Treadwell&Rollo

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Project No. 2543.02

Mr. Barney Chan
Alameda County Health Care Services
1131 Harbor Bay Parkway, 2nd Floor
Alameda, CA 94502

JUN 04 2002

Subject: Free-Phase Product Monitoring Plan
2855 Mandela Parkway
Oakland, California

Dear Mr. Chan:

On behalf of the property owners, Treadwell & Rollo, Inc. prepared this *Free-Phase Product Monitoring Plan* for the site located at 2855 Mandela Parkway in Oakland, California. The purpose of this Work Plan is to present the planned procedures to collect empirical data to demonstrate that the detected free-phase product plume has stabilized (i.e., not expanding). This Work Plan also includes procedures to begin continuous removal of the free-phase product from existing wells.

Site Background and Site Conditions

The existing building on the property is a 143,000 square foot, single-story industrial structure. The building is currently occupied by a number of commercial tenants, mainly for warehousing and storage operations. The building was originally constructed in 1941 and operated until approximately 1983 by International Harvester as a truck service and sales facility. A 350-gallon underground gasoline storage tank was removed from the property in 1991 by a previous owner, Cypress Property.

Geologic conditions at the site consist of approximately two to eight feet of relatively sandy fill material underlain by Bay Mud to a depth of at least 24 feet below grade. The clayey Bay Mud appears to include heterogeneous zones of sandier soil and organic matter. The stabilized groundwater depth is approximately eight to ten feet and there are indications of a localized (i.e., discontinuous) perched water zone at the interface between the fill and the Bay Mud.

At most soil boring locations, there is a shallow, sandy zone that typically occurs between the ground surface to 5 feet deep. That sandy zone is typically underlain by a clay zone. The base of the shallow sandy zone is sometimes very wet to saturated, and may represent a perched water zone at the interface between the sandy and clay zones. This perched water zone appears to be relatively thin, and may not be present beneath the entire site.

Environmental investigations have confirmed the presence of free-phase product (gasoline) within the Bay Mud and potentially significant concentrations of the gasoline constituents

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benzene, toluene, ethylbenzene, and total xylenes (BTEX) in groundwater beneath a portion of the property, including under the existing building. However, a soil-vapor survey in 1998 suggested only relatively low benzene concentrations in the shallow soil beneath the building. A sample of perched water was collected in 1999 above an area of groundwater known to contain detectable BTEX concentrations; the perched water samples did not contain detectable BTEX concentrations.

These previous investigation results suggest that gasoline vapors from the free-phase product and those dissolved in the groundwater are inhibited from upward migration into the fill zone beneath the building because of geologic conditions. These conditions include the low-permeability clayey Bay Mud matrix and the presence of a perched water zone, as well as other factors. A study of the indoor-ambient air quality completed in March 2001, concluded that gasoline vapors, specifically BTEX, are not migrating in significant concentrations from the subsurface into the building.

Based on additional investigations conducted in 2001, [redacted]ce. The peaty clay zone appears significantly more permeable that the surrounding clay, thereby allowing flow within that unit. The peaty clay zone was not encountered in each soil boring suggesting that the peaty clay zone is discontinuous. As such, the free-phase gasoline plume configuration is also likely discontinuous, occurring in localized areas rather than beneath the entire site.

[redacted]d at [redacted] This estimated volume is consistant with the reportedly leaking former 350-gallon UST that was removed from the site.

SCOPE OF WORK

Previous investigations indicate that free-phase product has been detected and removed (during 1999) from wells TR-4, TR-5, and TR-6; whereas, monitoring wells TR-7, TR-8, and TR-9 have not contained a measurable thickness or sheen of free-phase gasoline. The source of the free-phase gasoline (former UST) has been removed and the free-phase product plume does not appear to be migrating. [redacted] (i.e., not expanding), and to begin continuous free-phase product removal.

