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8 December 1994
Project 2530.02

Ms. Madhulla Logan
Alameda County Health Care Services Agency
1131 Harbour Bay Parkway
Alameda, California 94502

Subject: Proposed Approach for Monitoring Environmental Conditions at
2020 Sherman Avenue and 1521 Buena Vista Avenue
Alameda, California

Dear Ms. Logan:

As you requested in a meeting with Geomatrix Consultants (Geomatrix) and Greystone Homes, Inc. on 23 November 1994, this letter presents our proposed approach for monitoring environmental conditions at the subject site, located on Figure 1. Included in this letter are a brief summary of discussions held in our 23 November meeting, a summary of the results of the recent shallow groundwater quality survey completed in November 1994, and proposed approaches for monitoring groundwater and for characterizing and remediating, if necessary, soil at the site.

SUMMARY OF 23 NOVEMBER 1994 MEETING

Geomatrix and Greystone Homes met with you and Sum Arigala of the California Regional Water Quality Control Board (RWQCB) on 23 November to discuss the status of soil and groundwater characterization at the site. The objective of the meeting was to obtain input from the Alameda County Health Care Services Agency (ACHCSA) and the RWQCB on a proposed long-term management plan for the site. The following summarizes our discussions:

- ACHCSA has not yet received a copy of the screening level risk assessment performed by Geomatrix for 1,1-DCA concentrations detected in groundwater near the southeast corner of the warehouse at the site; the screening level risk calculations did not indicate that the concentrations detected in groundwater would present an unacceptable level of risk to public health, assuming residential development of the site. Geomatrix agreed to transmit a copy of this study to ACHCSA and the RWQCB; a copy of this study is attached as Appendix A.

- Soil sampling will be conducted near the southeastern corner of the warehouse following demolition of the warehouse to evaluate the potential presence of volatile organic compounds (VOCs) in the vadose zone soil. If

Geomatrix Consultants, Inc.
Engineers, Geologists, and Environmental Scientists

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elevated concentrations of VOCs are detected, a risk assessment may be conducted or the VOC-containing soils may be excavated and treated on-site by aeration or disposed off-site. It was determined that additional soil sampling at other locations within the warehouse are not needed because information on the historical usage at the site does not indicate the usage of solvents inside the building, and that the area most likely to have been a possible release area for solvents is the southeast corner of the warehouse (a railroad track maintenance vehicle was historically stored and maintained at that location).

- Petroleum hydrocarbons exist in shallow soil at the site; however, previous conversations with Dr. Ravi Arulanantham from your office indicated that the concentrations detected did not pose a significant threat from an exposure standpoint. Based on our understanding of our previous meeting with you regarding this issue, additional soil samples would be collected during site demolition to address the leaching potential of the near-surface petroleum-affected soil, and to document that the concentrations shown in previous sampling were representative of the soil underlying the paved portion of the site.
- The results of the recent shallow groundwater quality survey were presented by Geomatrix and a phased approach for a groundwater monitoring program was discussed. It is our understanding that both you and Mr. Arigala conceptually approved of the proposed program in the meeting. Mr. Arigala and you requested that we prepare a report summarizing the results of the recent shallow groundwater survey and containing a plan for the implementation of this program for your review.
- Mr. Arigala and you requested that the approach for addressing the potential presence of 1,1-DCA in soils near the southeastern corner of the warehouse be included in this report.

INVESTIGATION SUMMARY

Previous site investigations completed by others are described in our workplan dated 30 December 1993. Investigations completed by Geomatrix are described in our workplan dated 5 April 1994, and in our meeting summary letter to you of 9 September 1994. An additional groundwater survey was performed on 4 November 1994 to characterize the lateral extent of 1,1-DCA in groundwater. The results of this investigation are described

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below. Analytical results of this investigation and previous investigations conducted by Geomatrix are summarized in Tables 1 and 2, and the sampling locations are shown on Figures 2 and 3.

Eight borings were advanced to a depth of sixteen feet using a two-inch diameter direct-push and coring device operated by OnSite Services of Woodside, California. Two of the borings were sampled continuously for lithologic descriptions and to identify the location of groundwater; six of the borings were advanced by pushing to eight feet, then coring to 16 feet. In general, a layer of fill consisting of well-graded sand with gravel was found from a depth of four to six feet, and was underlain by dark gray silty clay. The clay appeared to be of very low permeability, and groundwater did not readily enter the borings; however, the clay appeared moist to wet at a depth of approximately eight to fourteen feet below the ground surface. After completing each boring, the coring device was removed from the hole. Five of the eight borings produced water and were sampled by the end of the day. The tops of the remaining three were covered securely and allowed to remain open over night. One of the three borings had produced water by the following morning and was sampled.

The groundwater samples were collected from the borings using a clean stainless steel bailer or new, disposable tygon tubing with a ball-check valve. The groundwater in the bailer or tubing was then transferred to laboratory - prepared bottles and placed on ice. The samples were delivered under chain-of-custody procedures to Inchcape Laboratories of San Jose, California, and five samples were analyzed for volatile organics by EPA Method 8010 within four days of their receipt. The additional sample, GW-28, was collected from a boring approximately 75 feet downgradient of GW-26 and was not analyzed because upgradient samples were reported to have no detectable VOCs.

The locations of the five groundwater samples which were analyzed are shown on Figure 2, and the analytical results are summarized in Table 1. Volatile organics, including 1,1-DCA, were not detected in any of these five groundwater samples. Analytical laboratory reports for these groundwater grab samples as well as those collected in April 1994 are attached as Appendix B.

PROPOSED APPROACH FOR GROUNDWATER MONITORING

Results of the recent shallow groundwater quality survey indicate that the extent of 1,1-DCA-containing groundwater is limited to within 300 feet or less of the apparent source area near the southeast corner of the warehouse at the site. Geomatrix recommends installing one to two monitoring wells to monitor the downgradient extent of the 1,1-DCA.

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In addition, water level measurements will be collected from existing on-site wells quarterly for one year to verify the direction of groundwater flow. The following describes this proposed approach for groundwater monitoring at the site.

Monitoring Well Installation and Groundwater Quality Monitoring

The installation of the wells will be conducted in a phased approach, as follows:

- a monitoring well (MW-10) will be installed near grab groundwater sampling point GW-21 (Figure 2) to assess the presence of 1,1-DCA at this location and verify the grab groundwater sampling results near this location. Groundwater samples collected from survey point GW-21 contained 22 micrograms per liter ($\mu\text{g/l}$) 1,1-DCA; samples collected downgradient of this location did not contain detectable concentrations of volatile organic compounds.
- if analytical results of groundwater samples collected from this well during the initial sampling events or at some time in the future indicate the presence of VOCs at concentrations exceeding acceptable discharge concentrations to Alameda Harbor, an additional groundwater monitoring well (MW-11) will be installed approximately 200 feet northeast (hydraulically downgradient) and added to the monitoring program.
- both of the well(s) will continue to be monitored on a periodic basis. If sampling and analysis results from the second monitoring well indicate the presence of VOCs at concentrations exceeding acceptable discharge requirements to the Alameda Harbor, the monitoring program will be re-evaluated. Re-evaluation could include conducting a risk assessment to evaluate potential impacts, if any, of discharge to the Alameda Harbor and/or a chemical transport study to evaluate the approximate amount of time it would take for the 1,1-DCA to migrate from MW-11 to the Harbor.

The proposed monitoring well(s) will be completed in the first encountered groundwater. The well or wells will be installed under the direction of a Geomatrix geologist registered in the State of California and according to Geomatrix protocols for well design and installation, attached as Appendix C. Hollow-stem auger equipment will be used to drill the borings, and the soil will be continuously sampled for lithologic description and to appropriately select the screened interval. The wells will be constructed of two-inch diameter PVC casing, and are expected to be screened from approximately 5 to 15 feet below the ground surface. Soil cuttings generated during the drilling operation will be stockpiled or barreled and retained for future disposal in accordance with regulatory

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requirements. The tops of the wells will be surveyed by a surveyor licensed in the State of California.

Groundwater samples will be collected from the well(s) in accordance with Geomatrix protocols, attached as Appendix C. The samples will be submitted to a California state certified laboratory for analysis for the presence of volatile organic compounds using EPA Method 8010. Sampling will be conducted on a quarterly basis for one year; results from this first year of sampling will be evaluated to assess an appropriate frequency for future monitoring events.

Water Level Measurement and Assessment of Groundwater Flow Direction

Water-levels will be measured on a quarterly basis for one year. The water level measurements will be collected from existing on-site wells MW-2, MW-4, M-5, and MW-8, and the new well(s) (Figure 2). A potentiometric map showing the water-level elevation will be constructed for each quarter.

PROPOSED APPROACH FOR SOIL CHARACTERIZATION AND REMEDIATION (IF NEEDED)

Soil sampling will be performed near the southeast corner of the warehouse located at 2020 Sherman Avenue after the building is removed. Soil samples will be obtained from the area where elevated concentrations of 1,1-DCA were reported in groundwater. If elevated concentrations of VOCs are detected, the VOC-containing soil will either be excavated to concentrations acceptable to the ACHCSA and RWQCB or a health risk assessment will be performed to determine whether soil remediation is needed and/or to assess appropriate cleanup goals for the soil.

SCHEDULE AND REPORTING

The installation of well MW-10 is tentatively scheduled for January 1994. The field work is anticipated to require 2 to 3 days to complete; samples collected from the well will be analyzed on a normal 2 week turn-around basis.

A report will be prepared within six weeks after receipt of the analytical results. The report will include a summary of field activities for well installation, a boring log and well completion details, a current groundwater gradient map, and analytical results for the first sampling event.

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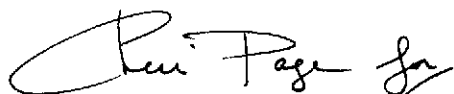
The well will continue to be sampled quarterly for at least one year and a quarterly report will be prepared within six weeks of each quarterly sampling event. The quarterly reports will include a summary of field activities, a current groundwater gradient map, and analytical results for groundwater samples collected from well MW-10.

If analytical results of samples from well MW-10 indicate the presence of VOCs above acceptable discharge limits, and the following quarterly sampling event verifies these results, monitoring well MW-11 will be installed within six weeks of receipt of these verifying results. Monitoring well MW-11 will then be incorporated into the periodic monitoring program at the site.

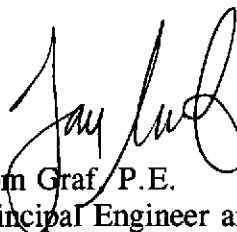
We appreciate your taking the time to meet with us. If you have any questions, please call either of the undersigned or Ms. Cheri Page.

Sincerely,

GEOMATRIX CONSULTANTS, INC.



Amanda Spencer, R.G., P.E.
Senior Hydrogeologist



Tom Graf, P.E.
Principal Engineer and Vice President

ALS/TEG/lam
CONTR\25302MEC.LTR

cc: Sum Arigala, RWQCB
Jeff Schroeder, Greystone Homes, Inc.

Attachments: Table 1 - Groundwater Grab Sample Results - January, April,
and November 1994
Table 2 - Soil Sample Results - January 1994
Figure 1 - Location Map
Figure 2 - Site Plan
Figure 3 - DCA Concentrations in Groundwater Grab Samples -
January 1994
Appendix A - Screening Health Evaluation
Appendix B - Analytical Laboratory Reports for Groundwater Grab Samples,
April and November 1994
Appendix C - Geomatrix Protocols

TABLE 1

GROUNDWATER GRAB SAMPLE RESULTS
JANUARY, APRIL, AND NOVEMBER 1994¹

Encinal Real Estate
2020 Sherman
Alameda, California

Sample	1,1-DCE µg/l	1,1-DCA µg/l	1,2-DCE µg/l	1,2-DCA µg/l	TCA µg/l	TCE µg/l	PCE µg/l	Benzene µg/l	Toluene µg/l	Ethylbenzene µg/l	Xylenes µg/l	Arsenic mg/l	Chromium mg/l	Lead mg/l	Thallium mg/l
January 1994															
GW-1	3	54	<6	<0.9	<0.02	<0.07	<0.02	<0.5	<0.8	<1	<3	NA	NA	NA	NA
GW-2	<0.07	<0.2	<3	<0.4	<0.01	<0.03	<0.01	<0.2	<0.4	<0.7	<2	NA	NA	NA	NA
GW-3	160	1800	<14	<2	74	<0.6	2	<1	8	<3	<8	NA	NA	NA	NA
GW-4	2	110	<3	<0.4	6	0.7	0.05	<0.2	<0.4	<0.7	<2	NA	NA	NA	NA
GW-5	4	240	<3	<0.4	<0.01	<0.03	<0.01	<0.2	<0.4	<0.7	<2	NA	NA	NA	NA
GW-6	1	230	<6	<0.9	<0.02	<0.07	<0.02	<0.5	<0.8	<1	<3	NA	NA	NA	NA
GW-7	1	200	<6	<0.9	<0.02	<0.07	<0.02	<0.5	<0.8	<1	<3	NA	NA	NA	NA
GW-8	11	140	<3	<0.4	<0.01	<0.03	<0.01	<0.2	<0.4	<0.7	<2	NA	NA	NA	NA
GW-9	<0.07	20	<3	<0.4	<0.01	<0.03	<0.01	<0.2	<0.4	<0.7	<2	NA	NA	NA	NA
P-1	4	390	<6	<0.9	<0.02	<0.07	<0.02	<0.5	<0.8	<1	<3	NA	NA	NA	NA
P-2	<0.5	4	0.6	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	0.009	<0.01	<0.04	<0.1
P-3	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA
P-4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA
B-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.002	<0.01	<0.04	<0.1
April 1994															
GW-18 ²	<5	<5	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA
GW-19 ²	<5	<5	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA
GW-20 ²	<5	<5	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA
GW-21 ²	<5	22	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1

GROUNDWATER GRAB SAMPLE RESULTS
JANUARY, APRIL, AND NOVEMBER 1994¹

Sample	1,1-DCE µg/l	1,1-DCA µg/l	1,2-DCE µg/l	1,2-DCA µg/l	TCA µg/l	TCE µg/l	PCE µg/l	Benzene µg/l	Toluene µg/l	Ethylbenzene µg/l	Xylenes µg/l	Arsenic mg/l	Chromium mg/l	Lead mg/l	Thallium mg/l
November 1994															
GW-22	<5	<5	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA
GW-24	<5	<5	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA
GW-25	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	NA	NA	NA	NA	NA	NA	NA	NA
GW-26	<5	<5	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA
GW-27	<5	<5	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

- NA - not analyzed
- DCA - dichloroethane
- TCA - trichloroethane
- DCE - dichloroethene
- TCE - trichloroethene
- PCE - tetrachloroethene

¹ Volatile organic analysis for samples P-1 and GW-1 through GW-9 were performed in the field by Tracer Research Corporation. All other analyses completed in January and April 1994 were performed by AEN laboratory. Analyses completed in November 1994 were performed by Inchcape Testing Services.

