



# Surface Water Treatment Plant Disinfection Alternative Evaluation

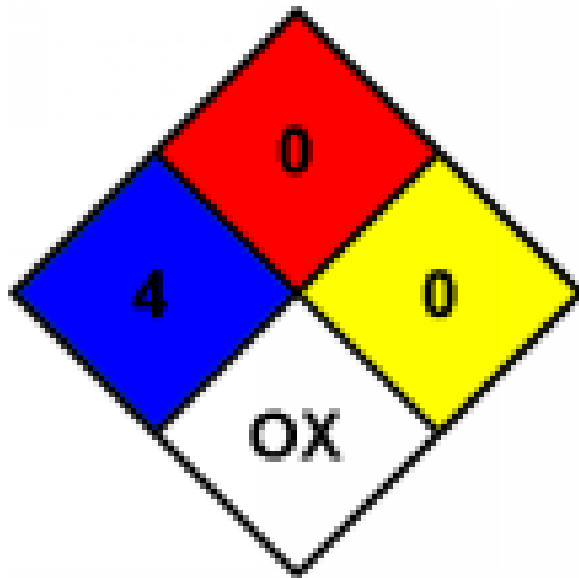
February 18, 2020

# Agenda

- Project Drivers
- Improvements Alternative Evaluation
- San Antonio Water System (SAWS) Visit
- Path Forward



# Project Drivers

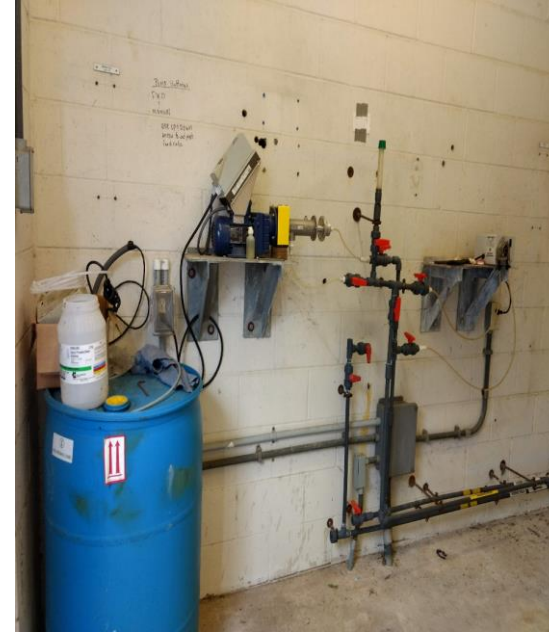


- Gas chlorine
- Rated 4 for health hazard, very short exposure could cause death or serious residual injury
- An oxidizer, increasing the rate of combustion/fire
- Require RMP and scrubber to handle potential leak
- Public safety concern during chemical transportation
- Operator safety during chemical handling and plant operation

# Existing Disinfection System



Chlorine Storage Room



Ammonia Feed Room



Chlorine Feed Room

# Project Goals

- Alternative disinfection technologies to improve operator safety with chemical handling
- Reduce potential chemical release (transportation and operation) and public exposure

# Disinfection Alternatives

- ChlorTainer Secondary Containment
- Bulk-Delivered Sodium Hypochlorite
- Onsite Hypochlorite Generation



# Alternative 1 – ChlorTainer Secondary Containment



- Gas chlorine is contained in a container
- Operation continues until gas chlorine is consumed
- Follow Standard Operation Procedure (SOP) after an event of leak
- Risk Management Plan (RMP) is still required

# Alternative 1- ChlorTainer Secondary Containment

## Pros

- Proven technology
- Produces stable product with long shelf life
- Easy to operate and maintain

## Cons

- Toxic hazardous gas and requires RMP
- High risk to operators from potential chlorine release when changing out ton cylinders
- High risk to public during chemical transportation
- Chemical price subject to market change
- Potential interruption on chemical supply chain due to natural disasters

# Alternative 2 – Bulk-Delivered Sodium Hypochlorite



- Commercially available 10% -15%, typically 12.5%
- Bulk storage tanks to meet 15-day onsite capacity
- Secondary containment
- New metering pumps
- Regulated as hazardous substance (safety and health program, hazard communication program, spill containment program, etc.)