There are presently six groundwater wells at the site. Wells TR-4, TR-5, and TR-6 (installed in 1999) are 4-inch diameter wells located within the central-portion of the free-phase product plume where the product appears to be thickest. These wells will be used to measure the free-phase product thickness at the site. Additionally, these wells were previously used to conduct preliminary passive-skimming, product-recovery tests (1999). Those tests indicated that free-phase product can be successfully recovered from those wells at a rate of up to 0.5 gallons per day from each well. Therefore based on the current investigation results, these three existing wells are appropriately placed to recover a majority of the free-phase product and will be used as ongoing product recovery wells. The product recovery efficiency from each of these wells will be monitored quarterly to evaluate whether alternative recovery techniques (i.e., in-well absorbents) or additional wells are required. Recommendations will be presented in the annual summary report.

Wells TR-7, TR-8, and TR-9 are 1-inch diameter wells that were placed around the free-phase product plume, approximately 25 to 30 feet from the estimated extent of that plume (Figure 1). These wells will be used to measure the groundwater elevation to calculate the hydraulic gradient, and to monitor the stability of the free-phase product plume. Because these wells are located along the immediate margin of the free-phase product plume, groundwater will not be purged or extracted from these wells so that free-phase product is not artificially drawn towards these monitoring points.

Fluid-Level Measurements

Groundwater levels and free-phase product thickness will be measured at the initiation of this monitoring program. These data will be used as baseline values. Groundwater elevations will be measured in wells TR-7, TR-8, and TR-9 at the same frequency as free-phase product is removed (see below) from wells TR-4, TR-5, and TR-6. These data will be used to evaluate whether the groundwater elevation affects free-phase product thickness and removal rates. The groundwater elevation data will also be used to calculate the local hydraulic gradient.

Groundwater levels will be measured using an electronic, down-hole water level indicator. Free-phase product thickness will be measured using an electronic oil/water interface probe. These fluid-level indicators are accurate to the nearest 0.01 foot. Water level measurements will be reported to an accuracy of 0.01-foot mean sea level.

Free-Phase Product Removal

Free-phase product has accumulated in wells TR-4, TR-5, and TR-6 since 1999. Because the free-phase product apparently flows into the wells from the thin relatively permeable zone at about 7 feet below the ground surface, and because this product floats on top of the water, a significant thickness (up to 12 feet) has accumulated in these three wells. Based on the measured free-phase product thickness, a total of approximately 20 gallons has accumulated in these three wells.

Because the free-phase product is apparently flowing within the shallow thin permeable zone, groundwater extraction will not enhance free-phase product recovery (i.e., an induced hydraulic cone-of-depression will not enhance product flow into the recovery wells). Therefore, passive product skimming devices will be placed within each of the 4-inch diameter wells to recover the free-phase product. The passive skimmers will have a capacity of between one and two gallons each. As discussed above, the existing three 4-inch-diameter wells are appropriately placed within the free-phase product plume to recover a majority of the product.

Initially the accumulated free-phase product will be removed. Based on the product recovery tests performed in 1999, we anticipate that free-phase product will initially flow into each of the three recovery wells at a rate of about 0.1 to 0.5 gallons per day. As the residual free-phase product plume is depleted, this flow rate will decrease.

After the present free-phase product accumulation has been removed, passive skimmers will be placed in the 4-inch diameter wells to collect the product. Because the skimmer retention capacity is roughly equivalent to the estimated daily inflow rate, w[redacted]ers [redacted] eval[redacted] If the daily product inflow rate is sufficiently high (i.e., exceeds the skimmer retention capacity), the skimmers may be fitted with extended product retention capacity.

The product inflow rate will continue to decrease as the mass of free-phase product is reduced. The passive skimmers will remain in the recovery wells until free product can no longer be removed using this technique. After the skimmers have been removed, techniques to further reduce hydrocarbons will be evaluated. The evaluation will consider installing hydrocarbon absorbents within the 4-inch diameter wells to collect thin free-phase product layers or sheens.

Free-Phase Product Disposal

All free-phase product removed from the subsurface will be recycled offsite at a licensed facility. The product will be containerized as it is removed from the wells, and stored onsite in approved fuel-storage containers placed in the flammable storage cabinet until recycling is ranged. The free-phase product will be handled according to requirements specified in a hazardous materials permit obtained from the local fire department.

