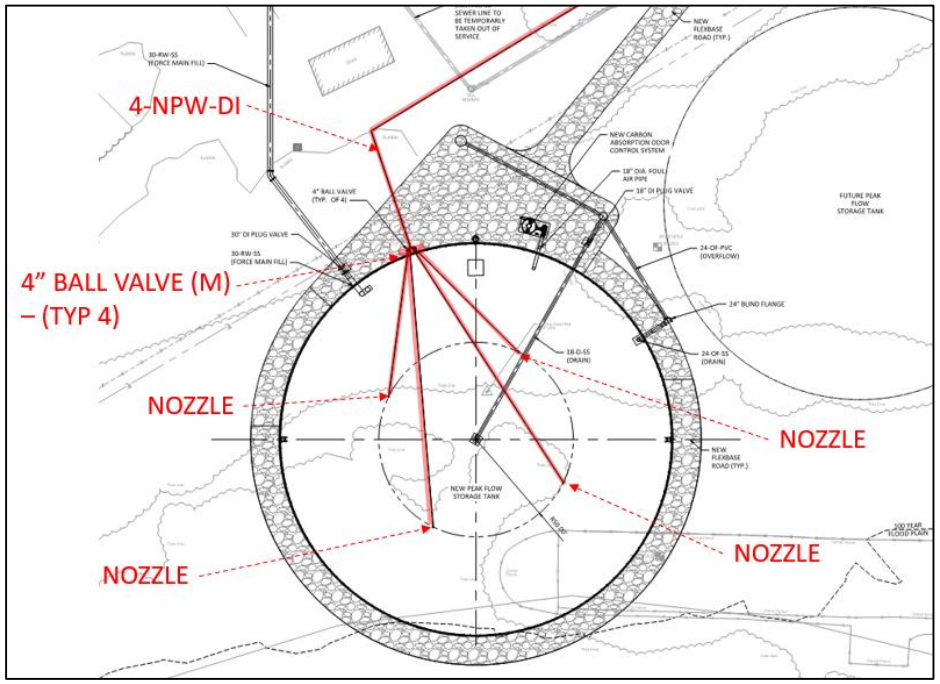
Booster Pump Station



- Connection at Filter Effluent Channel
- Maximum Design Flow – 250 GPM
- Maximum Design Pressure – 185 PSI
- Pump Power: 40 HP, 230/460 V, 60 Hz



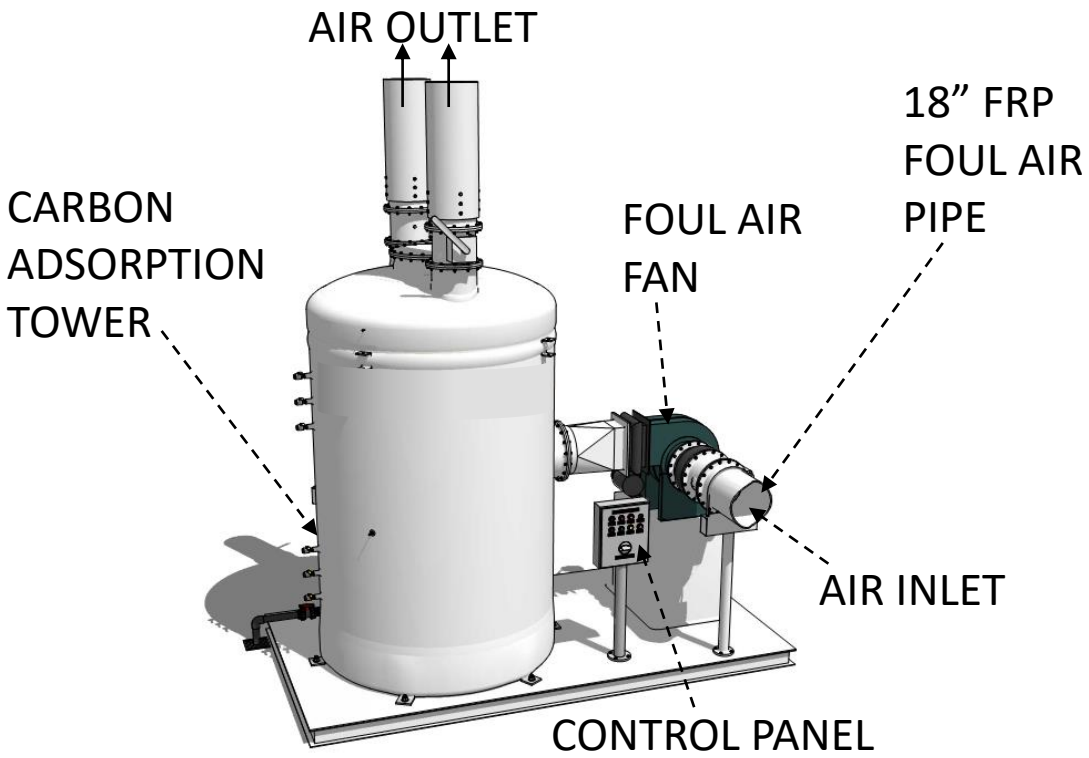
Nozzle Radius of Influence on Cleaning



NPW Piping Layout

System Components:
Storage Tank Odor Control

- Intermittent loading condition (~60 days/year)
- Biological technology is not recommended
- Physical-based carbon adsorption odor control technology is recommended



Design Considerations

- Design for airflow: 4,000 CFM
- Design H_2S Concentration: 10 ppm
- Carbon media life = 20 month (constant use)
- Estimated media life under intermittent use = ~ 10 years

Next Steps

- Estimated Project Cost = $13,000,000
- Schedule:
  - Completion of preliminary design – 1Q, 2020
  - Completion of final design – 4Q, 2020
  - Construction Phase – 24 months

Questions?