# Alternative 2- Bulk-Delivered Sodium Hypochlorite

## Pros

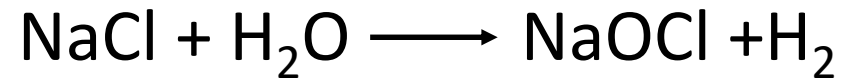
- Proven technology
- Does not require RMP
- Easy to operate and maintain (similar to other chemical storage and feed systems used at the plant)

## Cons

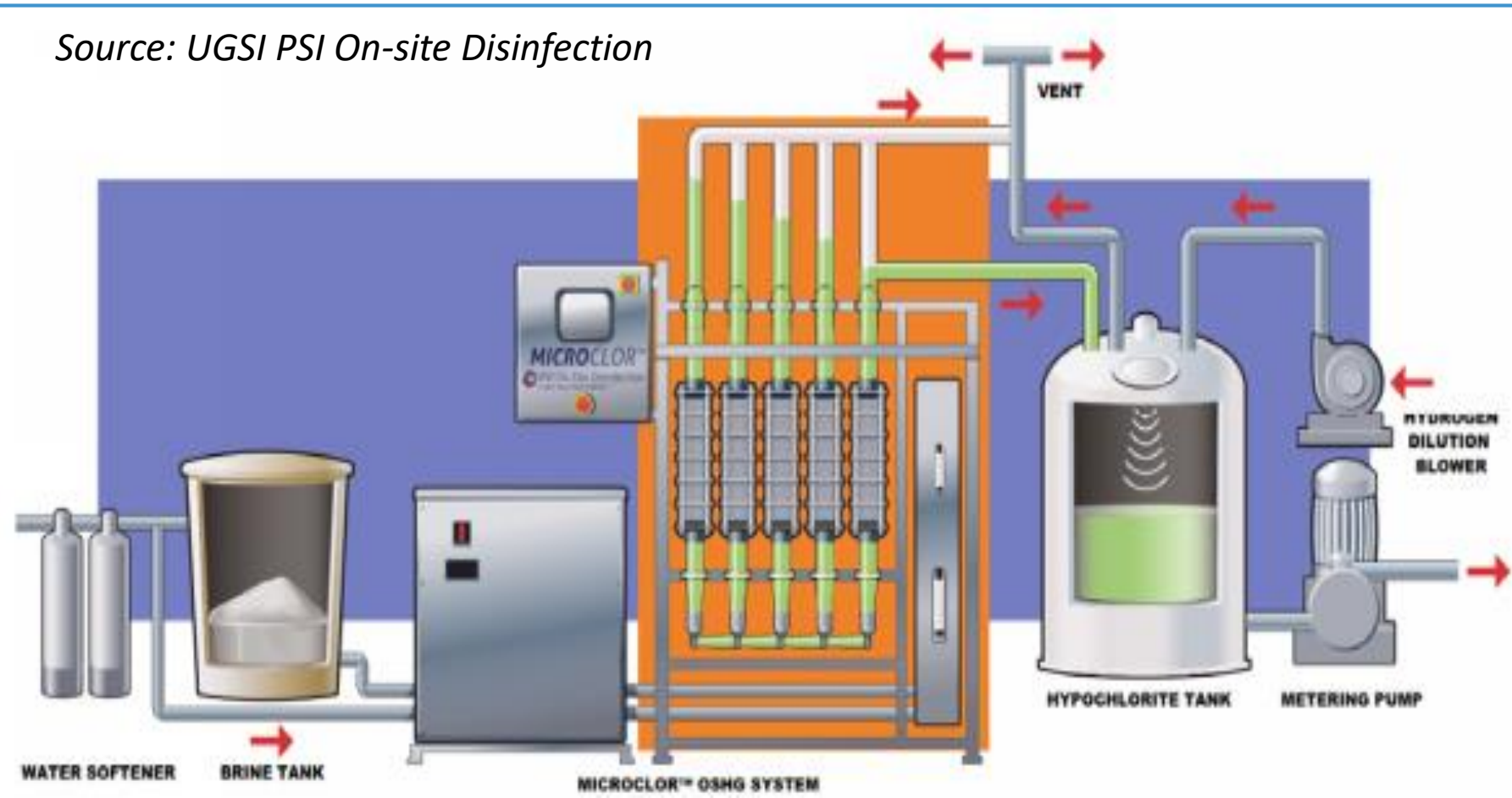
- Reduced shelf life from chemical degradation
- Potential leads to inefficient disinfection not meeting residual goal; Requires operator attention to adjust feed rates to offset
- Corrosive oxidant and require chemical safety programs
- Potential risk from chemical spills or inadvertent mixing with other chemicals resulting in undesired reaction
- Piping clogging, crystallization, and offgas issues
- Chemical price subject to market change
- Potential interruption on chemical supply chain due to natural disasters

# Alternative 3 – Onsite Hypochlorite Generation

- Low strength 0.8%
- On-site Hypochlorite Generation Recipe: water, salt, and power



