GeoStrategies Inc.
Environmental Consulting,
Engineering and Geologic Services

SID 3793

92 DEC -1 AM 8:23

Letter of Transmittal

Date: 11/30/92

From: ROBERT MALLORY
To: MR. DENNIS BYRNE
ACHCSA
80 SWAN WAY # 200
OAKLAND, CA. 94621

Project No: 7927
Subject: CONT. SITE ASSESSMENT - 3RD qtr. '92
ARCO SS# 2169
889 W. GRAND AVE.
OAKLAND, CA. 94601

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Comments:

CC: MR. MICHAEL WHELAN, ARCO PRODUCTS CO.
MR. H.C. WINSOR, ARCO PRODUCTS CO.
MR. RICHARD HIETT, RWQCB - S.F. REGION

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Robert C. Mallory
(Signed)

GeoStrategies Inc.

CONTINUING SITE ASSESSMENT/QUARTERLY MONITORING REPORT - Third Quarter 1992

ARCO Service Station No. 2169
889 West Grand Avenue
Oakland, California

792705-4

November 24, 1992

GeoStrategies Inc.
2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545
(510) 352-4800

November 24, 1992

ARCO Products Company
P.O. Box 5811
San Mateo, California 94402

Attn: Mr. Michael Whelan

Re: CONTINUING SITE ASSESSMENT/QUARTERLY MONITORING REPORT - Third Quarter 1992
ARCO Service Station No. 2169
889 West Grand Avenue
Oakland, California

Gentlemen:

INTRODUCTION

This Continuing Site Assessment/Quarterly Monitoring Report was prepared by GeoStrategies Inc. (GSI) and presents field activities and ground-water sampling results for the above referenced location (Plate 1). On June 8, 1992 four exploratory soil borings were drilled and completed as recovery well AR-2 and vapor extraction wells AV-1 through AV-3. Well locations are shown on Plate 2. A vapor extraction test was performed on June 11, 1992. Step/drawdown and constant-rate aquifer tests were performed on July 15 and 16, 1992. These tests were performed to evaluate air and groundwater flow characteristics in the unsaturated and saturated zones beneath the site. Quarterly monitoring and sampling of site wells were conducted by the ARCO contractor on July 17, 1992. Field work was performed to comply with current State of California Water Resources Control Board (SWRCB) and local agency guidelines. GSI Field Methods and Procedures were presented in the GSI Work Plan dated October 29, 1991.

SITE BACKGROUND

On May 14, 1991, GSI drilled five exploratory soil borings (A-A through A-E), as documented in a GSI Preliminary Tank Replacement Report dated July 1, 1991. Four soil borings were drilled adjacent to the underground storage tank (UST) complex (A-B through A-E) and one soil boring (A-A) was drilled in the proposed UST complex location. Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) and as Diesel (TPH - Diesel) and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) were detected in soil samples from each boring collected from 5.5 to 11.0 feet below grade. In addition, a well adjacent to the existing USTs was properly abandoned.

In February and March 1992, the underground storage tanks at the site were removed and replaced. The former tank complex was composed of four steel tanks: one 12,000 gallon tank (unleaded), one 8,000 gallon tank (regular), and two 6,000 gallon tanks (diesel and super unleaded). The present tank complex is composed of four double wall fiberglass 10,000 gallon tanks containing unleaded gasoline and diesel products. The location of the former and present tank complexes are shown on Plate 2. Soil sample analytical results from the former tank complex confirmed results from previous soil boring samples that petroleum hydrocarbons had impacted soil in the tank complex vicinity to a depth of 12 feet below grade. Soil sample results from product line trenching revealed a TPH-Diesel concentration of 450 ppm in the vicinity of the diesel dispenser on the westernmost island. This area was overexcavated and resampled at a depth of 7 feet below ground surface. Results of the second sample identified TPH-Diesel at a concentration of 54 ppm. TPH-Gasoline and benzene were reported at levels of less than or equal to 120 ppm and 0.36 ppm, respectively, from the remaining trench samples. An Underground Storage Tank Removal and Soil Sampling Report documenting the tank removal and soil sampling analytical results was issued by ROUX Associates (ROUX) on July 14, 1992.

Between March 16 and 25, 1992 five exploratory soil borings were drilled and completed as recovery well AR-1 and ground-water monitoring wells A-1 through A-4. TPH-Gasoline was detected in the soil sample from a depth of 10.0-feet in Boring A-1 at a concentration of 2.2 parts per million (ppm). Benzene was identified in samples from depths of 4.5-feet and 10.0-feet in Boring A-1 at concentrations of 0.024 ppm and 0.13 ppm, respectively. Results of this investigation are presented in the GSI Well Installation Report dated June 30, 1992.

Quarterly ground-water monitoring and sampling of site wells began in April, 1992. Ground-water samples are currently analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020.

WELL INSTALLATION FIELD ACTIVITIES

Four on-site exploratory borings were drilled on June 8, 1992, using a truck-mounted, hollow-stem auger drilling rig. Borings AV-1 through AV-3 and AR-2 were drilled to total depths ranging from 14.5 to 30.5 feet below grade. Soil samples were collected at five-foot intervals using a modified California split-spoon sampler fitted with stainless steel sample tube liners. A GSI geologist observed the drilling, described the soil samples using the Unified Soil Classification System (ASTM D 2488-84) and Munsell Soil Color Chart, and prepared a lithologic log for each boring. Exploratory boring logs are presented in Appendix A.

Soil Sampling

An Organic Vapor Monitor (OVM) photoionization detector was used to perform head-space analysis on soils from each sampled interval, as a reconnaissance - level test for the presence of Volatile Organic Compounds (VOCs) in the soil. Head-space analysis results are presented on each boring log in Appendix A.

Soil samples retained for chemical analyses were collected in clean stainless steel liners and sealed on both ends with aluminum foil and plastic end caps. Samples were labeled, entered onto a Chain-of-Custody form, and transported in a cooler with blue ice to Sequoia Analytical (Sequoia), a State-certified environmental laboratory located in Redwood City, California.

Recovery Well Installation

Boring AR-2 was drilled using 10-inch-diameter hollow-stem augers to a depth of 30.5 feet below existing ground surface. This boring was drilled through a 12-inch-diameter conductor casing installed to a depth of 10-feet below grade in the new tank complex. Native material was used to backfill the boring from 28.5 to 30.5 feet below grade during well construction. Recovery well AR-2 was constructed using 4-inch-diameter Schedule 40 PVC well casing and carbon steel 0.020-inch continuous wrap well screen. The well screen extends from 8.5 to 28.5 feet below grade. Lonestar #2/12 graded sand was placed in the annular space across the entire screened interval and extends 1.0-foot above the top of the well screen. A one-foot thick bentonite seal was placed above the sandpack and then hydrated with clean water. A neat cement seal was placed from the top of the bentonite to 1.0-foot below ground surface. The well was completed in an underground vault box, set in the concrete slab of the new tank complex, and a waterproof locking well cap and lock was placed on the well casing.

Vapor Extraction Well Installation

Borings AV-1 through AV-3 were installed using 8-inch-diameter hollow-stem augers to a depth of 14.5 feet below grade. Bentonite was placed in the lower 0.5 feet of Borings AV-1 through AV-3 as a bottom seal. The vapor extraction wells were constructed using 2-inch-diameter Schedule 40 PVC blank well casing and 0.020-inch factory slotted well screen. Well screen extends from [illegible] feet in each [illegible] Lonestar #2/12 graded sand was placed across the entire screened interval and extends one-half-foot above the top of the well screen. A one-half-foot thick bentonite seal was placed above the sandpack and then hydrated with clean water. A neat cement seal was placed from the top of the bentonite to approximately 1.0-foot below ground surface. A waterproof underground vault box, set in concrete, was installed over the top of each well and a waterproof locking well cap and lock were placed on the well casings. Well completion details are presented with the Exploratory Boring Logs in Appendix A.

Soil Chemical Analytical Results

Soil samples were analyzed for Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) and as Diesel (TPH-Diesel) according to EPA Method 8015 (Modified) and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) according to EPA Method 8020. Chemical analyses were performed by Sequoia in Redwood City, California.

Soil chemical analytical data are summarized in Table 1. Six soil samples from Borings AV-1 through AV-3, collected at depths ranging between 6.5 and 12 feet below grade, were selected for chemical analysis. Soil samples from Boring AR-2 were not analyzed due to fill material being encountered from ground surface to first encountered water. TPH-Gasoline was detected in the soil sample from Boring AV-2 at a depth of 6.5, at a concentration of 1.8 parts per million (ppm). Benzene was identified in soil samples collected at a depth of 6.5 feet from Borings AV-1 through AV-3 at concentrations of 0.15 ppm, 0.31 ppm, and 0.037 ppm, respectively. TPH-Gasoline was detected in each sample collected from depths of 11.5 to 12 feet from Borings AV-1 through AV-3 at concentrations of 12 ppm, 1,500 ppm, and 110 ppm, respectively. Benzene was reported in these samples at concentrations of 0.81 ppm, 21 ppm, and 2.4 ppm, respectively. TPH-Diesel was reported as not detected (ND) in each soil sample analyzed. The Sequoia chemical analytical report and Chain-of-Custody form are presented in Appendix B.

HYDROGEOLOGIC CONDITIONS

Regional Setting

The site is located in Oakland, California at the base of the Berkeley Hills approximately 1/2-mile east of the San Francisco Bay. The site is situated on alluvial-fan deposits of the Temescal Formation comprised of interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures (Radbruch, D.H., 1957). Local topography suggests ground-water flows to the west toward San Francisco Bay.

Local Setting

Based on exploratory boring data from previous investigations, the local subsurface lithology appears to consist of clay, sand, silt, and minor gravel to the total depth explored of 30.5 feet below ground surface. Borings AV-1 through AV-3 sampled subsurface lithology to a depth of 14.5 feet below ground surface and Boring AR-2 encountered fill material to a depth of 15 feet and native material to the total depth explored of 30.5 feet. Clay was observed in borings AV-1 through AV-3 from ground surface to between 10.5 (AV-2) and 13.5 (AV-1) feet below grade. The clay was underlain by sand, clayey and silty sand, and silt to the total depths of the borings. Boring AR-2 encountered interbedded sand, clayey sand, and sandy silt from 15 feet to the total depth explored of 30.5 feet. Cross-sections have been prepared from site boring logs and are presented on Plates 3 and 4. Groundwater was first encountered in Borings AV-1 through AV-3 at a depth of 12-feet below grade and in Boring AR-2 at a depth 15-feet below grade. Water-levels stabilized after completion of Well AR-2 at a depth of 13 feet below grade. This rise in the water-level in AR-2 indicates semi-confined to confined aquifer conditions.

VAPOR EXTRACTION TEST FIELD ACTIVITIES

An eight hour vapor extraction test was performed on June 11, 1992, utilizing vapor extraction well AV-2 and an Internal Combustion (IC) engine to create a vacuum on the extraction well and combust extracted vapors. Vapor extraction wells AV-1 and AV-3 were used to monitor vacuum pressure changes during the test using a manometer. Vacuum pressure and flow rate from the extraction well were measured and recorded on an approximate hourly basis throughout the test. Air stream concentrations from the extraction well before and after combustion (i.e. influent and effluent vapor concentration readings) were also monitored utilizing an infrared (IR) detector and recorded. Influent and effluent air stream samples were collected near the end of the test, entered on a Chain-of-Custody form and transported to Sequoia. Air samples were analyzed for TPH-Gasoline and BTEX according to EPA Methods 8015 (Modified) and 8020, respectively.

Vadose Zone Lithology

Based on exploratory borings drilled at the site, the unsaturated zone appears to be composed primarily of clay to a depth of approximately 8 feet and sand, silty and clayey sand, and silt to the static groundwater surface of approximately 12 to 13.5 feet below grade.

Results

Vacuum pressure, flow rate, and influent concentration data from the extraction well were recorded during the test and are presented in Table 2. Vacuum pressure in extraction well AV-2 ranged from 76.7 to 119.8-inches of water. Vacuum pressure results for the observation wells are presented in Table 3. Pressure changes recorded at the end of the test from the observation wells ranged from 0.14 to 1.4 inches of water. Vacuum pressure recorded at the end of the test have been used to construct a Vacuum Pressure Map (Plate 5). Based the Vacuum Pressure Map the estimated radius of influence is 50-feet from the extraction well. Flow rate from the extraction well ranged from 10.8 to 23.8 cubic feet per minute (cfm) and appeared to stabilize at approximately 22 cfm three hours into the test.

Influent vapor concentrations were recorded on an hourly basis during the eight hour test (Table 2). These data exceeded the maximum range of 14,000 parts per million (ppm) of the IR detector during each hour of the test. Concentrations measured by the IR detector are calibrated to Hexane and should not be considered a quantitative measure of TPH-Gasoline or BTEX.

The results of laboratory chemical analysis of the influent and effluent air samples are summarized in Table 4. TPH-Gasoline and benzene were identified in the effluent air sample at concentrations of 13 parts per million vapor (ppmv) and 1.9 ppmv, respectively. TPH-Gasoline and benzene were detected in the influent sample at concentrations of 24,000 ppmv and 1,300 ppmv, respectively. The air sample laboratory analytical report and Chain-of-Custody Form are presented in Appendix C.

AQUIFER TEST FIELD ACTIVITIES

A 4-hour step-drawdown test and a 24-hour constant-rate test were performed utilizing recovery well AR-1 on July 15 and 16, 1992. The tests were performed to assess the feasibility of utilizing recovery well AR-1 to achieve hydrodynamic control of groundwater for extraction of petroleum hydrocarbons from the first encountered water-bearing zone. Recovery well AR-1 was installed to extract groundwater from the shallow aquifer zone beneath the site and to assess aquifer parameters for potential recovery system design.

Water-level measurements were obtained from recovery wells AR-1 and AR-2 and monitoring wells A-1 through A-4 prior to conducting the test to establish baseline data (Plate 6). Pressure transducers connected to a Hermit SE2000 data logger were installed in recovery well AR-1 and two selected observation wells (A-1 and A-4) to monitor water-level changes during the tests. Water-level changes in Wells A-2, A-3 and AR-2 were measured with an electronic interface probe at various time intervals throughout the duration of the tests.

AQUIFER TEST RESULTS

Data collected during the 4-hour step-drawdown and 24-hour constant-rate test were evaluated and used to calculate specific aquifer parameters; Transmissivity (T) and Storativity (S). Additional aquifer and well characteristics evaluated include observed radius of influence and well efficiency.

Step-Drawdown Test

Well AR-1 was pumped at various discharge rates to establish an optimum long-term discharge rate for the 24-hour constant-rate test. The step-drawdown test consisted of three steps: for durations of 60, 120, and 140 minutes, respectively. The discharge rates for step one and two were 2.0 and 4.0 gallons per minutes (gpm). Step three was the recovery step. An evaluation of the step-drawdown test data from a time versus drawdown plot (Appendix D) indicated that a pumping rate of 3 gpm should be used for the constant-rate test.

Constant-Rate Test

Recovery well AR-1 was pumped for a total of 1340 minutes at a constant discharge rate. Maximum observed drawdown in the pumping well was 0.289 feet. Maximum observed drawdowns in the pumping well and observation wells are summarized in Table 5. Water-level data were collected and recorded as the pumping well recovered to greater than 90% of the total recorded drawdown in Well AR-1.

Time versus drawdown data were plotted for observation Wells A-1, A-2, A-3, A-4 and AR-2. Transmissivity (T) and Storativity (S) values were calculated from these field data plots using the Jacob Straight-line Method (Cooper & Jacob, 1946). Calculated transmissivity values from the field plots using the Jacob Method ranged from 1970 gallons per day per foot (gpd/ft) to 6600 gpd/ft. Storativity values ranged from 1.95×10^{-4} to 9.2×10^{-4}. Storativity values appear to be consistent with an aquifer that is semi-confined to confined. Jacob Method transmissivity and storativity data results are summarized in Table 5. Field Data Plots are presented in Appendix E.

To evaluate the potential effects of leakage into the semi-confining layer, GSI used Graphical Well Analysis Package (GWAP) software to analyze test data using the Theis Method (Hantush and Jacob, 1955). Data plots generated utilizing GWAP are presented in Appendix F. Transmissivity values calculated using the Theis Method for Wells A-1, A-2, A-3, A-4 and AR-2 ranged from 1,639 gpd/ft to 5574 gpd/ft. Storativity values for these wells ranged from 1.87×10^{-4} to 1.1×10^{-3}. These results appear consistent with Jacob Method values. Theis Method of transmissivity and storativity results are summarized in Table 5.

Approximately 4,620 gallons of groundwater were pumped during the aquifer tests. Groundwater was disposed of by Balch Petroleum.

Well Influence

Data collected from the observation wells during the 24-hour constant-rate aquifer test were used to construct a water-level map after 1340 minutes of pumping from recovery well AR-1 at 3.0 gpm (Plate 7). Drawdown was observed in each observation well ranging between 0.29 and 0.83 feet. The observed radius of influence appeared to be greater than 160 feet from the pumping well for the constant-rate test. The cone of depression created by pumping recovery well AR-1 did not equilibrate during the constant-rate test, indicating that pumping for a longer time duration may produce greater influence.

Well Efficiency

The well efficiency was calculated using step and constant rate drawdown data as described by Todd (1980). A graph of the Specific Capacity (Sw/Q) vs. Well Discharge (Q) is included in Appendix G. Well efficiency was calculated to be approximately 36% at a flow rate of 3 gpm. Calculations of the well efficiency are presented in Appendix G.

CURRENT QUARTER SAMPLING RESULTS

Depth to water-level measurements were obtained on May 20 and June 16, 1992 and prior to sampling on July 17, 1992 from each monitoring and recovery well. Static ground-water levels were measured from the surveyed top of the well box and recorded to the nearest $\pm$0.01 foot. Water-level data were referenced to Mean Sea Level (MSL) datum and used to construct potentiometric maps presented on Plates 8, 9, and 10 for each measurement date, respectively. Shallow ground-water flows north to northwest at approximate hydraulic gradients of 0.002, 0.004, and 0.003, respectively.

Each well was checked for the presence of floating product. Floating product was not observed in any well for each measurement date. Depth to groundwater and floating product measurements for May 20 and June 16, 1992 are presented in the attached EMCON Associates (EMCON) ground-water monitoring reports (Appendix H). Depth to groundwater and floating product measurements for July 17, 1922 are summarized in the attached EMCON ground-water sampling report (Appendix I). Current and historical water-level data and floating product measurements are summarized in Table 6.

Ground-water samples were collected on July 17, 1992. Samples were analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020. The ground-water samples were analyzed by Sequoia. A table of current chemical analytical data is included in the EMCON report in Appendix I. Current chemical analytical data have also been added to the Historical Groundwater Quality Database presented in Table 7. Chemical isoconcentration maps for TPH-Gasoline and benzene are presented on Plates 11 and 12, respectively.

SUMMARY

The results of this investigation are summarized below:

- Four exploratory soil borings were drilled on June 8, 1992 and completed as vapor extraction wells AV-1 through AV-3 and recovery well AR-2.

- Lithology of the borings consists primarily of clay underlain by interbedded sand and silt to the maximum depth explored of 14.5 feet for Wells AV-1 through AV-3 and 30.5 feet for Well AR-2.

- TPH-Gasoline was identified in soil samples from Borings AV-1, AV-2 and AV-3 from the interval of 11.5 to 12-feet below grade at concentrations ranging between 12 ppm and 1500 ppm. TPH-Gasoline was also identified in the 6.5-foot sample from Boring AV-2 at a concentration of 1.8 ppm. Benzene was detected in each soil sample analyzed at concentrations ranging between 0.037 ppm and 21 ppm.

- Ground water-levels were initially encountered at depths between 12.0 and 15.0 feet below grade. The water-level in Well AR-2 stabilized at a depth of 13 feet below grade.

- A vapor extraction test was performed on June 11, 1992 utilizing the newly installed vapor wells and an IC engine.

- Based on the 50 feet radius of influence of vacuum pressure, a flow rate of 20 cfm, and an influent concentration 24,000 ppmv, the test indicates that vapor extraction is a feasible remedial option.

- The observed radius of influence, based on the results of the aquifer test, appears to be approximately 160 feet.

- Based on aquifer test results it appears that a pump and treat system is a feasible option for remediating groundwater.

- Potentiometric data collected for the months of May, June, and July indicate that groundwater flows north and northwest at calculated hydraulic gradients ranging from 0.002 to 0.004.

- Floating product was not observed in any wells.

- TPH-Gasoline was identified in ground-water samples from Wells A-1, AR-1, and AR-2 at concentrations ranging between 150 ppb and 44,000 ppb. Benzene was detected in Wells A-1, AR-1, and AR-2 at concentrations ranging between 6.6 ppb and 4,300 ppb. TPH-Gasoline and benzene were reported as ND for Wells A-2 through A-4.

CONCLUSIONS

The distribution of petroleum hydrocarbons in soil and ground-water for this site have been reviewed. Based on these data, petroleum hydrocarbons in soil appear to be limited to the capillary fringe above groundwater and in the area adjacent to the former UST complex. Concentration levels appear to decrease with distance from the former UST complex. Hydrocarbon contamination has been identified in groundwater in the area beneath the former and present UST complexes and the west corner of the ARCO station property.

The observed radius of influence, stabilized flow rate and petroleum hydrocarbon concentrations resulting from the vapor extraction test indicate that vapor extraction is a feasible method of remediating petroleum hydrocarbons contamination in soil beneath the site. Results of the aquifer test indicate that a groundwater extraction remediation system is feasible for treatment of the petroleum hydrocarbon plume beneath the site. The observed radius of influence and flow rate appear to be sufficient to affect hydrodynamic control of the known hydrocarbon plume.

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Robert C. Mallory
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889 West Grand Avenue
Oakland, California

792705-4

November 24, 1992

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HAYWARD, CALIFORNIA 94545
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Recovery Well Installation

Boring AR-2 was drilled using 10-inch-diameter hollow-stem augers to a depth of 30.5 feet below existing ground surface. This boring was drilled through a 12-inch-diameter conductor casing installed to a depth of 10-feet below grade in the new tank complex. Native material was used to backfill the boring from 28.5 to 30.5 feet below grade during well construction. Recovery well AR-2 was constructed using 4-inch-diameter Schedule 40 PVC well casing and carbon steel 0.020-inch continuous wrap well screen. The well screen extends from 8.5 to 28.5 feet below grade. Lonestar #2/12 graded sand was placed in the annular space across the entire screened interval and extends 1.0-foot above the top of the well screen. A one-foot thick bentonite seal was placed above the sandpack and then hydrated with clean water. A neat cement seal was placed from the top of the bentonite to 1.0-foot below ground surface. The well was completed in an underground vault box, set in the concrete slab of the new tank complex, and a waterproof locking well cap and lock was placed on the well casing.

Vapor Extraction Well Installation

Borings AV-1 through AV-3 were installed using 8-inch-diameter hollow-stem augers to a depth of 14.5 feet below grade. Bentonite was placed in the lower 0.5 feet of Borings AV-1 through AV-3 as a bottom seal. The vapor extraction wells were constructed using 2-inch-diameter Schedule 40 PVC blank well casing and 0.020-inch factory slotted well screen. Well screen extends from 5 to 14 feet in each [illegible] Lonestar #2/12 graded sand was placed across the entire screened interval and extends one-half-foot above the top of the well screen. A one-half-foot thick bentonite seal was placed above the sandpack and then hydrated with clean water. A neat cement seal was placed from the top of the bentonite to approximately 1.0-foot below ground surface. A waterproof underground vault box, set in concrete, was installed over the top of each well and a waterproof locking well cap and lock were placed on the well casings. Well completion details are presented with the Exploratory Boring Logs in Appendix A.

Soil Chemical Analytical Results

Soil samples were analyzed for Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) and as Diesel (TPH-Diesel) according to EPA Method 8015 (Modified) and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) according to EPA Method 8020. Chemical analyses were performed by Sequoia in Redwood City, California.

Soil chemical analytical data are summarized in Table 1. Six soil samples from Borings AV-1 through AV-3, collected at depths ranging between 6.5 and 12 feet below grade, were selected for chemical analysis. Soil samples from Boring AR-2 were not analyzed due to fill material being encountered from ground surface to first encountered water. TPH-Gasoline was detected in the soil sample from Boring AV-2 at a depth of 6.5, at a concentration of 1.8 parts per million (ppm). Benzene was identified in soil samples collected at a depth of 6.5 feet from Borings AV-1 through AV-3 at concentrations of 0.15 ppm, 0.31 ppm, and 0.037 ppm, respectively. TPH-Gasoline was detected in each sample collected from depths of 11.5 to 12 feet from Borings AV-1 through AV-3 at concentrations of 12 ppm, 1,500 ppm, and 110 ppm, respectively. Benzene was reported in these samples at concentrations of 0.81 ppm, 21 ppm, and 2.4 ppm, respectively. TPH-Diesel was reported as not detected (ND) in each soil sample analyzed. The Sequoia chemical analytical report and Chain-of-Custody form are presented in Appendix B.

HYDROGEOLOGIC CONDITIONS

Regional Setting

The site is located in Oakland, California at the base of the Berkeley Hills approximately 1/2-mile east of the San Francisco Bay. The site is situated on alluvial-fan deposits of the Temescal Formation comprised of interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures (Radbruch, D.H., 1957). Local topography suggests ground-water flows to the west toward San Francisco Bay.

Local Setting

Based on exploratory boring data from previous investigations, the local subsurface lithology appears to consist of clay, sand, silt, and minor gravel to the total depth explored of 30.5 feet below ground surface. Borings AV-1 through AV-3 sampled subsurface lithology to a depth of 14.5 feet below ground surface and Boring AR-2 encountered fill material to a depth of 15 feet and native material to the total depth explored of 30.5 feet. Clay was observed in borings AV-1 through AV-3 from ground surface to between 10.5 (AV-2) and 13.5 (AV-1) feet below grade. The clay was underlain by sand, clayey and silty sand, and silt to the total depths of the borings. Boring AR-2 encountered interbedded sand, clayey sand, and sandy silt from 15 feet to the total depth explored of 30.5 feet. Cross-sections have been prepared from site boring logs and are presented on Plates 3 and 4. Groundwater was first encountered in Borings AV-1 through AV-3 at a depth of 12-feet below grade and in Boring AR-2 at a depth 15-feet below grade. Water-levels stabilized after completion of Well AR-2 at a depth of 13 feet below grade. This rise in the water-level in AR-2 indicates semi-confined to confined aquifer conditions.

