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DATE: October 12, 1993
PROJECT NUMBER: 62026.02
SUBJECT: ARCO Station No. 2185

FROM: John C. Young

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REPORT OF FINDINGS
INITIAL OFFSITE AND ADDITIONAL ONSITE SUBSURFACE INVESTIGATION AND AQUIFER PUMPING TEST

at

ARCO Station 2185
9800 East 14th Street
Oakland, California

62026.02

Report prepared for

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October 12, 1993

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REPORT OF FINDINGS
INITIAL OFFSITE AND ADDITIONAL ONSITE SUBSURFACE INVESTIGATION AND AQUIFER PUMPING TEST
at
ARCO Station 2185
9800 East 14th Street
Oakland, California

For ARCO Products Company

INTRODUCTION

At the request of ARCO Products Company (ARCO), RESNA Industries Inc. (RESNA) performed an initial offsite and additional onsite subsurface investigation and aquifer pumping test at ARCO Station 2185, located at 9800 East 14th Street in Oakland, California. This investigation was performed to evaluate further the extent of gasoline hydrocarbons in soil and groundwater related to the former gasoline underground storage tanks (USTs). The pumping test was performed to evaluate characteristics of the water-bearing zone, and to evaluate the feasibility of groundwater extraction at the subject site.

Work performed for this investigation included: drilling two onsite soil borings (B-13 and B-14); drilling one offsite soil boring (B-15); collecting and describing soil samples from the borings; constructing two 4-inch diameter groundwater monitoring wells (MW-5 and MW-6) in borings B-13 and B-14, respectively; constructing one 2-inch diameter groundwater monitoring well (MW-7) in boring B-15; developing the wells; sampling the wells; evaluating groundwater level and laboratory analyses data collected by EMCON Associates (EMCON) in conjunction with quarterly monitoring of pre-existing wells; submitting selected soil and groundwater samples for laboratory analyses; surveying the wells for wellhead elevation; performing step-drawdown test, groundwater pumping, and recovery tests; conducting a limited offsite record search; and preparing this report presenting field procedures, results and conclusions. This work was performed as outlined in RESNA's Work Plan for Additional Subsurface Investigation and Aquifer Pumping Test (RESNA, November 25, 1992), which was approved by the Alameda County Health Care Services Agency (ACHCSA) prior to commencement of the investigation.

SITE DESCRIPTION AND BACKGROUND

General

ARCO Station 2185 is located in a commercial and residential area on the southeastern corner of the intersection of East 14th Street and 98th Avenue in Oakland, California. The location of the site is shown on the Site Vicinity Map, Plate 1. The site is on a relatively flat, asphalt and concrete covered lot at an elevation of approximately 25 feet above mean sea level (msl). The site is currently occupied by an operating AM/PM mini-market and self-serve gasoline station with regular unleaded and supreme unleaded gasoline pumps. Pertinent site features include two service islands (located in the northern section of the site), a station building, four newly installed USTs in the northeastern portion of the site, seven groundwater monitoring wells, and two vapor extraction wells. These site features are shown on Plate 2, Generalized Site Plan.

Geology and Hydrogeology

The site is located in the East Bay Plain, an area of generally low relief lying between San Francisco Bay to the west and the foothills of the Diablo Range to the east. The East Bay Plain is underlain by about 1,000 feet of unconsolidated Quaternary sediments, consisting mostly of sand and silt deposited in alluvial environments, and clay and silt deposited in shoreline and estuarine environments (Hickenbottom and Muir, 1988). The soils in the vicinity of the site have been mapped as medium-grained alluvium consisting of moderately sorted fine sand, silt and clayey silt, with localized layers of coarse sand (Helley et al., 1979).

The direction of groundwater flow beneath the site appears to have previously been to the west-southwest based on third and fourth quarter 1992 monitoring data, and is currently interpreted to be flowing to the northwest based on first quarter 1993 monitoring data.

PREVIOUS ENVIRONMENTAL WORK

Previous environmental investigations performed at the site are summarized in Appendix A. Locations of borings and monitoring wells are shown on Plate 2. Cumulative results of groundwater monitoring and laboratory analyses of soil and groundwater are included in Tables 1 through 3.

PRELIMINARY RECORDS SEARCH

Environmental data bases from Federal, State, regional, and local regulatory agencies were researched by Vista Environmental Information, Inc. (Vista Environmental Information, Inc. November 1992) to determine whether releases have been detected within a 1-mile radius of the subject site. The records search was conducted to identify potential secondary sources of hydrocarbons in the soil and groundwater at the site. The results of this records search are summarized in the report titled " Vista Environmental Information, Inc., Radius Status Report", included in Appendix B. The databases searched include: National Priorities List (NPL) for 1992; The United States Environmental Protection Agencies (US EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list for 1992; Sites Authorized for Cleanup under the California Annual Work Plan (AWP); Abandoned Sites Program Inventory System (ASPIS) for 1991; California Leaking Underground Storage Tanks (LUST); and Active/Inactive Sanitary Landfills/Disposal Sites (SWIS) for 1991.

The results of the record search indicate that six sites are present within approximately ½-mile radius of ARCO Station 2185, as shown on the VISTA Radius Status Report map included in Appendix B. Of these six sites, three were on the ASPIS database (with a status of "no further action"), three were on the LUST database (with a status of "no action"), and one of the sites on the ASPIS database was also listed on the CERCLIS database (with a status of "no further remedial action planned"). Because five of the listed sites are situated downgradient of the subject site, they do not appear to have impacted the soils or groundwater beneath the subject site. The sixth site is situated upgradient and within 1/4-mile of the subject site. However, because soil and groundwater in the vicinity of upgradient

well MW-1 on the subject site have not had detectable gasoline hydrocarbons, it appears the subject site has not been impacted by upgradient offsite gasoline hydrocarbon sources.

Aerial photographs of the subject site and surrounding area taken in 1957, 1968, 1977, and 1988 were obtained from Pacific Aerial Surveys of Oakland, California (Pacific 1957, 1968, 1977, and 1988) to identify additional potentially impacted sites that do not appear in VISTA's report. Based on RESNA's review of these photographs it appears that a property located across East 14th Street from the subject site may have been a gasoline station from before 1968 until sometime between 1977 and 1988. This property is currently a Big-O Tire Center, and does not appear in VISTA's report.

WELL SURVEY

The County of Alameda Public Works Agency (CAPWA) has researched and provided information regarding the location water wells in the vicinity of the subject site (see Plate 3). The information included all known water supply, cathodic wells, monitoring wells, destroyed wells and geotechnical borings within a ½-mile radius of the site.

According to CAPWA records, there are five cathodic protection wells (22G1, 22G2, 22R1, 23D1, and 23F2), one irrigation well (23C3), and two destroyed wells (23C1 and 23C2) within a ½-mile radius of the site. The total depths of the cathodic wells are between 65 and 120 feet, and the total depth of the irrigation well is 260 feet. Depth to water data, where available (23C3 and 23L1), ranged from 20 to 41 feet. No other details of well construction were available at the time of this investigation.

FIELD WORK

Drilling

Field work at the site was conducted in accordance with RESNA field protocol and the Site Safety Plan (RESNA, June 16, 1992). A description of the field methods is included in Appendix C, Field Methods. Prior to drilling, well construction permits were acquired from

the Alameda County Flood Control and Water Conservation District, Zone 7 (ACFCWCD) for monitoring wells MW-5 through MW-7. In addition, minor encroachment permits were obtained from the City of Oakland and CalTrans for the installation of offsite well MW-7. Copies of the Zone 7 and CalTrans permits are included in Appendix D, and the City of Oakland permit is available by request through the City of Oakland.

On January 20 and 21, 1993, two onsite soil borings, B-13 and B-14, were drilled at the subject site, and two 4-inch diameter groundwater monitoring wells (MW-5 and MW-6) were constructed in the borings. On May 4, 1993, one offsite soil boring, B-15, was drilled in the sidewalk across East 14th Street from the subject site, and a 2-inch diameter groundwater monitoring well (MW-7) was constructed in the boring. Borings B-13 (MW-5) and B-14 (MW-6) were located roughly crossgradient and downgradient of the dispenser islands, respectively, and boring B-15 (MW-7) was located crossgradient of the former USTs, to delineate further the lateral and vertical extent of gasoline hydrocarbons in the soil and groundwater. In order to function as observation wells during the aquifer pumping test, wells MW-5 and MW-6 were also located at distances of approximately 20 feet and 45 feet from MW-3. The locations of these borings/wells are shown on Plate 2.

Soil Sampling and Description

Seventeen soil samples were collected from borings B-13 through B-15. A summary of the Unified Soil Classification System (USCS) used to identify the soil encountered during drilling is presented on Plate 4, and descriptions of the soil encountered in the borings are presented on the Logs of Borings, Plates 5 through 10. Soil samples from the borings were collected and described at intervals of approximately 5 feet from the ground surface to the total depth of the borings. Sampling procedures are described in Appendix C.

Soil cuttings generated from the borings were temporarily stockpiled onsite during each drilling event. The soil stockpiles were placed on and covered with plastic sheeting in the southern portion of the site, behind the station building. After the completion of drilling on January 21, and May 4, 1993, four soil samples were collected from each soil pile for

submittal to the laboratory for compositing and analyses. The method used to obtain these samples is described in Appendix C.

Well Construction and Development

Groundwater monitoring wells MW-5 and MW-6 were constructed in borings B-13 and B-14, respectively, using 4-inch diameter, Schedule 40, polyvinyl chloride (PVC) blank casing, and 4-inch diameter, 0.010 inch-slot PVC screen. Monitoring well MW-7 was constructed in boring B-15, using 2-inch diameter, Schedule 40, PVC blank casing and 2-inch diameter 0.010 inch-slot PVC screen. Filter pack used within the screened portion of the wells consisted of #2/12 Sand. For further details on individual well construction see Logs of Borings, Plates 5 through 10. Details regarding general well construction are described in Appendix C.

Groundwater monitoring wells MW-5 and MW-6 were developed on February 3, 1993, and groundwater monitoring well MW-7 was developed on May 12, 1993, to remove fine-grained sediments and allow better communication between the water-bearing zone and the well. A description of the methods used for well development is included in Appendix C.

Groundwater Sampling

EMCON field personnel purged and sampled groundwater monitoring wells MW-1 through MW-4 on January 14, 1993. RESNA field personnel purged and sampled groundwater monitoring wells MW-5 and MW-6 on February 11, and well MW-7 on May 14, 1993. EMCON's Water Sample Field Data Sheets and RESNA's Well Purge Data Sheets, are included in Appendix E.

Surveying

The wellheads for newly installed groundwater monitoring wells MW-5 through MW-7 were surveyed for top-of-casing (TOC) elevation to a local City of Oakland Datum benchmark by John E. Koch of Oakland, California, a licensed land surveyor. Wells MW-5 and MW-6

were surveyed on February 18, and well MW-7 was surveyed on May 11, 1993. The results of these wellhead surveys are included in Appendix F, Wellhead Survey.

Pumping and Recovery Test

A step-drawdown test was performed on March 8, 1993, to select the optimum pumping rate at which to perform a constant discharge pumping test. Well MW-3 was initially pumped at 0.3 gallon per minute (gpm) for 20 minutes with a drawdown of 0.11 feet; the pumping rate was then increased six times to rates ranging from approximately 0.6 to 7.2 gpm, and drawdown was measured at each rate for 30 minutes. Measured drawdowns after pumping at 0.6, 0.9, 1.8, 2.7, 3.6 and 7.2 gpm consisted of 0.26, 0.42, 0.86, 1.32, 1.81, and 3.5 feet, respectively. The results of the step-drawdown test indicated that the well could sustain a pumping rate of slightly more than 6 gpm.

Immediately prior to beginning the constant discharge test on March 10, 1993, RESNA field personnel measured DTW levels in pumping well MW-3 and in observation wells MW-1, MW-2, MW-4 through MW-6 to evaluate the hydraulic gradient and groundwater flow direction on the day of the pumping test. Water level measurements were obtained from the wells with an electric DTW probe. Floating product was not observed in the wells. Groundwater elevations during March 10, and 11, 1993 are reported in Table 4. The appropriate field procedures are described in Appendix C.

The 18-hour pumping and 1-hour recovery tests were conducted on March 10 and 11, 1993. Monitoring well MW-3 was pumped using a submersible pump and the pumping rate was adjusted by valving. The pumping rate was generally constant and averaged 6.5 gpm (1251 ft^3/day). The discharge rate was measured using a flowmeter and was confirmed by hourly measurements using a calibrated one-gallon bucket and a stopwatch. Pressure transducers attached to a Hermit datalogger were placed in pumping well MW-3 and observation wells MW-2, MW-5, and MW-6 from which water level data were recorded every five minutes or less. Water levels were measured using an electric sounder in wells MW-1, MW-2, MW-3, MW-4, MW-5, and MW-6, at periodic intervals during both the pumping and recovery portions of the test to confirm the measurements made by the datalogger. After 11½ hours

of pumping, water samples were collected at the discharge point for laboratory analyses to aid in future groundwater recovery system design. After pumping for 18 hours, the pump was turned off and recovery data were obtained for 1 hour, at which time at least 95 percent recovery had been achieved. The discharge water was removed from the site by a licensed hazardous waste hauler on March 12, 1993.

EVALUATION OF GROUNDWATER GRADIENT

Depth-to-water (DTW) levels were measured in the monitoring wells and the groundwater gradient was evaluated during first quarter 1993 monitoring (RESNA, April 21, 1993). Cumulative DTW measurements, wellhead elevations, and groundwater elevations are presented in Table 1, Cumulative Groundwater Monitoring Data. The Groundwater Gradient Maps from the first quarter 1993 monitoring report are reproduced here as Plates 11 through 13. Because the survey data of MW-5 and MW-6 were inadvertently transposed, the gradients and flow directions shown in our monitoring report (RESNA, April 21, 1993) have been modified. The average interpreted gradient and flow direction for the first quarter 1993 was 0.005 to the northwest. This flow direction is not consistent with those previously interpreted. For the third and fourth quarters of 1992 the flow direction was to the southwest. Hereafter, references to relative flow directions (upgradient, downgradient, crossgradient) will be based on a northwestward (first quarter 1993) flow direction.

LABORATORY METHODS

Six soil samples collected from borings B-13 through B-15, one groundwater sample collected from pumping well MW-3 during the pumping test, and groundwater samples from monitoring well MW-7 were delivered to Sequoia Analytical Laboratories of Redwood City, California (Hazardous Waste Testing Laboratory Certification # 1210) for analyses. Groundwater samples collected by EMCON from wells MW-1 through MW-4 during quarterly sampling and samples collected by RESNA from MW-5 and MW-6 were delivered to Columbia Analytical Services Inc., of San Jose (Hazardous Waste Testing Laboratory Certification # 1426) for analyses.

Soil Samples

Soil samples collected from borings B-13 through B-15 were analyzed in accordance with Alameda County Health Care Services Agency (ACHCSA) requirements for the gasoline constituents benzene, toluene, ethylbenzene, and total xylenes (BTEX) and total petroleum hydrocarbons as gasoline (TPHg) using modified Environmental Protection Agency (EPA) Methods 5030/8015/8020. Soil samples were selected for laboratory analyses based on:

- Location above first-encountered groundwater;
- Location in a potential confining or perching layer above or below first-encountered groundwater; and
- Areas where the presence of gasoline hydrocarbons was suspected.

where are Results ?

Soil samples collected from the soil stockpile were composited in the laboratory and analyzed for TPHg and BTEX using EPA Method 5030/8015/8020 - TCLP Extract for disposal purposes, TCLP Metals, STLC, reactivities, corrosivity, and ignitability (RCI).

Water Samples

Water samples from wells MW-1 through MW-6 were analyzed by Columbia Analytical Services, Inc. for TPHg and BTEX using Environmental Protection Agency (EPA) Methods 5030/8020/DHS LUFT Method. Water samples from MW-7 were analyzed by Sequoia for TPHg and BTEX using EPA Methods 5030/8015/8020. Analytical Results of these water analyses are summarized in Table 2, Cumulative Results of Laboratory Analyses of Groundwater Samples. Concentrations of TPHg and benzene in the groundwater are shown on Plate 14, TPHg/Benzene Concentrations in Groundwater. The Chain of Custody Records and Laboratory Analysis Reports are included in Appendix E.

Water samples obtained from MW-3 during the pumping test were analyzed by Sequoia Analytical for: 1) TPHg and BTEX using EPA Method 5030/8015/8020; 2) total hardness using standard method 314B; 3) calcium hardness using EPA Method 200.7; 4) bicarbonate

and total alkalinity using EPA standard method 403; 5) dissolved oxygen using EPA Method 360.1; 6) total dissolved solids using EPA Method 160.1; 7) Biochemical Oxygen Demand (BOD) using EPA Method 405.1; 8) chloride using EPA Method 300.0; 9) sulfate using EPA Method 300.0; 10) the metals iron, arsenic, lead, magnesium, zinc, manganese and copper using EPA Methods 7060, 200.7, and 239.2. These analyses were performed to provide information for remediation system design.

FIELD WORK RESULTS

Subsurface Materials

The earth materials encountered during this investigation consisted primarily of clayey silt with sand interbedded with clayey and silty sands. Graphic interpretations of the soil stratigraphy encountered in the borings are shown on Geologic Cross Sections A-A', B-B', and C-C' (Plates 15 through 17). The locations of these cross sections are shown on Plate 2.

Four lithologic units were encountered at the site. Probable fill material underlies the asphalt section, and consists of about 7 feet of silty clay beneath the northern-central portion, about 2 feet of sandy silt beneath the remainder of the site, and about 2 feet of silty clay offsite to the west. The fill contains brick, porcelain, and bark fragments. Underlying the fill is a potential confining silty clay to clayey silt unit, approximately 4 feet thick. This potential confining unit is underlain by clays, silts, and sands that form a single hydrostratigraphic unit between about 13 and 17 feet thick. The clayey and silty portions of the hydrostratigraphic unit typically contain rootholes, rootlets, and a blocky structure, and the sandy portions contain rootholes and rootlets. These features appear to allow water to readily flow through, and be stored in, the clays, silts, and sands of the hydrostratigraphic unit. The hydrostratigraphic unit is in turn underlain by a silty clay confining layer of unknown thickness in the southern portion of the site. The presence of a confining layer beneath the hydrostratigraphic unit elsewhere beneath the site is not certain because it has not been encountered. The groundwater appears to be unconfined because water levels

typically have been several feet below the overlying potential confining layer and because initial water levels measured in most of the completed wells appear to have dropped.

Pumping and Recovery Test Results and Analyses

Based on DTW level measurements obtained prior to beginning the pumping test on March 10, 1993, a groundwater gradient of 0.01 ft/ft and a flow direction to the north-northwest was interpreted, as shown on Plate 18. This evaluated groundwater gradient was consistent with previous gradients for first quarter 1993. Groundwater elevations before, during, and after the pumping test are shown on Table 4.

In tests where the specific capacity of the well (gallons per foot per foot of drawdown) is low in relation to the casing size, a significant period of the test can be affected by casing storage. During the initial portion of the test, much of the pumped water is derived from the well casing. Only after the water level has been lowered significantly does the water-bearing zone begin producing. Casing storage also affects observation wells that are close to the pumping well. The time when casing storage effects became negligible was estimated to be approximately 2-1/2 minutes using the method Schafer as described in Driscoll (1986).

The maximum drawdown in pumping well MW-3 was approximately 5.41 feet, and the maximum drawdowns in the observation wells ranged from 0.89 feet in MW-5 nearest the pumping well to 0.17 feet in MW-4. The maximum drawdown values at 1080 minutes into the pumping test are shown on Table 5, and time-drawdown data is included in Appendix G. The groundwater gradient at the time of maximum drawdown is shown on Plate 19, and the maximum drawdowns contours are shown on Plate 20. No obvious differences in directional permeabilities were noted.

Transmissivity (T) and storage coefficient (S) values were estimated from time-drawdown data measured by the datalogger in pumping well MW-3 and observation wells MW-2, MW-5, and MW-6; and from manually obtained data in these wells and observation wells MW-1 and MW-4. T and S values were estimated using the method of Cooper and Jacob (1946) utilizing the AQTESOLV software (Geraghty & Miller, 1991). In addition, T and S were

estimated from recovery time-drawdown data measured by the datalogger and manually in wells MW-3, MW-5, and MW-6 using the Theis method (1935) utilizing AQTESOLV. Datalogger and manual data from recovery in MW-2 were not analyzed because the data appeared to be anomalous. The semi-log plots are included as Plates G1 through G15 in Appendix G. Results are presented in Table 6.

For comparison with the AQTESOLV results, T and S were also estimated from distance-drawdown data for the time of maximum drawdown at the end of the test, at 1080 minutes. This plot is included as Plate G16 in Appendix G, and results are shown in Table 6.

The estimated transmissivity values ranged from 0.156 to 0.547 (average 0.375) ft^2/min, which are within one-half order of magnitude. These values are relatively close considering the apparent heterogeneity of the water-bearing unit; which varies from a silty clay to sand. The estimated storativity values ranged from 3.6×10^{-3} to 0.0347 (average 0.017), which includes the upper limit of values for confined aquifers (S = 0.005 to 0.00005) and the lower limit of specific yield values (S_y) for unconfined aquifers (S_y = 0.01 to 0.30) (Freeze and Cherry, 1979).

The efficiency of pumping well MW-3 was estimated by comparing the theoretical drawdown in the well to the actual drawdown. The theoretical drawdown was estimated using two methods; an empirical equation to calculate specific capacity (gallons per minute per foot of drawdown or Q/S) and by extrapolation on a distance versus drawdown plot.

The theoretical specific capacity Q/S can be calculated for MW-3 using the equation (Driscoll, 1986):

Q/S = T/1500, where Q is in gallons per day (gpd) and T is in gpd/ft

Substituting T = 2592 gpd/ft (or 0.289 ft^2/min - see Plate G16);

Q/S = 2592 gpd/ft/1500 = 1.73 gpm/ft

The total theoretical drawdown for a pumping rate of 6.5 gpm is calculated as the pumping rate divided by the specific capacity (Driscoll, 1986). Therefore, the theoretical drawdown in well MW-3 at a pumping rate of 6.5 gpm is calculated as:

6.5 gpm/1.73 gpm/ft = 3.75 ft

The efficiency of well MW-3 can be calculated by dividing the theoretical drawdown by the actual drawdown (5.41 feet) at the end of the pumping test:

(3.75 ft/5.41 ft) x 100 = 69 percent

Another estimate of theoretical drawdown was made using the following method. On a plot of the distance to the pumping well versus drawdown in each of the observation wells (distance versus drawdown plot) a straight line representing the cone of depression is drawn passing through the points. This line is extended to the distance corresponding to just outside the pumping well. The intersection of the extended line with the radius of the pumped well is the theoretical drawdown for a 100-percent efficient well. This plot is shown as Plate G17 in Appendix G. For MW-3, the theoretical drawdown from Plate G17 is estimated to be 3.35 feet. The efficiency of well MW-3 is again calculated:

(3.35 ft/5.41 ft) x 100 = 62 percent

Therefore, the efficiency of MW-3 appears to range between 62 and 69 percent.

A preliminary estimate of the capture zone (Bear, 1979) for this well was evaluated for an estimated pumping rate (Q) of 6.5 gpm (= 1251 ft^3/d), a transmissivity (T) of 0.375 ft^2/min (= 540 ft^2/d; the average T using each method discussed above), and the average hydraulic gradient (dh/dl) for first quarter 1993 of 0.0045. The width (w) of the zone of capture upgradient of MW-3 is 515 ft and the distance to the downgradient stagnation point (r) is 82 ft.

$$W = Q / T\,(dh/dl)$$
$$= 1251\ ft^3/d / 540\ ft^2/d\ (0.0045)$$
$$= 515\ ft$$

$$r = Q/2\,\pi\,T\,(dh/dl)$$
$$= 1251\ ft^3/d / [2\ (3.1416)\ 540\ ft^2/d\ (0.0045)]$$
$$= 82\ ft$$

The groundwater gradient after approximately one hour of recovery was approximately 0.008 to the northwest, as shown on Plate 21. This gradient indicates that the water-bearing zone is restored to its initial gradient (0.005) and flow direction in a relatively short time.

RESULTS OF LABORATORY ANALYSES

Soil Samples

The analytical results of soil samples are summarized in Table 3, Cumulative Results of Laboratory Analyses of Soil Samples. Concentrations of TPHg in soil are shown in the geologic cross sections on Plates 15 through 17. Laboratory Analyses Reports and Chain of Custody Records for Soil Samples are included in Appendix H.

Laboratory analytical results of soil samples collected from boring B-13, located in the vicinity of the dispenser islands, and boring B-15, located crossgradient of the former USTs, indicated nondetectable TPHg (less than 1 ppm) and BTEX (less than 0.0050 ppm). Laboratory analytical results of soil samples collected from boring B-14, located crossgradient of the dispenser islands and downgradient of the former tank excavation, indicated nondetectable TPHg and BTEX at a depth of 6 feet; and 43 ppm TPHg and minor concentrations of BTEX (0.58 ppm or less) at a depth of 11½ feet.

Laboratory analytical results of composite soil samples collected from the soil stockpile generated during drilling in January indicated the following; the presence of 14 ppm TPHg

and minor BTEX (0.13 ppm or less), 1.5 ppm barium (below STLC regulatory limits), nondetectable reactivity with sulfide and cyanide, negative reaction with water, a pH of 7.4, and a flashpoint of less than 100°C. The soil stockpile was removed from the site by ARCO's contractor, Dillard Trucking Inc. of Byron, California, on February 8, 1993. Laboratory analytical results from the soil stockpile generated during drilling in May indicated nondetectable TPHg and BTEX, 0.18 ppm lead (below STLC regulatory limits), nondetectable reactivity with sulfide and cyanide, negative reaction with water, a pH of 7.4 and a flashpoint below 100°C. The May soil stockpile was removed by Dillard on May 13, 1993.

Groundwater Samples

The following is a summary of first quarter 1993 groundwater sampling results based on RESNA's quarterly monitoring report (RESNA, April 21, 1993). Cumulative results of laboratory analyses of groundwater samples are presented in Table 2. A map depicting concentrations of TPHg and benzene in groundwater is reproduced in this report as Plate 14. Laboratory analytical results of water samples collected from MW-3 at the discharge point during the pumping test are presented in Table 7. Laboratory data sheets are included in Appendix E.

Laboratory analytical results of groundwater samples indicated significant concentrations of TPHg and benzene in groundwater from wells MW-2, MW-3, MW-5, and MW-6. TPHg ranged from 4,800 ppb in MW-6 to 44,000 ppb in MW-3. Benzene concentrations ranged from 620 ppb in MW-5 to 1,100 ppb in MW-3. Laboratory analytical results of the groundwater sample from monitoring well MW-7 indicated 350 ppb TPHg and 0.83 ppb benzene.

CONCLUSIONS

RESNA concludes the following, based on the results of this investigation:

Soil and Groundwater

- The majority of gasoline-impacted soil appears to be in the vicinity of the former USTs and former product lines at depths of less than about 15 feet as indicated by the presence of TPHg in downgradient borings B-10 and B-14, borings B1 through B4, B7, and B8, and in product line and tank excavation soil samples.

- The lateral extent of gasoline hydrocarbons in the soil at the subject site appears to be delineated to less than 1.0 ppm TPHg in the northwestern (B-13), northeastern (B-9) and southern (B-12) portions of the site, and offsite to the west (B-15).

- The vertical extent of gasoline hydrocarbons in the soil at the site appear to be delineated to less than 1.0 ppm TPHg at a depth of 23 feet directly northwest and generally downgradient (B-10) of the former USTs.

- The lateral extent of gasoline hydrocarbons in the groundwater has been delineated to nondetectable TPHg (less than 50 ppb) and benzene (less than 0.5 ppb) in the northeastern (MW-1) and southern (MW-4) portions of the site.

- First groundwater was encountered beneath the site at a depth of approximately 12 feet in wells MW-5 and MW-6, and at 11 feet in well MW-7. The groundwater flow direction appears to have changed since the last subsurface investigation, and is now flowing to the northwest rather than the southwest.

- The water-bearing zone from approximately 9 to 32 feet below grade appears to be heterogenous and unconfined.

- The interpreted average transmissivity of the unconfined water-bearing zone is approximately 0.375 ft^2/min and the specific yield is 0.017.

- The estimated limit of a capture zone downgradient of well MW-3 is 82 feet at a pumping rate of 6.5 gallons per minute.

- A preliminary estimate of the maximum sustainable yield from pumping well MW-3 appears to be at least 6.5 gpm.

- Results of this and previous environmental investigations indicate that the primary source of hydrocarbons at the site occur in the recently submerged capillary fringe soils (now saturated zone soils) in the vicinity of the USTs and service islands. The capillary fringe soils are now submerged due to the precipitation received in 1992/1993 and the resultant rise in groundwater elevations.

- The results of the limited offsite record search indicate that one site exists within ½-mile of the subject site in the upgradient direction. There is no evidence of hydrocarbon impact in the upgradient wells on the subject site, therefore it does not appear that the upgradient site is an offsite source of gasoline hydrocarbons. Based on RESNA's review of aerial photographs of the site and surrounding area, it appears that the property located across East 14th street from the subject may have been a gasoline station from before 1968 to sometime between 1977 and 1988.

- According to CAPWA records, there are five cathodic protection wells, one irrigation well, and two destroyed wells with a ½-mile radius of the site.