*Source: UGSI PSI On-site Disinfection*



# Alternative 3- Onsite Hypochlorite Generation

## Pros

- Proven technology
- Produces consistent product concentration onsite
- Low strength (0.8%) hypochlorite with least risk
- No storage of highly hazardous chemicals on site
- Does not require RMP
- Reduces plant chemical delivery traffic

## Cons

- Hydrogen gas byproduct requires dilution before venting outside
- Relatively new to operator; requires training
- Troubleshooting may involve mfr. support
- Requires cell PM cleaning

# Comparison



System Reliability	<ul style="list-style-type: none"> <li>Stable product with long shelf life</li> </ul>	<ul style="list-style-type: none"> <li>Limited shelf life due to product degradation</li> <li>Potentially lead to ineffective disinfection not meeting residual target</li> </ul>	<ul style="list-style-type: none"> <li>Produce consistent product concentration and high-quality disinfection product</li> </ul>
Safety Considerations (Public, Operator etc.)	<ul style="list-style-type: none"> <li>Toxic hazardous gas</li> <li>High risks during transportation</li> <li>Require RMP</li> </ul>	<ul style="list-style-type: none"> <li>Corrosive oxidant</li> <li>High risks during transportation</li> <li>Potential risk due to spill or inadvertent mixing with other chemicals</li> <li>No RMP but OSHA Chemical Safety Program</li> </ul>	<ul style="list-style-type: none"> <li>No storage of highly hazardous chemicals</li> <li>Least risk due to lower concentration of hypochlorite product</li> <li>Require venting of H2</li> </ul>
O & M Considerations	<ul style="list-style-type: none"> <li>Easy to operate and maintain</li> </ul>	<ul style="list-style-type: none"> <li>Easy to operate and maintain</li> <li>Potential equipment and piping clogging, crystallization and off-gassing</li> <li>Require softened water if dilution is required</li> <li>Potentially require adjustment on feed rates to offset chemical degradation</li> </ul>	<ul style="list-style-type: none"> <li>Require operator training</li> <li>Troubleshooting may involve mfr. assistance</li> <li>Require cell PM cleaning</li> </ul>

# Preliminary Life Cycle Cost Analysis (LCCA)

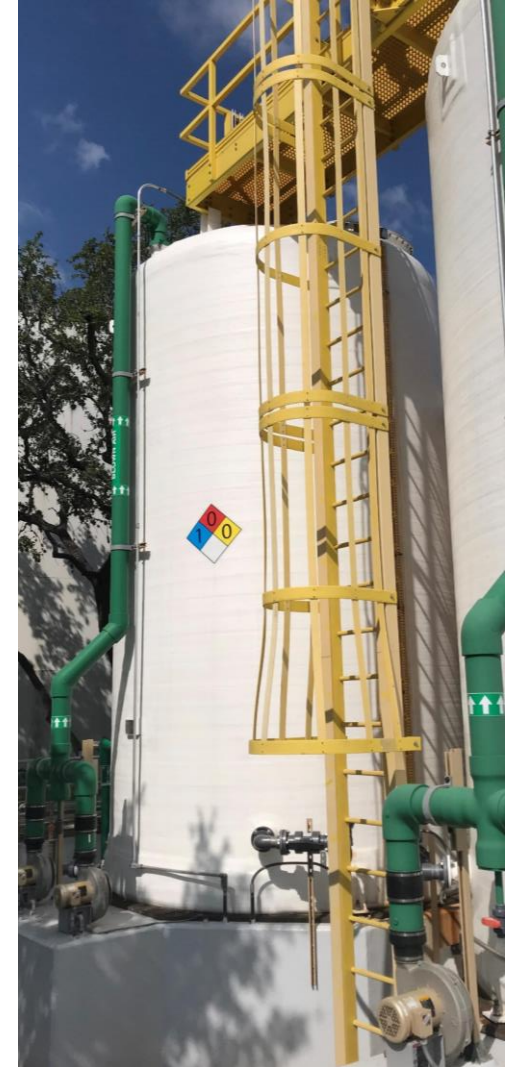
			RECOMMENDED OPTION FOR IMPROVEMENTS
Item	Alternative 1	Alternative 2	Alternative 3
	Gas Chlorine with ChlorTainer	Bulk Delivered Sodium Hypochlorite	Onsite Hypochlorite Generation
Capital Cost	\$2,023,000	\$1,096,000	\$2,543,000
Annual O& M Cost	\$43,000	\$55,600	\$33,500
20-Year Net Present Value	\$2,724,000	\$2,007,000	\$2,993,000

