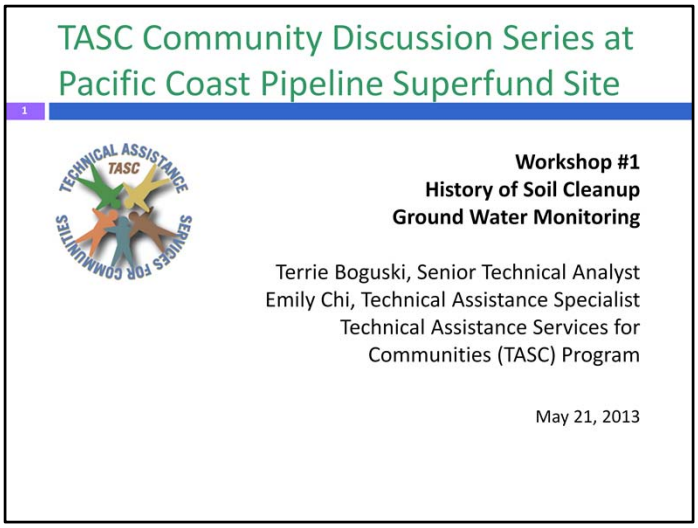
TASC Community Discussion Series at
Pacific Coast Pipeline Superfund Site
1
TECHNICAL ASSISTANCE
TASC
SERVICES FOR COMMUNITIES
Workshop #1
History of Soil Cleanup
Ground Water Monitoring
Terrie Boguski, Senior Technical Analyst
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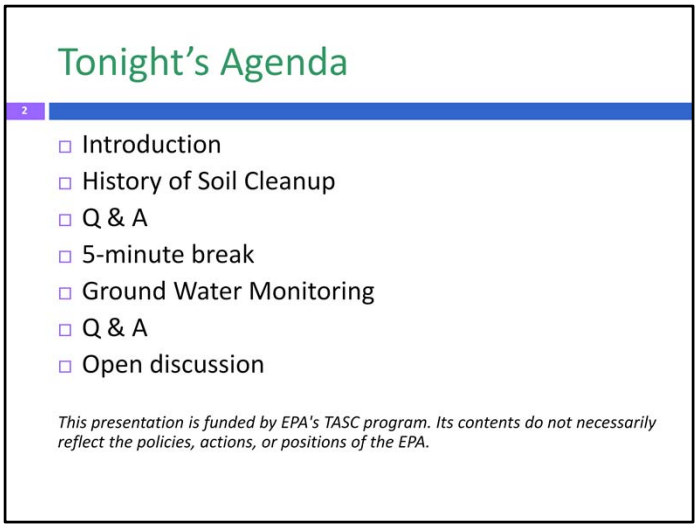
Technical Assistance Services for
Communities (TASC) Program
May 21, 2013


Tonight's Agenda
2
Introduction
History of Soil Cleanup
Q & A
5-minute break
Ground Water Monitoring
Q & A
Open discussion
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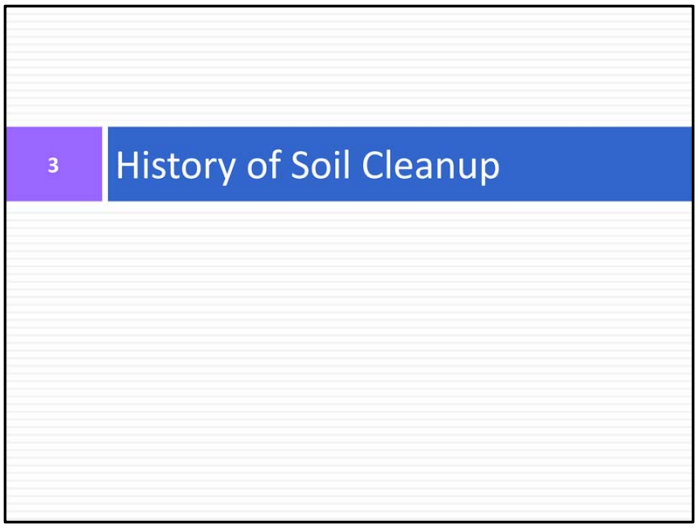
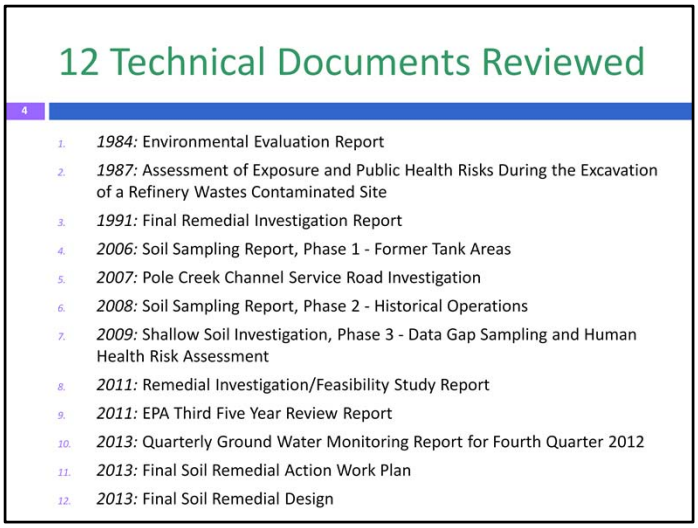
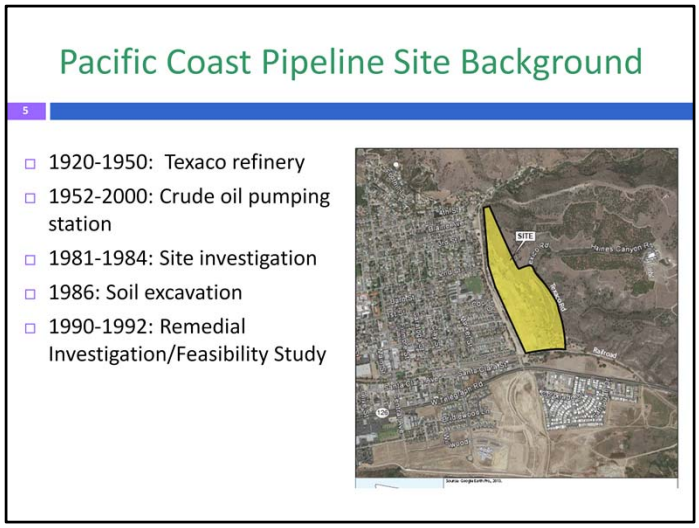
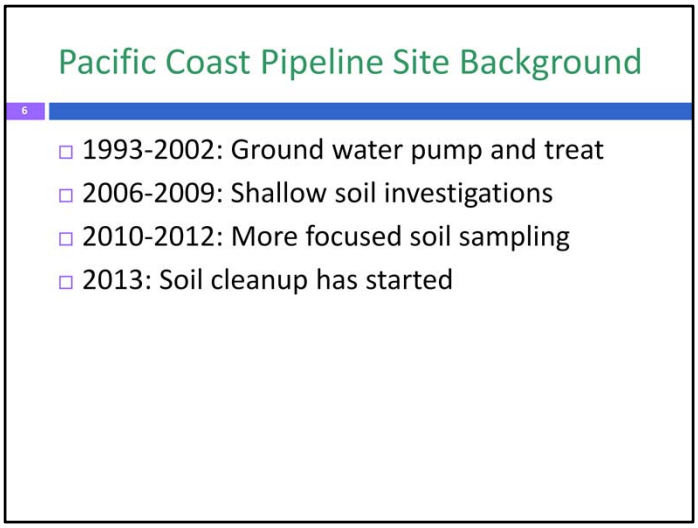