FEASIBILITY OF SOIL AND GROUNDWATER REMEDIATION ALTERNATIVES

Based on the results of this and previous environmental investigations, the feasibility of soil and groundwater remediation alternatives for the site are discussed:

Vapor Extraction: The results of Roux Associates one day vapor-extraction test performed in June (Roux, July 16, 1991) indicates the clayey near-surface soils beneath the site possess relatively low air permeabilities. As a result, it appears vapor extraction may not be a viable remediation alternative for these soils.

Air-Sparging: To be effective, air-sparging requires the presence of fairly permeable soils so that vapor extraction can capture off-gas in the vadose zone. Because the vadose zone consists of low permeable clayey soils, the use of vapor extraction and air-sparging appears to be limited. Therefore, air-sparging may not be a viable remediation alternative for the soil or groundwater beneath the site.

Pump and Treat: Pump and treat usually involves extraction of large quantities of impacted groundwater and removal of only relatively small quantities of hydrocarbons. Also, even after long periods of pumping it is difficult to attain suitably low hydrocarbon concentrations in groundwater when clayey subsurface soils that have adsorbed residual hydrocarbons are present. Because soils beneath the site that contain the highest hydrocarbon concentrations are fine-grained silts and clays, it appears that pump and treat will not be effective in attaining low hydrocarbon concentrations in groundwater. I don't agree

Minimal drawdown (less than about 0.5 feet) was measured in observation wells during RESNA's pumping test. Therefore, it would appear that numerous extraction wells pumping at fairly high rates would be required to lower the groundwater beneath the site and dewater impacted soils so that hydrocarbon vapors could be removed using vapor extraction. Therefore, it would appear that groundwater extraction in conjunction with vapor extraction may not be a viable remediation alternative.

Alternative Points of Compliance: Because it appears that current remediation technologies are limited by existing site conditions, alternative points of compliance may be a feasible alternative to site remediation.

LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological practice in California at the time this investigation was performed. This investigation was conducted solely for the purpose of evaluating environmental conditions of the soil and groundwater with respect to gasoline hydrocarbons related to the former gasoline USTs at the site. Groundwater monitoring field procedures and acquisition of groundwater data were performed under the direction of EMCON. With respect to groundwater monitoring, RESNA's scope of work was limited to interpretation of EMCON's field and laboratory data. No soil engineering or geotechnical references are implied or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this assessment is made from a limited number of observation points. Subsurface conditions may vary away from the data points available.

DISTRIBUTION

We recommend that copies of this report be sent to the following regulatory agencies:

Mr. Richard Heitt
Regional Water Quality Control Board
San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, California 94612

Mr. Barney Chan
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94624

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Roux, August 8, 1991. Preliminary Tank Replacement Assessment, ARCO Facility No. 2185, 9800 East 14th Street, Oakland, California. Doc #A102W01.1.8

Roux, November 22, 1991. Limited Subsurface Soil Investigation, ARCO Facility No. 2185, 9800 East 14th Street, Oakland, California. Doc #A102W03.1.1

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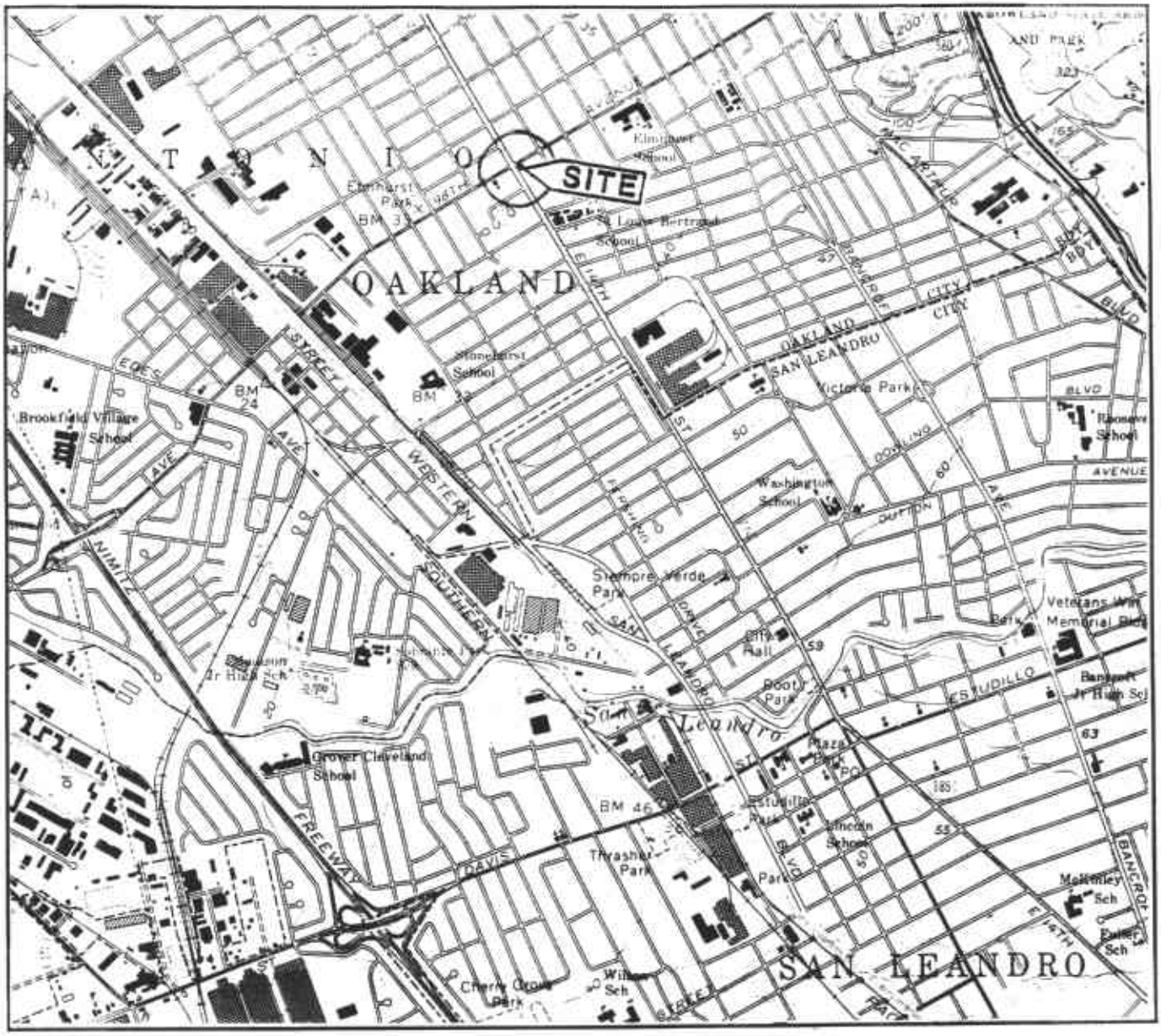
AERIAL PHOTOGRAPHS

Date	Agency	Type	No.
05/15/1957	Pacific Aerial Surveys	Black and White	AV-253-13-32
07/02/1968	Pacific Aerial Surveys	Black and White	AV-858-4-31
07/07/1977	Pacific Aerial Surveys	Black and White	AV-1377-7-33
03/30/1988	Pacific Aerial Surveys	Black and White	AV-3268-7-33



Base: U.S. Geological Survey
7.5–Minute Quadrangles
San Leandro, California.
Photorevised 1980

N

LEGEND

◉ = Site Location

Approximate Scale

2000 1000 0 2000 4000

feet

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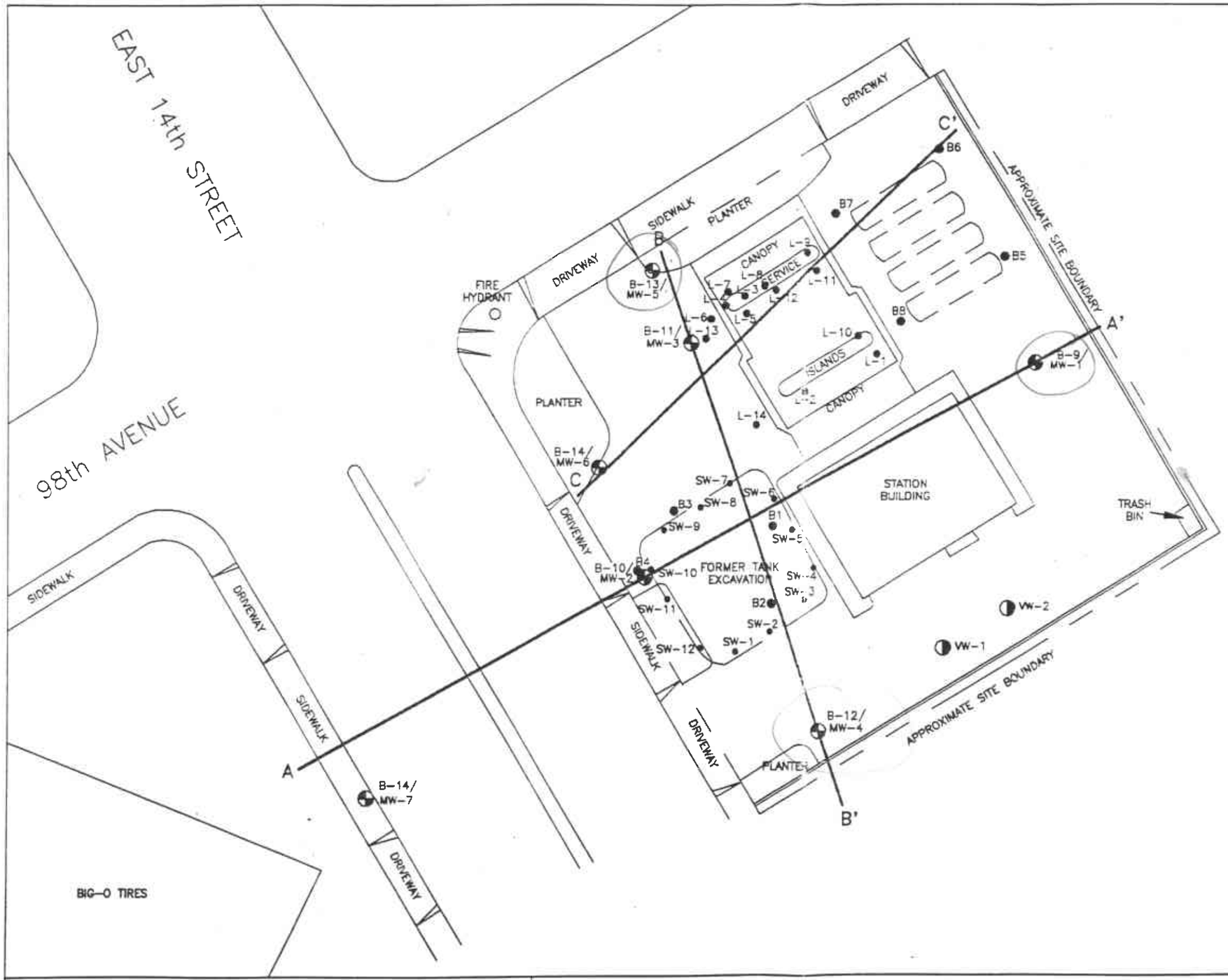
SITE VICINITY MAP
ARCO Station 2185
9800 East 14th Street
San Leandro, California

PLATE
1



EXPLANATION

- B-14/ MW-7 = Monitoring well (RESNA, July 1992)
- B8 = Soil boring (Roux Associates, May and September 1991)
- VW-2 = Vapor extraction well (Roux Associates, May 1991)
- L-13 = Soil boring (Roux Associates, November 1991)
- SW-12 = Tank pit soil sample (Roux Associates, November 1991)
- = Existing underground storage tanks
- C — C' = Geologic cross section

Approximate Scale

30 15 0 30 60

feet

Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992.

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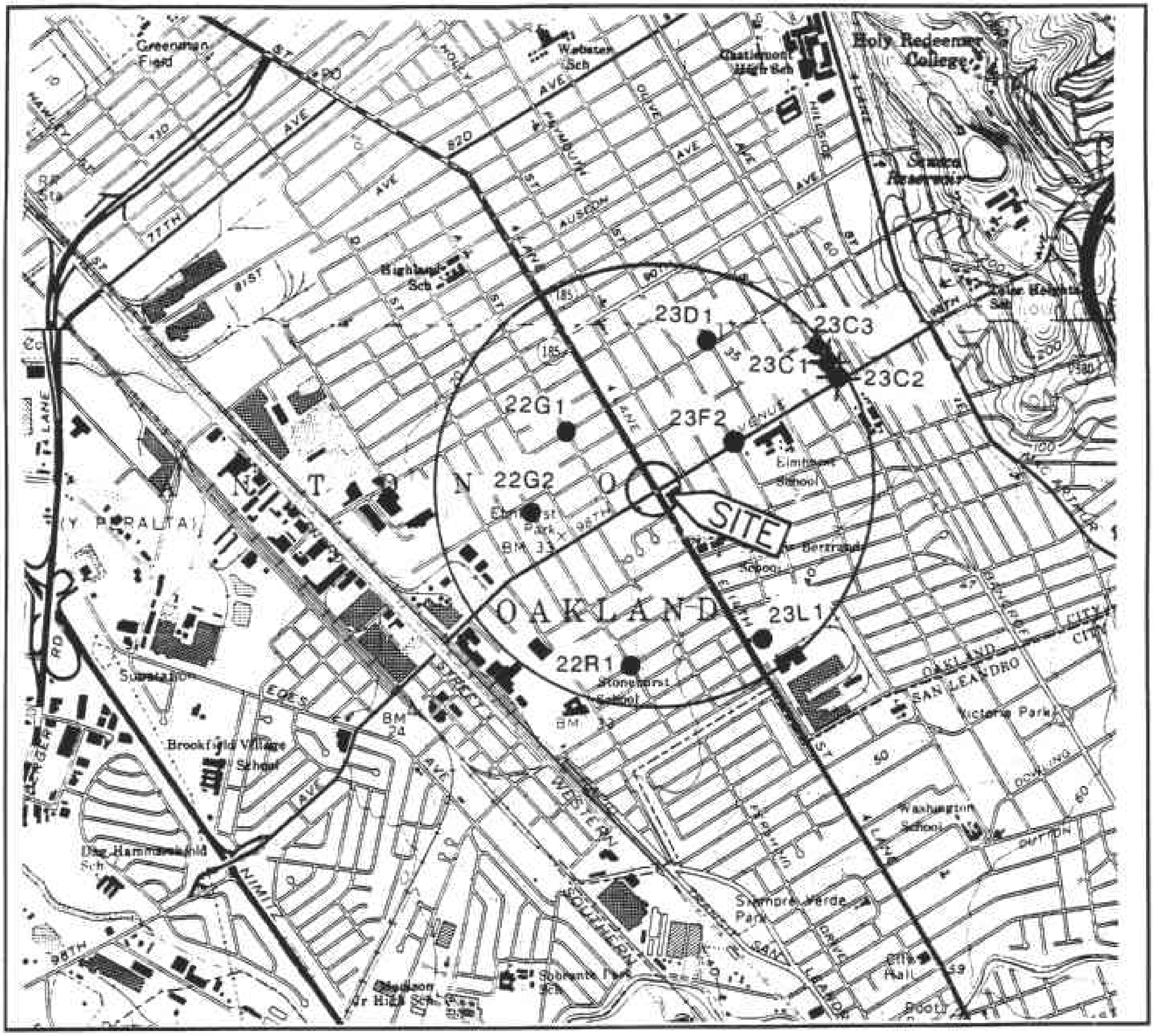
PROJECT 62026.02 62026ZM7

GENERALIZED SITE PLAN
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 2



Base: U.S. Geological Survey
7.5-Minute Quadrangles
San Leandro/Oakland East, California.
Photorevised 1980

LEGEND

(site symbol) = Site Location
23L1 ● = Well
23C2 (destroyed well symbol) = Destroyed well

N

Approximate Scale

2000 1000 0 2000 4000

feet

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APPROXIMATE WELL LOCATION MAP
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE
3

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION		LTR	DESCRIPTION
COARSE-GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded Gravels or Gravel-Sand mixtures, little or no fines.
		GP	Poorly-graded Gravels or Gravel-Sand mixtures, little or no fines.
		GM	Silty Gravels, Gravel-Sand-Silt mixtures.
		GC	Clayey Gravel, Gravel-Sand-Clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded Sand or Gravelly Sands, little or no fines.
		SP	Poorly-graded Sands or Gravelly Sands, little or no fines.
		SM	Silty Sands, Sand-Silt mixtures.
		SC	Clayey Sands, Sand-Clay mixtures.

MAJOR DIVISION		LTR	DESCRIPTION
FINE-GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic Silts and very fine sands, rock flour, Silty or Clayey fine Sands, or Clayey Silts with slight plasticity.
		CL	Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
		OL	Organic Silts and Organic Silt-Clays of low plasticity.
	SILTS AND CLAYS LL>50	MH	Inorganic Silts, micaceous or diatomaceous fine Sandy or Silty Soils, Elastic Silts.
		CH	Inorganic Clays of high plasticity, fat Clays.
		OH	Organic Clays of medium to high plasticity, organic Silts.
HIGHLY ORGANIC SOILS		PT	Peat and other highly Organic Soils.


Depth through which sampler is driven


Relatively undisturbed sample


No sample recovered


Static water level observed in well/boring


Initial water level observed in boring

S-10 Sample number


Sand pack


Bentonite


Neat cement


Caved native soil


Blank PVC


Machine-slotted PVC

P.I.D. Photoionization detector

N.T. Not tested using photoionization detector

BLOWS REPRESENT THE NUMBER OF BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES TO DRIVE THE SAMPLER THROUGH EACH 6 INCHES OF AN 18-INCH PENETRATION.

DASHED LINES SEPARATING UNITS ON THE LOG REPRESENT APPROXIMATE BOUNDARIES ONLY. ACTUAL BOUNDARIES MAY BE GRADUAL LOGS REPRESENT SUBSURFACE CONDITIONS AT THE BORING LOCATION AT THE TIME OF DRILLING ONLY.

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UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 4

PROJECT 62026.02

Depth of boring: 31 1/2 feet Diameter of boring: 10 inches Date drilled: 1-20-93

Well Depth: 29 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 9 to 29 feet Slot size: 0.010-inch

Drilling Company: Bayland Drilling Driller: John and Dwayne

Method Used: Hollow-Stem Auger Field Geologist: Erin McLucas

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0						
					Asphalt (4 inches).	
				GP	Sandy gravel, brown, damp, dense; baserock.	
2				CL	Silty clay, black, damp, medium plasticity, stiff;	
4						
6	S-6	3 5 7			trace sand.	
				ML	Clayey silt, olive, damp, medium plasticity, stiff;	
8						
	S-9.5	3 5 7				
10	S-11	1 2 2 3 3 4		SC	Clayey sand, fine-grained, brown, very moist to wet, medium dense;	
			▽			
12				ML	Clayey silt, olive with brown mottling, wet, medium plasticity, firm;	
14				SC	Clayey sand, fine-grained, brown, wet, medium dense;	
				ML	Clayey silt, olive with brown mottling, very moist, medium plasticity, firm;	
16	S-16	3 4 5 3 5 7		SC	Clayey sand, fine-grained, olive, wet, medium dense;	
18				CL	Silty clay, brown with reddish mottling, very moist to wet, medium plasticity, stiff;	
				SC	Clayey sand, medium-grained, brown, very moist to wet, medium dense;	
20				CL	Silty clay, olive, very moist, medium plasticity, stiff;	

(Section continues downward)

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LOG OF BORING B-13/MW-5

ARCO Station 2185
9800 East 14TH Street
Oakland, California

PLATE 5

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				CL	Silty clay, olive, very moist, medium plasticity, stiff;	
24						
26	S-26	7 10 12		SC	Clayey sand, fine-grained, brown, moist to wet, medium dense;	
28						
30	S-31	12 17 29				
32					Total depth = 31 1/2 feet.	
34						
36						
38						
40						
42						
44						
46						
48						
50						

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LOG OF BORING B-13/MW-5

ARCO Station 2185
9800 East 14TH Street
Oakland, California

PLATE 6

Depth of boring: 30 1/2 feet Diameter of boring: 10 inches Date drilled: 1-21-93

Well Depth: 28 1/2 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 8 1/2 to 28 1/2 feet Slot size: 0.010-inch

Drilling Company: Bayland Drilling Driller: John and Dwayne

Method Used: Hollow-Stem Auger Field Geologist: Erin McLucas

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0						
					Asphalt (4 inches).	
				GP	Sandy gravel, brown, damp, dense; baserock.	
2				CL	Silty clay, black, damp, medium plasticity, very stiff;	
4					increasing gravel.	
6	S-6	7 10 15				
				ML	Clayey silt, damp, brown, medium plasticity, stiff;	
8						
10	S-10	5 5 8		SP	Sand, fine-grained, very moist, olive, medium dense; hydrocarbon odor.	
	S-11.5	4 6 6		▽CL	Silty clay, very moist, olive with brown mottling, medium plasticity, stiff; odor.	
12	S-13	3 3 3		SP	Sand, fine-grained with gravel, wet, olive, loose; odor	
				SC	Clayey sand, very moist, olive with brown mottling; medium dense;	
14						
16	S-16	1 3 5		CL	Silty clay, moist to very moist, olive with brown mottling, medium plasticity, stiff; wet root holes	
18						
20	S-21	3 4 5		SC	Clayey sand, brown with reddish mottling, very moist to wet, loose; root holes.	

(Section continues downward)

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LOG OF BORING B-14/MW-6
ARCO Station 2185
9800 East 14TH Street
Oakland, California

PLATE 7

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22	S-21	3 4 5		SC	Clayey sand, brown with reddish mottling, very moist to wet, loose; root holes	
24						
26	S-26	3 4 5				
28					olive	
30	S-30	0 2 3				
					Total depth = 30 1/2 feet.	
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

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LOG OF BORING B-14/MW-6

ARCO Station 2185
9800 East 14TH Street
Oakland, California

PLATE 8

Depth of boring: 30-1/4 feet Diameter of boring: 8 inches Date drilled: 05/04/93

Well depth: 26 feet Material type: Sch 40 PVC Casing diameter: 2 inches

Screen interval: 11 to 26 feet Slot size: 0.010-inch

Drilling Company: Exploration Geoservices Driller: John and Danny

Method Used: Hollow-Stem Auger Field Geologist: Erin McLucas

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Concrete sidewalk (4 inches).	
				ML	Clayey silt, dark brown, damp, medium plasticity, stiff; fill.	
2				ML	Clayey silt with coarse sand and fine gravel, black, damp, medium plasticity, stiff; roots.	
4						
	S-5	8 11 26				
6				SC	Clayey sand, fine grained, trace gravel, brown, damp, dense.	
8				SM	Silty sand, tan, moist to very moist, dense.	
10		14 9				
	S-10.5	22 13		CL	Silty clay, grayish-tan with orange mottling, damp, medium plasticity, very stiff; rootholes, blocky structure.	
		14		SP	Sand, medium grained, tan, moist to wet, medium dense.	
12	S-12	22 11		CL	Silty clay, grayish-tan with orange mottling, damp to moist with wet rootholes, medium plasticity, very stiff; rootholes, blocky structure.	
14		13 21 10				
		21 22			Trace sand.	
16		10 22 25				
		8		CL	Sandy clay, grayish-tan with orange mottling, damp with wet rootholes, hard; rootholes and blocky structure.	
18		15 22				
20				CL	Silty clay, grayish-tan with orange mottling, moist with wet rootholes, medium plasticity, very stiff; rootholes, blocky structure.	

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PROJECT: 62026.02

LOG OF BORING B-15/MW-7
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 9

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
		9 15 15		CL	Silty clay, grayish-tan with orange mottling, moist with wet rootholes, medium plasticity, very stiff; rootholes, blocky structure.	
22						
24				SM	Silty sand, gray with orange mottling, very moist with wet rootholes, dense; rootholes and roots.	
		12 25				
26		21				
28				GP	Sandy gravel, fine with coarse sand, gray, wet, very dense.	
		23				
30		50/3"			Total Depth = 30-1/4 feet.	
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

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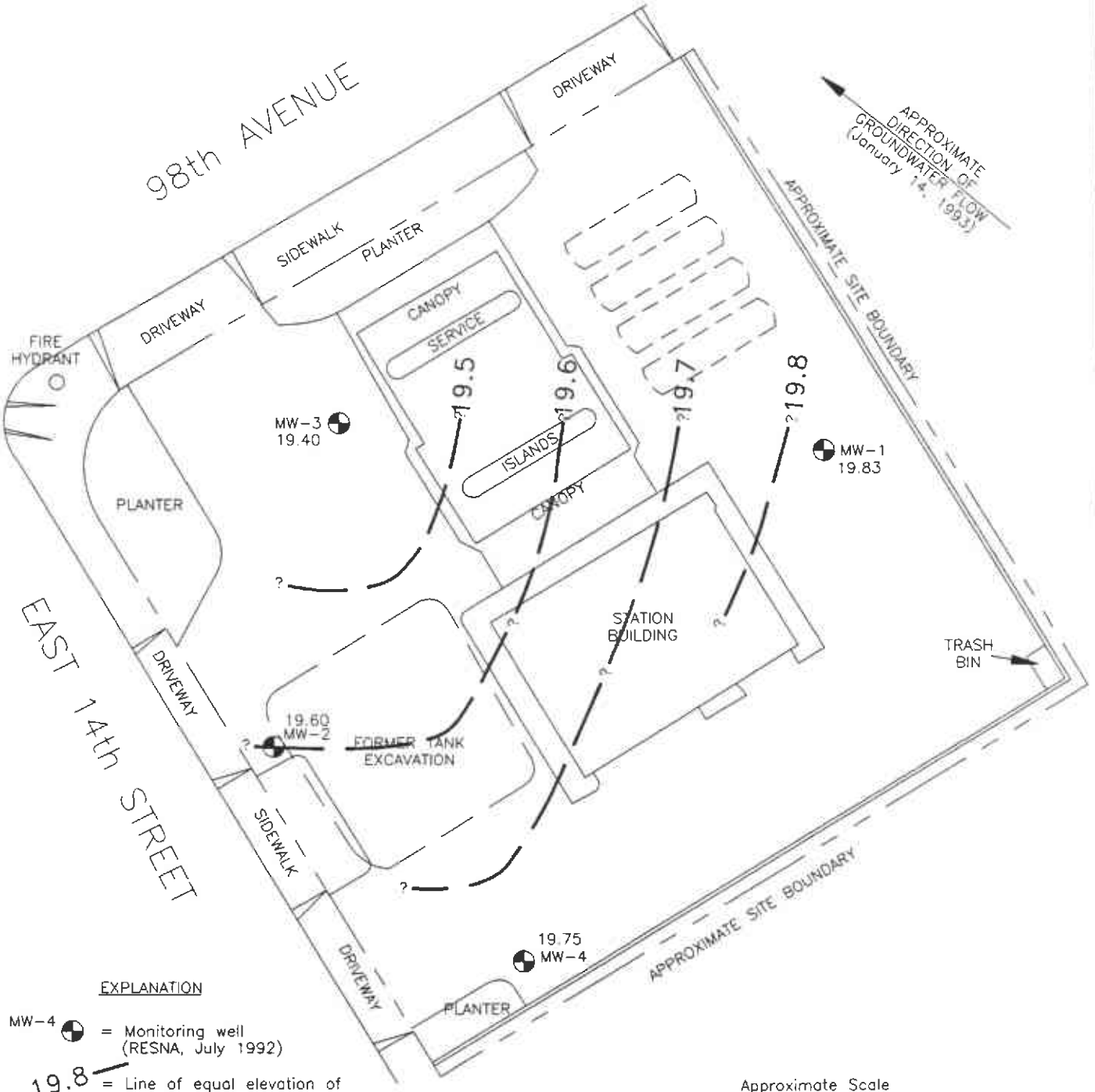
LOG OF BORING B-15/MW-7
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE
10



EXPLANATION

MW-4 = Monitoring well (RESNA, July 1992)

19.8 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

19.83 = Elevation of groundwater in feet above MSL, January 14, 1993

= Existing underground storage tanks

Approximate Scale

30 15 0 30 60

feet

Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992

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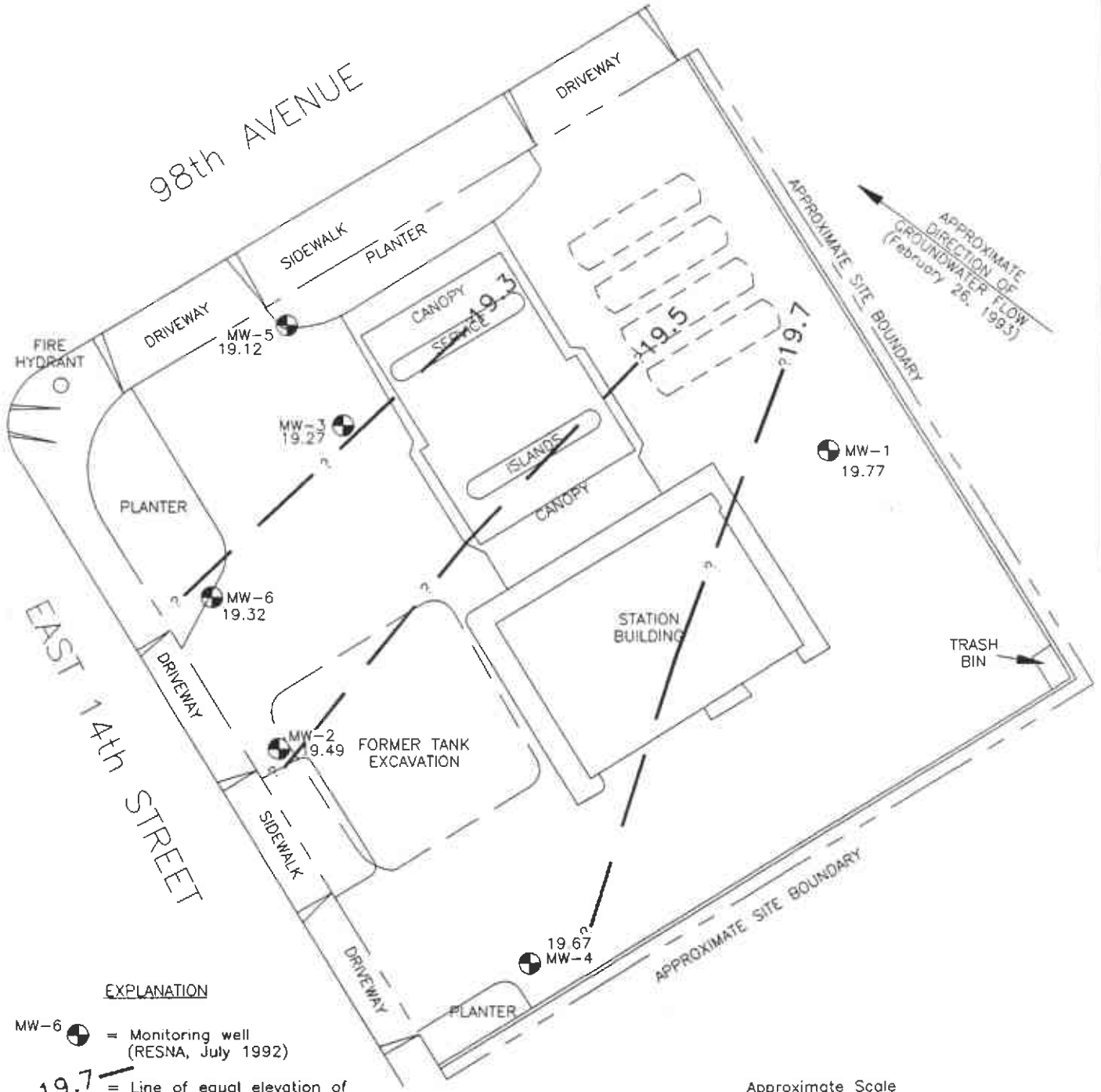
620262Q1

GROUNDWATER GRADIENT MAP
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE
11



Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992.

