SFPP Norwalk Tank Farm Update
Presented to the
Norwalk Restoration Advisory Board on
August 22nd, 2019

JACOBS®

www.jacobs.com | worldwide

Agenda

1. Site Overview
2. Remediation Systems Operations Update
   - SVE and Biosparge Systems
   - Groundwater and Total Fluids Extraction Systems
   - Mass Recovery Summary
3. Planned Remediation Activities
   - Overview of All Remediation Activities
   - Expand SVE System in Southeastern Area and Activate Biosparging
   - Offsite Dissolved Plumes – Planned Offsite Biosparging and Soil Vapor Extraction
   - Natural Source Zone Depletion Evaluation
4. Summary of First-half 2019 Semiannual Groundwater Monitoring

Site Overview

Site Location and SFPP Remediation Areas

Objectives

- Contaminant Mass Containment
- Contaminant Mass Removal

South-Central and Southeast Areas

- Biosparge System
- Soil Vapor Extraction (SVE) System
- Groundwater Extraction (GWE) System
- Total Fluids Extraction (TFE) System

West Side Barrier System

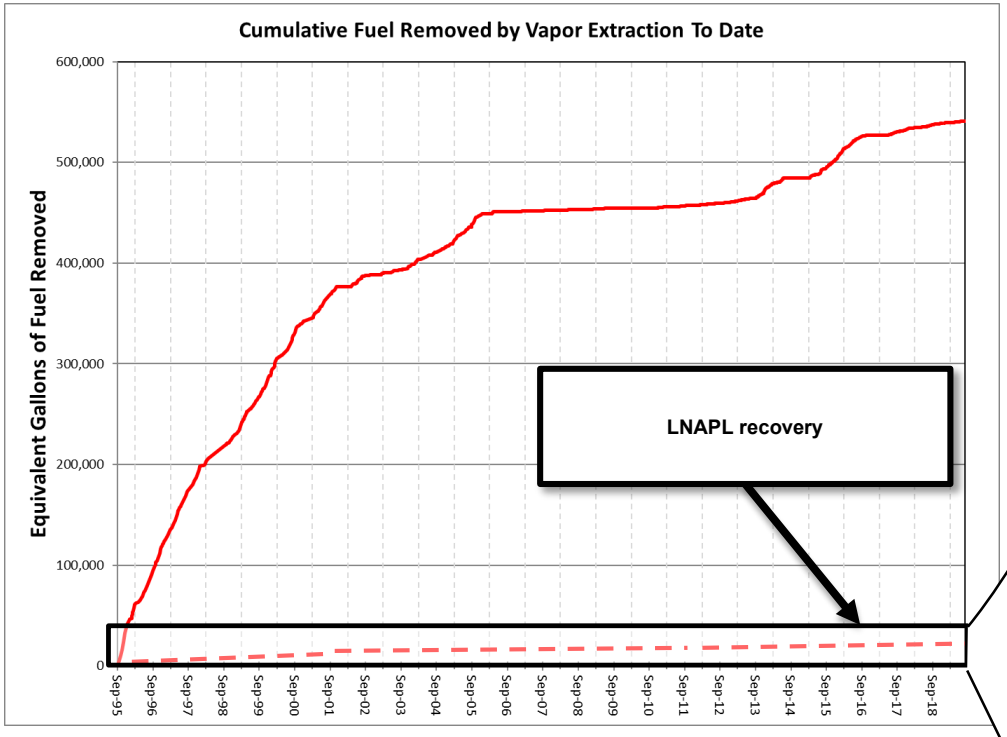
- Discontinued in August 2008
- Shut-down based on low concentrations of MTBE and 1,2-DCA

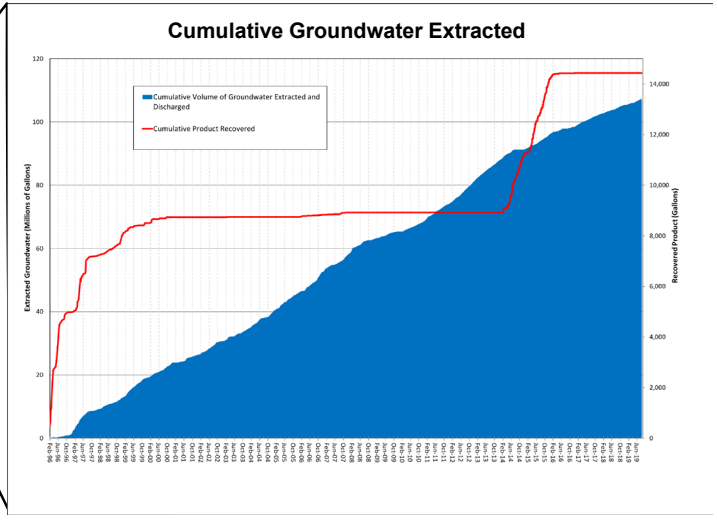
Remediation Systems Operations Summary

Remediation Systems Operations Summary

Time	SVE Runtime	Biosparge Runtime	SVE Mass Removal	GWTS Runtime	GWTS Removal Volume	Notes (No LNAPL was recovered in First Half 2019)
Q1 2019	76%	44%	3,492 lbs (529 gal)	74%	574,268 gal	-The GWTS, SVE, and biosparge systems were shutdown from the end of Dec 2018 to Jan 11 to repair air compressors that supply air to pneumatic valves on the RTO and the pneumatic pumps in the wells. -Biosparging at the site was suspended during 4Q2018 to Feb 9 to accommodate the installation, inspection, and start-up of the new 883-scfm biosparge system. -The SVE and biosparge systems were shut down on Feb 12, and restarted on Feb 21, 2019, to obtain static conditions for soil vapor sampling of soil vapor probes SVP-105 through SVP 109 in the south-central area. -The GWTS was shut down on March 19 through April 4, 2019, for carbon change-out and repairs to carbon vessels.
Q2 2019	84%	79%	6,286 lbs (952 gal)	80%	848,498 gal	-The biosparge system was shut down from Mar 29 to Apr 2, to include an output for indicator lights to the GWTS pad. -The SVE, biosparge, and GWTS were shut down on Apr 9 to Apr 23, to facilitate gauging and sampling activities during the first semiannual groundwater sampling event that was conducted April 16 to 23, 2019. - The SVE, biosparge, and the GWTS were shut down on May 6, to accommodate Southern California Edison's onsite activities.
Total	~80%	~63%	3.6 million lbs (540,549 gal)	~77%	106.8 million gal	

