

# Turnkey Performance Based Contracting Using Less Disruptive, More Efficient, Remedial Strategies

Presented by:



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EN Rx Inc.

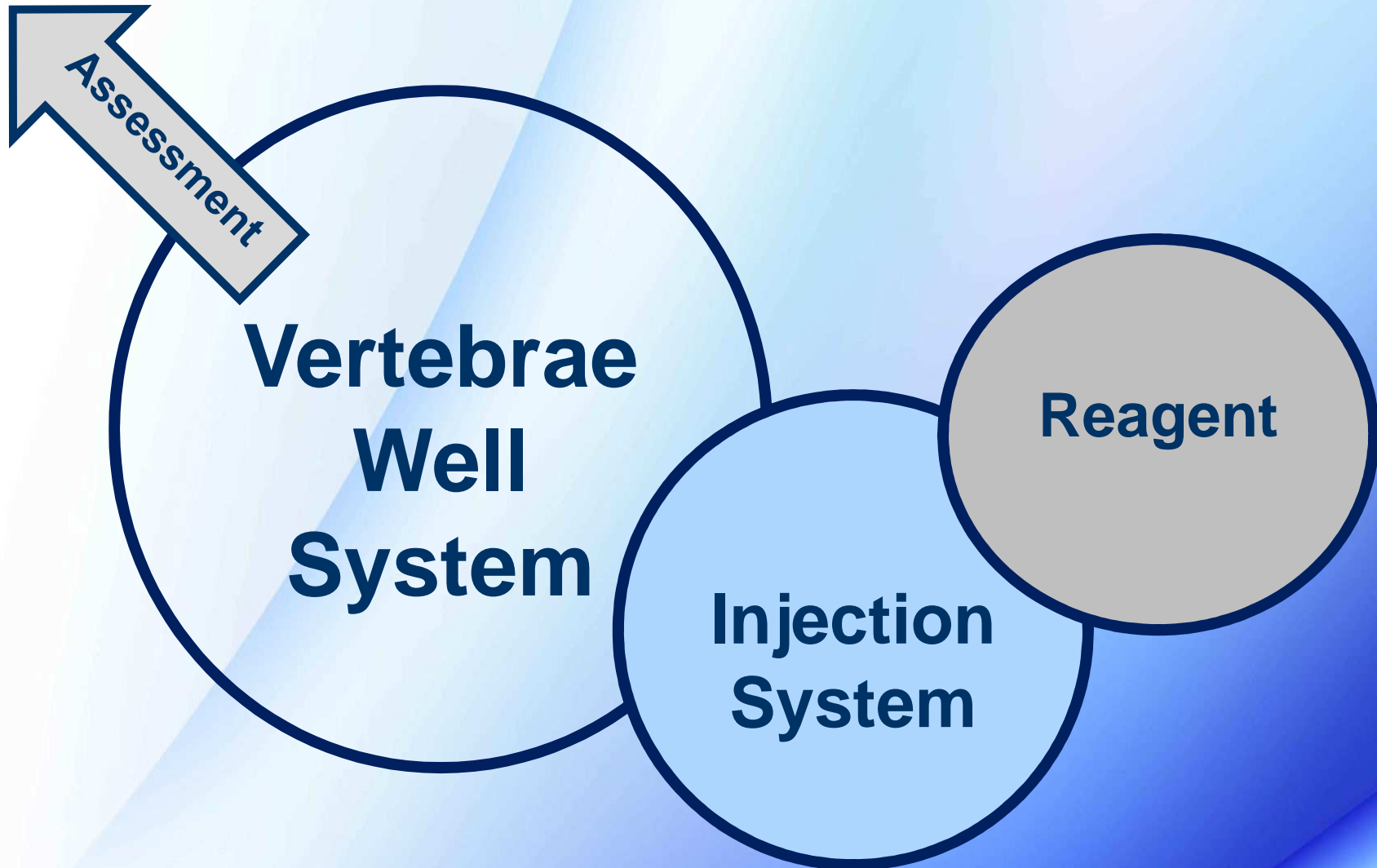


# The EN Rx Solution

- 3 State-of-the-art tools
  - Tools work in all phases.
  - Intune with our performance standards
- Provide turnkey full function remedial options
  - Streamline the process.
- Offer a Performance Based Remediation
  - Payment can be based on the goals



# The EN Rx Solution



# Primary Tools

- Vertebrae™ Well System

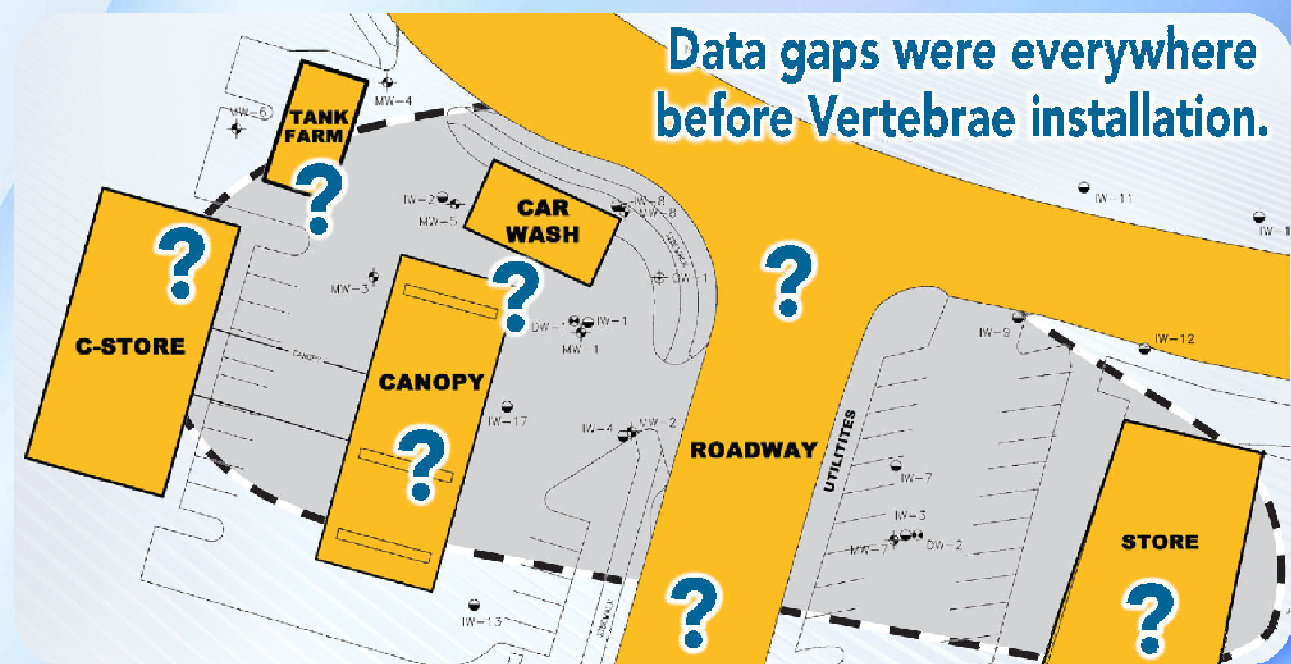
- **A Multi Function, Multi Well System**