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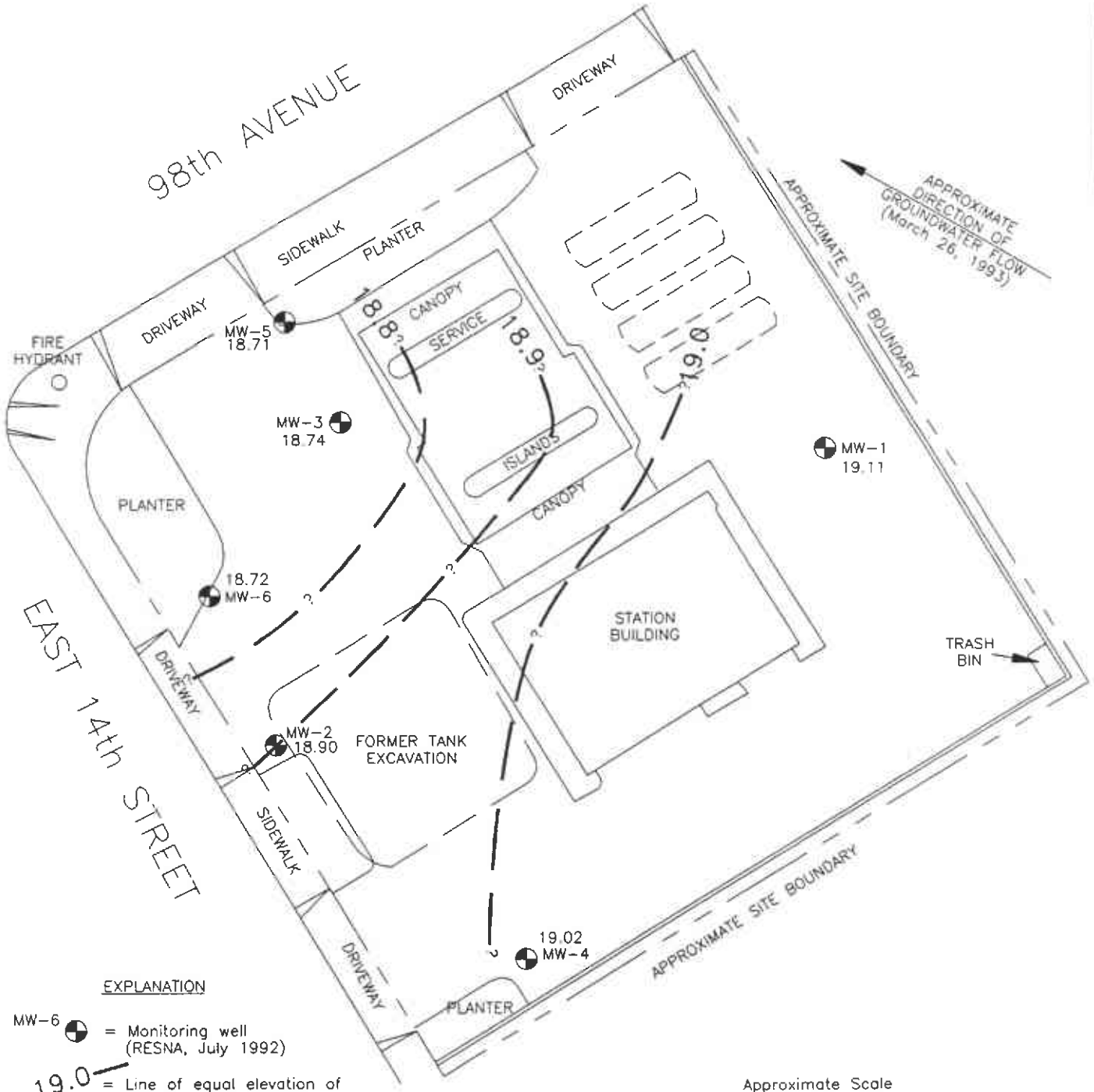
Working to Restore Nature

PROJECT 62026.02

62026Q1

GROUNDWATER GRADIENT MAP
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 12



EXPLANATION

MW-6 = Monitoring well (RESNA, July 1992)

19.0 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

19.11 = Elevation of groundwater in feet above MSL, March 26, 1993

= Existing underground storage tanks

Approximate Scale

30 15 0 30 60

feet

Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992.

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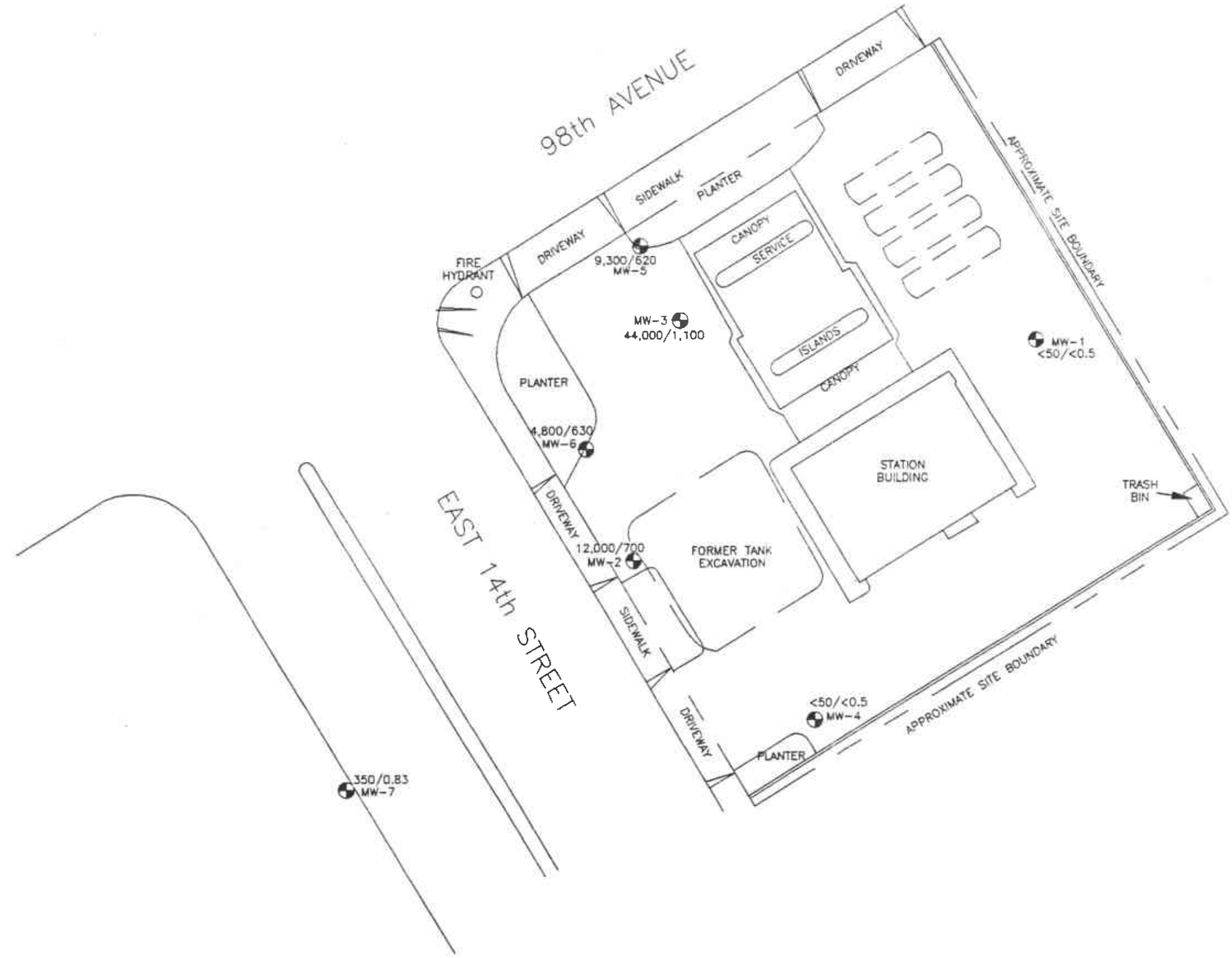
62026201

GROUNDWATER GRADIENT MAP
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE
13



EXPLANATION

MW-7 = Monitoring well (RESNA, July 1992)

44,000/1,100 = Concentrations of TPHg/benzene in groundwater in parts per billion; wells MW-1 through MW-4 sampled on January 14, 1993, and wells MW-5 and MW-6 sampled on February 11, 1993

= Existing underground storage tanks

Approximate Scale

30 15 0 30 60

feet

Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992.

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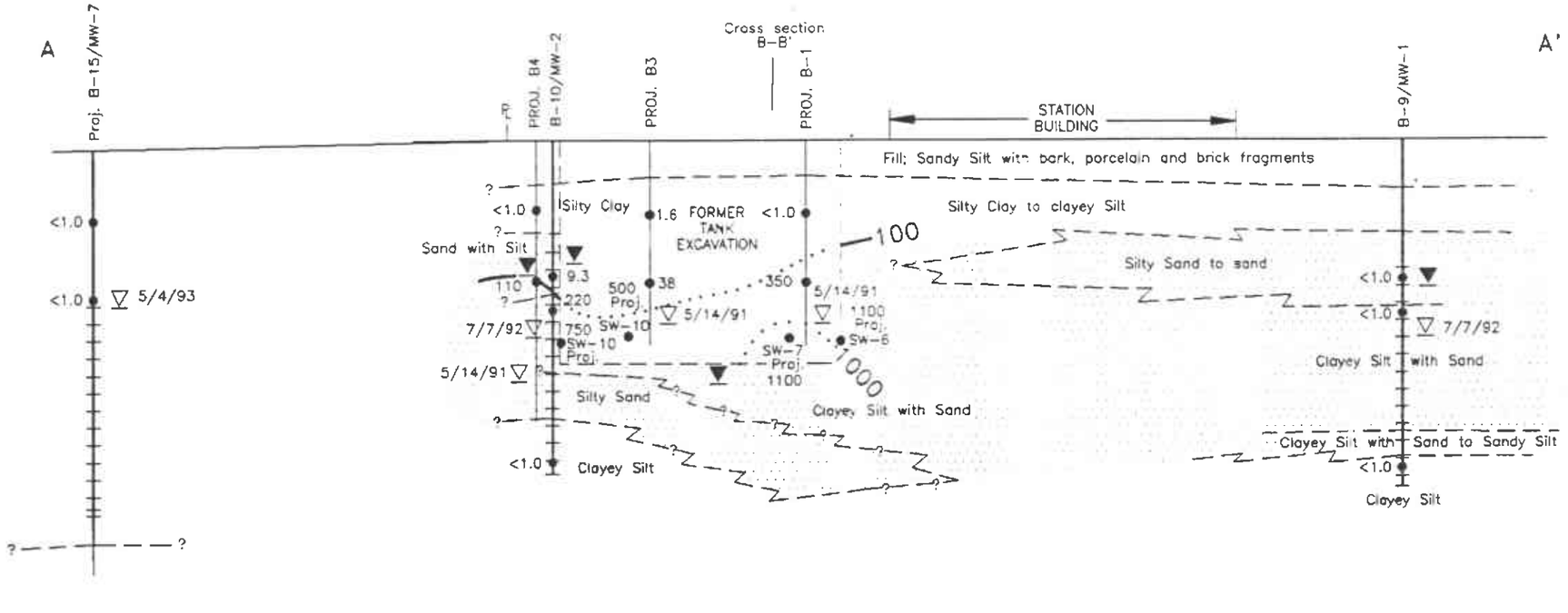
PROJECT 62026.02

TPHg/BENZENE CONCENTRATIONS IN GROUNDWATER
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE
14



EXPLANATION

1000 = Line of equal concentration of TPHg in soil in parts per million (ppm)

<1.0 = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (3/26/93)

= Hydrostratigraphic unit; consists of water bearing sands, silts, and clays with roothole

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

feet

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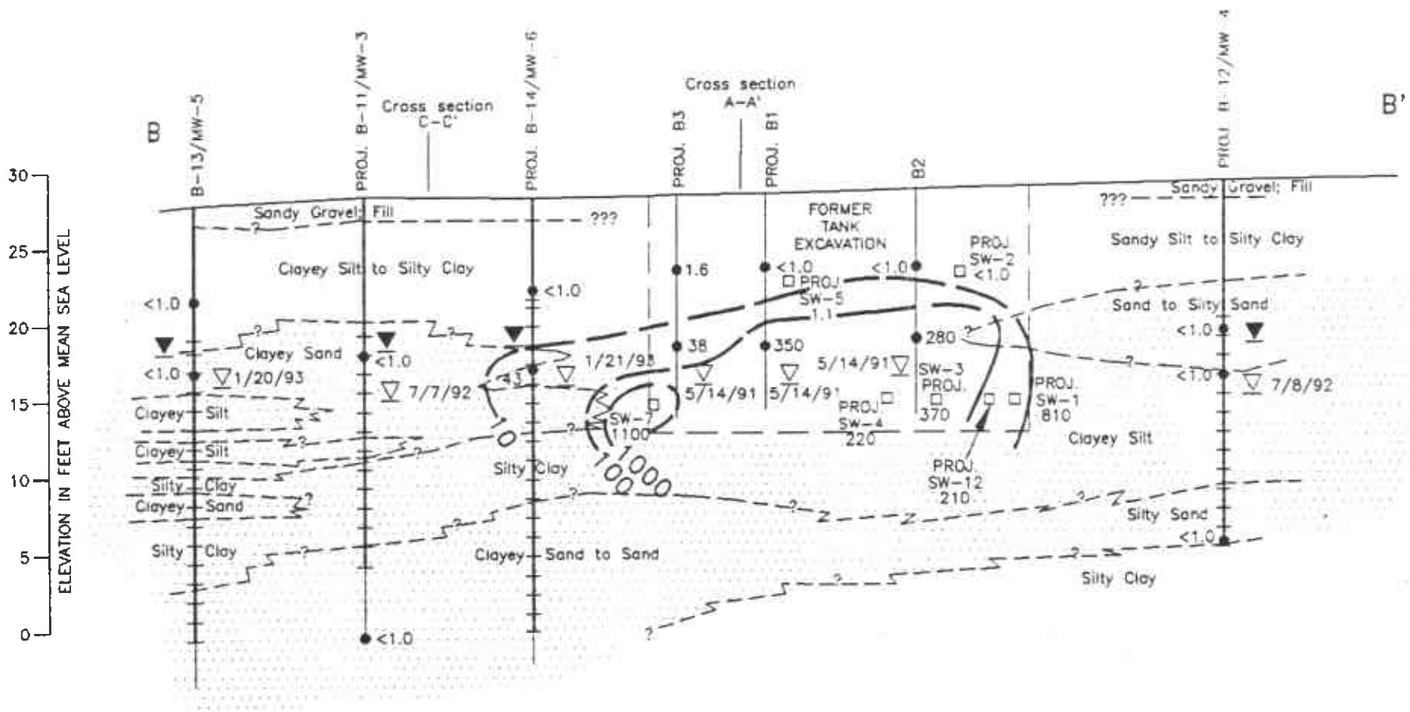
PROJECT 62026.02 620262A

GEOLOGIC CROSS SECTION A-A'
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE
15



EXPLANATION

—1000 = Line of equal concentration of TPHg in soil in parts per million (ppm)

SW-7 □ = Laboratory analyzed product line soil sample showing concentration of TPHg in ppm

<1.0 ♦ = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

▽ = Initial water level in boring

▼ = Static water level in well (3/26/93)

= Hydrostratigraphic unit; consists of water bearing sands, silts, and clays with rootholes

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

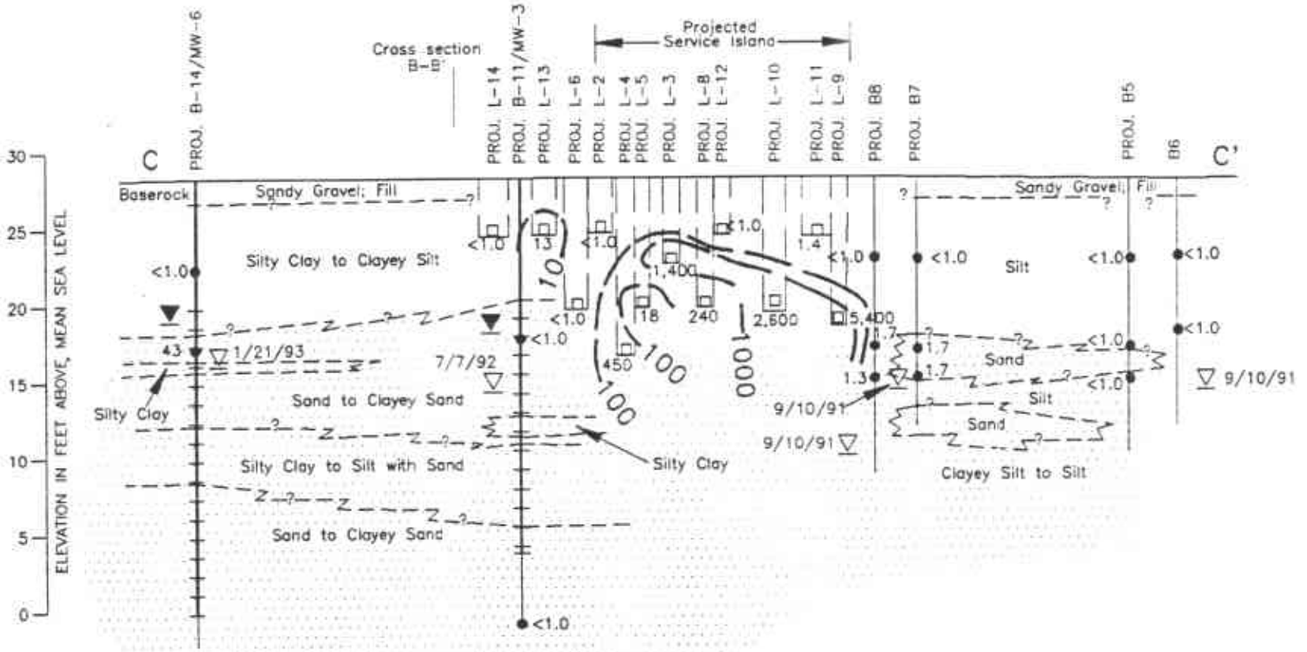
feet

RESNA
Working to Restore Nature

PROJECT 62026.02 620262B

GEOLOGIC CROSS SECTION B-B'
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 16



EXPLANATION

—1000 = Line of equal concentration of TPHg in soil in parts per million (ppm)

L-13 = Laboratory analyzed product line soil sample showing concentration of TPHg in ppm dashed line shows approximate location of product line trenches

<1.0 = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (3/26/93)

= Hydrostratigraphic unit; consists of water bearing sands, silts, and clays with roothales

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

feet

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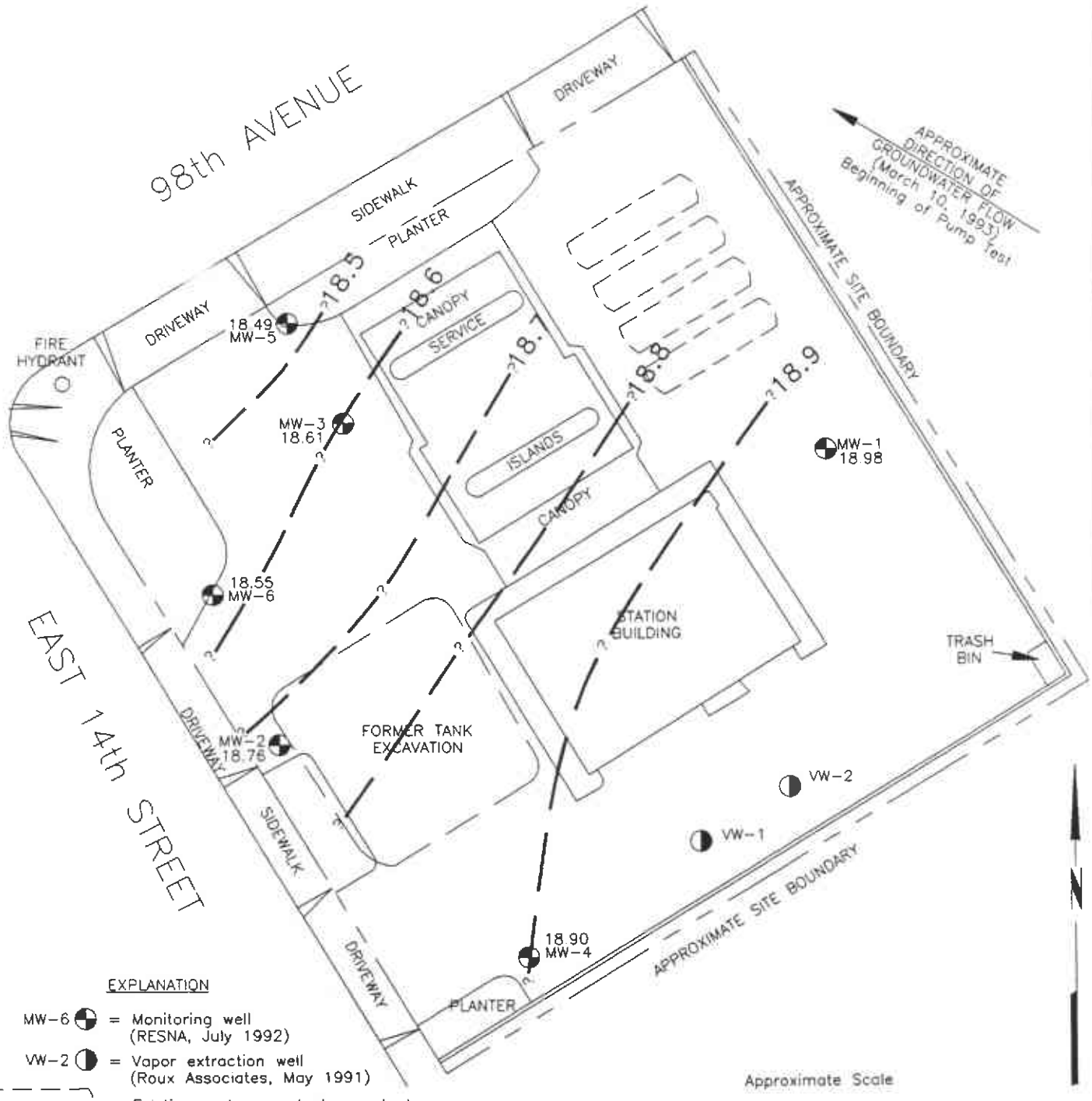
PROJECT 62026.02 620282C

GEOLOGIC CROSS SECTION C-C'
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE
17



Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992.

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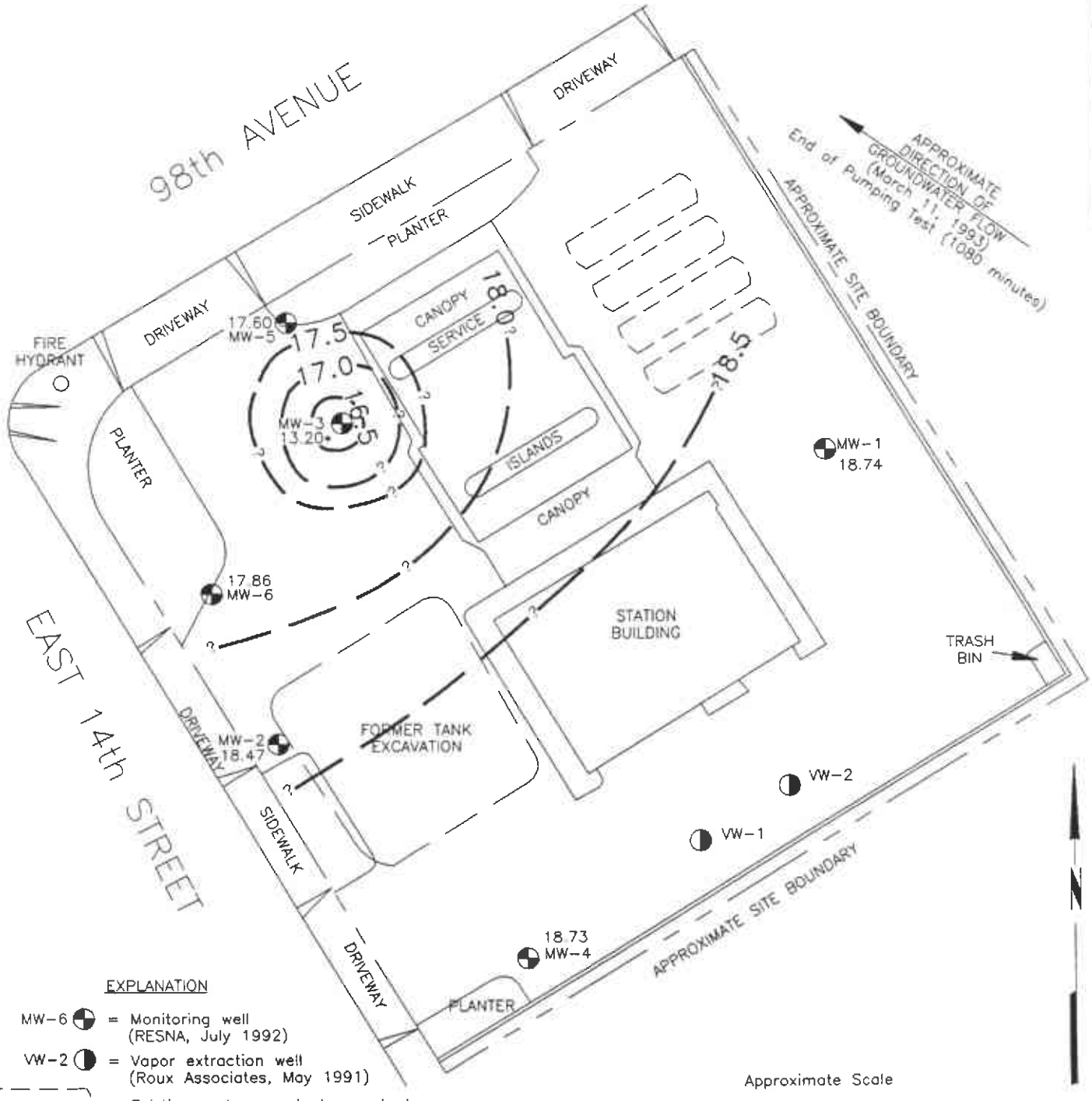
PROJECT 62026.02

62026GW

GROUNDWATER GRADIENT MAP
BEGINNING OF PUMP TEST
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 18



Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992.

