

Versar INC. SACRAMENTO

QUARTERLY GROUND-WATER SAMPLING REPORT
HOUSING AUTHORITY OF THE
CITY OF ALAMEDA SITE AT
1916 WEBSTER STREET
ALAMEDA, CALIFORNIA

Prepared for:

Housing Authority of the City of Alameda
701 Atlantic Avenue
Alameda, California 94501

Prepared by:

Versar Inc. - Sacramento
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628-3520

Versar Job No. 7703.22

June 9, 1992

PROJECT SUMMARY

On February 24, 1992, Versar, Inc. (Versar) collected ground-water samples as part of the third round of quarterly ground-water sampling requirements at the Housing Authority of the City of Alameda (HACA) site in Alameda, California. In addition, Versar attempted to collect soil samples at a depth of five feet with a hand auger to define the limits of the soil contamination. The hand auger reached a maximum depth of 18 inches. No evidence of shallow soil contamination was observed.

An underground gasoline storage tank was removed from the site in July, 1986 at which time petroleum hydrocarbon contamination was discovered in the soils in the vicinity of the tank. The impacted soils were excavated and aerated on the site prior to being used to backfill the excavation. Two ground-water monitoring wells (MW1 and MW2) were installed in August, 1986. Versar conducted a site assessment in July, 1991 to clarify the areal extent of the petroleum hydrocarbon contamination and to determine the local hydraulic gradient. During this assessment, a third ground-water monitoring well (MW3) was installed.

Ground-water monitoring is being conducted as part of the site investigation activities. Each sampling event includes: 1) the measurement of ground-water levels; 2) the determination of the hydraulic gradient; 3) the collection and analysis of the ground-water samples for total petroleum hydrocarbons as gasoline (TPH-G), and for benzene, toluene, ethylbenzene and xylenes (BTEX); and 4) the generation of a report summarizing the results of the sampling event. Mr. James G. Jensen, Geohydrologist, prepared this report under the guidance of Mr. Michael P. Sellens, Senior Geohydrologist, a Registered Geologist in the State of California.

The following conclusions summarize the findings of Versar's ground-water monitoring and sampling report:


- Ground-water samples collected during this event did not contain TPH-G, or benzene, toluene, or ethylbenzene at or above the relevant method's detection limits. All on-site wells were sampled.
- The ground-water sample from monitoring well MW2 contained xylenes in a concentration of 1.6 micrograms per liter, which is below the California Maximum Contaminant Level.


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- Ground-water samples collected from monitoring wells MW1 and MW3 did not contain any xylenes at or above the method's reporting limit.

Prepared by:

Reviewed by:


James G. Jensen
Geohydrologist


Michael P. Sellens, R.G. 4714
Senior Geohydrologist

DISCLAIMER

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Factual information regarding operations, conditions, and test data was obtained, in part, from the client and have been assumed by Versar to be correct and complete. Since the facts stated in this report are subject to professional interpretation, they could result in differing conclusions. In addition, the findings and conclusions contained in this report are based on various quantitative and qualitative factors as they existed on or near the date of the investigation. Therefore, if the recommendations made in this report are not implemented within a reasonable period of time, there can be no assurances that intervening factors will not arise that will affect the conclusions reached herein.

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This report reflects conditions, operations, and practices as observed during the investigation. Changes or modifications to procedures and/or facilities made after the site visit are not included.

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1.0 INTRODUCTION

This report describes the methods, procedures, and findings of the third round of quarterly ground-water sampling conducted at the Housing Authority of the City of Alameda (HACA) site located at 1916 Webster Street in Alameda, California. The first round was conducted in July, 1991. This report also describes the results of soil sampling at the site.

The City of Alameda has a population of approximately 80,000 people and is located in the northwest section of Alameda County. The site is at the southwest corner of the intersection of Webster Street and Atlantic Avenue and is approximately 0.5 miles south of the Oakland Inner Harbor and 0.75 miles north of San Francisco Bay. The location of the site is shown on Figure 1.

This report has been prepared by Versar Inc. (Versar) on behalf of HACA, which is proposing to develop the site. Prior to developing the site, HACA wants to secure approval from the Alameda County Department of Environmental Health, Hazardous Materials Division and the California Regional Water Quality Control Board (RWQCB) that the site is not a concern to human health or the environment. This investigation was performed as part of the scheduled quarterly sampling activities at the site.

1.1 Site Geology and Geohydrology

The site is located in the Coast Ranges geomorphic province, at an approximate elevation of six feet above mean sea level. The area is tectonically active, being situated between the Hayward Fault on the east and the San Andreas Fault on the west. The underlying bedrock consists of Mesozoic sedimentary and volcanic rocks found throughout the Coast Ranges. The general area surrounding the site is underlain by Quaternary marine and nonmarine terrace deposits consisting of clays and silts. The local soil stratigraphy at the site consists of sandy fill material overlying sandy clays and sands. The uppermost ground

water at the site is at approximately five feet below grade, or one foot above mean sea level. The ground-water level data are summarized on Table 1. The local ground-water gradient, as measured on February 24, 1992, is to the north-northwest at 0.04 feet per foot.

1.2 Site Background and History

This summary of the site background and history is based on a review of previous work done by Aqua Science Engineers, Inc. (Aqua Science). The site is the former operating office for HACA. The site consists of a warehouse and a parking lot. The potential for environmental impairment is based on soil contamination identified during the removal of a 280-gallon gasoline underground storage tank (UST) on July 16, 1986. Although the UST had not been in service for many years, it was reported to contain a mixture of water and regular gasoline. The UST contents were evacuated prior to the tank removal. A visual inspection did not indicate the presence of any holes in the UST. However, laboratory analysis of soil samples collected from the excavation identified elevated concentrations of total petroleum hydrocarbon as gasoline (TPH-G), as well as elevated concentrations of benzene, toluene, and xylene (Aqua Science, August 11, 1986).

Based on the results of the soil analysis, additional contaminated soil was excavated and additional samples were collected in July and August, 1986. During this time, eight boreholes were drilled on the site, two of which were converted to monitoring wells (MW1 and MW2). Ground-water samples were collected from the borings and the monitoring wells (Aqua Science, September 4, 1986). Results of laboratory analysis of these samples are summarized in Table 2. Locations of the boreholes and monitoring wells are shown on the Site Layout Map (Figure 2).

A review of the site investigation reports determined that soil excavation ceased in a northerly direction when field screening and visual observations indicated that all contaminated soil had been removed. Approximately 130 cubic yards of contaminated soil was excavated and aerated on the site. The treated soil was used as backfill in the excavation (Aqua Science, October 16, 1986). The previous reports and laboratory analytical results are summarized in the Versar (1991) Work Plan report (Versar, March 22, 1991).

No additional work was conducted at the site until 1990 when PRC Environmental Management, Inc. collected ground-water samples from the two monitoring wells (MW1 and MW2) as part of the sampling program for the nearby Alameda Naval Air Station. The samples were analyzed for volatile organic compounds (VOCs) by EPA Method 624 and extractable organic compounds (EOCs) by EPA Method 625. No VOCs or EOCs were reported from either of the monitoring wells (PRC Environmental Management, October 11, 1990).

