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6 May 1994

Mr. Ignacio Dayrit
City of Emeryville Redevelopment Agency
Department of Economic Development & Housing
2200 Powell Street, 12th Floor, Suite 1200
Emeryville, California 94608-1806

Subject: Addendum to Soil and Concrete Relocation Sampling Plan, The City of Emeryville
53rd & Hollis Streets
Emeryville, California

Dear Mr. Dayrit:

At your request, Erler & Kalinowski, Inc. ("EKI") is pleased to submit this Addendum to the Sampling Plan ("Sampling Plan") for materials relocation from the property located at 53rd and Ellis Streets, Emeryville, California ("City of Emeryville/PG&E Property"), dated 6 May 1994. The Addendum responds to comments made by the Department of Toxic Substances Control ("DTSC") staff on the Sampling Plan during our telephone discussion on 15 April 1994, and in its letter dated 15 April 1994. A copy of the DTSC's comment letter is attached for reference (Attachment A). Responses to individual comments are presented below.

1.0 RESPONSE TO NUMBERED COMMENTS BY DTSC ON SAMPLING PLAN

<u>Comment No. 1:</u> The report should be signed by an engineer or geologist certified in the State of California.

Response:
The Sampling Plan and this addendum were prepared under the direction of Vera H. Nelson, who is a registered civil engineer in the state of California (C.E. 47418). Her signature is provided at the end of this addendum.

<u>Comment No. 2:</u> Page 1, Section 1.0, Introduction: This section needs to include more information regarding the use of the soil at the Shellmound site. For example, will the soil be stockpiled prior to use as aggregate or immediately located along the roadway and covered? A map showing the location of the roadway would also be helpful.

Response:
The material that is selected for relocation and meets acceptance criteria set forth by the DTSC for relocation

will be transported to the properties located at Shellmound Street and Eastshore Highway, Emeryville California ("Shellmound Properties"). The concrete will be crushed on the City of Emeryville/PG&E Property prior to relocation or on the Shellmound Properties and stockpiled for use as aggregate or subbase in the construction of nearby roadways by the City of Emeryville (see Attachment B). Roadway construction is anticipated to begin within a few months after delivery of the material.

Soils transported to the Shellmound Properties from the City of Emeryville/PG&E Property will be uniformly spread across the Shellmound Properties to elevate the current grade. If all of the materials on the City of Emeryville/PG&E Property proposed for relocation are taken to the Shellmound Properties, the current grade of the Shellmound Properties will be raised by approximately one to two feet.

Upon development of the Shellmound Properties, these soils will be covered with additional fill. The additional fill will be used to further raise the grade of the Shellmound Properties such that it is closer to the elevation of Highway 80, as it is located after reconstruction (estimated at approximately 6 feet above current grade). Soils transported from the City of Emeryville/PG&E Property thus are anticipated to be covered by approximately four to five feet of additional fill. Current development plans for the Shellmound Properties include the construction of a shopping center. The shopping center and associated parking structures and paved lots will cover the surface of the Shellmound Properties, with the exception of the new Shellmound Street. The development of the Shellmound Properties is scheduled to occur in approximately three years.

Comment No. 3: Page 11, Section 5.2.1, Sample Collection from Stockpiles: Because samples will be collected with a stainless steel trowel or disposable plastic spoon, the Department prefers that samples be collected randomly from the backhoe bucket to ensure that the entire stockpile is sampled.

Response:
Samples will be collected from the backhoe bucket when forming materials stockpiles at the equivalent frequency of one sample analyzed per approximately 50 cubic yards of material.

Comment No. 4: Page 11, Section 5.3, Materials Sample Collection:
a. An attempt should be made to collect equal amounts of the different soil samples used for compositing.

b. Collection jars should have Teflon-lined caps.

Response:
a. An attempt will be made to collect equal amounts of the different samples used for compositing.

b. Sample collection jars will have Teflon-lined caps.

Comment No. 5: Page 12, Section 5.4, Laboratory Analysis of Samples: This section needs to include a description of sample and laboratory quality assurance/quality control, e.g., matrix spikes, replicates, equipment blanks, etc.

Response:
Quality control samples for materials sampling will consist of laboratory blanks, laboratory surrogates, and laboratory matrix spike/matrix spike duplicate samples ("MS/MSD"). Field duplicate soil samples will not be collected because of the potential differences in analytical results that can occur due to spatial variability of soils.

The quality control samples will be evaluated on the basis of laboratory accuracy and precision.

Laboratory Accuracy: Laboratory accuracy will be assessed on samples containing known chemical concentrations. Such samples will include MS/MSD samples, surrogate spike samples, and laboratory control spike samples.

Accuracy measurements will performed by the analytical laboratory for every 20 samples submitted for analysis by a given method, or once per day, if fewer than 20 samples are submitted for analysis. In the analytical laboratory, an environmental sample of the appropriate matrix for the analytical batch will be spiked with a known quantity of the analyte(s) (i.e., matrix spike sample) and analyzed in the same manner as the remainder of the analytical batch. The percent recovery for each matrix spike sample will be calculated and documented by the laboratory on the QA/QC laboratory report form supplied with each batch of samples.

The percent recovery is calculated as follows:

$$\%\ \text{Recovery} = \frac{(\text{Conc. of MS Sample} - \text{Conc. of Sample})}{(\text{Spike Conc. Added})} \times 100$$

Percent recovery values are compared by the laboratory to "Laboratory Control Limits" maintained by the certified laboratory. Laboratory Control Limits are laboratory-specific quality control parameters used to check the accuracy of analytical results. If percent recovery values are outside of Laboratory Control Limits, the laboratory rechecks its calculations and verifies that the instrumentation is calibrated properly with a calibration check standard. The laboratory also checks the results of associated surrogate and laboratory control samples. If all of these checks are verified, the deviation is attributed to matrix interference and not to any analytical sources. Table 1 summarizes typical Laboratory Control Limits for analytical methods to be conducted during the materials relocation sampling; actual control limits will be determined by the selected certified laboratory.

Laboratory Precision: Laboratory precision will be assessed through the analytical results of MS/MSD samples. Evaluation of precision with these samples will be performed by calculating the relative percent difference ("RPD") of chemical concentrations detected in the matrix spike and its duplicate.

Precision measurements will performed by the laboratory for every 20 samples submitted for analysis by a given method or once per day, if fewer than 20 samples are submitted. A second aliquot from the environmental sample used in preparing the MS sample will be spiked in the same manner to create a MSD sample. Both the MS and MSD samples will be analyzed in the same manner as the rest of the analytical batch. The RPD between the two spiked duplicates will be calculated by the laboratory and documented on the associated laboratory report form. The RPD is calculated as follows:

$$RPD = \frac{(\text{Conc. of MS} - \text{Conc. of MSD})}{(\text{Conc. of MS} + \text{Conc. of MSD})/2} \times 100$$

The RPD Laboratory Control Limit will be 50% for all methods.

<u>Comment No. 6:</u> Page 13, Section 6.0, Site Health and Safety Plan for Materials Relocation Project: This section should state that prior to initiation of field work, the Site Health and Safety Plan will be submitted to the Department for review and approval. In addition, the document will need to be signed by a Certified Industrial Hygienist.

Response:
Prior to initiation of materials relocation, a Site Health and Safety Plan will be prepared by the contractor selected by the City of Emeryville. The Site Health and Safety Plan will be submitted to DTSC for review.