3
History of Soil Cleanup


12 Technical Documents Reviewed
4
1. 1984: Environmental Evaluation Report
2. 1987: Assessment of Exposure and Public Health Risks During the Excavation of a Refinery Wastes Contaminated Site
3. 1991: Final Remedial Investigation Report
4. 2006: Soil Sampling Report, Phase 1 - Former Tank Areas
5. 2007: Pole Creek Channel Service Road Investigation
6. 2008: Soil Sampling Report, Phase 2 - Historical Operations
7. 2009: Shallow Soil Investigation, Phase 3 - Data Gap Sampling and Human Health Risk Assessment
8. 2011: Remedial Investigation/Feasibility Study Report
9. 2011: EPA Third Five Year Review Report
10. 2013: Quarterly Ground Water Monitoring Report for Fourth Quarter 2012
11. 2013: Final Soil Remedial Action Work Plan
12. 2013: Final Soil Remedial Design



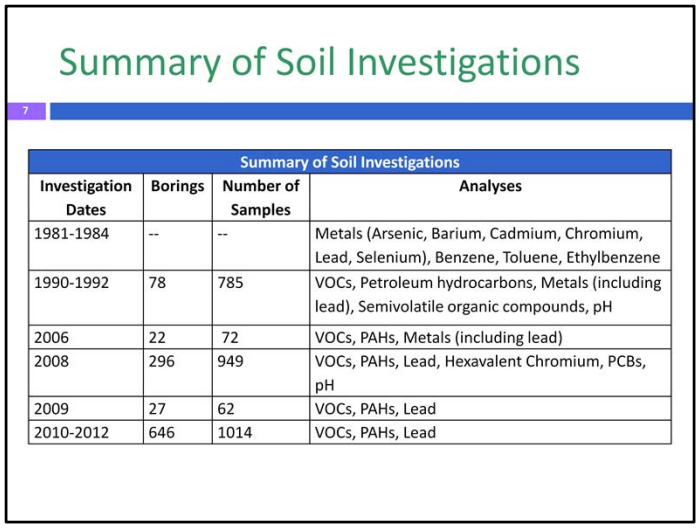
-56-acre site.
-1920-1950: Texaco operated an oil refinery at the Site.
-1952-2000: Site operated as a crude oil pumping station – a collection point for crude oil piped or trucked from oilfields surrounding Fillmore. Crude oil was pumped via pipeline from PCPL to Newhall, California.
-Almost all remaining facilities were dismantled and removed by July 2002, with the last remaining aboveground storage tank removed in August 2004.
-1981-1984: Site investigation (Environmental Assessment, requested by the California Regional Water Quality Control Board): Heavy metals and volatile organic compounds (VOCs) in soil and ground water.
-1986: Excavation - 38,000 tons of contaminated soil and waste were removed from the main waste pit and other small disposal areas. The contaminated soil and waste was shipped off site to Chem Waste Management in Kettleman City. This addressed the majority of soil impacts, but left predominantly shallow soil impacts that were likely associated with historical operations, incidental releases, and former waste management practices.
-1990-1992 – A Remedial Investigation and Feasibility Study (RI/FS) was conducted.



-1993-2002: Two extraction wells were installed to pump ground water contaminated primarily with benzene, which was then removed from the water by a carbon treatment system.
-2006-2009: Shallow soil investigation:

Phase 1 – Soil sampling under former storage tanks.
Phase 2 – Review of Site historical operations; shallow soil sampling across the Site.
Phase 3 – Soil sampling to fill data gaps.

-2010-2012: More focused soil sampling.
-2013: Soil cleanup started last week (mid-May 2013) - excavation of 18,500 cubic yards of soil is planned (this amount of soil would cover a football field almost 3 feet deep in soil).
-Surface of Site is almost ready for reuse.