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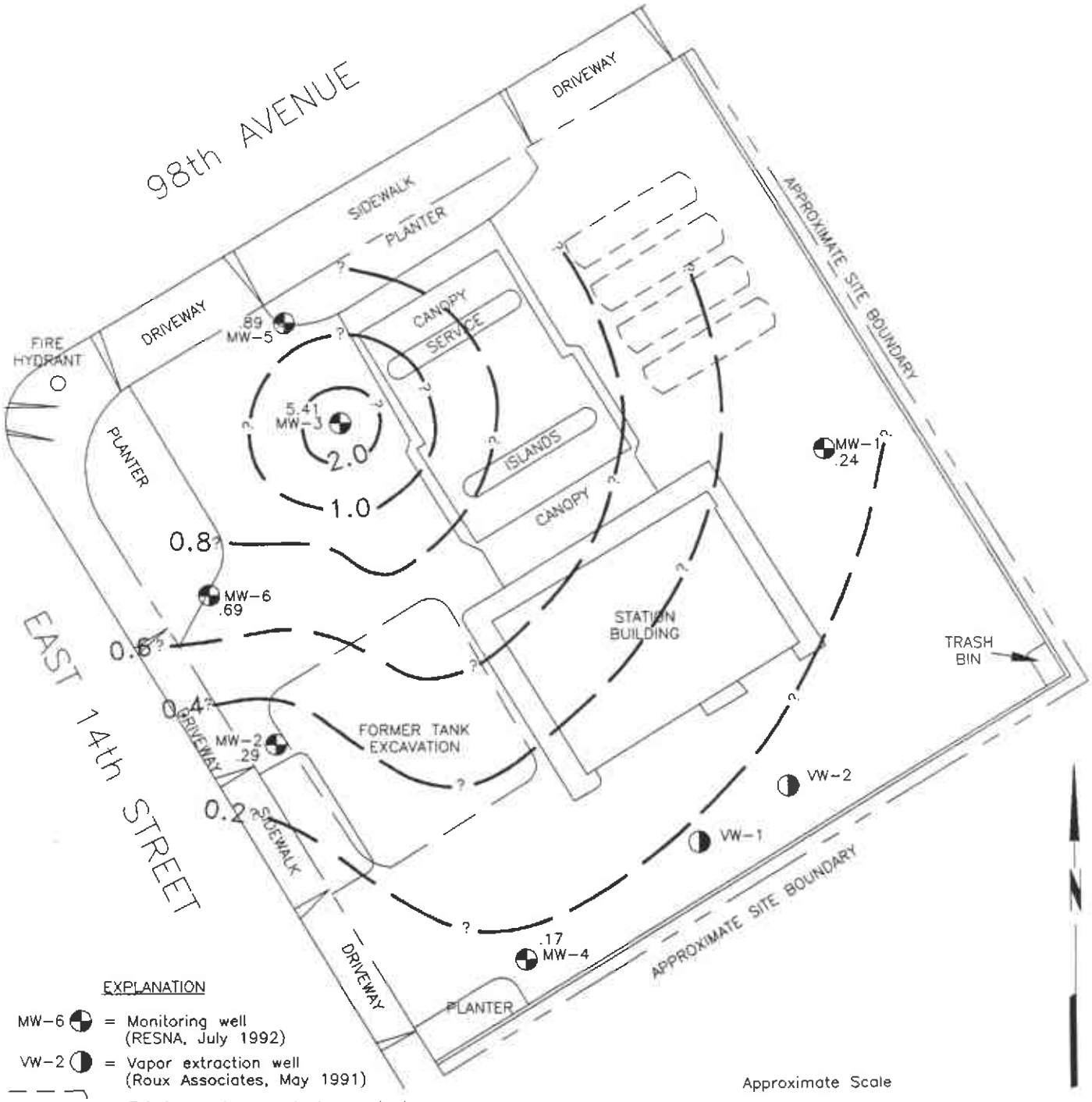
PROJECT 62026.02

62026DW

GROUNDWATER GRADIENT MAP
END OF PUMPING TEST (1080 MINUTES)
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 19



EXPLANATION

MW-6 = Monitoring well (RESNA, July 1992)

VW-2 = Vapor extraction well (Roux Associates, May 1991)

= Existing underground storage tanks

2.0 = Line of equal drawdown in wells in feet

5.41 = Drawdown in feet, March 11, 1993, end of pumping test

Approximate Scale

30 15 0 30 60

feet

Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992.

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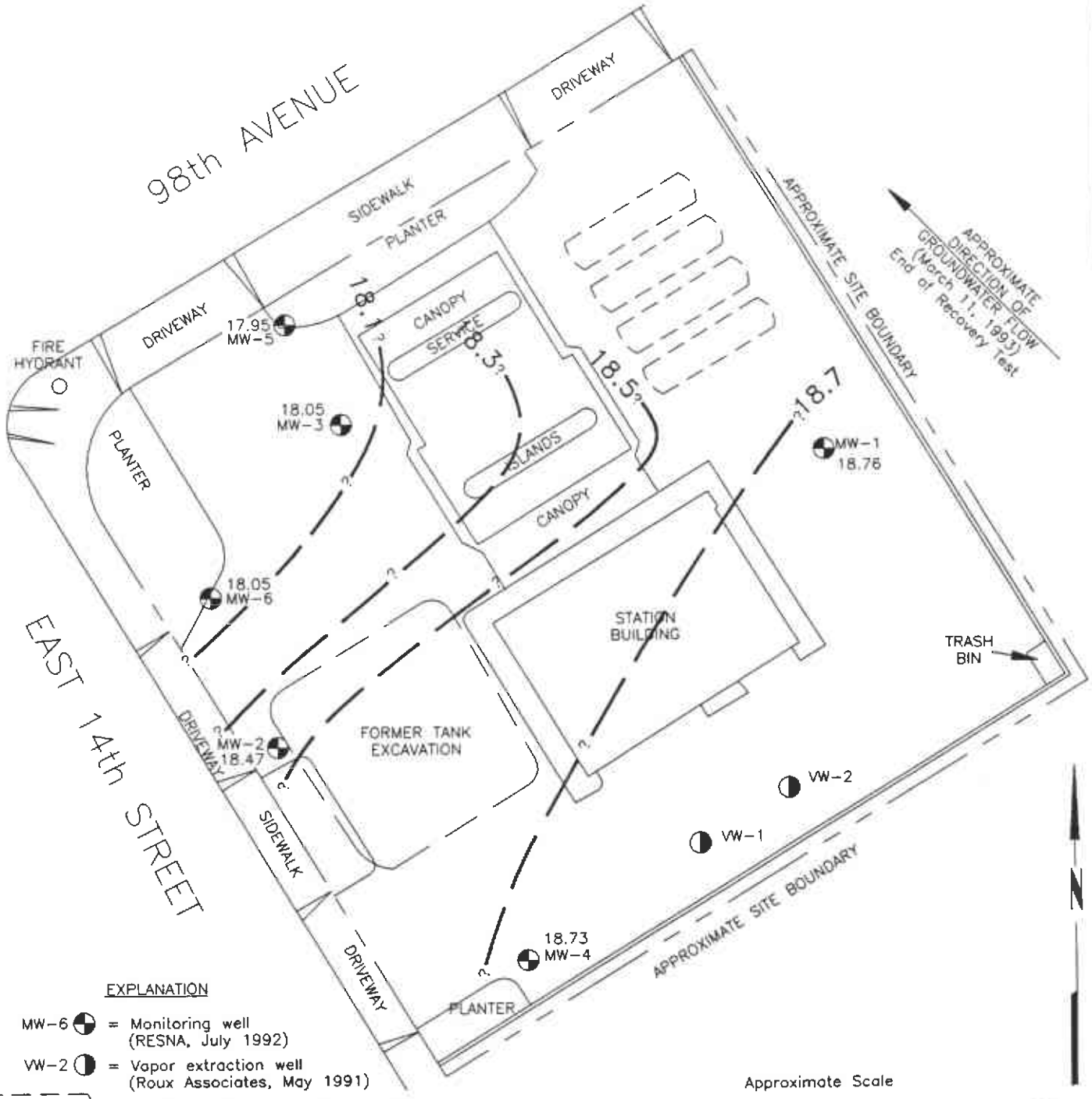
PROJECT 62026.02

62026.20w

GROUNDWATER DRAWDOWN MAP
END OF PUMPING TEST (1080 MINUTES)
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 20



Source: Modified from a site plan provided by Roux Associates dated December 1991. Also surveyed by John Koch, Licensed Land Surveyor, July 1992.

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PROJECT 62026.02

GROUNDWATER GRADIENT MAP
END OF RECOVERY TEST
ARCO Station 2185
9800 East 14th Street
Oakland, California

PLATE 21

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 2185
Oakland, California
(Page 1 of 2)

Date Well Measured	Well Elevation	Depth to Water	Water Elevation	Floating Product
MW-1				
7-24-92	29.15	13.38	15.77	None
8-26-92		13.92	15.23	None
9-22-92		14.18	14.97	None
10-19-92		14.52	14.63	None
11-23-92		14.54	14.61	None
12-16-92		12.20	16.95	None
01-14-93		9.32	19.83	None
02-26-93		9.38	19.77	None
03-26-93		10.04	19.11	None
MW-2				
7-24-92	28.47	12.95	15.52	None
8-26-92		13.55	14.92	None
9-22-92		13.78	14.69	None
10-19-92		14.09	14.38	None
11-23-92		14.06	14.41	None
12-16-92		11.70	16.77	None
01-14-93		8.87	19.60	None
02-26-93		8.98	19.49	None
03-26-93		9.57	18.90	None
MW-3				
7-24-92	28.57	12.90	15.67	Sheen
8-26-92		13.51	15.06	None
9-22-92		13.73	14.84	None
10-19-92		14.04	14.53	None
11-23-92		14.02	14.55	None
12-16-92		11.73	16.84	None
01-14-93		9.17	19.40	None
02-26-93		9.30	19.27	None
03-26-93		9.83	18.74	None

See notes on page 2 of 2

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 2185
Oakland, California
(Page 2 of 2)

Date Well Measured	Well Elevation	Depth to Water	Water Elevation	Floating Product
MW-4				
7-24-92	29.21	13.68	15.53	None
8-26-92		14.12	15.09	None
9-22-92		14.46	14.75	None
10-19-92		14.74	14.47	None
11-23-92		14.75	14.46	None
12-16-92		12.45	16.76	None
01-14-93		9.46	19.75	None
02-26-93		9.54	19.67	None
03-26-93		10.19	19.02	None
MW-5				
02-26-93	28.12	9.00	19.12	None
03-26-93		9.41	18.71	None
MW-6				
02-26-93	27.79	8.47	19.32	None
03-26-93		9.07	18.72	None

All measurements in feet.
Well Elevation if top-of-casing (TOC) in feet above mean sea level (msl).
Depth-to-Water (DTW) is measured in feet below TOC
Groundwater Elevation = TOC - DTW
Floating Product = Subjective evidence of floating product noted.
Wells surveyed on July 23, 1992 (Benchmark #24/D, near the corner of 98th Avenue [5' feet west of west curb] and East 14th Street [7' feet east of the south curb] in Oakland).

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF
GROUNDWATER SAMPLES
ARCO Station 2185
Oakland, California
(Page 1 of 1)

Well	TPHg	B	T	E	X
MW-1					
7-24-92	<50	<0.5	<0.5	<0.5	<0.5
10-19-92	<50	<0.5	<0.5	<0.5	<0.5
01-14-93	<50	<0.5	<0.5	<0.5	<0.5
MW-2					
7-24-92	5,900	510	<10*	370	430
10-19-92	4,100	110	<10*	100	62
01-14-93	12,000	700	10	720	680
MW-3					
7-24-92		Not sampled -- sheen			
10-19-92	42,000	740	1,100	1,500	5,700
01-14-93	44,000	1,100	840	2,200	9,600
MW-4					
7-24-92	<50	<0.5	<0.5	<0.5	<0.5
10-19-92	<50	<0.5	<0.5	<0.5	<0.5
01-14-93	<50	<0.5	<0.5	<0.5	<0.5
MW-5					
02-11-93	9,300	620	<50*	890	2,200
MW-6					
02-11-93	4,800	630	<10*	490	460
MW-7					
05-14-93	350	0.83	<0.5	<0.5	<0.5
MCL	—	1.0	—	680	1,750
DWAL	—	—	100	—	—

Results in parts per billion (ppb).
TPHg = Total petroleum hydrocarbons as gasoline using EPA Method 5030/8020/DHS LUFT.
B = benzene, T = toluene, E = ethylbenzene, X = total xylenes using EPA Method 5030/8020/DHS LUFT
< = Below indicated laboratory detection limits.
* = Laboratory raised Method Reporting Limit (MRL) due to high analyte concentration requiring sample dilution.
MCL = State Maximum Contaminant Level (California Department of Health Services, October 1990).
DWAL = State Recommended Drinking Water Action Level (California Department of Health Services, October 1990).

TABLE 3
CUMULATIVE RESULTS OF LABORATORY
ANALYSES OF SOIL SAMPLES
ARCO Station 2185
Oakland, California
(Page 1 of 3)

Sample ID	Depth	TPHg	B	T	E	X
May 1991						
B1-5	5	<1.0	0.021	<0.0050	<0.0050	<0.0050
B1-10	10	350	1.1	0.65	4.9	19
B2-5	5	<1.0	0.034	<0.0050	<0.0050	<0.0050
B2-10	10	280	1.3	0.34	3.4	10
B3-5	5	1.6	0.015	<0.0050	0.021	0.048
B3-10	10	38	<0.050	0.24	.031	2.0
B4-5	5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B4-10	10	110	0.40	0.20	0.72	0.24
September 1991						
B5-5	5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B5-11	11	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B5-13	13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B6-5	5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B6-10	10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B7-5	5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B7-11	11	1.7	0.04	0.013	0.0079	0.078
B7-13	13	1.7	0.27	0.0083	0.04	0.028
B8-5	5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B8-11	11	1.7	0.054	0.0094	0.012	0.019
B8-13	13	1.3	0.013	0.0073	0.0053	0.0069
Tank Excavation November 1991						
SW-1	14	810	3.4	1.0	13	50
SW-2	6	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
SW-3	14	370	1.6	17	8.8	53
SW-4	14	220	0.73	1.2	2.8	15
SW-5	6	1.1	0.014	0.0069	0.012	0.034
SW-6	14	230	0.84	2.3	2.4	15
SW-7	14	1100	5.9	28	15	90
SW-8	6	1.3	0.11	0.0054	<0.0050	0.016
SW-9	14	500	3.7	0.92	7.1	32
SW-10	14	750	5.9	5.3	10	61
SW-11	6	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
SW-12	14	210	1.6	0.26	3.2	5.0

See notes on page 3 of 3.

TABLE 3
CUMULATIVE RESULTS OF LABORATORY
ANALYSES OF SOIL SAMPLES
ARCO Station 2185
Oakland, California
(Page 2 of 3)

Sample ID	Depth	TPHg	B	T	E	X
Product Lines						
L-1	3	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
L-2	3	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
L-3	5	1,400	0.51	87	55	350
L-4	11	450	2.6	24	8.7	56
L-5	8	18	<0.0050	0.029	0.042	0.38
L-6	8	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
L-7	8	5.1	0.032	0.047	0.058	0.13
L-8	8	240	0.17	2.8	2.8	15
L-9	9.5	5,400	22	330	120	640
L-10	8	2,600	5	130	53	29
L-11	3	1.4	<0.0050	0.014	0.012	0.1
L-12	3	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
L-13	3	13	<0.0050	0.026	0.05	0.7
L-14	3	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
July 1992						
S-10.5-B9	10.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-13-B9	13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-23.5-B9	23.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-9.5-B10	9.5	9.3	0.034	0.023	0.014	0.059
S-12-B10	12	220	1.1	0.75	5.1	6.3
S-23-B10	23	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-10.5-B11	10.5	<1.0	0.0060	<0.0050	<0.0050	<0.0050
S-29-B11	29	<1.0	<0.0050	0.015	0.015	0.078
S-10-B12	10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-13-B12	13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-23.5-B12	23.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
Composited Stockpile Sample						
SPA-SPD	NA	<1.0	<0.0050	<0.0050	0.010	0.012
Borings January 1993						
S-6-B13 /MW5	6	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-11-B13	11	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-6-B14 /MW6	6	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-11.5-B14	11.5	43	0.12	0.062	0.48	0.58

See notes on page 3 of 3.

TABLE 3
CUMULATIVE RESULTS OF LABORATORY
ANALYSES OF SOIL SAMPLES
ARCO Station 2185
Oakland, California
(Page 3 of 3)

Sample ID	Depth	TPHg	B	T	E	X
Composited Stockpile Sample						
0121-SPA-D	NA	14	0.021	0.022	0.10	0.13
Additional analyses: nondetectable STLC metals, except 0.15 ppm barium, pH of 7.4, flashpoint of 100° C, nondetectable reactivity with sulfide and cyanide, negative reaction with water.						
Boring May 1993						
S-5-B15 /MW7	5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-10.5-B15	10.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
Composited Stockpile Sample						
0504-SP(A-D)	NA	<1.0	<0.5	<0.5	<0.5	<0.5
Additional analyses: 0.18 ppm STLC lead, pH of 7.4, flashpoint of less than 100° C, nondetectable reactivity with sulfide and cyanide, negative reaction with water.						

Results in parts per million (ppm).
Depth in feet below ground surface.
TPHg = Total petroleum hydrocarbons as gasoline using EPA Method 5030/8020/8015
B = benzene, T = toluene, E = ethylbenzene, X = total xylenes (EPA Method 8020/8015)
< = Below indicated laboratory reporting limits.
NA = Not applicable
Sample Identification:

S-10-B12
- Boring number
- Sample depth in feet below ground surface
- Soil sample

SW-1
- Sample number
- Former tank cavity sample

B1-5
- Sample depth in feet below ground surface
- Boring number

SPA-SPD
- Composite sample
- Soil pile

Line-1
- Sample number
- Product line sample

TABLE 4
GROUNDWATER ELEVATIONS PRIOR TO THE PUMPING TEST,
AT 1080 MINUTES INTO THE PUMPING TEST
AND AT THE END OF THE RECOVERY TEST
ARCO Station 2185
Oakland, California
March 10-11, 1993

	Groundwater Elevations (in feet)					
Time Date	Well MW-3*	Well MW-1	Well MW-2	Well MW-4	Well MW-5	Well MW-6
12:00pm 03/10/93	18.61	18.98	18.76	18.90	18.49	18.55
6:00am 03/11/93	13.20	18.74	18.47	18.73	17.60	17.86
7:00am 03/11/93	18.05	18.76	18.47	18.73	17.95	18.05

NOTES:
Groundwater elevation measured in feet
* = Pumping well

TABLE 5
GROUNDWATER DRAWDOWNS AT 1080 MINUTES INTO THE PUMPING TEST
ARCO Station 2185
Oakland, California
March 11, 1993

	Groundwater Drawdowns (in feet)					
Time Date	Well MW-3*	Well MW-1	Well MW-2	Well MW-4	Well MW-5	Well MW-6
6:00am 03/11/93	5.41	0.24	0.29	0.17	0.89	0.69

NOTES:
Groundwater drawdown measured in feet
* = Pumping well

TABLE 7
RESULTS OF LABORATORY ANALYSES OF GROUNDWATER SAMPLES
COLLECTED FROM MW-3 DURING PUMPING TEST
ARCO Station 2185
Oakland, California
March 10, 1993

Analyzed	Result in ppm
Hardness	270 ppm
Biochemical Oxygen Demand	30 ppm
Dissolved Oxygen	3.4 ppm
Total Dissolved Solids	370 ppm
Chloride	35 ppm
Sulfate	30 ppm
Arsenic	<0.0050 ppm
Barium	0.12 ppm
Lead	<0.0050 ppm
Calcium	52 ppm
Copper	<0.010 ppm
Zinc	<0.010 ppm
Total Petroleum Hydrocarbons as Gasoline	13,000 ppb
Benzene	170 ppb (200)
Toluene	340 ppb (430)
Ethylbenzene	710 ppb (880)
Total Xylenes	3,100 ppb (3,800)
Bicarbonate, Alkalinity	240 ppm

ppm = parts per million
ppb = parts per billion
< = less than detection limit
BTEX using EPA Method 5030/8015/8020; concentrations in parenthesis (3,800) using EPA Method 624

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APPENDIX A

PREVIOUS ENVIRONMENTAL WORK

PREVIOUS ENVIRONMENTAL WORK

Preliminary Tank Replacement Assessment

In May 1991, Roux conducted a preliminary tank replacement assessment at the site (Roux, August 1991). The purpose of the assessment was to evaluate the presence of gasoline hydrocarbons in the soil in the area of the existing USTs prior to the planned tank removal activities. The investigation consisted of drilling and sampling four soil borings (B1 through B4) in the area of the existing USTs, submitting selected soil samples for laboratory analyses (total petroleum hydrocarbons [TPHg] and benzene, toluene, ethylbenzene and total xylenes [BTEX] using EPA Method 8015/8020) and drilling two soil borings and installing two vapor-extraction wells (VW-1 and VW-2) to be used for a vapor extraction test (VET). Locations of the soil borings and vapor extraction wells are shown on Plate 2.

Based on laboratory analytical results, petroleum hydrocarbons were detected in soil samples collected from the borings B1 through B4 at depths of 5 and 10 feet below ground surface, adjacent to the former USTs. Concentrations of TPHg in the soil ranged from nondetectable (less than 1.0 part per million [ppm]) to 350 ppm, concentrations of BTEX ranged from nondetectable (less than 0.005 ppm) to 19 ppm. Results of laboratory analyses are shown on Table 2, Cumulative Results of Laboratory Analyses of Soil Samples.

Vapor Extraction Test

On June 6, 1991, Roux conducted a one day VET to evaluate whether subsurface soil conditions at the site were favorable for soil venting remediation techniques (Roux, July 1991). A vacuum was applied to vapor well VW-2 while vapor well VW-1 was monitored for air pressure change, to determine if the soils were amenable to vapor extraction and if so, to estimate the radius of influence. No air pressure change was detected in vapor well VW-1, indicating subsurface conditions at the site will not allow a capture radius of 21 feet, the distance between the two wells. From these results Roux concluded that the subsurface conditions at this site would not be suitable for soil venting remediation techniques.

Limited Subsurface Investigation

On September 10, 1991, Roux performed a limited subsurface investigation to evaluate the impact of gasoline hydrocarbons on the soil in the area of the then proposed new underground storage tank pit (Roux, November 1991). The investigation included drilling

four soil borings (B5 through B8), collecting samples for laboratory analyses and preparing a report of the findings.

The results of laboratory analyses indicated that the soil in borings B5 and B6, located on the eastern edge of the proposed tank pit, had not been impacted by gasoline hydrocarbons. However, results of laboratory analyses of soil samples from borings B7 and B8, indicated the presence of relatively minor concentrations of TPHg and BTEX at depths of 11 and 13 feet. Concentrations of TPHg in these borings at 11 and 13 feet ranged from 1.3 to 1.7 ppm, and concentrations of BTEX ranged from 0.0053 to 0.27 ppm. Results of laboratory analyses are summarized in Table 2.

Underground Storage Tank Removal

On October 30, 1991, three USTs were excavated and removed from the site by ARCO's tank replacement contractor, Paradiso Construction Co. (Paradiso) of Oakland, California (Roux, June 17, 1992). The former tank excavation for these USTs is shown on Plate 2. Because visibly impacted soil was observed in the former tank pit excavation, the pit was over-excavated prior to sampling. Paradiso over-excavated the former tank pit to a depth of approximately 16 feet, which was approximately one foot below the static water level, and widened the excavation laterally between 3 and 6 feet. Following sampling on November 6, 1991, the bottom five feet of the former tank cavity were filled with pea gravel, and the remainder of the cavity was filled with clean, imported fill material.

On November 6, 1991, twelve soil samples (SW-1 through SW-12) were collected by Roux from the sidewalls of the former UST excavation (Roux, June 17, 1992). The samples were analyzed for TPHg and BTEX by Sequoia Analytical of Concord, California. On November 5, 1991, former product and vent lines were excavated and removed by Paradiso. Because visibly impacted soil was observed beneath the product dispensers, selected areas were over-excavated prior to sampling. Fourteen soil samples (L-1 through L-14) were collected from below the removed lines and dispensers. These samples were also analyzed for TPHg and BTEX by Sequoia Analytical. Locations of the soil samples collected are shown on Plate 2. Results of laboratory analyses are presented in Table 2.

Roux concluded that although most of the impacted soil was removed from below the former tanks and dispensers during over-excavation, analytical results of the soil samples indicate that residual gasoline hydrocarbons may still be present in the vicinity of the former product dispensers and the former tank excavation (Roux, June 17, 1992).

Initial Subsurface Investigation

In July 1992, RESNA conducted an initial subsurface investigation (RESNA, September 28, 1992), which included drilling four soil borings (B-9 through B-12), one along each side of the site, and installing four groundwater monitoring wells (MW-1 through MW-4). The wells were surveyed, developed and sampled following installation.

Laboratory results of samples from the soil borings indicated that boring B-9, located upgradient from the former USTs, and boring B-12, located crossgradient from the former USTs, were not impacted by gasoline hydrocarbons. Laboratory results from soil samples from boring B-10, located immediately downgradient of the former USTs, and boring B-11, located downgradient of the pump islands, were impacted by gasoline hydrocarbons. The laboratory results of soil samples from these borings are presented in Table 2.

Laboratory analytical results of groundwater samples collected during July 1992, indicated that well MW-1, located upgradient from the former USTs, and well MW-4, located crossgradient from the former USTs, did not appear to be impacted by gasoline hydrocarbons. Laboratory analytical results from well MW-2, located near the southwestern edge of the former tank pit, indicated concentrations of 5,900 parts per billion (ppb) TPHg, and BTEX ranging from nondetectable (<10 ppb) to 510 ppb. Monitoring well MW-3, located downgradient from the dispenser islands, was not sampled due to the presence of a product sheen. Laboratory analytical results for groundwater samples are summarized in Table 3, Cumulative Results of Laboratory Analyses of Groundwater Samples.

Quarterly Groundwater Monitoring

Following the Initial Subsurface Investigation in July 1992, quarterly groundwater monitoring began at the site. Monitoring for the third quarter consisted of measuring depth-to-water levels to interpret groundwater gradient and flow direction. The analytical results from groundwater sampling during the July 1992 Initial Subsurface Investigation were used to represent third quarter 1992 sampling data. Based on monitoring data from July to December, first encountered groundwater beneath the site appeared to flow approximately southwest with a gradient of approximately 0.002; however, monitoring data from first quarter 1993, indicate a groundwater gradient of approximately 0.005 with a flow direction to the northwest. Graphic interpretations of the gradient from the first quarter 1993 are depicted on Plates 11 through 13, Groundwater Gradient Maps. Cumulative groundwater monitoring data results are shown in Table 1, Cumulative Groundwater Monitoring Data.

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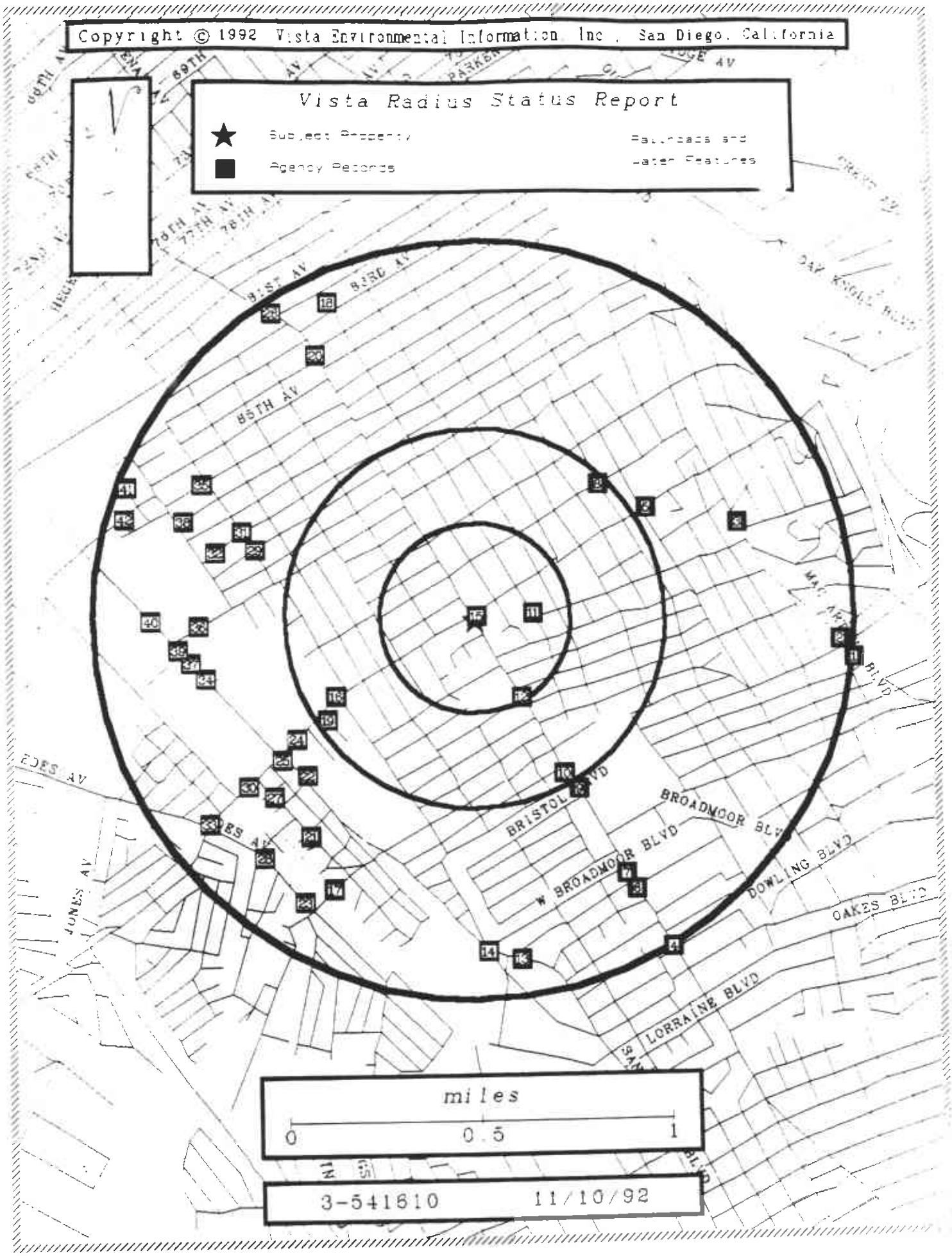
APPENDIX B

VISTA RADIUS STATUS REPORT


Copyright © 1992 Vista Environmental Information, Inc., San Diego, California
Vista Radius Status Report
Subject Property
Agency Records
Railroads and
Water Features
BRISTOL BLVD
BROADMOOR BLVD
W BROADMOOR BLVD
DOWLING BLVD
LORRAINE BLVD
OAKES BLVD
85TH AV
81ST AV
82ND AV
JONES AV
miles
0
0.5
1
3-541610
11/10/92

LIST OF SITES AND RECORDS

3-RISJOC-541610 Page:

SITE #	AGENCY & ID#	ENVIRONMENTAL RISK SITE AND DIRECTION FROM SUBJECT PROPERTY	11/10/92

WITHIN 1/4 MILE:

15 LUST — ARCO, 9800 E. 14TH ST., OAKLAND — Direction: --
Status Code: (None)

11 ASPIS 01420099 — ROY'S TRUCKING, 9912 WALNUT ST, OAKLAND 94603 — Direction: E
Status Code: NFA: No Further Action.

12 ASPIS 01720103 — WOLFGRAM ENTERPRISES INC., 10214 E 14TH ST, OAKLAND 94603 — Direction: SE
Status Code: NFA: No Further Action.