2.0 DUST CONTROL MEASURES

The following activities performed during materials relocation may cause the generation or migration of dust: (1) excavation of soil, (2) loading of soil into transportation vehicles, (3) movement of excavation equipment within the area of excavation, and (4) ambient wind movement traversing stockpiles of soil or excavation and loading activities.

Dust control measures to prevent potential migration of dust during soil excavation operations will consist of misting or spraying the soil with water. Prior to the commencement of and during excavation operations, the ground surface will be wetted, if necessary, to prevent the generation and migration of dust. If necessary, the excavating equipment will be followed by a worker operating dust control equipment. During the loading of soil onto transportation vehicles, soil drop heights will be kept to a minimum. Dust control measures for stockpiled materials will include: (1) covering soil stockpiles with weighted tarps, and (2) spraying uncovered soil stockpiles with water, as needed.

If excessive dust is generated (e.g., visible dust is seen to leave the area of excavation) and cannot be mitigated by increasing the dust control measures, excavation activities will be stopped during the period that the wind speed and/or wind direction is causing excessive dust formation. At no time will spraying or misting with water to control dust result in the ponding of water, the percolation of water through areas of soil containing chemicals of concern, or surface erosion.

3.0 POTENTIAL FATE AND TRANSPORT OF TOTAL PETROLEUM HYDROCARBONS

The fate and transport of total petroleum hydrocarbons ("TPH") in soil and concrete (i.e., materials) relocated from the City of Emeryville/PG&E Property to the Shellmound Properties was evaluated with the vadose zone leaching model, VLEACH (CH2M Hill, 1990). VLEACH is a one-dimensional finite difference vadose zone leaching model developed by CH2M Hill for the U.S. EPA. The model was used to evaluate the potential migration of TPH into groundwater from the vadose zone assuming (1) bare soil and (2) soil capped with asphalt and concrete.

In both the bare soil and capped soil cases, it was assumed that all of the relocated material from the City of Emeryville/PG&E Property contained TPH at a concentration of 400 mg/kg, the proposed maximum TPH concentration acceptance criterion for relocation. A third, more realistic, scenario was also evaluated wherein the concentration of TPH in relocated material from the City of Emeryville/PG&E Property was assumed to contain the average TPH concentration of 44 mg/kg, as measured in soil and concrete samples collected to date from the upper three feet at the City of Emeryville/PG&E Property. This scenario (44 mg/kg TPH) was evaluated for the bare soil and capped soil conditions. Concentrations of TPH in groundwater were calculated by assuming that TPH entered shallow groundwater that was flowing horizontally at a fixed volumetric flow rate across the length of the Shellmound Properties.

Results of VLEACH modeling indicate that hypothetical, maximum concentrations of TPH in groundwater may range from 0.001 ug/L for capped soil to 80 ug/L for bare soil. For the more realistic scenario, the hypothetical TPH concentration in groundwater was estimated to reach a maximum of 0.002 ug/L for capped soil and 9 ug/L for bare soil. These conservative concentration estimates do not represent a threat to groundwater quality because they are close to or below the method detection limit of 50 ug/L and are below one groundwater quality criteria of 100 ug/L for TPH as diesel recognized by the San Francisco Bay Region, Regional Water Quality Control Board ("RWQCB", San Francisco Bay Region, October 1992). The *Water Quality Control Plan, San Francisco Bay Region* refers to the Central Valley RWQCB's staff report, *A Compilation of Water Quality Goals* (May 1993), for identifying groundwater quality criteria and chemical concentrations (RWQCB, San Francisco Bay Region, October, 1992).

The following discussion presents the modeling approach and assumptions with regard to the conceptual model of the Shellmound Properties, chemical properties of TPH, properties of the soils in the vadose zone, infiltration rates of rainwater, and groundwater flow in the saturated zone. The results of the VLEACH modeling are then presented and discussed in light of the non-hazardous nature of the TPH and TPH groundwater quality goals.

3.1 Conceptual Model of the Shellmound Properties

Approximately two to three feet of surface soil and concrete are proposed to be removed by the City of Emeryville from the 4.5 acre City of Emeryville/PG&E Property. The surface soils will be relocated and spread over an area of approximately 8 acres at the Shellmound Properties. It is proposed that only materials with concentrations of less than 400 mg/kg TPH be moved to the Shellmound Properties. For modeling, the resulting thickness of relocated soils is assumed to be approximately 2 feet, or less. Depth to groundwater at the Shellmound Properties, prior to the addition of soils from the City of Emeryville/PG&E Property, reportedly ranges from 5.3 to 8.3 feet below ground surface (PES Environmental, Inc., May 1990; Wahler Associates, May 1992).

For the VLEACH modeling, it is assumed that the depth to groundwater with the inclusion of relocated soils is 8 feet, of which the top 2 feet contain a uniform concentration of 400 mg/kg TPH, the proposed criterion for materials relocation. This site conceptual model is conservative because a uniform, but maximum, concentration of TPH in materials relocated to the Shellmound Properties is proposed to be 400 mg/kg. The average and maximum concentrations of TPH measured to date in near-surface materials at the City of Emeryville/PG&E Property are 44 and 260 mg/kg, respectively (EKI, April 1994). For a more realistic, yet still conservative, evaluation of potential concentrations of TPH in shallow groundwater were also modeled assuming the top 2 feet of soil contained a uniform, average concentration of 44 mg/kg TPH.

For the modeling effort, it is assumed that the relocated material remains uncovered for three to five years before being used beneath roadways and other paving for on-site development. It should be noted, however, that relocated concrete, which contains the highest measured concentrations of TPH (a maximum measured concentration of 260 mg/kg TPH), is planned to be used under roadways within several months after relocation to the Shellmound Properties. Thus, the leachability of TPH in materials capped by asphalt or concrete was also modeled for 10 and 30 years to evaluate long-term mobility of TPH under such conditions.

3.2 Chemical Properties of TPH

Available laboratory data reports indicate that the TPH (determined by modified EPA Method 8015) detected in soils and concrete at the City of Emeryville/PG&E Property are non-gasoline, non-diesel hydrocarbons with carbon numbers greater than C16 to C18 (EKI, April 1994). Due to the site use history (EKI, April 1994), the TPH are believed to be composed primarily of transformer oils. Transformer oils, which are highly refined naphthenic oils (i.e., saturated rings with alkyl side chains), are non-carcinogenic and of low acute and chronic toxicity (Lipscomb, 1988).

The major chemical properties required to use the VLEACH model include: organic carbon partition coefficient ("Koc"), solubility in water ("Cmax"), and dimensionless Henry's constant ("Hc"). Due to the paucity of chemical property data available for specific naphthenic components of transformer oil, chemical properties for polycyclic aromatic hydrocarbons ("PAHs") are used in the model. Although PAHs were not present in the soils on the City of Emeryville/PG&E Property (EKI, April 1994), PAHs have chemical structures that are similar to naphthenic oils, except PAHs contain double bonds. Chemical properties for C12 through C20 PAHs are summarized in Table 2.

The chemical properties in Table 2 indicate that as the carbon chain length increases, the partitioning of TPH to organic matter (Koc) increases and the solubility and volatility (Hc) decrease. In other words, the mobility of the TPH decreases with increasing size. By assuming a carbon number of C16, the molecular hydrocarbon size is on the low end of that reported in site soils, parameters used to model the leachability of TPH in the vadose zone are conservative (i.e., the mobility of TPH is maximized). For the VLEACH modeling, Koc, Cmax, and Hc are assumed to equal 32,000 mL/g, 0.37 mg/L, and 0.0004, respectively.

