

Ms. Farah Naz & Mr. Muhammad Jamil's  
Eagle Gas Station, 4301 San Leandro Blvd., Oakland

# Project Status Update

Presentation prepared for::

Alameda County Environmental Health Services (ACEHS)

1) CAP For fixed DPE w/  
cost evaluation - OK

June 17, 2010

2) Reduce groundwater monitoring  
prior to remediation - OK to reduce costs

3) Sample MW-7D before  
decommissioning - email  
w/ plans OK



# Meeting Agenda

- **Overview of Project**
  - Site Description / Sensitive Receptors
  - Geology / Hydrogeology
  - Assessment History / Conclusions
  - Conceptual Site Model
  - Remediation History (Proposals, Bench Tests, Pilot Tests)
- **Financial Status of Project**
- **Recommended Additional Work**
  - CAP Preparation (full scale DPE system)
  - CAP Implementation
  - Outstanding Issues



# Project Overview

## SITE INFORMATION / DESCRIPTION

- Ms. Farah Naz and Mr. Muhammad Jamil own the property
- Ms. Naz is USTCF claimant; her son, Mr. Kafil, actively manages all aspects of work for his parents
- Located in southern portion of City of Oakland, at southern corner of San Leandro / High Street.
- Located ~1100 ft NE of I880, ~500 ft SE of 42<sup>nd</sup> Ave overpass
- Area is highly urbanized mixed industrial / commercial / residential
- Two property boundaries are commercial buildings flush with property lines (streets bound other edges of properties)
- Operating gas station with two gasoline USTs (10k; 15k) on SW portion of the property
- Two fuel dispenser islands, one along each street (NW, NE)
- Previous USTs (two 6k gas, two 4k diesel, and 1 300g WO) formerly located in same pit as current, along SW side of site

## SENSITIVE RECEPTORS

- No major ecological receptors, such as surface water bodies, homes with basements, and domestic drinking water wells, exist within a 2,000 ft of the site that could likely be impacted by the site contamination (Clearwater, 2001, 2008)
- Potential receptors appear to include only:
  - 1) Nearby human populations (VI)
  - 2) Groundwater considered suitable/potentially suitable for municipal and domestic water supply (MUN) as designated in the SFRWQCB Basin Plan. However, beneficial use is not currently being utilized in the area of the site.

# Project Overview

## GEOLOGY

- Investigated subsurface with 50+ soil borings and CPTs
- In general, conditions are typical of alluvial deposits along the bay margin
- Interbedded clayey sediments (lean clays to fat clays, and sandy clays) of low permeability, with thin interbeds of relatively more permeable clayey sands and clayey gravels
- Subsurface can be generally grouped into two hydrogeologic units
- **Zone A (also called Shallow)**
  - Surface to about 25 or 30 feet bgs
  - Consists primarily of clays with discontinuous, possibly meandering, layers of clayey gravel.
  - Unconfined groundwater occurs in this zone
  - There are 18 wells screened (approx 10-25' bgs) across Zone A
- **Zone B (also called Deep)**
  - About 25 or 30 feet bgs to at least 58 ft bgs (deepest exploration by RP)
  - Consists primarily of sandy soils (poorly to well-graded sand and silty sand) with thin interbeds of lean clay
  - Confined/semi-confined groundwater occurs in this zone
  - There are 7 wells discretely screened (approx 35-55' bgs) across Zone B
  - The transition between the two zones is reported a hard/competent layer where some boring meet refusal

# Project Overview

## HYDROGEOLOGY

- **Zone A / Shallow**
  - 18 wells screened (approx 10-25' bgs) across Zone A
  - DTW ranges 6.01 to 20.26 feet bgs; historic mean is about 9.5 feet bgs
  - Often, the tops of the well screens are submerged/drowned
  - Historic determinations of the groundwater flow in Zone A indicated an apparent mounding of the groundwater surface on site, with steep gradients to the northwest, southwest, northeast, and southeast.
  - Late 2006 investigations determined that on-site leakage of the domestic water supply and sewer are contributing to mounding.
  - Based on geomorphology and surface terrain and nearby sites, groundwater flow towards the bay (S, SW) is expected. Distribution of offsite groundwater impact supports a southwesterly flow.
- **Zone B / Deep**
  - 7 wells discretely screened (approx 35-55' bgs) across Zone B
  - DTW ranges 12.72 to 19.21 feet bgs; historic mean is about 15.5 feet bgs
  - Historic determinations of flow in deeper zone indicates north, east, and southeast flow directions.
  - Shallow gradients generally observed.
- Vertical gradient downward, consistently - head elevation difference of 5-7 feet between shallow/deep well pairs are typical