- A segmented and isolated set of permanent subsurface wells oriented horizontally that operate as traditional wells.
      - Custom construction – Typically 1.5” OD
      - Length and number of screened sections & spacing
    - Treatment use **but the modifications and advances allow Sampling/Assessment**

# Sampling/Assessment Advances

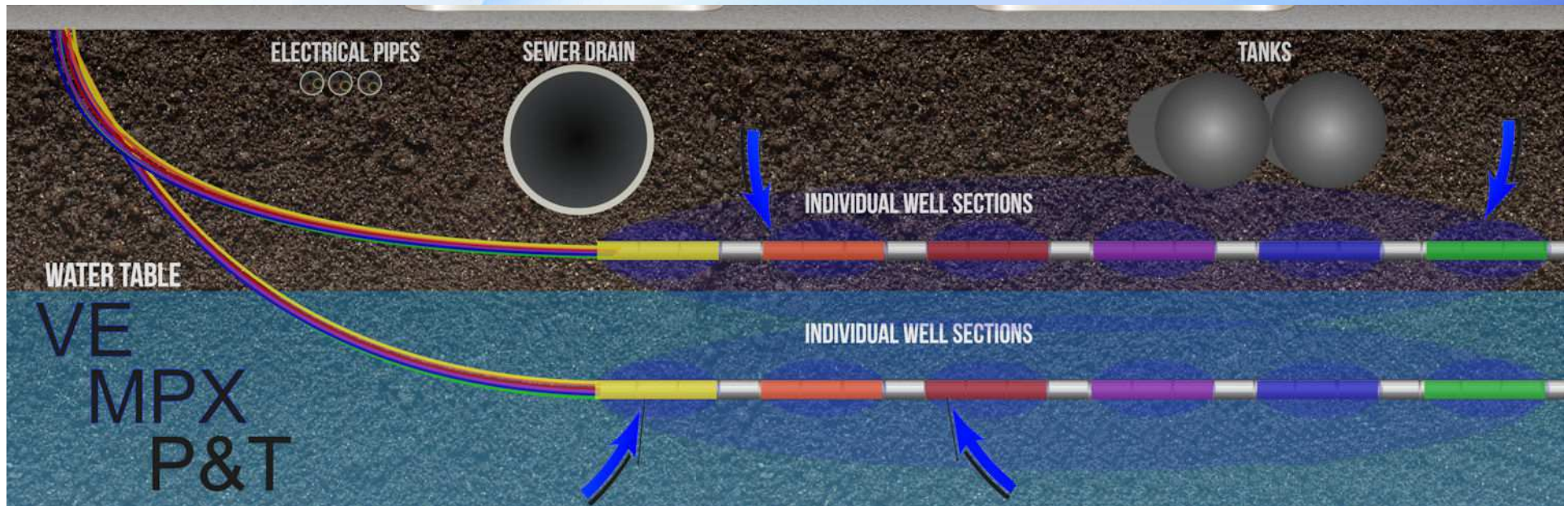
- Define the plume and addresses data gaps
  - Under tanks, fuel lines, dispensers, and canopies
  - Under pipelines, railways, etc.
  - Under buildings, busy parking lots, in ROW or under road ways
  - Under utilities below grade or when over head
  - Under wetlands, ponds, lakes, or on boggy or rough terrain.

**OFTEN  
THE  
DATA  
GAP IS  
THE HOT  
SPOT**



# If it is horizontal, where does it go?

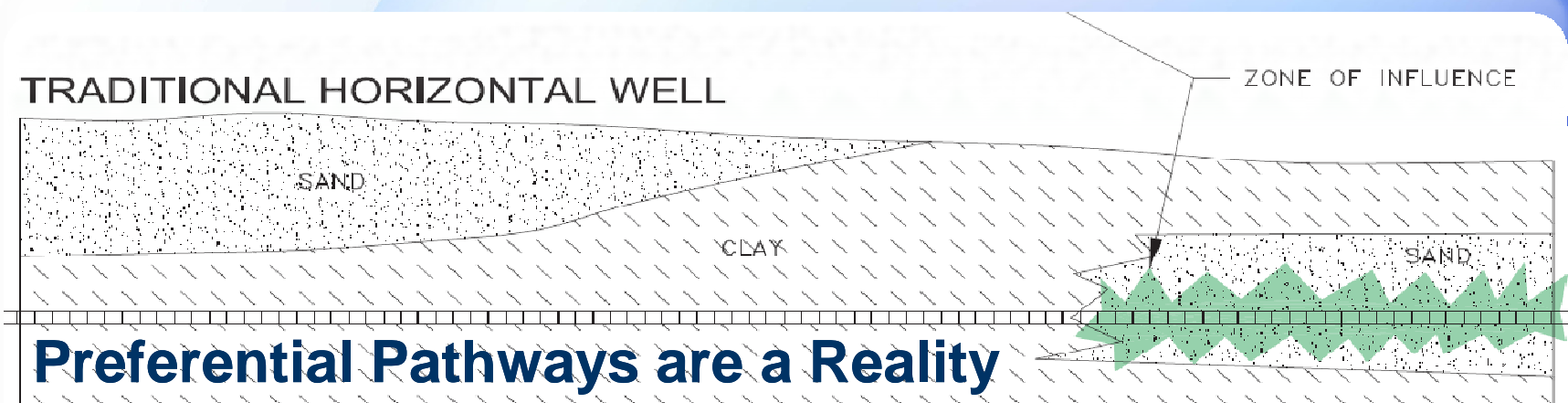
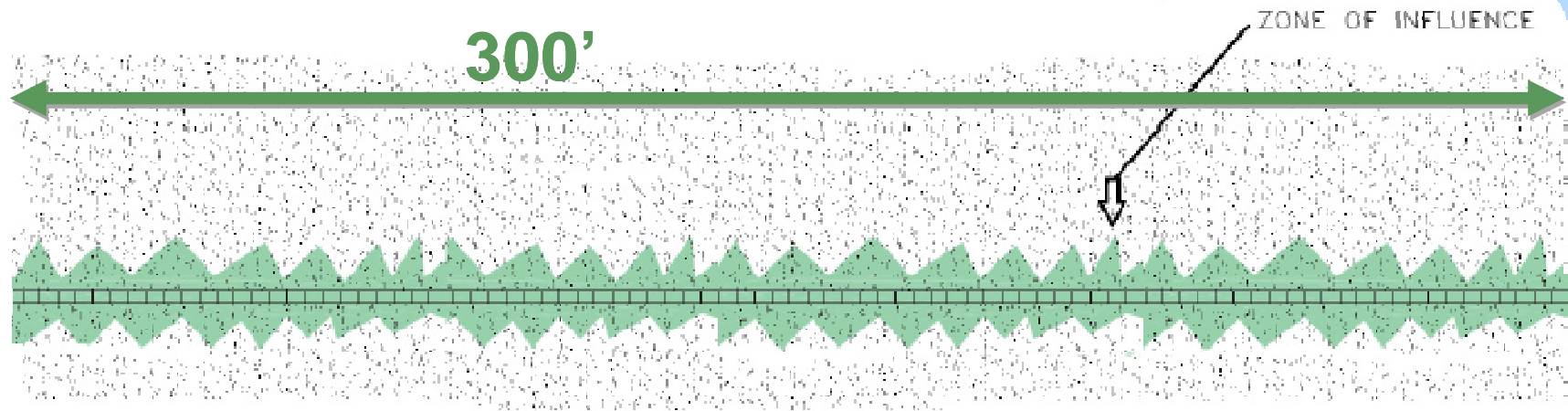
- Vertebræ™ is installed via Horizontal Directional Drilling (HDD) and can be installed
  - Above the water table for:
    - Soil gas sampling
    - vapor intrusion
    - SVE
  - At the water table for:
    - GW Sampling
    - P & T
    - Injection Technologies
    - Deep for air sparing (**single use**)