3.3 Properties of Soil in the Vadose Zone

Soils proposed for relocation from the City of Emeryville/PG&E Property are non-native fill materials that are composed primarily of silty clay and clayey silt materials with a small portion of sand and gravel (EKI, September 1993). At the Shellmound Properties, the soils are generally composed of fill material with varying degrees of clay, silt, sand, and gravel with slag and other debris to a depth of approximately 10 to 12 feet, below ground surface (TENERA Environmental Services, 1989; PES Environmental, Inc., 1990; Wahler Associates, 1992).

The soil parameters used in VLEACH are organic carbon fraction, bulk density, porosity, and moisture content. For highly non-volatile compounds, such as transformer oil, the organic carbon fraction is the most sensitive soil parameter in the model. Three measurements of the organic carbon fraction were performed on composite soil samples from the City of Emeryville/PG&E Property that did not contain TPH above the method detection limit (Attachment C). The measured organic carbon fraction ranged from 0.00096 for sandy material to 0.0073 for silty clay material. The average organic carbon fraction of 0.004 was used in the modeling effort. An average bulk density of 1.75 g/mL for fill material containing clays, silts, sands, gravels, and debris at a neighboring site, Myers Container Corporation, was used in VLEACH (TRC Environmental Consultants, Inc., March 1992). Site-specific data on moisture content and porosity of the fill are not available. The effective porosity and moisture content are assumed to equal 0.25 and 0.20, respectively, for silty clay materials.

3.4 Estimated Infiltration Rates of Rainwater

The infiltration rate of rainwater is the most sensitive of all parameters in VLEACH for highly non-volatile compounds. Infiltration rates were estimated using the Hydrologic Evaluation of Landfill Performance ("HELP") model (Schroeder et al., 1988) and meteorological data from Oakland and Berkeley, California (Earth Metrics Incorporated, March 1987). Default soil characteristics in the HELP model for silt and clay, the primary materials comprising the relocated soil, were used to evaluate a range of infiltration rates.

Infiltration rates estimated for clay and silt using HELP were 18% and 34% of incident rainfall, respectively. The average incident rainfall in Berkeley and Oakland is 20.8 inches (Earth Metrics Incorporated, March 1987). Thus, infiltration rates of 3.7 and 7.1 inches per year were used in VLEACH to represent a reasonable range of infiltration values for bare soils at the Shellmound Properties. Upon capping of the site with asphalt and concrete, the infiltration rate is assumed to decrease to 10% of the bare soil infiltration rate, or 0.37 to 0.71 inches per year.

3.5 Groundwater Flow in the Unsaturated Zone

Bay mud underlies the fill material at the Shellmound Properties at approximately 10 to 12 feet, below ground surface (PES Environmental, Inc., 1990) before relocation of soils to the Shellmound Properties. The bay muds are composed of low permeability clays and clayey sands interbedded with meandering sandy stream channels (PES Environmental, Inc., 1990; TRC Environmental Consultants, Inc., 1992). The mobile saturated zone is assumed to be 5 feet thick. A hydraulic gradient of 0.007 was measured at the Shellmound Properties (PES Environmental, Inc., 1990). The average hydraulic conductivity calculated from slug tests performed at the neighboring Myers Container Corporation property was 70 feet per day (TRC Environmental Consultants, Inc., 1992). The hydraulic conductivity of the soils underlying Myers Container Corporation is assumed to be similar to the soils underlying the Shellmound Properties.

Concentrations of TPH in groundwater were calculated by assuming that the mass per unit time of TPH leaching through the vadose zone (the VLEACH output) enters groundwater that is flowing horizontally at a fixed volumetric flow rate. The hydraulic gradient of 0.007, the hydraulic conductivity of 70 feet per day, and the cross-sectional area perpendicular to groundwater flow, 5 feet by 450 feet (e.g., cross-sectional area parallel to Temescal Creek along the Shellmound Properties) were used to calculate the volumetric flow rate of groundwater (1,100 cubic feet per day). To estimate maximum hypothetical concentrations of TPH in shallow groundwater, it is assumed that groundwater receives a constant input of TPH as it flows parallel to the long axis of the Shellmound Properties, from the southern Shellmound Properties boundary north to a point at Temescal Creek (approximately 700 feet, or over an area of approximately 230,000 square feet).

3.6 Discussion of VLEACH Modeling Results

Results of the fate and transport modeling using 400 mg/kg TPH and 44 mg/kg TPH in the top 2 feet of the vadose zone at the Shellmound Properties are summarized in Table 3. Due to the conservative nature of (1) the site conceptual model of groundwater flow across the long axis of the Shellmound Properties, and (2) the estimated chemical properties of TPH (which maximized mobility of TPH), the TPH concentrations presented in Table 3 represent hypothetical maximum concentrations of TPH in groundwater. For example, if off-site groundwater flowed under only 100 or 200 feet of the Shellmound Properties, instead of the calculated 700 feet, the concentration of TPH in groundwater due to the relocated soil would be significantly lower than concentrations presented in Table 3.

During the three to five years that the Shellmound Properties may remain undeveloped, the maximum concentrations of TPH predicted in groundwater (for groundwater that has flowed across the long axis of the Shellmound Properties to Temescal Creek) due to the relocated soils is 18 to 80 ug/L, assuming 400 mg/kg TPH and conservative parameters for the chemical properties of the TPH. For the more realistic scenario wherein the average TPH concentration in relocated soil equals 44 mg/kg, the maximum TPH concentration predicted in groundwater due to the relocated soils is 9 ug/L. Once soils are covered by asphalt and concrete during development of the Shellmound Properties, maximum concentrations of TPH in groundwater are expected to be significantly lower (0.001 to 0.02 ug/L for the 400 mg/kg TPH case and 0.002 ug/L for the 44 mg/kg TPH case, Table 3).

Modeled concentrations of TPH ranging from 0.001 ug/L to 80 ug/L, with a more realistic estimate of 9 ug/L, are not believed to represent a threat to groundwater quality at the Shellmound Properties for the following reasons:

- transformer oil is non-carcinogenic (Lipscomb, 1988);
- the more realistic, yet conservative, estimate of 9 ug/L is below the typical method detection limit of 50 ug/L for modified EPA Method 8015; and
- transformer oil has low acute and chronic toxicity; the EPA Suggested No-Adverse-Response Level ("SNARL") for toxicity other than cancer risk for diesel oil is 100 ug/L (RWQCB, Central Valley Region, May 1993).

The *Water Quality Control Plan, San Francisco Bay Region* refers to the Central Valley RWQCB's staff report, *A Compilation of Water Quality Goals* (May 1993), for identifying groundwater quality criteria and chemical concentrations (RWQCB, San Francisco Bay Region, October 1992). Of the petroleum hydrocarbons listed in *A Compilation of Water Quality Goals*, diesel oil is the petroleum hydrocarbon that most closely resembles transformer oil; however, transformer oil does not contain benzene, toluene, ethyl benzene, and xylenes. The only water quality goal listed for diesel oil is the EPA SNARL of 100 ug/L (RWQCB, Central Valley Region, May 1993).

According to the Alameda County Department of Public Works (Alton Geosciences, 1988), there are no groundwater production wells within one mile of the Shellmound Properties which use groundwater. Drinking water for surrounding properties is imported surface water supplied by the East Bay Municipal Utilities District. Upon development of the Shellmound Properties, on-site water will be supplied by the municipal water supply system.

