

Norwalk Tank Farm Update

*Defense Energy Support Center-
Americas West
Norwalk Tank Farm
Restoration Advisory Board*

July 29, 2010



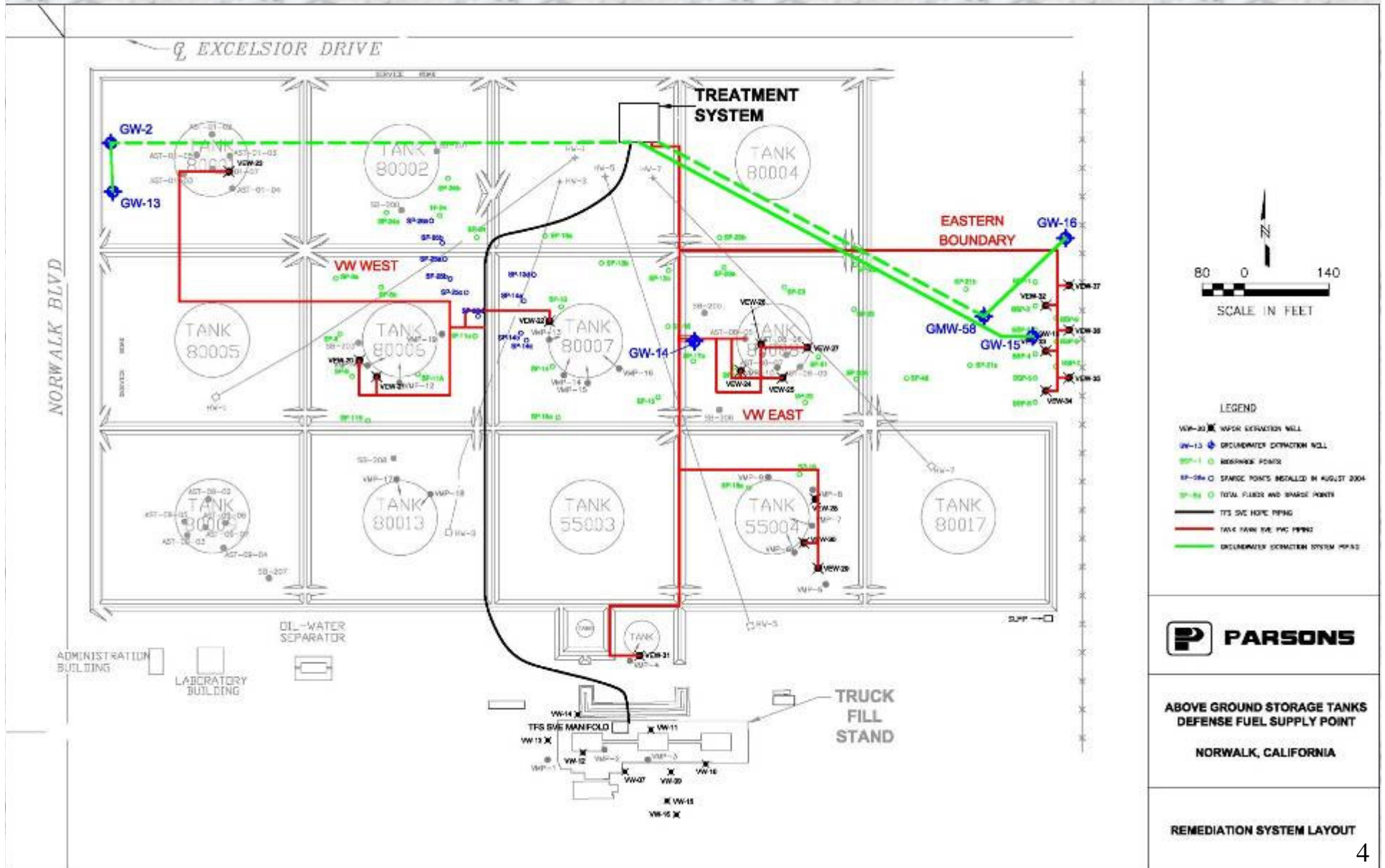
Presentation Overview

- General Site Activities
- Remediation System Update
- Additional Investigation Update
- Capture Zone Analysis Update
- Remedial Action Plan Update
- Planned Activities
- Tank Removal Update

General Site Activities

- Completed weed abatement in May
- Submitted NPDES Discharge Monitoring Report (DMR):
 - 4th Qtr 2009 (Feb 12) and 1st Qtr 2010 (Apr 13)
- Conducted Groundwater Monitoring (GWM):
 - Jan 11 – 13: 1st quarter sentry GWM event
 - April 12 – 19: 1st semiannual 2010 GWM event
- Submitted Groundwater Capture Report (Jun 17)

DESC Remediation System Layout



Groundwater Remediation System Activities

- Cleaned in-line filter screen at GW-16 (Jan 28 & Jun 22)
- Evacuated arsenic resin from small vessel (Feb 4)
- Pick up of large arsenic vessel for resin evacuation (Mar 24)
- Replaced valve at outlet of the third granular activated carbon (GAC) vessel (GAC-3) (Mar 25)
- Repaired leak at surge tank (Mar 25)
- Repaired broken hose at GW-16 (Mar 31)
- Repaired broken hose at GW-15 (Jun 23)

Groundwater Remediation System Activities (cont.)

- Groundwater treatment system (GWTS) motor failure June 7 - new motor procured and installed on June 16 – electrical short between PLC panel and motor identified and repaired on June 17
- Monthly sample collected June 22 shows selenium exceeds permit limit – RWQCB notified July 2 upon receipt of laboratory results
- Pump failure at GW-15 and GW-16 on June 23 – one pump will be repaired and a new pump ordered
- New groundwater permit issued R4-2008-0032 CI No. 7585

GWTS Operations Summary

- System **On** from December 31 through June 30 except for the following periods when it was **Off**:
 - Jan 6 – Jan 14: 1st quarter sentry GWM
 - Jan 30 – Feb 4: pending GAC change-out
 - Mar 23 – Mar 25: pending GAC change-out
 - Apr 1 – Apr 20: 1st semiannual GWM
 - Jun 7 – Jun 16: motor failure, procurement, replacement

Vapor Extraction System Optimization

- AQMD permit approval received (Feb 8)
- Conducted baseline testing and minor repairs (Mar)
- Conducted field monitoring and tests to trouble-shoot operational issues (Apr)
- Collect data for flow (pressure drop) calculations and final sketch of layout/dimensions (May 7)
- Process flow assessment; problems identified and solutions proposed (May 10)
- Revised flow calculations to include influent piping from all areas: WB, EB, TFS, and eastern wells (Jun 4)
- Final standardized re-piping configuration (changing from 4" to 12" post-fan through exhaust) developed by mechanical engineering department (Jul 15)
- Re-piping to be conducted in August
- O&M manual revision begin (May)

Remediation System Update

- Weekly System Inspections
- System Performance & Compliance Sampling:
 - First Quarter: January 26; February 17; March 3, and 18
 - Second Quarter: April 27; May 18; and June 22
- GWTS GAC Change Outs – GAC-1 GAC-2, and GAC-3 completed on February 3, 2010 and March 24, 2010
- GWTS shut down for quarterly groundwater monitoring events
 - First Quarter between January 6th and 14th
 - Second Quarter between April 1st and 20th

Overall Operations Summary

- Groundwater extracted and treated:
 - 1,283,961 gallons in Q1 2010
 - 1,155,509 gallons in Q2 2010
 - 50.8 million gallons since April 1996
- Vapor extraction system –AQMD permit approval received (Feb 8); performed system testing; conducted process flow calculations and re-design; re-piping and system restart to be conducted in August
- System performance - Since April 1996 through December 2009
 - Total Hydrocarbons Mass Removed: 428,722 gallons
 - Approx. 215,870 gallons recycled and destroyed
 - Estimated 212,851 gallons of hydrocarbons destroyed due to enhanced biodegradation