# Project Overview

## ASSESSMENT HISTORY

- **April 1999** - environmental assessment activities at the property initiated when 5 former USTs were removed/replaced. Strong petroleum odors identified, five soil samples and three groundwater samples collected --- confirmed unauthorized release. ACEHS directed over-ex and groundwater extraction. Totals removed = 80 tons soil, 1000 gallons groundwater. Engineered shoring was needed, but limited both excavation extents and amount of water available to pump. Confirmation soil samples from excavation and from 100-ft product piping run to islands indicated significant residual petroleum hydrocarbons and MTBE.
- **September 2000** - onsite monitoring wells MW-1, MW-2, and MW-3 installed and screened across first water (10-25' bgs). Results: water sampling indicated heavy impact in all three wells - up to 250,000 ug/L GRO and up to 400,000 ug/L MTBE.
- Quarterly monitoring started October 2000 and continued til August 2001
- **August 2001** - 8 additional offsite wells proposed; ACEHS (in Oct 2001) did not approve and requested further characterization of subsurface soils and groundwater onsite be completed prior to the installation of any off-site wells.
- Quarterly monitoring resumed in July 2003 and has continued through mid-2009 when frequency was reduced to semi-annual (1<sup>st</sup> and 3<sup>rd</sup>)
- **January 2004** - ACEHS requested WP for on- and off-site investigation
- **May 2005** - after confusion with Oakland Fire Department on lead agency oversight during 2004, ACEHS provided its review comments for IRAP, asked for WP.
- **August to November 2005** - Work plan submitted / approved

# Project Overview

## ASSESSMENT HISTORY

- **December 2005 and April 2006** – Investigation completed:
  - 17 additional on-site boring / wells
    - MW-4, -5-, -6, -7, -8 ---- shallow monitoring (10-25' bgs)
    - MW-4D, -5D ---- deeper monitoring (35-45' bgs)
    - IS-1, -2, -3, -4, -5, -6 --- injection wells shallow (10-25' bgs)
    - EW-1, -2 --- extraction wells shallow (10-25' bgs)
    - 2 onsite deeper soil borings, not converted to wells (SB-6D and SB-8D)
  - Results: extremely heavy GRO/MTBE/TBA impact in *all* 13 of the new onsite shallow wells but little to no impact in deeper zone.
- **2005/2006** – based on apparent mounding onsite, extensive resurvey efforts undertaken to ensure mounding was real (and not survey errors). Some minor errors found; no major changes in flow interpretations.
- **November 2006** - Sampling for *E. coli*, total coliform, and water treatment byproducts done on water from wells IS-5, MW-8, and MW-7 to identify whether on-site mounding caused by water and/or sewer line leaks. Sampling positive; leak testing performed and indicated both a crack and an off-set in the sewer line near well IS-1
- **May to December 2006** – ACEHD requested WP for additional on- and off-site investigations. Several letters back and forth, additional requests, major access (traffic and space considerations) issues, several modifications to work scope. Revised WP submitted/ approved in December 2006.