One additional monitoring well (MW3) was installed by Versar in July, 1991. MW3 was installed to determine the local ground-water gradient and to evaluate the ground-water quality. The two previously installed monitoring wells (MW1 and MW2) were evaluated as to their condition and were determined to be suitable for use as monitoring wells. MW1, MW2, and MW3 were developed and ground-water samples were collected. The ground-water samples were analyzed for total petroleum hydrocarbons as gasoline (TPH-G) and benzene, toluene, ethylbenzene, and xylenes (BTEX). The ground-water samples from MW1, MW2, and MW3 did not contain any TPH-G or toluene at or above the relevant method's detection limits. The ground-water sample from MW2 contained a benzene concentration of 3.7 micrograms per liter ($\mu\text{g/L}$), slightly above the California Maximum Contaminant Level (Cal MCL)

of 1.0 $\mu\text{g/L}$ (Versar, September 20, 1991). Results of laboratory analysis of these samples are summarized in Table 3.

In addition to the installation of MW3, a shallow soil boring (BH-7) was drilled at the north end of the previously excavated area to verify the areal extent of any soil contamination. Soil samples from BH-7 contained concentrations of TPH-G and BTEX, indicating that impacted soil is present north of the previous excavation limits (Versar, September 20, 1991).

The second quarterly ground-water sampling event was conducted on November 15 and 19, 1991 by Versar. MW1, MW2, and MW3 were purged and ground-water samples were collected. The ground-water samples were analyzed for TPH-G and BTEX. The ground-water samples collected from all on-site wells did not contain TPH-G, toluene, or ethylbenzene. The ground-water sample collected from MW2 contained a benzene concentration of 1.1 $\mu\text{g/l}$ and a xylenes concentration of 4.5 $\mu\text{g/l}$ (Versar, January 27, 1992). Results of the laboratory analyses are summarized in Table 3.

1.3 Site Investigation Objectives

The primary purpose of this site visit was to perform the third quarterly ground-water sampling event at the HACA site. The general objectives were:

- 1) Measure ground-water levels in MW1, MW2, and MW3, and determine the local hydrologic gradient.
- 2) Purge and collect ground-water samples from MW1, MW2, and MW3.
- 3) Analyze the ground-water samples for TPH-G and BTEX.
- 4) Prepare the third quarterly ground-water sampling report.

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An additional objective of this site visit was to collect soil samples for the purpose of defining the limits of the soil contamination.

2.0 SAMPLING ACTIVITIES

The third round of quarterly ground-water monitoring and sampling at the HACA site was conducted on February 24, 1992. The investigation included: 1) measurement of the ground-water levels in MW1, MW2, and MW3; 2) purging and sampling of MW1, MW2, and MW3; 3) laboratory analysis of the samples for TPH-G and BTEX; and 4) preparation of the third quarterly ground-water sampling report. The locations of MW1, MW2, and MW3 are shown on Figure 3.

2.1 Ground-Water Monitoring and Sampling

Prior to conducting any ground-water sampling, the depth to ground water was measured in each monitoring well. Ground water was present at depths below surface of 3.65 feet, 3.10 feet, and 3.23 feet, for monitoring wells MW1, MW2, and MW3, respectively. This data, corrected to previous survey data, was used to determine the ground-water gradient, which is to the north-northwest at 0.04 feet per foot (Figure 3). The ground-water level data is listed on Table 1. A historical hydrograph of the measured ground-water levels in MW1, MW2, and MW3 is included as Figure 4.

After measurement of ground-water levels in February, 1992, all wells were purged and sampled using a precleaned dedicated bailer following procedures outlined in Appendix A. A minimum of three casing volumes of ground water was purged from each well. Data collected during purging included the initial depth to ground water, temperature, pH, conductivity, and observations of sheen, odor, free product, and turbidity. Details of the purging were recorded and are included as Appendix B. The ground water in each well was determined to be stable with respect to the physical parameters upon completion of the purging.

Each well was allowed to recover to at least 90 percent of the pre-purging water level. Ground-water samples to be analyzed

for TPH-G and BTEX were collected from each well using a precleaned dedicated bailer. The samples for TPH-G and BTEX were placed in precleaned, 40-milliliter glass vials preserved with hydrochloric acid. Sample containers were labelled with the date and time of collection and stored at approximately 4°C in a cooler. A total of three samples were collected and submitted to Trace Analysis Laboratory (Trace), a California state certified laboratory, for analysis. The samples were prepared following EPA protocols and were accompanied by Versar's chain-of-custody record. The results of the laboratory analysis are presented in Section 3.0 Laboratory Analytical Results.

2.2 Additional Site Activities

In order to delineate the limits of soil contamination, a subsurface soil sampling program was initiated. Three borings were attempted using a two-inch diameter hand auger. The maximum depth of penetration achieved with the hand auger was 18 inches below ground surface. Penetration was restricted by the presence of a gravel layer present at a depth of 12 to 18 inches below the surface. No obvious odors were detected and the Foxboro 128 GC Organic Vapor Analyzer (OVA), used for field analysis, did not detect the presence of any organic vapor. No samples were collected for laboratory analysis. At the present time, alternative drilling methods are being evaluated.

3.0 LABORATORY ANALYTICAL RESULTS

A total of three ground-water samples were collected for laboratory analysis for TPH-G and for BTEX. TPH-G was analyzed following the DHS method, and BTEX was analyzed following a modified EPA Method 8020. The complete analytical procedure for each method is included in Appendix C. A copy of the laboratory analytical results and chain-of-custody records are included as Appendix C.

3.1 Ground-Water Sample Results

Trace reported the ground-water samples from MW1 and MW3 did not contain TPH-G or BTEX at or above the relevant method's reporting limits.

The ground-water samples from MW2 did not contain TPH-G, benzene, toluene, or ethylbenzene at or above the relevant method's reporting limits. A concentration of xylenes of 1.6 $\mu\text{g}/\text{l}$ was reported from the ground-water sample from monitoring well MW-2. This concentration is below the Cal MCL value of 1,750 $\mu\text{g}/\text{l}$ of xylenes. Ground-water sample results are summarized in Table 3 and on Figure 5.

4.0 FUTURE ACTIVITIES

This is the third sampling event of the scheduled quarterly sampling activities for the three monitoring wells MW1, MW2, and MW3 at the HACA site. The next round of sampling to evaluate ground-water contamination levels is scheduled for May, 1992.

The subsurface soil sampling program is scheduled to be continued in May, 1992 and the investigation completed in June, 1992.

5.0 REFERENCES

This investigation of the HACA site utilized the reference materials and reports documented below:

Aqua Science Engineers, Inc., August 11, 1986, A Proposal for Soil and Water Investigation at the Alameda Housing Authority.

Aqua Science Engineers, Inc., September 4, 1986, Soils Investigation - A Summary of Findings and a Proposal for Remedial Action.

Aqua Science Engineers, Inc., October 16, 1986, Soil and Water Quality Treatment Summary and Recommendations - A Final Report.

Davis, S.N., 1966, Hydrogeology Field Trip East Bay Area and Northern Santa Clara Valley, in Geology of Northern California: California Division of Mines and Geology, Bulletin 190, p. 465-471.

Norris, R.M. and Webb, R.W., 1990, Geology of California: John Wiley and Sons, New York, 541 p.

PRC Environmental Management, Inc., October 11, 1990, Copy of Laboratory Analytical Results.

U.S. Geological Survey Topographical Map, 7.5 Minute Series, Oakland West, California Quadrangle, 1959 (Photorevised 1980).

Versar Inc., March 22, 1991, Work Plan for the Subsurface Evaluation at 1916 Webster Street, Alameda, California.