# Why Does Discrete Matter?

## Existing Technology Design VS Reality

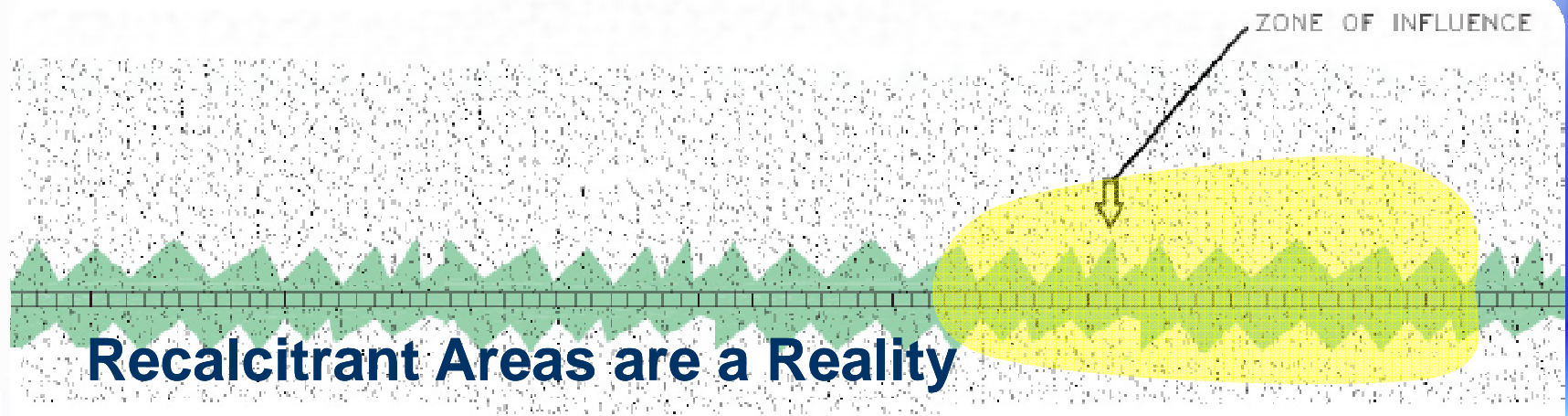
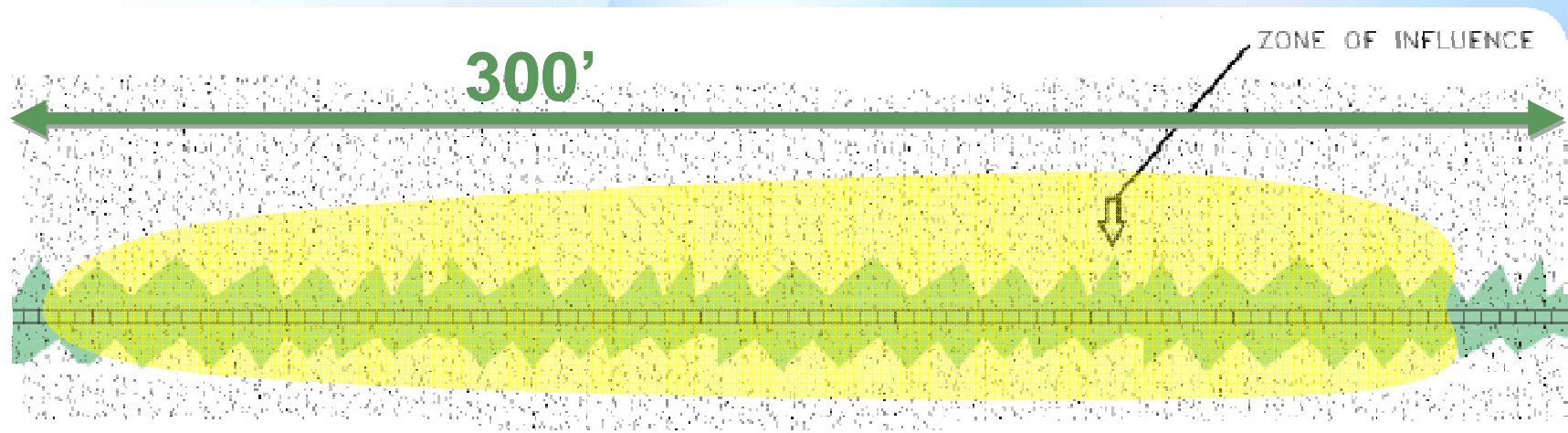


**Preferential Pathways are a Reality**



# Why Does Discrete Matter?

## Existing Technology Design VS Reality



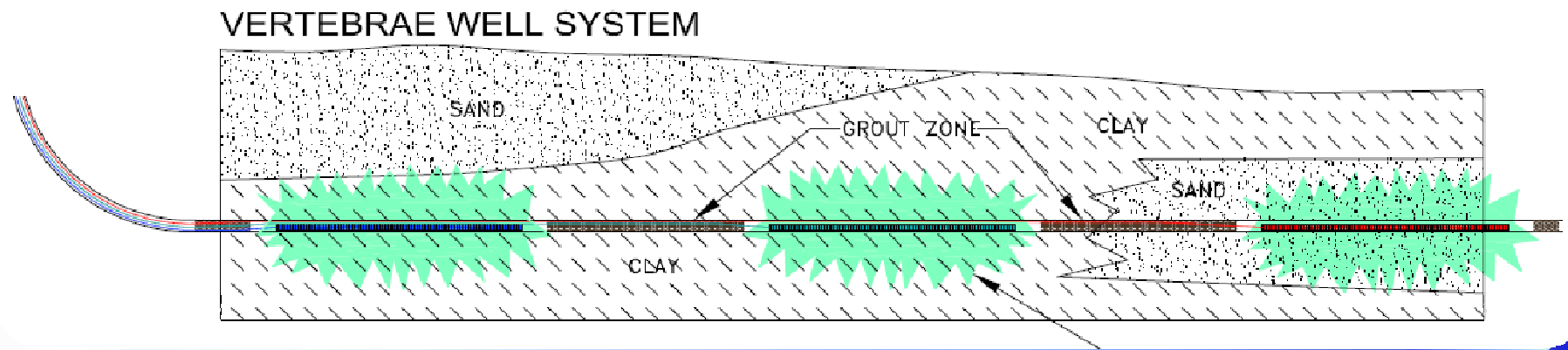
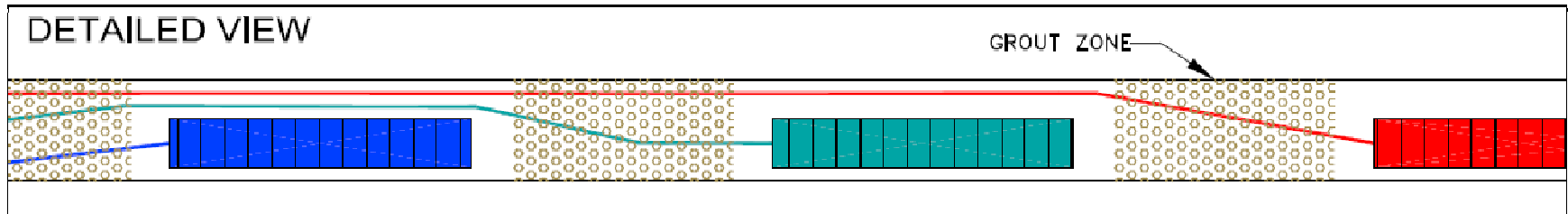