Selenium Issue

- Collected monthly compliance samples (Jun 22) – selenium result was 8.67 $\mu\text{g/L}$ which exceeds permit daily maximum limit (8 $\mu\text{g/L}$) (results were received July 1)
- Collected confirmation sample (Jul 1) – 7.8 $\mu\text{g/L}$
- Shut down system and notified RWQCB (Jul 2)
- Restarted system following 3Q GWM (Jul 14) with operation of selected wells to reduce selenium influent; operated with accelerated selenium sampling schedule per permit requirements
- Collected weekly selenium sample (Jul 12) – 7.79 $\mu\text{g/L}$ (results received July 20)
- Collected second weekly selenium sample (Jul 19) – 10.3 $\mu\text{g/L}$
- Notified RWQCB of second selenium exceedance (Jul 20, upon receipt of lab result)
- Shut down system (Jul 21)

Selenium Remedial Options

- Ion exchange – proper resin selection is important to minimize competing ions which reduce selenium selectivity
 - Influent data from the site was submitted for resin selection analysis to determine the correct resin (anion) in the proper form to be suitable for site conditions; selenium removal resin SBG1 was selected and design of removal system is under way
- Biological reduction – effective, but vulnerable to upsets in process feed, nutrient delivery, temperature, etc.
- Reverse osmosis – not selective for selenium; energy-intensive, subject to scaling, organic carbon interferes with efficiency and fouls the membrane

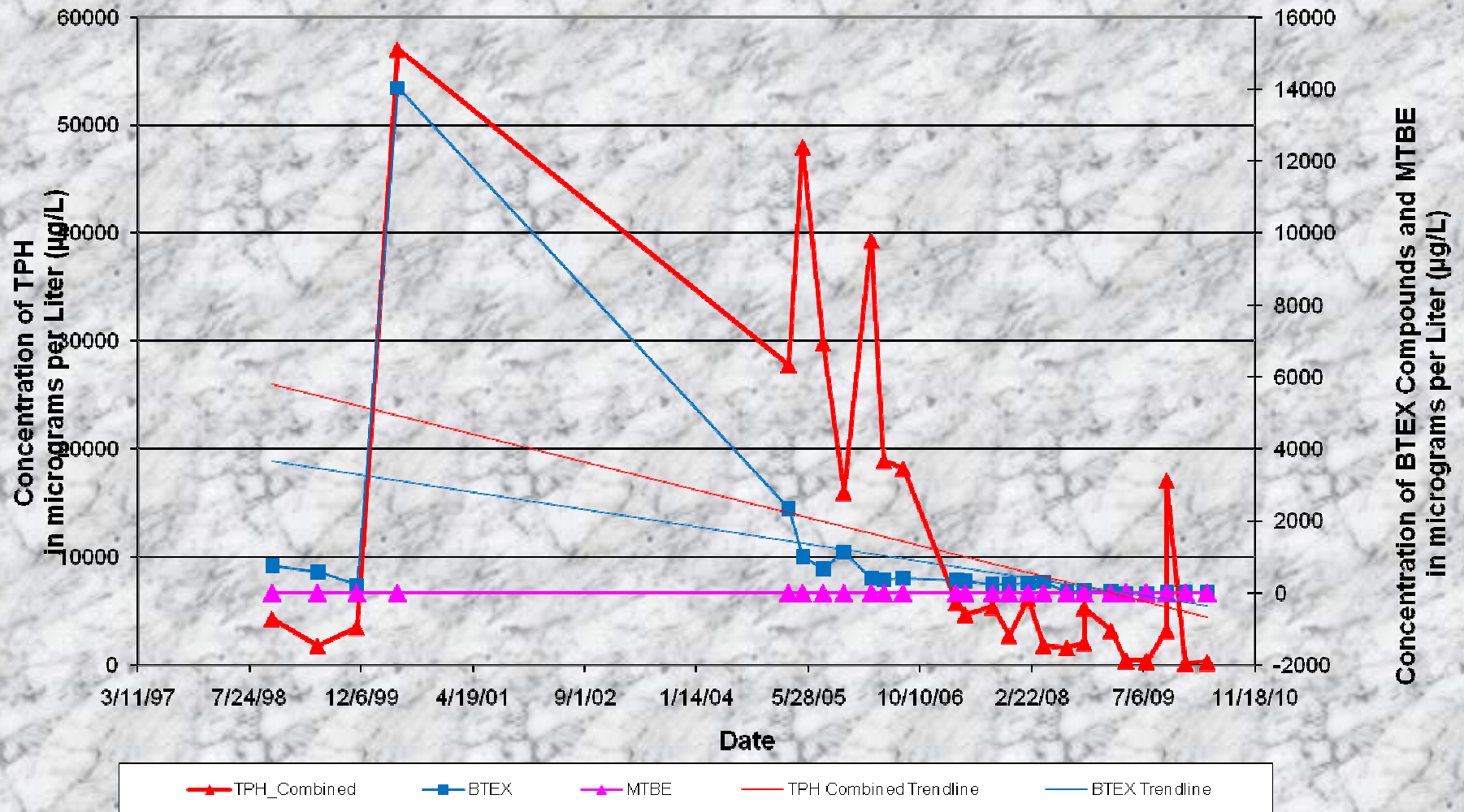
Selenium Remedial Options (cont.)

- Nano filtration – not selective for selenium; energy-intensive, subject to scaling, organic carbon interferes with efficiency and fowls the membrane
- Ferrous iron addition/ferrous hydroxide reduction - effective under certain conditions, but has high reagent requirement and produces sludge
- Activated alumina – effective at pH 5, removal efficiency decreases as pH increases (influent pH 7+); suffers from competing ions
- Anoxic biotreatment cell (ABC) – designed for wastewater treatment and treatment of mining effluent waters; nitrate can be interfering agent (preferentially reduced before selenium) (not aware of any nitrate data on hand)

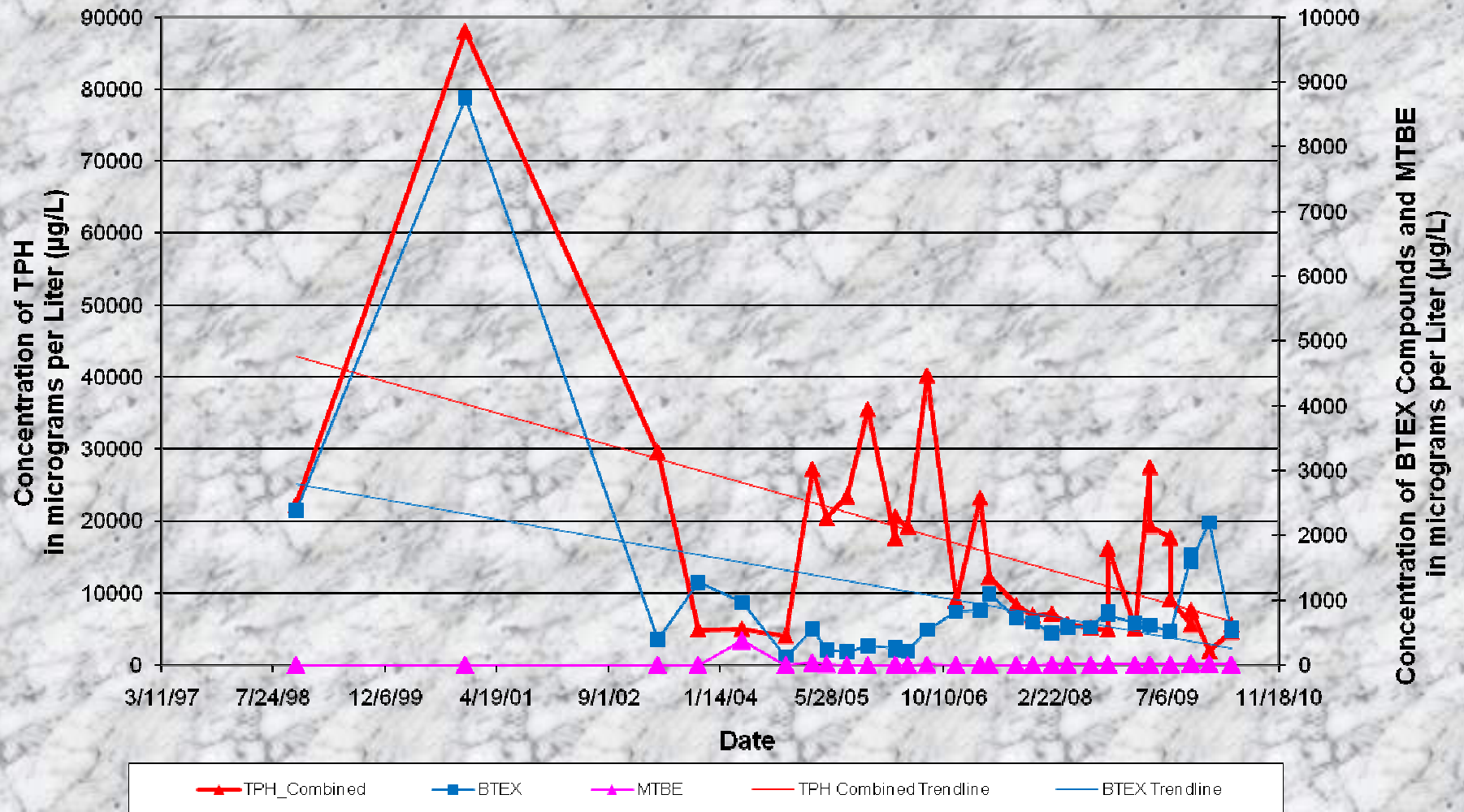
North-Eastern Area Groundwater Extraction Update