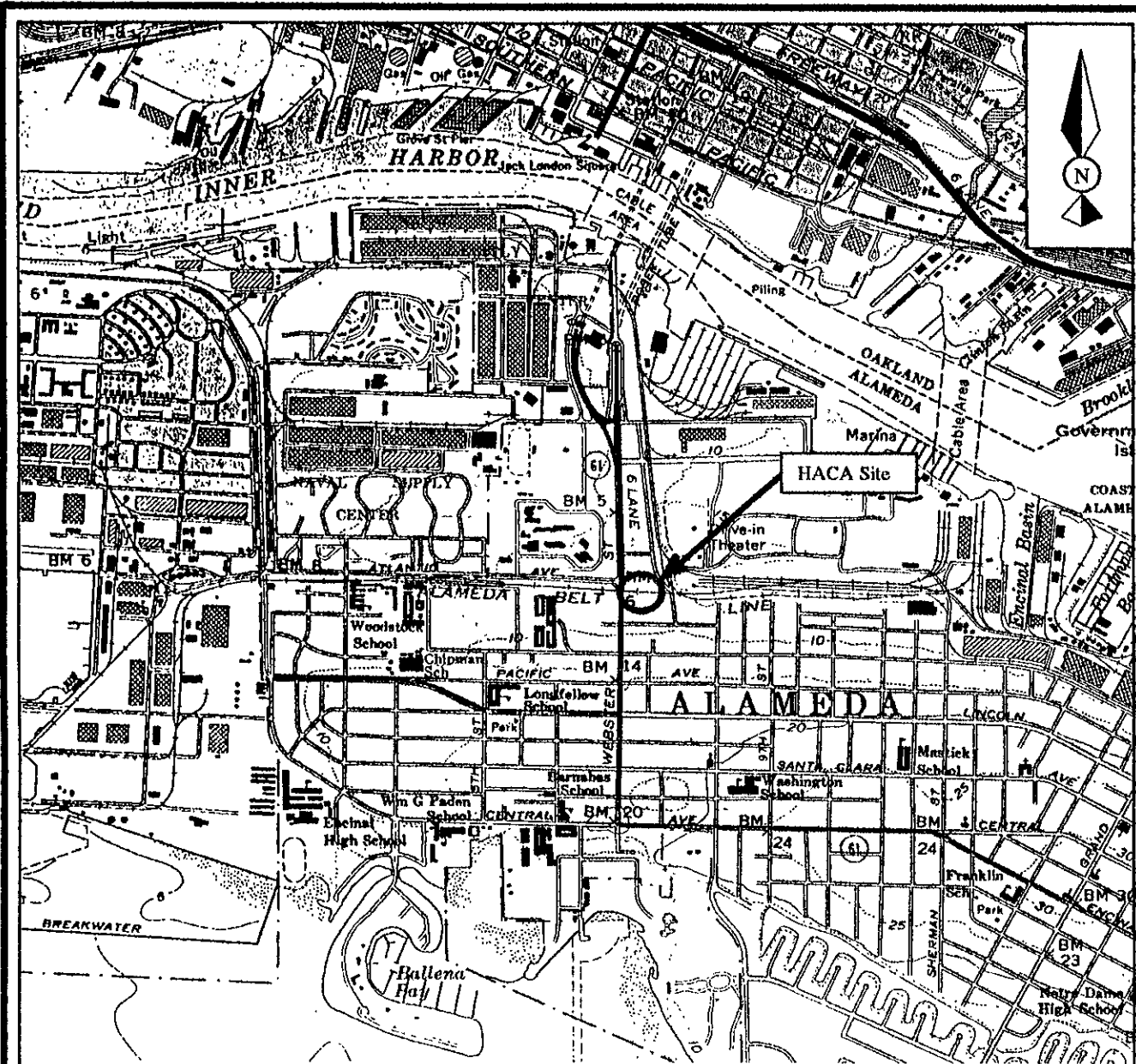
Versar Inc., September 20, 1991, Stage One Site Assessment of the Housing Authority of the City of Alameda Site at 1916 Webster Street, Alameda, California.

Versar Inc., January 27, 1992, Quarterly Ground-Water Sampling Report, Housing Authority of the City of Alameda Site at 1916 Webster Street, Alameda, California.

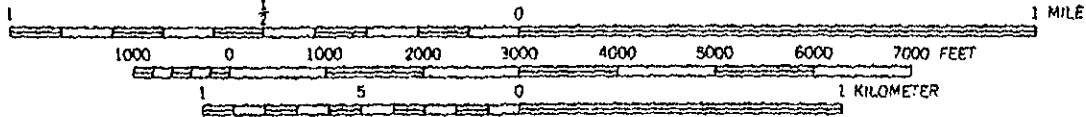
6.0 APPENDICES

The following Appendices A through C constitute the technical appendix to this report. The contents of each appendix is listed below.

- A Ground-Water Monitoring and Sampling Procedure
- B Test Data for Monitoring Wells Developed and Purged During February, 1992 Quarterly Ground-Water Sampling
- C Laboratory Analytical Results and Chain-of-Custody Records for Ground-Water Samples Collected During February, 1992 Quarterly Ground-Water Sampling