Site Mass Recovery Summary

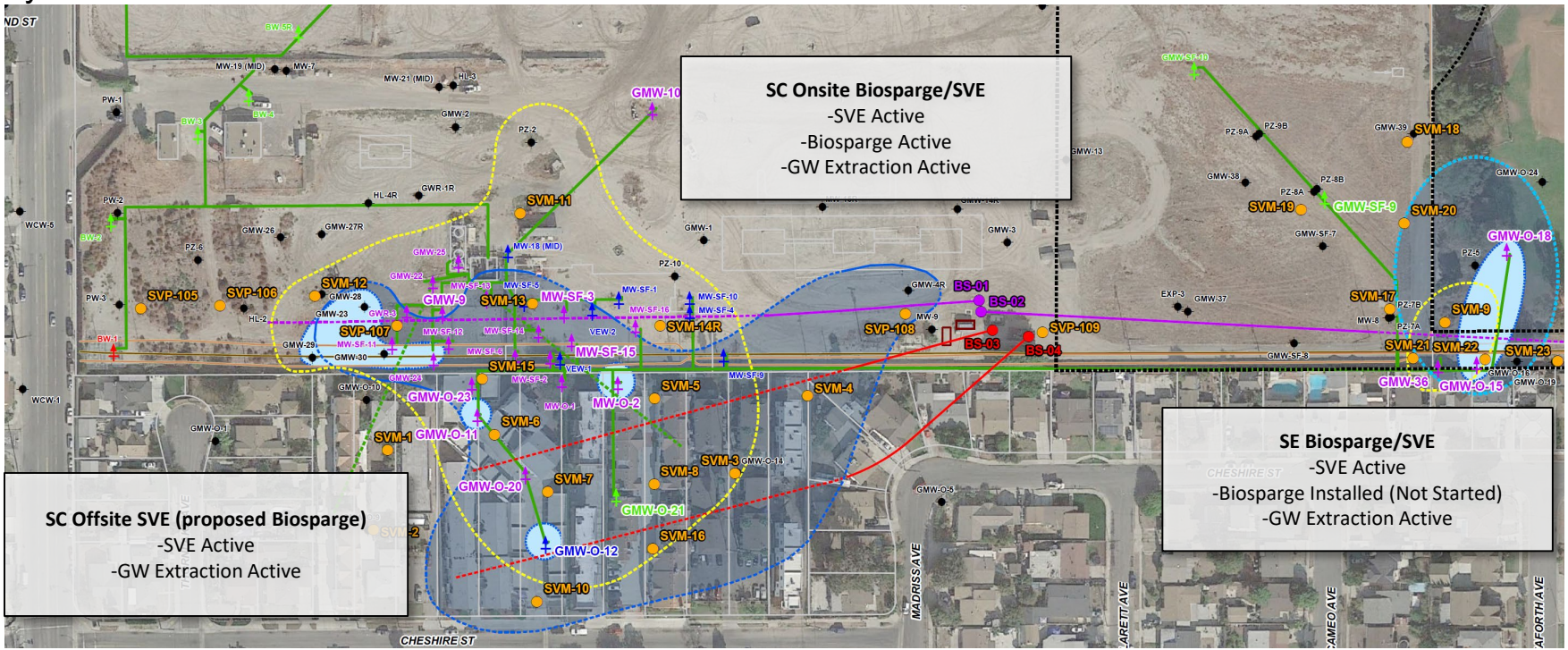




Planned Remediation Activities

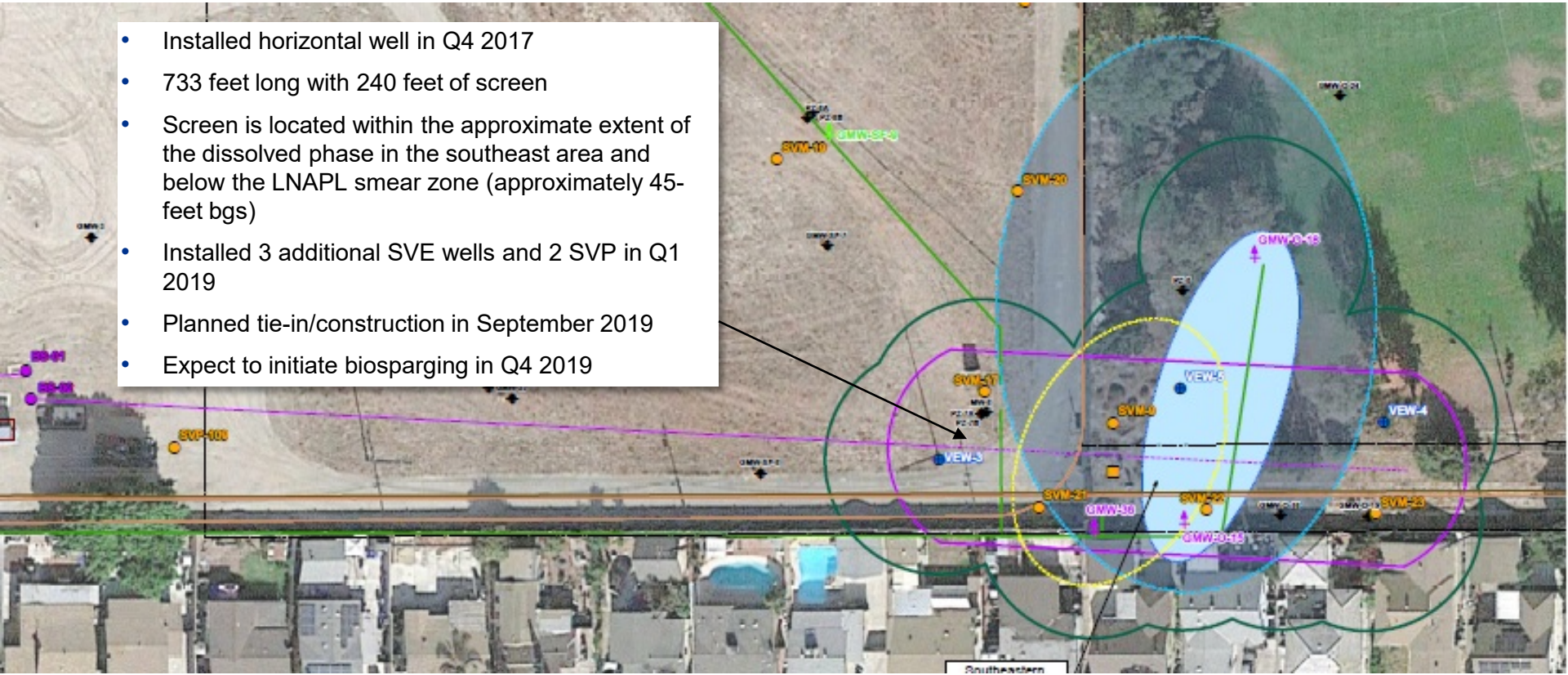
Overview of All Remedial Activities

-SE and SC Offsite have similar LNAPL types and distribution as SC Onsite
-Biosparge treatment of both areas is anticipated to progress similarly to the onsite South-Central Biosparge system