VAPOR EXTRACTION TEST FIELD ACTIVITIES

An eight hour vapor extraction test was performed on June 11, 1992, utilizing vapor extraction well AV-2 and an Internal Combustion (IC) engine to create a vacuum on the extraction well and combust extracted vapors. Vapor extraction wells AV-1 and AV-3 were used to monitor vacuum pressure changes during the test using a manometer. Vacuum pressure and flow rate from the extraction well were measured and recorded on an approximate hourly basis throughout the test. Air stream concentrations from the extraction well before and after combustion (i.e. influent and effluent vapor concentration readings) were also monitored utilizing an infrared (IR) detector and recorded. Influent and effluent air stream samples were collected near the end of the test, entered on a Chain-of-Custody form and transported to Sequoia. Air samples were analyzed for TPH-Gasoline and BTEX according to EPA Methods 8015 (Modified) and 8020, respectively.

Vadose Zone Lithology

Based on exploratory borings drilled at the site, the unsaturated zone appears to be composed primarily of clay to a depth of approximately 8 feet and sand, silty and clayey sand, and silt to the static ground-water surface of approximately 12 to 13.5 feet below grade.

Results

Vacuum pressure, flow rate, and influent concentration data from the extraction well were recorded during the test and are presented in Table 2. Vacuum pressure in extraction well AV-2 ranged from 76.7 to 119.8-inches of water. Vacuum pressure results for the observation wells are presented in Table 3. Pressure changes recorded at the end of the test from the observation wells ranged from 0.14 to 1.4 inches of water. Vacuum pressure recorded at the end of the test have been used to construct a Vacuum Pressure Map (Plate 5). Based the Vacuum Pressure Map the estimated radius of influence is 50-feet from the extraction well. Flow rate from the extraction well ranged from 10.8 to 23.8 cubic feet per minute (cfm) and appeared to stabilize at approximately 22 cfm three hours into the test.

Influent vapor concentrations were recorded on an hourly basis during the eight hour test (Table 2). These data exceeded the maximum range of 14,000 parts per million (ppm) of the IR detector during each hour of the test. Concentrations measured by the IR detector are calibrated to Hexane and should not be considered a quantitative measure of TPH-Gasoline or BTEX.

The results of laboratory chemical analysis of the influent and effluent air samples are summarized in Table 4. TPH-Gasoline and benzene were identified in the effluent air sample at concentrations of 13 parts per million vapor (ppmv) and 1.9 ppmv, respectively. TPH-Gasoline and benzene were detected in the influent sample at concentrations of 24,000 ppmv and 1,300 ppmv, respectively. The air sample laboratory analytical report and Chain-of-Custody Form are presented in Appendix C.

AQUIFER TEST FIELD ACTIVITIES

A 4-hour step-drawdown test and a 24-hour constant-rate test were performed utilizing recovery well AR-1 on July 15 and 16, 1992. The tests were performed to assess the feasibility of utilizing recovery well AR-1 to achieve hydrodynamic control of groundwater for extraction of petroleum hydrocarbons from the first encountered water-bearing zone. Recovery well AR-1 was installed to extract groundwater from the shallow aquifer zone beneath the site and to assess aquifer parameters for potential recovery system design.

Water-level measurements were obtained from recovery wells AR-1 and AR-2 and monitoring wells A-1 through A-4 prior to conducting the test to establish baseline data (Plate 6). Pressure transducers connected to a Hermit SE2000 data logger were installed in recovery well AR-1 and two selected observation wells (A-1 and A-4) to monitor water-level changes during the tests. Water-level changes in Wells A-2, A-3 and AR-2 were measured with an electronic interface probe at various time intervals throughout the duration of the tests.

AQUIFER TEST RESULTS

Data collected during the 4-hour step-drawdown and 24-hour constant-rate test were evaluated and used to calculate specific aquifer parameters; Transmissivity (T) and Storativity (S). Additional aquifer and well characteristics evaluated include observed radius of influence and well efficiency.

Step-Drawdown Test

Well AR-1 was pumped at various discharge rates to establish an optimum long-term discharge rate for the 24-hour constant-rate test. The step-drawdown test consisted of three steps: for durations of 60, 120, and 140 minutes, respectively. The discharge rates for step one and two were 2.0 and 4.0 gallons per minutes (gpm). Step three was the recovery step. An evaluation of the step-drawdown test data from a time versus drawdown plot (Appendix D) indicated that a pumping rate of 3 gpm should be used for the constant-rate test.

Constant-Rate Test

Recovery well AR-1 was pumped for a total of 1340 minutes at a constant discharge rate of 3.0 gpm. Maximum observed drawdown in the pumping well was 5.269 feet. Maximum observed drawdowns in the pumping well and observation wells are summarized in Table 5. Water-level data were collected and recorded as the pumping well recovered to greater than 90% of the total recorded drawdown in Well AR-1.

Time versus drawdown data were plotted for observation Wells A-1, A-2, A-3, A-4 and AR-2. Transmissivity (T) and Storativity (S) values were calculated from these field data plots using the Jacob Straight-line Method (Cooper & Jacob, 1946). Calculated transmissivity values from the field plots using the Jacob Method ranged from 1970 gallons per day per foot (gpd/ft) to 6600 gpd/ft. Storativity values ranged from 1.95×10^{-4} to 9.2×10^{-4}. Storativity values appear to be consistent with an aquifer that is semi-confined to confined. Jacob Method transmissivity and storativity data results are summarized in Table 5. Field Data Plots are presented in Appendix E.

To evaluate the potential effects of leakage into a confined aquifer, GSI used Graphical Well Analysis Package (GWAP) software to analyze test data using the Theis Method (Hantush and Jacob, 1955). Data plots generated utilizing GWAP are presented in Appendix F. Transmissivity values calculated using the Theis Method for Wells A-1, A-2, A-3, A-4 and AR-2 ranged from 1263 gpd/ft to 5574 gpd/ft. Storativity values for these wells ranged from 1.87×10^{-4} to 1.1×10^{-3}. These results appear consistent with Jacob Method values. Theis Method of transmissivity and storativity results are summarized in Table 5.

Approximately 4,620 gallons of groundwater were pumped during the aquifer tests. Groundwater was disposed of by Balch Petroleum.

Well Influence

Data collected from the observation wells during the 24-hour constant-rate aquifer test were used to construct a water-level map after 1340 minutes of pumping from recovery well AR-1 at 3.0 gpm (Plate 7). Drawdown was observed in each observation well ranging between 0.29 and 0.83 feet. The observed radius of influence appeared to be greater than 160 feet from the pumping well for the constant-rate test. The cone of depression created by pumping recovery well AR-1 did not equilibrate during the constant-rate test, indicating that pumping for a longer time duration may produce greater influence.

Well Efficiency

The well efficiency was calculated using step and constant rate drawdown data as described by Todd (1980). A graph of the Specific Capacity (Sw/Q) vs. Well Discharge (Q) is included in Appendix G. Well efficiency was calculated to be approximately 36% at a flow rate of 3 gpm. Calculations of the well efficiency are presented in Appendix G.

CURRENT QUARTER SAMPLING RESULTS

Depth to water-level measurements were obtained on May 20 and June 16, 1992 and prior to sampling on July 17, 1992 from each monitoring and recovery well. Static ground-water levels were measured from the surveyed top of the well box and recorded to the nearest $\pm$0.01 foot. Water-level data were referenced to Mean Sea Level (MSL) datum and used to construct potentiometric maps presented on Plates 8, 9, and 10 for each measurement date, respectively. Shallow ground-water flows north to northwest at approximate hydraulic gradients of 0.002, 0.004, and 0.003, respectively.

Each well was checked for the presence of floating product. Floating product was not observed in any well for each measurement date. Depth to groundwater and floating product measurements for May 20 and June 16, 1992 are presented in the attached EMCON Associates (EMCON) ground-water monitoring reports (Appendix H). Depth to groundwater and floating product measurements for July 17, 1922 are summarized in the attached EMCON ground-water sampling report (Appendix I). Current and historical water-level data and floating product measurements are summarized in Table 6.

Ground-water samples were collected on July 17, 1992. Samples were analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020. The ground-water samples were analyzed by Sequoia. A table of current chemical analytical data is included in the EMCON report in Appendix I. Current chemical analytical data have also been added to the Historical Groundwater Quality Database presented in Table 7. Chemical isoconcentration maps for TPH-Gasoline and benzene are presented on Plates 11 and 12, respectively.

SUMMARY

The results of this investigation are summarized below:

- Four exploratory soil borings were drilled on June 8, 1992 and completed as vapor extraction wells AV-1 through AV-3 and recovery well AR-2.
- Lithology of the borings consists primarily of clay underlain by interbedded sand and silt to the maximum depth explored of 14.5 feet for Wells AV-1 through AV-3 and 30.5 feet for Well AR-2.
- TPH-Gasoline was identified in soil samples from Borings AV-1, AV-2 and AV-3 from the interval of 11.5 to 12-feet below grade at concentrations ranging between 12 ppm and 1500 ppm. TPH-Gasoline was also identified in the 6.5-foot sample from Boring AV-2 at a concentration of 1.8 ppm. Benzene was detected in each soil sample analyzed at concentrations ranging between 0.037 ppm and 21 ppm.
- Ground water-levels were initially encountered at depths between 12.0 and 15.0 feet below grade. The water-level in Well AR-2 stabilized at a depth of 13 feet below grade.
- A vapor extraction test was performed on June 11, 1992 utilizing the newly installed vapor wells and an IC engine.
- Based on the 50 feet radius of influence of vacuum pressure, a flow rate of 20 cfm, and an influent concentration 24,000 ppmv, the test indicates that vapor extraction is a feasible remedial option.

- The observed radius of influence, based on the results of the aquifer test, appears to be approximately 160 feet.
- Based on aquifer test results it appears that a pump and treat system is a feasible option for remediating groundwater.
- Potentiometric data collected for the months of May, June, and July indicate that groundwater flows north and northwest at calculated hydraulic gradients ranging from 0.002 to 0.004.
- Floating product was not observed in any wells.
- TPH-Gasoline was identified in ground-water samples from Wells A-1, AR-1, and AR-2 at concentrations ranging between 150 ppb and 44,000 ppb. Benzene was detected in Wells A-1, AR-1, and AR-2 at concentrations ranging between 6.6 ppb and 4,300 ppb. TPH-Gasoline and benzene were reported as ND for Wells A-2 through A-4.

CONCLUSIONS

The distribution of petroleum hydrocarbons in soil and ground-water for this site have been reviewed. Based on these data, petroleum hydrocarbons in soil appear to be limited to the capillary fringe above groundwater and in the area adjacent to the former UST complex. Concentration levels appear to decrease with distance from the former UST complex. Hydrocarbon contamination has been identified in groundwater in the area beneath the former and present UST complexes and the west corner of the ARCO station property.

The observed radius of influence, stabilized flow rate and petroleum hydrocarbon concentrations resulting from the vapor extraction test indicate that vapor extraction is a feasible method of remediating petroleum hydrocarbons contamination in soil beneath the site. Results of the aquifer test indicate that a groundwater extraction remediation system is feasible for treatment of the petroleum hydrocarbon plume beneath the site. The observed radius of influence and flow rate appear to be sufficient to affect hydrodynamic control of the known hydrocarbon plume.

If you have any questions, please call.

GeoStrategies Inc. by,

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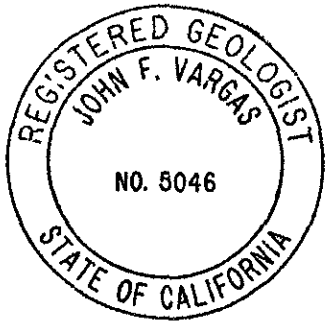

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Table 1.	Soil Analyses Data
Table 2.	Vacuum Pressure Results for Well AV-2
Table 3.	Vacuum Pressure Data for the Observation Wells
Table 4	Air Analyses Data
Table 5.	Constant Rate Aquifer Test Results
Table 6.	Historical Water-level Data
Table 7.	Historical Ground-water Quality Database

Plate 1.	Vicinity Map
Plate 2.	Site Plan
Plate 3.	Cross-section A - A'
Plate 4.	Cross-section B - B'
Plate 5.	Vacuum Pressure Map
Plate 6.	Water Level Map Prior To Pumping Well AR-1
Plate 7.	Water Level Map After Pumping Well AR-1
Plate 8.	Potentiometric Map - May 20, 1992
Plate 9.	Potentiometric Map - June 16, 1992
Plate 10.	Potentiometric Map - July 17, 1992
Plate 11.	TPH-G Isoconcentration Map
Plate 12.	Benzene Isoconcentration Map

Appendix A:	Exploratory Boring Logs and Well Construction Details
Appendix B:	Soil Chemical Analytical Report and Chain-of-Custody Form
Appendix C:	Air Chemical Analytical Report and Chain-of-Custody Form
Appendix D:	*Time vs. Drawdown*
Appendix E:	Field Data Plots: Jacob Method
Appendix F:	GWAP Data Plots: Theis Method
Appendix G:	Well Efficiency Calculation
Appendix H:	EMCON Ground-water Monitoring Reports
Appendix I:	EMCON Ground-water Sampling Report

QC Review: JLP

References Cited

Cooper, H. H., Jr., and C.E. Jacob, 1946, "A Generalized Graphical Method for Evaluating Formation Constant and Summarizing Well Field History." Transactions, American Geophysical Union, 27, pp. 526-34.

Dansby, D.A., and Price, C.A., 1990, Graphical Well Analysis Package (GWAP), Groundwater Graphics, Version 2.33.

Hantush, M.S., and Jacob, C.E., 1955, "Non-steady Radial Flow in an Infinite Leaky Aquifer". Trans. American Geophysical Union, 36, pp. 95-100.

Dorothy H. Radbruch, 1957, Areal and Engineering Geology of the Oakland West Quadrangle, California, U.S. Geological Survey Map I-239.

Neuman, S.P., 1975, "Analysis of pumping test data from an anisotropic unconfined aquifer considering delayed gravity response". Water Resources Res., 11pp. 329-342.

Todd, D.K., 1980, Groundwater Hydrology-Second Edition; John Wiley & Sons, Inc.

TABLES

TABLE 1

SOIL ANALYSES DATA

SAMPLE I.D.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)	TPH-D (PPM)
AV-1-6.5	08-Jun-92	11-Jun-92	<1.0	0.15	0.019	0.014	0.062	<1.0
AV-1-12	08-Jun-92	11-Jun-92	12	0.81	1.3	0.27	1.5	<1.0
AV-2.6.5	08-Jun-92	11-Jun-92	1.8	0.31	0.15	0.036	0.21	<1.0
AV-2-11.5	08-Jun-92	11-Jun-92	1500	21	84	27	170	<1.0
AV-3-6.5	08-Jun-92	11-Jun-92	<1.0	0.037	0.0050	0.018	0.028	<1.0
AV-3-11.5	08-Jun-92	11-Jun-92	110	2.4	4.6	1.9	10	<1.0

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
TPH-D = Total Petroleum Hydrocarbons calculated as Diesel
PPM = Parts Per Million

Notes: 1. All data shown as <x are reported as ND (none detected).
2. The last number of the sample I.D. corresponds to the depth the sample was collected.

TABLE 2

VACUUM PRESSURE RESULTS FOR WELL AV-2

TIME (minutes since start-up)	INFLUENT CONCENTRATION (PPM)	VACUUM PRESSURE AT WELL HEAD (inches of water)	FLOWRATE (cubic feet/min.)
0	>14,000	119.8	10.8
60	>14,000	80.1	17.1
120	>14,000	79.3	19.4
180	>14,000	79.8	22.8
240	>14,000	80.6	23.2
300	>14,000	76.7	21.6
315	>14,000	85.8	17.5
360	>14,000	85.1	21.1
420	>14,000	84.7	21.4
480	>14,000	87.6	22.4

PPM = Parts Per Million

Note: 1. Influent concentrations were measured using an infrared detector.

TABLE 3

VACUUM PRESSURE DATA FOR THE OBSERVATION WELLS

WELL NO.	TIME (minutes since start-up)	VACUUM PRESSURE (inches of water)
AV-1	18	0.20
	38	0.23
	66	0.10
	124	0.15
	184	0.10
	244	0.13
	324	0.05
	362	0.10
	423	0.16
	482	0.14
AV-3	20	0.91
	40	1.00
	68	1.10
	126	1.30
	186	1.30
	247	1.40
	326	1.22
	364	1.30
	423	1.40
	484	1.40

TABLE 4

AIR ANALYSES DATA

SAMPLE I.D.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPMV)	BENZENE (PPMV)	TOLUENE (PPMV)	ETHYLBENZENE (PPMV)	XYLENES (PPMV)
INFLUENT	11-Jun-92	12-Jun-92	24,000	1,300	1,200	85	350
EFFLUENT	11-Jun-92	12-Jun-92	13	1.9	0.29	0.10	0.51

TPH-G - Total Petroleum Hydrocarbons calculated as Gasoline
PPMV = Parts Per Million Vapor

Notes: 1. All data shown as <x are reported as ND (none detected).

TABLE 5

CONSTANT-RATE AQUIFER TEST RESULTS

WELL NO.	PUMP RATE (GPM)	PUMPING DURATION (MINS.)	MAXIMUM DRAWDOWN (FT)	THEIS T (GPD/FT)	THEIS S	JACOB T (GPD/FT)	JACOB S
A-1	----	----	0.83	1763	5.3E-04	1970	4.7E-04
A-2	----	----	0.35	3683	1.1E-03	5110	5.1E-04
A-3	----	----	0.29	4637	1.08E-03	5142	9.2E-04
A-4	----	----	0.64	2925	1.87E-04	3330	1.95E-04
AR-1	3	1340	8.29	N/A	N/A	N/A	N/A
AR-2	----	----	0.41	5574	2.62E-04	6600	2.04E-04

T = Transmissivity
S = Specific Yield
GPD/FT = Gallons per Day per Foot

N/A = Not Applicable

TABLE 6

HISTORICAL WATER-LEVEL DATA

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (FT)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
03-Apr-92	A-1	10.35	14.75	4.40	0.00
20-May-92	A-1	11.66	14.75	3.09	0.00
16-Jun-92	A-1	11.95	14.75	2.80	0.00
17-Jul-92	A-1	12.23	14.75	2.52	0.00
03-Apr-92	A-2	10.97	15.16	4.19	0.00
20-May-92	A-2	12.17	15.16	2.99	0.00
16-Jun-92	A-2	12.43	15.16	2.73	0.00
17-Jul-92	A-2	12.64	15.16	2.52	0.00
03-Apr-92	A-3	11.70	16.38	4.68	0.00
20-May-92	A-3	13.00	16.38	3.38	0.00
16-Jun-92	A-3	13.46	16.38	2.92	0.00
17-Jul-92	A-3	13.45	16.38	2.93	0.00
03-Apr-92	A-4	10.84	15.89	5.05	0.00
20-May-92	A-4	12.13	15.89	3.76	0.00
16-Jun-92	A-4	12.33	15.89	3.56	0.00
17-Jul-92	A-4	12.60	15.89	3.29	0.00
03-Apr-92	AR-1	11.07	15.71	4.64	0.00
20-May-92	AR-1	12.37	15.71	3.34	0.00
16-Jun-92	AR-1	12.47	15.71	3.24	0.00
17-Jul-92	AR-1	13.00	15.71	2.71	0.00
17-Jul-92	AR-2	13.14	15.79	2.65	0.00

Notes: 1. Static water elevations referenced to Mean Sea Level (MSL).
2. Well elevations and depths-to-water referenced to top of well box.
3. Well AR-2 has not been referenced to MSL.

TABLE 7

HISTORICAL GROUND-WATER QUALITY DATABASE

WELL NO.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	TPH-DIESEL (PPB)
A-1	03-Apr-92	10-Apr-92	34000	6200	3900	410	3100	6100
A-1	17-Jul-92	21-Jul-92	5600	3000	500	<100	<100	N/A
A-2	03-Apr-92	10-Apr-92	<30	<0.30	<0.30	<0.30	<0.30	<50
A-2	17-Jul-92	21-Jul-92	<50	<0.50	<0.50	<0.50	<0.50	N/A
A-3	03-Apr-92	10-Apr-92	200	0.79	0.65	4.4	<0.30	130
A-3	17-Jul-92	21-Jul-92	<50	<0.50	<0.50	1.3	2.3	N/A
A-4	03-Apr-92	10-Apr-92	35	<0.30	<0.30	<0.30	<0.30	85
A-4	17-Jul-92	21-Jul-92	<50	<0.50	<0.50	<0.50	<0.50	N/A
AR-1	03-Apr-92	10-Apr-92	17000	310	1400	320	3000	12000
AR-1	17-Jul-92	21-Jul-92	44000	9100	1800	1800	10000	N/A
AR-2	17-Jul-92	21-Jul-92	150	6.6	24	6.6	39	N/A

CURRENT REGIONAL WATER QUALITY CONTROL BOARD MAXIMIM CONTAMINANT LEVELS

Benzene 1. ppb Xylenes 1750. ppb Ethylbenzene 680. ppb

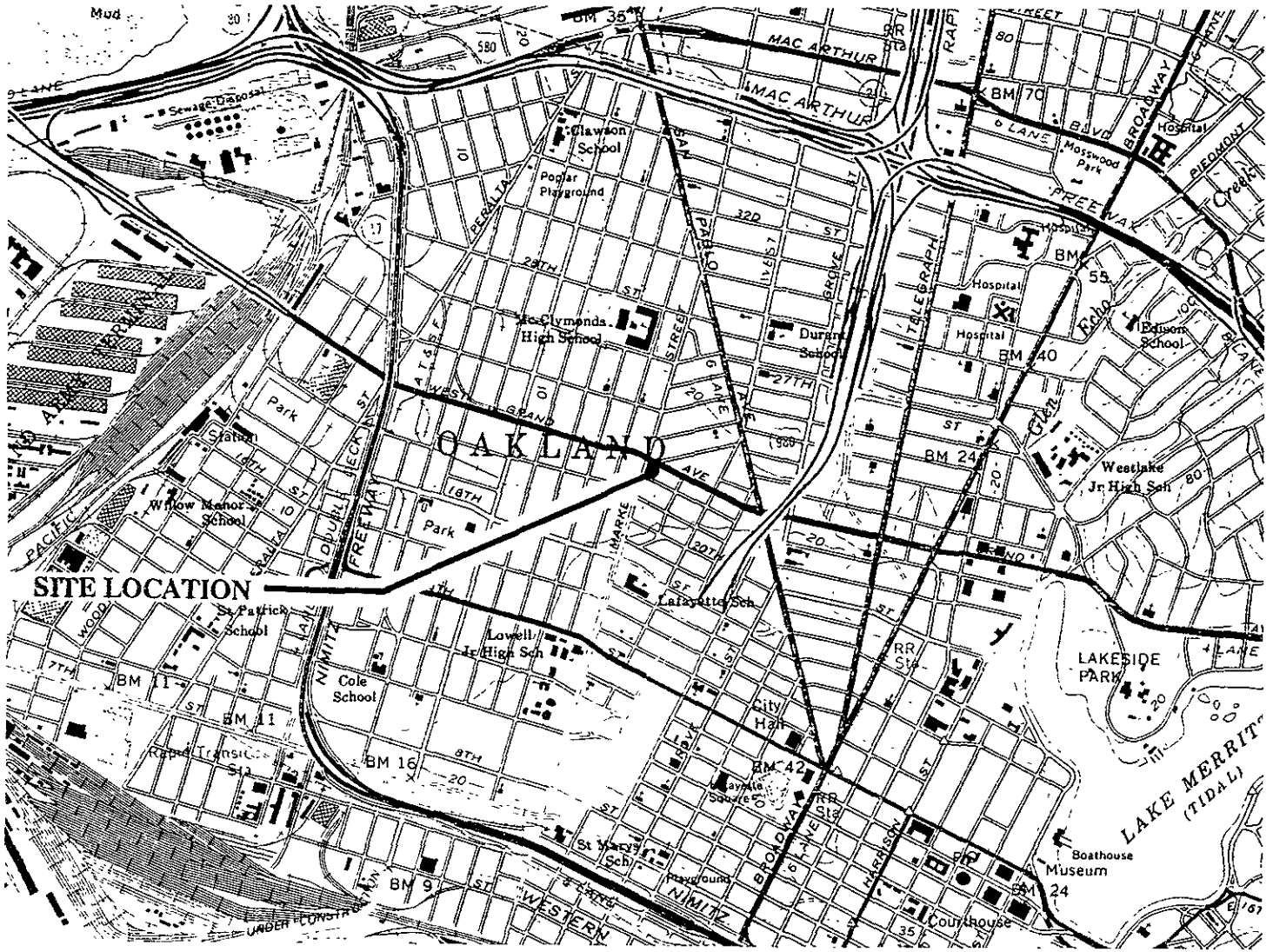
CURRENT DHS ACTION LEVELS

Toluene 100.0 ppb

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPB = Parts Per Billion
N/A = Not Analyzed

Notes: 1. DHS Action levels and MCL's are subject to change pending State of California review.
2. All data shown as <X are reported as ND (none detected).