# Why Does Discrete Mater?

## EN Rx VERTEBRAE™ Solution

- We Need Control
  - To eliminate or minimize preferential pathways.
  - To allow for adjustment of distribution





## Vertebrae™ Other Benefits

- Less business disruption
- Drilling away from plume
- Ability to go under obstacles
- **One** well vault in a convenient location
  - A safer one.





# Powerful Reagents

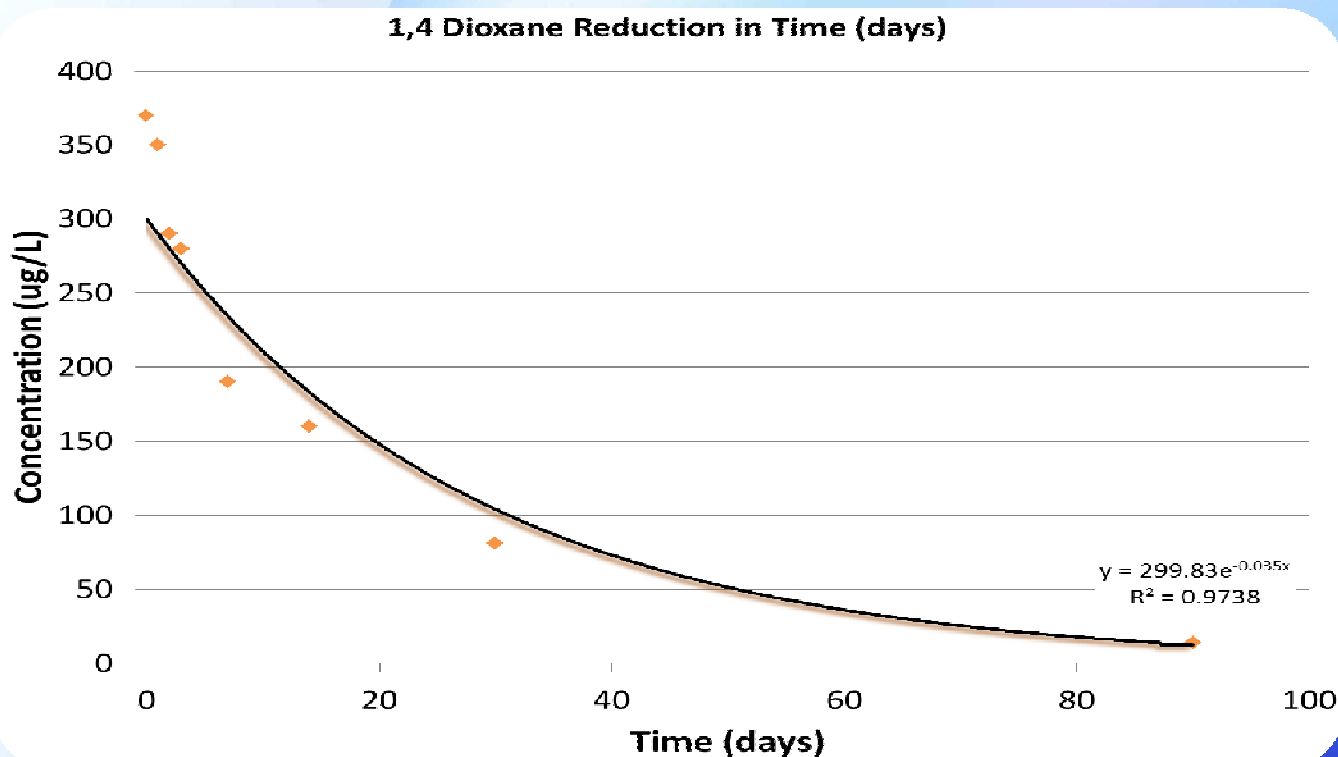
- We use EN Rx Reagent to provide certain success.
- Safest Chemical oxidant product on the market
  - Able to be used in shallow water table with system (<2 ft).
  - Able to be used on free product with no temperature change.
  - Able to be used around utilities with not harmful effects.
  - Able to be activated as one product, no two part mixtures.
  - Lowest viscosity available.
  - Easy on injection equipment.

This product allows use to take the typical reaction rate of Chemical Oxidants and slow it down to a point where it is controllable bringing efficiency and decision making back to the process.



# Powerful Reagents

- Modified Fenton's chemistry / Strong  $\cdot\text{OH}$  and long-lived reaction
  - Reduction of solvents, 1,4 Dioxane, DDX group, PCBs, phenols, etc.
  - 4% Solution
- Activated in tote or drum. Stable for months.



# FOCIS™

- A self-contained, solar-powered, un-manned, communication-ready, remediation platform capable of injections.

## Feedback Optimized Continuous Injection System

- Slow down the injection rate to collect data and ensure efficient use of reagent





# Case Study

A Jacksonville site: the release occurred in the tank vault, and due to limited access across the property and with the adjacent owners, invasive vertical wells and networks were not feasible.