Taking into account the conservative nature of the fate and transport modeling, the low concentration of TPH predicted to reach groundwater (9 ug/L), the method detection limit for TPH (50 ug/L), the water quality goal for TPH as diesel in the *Water Quality Control Plan* for San Francisco Bay (100 ug/L), and the improbable use of shallow groundwater for water supply, an acceptance criterion of 400 mg/kg TPH in relocated soil does not pose a threat to groundwater quality at the Shellmound Properties.

4.0 COMPARISON OF ARSENIC CONCENTRATIONS IN SOIL

Arsenic data for soil samples from the City of Emeryville/PG&E Property (EKI, April 1994) were compared to arsenic concentrations measured in soils at the Shellmound Properties (Table 4) to show that arsenic concentrations in soil planned for relocation are the similar to arsenic concentrations in existing soils at the Shellmound Properties. As discussed in the sampling plan (EKI, April 1994), only materials that contain (1) total arsenic concentrations less than 500 mg/kg, and (2) less than 5 mg/L extractable arsenic according to the Waste Extraction Test ("WET") (e.g., arsenic concentrations that are lower than the soluble threshold concentration limit ("STLC")) will be transported from the City of Emeryville/PG&E Property to the Shellmound Properties. Soil containing arsenic concentrations that are higher than 500 mg/kg or that exceed the STLC will remain at the City of Emeryville/PG&E Property.

For City of Emeryville/PG&E Property soils with arsenic concentrations below the STLC, the arithmetic mean arsenic concentration is 14.1 mg/kg, assuming arsenic concentrations in samples that were not detected above the laboratory detection limit equaled one-half the detection limit. For the Shellmound Properties, the arithmetic mean arsenic concentration is 14.3 mg/kg calculated from available data collected by several investigations (Table 4; Earth Metrics Incorporated, April 1989; TENERA Environmental Services, August 1989; Wahler Associates, May 1992; John Carollo Engineers, January 1993; PES Environmental, Inc., September 1991; McLaren Hart, September 1993).

Applying the non-parametric Mann Whitney test (i.e., it does not assume approximate normality for the two populations being tested) to the arsenic data, the null hypothesis that the means of the two populations are the same cannot be rejected at the 95% confidence interval. In other words, the arsenic concentrations measured in shallow soil samples at the City of Emeryville/PG&E Property that are below the STLC are statistically the same as arsenic concentrations measured in soil samples from the Shellmound Properties.

5.0 POTENTIAL AIRBORNE EXPOSURES TO ARSENIC

This section summarizes the screening level assumptions and calculations performed to evaluate the risk associated with potential airborne concentrations of arsenic from soils proposed for relocation from the City of Emeryville/PG&E Property to the Shellmound Properties. As summarized in the *Soil and Concrete Relocation Sampling Plan* (EKI, April

1994), arsenic was detected in seven of 19 soil samples collected from the top 3 feet of soil and concrete debris from the City of Emeryville/PG&E Property. The average and maximum concentrations of arsenic detected in all of these samples were 41 and 340 mg/kg, respectively. In calculating the average arsenic concentration in soil, samples that did not contain arsenic above the analytical detection limit were assumed to contain arsenic at concentrations equal to one-half the analytical detection limit.

To evaluate risk, 41 mg/kg arsenic was used as a representative concentration because average, or bulk, concentrations are more realistic for evaluation of exposure to fugitive dust (U.S. EPA, February 1985). An average concentration of 41 mg/kg arsenic was more appropriate than 14 mg/kg arsenic for the fugitive dust calculations because potential fugitive dust exposure may take place during excavation activities at both the City of Emeryville/PG&E Property and the Shellmound Properties.

The air exposure pathway analysis considered the inhalation of fugitive dust particles that contain arsenic (i.e., wind blown from stockpiles or surface soil). The risk associated with 41 mg/kg arsenic remaining in relocated soil was determined for two exposure scenarios:

(1) construction workers involved in relocating the soil, and

(2) residents living in the vicinity of the Shellmound Properties.

Results of the calculations are summarized in Table 5. Due to the uncertainty associated with construction schedules, several exposure times were evaluated for each scenario. For both scenarios, the breathing rate (or ventilation rate) for industrial and residential exposure was assumed to equal 20 cu m/day (DTSC, July 1992). Additional assumptions and conclusions are discussed below.

<u>5.1 Exposure to Construction Workers During Soil Relocation</u>

The soil relocation was assumed to take one to three months with construction personnel working 8 hour days, 5 days per week. During soil relocation, it is assumed that the maximum, continuous airborne dust concentration to which construction workers may be exposed is 1.0 mg/cu m. This value is rather extreme and represents continuous, visible dust clouds. During soil relocation, however, dust control measures will be implemented, and the maximum, time-weighted average fugitive dust concentration will likely be less than 1.0 mg/cu m.

For one and three month soil relocation times, the estimated incremental lifetime cancer risks associated with 41 mg/kg arsenic in soil are 3.9E-8 and 1.2E-7, respectively (Table 5). From this fugitive dust emission calculation, it can be concluded that an average concentration of arsenic of 41 mg/kg in airborne dust will result in a hypothetical, upper-bound incremental cancer risk that is one to two orders of magnitude less than one-in-a-million for unprotected, on-site construction workers. Furthermore, if such dusty conditions were to occur, they would be mitigated by dust control measures (e.g., wetting or covering) and workers could wear respirators as needed.

5.2 Exposures to Residents

Once the soil is relocated to the Shellmound Properties, the soil may remain uncovered for up to three years before it is used beneath roadways and other paving for on-site development. The hypothetical air pathway analysis for residents in the vicinity of the Shellmound Properties assumed exposure to occur 24 hours a day, 7 days a week for three and five years. The five year exposure was considered as the maximum likely time prior to site development. In this scenario, the dust concentration is expected to be significantly lower than during soil relocation. A fugitive dust concentration of 0.05 mg/cu m is recommended by DTSC to describe chronic inhalation exposure to non-volatile chemicals based on ambient dust concentrations (DTSC, PEA Guidance, January 1994). To be conservative, an average arsenic concentration of 41 mg/kg in relocated soil was used in the fugitive dust calculation, even though the average arsenic concentration in relocated soil is expected to equal 14 mg/kg.

For the three and five year exposure times, 41 mg/kg arsenic in wind-blown dust from uncovered soil results in estimated incremental lifetime cancer risks of 3.0E-7 and 5.0E-7, respectively (Table 5). From this conservative fugitive dust emission calculation, it can be concluded that a representative concentration of arsenic of 41 mg/kg will result in a hypothetical, upper-bound incremental lifetime cancer risk that is a factor of two to three less than one-in-a-million for residents in the vicinity of Shellmound Properties. These residential exposure scenarios are extremely conservative because the Shellmound Properties will not be occupied by residents and currently there are no residential units in the vicinity of the Shellmound Properties.

We hope that we have adequately addressed concerns of DTSC regarding the materials relocation from the City of

Emeryville/PG&E Property to the Shellmound Properties. If you have any questions regarding this letter, please do not hesitate to call.

Very truly yours,

ERLER & KALINOWSKI, INC.

Vera H. Nelson

Vera H. Nelson, C.E. 47418
Project Manager

Michelle K King for

Thomas W. Kalinowski, Sc.D.
Principal

cc: Carolyn Owen, Chiron Corporation
Sally Drach, Esq., McCutchen, Doyle, Brown and Enersen

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Standards and Criteria Work Group Memorandum, *California Cancer Potency Factors*, California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, 18 June 1992.

