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A Success Story in Executing Fast-Paced Water System Improvements in Missouri City, Texas

APWA SE Branch – Monthly Mtg

Nicholas Cook (Missouri City, TX)
Mike Halde, PE (HR Green)
Gabby Mejia, EIT (HR Green)

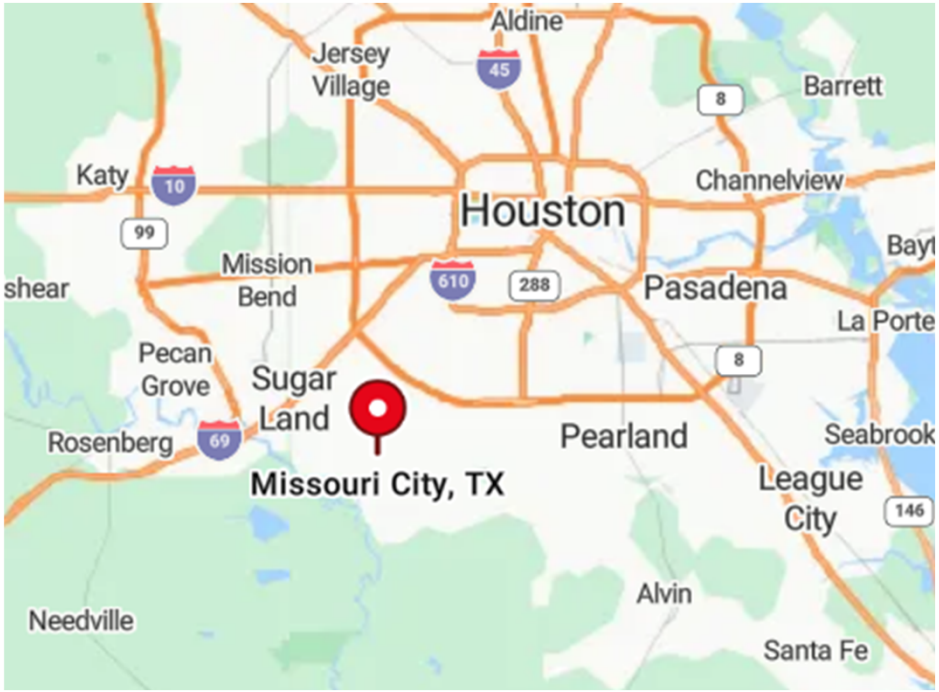
Agenda

1. Project Overview
2. TCEQ ACR and Permitting
3. Groundwater Supply
4. Project Execution: Water Plant #1 & #2 Improvements
5. Stakeholder Coordination & Future Strategy
6. Key Takeaways

