

Environmental Consulting, Engineering and Geologic Services 31P 3193

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Letter of Transmittal Date: 11/30/92	
From: ROBERT MALLORY Project No: 7927 To: MR. DENNIS BYRNE ACHCSA So SWAN WAY # Zoo OAKLAND, CA. 94621 The following items are: Enclosed Project No: 7927 Subject: CONT. SITE ASSESSMENT - 320 ANCO 55# 2169 889 W. GRAND AVE. OAKLAND, CA. 94621 Sent Separately via	gtn. ¹ 92
Date Description No. of Copies 1/2+/92 CONT. SITE ASSESSMENT/QUARTERLY MONTTONING REPORT 3 AD Qtr 92	
These are transmitted: At you request For your action For your approval For your files For your review For your information Preliminary	
CC: MR. MICHAEL WHELAN, ARCO PRODUCTS CO. MR. H.C. NINSOR, ARCO PRODUCTS CO. MR. RICHARD HIETT, RWQCB - S.F. REGION	
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CONTINUING SITE ASSESSMENT/QUARTERLY MONITORING REPORT - Third Quarter 1992

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



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.

ARCO Products Company November 24, 1992 Page 2

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.

ARCO Products Company November 24, 1992 Page 3

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.

ARCO Products Company November 24, 1992 Page 4

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 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.

ARCO Products Company November 24, 1992 Page 5

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.

ARCO Products Company November 24, 1992 Page 6

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 12feet 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 semiconfined 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.

ARCO Products Company November 24, 1992 Page 7

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.

ARCO Products Company November 24, 1992 Page 8

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 constantrate 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.

ARCO Products Company November 24, 1992 Page 9

Constant-Rate Test

Recovery well AR-1 was pumped for a total of 1340 minutes at a constant discharge rage was pumped for a total of 1340 minutes at a constant discharge rage was pumping well was pumping well and observation wells are summarized in Table 5. Water-level data were collected and recorded as the pumping well recovered to greater the 199% 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 x 10⁻⁴ to 9.2 x 10⁻⁴. Storativity values appear to be consistent with an aquifer that is seen 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 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 12 gpc/ft to 55/4 gpd/ft. Storativity values for these wells ranged from 1.87 x 10-4 to 1.1 x 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.

ARCO Products Company November 24, 1992 Page 10

Well Influence

Data collected from the observation wells during the 24-hour constantrate 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 ± 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 v 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.

ARCO Products Company November 24, 1992 Page 11

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:

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

ARCO Products Company November 24, 1992 Page 12

- o The observed radius of influence, based on the results of the aguifer test, appears to be approximately 160 feet.
- o Based on aquifer test results it appears that a pump and treat system is a feasible option for remediating groundwater.
- o 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.
- o Floating product was not observed in any wells.
- o 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.

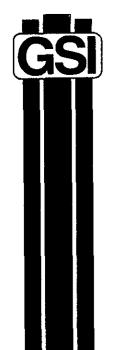
The observed radius of influence, stabilized flow rate and petroleum hydrocarbon concentrations resulting from the vapor extraction test indicate that vapor extraction is a feasible method of remediating petroleum hydrocarbons contamination in soil beneath the site. Results of the aquifer test indicate 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.



(Signed)

Environmental Consulting, Engineering and Geologic Services 3193

Lette	r of Transmittal
To:	ROBERT MALLORY Project No: 7927
	MR. DENNIS BYRNE Subject: CONT. SITE ASSESSMENT - 300 gtr. 9
	ACHCSA ANCO 55# 2169
	80 SWAN WAY # 200 889 W. GRAND AVE.
	OAKLAND, CA. 94621 OAKLAND, CA. 94601
The fo	llowing items are: Enclosed Sent Separately via
Date	Description No. of Copies
1/24/92	CONT SITE ASSESSMENT QUARTERLY MONITORING REPORT
	3 AD Qtr 92
These a	are transmitted: At you request For your action
	For your approval For your files
	For your review For your information
	Preliminary
Comme	ents:
	CC: MR. MICHAEL WHELAN, ARCO PRODUCTS CO.
	MR. H.C. WINSON, ARCO PRODUCTS CO.
	MR. RICHARD HIETT, RWQCB - S.F. REGION
	2140 W. Winton Avenue, Hayward, CA 94545 (510) 352-4800 - Fax (510) 783-1089
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CONTINUING SITE ASSESSMENT/QUARTERLY MONITORING REPORT - Third Quarter 1992



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:

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ARCO Products Company November 24, 1992 Page 2

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ARCO Products Company November 24, 1992 Page 3

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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 hollowstem 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-inchdiameter Schedule 40 PVC blank well casing and 0.020-inch factory slotted well screen. Well screen extends from to de leer in reach 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.

ARCO Products Company November 24, 1992 Page 5

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.

ARCO Products Company November 24, 1992 Page 6

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 12feet 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 semiconfined to confined aguifer 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.

ARCO Products Company November 24, 1992 Page 7

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.

ARCO Products Company November 24, 1992 Page 8

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 constantrate 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.

ARCO Products Company November 24, 1992 Page 9

Constant-Rate Test

Recovery well AR-1 was pumped for a total of 1340 minutes at a constant discharge rate of 1340 minutes at a con

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 x 10^{-4} to 9.2×10^{-4} . Storativity values appear to be consistent with an aquifer that is 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 accomplete against 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 1265 sparts to 5574 gpd/ft. Storativity values for these wells ranged from 1.87 x 10-4 to 1.1 x 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.

ARCO Products Company November 24, 1992 Page 10

Well Influence

Data collected from the observation wells during the 24-hour constantrate 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 ± 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 ν 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.

ARCO Products Company November 24, 1992 Page 11

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

ARCO Products Company November 24, 1992 Page 12

- o The observed radius of influence, based on the results of the aquifer test, appears to be approximately 160 feet.
- o Based on aquifer test results it appears that a pump and treat system is a feasible option for remediating groundwater.
- o 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.
- o Floating product was not observed in any wells.
- o 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.

ARCO Products Company November 24, 1992 Page 13

If you have any questions, please call.

GeoStrategies Inc. by,

Robert C. Mallory

Geologist

John F. Vargas Senior Geologist

R.G. 5046

RCM/JFV/rmt

Table 1. Soil Analyses Data

Table 2. Vacuum Pressure Results for Well AV-2

Table 3. Vacuum Pressure Data for the Observation Wells

NO. 5046

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

ARCO Products Company November 24, 1992 Page 14

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					
Appendix C.	Form					
Appendix D:	Time vs. Drawdown					
Appendix E:						
Appendix F:						
Appendix G:						
Appendix H:						
Appendix I:	• • • • • • • • • • • • • • • • • • • •					

QC Review: JHP

ARCO Products Company November 24, 1992 Page 15

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TABLES

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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 1.D. corresponds to the depth the sample was collected.

TABLE 2

VACUUM PRESSURE RESULTS FOR WELL AV-2

		INFLUENT	VACUUM PRESSURE A	Ţ
	TIME	CONCENTRATION	WELL HEAD	FLOWRATE
(minute	s since start-up)	(PPM)	(inches of water)	(cubic feet/min.)
======				=======================================
	0	>14,000	119.8	10.8
	60	>14,000	80.1	17.1
	120	>14,000	79.3	19.4
	100	-4/ 000	70.0	20.0
	180	>14,000	79.8	22.8
	240	>14,000	80.6	23.2
	210	- 14,000	00.0	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.

HELL NO	TIME	VACUUM PRESSURE
	(minutes since start-up)	
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		12-Jun-92		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	PUMP	PUMPING	MAXIMUM	TH	IEIS	L	ACOB	
NO.	RATE	DURATION	DRAWDOWN	Ţ	S	Ţ	S	
	(GPM)	(MINS.)	(FT)	(GPD/FT)		(GPD/FT)		
e=======	=======	=======================================			========	=======	=========	
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	

N/A = Not Applicable

T = Transmissivity

S = Specific Yield

GPD/FT = Gallons per Day per Foot

TABLE 6

HISTORICAL WATER-LEVEL DATA

MONITORING DATE	WELL NUMBER	DEPIH 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	
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-Арг-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	0.80
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- ման - 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.

WELL NO.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	TPH-DIESEL (PPB)
A·1		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

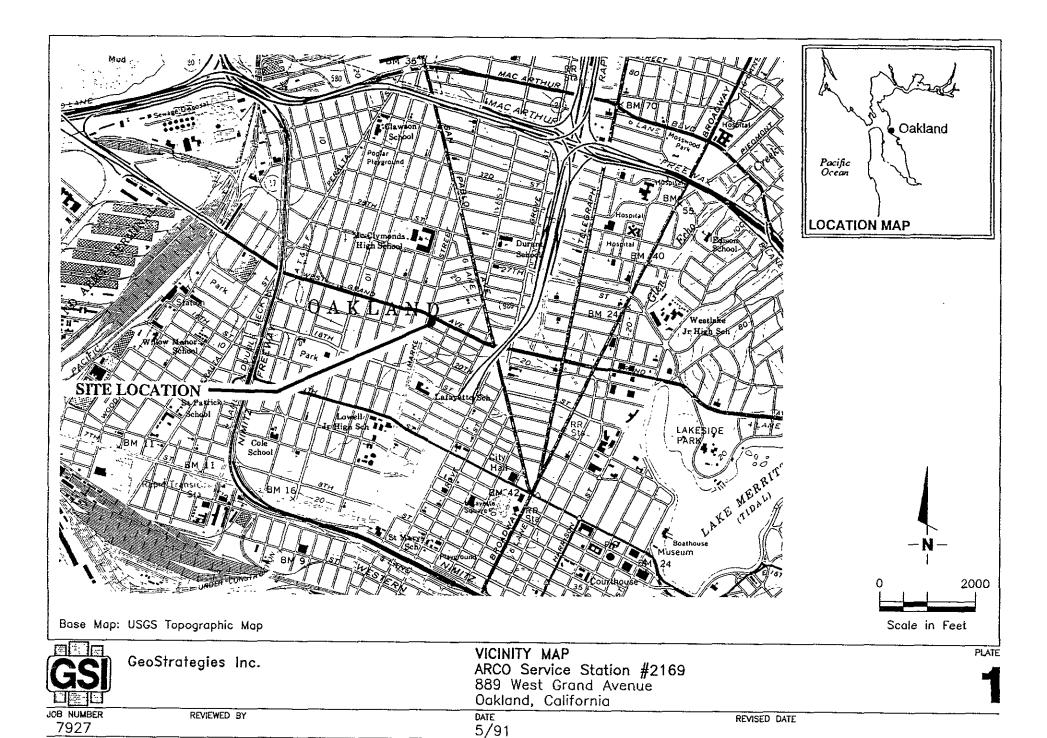
PPB = Parts Per Billion

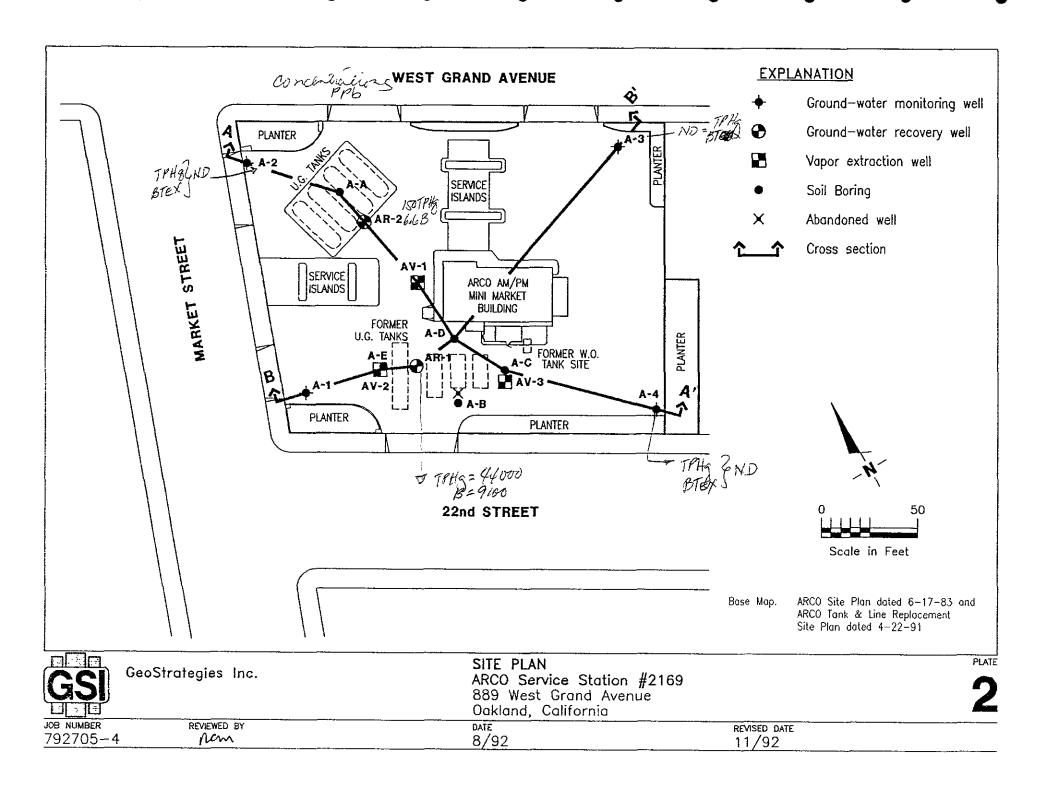
N/A = Not Analyzed

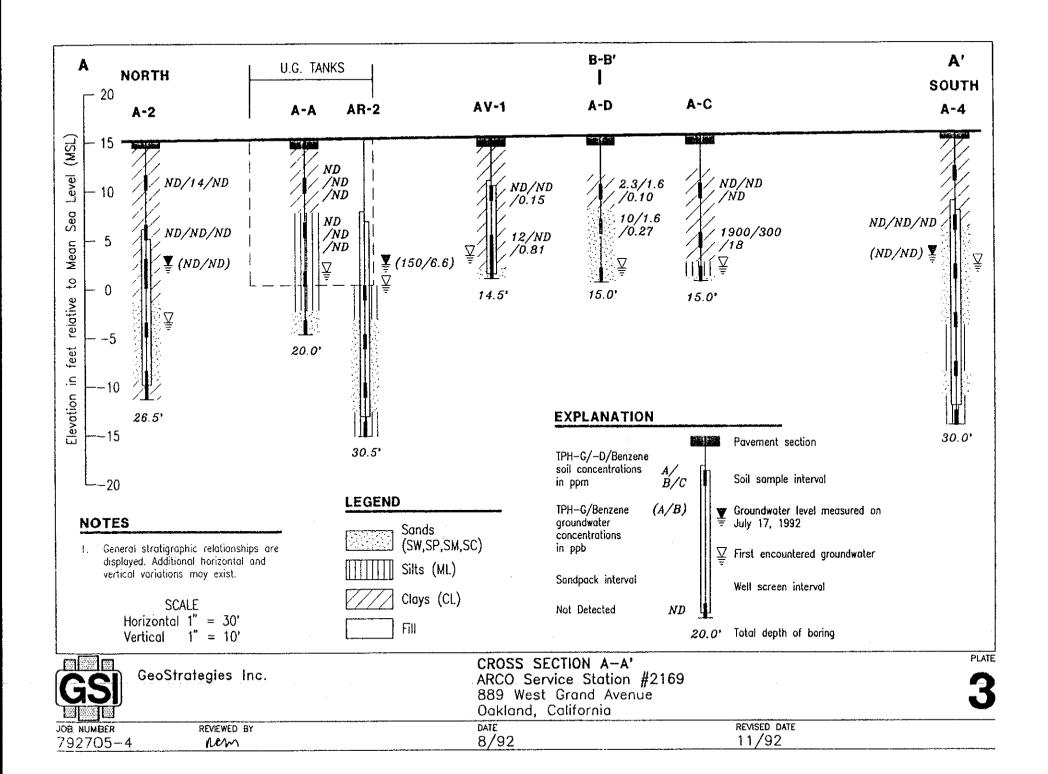
Notes: 1. DHS Action levels and MCL's are subject to change pending State of Celifornia review.