# Project Overview

## ASSESSMENT HISTORY

- **June and October 2007**- 4 additional on-site and 13 off-site borings/CPTs
  - MW-1D, -7D ---- two on-site deeper monitoring (35-45' bgs)
  - 4 CPTs (CPT-1D, CPT-7D, SB9, SB16)
  - 13 offsite soil borings down High St, San Leandro Blvd, and on properties to south; soil and grab water samples collected at multiple depths.
  - Installed/sampled 6 shallow multi-depth (3', 6', 9') soil gas wells (VP1 to VP6)
  - Inspection of onsite sanitary sewer, and collection of soil samples for persulfate bench testing
  - Results:
    - Some MTBE/TBA impact (ranging about 500-700 ug/L) in the new deep wells 1D, 7D
    - Grab water from offsite soil borings indicates MTBE/TBA plumes in shallow zone extends down High Street SW, and somewhat beneath properties to south; samples from along San Leandro much less impact. Not defined.
    - Deeper grab water samples along High St. indicated more significant impact in deeper zone too (SB18 at 40'; MTBE/TBA 14,000/33,000 ug/L). Not defined.
    - Soil gas results demonstrated attenuation as depth decreased, but some concentrations very high even in 3' samples. Needs additional assessment.
- **July 2008** - another WP submitted. Proposed off-site passive soil vapor survey (Gore-Sorber), installing additional groundwater monitoring well, determining whether the 42nd Avenue freeway onramp is a groundwater discharge area, repairing sewer lateral, and performing a HVDPE pilot test. ACEHD approved the WP but not Gore-Sorber survey aspect.
- **January 2009** - 3 onsite, 2 offsite boring/wells
  - MW-9, -10 ---- shallow monitoring (5-15' bgs)
  - MW-9D, -10D, -11D ---- deeper monitoring (30-40', 42-52', 40-45' bgs)
  - Results: Shallow wells indicated some MTBE/TBA impact (200-1300 ug/L). Deep wells indicated little to no impact.





# Project Overview

## SITE ASSESSMENT CONCLUSIONS:

- Lateral extent of MTBE/TBA/GRO plumes in shallow groundwater are not adequately delineated to the southwest (down High Street), south (beneath adjacent properties), or north (across intersection- high concentrations in MW-3) of the site.
- Lateral extent of MTBE/TBA/GRO plumes in deeper wells appear reasonably delineated at this time, although several issues:
  - Deep zone impact in borings southwest of MW-9D (SB15, -18, -19)
  - Recent high concentrations in MW-7D (to be discussed later in presentation).
- Vertical extent of groundwater impact is not adequately delineated (impact at 52' bgs in several boring south and southwest of site)
- VI risks may not be adequately assessed



# Project Overview

## CONCEPTUAL SITE MODEL

- Known near-surface conditions (to depths up to about 60 feet bgs) can be divided into two major zones: Zone A (shallow zone) and Zone B (deep zone). Zone A extends from the ground surface to a depth of approximately 25 to 30 feet bgs. Zone B extends from approximately 25 to 30 feet bgs to at least 58 feet bgs. Zone A is predominately clayey soil with discontinuous, possibly meandering, lenses of clayey sands and clayey gravels. Zone B is primarily constituted of sands (clean and silty sands) with thin interbeds of clay. The top of Zone B appears to be a hard layer.
- Groundwater flow in Zone A appears separate from the groundwater flow in Zone B, as flow directions appear different. A groundwater mound exists under the site in Zone A, with steep gradient to the northwest, northeast, southwest, and southeast. Groundwater gradient in Zone B is relatively flat but varies in direction (north and east).
- Although a clear downward gradient exists between the Zone A and B, downward transport of contaminants may have been restricted by the clayey soil and/or the hard layer located between the zones.
- Zone A is highly contaminated on-site, as well as off site to the south, southwest, and in the general direction along High Street. Groundwater within Zone B is relatively less contaminated than that within Zone A.

# Project Overview

## REMEDICATION PROPOSAL HISTORY

- **September 1999** - proposal to conduct a soil remediation pilot study using chemical oxidation of peroxide submitted.
- **January 2004** - proposal to apply enhanced biological method using pure oxygen diffusers (iSOC) was submitted. **June 2005** - proposal to perform simultaneous groundwater extraction and enhanced bioremediation with iSOC submitted.
- **October 2006** - proposal included in assessment work plan to conduct HVDPE test and use in conjunction with iSOC submitted.
- **December 2006** - proposal submitted recommending the application of bioremediation, HVDPE, and in-situ chemical oxidation with persulfate.
- **July 2008** - proposal submitted to conduct short-term HVDPE pilot test
- **May 2009** - IRAP submitted proposing to conduct a 30-day DPE remedial event and pilot test using a mobile HVDPE unit and 12 4" DPE wells (D1 thru D12) - four of which were slanted beneath building. Work approved by ACEHD in October 2009, implemented Dec09 to Jan10.