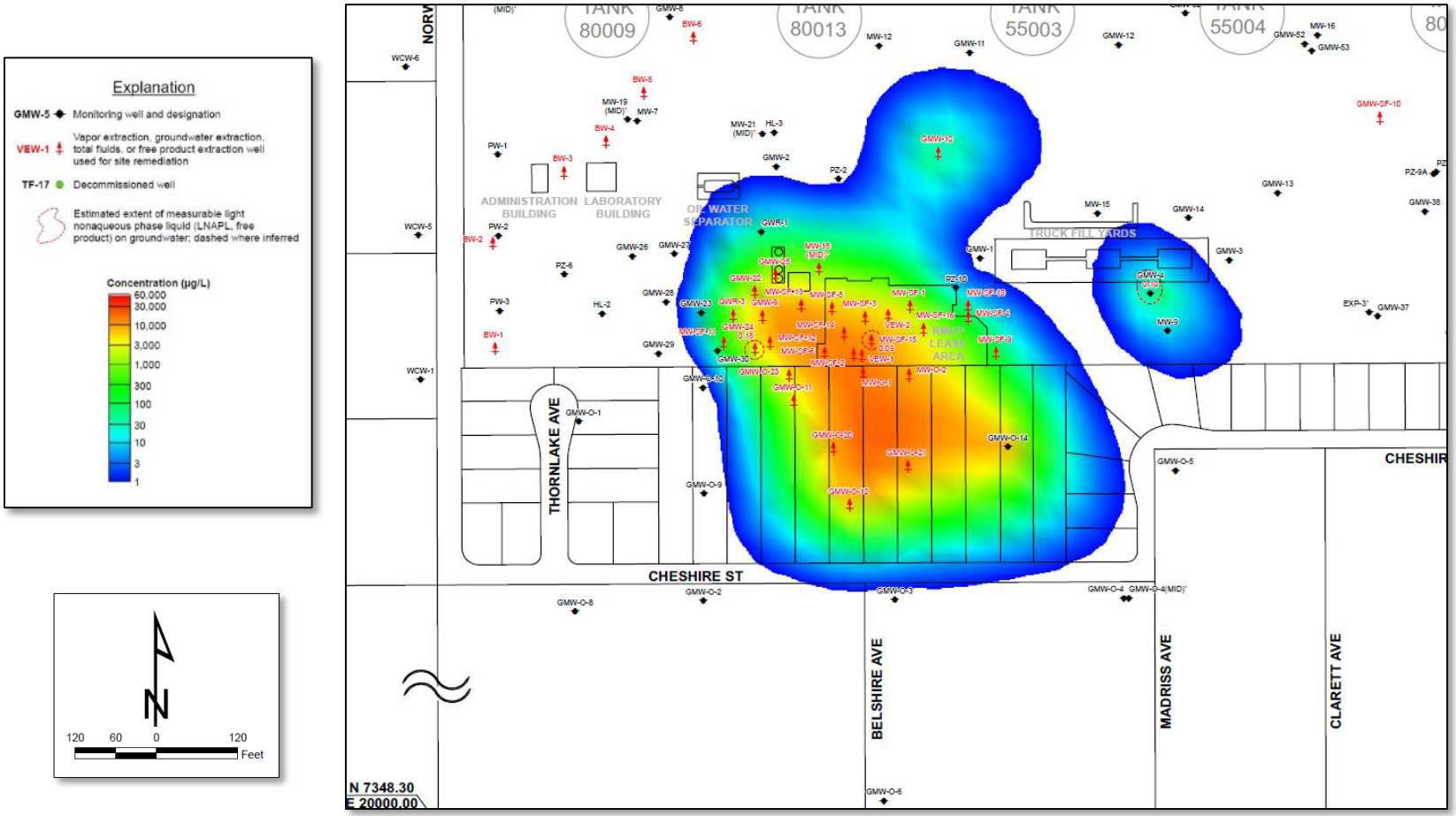


Southeastern Biosparge Well

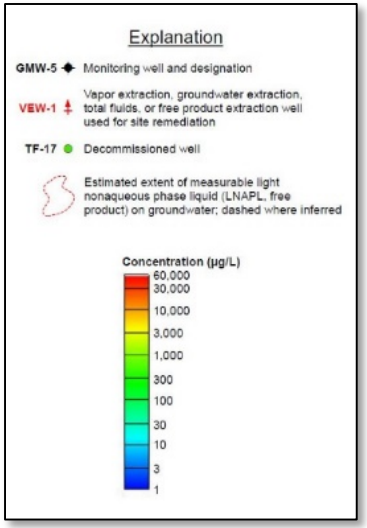
- Installed horizontal well in Q4 2017
- 733 feet long with 240 feet of screen
- Screen is located within the approximate extent of the dissolved phase in the southeast area and below the LNAPL smear zone (approximately 45-feet bgs)
- Installed 3 additional SVE wells and 2 SVP in Q1 2019
- Planned tie-in/construction in September 2019
- Expect to initiate biosparging in Q4 2019

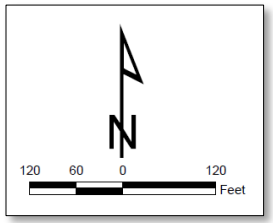


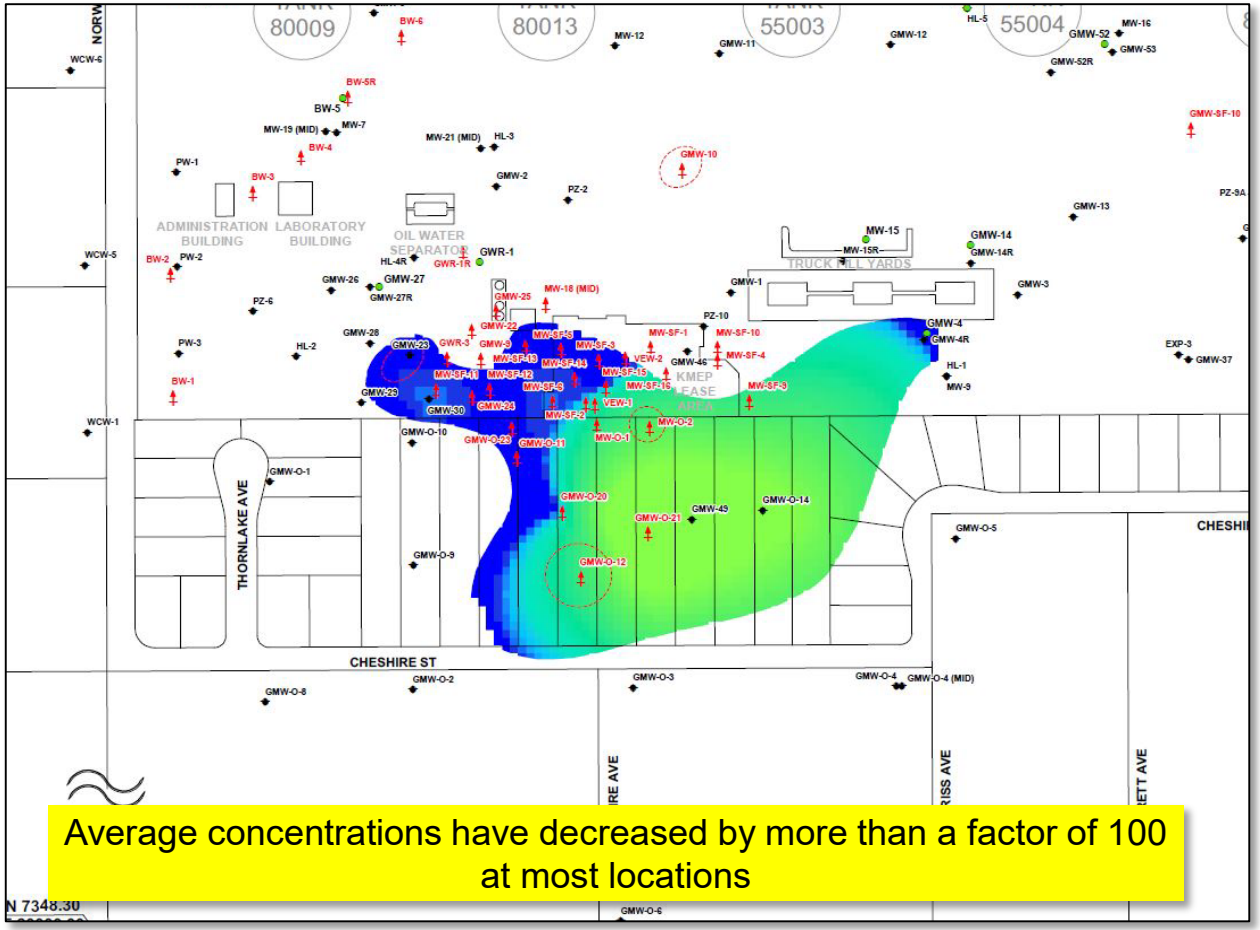
2013 Groundwater Benzene Concentrations (Pre-Biosparging)



2019 Groundwater Benzene Concentrations (Post Biosparging)



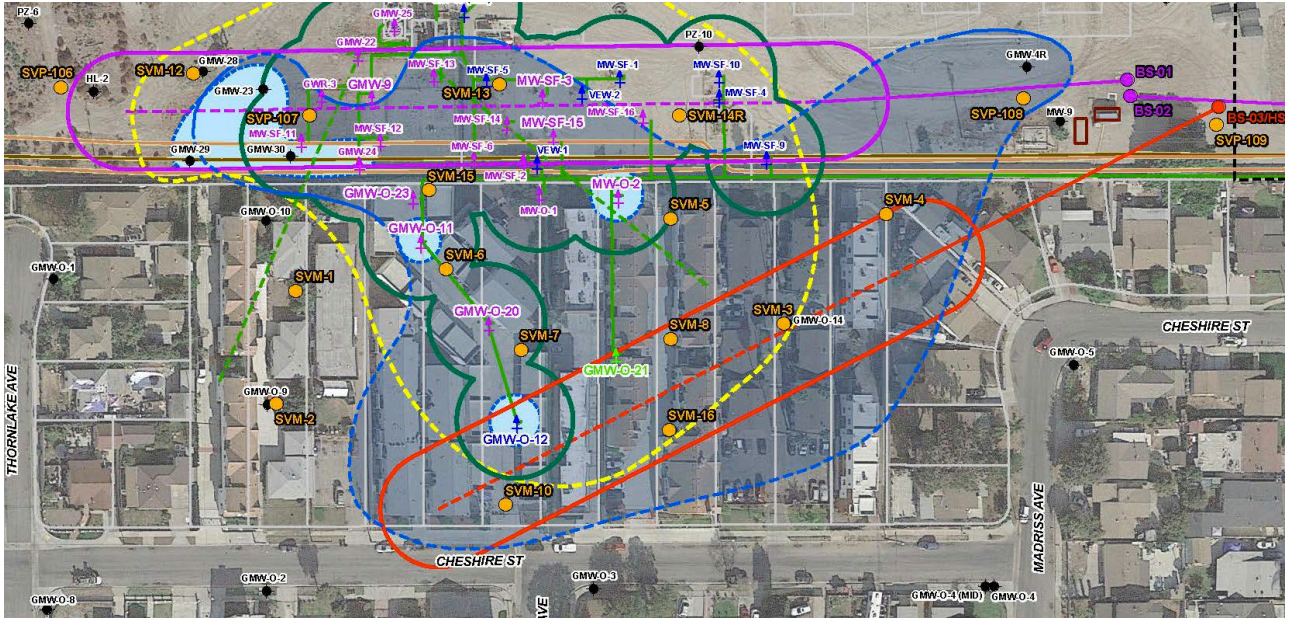




Average concentrations have decreased by more than a factor of 100 at most locations