WITHIN 1/4 TO 1/2 MILE:

8 CERCLIS CAD980496913 — VERDESE CARTER PARK, 96TH AVE & SUNNYSIDE, E OAKLAND 94603 — Direction: NE
Status Code: N: No futher remedial action planned on most recent event record.

10 CERCLIS CAD001718352 — GENERAL MOTORS PARTS DIV, 10626 E 14TH ST, OAKLAND 94603 — Direction: SE
Status Code: N: No futher remedial action planned on most recent event record.

16 LUST — PIONEER PACKING, 1025 98TH AVE, OAKLAND — Direction: SW
Status Code: O: No action.

16 LUST — ANGELO PARDISO, 1031 98TH AVE, OAKLAND — Direction: SW
Status Code: O: No action.

19 LUST — BERETTA PROPERTY, 9838 GOULD ST., OAKLAND 94603 — Direction: SW
Status Code: (None)

10 ASPIS 01500100 — GENERAL MOTORS PARTS DIVISION (2), 10626 E 14TH ST, OAKLAND 94603 — Direction: SE
Status Code: NFA: No Further Action.

WITHIN 1/2 TO 1 MILE:

SITE #	AGENCY & ID#	ENVIRONMENTAL RISK SITE AND DIRECTION FROM SUBJECT PROPERTY	
======	==========	==========	==========

WITHIN 1/2 TO 1 MILE:

5	CERCLIS	ELTRA CORP PRESTOLITE BATTERY OAKLAND	OAKLAND	
	CAD980637169	98TH ST & BANCROFT AVE	94603	Direction: NE
	Status Code:	N: No futher remedial action planned on most recent event record.		
9	CERCLIS	GENERAL MOTORS PARTS DIV	OAKLAND	
	CAD000625897	10800 E 14TH ST	94604	Direction: SE
	Status Code:	N: No futher remedial action planned on most recent event record.		
28	CERCLIS	ACTION PLATING	OAKLAND	
	CAD982347676	10132 EDES AVE	94603	Direction: SW
	Status Code:	(None)		
31	CERCLIS	CONTINENTAL PLATING CO INC	OAKLAND	
	CAD009183948	995 89TH AVE	94621	Direction: NW
	Status Code:	(None)		
39	CERCLIS	PACIFIC PUMPING CO MFG SITE	OAKLAND	
	CAD088772629	9201 SAN LEANDRO ST	94603	Direction: W
	Status Code:	(None)		
1	LUST	FOOTHILL SQUARE	OAKLAND	
		10700 MACARTHUR BLVD		Direction: E
	Status Code:	O: No action.		
2	LUST	ARCO	OAKLAND	
		10600 MACARTHUR BLVD		Direction: E
	Status Code:	5C: Pollution characterization underway.		
4	LUST	MINIT AUTO CARE	SAN LEANDRO	
		497 14TH ST E		Direction: SE
	Status Code:	O: No action.		
5	LUST	BP OIL/MOBIL	OAKLAND	
		2220 98TH AVE		Direction: NE
	Status Code:	5C: Pollution characterization underway.		
5	LUST	UNOCAL	OAKLAND	
		BANCROFT & 98TH		Direction: NE
	Status Code:	3B: Preliminary site assessment underway.		
6	LUST	GERMAN AUTOCRAFT	SAN LEANDRO	
		301 14TH ST E		Direction: SE
	Status Code:	O: No action.		

WITHIN 1/2 TO 1 MILE:

7 LUST SAN LEANDRO CHRYSLER SAN LEANDRO
232 14TH ST E Direction: SE
Status Code: 0: No action.

13 LUST NOR CAL WASTE EQUIPMENT SAN LEANDRO
299 PARK ST Direction: S
Status Code: 3B: Preliminary site assessment underway.

18 LUST PACIFIC BELL OAKLAND
8259 HOLLY ST Direction: NW
Status Code: 0: No action.

21 LUST MELROSE METAL FINISHING INC OAKLAND
10222 PEARMAIN ST Direction: SW
Status Code: 3A: Preliminary site assessment workplan submitted.

22 LUST WELLS FARGO BANK OAKLAND
9999 SAN LEANDRO ST Direction: SW
Status Code: 0: No action.

24 LUST FLEISCHMANNS YEAST INC OAKLAND
921 98TH AVE Direction: SW
Status Code: 5C: Pollution characterization underway.

25 LUST CITY OF OAKLAND OAKLAND
9801 SAN LEANDRO ST Direction: SW
Status Code: 3B: Preliminary site assessment underway.

26 LUST EAST OAKLAND YOUTH CENTER OAKLAND
8200 14TH ST E Direction: NW
Status Code: 5C: Pollution characterization underway.

26 LUST INDEPENDENT TEXACO OAKLAND
8124 14TH ST E Direction: NW
Status Code: 3A: Preliminary site assessment workplan submitted.

29 LUST LIDELL IRON CRAFT OAKLAND
1000 90TH AVE Direction: NW
Status Code: 0: No action.

30 LUST CITY OF OAKLAND OAKLAND
816 98TH AVE Direction: SW
Status Code: 3B: Preliminary site assessment underway.

LIST OF SITES AND RECORDS

3-RISJOC-541610 Page: 4

SITE #	AGENCY & ID#	ENVIRONMENTAL RISK SITE AND DIRECTION FROM SUBJECT PROPERTY	11/10/92

WITHIN 1/2 TO 1 MILE:

31 LUST RODRIGUES MANUEL — OAKLAND — Direction: NW
1009 89TH AVE
Status Code: 0: No action.

32 LUST LANAIDOR — OAKLAND — Direction: NW
925 89TH AVE
Status Code: 0: No action.

33 LUST UNKNOWN — OAKLAND — Direction: SW
670 98TH AVE
Status Code: 0: No action.

33 LUST CITY OF OAKLAND — OAKLAND — Direction: SW
98TH ST & EDES AVE
Status Code: 3B: Preliminary site assessment underway.

34 LUST GERBER PRODUCT CO. — OAKLAND — Direction: SW
9401 SAN LEANDRO ST
Status Code: 3B: Preliminary site assessment underway.

37 LUST QUIKRETE — OAKLAND — Direction: SW
9315 SAN LEANDRO ST
Status Code: 0: No action.

38 LUST BROCKWAY GLASS — OAKLAND — Direction: NW
8717 G ST
Status Code: 3B: Preliminary site assessment underway.

38 LUST ACKER AND GUERRERO ROOF — OAKLAND 94621 — Direction: NW
923 87TH AVE
Status Code: (None)

40 LUST ALAMEDA CHEMICAL COMPANY — OAKLAND — Direction: W
9029 SAN LEANDRO ST
Status Code: 0: No action.

40 LUST AMERICAN TRACTOR — OAKLAND — Direction: W
9131 SAN LEANDRO ST
Status Code: 5C: Pollution characterization underway.

41 LUST DREISBACH ASSOCIATES — OAKLAND — Direction: NW
8410 AMELIA ST
Status Code: 3B: Preliminary site assessment underway.

WITHIN 1/2 TO 1 MILE:

42	LUST	LONGVIEW FIBER CO 8511 BLAINE ST Status Code: 3B: Preliminary site assessment underway.	OAKLAND	Direction: NW
42	LUST	GEO M ROBINSON & CO 825 85TH AVE Status Code: 0: No action.	OAKLAND	Direction: NW
2	ASPIS 01720091	WALTER OPPENDAHL 10621 MACARTHUR BLVD Status Code: NFA: No Further Action.	OAKLAND 94605	Direction: E
3	ASPIS 01720097	LE DAYS EXPERT CLEANING 10016 MACARTHUR BLVD Status Code: NFA: No Further Action.	OAKLAND 94605	Direction: NE
5	ASPIS 01360058	ELTRA CORPORATION - PRESTOLITE BATTERY 98TH STREET & BANCROFT AVENUE Status Code: NFA: No Further Action.	OAKLAND 94603	Direction: NE
7	ASPIS 01720069	SUNSHINE CLEANERS 223 E 14TH ST Status Code: NFA: No Further Action.	SAN LEANDRO 94577	Direction: SE
9	ASPIS 01500099	GENERAL MOTORS PARTS DIVISION (1) 10800 E 14TH ST Status Code: NFA: No Further Action.	OAKLAND 94604	Direction: SE
14	ASPIS 01350053	MACHINING ENTERPRISES 111-D SAN LEANDRO BLVD Status Code: NFA: No Further Action.	SAN LEANDRO 94577	Direction: S
17	ASPIS 01280031	CHEMICALS & SUPPLIES 751 105TH AV Status Code: NFA: No Further Action.	OAKLAND 94603	Direction: SW
20	ASPIS 01720024	KENNETH B. WONG 8431 E 14TH ST Status Code: NFA: No Further Action.	OAKLAND 94621	Direction: NW
21	ASPIS 01330007	GOLDEN GATE DIE CASTING 10201 PEARMAN ST Status Code: NFA: No Further Action.	OAKLAND 94603	Direction: SW

SITE #	AGENCY & ID#	ENVIRONMENTAL RISK SITE AND DIRECTION FROM SUBJECT PROPERTY	11/10/92

WITHIN 1/2 TO 1 MILE:

23	ASPIS	CUSTOM COATINGS COMPANY	OAKLAND	
	01170026	10441 EDES AV	94603	Direction: SW
	Status Code: NFA: No Further Action.			
27	ASPIS	MILLER MACHINE COMPANY	OAKLAND	
	01340050	9929 PEARMAIN	94603	Direction: SW
	Status Code: NFA: No Further Action.			
35	ASPIS	P & S ENGINEERING DEVICES	OAKLAND	
	01350107	1000 86TH AV	94621	Direction: NW
	Status Code: NFA: No Further Action.			
36	ASPIS	PACO PUMPS	OAKLAND	
	01350116	845 92ND AV	94604	Direction: W
	Status Code: PEARL: Preliminary Endangerment Assessment Required, LOW priority.			
39	ASPIS	BALTIMORE AIR COIL COMPANY	OAKLAND	
	01350111	9201 SAN LEANDRO BLVD	94603	Direction: W
	Status Code: SSR: Site Screening Required.			

VISTA ENVIRONMENTAL INFORMATION, INC.

3-RISJ0C-541610 RADIUS STATUS REPORT

Date of Report: 11/10/92

Loan #: ARCO STATION 2185
RESNA INDUSTRIES - SAN JOSE
3315 ALMADEN EXPRESSWAY STE 34, SAN JOSE, CA 95118

Loan Property: 9800 EAST 14TH STREET
OAKLAND, CA 94603

VISTA DATABASE SEARCH RESULTS

Database & Date	Agency & Type of Records	Records Located Within: 0 to 1/4 mi.	1/4 to 1/2 mi.	1/2 to 1 mi.	TOTAL
NPL 1/92	US EPA Superfund Sites	0	0	0	0
CERCLIS 1/92	US EPA Potential Superfund Sites	0	2	5	7
AWP 10/91	CAL. EPA CASITES / Sites Authorized for Cleanup under the California Annual Work Plan	0	0	0	0
LUST various	CAL. REGIONAL WATER QUALITY CONTROL BOARD Leaking Underground Storage Tanks	1	3	30	34
SWIS 7/91	CAL. WASTE MGMT. BOARD Active/Inactive Sanitary Landfills/ Disposal Sites	0	0	0	0
ASPIS 10/91	CAL. EPA CASITES / Abandoned Site Program	2	1	14	17
	Total:	3	6	49	58

Note: Sites often have more than one environmental record.

RESNA
Working to Restore Nature

APPENDIX C

FIELD METHODS

FIELD METHODS

The following presents RESNA Industries' field protocol for a typical site investigation involving gasoline hydrocarbon-impacted soil and/or groundwater.

Site Safety Plan

The Site Safety Plan describes the safety requirements for the evaluation of gasoline hydrocarbons in soil, groundwater, and the vadose-zone at the site. The site Safety Plan is applicable to personnel of RESNA Industries and its subcontractors. RESNA Industries personnel and subcontractors of RESNA Industries scheduled to perform the work at the site are briefed on the contents of the Site Safety Plan before work begins. A copy of the Site Safety Plan is available for reference by appropriate parties during the work. A site Safety Officer is assigned to the project.

Soil Excavation

Permits are acquired prior to the commencement of work at the site. Samples are taken from the soil in the bucket by driving laboratory-cleaned brass sleeves into the soil. The samples are sealed in the sleeves using aluminum foil, plastic caps, and plastic zip-lock bags or aluminized duct tape; labeled; and promptly placed in iced storage. If field subjective analyses suggest the presence of gasoline hydrocarbons in the soil, additional excavation and soil sampling is performed, using similar methods. If groundwater is encountered in the excavation, groundwater samples are collected from the excavation using a clean Teflon® bailer. The groundwater samples are collected as described below under "Groundwater Sampling". The excavation is backfilled or fenced prior to departure from the site.

Sampling of Stockpiled Soil

One composite soil sample is collected for each 50 cubic yards of stockpiled soil, and for each individual stockpile composed of less than 50 cubic yards. The soil is evaluated using a field calibrated (using isobutylene) Thermo-Environmental Instruments Model 580 Organic Vapor Meter (OVM). This evaluation is done by placing the intake probe of the OVM against the surface of the soil. Field instruments such as the OVM are useful for measuring relative concentrations of vapor content, but cannot be used to measure levels of gasoline hydrocarbons with the accuracy of laboratory analysis. Composite soil samples are obtained by first evaluating relatively high, average, and low areas of hydrocarbon concentration by digging approximately one to two feet into the stockpile and placing the intake probe of a

field calibrated OVM against the surface of the soil; and then collecting one sample from the "high" reading area, and three samples from the "average" areas. Samples are collected by removing the top one to two feet of soil, then driving laboratory-cleaned brass sleeves into the soil. The samples are sealed in the sleeves using aluminum foil, plastic caps, and plastic zip-lock bags or aluminized duct tape; labeled; and promptly placed in iced storage for transport to the laboratory, where compositing is performed.

Soil Borings

Prior to the drilling of borings and construction of monitoring wells, permits are acquired from the appropriate regulatory agency. In addition to the above-mentioned permits, encroachment permits from the City or State are acquired if drilling of borings offsite on City or State property is necessary. Copies of the permits are included in the appendix of the project report. Prior to drilling, Underground Service Alert (USA) is notified of our intent to drill, and known underground utility lines and structures are approximately marked.

The borings are drilled by a truck-mounted drill rig equipped with 8- or 10-inch-diameter, solid-stem or hollow-stem augers. Other methods such as rotary or casing hammer may be used if special conditions are encountered. The augers, sampling equipment and other equipment that comes into contact with the soil are steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. Sampling equipment is cleaned with a trisodium phosphate solution and rinsed with clean water between samples. After drilling the borings, monitoring wells are constructed in the borings, or neat-cement grout with bentonite is used to backfill the borings to the ground surface.

Borings for groundwater monitoring wells are drilled to a depth of no more than 20 feet below the depth at which a saturated zone is first encountered, or a short distance into a stratum beneath the saturated zone which is of sufficient texture, moisture, and consistency to be judged as a perching layer by the field geologist, whichever is shallower. Drilling into a deeper aquifer below the shallowest aquifer is begun only after a conductor casing is properly installed and allowed to set, to seal the shallow aquifer.

Drill Cuttings

Drill cuttings subjectively evaluated as containing gasoline hydrocarbons at levels greater than 100 parts per million (ppm) are separated from those subjectively evaluated as containing gasoline hydrocarbons at levels less than 100 ppm. Evaluation is based either on subjective evidence of soil discoloration, or on measurements made using a field

calibrated OVM. Readings are taken by placing a soil sample into a ziplock-type plastic bag and allowing volatilization to occur. The intake probe of the OVM is then inserted into the headspace created in the plastic bag immediately after opening it. The drill cuttings from the borings are placed in labeled 55-gallon drums approved by the Department of Transportation, or on plastic at the site, and covered with plastic. The cuttings remain the responsibility of the client.

Soil Sampling in Borings

Soil samples are collected at no greater than 5-foot intervals from the ground surface to the total depth of the borings. The soil samples are collected by advancing the boring to a point immediately above the sampling depth, and then driving a California-modified, split-spoon sampler containing brass sleeves through the hollow center of the auger into the soil. (A standard penetrometer, which does not contain liners, may be used to collect samples when laboratory analysis for volatile components is not an issue. The sampler and brass sleeves are laboratory-cleaned, steam-cleaned, or washed thoroughly with Alconox® and water, prior to each use. The sampler is driven with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive six inches are counted and recorded to evaluate the relative consistency of the soil. When necessary, the sampler may be pushed by the drill rig hydraulics. In this case, the pressure exerted (in pounds per square inch) is recorded.

The samples selected for laboratory analysis are removed from the sampler and quickly sealed in their brass sleeves with aluminum foil, plastic caps, and plastic zip-lock bags or aluminized duct tape. The samples are then labeled, promptly placed in iced storage, and delivered to a laboratory certified by the State of California to perform the analyses requested.

One of the samples in brass sleeves not selected for laboratory analysis at each sampling interval is tested in the field using an OVM that is field calibrated at the beginning of each day it is used. This testing is performed by inserting the intake probe of the OVM into the headspace in the plastic bag containing the soil sample as described in the Drill Cuttings section above. The OVM readings are presented in Logs of Borings included in the project report.

Logging of Borings

A geologist is present to log the soil cuttings and samples using the Unified Soil Classification System. Samples not selected for chemical analysis, and the soil in the sampler shoe, are extruded in the field for inspection. Logs include texture, color, moisture, plasticity, consistency, blow counts, and any other characteristics noted. Logs also include subjective evidence for the presence of gasoline hydrocarbons, such as soil staining, noticeable or obvious product odor, and OVM readings.

Well Construction

Vapor extraction wells were constructed in selected boring using clean 4-inch-diameter, thread-jointed, Schedule 40 PVC casing. No chemical cements, glues, or solvents were used in well construction. Each casing bottom was sealed with a threaded end-plug, and each casing top with a locking plug. The screened portions of the wells were constructed of machine-slotted PVC casing with 0.100-inch-wide slots to allow air-flow communication between stratigraphic units and the well. The screened sections in groundwater monitoring wells were placed to allow monitoring during seasonal fluctuations of groundwater levels. Recovery well was constructed using the same protocol, mentioned above, however the well diameter was larger (6-inch) to allow installation of pumping equipment, and stainless steel screen is used, so the well can withstand long term pumping.

The annular space of each well was backfilled with No. 3 sand (recovery well), or pea gravel (vapor extraction wells) to approximately two feet above the top of the screened casing. A 1- to 2-foot-thick bentonite plug was placed above the sand as a seal against cement entering the filter pack. The remaining annulus was then backfilled with a slurry of water, neat cement, and bentonite to approximately one foot below the ground surface.

An aluminum utility box with a PVC apron was placed over each wellhead and set in concrete placed flush with the surrounding ground surface. Each wellhead cover has a seal to protect the well against surface-water infiltration and requires a special wrench to open. The design discourages vandalism and reduces the possibility of accidental disturbance of the well.

Well Development

The recovery well was developed by over-pumping and surge-block techniques. The well was pumped, allowed to recharge, and pumped again until the water removed from the wells is determined to be clear. Turbidity measurements (in NTUs) were recorded during well development and are used in evaluating well development. The development method used, initial turbidity measurement, volume of water removed, final turbidity measurement, and other pertinent field data and observations were recorded. The well was allowed to equilibrate for at least 48 hours after development prior to sampling. Water generated by well development is stored in 17E Department of Transportation (DOT) 55-gallon drums on site, and remains the responsibility of the client.

Sample Labeling and Handling

Sample containers are labeled in the field with the job number, unique sample location, depth, and date, and promptly placed in iced storage for transport to the laboratory. A Chain of Custody Record is initiated by the field geologist and updated throughout handling of the samples, and accompanies the samples to a laboratory certified by the State of California for the analyses requested. Samples are transported to the laboratory promptly to help ensure that recommended sample holding times are not exceeded. Samples are properly disposed of after their useful life has expired.

Aquifer Testing

The initial water levels in wells to be used during the test are measured prior to commencement of pumping. The flow rate of the pump is adjusted to the desired pumping rate, and water levels allowed to recover to initial levels. Pumping then begins, and the starting time of pumping is recorded. Drawdowns in observation wells are recorded at intervals throughout pumping using pressure transducers and manual methods. Evacuated water is stored in a storage tank at the site and remains the responsibility of the client. After the pump is shut off, recovery measurements are taken in the wells until recovery is at least 80 percent of the initial water level. Barometric pressure and tidal information (if appropriate) are collected for the time interval of the pumping test to allow evaluation of possible effects of atmospheric pressure and tidal fluctuations on the groundwater levels.

RESNA
Working to Restore Nature

APPENDIX D

PERMITS

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT ARCO STATION 2185
9800 EAST 14TH STREET
OAKLAND CA

CLIENT
Name ARCO PRODUCTS COMPANY
Address P.O. BOX 5811 Phone (415) 571-7435
City SAN MATEO Zip 94402

APPLICANT
Name RESNA INDUSTRIES INC
ERIN MCLUCAS
Address 3315 ALMADEN EXPY Phone (408) 264-7723
City SAN JOSE Zip 95118

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	___	General	___
Water Supply	___	Contamination	___
Monitoring	✓	Well Destruction	___

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other ___
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger HOLLOW STEM
Cable ___ Other ___

DRILLER'S LICENSE NO. 484288

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 30 ft.
Surface Seal Depth 5 ft. Number 1

GEOTECHNICAL PROJECTS
Number of Borings ___ Maximum
Hole Diameter ___ in. Depth ___ ft.

ESTIMATED STARTING DATE 5-3-93
ESTIMATED COMPLETION DATE 5-7-93

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE Erin D. McLucas Date 4/27/93

FOR OFFICE USE

PERMIT NUMBER 93203
LOCATION NUMBER ___

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

(B.) WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 26 Apr 9
Wyman Hong

31992

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT ARCO STATION 2185
9800 EAST 14TH STREET
OAKLAND CALIFORNIA

CLIENT
Name ARCO PRODUCTS COMPANY
Address P.O. Box 5811 Phone (415) 571-7435
City SAN MATEO Zip 94402

APPLICANT
Name RESNA INDUSTRIES INC
ERIN McLUCAS
Address 3335 ALMADEN EXPY, SUITE 3 Phone (408) 264-7723
City SAN JOSE Zip 95118

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	___	General	___
Water Supply	___	Contamination	___
Monitoring	X	Well Destruction	___

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other ___
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger HOLLOW STEM
Cable ___ Other ___

DRILLER'S LICENSE NO. 484288

WELL PROJECTS

Drill Hole Diameter	10	in.	Maximum Depth	35	ft.
Casing Diameter	4	in.			
Surface Seal Depth	5	ft.	Number	2	

GEOTECHNICAL PROJECTS

Number of Borings	___		Maximum Depth	___	ft.
Hole Diameter	___	in.			

ESTIMATED STARTING DATE 01/28/93
ESTIMATED COMPLETION DATE 01/29/93

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE Erin D McLucas Date 1/11/93

FOR OFFICE USE

PERMIT NUMBER 93020
LOCATION NUMBER ___

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

(B) WATER WELLS, INCLUDING PIEZOMETERS
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C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 19 Jan 93
Wyman Hong

31992

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

ENCROACHMENT PERMIT

TR-0120 (NEW 9/91)

Permit No.	0493-6SV-0155
Dist/Co/Rte/PM	04-ALA-185 7.25 MAR
Date	February 23, 1993
Fee Paid	$ 260.00
Deposit	$ - -
Performance Bond Amount (1)	$ 2,000.00
Payment Bond Amount (2)	$ - -
Bond Company	United Pacific Insurance Co.
Bond Number (1)	U-8003444
Bond Number (2)	

In compliance with (check one):

X Your application of January 8,1993

____ Utility Notice No. _____ of _____

____ Agreement No. _____ of _____

____ R/W Contract No. _____ of _____

TO:

Arco Products Company
P.O. Box 5811
San Mateo, Ca 94402

ATTN: Mr. Mike Whelan
PHONE: (415) 571-7435

, PERMITTEE

and subject to the following, PERMISSION IS HEREBY GRANTED to:

Install, maintain and monitor one 2" diameter groundwater monitoring well on the west side of State Highway 04-ALA-185, Post Mile 7.25, at 98th Avenue.

Two days before work is started under this permit, notice shall be given to, and approval of construction details, operations, public safety, and traffic control shall be obtained from State Representative N. Freitag 600 Lewelling Blvd., P. O. Box 337, San Lorenzo, 94580, 510-352-0636.

Immediately following completion of the work permitted herein, the Permittee shall fill out and mail th Notice of Completion attached to this permit.

The following attachments are also included as part of this permit. (Check applicable):

X Yes	__ No	General Provisions
__ Yes	X No	Utility Maintenance Provisions
__ Yes	X No	Special Provisions
__ Yes	X No	A Cal-OSHA permit required prior to beginning work; # _____

In addition to fee the permittee will be billed actual costs for:

__ Yes	X No	Review
__ Yes	X No	Inspection
X Yes	_____	Field Work

(If any Caltrans effort expended)

__ Yes X No The information in the environmental documentation has been reviewed and considered prior to approval of this permit.

This permit is void unless the work is completed before March 30, 1995.
This permit is to be strictly construed and no other work other than specifically mentioned is hereby authorized.
No project work shall be commenced until all other necessary permits and environmental clearances have been obtained.

APPROVED:

Preston W. Kelley, District Director

BY:

R. L. Cashion, District Permit Engineer

RESNA
Working to Restore Nature

APPENDIX E

EMCON'S FIELD REPORTS, SUMMARY OF GROUNDWATER MONITORING DATA, AND WATER SAMPLE FIELD DATA SHEETS; RESNA'S WELL PURGE DATA SHEETS; AND, LABORATORY ANALYSES REPORTS AND CHAIN OF CUSTODY RECORDS FOR GROUNDWATER SAMPLES

Columbia Analytical Services, Inc.

March 1, 1993

Service Request No. SJ93-0207

Joel Coffman
RESNA
3315 Alamaden Expressway, #34
San Jose, CA 95118

Re: **ARCO Facility No. 2185**

Dear Mr. Coffman:

Attached are the results of the water samples submitted to our lab on February 12, 1993. For your reference, these analyses have been assigned our service request number SJ93-0207.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Keoni A. Murphy
Laboratory Manager

Annelise J. Bazar
Regional QA Coordinator

KAM/kt

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: ARCO Facility No. 2185
Sample Matrix: Water

Date Received: 02/12/93
Service Request No.: SJ93-0207

BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
µg/L (ppb)

Sample Name:		W-9-MW6	M-9-MW5	Method Blank
Date Analyzed:		02/23/93 *	02/23/93 *	02/23/93
Analyte	**MRL**			
Benzene	0.5	630.	620.	ND
Toluene	0.5	<10. **	<50. **	ND
Ethylbenzene	0.5	490.	890.	ND
Total Xylenes	0.5	460.	2,200.	ND
TPH as Gasoline	50	4,800.	9,300.	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* This sample was part of the analytical batch started on February 23, 1993. However, it was analyzed after midnight so the actual date analyzed is February 24, 1993.
** Raised MRL due to high analyte concentration requiring sample dilution.