Project Overview

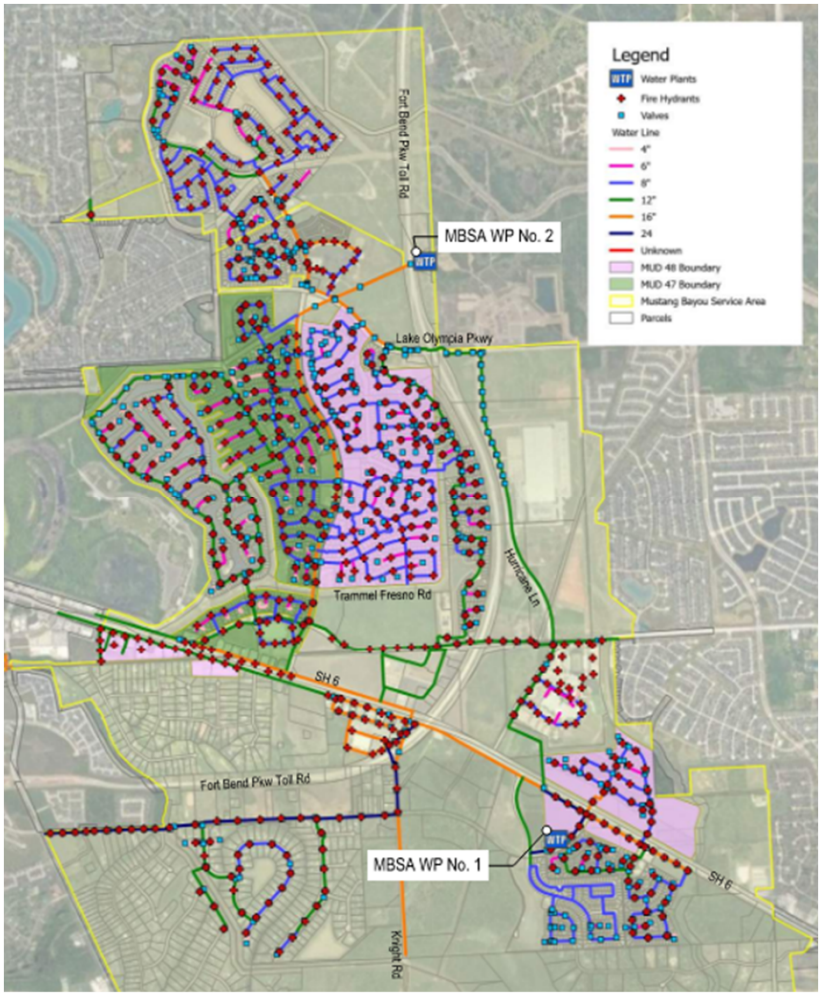
Missouri City, Texas

- Location in Fort Bend County
- Population: ~77,000 and growing
- Area: ~30 square miles
- Rapid growth → Demand on Infrastructure
- Services Area – Steep Bank/Flat Bank, Mustang Bayou, Sienna.



Missouri City Water System Overview

- Serves City, MUD 47 and MUD 48 water systems
- Emergency water supply from MUD 23 (two-way)
- Quail Valley Utility District - Operator
- Water Plant No. 1 (WP1)
  - Groundwater well (~2,100 gpm to 2,700 gpm)
  - 1 GST, 2 HPTs, and 5 booster pumps
- Water Plant No. 2 (WP2)
  - Groundwater well (~1,100 gpm)
  - 3 GSTs, 2 HPTs, and 5 booster pumps



Missouri City Project Timeline

Today's presentation includes this case-study

2024

2024 ACR: 4,755 increased to 5,333 connections

2025

Water Plant #1 Upgrade
Pumping Capacity: **29% ↑**
2025 ACR: 6,333 connections

2025 – 2027

Water Plant #2
New 2,600 gpm well
New ground storage tanks

2029

New 1-MG elevated storage tank and
New surface water transmission lines

TCEQ ACR Study and Permitting

TCEQ Alternative Capacity Requirement (ACR)

- TCEQ Chapter 290, Subchapter D, Section 45 – Capacity Rules for PWS
- What is an ACR?
  - Public Water System (PWS) specific capacity exception
  - Established different capacity for a PWS – usually lower than the Rule
  - For example, 0.4 gpm/conn of well capacity in lieu of required 0.6 gpm/conn
  - ACR rules noted are in Section 290.45 (g)
  - Who is eligible for an ACR?

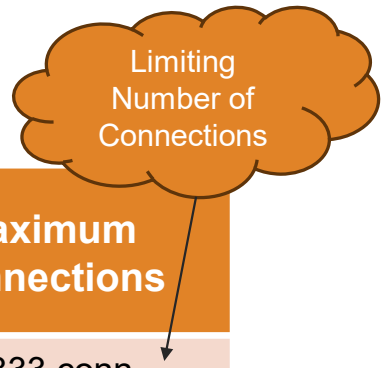
TCEQ ACR for Elevated Storage Tank

- Systems with > 2,500 connections must provide 100 gallons per connection of elevated storage
- ACR allows intermediate alternative methods instead of elevated storage
- Must meet TCEQ pressure & reliability requirements
- Capacity is based on number of existing and future connections

ACR Submittal Package

- ✓ Detailed inventory of:
  - Water production
  - Storage
  - Pressure
  - Booster pumps
  - Emergency power
- ✓ 36 months of system production data
- ✓ Monthly active connection counts
- ✓ Hydraulic modeling and system evaluation signed and sealed
- ✓ Emergency Response Plan

Desktop Study – Water System Capacity Calcs



Component	TCEQ minimum based on 30 TAC §290.45(b)(1)(D)	Existing Capacity Provided (4,832 connections)	Maximum Connections
Well Supply	0.60 gpm/conn	0.66 gpm/conn	5,333 conn
Storage Tanks	200 gal/conn	285 gal/conn	6,880 conn
Hydropneumatic Tanks	11.94 gal/conn	16.56 gal/conn	6,699 conn
Booster Pumps	0.96 gpm/conn	1.76 gpm/conn	8,848 conn
Emergency Power	Required for production/pressure maintenance during outage	950 kW total	N/A