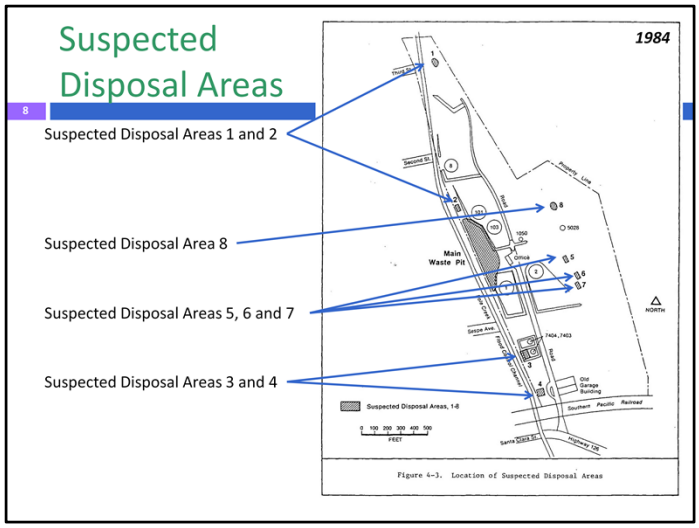


Summary of Soil Investigations

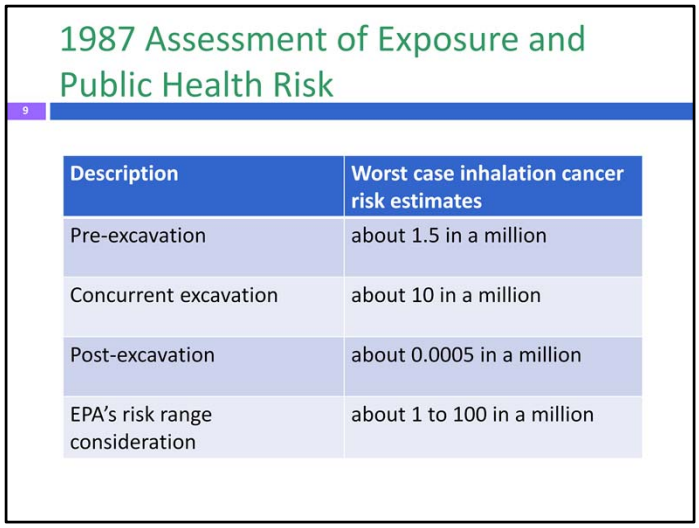
7

Summary of Soil Investigations			
Investigation Dates	**Borings**	**Number of Samples**	**Analyses**
1981-1984	--	--	Metals (Arsenic, Barium, Cadmium, Chromium, Lead, Selenium), Benzene, Toluene, Ethylbenzene
1990-1992	78	785	VOCs, Petroleum hydrocarbons, Metals (including lead), Semivolatile organic compounds, pH
2006	22	72	VOCs, PAHs, Metals (including lead)
2008	296	949	VOCs, PAHs, Lead, Hexavalent Chromium, PCBs, pH
2009	27	62	VOCs, PAHs, Lead
2010-2012	646	1014	VOCs, PAHs, Lead

1981-1984: Soil borings were done in suspected waste areas. The investigation recorded the materials found in the borings at various depths to estimate presence/type of waste and volume of waste.
1986: 33,000 cubic yards of waste material and contaminated soil from the main waste pit and eight other areas was excavated and hauled off site. The table shows the contaminants found in the main waste pit.



1984 Site Investigation (Environmental Evaluation):
-Goal: To determine waste volumes, environmental impacts, waste existence and type in other disposal areas.
-8 suspected waste disposal areas were investigated by hand-driven coring methods.
-Wastes encountered in areas 1, 2 ,3, 5 and 8 were petroleum wastes similar to wastes in the main pit.
-Area 7 contained a well sorted, yellow clay material over a black waste. The clay was probably a used commercial filter clay that was spread in the area for drying.
-Areas 4 and 6 had surface obstructions and could not be drilled. It is likely that wastes exist at Area 4.
-Waste volumes are considered to be small for the disposal Areas 1, 5 and 8, although accurate volume estimates were not possible at the time of the investigation.
-Remedial action alternatives discussed in the site investigation report included no action, waste encapsulation and waste removal. Waste removal was selected.



1987 Assessment of Exposure and Public Health Risk

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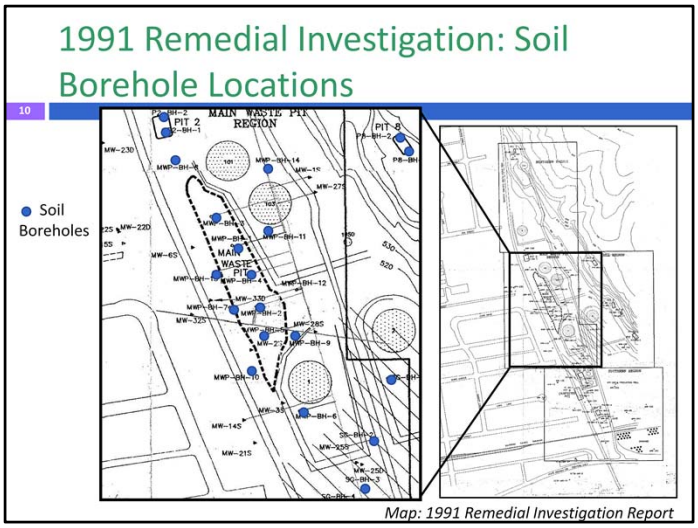
Description	Worst case inhalation cancer risk estimates
Pre-excavation	about 1.5 in a million
Concurrent excavation	about 10 in a million
Post-excavation	about 0.0005 in a million
EPA's risk range consideration	about 1 to 100 in a million

In 1987 an assessment of exposure and public health risk was published. This report evaluated human health cancer risk from exposure to benzene vapors associated with the main waste pit. The report estimated that before excavation, the lifetime increased risk for exposure to benzene in air near the main waste pit was about 1.5 in a million. During excavation, due to waste materials and soil being moved, the estimated lifetime risk temporarily increased to about 10 in a million. After excavation, benzene in air near the main waste pit was reduced and the estimated risk fell to much less than one in a million (0.0005 in a million). To put these numbers in perspective. EPA doesn't usually require any cleanup action if the increased lifetime risk of cancer is less than one in a million. If the increased lifetime risk of cancer is more than 100 in a million, EPA usually requires cleanup action. For risks that fall between 1 and 100 in a million, EPA may require cleanup action depending on the specific situation.



1991 Remedial Investigation Goals:

-To fully determine the nature and extent of any remaining contamination.

-Identify any potential health or environmental threat.

Objectives: To characterize the hydrogeology of the facility and assess the impacts of past operations and waste disposal practices.

Subsurface Soils (this map):

-78 boreholes were drilled, ranging from 40 to 161 feet in depth. Soil samples were collected every five feet to characterize the subsurface physical features.

Subsurface Soil Analysis Results:

-Very low levels of volatile organic compounds (VOCs) and some semivolatile organic compounds (SVOCs) were found in the main waste pit and southern regions of the Site.

-Total levels for all metals were within background levels in all samples.