Approved by: Kristin Murphy Date: March 1, 1993

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: ARCO Facility No. 2185
Sample Matrix: Water

Date Received: 02/12/93
Service Request No.: SJ93-0207

Initial Calibration Verification
BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
Nanograms

Date Analyzed: 02/02/93

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	279.	111.	85-115
Toluene	250.	287.	115.	85-115
Ethylbenzene	250.	277.	111.	85-115
Total Xylenes	750.	780.	104.	85-115
TPH as Gasoline	2,500.	2,413.	96.	90-110

TPH Total Petroleum Hydrocarbons

Approved by: Robert Murphy Date: March 1, 1993

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: ARCO Facility No. 2185
Sample Matrix: Water

Date Received: 02/12/93
Service Request No.: SJ93-0207

Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery *a,a,a*-Trifluorotoluene
W-9-MW6	02/23/93	106.
W-9-MW5	02/23/93	96.
MS	02/23/93	93.
DMS	02/23/93	88.
Method Blank	02/23/93	86.
CAS Acceptance Criteria		70-130

TPH Total Petroleum Hydrocarbons

Approved by: Kevin Murphy Date: March 1 1993

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: ARCO Facility No. 2185
Sample Matrix: Water

Date Received: 02/12/93
Service Request No.: SJ93-0207

Matrix Spike Summary
BTE
EPA Methods 5030/8020
µg/L (ppb)

Date Analyzed: 02/23/93

Analyte	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria
Benzene	25.	0.7	30.7	32.6	120.	128.	39-150
Toluene	25.	1.4	30.8	32.6	118.	125.	46-148
Ethylbenzene	25.	ND	30.1	31.7	120.	127.	32-160

ND None Detected at or above the method reporting limit

Approved by: _____ Date: March 1, 1993

ARCO Products Company ◇
Division of AtlanticRichfieldCompany

Task Order No. 62026.02 2185 - 92 - 2A

Chain of Custody

ARCO Facility no.	2185	City (Facility)	OAKland	Project manager (Consultant)	Joel Coffman / Erin H.
ARCO engineer	Mike Whelan	Telephone no. (ARCO)		Telephone no. (Consultant)	408 264 7723 — Fax no. (Consultant) 264 2435
Consultant name	RESNA IND.	Address (Consultant)	3315 Almaden Exp. Suit 34 San Jose CA		

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH Gas EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
W-9-HW6	1-3	3		X		✓	✓	2-11-93	11:55	*	✓											
W-9-HW5	4-6	3		X		✓	✓	2-11-93	13:00		✓											

Laboratory name: Columbia

Contract number: 07077

Method of shipment: CAS Courier

Special detection Limit/reporting:

Special QA/QC:

Remarks:

Lab number: 9193-0207

Condition of sample: Ok

Temperature received: cool

Relinquished by sampler	Date	Time	Received by
E. Cardenas	2-11-93	9:03	

Relinquished by	Date	Time	Received by

Relinquished by	Date	Time	Received by laboratory	Date	Time
			[signature]	2-12-93	9:30 AM

Turnaround time

- Priority Rush 1 Business Day [ ]
- Rush 2 Business Days [ ]
- Expedited 5 Business Days [ ]
- Standard 10 Business Days [X]

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

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco 2185-92-2A	Sampled:	May 14, 1993
3315 Almaden Expwy., Suite 34	Sample Matrix:	Water	Received:	May 14, 1993
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	May 17, 1993
Attention: Erin McLucas	First Sample #:	3E58101		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 3E58101 W-10-MW7
Purgeable Hydrocarbons	50	350
Benzene	0.50	0.83
Toluene	0.50	N.D.
Ethyl Benzene	0.50	N.D.
Total Xylenes	0.50	N.D.
Chromatogram Pattern:		Discrete Peaks

Quality Control Data

Report Limit Multiplication Factor:	1.0
Date Analyzed:	5/14/93
Instrument Identification:	GCHP-3
Surrogate Recovery, %: (QC Limits = 70-130%)	94

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

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Erin McLucas

Client Project ID: Arco 2185-92-2A
Matrix: Water

QC Sample Group: 3E58101

Reported: May 17, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M. Nipp	M. Nipp	M. Nipp	M. Nipp
Conc. Spiked:	10	10	10	30
Units:	µg/L	µg/L	µg/L	µg/L
LCS Batch#:	BLK051493	BLK051493	BLK051493	BLK051493
Date Prepared:	N/A	N/A	N/A	N/A
Date Analyzed:	5/14/93	5/14/93	5/14/93	5/14/93
Instrument I.D.#:	GCHP-2	GCHP-2	GCHP-2	GCHP-2
LCS % Recovery:	110	110	110	110
Control Limits:	80-120	80-120	80-120	80-120
MS/MSD Batch #:	3E49103	3E49103	3E49103	3E49103
Date Prepared:	N/A	N/A	N/A	N/A
Date Analyzed:	5/14/93	5/14/93	5/14/93	5/14/93
Instrument I.D.#:	GCHP-2	GCHP-2	GCHP-2	GCHP-2
Matrix Spike % Recovery:	110	110	110	110
Matrix Spike Duplicate % Recovery:	120	110	110	110
Relative % Difference:	8.7	0.0	0.0	0.0

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

Please Note:
The LCS is a control sample of known, interferant free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

Chain of Custody

ARCO Products Company
Division of Atlantic Richfield Company

Task Order No. 2185-92-2A

ARCO Facility no. 2185	City (Facility) OAKLAND	Project manager (Consultant) ERIN McLUCAS	Laboratory name SEQUOIA
ARCO engineer MIKE WHELAN	Telephone no. (ARCO) (415)571-2164	Telephone no. (Consultant) (408)264-7723	Fax no. (Consultant) (408)264-2435	Contract number 07-073
Consultant name RESNA INDUSTRIES	Address (Consultant) 3315 ALMADEN EXPY, SUITE 34, SAN JOSE CA 95118		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 8020/EPA 8020	BTEX/TPH EPA M8020/8015	TPH Modified 8015 Gas / Diesel	Oil and Grease 413.1 / 413.2	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals / VOA / Semi VOA	CAM Metals EPA 6010/7000 TTLC / STLC	Lead Org./DHS / Lead EPA 7420/7421			Special detection Limit/reporting
W-10-MW7	3			✓		✓	✓	5/14/93	12:40		✓				9305581-01								

Special QA/QC

Remarks

Lab number 9305-581

Turnaround time
- Priority Rush 1 Business Day [X]
- Rush 2 Business Days [ ]
- Expedited 5 Business Days [ ]
- Standard 10 Business Days [ ]

Condition of sample

Temperature received

	Date	Time	Received by
Relinquished by sampler	5/14/93	1:45	
Relinquished by			Received by
Relinquished by			Received by laboratory: Date 5-14-93 Time 1:45 pm

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

EMCON
ASSOCIATES
Consultants in Wastes
Management and
Environmental Health

Date February 4, 1993
Project CG70-054.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95118

We are enclosing:

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

For your: X Information Sent by: X Mail

Comments:
Enclosed are the data from the first quarter 1993 monitoring event at ARCO service station 2185, 9800 East 14th Street, Oakland, California. Groundwater monitoring is conducted consistent with applicable regulatory guidelines. Please call if you have any questions: (408) 453-2266.

Jim Butera

Reviewed by:

Robert Porter, Senior Project Engineer.

(408) 453-2266 Fax (408) 453-0452

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 0670 054.01 STATION ADDRESS : 9800 East 14th Street, Oakland DATE : 1-14-93

ARCO STATION # : 2185 FIELD TECHNICIAN : KEICHEL/KERFER/GALLEGOS DAY : THURSDAY

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	OK	YES	OK	3259	OK	9.32	9.32	ND	NA	23.6	WATER IN BOX, BELOW LID
2	MW-2	OK	YES	OK	3259	OK	8.87	8.87	ND	NA	23.6	--
3	MW-3	OK	YES	OK	3259	OK	9.17	9.17	ND	NA	23.2	LID WAS LOOSE WATER IN BOX, BELOW LID
4	MW-4	OK	YES	OK	3259	OK	9.46	9.46	ND	NA	23.8	--

SURVEY POINTS ARE TOP OF WELL CASINGS

Summary of Groundwater Monitoring Data
First Quarter 1993
ARCO Service Station 2185
9800 East 14th Street, Oakland, California
micrograms per liter (µg/l) or parts per billion (ppb)

Well ID and Sample Depth	Sampling Date	Depth To Water (feet)	Floating Product Thickness (feet)	TPH[1] as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl benzene (ppb)	Total Xylenes (ppb)
MW-1(23)	01/14/93	9.32	ND.[2]	<50.	<0.5	<0.5	<0.5	<0.5
MW-2(23)	01/14/93	8.87	ND.	12,000.	700.	10.	720.	680.
MW-3(23)	01/14/93	9.17	ND.	44,000.	1,100.	840.	2,200.	9,600.
MW-4(23)	01/14/93	9.46	ND.	<50.	<0.5	<0.5	<0.5	<0.5

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

Columbia Analytical Services, Inc.

January 28, 1993

Service Request No. SJ93-0055

Jim Butera
EMCON Associates
1921 Ringwood Avenue
San Jose, CA 95131

Re: **EMCON Project No. 0G70-054.01**
ARCO Facility No. 2185

Dear Mr. Butera:

Attached are the results of the water samples submitted to our lab on January 14, 1993. For your reference, these analyses have been assigned our service request number SJ93-0055.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Keoni A. Murphy
Laboratory Manager

Annelise J. Bazar
Regional QA Coordinator

KAM/kt

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. 0G70-054.01
ARCO Facility No. 2185

Date Received: 01/14/93
Service Request No.: SJ93-0055
Sample Matrix: Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
µg/L (ppb)

Sample Name:		MW-1 (23)	MW-2 (23)	MW-3 (23)
Date Analyzed:		01/21/93	01/21/93	01/21/93
Analyte	MRL			
Benzene	0.5	ND	700.	1,100.
Toluene	0.5	ND	10.	840.
Ethylbenzene	0.5	ND	720.	2,200.
Total Xylenes	0.5	ND	680.	9,600.
TPH as Gasoline	50	ND	12,000.	14,000.

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by: _____ Date: January 25, 1993

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. 0G70-054.01
ARCO Facility No. 2185

Date Received: 01/14/93
Service Request No.: SJ93-0055
Sample Matrix: Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
µg/L (ppb)

Sample Name:		MW-4 (23)	Method Blank
Date Analyzed:		01/21/93	01/21/93
Analyte	**MRL**		
Benzene	0.5	ND	ND
Toluene	0.5	ND	ND
Ethylbenzene	0.5	ND	ND
Total Xylenes	0.5	ND	ND
TPH as Gasoline	50	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by: [signature] Date: January 28, 1993

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Associates
Project: EMCON Project No. 0G70-054.01
ARCO Facility No. 2185

Date Received: 01/14/93
Service Request No.: SJ93-0055

Initial Calibration Verification
BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
Nanograms

Date Analyzed: 01/21/93

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	252.	101.	85-115
Toluene	250.	258.	103.	85-115
Ethylbenzene	250.	239.	96.	85-115
Total Xylenes	750.	687.	92.	85-115
TPH as Gasoline	2,500.	2,273.	91.	90-110

TPH Total Petroleum Hydrocarbons

Approved by: _____ Date: January 25, 1993

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Associates
Project: EMCON Project No. 0G70-054.01
ARCO Facility No. 2185

Date Received: 01/14/93
Service Request No.: SJ93-0055
Sample Matrix: Water

Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery α,α,α-Trifluorotoluene
MW-1 (23)	01/21/93	110.
MW-2 (23)	01/21/93	120.
MW-3 (23)	01/21/93	109.
MW-4 (23)	01/21/93	107.
MW-1 (23) MS	01/21/93	117.
MW-1 (23) DMS	01/21/93	117.
Method Blank	01/21/93	104.
CAS Acceptance Criteria		70-130

TPH Total Petroleum Hydrocarbons

Approved by: _____ Date: January 25, 1993

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Associates
Project: EMCON Project No. 0G70-054.01
ARCO Facility No. 2185

Date Received: 01/14/93
Service Request No.: SJ93-0055
Sample Matrix: Water

Matrix Spike/Duplicate Matrix Spike Summary
Total Petroleum Hydrocarbons as Gasoline
EPA Methods 5030/California DHS LUFT Method
µg/L (ppb)

Sample Name: MW-1 (23)
Date Analyzed: 01/21/93

Analyte	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria
TPH as Gasoline	250.	ND	282.	245.	113.	98.	70-130

TPH Total Petroleum Hydrocarbons
ND None Detected at or above the method reporting limit

Approved by: _____ Date: January 28, 1993

ARCO Products Company
Division of Atlantic Richfield Company

Chain of Custody

Task Order No. EMCGC-92-1

ARCO Facility no: 2185 | City (Facility): OAKLAND | Project manager (Consultant): Jim Butera

ARCO engineer: Kyle Christie | Telephone no (ARCO): (408) 571-2434 | Telephone no (Consultant): 453-0719 | Fax no (Consultant): 453-0452

Consultant name: EMCON Associates | Address (Consultant): 1938 Junction Ave San Jose

Laboratory name: CAS

Contract number: 07077

Method of shipment: Sampler will deliver

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 8021/EPA 8020	BTEX/TPH EPA M602/8020/8015 GAS	TPH Modified 8015 Gas / Diesel	Oil and Grease 413.1 / 413.2	TPH EPA 418.1/SM503E	EPA 8010/8010	EPA 8240/8240	EPA 8250/8270	TCLP Metals / VOA / VOA	CAM Metals EPA 6010/7000	Lead Org./DHS / Lead EPA / 7420/7421
MW1(2')	1	2		X		X	HCl	1/14/93	1155		X									
MW2(2')	3	2		X		X	HCl		1206		X									
MW3(2')	5	2		X		X	HCl		1249		X									
MW4(2')	7	2		X		X	HCl		1235		X									

Special detection Limit/reporting: lowest possible

Special QA/QC: MS MSD

Remarks: 3-40 ml VOA HCl

OE9D-054 01

54

Lab number: 5593-0055

Turnaround time

Priority Rush 1 Business Day [ ]

Rush 2 Business Days [ ]

Expedited 5 Business Days [ ]

Standard 10 Business Days [X]

Condition of sample: OK

Relinquished by sampler: [signature] | Date: 1/14/93 | Time: 1630

Relinquished by: [signature] | Date | Time

Relinquished by | Date | Time

Temperature received: cool

Received by: [signature] CAS/SJ | 1/14/93 | 1630

Received by laboratory | Date | Time

White copy - Laboratory; Canary copy - ARCO Environmental Engineering; Pink copy - Consultant

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 6770-054.01 SAMPLE ID: MW-1 (23)

PURGED BY: K REICHELDERFER CLIENT NAME: ARCO 2185

SAMPLED BY: V LOCATION: 9800 E 14TH ST OAKLAND, C

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 5.33

DEPTH TO WATER (feet): 9.32 CALCULATED PURGE (gal.): 21.33

DEPTH OF WELL (feet): 23.6 ACTUAL PURGE VOL (gal.): 28.00

DATE PURGED: 1-14-93 Start (2400 Hr) 1135 End (2400 Hr) 1147

DATE SAMPLED: 1-14-93 Start (2400 Hr) 1155 End (2400 Hr) 1157

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1139	9.50	6.60	511	63.3	BROWN	HEAVY
1143	19.00	6.66	506	63.0	1	1
1147	28.00	6.71	508	62.7	V	V

O. O. (ppm): NR ODOR: NONE COLOR (COBALT 0 - 100): NR TURBIDITY (NTU 0 - 200): NR

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

PURGING EQUIPMENT

___ 2" Bladder Pump ___ Bailer (Teflon &)
___ Centrifugal Pump X Bailer (PVC)
___ Submersible Pump ___ Bailer (Stainless Steel)
___ Well Wizard™ ___ Dedicated
Other: ___

SAMPLING EQUIPMENT

___ 2" Bladder Pump X Bailer (Teflon &)
___ DDL Sampler ___ Bailer (Stainless Steel)
___ Dipper ___ Submersible Pump
___ Well Wizard™ ___ Dedicated
Other: ___

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: WATER IN BOX, BELOW LWC

Meter Calibration: Date: 1-14-93 Time: 1120 Meter Serial #: 9203 Temperature °F: 58.1

(EC 1000 1538 / 1000) (DI 7.12) (pH 7 7.18 / 7.00) (pH 10 9.96 / 10.00) (pH 4 3.97 / ___)

Location of previous calibration: ___

Signature: Kevin Reichelderfer Reviewed By: JG Page 1 of 4

WATER SAMPLE [illegible]

EMCON ASSOCIATES

PROJECT NO: [illegible]
PURGED BY: M [illegible]
SAMPLED BY: M [illegible]

SAMPLE ID: MW-2
CLIENT NAME: ARCO 2185
LOCATION: Oakland CA

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

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

CASING ELEVATION (feet/MSL): [illegible]
DEPTH TO WATER (feet): 8.8
DEPTH OF WELL (feet): 22.[illegible]

VOLUME IN CASING (gal.): 9.[illegible]
CALCULATED PURGE (gal.): 28.5
ACTUAL PURGE VOL. (gal.): 29.0

DATE PURGED: 1-14-93 Start (2400 Hr) 1140 End (2400 Hr) 1153
DATE SAMPLED: 1-14-93 Start (2400 Hr) 1158 End (2400 Hr) 1200

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1144	10.0	6.22	1015	63.2	Grey	heavy
1148	20.0	6.40	1089	63.5	"	"
1153	29.0	6.30	[illegible]	64.1	"	"

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

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

PURGING EQUIPMENT

___ 2" Bladder Pump
___ Centrifugal Pump
___ Submersible Pump
___ Well Wizard™
___ Bailer (Teflon®)
X Bailer (PVC)
___ Bailer (Stainless Steel)
___ Dedicated
Other: ___

SAMPLING EQUIPMENT

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

WELL INTEGRITY: Good LOCK #: 3255

REMARKS: Sheen on top of water
All samples taken

Meter Calibration: Date: 1-14-93 Time: 1130 Meter Serial #: 4572 Temperature °F: 55.6
(EC 1000 1074 / 1000) (DI ___) (pH 7 6.94 / 7.00) (pH 10 10.19 / 10.00) (pH 4 3.97 / ___)

Location of previous calibration: ___

Signature: [signature] Reviewed By: [initials] Page 2 of 4

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 0670-054.01
PURGED BY: M. Callkas
SAMPLED BY: M. Callkas

SAMPLE ID: MW-3
CLIENT NAME: ARCO #2185
LOCATION: Oakland CA

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

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

CASING ELEVATION (feet/MSL): NR
DEPTH TO WATER (feet): 9.17
DEPTH OF WELL (feet): 23.2

VOLUME IN CASING (gal.): 9.1
CALCULATED PURGE (gal.): 27.4
ACTUAL PURGE VOL. (gal.): 27.50

DATE PURGED: 1-14-93 Start (2400 Hr) 1224 End (2400 Hr) 1237
DATE SAMPLED: 1-14-93 Start (2400 Hr) 1242 End (2400 Hr) 1244

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (μmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1226	9.5	6.54	796	64.8	Grey	Heavy
1233	19.0	6.22	794	65.2	"	"
1237	27.5	6.15	777	65.7	"	"

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

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

PURGING EQUIPMENT

____ 2" Bladder Pump
____ Centrifugal Pump
____ Submersible Pump
____ Well Wizard™
____ Bailer (Teflon®)
✓ Bailer (PVC)
____ Bailer (Stainless Steel)
____ Dedicated
Other: ____

SAMPLING EQUIPMENT

____ 2" Bladder Pump
____ DDL Sampler
____ Dipper
____ Well Wizard™
✓ Bailer (Teflon®)
____ Bailer (Stainless Steel)
____ Submersible Pump
____ Dedicated
Other: ____

WELL INTEGRITY: Good LOCK #: 3259

REMARKS: All samples taken

Meter Calibration: Date: 1-14-93 Time: ____ Meter Serial #: 4572 Temperature °F: ____

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

Location of previous calibration: MW-2

Signature: [signature] Reviewed By: [initials] Page 3 of 4

WATER SAMPLE FIELD DATA SHEET

Rev. 2 5/91

EMCON ASSOCIATES

PROJECT NO: 2670-C5A.01 | SAMPLE ID: MW-4/231

PURGED BY: K REICHELDERFER | CLIENT NAME: ARCO 2185

SAMPLED BY: V | LOCATION: 2500 E 14TH ST OAKLAND CA

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

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

CASING ELEVATION (feet/MSL): NR | VOLUME IN CASING (gal.): 9.36

DEPTH TO WATER (feet): 9.47 | CALCULATED PURGE (gal.): 28.09

DEPTH OF WELL (feet): 23.8 | ACTUAL PURGE VOL (gal.): 28.50

DATE PURGED: 1-14-93 | Start (2400 Hr) 1216 | End (2400 Hr) 1228

DATE SAMPLED: 1-14-93 | Start (2400 Hr) 1235 | End (2400 Hr) 1237

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1220	9.50	6.78	567	63.6	LT BROWN	MODERATE
1224	19.00	6.65	574	64.4	1	1
1228	28.50	6.64	569	64.3	V	V

D. O. (ppm): NR | ODOR: SLIGHT | COLOR: NR (CCSALT 0 - 100) | TURBIDITY: NR (NTU 0 - 200)

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

PURGING EQUIPMENT

___ 2" Bladder Pump
___ Centrifugal Pump
___ Submersible Pump
___ Well Wizard™
___ Bailer (Teflon®)
X Bailer (PVC)
___ Bailer (Stainless Steel)
___ Dedicated
Other: ___

SAMPLING EQUIPMENT

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

WELL INTEGRITY: OK | LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: 1-14-93 Time: 1120 Meter Serial #: 9203 Temperature °F: ___

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

Location of previous calibration: 2 MW-1

Signature: [signature] | Reviewed By: KP | Page 4 of 4

RESNA
Working to Restore Nature

WELL PURGE DATA SHEET

Project Name: ARCO Station 2185 **Job No.** 62026.02

Date: February 11, 1993 **Page 1 of 1**

Well No. MW-5 **Time Started** 12:00

Time	Gallons	Temperature	pH	Conductivity
12:00	Started pumping.			
12:00	0	66.6	7.64	4.29
12:06	10	66.4	7.44	7.44
12:12	20	65.8	7.24	4.56
12:18	30	65.7	7.22	4.53
12:21	35	66.0	7.21	4.83
12:24	44	65.8	7.23	4.63
12:24	Stopped pumping.			

Notes:

Well Diameter (inches) : 4"
Depth to Bottom (feet) : 26.65
Depth to Water - initial (feet) : 9.70
Depth to Water - final (feet) : 11.20
% recovery : 91
Time Sampled : 13:00
Gallons per Well Casing Volume : 11.80
Gallons Purged : 44
Well Casing Volume Purged : 4.0
Approximate Pumping Rate (gpm) : 1.8

RESNA
Working to Restore Nature

WELL PURGE DATA SHEET

Project Name: ARCO Station 2185 Job No. 62026.02

Date: February 11, 1993 Page 1 of 1

Well No. MW-6 Time Started 11:21

Time	Gallons	Temperature	pH	Conductivity
11:21	Started pumping.			
11:21	0	63.4	7.92	8.01
11:27	10	66.0	7.33	7.28
11:31	20	66.0	7.31	7.20
00:37	30	66.3	7.11	7.33
11:43	40	66.4	7.29	7.27
11:49	50	66.1	7.32	7.29
11:49	Stopped pumping.			

Notes:

Well Diameter (inches) : 4"
Depth to Bottom (feet) : 27.55
Depth to Water - initial (feet) : 9.25
Depth to Water - final (feet) : 9.26
% recovery : 100
Time Sampled : 11:55
Gallons per Well Casing Volume : 12
Gallons Purged : 50
Well Casing Volume Purged : 4.2
Approximate Pumping Rate (gpm) : 1.9

RESNA
Working to Restore Nature

WELL PURGE DATA SHEET

Project Name: ARCO Station 2185 Job No. 62026.02

Date: May 14, 1993 Page 1 of 1

Well No. MW-7 Time Started 12:00

Time	Gallons	Temperature	pH	Conductivity
12:00	Started pumping.			
12:00	0	69.9	9.68	7.87
12:03	3	68.3	9.15	7.17
12:06	6	66.9	8.67	6.26
12:09	10	66.3	8.98	6.18
12:09	Stopped pumping.			

Notes:

Well Diameter (inches) : 4"
Depth to Bottom (feet) : 25.10
Depth to Water - initial (feet) : 10.80
Depth to Water - final (feet) : 10.81
% recovery : 100
Time Sampled : 12:40
Gallons per Well Casing Volume : 2.4
Gallons Purged : 10
Well Casing Volume Purged : 4.2
Approximate Pumping Rate (gpm) : 1.1

Emcon Associates
[illegible] • (408) 453-0719 • [illegible]

Date March 02,1993
Project 0G70-054.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95118

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	February 1993 monthly water level survey, ARCO
	station 2185, 9800 East 14th Street, Oakland, CA

For your: X Information Sent by: X Mail

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

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER ROBERT CURTIS PORTER No: 4094 Exp 4/30/96 INDUSTRIAL STATE OF CALIFORNIA

Jim Butera JB

Robert Porter, Senior Project Engineer.

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 0G70-054.01 STATION ADDRESS : 9800 East 14th Street, Oakland DATE : 2-26-93

ARCO STATION # : 2185 FIELD TECHNICIAN : B. Stafford DAY : Friday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	ok	Yes	ok	3259	Yes	~~9.54~~ 9.38	~~9.54~~ 9.38	ND	ND	~~23.8~~ 23.58	—
2	MW-2	ok	Yes	ok	3259	Yes	8.98	8.98	ND	ND	23.7	—
3	MW-3	ok	Yes	ok	3259	Yes	9.30	9.30	ND	ND	23.3	—
4	MW-4	ok	Yes	ok	3259	Yes	9.54	9.54	ND	ND	23.8	—
5	MW-5	ok	Yes	ok	3259	Yes	9.00	9.00	ND	ND	26.9	—
6	MW-6	ok	Yes	ok	3259	Yes	8.47	8.47	ND	ND	27.8	—

SURVEY POINTS ARE TOP OF WELL CASINGS

EMCON Associates

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

APP

Date April 1, 1993

Project 0G70-054.01

To:

Mr. Joel Coffman

RESNA/ Applied Geosystems

3315 Almaden Expressway, Suite 34

San Jose, California 95118

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	March 1993 monthly water level survey, ARCO
	station 2185, 9800 East 14th Street, Oakland, CA

For your: X Information Sent by: X Mail

Comments:

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

Jim Butera JB

Reviewed by:

No: 4034

Exp. 6/30/96

INDUSTRIAL

STATE OF CALIFORNIA

Robert Porter, Senior Project Engineer.