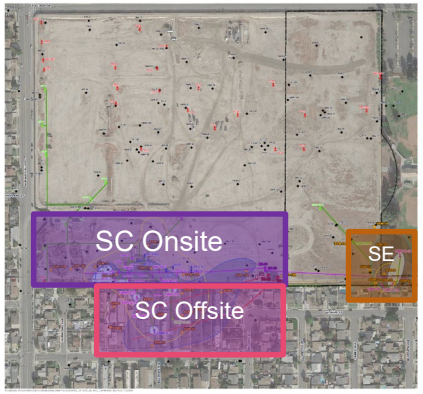
Planned Offsite Biosparge Layout

- One 800’ horizontal biosparge well and SVE well pair (“stacked”)
- Likely Installation in late 2019
- Operate to technical endpoint
- Utilize existing and additional probes for vapor monitoring to achieve remedial objective.



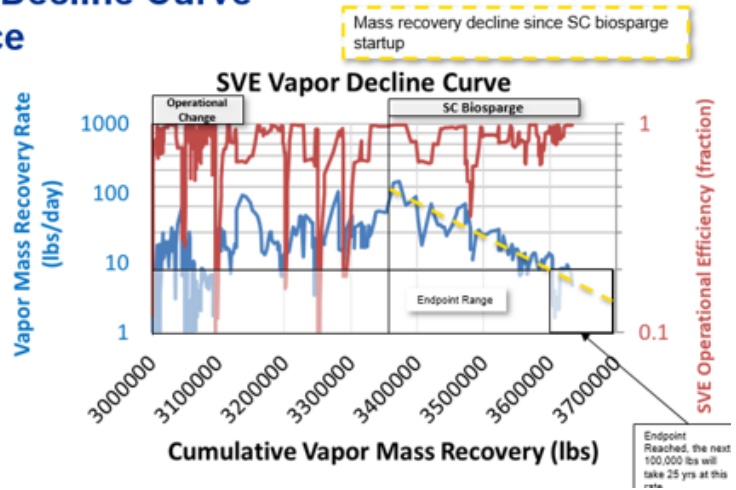
Natural Source Zone Depletion Evaluation

- NSZD = naturally occurring biodegradation processes that reduce source mass
- Based on the:
  - Decline in mass removal
  - Decrease in dissolved concentrations that are near or below MCLs



Vapor Removal Decline Curve and Performance

- Decline Curve Since 2016 Operation of SC Biosparge
- 3 years of operation to reach endpoint



Temporarily suspend pump and treat, biosparge and SVE in the south-central area to evaluate NSZD using soil gas and groundwater indicators. A NSZD WP was submitted to the Water Board on July 2019. Response expected in September 2019.

Summary of First-half 2019 Semiannual Groundwater Monitoring

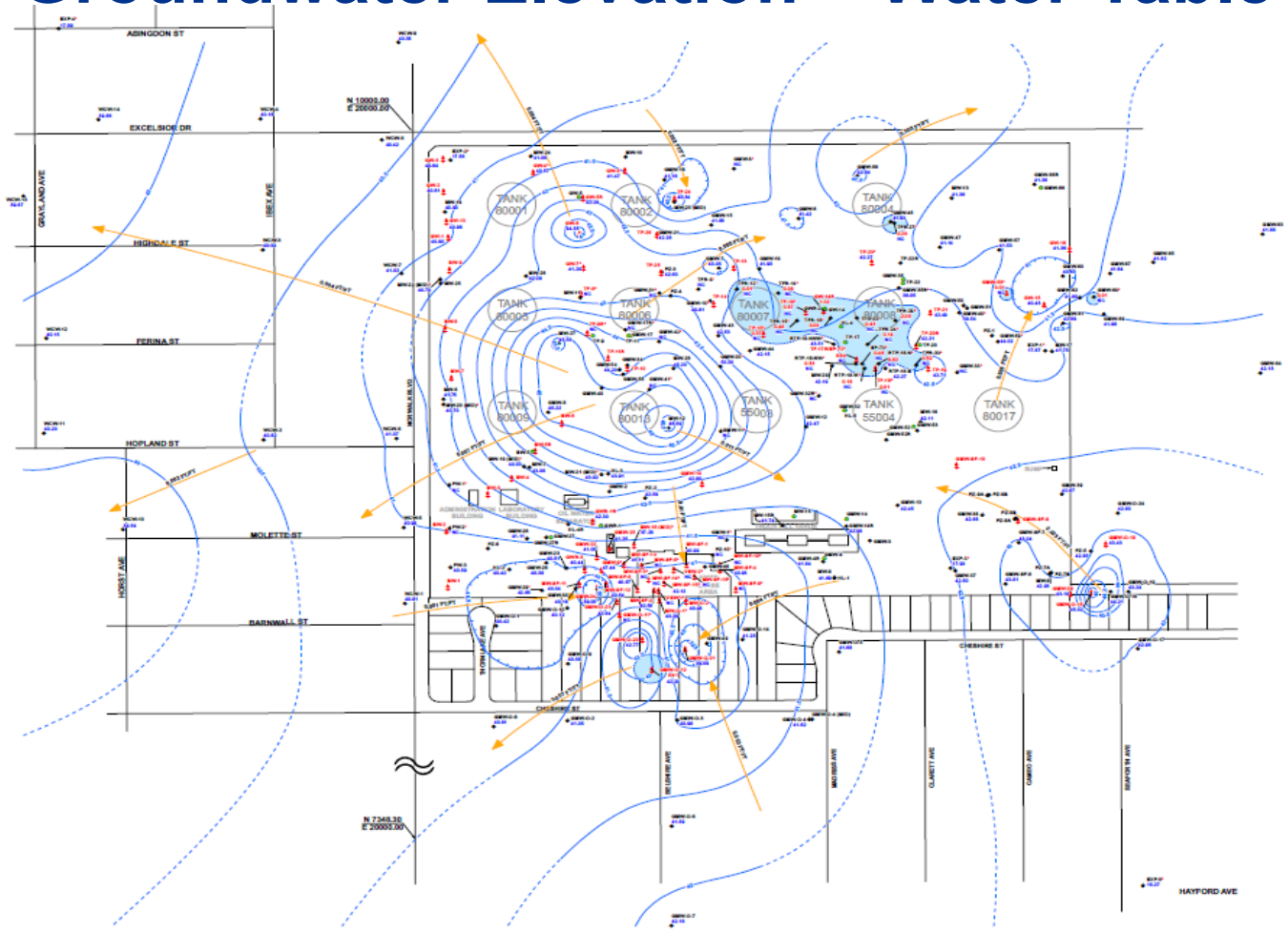
First-half 2019 Semiannual Groundwater Monitoring

- Site-wide monitoring in April/May 2019 – both Kinder Morgan and DLA
- Well Gauging (Blaine Tech and SGI)
  - 188 wells gauged
- Well Sampling (Blaine Tech and SGI)
  - Low-flow sampling methods (submersible pumps)
  - 138 wells sampled (split samples collected in EXP-1, EXP-2, and EXP-3)
  - Kinder Morgan and DLA remediation systems remained offline during gauging activities with exception of DLA sparge system