# Project Overview

## BENCH-SCALE TEST HISTORY

- **March 2006** - *Bench Test for Using Advanced Oxidation - A Summary Report*. Indicated that ozone is ineffective to treat MTBE and TBA under existing concentrations.
- **May 2006** - *Activated Carbon and Organoclay (EC-300) Bench Test Report*. Indicated that activated carbon and Organoclay (EC-300) are both effective in the treatment of MTBE and TBA at concentrations of 540,000 and 61,000 ug/L, respectively. Activated carbon has a better treatment efficiency than EC-300.
- **July 2007** - *Bioremediation Feasibility Study Report*. Indicated subsurface environment is generally anaerobic and reducing. Lack of sufficient oxygen and essential nutrient is limiting the aerobic degradation of petroleum hydrocarbons.
- **February 2008** - *Persulfate Bench Test Results*. Indicated release of heavy metals such as arsenic, chromium, lead, and selenium must be carefully evaluated before in-situ treatment of the source zone using persulfate is seriously considered.



# Project Overview

## PILOT-SCALE TESTING

- December 2009 – 31-day DPE test, using array of 13 extraction wells and mobile DPE unit (CalClean; liquid-ring blower and thermal oxidizer) was conducted
- Soil vapor oxidized using 450 cfm thermal oxidizer
- Extracted groundwater treated using two 500lb GAC vessels; discharge to sewer
- 12 new 4" DPE wells (D1 thru D12) were installed (D7, D10, D11, D12 angled beneath building). Screen intervals 8-23 feet bgs (angled 10-30 ft bgs).
- During the 31-day period, three (3) individual tests were performed:
  - **Test 1 (14 days) -- Wells D5, D6, D8, D9 and EW-1 (southern corner of site)**
    - Extraction flow rate ranged 112 to 217 cfm at applied vacuum of 13 to 17 " Hg
    - Influent PID measurements ranged 584 to 3680 ppmv (highest at EW-1)
    - 10,650 gallons of groundwater was extracted at combined avg extraction rate of 0.5 gpm (over the 14 day period)
    - Initial depth to water at the site ranged between 8.3 and 13.3 feet bgs; stingers were set in extraction wells between 16 and 22 feet bgs
    - Induced vacuum observed in wells VP-2, VP-5, and MW-7
    - Groundwater drawdown: 1.5 feet observed at MW-4; 1.16 feet observed at MW-7.
    - Given that VP-5 and VP-2 are located at 40 feet from the nearest extraction well, the radius of influence is estimated by Stratus to be 40 feet.



# Project Overview

## PILOT-SCALE TESTING

- **Test 2 (8 days) - Wells D1, D2, D3, D4, D5, and EW-1 (in north/east half of site)**
  - Extraction flow rate ranged 196 to 208 cfm at applied vacuum of 15 " Hg
  - Influent PID measurements ranged 1128 to 1684 ppmv (highest at D3)
  - 2,220 gallons of groundwater was extracted at combined avg extraction rate of 0.2 gpm (over the 8 day period)
  - Initial depth to water at the site ranged between 8.3 and 11.5 feet bgs; stingers were set in extraction wells between 16 and 22 feet bgs
  - Induced vacuum observed in wells MW-3, IS-4, and IS-6, although inconsistently and at very low levels
  - Groundwater drawdown: 5.4 feet observed at MW-5; 2.71 feet observed at IS-4
  - Given that MW-3 and IS-6 are located at 25 feet from the nearest extraction well, the radius of influence is estimated by Stratus to be 25 feet.
  
- **Test 3 (9 days) -- D3, D4, D7, D10, D11, D12, IS-3, and MW-8 (center/beneath building)**
  - Extraction flow rate ranged 214 to 226 cfm at applied vacuum of 13 " Hg
  - Influent PID measurements ranged 622 to 2030 ppmv (highest at D12)
  - 9,110 gallons of groundwater was extracted at combined avg extraction rate of 0.7 gpm (over the 9 day period)
  - Initial depth to water at the site ranged between 8.1 and 16.1 feet bgs; stingers were set in extraction wells between 16 and 25 feet bgs
  - Induced vacuum observed in wells MW-7, MW-8 VP-2, IS-5, and IS-3
  - Groundwater drawdown: 0.64 feet observed at IS-1; 0.27 feet observed at IS-5
  - Given that IS-5 is located at 20 feet from the nearest extraction well, the radius of influence is estimated by Stratus to be 20 feet.