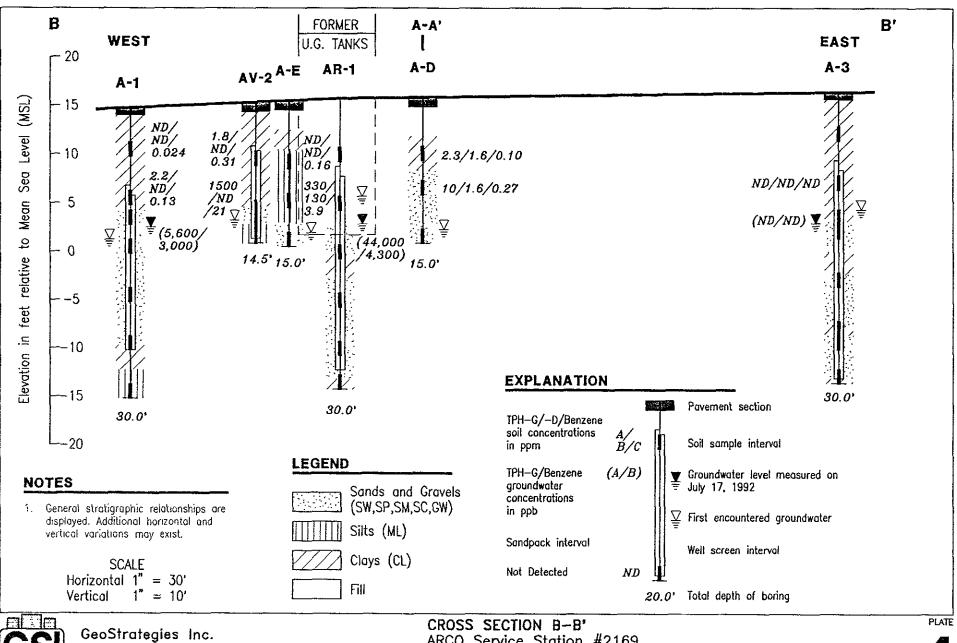
2. All data shown as <X are reported as ND (none detected).

ILLUSTRATIONS





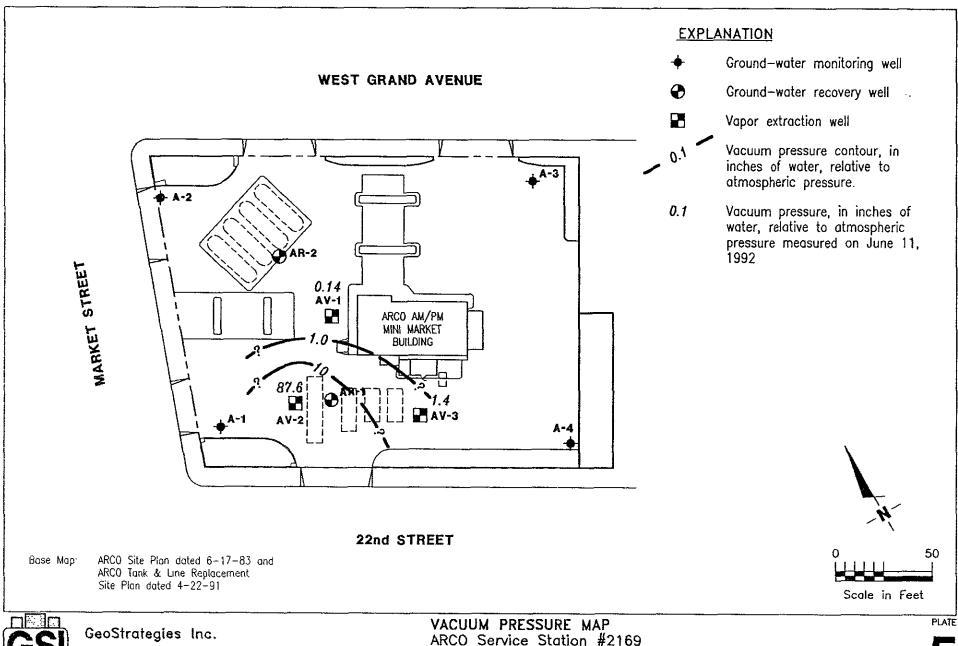




ARCO Service Station #2169 889 West Grand Avenue Oakland, California

JOB NUMBER 792705-4 REVIEWED BY com

DATE 8/92



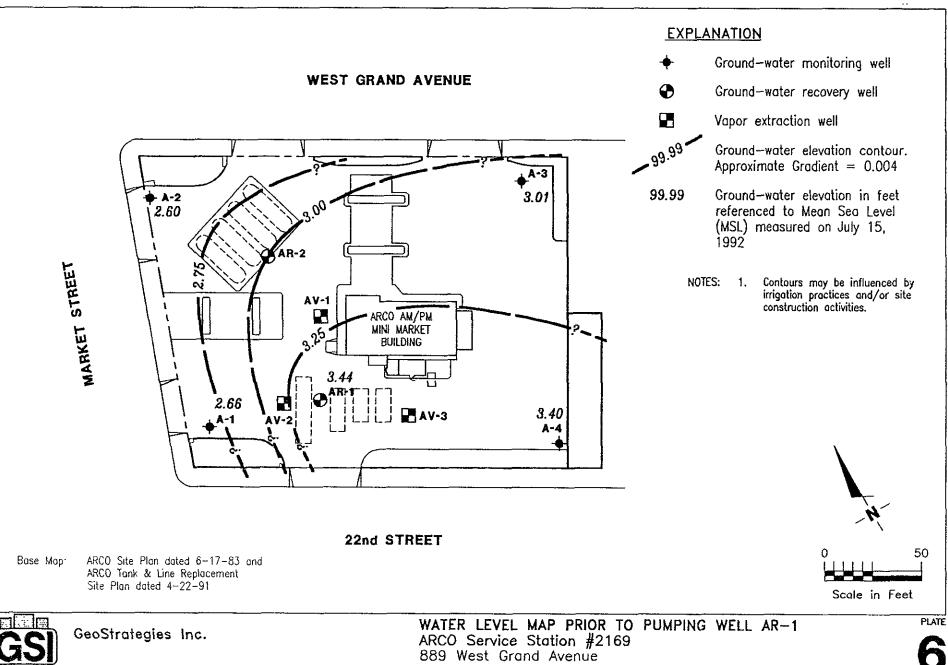
GSI

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

5

JOB NUMBER 792705-4 REVIEWED BY

DATE 8/92



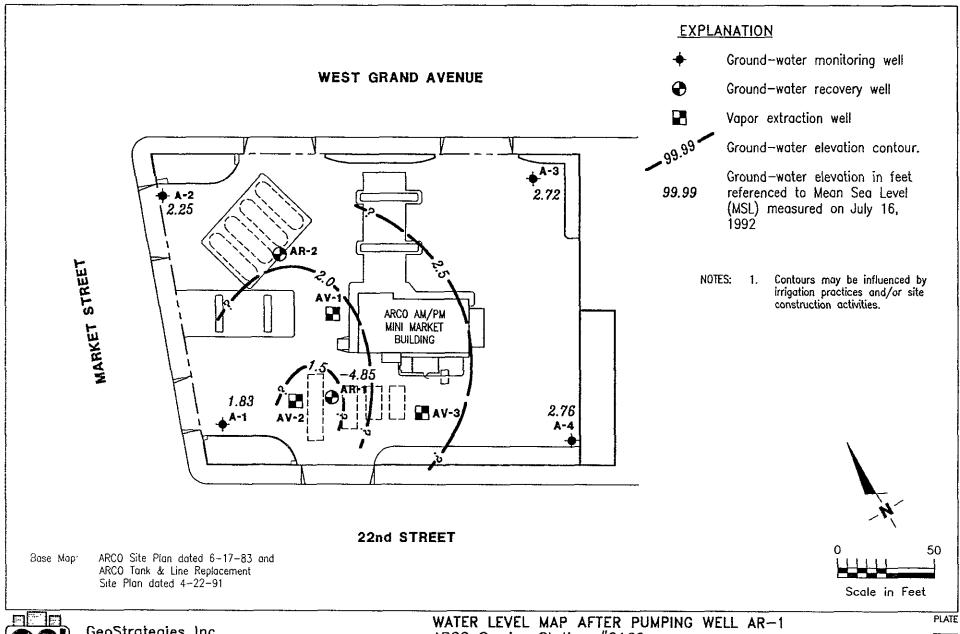
Oakland, California

DATE

REVISED DATE

JOB NUMBER 792705-4 REVIEWED BY nem

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ARCO Service Station #2169 889 West Grand Avenue

Oakland, California

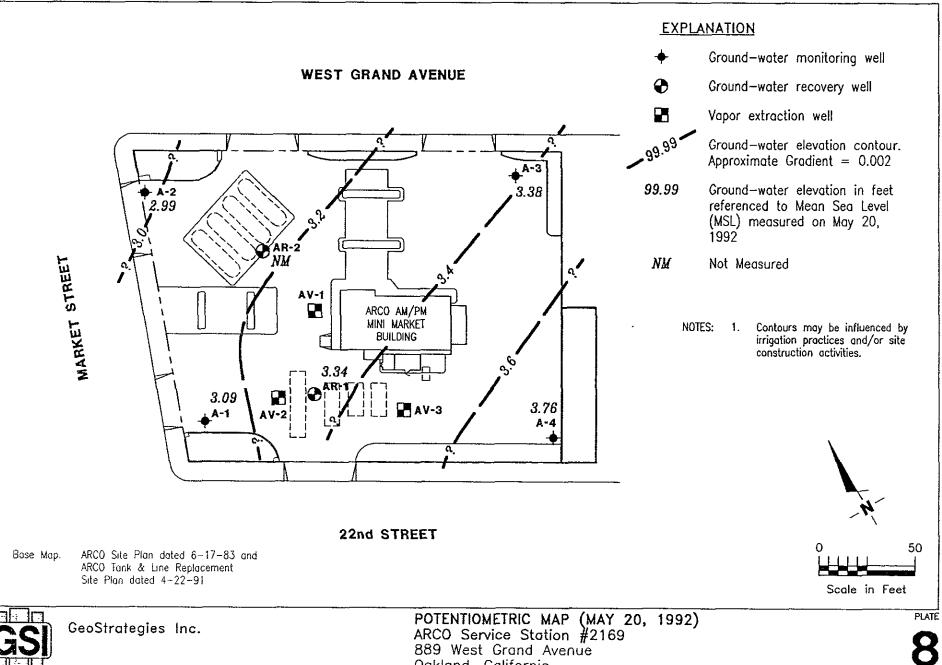
DATE

8/92

REVIEWED BY

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JOB NUMBER 792705-4



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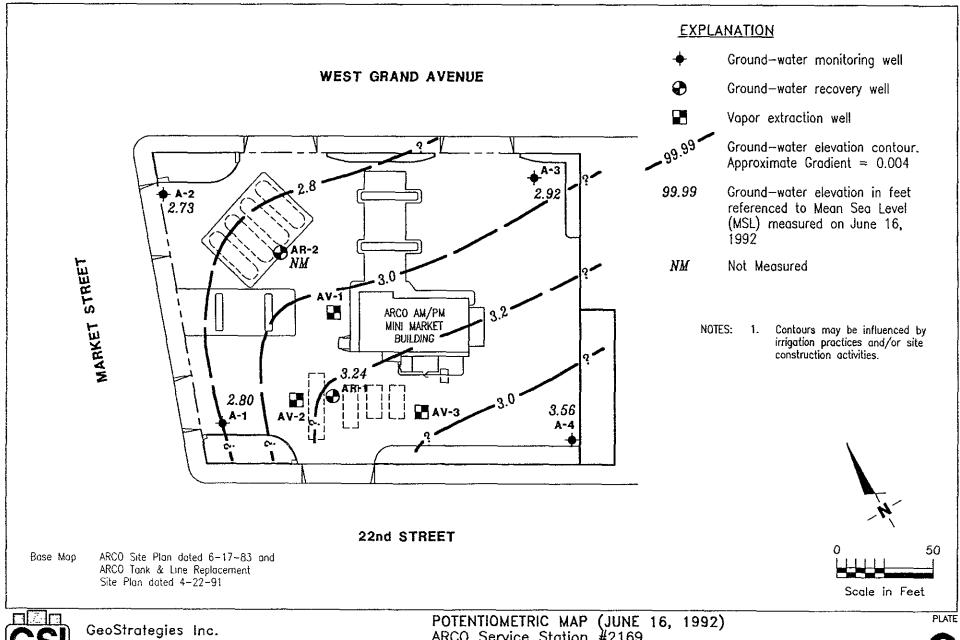
792705-4

Oakland, California

DATE 8/92 REVISED DATE

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ARCO Service Station #2169

889 West Grand Avenue

Oakland, California

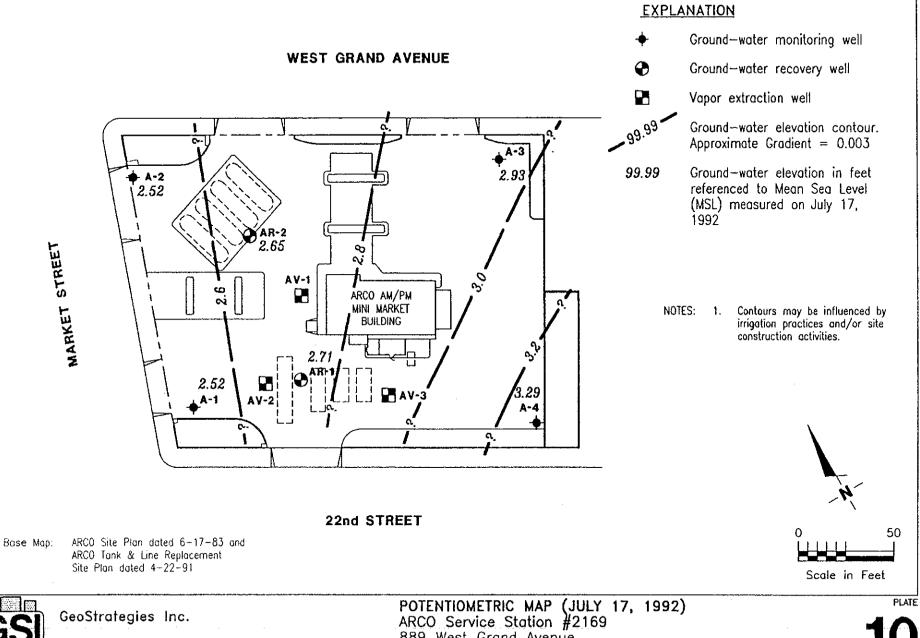
DATE

REVISED DATE

JOB NUMBER 792705-4 REVIEWED BY nem

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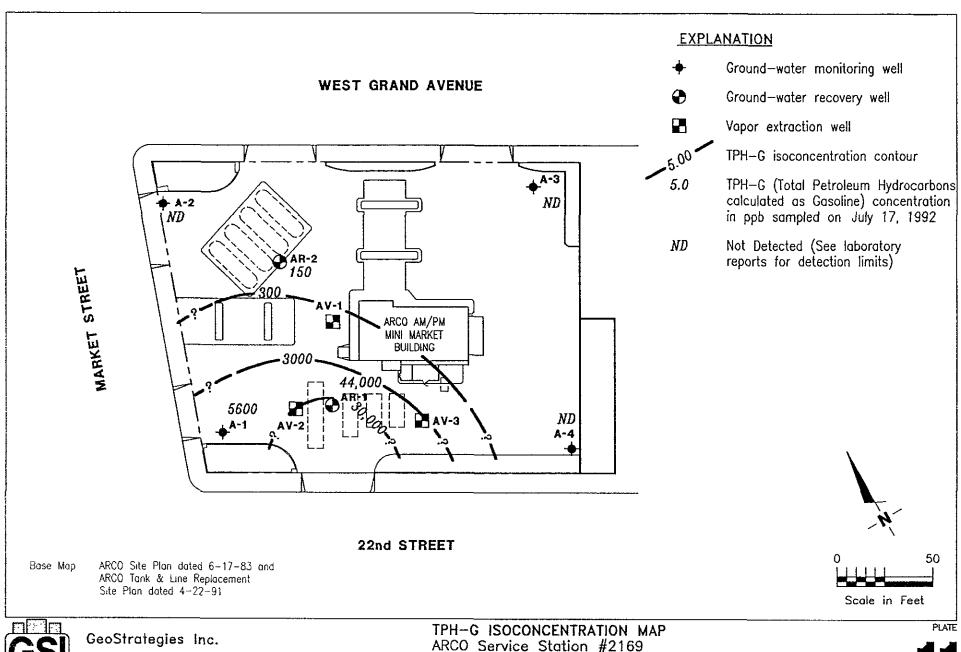