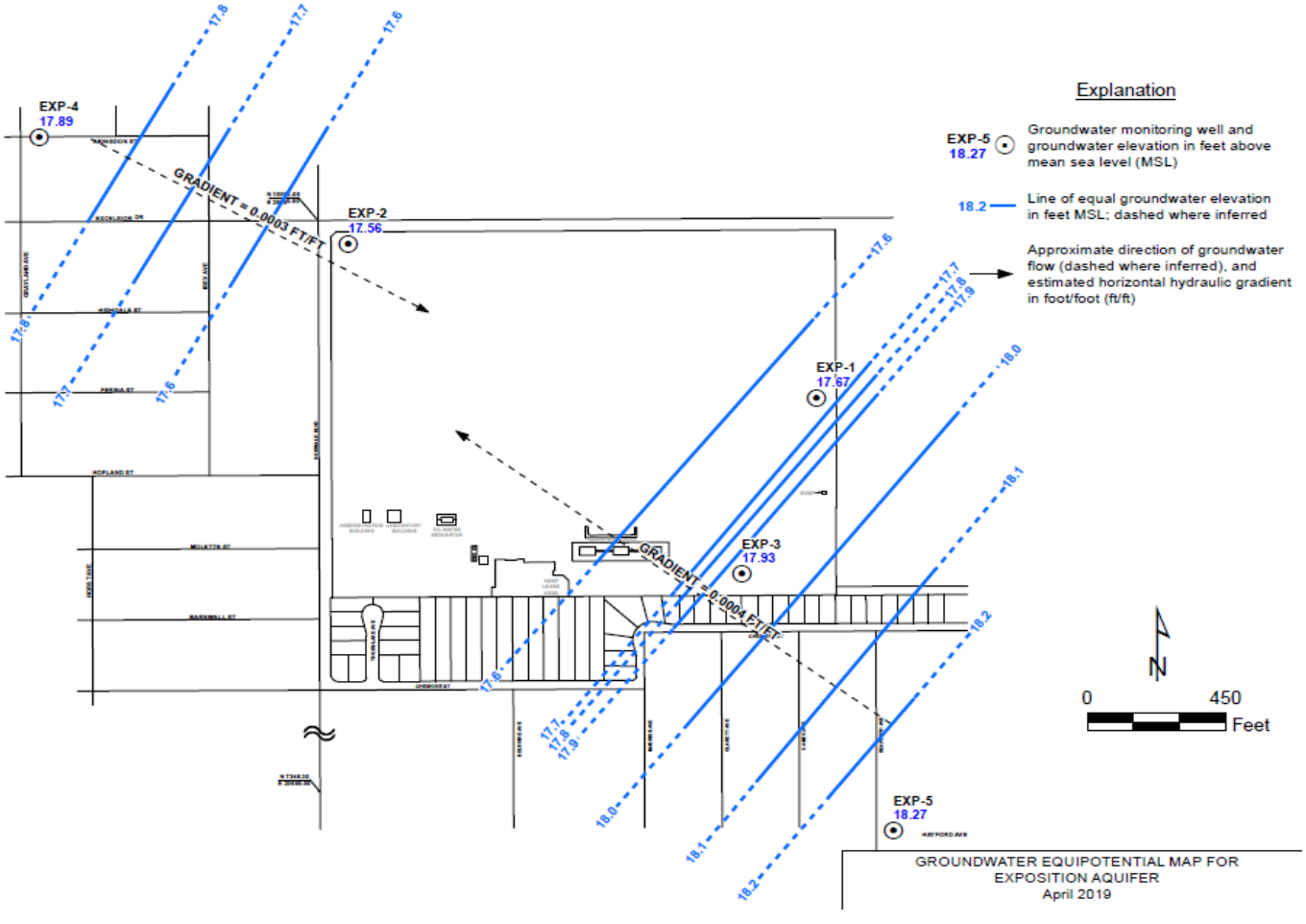
First-half 2019 Semiannual Groundwater Monitoring

- Uppermost Aquifer Groundwater Elevations and Flow
  - Groundwater elevations increased over most of the site compared to November 2018
  - Groundwater flow: converging toward groundwater depressions in the south-western, north-central, and eastern areas; diverging away from groundwater mounds in north-west, south-central and south-east areas
  - Horizontal hydraulic gradient between 0.001 to 0.011 ft/ft
- Exposition Aquifer Groundwater Elevations and Flow
  - Groundwater elevations increased between 1.03 and 1.33 ft/ft relative to November 2018
  - Horizontal hydraulic gradient was 0.0003 ft/ft to the east-southeast in the central/northwestern portions of the gauging area, and 0.0004 ft/ft to the northwest in the eastern/southeastern offsite areas

Groundwater Elevation – Water Table



Groundwater Elevation – Exposition Aquifer



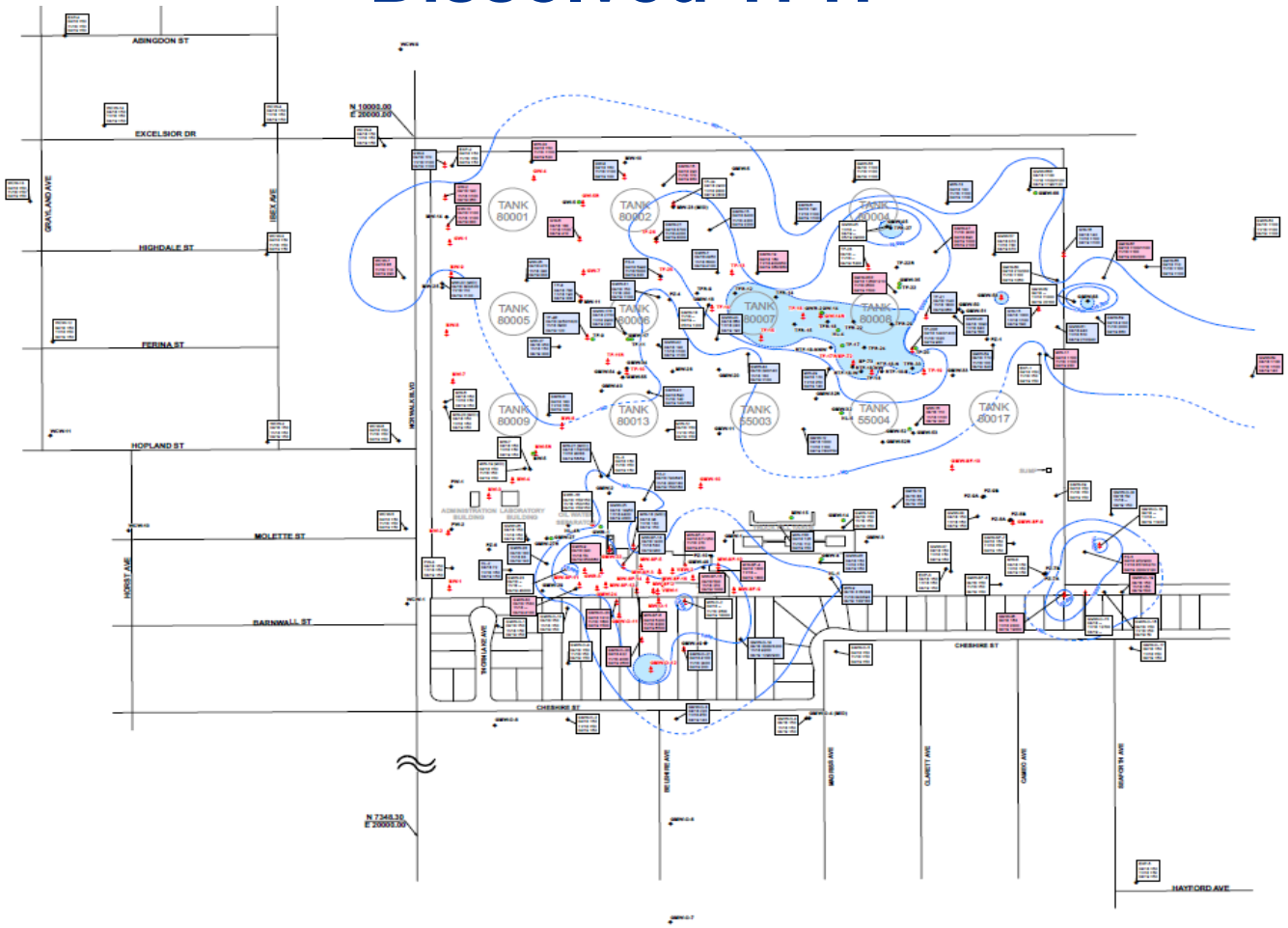
First Semiannual 2019 Groundwater Monitoring Report – Free Product

- Free Product measured in 21 of the 188 wells that were gauged.
  - North-central area: EP-73, GW-14R, TF-15, TF-16, TF-17R/EP-72, TF-18, TFR-12, TFR-14, TFR-15, TFR-18, TFR-22, TFR-24, TFR-27, TFR-29, TFR-33, RTF-18-N, RTF-18-NW, and RTF-18-W
  - Eastern area: GMW-58 and GMW-68
  - South-central area: GMW-O-12
  - 0.01 foot (in wells GMW-58, GMW-68, TF-18, and TFR-12) to 2.05 feet (in well TFR-29)
  - Decrease in product areal extent and thickness is primarily likely due to ongoing remediation efforts.