# Research of other Water Systems Switching to OHSB

Site Name	State	Plant Capacity/OHSB System Capacity	System Replaced	Startup Date
Otay WTP	San Diego, CA	34 MGD/2, 1,000 PPD skids	Chlorine Gas	2011
Hendersonville WTP	Hendersonville, TN	10 MGD/2, 300 PPD skids	Chlorine Gas	2014
Blackman WTP	Springfield, MO	52.5 MGD/3, MC-1500	Chlorine Gas	2013
Daphne WP	Daphne, AL	100 PPD	New Water Plant	2009
Vacaville WP	Vacaville, CA	12MGD/1, 400 PPD Skid	Chlorine Gas	2014
Olivehain WP	Encinitas, CA	34 MGD/1, 2,400 PPD Skid	Chlorine Gas	2014
Austin WTP 4	Austin, TX	50 MGD/ 3, 1,500 PPD Skids	New Water Plant	Aug-15
SAWS Marbach PS	San Antonio, TX	2, MC-500	Chlorine Gas	Nov-16
SAWS Maltsberger PS	San Antonio, TX	2, MC-800	Chlorine Gas	Sep-16
SAWS NACO PS	San Antonio, TX	2, MC-1200	Chlorine Gas	Aug-16
SAWS Wurzbach PS	San Antonio, TX	2, MC-1000	Chlorine Gas	Feb-17

# SAWS Visit

- Concerns over Operator safety
- Increasing levels of regulation
- A good-neighbor ethic



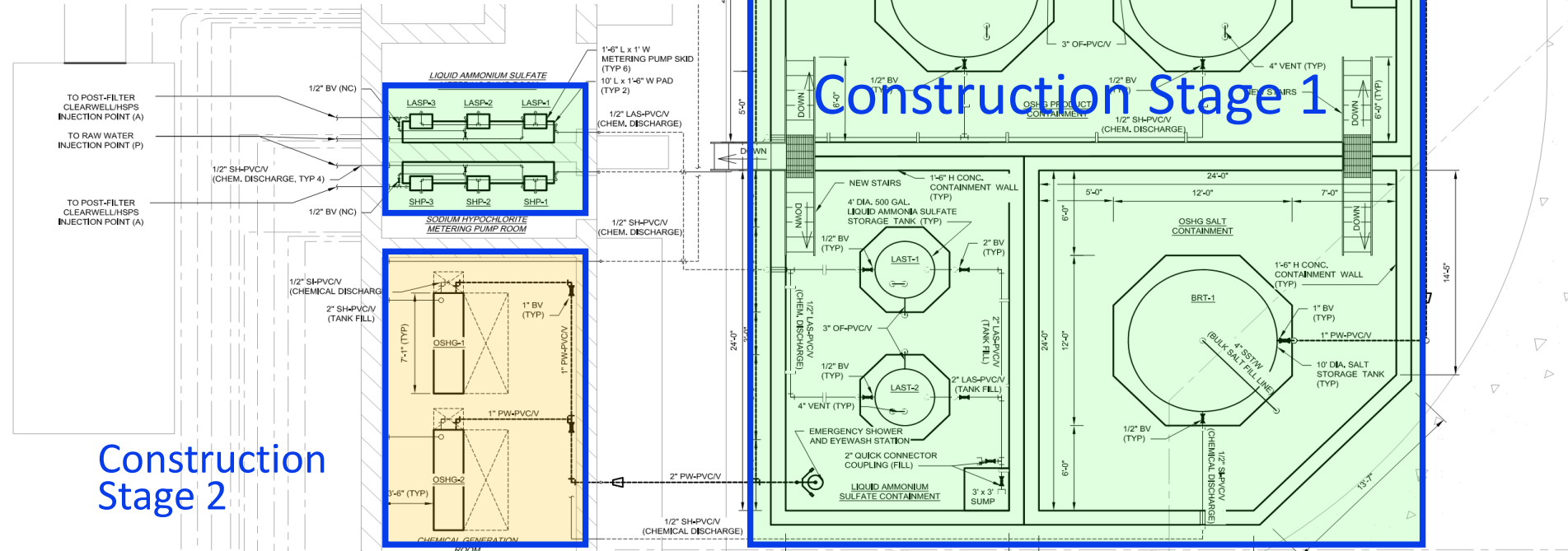
# Path Forward

# Proposed Disinfection System Improvements

- Furnish and install two 200 ppd on-site hypochlorite generator units, with brine storage tank, hypo tanks, metering pumps, blowers, and auxiliary components
- Modify existing chlorine building to enclose current chlorine room, new door, HVAC improvement, hydrogen piping roof penetration etc.
- Replace aqua ammonia storage and feed system with new liquid ammonium sulfate system
- Electrical, instrumentation and control, and SCADA integration to accommodate new system
- Chemical containment, metal railing, etc.
- Yard piping, and site civil improvements for chemical unloading