Surface Soils:

-32 random samples were collected and analyzed to determine the presence of chemicals of concern in known, suspect and background areas.

Surface Soil Analysis Results:

-The concentrations of metals, VOCs and semivolatile organics were very low to below detection limits, and well within normal levels.

-What happened to the boreholes after sampling?

-Boreholes not converted into ground water monitoring wells were abandoned in accordance with appropriate regulations.

-Abandoned boreholes were plugged with an expansive grout mixture.

-All drilling activities were monitored

-Benzene concentrations in air were below 1 part per million (ppm).

-Hazardous materials disposal

-Soil cuttings from the rigs were collected in soil bins, which were then covered to prevent evaporation of any VOCs upon the completion of each borehole. These bins were then transported to a designated soil storage area of the facility, and emptied into roll-off soil bins for off-site disposal.

All Soil Borings

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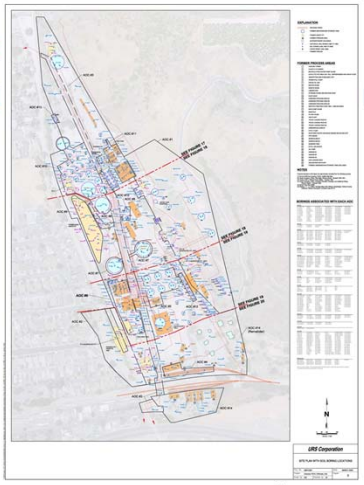
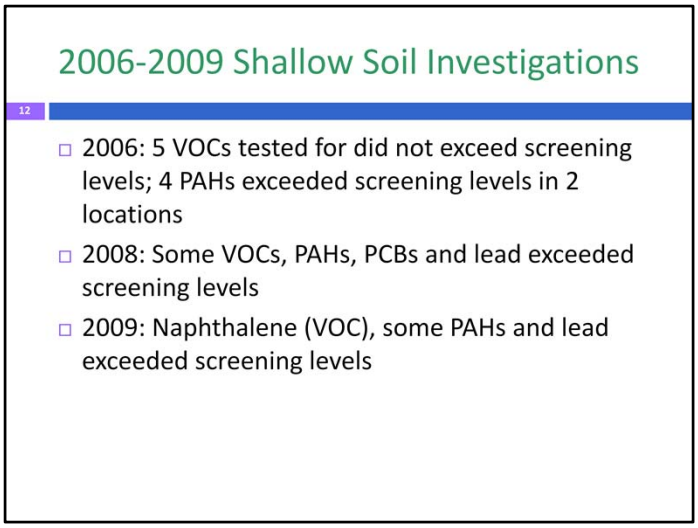
- All historical and recent soil boring locations



Map: 2011 RI/FS Figure 3

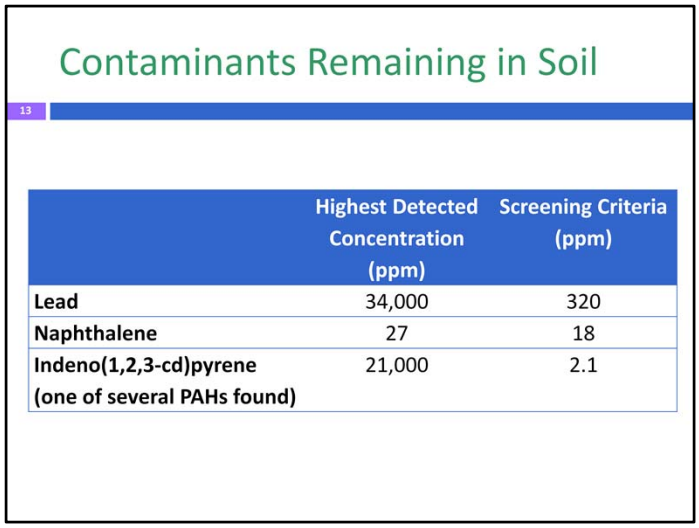


2006 (Phase 1) – Soils under former storage tanks were investigated.
-22 soil borings to a depth of approximately 10 feet below ground surface; 72 soil samples were taken from these 22 locations.

2008 (Phase 2) – Historical Operations
-A safety plan was put in place to protect workers who were conducting soil sampling. The report indicated that the public was protected because of limited access to the Site.
-Soil samples were generally collected from each of 296 borings at depths of 1, 5 and 10 feet below ground surface.

-Former Refinery/Pumping Process Areas (91 borings), Former Waste Pits (28 borings), Former Aboveground Storage Tanks (135 borings), Conveyance Piping within Main Pipeline Corridor (30 borings), Background Areas (12 borings).

2009 (Phase 3)– Data Gap Sampling
-Objective: To supplement data on the extent of impacts to shallow soil from historical operations and to determine whether the potential exists for risk to human health.
-62 soil samples were analyzed from 27 soil borings.



	Highest Detected Concentration (ppm)	Screening Criteria (ppm)
Lead	34,000	320
Naphthalene	27	18
Indeno(1,2,3-cd)pyrene (one of several PAHs found)	21,000	2.1

Context for 2011 RI/FS

-The 1992 ROD did not include a remedy for shallow soils, which will be needed for potential redevelopment of the Site as a commercial/industrial property, because:

-The Site was still an operating crude oil pumping station at that time.

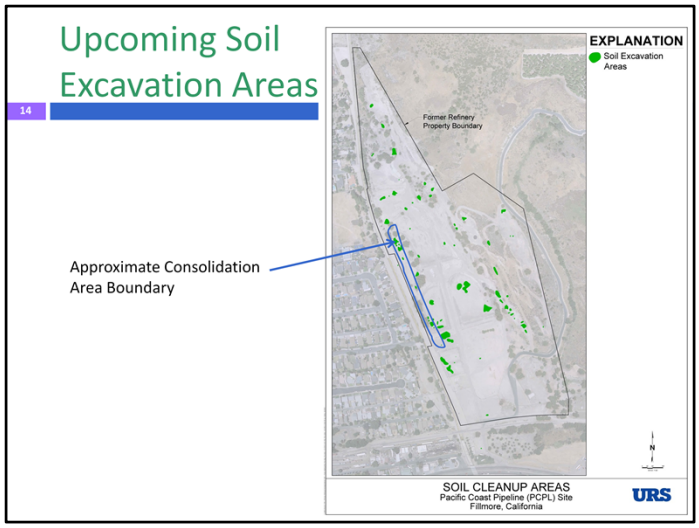
-The waste pits, unused since 1950, were remediated in 1986.