# Case Study

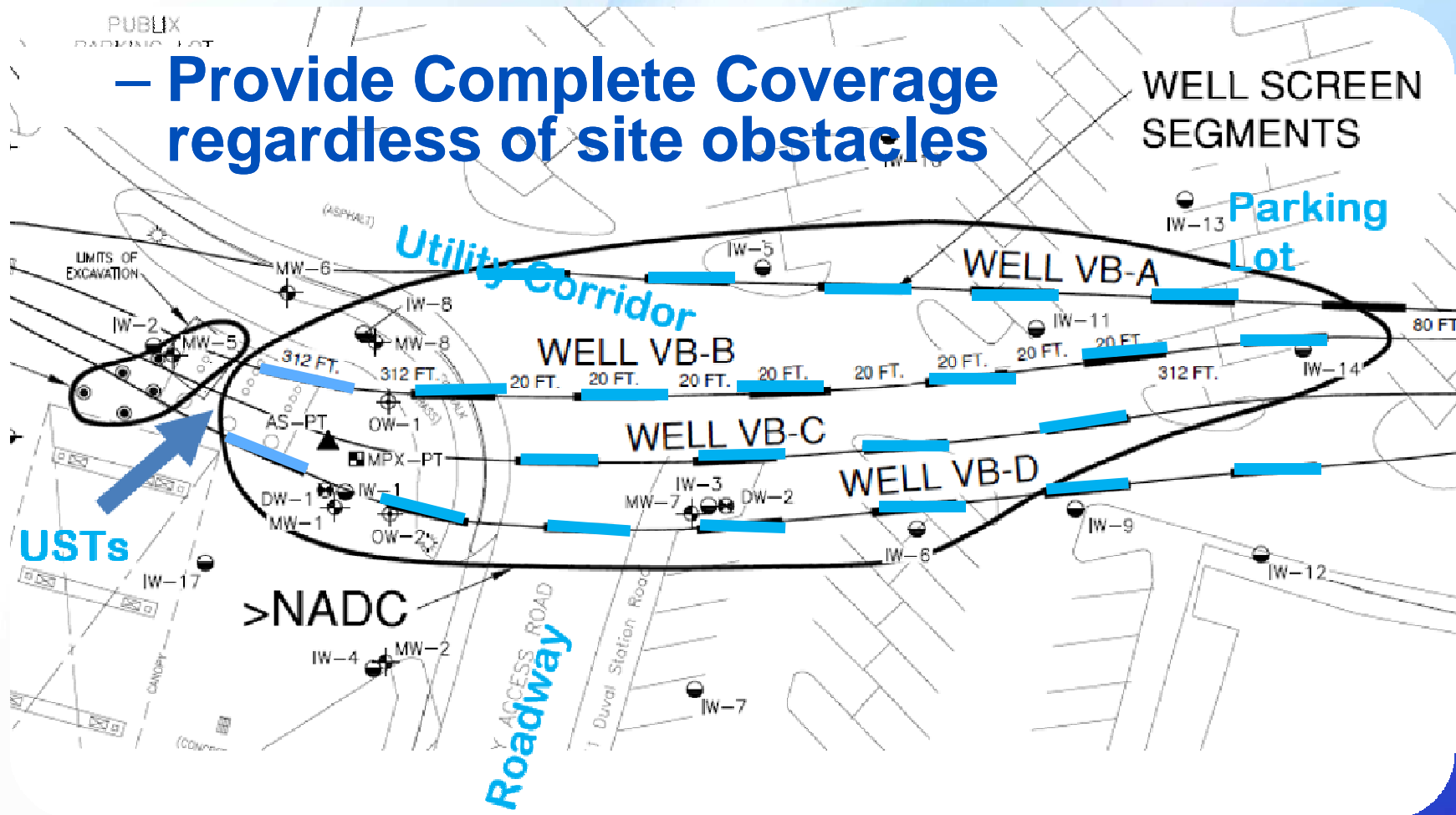
- Water table at 4 ft
- Sandy soils to 22 ft bgs
- Silty sand 22-27 ft bls
- Unleaded Petroluem Impact
- Groundwater flow transport at 18-22 ft bls



# Complete Coverage

– Provide Complete Coverage regardless of site obstacles

WELL SCREEN SEGMENTS

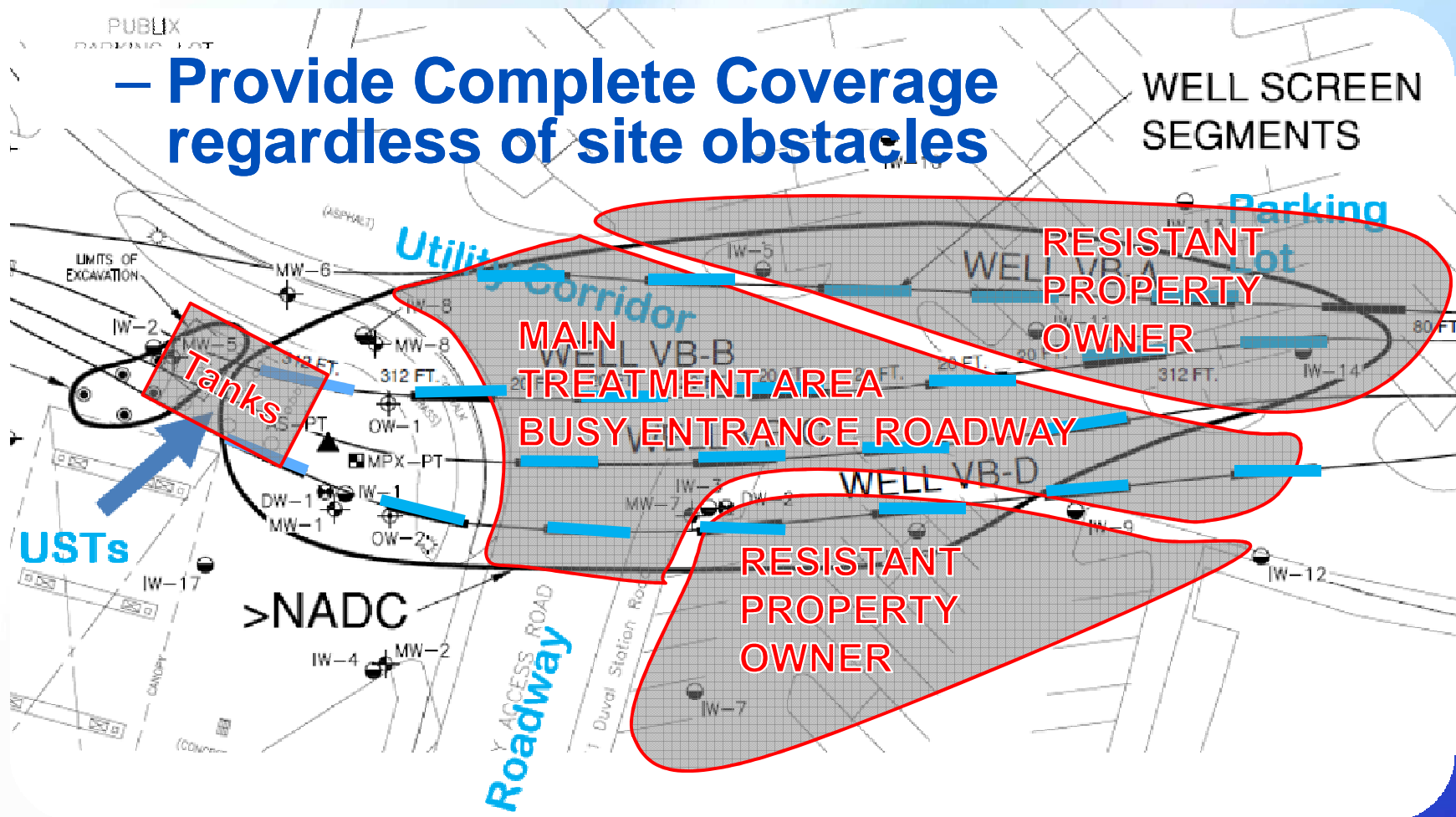






# Controlled Treatment

– Provide Complete Coverage regardless of site obstacles





# Quick Installation

4 Vertebrae™ Well Systems were installed - 8 Days



**60% Less Time  
Better Coverage**

# Installation Cost

- Not only is the project streamlined it is cost effective.