² Vinyl chloride results for these samples were not detected (<5 ppb).

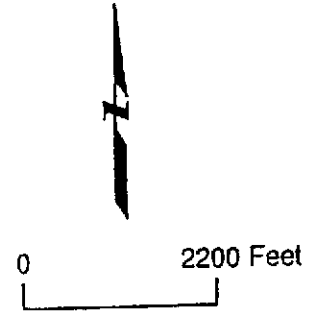
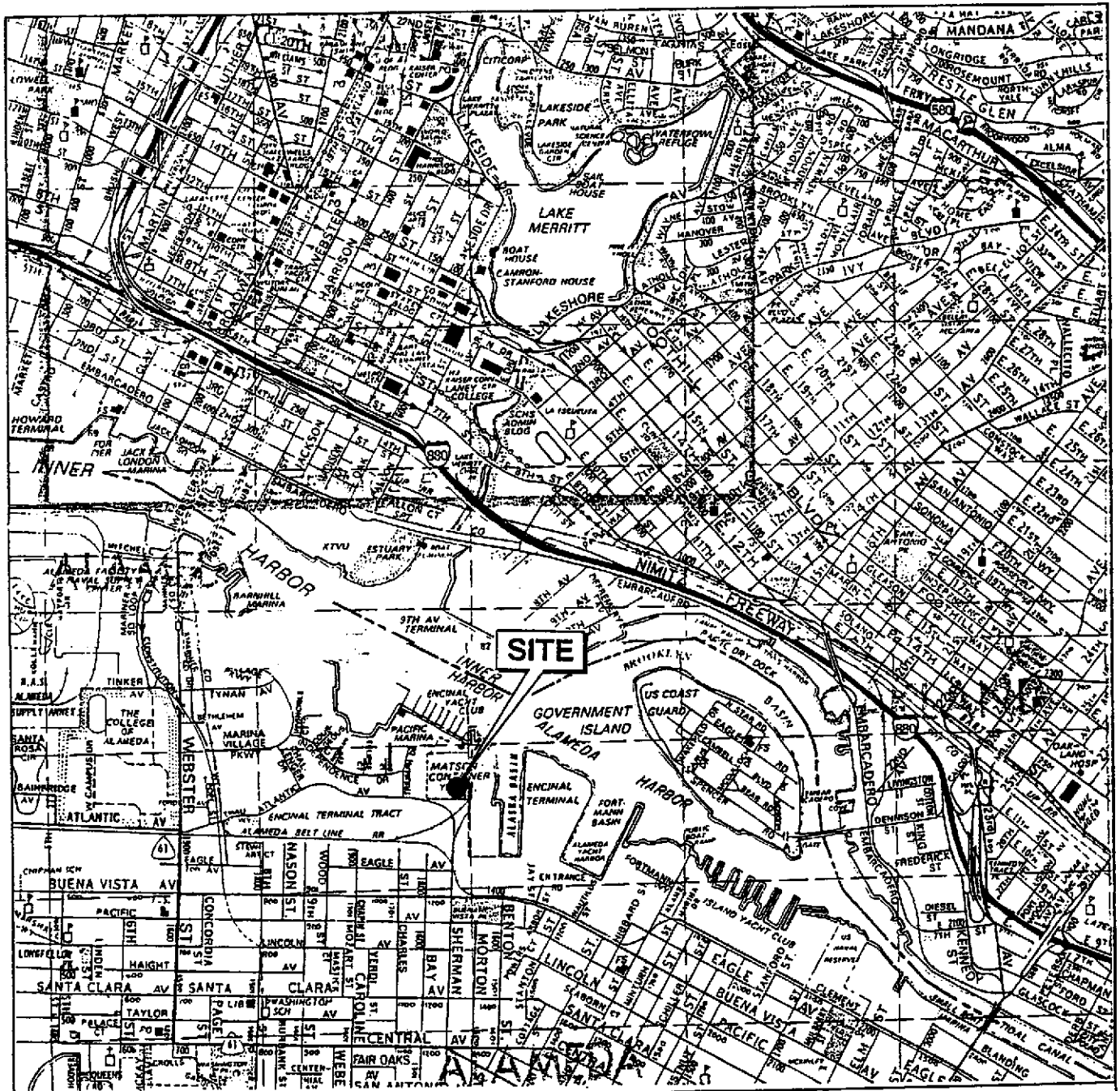
TABLE 2

SOIL SAMPLE RESULTS
JANUARY 1994
Encinal Real Estate
2020 Sherman
Alameda, California

Composite Sample Identification ¹	Benzene µg/l	Toluene µg/l	Ethylbenzene µg/l	Xylene µg/l	Gasoline mg/kg	Diesel mg/kg	Oil mg/kg
P-1-2.5, P-3-2.0, B-1-2.0, B-2-2.0	<5	<5	<5	<5	<0.2	<10	610
P-1-6.0, P-3-4.5, B-1-6.0, B-2-6.0	<5	<5	<5	<5	<0.2	5	20

Note:

¹ Composite sample identification is comprised of the boring number and its depth below ground surface.

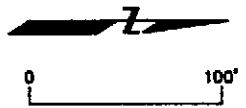
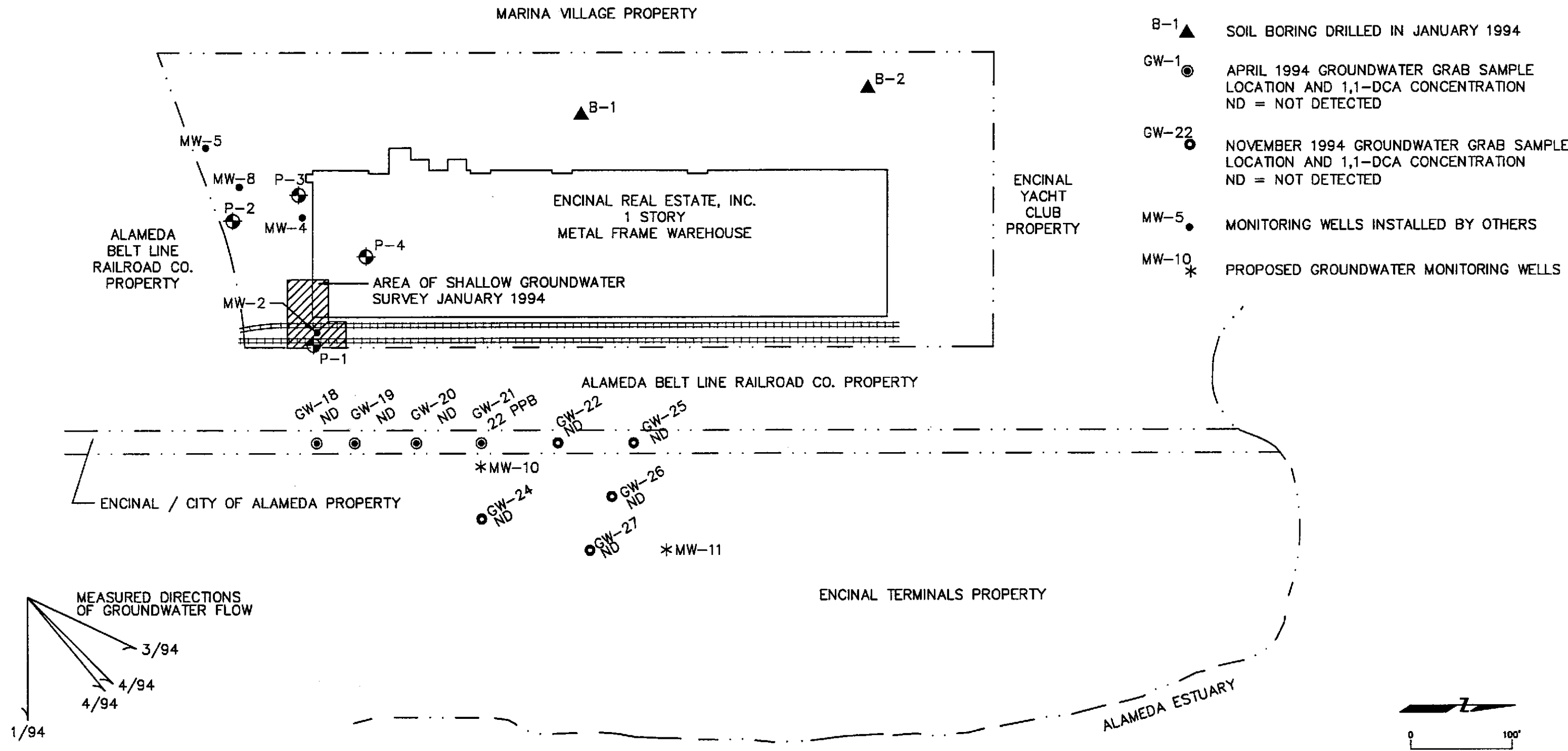


SITE LOCATION MAP
2020 Sherman
Alameda, California

Figure
1
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EXPLANATION

- APPROXIMATE PROPERTY LINE
- P-1 ● TEMPORARY PIEZOMETER LOCATIONS INSTALLED AND DESTROYED IN JANUARY 1994
- B-1 ▲ SOIL BORING DRILLED IN JANUARY 1994
- GW-1 ● APRIL 1994 GROUNDWATER GRAB SAMPLE LOCATION AND 1,1-DCA CONCENTRATION ND = NOT DETECTED
- GW-22 ● NOVEMBER 1994 GROUNDWATER GRAB SAMPLE LOCATION AND 1,1-DCA CONCENTRATION ND = NOT DETECTED
- MW-5 ● MONITORING WELLS INSTALLED BY OTHERS
- MW-10 * PROPOSED GROUNDWATER MONITORING WELLS