REPORTING

Status reports will be prepared and submitted to the ACHCS on a quarterly (i.e., once every 3 months) basis for the first year of this monitoring program. The fourth monitoring report will provide a summary of the previous year's activities and will present recommended modifications to the monitoring program based on empirical data collected and analyzed. The quarterly monitoring reports will include all monitoring data presented in tabular format, a summary of the free-phase product volume removed, and will include a groundwater gradient map.

If you have any questions regarding this Work Plan, please call David Kleesattel at (510) 874-4500, extension 541.

Sincerely,
Treadwell & Rollo, Inc.

David R. Kleesattel, R.G.
Senior Geologist

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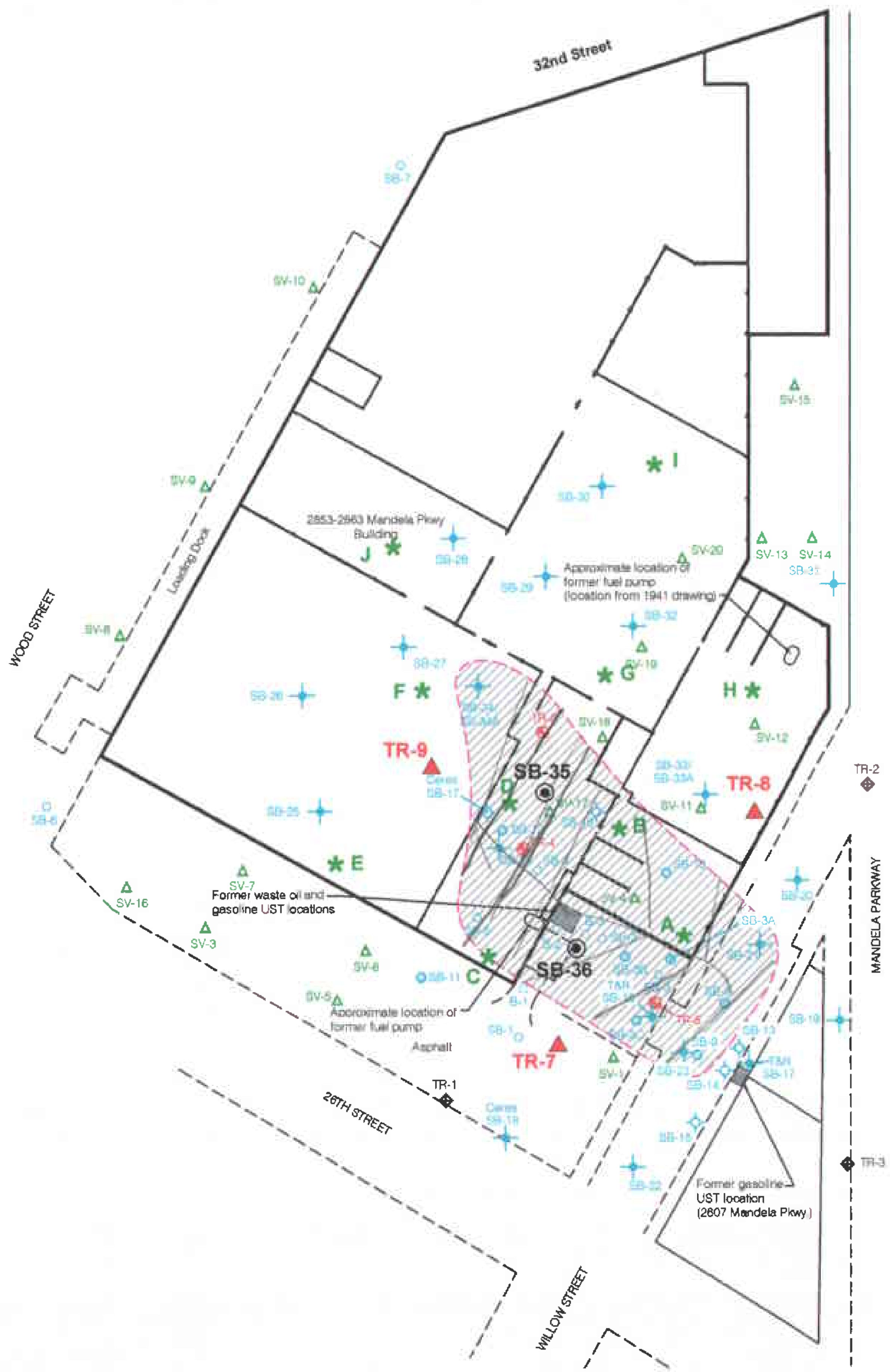
Attachments: Figure 1. Site Plan