Desktop Study – ACR Supporting Calcs for Pressure Maintenance

MDD (in gpm) =	2,509 gpm
Connections (at time of MDD) =	4,832 conn
MDD per Connection =	0.52 gpm/conn
Required Capacity per Connection =	0.60 gpm/conn
Safety Factor =	1.15
Equivalency Ratio =	0.995
Minimum Capacity Requirement =	12.0 gal/conn
Alternative Capacity Requirement (ACR) =	11.94 gal/conn
Existing Capacity Provided =	16.56 gal/conn

Fire Hydrant Flow Test

- Conducted field hydrant flow testing at 15 locations throughout the service area.
- Measured static pressure, residual pressure, and flow rates.
- Used test results to calibrate the WaterGEMS hydraulic model.
- Calibration results within 0–3.5 psi of field measurements

Fire flow testing Images

Model Scenarios

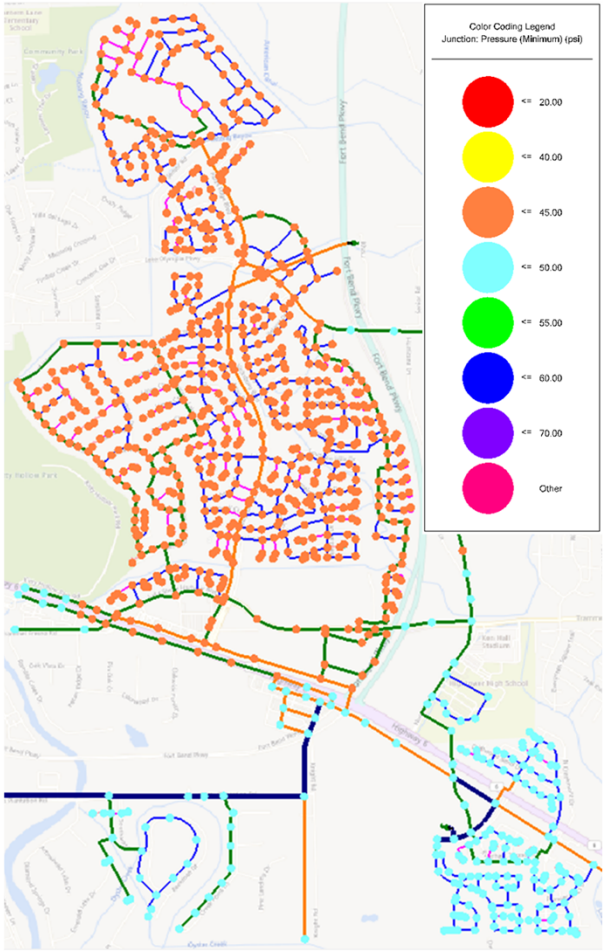
- **Average Daily Demand (ADF)** – normal daily operations
- **Maximum Daily Demand (MDD)** – highest daily demand conditions
- **Peak Hour / Power Loss** – pumps offline before generator startup
- **Emergency Operations** – system on generator power only
  - TCEQ required 0.35 gpm/conn