TENERA Environmental Services, *Plan of Remediation for Development of the Marriott Site in Emeryville, California*, 28 August 1989.

TRC Environmental Consultants, Inc., *Remedial Investigation*, Myers Container Corporation, 4500 Shellmound Street, Emeryville, California, 12 March 1992.

U.S. Environmental Protection Agency, *Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites*, C. Cowherd, G. Muleski, P.J. Englehart, D.A. Gillette, for Office of Health and Environmental Assessment, February 1985.

Wahler Associates, *Hazardous Waste Investigations and Remedial Alternatives for Shellmound Ventures Property*, May 1992.

TABLE 1

TYPICAL PERCENT RECOVERIES
LABORATORY CONTROL LIMITS

Soil and Concrete Relocation Sampling Plan
City of Emeryville/PG&E Property, Emeryville, California
(EKI 930028.00)

Method	Analyte	Matrix	Percent Recovery Laboratory Control Limit
EPA 8080 PCBs	PCBs	Soil	30% to 140%
EPA 8015 (modified) TEPH	TEPH	Soil	38% to 122%
AA/ICP Metals	Arsenic	Soil	75% to 125%

TABLE 2

SELECTED CHEMICAL PROPERTIES OF COMPOUNDS
THAT CONTAIN CARBON CHAIN LENGTHS GREATER THAN 16 (a)

City of Emeryville/PG&E Property, Emeryville, California
(EKI 930028.00)

Carbon Chain Length	log Koc log (mL/g)	Solubility (mg/L)	Henry's Constant (-)
C12	3.68 - 3.71	3.4 - 3.9	4.5E-3 - 1.1E-2
C14	3.72 - 4.59	0.045 - 1.29	7.0E-4 - 5.0E-3
C16	4.62 - 5.13	0.013 - 0.37	4.0E-4 - 8.0E-4
C18	5.39 - 6.14	0.002 - 0.044	2.7E-5 - 3.0E-4
C20	5.74 - 6.64	0.0006 - 0.004	<1.0E-4

Notes:

(a) Chemical and physical properties obtained from Montgomery and Welkom, 1991. Due to the paucity of data available for specific naphthenic components of transformer oil (e.g., saturated rings with alkyl chains) that comprise total petroleum hydrocarbons (TPH) detected at the site, data presented are for polycyclic aromatic hydrocarbons with carbon chain lengths ranging from C12 through C20. These compounds are not present in the soils on the PG&E/City of Emeryville property, but they have chemical structures that are similar to compounds detected at the site.

TABLE 3

ESTIMATED LEACHABILITY OF TOTAL PETROLEUM HYDROCARBONS (TPH)
THAT CONTAIN CARBON CHAIN LENGTHS GREATER THAN 16
USING VLEACH

Soil and Concrete Relocation Sampling Plan
City of Emeryville/PG&E Property, Emeryville, California
(EKI 930028.00)

Assumed Conditions (a)	Maximum Estimated TPH Concentration in Groundwater Due to TPH in Relocated Soils as a Function of Infiltration Rate (ug/L) (b)		More Realistic TPH Concentration in Groundwater Due to TPH in Relocated Soils (e)
	Low (c)	High (d)	
Bare Soil			
3 years	18	80	8.8
5 years	18	80	8.9
Capped Soil (f)			
10 years	1.4E-03	1.6E-02	1.7E-03
30 years	1.4E-03	1.8E-02	2.0E-03

Notes:

(a) Silty clay material: effective porosity=0.25, moisture content=0.20, organic carbon fraction=0.004, bulk density=1.75.
Depth to groundwater=6 feet plus 2 feet imported soil from PG&E/City of Emeryville Property.
TPH concentration in top 2 feet of soil=400 mg/kg.
TPH properties: log Koc=4.5, Henry's Constant=0.0004, Solubility=0.37 mg/L (conservative for TPH that contains carbon chain lengths of C16 and greater, see Table 2).

(b) TPH concentrations in groundwater estimated using the program VLEACH coupled with a dilution calculation that accounts for TPH entering groundwater from the vadose zone. Dilution calculation assumes a groundwater gradient of 0.007 (PES, 1991), a horizontal hydraulic conductivity of 70 ft/day (TRC, 1992), and groundwater flowing from the southern property boundary to Temescal Creek.

(c) Low infiltration rate assumes infiltration equals 18% of average annual rainfall (3.7 inches/year) as determined by HELP modeling.

(d) High infiltration rate assumes infiltration equals 34% of average annual rainfall (7.1 inches/year) as determined by HELP modeling.

(e) More realistic TPH concentrations in groundwater due to TPH in relocated soils assumes that the TPH concentration in the top 2 feet of soil equals 44 mg/kg and the infiltration rate equals the maximum of 34% of average annual rainfall for the bare soil case. All other chemical properties and parameters are the same as the other cases.

(f) Capped conditions assumes the property is developed with asphalt and concrete. Vadose zone conditions are the same as the uncapped case, except the infiltration rate is 10% of the uncapped case.

TABLE 4

SUMMARY OF ARSENIC CONCENTRATIONS IN SOIL

Shellmound Properties, Emeryville, California
(EKI 930028.00)

SAMPLE NUMBER	DATE SAMPLED	SOURCE OF DATA (a)	SAMPLE COLLECTION DEPTH (Feet BGS)	ARSENIC (mg/kg)	ARSENIC 10 x STLC (mg/l)	ARSENIC (WET) (mg/l)	ARSENIC STLC (mg/l)
SHELLMOUND I							
N-3	8/28/87	EMI, 1989; TES, 1989	3.0	20	50	---	5.0
N-8	8/28/87	EMI, 1989; TES, 1989	5.0	8.6 (b)	50	---	5.0
N-9	8/28/87	EMI, 1989; TES, 1989	10.0	32.4	50	---	5.0
HW-1-2	4/10/92	Wahler, 1992	5.5	---	50	<0.05	5.0
HW-2-2	4/9/92	Wahler, 1992	6.0	<0.25	50	<0.05	5.0
EBM-B-16	7/92	JCE, 1993; MH,1993	5.5	3.0	50	---	5.0
EBM-B-16	7/92	JCE, 1993; MH,1993	10.5	4.0	50	---	5.0
EBM-B-16	7/92	JCE, 1993; MH,1993	16.0	<3.0	50	---	5.0
SHELLMOUND II							
N-1	8/28/87	EMI, 1989; TES, 1989	3.0	19.2	50	---	5.0
N-2	8/28/87	EMI, 1989; TES, 1989	8.0	19.3	50	---	5.0
N-5	8/28/87	EMI, 1989; TES, 1989	5.0	8.6 (b)	50	---	5.0
HW-3-1	4/9/92	Wahler, 1992	2.5	6.2	50	0.5	5.0
HW-4-3	4/9/92	Wahler, 1992	11.0	1.2	50	<0.05	5.0
EBM-B-5	7/92	JCE, 1993; MH,1993	5.5	14	50	---	5.0
EBM-B-5	7/92	JCE, 1993; MH,1993	10.5	39	50	---	5.0
EBM-B-5	7/92	JCE, 1993; MH,1993	15.5	2.0	50	---	5.0
EBM-B-5	7/92	JCE, 1993; MH,1993	20.5	<2.0	50	---	5.0

TABLE 4

SUMMARY OF ARSENIC CONCENTRATIONS IN SOIL

Shellmound Properties, Emeryville, California
(EKI 930028.00)