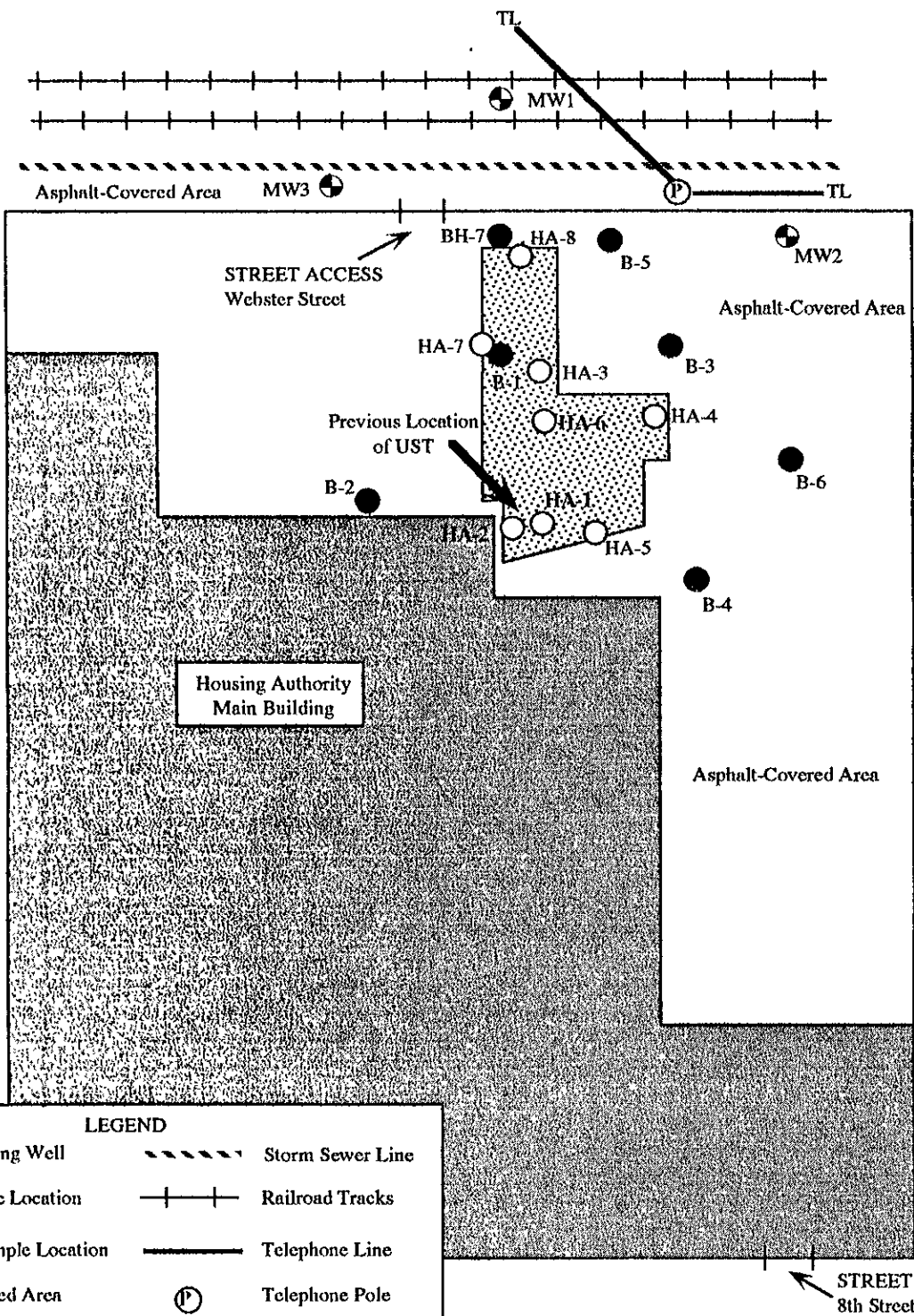
SCALE 1:24000



CONTOUR INTERVAL 20 FEET
 DOTTED LINES REPRESENT 5-FOOT CONTOURS
 NATIONAL GEODETIC VERTICAL DATUM OF 1929
 DEPTH CURVES IN FEET—DATUM IS MEAN LOWER LOW WATER

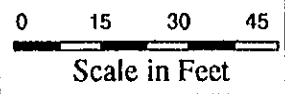
Source: USGS, Oakland West, California, 1959, Photorevised 1980

| | | |
|----------------------|---|-------------|
| Scale 1:24,000 | Site Location Map | Figure 1 |
| Project No. 7703.022 | Housing Authority of the City of Alameda Alameda, California | Versar Inc. |



LEGEND

- Monitoring Well
- Borehole Location
- Soil Sample Location
- Excavated Area
- Storm Sewer Line
- Railroad Tracks
- Telephone Line
- Telephone Pole



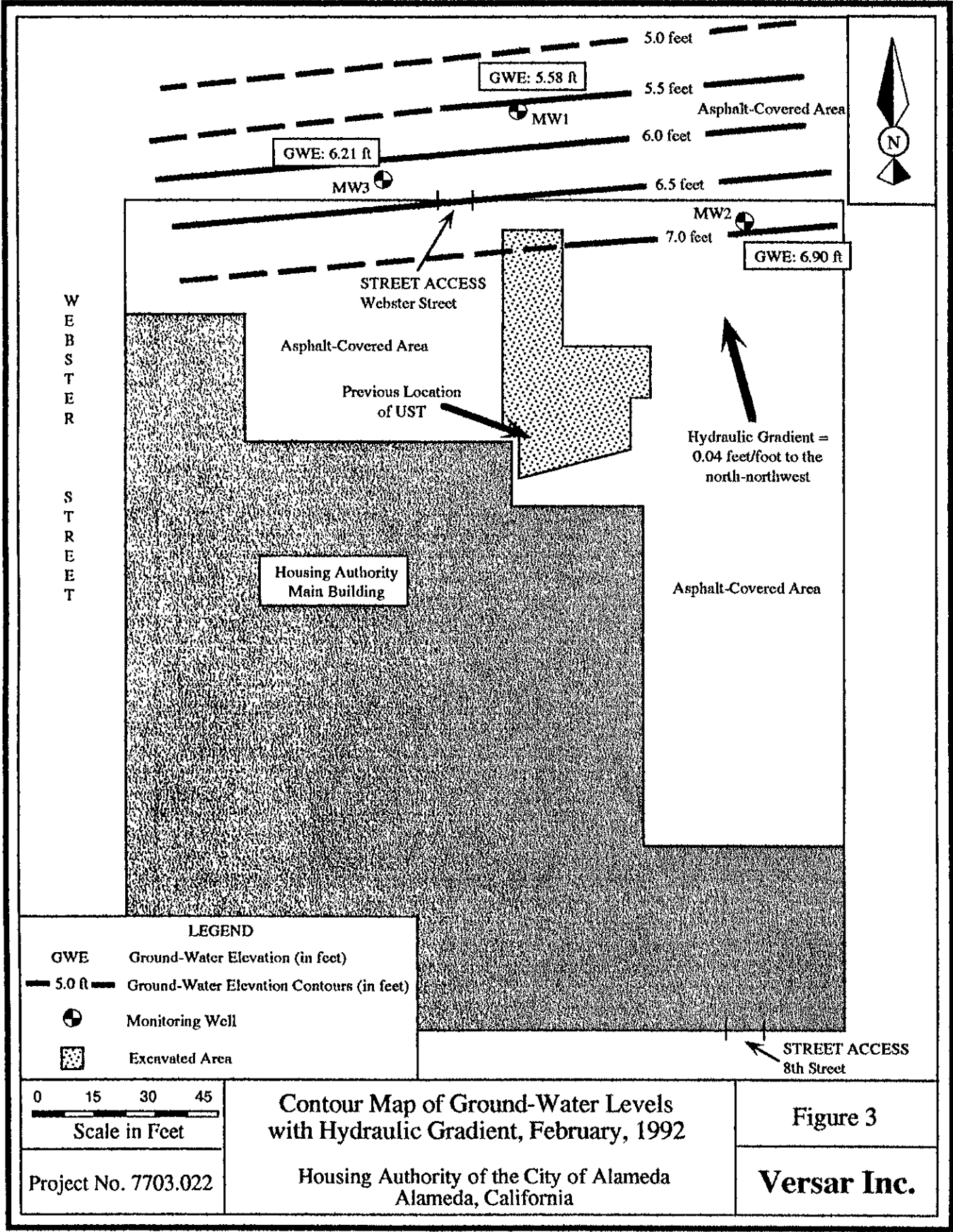
Site Layout Map

Housing Authority of the City of Alameda
Alameda, California

Figure 2

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W
E
B
S
T
E
R

S
T
R
E
E
T

Housing Authority
Main Building

Hydraulic Gradient =
0.04 feet/foot to the
north-northwest

LEGEND

- GWE Ground-Water Elevation (in feet)
- 5.0 ft — Ground-Water Elevation Contours (in feet)
- Monitoring Well
- ▨ Excavated Area