ILLUSTRATIONS



Base Map: USGS Topographic Map

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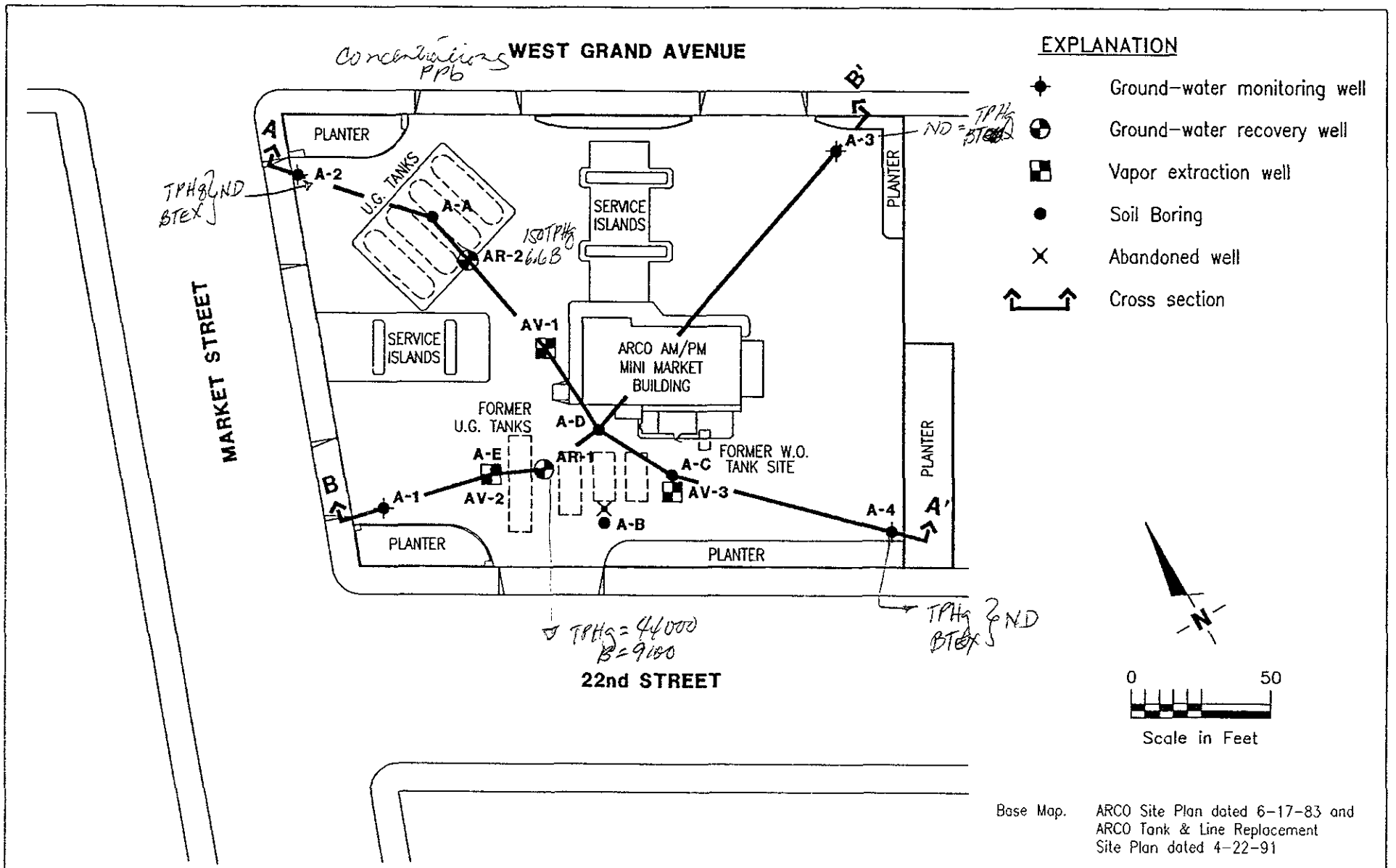
VICINITY MAP
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE
1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7927		5/91	



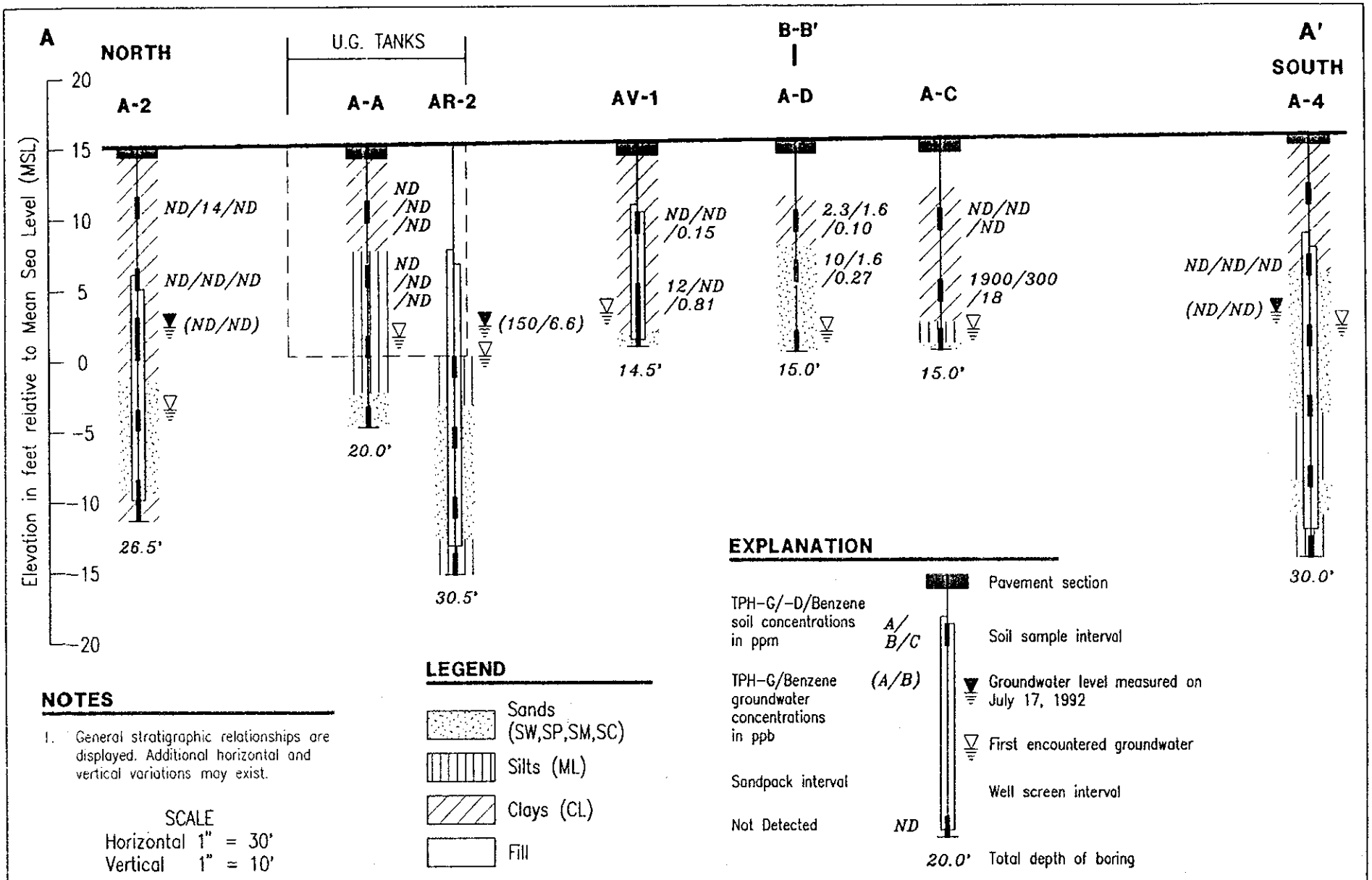
Base Map. ARCO Site Plan dated 6-17-83 and ARCO Tank & Line Replacement Site Plan dated 4-22-91

GeoStrategies Inc.

SITE PLAN
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 2

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4		8/92	11/92

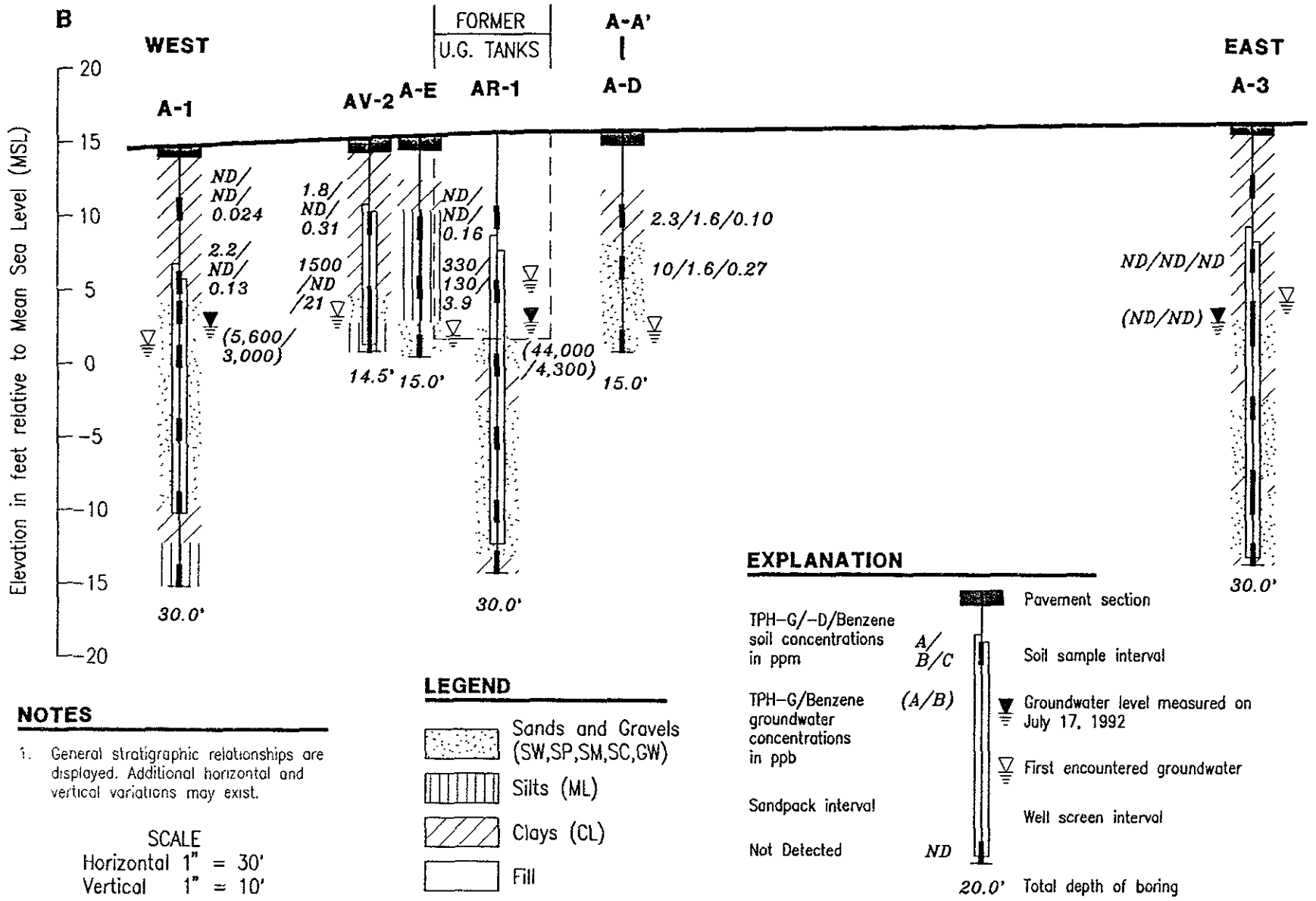


GeoStrategies Inc.

CROSS SECTION A-A'
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE
3

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4	nem	8/92	11/92



NOTES

1. General stratigraphic relationships are displayed. Additional horizontal and vertical variations may exist.

SCALE
Horizontal 1" = 30'
Vertical 1" = 10'

LEGEND

- Sands and Gravels (SW,SP,SM,SC,GW)
- Silts (ML)
- Clays (CL)
- Fill

EXPLANATION

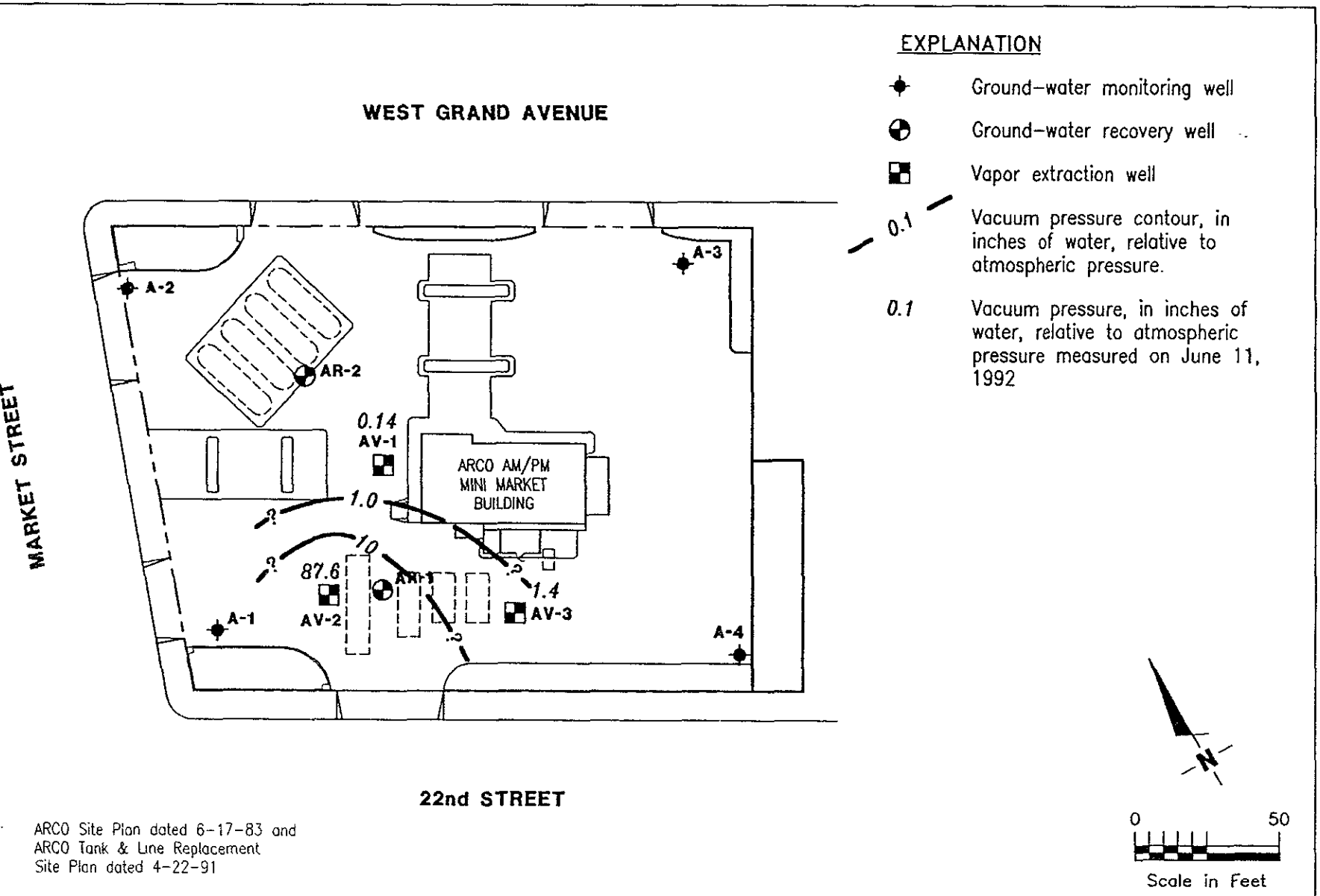
- TPH-G/-D/Benzene soil concentrations in ppm — *A/ B/C*
- TPH-G/Benzene groundwater concentrations in ppb — *(A/B)*
- Sandpack interval
- Not Detected — *ND*
- Pavement section
- Soil sample interval
- Groundwater level measured on July 17, 1992
- First encountered groundwater
- Well screen interval
- *20.0'* Total depth of boring

GeoStrategies Inc.

CROSS SECTION B-B'
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE **4**

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4	rcm	8/92	



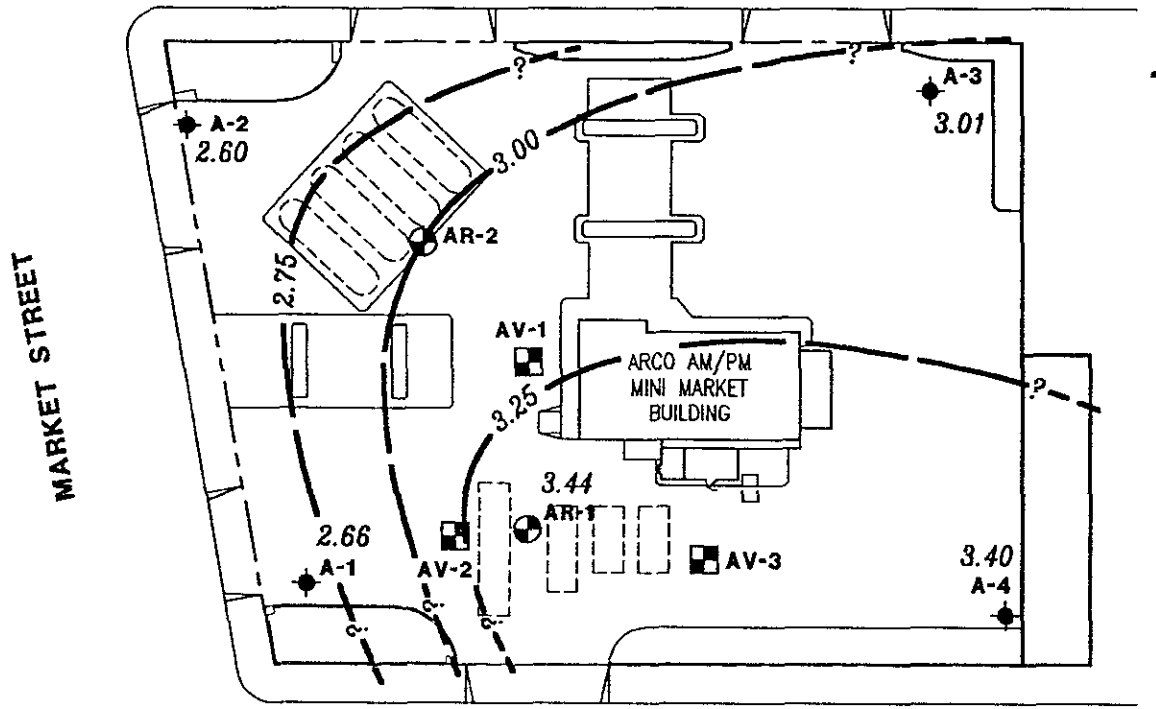
Base Map: ARCO Site Plan dated 6-17-83 and ARCO Tank & Line Replacement Site Plan dated 4-22-91

GeoStrategies Inc.

VACUUM PRESSURE MAP
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 5

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4	RCM	8/92	



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- Vapor extraction well
- 99.99 — Ground-water elevation contour. Approximate Gradient = 0.004
- 99.99 — Ground-water elevation in feet referenced to Mean Sea Level (MSL) measured on July 15, 1992

NOTES: 1. Contours may be influenced by irrigation practices and/or site construction activities.

Base Map: ARCO Site Plan dated 6-17-83 and ARCO Tank & Line Replacement Site Plan dated 4-22-91

N

0 50

Scale in Feet

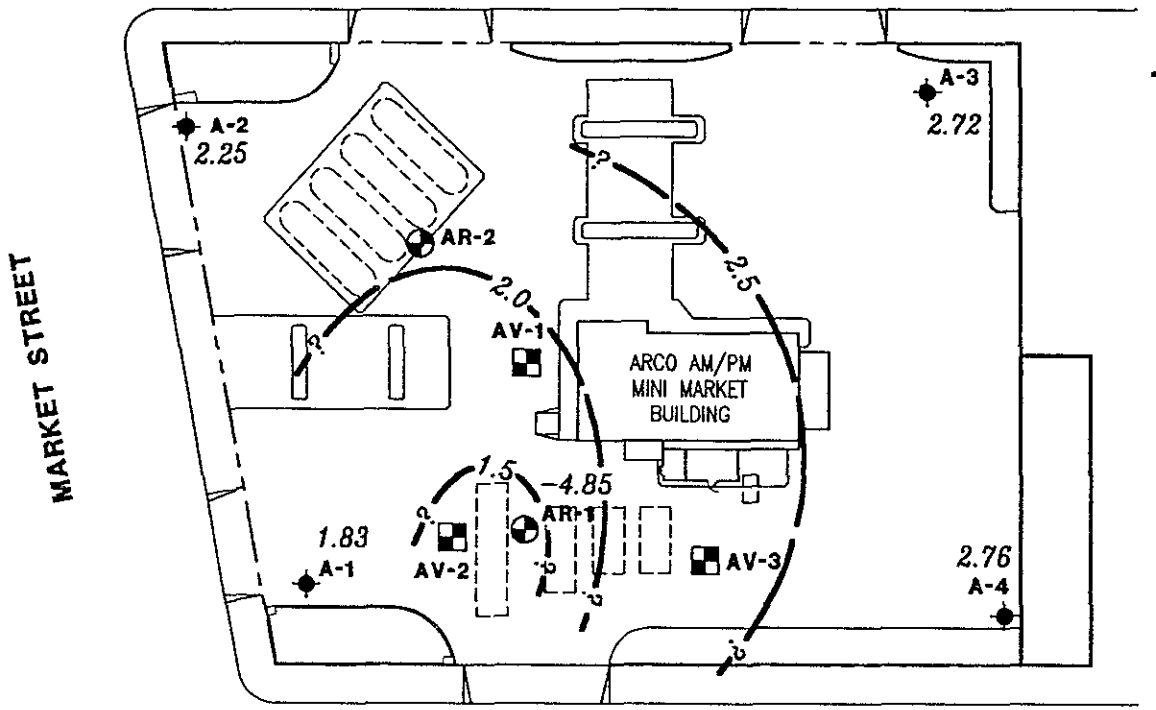
GeoStrategies Inc.

WATER LEVEL MAP PRIOR TO PUMPING WELL AR-1

ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 6

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4		8/92	



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- Vapor extraction well
- 99.99 — Ground-water elevation contour.
- 99.99 — Ground-water elevation in feet referenced to Mean Sea Level (MSL) measured on July 16, 1992

NOTES: 1. Contours may be influenced by irrigation practices and/or site construction activities.

Base Map: ARCO Site Plan dated 6-17-83 and ARCO Tank & Line Replacement Site Plan dated 4-22-91

N

0 50

Scale in Feet

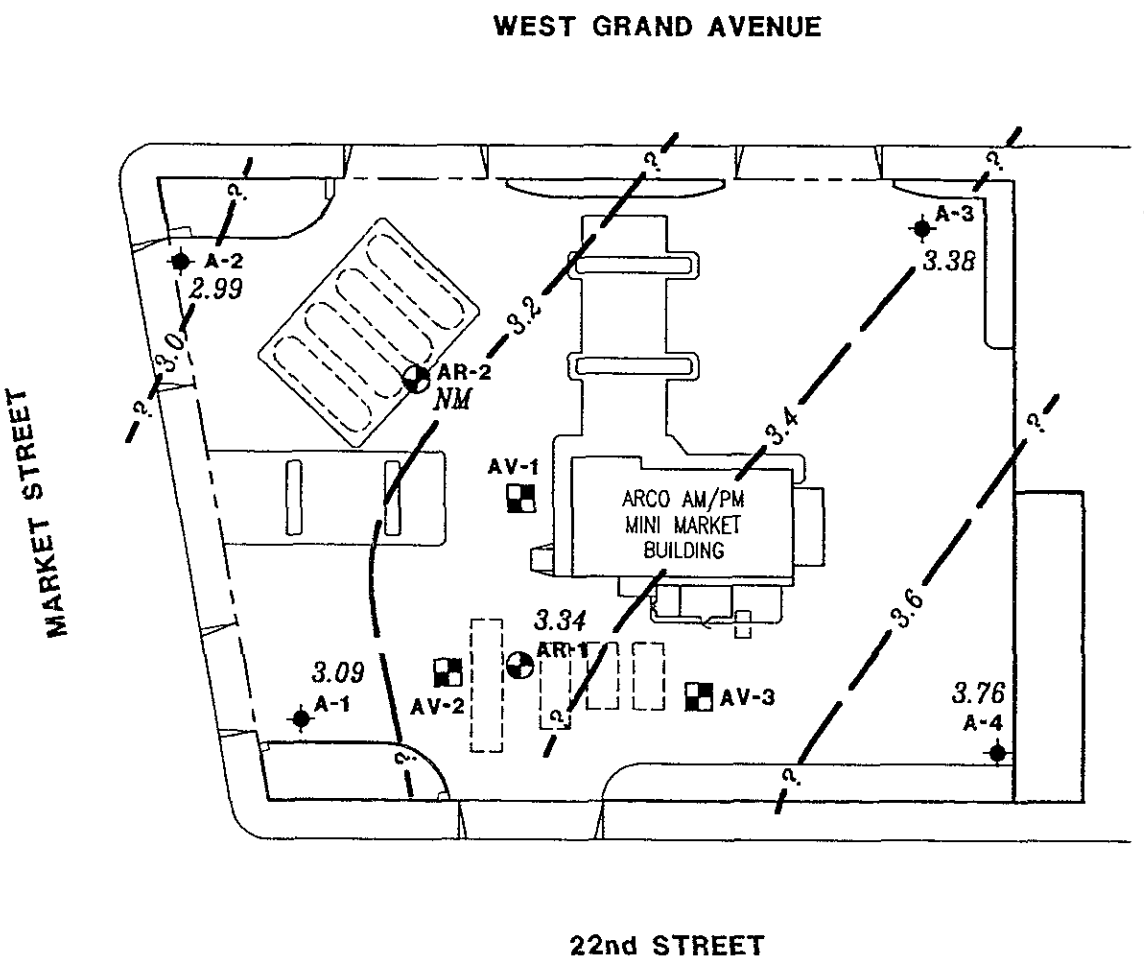
GeoStrategies Inc.

WATER LEVEL MAP AFTER PUMPING WELL AR-1

ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 7

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4	RCM	8/92	



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- Vapor extraction well
- 99.99 — Ground-water elevation contour. Approximate Gradient = 0.002
- *99.99* — Ground-water elevation in feet referenced to Mean Sea Level (MSL) measured on May 20, 1992
- *NM* — Not Measured

NOTES: 1. Contours may be influenced by irrigation practices and/or site construction activities.