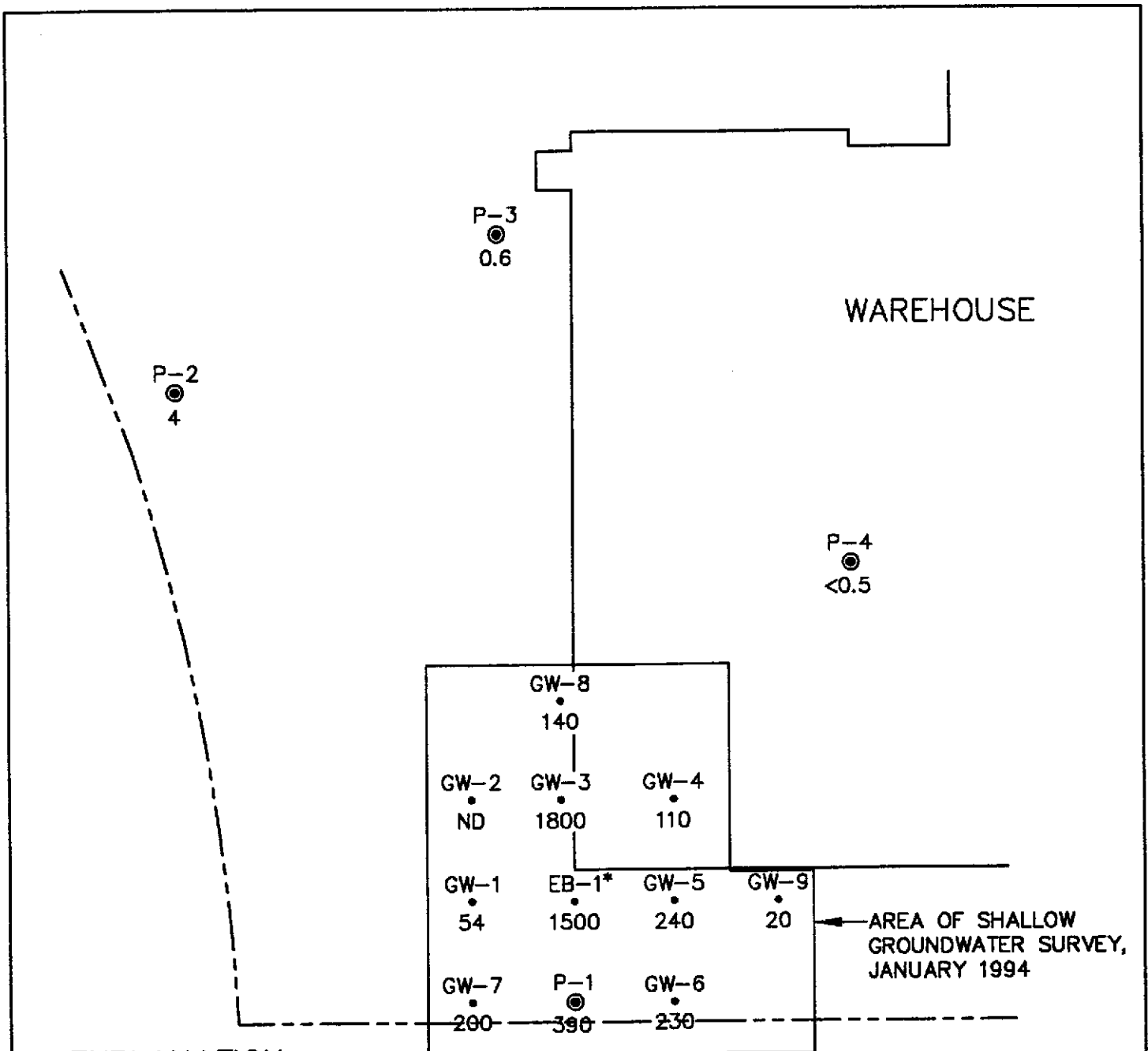


Revisions

SOIL AND GROUNDWATER SAMPLE LOCATIONS
JANUARY, APRIL & NOVEMBER 1994

ENCINAL REAL ESTATE
2020 SHERMAN AVE.
ALAMEDA, CALIFORNIA

Figure
2
Project No.
2530.02

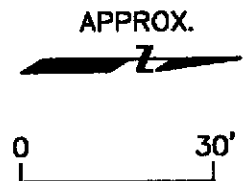


EXPLANATION

P-1 ●
390 TEMPORARY PIEZOMETER LOCATION AND
1,1 - DICHLOROETHANE CONCENTRATION
(1,1 - DCA) IN GROUNDWATER GRAB SAMPLE
IN PARTS PER BILLION.

GW-1 ●
54 SHALLOW GROUNDWATER SURVEY POINT
AND 1,1 - DCA CONCENTRATION IN GROUNDWATER
GRAB SAMPLE IN PARTS PER BILLION

*GROUNDWATER GRAB SAMPLE FROM BORING
EB-1 WAS COLLECTED AND ANALYZED BY OTHERS
IN 1990.



APPENDIX A
SCREENING HEALTH EVALUATION

APPENDIX A

SCREENING HEALTH EVALUATION

A screening-level evaluation was conducted to assess the potential health risks associated with the volatilization of 1,1-dichloroethane (1,1-DCA) from groundwater and subsequent inhalation of vapors by a hypothetical future on-site resident. The screening evaluation was composed of the following steps:

- Estimating vapor flux from groundwater,
- Estimating ambient air concentration,
- Estimating lifetime average daily dose, and
- Estimating lifetime excess cancer risk.

A brief description of each step is provided below; detailed calculations are presented in Attachment 1.

ESTIMATING VAPOR FLUX FROM GROUNDWATER

The vapor flux of 1,1-DCA from groundwater was estimated using the Farmer Model, a simple screening tool recommended by the U.S. EPA as a first step in estimating vapor flux from soil or groundwater (EPA, 1992). The Farmer model assumes that the chemical's concentration in groundwater can be used to estimate the chemical's concentration in soil gas. Once in the vapor phase, the model assumes that the chemical diffuses through the soil at a rate dependent on a number of chemical and physical properties, including the soil porosity and the chemical's air diffusion coefficient. The Farmer model likely overestimates vapor flux from groundwater, because it does not take into account reduction in the source over time or the effect of the capillary fringe on vapor phase diffusion. The vapor flux estimated by the Farmer model is expressed in units of milligrams chemical per square meter per second ($\text{mg}/\text{m}^2\text{-sec}$).

ESTIMATING AMBIENT AIR CONCENTRATION

The ambient concentration of 1,1-DCA in air was estimated using a box model, which is used by the U.S. EPA to calculate preliminary remediation goals (EPA, 1991a). A box model is a simple mass-balance equation that uses the concept of a theoretically enclosed space or box over the area of interest. The model assumes that compounds enter the box via vapor flux and are removed by wind or ventilation. The box model fails to fully take into account the various processes of dispersion and may predict relatively high ambient air

concentrations even at relatively low vapor flux rates. The ambient air concentration estimated by the box model is expressed in units of milligrams chemical per cubic meters of air (mg/m^3).

ESTIMATING LIFETIME AVERAGE DAILY DOSE

The lifetime average daily dose (LADD) of 1,1-DCA was estimated using standard default assumptions that take into account the amount of air inhaled per day, body weight, and the frequency and duration of exposure. The default assumptions used in this evaluation are recommended by the Department of Toxic Substances Control (DTSC) of the California EPA and the U.S. EPA (DTSC, 1992; EPA, 1991b). The (LADD) is expressed in units of milligrams chemical per kilogram body weight per day ($\text{mg}/\text{kg}\text{-day}$).

ESTIMATING LIFETIME EXCESS CANCER RISK

The lifetime excess cancer risk was estimated for the hypothetical future on-site resident by multiplying the LADD by the carcinogenic potency slope factor (SF). The SF, which is expressed in units of risk per milligrams chemical per kilogram body weight per day [$(\text{mg}/\text{kg}\text{-day})^{-1}$], is the 95 percent upper confidence limit of the probability of a carcinogenic response per unit daily intake over a lifetime. By using the 95 percent upper confidence limit, the estimate of carcinogenic response is conservative and usually overestimates the risk posed by the chemical.

CONCLUSIONS

Based on the maximum detected concentration of 1.8 milligrams per liter (mg/l), the estimated lifetime excess cancer risk for the hypothetical future on-site resident is 3 in 10 million (3×10^{-7}), which is lower than the range of risks generally considered acceptable by regulatory agencies. Based on this screening evaluation, the presence of 1,1-DCA in groundwater at the Encinal Terminal site should not pose an unacceptable health risk to a hypothetical future on-site resident. It should also be noted that the U.S. EPA does not agree with the California EPA that 1,1-DCA is a possible human carcinogen. As discussed in a memorandum presented in Attachment 2, the potential noncarcinogenic health risks also could be evaluated; however, it is likely that the above evaluation based on carcinogenic health risks is more health conservative.

REFERENCES

Department of Toxic Substances Control (DTSC), 1992, Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted

Facilities: California EPA, Department of Toxic Substances Control, Sacramento, California

United States Environmental Protection Agency (EPA), 1991a, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), Interim: Publication 9285.7-01B, Office of Emergency and Remedial Response, Washington, D.C.

EPA, 1991b, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors:" OSWER Directive 9285.6-03, Washington, D.C.

EPA, 1992, Air/Superfund National Technical Guidance Study Series, Assessing Potential Indoor Air Impacts for Superfund Sites: EPA-451/R-92-002, Office of air Quality Planning and Standards, Triangle Park, North Carolina

ATTACHMENT 1

SCREENING CALCULATION OF VOLATILIZATION OF 1,1-DICHLOROETHANE VAPORS FROM GROUNDWATER AND ESTIMATED EXCESS CANCER RISK TO A HYPOTHETICAL FUTURE ON-SITE RESIDENT

Step 1 Estimate of Vapor Flux from Groundwater using the Farmer Model

$$\text{Vapor Flux (mg/cm}^2\text{-sec)} = \frac{D_g \times (C_2 - C_1)}{L}$$

where:

- D_g = Soil-gas diffusion coefficient (cm³/cm-sec)
= D_g^{air} (cm³/cm-sec) $\times [(P_a)^{10/3} \div (P_t)^2]$
- C_2 = Vapor concentration of contaminant at bottom of soil layer (mg/cm³)
- C_1 = Vapor concentration of contaminant at surface (assumed to be 0)
- L = Thickness of clean soil layer

Inputs - Soil

- P_t = 0.35 (average value of 0.50 for clay, 0.20 for silty sand; default value for compacted soil; EPA, 1988)
- P_a = 0.20 (assumes 15% moisture content; professional judgment)
- L = 6 ft or 180 cm (site-specific)

Inputs - 1,1-Dichloroethane (1,1-DCA)

$$C_2 = C_w \times 1\ell/1000 \text{ cm}^3 \times \frac{K_{\text{henry}}}{R \times T}$$

where:

- C_w = 1,1-DCA concentration in groundwater (1.8 mg/ℓ; maximum value)
- K_{henry} = 5.2×10^{-3} atm-m³/mol (average of values from Montgomery and Welkom, 1989)
- R = Universal gas constant (8.21×10^{-5} atm-m³/mol-°K)
- T = Temperature of soil (298°K)

therefore:

$$C_2 = 1.8 \text{ mg/l} \times 1\text{l}/1000 \text{ cm}^3 \cdot \times \frac{5.2 \times 10^{-3} \text{ atm}\cdot\text{m}^3/\text{mol}}{8.21 \times 10^{-5} \text{ atm}\cdot\text{m}^3/\text{mol}\cdot^\circ\text{K} \times 298^\circ\text{K}}$$

$$= 3.9 \times 10^{-4} \text{ mg/cm}^3$$

$$D_g = D_g^{\text{air}} \times (P_a^{10/3} \div P_t^2)$$

where:

$$D_g^{\text{air}} = 0.094 \text{ cm}^3/\text{cm}\cdot\text{sec} \text{ (Shen, 1981; non-specific dichloroethanes)}$$

therefore:

$$D_g^{\text{air}} = 0.094 \text{ cm}^3/\text{cm}\cdot\text{sec} \times (0.2^{10/3} \div 0.35^2)$$

$$= 0.094 \text{ cm}^3/\text{cm}\cdot\text{sec} \times (4.7 \times 10^{-3} \div 1.2 \times 10^{-1})$$

$$= 3.6 \times 10^{-3} \text{ cm}^3/\text{cm}\cdot\text{sec}$$

therefore:

$$\text{Vapor Flux} = \frac{3.6 \times 10^{-3} \text{ cm}^3/\text{cm}\cdot\text{sec} \times 3.9 \times 10^{-4} \text{ mg/cm}^3}{180 \text{ cm}}$$

$$= 7.8 \times 10^{-9} \text{ mg/cm}^2\cdot\text{sec} \text{ or } 7.8 \times 10^{-5} \text{ mg/m}^2\cdot\text{sec}$$

Step 2 Estimating Ambient Air Concentration using the Box Model

$$\text{Air (mg/m}^3) = \frac{\text{Flux (mg/m}^2\cdot\text{sec)} \times \text{EA (m}^2)}{\text{WS (m/sec)} \times \text{Height (m)} \times \text{Width (m)}}$$

where:

- Flux = Vapor flux ($7.8 \times 10^{-5} \text{ mg/m}^2\cdot\text{sec}$; calculated above)
- EA = Emissions area (5000 ft^2 or 460 m^2 ; default residential lot, DTSC, 1994)
- WS = Wind speed (2 m/sec; professional judgment)
- Height = Height of box (2 m; professional judgment)
- Width = Width of box (21 m; square root of emissions area)

therefore:

$$\begin{aligned} \text{Air} &= \frac{7.8 \times 10^{-5} \text{ mg/m}^2\text{-sec} \times 460 \text{ m}^2}{2 \text{ m/sec} \times 2 \text{ m} \times 21 \text{ m}} \\ &= 4.2 \times 10^{-4} \text{ mg/m}^3 \end{aligned}$$

Step 3 Estimating Lifetime Average Daily Dose (LADD)

$$\text{LADD (mg/kg-day)} = \frac{\text{Air (mg/m}^3) \times \text{BR (m}^3\text{/day)} \times \text{B (\%)} \times \text{EF (days/yr)} \times \text{ED (yr)}}{\text{BW (kg)} \times \text{AT (days)}}$$

where:

- Air = Air concentration ($4.2 \times 10^{-4} \text{ mg/m}^3$; calculated above)
- BR = Breathing rate (20 m³/day; DTSC, 1992; EPA, 1991)
- B = Bioavailability (100%; maximum)
- EF = Exposure frequency (350 days/yr; DTSC, 1992; EPA, 1991)
- ED = Exposure duration (30 yrs; DTSC, 1992; EPA, 1991)
- BW = Body weight (70 kg; DTSC, 1992; EPA, 1991)
- AT = Averaging time (70 yrs \times 365 days/yr or 25550 days; DTSC, 1992; EPA, 1991)

therefore:

$$\begin{aligned} \text{LADD} &= \frac{4.2 \times 10^{-4} \text{ mg/m}^3 \times 20 \text{ m}^3\text{/day} \times 100\% \times 350 \text{ days/yr} \times 30 \text{ yrs}}{70 \text{ kg} \times 25550 \text{ days}} \\ &= 5.0 \times 10^{-5} \text{ mg/kg-day} \end{aligned}$$

Step 4 Estimating Lifetime Excess Cancer Risk

$$\text{Risk} = \text{LADD} \times \text{SF}$$

where:

- LADD = Lifetime average daily dose ($5.0 \times 10^{-5} \text{ mg/kg-day}$; calculated above)
- SF = Slope factor [$0.0057 \text{ (mg/kg-day)}^{-1}$; OEHHA, 1992]

therefore:

$$\begin{aligned} \text{Risk} &= 5.0 \times 10^{-5} \text{ mg/kg-day} \times 0.0057 \text{ (mg/kg-day)}^{-1} \\ &= 3 \times 10^{-7} \end{aligned}$$

REFERENCES

- Department of Toxic Substances Control (DTSC), 1992, Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities: California EPA, Department of Toxic Substances Control, Sacramento, California
- DTSC, 1994, Preliminary Endangerment Assessment Guidance Manual: California EPA, Department of Toxic Substances Control, Sacramento, California
- Montgomery, J.H. and L.M. Welkom, 1989, Groundwater Chemicals Desk Reference, Lewis Publishers, Chelsea, Michigan.
- Office of Environmental Health Hazard Assessment (OEHHA), Expedited Cancer Potency Values and Proposed Regulatory Levels for Certain Proposition 65 Carcinogens: California EPA, Office of Environmental Health Hazard Assessment, Reproductive and Cancer Hazard Assessment Section, Sacramento, California.
- Shen, T.T., 1981, Estimating Hazardous Air Emissions from Disposal Sites: Pollution Engineering, 13(8):31-34.
- United States Environmental Protection Agency (EPA), Superfund Exposure Assessment Manual: EPA/540/1-88/001, Office of Remedial Response, Washington, D.C.
- EPA, 1991, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors:" OSWER Directive 9285.6-03, Washington, D.C.

