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PROTECTION
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June 13, 1997

Juliet Shin
Alameda Health Care Services
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: **Work Plan Addendum**
Shell Service Station
4255 MacArthur Boulevard
Oakland, California
WIC #204-5510-0600
Cambria Project #240-524-1

Dear Ms. Shin:

On behalf of Shell Oil Products Company (Shell), Cambria Environmental Technology, Inc. (Cambria) has prepared this correspondence responding to your October 31, 1996 letter regarding the site referenced above. In your letter, you requested (1) a corrective action proposal, (2) risk assessment information, (3) analysis of ground water samples for selected metals, and (4) use of a lower detection limit for the analysis of total petroleum hydrocarbons as gasoline. Cambria submitted a response to these four items in a May 19, 1997 letter. Additional information regarding the corrective action proposal and the risk assessment for this site are presented below.

## BACKGROUND

***Site Location and Topography:*** The site is an active Shell service station located at the intersection of MacArthur Boulevard and High Street in mixed commercial and residential area of Oakland, California (Figure 1). An active Unocal service station and a former Chevron service station are located east of the site. A trailer park and adjacent California Department of Transportation (Caltrans) access to Interstate 580 are located immediately southwest of the site. Topography slopes toward the west, with a 5 foot elevation difference between grade at the Shell Station and the trailer park property, and an additional 5 foot elevation difference between grade at the trailer park property and the Caltrans property.

***Well Locations:*** Groundwater monitoring wells MW-1 and MW-3 are located on the Shell site, well MW-2 is installed at the trailer park property, and well MW-4 is installed farther down gradient at the Caltrans property (Figure 1). The stratigraphy beneath the site and vicinity typically consists of 12 to 15 feet of silts and clays, underlain by silty/clayey sands. Based on the boring logs for wells MW-1,

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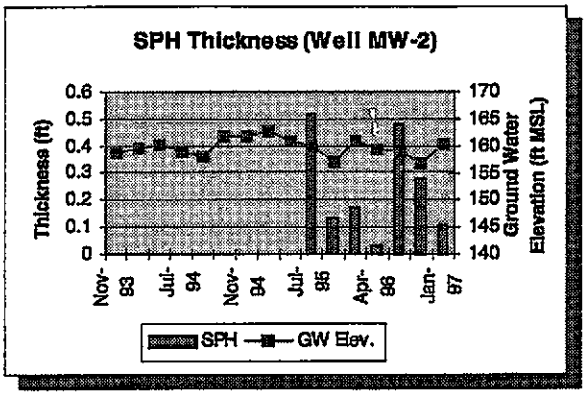
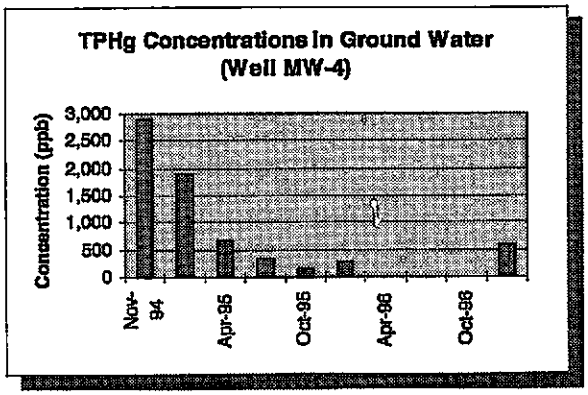
MW-2 and MW-4, the transition zone from the shallow fine-grained soil to the silty/clayey sand follows topography, sloping toward the west at a depth of 12 to 15 feet.

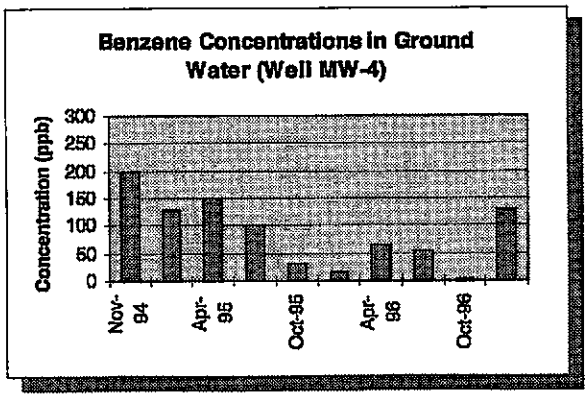
***Ground Water Elevation:*** During first quarter 1997, groundwater was encountered at 7-13 feet below grade, which corresponds to a potentiometric surface of 168 feet above mean sea level (MSL) at well MW-1 to 156.55 feet MSL at well MW-4 (Figure 1). Groundwater flows toward the west at a relatively steep gradient of approximately 0.075 to 0.1.