Hydraulic Model Results Summary

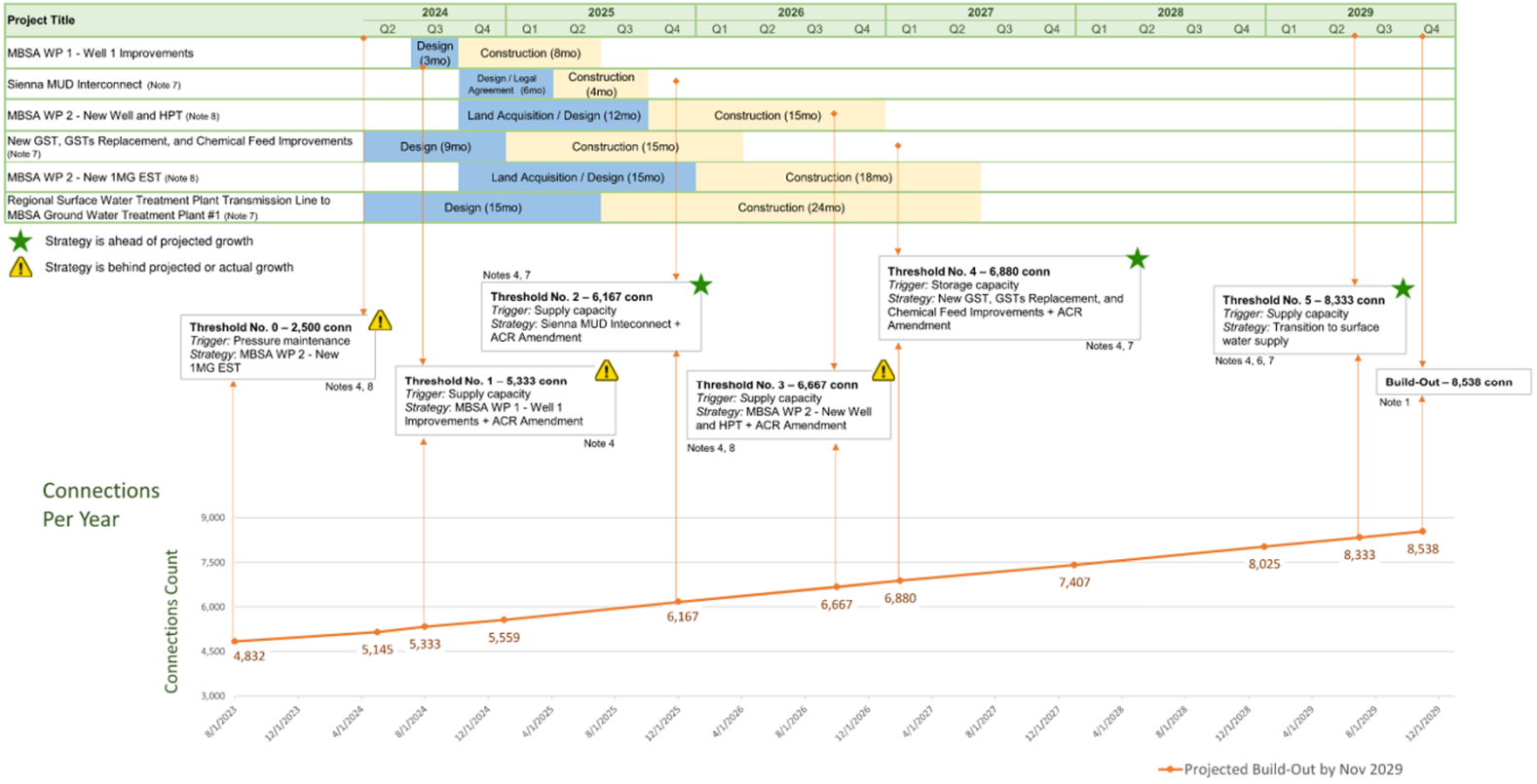
Scenario No.	Scenario Description	Condition Evaluated	Lowest Pressure (psi)
1	Existing System ADF	Normal Operations	55
2	Existing System MDD	Maximum Day Demand	47.9
3	Existing System 0.35 gpm/conn	Emergency Power	63
4	Existing System 1.5 gpm/conn	Peak Demand	57.6
5	Maximum System ADF	Normal Operations	53.1
6	Maximum System MDD	Maximum Day Demand	47.5
7	Maximum System 0.35 gpm/conn	Emergency Power	62.9
8	Maximum System 1.5 gpm/conn	Peak Demand	56.3

Results of ACR Study

- Meets TCEQ requirements
- Pressures maintained (>35 psi normal / >20 psi emergency)
- First Phase – Capacity ↑ from 4,755 to 5,333 connections
- Limiting factor: Available well production capacity
- EST project removes ACR need



Longer Term Plan



Groundwater Supply Feasibility Study

Feasibility Study Goals

- Find capacity within 12 months (min. 500 gpm)
- On-site water source
- Same water quality (i.e. disinfection treatment)
- Use existing site footprint and infrastructure

Alternative Analysis

Alternative	Project Description	Preference
1	New well at same site (same aquifer, allowing simultaneous operations)	
1A	New well at same site (same aquifer, no simultaneous operations)	
2	New well at same site (deeper aquifer)	
3	New well at different site (same aquifer)	
4	Upsize well production (pump upgrade)	

Selected Alternatives – Well Improvements

- Upsize existing well pump at Water Plant #1
  - Capacity increase: 2,100 gpm → 2,700 gpm
  - Benefits: Low cost, fast implementation, and immediate capacity increase
- New well at Water Plant #2
  - Capacity increase: 1,100 gpm → 2,100 - 2,600 gpm
  - Benefits: Same site, provides partial back up supply, and relatively faster execution