Base Map. ARCO Site Plan dated 6-17-83 and ARCO Tank & Line Replacement Site Plan dated 4-22-91

N

0 50

Scale in Feet

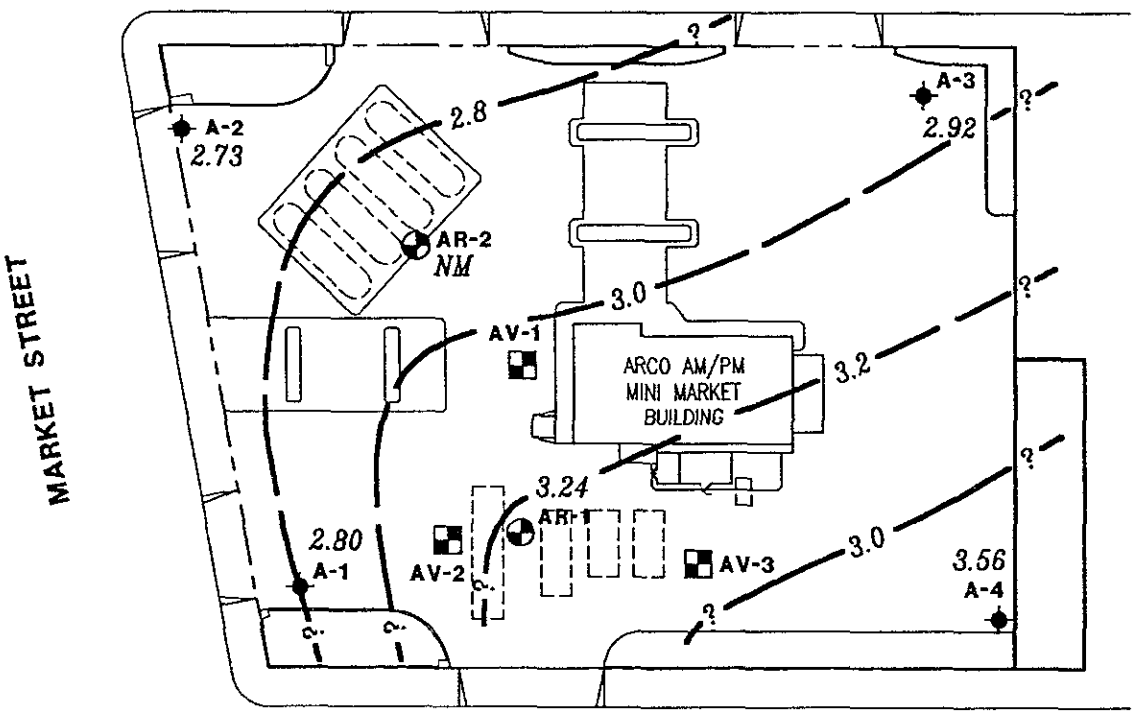
GeoStrategies Inc.

POTENTIOMETRIC MAP (MAY 20, 1992)

ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 8

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4	ncm	8/92	11/92



EXPLANATION

- Ground–water monitoring well
- Ground–water recovery well
- Vapor extraction well
- 99.99 — Ground–water elevation contour. Approximate Gradient = 0.004
- *99.99* — Ground–water elevation in feet referenced to Mean Sea Level (MSL) measured on June 16, 1992
- *NM* — Not Measured

NOTES: 1. Contours may be influenced by irrigation practices and/or site construction activities.

Base Map: ARCO Site Plan dated 6–17–83 and ARCO Tank & Line Replacement Site Plan dated 4–22–91

N

0 50

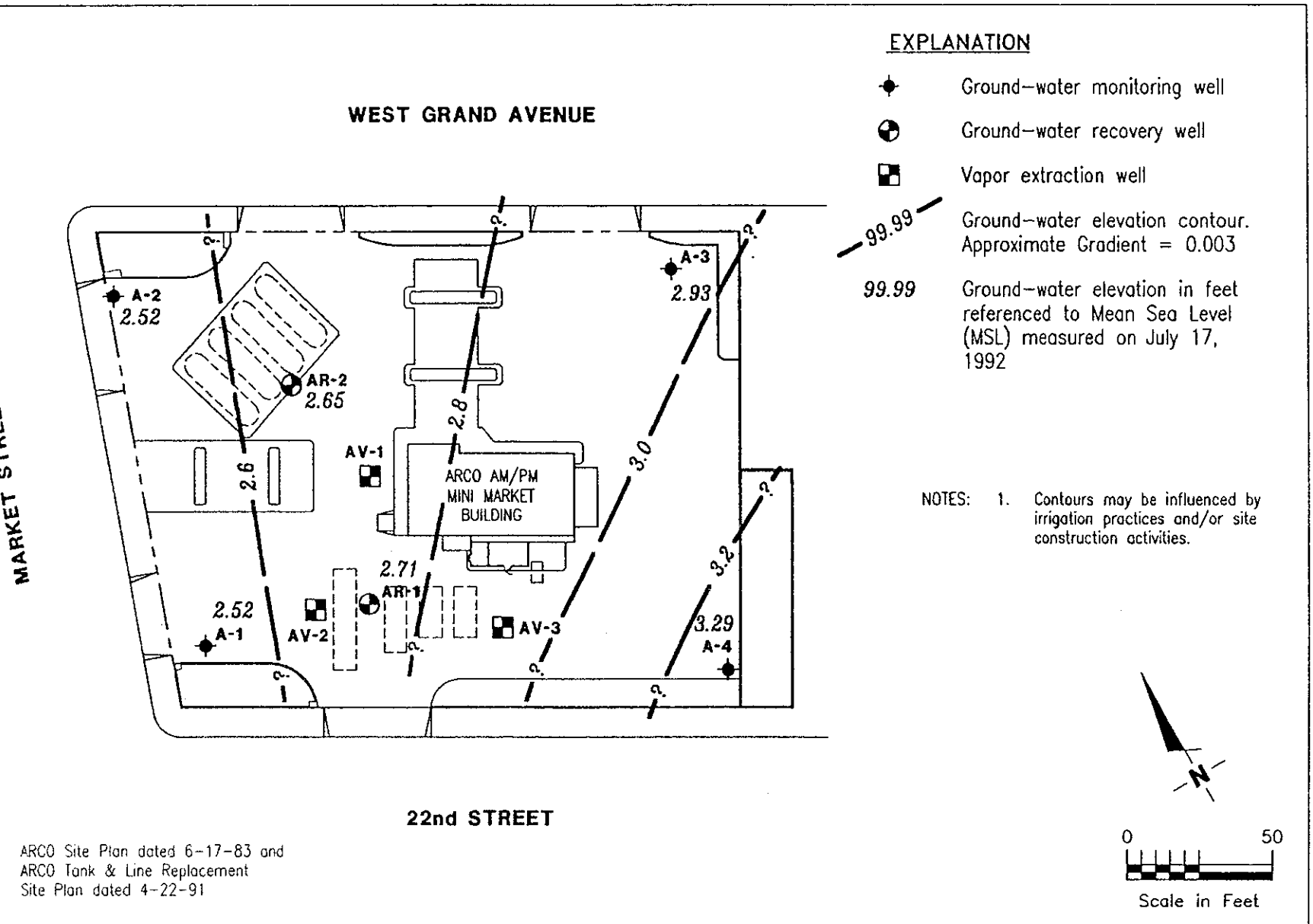
Scale in Feet

GeoStrategies Inc.

POTENTIOMETRIC MAP (JUNE 16, 1992)
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 9

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705–4	nem	8/92	11/92



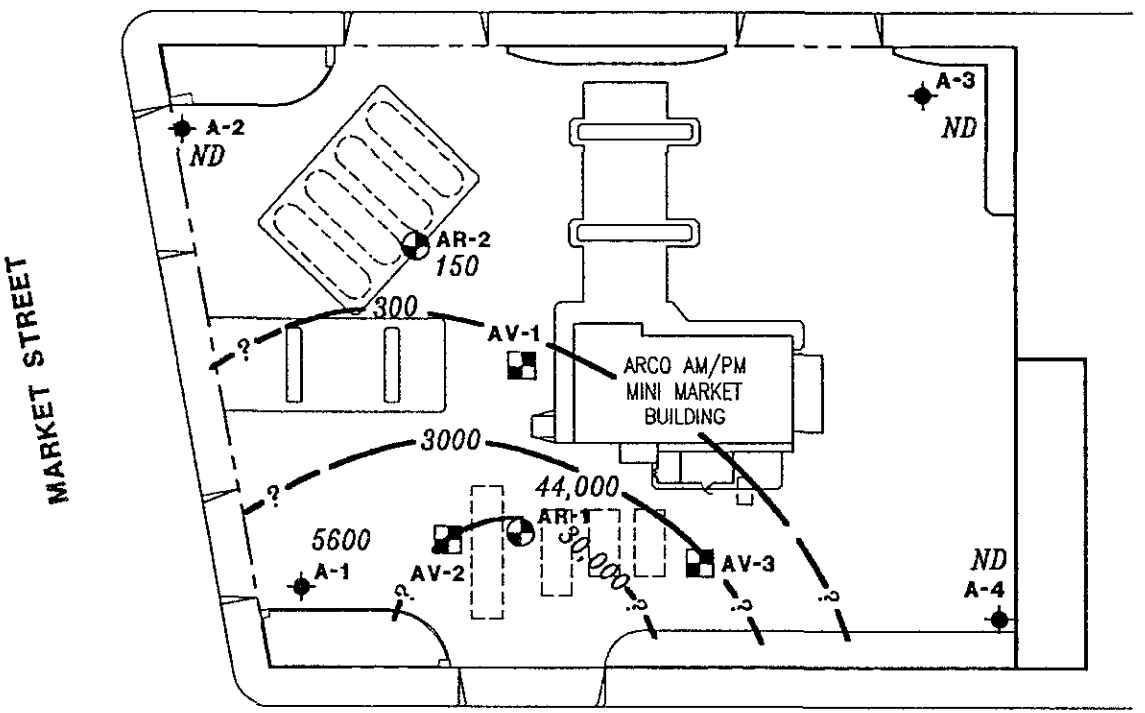
Base Map: ARCO Site Plan dated 6-17-83 and ARCO Tank & Line Replacement Site Plan dated 4-22-91

GeoStrategies Inc.

POTENTIOMETRIC MAP (JULY 17, 1992)
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 10

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4	RCM	8/92	11/92



EXPLANATION

- Ground–water monitoring well
- Ground–water recovery well
- Vapor extraction well
- 5.00 — TPH–G isoconcentration contour
- 5.0 — TPH–G (Total Petroleum Hydrocarbons calculated as Gasoline) concentration in ppb sampled on July 17, 1992
- ND — Not Detected (See laboratory reports for detection limits)

Base Map: ARCO Site Plan dated 6–17–83 and ARCO Tank & Line Replacement Site Plan dated 4–22–91

N

0 50

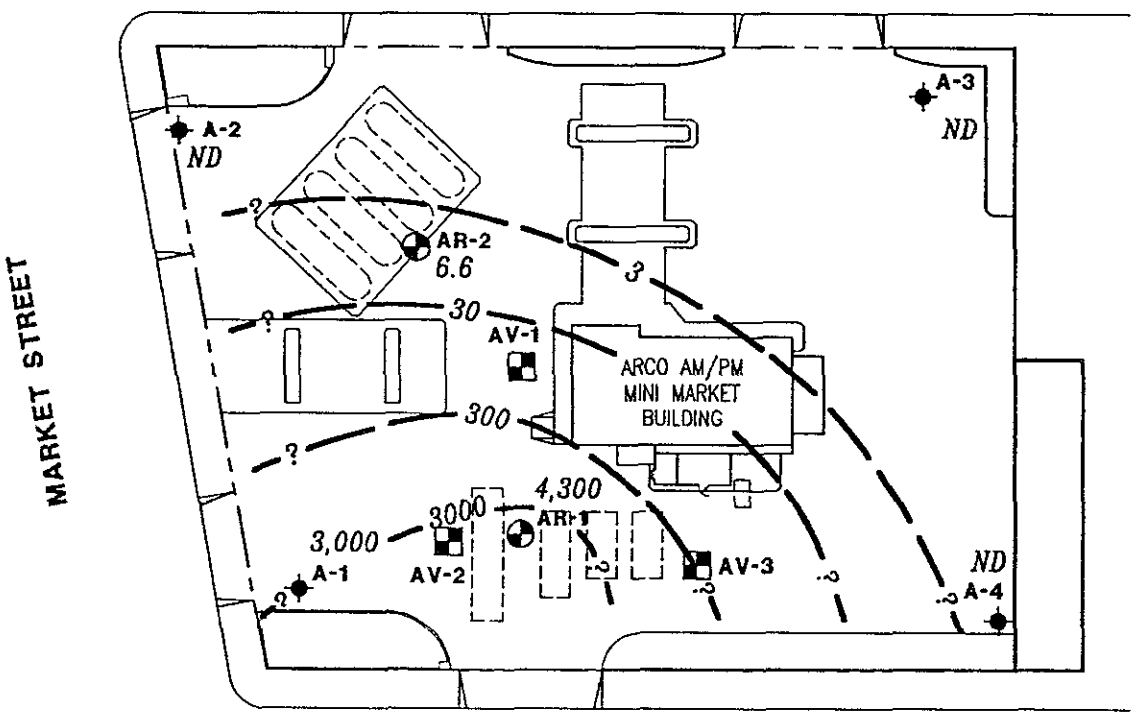
Scale in Feet

GeoStrategies Inc.

TPH–G ISOCONCENTRATION MAP
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 11

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705–4	MCm	8/92	11/92



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- Vapor extraction well
- 0.05 — Benzene isoconcentration contour
- *0.05* — Benzene concentration in ppb sampled on July 17, 1992
- *ND* — Not Detected (See laboratory reports for detection limits)

N

0 50

Scale in Feet

Base Map ARCO Site Plan dated 6-17-83 and ARCO Tank & Line Replacement Site Plan dated 4-22-91

GeoStrategies Inc.

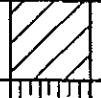
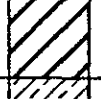
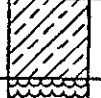
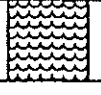
BENZENE ISOCONCENTRATION MAP

ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE **12**

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4	pcm	8/92	11/92

APPENDIX A
EXPLORATORY BORING LOGS
AND
WELL CONSTRUCTION DETAILS

MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 15% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 15% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS *OF MEDIUM TO HIGH PLASTICITY*
HIGHLY ORGANIC SOILS			PT		PEAT AND OTHER HIGHLY ORGANIC SOILS

LL - Liquid Limit (%)

PI - Plastic Index (%)

PID - Volatile Vapors in ppm

MA - *Particle Size Analysis*

2.5 YR 6/2 - Soil Color according to Munsell Soil Color Charts (1975 Edition)

5 GY 5/2 - GSA Rock Color Chart

- No Soil Sample Recovered
- "Undisturbed" Sample
- Bulk or Classification Sample
- First Encountered Ground Water Level
- Piezometric Ground Water Level

Penetration - Sample drive hammer weight - 140 pounds falling 30 inches. Blows required to drive sampler 1 foot are indicated on the logs

GeoStrategies Inc.

Unified Soil Classification - ASTM D 2488-85 and Key to Test Data

Field location of boring:

(See Plate 2)

Project No.:	792705	Date: 6/8/92	Boring No: AR-2
Client:	ARCO Products Company SS #2169		
Location:	889 W. Grand Avenue		
City:	Oakland		Sheet 1 of 2
Logged by:	RCM	Driller: W. Hazmat	

Casing installation data:

Drilling method: Hollow Stem Auger

Hole diameter: 10 - inches

Top of Box Elevation: Datum:

Water Level	15.0'			
Time	9:14			
Date	6/8/92			

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				Conductor casing to 10.5 feet.
				2				FILL - pea gravel to 15 feet.
				3				
				4				
				5				
				6				
				7				
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15		▽		
		S&H						SANDY SILT (ML) - yellowish brown (10 YR 5/4); very stiff; moist; 70% silt; 30% fine to coarse sand; trace gravel; greenish gray (5 GY 5/1) discoloration in rootholes.
			AR-2	16				
0	31		16.5					
				17				
				18				
				19				
				20				

Remarks: * Converted to equivalent standard penetration blows/ft.

GSI GeoStrategies Inc.

Log of Boring

BORING NO. AR-2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705		6/92		

Field location of boring:	Project No.: 792705	Date: 6/8/92	Boring No:
(See Plate 2)	Client: ARCO Products Co. SS #2169		AR-2
	Location: 889 W. Grand Avenue		
	City: Oakland, California		Sheet 2
	Logged by: RCM	Driller: W. Hazmat	of 2

Drilling method: Hollow Stem Auger
Hole diameter: 10 - inches
Casing installation data:
Top of Box Elevation: Datum:

Water Level			
Time			
Date			

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
		S&H	AR-2	21				SAND with GRAVEL (SW) - brown (10 YR 4/3); dense; saturated; 60% fine to coarse sand; 40% angular to sub-rounded, fine to medium gravel.
			21.0					
0	40							
				22				
				23				
				24				
				25				
		S&H						CLAYEY SAND (SC) - dark greenish gray (5 GY 4/1); dense; saturated; 80% fine to medium sand; 20% clay.
			AR-2	26				
0	35		26.5					SAND (SP) - dark greenish gray (5 GY 4/1); dense; saturated; 100% fine sand.
				27				
				28				
				29				
		S&H	AR-2					SILT with SAND (ML) - dark greenish gray (5 GY 4/1); hard; damp; 80% silt; 20% fine to coarse sand.
			30.0	30				
0	32							
				31				
				32				Bottom of boring at 30.5 feet. 6/8/92.
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				

Remarks:

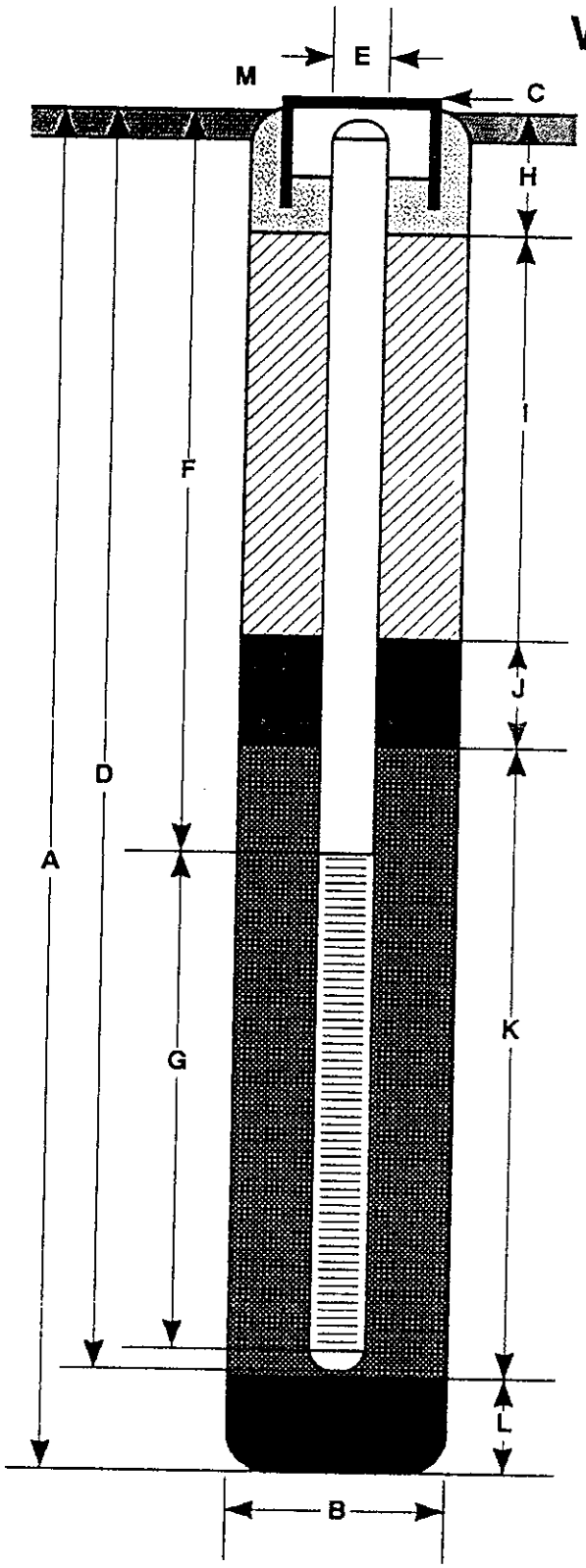
GeoStrategies Inc.

Log of Boring

BORING NO
AR-2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705		6/92		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 30.5 ft.

B Diameter of Boring 10 in.
Drilling Method Hollow Stem Auger

C Top of Box Elevation ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length 28.5 ft.
Material Sch. 40 PVC & Carbon Steel

E Casing Diameter 4 in.

F Depth to Top Perforations 8.5 ft.

G Perforated Length 20.0 ft.
Perforated Interval from 8.5 to 28.5 ft.
Perforation Type Continuous Wrap
Perforation Size 0.020 in.

H Surface Seal from 0 to 1.0 ft.
Seal Material Concrete

I Backfill from 1.0 to 6.5 ft.
Backfill Material Neat Cement

J Seal from 6.5 to 7.5 ft.
Seal Material Bentonite

K Gravel Pack from 7.5 to 28.5 ft.
Pack Material Lonestar #2/12 Graded Sand

L Bottom Seal 2 ft.
Seal Material Native Material

M Waterproof vault box with waterproof locking cap and lock.

Note: Depths measured from initial ground surface.

GSI GeoStrategies Inc.

Well Construction Detail

WELL NO. AR-2

JOB NUMBER	REVIEWED BY PG/CEG	DATE	REVISED DATE	REVISED DATE
792705-4		6/92		

Field location of boring:

(See Plate 2)

Project No.:	792705	Date: 6/8/92	Boring No: AV-1
Client:	ARCO Products Co. SS #2169		
Location:	889 W. Grand Avenue		
City:	Oakland, California		Sheet 1 of 1
Logged by:	RCM	Driller: W. Hazmat	

Drilling method: Hollow Stem Auger

Hole diameter: 8-inches

Casing installation data:

Top of Box Elevation: Datum:

Water Level	12.0'			
Time	14:35			
Date	6/8/92			

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				PAVEMENT SECTION - 1.0 feet.
				2				CLAY (CL) - black (10 YR 2/1); medium stiff; damp; 90 % clay; 10% fine sand.
				3				
				4				
				5				
		S&H						COLOR CHANGE to dark grayish brown (2.5 Y 4/2); very stiff; iron oxide staining in rootholes at 5.0 feet.
			AV-1	6				
444	22		6.5	7				
				8				
				9				
				10				
		S&H						
			AV-1	11				Minor greenish gray (5 GY 5/1) discoloration; moist at 11.5 feet.
2146	21		11.5					
		S&H		12		▽		Saturated at 12.0 feet.
1062	22			13				
		S&H	AV-1					
			14.0	14				
1875	29							CLAYEY SAND (SC) - light yellowish brown (2.5 Y 6/4); dense; saturated, 75% fine to medium sand, 25% clay; greenish gray (5 GY 5/1) discoloration in rootholes.
				15				
				16				
				17				Bottom of boring at 14.5 feet. 6/8/92.
				18				
				19				
				20				

Remarks: * Converted to equivalent standard penetration blows/ft.

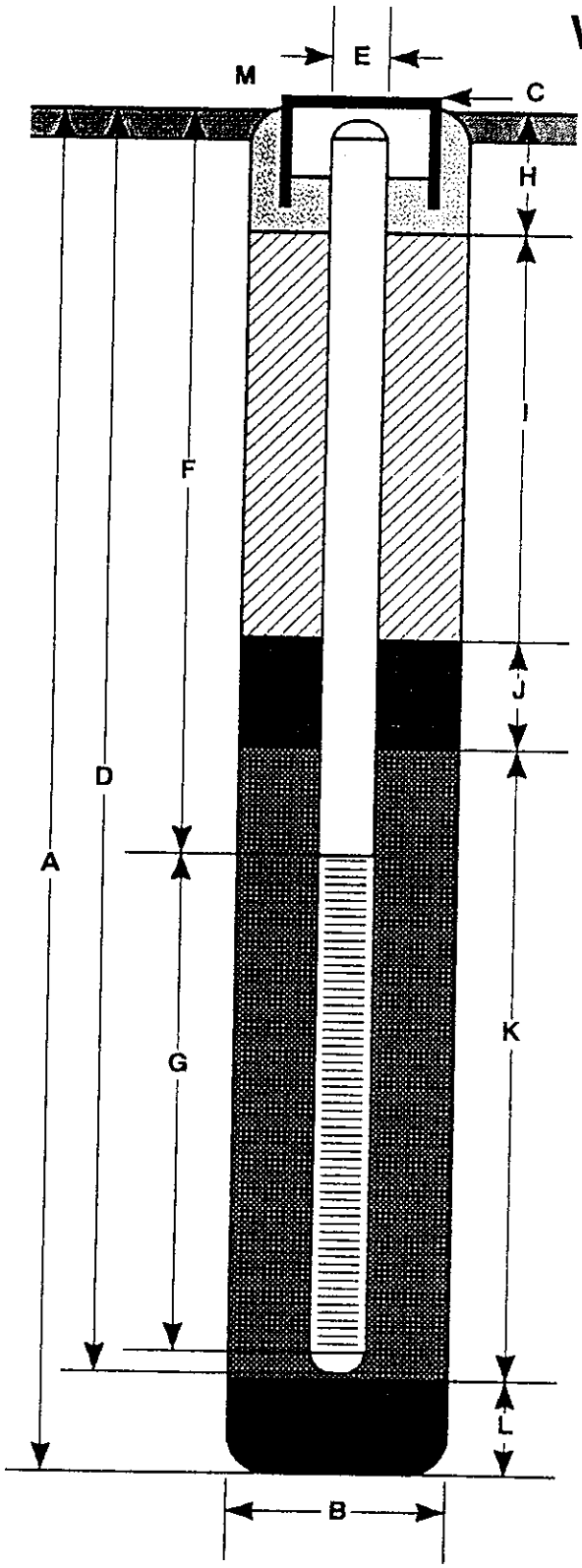
GSI GeoStrategies Inc.

Log of Boring

BORING NO. AV-1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705		6/92		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring: 14.5 ft.

B Diameter of Boring: 8 in.
Drilling Method: Hollow Stem Auger

C Top of Box Elevation: ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length: 14 ft.
Material: Schedule 40 PVC

E Casing Diameter: 2 in.

F Depth to Top Perforations: 5 ft.

G Perforated Length: 9 ft.
Perforated Interval from 5 to 14 ft.
Perforation Type: Factory Slotted
Perforation Size: 0.020 in.

H Surface Seal from 0 to 1.0 ft.
Seal Material: Concrete

I Backfill from 1.0 to 4.0 ft.
Backfill Material: Neat Cement

J Seal from 4.0 to 4.5 ft.
Seal Material: Bentonite

K Gravel Pack from 4.5 to 14.0 ft.
Pack Material: Lonestar #2/12 Graded Sand

L Bottom Seal: 0.5 ft.
Seal Material: Bentonite

M Waterproof vault box with waterproof locking cap and lock.