0 15 30 45
 ───────────
 Scale in Feet

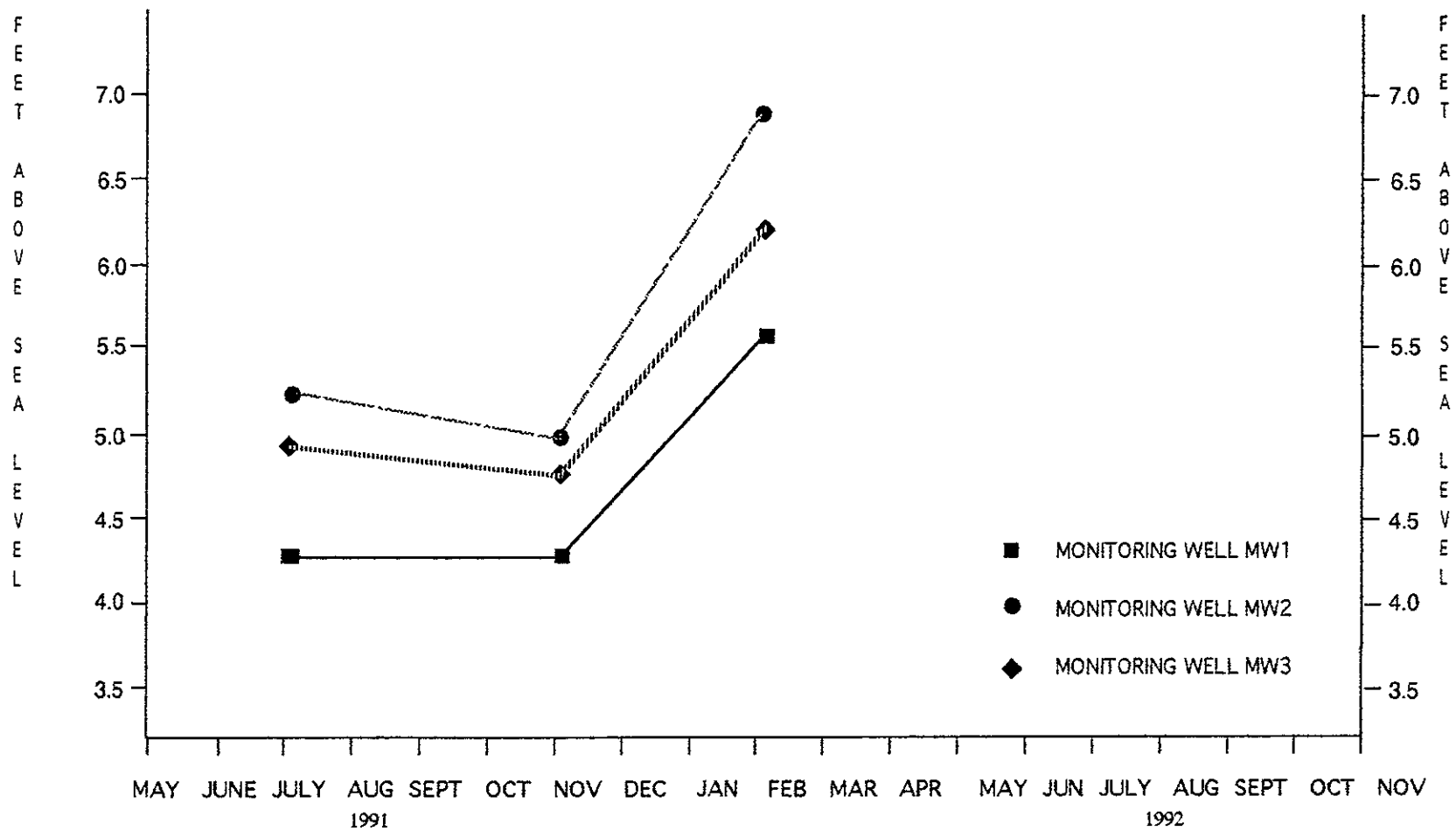
**Contour Map of Ground-Water Levels
with Hydraulic Gradient, February, 1992**

Figure 3

Project No. 7703.022

Housing Authority of the City of Alameda
Alameda, California

Versar Inc.



No Scale

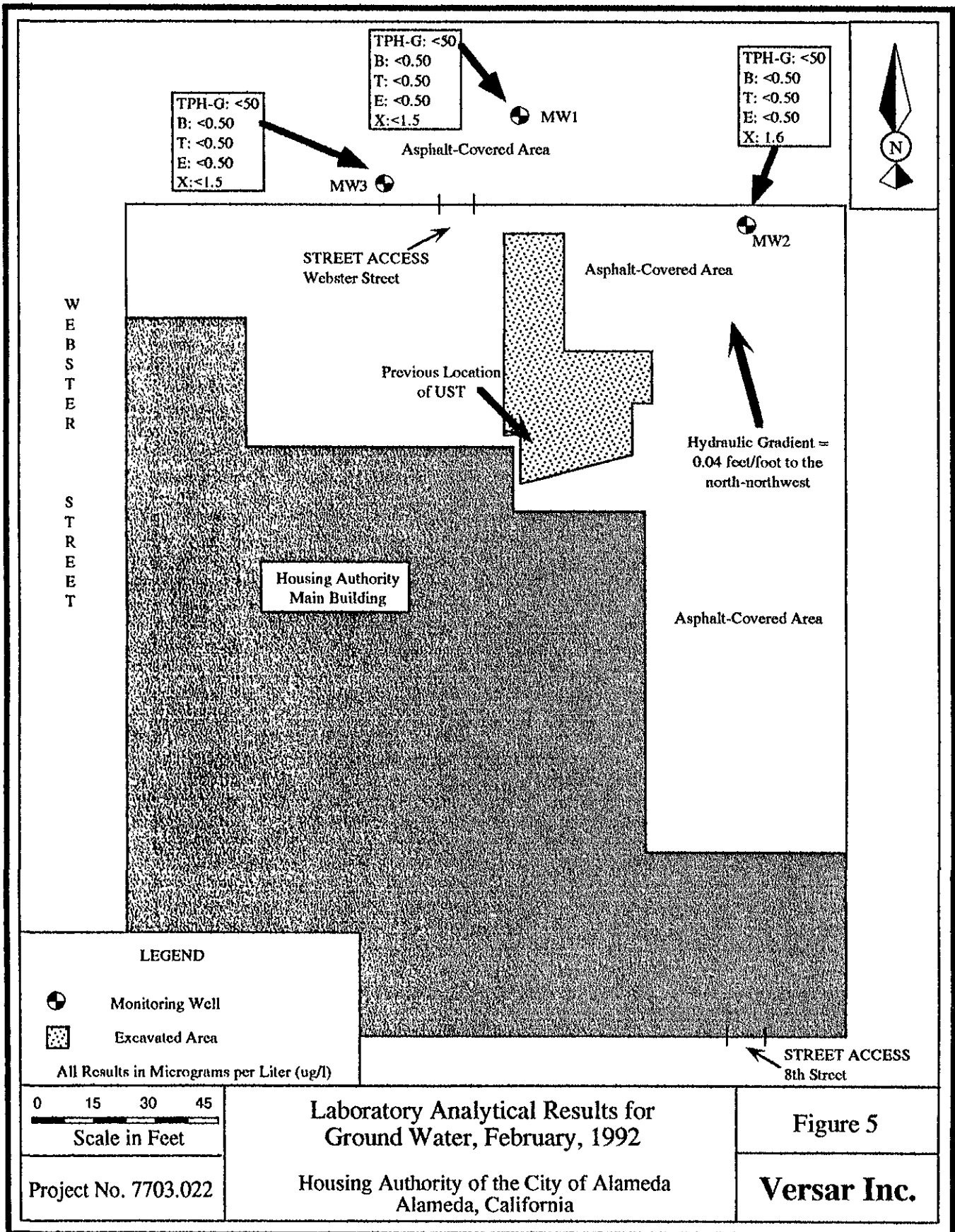
Hydrograph of Ground-Water Levels

Figure 4



Project No. 7703.022

Housing Authority of the City of Alameda
Alameda, California

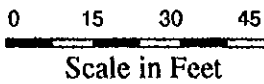
Versar Inc.