	<b>Mobilization</b>	<b>Drilling</b>	<b>Time</b>	<b>Trenching</b>	<b>Oversight</b>	<b>Total Cost</b>
<b>HSA</b>	\$ 500	\$ 32,200	4 wks	\$ 88,960	\$ 20,000	\$ 141,660
<b>Vertebrae™</b>	\$ 1,500	\$ 106,500	2 wks	Included	\$ 10,000	<b>\$ 118,000</b>

- Including trenching direct cost comparison

Cost estimate from a PBR site in Jacksonville. Vertebrae™ costs are actual costs to the client after project completion.

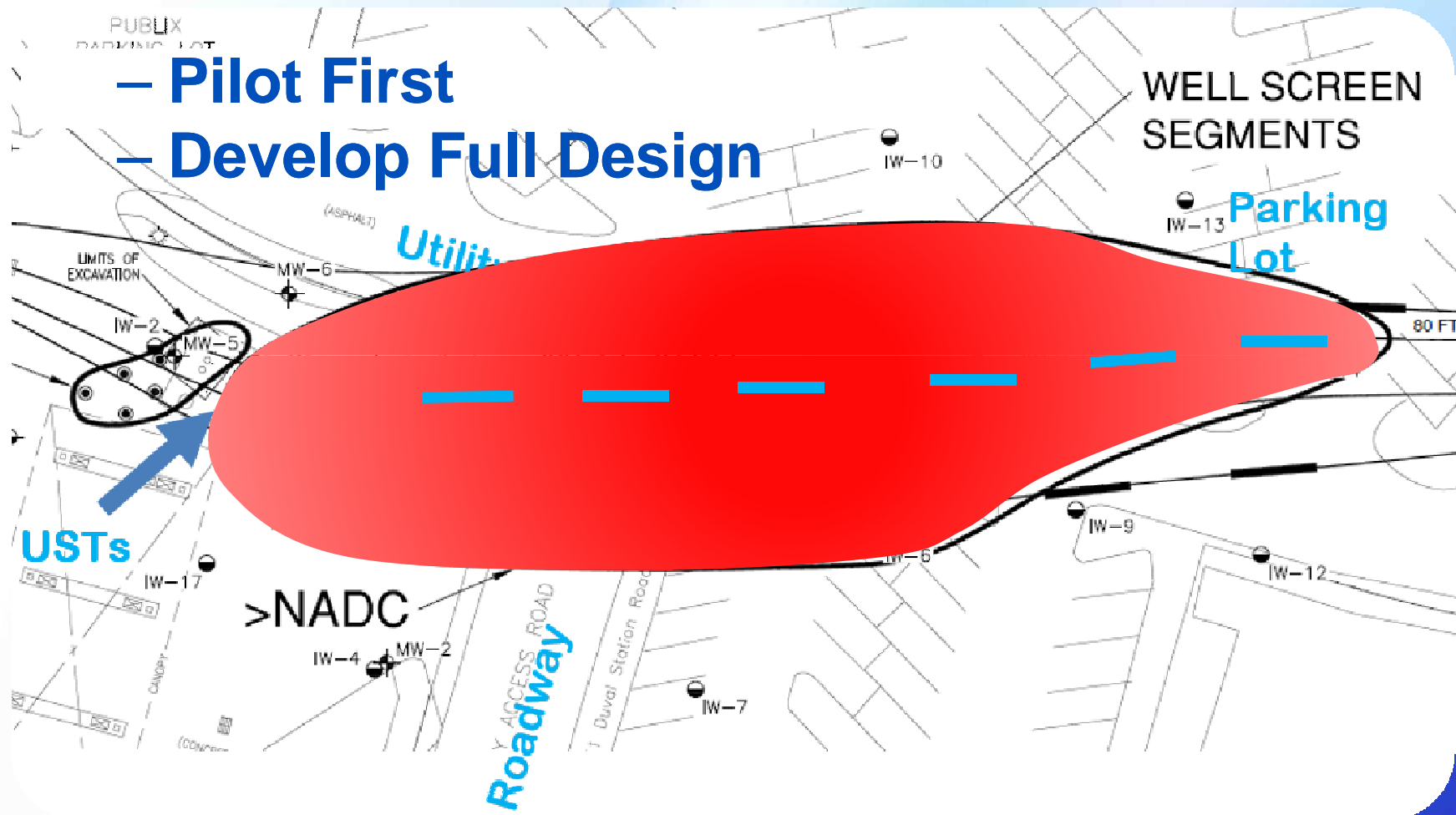
## FOCIS™

- Injection of 0.5 gpm of water mixed with EN Rx activated hydrogen peroxide.
- Pressure for injection remained below 3 psi for all the wells.