-The three-phased investigation addressed shallow soils within the upper 10 feet of soil. The soil results were used in a risk assessment (human and ecological) to establish site-specific remediation goals.

-This, along with an updated ground water remedy, is the focus of the 2011 RI/FS report for inclusion in an upcoming revision to the ROD.

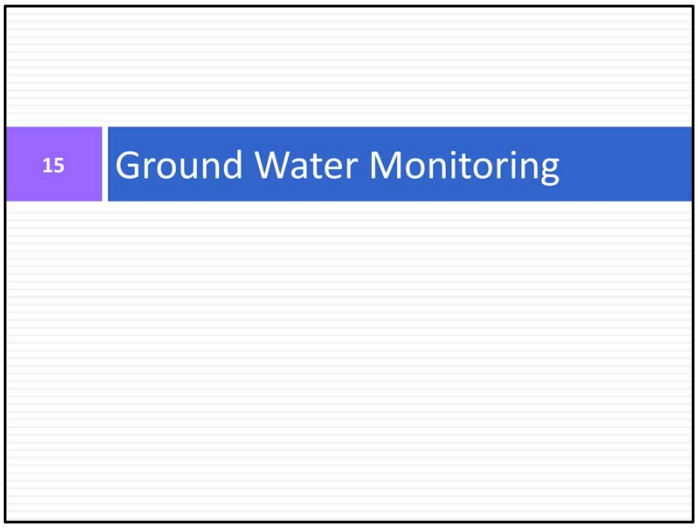
-Health and safety during the investigations was guided by the PCPL Superfund Site Fillmore, California Health and Safety Plan dated July 21, 2005 [revised October 3, 2006].

-The most recent version of the Health and Safety Plan (HASP) is dated October 23, 2009.



Soil Remedial Action Objectives:
-Prevent human exposure to shallow soil contaminated above threshold levels for commercial land use, construction activities, and recreational activities.
-Prevent contaminants in the waste pit (lead, PAHs) from migrating into underlying ground water (installation of an engineered cap will eliminate the risk for ground water to become contaminated with lead and PAHs).
-Reduce contamination in soil below toxicity threshold levels so it is not toxic to the plants and animals of the existing scrub habitat.
Consolidation Area: Future site of 18,500 cubic yards of soil from excavation of 80 different areas in 2013. It will be covered by an engineered cap which will include a geosynthetic clay liner to reduce rainwater percolation into the area and minimize the potential for leaching of contaminants into the ground water.
Trench Sampling in Consolidation Area was done to evaluate if additional space for consolidating the excavated soils was needed. The trench sampling included: 70 samples from 23 soil borings, analyzed for lead, PAHs, VOCs. Results were:
-Three samples exceeded Record of Decision (ROD) cleanup levels for lead.
-One sample exceeded ROD cleanup levels for naphthalene.
-Four samples exceeded ROD cleanup levels for benzo(a)pyrene.

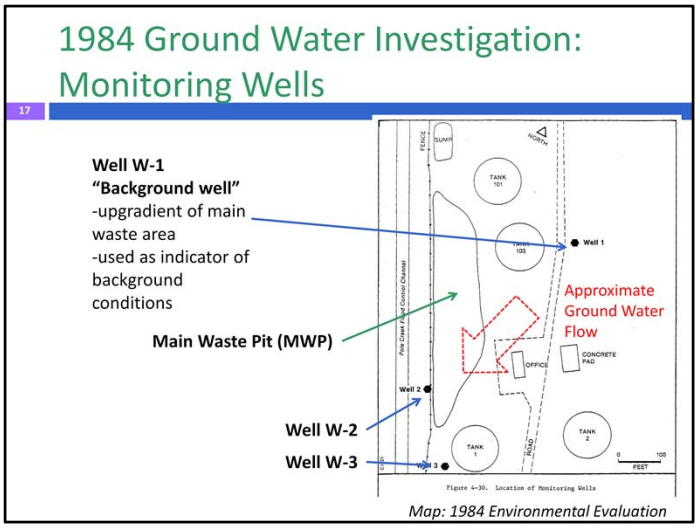
Air Monitoring Plans (more information will be presented in the next workshop)
-The contractor will implement a dust suppression and air monitoring program in the air at and near the Site during remedial activities.
-Real-time, continuous monitoring for respirable particulate matter.
-Nine dust stations will be monitored using real-time analyzers upwind and downwind along perimeter locations of the Site.
-Soil gas sampling directly above the two ground water plumes indicates that the benzene will not migrate to indoor air.
-Soil gas sampling west of Pole Creek in 1988 did not find any evidence of site contaminants migrating to the surface in soil gas.


15
Ground Water Monitoring

5 Technical Documents Reviewed

16

1. *1984:* Environmental Evaluation Report
2. *1991:* Final Remedial Investigation Report
3. *1992:* Record of Decision
4. *2011:* Remedial Investigation/Feasibility Study Report
5. *2013:* Quarterly Ground Water Monitoring Report for Fourth Quarter 2012



Map: 1984 Environmental Evaluation

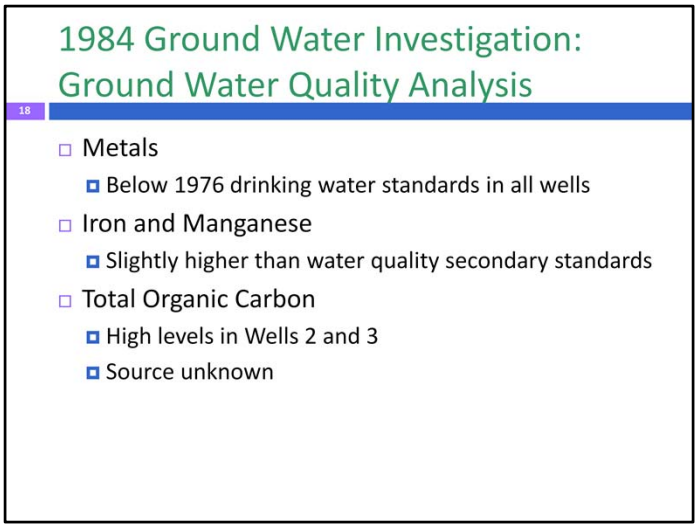
1984 Ground Water Investigation (Environmental Evaluation)