M E M O R A N D U M

TO: Elizabeth Nixon **DATE:** 12 May 1994

FROM: Greg Brorby *GB*

SUBJECT: Toxicity Criteria Available for Evaluating Exposures to 1,1-Dichloroethane
Encinal Terminals
Project #2530

Following our conversation of your meeting with the Alameda County Department of Environmental Health and the Regional Water Quality Control Board (RWQCB) on the Encinal Terminals site, I wanted to summarize the availability of toxicity criteria for evaluating exposure to 1,1-dichloroethane (1,1-DCA).

Currently, there are no toxicity criteria for 1,1-DCA listed on EPA's Integrated Risk Information System (IRIS). According to IRIS, a risk assessment is currently under review by an EPA work group to establish oral and inhalation reference doses (RfDs). RfDs are used to evaluate noncarcinogenic health effects. No such assessment is under review to establish oral or inhalation slope factors, which are used to evaluate carcinogenic health risks.

My original calculations from January of this year were based on a oral slope factor developed by the Office of Environmental Health Hazard Assessment (OEHHA) of the California EPA for the purposes of developing an Acceptable Daily Intake (ADI) under Proposition 65. I do not know why the State of California and EPA do not agree as to the carcinogenicity of 1,1-DCA; however, the State has taken a more conservative view than EPA for several chemicals, most notably hexavalent chromium.

EPA Region IX issues Preliminary Remediation Goals (PRGs) for numerous chemicals on a quarterly basis. PRGs for 1,1-DCA are listed in their most recent table, dated 1 February 1994, based on noncarcinogenic health effects. Region IX cites EPA's Health Effects Assessment Summary Tables (HEAST) as the source of the RfDs used in their calculations. Toxicity criteria listed in HEAST are provisional, having undergone review and having the concurrence of individual Agency Program Offices. These provisional criteria could be used to evaluate the potential noncarcinogenic health effects associated with inhalation exposure to 1,1-DCA vapors being released by groundwater at the Site, but it is likely that the evaluation based on carcinogenic health risks is more health conservative.

Please let me know if I can be of any additional assistance.

APPENDIX B

**ANALYTICAL LABORATORY REPORTS FOR GROUNDWATER GRAB SAMPLES,
APRIL AND NOVEMBER 1994**

Corrected
Analytical Laboratory Report
Halogenated Volatile Hydrocarbons
EPA Method 8010

Date Sampled:	4/8/94	Project Manager:	Cheri Page
Date Received:	4/8/94	Client:	Geomatrix
Date Analyzed:	4/8/94	Project:	2530A
Date Reported:	4/8/94	Matrix:	Water
Report #:	404013.hal	COC #:	5910
Lab ID #:	2A036	Units:	ug/L

Field ID #:		GW-18	GW-19	GW-20	GW-21		
Sample ID #:		01	02	03	04		
COMPOUND	PQL						
Vinyl chloride	10	ND	ND	ND	ND		
1,1-Dichloroethene	5	ND	ND	ND	ND		
trans-1,2-Dichloroethene	5	ND	ND	ND	ND		
1,1-Dichloroethane	5	ND	ND	ND	22		
cis-1,2-Dichloroethene	5	ND	ND	ND	ND		
Trichloroethene	5	ND	ND	ND	ND		
Tetrachloroethene	5	ND	ND	ND	ND		
1,2 Dichloroethane	5	ND	ND	ND	ND		
1,1,1 Trichloroethane	5	ND	ND	ND	ND		
Dilution Factors		1	1	1	1		

PQL: Practical Quantitation Limit

Emilia P. Pyle

Laboratory Director

6-3-94

Date

Chain-of-Custody Record

NO 5910

Date: 4/8/94

Page 1 of 1

Project No.: 2530A

ANALYSES

REMARKS

Samplers (Signatures):

Cheri Page

Date	Time	Sample Number
4/8	3:20	GW-18
↓	2:50	GW-19
↓	1:55	GW-20
↓	12:55	GW-21

EPA Method 8010	EPA Method 8020	EPA Method 8240 *	EPA Method 8270	TPH as gasoline	TPH as diesel	TPH as BTEX	Cooled	Soil (S) or water (W)	Acidified	Number of containers
		X					Y	W	N	2
		X					Y	W	N	2
		X					Y	W	N	3
		X					Y	W	N	2

* select compounds including 1,1-DCA; ~~1,1-DCE~~ DCE, TCE, TEA, PCE, VC.

Turnaround time:

2 days

Results to:

Cheri Page

Total No. of containers:


9

Relinquished by: *Cheri Page*
 Signature: *Cheri Page*
 Printed name: *Geomatrix*
 Company:

Date: 4/8
 Relinquished by:
 Signature:
 Printed name:
 Company:

Date:
 Relinquished by:
 Signature:
 Printed name:
 Company:

Date:
 Method of shipment: *Lab P/U*
 Laboratory comments and Log No.:

 **Geomatrix Consultants**
 100 Pine St. 10th Floor
 San Francisco, CA. 94111
 (415) 434-9400

415 434-1365 / Kay



Inchcape Testing Services

Anamatrix Laboratories

1961 Concourse Drive
Suite E
San Jose, CA 95131
Tel: 408-432-8192
Fax: 408-432-8198

MS. CHERI PAGE
GEOMATRIX CONSULTANTS INC.
100 PINE STREET, SUITE 1000
SAN FRANCISCO, CA 94111

Workorder # : 9411071
Date Received : 11/05/94
Project ID : 2530.02
Purchase Order: N/A

The following samples were received at Anamatrix for analysis :

ANAMATRIX ID	CLIENT SAMPLE ID
9411071- 1	GW-22
9411071- 2	GW-24
9411071- 3	GW-27
9411071- 4	GW-26

This report is organized in sections according to the specific Anamatrix laboratory group which performed the analysis(es) and generated the data.

The results contained within this report relate to only the sample(s) tested. Additionally, these data should be considered in their entirety and Anamatrix cannot be responsible for the detachment, separation, or otherwise partial use of this report.

Anamatrix is certified by the California Department of Health Services (DHS) to perform environmental testing under Certificate Number 1234.

If you have any further questions or comments on this report, please call your project manager as soon as possible. Thank you for using Inchcape Testing Services.

Judd Springer for
Susan Kraska Yeager
Laboratory Director

Kilna Desai
Project Manager

11-8-94
Date

This report consists of 16 pages.



ANAMATRIX REPORT DESCRIPTION GC

Organic Analysis Data Sheets (OADS)

OADS forms contain tabulated results for target compounds. The OADS are grouped by method and, within each method, organized sequentially in order of increasing Anamatrix ID number.

Surrogate Recovery Summary (SRS)

SRS forms contain quality assurance data. An SRS form will be printed for each method, if the method requires surrogate compounds. They will list surrogate percent recoveries for all samples and any method blanks. Any surrogate recovery outside the established limits will be flagged with an "***", and the total number of surrogates outside the limits will be listed in the column labelled "Total Out".

Matrix Spike Recovery Form (MSR)

MSR forms contain quality assurance data. They summarize percent recovery and relative percent difference information for matrix spikes and matrix spike duplicates. This information is a statement of both accuracy and precision. Any percent recovery or relative percent difference outside established limits will be flagged with an "***", and the total number outside the limits will be listed at the bottom of the page. Not all reports will contain an MSR form.

Qualifiers

Anamatrix uses several data qualifiers (Q) in its report forms. These qualifiers give additional information on the compounds reported. They should help a data reviewer to verify the integrity of the analytical results. The following is a list of qualifiers and their meanings:

- U - Indicates that the compound was analyzed for, but was not detected at or above the specified reporting limit.
- B - Indicates that the compound was detected in the associated method blank.
- J - Indicates that the compound was detected at an amount below the specified reporting limit. Consequently, the amount should be considered an approximate value. Tentatively identified compounds will always have a "J" qualifier because they are not included in the instrument calibration.
- E - Indicates that the reported amount exceeded the linear range of the instrument calibration.
- D - Indicates that the compound was detected in an analysis performed at a secondary dilution.

Absence of a qualifier indicates that the compound was detected at a concentration at or above the specified reporting limit.

REPORTING CONVENTIONS

- ♦ Due to a size limitation in our data processing step, only the first eight (8) characters of your project ID and sample ID will be printed on the report forms. However, the report cover letter and report summary pages display up to twenty (20) characters of your project and sample IDs.
- ♦ Amounts reported are gross values, i.e., not corrected for method blank contamination.

REPORT SUMMARY
ANAMETRIX, INC. (408)432-8192

MS. CHERI PAGE
GEOMATRIX CONSULTANTS INC.
100 PINE STREET, SUITE 1000
SAN FRANCISCO, CA 94111

Workorder # : 9411071
Date Received : 11/05/94
Project ID : 2530.02
Purchase Order: N/A
Department : GC
Sub-Department: VOA

SAMPLE INFORMATION:

ANAMETRIX SAMPLE ID	CLIENT SAMPLE ID	MATRIX	DATE SAMPLED	METHOD
9411071- 1	GW-22	WATER	11/04/94	8010
9411071- 2	GW-24	WATER	11/05/94	8010
9411071- 3	GW-27	WATER	11/04/94	8010
9411071- 4	GW-26	WATER	11/04/94	8010

REPORT SUMMARY
ANAMETRIX, INC. (408)432-8192

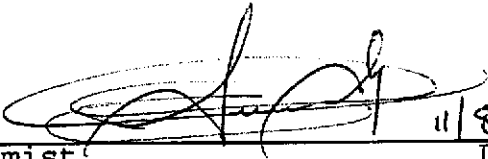
MS. CHERI PAGE
GEOMATRIX CONSULTANTS INC.
100 PINE STREET, SUITE 1000
SAN FRANCISCO, CA 94111

Workorder # : 9411071
Date Received : 11/05/94
Project ID : 2530.02
Purchase Order: N/A
Department : GC
Sub-Department: VOA

QA/QC SUMMARY :

- The amount of methylene chloride reported for sample GW-22 is artificially magnified by the dilution factor and is within normal laboratory background levels in the diluted sample.
- Samples were analyzed at a dilution due to foaminess.