cc: Ms. Faye Beverett
Mr. Richard C. Jacobs, Esq.



EXPLANATION

- Soil boring (06/92)
- Soil boring (08/98)
- Soil boring (10/98)
- Soil boring (11/98)
- Soil boring (1999)
- Piezometer (1999)
- Monitoring well (1999)
- Soil vapor sampling (08/98)

Free product extent based on:
1 - direct observation of product
2 - benzene >2000 m g/L

G Soil - vapor collection point

SB-35 Soil boring

TR-7 Free product monitoring piezometer

Note:
Free product may not necessarily be present at all locations within the extent envelope indicated.

0 80 Feet
Approximate scale

2855 MANDELA PARKWAY PROPERTY
Oakland, California

SITE PLAN SHOWING SAMPLING LOCATIONS

Date 06/03/02	Project No. 2543.01	Figure 1

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References: Ceres Associates, 1998. Interactive Resources, 1999.

PLANNED SAMPLING LOCATIONS V1 254301.DWG

Free product recovery without groundwater depression: This type of system is generally used in settings where long-term hydraulic control of the contaminant plume is not required, or as part of an interim remedial action. The goal is to collect free product with little or no recovery of groundwater. This is accomplished by using skimmers, canisters, or absorbent filters. Skimming systems rely on pumps (surface mounted or floating) to actively extract free product. The more common forms of skimmers used include floating skimmers, belt skimmers or pneumatic pumps. Floating skimmers are placed on the water table where a hydrophobic screen or floating screen inlet allows only free product to enter the pump device or bailer. Belt skimmers use a continuous loop of hydrophobic material to soak up free product as it is cycled into and out of the well. Pneumatic skimmers may have a top intake that allows skimming of fluids from the free product/water interface, or they may have a density sensitive float valve that permits the passing of water before the valve seats. Canisters are constructed of a hydrophobic material which allows only free product to enter. Gravity induces contaminant flow into the bottom of the canister where it accumulates. The product is then removed by manually bailing or through the use of a pump. Absorbent filters are placed in the well across the surface of the free product layer. Since the material retains product from the water surface, it must be replaced periodically and properly disposed of.

- Recoverable freeproduct ranges from 20-50% of total volume.
- Recovery rate likely less ~~than~~ after start up.

TOTAL VOL 2500 gal × .35 (est recov. rate) = 875 / .1 gal day = 8750 days = 24 yrs / 3 wells = 8 yrs