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO.
AV-1

JOB NUMBER	REVIEWED BY PG/CEG	DATE	REVISED DATE	REVISED DATE
792705-4		6/92		

Field location of boring:

(See Plate 2)

Project No.:	792705	Date: 6/8/92	Boring No. AV-2
Client:	ARCO Products Co. SS #2169		
Location:	889 W. Grand Avenue		
City:	Oakland, California		Sheet 1 of 1
Logged by:	RCM	Driller: W. Hazmat	

Drilling method: Hollow Stem Auger

Hole diameter: 8-inches

Casing installation data:

Top of Box Elevation: Datum:

Water Level	12.0'			
Time	15:40			
Date	6/8/92			

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				PAVEMENT SECTION - 1.0 feet.
				2				CLAY (CL) - very dark gray (10 YR 3/1); medium stiff; damp; 90 % clay; 5% fine sand; brick fragments.
				3				
				4				
				5				
		S&H						COLOR CHANGE to pale olive (5 Y 6/3); trace fine gravel at 5.0 feet.
			AV-2	6				
114	33		6.5	7				
				8				
				9				
				10				
		S&H						
			AV-2	11				
896	24		11.5					SAND with GRAVEL (SW) - yellowish brown (10 YR 5/4); medium dense, saturated; 80% fine to medium sand; 20% fine gravel.
		S&H		12		▽		
702	18			13				SANDY SILT (ML) - brown (10 YR 5/3); very stiff; saturated; 70% silt; 30% fine sand.
		S&H	AV-2					
			14.0	14				
655	31			15				
				16				Bottom of boring at 14.5 feet. 6/8/92.
				17				
				18				
				19				
				20				

Remarks: * Converted to equivalent standard penetration blows/ft.

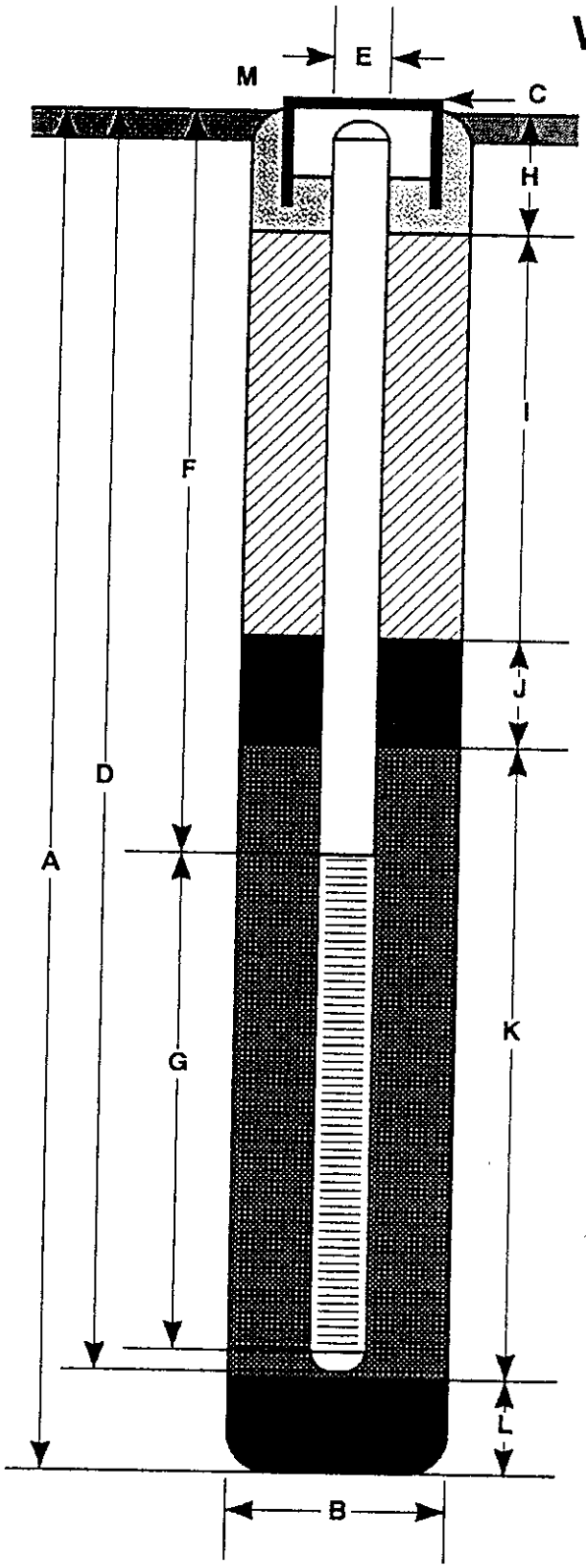
GSI GeoStrategies Inc.

Log of Boring

BORING NO. AV-2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705		6/92		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 14.5 ft.

B Diameter of Boring 8 in.
Drilling Method Hollow Stem Auger

C Top of Box Elevation _____ ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length 14 ft.
Material Schedule 40 PVC

E Casing Diameter 2 in.

F Depth to Top Perforations 5 ft.

G Perforated Length 9 ft.
Perforated Interv[redacted]
Perforation Type Factory Slotted
Perforation Size 0.020 in.

H Surface Seal from 0 to 1.0 ft.
Seal Material Concrete

I Backfill from 1.0 to 4.0 ft.
Backfill Material Neat Cement

J Seal from 4.0 to 4.5 ft.
Seal Material Bentonite

K Gravel Pack from 4.5 to 14.0 ft.
Pack Material Lonestar #2/12 Graded Sand

L Bottom Seal 0.5 ft.
Seal Material Bentonite

M Waterproof vault box with waterproof locking cap and lock.

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO. [redacted]

JOB NUMBER	REVIEWED BY PG/CEG	DATE	REVISED DATE	REVISED DATE
792705-4		6/92		

Field location of boring:

(See Plate 2)

Project No.:	792705	Date: 6/8/92	Boring No: AV-3
Client:	ARCO Products Co. SS #2169		
Location:	889 W. Grand Avenue		
City:	Oakland, California		Sheet 1 of 1
Logged by:	RCM	Driller: W. Hazmat	

Drilling method: Hollow Stem Auger

Hole diameter: 8-inches

Casing installation data:

Top of Box Elevation: Datum:

Water Level	12.0'			
Time	14:30			
Date	6/8/92			

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				PAVEMENT SECTION - 1.0 feet.
				2				CLAY (CL) - very dark gray (10 YR 3/1); medium stiff; damp; 95 % clay; 5% fine sand.
				3				
				4				
				5				
		S&H						COLOR CHANGE to light olive brown (2.5 Y 5/4); minor white nodules at 5.0 feet.
			AV-3	6				
186	12		6.5					
				7				
				8				
				9				
				10				
		S&H						Minor greenish gray (5 GY 5/1) discoloration; moist at 11.5 feet.
			AV-3	11				
765	18		11.5					
		S&H		12		▽		SILTY SAND (SM) - greenish gray (5 GY 5/1); medium dense, saturated; 65% fine to coarse sand; 35% silt.
435	20			13				
		S&H	AV-3					SANDY SILT (ML) - yellowish brown (10 YR 5/4); very stiff; saturated; 70% silt; 30% fine sand.
			14.0	14				
275	19							
				15				
				16				Bottom of boring at 14.5 feet. 6/8/92.
				17				
				18				
				19				
				20				

Remarks: * Converted to equivalent standard penetration blows/ft.

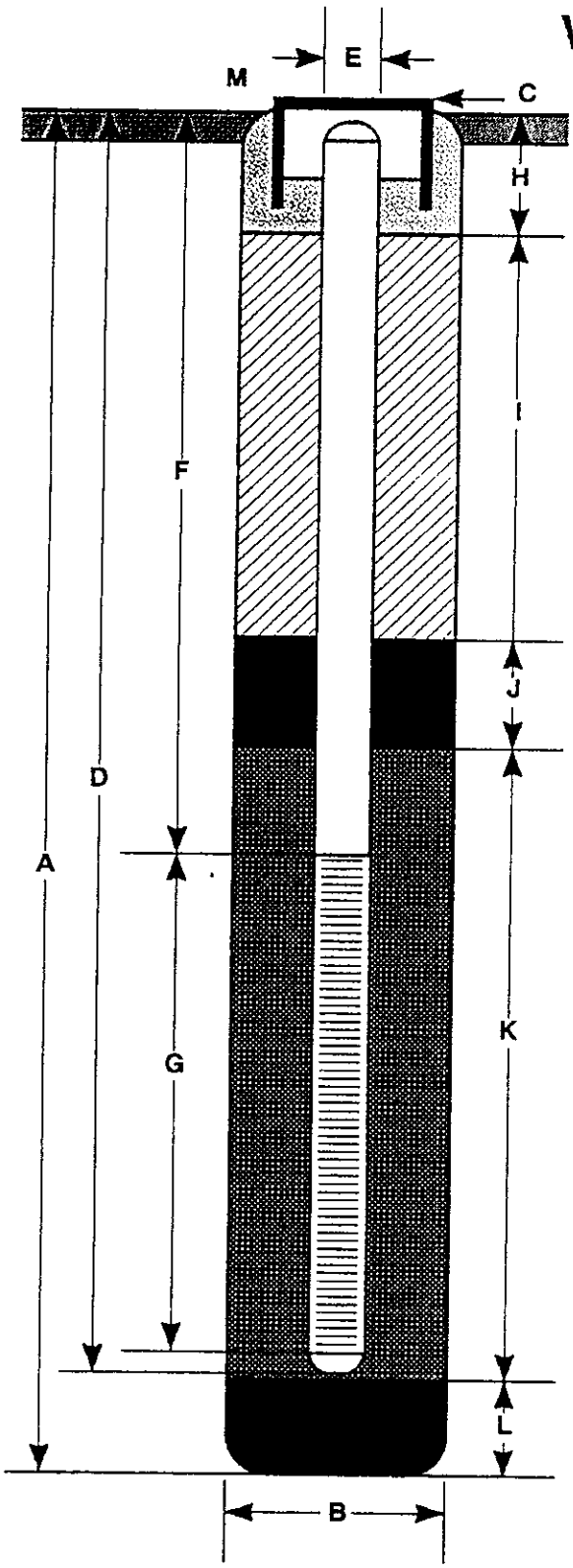
GeoStrategies Inc.

Log of Boring

BORING NO. AV-3

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705		6/92		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring: 14.5 ft.

B Diameter of Boring: 8 in.
Drilling Method: Hollow Stem Auger

C Top of Box Elevation: ____ ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length: 14 ft.
Material: Schedule 40 PVC

E Casing Diameter: 2 in.

F Depth to Top Perforations: 5.0 ft.

G Perforated Length: 9.0 ft.
Perforated Interval from 5 to 14 ft.
Perforation Type: Factory Slotted
Perforation Size: 0.020 in.

H Surface Seal from 0 to 1.0 ft.
Seal Material: Concrete

I Backfill from 1.0 to 4.0 ft.
Backfill Material: Neat Cement

J Seal from 4.0 to 4.5 ft.
Seal Material: Bentonite

K Gravel Pack from 4.5 to 14.0 ft.
Pack Material: Lonestar #2/12 Graded Sand

L Bottom Seal: 0.5 ft.
Seal Material: Bentonite

M Waterproof vault box with waterproof locking cap and lock.

Note: Depths measured from initial ground surface.

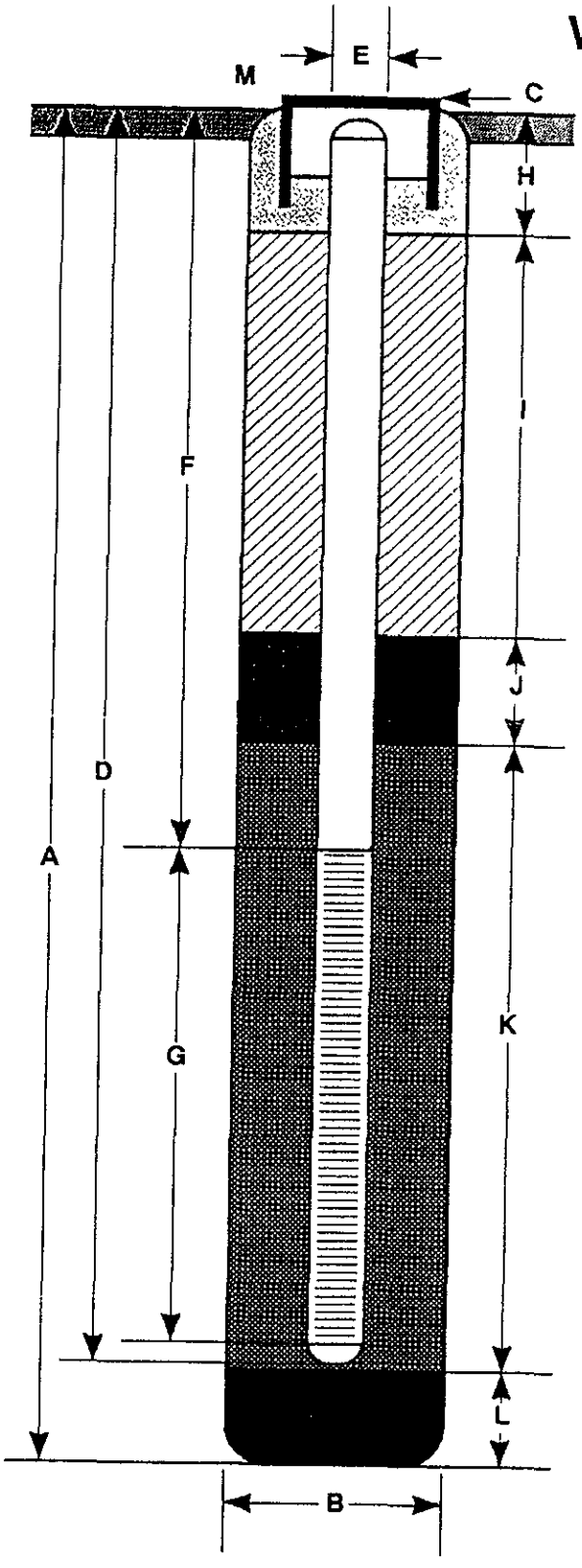
GSI GeoStrategies Inc.

Well Construction Detail

WELL NO. **AV-3**

JOB NUMBER	REVIEWED BY PG/CEG	DATE	REVISED DATE	REVISED DATE
792705-4		6/92		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 30.5 ft.

B Diameter of Boring 10 in.
Drilling Method Hollow Stem Auger

C Top of Box Elevation _____ ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length 28.5 ft.
Material Sch. 40 PVC & Carbon Steel

E Casing Diameter 4 in.

F Depth to Top Perforations 8.5 ft.

G Perforated Length 20.0 ft.
Perforated Interval from 8.5 to 28.5 ft.
Perforation Type Continuous Wrap
Perforation Size 0.020 in.

H Surface Seal from 0 to 1.0 ft.
Seal Material Concrete

I Backfill from 1.0 to 6.5 ft.
Backfill Material Neat Cement

J Seal from 6.5 to 7.5 ft.
Seal Material Bentonite

K Gravel Pack from 7.5 to 28.5 ft.
Pack Material Lonestar #2/12 Graded Sand

L Bottom Seal 2 ft.
Seal Material Native Material

M Waterproof vault box with waterproof locking cap and lock.

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO. **AR-2**

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705-4		6/92		

Field location of boring:

(See Plate 2)

Project No.:	792705	Date: 6/8/92	Boring No: AV-1
Client:	ARCO Products Co. SS #2169		
Location:	889 W. Grand Avenue		
City:	Oakland, California		Sheet 1 of 1
Logged by:	RCM	Driller: W. Hazmat	

Drilling method: Hollow Stem Auger

Hole diameter: 8-inches

Casing installation data:

Top of Box Elevation: Datum:

Water Level	12.0'			
Time	14:35			
Date	6/8/92			

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				PAVEMENT SECTION - 1.0 feet.
				2				CLAY (CL) - black (10 YR 2/1); medium stiff; damp; 90 % clay; 10% fine sand.
				3				
				4				
				5				
		S&H						COLOR CHANGE to dark grayish brown (2.5 Y 4/2); very stiff; iron oxide staining in rootholes at 5.0 feet.
			AV-1	6				
444	22		6.5	7				
				8				
				9				
				10				
		S&H						
			AV-1	11				Minor greenish gray (5 GY 5/1) discoloration; moist at 11.5 feet.
2146	21		11.5					
		S&H		12		▽		Saturated at 12.0 feet.
				13				
1062	22							
		S&H	AV-1					
			14.0	14				CLAYEY SAND (SC) - light yellowish brown (2.5 Y 6/4); dense; saturated, 75% fine to medium sand, 25% clay; greenish gray (5 GY 5/1) discoloration in rootholes.
1875	29			15				
				16				Bottom of boring at 14.5 feet. 6/8/92.
				17				
				18				
				19				
				20				

Remarks: * Converted to equivalent standard penetration blows/ft.

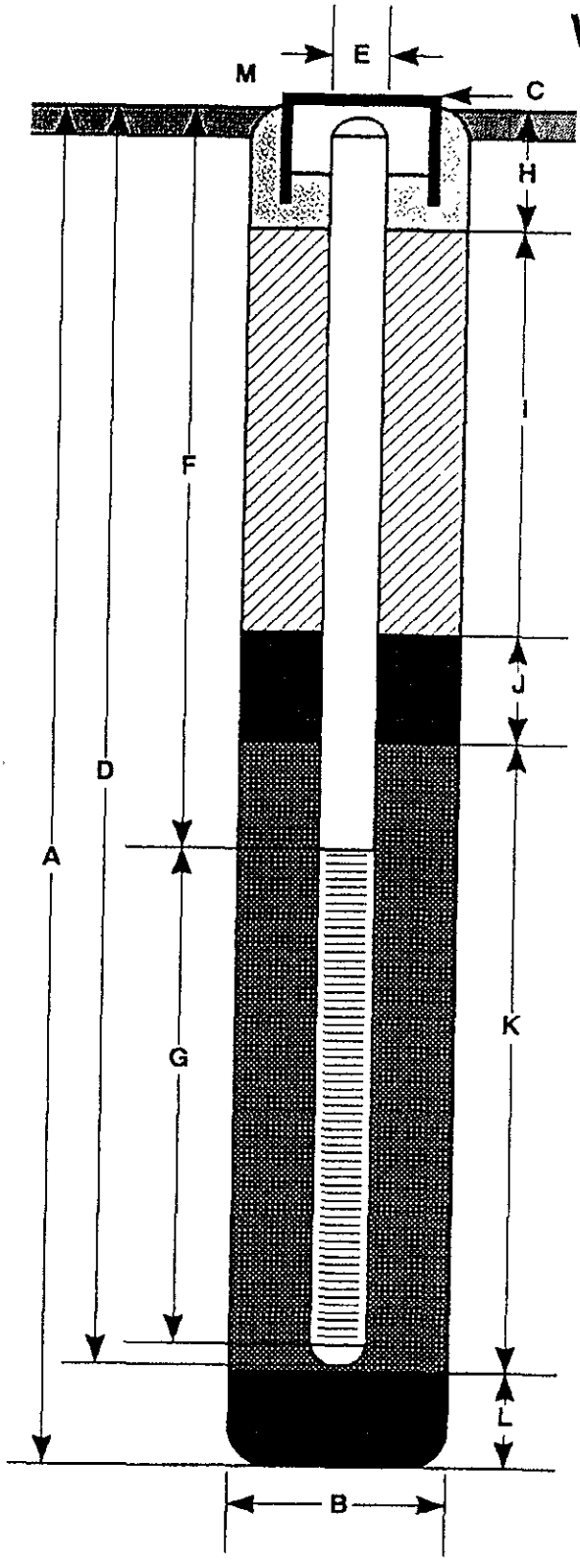
GSI GeoStrategies Inc.

Log of Boring

BORING NO. AV-1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705		6/92		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 14.5 ft.

B Diameter of Boring 8 in.
Drilling Method Hollow Stem Auger

C Top of Box Elevation _____ ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length 14 ft.
Material Schedule 40 PVC

E Casing Diameter 2 in.

F Depth to Top Perforations 5 ft.

G Perforated Length 9 ft.
Perforated Interval from 5 to 14 ft.
Perforation Type Factory Slotted
Perforation Size 0.020 in.

H Surface Seal from 0 to 1.0 ft.
Seal Material Concrete

I Backfill from 1.0 to 4.0 ft.
Backfill Material Neat Cement

J Seal from 4.0 to 4.5 ft.
Seal Material Bentonite

K Gravel Pack from 4.5 to 14.0 ft.
Pack Material Lonestar #2/12 Graded Sand

L Bottom Seal 0.5 ft.
Seal Material Bentonite

M Waterproof vault box with waterproof locking cap and lock.

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO.
AV-1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705-4		6/92		

Field location of boring:

(See Plate 2)

Project No.: 792705	Date: 6/8/92	Boring No.	
Client: ARCO Products Co. SS #2169		AV-2	
Location: 889 W. Grand Avenue			
City: Oakland, California		Sheet 1	
Logged by: RCM	Driller: W. Hazmat	of 1	

Drilling method: Hollow Stem Auger

Hole diameter: 8-inches

Casing installation data:

Top of Box Elevation: Datum:

Water Level	12.0'			
Time	15:40			
Date	6/8/92			

PID (ppm)	Blows/ft * or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				PAVEMENT SECTION - 1.0 feet.
				2				CLAY (CL) - very dark gray (10 YR 3/1); medium stiff; damp; 90 % clay; 5% fine sand; brick fragments.
				3				
				4				
				5				
		S&H						COLOR CHANGE to pale olive (5 Y 6/3); trace fine gravel at 5.0 feet.
			AV-2	6				
114	33		6.5					
				7				
				8				
				9				
				10				
		S&H						
			AV-2	11				
896	24		11.5					
		S&H		12		▽		SAND with GRAVEL (SW) - yellowish brown (10 YR 5/4); medium dense, saturated; 80% fine to medium sand; 20% fine gravel.
702	18			13				SANDY SILT (ML) - brown (10 YR 5/3); very stiff; saturated; 70% silt; 30% fine sand.
		S&H	AV-2					
			14.0	14				
655	31							
				15				
				16				Bottom of boring at 14.5 feet. 6/8/92.
				17				
				18				
				19				
				20				

Remarks: * Converted to equivalent standard penetration blows/ft.

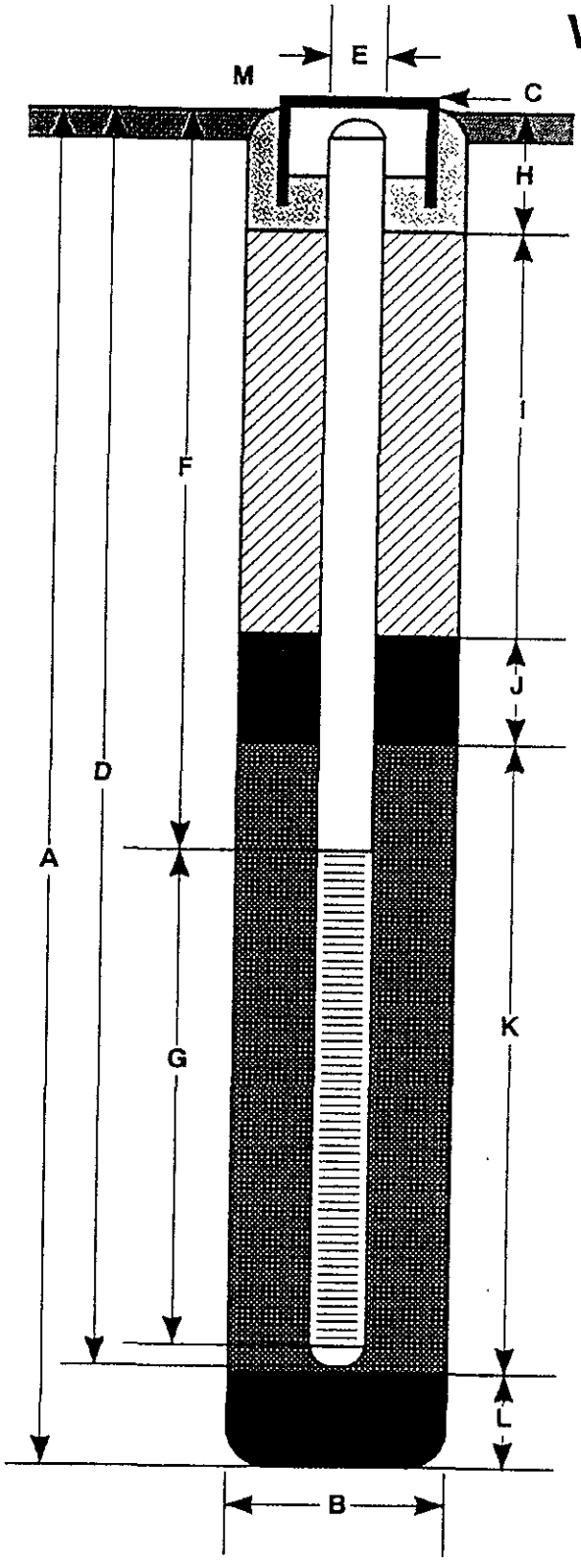
GSI GeoStrategies Inc.

Log of Boring

BORING NO. AV-2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705		6/92		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 14.5 ft.

B Diameter of Boring 8 in.
Drilling Method Hollow Stem Auger

C Top of Box Elevation _____ ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length 14 ft.
Material *Schedule 40 PVC*

E Casing Diameter 2 in.

F Depth to Top Perforations 5 ft.

G Perforated Length 9 ft.
Perforated Interv [redacted]
Perforation Type Factory Slotted
Perforation Size 0.020 in.

H Surface Seal from 0 to 1.0 ft.
Seal Material Concrete

I Backfill from 1.0 to 4.0 ft.
Backfill Material Neat Cement

J Seal from 4.0 to 4.5 ft.
Seal Material Bentonite

K Gravel Pack from 4.5 to 14.0 ft.
Pack Material Lonestar #2/12 Graded Sand

L Bottom Seal 0.5 ft.
Seal Material Bentonite

M Waterproof vault box with waterproof locking cap and lock.

Note: Depths measured from initial ground surface.

GSI GeoStrategies Inc.

Well Construction Detail

WELL NO. [redacted]

JOB NUMBER	REVIEWED BY PG/CEG	DATE	REVISED DATE	REVISED DATE
792705-4		6/92		

Field location of boring:

(See Plate 2)

Project No.:	792705	Date: 6/8/92	Boring No: AV-3
Client:	ARCO Products Co. SS #2169		
Location:	889 W. Grand Avenue		
City:	Oakland, California		Sheet 1 of 1
Logged by:	RCM	Driller: W. Hazmat	

Drilling method: Hollow Stem Auger

Hole diameter: 8-inches

Casing installation data:

Top of Box Elevation: Datum:

Water Level	12.0'			
Time	14:30			
Date	6/8/92			

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				PAVEMENT SECTION - 1.0 feet.
				2				CLAY (CL) - very dark gray (10 YR 3/1); *medium stiff*; damp; 95 % clay; 5% fine sand.
				3				
				4				
				5				
		S&H						COLOR CHANGE to light olive brown (2.5 Y 5/4); minor white nodules at 5.0 feet.
			AV-3	6				
186	12		6.5					
				7				
				8				
				9				
				10				
		S&H						Minor greenish gray (5 GY 5/1) discoloration; moist at 11.5 feet.
			AV-3	11				
765	18		11.5					
		S&H		12		▽		SILTY SAND (SM) - greenish gray (5 GY 5/1); medium dense, saturated; 65% fine to coarse sand; 35% silt.
435	20			13				
		S&H	AV-3					SANDY SILT (ML) - yellowish brown (10 YR 5/4); very stiff; saturated; 70% silt; 30% fine sand.
			14.0	14				
275	19							
				15				
				16				*Bottom of boring at 14.5 feet.* 6/8/92.
				17				
				18				
				19				
				20				

Remarks: * Converted to equivalent standard penetration blows/ft.