M. Houssein 11/8/94
Department Supervisor Date

 11/8/94
Chemist Date

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192

Project ID : 2530.02
 Sample ID : GW-22
 Matrix : WATER
 Date Sampled : 11/ 4/94
 Date Analyzed : 11/ 7/94
 Instrument ID : AD15

Anamatrix ID : 9411071-01
 Analyst : *[Signature]*
 Supervisor : *[Signature]*
 Dilution Factor : 10.0
 Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	10.	ND	U
74-87-3	Chloromethane	10.	ND	U
75-01-4	Vinyl chloride	5.0	ND	U
74-83-9	Bromomethane	5.0	ND	U
75-00-3	Chloroethane	5.0	ND	U
75-69-4	Trichlorofluoromethane	5.0	ND	U
76-13-1	Trichlorotrifluoroethane	5.0	ND	U
75-35-4	1,1-Dichloroethene	5.0	ND	U
75-09-2	Methylene chloride	10.	17.	U
156-60-5	trans-1,2-Dichloroethene	5.0	ND	U
75-34-3	1,1-Dichloroethane	5.0	ND	U
156-59-2	cis-1,2-Dichloroethene	5.0	ND	U
67-66-3	Chloroform	5.0	ND	U
71-55-6	1,1,1-Trichloroethane	5.0	ND	U
56-23-5	Carbon tetrachloride	5.0	ND	U
107-06-2	1,2-Dichloroethane	5.0	ND	U
79-01-6	Trichloroethene	5.0	ND	U
78-87-5	1,2-Dichloropropane	5.0	ND	U
75-27-4	Bromodichloromethane	5.0	ND	U
110-75-8	2-Chloroethylvinylether	10.	ND	U
10061-01-5	cis-1,3-Dichloropropene	5.0	ND	U
10061-02-6	trans-1,3-Dichloropropene	5.0	ND	U
79-00-5	1,1,2-Trichloroethane	5.0	ND	U
127-18-4	Tetrachloroethene	5.0	ND	U
124-48-1	Dibromochloromethane	5.0	ND	U
108-90-7	Chlorobenzene	5.0	ND	U
75-25-2	Bromoform	5.0	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	ND	U
541-73-1	1,3-Dichlorobenzene	5.0	ND	U
106-46-7	1,4-Dichlorobenzene	5.0	ND	U
95-50-1	1,2-Dichlorobenzene	5.0	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192

Project ID : 2530.02
 Sample ID : GW-24
 Matrix : WATER
 Date Sampled : 11/ 5/94
 Date Analyzed : 11/ 7/94
 Instrument ID : AD15

Anamatrix ID : 9411071-02
 Analyst : *TS*
 Supervisor : *TS*
 Dilution Factor : 10.0
 Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	10.	ND	U
74-87-3	Chloromethane	10.	ND	U
75-01-4	Vinyl chloride	5.0	ND	U
74-83-9	Bromomethane	5.0	ND	U
75-00-3	Chloroethane	5.0	ND	U
75-69-4	Trichlorofluoromethane	5.0	ND	U
76-13-1	Trichlorotrifluoroethane	5.0	ND	U
75-35-4	1,1-Dichloroethene	5.0	ND	U
75-09-2	Methylene chloride	10.	ND	U
156-60-5	trans-1,2-Dichloroethene	5.0	ND	U
75-34-3	1,1-Dichloroethane	5.0	ND	U
156-59-2	cis-1,2-Dichloroethene	5.0	ND	U
67-66-3	Chloroform	5.0	ND	U
71-55-6	1,1,1-Trichloroethane	5.0	ND	U
56-23-5	Carbon tetrachloride	5.0	ND	U
107-06-2	1,2-Dichloroethane	5.0	ND	U
79-01-6	Trichloroethene	5.0	ND	U
78-87-5	1,2-Dichloropropane	5.0	ND	U
75-27-4	Bromodichloromethane	5.0	ND	U
110-75-8	2-Chloroethylvinylether	10.	ND	U
10061-01-5	cis-1,3-Dichloropropene	5.0	ND	U
10061-02-6	trans-1,3-Dichloropropene	5.0	ND	U
79-00-5	1,1,2-Trichloroethane	5.0	ND	U
127-18-4	Tetrachloroethene	5.0	ND	U
124-48-1	Dibromochloromethane	5.0	ND	U
108-90-7	Chlorobenzene	5.0	ND	U
75-25-2	Bromoform	5.0	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	ND	U
541-73-1	1,3-Dichlorobenzene	5.0	ND	U
106-46-7	1,4-Dichlorobenzene	5.0	ND	U
95-50-1	1,2-Dichlorobenzene	5.0	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192

Project ID : 2530.02
 Sample ID : GW-27
 Matrix : WATER
 Date Sampled : 11/ 4/94
 Date Analyzed : 11/ 7/94
 Instrument ID : AD15

Anamatrix ID : 9411071-03
 Analyst :
 Supervisor : *[Signature]*
 Dilution Factor : 10.0
 Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	10.	ND	U
74-87-3	Chloromethane	10.	ND	U
75-01-4	Vinyl chloride	5.0	ND	U
74-83-9	Bromomethane	5.0	ND	U
75-00-3	Chloroethane	5.0	ND	U
75-69-4	Trichlorofluoromethane	5.0	ND	U
76-13-1	Trichlorotrifluoroethane	5.0	ND	U
75-35-4	1,1-Dichloroethene	5.0	ND	U
75-09-2	Methylene chloride	10.	ND	U
156-60-5	trans-1,2-Dichloroethene	5.0	ND	U
75-34-3	1,1-Dichloroethane	5.0	ND	U
156-59-2	cis-1,2-Dichloroethene	5.0	ND	U
67-66-3	Chloroform	5.0	ND	U
71-55-6	1,1,1-Trichloroethane	5.0	ND	U
56-23-5	Carbon tetrachloride	5.0	ND	U
107-06-2	1,2-Dichloroethane	5.0	ND	U
79-01-6	Trichloroethene	5.0	ND	U
78-87-5	1,2-Dichloropropane	5.0	ND	U
75-27-4	Bromodichloromethane	5.0	ND	U
110-75-8	2-Chloroethylvinylether	10.	ND	U
10061-01-5	cis-1,3-Dichloropropene	5.0	ND	U
10061-02-6	trans-1,3-Dichloropropene	5.0	ND	U
79-00-5	1,1,2-Trichloroethane	5.0	ND	U
127-18-4	Tetrachloroethene	5.0	ND	U
124-48-1	Dibromochloromethane	5.0	ND	U
108-90-7	Chlorobenzene	5.0	ND	U
75-25-2	Bromoform	5.0	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	ND	U
541-73-1	1,3-Dichlorobenzene	5.0	ND	U
106-46-7	1,4-Dichlorobenzene	5.0	ND	U
95-50-1	1,2-Dichlorobenzene	5.0	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192

Project ID : 2530.02
 Sample ID : GW-26
 Matrix : WATER
 Date Sampled : 11/ 4/94
 Date Analyzed : 11/ 7/94
 Instrument ID : AD15

Anamatrix ID : 9411071-04
 Analyst : *WJ*
 Supervisor : *DL*
 Dilution Factor : 10.0
 Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	10.	ND	U
74-87-3	Chloromethane	10.	ND	U
75-01-4	Vinyl chloride	5.0	ND	U
74-83-9	Bromomethane	5.0	ND	U
75-00-3	Chloroethane	5.0	ND	U
75-69-4	Trichlorofluoromethane	5.0	ND	U
76-13-1	Trichlorotrifluoroethane	5.0	ND	U
75-35-4	1,1-Dichloroethene	5.0	ND	U
75-09-2	Methylene chloride	10.	ND	U
156-60-5	trans-1,2-Dichloroethene	5.0	ND	U
75-34-3	1,1-Dichloroethane	5.0	ND	U
156-59-2	cis-1,2-Dichloroethene	5.0	ND	U
67-66-3	Chloroform	5.0	ND	U
71-55-6	1,1,1-Trichloroethane	5.0	ND	U
56-23-5	Carbon tetrachloride	5.0	ND	U
107-06-2	1,2-Dichloroethane	5.0	ND	U
79-01-6	Trichloroethene	5.0	ND	U
78-87-5	1,2-Dichloropropane	5.0	ND	U
75-27-4	Bromodichloromethane	5.0	ND	U
110-75-8	2-Chloroethylvinylether	10.	ND	U
10061-01-5	cis-1,3-Dichloropropene	5.0	ND	U
10061-02-6	trans-1,3-Dichloropropene	5.0	ND	U
79-00-5	1,1,2-Trichloroethane	5.0	ND	U
127-18-4	Tetrachloroethene	5.0	ND	U
124-48-1	Dibromochloromethane	5.0	ND	U
108-90-7	Chlorobenzene	5.0	ND	U
75-25-2	Bromoform	5.0	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	ND	U
541-73-1	1,3-Dichlorobenzene	5.0	ND	U
106-46-7	1,4-Dichlorobenzene	5.0	ND	U
95-50-1	1,2-Dichlorobenzene	5.0	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192

Project ID : 2530.0
 Sample ID : VBLKA2
 Matrix : WATER
 Date Sampled : 0/ 0/ 0
 Date Analyzed : 11/ 7/94
 Instrument ID : AD15

Anamatrix ID : BN0703I1
 Analyst : *TS*
 Supervisor : *SL*
 Dilution Factor : 1.0
 Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
110-75-8	2-Chloroethylvinylether	1.0	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

SURROGATE RECOVERY SUMMARY -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192

Project ID : 2530.02
 Matrix : LIQUID

Anamatrix ID : 9411071
 Analyst : *UJ*
 Supervisor : *sh*

	SAMPLE ID	SU1	SU2	SU3
1	VBLKA1	80	81	80
2	GW-22	84	85	86
3	GW-24	84	82	84
4	GW-27	86	84	88
5	VBLKA2	84	85	78
6	GW-26	85	86	85
7				
8				
9				
10				
11				
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QC LIMITS

 SU1 = Bromochloromethane (56- 99)
 SU2 = 1-Chloro-2-fluorobenze (73-110)
 SU3 = 2-Bromochlorobenzene (65-108)

* Values outside of Anamatrix QC limits

EPA METHOD 601/8010
 INCHCAPE TESTING SERVICES - ANAMETRIX
 (408) 432-8192

LABORATORY CONTROL SAMPLE

Sample ID:	LAB CONTROL SAMPLE	Laboratory ID:	MN070111
Batch:	11071	Instrument ID:	AD15
Matrix:	WATER	Concentration Units:	ug/L
Date Analyzed:	11/7/94	Analyst:	<i>ES</i>
		Supervisor:	<i>SL</i>

COMPOUND NAME	SPIKE AMOUNT	LCS REC	%REC LCS	%RECOVERY LIMITS
Trichlorotrifluoroethane	10	10.8	108%	65-116
1,1-Dichloroethene	10	11.1	111%	64-125
trans-1,2-Dichloroethene	10	11.2	112%	77-113
1,1-Dichloroethane	10	11.5	115%	85-129
cis-1,2-Dichloroethene	10	12.3	123%	78-130
1,1,1-Trichloroethane	10	11.3	113%	83-125
Trichloroethene	10	11.3	113%	76-124
Tetrachloroethene	10	10.9	109%	80-118
Chlorobenzene	10	9.8	98%	81-130
1,3-Dichlorobenzene	10	10.6	106%	82-115
1,4-Dichlorobenzene	10	10.6	106%	85-122
1,2-Dichlorobenzene	10	10.5	105%	86-122

Quality control limits are based on data generated by ITS-Anametrix Laboratories.



SAMPLE RECEIVING CHECKLIST

WORKORDER NUMBER: 9411071

CLIENT PROJECT ID: 2530.02

COOLER

Shipping slip (airbill, etc.) present?	YES	NO	<input checked="" type="radio"/> N/A
If YES, enter carrier name and airbill #: _____			
Custody Seal on the outside of cooler?	YES	NO	<input checked="" type="radio"/> N/A
Condition: INTACT _____ BROKEN _____			
Temperature of sample (s) within range?	<input checked="" type="radio"/> YES	NO	N/A
List temperature of cooler (s): <u>4°C</u>			

SAMPLES

Chain of custody seal present for each container?	YES	NO	<input checked="" type="radio"/> N/A
Condition: INTACT _____ BROKEN _____			
Samples arrived within holding time?	<input checked="" type="radio"/> YES	NO	N/A
Samples in proper containers for methods requested?	<input checked="" type="radio"/> YES	NO	
Condition of containers: INTACT <input checked="" type="checkbox"/> BROKEN _____			
If NO, were samples transferred to proper container? _____			
Were VOA containers received with zero headspace?	<input checked="" type="radio"/> YES	NO	N/A
If NO, was it noted on the chain of custody? _____			
Were container labels complete? (ID, date, time preservative, etc.)	<input checked="" type="radio"/> YES	NO	
Were samples preserved with the proper preservative?	YES	NO	<input checked="" type="radio"/> N/A
If NO, was the proper preservative added at time of receipt? _____			
pH check of samples required at time of receipt?	YES	<input checked="" type="radio"/> NO	
If YES, pH checked and recorded by: _____			
Sufficient amount of sample received for methods requested?	<input checked="" type="radio"/> YES	NO	
If NO, has the client or lab project manager been notified? _____			
Field blanks received with sample batch? # of Sets: _____	YES	NO	<input checked="" type="radio"/> N/A
Trip blanks received with sample batch? # of Sets: _____	YES	NO	<input checked="" type="radio"/> N/A

CHAIN OF CUSTODY

Chain of custody received with samples?	<input checked="" type="radio"/> YES	NO
Has it been filled out completely and in ink?	<input checked="" type="radio"/> YES	NO
Sample ID's on chain of custody agree with container labels?	<input checked="" type="radio"/> YES	NO
Number of containers indicated on chain of custody agree with number received?	<input checked="" type="radio"/> YES	NO
Analysis methods clearly specified?	<input checked="" type="radio"/> YES	NO
Sampling date and time indicated?	<input checked="" type="radio"/> YES	NO
Proper signatures of sampler, courier, sample custodian in appropriate place? with time and date?	<input checked="" type="radio"/> YES	NO
Turnaround time? REGULAR _____ RUSH <input checked="" type="checkbox"/>		

Any NO response and/or any "BROKEN" that was checked must be detailed in the Corrective Action Form.