889 West Grand Avenue

Oakland, California

DATE 8/92 REVISED DATE 11/92

JOB NUMBER 792705-4 REVIEWED BY *Nom*



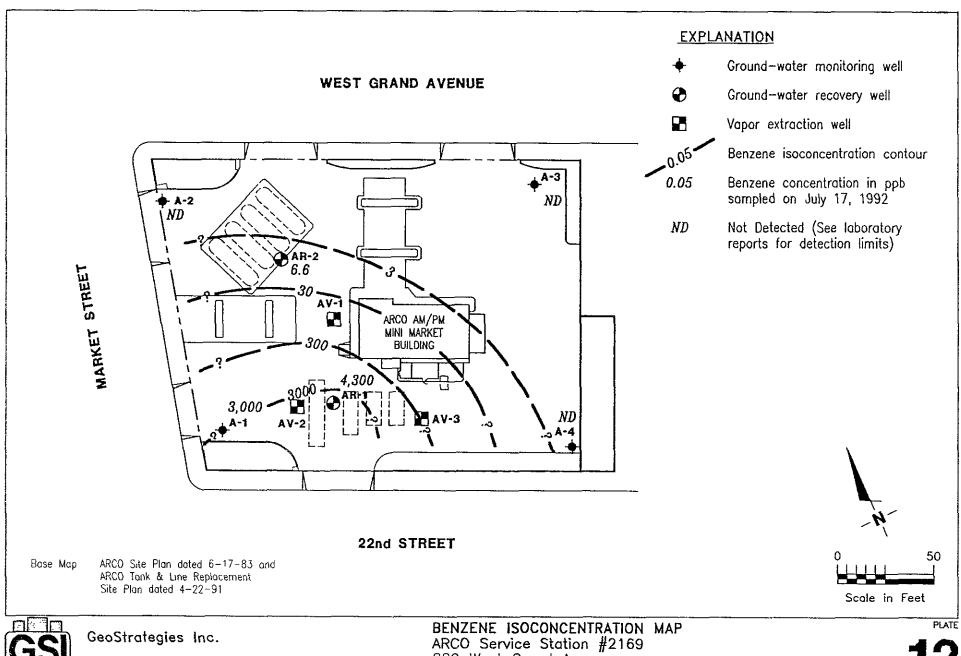


TPH-G ISOCONCENTRATION MAP ARCO Service Station #2169 889 West Grand Avenue Oakland, California

11

JOB NUMBER 792705-4 REVIEWED BY

DATE 8/92 REVISED DATE 11/92



889 West Grand Avenue Oakland, California

JOB NUMBER REVIEWED BY 792705-4 rem

DATE 8/92 REVISED DATE 11/92

APPENDIX A EXPLORATORY BORING LOGS AND WELL CONSTRUCTION DETAILS

	MAJOR DIVI	SIONS			TYPICAL NAMES
:VE		CLEAN GRAVELS WITH LITTLE	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
). 200 SIE	GRAVELS	OR NO FINES	GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	GRAVELS WITH	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
GRAINE		OVER 15% FINES	GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
OARSE HALF IS (CLEAN SANDS WITH LITTLE	sw		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
R THAN	SANDS MORE THAN HALF	OR NO FINES	SP -		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
MOF	COARSE FRACTION IS BMALLER THAN NO. 4 SIEVE SIZE	SANDS WITH	SIVI [- - WITHOUT GRA	SILTY SANDS WITH OR WITHOUT GRAVEL	
		OVER 15% FINES	sc		CLAYEY SANDS WITH OR WITHOUT GRAVEL
SIEVE			ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
ILS N NO. 200	SILTS AN LIQUID LIMIT !	-	CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
INED SO	,		OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
VE-GRA			МН		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AN LIQUID LIMIT GRE		СН		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
MORE			ОН		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
	HIGHLY ORG	ANIC SOILS	PT		PEAT AND OTHER HIGHLY ORGANIC SOILS

LL - Liquid Limit (%)
PI - Piastic Index (%)

PID - Volatile Vapors in ppm
MA - Particle Size Analysis
2.5 YR 6/2 - Soil Color according to

 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 Wa

- First En∞untered 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 loo	ation of t	oring:						Project No.:		Date:	6/8/92	Boring	No:
								Client:	ARCO Prod	ucts Compa	ny SS #2169	,,,	
		(5	See Plate	2)				Location:	_889 W. Grar	nd Avenue		~~	₹-2
(City:	Oakland			Sheet	1
j								Logged by:		Driller:	W. Hazmat	of	2
Drilling	method:	Hollow:	Stem Au	aer		 	,	Casing instal	lation data:				
Hole dia		10 - incl						Top of Box E	levation:		Datum:		
	िक्र		T				્ર	Water Level	15.0'	T		l	
PiO (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	e ja	Depth (ft.)	Sample	 	Soil Group Symbol (USCS)	Time	9:14				
E &	Mo alow	<u> </u> \$-\$	Sample	8	S.	Well	o i o	Date	6/8/92				
	_ &						\$ \$			Description		·	
	ļ		<u> </u>	_		_		Conduc	ctor casing to	10.5 feet.			
ļ <u></u>	ļ	ļ	ļ	1		_							
<u> </u>	 			1	<u> </u>	4		FILL - p	ea gravel to	15 feet.			
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				14									
				ا مر	<u> </u>				A11 = 12 - 1				
		S&H	<u> </u>	15		Δ̈́		SANDY	SILI (ML) - y	ellowish bro	wn (10 YR 5/	4); ven	<u> </u>
		San	AR-2	16				SUIT; MO	ist; /U% siit; ;	JU% TINE to	coarse sand;	trace	
0	31		16.5	וט	:4		<u> </u>	gravei; ç roothole	arenisti gray	(5 (3 (3/1)	discoloration	<u> </u>	
			10.5	17				100011016	· .			···	
				'			<u> </u>	***					
				18									
				-			/ :						
				19			[: : : برا			***************************************			
				' Ì			$[\cdots :]$	***					
				20									
Hemarks:	* Conve	erted to e	equivalei	nt st	anda	ard pene	tration b	lows/ft.					
							•••						
	883						Log of E	loring				900	ING NO.

JOB NUMBER 792705

REVIEWED BY AGACEG

0ATE 6/92

REVISED DATE

PIEVISED DATE

Field loc	ation of t	oring:						Project No.:		Date:	6/8/92	Boring No:
								Client:		lucts Co. SS	#2169	AR-2
		(S	See Plate	2)				Location:	889 W. Grai			ļ
-								City:	Oakland, Ca			Sheet 2
İ								Logged by:		Driller:	W. Hazmat	of 2
								Casing instal	lation data:			
Drilling		Hollow 9		ger								
Hole dia	meter:	10 - inct	nes					Top of Box E	levation:		Datum:	
1	ক্তি			T_			9	Water Level				
Plo (mdd)	Blows/ft.* or Pressure (psi)	Type of Sample	6 pg	Depth (ft.)	Semple	₹ 8	l og S	Time				
_ ਛੁਊ	No.	T-YP	Sample	1 2	Seg	Well	F 2	Date				
ŀ			-	"			Soil Group Symbol (USCS)			Description	<u> </u>	
		S&H	AR-2				1	SAND	with GRAVEL		n (10 YR 4/3): dense:
-			21.0	21				saturate	ed: 60% fine	to coarse sa	nd; 40% angi	ular to
0	40	 	<u> </u>	1	7				inded, fine to			
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	 	 	 	24								
				- '			1///					
				25			1///		 -			
<u> </u>	 	S&H				· I	1///	CLAVE	Y SAND ISC) - dark groo	nish gray (5 G	2V 4/1):
	 		AR-2	26				dense.	saturated: 80) - dalk gree	edium sand; 2	21 4/1),
0	35		26.5	20			K / /	SAND	SDI - dark or	oppieh grav	/E GV 4/1\2 d	oneou
 	00		20.5	27				SAND	3r) - dark gr ed; 100% fine	eeriisii gray	(5 GY 4/1); d	ense;
				21				Salurale	su, 100% line	sanu,		
				28	\vdash		1					
				20	 				· 			
				29					······································			
		S&H	AR-2	23				CII T with	b CANID (Adl	\ doub ====		OV 4/4)
		Jari	30.0	30			11 11	SILI WI	III SAND (IVIL	.) - dark gree	nish gray (5	GY 4/1);
0	32		30.0	30				naid, u	amp, 60% Sill	., 20% line to	coarse sand	1,
	02			31	ZI							·····
				31	_				· · · · · · · · · · · · · · · · · · ·			
				00				Datte	-6			
		<u> </u>		32	\vdash				of boring at 3	30.5 feet,		
ļ				20				6/8/92.				
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Remarks:												
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JOB NUMBER 792705

REVIEWED BY PIG/CEG

DATE 6/92

REVISED DATE

M → E	WELLCONSTRUCTION DETAIL
	A Total Depth of Boring30.5_ ft.
	$oldsymbol{\Pi}$
	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.
F	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.
◄──B ──►	_
1	Note: Depths measured from initial ground surface.
GSI GeoStrategies Inc.	Well Construction Detail WELL NO.
	AR-2
DB NUMBER REVIEWED BY POICEG 792705-4 ATV	DATE REVISED DATE REVISED DATE 6/92

Field lo	ocation of	boring:		·				Project No.:	792705	Date:	6/0/00	
1								Client:	ARCO Prov	ducts Co. SS	6/8/92	Boring No.
			(See Pla	ate 2)				Location:	889 W. Gra	nd Avenue	7#4109	AV-1
1								City:	Oakland, C	alifornia		L
i								Logged by:	BCM	Driller:	VAC 1 In-	Sheet 1
<u> </u>								Casing instal	lation data:	Dimer.	W. Hazmat	of 1
	method: iameter:	Hollow 8-inche	Stem /	Auger				1				
		O-INCIR	2 5		1			Top of Box E			Datum:	
a E	Blows/ft.* or Pressure (psi)	5 9		£	9		Soil Group Symbol (USCS)	Water Level	12.0'			
OF G	fows or	Type of Sample	Sample	Depth (ft.)	Samole	Vell	2 5 5 5 5	Time	14:35			
	" &	("	"2	ă	l "		S de X	Date	6/8/92			
	<u> </u>	 -	 	+-	-	 	0	DAVEN	CNTOFOTIO	Description		
	T	 	 	1	\vdash			PAVEM	ENT SECTION	ON - 1.0 feet.		
		1	· · · · ·			7		CLAY (CI) blook (d	0.1/0.0/41	10	
			T	7 2	 	7		Clay: 10	% fine sand.	0 YH 2/1); r	nedium stiff; d	amp; 90 %
					- -	7		Ciay, 10	76 Title Sand.			
				3	\Box							<u></u>
_						7		<u> </u>				
				4							<u> </u>	
						1						
	 			5]		COLOR	CHANGE to	dark oravic	h brown (2.5	V 4/00
	ļ	S&H		_] .				very stiff	: iron oxide	staining in re	ootholes at 5.0	Y 4/2);
		<u> </u>	AV-1	_ 6]			,	otalimig iii t	outibles at 5.0	J teet.
444	22	·	6.5]			·			
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		Зап	AV-1	-			V/A					······································
2146	21		11.5	11	-			Minor gre	enish gray (5 GY 5/1) di	scoloration; n	noist at
		S&H	11.3	12	-			I 1.5 1 00 1,				
	+	0011		12		Ā	///	Saturated	d at 12.0 feet			
1062	22		<u> </u>	13			Y//}-					
		S&H	AV-1	13	┡┈┤		Y//}	······································				
			14.0	14			5.4.4	OLANCE:	<u> </u>			·
1875	29		14.0	'			///	dence: =	SAND (SC)	- light yellow	vish brown (2.	5 Y 6/4);
			<u></u>	15	-		111	uense, sa	iturated, 75%	o tine to med	lium sand. 25°	% clav.
				1 -			-	greenish	yiay (5 GY 5	(1) discolora	ation in rootho	ies.
		$\overline{}$	•	16		}	-	·				
	.		· · · · · · · · · · · · · · · · · · ·			j	-	Bottom of	boring at 14	C fort		
				17				6/8/92.	boring at 14	.5 reet.		
				1	7		}	J. G. J. E.			······································	
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				19		[<u></u>					
							 					
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marks:	* Conver	ted to e	quivale	nt star	nda	rd penet	ration blo	ws/ft.		· · · · · · · · · · · · · · · · · · ·		
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20	.∎) GeoS	trategie	es Inc.			•	-	ציייי				BORING NO.