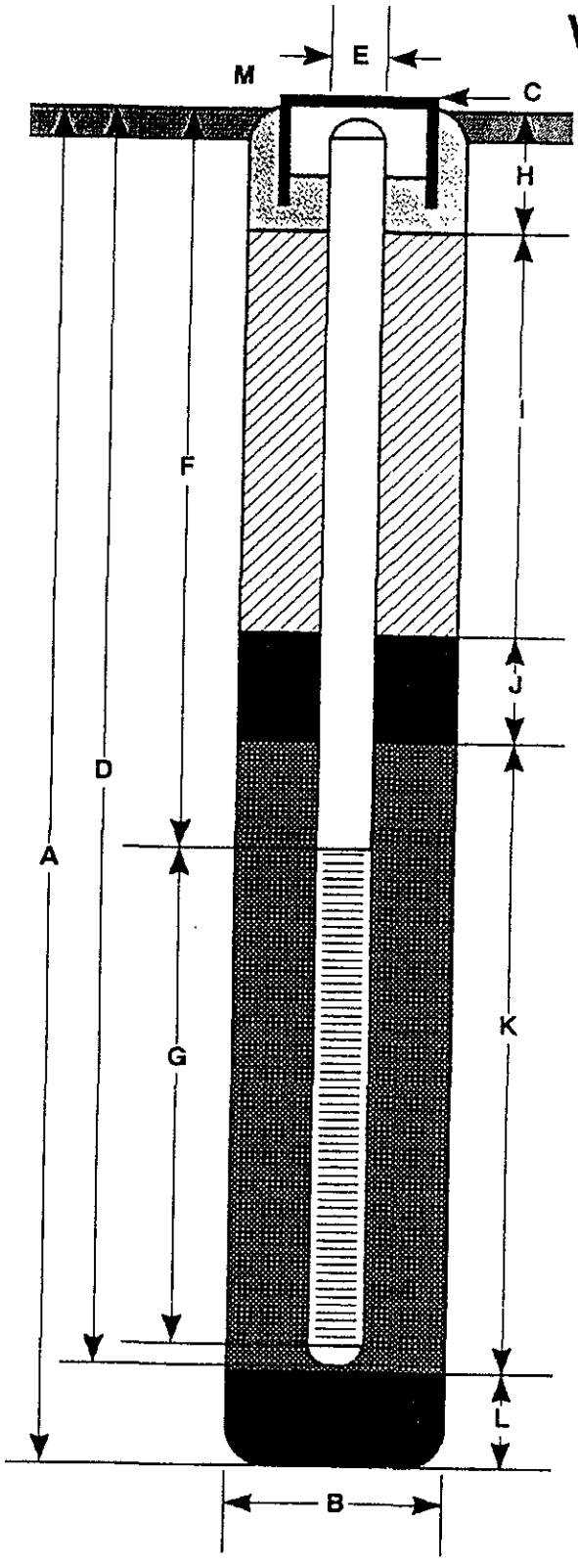
GSI GeoStrategies Inc.

Log of Boring

BORING NO. AV-3

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705		6/92		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 14.5 ft.

B Diameter of Boring 8 in.
Drilling Method Hollow Stem Auger

C Top of Box Elevation _____ ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length 14 ft.
Material Schedule 40 PVC

E Casing Diameter 2 in.

F *Depth to Top Perforations* 5.0 ft.

G Perforated Length 9.0 ft.
Perforated Interval from 5 to 14 ft.
Perforation Type Factory Slotted
Perforation Size 0.020 in.

H Surface Seal from 0 to 1.0 ft.
Seal Material Concrete

I Backfill from 1.0 to 4.0 ft.
Backfill Material Neat Cement

J Seal from 4.0 to 4.5 ft.
Seal Material Bentonite

K Gravel Pack from 4.5 to 14.0 ft.
Pack Material Lonestar #2/12 Graded Sand

L Bottom Seal 0.5 ft.
Seal Material Bentonite

M Waterproof vault box with waterproof locking cap and lock.

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO.
AV-3

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
792705-4		6/92		

APPENDIX B
SOIL CHEMICAL ANALYTICAL REPORT
AND
CHAIN-OF-CUSTODY FORM

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: John Vargas

Project: Arco 2169, Oakland

Enclosed are the results from 6 soil samples received at Sequoia Analytical on April 9,1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2061686	Soil, AV-1-6.5	6/8/92	EPA 3550/8015 EPA 5030/8015/8020
2061687	Soil, AV-1-11.5	6/8/92	EPA 3550/8015 EPA 5030/8015/8020
2061688	Soil, AV-2-6.5	6/8/92	EPA 3550/8015 EPA 5030/8015/8020
2061689	Soil, AV-2-11.5	6/8/92	EPA 3550/8015 EPA 5030/8015/8020
2061690	Soil, AV-3-6.5	6/8/92	EPA 3550/8015 EPA 5030/8015/8020
2061691	Soil, AV-3-11.5	6/8/92	EPA 3550/8015 EPA 5030/8015/8020

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Christine Middleton
for Nokowhat D. Herrera
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan	Client Project ID:	Arco 2169, Oakland	Sampled:	Jun 8, 1992
2150 W. Winton Avenue	Matrix Descript:	Soil	Received:	Jun 9, 1992
Hayward, CA 94545	Analysis Method:	EPA 3550/8015	Extracted:	Jun 11, 1992
Attention: John Vargas	First Sample #:	206-1686	Analyzed:	Jun 11, 1992
			Amended:	Jun 22, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
206-1686	AV-1-6.5	N.D.
206-1687	AV-1-11.5	N.D.
206-1688	AV-2-6.5	N.D.
206-1689	AV-2-11.5	N.D.
206-1690	AV-3-6.5	N.D.
206-1691	AV-3-11.5	N.D.

Detection Limits:	**1.0**

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Christine Middleton

Nokowhat D. Herrera
Project Manager

Please Note:
Samples 2061687, 89 & 91 appear to contain gasoline.

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: John Vargas

Client Project ID: Arco 2169, Oakland

QC Sample Group: 2061686 - 91

Amended: Jun 22, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Diesel

Method:	EPA 8015
Analyst:	R.Lee
Reporting Units:	mg/kg
Date Analyzed:	Jun 11, 1992
QC Sample #:	DBLK061192

Sample Conc.:	N.D.
Spike Conc. Added:	15
Conc. Matrix Spike:	11
Matrix Spike % Recovery:	73
Conc. Matrix Spike Dup.:	12
Matrix Spike Duplicate % Recovery:	80
Relative % Difference:	8.7

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

SEQUOIA ANALYTICAL
680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan	Client Project ID:	Arco 2169, Oakland	Sampled:	Jun 8, 1992
2150 W. Winton Avenue	Matrix Descript:	Soil	Received:	Jun 9, 1992
Hayward, CA 94545	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Jun 11, 1992
Attention: John Vargas	First Sample #:	206-1686	Amended:	Jun 22, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
206-1686	AV-1-6.5	N.D.	0.15	0.019	0.014	0.062
206-1687	AV-1-11.5	12	0.81	1.3	0.27	1.5
206-1688	AV-2-6.5	1.8	0.31	0.15	0.036	0.21
206-1689	AV-2-11.5	1,500	21	84	27	170
206-1690	AV-3-6.5	N.D.	0.037	N.D.	0.018	0.028
206-1691	AV-3-11.5	110	2.4	4.6	1.9	10
Detection Limits:		**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Christine Middleton
per Nokowhat D. Herrera
Project Manager

Please Note:
The above samples appear to contain gasoline.

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: John Vargas

Client Project ID: Arco 2169, Oakland

QC Sample Group: 2061686 - 91

Amended: Jun 22, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	L.Laikhtman	L.Laikhtman	L.Laikhtman	L.Laikhtman
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jun 11, 1992	Jun 11, 1992	Jun 11, 1992	Jun 11, 1992
QC Sample #:	GBLK061192	GBLK061192	GBLK061192	GBLK061192
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.23	0.22	0.22	0.66
Matrix Spike % Recovery:	115	110	110	110
Conc. Matrix Spike Dup.:	0.24	0.24	0.23	0.70
Matrix Spike Duplicate % Recovery:	120	120	115	117
Relative % Difference:	4.3	8.7	4.4	5.8

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

for Nokowhat D. Herrera
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 2169-92-2

Chain of Custody

ARCO Facility no. 2169	City (Facility) OAKLAND	Project manager (Consultant) JOHN VARGAS	Laboratory name SEQUOIA
ARCO engineer MICHAEL WHELAN	Telephone no. (ARCO)	Telephone no. (Consultant) (510)-352-4800	Fax no. (Consultant) (510)-783-1089	Contract number 07-073
Consultant name GeoSTRATEGIES INC.	Address (Consultant) 2150 W. WINTON AVE, HAYWARD		Method of shipment COURIER

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☒	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
AV-1-6.5		1	X			X		6/8/92	14:00		X	X			2X6		1686			
AV-1-11.5		1	X			X		6/8/92	14:15		X	X					1687			
AV-2-6.5		1	X			X		6/8/92	15:15		X	X					1688			
AV-2-11.5		1	X			X		6/8/92	15:30		X	X					1689			
AV-3-6.5		1	X			X		6/8/92	16:20		X	X					1690			
AV-3-11.5		1	X			X		6/8/92	16:30		X	X				V	1691			

Special detection Limit/reporting: LOWEST POSSIBLE

Special QA/QC: NORMAL

Remarks

Lab number

Turnaround time

Priority Rush 1 Business Day ☐

Rush 2 Business Days ☐

Expedited 5 Business Days ☐

Standard 10 Business Days ☒

Condition of sample: good

Temperature received: cool

	Date	Time		Date	Time
Relinquished by Sampler: Robert M. Melling	6/9/92	15:26	Received by: Mark V. Ellis	6-9-92	5:26
Relinquished by: Mark V. Ellis	6-9-92	4:00	Received by:		
Relinquished by:			Received by laboratory: [illegible]	6-9	1600

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering, Pink copy — Consultant

ARPC 3292 (2-91)

APPENDIX C
AIR CHEMICAL ANALYTICAL REPORT
AND
CHAIN-OF-CUSTODY FORM

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Barry McCoy

Project: 9927.06, Arco 2169, Oakland

Enclosed are the results from 2 special matrix samples received at Sequoia Analytical on June 11,1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2061972	Air, Influent	5/29/92	EPA 5030/8015/8020
2061973	Air, Effluent	5/29/92	EPA 5030/8015/8020

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Christine Middleton

Nokowhat D. Herrera
Project Manager

927-A

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan	Client Project ID:	9927.06, Arco 2169, Oakland	Sampled:	Jun 11, 1992
2150 W. Winton Avenue	Matrix Descript:	Air	Received:	Jun 11, 1992
Hayward, CA 94545	Analysis Method:	EPA 5030/8015/8020	Analyzed:	6/11-12/92
Attention: Barry McCoy	First Sample #:	206-1972	Reported:	Jun 15, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons ppmv	Benzene ppmv	Toluene ppmv	Ethyl Benzene ppmv	Xylenes ppmv
206-1972	Influent	24,000	1,300	1,200	85	350
206-1973	Effluent	13	1.9	0.29	0.10	0.51
Detection Limits:		**2.3**	**0.019**	**0.016**	**0.014**	**0.014**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

Please Note:
A molecular weight of 65 was used to calculate ppmv for TPH-G.

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Barry McCoy

Client Project ID: 9927.06, Arco 2169, Oakland

QC Sample Group: 206-1972

Reported: Jun 15, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M.Nipp	M.Nipp	M.Nipp	M.Nipp
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Jun 12, 1992	Jun 12, 1992	Jun 12, 1992	Jun 12, 1992
QC Sample #:	GBLK061292	GBLK061292	GBLK061292	GBLK061292
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	8.8	8.8	8.9	27
Matrix Spike % Recovery:	88	88	8.7	90
Conc. Matrix Spike Dup.:	8.6	8.6	8.7	26
Matrix Spike Duplicate % Recovery:	86	86	87	87
Relative % Difference:	2.3	2.3	2.3	3.8

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

% Recovery:	$\frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}}$	x 100
Relative % Difference:	$\frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}}$	x 100

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Barry McCoy

Client Project ID: 9927.06, Arco 2169, Oakland

QC Sample Group: 206-1973

Reported: Jun 15, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M.Nipp	M.Nipp	M.Nipp	M.Nipp
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Jun 11, 1992	Jun 11, 1992	Jun 11, 1992	Jun 11, 1992
QC Sample #:	GBLK061192	GBLK061192	GBLK061192	GBLK061192
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	10	11	11	33
Matrix Spike % Recovery:	100	110	110	110
Conc. Matrix Spike Dup.:	9.9	10	11	32
Matrix Spike Duplicate % Recovery:	99	100	110	107
Relative % Difference:	1.0	9.5	0.0	3.1

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

2061972.GET <3>

ARCO Products Company
Division of Atlantic Richfield Company

Chain of Custody

Task Order No. 2169-92-2

COPY

ARCO Facility no: 2169	City (Facility): Oakland	Project manager (Consultant): John Vargas	Laboratory name: Seq
ARCO engineer: Mike Whelan	Telephone no. (ARCO):	Telephone no. (Consultant): (510) 583-3500	Fax no. (Consultant): (510) 783-1089
Consultant name: Gettler-Ryan Inc.	Address (Consultant): 3150 W. Winton, Hayward, CA 94545		Contract number: 07-073

Sample I.D.	Lab no.	Container no	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	
Influent		1			Air			6-11-92	1415		X			2061972							
Effluent		1			Air			6-11-92	1420		X			↓ 73							

Special detection Limit/reporting: Standard

Special QA/QC: Standard

Remarks: GR# 992706
Influent - Sample Type
Effluent - Exhaust

Lab number:

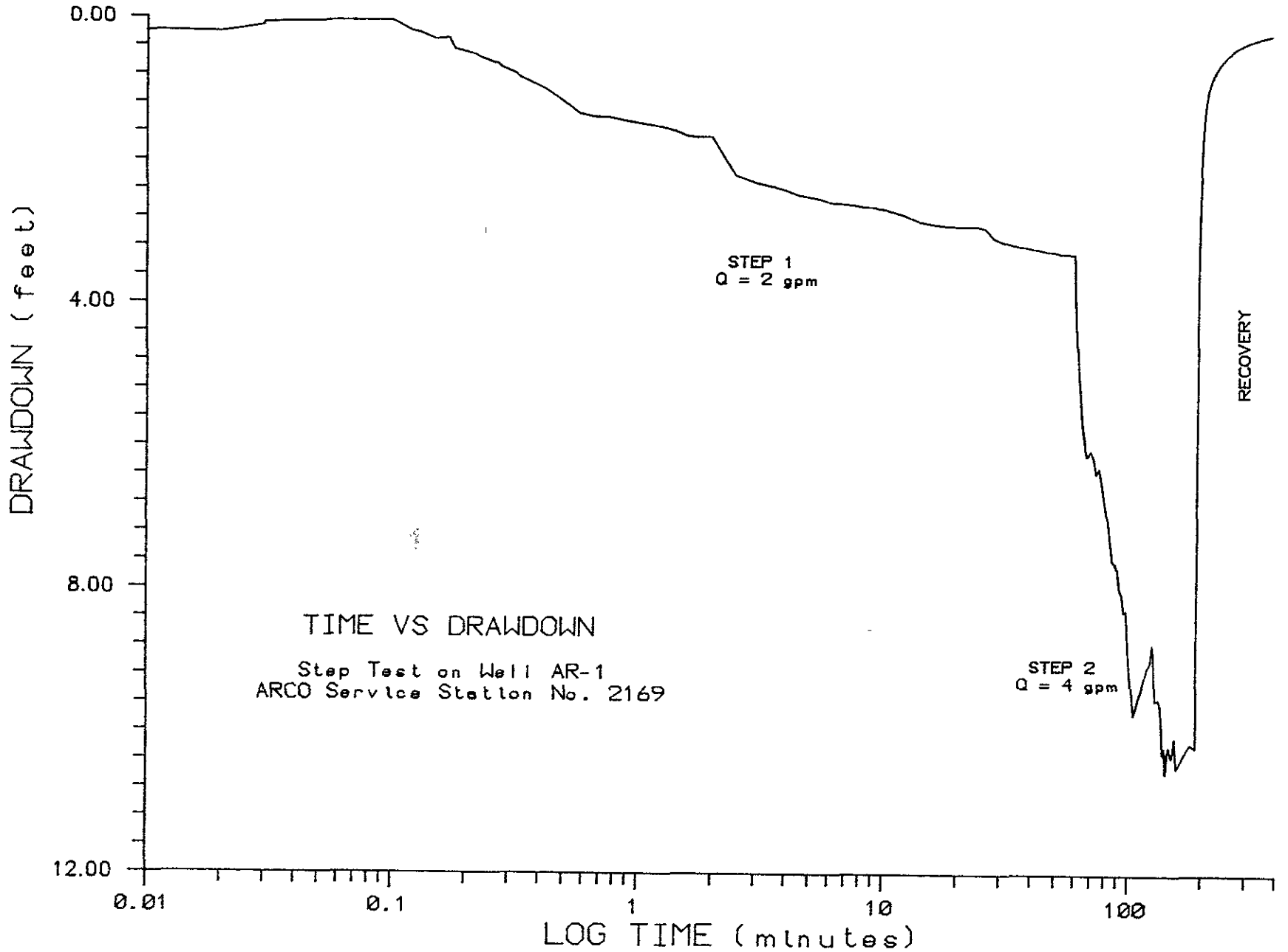
Condition of sample: Good		Temperature received:	
Relinquished by sampler:	Date: 6-11-92	Time: 1432	Received by: B. McCoy
Relinquished by: B. McCoy	Date: 6-11-92	Time: 1611	Received by:
Relinquished by:	Date:	Time:	Received by laboratory:	Date: 6-11	Time: 1611

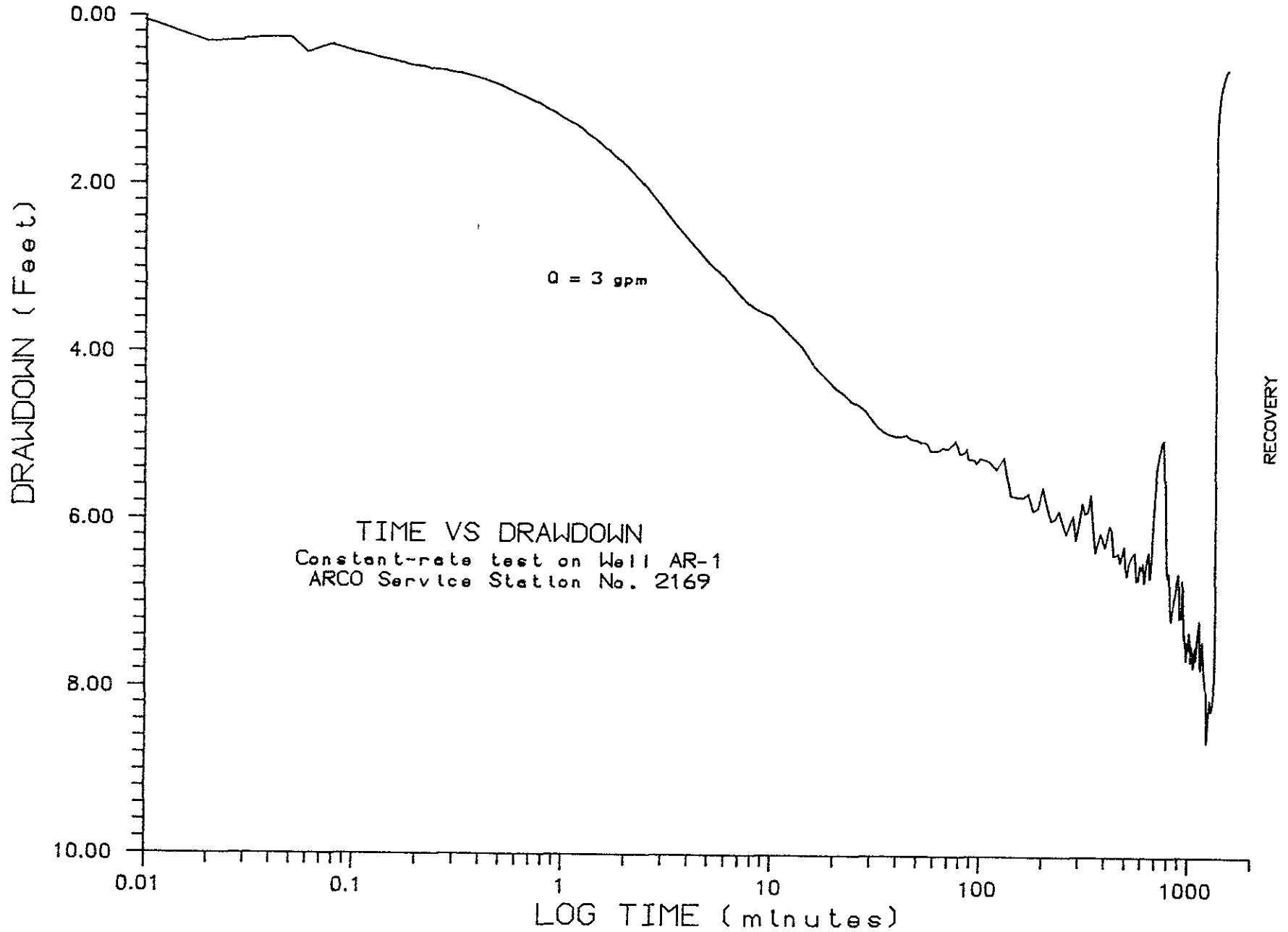
Turnaround time

- Priority Rush 1 Business Day ☑
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering, Pink copy — Consultant
APPC-3292 (2-91)

APPENDIX D
TIME VS. DRAWDOWN

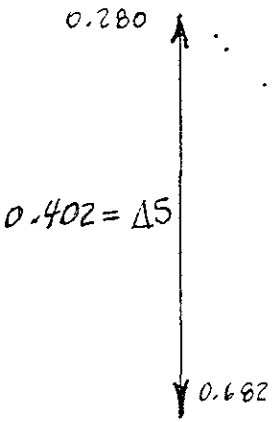

0.00
4.00
8.00
12.00
DRAWDOWN (feet)
0.01
0.1
1
10
100
LOG TIME (minutes)
STEP 1
Q = 2 gpm
STEP 2
Q = 4 gpm
RECOVERY
TIME VS DRAWDOWN
Step Test on Well AR-1
ARCO Service Station No. 2169


0.00
2.00
4.00
6.00
8.00
10.00
DRAWDOWN (Feet)
Q = 3 gpm
RECOVERY
TIME VS DRAWDOWN
Constant-rate test on Well AR-1
ARCO Service Station No. 2169
0.01
0.1
1
10
100
1000
LOG TIME (minutes)

APPENDIX E
FIELD DATA PLOTS: JACOB METHOD

Constant rate

A-1



$$T = \frac{264\,(Q)}{\Delta s}$$

$$T = \frac{264\,(3)}{0.402}$$

$$\boxed{T = 1.97 \times 10^{3}}$$

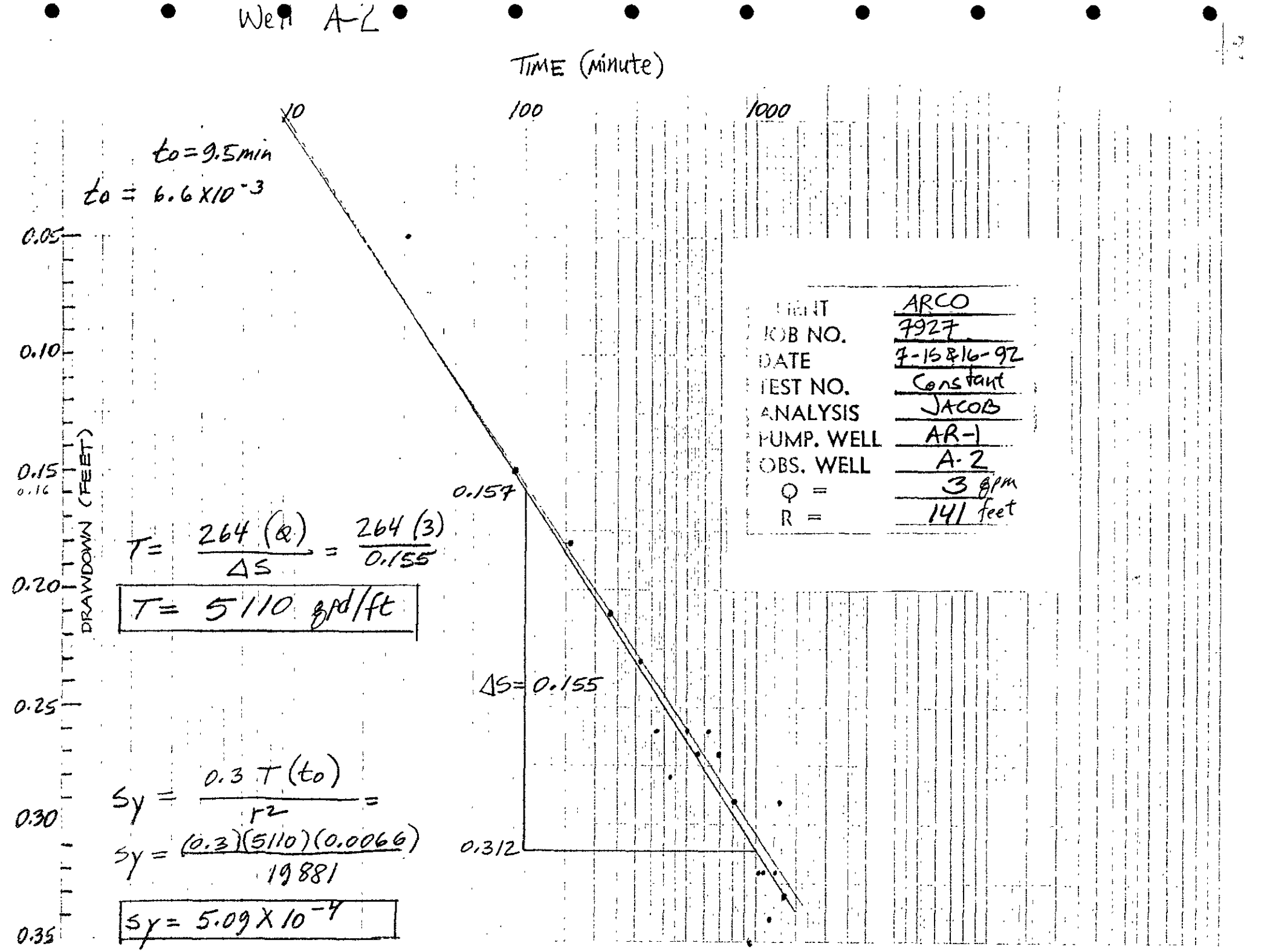
$$S_y = \frac{0.3\,(T)\,t_o}{r^2}$$

$$S_y = \frac{0.3\,(1.9 \times 10^{3})\,0.0029}{59^2}$$

$$\boxed{S_y = 4.75 \times 10^{-4}}$$

CLIENT	ARCO
JOB NO.	7927
DATE	15 July 92
TEST NO.	Constant
ANALYSIS	Jacob
PUMP. WELL	AR-1
OBS. WELL	A-1
Q =	.3 gpm
R =	59 feet