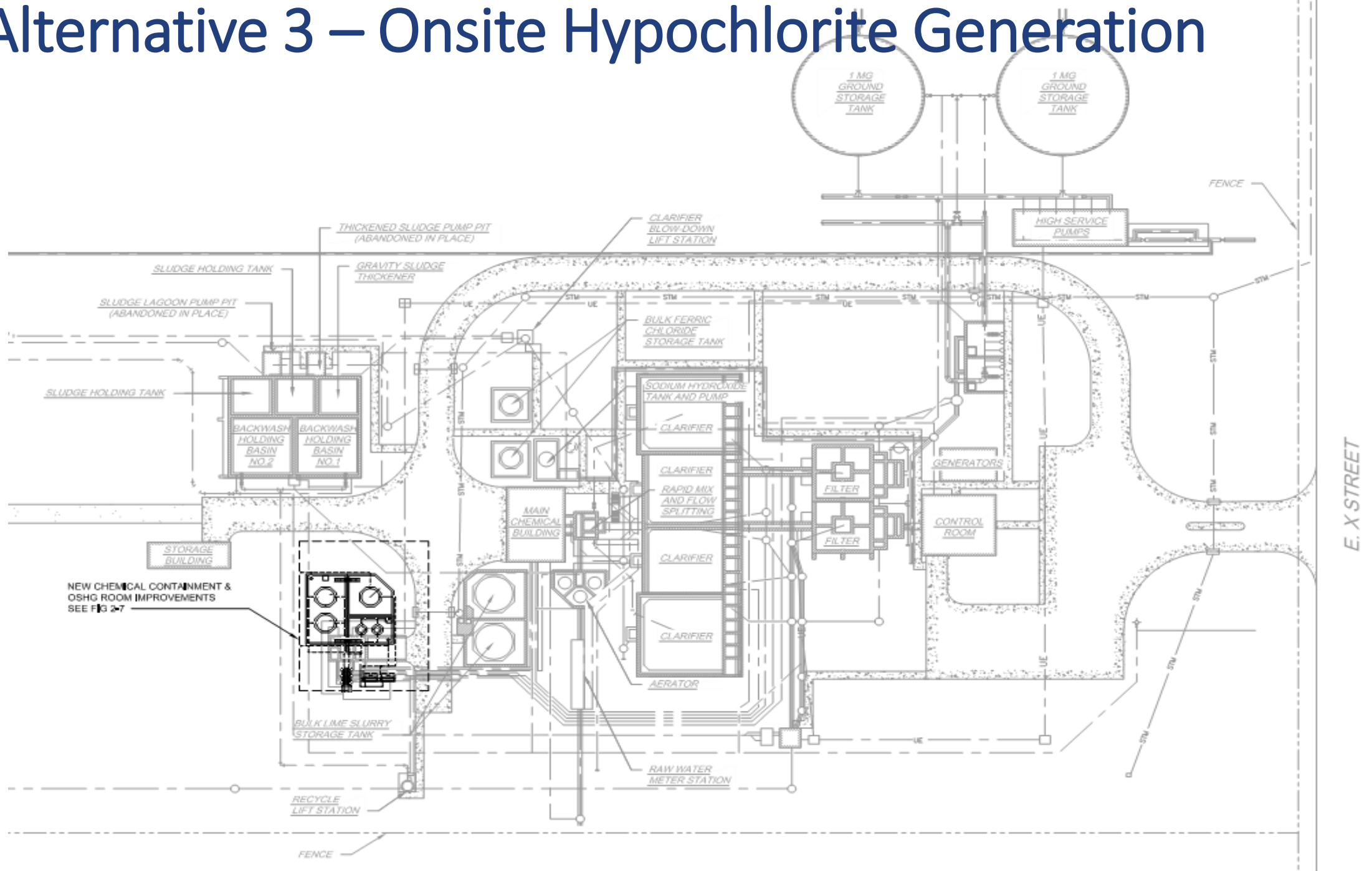


- Two product solution tanks
- Two generators
- Three metering pumps
- Repurpose  $\text{Cl}_2$  storage room for hypo generators
- MOPO consideration: limited impact with proper construction staging



# Alternative 3 – Onsite Hypochlorite Generation

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# Questions?