GSI

AV-1

JO8 NUMBER 792705

REVIEWED BY RG/CEG

0ATE 6/92

REVISED DATE

	M -> E -	WELLCONSTRUCTION DETAIL
A	C	
GSI GeoStrat	egies Inc.	Note: Depths measured from initial ground surface. Well Construction Detail WELL NO.
DE NUMBER	REVIEWED BY PIGICEG	AV-1

(See Plate 2) Location: 889 W. Grand Avenue City: Oakland, California Logged by: RCM Driller: W. Casing installation data: Hole diameter: 8-inches									Project No.: Client:		Date:	6/8/92 5 #2169	Boring	No
Drilling method: Hollow Stem Auger Hollow Stem Auger Hollow Stem Auger S-inches Top of Box Elevation: Dead of Market Dead of M			((See Pla	ite 2)				Location:	889 W. Gra	nd Avenue		A	V-2
Drilling method: Hollow Stem Auger Hollow Stem Auger Hollow diameter: 8-inches Top of Box Elevation: Dox									City:	Oakland, Ca	alifornia		Sheet	1
Drilling method: Hollow Stem Auger Hollow Stem Auger Hole diameter: 8-inches Top of Box Elevation: Date D									Logged by:	RCM		W. Hazmat		
Top of Box Elevation: Dox	Drilling	method:	Hollow	Stom A					Casing installa	tion data:			1	<u> </u>
Q E S S H AV-2 11 13 S S H AV-2 14 15 S AND with GRAVEL (SW) - yellowish medium dense, saturated; 80% fine to 20% fine gravel. S S H AV-2 11 S S H AV-2 14 15 S AND S H AV-2 15 S AND S H AV-2 16 S AND S H AV-2 16 S AND S H AV-2 16 S AND S H AV-2 17 S AND S H AV-2 17 S AND S H AV-2 18 S B AV-2 14 S B AV-2 14 S B AV-2 15 S AND S H AV-2 16 S AND S H AV-2 17 S AND S H AV-2 17 S AND S H AV-2 18 S AND S H AV-2 19 S AND					luger			· · · · · · · · · · · · · · · · · · ·	Top of Roy Ele			-		
PAVEMENT SECTION - 1.0 feet. CLAY (CL) - very dark gray (10 YR 3 damp; 90 % clay; 5% fine sand; brick damp; 90 % clay; 5%		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	<u> </u>									Datum:		
PAVEMENT SECTION - 1.0 feet. CLAY (CL) - very dark gray (10 YR 3 damp; 90 % clay; 5% fine sand; brick damp; 90 % clay; 5%	οÊ	fr.	9 0₹	9 50	€	٩		and Sign						
PAVEMENT SECTION - 1.0 feet. CLAY (CL) - very dark gray (10 YR 3 damp; 90 % clay; 5% fine sand; brick damp; 90 % clay; 5%	ਤੋਂ ਫੁੱ	Swol	Semi	Sem	e ti	J. J.	. Nei	2 S				 	ļ <u></u> _	
PAVEMENT SECTION - 1.0 feet. CLAY (CL) - very dark gray (10 YR 3 damp; 90 % clay; 5% fine sand; brick damp; 90 % clay; 5%		a a	_		٩	"		S te	Date	0/0/92	Description	<u> </u>		
CLAY (CL) - very dark gray (10 YR 3 damp; 90 % clay; 5% fine sand; brick damp; 90 % clay; 5% fine sand; brick s&H									PAVEME	NT SECTIO	N - 1.0 feet.			
S&H AV-2 6 S&H AV-2 11 AV-2		 	<u> </u>		_ 1	<u> </u>	_						· · · · · · ·	
S&H AV-2 6 S&H AV-2 11 AV-2 AV		 	 		\dashv		-		CLAY (C	L) - very da	rk gray (10 \	/R 3/1); medi	um stiff	:
S&H AV-2 6			- 	 	- 2	-	-		damp; 90	% clay; 5%	fine sand;	brick fragmer	its.	
S&H AV-2 6		 	 	<u> </u>	۱,		-	Y///						
S&H		 	 	 	٦,	-	-							
S&H		 	 	 	_ ا	\vdash	1							
S&H			 	 	┤ `	-	-						·	
S&H		 	 	 	5	-	1		COLOR	HANGE to	nole elice (C 37 (2/2)		
114 33 6.5 7 8 9 9 10			S&H	T			1		gravel at !	5 O feet	pale olive (5 Y 6/3); trac	e fine	
10				AV-2	6		_		9.470,41	0.0 1001.				
S&H N-2 11 N-2	114	33		6.5]			· · · · · · · · · · · · · · · · · · ·				
9			<u> </u>	<u> </u>	7]							_
9 10 S&H AV-2 11				ļ	4		_					***		
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S&H					10		1							
AV-2 11			S&H		┤ '		1			····				
S&H 12 2 2				AV-2	11		1							
702 18 13 20% fine gravel. SANDY SILT (ML) - brown (10 YR 5/3) saturated; 70% silt; 30% fine sand. 15 Bottom of boring at 14.5 feet. 6/8/92.	896	24					1	1.:::	SAND with	GRAVEL	(SW) - vollo	wich brown /	10 VD 5	74
702 18			S&H] 12		∇		medium de	ense, satura	ted: 80% fi	Wish or and or	O YH 5	/4)
702 18 13 13 SANDY SILT (ML) - brown (10 YR 5/3) saturated; 70% silt; 30% fine sand. 15 Bottom of boring at 14.5 feet. 6/8/92. 17 18] 🗦	1:::1	20% fine a	ravel.				
14.0 14	702	18			13		[SANDY SI	LT (ML) - bi	rown (10 YR	5/3): verv sti	ff:	—
8655 31			S&H						saturated;	70% silt; 30	% fine sand	l.		•
15 Bottom of boring at 14.5 feet. 6/8/92.	855	21	·	14.0	14		ļ							
Bottom of boring at 14.5 feet. 6/8/92.		31		;	 									
16 6/8/92.	-+				¹3]	Day - 1	L				
17 18					16			-	Bottom of	boring at 14	.5 feet.			
18					┤ `				0/0/92.					
18					17			1 }						
] [·	
19					18					····				
19										····			·	
					19					·····				
20 Z	marks	+ 0.	1		20									
narks: * Converted to equivalent standard penetration blows/ft.	narks,	- Conve	erted to e	equivale	ent sta	and	ard per	netration bl	ows/ft.	 -				

GSI

GeoStrategies Inc.

AV-2

JOB NUMBER 792705

REVIEWED BY RG/CEG

DATE 6/92

REVISED DATE

M - E - C	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.
	Perforated Length Perforated Interv Perforation Type 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
K	J Seal from 4.0 to 4.5 ft. Seal Material Bentonite
G H	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.
← B →	Note: Depths measured from initial ground surface.
GeoStrategies Inc.	Well Construction Detail WELL NO
NUMBER REVIEWED BY PRICEG 2705-4	DATE REVISED DATE REVISED DATE 6/92

, 1010 100	auon or	ooning.						Project No.: Client:		Date:	6/8/92	Boring No:
		(See Pla	te 2)				Location:	ARCO Prod 889 W. Gran	ucts Co. SS	#2169	AV-3
		`						City:	Oakland, Ca		· · · · · · · · · · · · · · · · · · ·	Sheet 1
								Logged by:	RCM	Driller:	W. Hazmat	of 1
	···							Casing install			vv. Haziliat	1 01 1
	method:		Stem A	uger				1				
Hole dia	T	8-inche	s		, .		-	Top of Box E	levation:		Datum:	
_	, (S	= 0		7			SS	Water Level	12.0'			
F (E)	Blows/ft. or essure (p	Type of Sample	Sample Number	Depth (ft.)	Semple	Well	G G	Time	14:30			
3	Blows/ft.* or Pressure (psi)	15.00	0 €	₫	ď	-	Soil Group Symbol (USCS)	Date	6/8/92			
	<u> </u>				-	<u>-{</u>	ଜ	DAY (E)	<u></u>	Description		
	 		 	վ լ		-		PAVEM	ENT SECTIO	N - 1.0 feet.		
			1	┪′	-	1		CLAY (Cl.) - veny dar	k grav (10)	(D 0/4),	
				2	-	-		damp. 9	55 % clay; 5%	fine sand	/R 3/1); medi	um stm;
						7			5 70 Okty, 570	ine sand,		
				3]						
				_]								
				_ 4		1	V//					
			 		<u></u>	1	1//					
		S&H	 	5		}		COLOR	CHANGE to	light olive I	orown (2.5 Y	5/4); minor
		Jan	AV-3	6	₽	1		white no	dules at 5.0 f	eet.	·	
186	12	 	6.5	-	-]	Y//		-			
		<u> </u>	0.5	7		-						
		 -	 	┤ ' ╷		1						
				8	-	1						
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				9]						
			<u></u>				V/Λ			· · · · · · · · · · · · · · · · · · ·		
		0.011	ļ	10		į						
		S&H	41/0	ا ۱		ļ		Minor gr	eenish gray (5 GY 5/1) d	iscoloration;	moist at
765	18	<u> </u>	AV-3	11	.		Y//	11.5 feet	· · · · · · · · · · · · · · · · · · ·			
705	10	S&H	11.5	12		,,	Y//	CILTYC	AAID (OLD)			
				- ' -		Ϋ́		dence c	AND (SM) - g	reenish gra	y (5 GY 5/1);	medium
435	20			13				delise, s	aturateu, 65%	s line to coa	rse sand; 359	% silt.
	7	S&H	AV-3	`				SANDY	SILT (ML) - ve	ellowich bro	wn (10 YR 5/4	4)
			14.0	14			╏╏┊╏┋	stiff; satu	rated; 70% s	ilt: 30% fine	sand	i); very
275	19						<u> </u>			, 5570 1110	Sur iti.	
]			15 [
] [1.11		
				16				Bottom o	f boring at 14	l.5 feet.		
				1				6/8/92.				
				17			_			-		
<u>_</u>				1			-					
				18			-					
				19			-		*			
			·	'3			-			·		
				20	\dashv		<u> </u>					
emarks:	* Conve	rted to e	guivale	nt sta	anda	ard pene	tration blo	ows/ft				
			1			pono		o 11 O/ 16.				
	<u> </u>					·	Log of B	orina				
	- A							viniy.				BORING NO.

AV-3

ЈОВ NUMBER 792705

REVIEWED BY AGICEG

DATE 6/92

REVISED DATE

	A Total Depth of Boring	<u>14.5</u> ft
	B Diameter of Boring	8 in
	Drilling Method Hollow Stem Au	uger
	C Top of Box Elevation	#
	Referenced to Mean Sea Level	
	Referenced to Project Datum	
	D Casing Length	14 ft.
	D Casing Length Schedule 40 PV	<u> </u>
	E Casing Diameter	2 in
		<u>5.U</u> ft.
	G Perforated Length	9;0 ft.
	Perforated Interval from 5 to	14 ft.
Ţ	Perforation Type Factory Slotte	
	Perforation Size 0.020	in.
	H Surface Seal from 0 to	10 #
	H Surface Seal from 0 to Seal Material Concrete	1,0 IL
	I Backfill from 1.0 to Backfill Material Neat Cement	4.0 ft.
	Backfill Material Neat Cement	
	J Seal from 4.0 to	4.5 ft.
K K	Seal Material Bentonite	
ì	K Graval Baak from	
	K Gravel Pack from 4.5 to 1 Pack Material Lonestar #2/12 Gradeo	14.0 ft.
	Editoda #2 12 Glade	Janu
	The second secon	0.5 ft.
	Seal Material Bentonite	
	M Waterproof vault box with waterproof	lookina
	cap and lock.	<u>iockii</u> lg
Y		
A		
<u> </u>		
← B →		
	Note: Depths measured from initial ground s	urface.

JOB NUMBER REVIEWED BY PG/CEG DATE 792705-4 71 6/92

	M E C	WEL	LCONSTRUCTION DETA	JL
A		A	Total Depth of Boring 30.5	ft.
		В —	Diameter of Boring 10 Drilling Method Hollow Stem Auger	in.
		С		ft.
		D	Casing Length 28.5 Material Sch. 40 PVC & Carbon Steel	ft.
		E	Casing Diameter4i	
		F	Depth to Top Perforations 8.5	
		_ G	Perforated Length 20.0 f Perforated Interval from 8.5 to 28.5 f Perforation Type Continuous Wrap Perforation Size 0.020	
	D A	- н	Surface Seal from 0 to 1.0 ft Seal Material Concrete	t.
		l	Backfill from 1.0 to 6.5 ft Backfill Material Neat Cement	.
	K	J	Seal from 6.5 to 7.5 ft Seal Material Bentonite	1 M4
	G	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	
		М	Waterproof vault box with waterproof locking cap and lock.	
	/ L			
	▼ B	Note	e: Depths measured from initial ground surface.	
GSI	GeoStrategies Inc.	Well Con	.	ELL NO.
JOB NUMBER	SEMENTS OF STREET	·	AR	-2
792705-4	REVIEWED BY ROICEG		DATE REVISED DATE REVISED D 6/92	ATE .

Field lo	cation of	boring:						Project No.:	792705	Date:	6/8/92	I Parion Mai
1								Client:	ARCO Prod		0/0/92 3.#2160	Boring No:
		+	(See Pla	ate 2)				Location:	889 W. Grai	ad Avenue	7#2109	AV-1
1				·				City:	Oakland, Ca			Charles
İ								Logged by:	RCM	Driller:	10/ Ll=====	Sheet 1
								Casing instal		Dimor.	W. Hazmat	of 1
	method:	Hollow	Stem A	∖uger				1				
Hole di	ameter:	8-inche	es				· · · · · · · · · · · · · · · · · · ·	Top of Box E	levation:		Datum:	
1	Blows/fi.* or Pressure (psi)			_			(S)	Water Level	12.0'			
Ord (mdd)	11/5×10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Type of Sample	Semple	Depth (tt.)	Sample	Welf	Soil Group Symbol (USCS)	Time	14:35		-	
- 9	Bio Ser	ļ ⊱∑%	3 2	8	3	_ ≥ %	Jog Io	Date	6/8/92		 	
	<u> </u>		<u></u>	<u> </u>	<u> </u>		ँ के			Description		<u> </u>
		<u> </u>	<u> </u>	_	_	1		PAVEM	ENT SECTIO	N - 1.0 feet.	 	
		 	 	1		_						
		 	<u> </u>		<u></u>	_	V//	CLAY (CL) - black (1	0 YR 2/1); r	nedium stiff; o	lamp: 90 %
-		ļ <u> </u>		_ 2		1	V//	clay; 10	% fine sand.			
	 		ļ		<u></u>	1	V//					
	 		- -	_ 3		i	V//					
	·	 	 	_	<u> </u>	-	Y//					
		<u> </u>	 	4	<u> </u>	1	V//			······	· · · · · · · · · · · · · · · · · · ·	
	 	<u> </u>	 	⊣	<u> </u>	4						····
		COLL	 	_ 5		4	V/Λ	COLOR	CHANGE to	dark gravis	h brown (2.5	Y 4/2):
· · · · · · · · · · · · · · · · · · ·	ļ	S&H				-		very stif	f; iron oxide :	staining in re	ootholes at 5.	0 feet
444			AV-1	_ 6		j						
444	22		6.5	┥_ ;		}	V/Λ					
 	ļi			_ 7		j	V/A					1 711
			ļ	_		i	V/A					
			ļ	8		ļ	V/Λ				··· , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
				_			V/Λ				· · · · · · · · · · · · · · · · · · ·	
	 			9			V/Λ					
	 		ļ	1								
		S&H		_ 10		ı	V/A	······································				
		Jan	A)/ 1				///	*				
2146	21		AV-1 11.5	11			V/A	Minor gre	eenish gray (5 GY 5/1) d	iscoloration; r	noist at
2140		S&H	11.5	10				11.5 feet	<u> </u>			
		3017		12		$\dot{\bar{\Delta}}$		Saturate	d at 12.0 feet.			
1062	22			4.0		•					······································	
1002		S&H	AV-1	13	\vdash		$V//\Lambda$					
		Jan	14.0	١,,			4.4.4					
1875	29			14			////	CLAYEY	SAND (SC)	 light yellov 	vish brown (2	.5 Y 6/4);
				15			1.1.1	aense; sa	aturated, 75%	fine to med	dium sand, 25	% clav:
				վ ՝° ├				greenish	gray (5 GY 5	discolor	ation in rooth	oles.
	·			16								
-				┤ ^{''°} ├		ļ	-	Date		1.1.		
				17		}	<u> </u>	Bottom o	f boring at 14	.5 feet.		
				{ ' ' }	\dashv		<u> </u>	6/8/92.	·			
			···	18	\dashv	ļ	<u> </u>					
				'0 -		1				·	*	
	-		**	19			ļ					
-				13 -		ļ	-					
				20		ł	-					
emarks:	* Conver	ted to e	quivale	nt eta	nda	rd pana	tration blo					
	0011401	.50 10 6	quivale	ווו טומ	nud	in hette	u auon Dio	ws/π.				
	29											
		Strategi	es Inc.				og of Bo	oring				BORING NO.