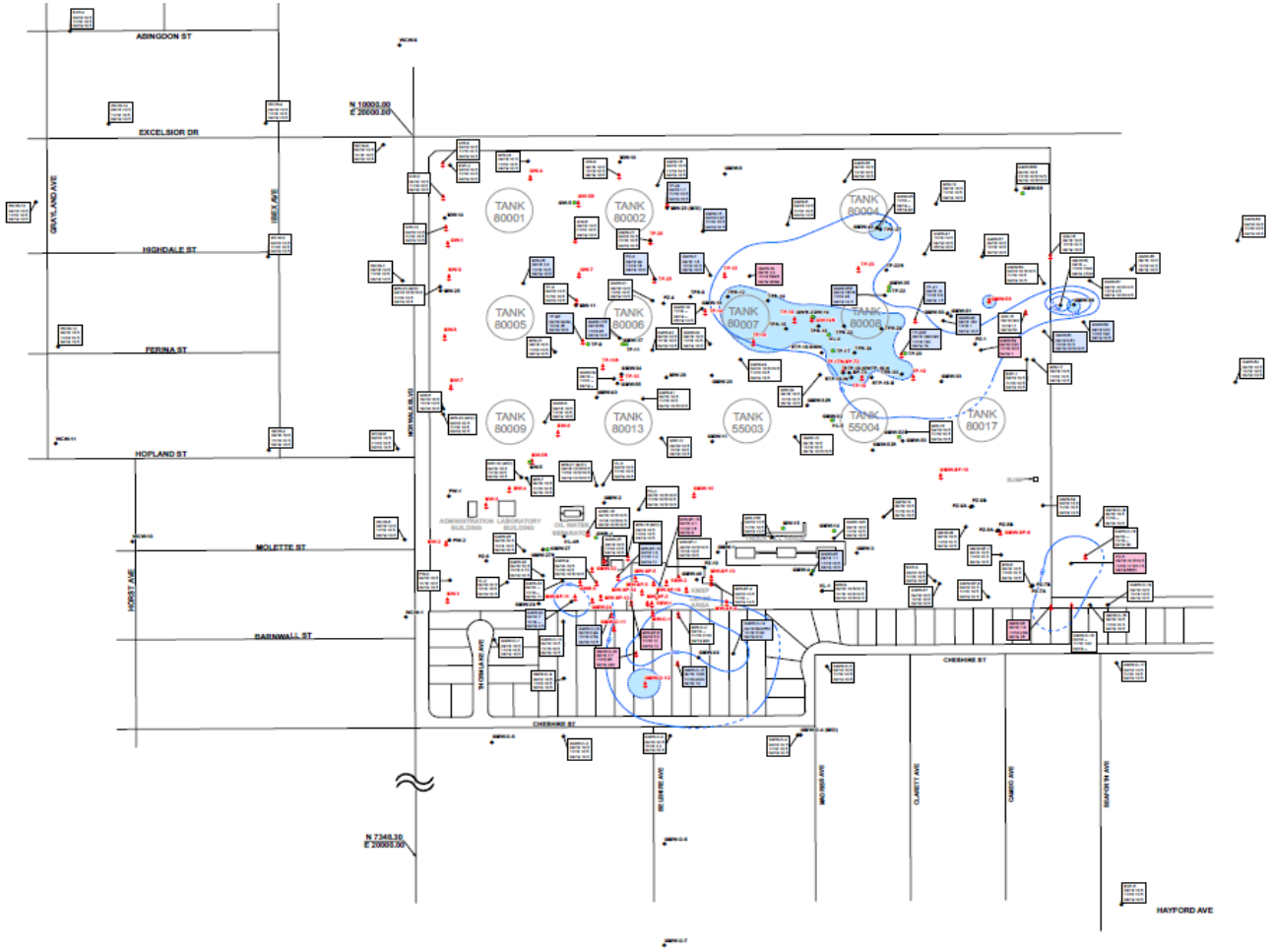
First Semiannual 2019 Groundwater Monitoring Report – Dissolved Contaminants

- Uppermost Aquifer Wells
  - In most areas, the lateral extents of TPH, benzene, 1,2-DCA, MTBE, and TBA have been reduced from the historical maximum and appear to be consistent with previous monitoring events
  - Reduction and consistency of plumes is a result of hydraulic containment by the treatment systems and attenuation mechanisms
  - Free product accumulation across the site has, decreased, relative to the 2018 events, likely due to remediation efforts and an increase in precipitation in 2019
  - Low level detections of MTBE and 1,2-DCA and plume extents in the western area do not warrant restarting the WSB treatment system.