Project Execution: Water Plant #1 Improvements

WP #1 Improvement Project

- Goal: Increase groundwater production while maintaining service

Phased Implementation

Phase 1 – Temporary rental pump and disinfection system improvements:

- Validate well performance
- Successful results utilized to order pump and apply for ACR
- 36-hour test
- LAS & Chlorine treatment
- Cost: $305,000

Phase 2 – Permanent installation:

- Wire-brush cleaning
- Long-term production increase
- Cost:$410,000

Phase 1: Regulatory Approval

- Submitted to TCEQ:
  - Emergency Authorization Request tied to low demand period
  - Existing site photos
  - Well testing and rental pump specifications
  - Chemical feed improvement plans & calculations
  - ACR 2024 Approval
- Outcome: TCEQ approved the temporary 2,600 gpm rental pump and temporary chloramine system upgrades approved in 4 days.

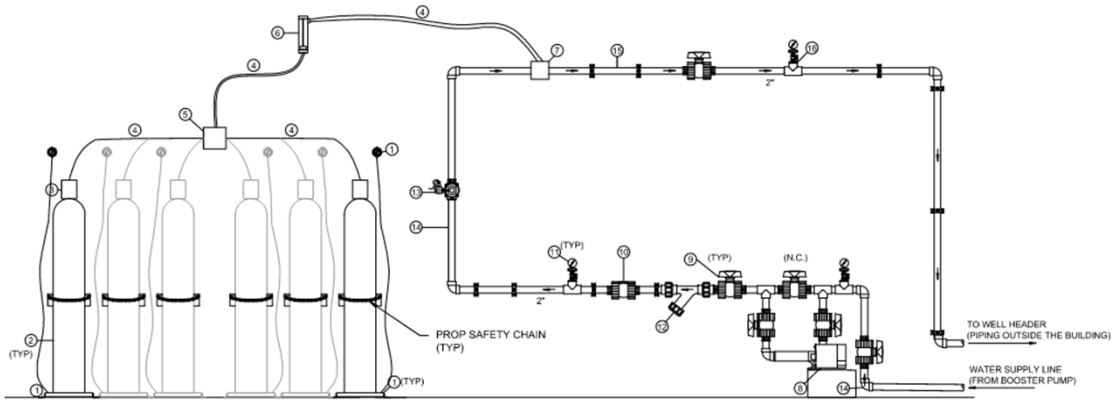
Phased 1: Expansion of Chemical Feed System

Chlorine

- Chlorine system expanded from 4 cylinders to 6 cylinders
- Additional cylinder scales
- New automatic switchover system, ejector and rotameter, chlorine booster pump, chlorine gas cabinets (250 ppd to 500 ppd)

LAS

- Upsized the bulk storage
- Increase feed piping size using same injection points
- Upsized the metering pump



Phase 1: Rental Pump Design

- Same pump setting depth, increased flow – so new TDH and Flow
- Target flow: ±2,600 gpm
- Upsized the column pipe (10 in to 12 in)
- Site power used since it used the same 300 HP needed

Phase 1: Rental Pump Testing

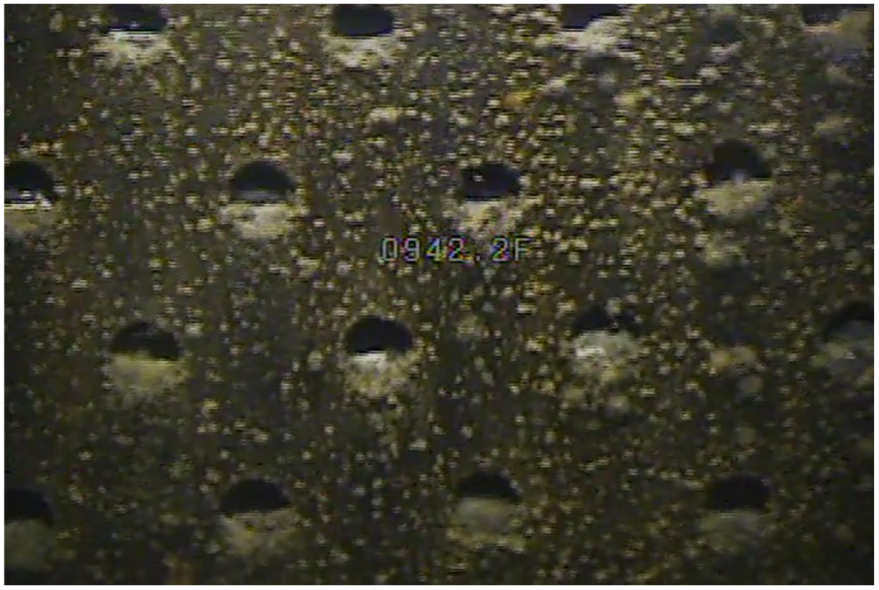
- **Video Survey** - Assessed existing well condition.
- **Short term test (2-hr)** – Evaluated drawdown, specific capacity, sand production, motor loading, and pumping performance at increased flow rates.
- **36-hour Test** – Evaluated long-term aquifer response, drawdown, specific capacity, and sustainable well production at approximately 2,600 gpm.
- **Water Quality Report** - Collected Type A and Type B samples for water quality evaluation.