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 0G70-054.01 STATION ADDRESS : 9800 East 14th Street, Oakland DATE : 3/26/93

ARCO STATION # : 2185 FIELD TECHNICIAN : B. Stafford DAY : Friday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	ok	Yes	ok	3259	Yes	10.04	10.03	ND	ND	23.6	
2	MW-2	ok	Yes	ok	3259	Yes	9.57	9.57	ND	ND	23.6	
3	MW-3	ok	Yes	ok	3259	Yes	7.83	7.83	ND	ND	23.2	
4	MW-4	ok	Yes	ok	3259	Yes	10.19	10.19	ND	ND	23.8	
5	MW-5	ok	Yes	ok	3259	Yes	9.41	9.41	ND	ND	26.8	
6	MW-6	ok	Yes	ok	3259	Yes	9.07	9.07	ND	ND	27.5	

SURVEY POINTS ARE TOP OF WELL CASINGS

SEQUOIA ANALYTICAL

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

RECEIVED
MAR 29 1993
RESNA

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

6202G.02

Project: Arco/2185, Oakland

Enclosed are the results from 1 water sample received at Sequoia Analytical on March 11,1993. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
3C48101	Water, W-MW3	3/10/93	Bicarbonate Alkalinity Total Dissolved Solids Biochemical Oxygen Demand Dissolved Oxygen Chloride Sulfate Hardness EPA 5030/8015/8020 EPA 624 Calcium STLC Cam Metals

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

for Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco/2185, Oakland	Sampled: Mar 10, 1993
3315 Almaden Expwy., Suite 34	Sample Matrix:	Water	Received: Mar 11, 1993
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported: Mar 25, 1993
Attention: Joel Coffman	First Sample #:	3C48101	

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 3C48101 W-MW3	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	50	13,000					
Benzene	0.50	170					
Toluene	0.50	340					
Ethyl Benzene	0.50	710					
Total Xylenes	0.50	3,100					
Chromatogram Pattern:		Gas					

Quality Control Data

Report Limit Multiplication Factor:	40
Date Analyzed:	3/14/93
Instrument Identification:	GCHP-3
Surrogate Recovery, %: (QC Limits = 70-130%)	89

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

SEQUOIA ANALYTICAL

for Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco/2185, Oakland	Sampled:	Mar 10, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Water, W-MW3	Received:	Mar 11, 1993
San Jose, CA 95118			Analyzed:	see below
Attention: Joel Coffman	Lab Number:	3C48101	Reported:	Mar 25, 1993

LABORATORY ANALYSIS

Analyte	Date Analyzed	Detection Limit mg/L	Sample Result mg/L
Bicarbonate Alkalinity	3/16/93	1.0	240
Total Dissolved Solids	3/12/93	1.0	370
Biochemical Oxygen Demand	3/11/93	1.0	30
Dissolved Oxygen	3/11/93	0.10	3.4
Chloride	3/15/93	0.20	95
Sulfate	3/15/93	0.10	30
Hardness	3/16/93	1.0	270

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco/2185, Oakland	Sampled: Mar 10, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Water, W-MW3	Received: Mar 11, 1993
San Jose, CA 95118	Analysis Method:	EPA 624	Analyzed: Mar 16, 1993
Attention: Joel Coffman	Lab Number:	3C48101	Reported: Mar 25, 1993

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	230	N.D.
Benzene	46	200
Bromodichloromethane	46	N.D.
Bromoform	46	N.D.
Bromomethane	46	N.D.
2-Butanone	230	N.D.
Carbon disulfide	46	N.D.
Carbon tetrachloride	46	N.D.
Chlorobenzene	46	N.D.
Chloroethane	46	N.D.
2-Chloroethyl vinyl ether	230	N.D.
Chloroform	46	N.D.
Chloromethane	46	N.D.
Dibromochloromethane	46	N.D.
1,1-Dichloroethane	46	N.D.
1,2-Dichloroethane	46	N.D.
1,1-Dichloroethene	46	N.D.
cis-1,2-Dichloroethene	46	N.D.
trans-1,2-Dichloroethene	46	N.D.
1,2-Dichloropropane	46	N.D.
cis-1,3-Dichloropropene	46	N.D.
trans-1,3-Dichloropropene	46	N.D.
Ethylbenzene	46	880
2-Hexanone	230	N.D.
Methylene chloride	120	N.D.
4-Methyl-2-pentanone	230	N.D.
Styrene	46	N.D.
1,1,2,2-Tetrachloroethane	46	N.D.
Tetrachloroethene	46	N.D.
Toluene	46	430
1,1,1-Trichloroethane	46	N.D.
1,1,2-Trichloroethane	46	N.D.
Trichloroethene	46	N.D.
Trichlorofluoromethane	46	N.D.
Vinyl acetate	46	N.D.
Vinyl chloride	46	N.D.
Total Xylenes	46	3,950

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco/2185, Oakland	Sampled: Mar 10, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Water, W-MW3	Received: Mar 11, 1993
San Jose, CA 95118			
Attention: Joel Coffman	Lab Number:	3C48101	Reported: Mar 25, 1993

INORGANIC PERSISTENT AND BIOACCUMULATIVE TOXIC SUBSTANCES

Analyte	Soluble Threshold Limit Concentration (Waste Extraction Test) STLC Max. Limit (mg/L)	Detection Limit (mg/L)	Analysis Result (mg/L)	Total Threshold Limit Concentration TTLC Max. Limit (mg/L)	Detection Limit (mg/L)	Analysis Result (mg/L)
Antimony	15	0.0050	N.D.	500	0.0050	—
Arsenic	5	0.0050	N.D.	500	0.0050	—
Barium	100	0.10	0.12	10,000	0.10	—
Beryllium	0.75	0.010	N.D.	75	0.010	—
Cadmium	1	0.010	N.D.	100	0.010	—
Chromium (VI)	5	0.0050	—	500	0.0050	—
Chromium	560	0.010	N.D.	2,500	0.010	—
Cobalt	80	0.050	N.D.	8,000	0.050	—
Copper	25	0.010	N.D.	2,500	0.010	—
Lead	5	0.0050	N.D.	1,000	0.0050	—
Mercury	0.2	0.00020	N.D.	20	0.00020	—
Molybdenum	350	0.050	N.D.	3,500	0.050	—
Nickel	20	0.050	N.D.	2,000	0.050	—
Selenium	1	0.0050	N.D.	100	0.0050	—
Silver	5	0.010	N.D.	500	0.010	—
Thallium	7	0.0050	N.D.	700	0.0050	—
Vanadium	24	0.050	N.D.	2,400	0.050	—
Zinc	250	0.010	N.D.	5,000	0.010	—
Asbestos	-	10	—	10,000	10	—
Fluoride	180	0.10	—	18,000	0.10	—

Asbestos results are reported as fibers/g.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco/2185, Oakland	Sampled: Mar 10, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Water, W-MW3	Received: Mar 11, 1993
San Jose, CA 95118			Analyzed: see below
Attention: Joel Coffman	Lab Number:	3C48101	Reported: Mar 25, 1993

LABORATORY ANALYSIS

Analyte	Date Analyzed	Detection Limit mg/L	Sample Result mg/L
Calcium (STLC)	3/14/93	0.50	52

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID: Arco/2185, Oakland	
3315 Almaden Expwy., Suite 34	Matrix: Water	
San Jose, CA 95118		
Attention: Joel Coffman	QC Sample Grou 3C48101	Reported: Mar 25, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	A.Miraftab	A.Miraftab	A.Miraftab	A.Miraftab
Conc. Spiked:	10	10	10	30
Units:	µg/L	µg/L	µg/L	µg/L
LCS Batch#:	GBLK031493	GBLK031493	GBLK031493	GBLK031493
Date Prepared:	-	-	-	-
Date Analyzed	3/14/93	3/14/93	3/14/93	3/14/93
Instrument I.D.#:	GCHP-3	GCHP-3	GCHP-3	GCHP-3
LCS % Recovery:	98	95	95	97
Control Limits:	80-120	80-120	80-120	80-120
MS/MSD Batch #:	G3C39702	G3C39702	G3C39702	G3C39702
Date Prepared:	-	-	-	-
Date Analyzed	3/14/93	3/14/93	3/14/93	3/14/93
Instrument I.D.#:	GCHP-3	GCHP-3	GCHP-3	GCHP-3
Matrix Spike % Recovery:	99	96	97	97
Matrix Spike Duplicate % Recovery:	98	96	97	97
Relative % Difference:	1.0	0.0	0.0	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: Arco/2185, Oakland
Matrix: Water

QC Sample Goup 3C48101

Reported: Mar 25, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Alkalinity	Hardness	Biochemical Oxy. Demand
Method:	SM403	SM314B	EPA 405.1
Analyst:	N.Northey	N.Northey	G.Grespan
Units:	mg/L	mg/L	mg/L
Date:	3/15/93	3/16/93	3/11/93
Sample #:	3C46101	3B34205	3C41301
Sample Concentration:	220	216	N.D.
Sample Duplicate Concentration:	220	216	N.D.
% RPD:	0.0	0.0	0.0
Control Limits:	0-30	0-30	0-30

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: Arco/2185, Oakland
Matrix: Water

QC Sample Group: 3C48101

Reported: Mar 25, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Chlorine	Sulfate	Ttl Dissolved Solids
Method:	EPA 300.0	EPA 300.0	EPA 160.1
Analyst:	G. Kem	G. Kem	Y. Arteaga
Conc. Spiked:	3.0	5.0	N/A
Units:			
LCS Batch#:	LCS031593	LCS031593	N/A
Date Prepared:	3/15/93	3/15/93	N/A
Date Analyzed	3/15/93	3/15/93	N/A
Instrument I.D.#:	N/A	N/A	N/A
LCS % Recovery:	100	98	N/A
Control Limits:	90-110	90-110	N/A
MS/MSD Batch #:	3C47102	3C47102	3C461
Date Prepared:	3/15/93	3/15/93	3/12/93
Date Analyzed	3/15/93	3/15/93	3/12/93
Instrument I.D.#:	N/A	N/A	N/A
Matrix Spike % Recovery:	100	90	100
Matrix Spike Duplicate % Recovery:	100	90	104
Relative % Difference:	0.0	0.0	2.3

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: Arco/2185, Oakland
Matrix: Water

QC Sample Group: 3C48101

Reported: Mar 26, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	1,1-Dichloro-ethene	Trichloroe-thene	Benzene	Toluene	hlorobenzene
Method:	EPA 8240	EPA 8240	EPA 8240	EPA 8240	EPA 8240
Analyst:	S. Hoffman	S. Hoffman	S. Hoffman	S. Hoffman	S. Hoffman
Conc. Spiked:	50	50	50	50	50
Units:	µg/L	µg/L	µg/L	µg/L	µg/L
LCS Batch#:	VBLK031293	VBLK031293	VBLK031293	VBLK031293	VBLK031293
Date Prepared:	3/22/93	3/22/93	3/22/93	3/22/93	3/22/93
Date Analyzed	3/12/93	3/12/93	3/12/93	3/12/93	3/12/93
Instrument I.D.#:	F2	F2	F2	F2	F2
LCS % Recovery:	104	96	98	98	94
Control Limits:	61-145	71-120	76-127	76-125	75-130
MS/MSD Batch #:	V3C22302	V3C22302	V3C22302	V3C22302	V3C22302
Date Prepared:	3/12/93	3/12/93	3/12/93	3/12/93	3/12/93
Date Analyzed	3/12/93	3/12/93	3/12/93	3/12/93	3/12/93
Instrument I.D.#:	F2	F2	F2	F2	F2
Matrix Spike % Recovery:	108	88	98	96	88
Matrix Spike Duplicate % Recovery:	92	84	90	90	88
Relative % Difference:	14	4.7	8.5	6.5	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

SEQUOIA ANALYTICAL

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: Arco/2185, Oakland

QC Sample Group: 3C48101

Reported: Mar 16, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Lead STLC	Mercury STLC	Arsenic STLC	Selenium STLC	Thallium STLC	Antimony STLC	Beryllium
Method:	EPA 7421	EPA 7421	EPA 7060	EPA 7740	EPA 7841	EPA 7041	EPA 200.7
Analyst:	S. Chin	S. Chin	F. Contreras	F. Contreras	F. Contreras	F. Contreras	M. Mistry
Reporting Units:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Date Analyzed:	Mar 15, 1993	Mar 19, 1993	Mar 17, 1993	Mar 17, 1993	Mar 17, 1993	Mar 16, 1993	Mar 14, 1993
QC Sample #:	3C44402	3C81303	3C48101	3C48101	3C48101	3C48101	BLK031293
Sample Conc.:	39	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	100	0.0020	0.50	0.50	0.50	0.50	1.0
Conc. Matrix Spike:	140	0.0021	0.46	0.50	0.44	0.43	1.0
Matrix Spike % Recovery:	101	105	92	100	88	86	100
Conc. Matrix Spike Dup.:	130	0.0020	0.46	0.50	0.44	0.47	1.0
Matrix Spike Duplicate % Recovery:	91	100	92	100	88	93	100
Relative % Difference:	7.4	4.9	0.0	0.0	0.0	8.9	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

$$\% \text{ Recovery:} \quad \frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{(\text{Conc. of M.S. + Conc. of M.S.D.}) / 2} \times 100$$

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: Arco/2185, Oakland

QC Sample Group: 3C48101

Reported: Mar 26, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Cadmium	Chromium	Nickel
Method:	EPA 200.7	EPA 200.7	EPA 200.7
Analyst:	M. Mistry	M. Mistry	M. Mistry
Reporting Units:	mg/L	mg/L	mg/L
Date Analyzed:	Mar 14, 1993	Mar 14, 1993	Mar 14, 1993
QC Sample #:	BLK031293	BLK031293	BLK031293
Sample Conc.:	N.D.	N.D.	N.D.
Spike Conc. Added:	1.0	1.0	1.0
Conc. Matrix Spike:	0.96	0.94	1.0
Matrix Spike % Recovery:	96	94	100
Conc. Matrix Spike Dup.:	0.95	0.92	0.98
Matrix Spike Duplicate % Recovery:	95	92	98
Relative % Difference:	1.0	2.2	2.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

$$\text{\% Recovery:} \quad \frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}} \times 100$$

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No.

Chain of Custody

ARCO Facility no. 2185
City (Facility) OAKLAND
Project manager (Consultant) JOEL COFFMAN
Laboratory name
ARCO engineer MIKE WHELAN
Telephone no. (ARCO) (415) 571-7455
Telephone no. (Consultant) (408) 264-7723
Fax no. (Consultant) (408) 264-2435
Contract number
Consultant name RESNA INDUSTRIES INC
Address (Consultant) 3315 ALMADEN EXPY SUITE 34 SJ 95118
Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	TOTAL HARDNESS (~~BTEX 602/EPA 8020~~)	BTEX/TPH EPA M602/8020/8015	CALCIUM, MAGNESIUM (~~TPH Modified 8015 Gas ☐ Diesel ☐~~)	BICARBONATE ALKALINITY (~~Oil and Grease~~ 413.1 ☐ 413.2 ☐)	DISSOLVED OXYGEN (~~TPH EPA 418.1/SM503E~~)	CHLORINATED HYDROCARBONS (~~EPA 601/8010~~)	TOTAL DISSOLVED SOLIDS (~~EPA 624/8240~~)	BOD (~~EPA 625/8270~~)	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☒	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	CHLORIDE	SULFATE
W-MW3		6 40ml VOAs		✓		✓	HCL	3/10/93	22:30		✓							9303481-01				
W-MW3		1		✓		✓				✓												
W-MW3		1		✓		✓						✓										
W-MW3		1		✓		✓	[illegible]						✓									
W-MW3		1		✓		✓								✓								
W-MW3		1		✓		✓									✓							
W-MW3		1		✓		✓										✓						
W-MW3		1		✓		✓											✓					
~~W-MW3~~		~~1~~		~~✓~~		~~✓~~																
W-MW3		2		✓		✓	HNO3												✓			
W-MW3		1		✓		✓																✓
W-MW3		1		✓		✓															✓	

Special detection Limit/reporting

Special QA/QC

Remarks: BOD + Dissolved oxygen immediately only 13 bottles were filled however there should be enough water for all tests requested

Lab number

Turnaround time
Priority Rush 1 Business Day ☐
Rush 2 Business Days ☐
Expedited 5 Business Days ☐
Standard 10 Business Days ☐

Condition of sample:
Temperature received:

Relinquished by sampler: Glen D. McLucas — Date 3/11/93 — Time 15:25
Received by: Tina Van Zandt
Relinquished by: Tina Van Zandhove — Date 3/11/93 — Time 1610
Received by
Relinquished by — Date — Time
Received by laboratory: [signature] — Date 3.11.93 — Time 1610

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

RESNA
Working to Restore Nature

APPENDIX F

WELLHEAD SURVEY

JOHN E. KOCH
Land Surveyor
CA State Lic. No. LS4811
5427 Telegraph Ave., Suite A
Oakland, CA 94609
(510) 655-9956
FAX (510) 655-9745

FACSIMILE TRANSMITTAL LETTER

TO:Erin McLucas

FROM:John Koch

Job No.:93035

COMPANY:RESNA

Re:RESNA Proj.62026.02

FAX NO:(408) 264-2435

SUBJECT:Arco Station 2185
9800 East 14th Street
Oakland, CA

PER: _x_ Your request.

___ Our telephone conversation of:

___Other:_____.

FIND ENCLOSED:

1. Plot of specified wells.

NO. OF PAGES (including transmittal): 1

MESSAGE:

HARDCOPY TO FOLLOW VIA U.S. MAIL

JOHN E. KOCH
Land Surveyor
CA. State Lic. No. LS4811
5427 Telegraph Ave., Suite A
Oakland, CA 94609
(510)655-9956
FAX(510)655-9745

RESNA / San Jose
3315 Almaden Expressway, Suite 34
San Jose, CA 95118
(408)264-7723
FAX(408)264-2435

05/13/93

Tabulation of Elevations as of
5:00 p.m. 05/11/93

Job #93035
RESNA Project 62026.02
Project Geologist:Joel Coffman
Site: Arco Station 2185
9800 East 14th Street
@ 98th Avenue
Oakland, CA

BENCHMARK: Bench Mark #24/D (El.=26.88') is the Standard Oakland disc under standard casting in the concrete walk 5' West of the West curb of 98th Avenue and 7' South curb of E 14th Street. Datum is City of Oakland.

MONITOR WELL DATA TABLE

Well Designation	Elevation	Description
MW-1*	29.15	Top of PVC Casing
	29.39	Top of Box
MW-2*	28.47	Top of PVC Casing
	28.81	Top of Box
MW-3*	28.57	Top of PVC Casing
	28.81	Top of Box
MW-4*	29.21	Top of PVC Casing
	29.42	Top of Box
MW-5**	28.12	Top of PVC Casing
	28.35	Top of Box
MW-6**	27.79	Top of PVC Casing
	28.83	Top of Box
MW-7	27.88	Top of PVC casing
	28.26	Top of Box

JOHN E. KOCH, P.L.S. RESNA PROJECT #62026.02 JEK JOB #93035

NOTES:

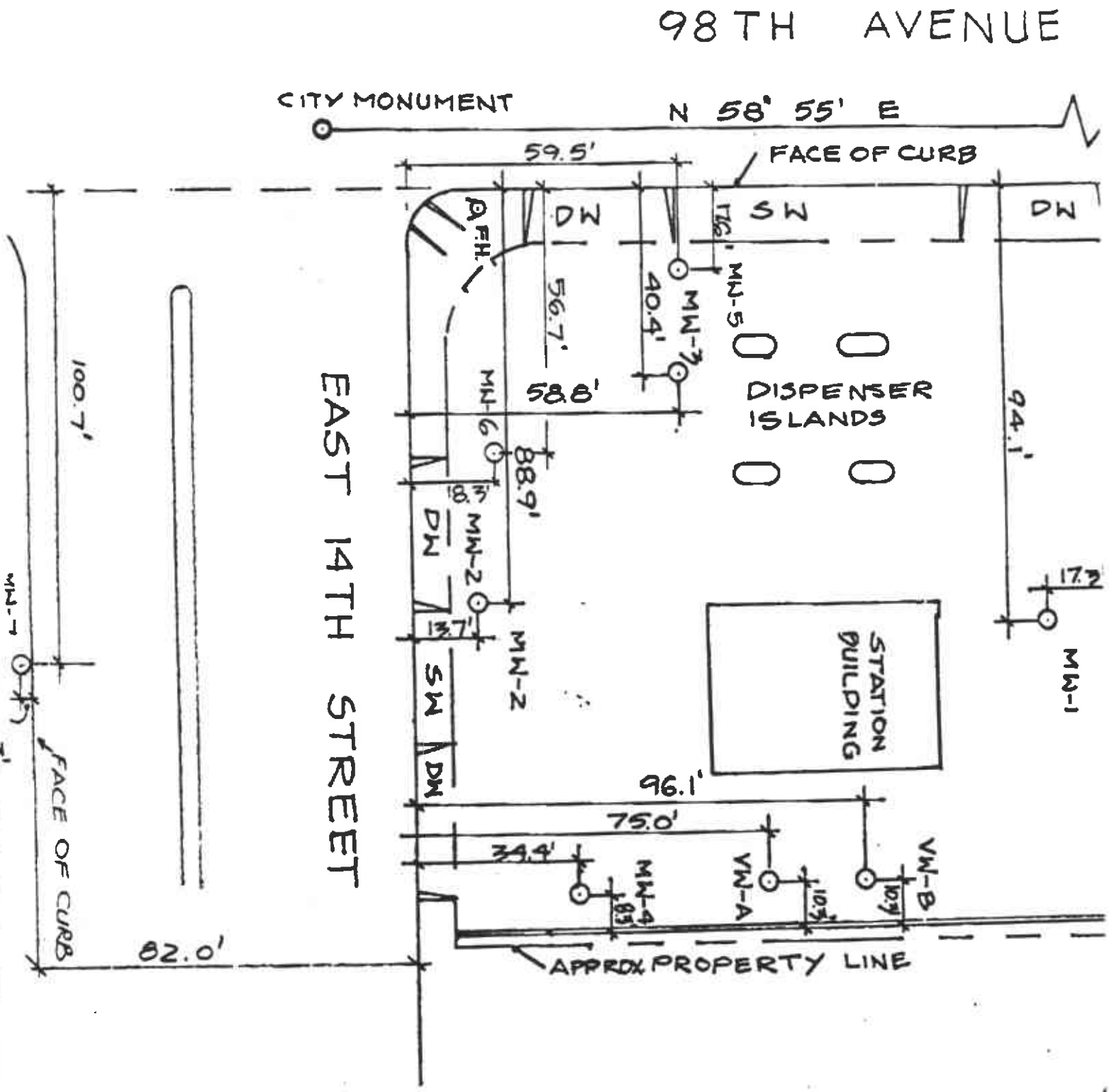
1. Datum is City of Oakland = (USGS) + 3.00'

2. Top of PVC Casing Elevation is at notch set on top of PVC for all wells. Notch bearing N for all wells.

3. Top of Box Elevation is at notch set on rim for all wells. Notch bearing N for all wells.

* Denotes MW's surveyed on 07/23/92 (JEK JOB #92061).

** Denotes MW's surveyed on 02/18/93 (JEK JOB #93009).



SITE
ARCO
9800
DAKL
RESI

CLIF

NUMBER	CASING	BOX
MW-1	29.15'	29.39'
MW-2	28.47'	28.81'
MW-3	28.57'	28.81'
MW-4	29.21'	29.42'
MW-5	28.12'	28.35'
MW-6	27.79'	28.83'

NEW WELL ELEVATION		
MW-7	27.88'	28.26'

LEGEND:

DW - DRIVEWAY

SW = SIDEWALK

F.H. = FIRE HYDRANT

30' 15' 0' 30' 60'

SCALE : 1" = 30'

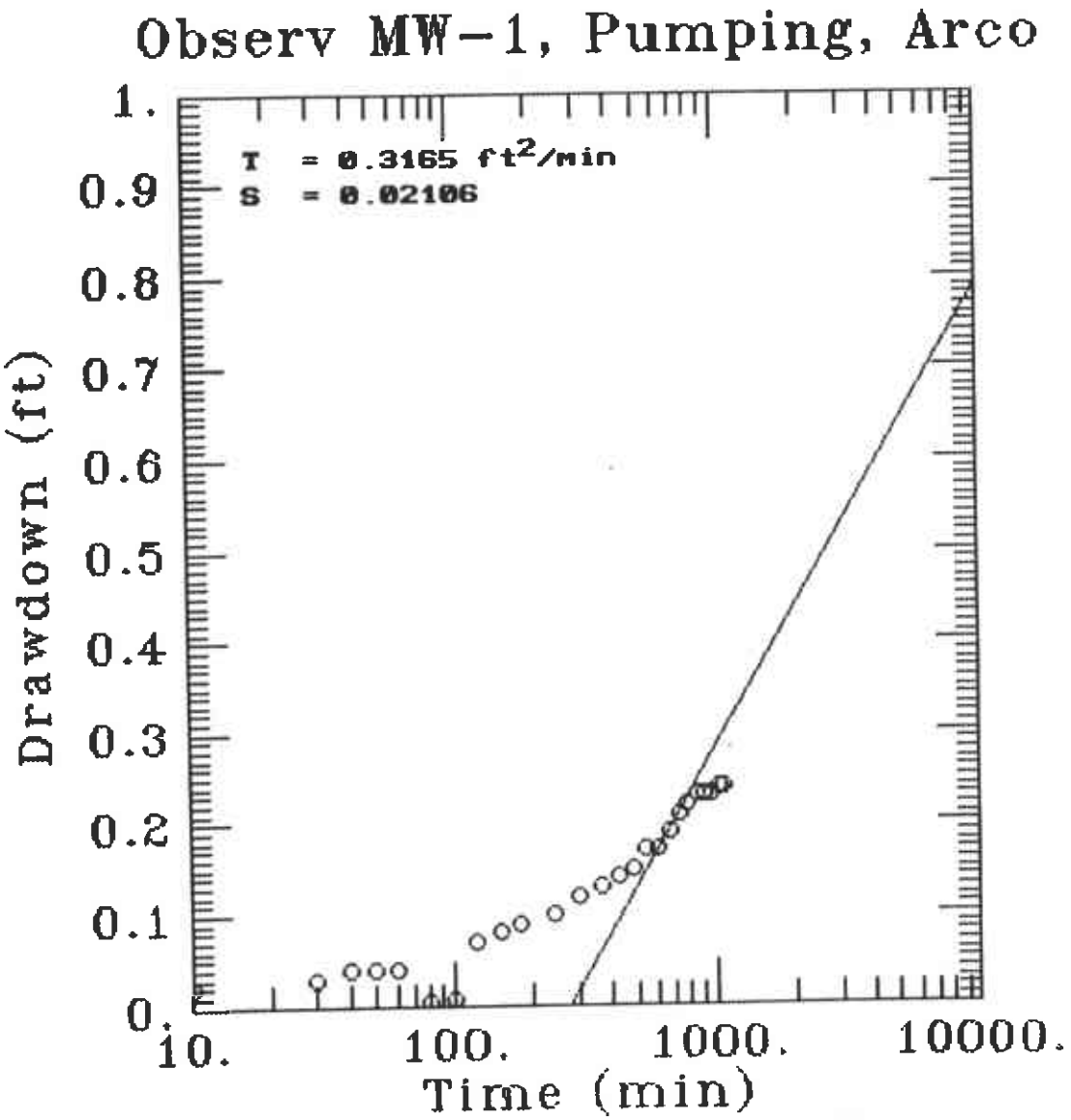
TION 2185,
ST 14TH STREET
, CA
ROJECT 62026.02

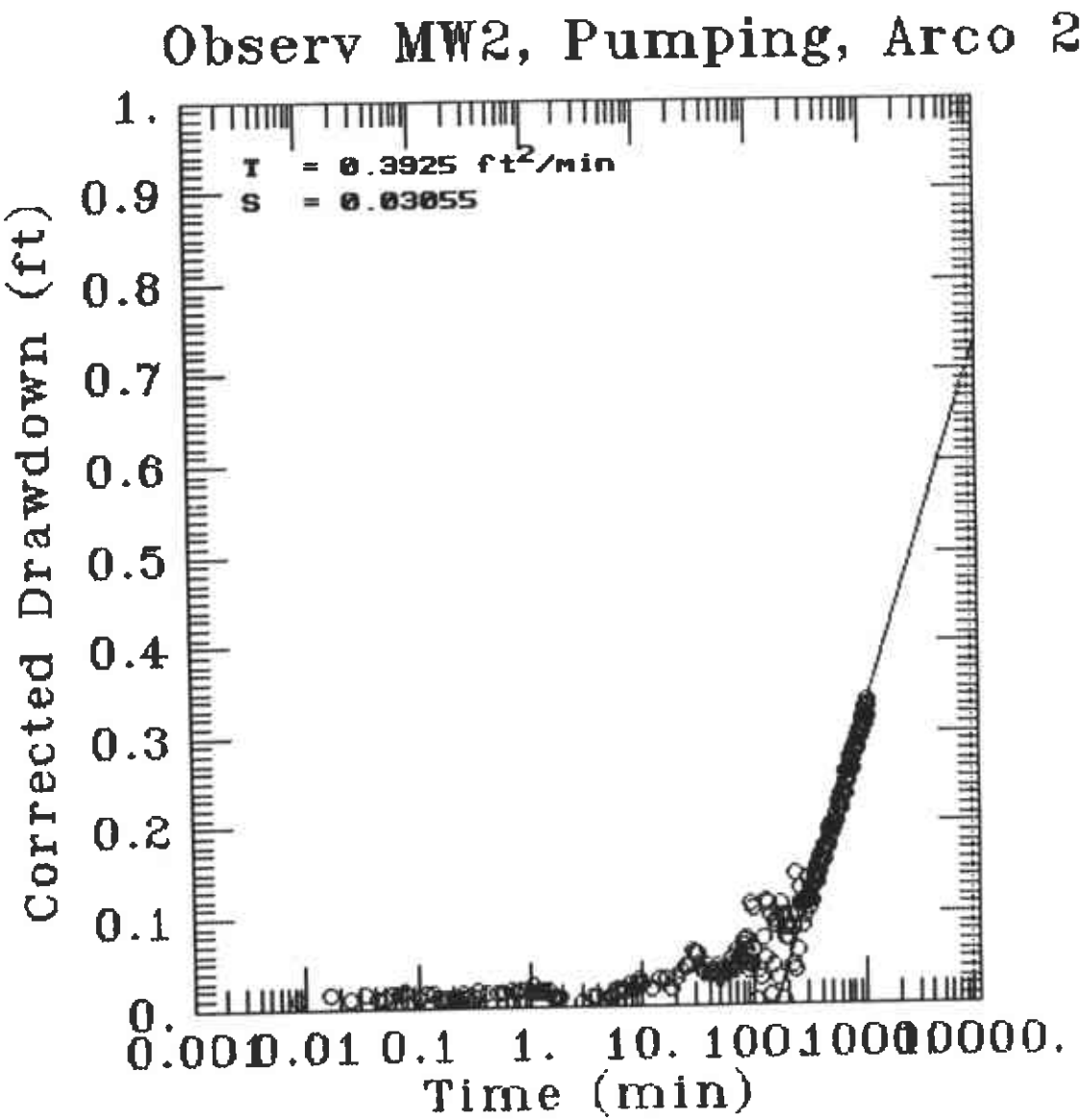
JOHN E. KOCH
LAND SURVEYOR
CA. STATE LIC. NO. LS4811
5427 TELEGRAPH AVE., SUITE A
OAKLAND, CA. 94609
(510) 655-9956
(510) 655-9745