- To recall, groundwater extraction began from GW-15 on April 22, 2009 and GW-16 on July 22, 2009
- Since the April and July 2009 GWM events, concentrations of TPH from April 2010 at GMW-59, GMW-60, and GMW-61 have decreased; at GMW-62 they have increased; and have remained generally the same at GMW-58
- All concentrations at GMW-63 and GMW-64 located in Holifield Park remain non detect
- Concentration slides to follow for eastern GWM wells and indicate an overall decreasing trend in TPH at all wells, including GMW-62

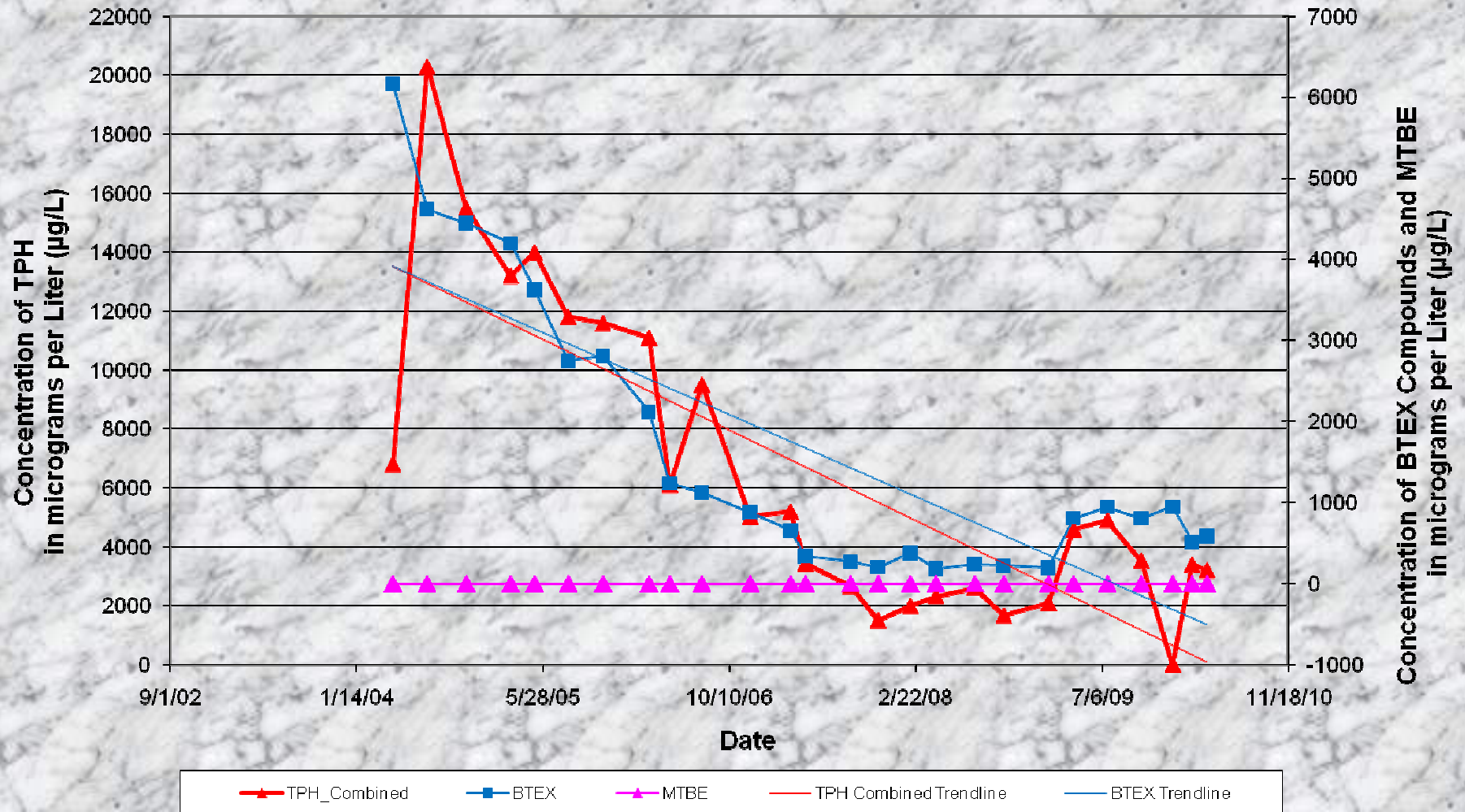
GMW-58 Concentration Trends