Well A-2



$t_o = 9.5 \text{ min}$

$t_o = 6.6 \times 10^{-3}$

$$T = \frac{264\,(Q)}{\Delta S} = \frac{264\,(3)}{0.155}$$

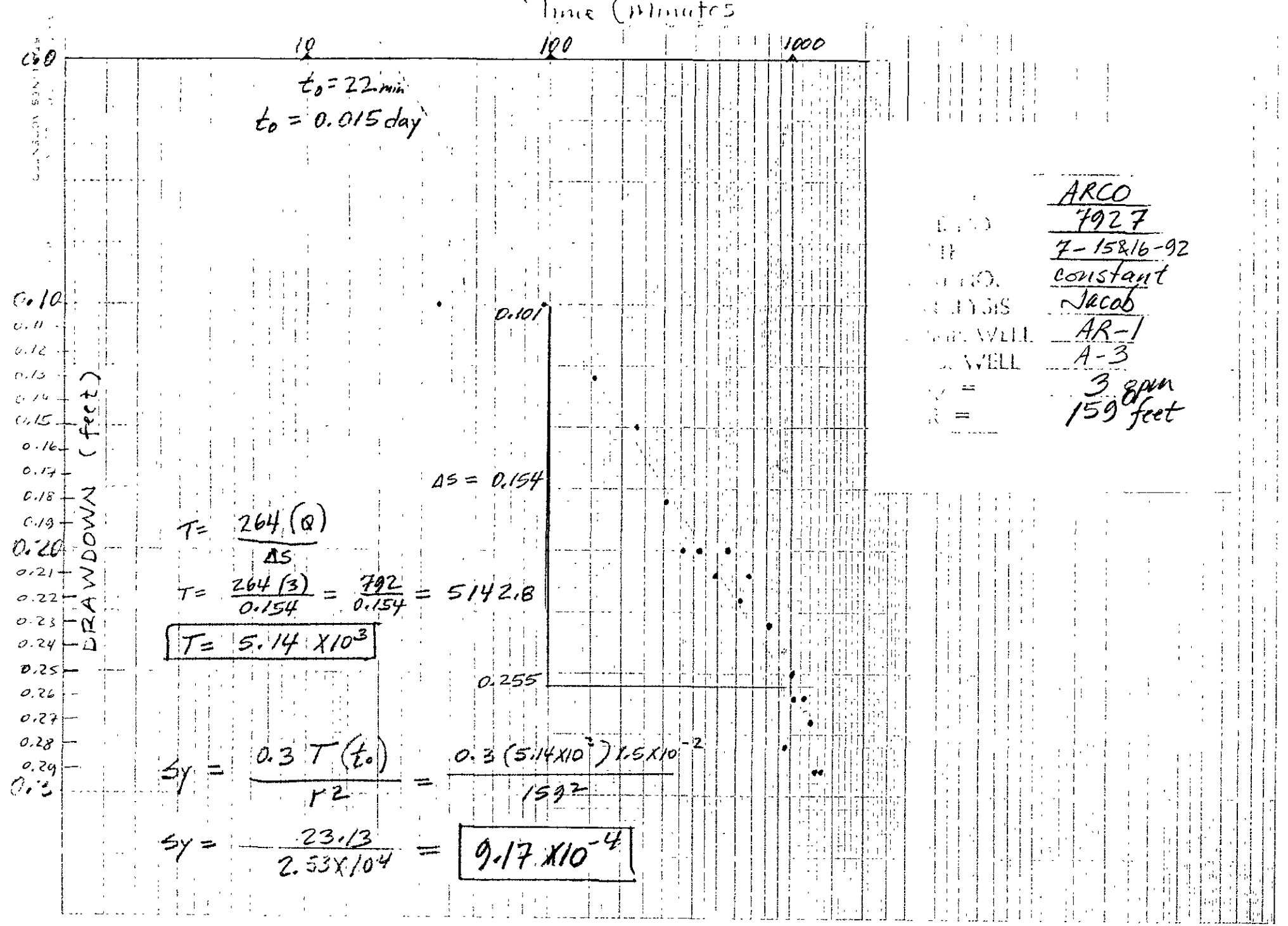
$$\boxed{T = 5110 \text{ gpd/ft}}$$

$$S_y = \frac{0.3\,T\,(t_o)}{r^2} =$$

$$S_y = \frac{(0.3)(5110)(0.0066)}{19881}$$

$$\boxed{S_y = 5.09 \times 10^{-4}}$$

Constant WELL A-3



ARCO
7927
7-15&16-92
constant
Jacob
AR-1
A-3
3 span
159 feet

$$T = \frac{264\,(Q)}{\Delta S}$$

$$T = \frac{264\,(3)}{0.154} = \frac{792}{0.154} = 5142.8$$

$$\boxed{T = 5.14 \times 10^3}$$

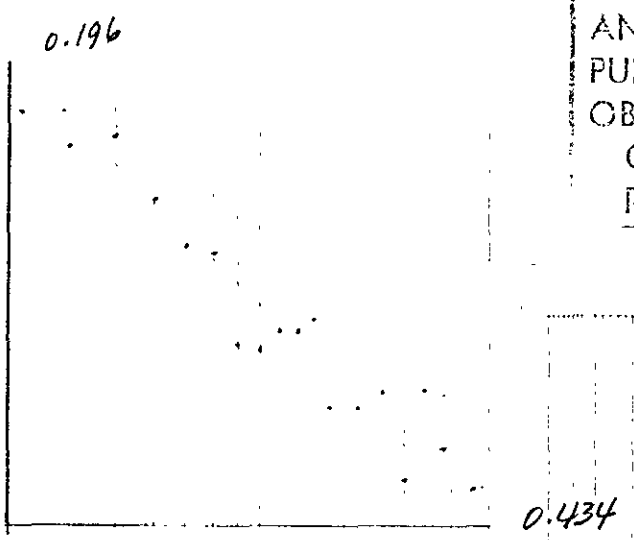
$$Sy = \frac{0.3\,T\,(t_o)}{r^2} = \frac{0.3\,(5.14 \times 10^3)\,1.5 \times 10^{-2}}{15^2}$$

$$Sy = \frac{23.13}{2.53 \times 10^4} = \boxed{9.17 \times 10^{-4}}$$

$t_o = 7.6 \text{ min}$

$t_o = 3.2 \times 10^{-3}$

CLIENT	ARCO
JOB NO.	7927
DATE	15 July 92
TEST NO.	Constan
ANALYSIS	Jacob
PUMP. WELL	AR-1
OBS. WELL	A-4
Q =	3 gpm
R =	128 feet



.196
.434

$\Delta s = .434 - .196$

$\Delta s = 0.238$

$$T = \frac{264 Q}{\Delta s}$$

$$T = \frac{264(3)}{0.238}$$

$$\boxed{T = 3.33 \times 10^3 \text{ gpd/ft.}}$$

$$Sy = \frac{0.3\, T (t_o)}{r^2}$$

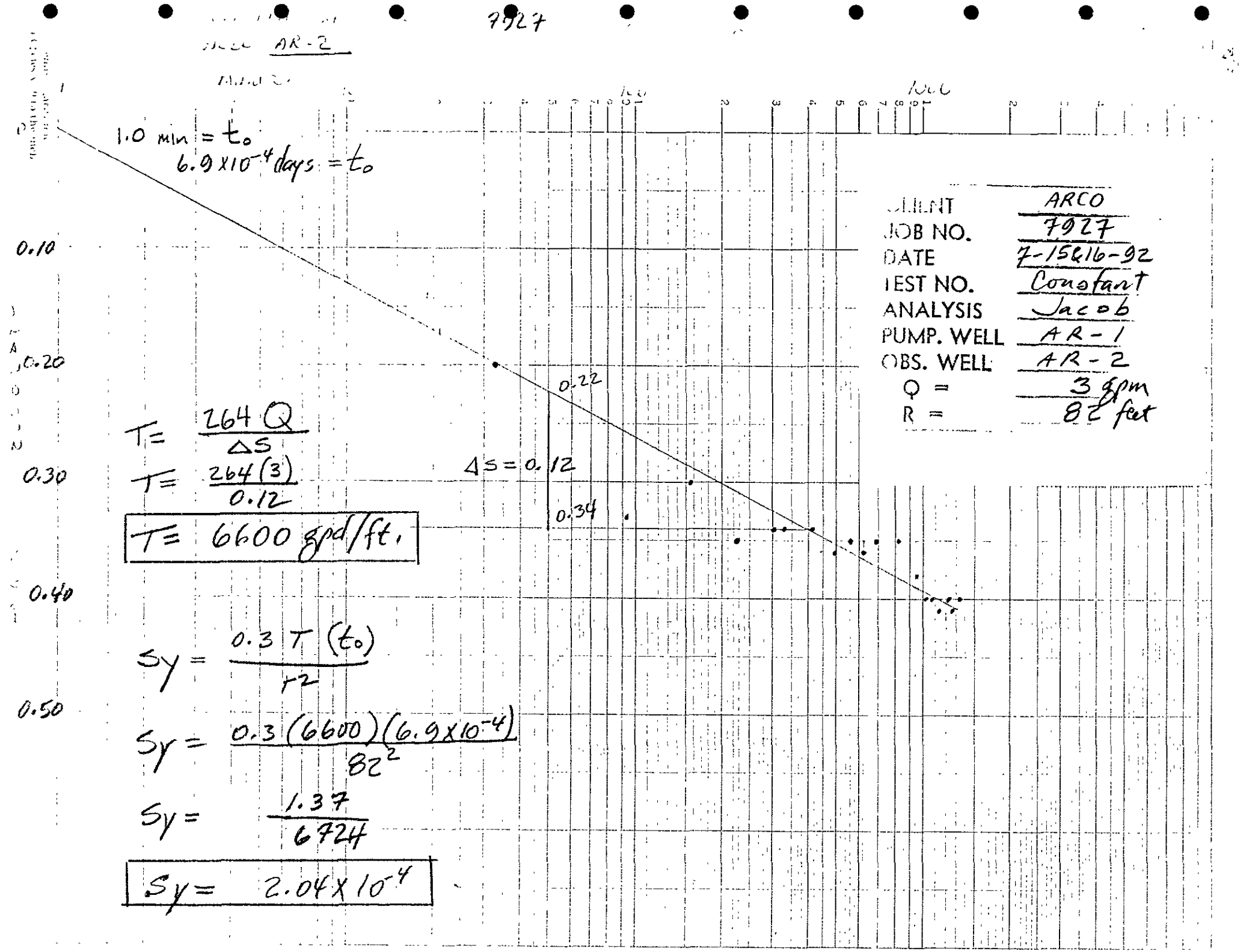
$$Sy = \frac{0.3 \left(3.33 \times 10^3\right) 3.2 \times 10^{-3}}{128^2}$$

$$Sy = \frac{3.19}{16384}$$

$$\boxed{Sy = 1.95 \times 10^{-4}}$$

7927

ARCO AR-2



$$T = \frac{264\,Q}{\Delta s}$$

$$T = \frac{264(3)}{0.12}$$

$$\boxed{T = 6600 \text{ gpd/ft.}}$$

$$S_y = \frac{0.3\,T\,(t_o)}{r^2}$$

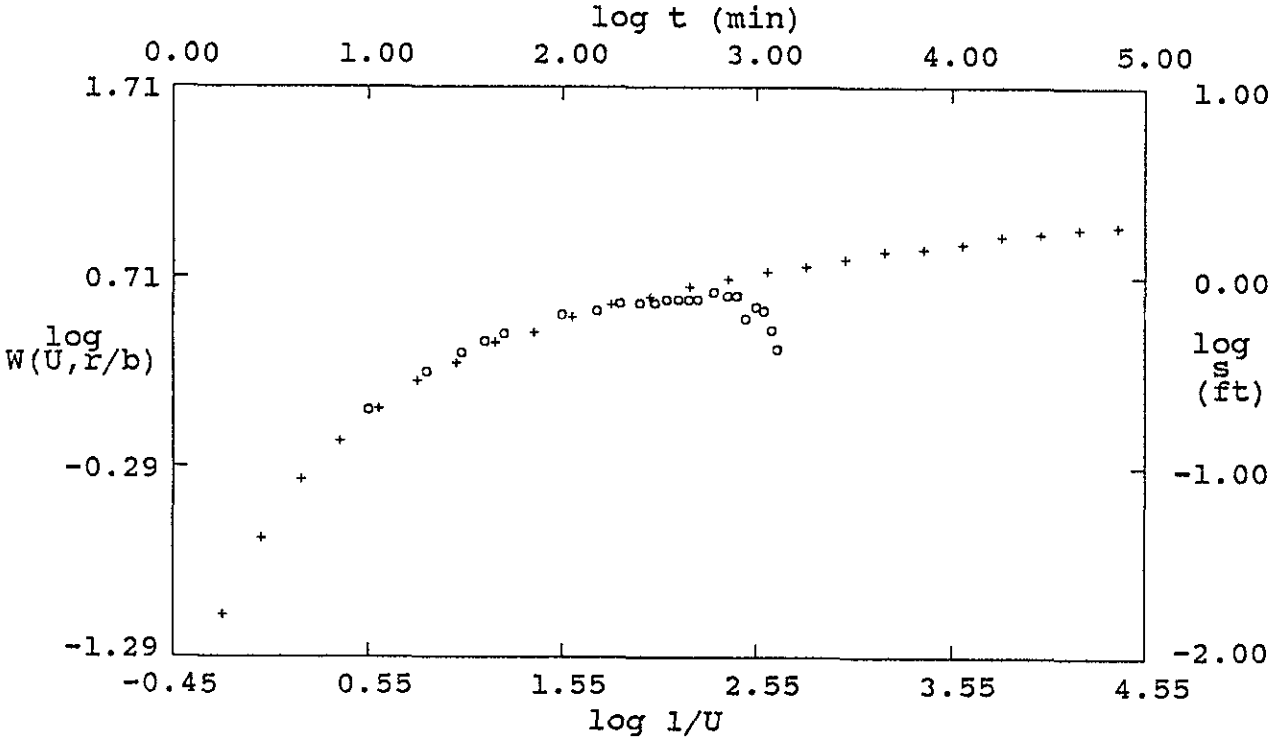
$$S_y = \frac{0.3(6600)(6.9 \times 10^{-4})}{82^2}$$

$$S_y = \frac{1.37}{6724}$$

$$\boxed{S_y = 2.04 \times 10^{-4}}$$

APPENDIX F
GWAP DATA PLOTS: THEIS METHOD

Well A-1



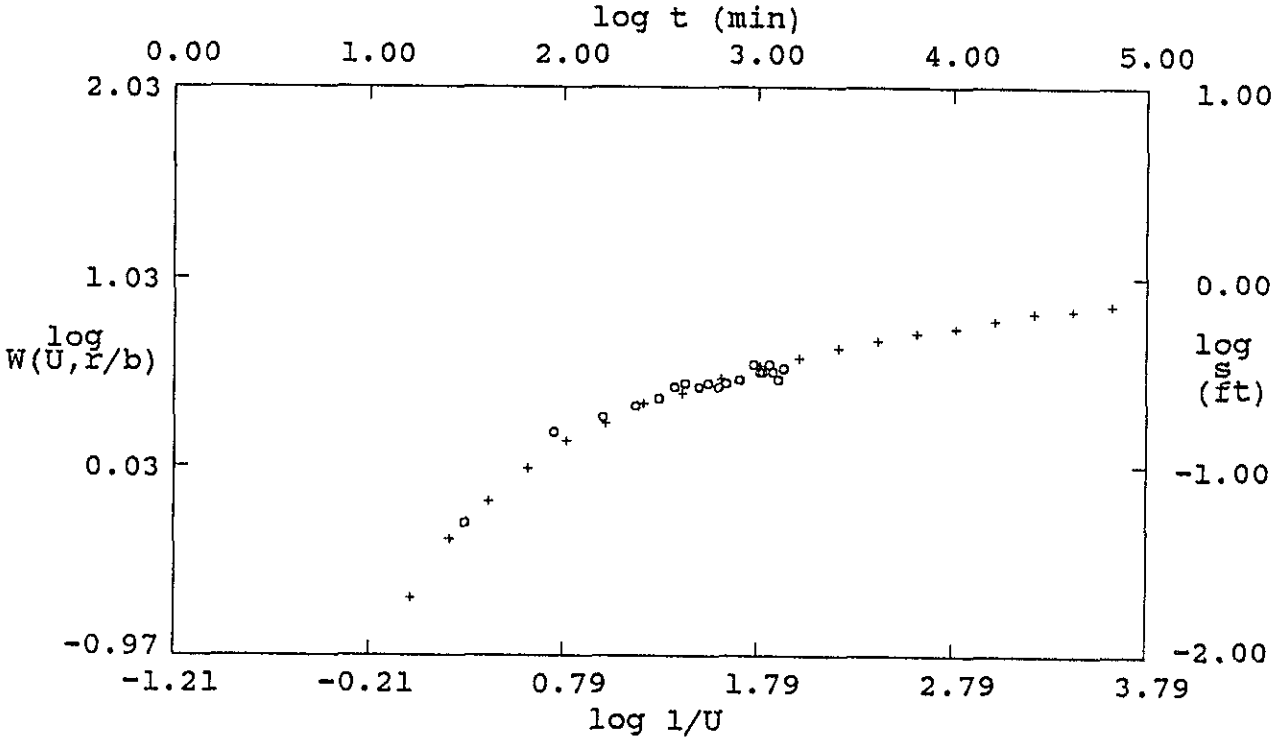
o - Data

\+ - Type Curve
Confined Leaky: r/B = Theis

SOLUTION

Transmissivity	=	1.763E+0003 gpd/ft
Aquifer Thick.	=	1.500E+0001 ft
Hydraulic Cond.	=	1.175E+0002 gpd/sq ft
Storativity	=	5.301E-0004

Well A-2



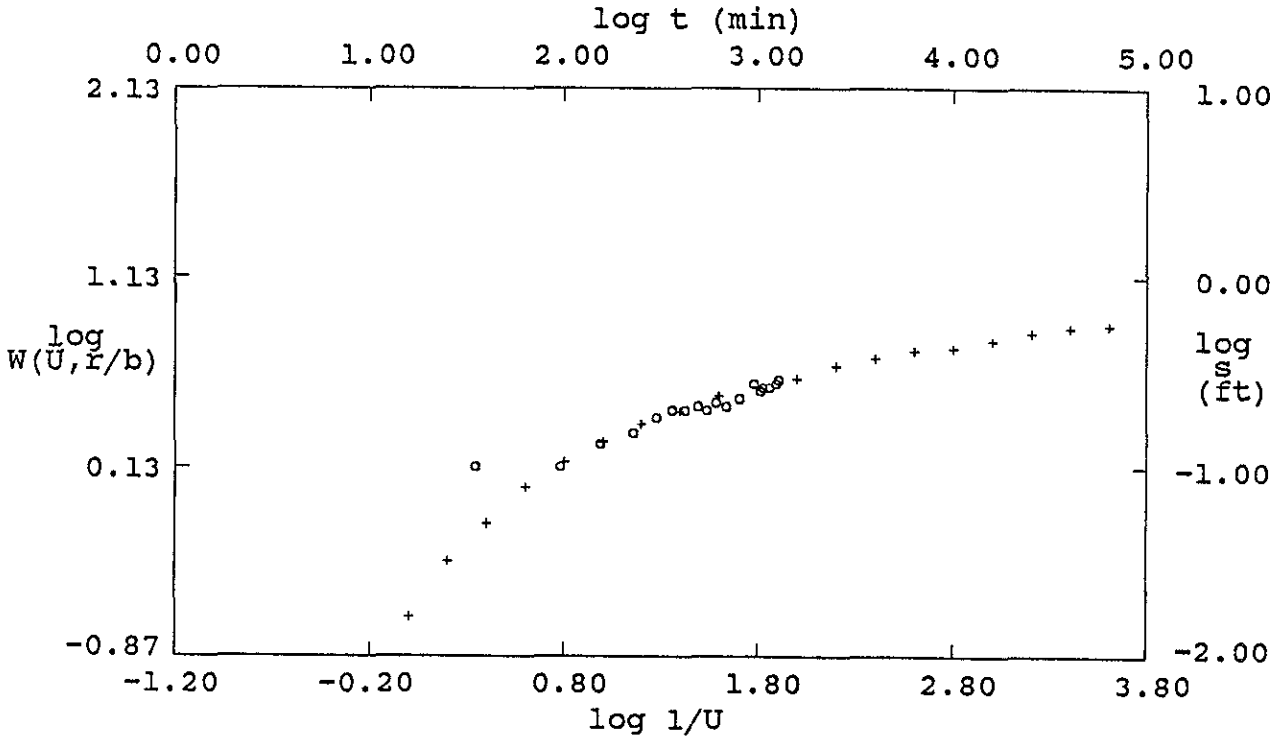
o - Data

\+ - Type Curve
Confined Leaky: r/B = Theis

SOLUTION

Transmissivity	=	3.683E+0003 gpd/ft
Aquifer Thick.	=	1.500E+0001 ft
Hydraulic Cond.	=	2.455E+0002 gpd/sq ft
Storativity	=	1.116E-0003

Well A-3



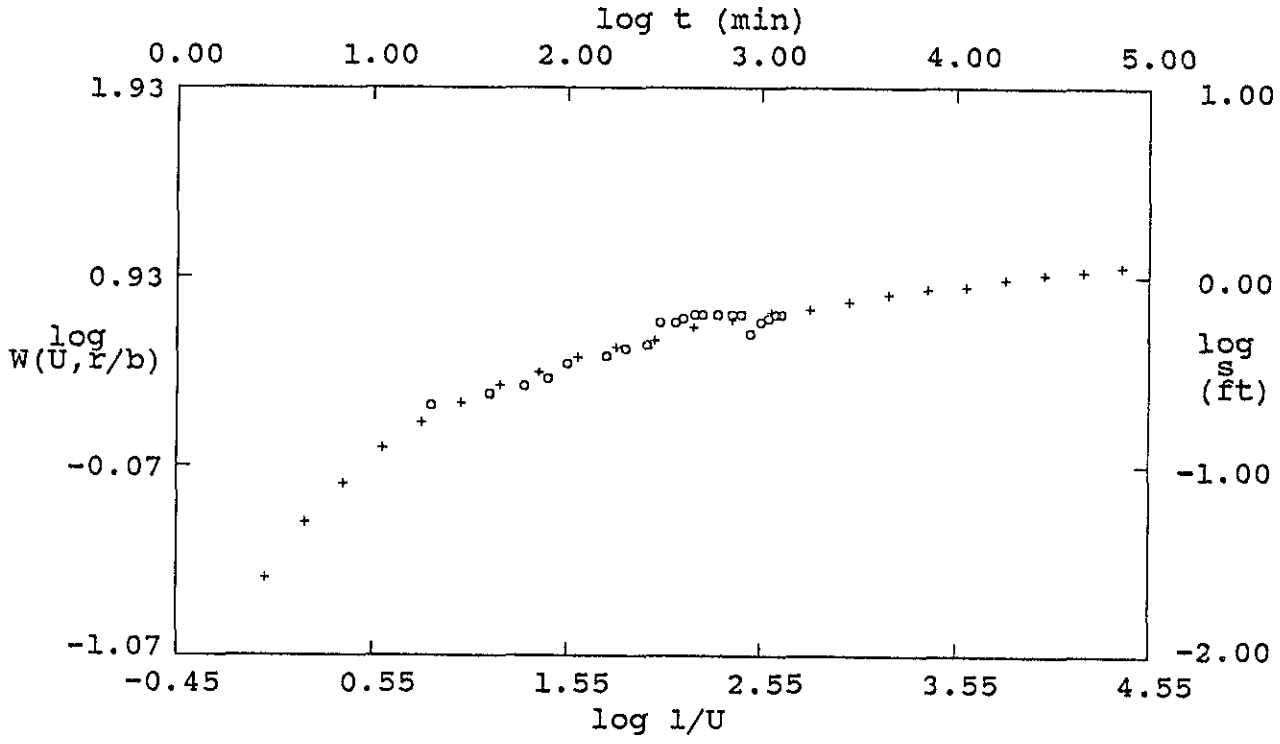
o - Data

\+ - Type Curve
Confined Leaky: r/B = Theis

SOLUTION

Transmissivity	=	4.637E+0003 gpd/ft
Aquifer Thick.	=	1.500E+0001 ft
Hydraulic Cond.	=	3.091E+0002 gpd/sq ft
Storativity	=	1.080E-0003