JOB NUMBER 792705

REVIEWED BY ROUCEG

DATE 6/92

REVISED DATE

		M	C		Depth of Boring		
				B Diame Drilling	ter of Boring Method	Hollow Stem	8 i Auger
				C Top of	Box Elevation eferenced to Mea eferenced to Pro	ın Sea Level ject Datum	fi
				D Casing	Length	Schedule 40.0	14 ft
	F				Diameter		•
					o Top Perforatio		
		<i>(///</i> //	1	Lettola	ited Length ited Interval from ition Type tion Size	ractory Slot	ted
,	b V				Seal fromaterial		
Î	1				from Material		
			K	J Seal fro Seal Ma	m aterial	4.0 to Bentonite	4.5 ft.
	Ğ			K Gravel F Pack M	Pack fromaterialLonesta	4.5 to ar #2/12 Grade	14.0 ft. ed Sand
				L Bottom Seal Ma		Bentonite	0.5 ft.
				M <u>Water</u>	proof vault box v cap an	vith waterproo	of locking
			Ž.				
		В	-	Note: Depth	s measured from	initial ground	surface,
Ge Ge	oStrategies	Inc.	Well (Constructio	n Detail		WE

6/92

Field lo	cation of	boring:						Project No.:	792705	Date:	6/8/92	T D 11_
								Client;	ARCO Prod		0/0/92	Boring No.
		(See Pla	te 2)				Location:	889 W. Gran	nd Avenue	7#2109	AV-2
ł				•				City:	Oakland, Ca	difornia		L
ļ								Logged by:	BCM	Driller:	W Harris	Sheet 1
								Casing instal	lation data:	- Jiller.	W. Hazmat	of 1
Drilling Hole dia	method:	Hollow	Stem A	uger]				
71018 01	~	8-inche	<u> </u>		,			Top of Box E			Datum:	
- 2	Blows/fit or Or Pressure (psi)	<u></u>	9 5	₽			Soil Group Symbol (USCS)	Water Level	12.0'			
Open)	Surge Surge	Type of Semple	Sample	Depth (ft.)	Sample	Well	85	Time	15:40	<u> </u>		
_	P. 89.	1 - 0	σž	8	3	- "	8 4	Date	6/8/92			
	 	 			-		Ű,	DAVE		Description		
	 	 	+		-	4		PAVEN	ENT SECTIO	N - 1.0 feet.		
	 	 	+	┥′	\vdash	-{		CLAV	201			
	<u> </u>			2		-		damo: C	OL) - very dar	k gray (10	/R 3/1); medic	um stiff;
	i	 		¬	-	1		uamp, s	0 % clay; 5%	tine sand;	brick fragmen	its.
	 	 	 -	3	}	-						
			T	┪ -		1						
		<u> </u>	1	4	 	1						
	1		 	┦ `	 	1						
•				5		1		COLOR	CHANGE to	nole alive (5.14.040)	
		S&H		~		1		OOLON	t 5.0 feet.	pale olive (5 Y 6/3); trace	e tine
•			AV-2	6				gravera	t 5.0 leet.			
114	33		6.5	7		4						
_				7		1					····	
				1		1						
				8		1						
] []		·				
			<u> </u>	9								
	<u> </u>		ļ	ا . ا		ļ						
	-		 	10								
		S&H	41/0				V/A					
896	24	.	AV-2	11			1					
090	- 24	S&H	11.5	140		_		SAND w	ith GRAVEL	(SW) - yello	wish brown (1	0 YR 5/4);
		Sari		12		Ϋ́	. : : }	<u>me</u> alum	oense, satura	ated; 80% fi	ne to medium	sand;
702	18		<u> </u>	13	\vdash		<u> </u>	20% fine	gravel.	1.22		
		S&H	AV-2	∤ ' ॅ ा				SANUY	DIL (ML) - DI	rown (10 YF	1 5/3); very sti	f;
1	 		14.0	14			-	saturate(j; 70% silt; 30	% fine sand	<u>l,</u>	
655	31		- 1,0	1	H		[]	·				
i			•	15			╎┖┸┸┸ ┩╌					
		_	- 					Bottom o	f boring at 14	E foot		
				16			-	6/8/92.	boning at 14	.5 leet.		
				1 [<u> </u>					
				17								
-				_		ł					·	
				18			_					
				19	\dashv		-					
+				``			ļ					
				20	\dashv		}-					
emarks:	* Conve	rted to e	quivale	nt sta	anda	ard pens	tration bl	ows/ft		· · · · · · · · · · · · · · · · · · ·		
			,			poile	wildi	J 17 O/ 1C.				
							Log of B	oring				
		Chrotoci						v: 1119				BORING NO

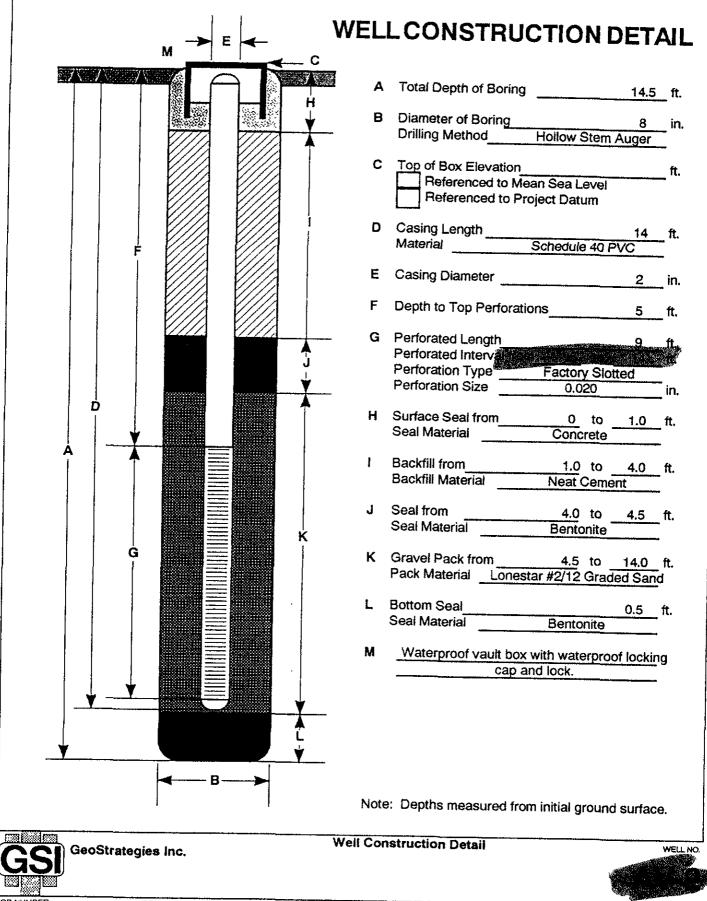
JOB NUMBER 792705

REVIEWED BY PIG/CEG m

0ATE 6/92

REVISED DATE

FIEVISED DATE



792705-4

REVIEWED BY POJCEG

0ATE 6/92

REVISED DATE

Field lo	cation of	boring:						Project No.:	792705	Date:	6/0/00	Та
								Client:	ARCO Pro	ducts Co. SS	6/8/92	Boring No:
		(See Pla	te 2)				Location:	889 W. Gra	nd Avenue	#2109	AV-3
Ĭ				•				City:	Oakland, C	alifornia		Ł
								Logged by:	RCM.	Driller:	M/ Hamma	Sheet 1
								Casing insta	lation data:	Dillion.	W. Hazmat	of 1
Utilling Hale dis	method:	Hollow 8-inche	Stem A	uger								
		OFINITION	/S		 -			Top of Box E			Datum:	
- 2	Blows/ft.* or Pressure (psi)	20 00	22 5	12	و		Soil Group Symbol (USCS)	Water Level				
Op (mod)	Soure Soure	Type of Sample	Sample	Depth (ft.)	Sample	Well	│ S =	Time	14:30			
ĺ	an é	""	0.2	8	\ °		8	Date	6/8/92	<u> </u>	<u> </u>	
		 	-	+	+	 	00	DAVEN	MENT SECTION	Description		
		<u> </u>	<u> </u>	┥1	H-	┥	4	FAVEIV	MENT SECTION	<u> </u>		
	1	1	1	٦ ٔ		7	777	CLAY	CL) - very de	ork arou (40)	/D 0/4> #	
				2		†		damo. c	95 % clay; 5%	fine cond	/R 3/1); medi	um stiff;
			7	7		7		danp, c	20 /6 Clay, 57	o inte Sand.		
				3		1			 			
						7	1//					
] 4								
				J								······································
] 5]		COLOF	CHANGE t	o light olive l	orown (2.5 Y s	5/4): minor
		S&H	1					white no	odules at 5.0	feet.	3104411 (2.3)	<i>3</i> /4), IIIIIOI
400			AV-3	6								
186	12		6.5								······································	
				7		4						
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				┤ "			Y//				····	
	- 			10			Y//	<u> </u>			· · · · · · · · · · · · · · · · · · ·	
		S&H	-	1.0			///	Minor or	onnich are	/F 00/ F/15 I		
			AV-3	11				11.5 feet	eemsn gray	(3 GY 5/1) a	iscoloration; r	noist at
765	18		11.5					11.5 166		··· <u>·</u>		
		S&H		12		∇	///	SILTYS	AND (SM) -	reenish ara	y (5 GY 5/1); ı	
						$\bar{\bar{\Delta}}$		dense, s	aturated: 659	% fine to coa	rse sand; 35%	Coite
435	20			13							100 04114, 037	o Sitt.
		S&H	AV-3					SANDY	SILT (ML) - y	ellowish brov	vn (10 YR 5/4): verv
275	19	- -	14.0	14				stiff; satu	rated; 70% s	ilt; 30% fine	sand.	7
E13	13			┤ _{┩╒} ┞			┸┸┸┸					[
-+				15			<u> </u>					
+				16	\dashv		-	Dottom o	of he makes and			
				' `	\dashv		<u> </u>	6/8/92.	of boring at 1	4.5 teet,		
				17	\neg	}	\ -	0/0/92.				
			· _ · _ · _ · _ · _ · _ · _ · _ · _ · _				<u> </u> -					
				18		}	<u> </u>	······································				
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				19		[<u> </u>					
						- 1						
emerke:	. 00			20								
vicialită. 1	Conver	ted to e	quivalei	nt sta	nda	rd pene	tration blo	ws/ft.				
(SE 22)												İ
	■ GeoS	itrategi	es Inc.			!	Log of Bo	oring				BOFING NO.

GSI

AV-3

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

ATE REVISED DATE

M -> E - C	WELL CONSTRUCTION DETAIL A Total Depth of Boring14.5_ 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
F F	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
K	J Seal from 4.0 to 4.5 ft. Seal Material Bentonite
G	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.
	-
≺ ——8——	Note: Depths measured from initial ground surface.
GeoStrategies Inc.	Well Construction Detail WELL, NO. AV-3

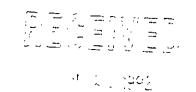
JOB NUMBER 792705-4

REVIEWED BY RIGHT

DATE 6/92 REVISED DATE

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





GETTLER-RYAN INC.

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

Nokowhat D. Herrera Project Manager



Gettler Ryan ₹2150 W. Winton Avenue Hayward, CA 94545

Attention: John Vargas

Gettler Ryan Client Project ID: Arco 2169, Oakland Sampled: Jun 8, 1992

Matrix Descript: Soil

Analysis Method: EPA 3550/8015 First Sample #: 206-1686

Jun 9, 1992 Received:

Extracted: Jun 11, 1992

Analyzed: Jun 11, 1992 Amended: Jun 22, 1992 # -ambit-violitie indialori adamit president metalist, alexistatara i salatitat absellatament delambit. Parti batta alambit i alambit belambit alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta alambit batta

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.

|--|

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.

Juddlite

SEQUOIA ANALYTICAL

Please Note:

Samples 2061687, 89 & 91 appear to contain gasoline.

Nokowhat D. Herrera Project Manager



Gettler Ryan

Client Project ID: Arco 2169, Oakland

2150 W. Winton Avenue Hayward, CA 94545

Attention: John Vargas

QC Sample Group: 2061686 - 91

Amended: Jun 22, 1992 ann an airtean an an taraigh ann an airtean an an airtean an an an an an an an an an airtean an airtean an air

QUALITY CONTROL DATA REPORT

NALYTE	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		
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	.0	-	
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 × 100 Spike Conc. Added Relative % Difference: Conc. of M.S. - Conc. of M.S.D. x 100 (Conc. of M.S. + Conc. of M.S.D.) / 2

2061686.GET <2>

Gettler Ryan 2150 W. Winton Avenue Hayward, CA 94545

Client Project ID:

Arco 2169, Oakland Soil

Sampled: Received:

Jun 8, 1992 Jun 9, 1992

Matrix Descript: Analysis Method:

EPA 5030/8015/8020

Analyzed:

Jun 11, 1992

Attention: John Vargas De la divinida di la Causa de la comencia de la comencia de la comencia de la comencia de la comencia de la com

First Sample #:

206-1686

Amended:

Jun 22, 1992

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

Sample	Sample	Low/Medium B.P.			Ethyl	
Number	Description	Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	T oluene mg/kg (ppm)	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

isten hadleten

Please Note:

The above samples appear to contain gasoline.

Nokowhat D. Herrera Project Manager



Gettler Ryan

Client Project ID: Arco 2169, Oakland

2150 W. Winton Avenue Hayward, CA 94545

Hayward, CA 94545
Attention: John Vargas QC Sample Group: 2061686 - 91 Amended: Jun 22, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method: Analyst: Reporting Units: Date Analyzed: QC Sample #:	EPA 8020 L.Laikhtman mg/kg Jun 11, 1992 GBLK061192	EPA 8020 L.Laikhtman mg/kg Jun 11, 1992 GBLK061192	EPA 8020 L.Laikhtman mg/kg Jun 11, 1992 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

Nokowhat D. Herrera Project Manager

% Recovery:	Conc. of M.S Conc. of Sample	x 100		
	Spike Conc. Added			
Relative % Difference:	Conc. of M.S Conc. of M.S.D.	x 100		
	(Conc. of M.S. + Conc. of M.S.D.) / 2			
			2061686.GET < 4	>

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				Matrix		Prese	rvalion				3015	2021		 				Semi	00070			Method of shipment
Sample I.D.	La b по.	Container no.	Soil	Water	Other	Ice	Acıd	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas Diese/M	Oil and Grease 413.1 C 413.2	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Semi Metals □ VOA □ VOA □	CAM Metals EPA 6	Lead Org./DHS [] Lead EPA 7420/7421		courier
AV-1-65		1	X			X		6/8/92	14:00		X	X			\propto	L	(5	1				Special detection Limit/reporting
14-1-115		1	X			X		6/3/92	14:15		X	X				1	16	3				WEST
14-265		1	X	<u> </u>		X		6/8/92	15:15	<u> </u>	X	1		<u> </u>			165	8				POSSIBLE
11-2-115		1	X	 	<u> </u>	X		6/8/92	15:30		X	X		_	<u> </u>	 	165	\$9				Special QA/QC
14-3-65			X	-		X			16:20	 	X	X		<u> </u>		 		C	 			NORMAL
AV-3-115		1	X	<u> </u>		X		6/3/92	11:30	-	X	X				 	16	71				-
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GeoStrategies Inc.

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





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

Nokowhat D. Herrera Project Manager



Gettler Ryan

2150 W. Winton Avenue

Client Project ID:

9927.06, Arco 2169, Oakland

Sampled:

Jun 11, 1992 Jun 11, 1992

Hayward, CA 94545

Matrix Descript: Analysis Method:

EPA 5030/8015/8020

Received: Analyzed:

6/11-12/92

.. Attention: Barry McCoy YONG UNITED A CAMBO KANDON PARABARAN

First Sample #:

206-1972

Air

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.