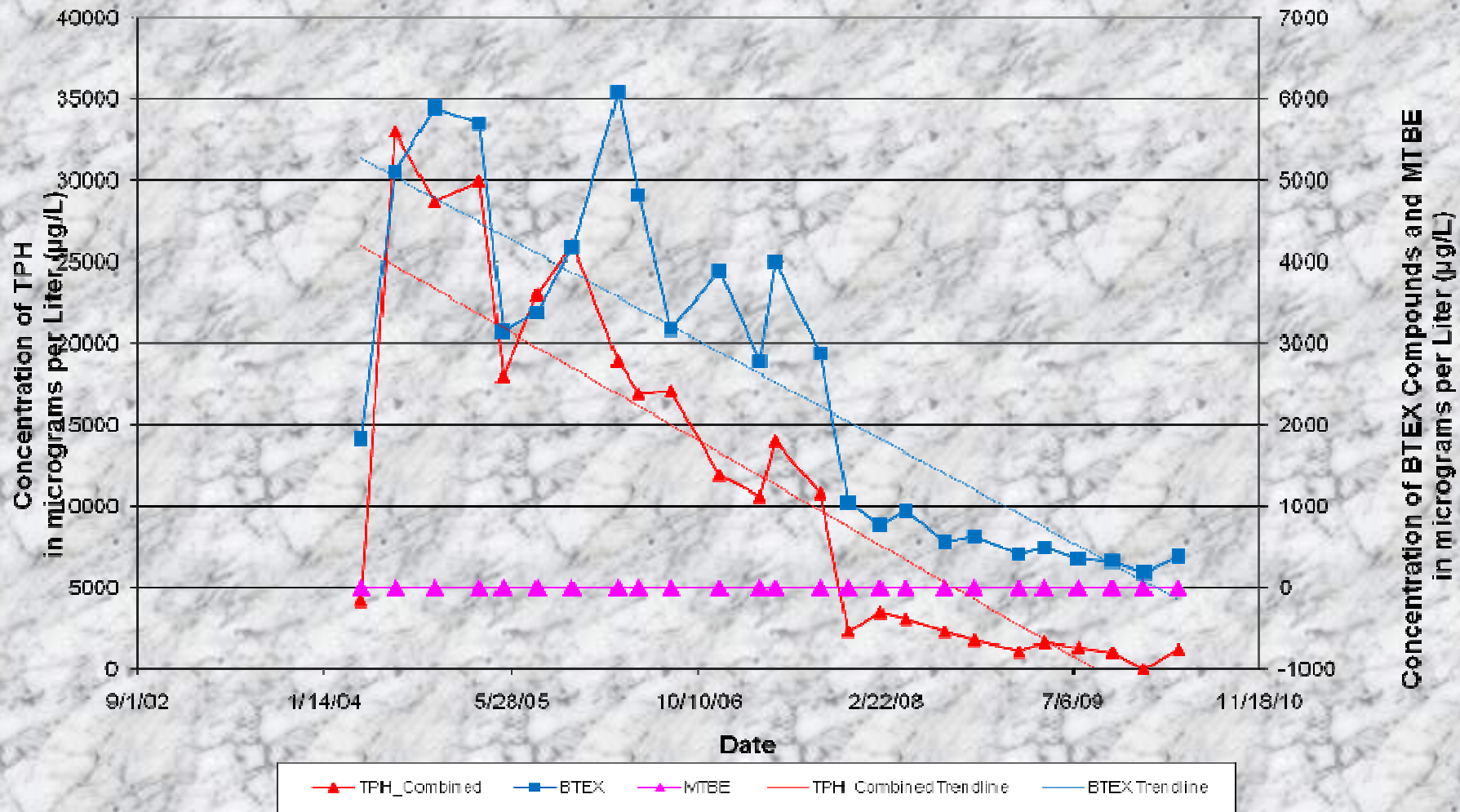
GMW-59 Concentration Trends



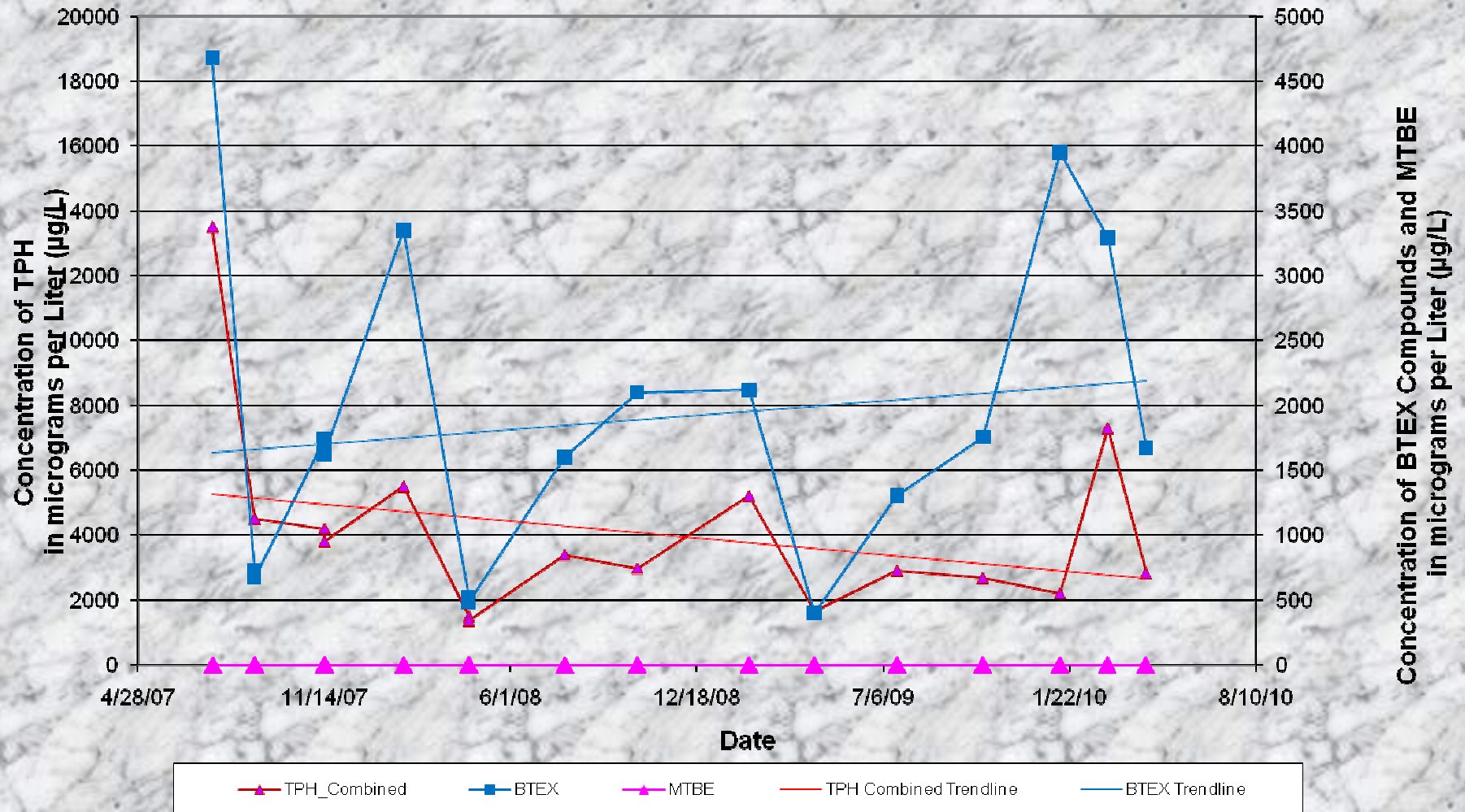
GMW-60 Concentration Trends



GMW-61 Concentration Trends



GMW-62 Concentration Trends

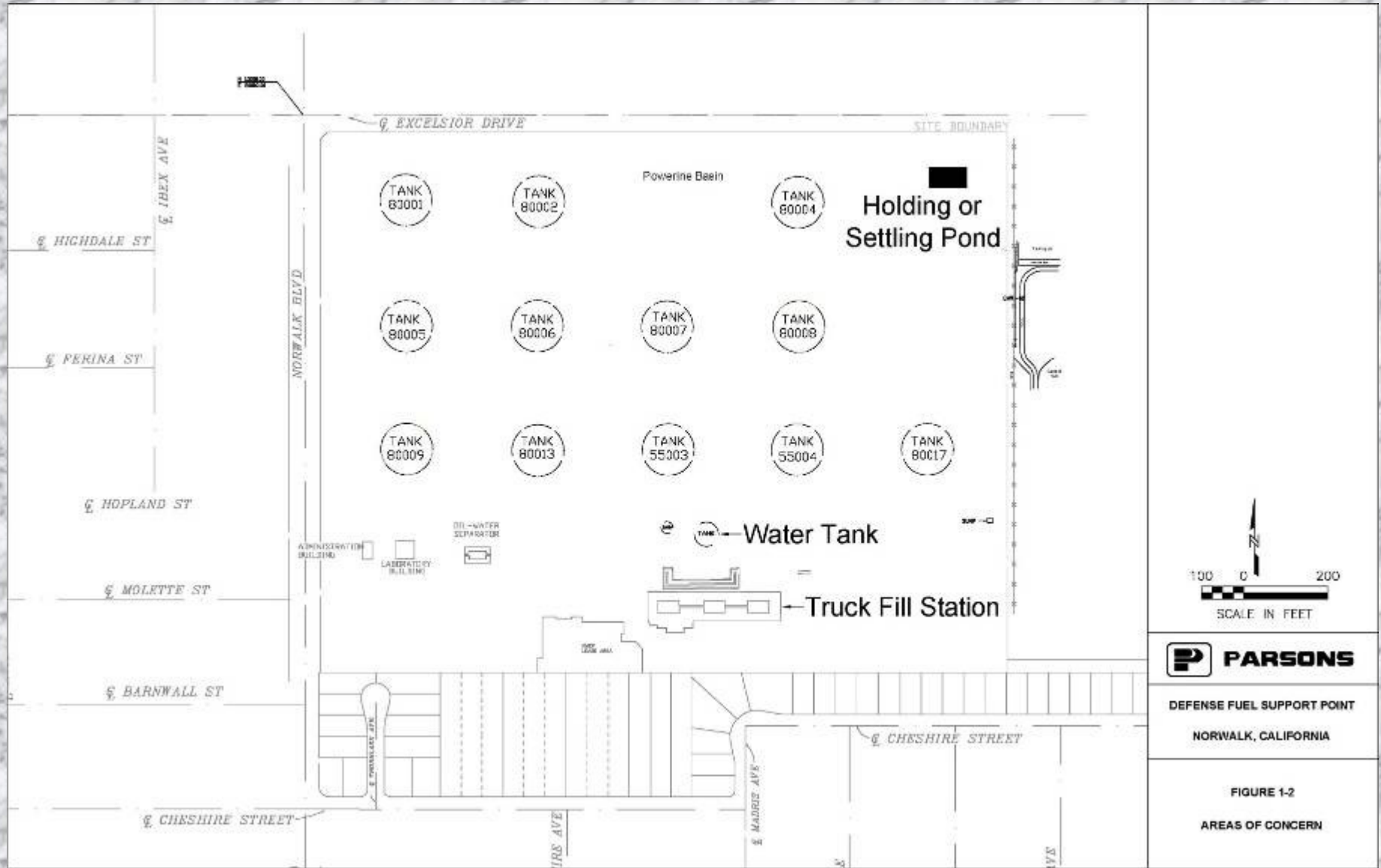


Additional Investigation Update

TFS, Water Tank, NE Settling Pond

- Addendum Work Plan submitted April 1
- Concurrence on the addendum work plan was received by the RWQCB on April 23
- Objective: to further assess the distribution of contaminants in these areas to adequately assess the extent and nature of contaminants in soil at these locations