# Controlled Treatment

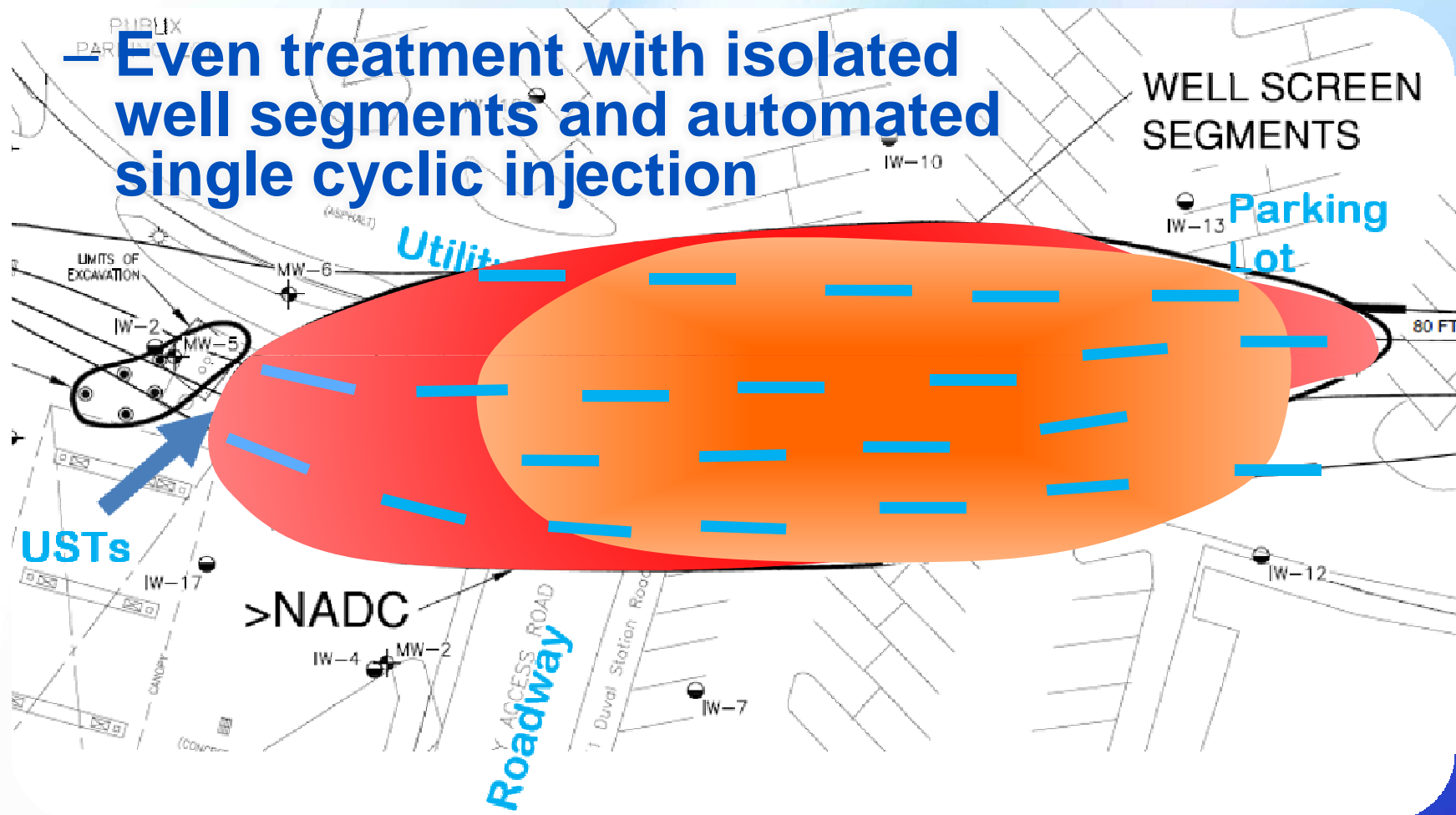
- Pilot First
- Develop Full Design



- 2 Month Pilot- 60%, 76%, and 83% reduction in target wells.
- 3000 pounds of Activated Product, Operation 24/7, 11.5% Runtime.

# Controlled Treatment

- Even treatment with isolated well segments and automated single cyclic injection

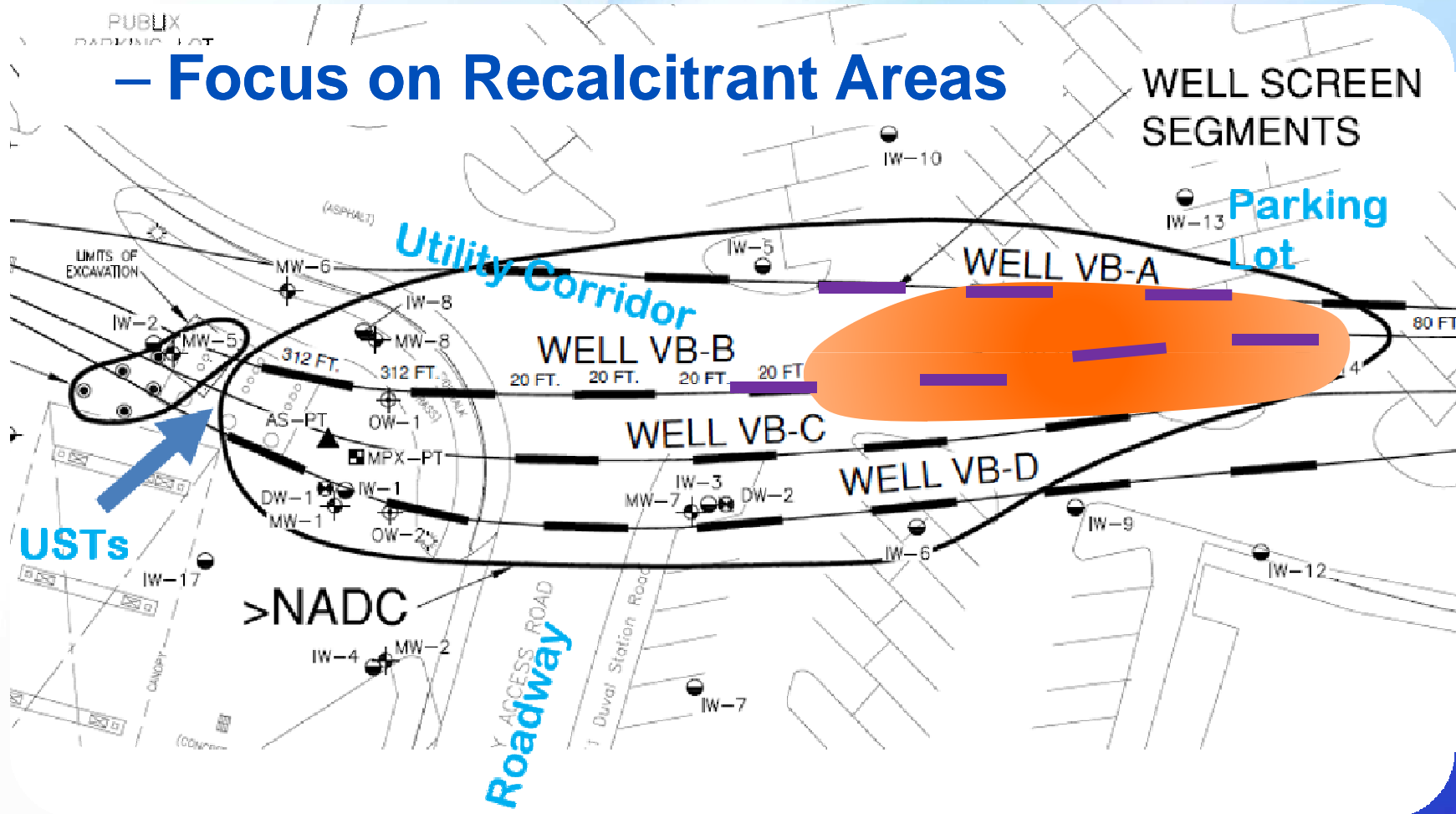


- 6 Month Full Scale – 6% Runtime. 97% Average total reduction
- 6000 pounds of Activated Product, 8560 gallons of injection.