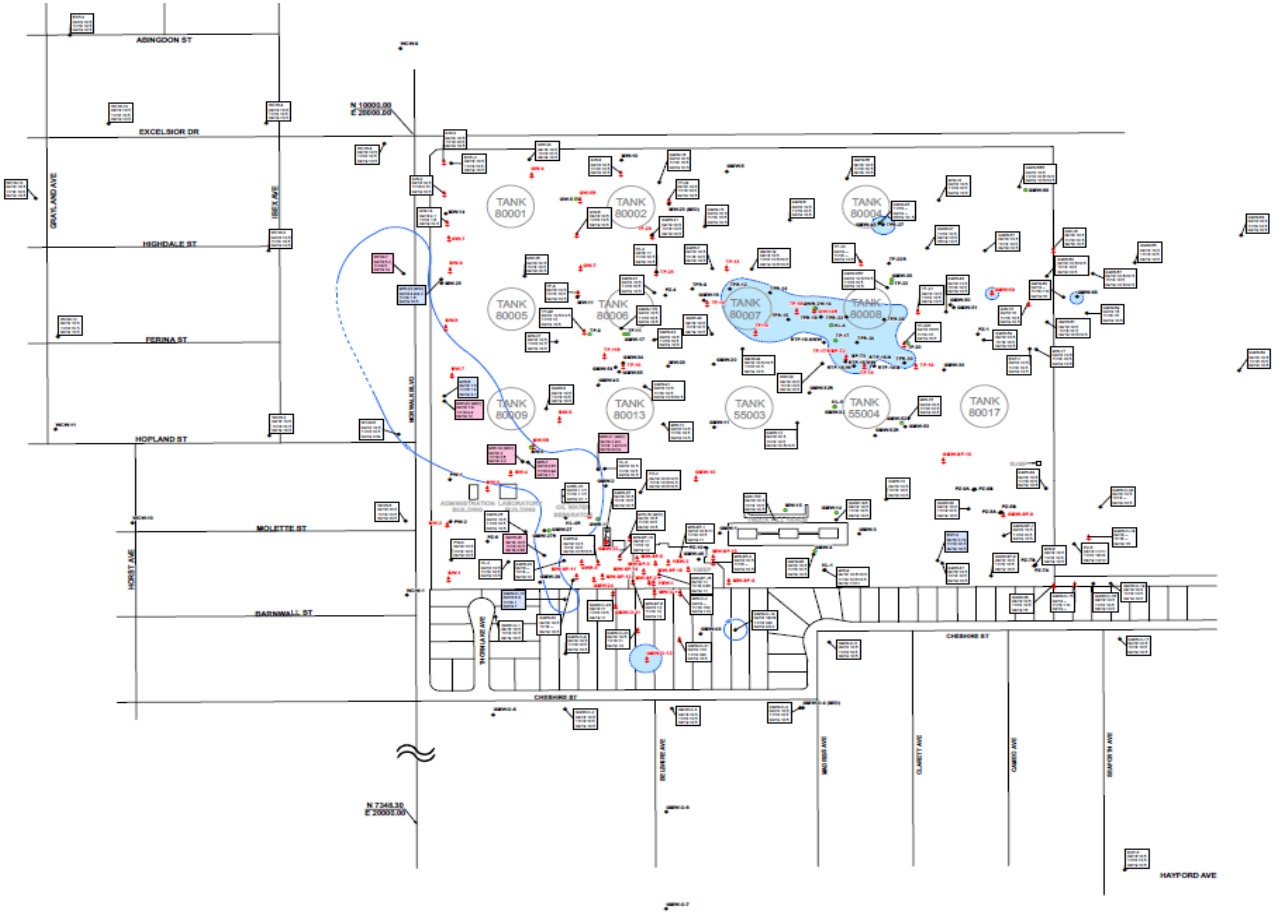
Dissolved TPH



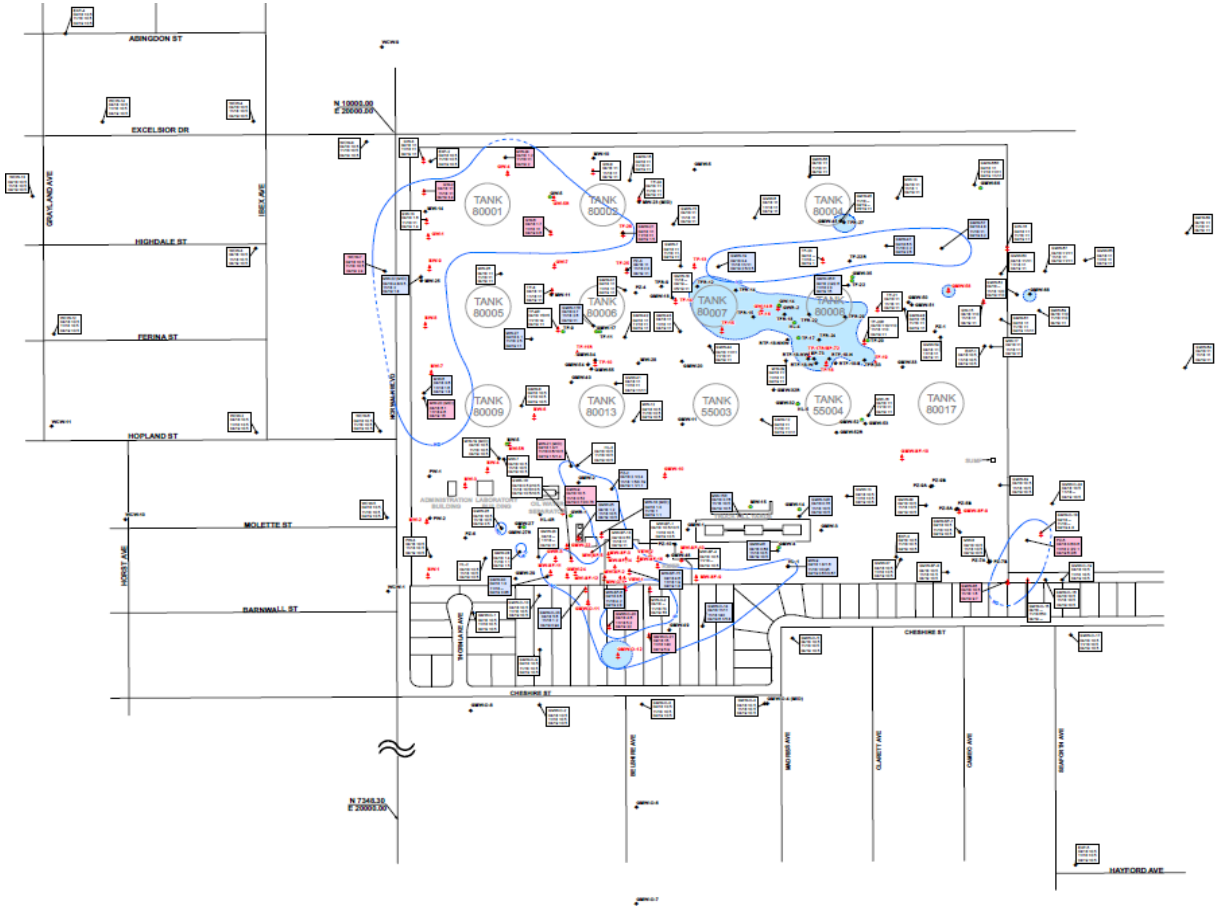
Dissolved Benzene



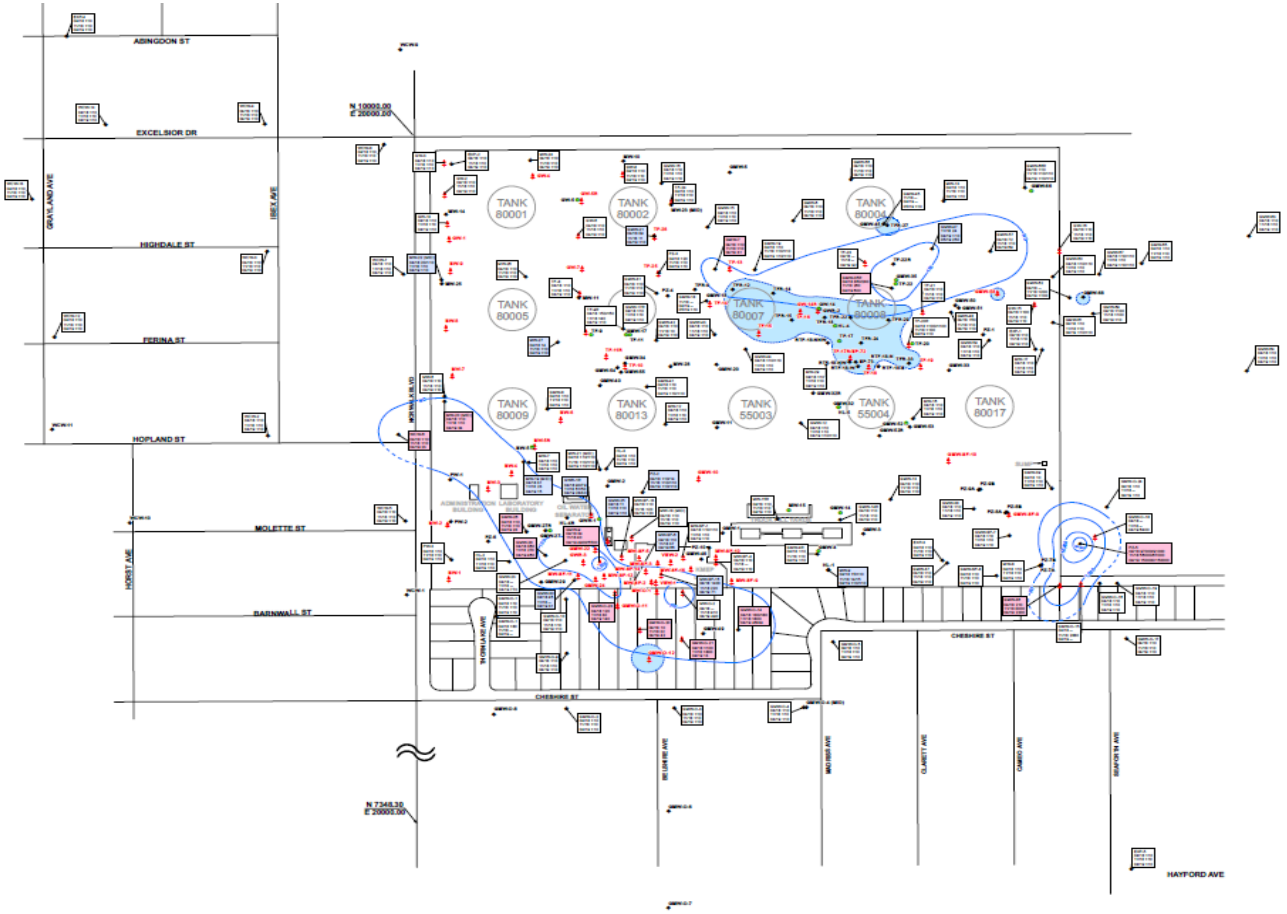
Dissolved (1,2-DCA)