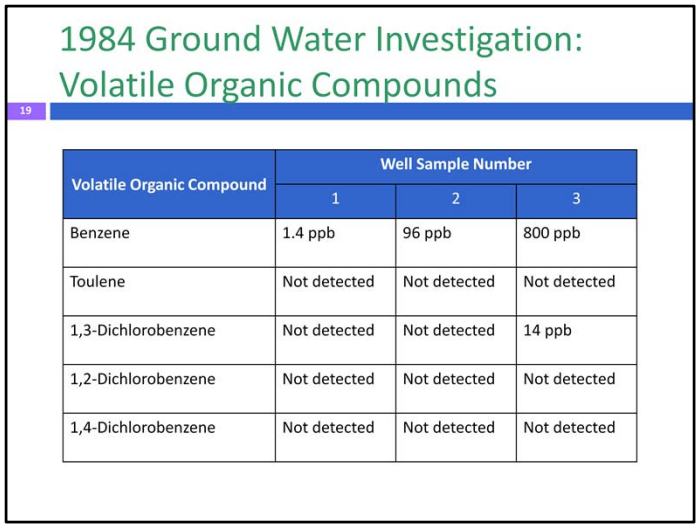
-The principal objectives of the monitoring well installation program were to locate and sample the ground water at the Site and to determine if (and to what degree) ground water has been impacted.

-Three monitoring wells were installed; one upgradient and two downgradient of the waste area.

-Ground water existed at approximately 85 feet below the main waste pit surface elevation at the time of installation but is expected to fluctuate substantially with long-term climatic conditions.

-Ground water in the vicinity of the main waste pit has been impacted by volatile hydrocarbons (benzene primarily) which presumably originated from the main waste pit. Trace metals, except iron and manganese (probably naturally occurring) were found to be low.


1984 Ground Water Investigation:
Ground Water Quality Analysis
18
Metals
Below 1976 drinking water standards in all wells
Iron and Manganese
Slightly higher than water quality secondary standards
Total Organic Carbon
High levels in Wells 2 and 3
Source unknown



1984 Ground Water Investigation: Volatile Organic Compounds

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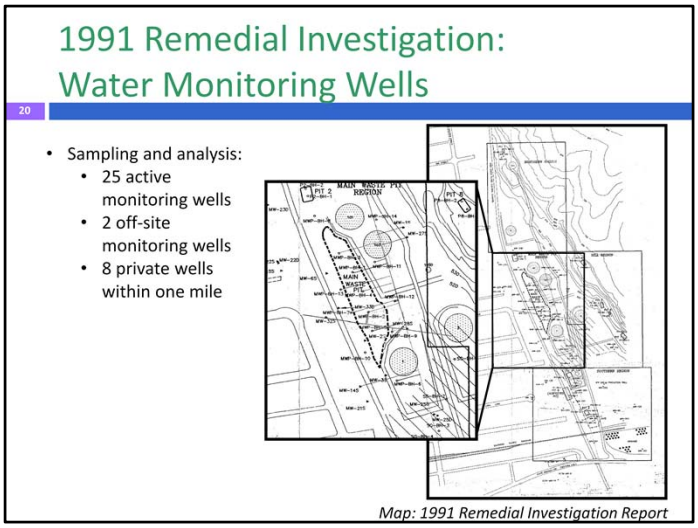
Volatile Organic Compound	Well Sample Number		
	1	2	3
Benzene	1.4 ppb	96 ppb	800 ppb
Toulene	Not detected	Not detected	Not detected
1,3-Dichlorobenzene	Not detected	Not detected	14 ppb
1,2-Dichlorobenzene	Not detected	Not detected	Not detected
1,4-Dichlorobenzene	Not detected	Not detected	Not detected

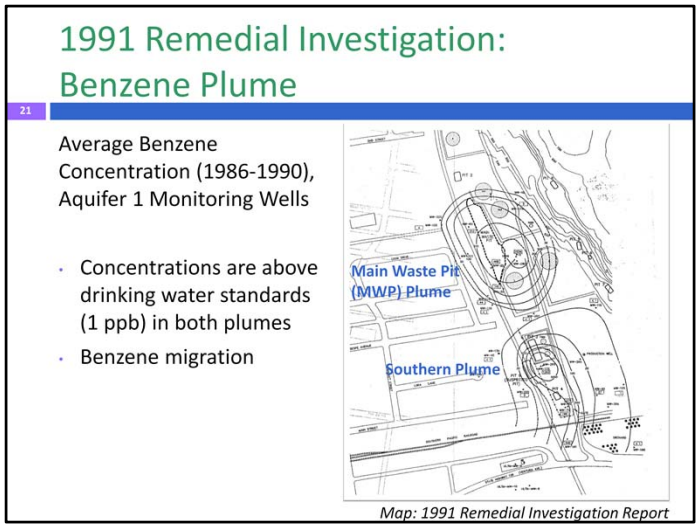
-The report indicated that if the on-site waste pits were contaminating the ground water, the above chemicals would likely be present.
-Wells 2 and 3 display benzene levels higher than the background level in Well 1.
-Currently (in 2013), the drinking water standard (MCL) for benzene is 5 parts per billion (ppb) at the federal level and 1 ppb for California. For 1,3-Dichlorobenzene, the drinking water standard is 0.5 ppb.
-When the 1984 ground water investigation showed that ground water was contaminated, EPA became involved in the site investigation and instructed Texaco to conduct additional investigation of the ground water.