Gettier Ryan

Ryan Client Project ID: 9927.06, Arco 2169, Oakland

32150 W. Winton Avenue Hayward, CA 94545

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes	
Method: Analyst: Reporting Units: Date Analyzed: QC Sample #:	EPA 8020 M.Nipp µg/L Jun 12, 1992 GBLK061292	EPA 8020 M.Nipp μg/L Jun 12, 1992 GBLK061292	EPA 8020 M.Nipp μg/L Jun 12, 1992 GBLK061292	EPA 8020 M.Nipp µg/L Jun 12, 1992 GBLK061 <i>2</i> 92	
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	

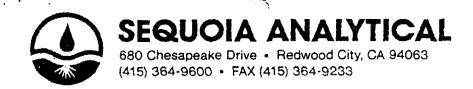
Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera Project Manager

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

2061972.GET <2>



Gettler Ryan Client Pr

Client Project ID: 9927.06, Arco 2169, Oakland

2150 W. Winton Avenue Hayward, CA 94545

Attention: Barry McCoy

QC Sample Group: 206-1973

Reported: Jun 15, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes	
Method: Analyst: Reporting Units: Date Analyzed: QC Sample #:	EPA 8020 M.Nipp µg/L Jun 11, 1992 GBLK061192	EPA 8020 M.Nipp µg/L Jun 11, 1992 GBLK061192	EPA 8020 M.Nipp µg/L Jun 11, 1992 GBLK061192	EPA 8020 M.Nipp µg/L Jun 11, 1992 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.	x 100		
	(Conc. of M.S. + Conc. of M.S.D.) / 2			
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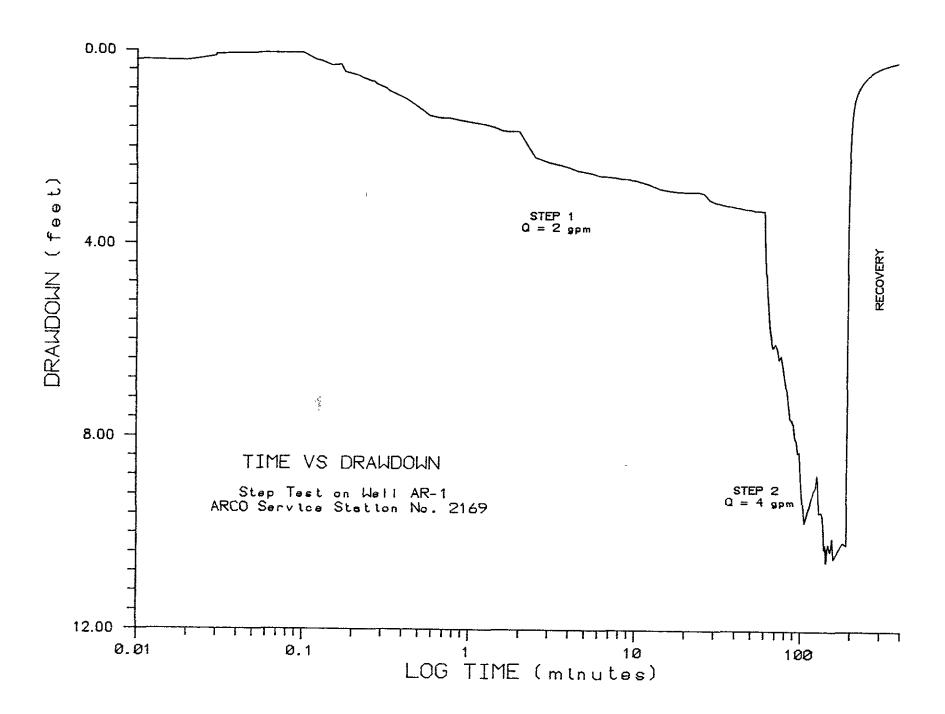
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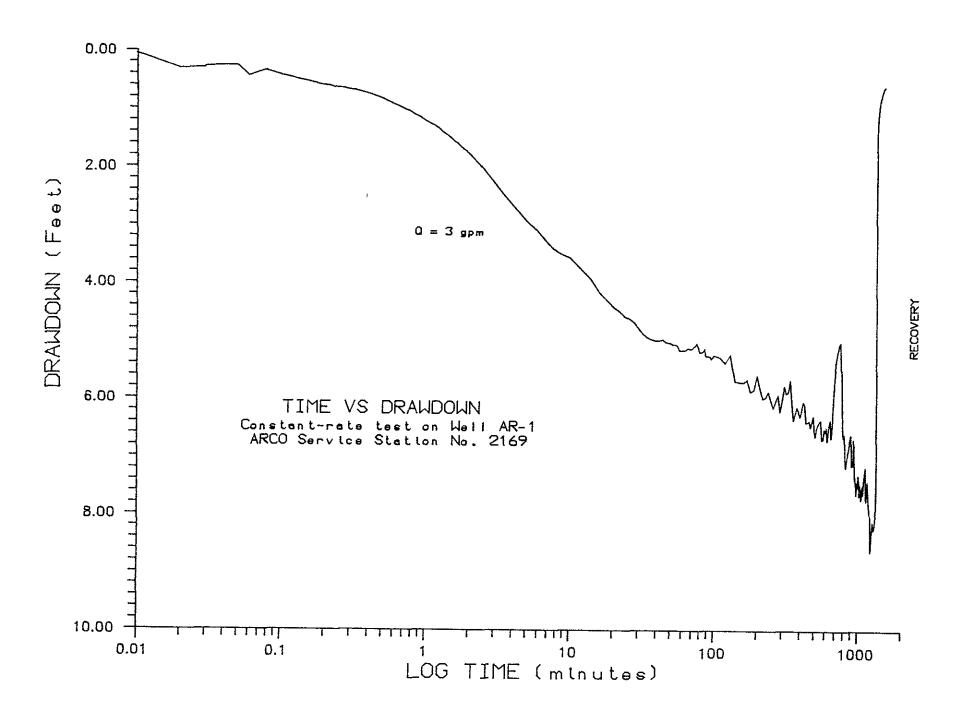
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APPC-3292 (2-91)

GeoStrategies Inc.

APPENDIX D
TIME VS. DRAWDOWN





GeoStrategies Inc.

APPENDIX E FIELD DATA PLOTS: JACOB METHOD

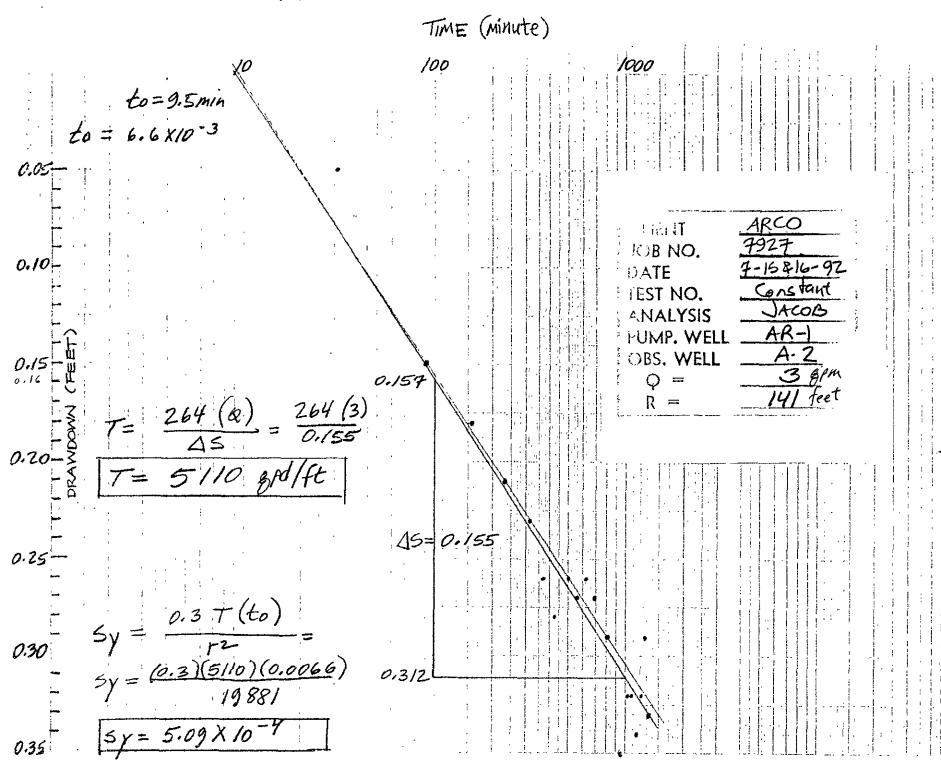
constation

0.40Z = AS ARCO CLIENT JOB NO. DATE TEST NO.

13

-7

19



	Time (Minutes	
00	19 190	
2 2 3 8	$t_0 = 22 min$ $t_0 = 0.015 day$	
VCT &	to = 0.015 day	
;		1000
		ARCO 7927
<u>.</u>		7-152/6-92
0.10		11318 Constant
0.12	0.101	iii war Will AR-I
0./3		$\frac{A-3}{3}$
0.15		3 8pm 159 feet
0.16	AS = 0.154	
0.18 0.13		
0.20	$T = \frac{264}{45}$	
0.21	$\frac{3}{7}$ $\frac{264(3)}{1}$ $\frac{792}{1}$ $\frac{5142}{1}$	
0.23		
0.25	0.255	
0.26		
0.28	0.3 T(to) 0.3 (5.14x10) 25x10-2	
0.29	$= \frac{3}{2} = $	
1	$5y = \frac{23.13}{2.53\times10^4} = 9.17.10^{-4}$	
Ę		

My Constant note

 $t_0 = 7.6 \, \text{min}$ $t_0 = 3.2 \, \text{x} \, 10^{-3}$

-15.

- 2

٠3

. 4

.7

CLIENT ARCO

JOB NO. 7977

DATE 15July 92

TEST NO. Constan

ANALYSIS Jacob

PUMP. WELL AR-1

OBS. WELL A-4 Q = 3 gpm

 $\Delta C = .434 - .196$ $\Delta C = 0.738$

T= 26+Q

T= 264(2) 0.238

T= 3.33 × 103 gpd/ft.

$$6y = \frac{0.3 T(t_0)}{r^2}$$

$$\leq \gamma = \frac{0.3 (3.33 \times 6^3) 3.2 \times 10^{-3}}{128^2}$$

$$5y = \frac{3.19}{16384}$$

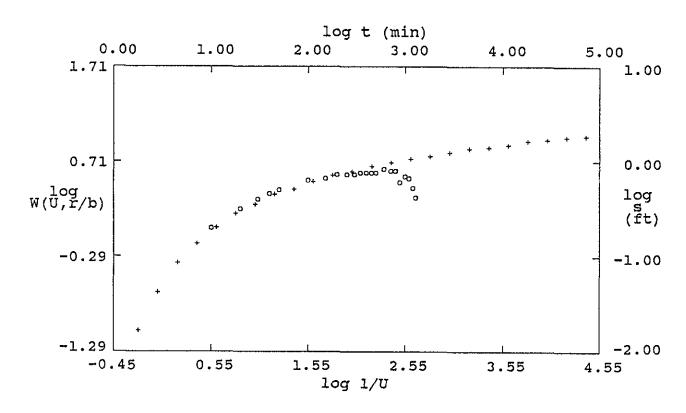
$$sy = 1.95 \times 10^{-4}$$

0.434

1	Minu 2	7927	,	Nic	
1.0 41.1		51 7 71	 χ 4. σ, c	7.00	
6.	= to 0 x10-4 days = to			JUILNT Job No.	ARCO 7927
				DATE LEST NO. ANALYSIS	7-15616-92 Constant Jacob
	164 Q	0.22		PUMP. WELL OBS. WELL Q = R =	AR-1 AR-2 3 gpm 8 t feet
0 7=	264(3)	15 = 0.12 0.34			
to [<u>T</u> =	6600 gpd/ft.				
Sy	= 0.3 T (to)				
5y=	0.3 (6600) (6.9x 82 ²	10-4)			
Sy	$= 2.04 \times 10^{-4}$				

GeoStrategies Inc.