Phase 2: Permanent Pump Sizing

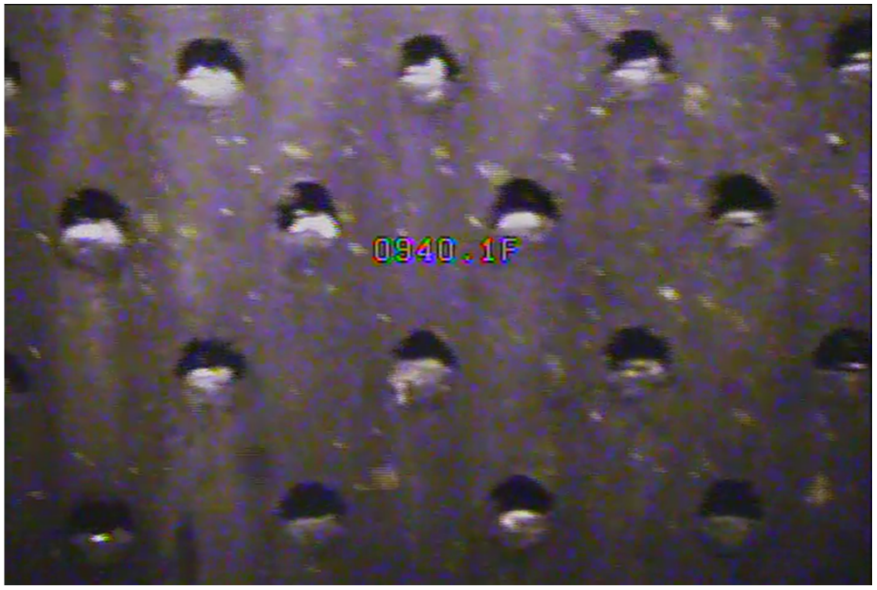
- Video survey confirmed the well was in good condition.
- Short-term testing verified increased pumping rates did not generate any sand.
- A 36-hour pumping test demonstrated sustainable production at 2,600 gpm.
- Intera evaluated future drought conditions, aquifer response, and total dynamic head requirements.
- Multiple pump operating points were reviewed while maintaining the existing 300 HP motor.
- A permanent 2,700 gpm pump was selected as the optimal balance between increased production and avoiding major electrical upgrades.

Phase 2: Video Surveying and Cleaning

Before Cleaning



After Cleaning



Phase 2: Pump Installation and Testing

- Pump and column pipe installation
- Disinfection of Well
- BAC-T testing
- Short-term performance testing


Column pipe


Strainer


Pump

How Did We Accelerate Project Delivery?

ARPA Funding

Emergency Interconnect

Procurement through interlocal agreement

Accelerated TCEQ approvals

Construction duration 6-month (Nov 25' – April 26')

Operational Considerations During Construction

- Emergency interconnect use
- Coordinate operations between water systems
- Notify customers
- Maintain system pressure during targeted flushing
- Monitor disinfectant residuals (chlorine vs chloramine)

Project Results

- +600 gpm well production increase
- Increased disinfection treatment capacity
- Supported 1,000+ new connections (ACR w/ temporary rental pump)
- Maintained compliance
- Zero service interruptions