- Field activities were conducted from April 28 – June 14 and included the following:
 - Gore™ soil gas survey and
 - soil sampling

TFS, Water Tank, NE Settling Pond Site Locations



DEFENSE FUEL SUPPORT POINT
NORWALK, CALIFORNIA

FIGURE 1-2
AREAS OF CONCERN

TFS, Water Tank, NE Settling Pond Field Activities

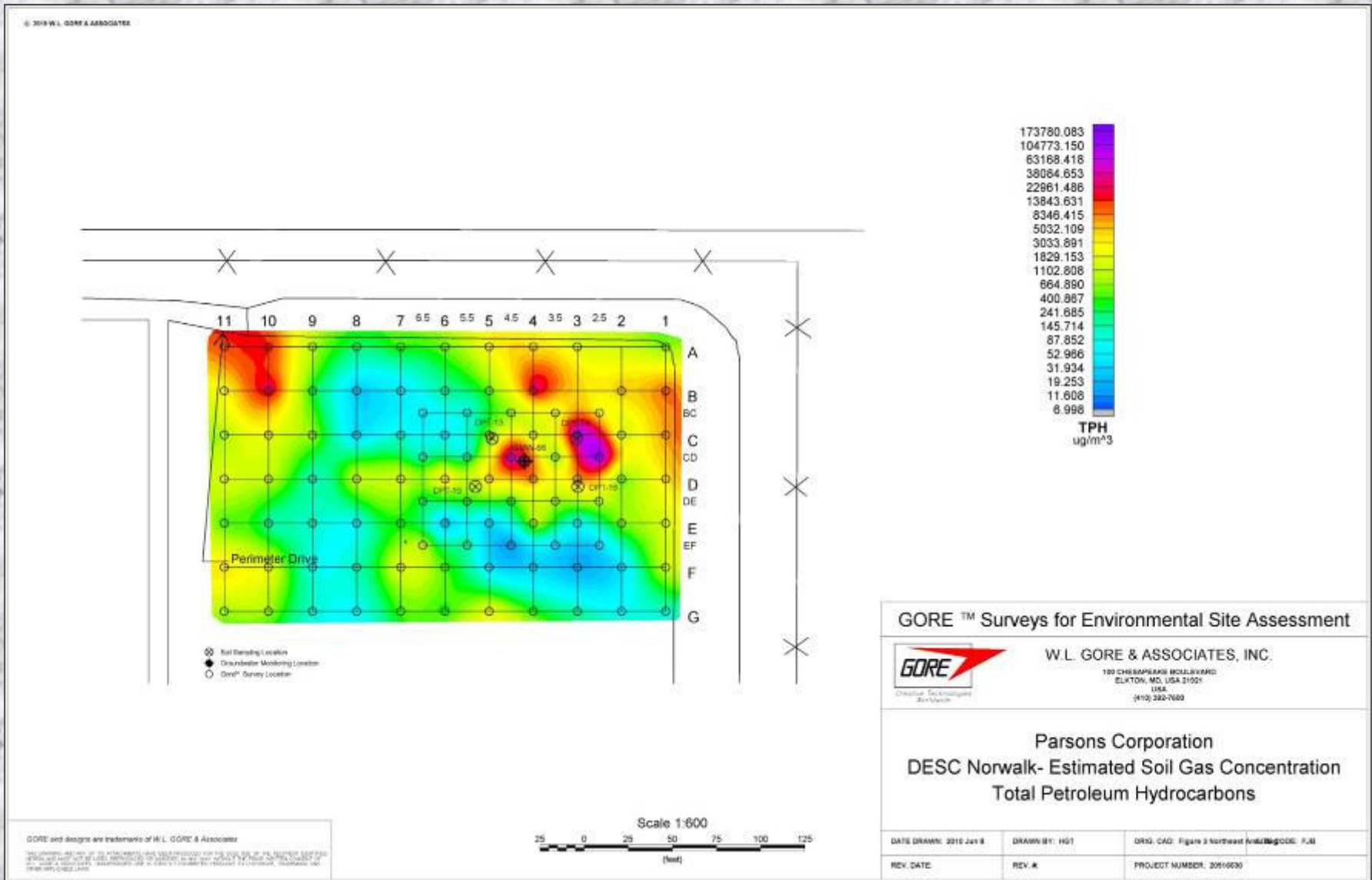
- Gore™ survey was conducted in the NE corner of the site covering an approximate area 275 feet by 175 feet and included the sampling of soil gas at 97 locations
- Soil sampling using direct-push technology (DPT) was conducted at the NE corner, TFS, and water tank areas at 25 locations