Well A-4



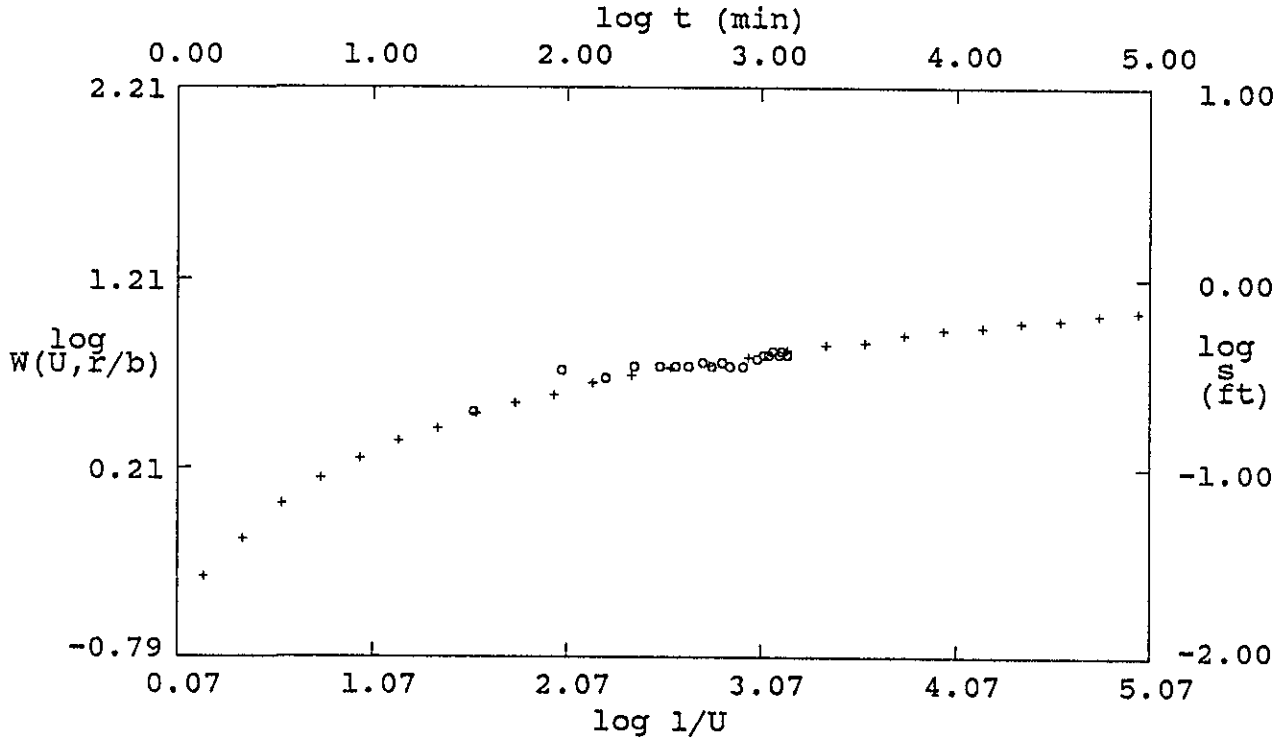
o - Data

\+ - Type Curve
Confined Leaky: r/B = Theis

SOLUTION

Transmissivity	=	2.925E+0003 gpd/ft
Aquifer Thick.	=	1.500E+0001 ft
Hydraulic Cond.	=	1.950E+0002 gpd/sq ft
Storativity	=	1.869E-0004

Well AR-2



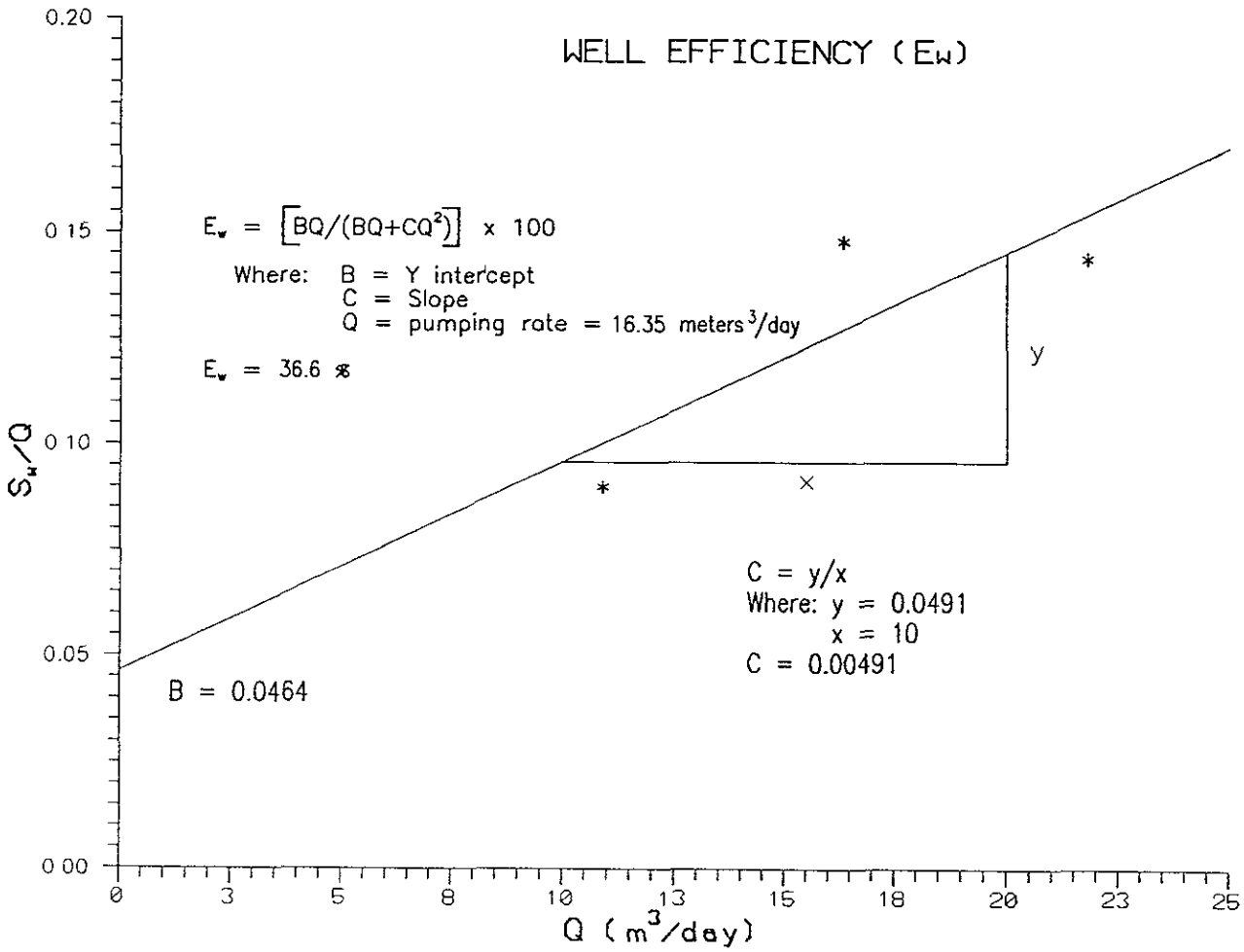
o - Data

\+ - Type Curve
Confined Leaky: r/B = Theis

SOLUTION

Transmissivity	=	5.574E+0003 gpd/ft
Aquifer Thick.	=	1.500E+0001 ft
Hydraulic Cond.	=	3.716E+0002 gpd/sq ft
Storativity	=	2.621E-0004

APPENDIX G
WELL EFFICIENCY CALCULATION



GeoStrategies Inc.

WELL EFFICIENCY GRAPH
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792705-4	RCM	9/92	11/92

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

Date June 18, 1992
Project G70-52.01

To:
Mr. John Vargas
GeoStrategies Inc.
2140 West Winton Avenue
Hayward, California 94545

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	June 1992 monthly water level survey, ARCO
	station 2169, 889 West Grand Ave. Oakland, CA.

For your: X Information Sent by: X Mail

Comments:
Monthly water level data for the above mentioned site are attached. Please call if you have any questions: (408) 453-2266.

Jim Butera JB

Reviewed by:

REG. NO. 4554 EXP. 6/30/96 REGISTERED PROFESSIONAL INDUSTRIAL HYGIENIST STATE OF CALIFORNIA

Robert C Porter
Robert Porter, Senior Project Engineer

1938 Junction Avenue, San Jose, California 95131-2102, (408) 453-0719, Fax (408) 453-0452

927 - A

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-52.01 STATION ADDRESS : 889 West Grand Ave, Oakland, CA DATE : 6/6-99

ARCO STATION # : 2169 FIELD TECHNICIAN : J. Williams DAY :

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	A-1	OK	OK	OK	2268	OK	11.95	11.95	ND	ND	24.35	NEED NEW LOCK
2	A-2				2268		12.43	12.44	ND	ND	25.20	—
3	A-3				2268		13.26	13.26	ND	ND	29.10	—
4	A-4				2268		12.33	12.33	ND	ND	28.00	—
5	AR-1				2262		12.47	12.48	ND	ND	27.70	—

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

RECEIVED
MAY 27 1992
GeoStrategies Inc.

Date May 21, 1992
Project G70-52.01

To:
Mr. John Vargas
GeoStrategies Inc.
2140 West Winton Avenue
Hayward, California 94545

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	May 1992 monthly water level survey, ARCO
	station 2169, 889 West Grand Ave. Oakland, CA.

For your: X Information Sent by: X Mail

Comments:
Monthly water level data for the above mentioned site are attached. Please call if you have any questions: (408) 453-2266.

Reviewed by: Jim Butera

REGISTERED PROFESSIONAL ENGINEER ROBERT CURTIS PORTER No: 4094 Exp. 6/30/92 INDUSTRIAL STATE OF CALIFORNIA

Robert Porter, Senior Project Engineer

927-A

1938 Junction Avenue, San Jose, California 95131-2102, (408) 453-0719, Fax (408) 453-0452

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-52.01 STATION ADDRESS : 889 West Grand Ave, Oakland, CA DATE : 5-26-92

ARCO STATION # : 2169 FIELD TECHNICIAN : M. Kmetko / J. Bufera DAY : Wednesday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	A-1	Ok	yes	yes	2268	yes	11.66	11.66	NA	ND	24.35	—
2	A-2	Ok	yes	yes	2268	yes	12.17	12.18	ND	ND	25.15	—
3	A-3	ok	yes	yes	2268	yes	13.00	13.00	ND	ND	29.1	—
4	A-4	Ok	yes	yes	2268	yes	12.13	12.14	ND	ND	27.90	—
5	AR#1	Ok	yes	yes	2268	yes	12.37	12.37	ND	ND	27.74	—

APPENDIX I
EMCON GROUND-WATER SAMPLING REPORT

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

RECEIVED
OCT 14 1992
GeoStrategies Inc.

Date August 10, 1992
Project G70-23.01

To:
Mr. John Vargas
GeoStrategies, Inc.
2140 West Winton Avenue
Hayward, California 94545

We are enclosing:

Copies	Description
1	Depth To Water / Floating Product Survey Results
3	Summary of Groundwater Monitoring Data
1	Certified Analytical Reports with Chain-of-Custody
6	Water Sample Field Data Sheets

For your: X Information Sent by: X Mail

Comments:

Enclosed are the data from the third quarter 1992 monitoring event at ARCO service station 2169, 889 West Grand Avenue, Oakland, CA. Groundwater monitoring is conducted consistent with applicable regulatory guidelines. Please call if you have any questions: (408) 453-2266.

Reviewed by:

Jim Butera JB.

REGISTERED PROFESSIONAL ENGINEER ROBERT PORTER No: 4594 Exp. 4/30/96 INDUSTRIAL STATE OF CALIFORNIA

Robert Porter, Senior Project Engineer.

1938 Junction Avenue, San Jose, California 95131-2102, (408) 453-0719, Fax (408) 453-0452

917-A

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-52.01 STATION ADDRESS : 889 West Grand Ave, Oakland, CA DATE : 7-17-92

ARCO STATION # : 2169 FIELD TECHNICIAN : J.W./R.S. DAY : Friday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	A-1	Yes	Yes	Yes	2268	Yes	12.23	12.23	N.D	N.D	24.39	-
2	A-2	Yes	Yes	Yes	2268	Yes	12.64	12.64	N.D	N.D	25.17	-
3	A-3	Yes	Yes	Yes	2268	Yes	13.45	13.45	N.D	N.D	29.15	-
4	A-4	Yes	Yes	Yes	2268	Yes	12.60	12.60	N.D	N.D	27.95	-
5	AR-1	Yes	Yes	Yes	2268	Yes	13.00	13.00	N.D	N.D	27.75	-
6	AR-2	Yes	Yes	Yes	NO	Yes	13.14	13.14	N.D	N.D	29.2	-

SURVEY POINTS ARE TOP OF WELL BOXES

Summary of Groundwater Monitoring Data
Third Quarter 1992
ARCO Service Station 2169
889 West Grand Avenue, Oakland, California
micrograms per liter (µg/l) and milligrams per liter (mg/l)

Well ID and Sample Depth	Sampling Date	Depth To Water (feet)	Floating Product Thickness (feet)	TPH[1] as Gasoline (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethyl-benzene (µg/l)	Total Xylenes (µg/l)
A-1(24)	07/17/92	12.23	ND.[2]	5,600.	3,000.	500.	<0.5	<0.5
A-2(25)	07/17/92	12.64	ND	<50.	<0.5	<0.5	<0.5	<0.5
A-3(29)	07/17/92	13.45	ND	<50.	<0.5	<0.5	1.3	2.3
A-4(27)	07/17/92	12.60	ND	<50.	<0.5	<0.5	<0.5	<0.5
AR-1(27)	07/17/92	13.00	ND	44,000.	4,300.	9,100.	1,800.	10,000.
AR-2(29)	07/17/92	13.14	ND	150.	6.6	24.	6.6	39.

1. TPH. = Total petroleum hydrocarbons
2. ND. = Not detected

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Emcon Associates
1938 Junction Avenue
San Jose, CA 95131
Attention: Jim Butera

Project: Arco 2169

Enclosed are the results from 6 water samples received at Sequoia Analytical on July 17,1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2072776	Water, A-1, (24)	7/17/92	EPA 5030/8015/8020
2072777	Water, A-2, (25)	7/17/92	EPA 5030/8015/8020
2072778	Water, A-3, (29)	7/17/92	EPA 5030/8015/8020
2072779	Water, A-4, (27)	7/17/92	EPA 5030/8015/8020
2072780	Water, AR-1, (27)	7/17/92	EPA 5030/8015/8020
2072781	Water, AR-2, (29)	7/17/92	EPA 5030/8015/8020

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Maile A. Springer
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Emcon Associates	Client Project ID:	Arco 2169	Sampled:	Jul 17, 1992
1938 Junction Avenue	Sample Matrix:	Water	Received:	Jul 17, 1992
San Jose, CA 95131	Analysis Method:	EPA 5030/8015/8020	Reported:	Jul 30, 1992
Attention: Jim Butera	First Sample #:	207-2776		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 207-2776 A-1, (24)	Sample I.D. 207-2777 A-2, (25)	Sample I.D. 207-2778 A-3, (29)	Sample I.D. 207-2779 A-4, (27)	Sample I.D. 207-2780 AR-1, (27)	Sample I.D. 207-2781 AR-2, (29)
Purgeable Hydrocarbons	50	5,600	N.D.	N.D.	N.D.	44,000	150
Benzene	0.50	3,000	N.D.	N.D.	N.D.	4,300	6.6
Toluene	0.50	500	N.D.	N.D.	N.D.	9,100	24
Ethyl Benzene	0.50	N.D.	N.D.	1.3	N.D.	1,800	6.6
Total Xylenes	0.50	N.D.	N.D.	2.3	N.D.	10,000	39
Chromatogram Pattern:		Gas	--	Gas	--	Gas	Gas

Quality Control Data

Report Limit Multiplication Factor:	200	1.0	1.0	1.0	400	1.0
Date Analyzed:	7/21/92	7/21/92	7/21/92	7/21/92	7/21/92	7/21/92
Instrument Identification:	GCHP-3	GCHP-3	GCHP-3	GCHP-3	GCHP-3	GCHP-3
Surrogate Recovery, %: (QC Limits = 70-130%)	104	91	106	101	113	114

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Maile A. Springer
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Emcon Associates
1938 Junction Avenue
San Jose, CA 95131
Attention: Jim Butera

Client Project ID: Arco 2169

QC Sample Group: 2072776 - 81

Reported: Jul 30, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M.Nipp	M.Nipp	M.Nipp	M.Nipp
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Jul 21, 1992	Jul 21, 1992	Jul 21, 1992	Jul 21, 1992
QC Sample #:	GBLK072192	GBLK072192	GBLK072192	GBLK072192
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	10	10	10	30
Matrix Spike % Recovery:	100	100	100	100
Conc. Matrix Spike Dup.:	10	10	10	30
Matrix Spike Duplicate % Recovery:	100	100	100	100
Relative % Difference:	0.0	0.0	0.0	0.0

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Maile A. Springer
Project Manager

% Recovery:	$\frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}}$	x 100
Relative % Difference:	$\frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}}$	x 100

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

COPY

Chain of Custody

ARCO Facility no. 2169	City (Facility) OAKLAND	Project manager (Consultant) JIM BUTERA	Laboratory name SEQUOIA
ARCO engineer Kyle Christie	Telephone no. (ARCO) (415)571-2434	Telephone no. (Consultant) (408)453-7719	Fax no. (Consultant) (408)453-0452
Consultant name EMCON ASSOCIATES	Address (Consultant) 1938 JUNCTION AVE SAN JOSE		Contract number 07-073

Sample I.D.	Lab no.	Container no	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH GAS EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
A-1(24)		2		X		X	HCl				X				601.8270					
A-2(25)		2		X		X	HCl				X							77		
A-3(29)		2		X		X	HCl				X							78		
A-4(28)		2		X		X	HCl				X							79		
MW-1(27)		2		X		X	HCl				X							80		
MW-2(26)		2		X		X	HCl				X						↓	81		

Special detection Limit/reporting: Lowest feasible

Special QA/QC: AS NORMAL

Remarks: 2-40ml HCl VOA's

Lab number

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☑

Method of shipment

Condition of sample: good		Temperature received: cool	
Relinquished by sampler: [illegible]	Date: [illegible] Time: 16:40	Received by: 483 7-17 16:45	
Relinquished by: Brenda Kelly 483	Date: 7-17-92 Time: 18:35	Received by:	
Relinquished by:	Date: Time:	Received by laboratory: [illegible]	Date: 7/17 Time: 1835

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC-3292 (2-91)

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70-52.01 SAMPLE ID: A-1

PURGED BY: J. Williams CLIENT NAME: ARCO 2169

SAMPLED BY: J. Williams LOCATION: Oakland CA

TYPE: Ground Water ✓ Surface Water ____ Treatment Effluent ____ Other ____

CASING DIAMETER (inches): 2 ____ 3 X 4 ____ 4.5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL): WR VOLUME IN CASING (gal.): 4.52

DEPTH TO WATER (feet): 12.23 CALCULATED PURGE (gal.): 22.62

DEPTH OF WELL (feet): 24.39 ACTUAL PURGE VOL. (gal.): 23.0

DATE PURGED: 07-17-92 Start (2400 Hr) 12:24 End (2400 Hr) 12:40

DATE SAMPLED: 07-17-92 Start (2400 Hr) 12:43 End (2400 Hr) 12:44

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1231	4.5	6.55	1573	80.0	GRAY	HEAVY
1234	9.0	6.99	1444	76.7	1	2
1235	13.5	7.01	1433	75.7	1	1
1237	18.0	7.04	1423	75.4	2	2
1240	23.0	7.04	1434	75.0	1	1

D. O. (ppm): WR ODOR: STRONG

COLOR (COBALT 0 - 100): WR TURBIDITY (NTU 0 - 200): WR

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): WR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
✓ 2" Bladder Pump	Bailer (Teflon®)	2" Bladder Pump	X Bailer (Teflon®)
Centrifugal Pump	Bailer (PVC)	DDL Sampler	Bailer (Stainless Steel)
Submersible Pump	Bailer (Stainless Steel)	Dipper	Submersible Pump
Well Wizard™	Dedicated	Well Wizard™	Dedicated
Other:		Other:	

WELL INTEGRITY: OK LOCK #: 2268

REMARKS:

Meter Calibration: Date: 7-17-92 Time: ____ Meter Serial #: ____ Temperature °F: 84.3

(EC 1000 1031 / 1000) (DI ____) (pH 7 7081 7.00) (pH 10 9.94 / 10.00) (pH 4 4.00 / ____)

Location of previous calibration: A-1

Signature: Joe Williams Reviewed By: JB Page 1 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70.52.01 SAMPLE ID: A-2

PURGED BY: J. Williams CLIENT NAME: ARCO 2169

SAMPLED BY: J. Williams LOCATION: OAKLAND

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 X 4 ___ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): N.A. VOLUME IN CASING (gal.): 4.67

DEPTH TO WATER (feet): 12.64 CALCULATED PURGE (gal.): 23.36

DEPTH OF WELL (feet): 25.17 ACTUAL PURGE VOL (gal.): 24.0

DATE PURGED: 7-17-92 Start (2400 Hr) 1300 End (2400 Hr) 1308

DATE SAMPLED: 7-17-92 Start (2400 Hr) 1310 End (2400 Hr) 1312

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1303	4.75	7.11	1044	74.6	Blood	Heavy
1306	9.50	7.04	1089	72.2	〃	〃
1306	14.25	7.05	1094	71.7	〃	〃
1307	19.0	7.07	1088	70.6	〃	〃
1308	23.75	7.10	1097	70.9	〃	〃

D. O. (ppm): ND ODOR: None NR (COBALT 0 - 100) NR (NTU 0 - 200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NO

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
✓ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: Grundfos pump		Other:	

WELL INTEGRITY: OK LOCK #: 2768

REMARKS:

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: M-1

Signature: [signature] Reviewed By: JB Page 2 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70-5201 SAMPLE ID: A-3

PURGED BY: J. Williams CLIENT NAME: Arco 2169

SAMPLED BY: J. Williams LOCATION: Oakland

TYPE: Ground Water X Surface Water ____ Treatment Effluent ____ Other ____

CASING DIAMETER (inches): 2 ____ 3 X 4 ____ 4.5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL): N.A. VOLUME IN CASING (gal.): 5.8

DEPTH TO WATER (feet): 13.45 CALCULATED PURGE (gal.): 29.2

DEPTH OF WELL (feet): 29.15 ACTUAL PURGE VOL (gal.): 30

DATE PURGED: 7-17-92 Start (2400 Hr) 1328 End (2400 Hr) 1336

DATE SAMPLED: 7-17-92 Start (2400 Hr) 1337 End (2400 Hr) 1338

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1331	6	7.85	946	70.9	GRAY	HEAVY
1332	12	7.85	978	69.9	"	"
1334	18	7.78	995	69.6	"	"
1335	24	7.75	991	69.5	"	"
1336	30	7.76	991	69.7	"	"

D. O. (ppm): N/A ODOR: Slight

COLOR (COBALT 0 - 100): N/A

TURBIDITY (NTU 0 - 200): N/A

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): N/A

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	____ Bailer (Teflon®)	____ 2" Bladder Pump	✓ Bailer (Teflon®)
X Centrifugal Pump	____ Bailer (PVC)	____ DDL Sampler	____ Bailer (Stainless Steel)
____ Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well Wizard™	____ Dedicated	____ Well Wizard™	____ Dedicated
Other: Suction		Other:	

WELL INTEGRITY: OK LOCK #: 2268

REMARKS: ____

Meter Calibration: Date: ____ Time: ____ Meter Serial #: ____ Temperature °F: ____

(EC 1000 ____ / ____) (DI ____) (pH 7 ____ / ____) (pH 10 ____ / ____) (pH 4 ____ / ____)

Location of previous calibration: N/A

Signature: [signature] Reviewed By: JB

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70-52.01 SAMPLE ID: A-4

PURGED BY: J. Williams CLIENT NAME: Acco 2169

SAMPLED BY: J. Williams LOCATION: Oakland CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 X 4 ___ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): 5.7

DEPTH TO WATER (feet): 12.60 CALCULATED PURGE (gal.): 28.5

DEPTH OF WELL (feet): 27.95 ACTUAL PURGE VOL. (gal.): 30

DATE PURGED: 7-17-92 Start (2400 Hr) 1347 End (2400 Hr) 1359

DATE SAMPLED: 7-17-92 Start (2400 Hr) 1400 End (2400 Hr) 1402

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1352	6	7.67	914	69.9	GRAY	HEAVY
1353	12	7.67	925	70.1	"	"
1356	18	7.56	932	70.1	"	"
1358	24	7.70	873	71.8	"	"
1359	30	7.70	907	71.0	"	"

D. O. (ppm): NR ODOR: MODER NR (COBALT 0 - 100) NR (NTU 0 - 200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
X Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: OK LOCK #: 2268

REMARKS: ___

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: A-1

Signature: [signature] Reviewed By: JB Page 4 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70.52.01 SAMPLE ID: A-R-1

PURGED BY: J. Williams CLIENT NAME: Acco 2169

SAMPLED BY: J. Williams LOCATION: OAKLAND CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ___ 4.5 ___ 6 X Other ___

CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): 21.6

DEPTH TO WATER (feet): 13.0 CALCULATED PURGE (gal.): 108.2

DEPTH OF WELL (feet): 27.75 ACTUAL PURGE VOL. (gal.): 110

DATE PURGED: 7-17-92 Start (2400 Hr) 1418 End (2400 Hr) 1443

DATE SAMPLED: 7-17-92 Start (2400 Hr) 1444 End (2400 Hr) 1447

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1421	22	7.45	1048	71.0	GRAY	HEAVY
1427	44	7.47	1011	71.5	2	1
1434	66	7.44	973	73.4	2	2
1438	88	7.43	1010	71.5	1	1
1443	110	7.50	1029	69.8	1	1

D. O. (ppm): NR ODOR: STRONG

NR (COBALT 0 - 100) NA (NTU 0 - 200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): DR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
X Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: OK LOCK #: 2265

REMARKS: ___

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: 17-1

Signature: [signature] Reviewed By: JB Page 5 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70-5201 SAMPLE ID: AR-2

PURGED BY: J. Williams CLIENT NAME: Arco 2169

SAMPLED BY: J. Williams LOCATION: OAKLAND CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 X 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): N.A. VOLUME IN CASING (gal.): 10.5

DEPTH TO WATER (feet): 13.14 CALCULATED PURGE (gal.): 52.6

DEPTH OF WELL (feet): 29.2 ACTUAL PURGE VOL. (gal.): 55

DATE PURGED: 7.17.92 Start (2400 Hr) 1505 End (2400 Hr) 1521

DATE SAMPLED: 7-17-92 Start (2400 Hr) 1524 End (2400 Hr) 1526

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1505	10.5	7.63	985	73.5	GRAY	HEAVY
1511	21.0	7.17	1024	70.5	"	"
1514	31.5	7.05	1184	69.5	"	"
1519	42.0	7.01	1189	69.6	"	"
1521	52.5	7.01	1190	90.7	"	"

D. O. (ppm): NR ODOR: SLIGHT

NR (COBALT 0 - 100) NR (NTU 0 - 200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): ND

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
X Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: OK LOCK #: MC 1.0ck

REMARKS: ___

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: ATC

Signature: [signature] Reviewed By: JB Page 6 of 6