Dissolved MTBE

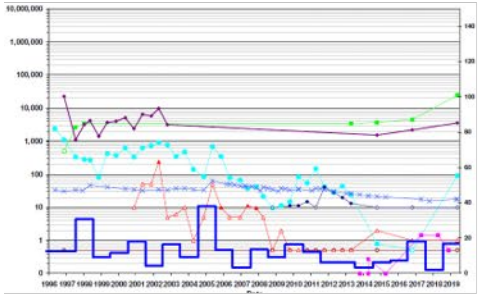


Dissolved TBA

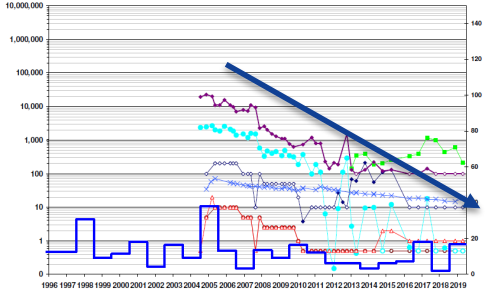


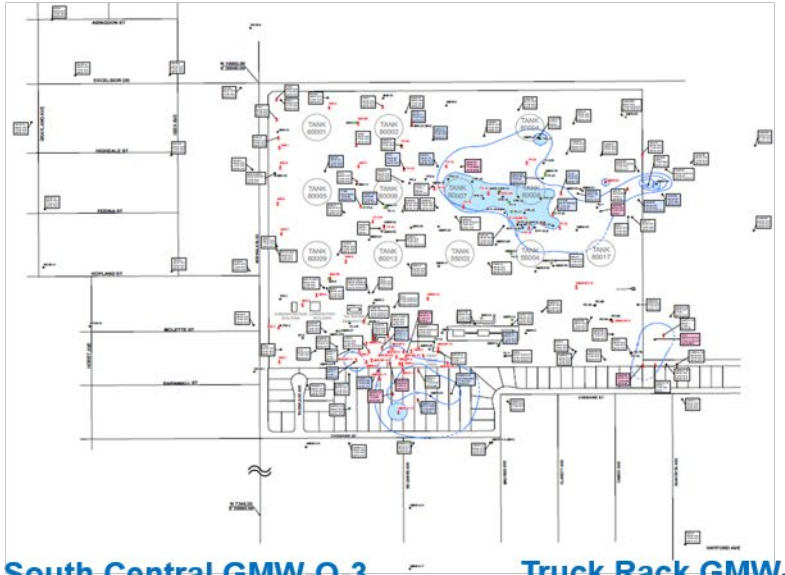
Time Series – Dissolved Benzene

Tank Farm GMW-45

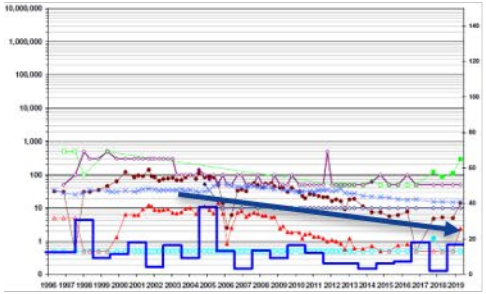


Northeast GMW-61

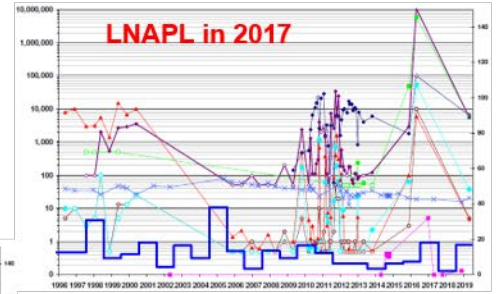




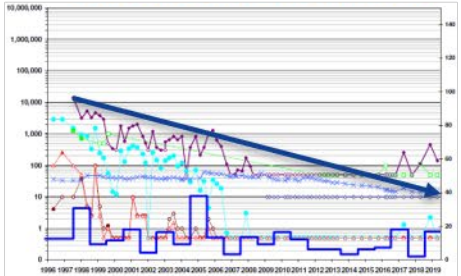
West – WCW-7



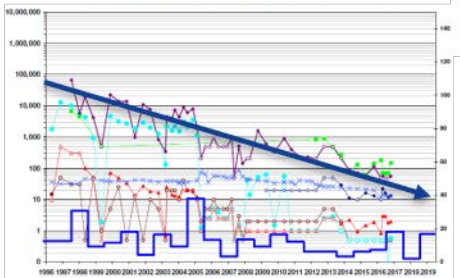
Southeast GMW-O-18



South Central GMW-O-3



Truck Rack GMW-1

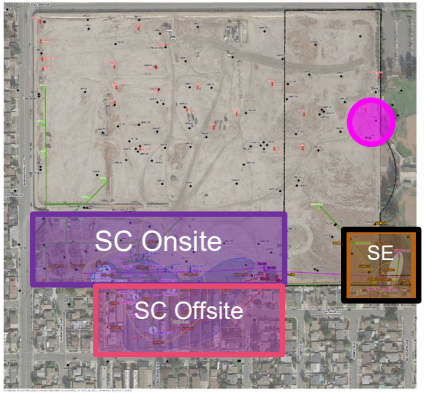


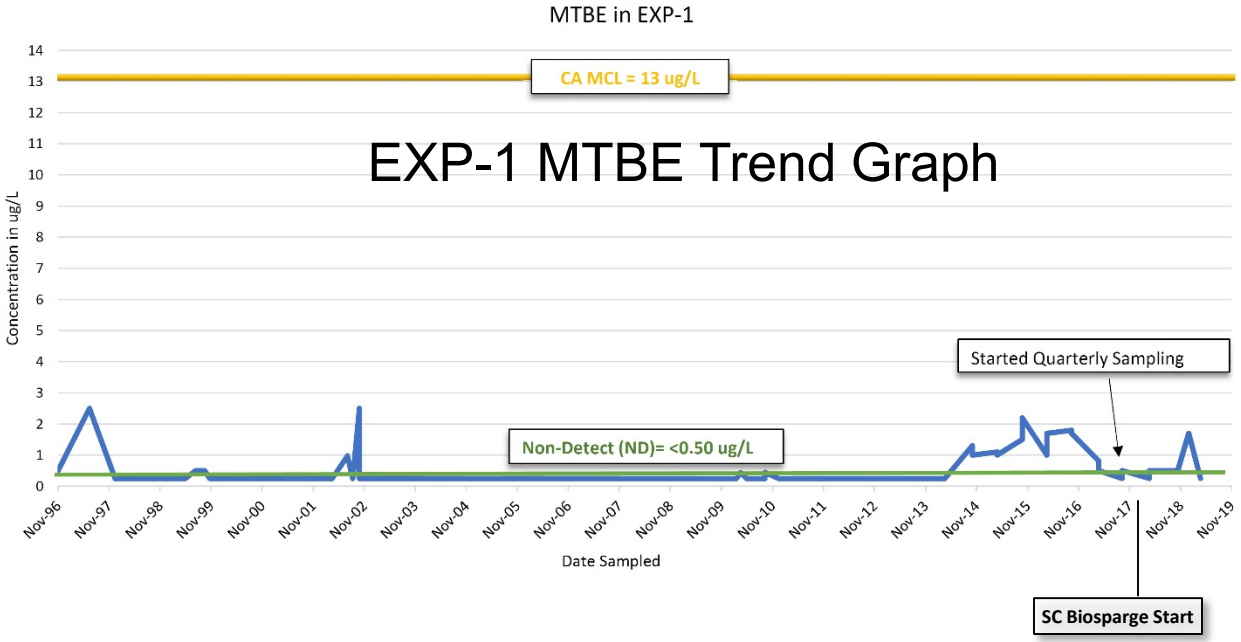
First Semiannual 2019 Groundwater Monitoring Report

- Exposition Aquifer wells sampled:
  - EXP-1, -2, and -3 (sampled twice by Kinder Morgan and DLA)
  - EXP-4 sampled once by SFPP
  - EXP-5 sampled once by SFPP
- All analytical results were Non Detect (ND)

Exposition Aquifer Update

- 5 wells screened in Exposition Aquifer, only one with detections in the last 10 years
- EXP-1 below MCLs, no increasing trend
- 7 of the last 8 results were non-detect.
- Continue with semi-annual sampling frequency





Questions?

August 22, 2019

JACOBS®

www.jacobs.com | worldwide