SAMPLE NUMBER	DATE SAMPLED	SOURCE OF DATA (a)	SAMPLE COLLECTION DEPTH (Feet BGS)	ARSENIC (mg/kg)	ARSENIC 10 x STLC (mg/l)	ARSENIC (WET) (mg/l)	ARSENIC STLC (mg/l)
SHELLMOUND II continued							
EBM-B-5	7/92	JCE, 1993; MH,1993	25.5	<3.0	50	---	5.0
EBM-B-6	7/92	JCE, 1993; MH,1993	8.0	32	50	---	5.0
EBM-B-6	7/92	JCE, 1993; MH,1993	9.5	37	50	---	5.0
EBM-B-6	7/92	JCE, 1993; MH,1993	13.0	<3.0	50	---	5.0
EBM-B-6	7/92	JCE, 1993; MH,1993	23.0	5.0	50	---	5.0
EBM-B-6	7/92	JCE, 1993; MH,1993	28.0	4.0	50	---	5.0
SHELLMOUND III							
N-6	8/28/87	EMI, 1989; TES, 1989	5.0	8.6 (b)	50	---	5.0
T-1	8/10/90	PES, 1991	6.0	60	50	---	5.0
T-7	8/10/90	PES, 1991	2.0	20	50	---	5.0
T-8	8/10/90	PES, 1991	2.0	7.5	50	---	5.0
T-10	8/10/90	PES, 1991	1.0	6.4	50	---	5.0
T-13	8/10/90	PES, 1991	1.0	9.4	50	---	5.0
B-1	4/17/89	TES, 1989; PES, 1991	2.5	23	50	---	5.0
B-2	4/17/89	TES, 1989; PES, 1991	1.0	7.3	50	---	5.0
B-3	4/17/89	TES, 1989; PES, 1991	2.0	38	50	---	5.0
B-4	4/18/89	TES, 1989; PES, 1991	3.0	8.2	50	---	5.0
B-5	4/18/89	TES, 1989; PES, 1991	4.0	9.0	50	---	5.0
B-6	4/18/89	TES, 1989; PES, 1991	2.5	36	50	---	5.0

TABLE 4

SUMMARY OF ARSENIC CONCENTRATIONS IN SOIL

Shellmound Properties, Emeryville, California
(EKI 930028.00)

SAMPLE NUMBER	DATE SAMPLED	SOURCE OF DATA (a)	SAMPLE COLLECTION DEPTH (Feet BGS)	ARSENIC (mg/kg)	ARSENIC 10 x STLC (mg/l)	ARSENIC (WET) (mg/l)	ARSENIC STLC (mg/l)
SHELLMOUND III continued							
B-7	4/19/89	TES, 1989; PES, 1991	6.0	28	50	---	5.0
B-8	4/19/89	TES, 1989; PES, 1991	2.0	12	50	---	5.0
B-9	4/19/89	TES, 1989; PES, 1991	2.0	8.7	50	---	5.0
HW-5-1	4/9/92	Wahler, 1992	2.5	<0.25	50	<0.05	5.0

Arithmetic Average of Arsenic Concentrations Detected (c)

Shellmound I	9.9 mg/kg
Shellmound II	13 mg/kg
Shellmound III	18 mg/kg
Shellmound I, II, III	14 mg/kg

STLC Soluble threshold limit concentration
WET Waste extraction test
BGS Below ground surface
mg/kg Milligrams per kilogram
mg/l Milligrams per liter
<0.25 Not detected at or above the indicated laboratory detection limit
--- Not analyzed

TABLE 4

SUMMARY OF ARSENIC CONCENTRATIONS IN SOIL

Shellmound Properties, Emeryville, California
(EKI 930028.00)

Notes:

(a) Data obtained from the following sources:

EMI: Earth Metrics Incorporated, Environmental Site Assessment for the Chiron Site, Parcels 1 and 2 in Emeryville, California, report dated April 1989.

TES: TENERA Environmental Services, Plan of Remediation for Development of the Marriot Site in Emeryville, California, report dated 28 August 1989.

Wahler: Wahler Associates, Hazardous Waste Investigations and Remedial Alternatives for Shellmound Ventures Property, report dated May 1992.

JCE: John Carollo Engineers, East Bay Municipal Utility District North Interceptor Relocation Project, Draft Environmental Site Investigation, report dated January 1993.

PES: PES Environmental, Inc., Preliminary Endangerment Assessment, Shellmound III Site, 4300 Eastshore Highway, Emeryville, California, report dated 27 September 1991.

MH: McLaren Hart, Transmittal of Revised Tables and Figures for Shellmound I, II, and III Properties, letter dated 9 September 1993.

(b) Laboratory reported that compound was detected (>4.0 mg/kg) but was less than the quantitation limit of 3.3 times the detection limit (13.2 mg/kg). Value reported is the average of the detection limit and the quantitation limit values.

(c) The value of 1/2 the laboratory-reported limit of detection was used for calculating concentration averages where compounds were reported as not detected.

TABLE 5

ESTIMATED RISK ASSOCIATED WITH ARSENIC IN FUGITIVE DUST

Soil and Concrete Relocation Sampling Plan
City of Emeryville/PG&E Property and Shellmound Properties, Emeryville, California
(EKI 930028.00)

Assumed Conditions (a)	CPF (b) (mg/kg/day)^-1	Estimated Breathing Rate (cu m/day) (c)	Assumed Dust Concentration (mg/cu m) (d)	Estimated Incremental Cancer Risk for Inhalation of Arsenic in Soil (e)
Construction Exposure				
1 month	12	20	1.00	3.9E-08
3 months	12	20	1.00	1.2E-07
Residential Exposure				
3 years	12	20	0.05	3.0E-07
5 years	12	20	0.05	5.0E-07

Notes:

(a) Construction Exposure assumes 8 hr/day, 5 day/wk exposure for the duration specified. Residential Exposure assumes 24 hr/day, 7 day/wk exposure for the duration specified.

(b) Inhalation Cancer Potency Factor (CPF) obtained from Standards and Criteria Work Group memorandum, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, dated 18 June 1992.

(c) Breathing rate for industrial and residential exposure is assumed to be 20 cu m/day (DTSC, July 1992).

(d) A default value of 0.05 mg/cu m respirable dust is recommended by DTSC (January 1994). For excavation activities, the respirable dust concentration may be higher than 0.05 mg/cu m. As a worst case estimate, an airborne average dust concentration of 1 mg/cu m was assumed for construction activities.

(e) Lifetime incremental cancer risk is calculated for a 70 kg human with a 70 year lifetime who is exposed to respirable fugitive dust containing an average arsenic concentration of 41 mg/kg.

ATTACHMENT A

DTSC Comments on the Soil and Concrete
Relocation Sampling Plan
Dated 15 April 1994

City of Emeryville/PG&E Property, Emeryville, California
(EKI 930028.00)

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY

PETE WILSON, Governor

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
REGION 2
700 HEINZ AVE., SUITE 200
BERKELEY, CA 94710-2737
(510) 540-3839

April 15, 1994

Mr. Kofi Bonner
Director of Economic Development
and Housing
Emeryville Redevelopment Agency
2200 Powell Street, 12th Floor
Emeryville, California 94608

Dear Mr. Bonner:

COMMENTS TO THE SOIL AND CONCRETE RELOCATION SAMPLING PLAN, CITY OF EMERYVILLE/PG&E SITE, 53RD AND HOLLIS STREETS, EMERYVILLE

The Department of Toxic Substances Control (Department) has received the above mentioned report submitted by Erler & Kalinowski, Inc. on behalf of the City of Emeryville and Chiron Corporation. In general, the plan was well written, but requires some modification prior to its approval. The Department's comments are as follows:

1. The report should be signed by an engineer or geologist certified in the State of California.

2. Page 1, Section 1.0, Introduction: This section needs to include more information regarding the use of the soil at the Shellmound Site. For example, will the soil be stockpiled prior to use as aggregate or subbase, and for how long, or will the soil be immediately located along the roadway and covered? A map showing the location of the roadway would also be helpful.