Gore™ Survey Results

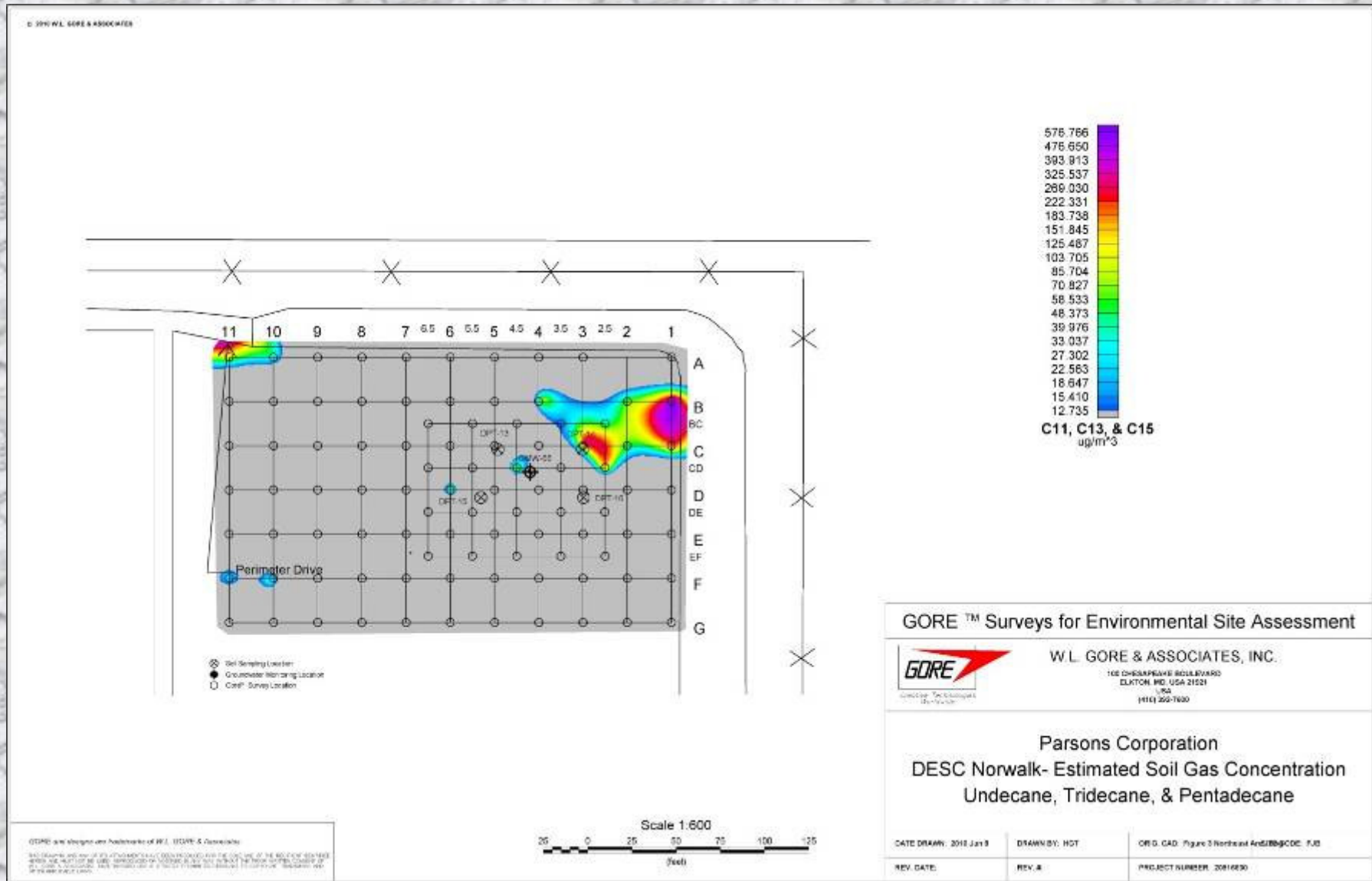
NE Corner of Site

- Reported concentrations of TPH, BTEX compounds, and carbon range C11, C12, and C15
- Distribution of TPH and carbon range C11, C13, and C15 were graphed as shown in following slides.
- Spatial patterns generated during the survey indicate the presence of TPH throughout the entire survey area, with highest detections near grid intersections CD2.5, CD4.5 and C3.
- Spatial pattern for the carbon range C11, C13, and C15 indicated these target compounds primarily in the NE portion of the survey area with additional detections in the central, NW, and SW portions.

Gore™ Soil Gas TPH Concentration NE Corner of Site



Gore™ Soil Gas C11, C13, and C15 Concentration - NE Corner of Site



TFS, Water Tank, NE Settling Pond Soil Sampling Summary

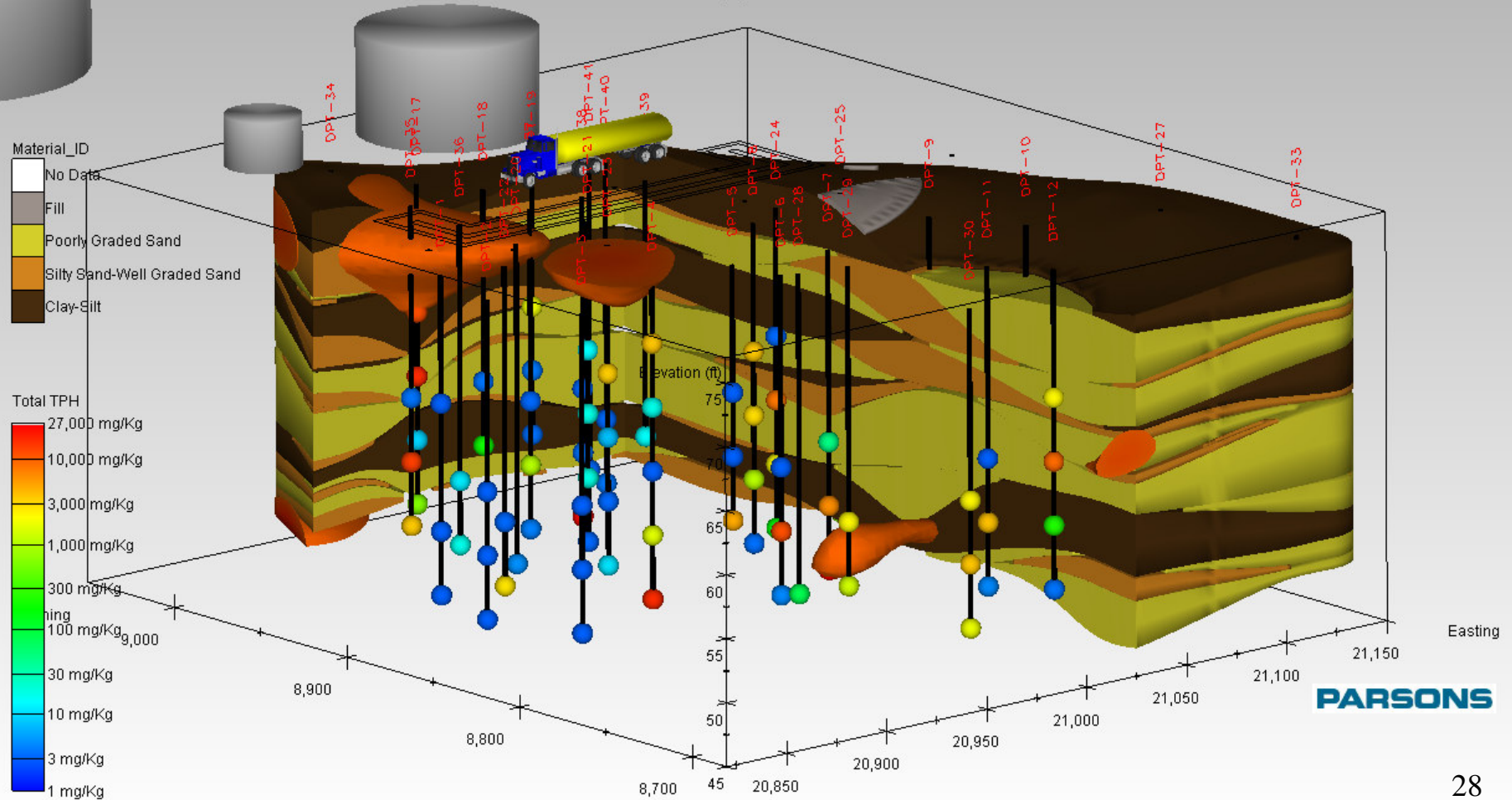
- Selected soil samples collected during this investigation were analyzed for 71 target VOCs, TPHg, and TPH as JP-5
- 25 soil borings were drilled and sampled:
 - 12 in the TFS (DPT-20 through DPT-31)
 - 9 in the water tank area (DPT-33 through DPT-41)
 - 4 in the NE corner of the site (DPT-42 through DPT-45)
- 42 collected soil samples were analyzed at the laboratory

Truck Fill Station Soil Results

- Elevated fuel contaminant concentrations are present at depths between 5 to 25 feet beneath the TFS area
- Based on the field and analytical data collected, the lateral extent of impacted soil has been adequately assessed
- The highest concentration of TPHg (16,000 mg/kg) and TPH as JP-5 (11,000 mg/kg) were detected at the south-center portion (DPT-7) at 25 feet bgs
- Benzene was detected at six DPT locations from 10 to 25 feet bgs at a maximum concentration of 390 $\mu\text{g}/\text{kg}$ at DPT-4 at 25 feet bgs
- MTBE and TBA were not detected above respective reporting limits in any of the soil samples analyzed