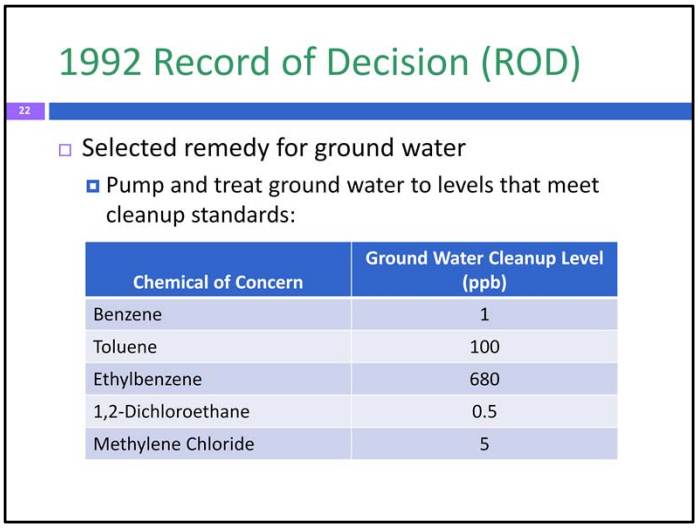
1991 RI Objectives:
-To assess the existence, nature, and horizontal and vertical extent of chemical contamination in the ground water.
-To build a ground water monitoring well network to detect current and future movement of chemicals in the perched zone (explained below) and main aquifer and to assess the need for any future remedial actions.
-To characterize hydrogeologic units, ground water elevations, flow directions and velocities, and likely chemical migration pathways.

Defined three aquifers:
-Perched Aquifer: A shallow zone of discontinuous ground water, occurring in scattered spots
-Aquifer 1: An unconfined zone below the Perched Aquifer. Aquifers are considered unconfined when the ground water is in direct contact with the atmosphere through open pore spaces of soil or rock.
-Aquifer 2: A confined (or partially confined) aquifer below Aquifer 1. Confined aquifers are generally deeper under the ground than unconfined aquifers. Ground water movement into and out of confined aquifers is limited by relatively impermeable rock or clay.

-The only ground water impacted to any degree by petroleum hydrocarbons on the facility has been observed in Aquifer 1.



-The outermost rings represent 1 ppb. The inner rings are progressively higher concentrations.
-Benzene migration concerns in 1991:
    -MWP: Migration to north and east is limited by the extent of Aquifer 1 and local flow limits migration to the south.
    -Southern Plume: May expand to the west or southwest due to off-site sources of benzene.
-Of all VOCs detected, only benzene in ground water appears to present any level of concern at the facility.
-Semivolatile compounds: Did not exceed regulatory threshold values.
-Metals: Arsenic, barium and cadmium each exceeded MCLs in only one well and it was a different well for each metal.



1992 Record of Decision (ROD)

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- Selected remedy for ground water
  - Pump and treat ground water to levels that meet cleanup standards:

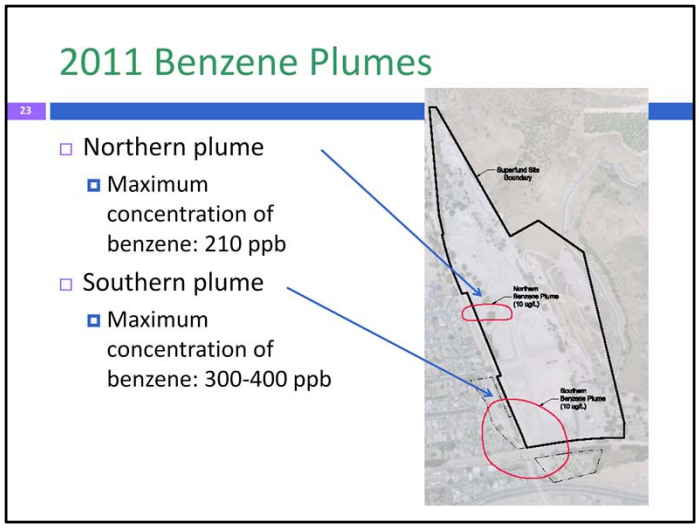
Chemical of Concern	Ground Water Cleanup Level (ppb)
Benzene	1
Toluene	100
Ethylbenzene	680
1,2-Dichloroethane	0.5
Methylene Chloride	5

EPA identified five chemicals of concern (COCs) in the 1992 Record of Decision (ROD):

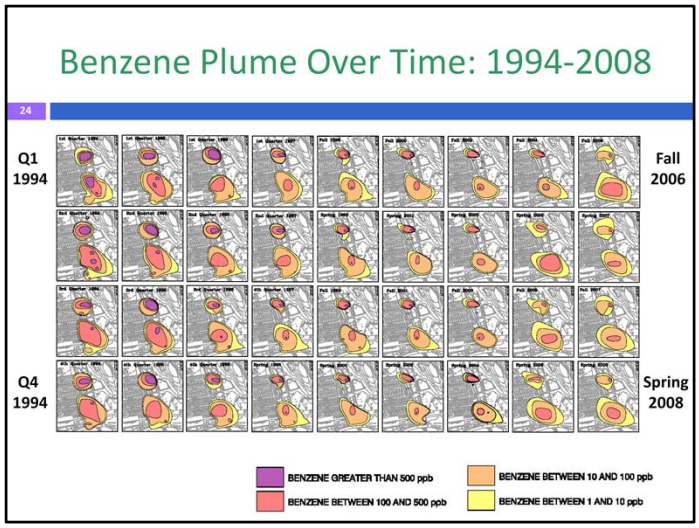
-Benzene – the primary concern in ground water.
-Toluene – significantly less abundant in ground water at the Site than benzene.
-Ethylbenzene – concentrations have not exceeded cleanup goal since 1990.
-1,2-dichloroethane (1,2-DCA) – not detected since 1991.
-Methylene chloride – not detected since 1991.

-Ground water monitoring has taken place four times a year since 1993.
-By 2002, the ground water extraction/treatment system had reached its effective limit and was discontinued with approval of EPA.
-In 2003/2004, a pilot study was conducted to assess an alternative ground water treatment option.
-Decided to use natural processes to decrease benzene levels (with periodic monitoring to check on progress).
-Evidence supporting monitored natural attenuation (MNA) as the final ground water remedy includes:

-Continued decline in dissolved benzene concentrations over time.
-Dissolved benzene plumes are stable and shrinking.
-Chemical analysis indicates that natural bacteria are changing benzene into nontoxic substances.