3. Page 11, Section 5.2.1 Sample Collection from Stockpiles: Because samples will be collected with a stainless steel trowel or disposable plastic spoon, the Department prefers that samples be collected randomly from the backhoe bucket to ensure that the entire stockpile is sampled.

4. Page 11, Section 5.3, Materials Sample Collection:
   a. An attempt should be made to collect equal amounts of the different samples used for compositing.

   b. Collection jars should have Teflon-lined caps.

Printed on Recycled Paper

5. Page 12, Section 5.4, Laboratory Analysis of Samples: This section needs to include a description of sample and laboratory quality assurance/quality control, e.g. matrix spikes, replicates, equipment blanks, etc.

6. Page 13, Section 6.0, Site Health and Safety Plan for Materials Relocation Project: This section should state that prior to initiation of field work, the Site Health and Safety Plan will be submitted to the Department for review and approval. In addition, the document will need to be signed by a Certified Industrial Hygienist.

In addition, based upon a telephone conversation with your consultants and my staff on April 15, 1994, the City of Emeryville will submit an addendum to this plan which will include: 1) A description of the intended handling and use of the excavated soil, and controls that will be used to mitigate dust and other potential routes of exposure, 2) A discussion and calculations describing the potential fate and transport of total petroleum hydrocarbons at the Shellmound site, and 3) A discussion and calculations regarding potential airborne exposures to arsenic.

If you have any questions regarding this letter, please contact Lynn Nakashima of my staff, at (510) 540-3839.

Sincerely,

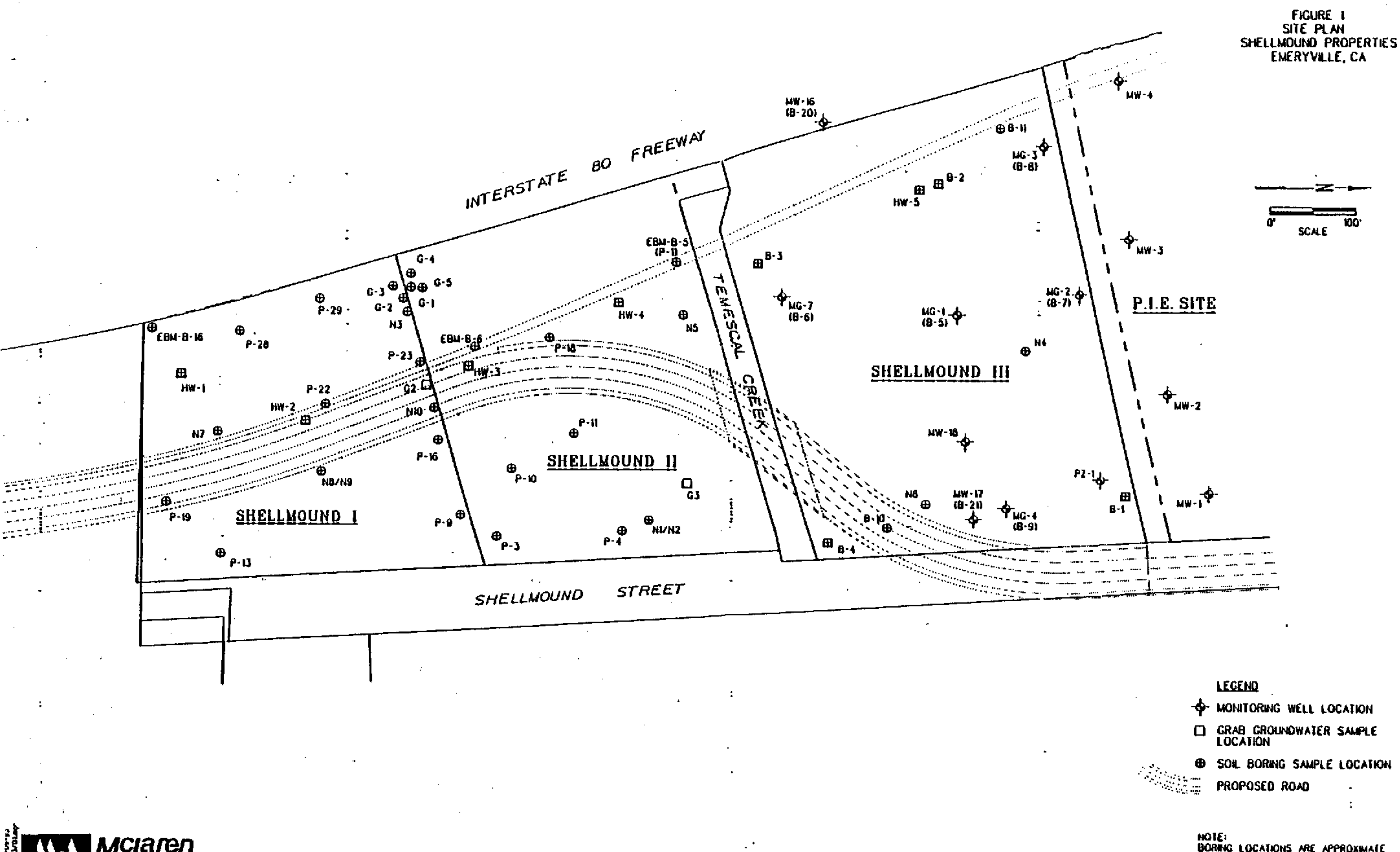
Barbara J Cook

Barbara J. Cook, P.E., Chief
Site Mitigation Branch

ATTACHMENT B

Map Depicting Relocation of Roadway
from McLaren Hart, 30 June 1992

Shellmound Properties, Emeryville, California
(EKI 930028.00)



Map Showing Relocation of Roadway From McLaren Hart, 30 June 1992.

ATTACHMENT C

Total Organic Carbon Results
Composite Soil Samples

City of Emeryville/PG&E Property, Emeryville, California
(EKI 930028.00)

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Erler & Kalinowski, Inc.	Client Project ID:	930028.00, Chiron	Sampled:	Jul 21, 1993
1730 So. Amphlett Blvd., Suite 320	Sample Descript:	Soil	Relogged:	Apr 19, 1994
San Mateo, CA 94402	Analysis for:	Total Organic Carbon		
Attention: Britt V. Thaden	First Sample #:	4DB2701	Analyzed:	Apr 22, 1994
			Reported:	Apr 26, 1994

LABORATORY ANALYSIS FOR: Total Organic Carbon

Sample Number	Sample Description	Detection Limit mg/kg	Sample Result mg/kg
4DB2701	C-2C, C-3B C-3C comp	50	7,300
4DB2702	C-8B, C-8C comp	50	4,100