Sample Custodian: CN

Date: 11-05-94

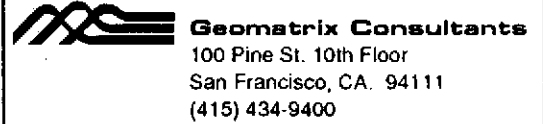
Project Manager: KD

Date: 11/7/94

9411071

② 11/5/94

Chain-of-Custody Record			No. 6231											Date: 11/5/94			Page 1 of 1										
Project No.: 2530.02			ANALYSES											REMARKS													
Samplers (Signatures): R. Daniel Pearson			EPA Method 8010	EPA Method 8020	EPA Method 8240	EPA Method 8270	TPH as gasoline	TPH as diesel	TPH as BTEX																Additional comments		
Date	Time	Sample Number																									
② 11/5	0830	GW 24	X																								no acid - 7 day holding
			Turnaround time: 48 hours				Results to: Cheri Page				Total No. of containers: 2																
Relinquished by: RDP			Date: 11/5/94				Relinquished by:				Date:				Method of shipment: hand												
Signature: R. Daniel Pearson							Signature:								Laboratory comments and Log No.:												
Printed name: R. Daniel Pearson							Printed name:																				
Company: Geomatrix							Company:																				
Received by: Calvin Robins			Time: 1147				Received by:				Time:																
Signature: CALVIN ROBINSON							Signature:																				
Printed name: ANAMETRIX							Printed name:																				
Company:							Company:																				



9411071

(16) cil 11:50

Chain-of-Custody Record			No 5162										Date: 11/4/99			Page 1 of 1				
Project No.: 2530.02			ANALYSES										REMARKS			Additional comments				
Samplers (Signatures): <i>Chen Page</i>			EPA Method 8010	EPA Method 8020	EPA Method 8240	EPA Method 8270	TPH as gasoline	TPH as diesel	TPH as BTEX							Cooled	Soil (S) or water (W)	Acidified	Number of containers	
Date	Time	Sample Number																		
11/4	4:35	GW-22	X												X	W		2	no acid - 7 day holding	
			Turnaround time: 18 hours					Results to: <i>Chen Page</i>					Total No. of containers: 2							
Relinquished by:			Date: 11/4		Relinquished by: Received			Date: 11-4-99		Relinquished by:			Date:		Method of shipment: Lab P/U					
Signature: <i>Chen Page</i>					Signature: <i>Calvin Robinson</i>			Signature:		Signature:			Laboratory comments and Log No.:							
Printed name: <i>Chen Page</i>			5:55		Printed name: CALVIN ROBINSON			Printed name:		Printed name:										
Company: <i>Geomatrix</i>					Company: <i>GEOMETRIX</i>			Company:		Company:										
Received by:			Time:		Received by:			Time:		Received by:			Time:							
Signature:					Signature:			Signature:		Signature:			Signature:							
Printed name:					Printed name:			Printed name:		Printed name:			Printed name:							
Company:					Company:			Company:		Company:			Company:							

Chain-of-Custody Record

No. 5161

Date: 11/4/94

Page 1 of 1

Project No.: 2530.02

ANALYSES

REMARKS

Samplers (Signatures):
Cheri Page

Date	Time	Sample Number	EPA Method 8010	EPA Method 8020	EPA Method 8240	EPA Method 8270	TPH as gasoline	TPH as diesel	TPH as BTEX	TPH as TPH	Cooled	Soil (S) or water (W)	Acidified	Number of containers
11/4	3:00	GW-25								HELD	X			2
11/4	4:50	GW-27	X							X	X			2
11/4	3:00	GW-28								X	X			2
11/4	4:00	GW-26	X							X	X			2

held all samples - not acidified. 7 day holding time.

sample #2 (GW-27) taken off hold by Cheri 11/7/94 (WD)

sample #4 (GW-26) also taken off hold (WD) 11-7-94

Turnaround time:

Results to: Cheri Page

Total No. of containers: 8


Relinquished by: **Cheri Page**
Signature: *Cheri Page*
Printed name: Cheri Page
Company: Geomatrix

Date: 11/4
Relinquished by: *[Signature]*
Signature: *[Signature]*
Printed name: Eddie Wehrli
Company: Anamatrix

Time: 4:20
Received by: **Calvin Robinson**
Signature: *Calvin Robinson*
Printed name: Calvin Robinson
Company: ANAMATRIX

Date:
Relinquished by:
Signature:
Printed name:
Company:
Time:
Received by:
Signature:
Printed name:
Company:

Date:
Method of shipment: **Let P/C**
Laboratory comments and Log No.: **ALL SAMPLES COLD PROPER CONTAINERS NO BUBBLES.**

 **Geomatrix Consultants**
100 Pine St. 10th Floor
San Francisco, CA. 94111
(415) 434-9400



Inchcape Testing Services

Anamatrix Laboratories

1961 Concourse Drive
Suite E
San Jose, CA 95131
Tel: 408-432-8192
Fax: 408-432-8198

MS. CHERI PAGE
GEOMATRIX CONSULTANTS INC.
100 PINE STREET, SUITE 1000
SAN FRANCISCO, CA 94111

Workorder # : 9411067
Date Received : 11/04/94
Project ID : 2530.02
Purchase Order: N/A

The following samples were received at Anamatrix for analysis :

ANAMATRIX ID	CLIENT SAMPLE ID
9411067- 1	GW-25
9411067- 2	GW-27
9411067- 3	GW-28
9411067- 4	GW-26

This report is organized in sections according to the specific Anamatrix laboratory group which performed the analysis(es) and generated the data.

The results contained within this report relate to only the sample(s) tested. Additionally, these data should be considered in their entirety and Anamatrix cannot be responsible for the detachment, separation, or otherwise partial use of this report.

Anamatrix is certified by the California Department of Health Services (DHS) to perform environmental testing under Certificate Number 1234.

If you have any further questions or comments on this report, please call your project manager as soon as possible. Thank you for using Inchcape Testing Services.

Susan Kraska Yeager

Susan Kraska Yeager
Laboratory Director

Kilma Desai

Project Manager

11-11-94
Date

This report consists of 10 pages.



ANAMATRIX REPORT DESCRIPTION GC

Organic Analysis Data Sheets (OADS)

OADS forms contain tabulated results for target compounds. The OADS are grouped by method and, within each method, organized sequentially in order of increasing Anamatrix ID number.

Surrogate Recovery Summary (SRS)

SRS forms contain quality assurance data. An SRS form will be printed for each method, if the method requires surrogate compounds. They will list surrogate percent recoveries for all samples and any method blanks. Any surrogate recovery outside the established limits will be flagged with an "***", and the total number of surrogates outside the limits will be listed in the column labelled "Total Out".

Matrix Spike Recovery Form (MSR)

MSR forms contain quality assurance data. They summarize percent recovery and relative percent difference information for matrix spikes and matrix spike duplicates. This information is a statement of both accuracy and precision. Any percent recovery or relative percent difference outside established limits will be flagged with an "***", and the total number outside the limits will be listed at the bottom of the page. Not all reports will contain an MSR form.

Qualifiers

Anamatrix uses several data qualifiers (Q) in its report forms. These qualifiers give additional information on the compounds reported. They should help a data reviewer to verify the integrity of the analytical results. The following is a list of qualifiers and their meanings:

- U - Indicates that the compound was analyzed for, but was not detected at or above the specified reporting limit.
- B - Indicates that the compound was detected in the associated method blank.
- J - Indicates that the compound was detected at an amount below the specified reporting limit. Consequently, the amount should be considered an approximate value. Tentatively identified compounds will always have a "J" qualifier because they are not included in the instrument calibration.
- E - Indicates that the reported amount exceeded the linear range of the instrument calibration.
- D - Indicates that the compound was detected in an analysis performed at a secondary dilution.

Absence of a qualifier indicates that the compound was detected at a concentration at or above the specified reporting limit.

REPORTING CONVENTIONS

- ♦ Due to a size limitation in our data processing step, only the first eight (8) characters of your project ID and sample ID will be printed on the report forms. However, the report cover letter and report summary pages display up to twenty (20) characters of your project and sample IDs.
- ♦ Amounts reported are gross values, i.e., not corrected for method blank contamination.

REPORT SUMMARY
ANAMETRIX, INC. (408)432-8192

MS. CHERI PAGE
GEOMATRIX CONSULTANTS INC.
100 PINE STREET, SUITE 1000
SAN FRANCISCO, CA 94111

Workorder # : 9411067
Date Received : 11/04/94
Project ID : 2530.02
Purchase Order: N/A
Department : GC
Sub-Department: VOA

SAMPLE INFORMATION:

ANAMETRIX SAMPLE ID	CLIENT SAMPLE ID	MATRIX	DATE SAMPLED	METHOD
9411067- 1	GW-25	WATER	11/04/94	8010

REPORT SUMMARY
ANAMETRIX, INC. (408)432-8192

MS. CHERI PAGE
GEOMATRIX CONSULTANTS INC.
100 PINE STREET, SUITE 1000
SAN FRANCISCO, CA 94111

Workorder # : 9411067
Date Received : 11/04/94
Project ID : 2530.02
Purchase Order: N/A
Department : GC
Sub-Department: VOA

QA/QC SUMMARY :

- Sample was analyzed at a dilution due to foaminess.

M. Hassania 11/11/94
Department Supervisor Date

Kamel G. Kamel 11/11/94
Chemist Date

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192.

Project ID : 2530.02
 Sample ID : GW-25
 Matrix : WATER
 Date Sampled : 11/ 4/94
 Date Analyzed : 11/11/94
 Instrument ID : HP24

Anamatrix ID : 9411067-01
 Analyst : *AK*
 Supervisor : *AK*
 Dilution Factor : 5.0
 Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	5.0	ND	U
74-87-3	Chloromethane	5.0	ND	U
75-01-4	Vinyl chloride	2.5	ND	U
74-83-9	Bromomethane	2.5	ND	U
75-00-3	Chloroethane	2.5	ND	U
75-69-4	Trichlorofluoromethane	2.5	ND	U
76-13-1	Trichlorotrifluoroethane	2.5	ND	U
75-35-4	1,1-Dichloroethene	2.5	ND	U
75-09-2	Methylene chloride	5.0	ND	U
156-60-5	trans-1,2-Dichloroethene	2.5	ND	U
75-34-3	1,1-Dichloroethane	2.5	ND	U
156-59-2	cis-1,2-Dichloroethene	2.5	ND	U
67-66-3	Chloroform	2.5	ND	U
71-55-6	1,1,1-Trichloroethane	2.5	ND	U
56-23-5	Carbon tetrachloride	2.5	ND	U
107-06-2	1,2-Dichloroethane	2.5	ND	U
79-01-6	Trichloroethene	2.5	ND	U
78-87-5	1,2-Dichloropropane	2.5	ND	U
75-27-4	Bromodichloromethane	2.5	ND	U
110-75-8	2-Chloroethylvinylether	5.0	ND	U
10061-01-5	cis-1,3-Dichloropropene	2.5	ND	U
10061-02-6	trans-1,3-Dichloropropene	2.5	ND	U
79-00-5	1,1,2-Trichloroethane	2.5	ND	U
127-18-4	Tetrachloroethene	2.5	ND	U
124-48-1	Dibromochloromethane	2.5	ND	U
108-90-7	Chlorobenzene	2.5	ND	U
75-25-2	Bromoform	2.5	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	2.5	ND	U
541-73-1	1,3-Dichlorobenzene	2.5	ND	U
106-46-7	1,4-Dichlorobenzene	2.5	ND	U
95-50-1	1,2-Dichlorobenzene	2.5	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192

Project ID : 2530.0
 Sample ID : VBLKB1
 Matrix : WATER
 Date Sampled : 0/ 0/ 0
 Date Analyzed : 11/10/94
 Instrument ID : HP24

Anamatrix ID : BN1003I1
 Analyst : *kk*
 Supervisor : *sl*
 Dilution Factor : 1.0
 Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
110-75-8	2-Chloroethylvinylether	1.0	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

SURROGATE RECOVERY SUMMARY -- EPA METHOD 8010
 ANAMETRIX, INC. (408)432-8192

Project ID : 2530.02
 Matrix : LIQUID

Anamatrix ID : 9411067
 Analyst :
 Supervisor : *sh kk*

	SAMPLE ID	SU1	SU2	SU3
1	VBLKB1	74	88	89
2	GW-25	76	84	88
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
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24				
25				
26				
27				
28				
29				
30				

QC LIMITS

SU1 = Bromochloromethane (56- 99)
 SU2 = 1-Chloro-2-fluorobenze (73-110)
 SU3 = 2-Bromochlorobenzene (65-108)

* Values outside of Anamatrix QC limits

EPA METHOD 601/8010
 INCHCAPE TESTING SERVICES - ANAMETRIX
 (408) 432-8192

LABORATORY CONTROL SAMPLE

Sample ID: LAB CONTROL SAMPLE
 Batch: 11067
 Matrix: WATER
 Date Analyzed: 11/10/94

Laboratory ID: MN1001I1
 Instrument ID: HP24
 Concentration Units: ug/L
 Analyst: *KL*
 Supervisor: *sh*

COMPOUND NAME	SPIKE AMOUNT	LCS REC	%REC LCS	%RECOVERY LIMITS
Trichlorotrifluoroethane	10	9.1	91%	65-116
1,1-Dichloroethene	10	9.8	98%	64-125
trans-1,2-Dichloroethene	10	10.6	106%	77-113
1,1-Dichloroethane	10	10.6	106%	85-129
cis-1,2-Dichloroethene	10	12.2	122%	78-130
1,1,1-Trichloroethane	10	10.8	108%	83-125
Trichloroethene	10	10.7	107%	76-124
Tetrachloroethene	10	9.0	90%	80-118
Chlorobenzene	10	9.5	95%	81-130
1,3-Dichlorobenzene	10	10.3	103%	82-115
1,4-Dichlorobenzene	10	10.5	105%	85-122
1,2-Dichlorobenzene	10	10.5	105%	86-122

Quality control limits are based on data generated by ITS-Anametrix Laboratories.