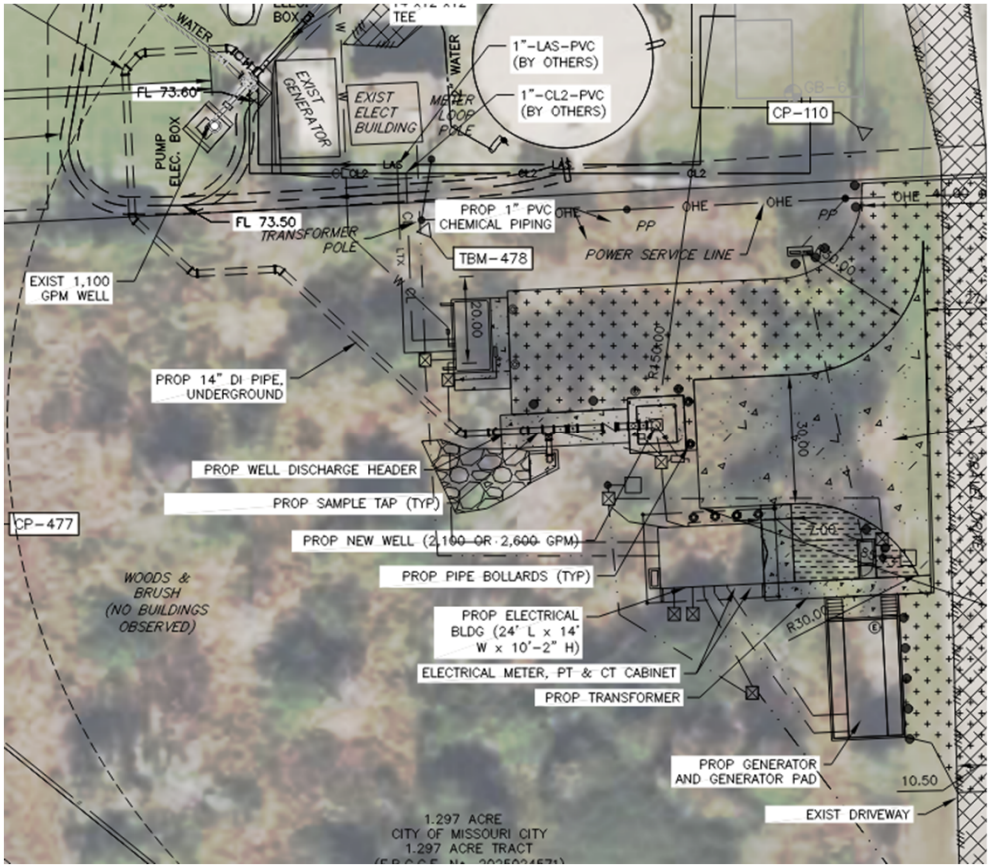
Project Execution: Water Plant #2 Improvements

WP #2 Improvement Project

- Goal: Increase production capacity

Project Details

- Construct a new groundwater well
- Increase production capacity up to 2,600 gpm (Alternative design 2100 and 2600 gpm)
- Maintain the existing well as a backup supply source
- Expand the WP#2 site onto newly acquired property
- Provide new electrical service and generator
- Two (2) new buildings – electrical and temporary disinfection system
- Temporary disinfection system – LAS & CL2-gas



Stakeholder Coordination and Future Strategy

Stakeholder Coordination

- **Regional Collaboration**: Unified service through Regional Joint Water Facilities Agreements between the City and MUDs
- **Operational Resiliency**: Trial-testing and utilizing emergency interconnects with FB MUD #23 during construction
- **Water Quality Management**: Targeted Flushing, Proactive Communication to Customers, and Enhanced monitoring during disinfection residuals conversion

Ongoing and Future Projects

Ongoing Improvements (Design Phase)

- New groundwater well at Water Plant #2
- Ground storage tanks and disinfection upgrades
- Surface Water Transmission Line

Future Projects

- Elevated storage tank Improvements

Key Takeaways

Key Takeaways

- Hydraulic modeling supports long-term planning
- TCEQ ACR - an interim solution
- Phased implementation reduces project risk
- Stakeholder partnership & coordination is critical
- EST is ultimately required

APWA - 2026 Project of the Year

Questions?

Nicholas Cook
Direct 281-403-8573
nicholas.cook@missouricitytx.gov

Gabby Mejia, EIT
Direct 346-439-9661
gabriela.mejia@hrgreen.com

Mike Halde, PE
Direct 713-338-8015
mhalde@hrgreen.com