LEGEND

-  Monitoring Well
-  Excavated Area

All Results in Micrograms per Liter (ug/l)



**Laboratory Analytical Results for
Ground Water, February, 1992**

Housing Authority of the City of Alameda
Alameda, California

Figure 5

Versar Inc.

Project No. 7703.022

TABLE 1
 MONITORING WELL GROUND-WATER LEVELS
 Housing Authority of the City of Alameda
 Alameda, California

| | MW1 | MW2 | MW3 | Hydraulic Gradient (feet/foot) |
|-----------------------------------|------|------|------|-----------------------------------|
| Reference Casing Elevation (feet) | 9.23 | 10.0 | 9.44 | |
| <u>July 16, 1991</u> | | | | 0.03 to the north |
| Depth to Ground Water (feet) | 4.92 | 4.76 | 4.50 | |
| Ground-Water Elevation (feet) | 4.31 | 5.24 | 4.94 | |
| <u>November 15, 1991</u> | | | | 0.02 to the north |
| Depth to Ground Water (feet) | 4.92 | 5.0 | 4.65 | |
| Ground-Water Elevation (feet) | 4.31 | 5.0 | 4.79 | |
| <u>February 24, 1992</u> | | | | 0.04 to the north-northwest |
| Depth to Ground Water (feet) | 3.65 | 3.10 | 3.23 | |
| Ground-Water Elevation (feet) | 5.58 | 6.90 | 6.21 | |

TABLE 2

LABORATORY ANALYTICAL RESULTS FOR GROUND WATER¹ -
PREVIOUS INVESTIGATION²

Housing Authority of the City of Alameda
Alameda, California

| Sample ID | TPH as Gasoline ³ (mg/l) | Benzene ⁴ (mg/l) | Toluene (mg/l) | Ethylbenzene (mg/l) | Xylenes (mg/l) |
|------------------------------|-------------------------------------|-----------------------------|---------------------------|---------------------|----------------|
| <u>July and August, 1986</u> | | | | | |
| B-1 | 37 <i>37,000 ppb</i> | 5.1 | 5.2 <i>5,100 ppb</i> | NA ⁵ | 1.3 |
| B-2 | <0.050 | <0.001 | <0.001 | NA | <0.001 |
| B-3 | <0.050 | <0.001 | 0.003 | NA | 0.004 |
| B-4 | <0.050 | 0.20 | 0.003 <i>200 ppb</i> | NA | 0.005 |
| B5 | 20 <i>20,000 ppb</i> | 1.26 | 0.033 <i>1,260 ppb</i> | NA | 0.32 |
| B6 | 0.050 | 0.005 | 0.003 | NA | 0.024 |
| W1 (MW1) | <0.050 | 0.003 | 0.003 | NA | 0.006 |
| W2 (MW2) | 0.29 | <0.010 | 0.006 | NA | 0.009 |

¹Results are expressed in milligrams per liter (mg/l) approximately equal to parts per million.

²Source of data is the Aqua Science Engineers Inc. reports (1986).

³EPA Method 5020/8015 for TPH-G. Reporting limit unknown.

⁴EPA Method 5020/8020 for BTX. Reporting limit 0.2 µg/L for benzene. Reporting limit for toluene and xylenes unknown.

⁵Not analyzed for this constituent.

TABLE 3
 LABORATORY ANALYTICAL RESULTS FOR GROUND WATER¹ -
 VERSAR INVESTIGATION
 Housing Authority of the City of Alameda
 Alameda, California

| Sample ID | Date | TPH as ² Gasoline (µg/l) | Benzene ³ (µg/l) | Toluene (µg/l) | Ethylbenzene (µg/l) | Xylenes (µg/l) |
|----------------------|-------|---|--------------------------------|-------------------|------------------------|-------------------|
| MW1 | 07-91 | <50 | <0.50 | <0.50 | <0.50 | <1.5 |
| | 11-91 | <50 | <0.50 | <0.50 | <0.50 | <1.5 |
| | 02-92 | <50 | <0.50 | <0.50 | <0.50 | <1.5 |
| MW2 | 07-91 | <50 | 3.7 | <0.50 | 0.50 | 5.1 |
| | 11-91 | <50 | 1.1 | <0.50 | <0.50 | 4.5 |
| | 02-92 | <50 | <0.50 | <0.50 | <0.50 | 1.6 |
| MW3 | 07-91 | <50 | <0.50 | <0.50 | <0.50 | <1.5 |
| | 11-91 | <50 | <0.50 | <0.50 | <0.50 | <1.5 |
| | 02-92 | <50 | <0.50 | <0.50 | <0.50 | <1.5 |
| Cal MCL ⁴ | | -- | 1 | 100 ⁵ | 680 | 1,750 |

¹Results are expressed in micrograms per liter (µg/l) approximately equal to parts per billion.

²EPA Method 5030/DHS Method, LUFT Field Manual. Reporting limit 50 µg/l.

³EPA Method 5030/8020 for BTEX. Reporting limit 0.5 µg/l for benzene, toluene and ethylbenzene, 1.5 µg/l for xylenes.

⁴California EPA Maximum Contaminant Level for drinking water (U.S. EPA, 1991).

⁵California DOHS level for drinking water (U.S. EPA, 1991).

APPENDIX A

Ground-Water Monitoring and Sampling Procedure

Ground-Water Monitoring and Sampling Procedure

Following the installation and stabilization of a monitoring well, a ground-water sample from the monitoring well will be collected and analyzed, as described below.

1. Check the ambient air surrounding the protective riser using an appropriately calibrated analytical field instruments, and record reading in the field notebook.
2. Remove the wellhead lock and open the hinged cap on the protector casing.
3. Check the air space inside the protector casing around the PVC monitoring tube with an analytical field instrument, and record reading in the field notebook.
4. Remove the cap on top of the PVC casing.
5. Check the air space inside the PVC casing with an analytical field instrument, and record the reading in the field notebook. If anomalous readings are noted, all sampling personnel must don the appropriate respiratory gear.
6. Lower a decontaminated transparent bailer to the water surface in the well and carefully sample the uppermost interval of water. Retrieve the bailer and examine the surface of the water for any non-aqueous floating chemicals.
7. Measure the water level in the well using a decontaminated electronic water level detector with a visible or acoustical indicator. All measurements must be made to the nearest 0.01 foot, and measured relative to the top of the casing. Record the depth of water in the appropriate column of the Monitoring Well Purging Table shown in Figure GW-1.
8. Lower a decontaminated, weighted wire line or the above-water measuring instrument, as appropriate, to the bottom of the well and note the total depth of the well. Record the depth confirmation measurement in the appropriate column of the table.
9. Insert a decontaminated pump or dedicated disposable bailer into the well and begin to purge the well. A calibrated receptacle must be positioned near the

wellhead to receive all of the fluid purged. The water will be withdrawn from the top of the water column. A minimum of five casing volumes will be purged from the well (or to dryness, as applicable). Do not allow the purge rate to reach a point where the recharge water is entering the well bore in an agitated state. In addition to the requirement to remove five well volumes, a grab sample of the purged fluid will be taken at the commencement of well evacuation and at periodic intervals. The temperature, specific conductance, and pH of the sample will be measured and recorded in the field notebook. Purging will continue until the measured temperature and pH stabilizes.