SAMPLE RECEIVING CHECKLIST

WORKORDER NUMBER: 9411067

CLIENT PROJECT ID: 2530.02

COOLER

Shipping slip (airbill, etc.) present?	YES	NO	<input checked="" type="radio"/> N/A
If YES, enter carrier name and airbill #: _____			
Custody Seal on the outside of cooler?	YES	NO	<input checked="" type="radio"/> N/A
Condition: INTACT _____ BROKEN _____			
Temperature of sample (s) within range?	<input checked="" type="radio"/> YES	NO	N/A
List temperature of cooler (s): <u>5°C</u>			

SAMPLES

Chain of custody seal present for each container?	YES	NO	<input checked="" type="radio"/> N/A
Condition: INTACT _____ BROKEN _____			
Samples arrived within holding time?	<input checked="" type="radio"/> YES	NO	N/A
Samples in proper containers for methods requested?	<input checked="" type="radio"/> YES	NO	
Condition of containers: INTACT <input checked="" type="checkbox"/> BROKEN _____			
If NO, were samples transferred to proper container? _____			
Were VOA containers received with zero headspace?	<input checked="" type="radio"/> YES	NO	N/A
If NO, was it noted on the chain of custody? _____			
Were container labels complete? (ID, date, time preservative, etc.)	<input checked="" type="radio"/> YES	NO	
Were samples preserved with the proper preservative?	YES	NO	<input checked="" type="radio"/> N/A
If NO, was the proper preservative added at time of receipt? _____			
pH check of samples required at time of receipt?	YES	<input checked="" type="radio"/> NO	
If YES, pH checked and recorded by: _____			
Sufficient amount of sample received for methods requested?	<input checked="" type="radio"/> YES	NO	
If NO, has the client or lab project manager been notified? _____			
Field blanks received with sample batch? # of Sets: _____	YES	NO	<input checked="" type="radio"/> N/A
Trip blanks received with sample batch? # of Sets: _____	YES	NO	<input checked="" type="radio"/> N/A

CHAIN OF CUSTODY

Chain of custody received with samples?	<input checked="" type="radio"/> YES	NO
Has it been filled out completely and in ink?	<input checked="" type="radio"/> YES	NO
Sample ID's on chain of custody agree with container labels?	<input checked="" type="radio"/> YES	NO
Number of containers indicated on chain of custody agree with number received?	<input checked="" type="radio"/> YES	NO
Analysis methods clearly specified?	YES	<input checked="" type="radio"/> NO
Sampling date and time indicated?	<input checked="" type="radio"/> YES	NO
Proper signatures of sampler, courier, sample custodian in appropriate place? with time and date?	<input checked="" type="radio"/> YES	NO
Turnaround time? REGULAR _____ RUSH _____		

Any NO response and/or any "BROKEN" that was checked must be detailed in the Corrective Action Form.

Sample Custodian: CR

Date: 11-4-94


Project Manager: KD

Date: 11/7/94

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Chain-of-Custody Record			No. 5161	Date: 11/4/94		Page 1 of 1										
Project No.: 2530.02			ANALYSES										REMARKS			
Samplers (Signatures): <i>Cheri Page</i>			EPA Method 8010	EPA Method 8020	EPA Method 8240	EPA Method 8270	TPH as gasoline	TPH as diesel	TPH as BTEX	HOLD	018X	Cooled	Soil (S) or water (W)	Acidified	Number of containers	Additional comments
Date	Time	Sample Number														
① 11/4	3:00	GW-25								X		X			2	<p>Hold all samples - not acidified. 7 day holding time.</p> <p>sample #2 (GW-27) taken off hold by Cheri 11/7/94 (LD)</p> <p>sample #4 (GW-26) also taken off hold (LD) 11/7/94</p>
② 11/4	4:50	GW-27								X		X			2	
③ 11/4	3:30	GW-28								X		X			2	
④ 11/4	4:00	GW-26								X		X			2	
 			 										 			
			Turnaround time:				Results to: <i>Cheri Page</i>				Total No. of containers: 8					
Relinquished by: <i>Cheri Page</i>		Date: 11/4	Relinquished by: <i>[Signature]</i>		Date:	Relinquished by:		Date:	Relinquished by:		Date:	Method of shipment: <i>Let P/O</i>		Laboratory comments and Log No.: ALL SAMPLES COLD PROPER CONTAINERS NO BUBBLES.		
Signature: <i>Cheri Page</i>			Signature: <i>[Signature]</i>			Signature:			Signature:			Laboratory comments and Log No.:				
Printed name:			Printed name: <i>Eddie Wehr</i>			Printed name:			Printed name:			Company:		 Geomatrix Consultants 100 Pine St. 10th Floor San Francisco, CA. 94111 (415) 434-9400		
Company: <i>Geomatrix</i>			Company: <i>Amametrix</i>			Company:			Company:			Company:				
Received by: <i>Eddie Wehr</i>		Time: 4:20	Received by: <i>Calvin Robinson</i>		Time:	Received by:		Time:	Received by:		Time:					
Signature: <i>[Signature]</i>			Signature: <i>Calvin Robinson</i>			Signature:			Signature:							
Printed name:			Printed name:			Printed name:			Printed name:							
Company: <i>Amametrix</i>			Company: <i>AMAMETRIX</i>			Company:			Company:							

APPENDIX C
GEOMATRIX PROTOCOLS

PROTOCOL

INSTALLATION AND DESTRUCTION OF WELLS

1.0 INTRODUCTION

This protocol describes procedures to be followed during the installation or destruction of monitoring, groundwater extraction, and vapor extraction wells. The procedures presented herein are intended to be of general use. As the work progresses, and if warranted, appropriate revisions will be made and approved by the project manager. Detailed procedures in this protocol may be superceded by applicable regulatory requirements.

2.0 WELL INSTALLATION

If required, permits for the installation of wells will be acquired from the appropriate regulatory agency before drilling is initiated. After well installation, well completion report(s) will be completed and filed with the California State Department of Water Resources or the appropriate agency.

Each groundwater monitoring well will be designed to enable measurement of the potentiometric surface and to permit water sampling of a specific water-bearing zone. Each vapor monitoring well will be designed to enable measurement of pressure conditions and permit sampling of a specific zone. The field geologist/engineer, in consultation with the project Geologist or Engineer who will be registered with the State of California if required, will specify the screened interval using the lithologic log and geophysical log (if performed) and will select the well materials and techniques for well completion to be compatible with the formations and the intended use of the well. Drilling and logging of the borings for the wells will be in conformance with the protocol DRILLING OF SOIL BORINGS.

Construction of all wells will be in conformance with the following provisions. A TYPICAL MONITORING WELL CONSTRUCTION DIAGRAM is attached.

2.1 WELL SCREEN AND CASING

The well casing will generally consist of threaded stainless steel or polyvinyl chloride (PVC) schedule 40 (minimum) casing. The inside diameter of the casing will be large enough to permit easy passage of an appropriate water level probe and equipment for purging wells and water sample collection.

The well screen will generally consist of machine-slotted or wire-wrapped PVC or stainless steel screen. The slot sizes will be compatible in size with the selected filter material. The screened sections will provide flow between the target zone and the well, allowing efficiency in well development and collection of representative samples.

2.2 FILTER MATERIAL

Filter material will be well graded, clean sand with less than 2 percent by weight passing a No. 200 sieve and less than 5 percent by weight of calcareous material. The filter material will be either a standard sand gradation designed for a range of anticipated soil types or a sand gradation specifically designed to fit the soils collected from anticipated well completion zones.

2.3 SETTING SCREENS AND RISER CASING

Upon completion of drilling and/or geophysical logging, the boring will be sounded to verify the total depth, and the well casing will be assembled and lowered into the boring. Well casing materials will be measured to the nearest 0.01 foot and steam cleaned before being lowered into the borehole. The casing and screen will be suspended a few inches above the bottom of the boring. The well assembly will be designed so that the well screen is opposite the target zone. The bottom of the screen will typically be flush with the bottom of the well and will be fitted with a secure bottom cap. The PVC casing and well screen joints will be flush coupled. No PVC cement or other solvents will be used to

fasten the joints of casing or well screen. When installing wells in an open borehole, stainless steel centralizers will be used immediately above and below the well screen and approximately every thirty (30) to fifty (50) feet along the length of the casing.

Centralizers need not be placed on well assemblies installed within augers or drill casings because the auger or drill casing will adequately center the well casing and screen in the borehole.

For borings drilled by the mud rotary method, potable water may be added to the drill mud fluid and circulated in the borehole after completion of the boring. Circulation will continue until the suspended sediment in the return fluid has been thinned. If borehole conditions are relatively stable, the mud will be thinned before the casing assembly is lowered to the specified depth. This is preferred because it minimizes clogging of the well screen with thick mud. Conversely, if borehole conditions are relatively unstable, the mud will be thinned after the casing is placed at the specified depth but prior to installation of annular fill materials. After installation of the well assembly, a slurry of filter sand and potable water will then be tremied into the annular space. For borings drilled using the hollow stem auger method, the filter sand will be placed after the well assembly has been lowered to the specific depth through the augers. The augers will be incrementally raised as the filter sand is placed by free fall through the augers. The depth to the top of the filter pack will be measured after each increment to detect possible bridging. If bridging occurs, it will be broken by washing the filter materials into proper place with potable water, or by repeatedly raising and lowering the augers slightly. The filter sand will be placed in a calculated quantity sufficient to fill the annular space to a level of about 1 to 2 feet above the top of the well screen for monitoring wells. For extraction wells the level of filter sand above the well screen will be based on site-specific conditions. The depth to the top of the filter pack will be verified by measuring, using a tremie pipe or a weighted tape.

Groundwater extraction wells or monitoring wells may be surged before placement of the transition seal to promote filter pack settlement, as specified by the project manager.

Once the depth to the top of the filter pack has been verified, bentonite or fine sand may be placed in the annular space as a transition seal between the filter sand and the grout. If bentonite is to be placed below standing water, a high solids bentonite grout will be pumped through a tremie pipe, or pellets may be poured through the annulus. If bentonite is to be placed above standing water, a high solids bentonite grout should be used or pellets may be placed in three-inch lifts. Each lift should be hydrated using approximately one gallon of potable water per 3-inch lift of pellets. A sufficient quantity of bentonite will be poured to fill the annular space to a level of about 2 feet above the top of the filter pack. The completed bentonite transition seal will be allowed to hydrate for at least 30 minutes prior to placing the grout. If a layer of fine sand is placed as the transition seal, the fine sand will be mixed with potable water and placed as a slurry through the tremie pipe or poured dry through the annulus. The depth to the top of the transition seal will be verified by measuring, using the tremie pipe or a weighted tape.

A neat cement grout, cement/sand grout, or cement/bentonite grout seal will be placed from the top of the transition seal to the ground surface. The grout seal will be placed by pumping through a tremie pipe lowered to within five feet of the top of the transition seal in mud rotary borings. The grout seal will be placed in hollow stem auger borings by free fall through the augers as they are incrementally raised or by pumping through flexible hose lowered to near the bottom of the zone to be grouted. The grout must be tremied if there is any standing water in the augers above the transition seal. Grout/additive/water mixtures will be determined on a site-specific basis. Typical specifications of grout mixtures include: a) neat cement/bentonite grout, a mixture of one sack (94 pounds) portland cement, approximately 2 to 5 percent by weight (of cement) powdered bentonite, and approximately 6 to 8 gallons of water; b) neat cement grout consisting of one sack of portland cement and approximately 5 to 6 gallons of water; and c) cement/sand grout consisting of no more than two parts sand to 1 part cement and approximately 7 gallons of water. Only potable water will be used to prepare the grout. After grouting, no work will be done on the monitoring well until the grout has set a minimum of 24 hours.

2.4 DEVELOPMENT OF GROUNDWATER MONITORING OR EXTRACTION WELLS

When the well installation is complete, the well will be developed by surging, bailing, and/or pumping or other appropriate method as specified by the project manager. The objectives of well development are to remove sediment that may have accumulated during well installation, to consolidate the filter pack around the well screen, and to enhance the hydraulic connection between the target zone and the well. A minimum of 24 hours must pass between completion of grouting and development, to allow sufficient curing of the grout. In most instances, a bailer will be used to remove sediment and turbid water from the bottom of the well. A surge block then used within the entire screened interval to flush the filter pack of fine sediment. Surging will be conducted slowly to minimize disruption to the filter pack and screen. The well will be bailed again to remove sediment drawn in by the surging process until suspended sediment is minimized. Following the bailing and surging the well will be further developed using air-lift or pumping methods. A bailer may be used for low-yield wells. The well will be developed at a higher pumping rate than the anticipated rate of future purging, if possible. During development, the turbidity of the water will be monitored and the pH, specific conductance, and temperature of the return water will be measured. Drawdown and recovery will be measured during and at the end of the development process, respectively, using an electric sounder. Well development will proceed until the return water is of sufficient clarity, in the judgment of the Geomatrix field personnel. If the screened interval is too long to be developed adequately in one stage, additional stages will be employed, in which the end of the pump intake will be raised or lowered to various depths, as required.

2.5 SURFACE COMPLETION

Upon completion of the well, a suitable slip-on cap, threaded end cap, or waterproof cap will be fitted on the top of the riser casing to prevent the entry of surface runoff or foreign matter. A steel protective well cover (e.g., stovepipe) will be completed either above the ground surface, or a vault with a traffic rated cover will be completed at the ground

surface. All wells will be locked for security, and will be designed to limit surface water infiltration.