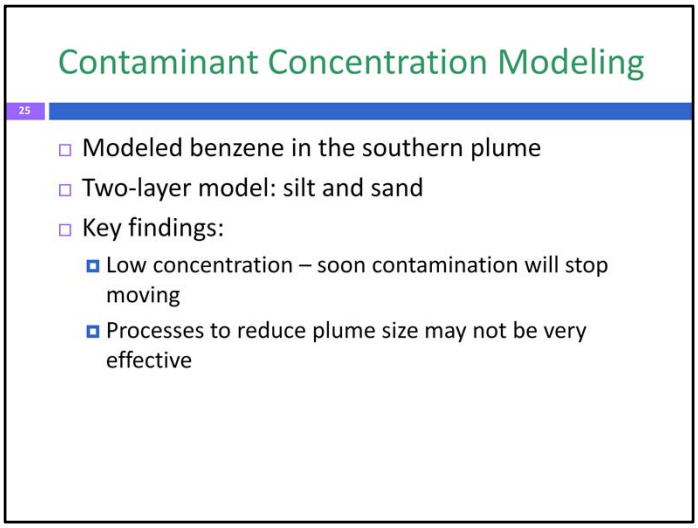
-Concentration and mass for the northern ground water plume have significantly declined over time and the plume center of mass has remained stable.
-Concentration and mass for the southern ground water plume have been relatively stable over time and the plume center of mass has migrated upgradient in recent years along the plume centerline, which indicates that the plume is receding.



-2008: Ground water benzene concentrations ranged up to 390 µg/L (micrograms per liter), a reduction of greater than 90 percent compared to dissolved benzene concentrations prior to operation of the ground water treatment system and soil vapor extraction system.
-The most recent ground water monitoring data from the 2012 ground water monitoring report indicate:

-Benzene results are consistent with declining historical results, and the plume is smaller.

-Maximum concentration detected in the northern plume was 110 ppb and the maximum in the Southern plume was 350 ppb.



The 2011 RI/FS report explained that EPA used a model to better understand how contaminants migrate in ground water.

-The model performed many calculations to help show the extent and longevity of dissolved benzene within the southern plume.

-The model had two layers to mimic the two different soil types (silt and sand) within the southern plume. Volatilization (chemicals changing from a liquid to a gas) processes can occur in the upper silt layer, but not in the lower sand layer.

-Key model output findings:

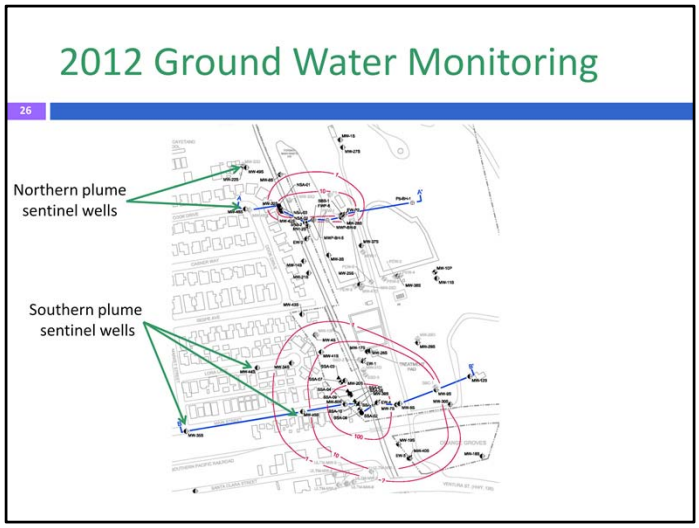
-Light non-aqueous phase liquid (LNAPL) is already near the calculated residual saturation. Residual saturation means that the LNAPL can't be further extracted from soil pores.

-Removing benzene from silt will not change the plume size; only changes in benzene in the sand layer will decrease plume size.

-Removing benzene from the sand layer may not help reduce plume size.

-Basically, recovery of benzene via processes like air sparging will not be very effective.

-Air sparging is the injection of air into the subsurface to remove VOCs.



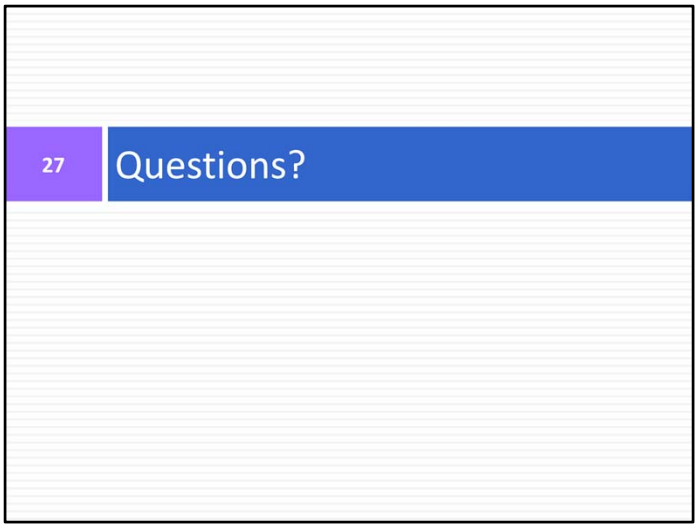
-This map is already out of date - more wells have been installed.
-There are 43 ground water monitoring wells in the ground water monitoring program in this 2012 map.
Starting in 2013:

The monitoring well network will be revised.
Sampling of ground water monitoring wells will be done twice a year.

Ground water monitoring data in sentinel wells (explained below) are evaluated using the EPA action criteria:
-Northern Plume: Benzene concentration exceeding 20 µg/L in ground water monitoring wells MW-48S/MW-49S.
-Southern Plume: Benzene concentration exceeding 150 µg/L in ground water monitoring well MW-45S or 1 µg/L in ground water monitoring wells MW-35S/MW-44S.

-During this quarter, benzene did not exceed the action criteria in downgradient sentinel wells.
-If the EPA criteria were to be reached, it would signal the possibility of further migration of the benzene plume beneath the Site.

-Sentinel wells are ground water monitoring wells downgradient of a contaminant plume. These wells serve as a warning. If contamination is detected in these sentinel wells, actions should be taken to prevent contamination from going further downgradient and reaching more sensitive areas.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Questions?

Contact Information

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