***Separate-Phase Hydrocarbon Occurrence:*** Separate-phase hydrocarbons (SPH) have been detected in wells MW-2 and MW-3 at the site. As shown on the adjacent graph, SPH thickness appears to be greatest when ground water is about 158 to 160 feet MSL, or about 10 to 12 feet deep, and varies with seasonal depth to water changes. During the summers of 1995 and 1996, approximately 0.5 feet of SPH were encountered in well MW-2. The SPH thickness decreased with increasing depth to water (i.e., decreasing water level elevation). This pattern suggests that SPH is immobilized below the water table during the wet winter months and would potentially be mobile only during the drier summer months when the water table is lower. However, as discussed below, the SPH is not migrating even during the summer months.




***Hydrocarbon Plume Stability:*** As shown on the adjacent graphs, both total petroleum hydrocarbons as gasoline (TPHg) and benzene concentrations in down gradient well MW-4 are steadily decreasing, and except for the most recent sampling event, are down by an order of magnitude compared to concentrations detected in November1994. Because well MW-4 is the down gradient well, and hydrocarbon concentrations in this well are decreasing, it appears that the hydrocarbon plume is shrinking and pulling back toward the Shell site. In addition, because the hydrocarbon concentrations in down gradient well MW-4 are decreasing, it is apparent that the SPH detected at the Shell site is not migrating down gradient nor are they resulting in an expanding hydrocarbon plume.



## CORRECTIVE ACTION PROPOSAL

But can continue to dissolve

As described above, the SPH in well MW-2 is submerged during much of the year and is, thereby, inhibited from migrating by natural hydrogeologic conditions. In addition, the fact that hydrocarbon concentrations are decreasing in down gradient well MW-4 indicates that the SPH is not resulting in an expanding aqueous-phase hydrocarbon plume. Therefore, it does not appear that SPH containment measures are necessary to prevent either SPH migration or aqueous-phase hydrocarbon migration. Natural hydrogeologic and biodegradation processes appear sufficient to maintain a stable to shrinking hydrocarbon plume at this time.

Since there appears to be a relatively limited SPH mass in the subsurface, and since this mass appeared to be contained below the water table during much of the year, short-term dual-phase extraction during the summer months when ground water is naturally low appears to be the most appropriate corrective action for the site. Cambria will evaluate dual-phase extraction at the site based on the results of the SVE pilot test that we will conduct during third quarter 1997. We will evaluate the results of the upcoming SVE pilot test and prepare a corrective action plan for this site.

## RISK ASSESSMENT

The adjacent trailer park appears to be covered with asphalt, and 12 to 15 feet of fine-grained, low permeability soil separates the surface from the water-bearing zone. Based on the presence of asphalt cover, dermal contact with or ingestion of benzene in soil does not appear to be possible. In addition, the shallow water-bearing zone is not a known drinking water source, therefore ingestion of ground water from beneath the site is unlikely.

Based on this review of potential exposure pathways at the site, inhalation of petroleum hydrocarbon vapors volatilizing from soil and ground water at the trailer park is the most likely potentially complete pathway. Shell will arrange for the preparation of a human health risk assessment for benzene via inhalation using residential exposure scenarios and a risk target level of $1 \times 10^{-6}$.

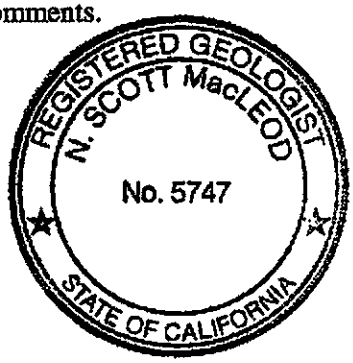
## SCHEDULE

Shell will submit the human health risk assessment within 45 days of approval of this work plan addendum. This submittal will include a schematic cross-section of the subsurface geology. In addition, Cambria will conduct a SVE pilot test during the upcoming quarter. We will provide you with 2 days notice prior to conducting on-site activities.

## CLOSING

We appreciate your assistance with this project, and we will contact you following completion of the risk assessment and SVE pilot test to discuss remediation alternatives for this site. Please contact me at (510) 420-3301 if you have any questions or comments.