2.6 DOCUMENTATION

A well construction diagram for each well will be completed in the field on the MONITORING WELL LOG by the field geologist/engineer and submitted to the project geologist or engineer upon completion of each well. Well installation and construction data will be summarized on the FIELD WELL CONSTRUCTION SUMMARY. Well development notes and field measurements of water quality parameters will be summarized on a MONITORING WELL SAMPLING RECORD. A DAILY FIELD RECORD and the well development record will also be submitted to the project geologist or engineer upon completion of each monitoring well.

3.0 CLEANING OF DRILLING EQUIPMENT

Cleaning of the drill rig and associated drilling equipment will follow the procedures discussed in Section 2 of the protocol DRILLING AND DESTRUCTION OF SOIL BORINGS.

All well casing materials will be cleaned thoroughly before they are installed. Well development equipment will be cleaned thoroughly before use. The following cleaning procedure has been found to be effective and will be used or adapted as appropriate for general conditions of materials or equipment to be cleaned.

1. Swab surfaces, inside and out, with a laboratory grade detergent-potable water solution or steam clean with a detergent-potable water solution.
2. Steam rinse with potable water or rinse in deionized or organic-free water.
3. Cover with clean plastic to protect materials and equipment from contact with chemical products, dust, or other contaminants.

Alternatively, well casing materials that have been steam-cleaned and sealed in individual airtight plastic bags by the factory can be used.

Decontamination rinsate will be collected and stored for future disposal by the client in accordance with legal requirements.

4.0 WELL DESTRUCTION

Destruction of wells will be completed in accordance with applicable state and local requirements. If required, permits for destruction will be obtained from the appropriate regulatory agency. As part of destruction design and implementation, care will be taken to seal groundwater pathways between multiple aquifers, and limit surface water infiltration through the destroyed borehole.

If possible, the well casing will be removed from the borehole. For shallow wells, and if the well has been completed in the uppermost aquifer, the casing may be pulled from the borehole before auger entry. Alternatively, and if the well has been completed below the uppermost aquifer, the annular fill may be drilled out with hollow-stem augers and the casing removed from the borehole through the augers. If the well casing is PVC or other similar material and cannot be removed as described above, it may be removed by drilling out the casing and annular fill using a tricone or drag bit and a rotary drilling method. The borehole will be redrilled to the same or slightly larger diameter than the original borehole. The redrilled borehole will be plumb and adequately centered, and all the well casing will be removed. The borehole will be filled with a neat cement, cement/sand or cement/bentonite grout. A high-solids bentonite grout may be used in the saturated zone. The grout will be placed in one continuous pour before its initial set from the bottom of the boring to the ground surface. The grout will be emplaced by pumping through a tremie pipe or flexible hose which is initially lowered to the bottom of the borehole. and raised incrementally as emplacement proceeds. The augers should be raised incrementally as emplacement proceeds, but not to exceed increments of 20 feet or greater than allowed by

borehole stability. Boreholes that are terminated above the water table and are not greater than 20 feet deep may be grouted by a continuous pour originating at the ground surface.

If the well casing cannot be removed, grout may be tremied into the casing as described above. If the filter pack interconnects multiple distinct water-yielding zones, the casing must be cut opposite the aquifer to be sealed as well as through the intervening aquitard before grout is emplaced. This will allow the grout to seal the filter pack area, thereby prohibiting vertical movement of groundwater between the zones. Grout should be placed opposite the aquifer and for a vertical distance of at least ten feet above (and below the aquifer, if applicable). If the aquifer is confined and the head pressure is great, the grout may need to be emplaced under pressure.

The volume of sealing material used will be calculated and compared to the casing or borehole volume to ensure bridging has not taken place during well destruction. If the well is in an urban area and if the casing remains in the borehole, a hole will be excavated around the well to a depth of five feet, and the casing will be removed to the bottom of the excavation. The sealing material will be allowed to spill over into the excavation to form a cap. The remainder of the excavation will be backfilled with either native material, grout, or concrete.

PROTOCOL

SAMPLING OF GROUNDWATER MONITORING WELLS AND WATER SUPPLY WELLS

1.0 INTRODUCTION

This protocol describes procedures to be followed during collection of field water quality measurements and groundwater samples for laboratory chemical analysis from monitoring wells and water supply wells. The procedures presented herein are intended to be of general use. As the work progresses, and if warranted, appropriate revisions will be made by the Geomatrix project manager.

2.0 SAMPLING

2.1 SAMPLE COLLECTION

- A. Monitoring Wells - For wells completed without dedicated sampling pumps, at least four well casing volumes or one saturated borehole volume, whichever is greater, will be removed to purge the well prior to collection of groundwater samples. The saturated borehole volume is the volume of water in the well casing plus the volume of water in the filterpack. Periodic observations of turbidity and measurements of temperature, pH, and specific conductance will be made with field equipment during purging to evaluate whether the water samples are representative of the target zone. Samples will be collected only when: 1) a minimum of four sets of parameter readings have been taken, and 2) the temperature, pH, and specific conductance reach relatively constant values, and the turbidity has stabilized.

Wells that recharge very slowly may be purged dry once, allowed to recharge, and then sampled as soon as sufficient water is available. In this case, at least two parameter readings of field water quality should be taken; one initially and one after recharge.

A submersible pump, diaphragm pump, positive displacement pump which may contain a bladder, or a bailer will be used for evacuating (purging) the monitoring well casing. Generally, purging will begin with the pump inlet at the midscreen interval and the pump will be raised through the water column as

purging progresses, ending just below the water table in order to remove stagnant water from the well casing. The majority of the purge volume will be taken from the mid-screen interval. Purging will progress at a rate intended to minimize differential drawdown between the interior of the wellscreen and the filter sand, to limit cascading water along the inside of the well casing.

Clean latex or solvex gloves will be worn by the sampler before beginning sampling. A Teflon bailer or a stainless steel positive displacement Teflon bladder pump with Teflon tubing will be used to collect the water samples for laboratory chemical analysis. The sample will be taken from the midscreen interval and the depth will be recorded.

Each sampling episode will begin with the well having the least suspected concentrations of target compounds. Successive wells will be sampled in sequence of increasing suspected concentration.

- B. Water Supply Wells - Water supply wells, designated by the project manager, will be sampled by purging the wells for a period of time adequate to purge the pump riser pipe. If the well is currently pumping, the sample can be taken without purging the well. Water samples will then be collected from the discharge point nearest the well head. Samples will be collected directly in laboratory-prepared bottles.
- C. Extraction Wells - Extraction wells will be sampled while extraction is occurring, from an in-line sampling port after purging the sampling line. Samples will be collected directly in laboratory-prepared bottles.

A MONITORING WELL SAMPLING RECORD will be used to record the following information:

- Sample I.D.
- Duplicate I.D., if applicable
- Date and time sampled.
- Name of sample collector.
- Well designation (State well numbering system for water supply wells, and unique sequential number for other wells).
- Owner's name, or other common designation for water supply wells.
- Well diameter
- Depth to water on day sampled
- Casing volume on day sampled
- Method of purging (bailing, pumping, etc.).
- Amount of water purged.
- Extraordinary circumstances (if any).

- Results of instrument calibration/standardization and field measurements (temperature, pH, specific electrical conductance) and observed relative turbidity.
- Depth from which sample was obtained.
- Number and type of sample container(s).
- Purging pump intake depth.
- Times and volumes corresponding to water quality measurement.
- Purge rate.

2.2 SAMPLE CONTAINERS AND PRESERVATION

Appropriate sample containers and preservatives for the analyses to be performed will be obtained from the subcontracted analytical laboratory. Frequently requested analyses and sample handling requirements are listed in Table 1.

2.3 SAMPLE LABELING

Sample containers will be labeled with self-adhesive tags having the following information written in waterproof ink:

- A. Geomatrix
- B. Project number.
- C. Sample number.
- D. Date and time sample was collected.
- E. Initials of sample collector.

2.4 QUALITY CONTROL SAMPLES

In order to evaluate the precision and accuracy of analytical data, quality control samples such as duplicates and blanks will be periodically employed. These samples will be collected, or prepared and analyzed by the laboratory, as specified in the project Quality Assurance Project Plan or by the project manager.

2.5 HANDLING, STORAGE, AND TRANSPORTATION

Efforts will be made to handle, store, and transport supplies and samples safely. Exposure to dust, direct sunlight, high temperature, adverse weather conditions, and possible

contamination will be avoided. Samples will be placed in a clean chest, which contains ice or blue ice if cooling is required, immediately following collection and will be transported to the subcontracted laboratory as soon as possible.

3.0 FIELD MEASUREMENTS

Field measurements of temperature, pH, and specific conductance will be performed on groundwater samples. Data obtained from field water quality measurements will be recorded on the MONITORING WELL SAMPLING RECORD. Field measurements will be made on aliquots of groundwater that will not be submitted for laboratory analysis.

3.1 TEMPERATURE MEASUREMENT

Temperature measurements will be made with a mercury filled thermometer or an electronic thermistor, and all measurements will be recorded in degrees Celsius.

3.2 PH MEASUREMENT

The pH measurement will be made as soon as possible after collection of the sample, generally within a few minutes.

The pH meter will be calibrated at the beginning and once during each sampling day and whenever appropriate in accordance with the equipment manufacturer's specifications as outlined in the instruction manual for the specific pH meter used. Two buffers (either pH-4 and pH-7, or pH-7 and pH-10, whichever most closely bracket the anticipated range of groundwater conditions) will be used for instrument calibration.

3.3 SPECIFIC CONDUCTANCE MEASUREMENT

Specific conductance will be measured by immersing the conductivity probe directly in the water source or into a sample. The probes used should automatically compensate for the temperature of the sample. Measurements will be reported in units of micromhos per centimeter at 25 degrees Celsius.

The specific conductance meter will be calibrated at the beginning and once during each sampling day in accordance with the equipment manufacturer's specifications as outlined in the instruction manual for the specific conductivity meter used. The conductivity meter will be calibrated with a standardized potassium chloride (KCl) solution.

4.0 DOCUMENTATION

4.1 FIELD DATA SHEETS

A MONITORING WELL SAMPLING RECORD will be used to record the information collected during water quality sampling. Following completion of sampling and review by the project manager or task leader, the original data sheets will be placed in the project file.

4.2 CHAIN-OF-CUSTODY PROCEDURES

After samples have been collected and labeled, they will be maintained under chain-of-custody procedures. These procedures document the transfer of custody of samples from the field to a designated laboratory.

A CHAIN-OF-CUSTODY RECORD will be filled out for each shipment of samples to be sent to the laboratory for analysis. Each sample will be entered on the Chain-of-Custody form after it is collected and labeled. Information contained on the triplicate carbonless form will include the following:

- Name of sampler.
- Date and time sampled.
- Sample I.D.
- Number of sample bottles.
- Sample Matrix (soil, water, or other).
- Analyses required.
- Remarks, including any preservatives, special conditions, or specific quality control measures.
- Turnaround time and person to receive lab report.
- Project number.
- Signatures of all people assuming custody.

- Signatures of field sampler at top of chain-of-custody.
- Condition of samples when received by lab.

Blank spaces on the CHAIN-OF-CUSTODY RECORD will be crossed out between last sample number listed and signatures at the bottom of the sheet.

The field sampler will sign the and record the time and the date at the time of transfer to the laboratory or to an intermediate person. A set of signatures is required for each relinquished/reserved transfer including transfer within Geomatrix. The original imprint of the chain-of-custody record will accompany the sample containers. Following review by the project manager or task leader, a duplicate copy will be placed in the project file.

5.0 EQUIPMENT CLEANING

Bailers, sampling pumps, purge pumps, and any other purging or sampling apparatus will be cleaned before and after sampling of each well. Factory new and sealed disposable bailers may be used for sampling, but may not be reused. Thermometers, pH electrodes, and conductivity probes that will be used repeatedly will be cleaned before and after sampling each well and at any time during sampling if the object comes in contact with foreign matter.

Purged waters and solutions resulting from cleaning of purging or sampling equipment will be collected stored for future disposal by the client in accordance with legal requirements. Disposal of purged water will be arranged following receipt of laboratory analyses for groundwater samples.

Cleaning of reusable equipment which is not dedicated to a particular well will consist of the following:

- Bailers - the inside and outside of bailers will be cleaned in a solution of laboratory grade detergent and potable water, followed by a thorough rinse with

deionized (DI) water. They may also be steam cleaned, followed by a DI rinse. If metals samples are to be collected, the bailer should be rinsed with a pH2 nitric acid solution before the final DI rinse.

- Purge Pumps - All downhole, reusable portions of purge pumps will be steam cleaned on the outside. If the pump does not have a backflow check valve, the inside of the pump and tubing should also be steam cleaned. For purge pump with a backflow check valve, the interior of the pump and tubing may be cleaned by pumping a laboratory-grade detergent and potable water solution through the system followed by a potable water rinse, or by steam-cleaning.
- Water Quality Meters - All meters will be cleaned by rinsing the probe portions in DI water and allowing to air-dry.
- Bailer Tripod - The tripod cable will be steam cleaned or rinsed with DI water.

Sample bottles and bottle caps will be cleaned by the subcontracted laboratory using standard EPA-approved protocols. Sample bottles and bottle caps will be protected from contact with solvents, dust, or other contamination between time of receipt by Geomatrix Consultants and time of actual usage at the sampling site. Sample bottles will not be reused.