10. Measure the purged volume in the designated receptacle. After the minimum specified volume has been recovered and the water temperature and pH have stabilized (or the well has been pumped dry), stop pumping, note the time, remove the pumping device, and measure the depth to water. Make the appropriate entries on the table.
11. If the fluid being purged continues to carry a high suspended load, purging may be continued until the recovered fluid is relatively clear. The decision to continue purging beyond five volumes and/or temperature stabilization is to be made by the sampling team supervisor on a case-by-case basis.

The ground-water samples will be collected using the procedures given below.

1. Measure the water level in the well using a decontaminated measuring device. All measurements must be made to the nearest 0.01 foot, and measured relative to the top of the casing. Record the depth of the water in the appropriate column in the Ground Water Monitoring Data Sheet, shown in Figure GW-2.
2. Inspect the dedicated disposable bailer to ensure that the bottom valve assembly is working correctly.
3. Insert the bailer into the PVC monitoring tube and carefully lower it into the well. Take extreme care to avoid agitating and aerating the fluid column in the well.
4. Slowly withdraw the bailer and transfer the water samples to the appropriate containers, as described herein.

5. Temperature, specific conductance, pH, and organic vapor concentration must be measured on aliquots of water prior to recovery of the primary samples. Water used for field measurements is not to be used to fill sample containers designated for laboratory analysis.
 - a. Temperature: The final sample temperature reading is to be obtained by placing an aliquot of water in a flask or thermos bottle and measuring the temperature with the proper probe. After the temperature has stabilized, make the appropriate entry in the table.
 - b. Specific Conductance: The specific conductance of the water is to be obtained using the appropriate meter. Carefully follow the manufacturer's instructions concerning operation of the instrument and the required temperature compensation procedures. Make the appropriate entry in the table.
 - c. pH: Measure the pH of the water using a pH electrode or similar measuring device inserted into an aliquot of water. Enter the results in the table.
 - d. Organic Vapor Concentration: Place 100 milliliters of the water in a jar and seal the top. After 10 minutes, measure the organic vapor concentration in the head space of a jar containing an aliquot of water using an analytical field instrument calibrated to a known concentration of gas using accepted procedures. Record the results in the table.
6. Carefully lower the bailer into the well and recover a fresh water sample.
7. Fill the appropriate sample containers by releasing water from the bailer via the bottom emptying device with a minimum of agitation.

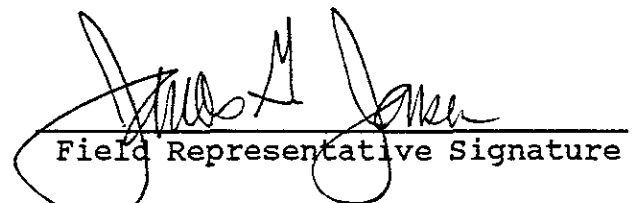
APPENDIX B

Test Data for Monitoring Wells Developed and Purged
During February, 1992 Third Quarterly Ground-Water Sampling

MONITORING WELL PURGING TABLE

Housing Authority of the City of Alameda
Alameda, California

| WELL NO. | DATE (M/D) | DEPTH OF WELL | DEPTH TO WATER (ft) | | | TIME | | | PURGE VOLUME (gals) | NOTES |
|----------|------------|---------------|---------------------|------|------|------|------|------|---------------------|-------|
| | | | BP | AP | BS | SP | EP | SS | | |
| MW1 | 2-24-92 | 14.75' | 3.65 | 5.63 | 3.62 | 1050 | 1130 | 1630 | 6 | |
| MW2 | 2-24-92 | 12.98' | 3.10 | 5.96 | 3.11 | 1245 | 1300 | 1700 | 6 | |
| MW3 | 2-24-92 | 14.42' | 3.23 | 3.98 | 3.18 | 1145 | 1220 | 1645 | 6 | |


Field Representative Signature

Versar INC. SACRAMENTO

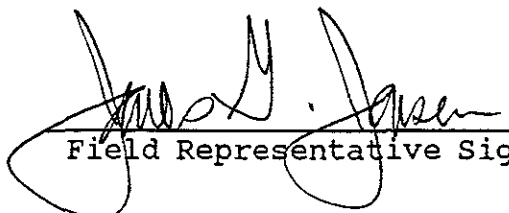
GROUND-WATER MONITORING DATA SHEET

(Page 1 of 3)

Housing Authority of the City of Alameda
Alameda, California

| WELL NO. | DEPTH (ft) | TEMP (C) | pH | COND (mho/cm) | O.V.A. (ppm) | SHEEN | ODOR | FREE PRODUCT | TURBID (NTU) | CUMM. VOLUME PURGED (gals) | NOTES |
|----------|------------|----------|------|---------------|--------------|-------|------|--------------|--------------|----------------------------|--------|
| MW1 | 3.65 | 17.4 | 7.46 | 2960 | --- | None | None | None | 5.2 (clear) | initial | |
| MW1 | --- | 17.4 | 7.83 | 3000 | --- | None | None | None | 200+ | 1 | |
| MW1 | --- | 17.1 | 7.80 | 2940 | --- | None | None | None | 200+ | 3 | |
| MW1 | 5.63 | 18.9 | 7.76 | 2940 | --- | None | None | None | 200+ | 6 | |
| MW1 | 3.62 | 19.6 | 7.34 | 2730 | --- | None | None | None | 18.5 (clear) | --- | Sample |

DATE: 2-24-92 LOCATION: 7703.022

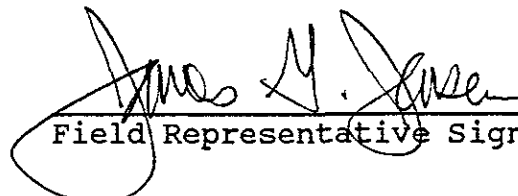

Field Representative Signature

GROUND-WATER MONITORING DATA SHEET

(Page 2 of 3)

Housing Authority of the City of Alameda
Alameda, California

| WELL NO. | DEPTH (ft) | TEMP (C) | pH | COND (mho/cm) | O.V.A. (ppm) | SHEEN | ODOR | FREE PRODUCT | TURBID (NTU) | CUMM. VOLUME PURGED (gals) | NOTES |
|----------|------------|----------|------|---------------|--------------|-------|--------|--------------|----------------------------------|----------------------------|--------|
| MW2 | 3.10 | 17.7 | 7.30 | 6350 | --- | None | None | None | 12.78 (clear/ orange) | initial | |
| MW2 | --- | 17.3 | 7.44 | 6430 | --- | None | Slight | None | 200+ | 1 | |
| MW2 | --- | 17.3 | 7.09 | 6730 | --- | None | Slight | None | 200+ | 3 | |
| MW2 | 5.96 | 17.4 | 7.17 | 7090 | --- | None | Slight | None | 200+ | 6 | |
| MW2 | 3.11 | 17.4 | 7.78 | 5990 | --- | None | Slight | None | 154.5 (orange/ sl. cloudy) | --- | Sample |

DATE: 2-24-92LOCATION: 7703.022


Field Representative Signature

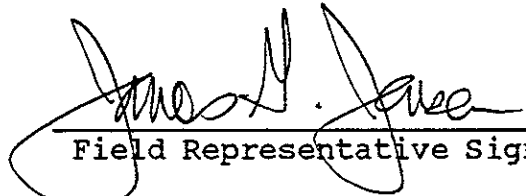
Versar INC. SACRAMENTO

GROUND-WATER MONITORING DATA SHEET

(Page 3 of 3)