Truck Fill Station Cross-Section Preliminary/Work-In Progress

Conceptual Site Model
Defense Fuel Support Point, Norwalk, CA



Water Tank Area Soil Results

- Elevated fuel contaminant concentrations are present in soil south and southwest of the existing tank
- Based on the field and analytical data collected, the lateral extent of impacted soil has been adequately assessed
- The highest TPHg and TPH as JP-5 concentrations within the water tank area (14,000 mg/kg and 11,000 mg/kg, respectively) were detected at DPT-17 at 5 feet bgs
- Benzene was detected at four DPT locations at 20 and 25 feet bgs at a maximum concentration of 45 µg/kg at DPT-38
- MTBE and TBA were not detected above respective reporting limit in any of the soil samples analyzed

Northeast Area Soil Results

- TPH as JP-5 was not detected in any of the soil samples collected from the northeast settling pond area during this investigation
- TPHg was reported at a concentration 0.35 mg/kg in one soil sample (GMW-66 at 5 feet) collected from this area during the previous investigation
- Benzene was detected in three of the soil samples collected, with a maximum concentration of 1.9 $\mu\text{g}/\text{kg}$
- MTBE and TBA were not detected above respective reporting limit in any of the soil samples analyzed

TFS, Water Tank, NE Settling Pond Recommendations

- No further action or remedial action for soil in the NE corner of the site are needed
- Remedial options for soil at the TFS and water tank areas are currently being evaluated
- Investigation summary report is under-way and will be submitted

Capture Zone Analysis Update

- Report submitted June 17, 2010
- Objectives:
 - delineate groundwater capture areas with the addition of the most recent groundwater extraction well GW-16
 - compare capture induced from the DESC controlled groundwater extraction system to the KMEP controlled extraction wells
 - investigate mechanisms for early breakthrough of TBA in the DESC controlled groundwater treatment system

Capture Zone Analysis Update

(cont.)

- The capture analysis explored the following lines of evidence for capture effectiveness:
 - water level measurements prior to and during groundwater extraction
 - estimation of drawdown induced by groundwater extraction
 - groundwater elevation contouring
 - 2D analytical flow modeling (using data from DESC and KMEP extraction wells)
 - plotting of COC trends for the northeastern area
 - sampling of groundwater from the groundwater extraction wells

Capture Zone Analysis Conclusions

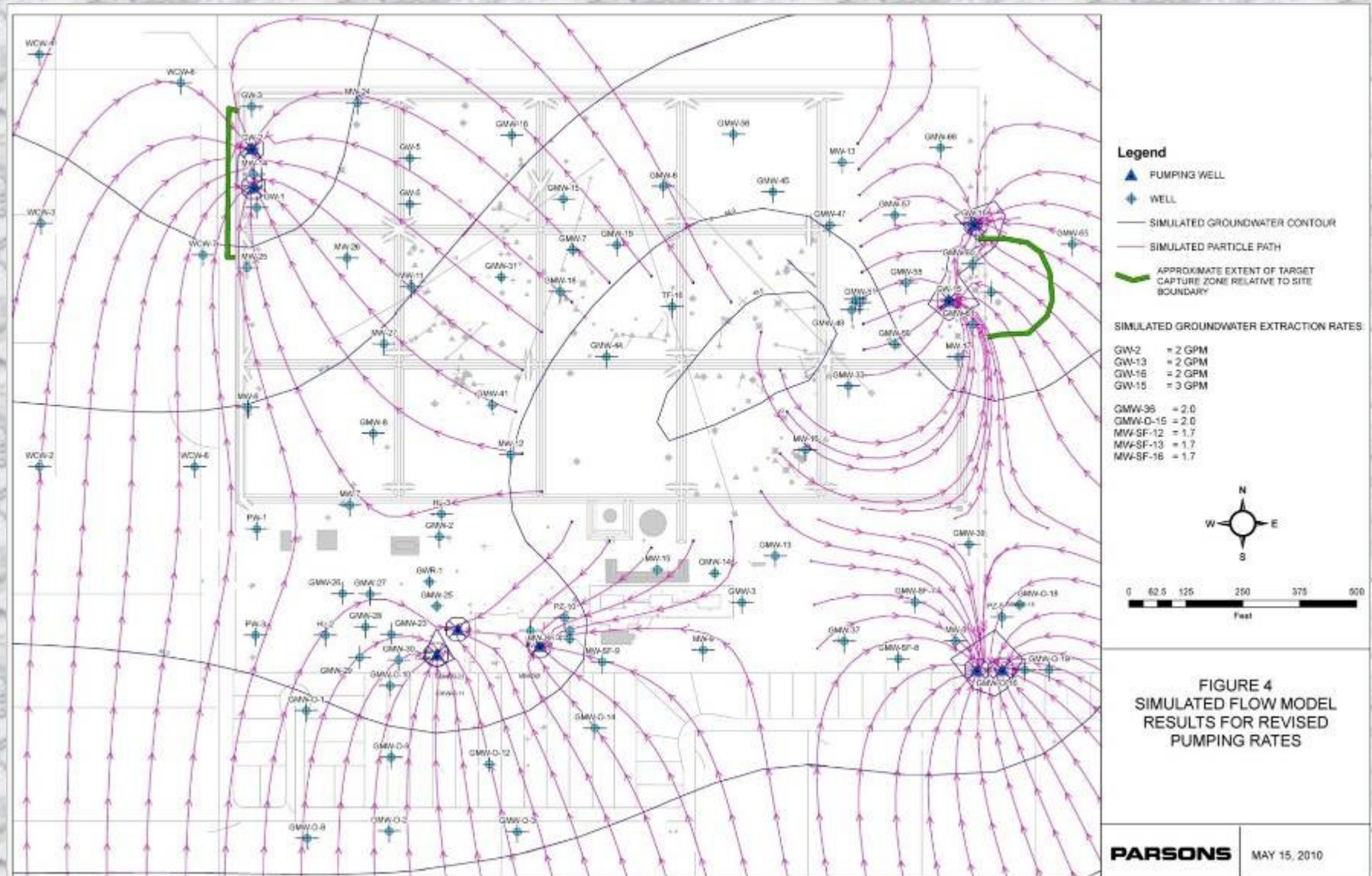
- Current groundwater extraction rates in DESC wells GW-2 (3.4 gpm), GW-13 (3.4 gpm), GW-15 (5.5 gpm), and GW-16 (2.2 gpm) are sufficient at achieving target capture areas and limiting the potential for further offsite migration of COCs as well as capturing and pulling back existing COCs in groundwater already offsite
- Groundwater flow modeling results agree with water level contouring
- The model results support the above conclusion that the extraction rates at wells GW-2, GW-13, GW-15, and GW-16 are more than sufficient for limiting the potential for further migration of COCs offsite

Capture Zone Analysis Conclusions

(cont.)

- The increased TBA that was causing the frequent breakthrough was related to non-equilibrium pumping rates across the site and the DESC extraction wells were pulling in most of the VOCs including TBA
- Analytical trends in the northeast area suggest a significant downward trend in COCs in groundwater, supporting the capture effectiveness
- Analytical samples from extraction wells suggest the highest mass load to the DESC northern treatment system is from wells GW-15 and GW-2
- Predictive modeling suggests that lower extraction rates can still maintain a sufficient capture area

Capture Zone Analysis Simulated Results



Capture Zone Analysis Recommendations

- Based on this capture analysis, it is recommended to reduce long-term average groundwater extraction rates from the DESC wells to the following: 2 gpm at GW-2, GW-13, and GW-16, and 3 gpm at GW-15
- If the pumping rates are balanced and coordinated with KMEP, then the breakthrough of our GAC can be reduced to acceptable levels
- RWQCB requested a site-wide groundwater model be created using this model developed by Parsons and the model developed by AMEC (Jul 12)

DESC/KMEP Combined Groundwater Model

- Parsons and AMEC discussed the best approach for creating a combined groundwater flow model of typical long-term site conditions
- Both parties agreed to re-calibrate the active pumping groundwater model by incrementally changing the parameters in the “Parsons” model towards the “AMEC” model, thereby “averaging” the parameters
- This gradual change was continued until the calibration statistics approached an acceptable solution; after calibration, additional KMEP wells were included in the southeast and south-central areas (these wells are typically active, but were under maintenance during the target water level event used for the June 17 submittal)

DESC/KMEP Combined Groundwater Model (cont.)