# Project Overview

## PILOT TEST RESULTS

- Cumulative total of 22,000 gallons of groundwater were removed; estimated 3,600 lbs GRO removed.
- Concentrations of petroleum hydrocarbons were high in extracted groundwater stream, consistent with concentrations in monitoring wells.
- Influent concentrations in soil vapor were relatively low, considering the magnitude of groundwater impact. This may be due to stinger depth placement.
- ROI varied due to testing methods, but Stratus estimated ROI to be approximately 25-35 feet based on the data collected.
- Test data indicates DPE is an feasible alternative for the site.
- Previous consultant proposed additional 30-day mobile DPE events (at least 2); ACHCA approved in letter 3/29/10. This approach is cost ineffective; Stratus recommends installation of fixed system.



# Financial Status of Project

- Claimant is B priority class
- Total spent to date (thru RR#17) is \$1,203,000
- Funds remaining are approximately \$300,000
  
- Additional site characterization, groundwater monitoring, vapor intrusion, risk assessment and well abandonment work is necessary, but remaining USTCF monies appear best focused on remediation efforts.
  
- Costs
  - Semi-annual groundwater monitoring/sampling/reporting = \$12k (per year)
  - DPE system installation = \$160k
  - Operation & maintenance (O&M) of DPE system = \$125k (per year)
  
- Timeframe in which money would be depleted:
  - Continue monitoring/sampling and reporting during 2010 and 2011
  - Design, permit, construct, install DPE system during 2011
  - Operate system full time during second half 2011 / first half 2012





# Recommended Additional Work

- CAP Preparation --- to ACEHS by September 15, 2010
  - Full-scale DPE system to utilize existing wells already constructed
- CAP Implementation
  - Design
  - Permitting (PG&E, EBMUD, BAAQMD, building)
  - Construction
  - Installation
  - Startup - anticipated around June 2011
- Outstanding Issues:
  - MW-7D / IS-5
  - Leaking sewer / onsite water supply
  - Groundwater sampling - frequency/methods



# Groundwater Monitoring Program

- Quarterly Program History:

- July 2, 2008 – Consultant requested the elimination of MW-6, IS-1, IS-2, IS-3, IS-6, and EW-1 from quarterly monitoring program.
- September 9, 2008 - ACEH approves removal of MW-6, IS-1, IS-2, IS-3, IS-6, and EW-1 from quarterly monitoring program.
- January 14, 2009 – Consultant requested low-flow sampling from wells MW-1, MW-3, MW-4, MW-8, MW-7D, MW-9, MW-9D, MW-10, MW-10D
- February 20, 2009 - *Request for Modifying the Quarterly Groundwater Monitoring Program* sent. This letter is missing from GeoTracker. Based on what was done during 3Q09 and 1Q10, it appears *only* wells MW-4, -7, -7D, -8, -9, -9D, -10, -10D, and IS-5 are now sampled during 1<sup>st</sup> / 3<sup>rd</sup> and that the remaining 16 wells were completely dropped from program.
- April 24, 2009 - ACEH approves reduced M&S as outlined in February 20, 2009 letter.

- Stratus' Recommendation:

- Semi-annual monitoring/sampling during 1<sup>st</sup>/3<sup>rd</sup> quarters each year
- Semi-annual monitoring of MW-3, 4, -4D, -7, -7D, -8, -9, -9D, -10, -10D, IS-5, and EW-2
- Annual monitoring of all 25 wells during 3<sup>rd</sup> quarter
- No analytical changes (GRO, DRO, BTEX, MTBE, TBA, TAME, ETBE, DIPE)
- Conventional 3-well volume sampling of shallow wells (well screens submerged)
- Low-flow micro-purge of deep zone wells