APPENDIX F GWAP DATA PLOTS: THEIS METHOD



+ - Type Curve

Confined Leaky: r/B = Theis

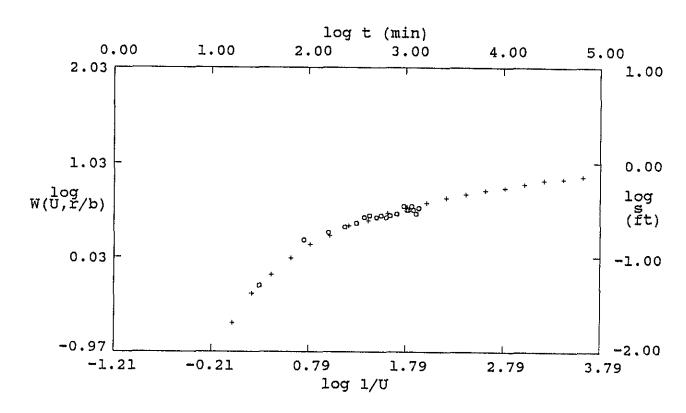
SOLUTION

Transmissivity = 1.763E+0003 gpd/ft

Aquifer Thick. = 1.500E+0001 ft

Hydraulic Cond.= 1.175E+0002 gpd/sq ft

Storativity = 5.301E-0004



+ - Type Curve

Confined Leaky: r/B = Theis

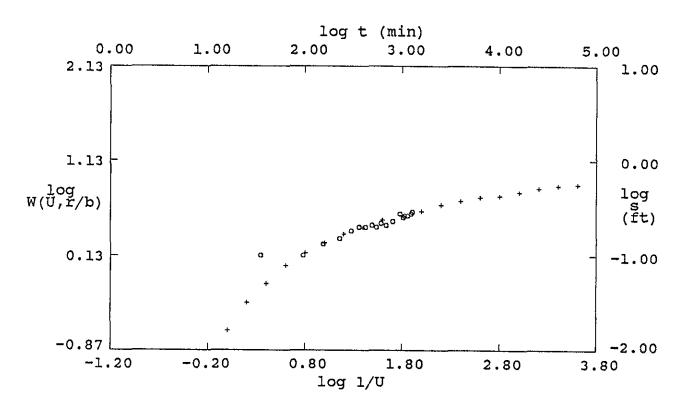
SOLUTION

Transmissivity = 3.683E+0003 gpd/ft

Aquifer Thick. = 1.500E+0001 ft

Hydraulic Cond.= 2.455E+0002 gpd/sq ft

Storativity = 1.116E-0003



+ - Type Curve

Confined Leaky: r/B = Theis

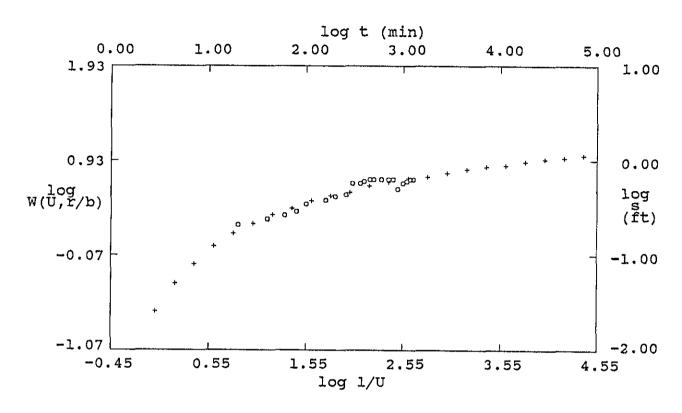
SOLUTION

Transmissivity = 4.637E+0003 gpd/ft

Aquifer Thick. = 1.500E+0001 ft

Hydraulic Cond.= 3.091E+0002 gpd/sq ft

Storativity = 1.080E-0003



+ - Type Curve

Confined Leaky: r/B = Theis

SOLUTION

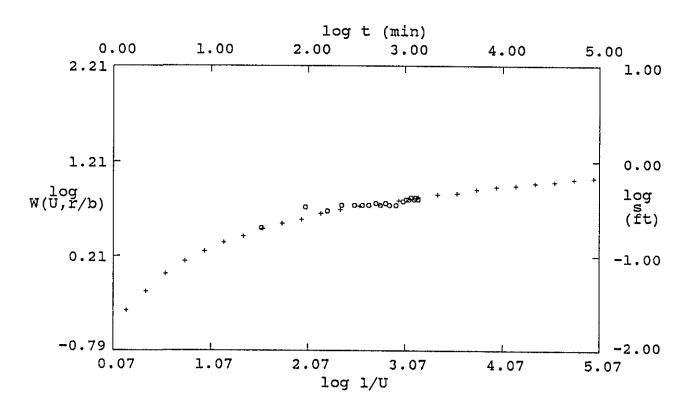
Transmissivity = 2.925E+0003 gpd/ft

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

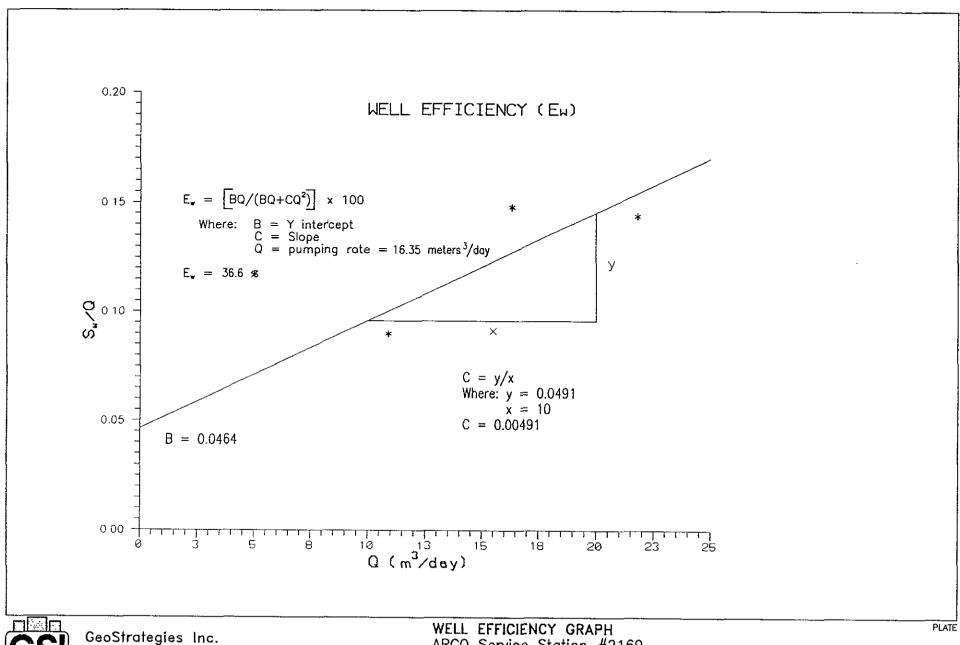
Aquifer Thick. = 1.500E+0001 ft

Hydraulic Cond. = 3.716E+0002 gpd/sq ft

Storativity = 2.621E-0004

GeoStrategies Inc.

APPENDIX G WELL EFFICIENCY CALCULATION



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

JOB NUMBER 792705-4 REVIEWED BY now

DATE 9/92 REVISED DATE 11/92

(



RECEIVED

JUN 25 1992

GeoStrategies Inc.

Date

June 18, 1992

nal Control		Projec	et <u>G70-52.01</u>
То:			
Mr. John Vargas			
GeoStrategies Inc.			
2140 West Winton		_	
Hayward, Californ			
We are enclosing			
Copies	Description		
1	•	er/Floating Pro	duct Survey Results
	****		el survey, ARCO
			nd Ave. Oakland, CA.
For your: X	Information	Sent by:	X Mail
Comments:			
Monthly water	level data for the ab	ove mentioned	site are attached. Please
call if you have	any questions: (408	<u>3) 453-2266.</u>	
			Jim Butera <i>JB</i>
	· · · · · · · · · · · · · · · · · · ·		<u> </u>
Reviewed by:	.*		
[] =			
		l tali	A
<i>f</i> /,	7301 96		Robert C Porter
`	CONCUST BY AN	Robe	ert Porter, Senior Project
	OF CALIFO		Engineer



FIELD REPORT DEPTH TO WATER/FLOATING PRODUCT SURVEY

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

ARCO STATION #: 2169 FIELD TECHNICIAN: SWIMMONS DAY:

	· · · · · · · · · · · · · · · · · · ·								1.0			
D734	WELL	Well	Well			Locking	FIRST	SECOND	DÉPTH TO	l i	WELL	
DTW Order	ID	Box Seal	Lid Secure	Gasket	Lock	Well Cap	DEPTH TO WATER		FLOATING	1	TOTAL	×.
		OCL	Jecuis	Gasker	LOCK	Сар	(feet)	WATER (feet)	(feet)	THICKNESS (feet)		COMMENTS
1	A-1	OK	ok	04	2268	10K		11.95	ND	ND	(feet) 24-,35	his on Alman and part
2	A-2	1	17	1	2268	- ,	12.43	12.44	120			NEED NEW LOCK
		-	 	 		-				ND	25.20	
3	A-3		<u> </u>	 	2268	_	13.26	13.26	ND	ND	29.10	-
4	A-4				2268		12.33	12.33	ND	ИВ	2800	_
5	AR-1		1	1	2262		12.47	12.48	NO	ND	27.70	-
						,						
	,,											
			 					-				
			-					· · · · · · · · · · · · · · · · · · ·				
	 		ļ									



RECEIVED

MAY 27 1992

GeoStrategies Inc.

May 21, 1992

ental Control		Project	G70-52.01
То:			
Mr. John Vargas			
GeoStrategies Inc.			
2140 West Winton Av	/Anue		
Hayward, California			
riaywara, gamonna	04040		
We are enclosing:			
Copies	Description		
oopies 1	•	or/Electing Broduct	Cuntou Daguita
<u> </u>		er/Floating Product	
		thly water level sur	
	station 2169, 8	889 West Grand Av	e. Oakland, CA.
Ear vour	Information	Comt buy	8.4 - 11
For your: X	Information	Sent by: X	Mail
Comments:			
Monthly water lev	el data for the abc	ve mentioned site	are attached. Please
	ny questions: (408)		
•	-	· · · · · · · · · · · · · · · · · · ·	
, 1	A STATE OF THE STA		
18 C			
15%			Jim Butera
Reviewed by:	37	*	
Heviewed by:	o: 4094	1	
MC EX	P.6/30/92		
	Course Day	, 1 ,	
	E OF CALLED	Lobert	Horto
	CA.	Robert Po	orter, Senior Project
			Engineer

Date

FIELD REPORT DEPTH TO WATER/FLOATING PRODUCT SURVEY

PROJECT #: G70-52.01 STATION ADDRESS: 889 West Grand Ave, Oakland, CA

STATION ADDRESS: 889 West Grand Ave, Oakland, CA DATE: 5-20-72

FIELD TECHNICIAN: M. Kmithel / J. B. Fen A DAY: Was day ARCO STATION #: 2169

DTW WELL Box Lid Secure Gasket Lock Lock Cap FIRST DEPTH TO FLOATING PRODUCT TOTAL DEPTH DEPTH TO FLOATING PRODUCT TOTAL DEPTH DEPTH DEPTH TOTAL DEPTH DEPTH TOTAL DEPTH DEPTH DEPTH TOTAL DEPTH									,				
Order ID Seal Secure Gasket Lock Cap WATER (feet) WATER (feet) PRODUCT THICKNESS (feet) DEPTH (feet) COMMENTS 1 A-1 OK YeS Jes BZCR YES II.CG II.CG IVA ND 2435 — 2 A-2 OK Yes Yes I2.17 I2.18 ND ND 25.15 — 3 A-3 OK Yes Yes I3.00 I3.00 NB Z9.1 — 4 A-4 OK Yes I4es I2.13 I2.14 NO ND Z7.96 —		14/5(1)	1				ļ, -	1	ł .			WELL	
1 A-1 Ok Yes 1es 3268 Yes 11.66 11.66 NA ND 2435 — 2 A-2 Ox Yes 4x 2268 Yes 12.17 12.18 ND ND 25.15 — 3 A-3 OK 9es Yes 2268 Yes 13.00 13.00 NM ND 29.1 — 4 A-4 OK 4x 1965 2468 1965 12.13 12.14 ND ND 27.90 —		1	l	1			i .	1	DEPTH TO	FLOATING	PRODUCT	TOTAL	
1 A-1 OK YES 1ES BICK YES 11.46 II.46 NA ND 1435 — 2 A-2 OK YES 4ES 6268 YES 12.17 12.18 ND ND 25.15 — 3 A-3 OK YES 4ES 2268 YES 13.00 13.00 NU XD 29.1 — 4 A-4 OK YES 4ES 6268 YES 12.13 12.14 ND ND 27.96 —	Order	טו ן	Seal	Secure	Gasket	Lock	Сар		WATER .	PRODUCT	THICKNESS	DEPTH	COMMENTS
2 A-2 Or yes yes 12.17 12.18 ND ND 25.15 - 3 A-3 OR 98 Yes 2260 Yes 13.00 13.00 NN ND 29.1 - 4 A-4 OK Yes yes 246 Yes 12.13 12.14 ND ND 27.90 -				ļ <u></u>					(feet)	(feet)	(feet)	(feet)	-
2 A-2 Or yes yes 12.17 12.18 ND ND 25.15 — 3 A-3 OR 98 Yes 2268 Yes 13.00 13.00 NW ND 29.1 — 4 A-4 OR Yes yes 248 yes 12.13 12.14 ND ND 27.90 —	1	A-1	OK	yes	123	3268	yes	11.46	11.46	NA	ND	2435	
4 A-4 OK- 4-5 4-5 2148 4-5 12.13 12.14 ND ND 27.90 -	2	A-2	ox	yes.	403	2248	५२3	12.17	12.18	MD	120		
4 A-4 OK 405 465 ELLE 465 12.13 12.14 ND ND 27.90 -	3	A-3	oke	983	ye;	2248	785	13.00	13.00	NE	ND	29.1	
5 AR多1 C/C Yes Yes 12.8 Yes 12.37 12.37 ND ND 27.7 / 一	4	A-4	OK-	405	463	U.E.	ljes	12.13	12.14	MD	ND		_
	5	AR\$1	010	403	403	2268	405	12.37	12.37	٨Ŋ	NĎ	27.74	
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GeoStrategies Inc.

APPENDIX I EMCON GROUND-WATER SAMPLING REPORT



RECEIVED

OCT 1 4 1992

GeoStrategies Inc.

fanagement and		Date	August 10, 1992
ironmental Control		Project	G70-23.01
То:			
Mr. John Vargas	S		
GeoStrategies, I		-	
2140 West Wint			
Hayward, Califo			
We are enclosi	ng:		
Copies	Description		
1	Depth To Water	r / Floating Product Su	urvey Results
3	Summary of Gr	oundwater Monitoring	Data
1	Certified Analyt	ical Reports with Cha	in-of-Custody
6	Water Sample I	Field Data Sheets	
For your:	X Information	Sent by: X	Mail
Comments:			
Enclosed ar	e the data from the	third quarter 1992	monitoring event at
ARCO servi	<u>ice station 2169, 8</u>	89 West Grand Ave	nue, Oakland, CA.
Groundwater	r monitoring is condu	icted consistent with	applicable regulatory
<u>auidelines.</u>	Please call if you have	ve any questions: (40)8) 453-2266 <u>.</u>
	10 COM 10		Jim Butera <i>Jb</i> .
Reviewed by:	1818 1818 1818 1818 1818 1818 1818 181		
	원 No: 4594 Exp.//		10.
	03/1/3/90	1/3/ /4/LU	Kata
	USTR	Robert Po	rter, Senior Project
	CALIF		Engineer.

FIELD REPORT DEPTH TO WATER/FLOATING PRODUCT SURVEY

PROJECT #: G70-52.01 STATION ADDRESS: 889 West Grand Ave, Oakland, CA

DATE: 7-17-92 DAY: Friday ARCO STATION #: 2169 FIELD TECHNICIAN: 5W./RS.

J					,							/
	1415-21	Well	Well			Locking	FIRST	SECOND		FLOATING	WELL	
DTW	WELL ID	Box	Lid			Weli	DEPTH TO			PRODUCT	TOTAL	
Order	טו	Seal	Secure	Gasket	Lock	Cap	WATER	WATER		THICKNESS	DEPTH	COMMENTS
		 	-	1.1			(feet)	(feet)	(feet)	(feet)	(feet)	
1	A-1	Yes	4es	Yes .	2268	45	12.23	12.23	N. D	12 O	24.39	_
2	A-2	425	405	405	2268	4es	1264	1264	N-D		25,17	
3	A-3	ues	405	yes	2268	423	13.45	13.45	N.D	ND	29.15	-
4	A-4	yes	465	ues	226R	425	12,60	12,60	とら	NID	27,95	
5	AR-1	405	4es	4es	2268	4 e s	13,00	13.00	h _i b'r	N.D	27.75	-
6	AR-2	405	4es	4es	140	yes	13.H	13.14	N.D	N.D	29,2	
							•					
						·-·						
ı							•					

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

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

Emcon Associates 1938 Junction Avenue San Jose, CA 95131

Client Project ID:

Water

Arco 2169

Sampled: Jul 17, 1992 Received: Jul 17, 1992

Attention: Jim Butera

Sample Matrix: Analysis Method:

EPA 5030/8015/8020

Reported:

Jul 30, 1992

Ontropologica de la companio de la companio de la companio de la companio de la companio de la companio de la c

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 Pat	tern:	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

Emcon Associates Client Project ID: Arco 2169

1938 Junction Avenue San Jose, CA 95131

Attention: Jim Butera

QC Sample Group: 2072776 - 81

Reported: Jul 30, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes	
Method: Analyst: Reporting Units: Date Analyzed: QC Sample #:	EPA 8020 M.Nipp µg/L Jul 21, 1992 GBLK072192	EPA 8020 M.Nipp μg/L Jul 21, 1992 GBLK072192	EPA 8020 M.Nipp μg/L Jul 21, 1992 GBLK072192	EPA 8020 M.Nipp µg/L Jul 21, 1992 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: Conc. of M.S. - Conc. of Sample x 100 Spike Conc. Added

Relative % Difference: Conc. of M.S. - Conc. of M.S.D. x 100

(Conc. of M.S. + Conc. of M.S.D.) / 2

ABCO!	Drod	ducto	Cam		4													200	75			 _
ARCO I	Divisio	on bi Atlant	COIII	Pariy Company	↔			Task (Order No.	El	UC	GC	9- 4	1)-	- /		-	C	Q		Y	Chain of Custody Laboratory name FOULOUA
ARCO Facility	y no.	216	,9	Cil	ty acility)	OAK	TAN	$\overline{\Omega}$		Project	i mana	ger .	九	1/1	131	177	ZA			— y =		Laboratory name
ARCO engine	aer /	Kyle	11	11751	Fie	OAK	Telephor	0 pe no. 4/5/5/7/	-1434	Telepho (Consul	one no	шċ	<u> </u>	<u>ャ</u>) コ	<u> 1-1-</u> 2 1 <i>C</i> 7	Far	x no.	Tu	014	152-	0457	SEQUUIA Contract number.
Consultant na	ame	可以	\overline{c}	As	50.0°	11+TEC	_ <u></u>	Address (Consult	19	38	Harry	1, 12	155 16T		<u> </u>	1100	nsuitan	الا لام	<u> </u>	Esc	<u> </u>	
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	1			Matrix		Prese	ervation			1	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	™	ا ا	ا پيا		1	1	TCLP Semi	950 000	Lead Org./DHS C Lead EPA 7420/7421 C		Method of shipment
ġ	ı	5						Sampling date	Sampling time	ρ <u>ζ</u>	138	ed 801	413.2	SMSO	9		2] " <u>"</u>	PA 60	F 기		
Sample 1.D.	ē	Container	Soil	Water	Other	lce	Acid	- Sund	pring	PA 80	7 PH	og ∩	ا قُ	18.1	8/16	24/82	25/82			2.9.70 PA-1.		
San	Lab	So			1			Sam	Sam	BTEX 602/EPA 8020	8ТЕХ/ГРН С . 1.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.	TPH Modified 8015 Gas Diesel	Oil and Grease	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	를 를 하는 다음 이 기를 받는 다음 이 기를 받는다.	MAN THE	.ead 5		
1-1(24)		7		Х		X	HCI				X					1			-			Special detection Limit/reporting
1-2(25)		2		1			1:1C/	<i>/</i>	1	+	7	 			-3	(ပ				-	-	Lowest
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N 3(24) N-4(28) N-4(28)				<u> </u>	 	<u> </u>	ILI		 	- '	X	ļ	 	<u> </u>	<u> </u> '		 	78				
N-4(28 }	<u>/</u>	2	<u> </u>	X	ļ	X	HIL			_ '	X	<u> </u>			<u></u> !		1 1	29				Special QA/QC
12-1(28)	<i> </i>	2	<u> </u>	1		X	ITCI			1	X	1		<u> </u>				50				AS NumAl
111.2(29)	1	2		X		X	HCI				メ							81				- NURMAI
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tom derene ? .	′,						Date		Time	Receive	ed by a	laborato		W۱	١.	Da	ate	111)	Time 18	35	Standard 10 Business Days
													<i>U</i> \			- 1	,	1 1 1	٠ ۱	, ,	-	14 Dusiness Days