# Focused Treatment

## – Focus on Recalcitrant Areas

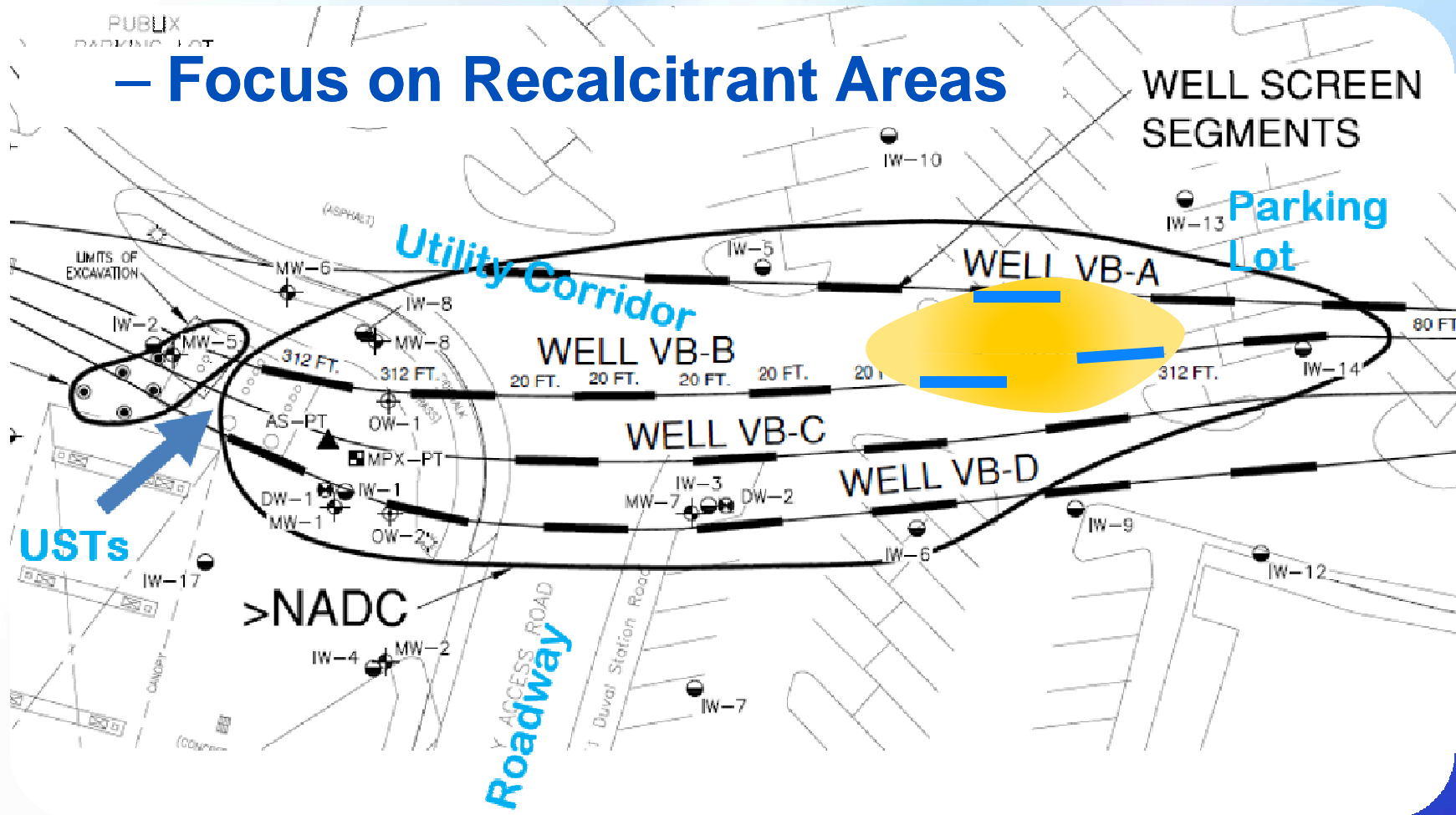


- 2 Quarter Polish - 2 Remaining Recalcitrant Wells.
- 2000 (Q1) lbs, 1000 (Q2) lbs of Activated Product.



# Focused Treatment

## – Focus on Recalcitrant Areas



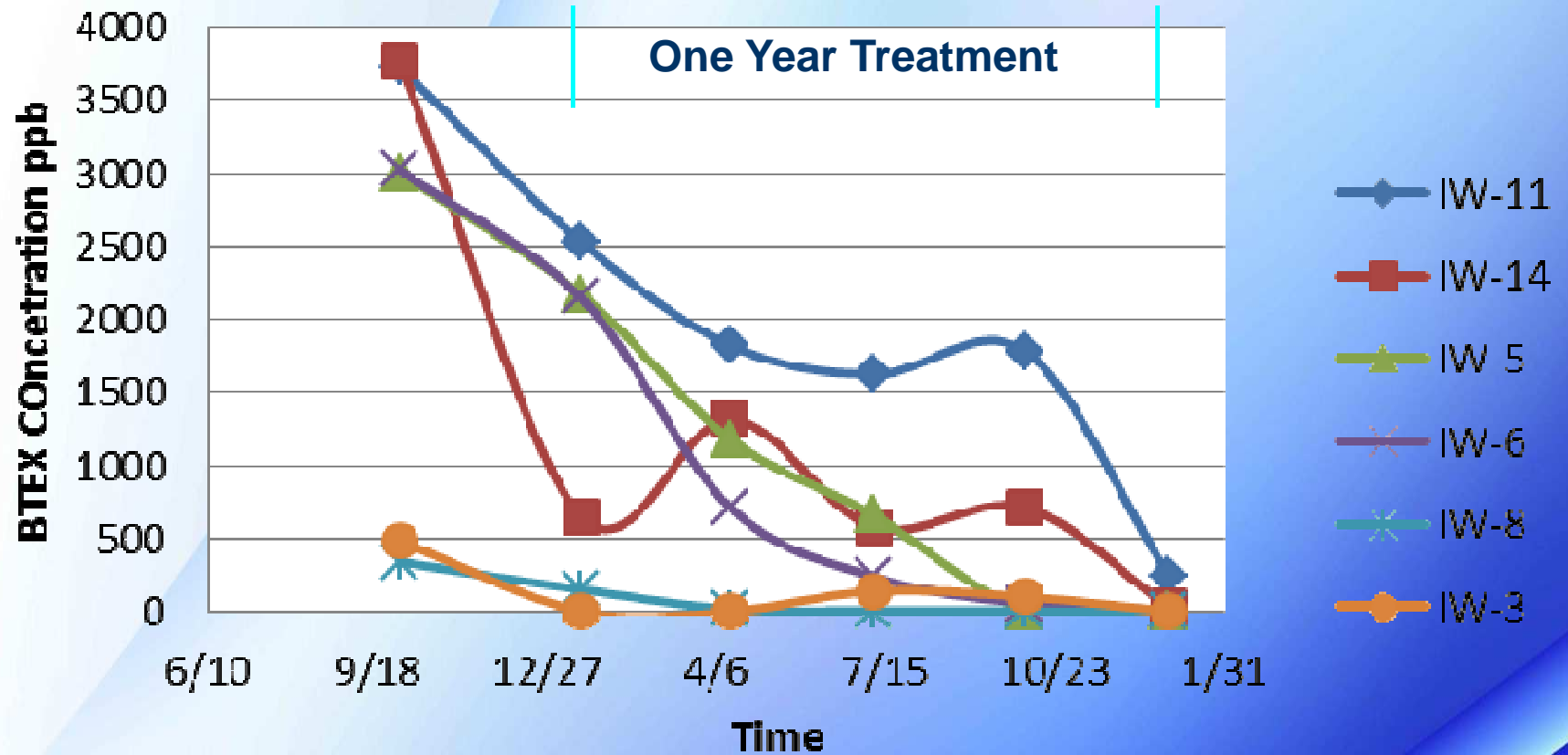
- 2 Quarter Polish - 2 Remaining Recalcitrant Wells.
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# Controlled Success

## Milestone Well Reductions



# Treatment Summary

- Install wells in data gaps
- Engineer is in Control
  - Provides superior treatment.
- Sustainable Technology
  - Very Low Power – 8 to 10 Watts
- Very Small Footprint
  - System and Well layout.
- Various Reagents
  - Chem-ox – Capable of large amounts of injection



# Performance Based Work

- Our tools provide confidence and the leading edge when performing remediation.
- Performance based contracting passes confidence along to client/owner and regulators.
  - Case Study Pay Layout
    - 25% Installation
    - 15% - 50% progress
    - 25% - 75% progress
    - 20% - Goal
    - 15% - Site Closure
- The contract includes everything but sampling and reporting.



# Better Performance

- We know our products and have developed confidence.
- Horizontal Well System provide the most efficient cleanup for all technology types.
- Our injection system is the best of two ideas
  - Mechanical system allows endurance
  - Chemical oxidants offer speed.

# Conclusions

Thanks



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