- Re-Calibrated Parameters:
 - Hydraulic Conductivity = 20 ft/day
 - Unit thickness = 34.0 ft
 - Reference head = 45.7 ft
 - Hydraulic gradient = 0.001 dimensionless
 - Storage = 0.005 dimensionless

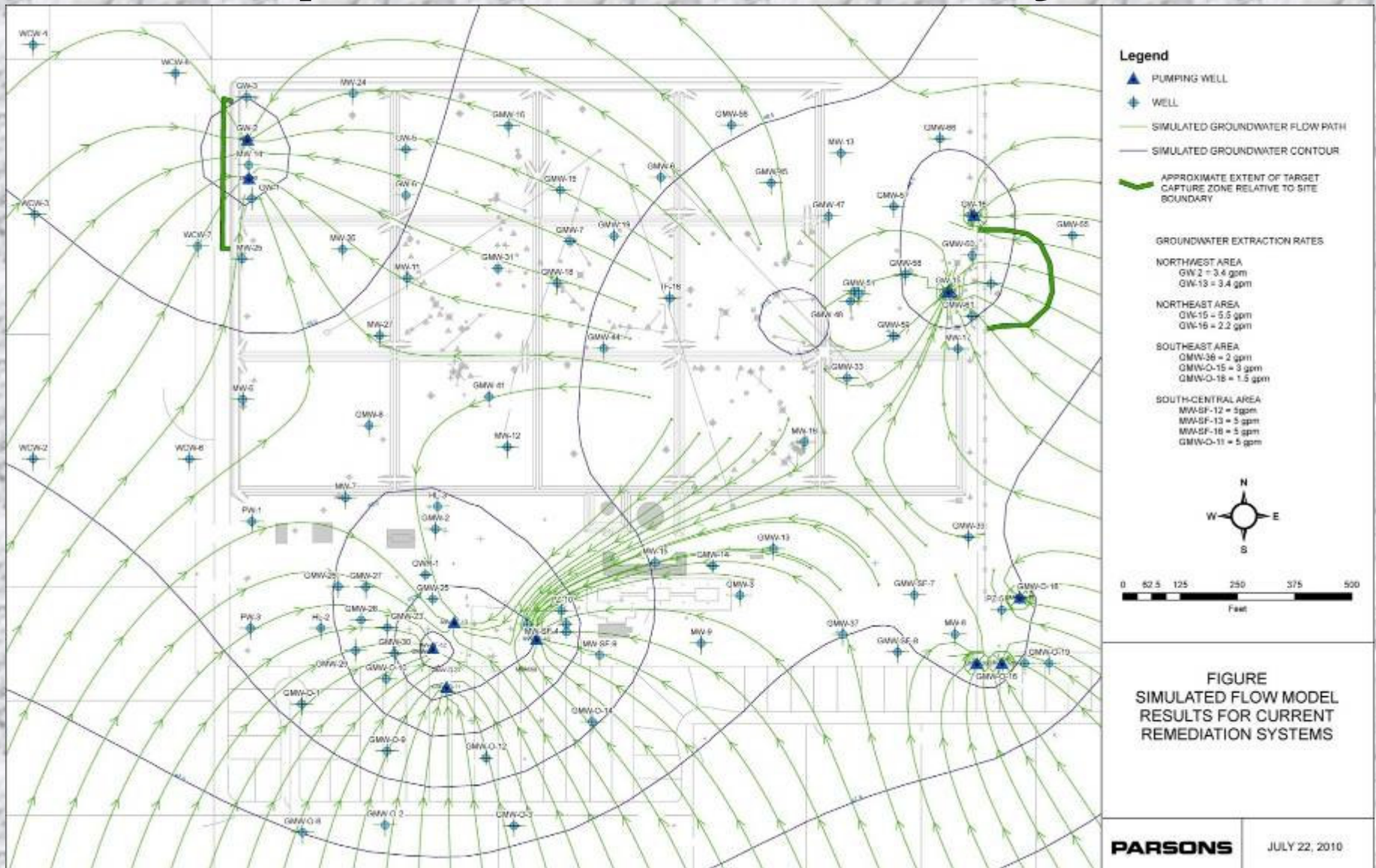
DESC/KMEP Combined Groundwater Model (cont.)

- Calibration statics:
 - Number of targets = 83
 - Residual mean = 0.032 ft
 - Residual Standard Deviation = 0.292 ft
 - Residual Sum of squares = 7 ft²
 - Absolute Residual Mean = 0.234 ft
 - Observed Range in head = 2.79 ft
 - RSTD/range = 0.105
 - ARM/range = 0.084

DESC/KMEP Combined Groundwater Model Flow Rates

- Northwest Area
 - GW-2 = 3.4 gpm
 - GW-13 = 3.4 gpm
- Northeast Area
 - GW-15 = 5.5 gpm
 - GW-16 = 2.2 gpm
- Southeast Area
 - GMW-36 = 2 gpm
 - GMW-O-15 = 3 gpm
 - GMW-O-18 = 1.5 gpm
- South-Central Area
 - MW-SF-12 = 5 gpm
 - MW-SF-13 = 5 gpm
 - MW-SF-16 = 5 gpm
 - GMW-O-11 = 5 gpm

DESC/KMEP Combined Simulated Capture Zone February 2010



DESC/KMEP Combined Groundwater Model Observations

- Hydraulic parameters from individually derived models from Parsons and AMEC were similar (e.g. hydraulic conductivity 12 ft/day – 34 and 50 ft /day) indicating a degree of certainty in the models accuracy
- Model generalizes groundwater flow across the site
- Groundwater extraction from the 10 active wells, pumping at approximately 59,000 gallons per day, provides effective groundwater capture of site compounds
- Model suggests there is an inward gradient along a large majority of the site boundary; only along a short section of the northern property boundary (where wells are below regulatory limits) is there an outward gradient.

DESC/KMEP Combined Groundwater Model Limitations

- Model was designed with sufficient complexity to broadly identify groundwater flow paths, small scale groundwater flow paths may not be fully realized in the site-wide model
- Water-level contours calculated by the model in areas outside of the monitoring well network should be considered less accurate than the water-level contours in the area bounded by the monitoring well network
- Basic assumption of the model was that water bearing unit could be considered heterogeneous and isotropic; it is known that the groundwater system is heterogeneous; however, at the scale of the model, most of the aquifer variability is believed to "average out" so that the assumption is valid for the scale of the model

Remedial Action Plan Update

- Presented update at January RAB meeting; schedule was subsequently emailed
- Groundwater extraction system was shut down due to selenium exceedance
- VES not yet fully operational
- Regulatory concurrence for cleanup goals still pending
- Therefore plan effectiveness and schedule update is delayed

Planned Activities for Next Semiannual Period

- Design and implement selenium treatment option for the GWTS
- Site-wide weed abatement
- Conduct 3rd quarter sentry GWM (Jul 12–13) and 2nd semiannual GWM event
- Prepare and submit NPDES DMR for 2nd and 3rd quarters 2010
- Prepare and Submit Second Supplemental Investigation Report for TFS, Water Tank, and NE Settling Pond Areas
- Re-pipe and configure VES from the fan through the treatment stream; startup and optimize VES
- Prepare and submit LNAPL characterization and vapor monitoring program work plan
- Submit No Further Action for soil in the NE corner of site

Tank Removal Update

- Air Force is preparing statement of work and is expected to be issued late summer
- Award and work to begin early next year
- Work includes the tanks, piping, TFS, appurtenances, pump house, and two sheds (no berms)

Discussion