Housing Authority of the City of Alameda
Alameda, California

| WELL NO. | DEPTH (ft) | TEMP (C) | pH | COND (mho/cm) | O.V.A. (ppm) | SHEEN | ODOR | FREE PRODUCT | TURBID (NTU) | CUMM. VOLUME PURGED (gals) | NOTES |
|----------|------------|----------|------|---------------|--------------|-------|-------------|--------------|---------------------------|----------------------------|--------|
| MW3 | 3.23 | 18.1 | 7.70 | 1220 | --- | None | None | None | 24.2 (slightly cloudy) | initial | |
| MW3 | --- | 18.8 | 7.65 | 2780 | --- | None | Very Slight | None | 200+ | 1.5 | |
| MW3 | --- | 17.9 | 7.51 | 2860 | --- | None | Very Slight | None | 200+ | 3 | |
| MW3 | 3.98 | 17.4 | 7.64 | 2660 | --- | None | None | None | 200+ | 6 | |
| MW3 | 3.18 | 17.2 | 7.65 | 1040 | --- | None | Very Slight | None | 36.2 (clear) | --- | Sample |

DATE: 2-24-92LOCATION: 7703.022


Field Representative Signature

Versar INC. SACRAMENTO

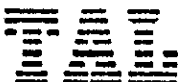
APPENDIX C

Laboratory Analytical Results and Chain-of-Custody Records
for Ground-Water Samples Collected During February, 1992
Third Quarterly Ground-Water Sampling

Trace Analysis Laboratory, Inc.

3423 Investment Boulevard, #8 • Hayward, California 94545

Telephone (510) 783-6960
Facsimile (510) 783-1512



March 12, 1992

RECEIVED
MAR 23 1992
Ans'd.....

Mr. James Jensen
Versar, Inc.
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628

Dear Mr. Jensen:

Trace Analysis Laboratory received three water samples on February 24, 1992 for your Project No. 7703.22, Alameda Housing (our custody log number 1828).

These samples were analyzed for Total Petroleum Hydrocarbons as Gasoline, and Benzene, Toluene, Ethylbenzene and Xylenes. Our analytical report, the completed chain of custody form, and our analytical methodologies are enclosed for your review.

Trace Analysis Laboratory is certified under the California Environmental Laboratory Accreditation Program. Our certification number is 1199.

If you should have any questions or require additional information, please call me.

Sincerely yours,

A handwritten signature in cursive script, appearing to read 'Jennifer Peko', written in dark ink.

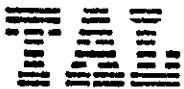
Jennifer Peko
Project Specialist

Enclosures

Trace Analysis Laboratory, Inc.

3423 Investment Boulevard, #8 • Hayward, California 94545

Telephone (510) 783-6960
Facsimile (510) 783-1512



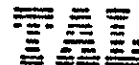
LOG NUMBER: 1828
DATE SAMPLED: 02/24/92
DATE RECEIVED: 02/24/92
DATE ANALYZED: 03/06/92 and 03/07/92
DATE REPORTED: 03/12/92

CUSTOMER: Versar, Inc.
REQUESTER: James Jensen
PROJECT: No. 7703.22, Alameda Housing

Sample Type: Water

| Method and Constituent: | Units | MW1 | | MW2 | | MW3 | |
|--|-------|---------------|-----------------|---------------|-----------------|---------------|-----------------|
| | | Concentration | Reporting Limit | Concentration | Reporting Limit | Concentration | Reporting Limit |
| DHS Method: | | | | | | | |
| Total Petroleum Hydrocarbons as Gasoline | ug/l | ND | 50 | ND | 50 | ND | 50 |
| EPA Method 8020 for: | | | | | | | |
| Benzene | ug/l | ND | 0.50 | ND | 0.50 | ND | 0.50 |
| Toluene | ug/l | ND | 0.50 | ND | 0.50 | ND | 0.50 |
| Ethylbenzene | ug/l | ND | 0.50 | ND | 0.50 | ND | 0.50 |
| Xylenes | ug/l | ND | 1.5 | 1.6 | 1.5 | ND | 1.5 |

Concentrations reported as ND were not detected at or above the reporting limit.



LOG NUMBER: 1828
DATE SAMPLED: 02/24/92
DATE RECEIVED: 02/24/92
DATE ANALYZED: 03/06/92 and 03/07/92
DATE REPORTED: 03/12/92
PAGE: Two

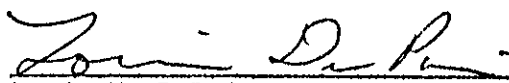
Sample Type: Water

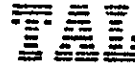
| Method and Constituent: | Units | Method Blank | |
|---|-------|--------------------|--------------------|
| | | Concen- tration | Reporting Limit |
| DHS Method: | | | |
| Total Petroleum Hydro- carbons as Gasoline | ug/l | ND | 50 |
| EPA Method 8020 for: | | | |
| Benzene | ug/l | ND | 0.50 |
| Toluene | ug/l | ND | 0.50 |
| Ethylbenzene | ug/l | ND | 0.50 |
| Xylenes | ug/l | ND | 1.5 |

QC Summary:

% Recovery: 88
% RPD: 3.4

Concentrations reported as ND were not detected at or above the reporting limit.


Louis W. DuPuis
Quality Assurance/Quality Control Manager



TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-G) FOR WATER,
BY PURGE AND TRAP

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column, flow rate, and temperature program as specified below.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap. Up to 5 ml of sample is purged by this method.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A flame ionization detector (FID) is used to detect total petroleum hydrocarbons as gasoline (TPH-G). The FID is preceded by a photoionization detector (PID).

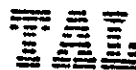
Gas Chromatograph Conditions:

| | |
|-----------------------|---------------------|
| CARRIER GAS: | Nitrogen |
| FLOW RATE: | 30 ml/min. |
| INJECTOR TEMPERATURE: | 240° C |
| DETECTOR TEMPERATURE: | 270° C |
| INITIAL TEMPERATURE: | 50° C |
| | Hold for 2 minutes |
| PROGRAM RATE: | 6° C/min. |
| FINAL TEMPERATURE: | 90° C |
| | Hold for 17 minutes |

Calculation:

Total Petroleum Hydrocarbons as Gasoline is quantified by comparing the sum of the area of peaks from the sample, to the sum of the area of peaks in the gasoline standard.

1/2/90



BENZENE, TOLUENE, XYLENES, AND ETHYLBENZENE (BTXE) FOR WATER,
BY PURGE AND TRAP

Method:

This method is EPA Method 8020 as referenced in the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative carrier gas as specified below.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A photoionization detector (PID) is used to detect BTXE. The PID is followed by a flame ionization detector (FID).

Gas Chromatograph Conditions:

| | |
|-----------------------|------------|
| CARRIER GAS: | Nitrogen |
| FLOW RATE: | 30 ml/min. |
| INJECTOR TEMPERATURE: | 240° C |
| DETECTOR TEMPERATURE: | 270° C |
| INITIAL TEMPERATURE: | 50° C |
| Hold for 2 minutes | |
| PROGRAM RATE: | 6° C/min. |
| FINAL TEMPERATURE: | 90° C |
| Hold for 17 minutes | |

Calculation:

BTXE are identified by comparing the retention times of the sample peaks to those of the standards. BTXE are quantified by comparing the area of the sample peaks to those of the standards. If BTX or E is present and Total petroleum Hydrocarbons as Gasoline (TPH-G) is not, the analysis is confirmed by using a second column or a gas chromatograph mass spectrometer (GC/MS).

1/2/90