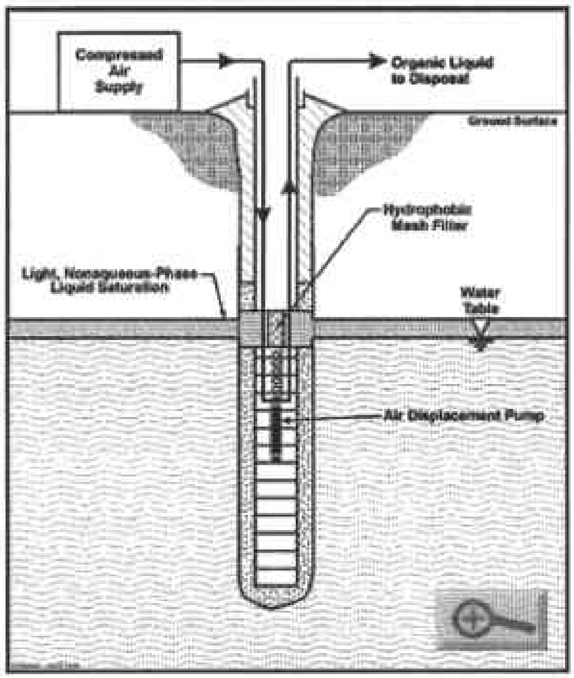
875 / .5 gal day ≈ 4.8 yrs / 3 = 1.6 yr

OPTIONS
- Add more recovery wells.
- trench / fr. drain

A Containment/Removal • *Remediation* Technology

Skimming

Applicability | Limitations | Duration | Cost Range
More Info | Contacts | Related Sites



Skimming typically is done using a floating filter of oleophilic/hydrophobic mesh with a high affinity for nonpolar hydrocarbons and the ability to reject polar molecules such as water. A mesh cylinder is designed to float in the LNAPL layer in a recovery well. LNAPL floating on the water surface in the well passes through the mesh while water is prevented from entering by the mesh. The LNAPL runs down into a collection pot and periodically is discharged by air pressure to a central holding tank on the surface. The pressurization cycle may be controlled by a timer, by high- and low-level switches, or manually.

Shallow wells with low recovery rates can use rope wick or belt skimmers. The rope wick or belt skimmer uses a continuous loop of rope or belt made of an oleophilic/hydrophobic material. The rope or belt is strung through the LNAPL layer and up through a pair of compression rollers. The rollers provide the motive force for the rope or belt while squeezing out any retained LNAPL into a small container. LNAPL collected in the container periodically is pumped to a central holding tank. Large trench recovery points can be fitted with drum or disk skimmers that are too large to fit into a well.

Status: Conventional

Applicability

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Contaminants	Media	Location	Treatment Site	Secondary Process
Free Phase LNAPL	Groundwater		In Situ	NA

Skimmer systems are effective at removing LNAPL from the well while withdrawing little or no water and producing little or no drawdown; thus they have limited pressure head to move LNAPL toward the recovery point. Skimmers will recover LNAPL when the thickness of the floating layer is too thin to allow efficient recovery with a pump. A skimmer can recover LNAPL even when the floating layer in the well is less than ¼-in. thick.

Limitations

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The following factors may limit the applicability and effectiveness of the process:

- The rate of recovery is low because the skimmer relies on the passive movement of LNAPL into the product recovery wells or trenches.
- The passive action results in a small radius of influence out from the recovery point.
- Biofouling of the oleophilic filter can occur frequently at some sites.

Duration

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Skimming is a long-term technology typically requiring 1 to 5 years of operation and maintenance. The duration of the operation and maintenance is dependent on the following conditions:

- Cleanup goals.
- The volume of free product present at the site.
- In situ characteristics including permeability and anisotropy.
- The radius of influence for free-product collection.
- The achievable rate of free-product extraction.
- The frequency with which the oleophilic filter becomes fouled. If the filter is frequently fouled, the system will often be shut down for maintenance and it will take longer to meet cleanup goals.

Cost Range

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$100,000 to $500,000 per acre

The major cost items included in the cost estimate range for skimming are designated in the following table:

Pretreatment Activities Included in Cost	
None	
Fixed Cost Items Included	**Variable Cost Items Included**
Extraction well and skimmer installation	Operating and maintenance labor

Extraction well and skimmer installation	Operating and maintenance labor
Air compressor installation	Utilities
Monitoring well installation	Site supervision
	Site quality assurance and health and safety support
	Sampling and analysis for process control
Residuals Management Activities Included in Cost	
Off-site disposal of organic liquid	
Comments	
Indirect costs such as project management, design and engineering, vendor selection, home office support, permit preparation and fees, regulatory interaction, site characterization, treatability testing, performance bond, and contingencies are not included in the estimated cost range.	

More Info

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Type	Title

Contacts

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Contact	Organization
NFESC Environmental Restoration POC	

Related Sites

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Site Name / Provider / Description