Sincerely,
Cambria Environmental Technology, Inc.




N. Scott MacLeod, R.G.
Principal Geologist

cc: A. E. (Alex) Perez, Shell Oil Products Company, P.O. Box 4023, Concord, California 94524

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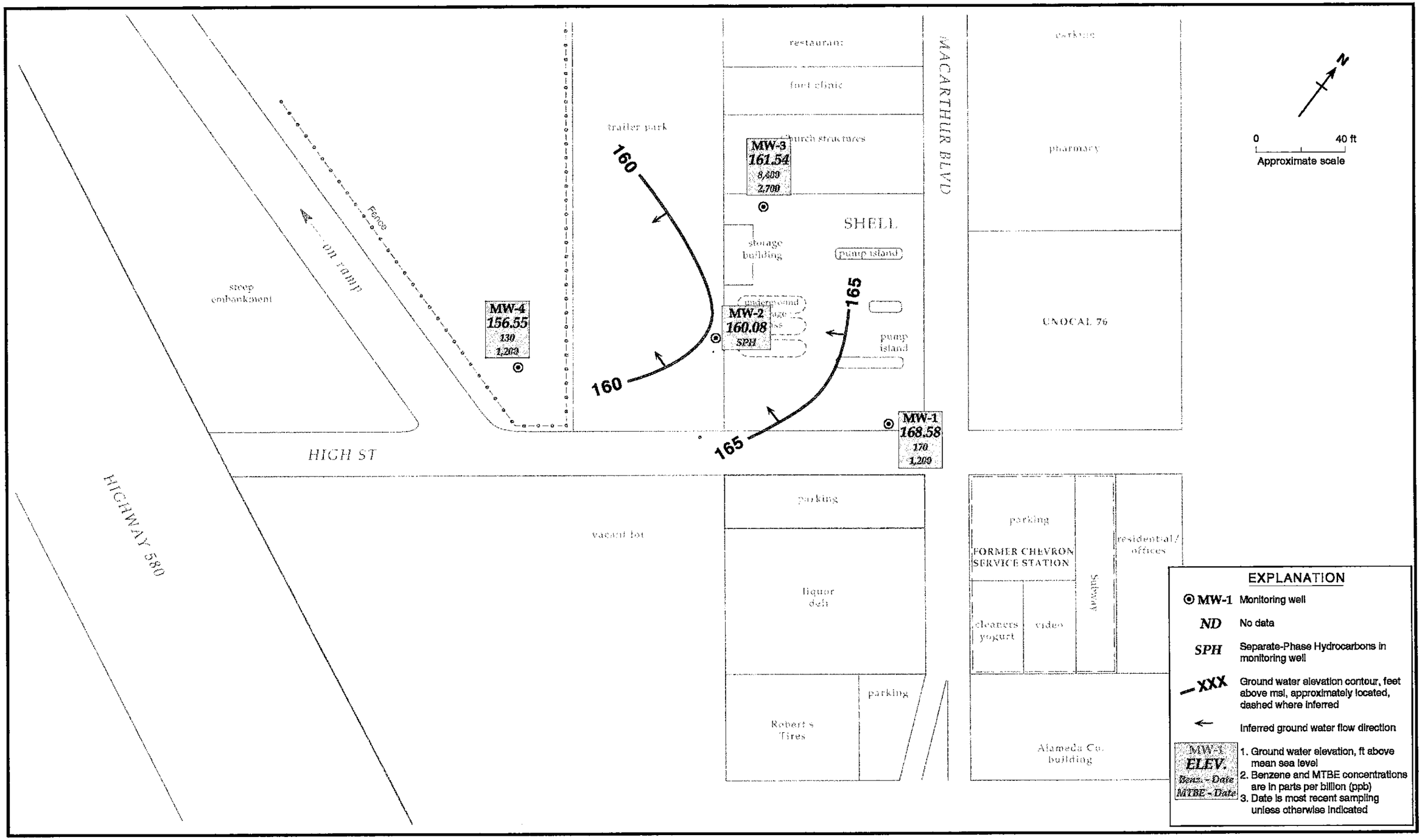


Figure 1. Montoring Well Locations, Ground Water Elevation Contours, and Benzene Concentrations in Ground Water - January 22, 1997 - Shell Service Station WIC #204-5510-0600, 4255 MacArthur Boulevard, Oakland, California

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