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Eileen A. Manning
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Erler & Kalinowski, Inc.	Client Project ID: 930028.00, Chiron	Sampled:	Jul 20, 1994
1730 So. Amphlett Blvd., Suite 320	Sample Descript: Soil, C16B, C-17B comp	Relogged:	Apr 19, 1994
San Mateo, CA 94402		Analyzed:	see below
Attention: Britt V. Thaden	Lab Number: 4DB2703	Reported:	Apr 26, 1994

LABORATORY ANALYSIS

Analyte	Date Analyzed	Detection Limit mg/kg	Sample Result mg/kg
Total Organic Carbon	4/22/94	50	960

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Eileen A. Manning
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Erler & Kalinowski, Inc.	Client Project ID:	930028.00, Chiron		Sampled:	N.A.
1730 So. Amphlett Blvd., Suite 320	Sample Descript:	Soil, Method Blank		Received:	N.A.
San Mateo, CA 94402				Analyzed:	see below
Attention: Britt V. Thaden	Lab Number:	4DB2704		Reported:	Apr 26, 1994

LABORATORY ANALYSIS

Analyte	Date Analyzed	Detection Limit mg/kg	Sample Result mg/kg
Total Organic Carbon	4/22/94	50	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Eileen A. Manning
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Erler & Kalinowski, Inc.
1730 So. Amphlett Blvd., Suite 320
San Mateo, CA 94402
Attention: Britt V. Thaden

Client Project ID: 930028.00, Chiron
Matrix: Solid
QC Sample Group: 4DB2701-04

Reported: Apr 26, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Total Organic Carbon
Method:	EPA 415.1
Analyst:	K. Hynes
MS/MSD Batch#:	4BB2701
Date Prepared:	4/20/94
Date Analyzed:	4/22/94
Instrument I.D.#:	N.A.
Conc. Spiked:	5000 mg/kg
Matrix Spike % Recovery:	93
Matrix Spike Duplicate % Recovery:	110
Relative % Difference:	17
LCS Batch#:	
Date Prepared:	
Date Analyzed:	
Instrument I.D.#:	
LCS % Recovery:	
% Recovery Control Limits:	80-120

SEQUOIA ANALYTICAL

Eileen A. Manning
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

CHAIN OF CUSTODY / SAMPLE ANALYSIS REQUEST

...ler & Kalinowski, Inc.	Analytical Laboratory: Sequoia
...oject Number: 930028.00	Date Sampled: 7/21/93
...oject Name: CHIRON	Sampled By: R.Dleon / GL CLARK
...urce of Samples: Soil Borings	Report Results To: GAIL CLARK
...cation: Emeryville - PG&E @ 53 Hollis	Phone Number: 415) 578-1172

Lab Sample I D	Field Sample I D	Sample Type	Number and Type of Containers	Time Collected	Analyses Requested (EPA Method Number)	Results Required By (Date/Time)
307981 01	C-1-A	Soil	1- Brass Liner	13:10	COMPOSITE AND ANALYZE AS BELOW	72 HOUR TAT
	C-2-A	↓	↓	12:10		↓
	C-3-A			12:34		
02	C-1 B			13:16	COMPOSITE AND EPA 8080 PCB; EPA 8015 TEPH-D; EPA 8015 TVPH-g; EPA 8240 VOC; METALS: ARSENIC, CADMIUM, HEX CHROME, TOTAL CHROME, LEAD, MERCURY.	
	C-1 C			13:20		
	C-2 B			12:18		
	C-2 C			12:25		
	C-3 B			12:38		
	C-3 C	↓	↓	12:42		↓

...cial Instructions: 19 APRIL 1994
COMPOSITE SAMPLES: C-2C, C-3B, C-3C; ANALYZES FOR TOTAL ORGANIC CARBON (BVT)

...inquished By: Name / Signature / Affiliation	Date	Time	Received By: Name / Signature / Affiliation
D.Leon / [signature] / EKI	7/21/93	1745	[signature]

TUE 10:12 ERLER & KALINOWSKI FAX NO. 4155789131 P.04

CHAIN OF CUSTODY / SAMPLE ANALYSIS REQUEST

Erler & Kalinowski, Inc.

Project Number: 930028.00

Project Name: CHIRON

Source of Samples: Soil Borings

Location: Emeryville (PG&E @ 53rd/Hollis)

Analytical Laboratory: SEQUOIA

Date Sampled: 7/21/93

Sampled By: R.D. Lion / G.L. Clark

Report Results To: GAIL CLARK

Phone Number: (415) 578-1172

Lab Sample I D	Field Sample I D	Sample Type	Number and Type of Containers	Time Collected	Analyses Requested (EPA Method Number)	Results Required By (Date/Time)
9307981 05	C-7 A	Soil	1 - BRASS LINER	10:56	COMPOSITE & ANALYZE AS BELOW	72 HR
	C-8 A	↓	↓	11:25		↓
	~~C-9 A~~			—		
06	C-7 B			11:00	COMPOSITE ANALYSIS: EPA 8080 PCB; EPA 8015 TEPH-D; EPA 8015 TVPH-G; EPA 8240 VOC; METALS: ARSENIC, CADMIUM, CHROMIUM (TOTAL AND HEXAVALENT), LEAD, MERCURY.	
	C-7 C			11:14		
	C-8 B			11:28		
	C-8 C			11:33		
	~~C-9 B~~			—		
	C-9 C	↓	↓	11:51		↓

Special Instructions: 19 APRIL 1994

COMPOSITE SAMPLES: C-8B, C-8C; ANALYZE FOR TOTAL ORGANIC CARBON (BVT)

Relinquished By: Name / Signature / Affiliation	Date	Time	Received By: Name / Signature / Affiliation
R.D. Lion / [signature] /EKI	7/21/93	1745	[signature]

CHAIN OF CUSTODY / SAMPLE ANALYSIS REQUEST

Erler & Kalinowski, Inc.

Project Number: 930028.00

Project Name: CHIRON

Source of Samples: SOIL BORINGS

Location: EMERYVILLE (HOLLIS / 53rd) PG&E

Analytical Laboratory: SEQUOIA

Date Sampled: 7/20/93

Sampled By: ROGER LION / GAIL CLARK

Report Results To: GAIL CLARK

Phone Number: (415) 578-1172

Lab Sample I D	Field Sample I D	Sample Type	Number and Type of Containers	Time Collected	Analyses Requested (EPA Method Number)	Results Required By (Date/Time)
18	C-16A	SOIL	1 BRASS LINER	11:25	COMPOSITE: (ANALYZE AS BELOW)	72 HR TAT
19	C-17A	↓	↓	10:45		↓
20	C-18A	↓	↓	10:15		↓
21	C-16B	↓	↓	11:30	COMPOSITE: EPA 8080 - PCB's; EPA 8015 TEPH-D; EPA 8015 TVPH-G; EPA 8240 - VOC's; METALS: ARSENIC, CADMIUM, CHROME (6 & TOTAL CHROME), LEAD, MERCURY	↓
22	C-16C	↓	↓	11:38		↓
23	C-17B	↓	↓	10:52		↓
24	C-17C	↓	↓	11:05		↓
25	C-18B	↓	↓	10:20		↓
26	C-18C	↓	↓	10:24		↓

Special Instructions: 19 APRIL 1994
COMPOSITE SAMPLES: C-16B, C-17B; ANALYZE FOR TOTAL ORGANIC CARBON (BVT)

Relinquished By: Name / Signature / Affiliation	Date	Time	Received By: Name / Signature / Affiliation
ROGER D LION [signature] /EKI	7/20/93	14:33	D.J. [signature] PRIME
D.J. [signature] PRIME	7/20	1600	[signature]