WATER SAMPLE FIELD	D DATA	SHEET	Rev. 2, 5
PROJECT NO: <u>670-52.01</u>	SAMPLE ID:	A-1	i €
EMCON PURGED BY: J William	CLIENT NAME:	ARCO .	2169
SAMPLED BY:		OHK /A	
TYPE: Ground Water Surface Water Treatm			
CASING DIAMETER (inches): 2 3 × 4	4.5	6 Oth	ier
CASING ELEVATION (feet/MSL): WR VC	DLUME IN CASING	(gal.): 4	,52
DEPTH TO WATER (feet): 17:25 CA	LCULATED PURG		
1	TUAL PURGE VOL		
DATE PURGED: 07-17-97 Start (2400 Hr)		nd (2400 Hr) .	12:40
DATE SAMPLED: <u>07-17-97</u> Start (2400 Hr) _/	12;43 E	nd (2400 Hr)	12:44
F	TEMPERATURE	COLOR	TURBIDITY
(2400 Hr) (gul.) (units) (μπhos/cm Φ 25° C) 1231	(°F) <i>80,0</i>	(visual)	(Visual)
1234 9.0 6.99 1444	76.7	1	HE HUY
1735 13,5 7,01 1433	75,7	1	
1737 18.0 7.07 1423	75.4	٣ 	<u></u>
12:40 230 7.04 1434	75.0	$\frac{\sim}{J}$	
D. O. (ppm): WA ODOR: - STROW		1)1	- Nn
В. С. (рр.н.).		OBALT 0 - 100)	(NTU 0 - 200)
FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP	-1): <u>W</u> R		
PURGING EQUIPMENT	1		
	2* Bladder Pump	EQUIPMENT X	
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	,	paner	(Teflon®)
Centrifugal Pump — Baller (PVC) — Baller (Stainless Steel) —	DDL Sampler Dipper		(Stainless Steel) Ksible Pump
Well Wizard** Dedicated	Well Wizardna	Dedica	'
Other: Other:	•		
VELL INTEGRITY: OK		LOCK#:	2268
			<u>- </u>
EMARKS:			
Meter Calibration: Date: 7-/7-9 7 Time: Meter Serial	#•	Temperatur	9 OF 843

Signature: One William C Reviewed By: JB Page / of C

Location of previous calibration: A - /

(EC 1000 (03/ / 1000) (DI ____) (pH 7 208/ 200) (pH 10 999 / (0.00) (pH 4 4.00 / ____)

							·
		_			D DATA		Rev. 2,
EMCON					SAMPLE ID		1.0
ASSOCIATES		۲: <u>ح. این</u> ۲: <u>ح. این</u>				APCO 21	
			<u> UIANS</u>		LOCATION	: <u>BAKLA</u>	00
	ınd Water ⊻				ent Effluent	Other	
CASING DIAM	ETER (inches):	Z	3 <u>×</u>	4	4.5	6 Oth	er
CASING ELE	EVATION (feet/N	ISL):	A	VOL	UME IN CASINO	3 (gal.): 4	67
•	TO WATER (f				CULATED PUR	_	_
DEPT	H OF WELL (f	eet): <u>25.</u>	17		UAL PURGE VO		
	ED: <u>구ィァ</u>			-		End (2400 Hr) .	1308
DATE SAMPL	ED: 7-17	-7/	Start (240	00 Hr)	3 10	End (2400 Hr) .	1312
TIME (2400 Hr)	VOLUME (gal.)	pН	E.C		EMPERATURE	COLOR	TURBIDITY
*	4.75	(edinu) \\ \7	(µmhos/cm	•	74.6	(visual) BLOW &	(visual) #140 Y
1305	9.50	7.04	108	-	72, 2	1	11410
1306	14.25	705	109	4	71,7	1	1
1307	19.0	7.07	108	8	70.6	Ł	_
1308	23.75	710)	709		
D. O. (ppm):	\mathcal{L}		DOR:	NONE		<u>n</u> n	NA
	MPLES COLLEC	TED ATTUCK	101 / a E	Voun		(COBALTO - 100)	(NTU 0 - 200)
	WLTE2 COTTED	IED WI IUIS M	CTT (1.8. LE	5-1, XUUP-1	·):	10 8	
	PURGING FOU	IPMENT			SAMPLING	G EQUIPMENT	
2° Bladde	•	- Beiler (Tellon	3)	2	2° Bladder Pump	Bailer	(Tefion®)
Centrifugs — Submersit	•	Bailer (PVC) Bailer (Steining)	Cto-()		ODL Sampler	ř	(Stainless Steel)
Well Wize	udin	 Bailer (Stainle Declicated 	83 (1 99 1)		Dipper Vell Wizard ^{ny}	Subme	rsible Pump
Other:	UZZI DUMP		······································	Other:			
IL INTEGRIT	Y:	05				LOCK#· Z	768
MARKS:	-						
iii ii ii ii ii ii ii ii ii ii ii ii ii							
ter Calibration	: Date:	Time:	Ma	ter Serial #		Temperatura	

Signature: As William Reviewed By: TB Page Z of C

Location of previous calibration: 14.1

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

EMCON

Rev. 2, 5/91

WATER SAMPLE FIELD DATA SHEET
PROJECT NO: 670-5201 SAMPLE ID: A-3
EMCON PURGED BY: 3. W. HILLANS CLIENT NAME: Acco 2169
SAMPLED BY: J. W. 1112-5 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): LA 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.): 76
DATE PURGED: 7-17-92 Start (2400 Hr) 1338 End (2400 Hr) 1336
DATE PURGED:
TIME VOLUME pH E.C. TEMPERATURE COLOR TURBIDIT (2400 Hr) (gal.) (units) (umhos/cm @ 25° C) (°F) (visual) (visual)
(2400 Hr) (gal.) (units) (umhos/cm @ 25° C) (°F) (visual) (visual) 1351 6 7.85 946 70.9 6844 HE18U4
1332 12 985 978 69.9 L
1334 18 778 995 696 L
1338 24 7.75 991 699 L L 1336 36 776 991 699 6
D. O. (ppm): N1. ODOR: 5/15/1- NA NA
(COBALT 0 - 100) (NTU 0 - 200
FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1):
PURGING EQUIPMENT SAMPLING EQUIPMENT
2° Bladder Pump — Bailer (Teffon®) — 2° Bladder Pump — Bailer (Teffon®)
Centrifugal Pump — Bailer (PVC) — DDL Sampler — Bailer (Stainless Steel) — Dipper — Submersible Pump — Bailer (Stainless Steel) — Dipper — Submersible Pump
Submersible Pump — Bailer (Stainless Steel) — Dipper — Submersible Pump — Well Wizard™ — Dedicated — Well Wizard™ — Dedicated
Curer:
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://
Signature: Archive Reviewed By: B Page 3 of 4
Signature: Page _5 of

EMCON

Rev. 2, 5/91

(AAA)	VIEW SAMLE	FIELD DATE	A SHEE!	
PROJECT	NO: G70-52-01	SAMPLE	ID: <u>A.4</u>	
EMCON PURGED	BY: 5.13:11,8ms	CLIENT NAV	1E ACCO 2169	
	BY: J. Williams		IN: OAKIANO	
TOTAL Control Water	¥			
	Surface Water	Treatment Effluent	Other	
CASING DIAMETER (inches): Z 3	44.5	6Other	
CASING ELEVATION (feet	VMSL): KA	VOLUME IN CASI	NG (gal.): 5.7	
1	(feet): <u>12.60</u>		_	·
	(feet): 27.95			
DATE PURGED: 7.		00 Hr) <u>1345</u>	End (2400 Hr) /3	s ⁻⁵
DATE SAMPLED:	· / -	00 Hr) <u>140じ</u>	End (2400 Hr) / 4/2	
TIME VOLUME	pH E.C	-		
(2400 Hr) (gal.)	(units) (µmhos/cm	@ 25° C) (°F)	- 992011 101	RBIDITY (visual)
1357 6		<u> 699</u>	10	FZNUV
1353 12	- 767 929		<u>'</u> }_	
<u>1356</u> 18	· ————————————————————————————————————	70.1		1
1358 24	·	718	_1	1
<u> 1359 30 </u>	770 90	71.0	<u></u>	L
D. O. (ppm): 4.7	ODOR:	NONE	hr A	· /\
			(COBALT 0 - 100) (NTU	J 0 - 200)
FIELD QC SAMPLES COLLE	ECTED AT THIS WELL (i.e. FI	B-1, XDUP-1):	NR	
PURGING EC	או וומגאבאוד	SAMPI II	ייין איין אויין איין איין איין איין איין	
			NG EQUIPMENT	
Z Bladoer Pump	Bailer (Teffon®)	2° Bladder Pump	Bailer (Teflono	
Centrifugal Pump -	Bailer (PVC) Bailer (Stainless Steel)	DDL Sampler Dipper	Bailer (Stainte	1
·	— Dedicated	— Upper — Well Wizard™	Submersible Dedicated	Pump
Other:		Other:		
VELL INTEGRITY:	k -		22.6	······································
			LOCK #: <u>~ G</u>	مسيد
IEMARKS:				
Meter Calibration: Date:				
EC 1000/) (I	DI/_) (pH 10/_) (pH 4/_)
ocation of previous calibration:				
Co. 151/2	A R	7B	- 4.	
Ignature:	H	eviewed By:	Page of	<u></u>

EMCON

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

	PROJECT NO:	(a 70 s	111 1 1 12.73	SAMPLE	10: <u>A.P.</u>	1					
EMCON	PURGED BY:			CLIENT NAM		3/4					
ASSOCIATES	SAMPLED BY:				ON: OAKIA						
	\					017 (74					
TYPE: Ground Water Surface Water Treatment Effluent Other											
CASING DIAMETER (inches): 2 3 4 4.5 6 \(\times \) Other											
CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): 21.6											
DEPTH TO WATER (feet): 13.7 CALCULATED PURGE (gal.): 2708.2											
DEPTH OF WELL (feet): 27-75 ACTUAL PURGE VOL (gal.): 1/0											
<u> </u>											
	ED: 7:17 4	2	Start (2400 Hr)	1418	End (2400 Hr)	1843					
DATE SAMPL	ED: <u>^ - パケー</u>		Start (2400 Hr)		End (2400 Hr)						
TIME (2400 Hr)	VOLUME (gal.)	рH	E.C.	TEMPERATUR		TURBIDITY					
1421	22.	(units)	(µmhos/cm @ 25° (71.6	(visual) CLIF4	(visual) 17 4 11 4					
1427	44	7.47	1011	715	1	1					
1434	66	7,44	973	73.4	2	1					
1438	88	903	1010	715	·\$						
1443	110	750	1029	69.8	L	1					
D. O. (ppm):	WIL	_ OE	OR: STRO	iv	NL	ia					
į					(COBALT 0 - 100)	(NTU 0 - 200)					
FIELD QC SAM	IPLES COLLECTED	AT THIS WE	LL (i.e. FB-1, XI	OUP-1):	br						
	PURGING EQUIPM	<u>IENT</u>		SAMPL	ING EQUIPMENT						
2* Bladder	Pump	Bailer (Teffon®)		2º Bladder Pump	\ \ \ \	1					
Centrifuga	Pump :	Bailer (PVC)	_	DDL Sampler		r (Stainless Steel)					
—— Submersib	le Pump ——	Bailer (Stainless	: Steel) —	— Dipper	Subn	nersible Pump					
Other:		Dedicated	Othe	— Well Wizard ^m	Dedic	cated					
	5.	 				72					
WELL INTEGRIT	r: <u>6K</u>				LOCK#:	2666					
						·					
					· · · · · · · · · · · · · · · · · · ·						
Meter Calibration: Date: Time: Meter Serial #: Temperature °F:											
(EC 1000	(EC 1000/) (DI) (pH 7/) (pH 10/) (pH 4/)										
Location of previous	us calibration:	4-1									
Sanatura: O.	uffer.		Daviess	ad Bur TB	Daga (5 4 6					
ynatule			- ITCVICA								

	WATED	CAMPLE		DATA	CUEET	Rev. 2, 5
	PROJECT NO: G	SAMPLE			AR-2	
EMCON	PURGED BY: 5.					
ASSOCIATES	SAMPLED BY: 1				DAKLAN	
						1) (A.
TYPE: Grout	nd Water <u> </u>	ace Water	Treatment	t Effluent	Other	
CASING DIAME	TER (inches): 2	_ 3	4 <u>X</u>	4.5	6 Oth	ıer
CASING ELE	VATION (feet/MSL): _	NA-	VOLU	ME IN CASING	G (gal.):/	0.5
	TO WATER (feet) :				SE (gal.): 5	
	H OF WELL (feet):				DL (gal.):	
					(84)	
DATE PURG	ED: 7.17.92	Start (2400	Hr) 150	<u>05</u>	nd (2400 Hr)	1521
DATE SAMPL	ED: <u>7:17-92</u>	Start (2400	Hr) _15		nd (2400 Hr)	
TIME	VOLUME pl-	E.C.	TE	MPERATURE	COLOR	TURBIDITY
(2400 Hr)	(gal.) (unit	s) (jumhos/cm @	25° C)	(*F)	(visual)	(visual)
	$\frac{10.5}{21.0} \frac{76}{7}$			73 5	GRPF	HZIANY
				70,5		
1514				69.8	<u>''</u>	<u>//</u>
				90,7	**	
			255	70,1		
D. O. (ppm): .	1010	ODOR:	57,7		FUR COBALT 0 - 100)	(NTU 0 - 200)
FIELD QC SAM	IPLES COLLECTED AT T	HIS WELL (i.e. FB-	1, XDUP-1)		WD	(**************************************
ŗ	PURGING EQUIPMENT			SAMPLING	EQUIPMENT	
2° Bladder		(Teflon®)	2*	Bladder Pump	Bailer	(Toffond)
Centrifugal	-	•)L Sampler		(Stainless Steel)
Submersib		Stainless Steel)		pper		rsible Pump
Well Wizar	rd™ — Dedica	ted	We	il Wizaro™	Dedica	ted
ELL INTEGRITY	1:OK				LOCK#: M	D' 1.00 K
MARKS: ——			···········			
		-				
	Date: Tim					
	./) (DI)) (pH 1	0/) (pH 4	/)
ocation of previou	us calibration:					

Signature: -

Reviewed By: TB Page 6 of 6