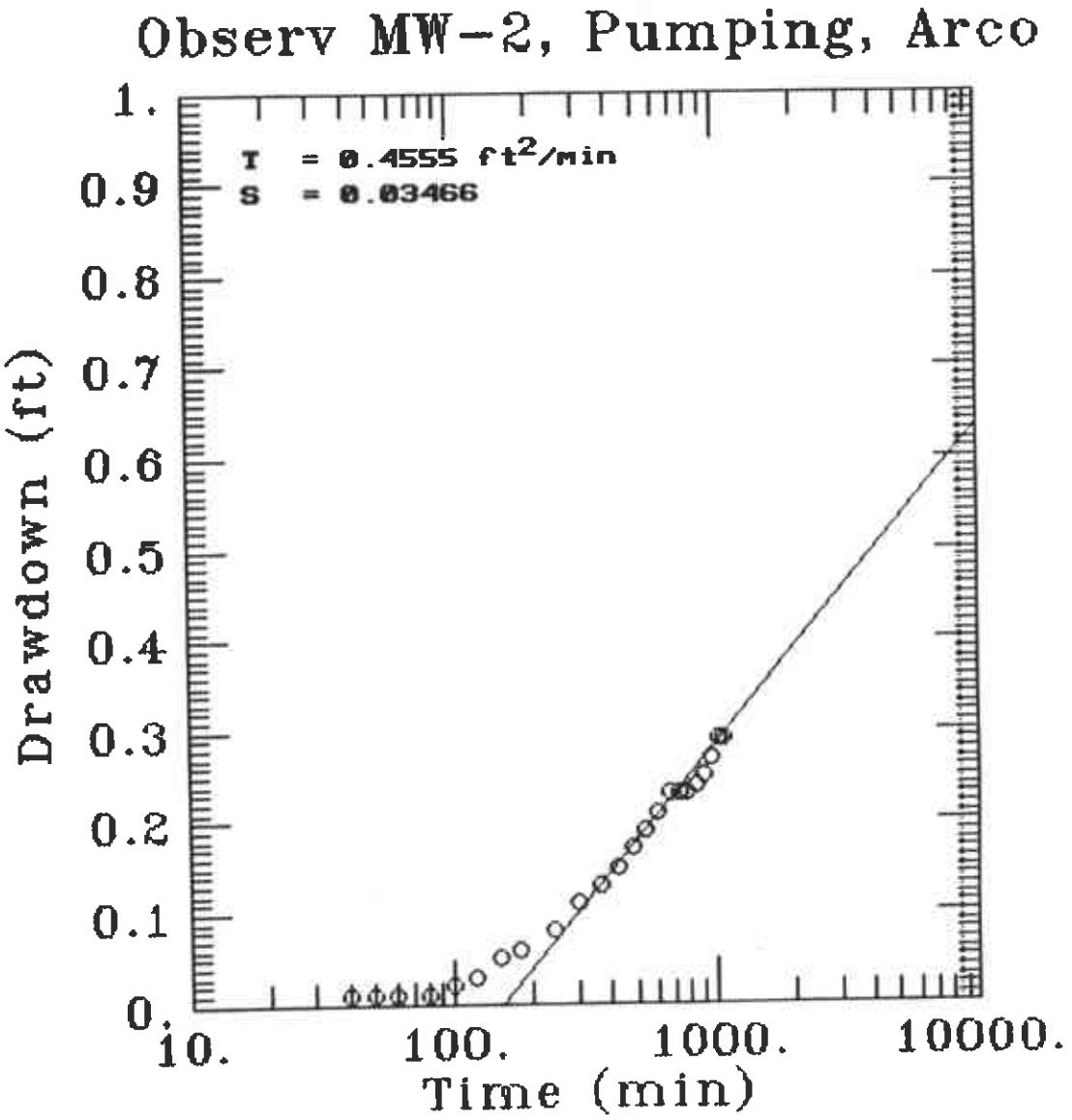
RESNA
Working to Restore Nature

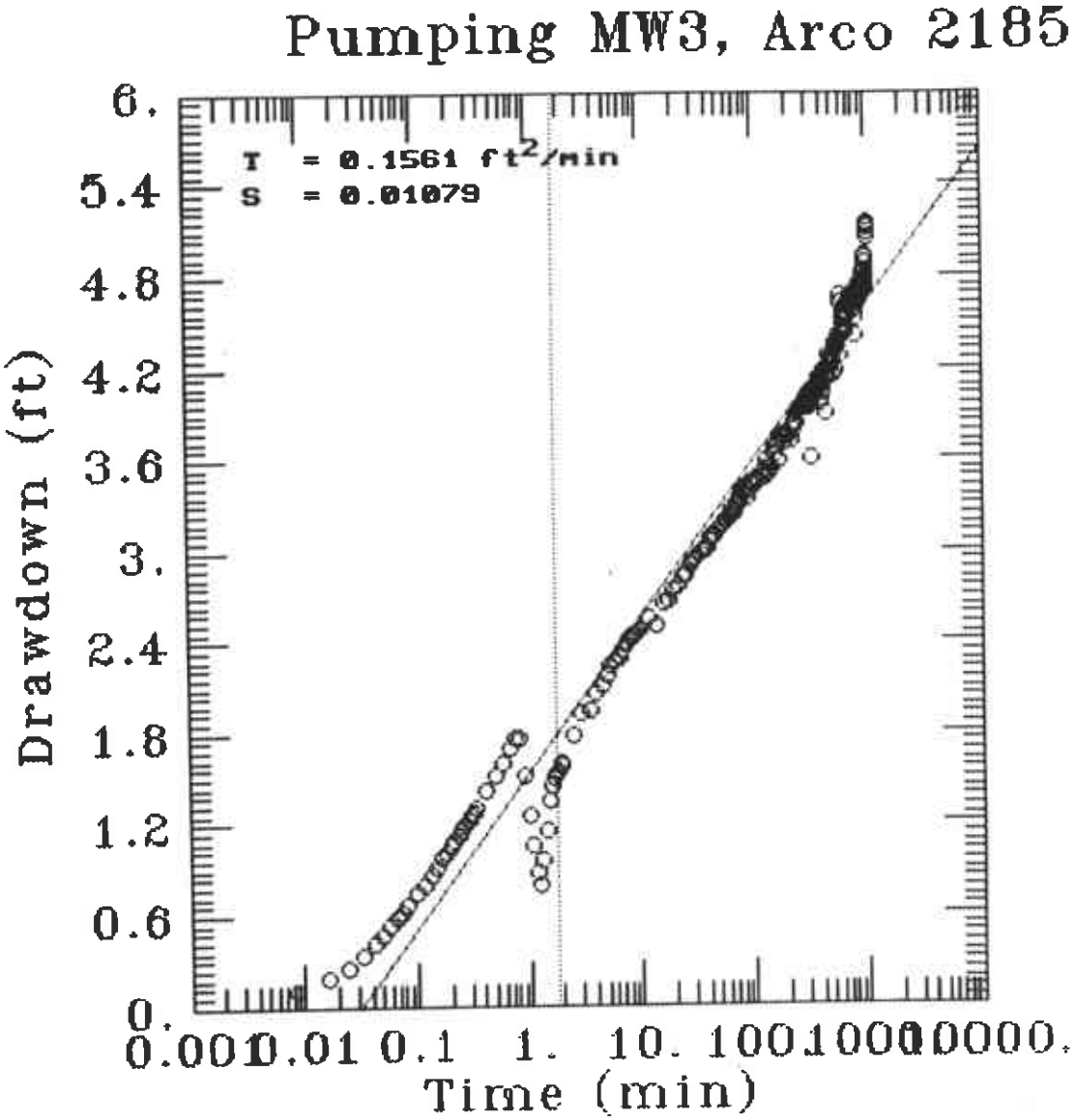
APPENDIX G

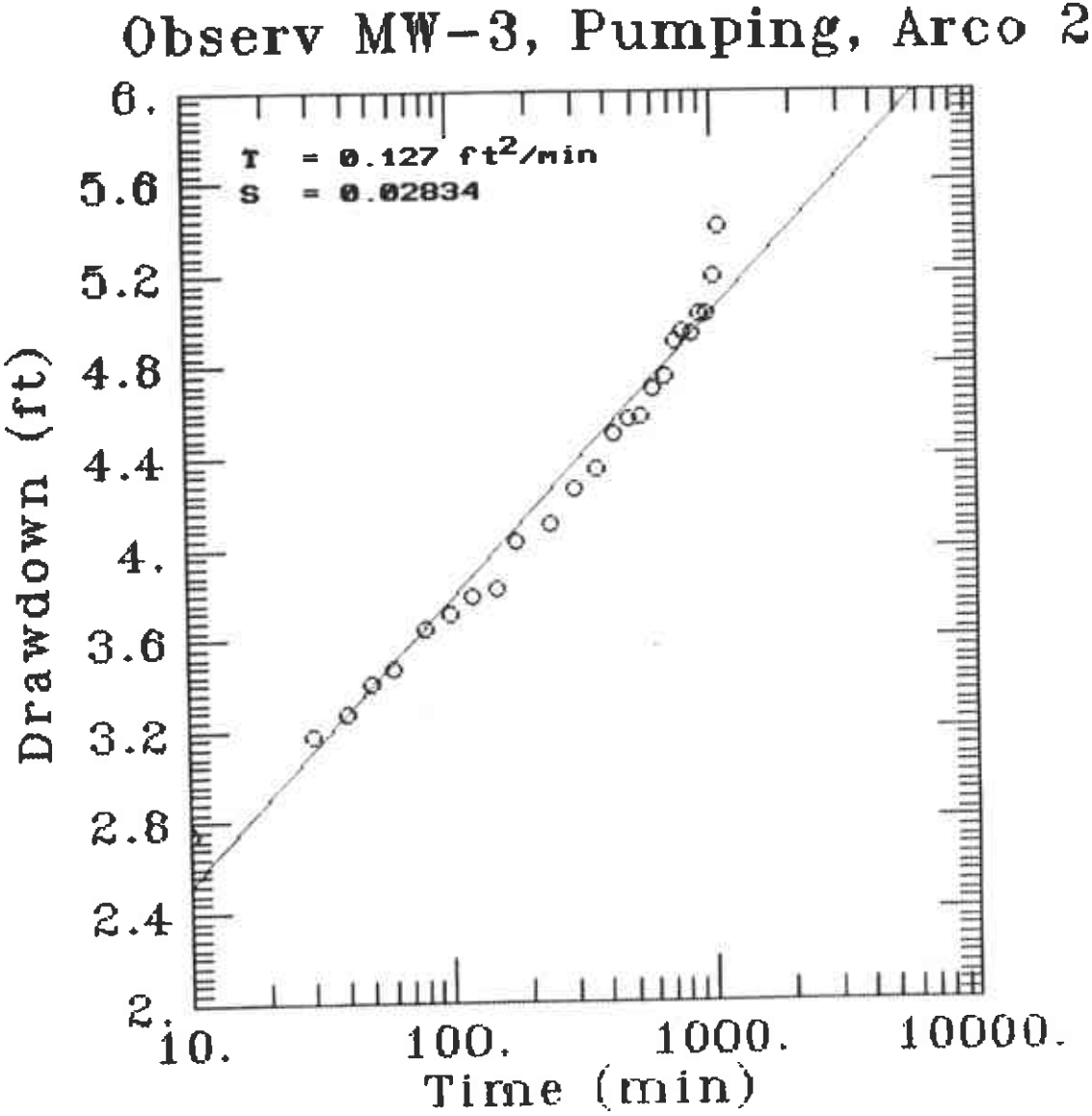
PUMPING AND RECOVERY TEST DATA AND ANALYSES

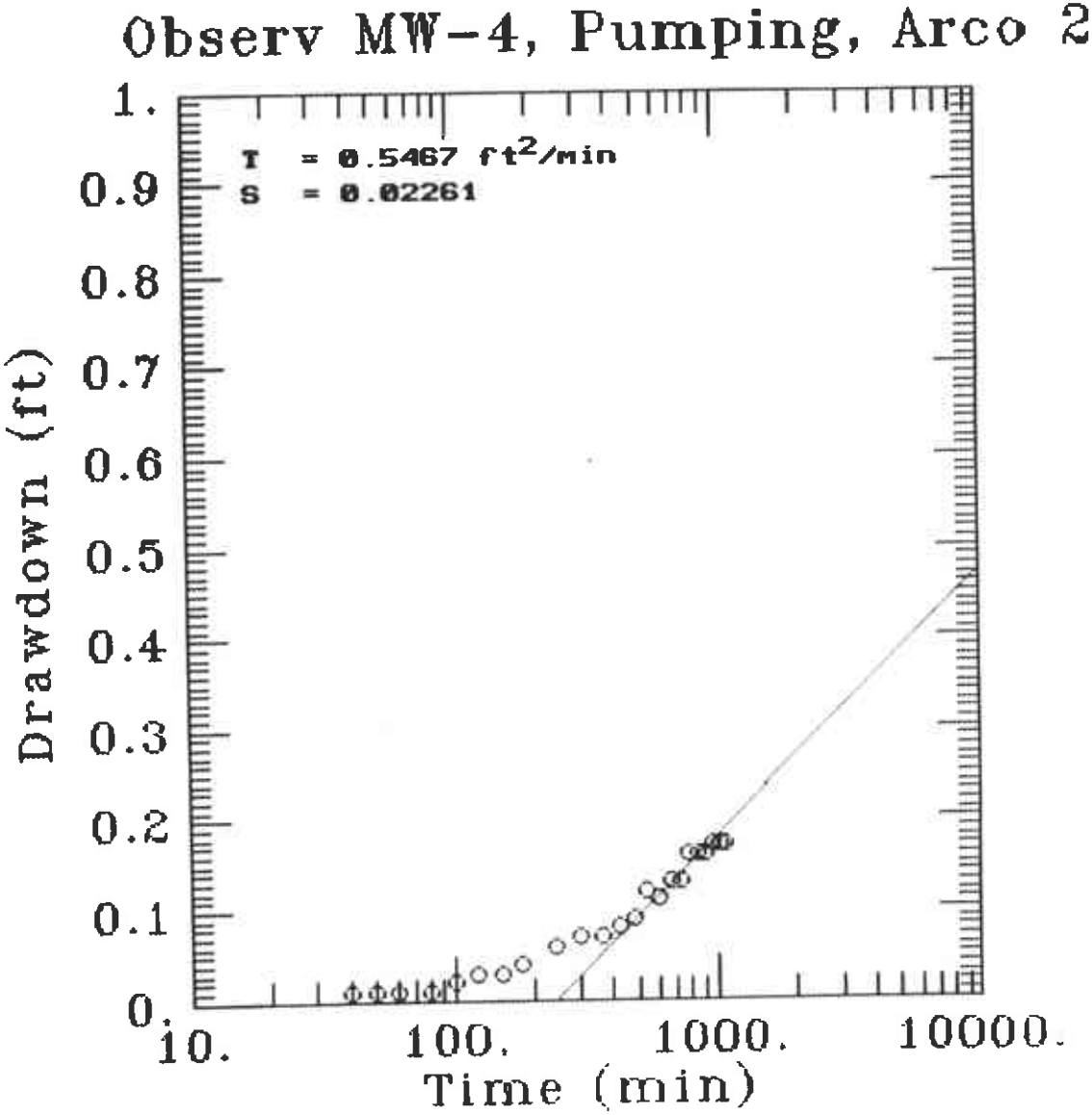

Observ MW-1, Pumping, Arco 2185
T = 0.3165 ft²/min
S = 0.02106
Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
10.
100.
1000.
10000.
Time (min)

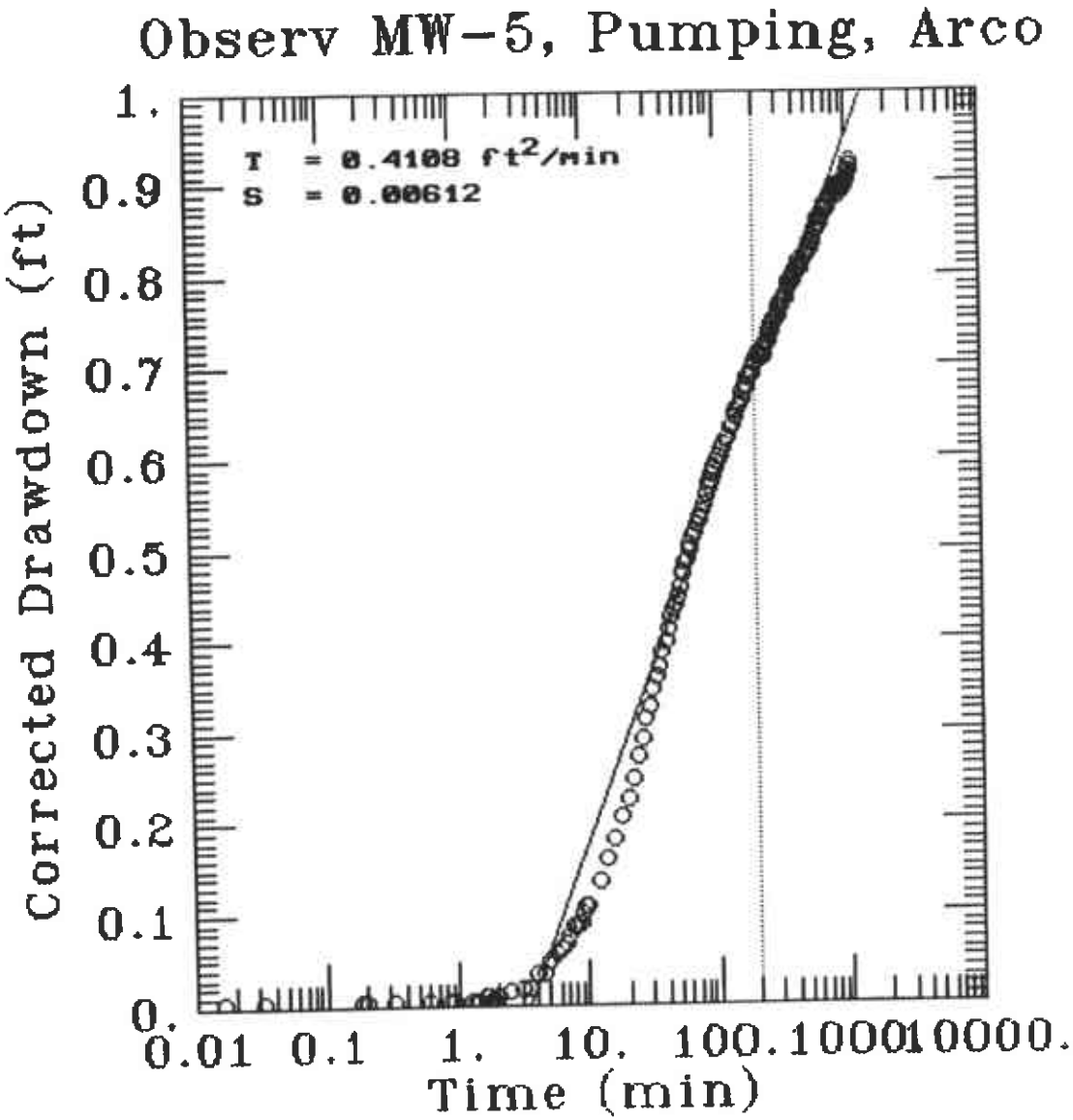

Observ MW2, Pumping, Arco 2185
T = 0.3925 ft²/min
S = 0.03055
Corrected Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
0.001
0.01
0.1
1.
10.
100
1000
10000.
Time (min)

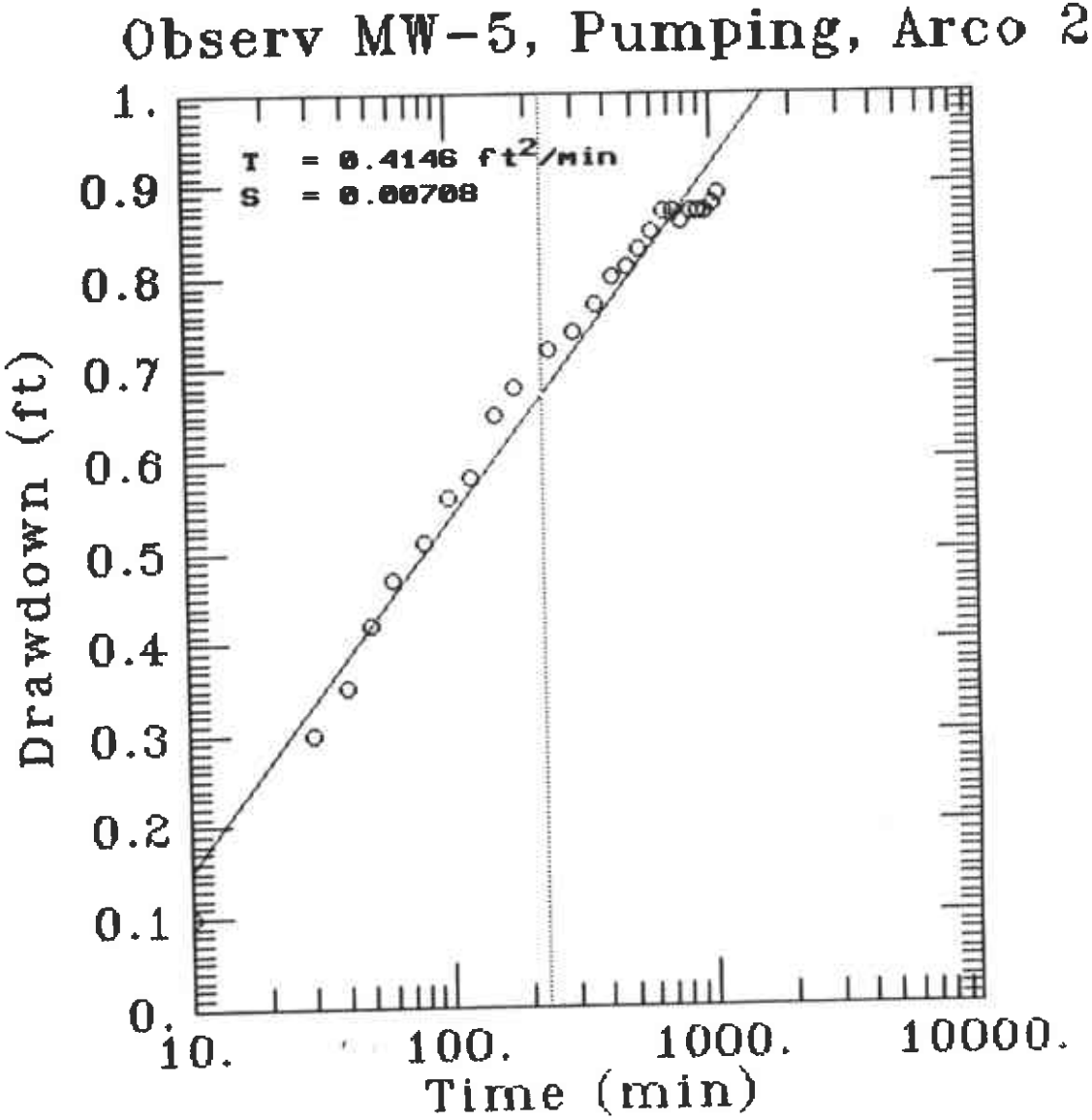

Observ MW-2, Pumping, Arco 2185
T = 0.4555 ft²/min
S = 0.03466
Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
10.
100.
1000.
10000.
Time (min)

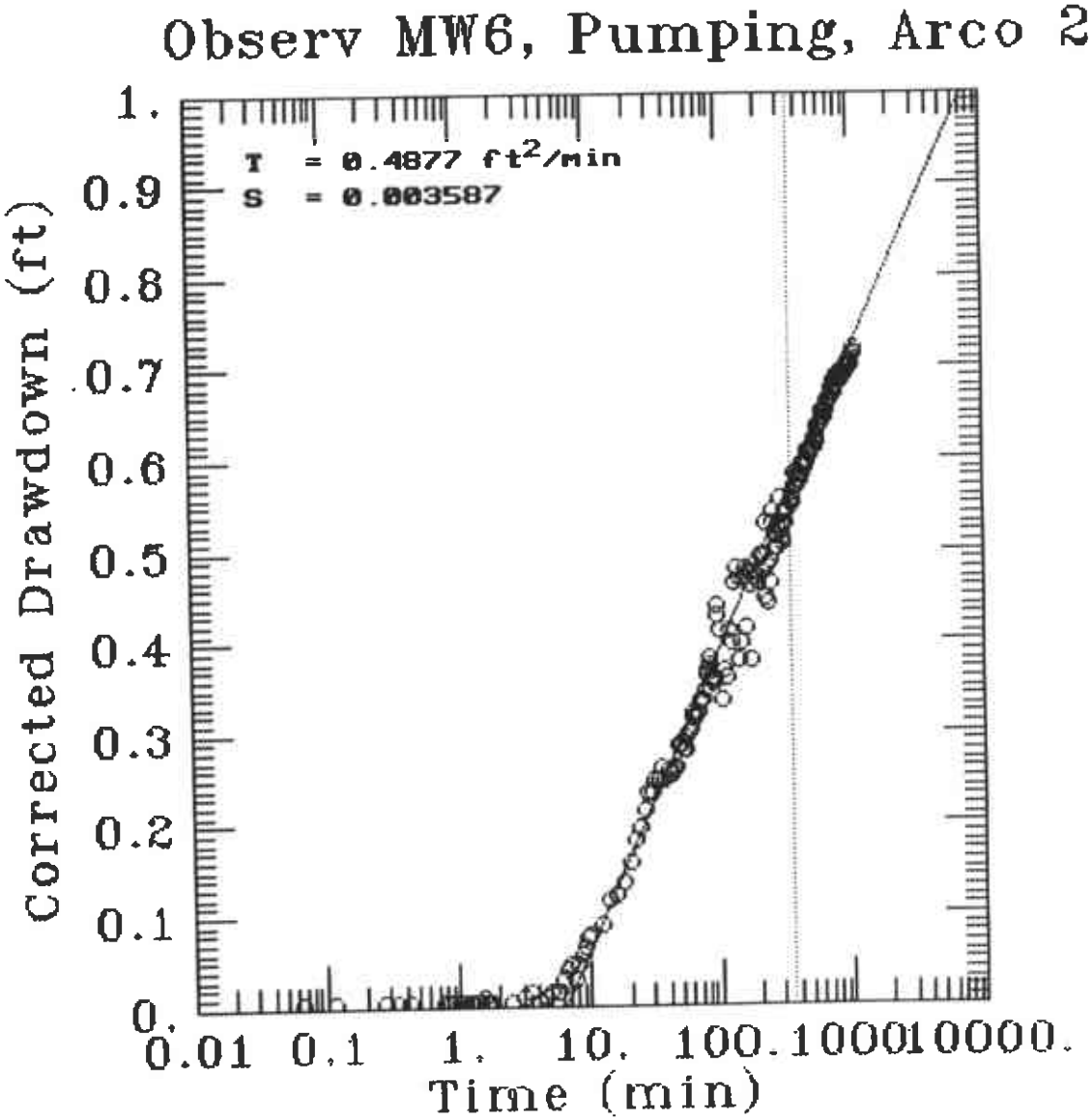

Pumping MW3, Arco 2185
T = 0.1561 ft²/min
S = 0.01079
Drawdown (ft)
6.
5.4
4.8
4.2
3.6
3.
2.4
1.8
1.2
0.6
0.
0.001 0.01 0.1 1. 10. 100 1000 10000.
Time (min)

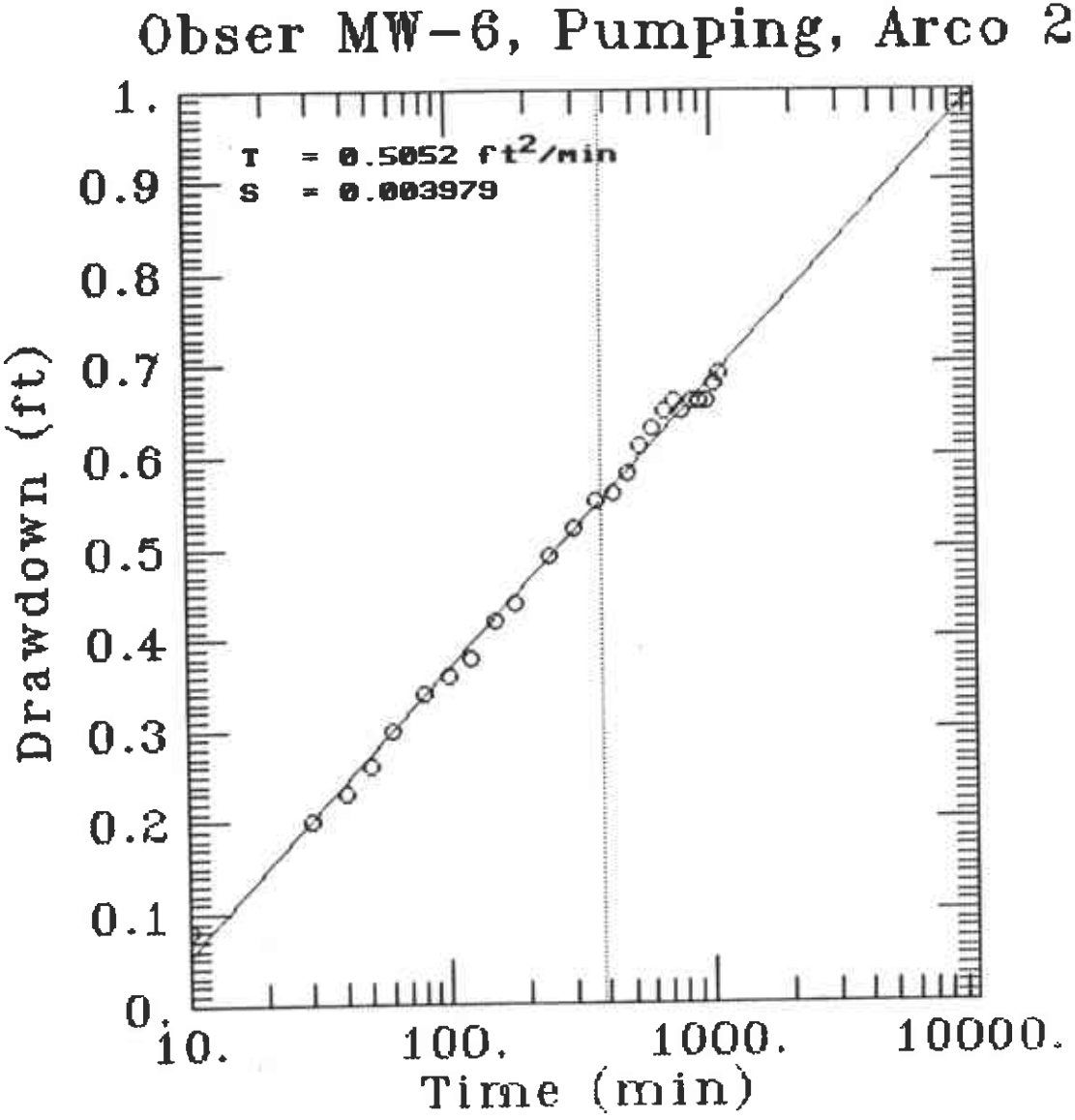

Observ MW-3, Pumping, Arco 2185
T = 0.127 ft²/min
S = 0.02834
Drawdown (ft)
6.
5.6
5.2
4.8
4.4
4.
3.6
3.2
2.8
2.4
2
10.
100.
1000.
10000.
Time (min)


Observ MW-4, Pumping, Arco 2185
T = 0.5467 ft²/min
S = 0.02261
Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
10.
100.
1000.
10000.
Time (min)

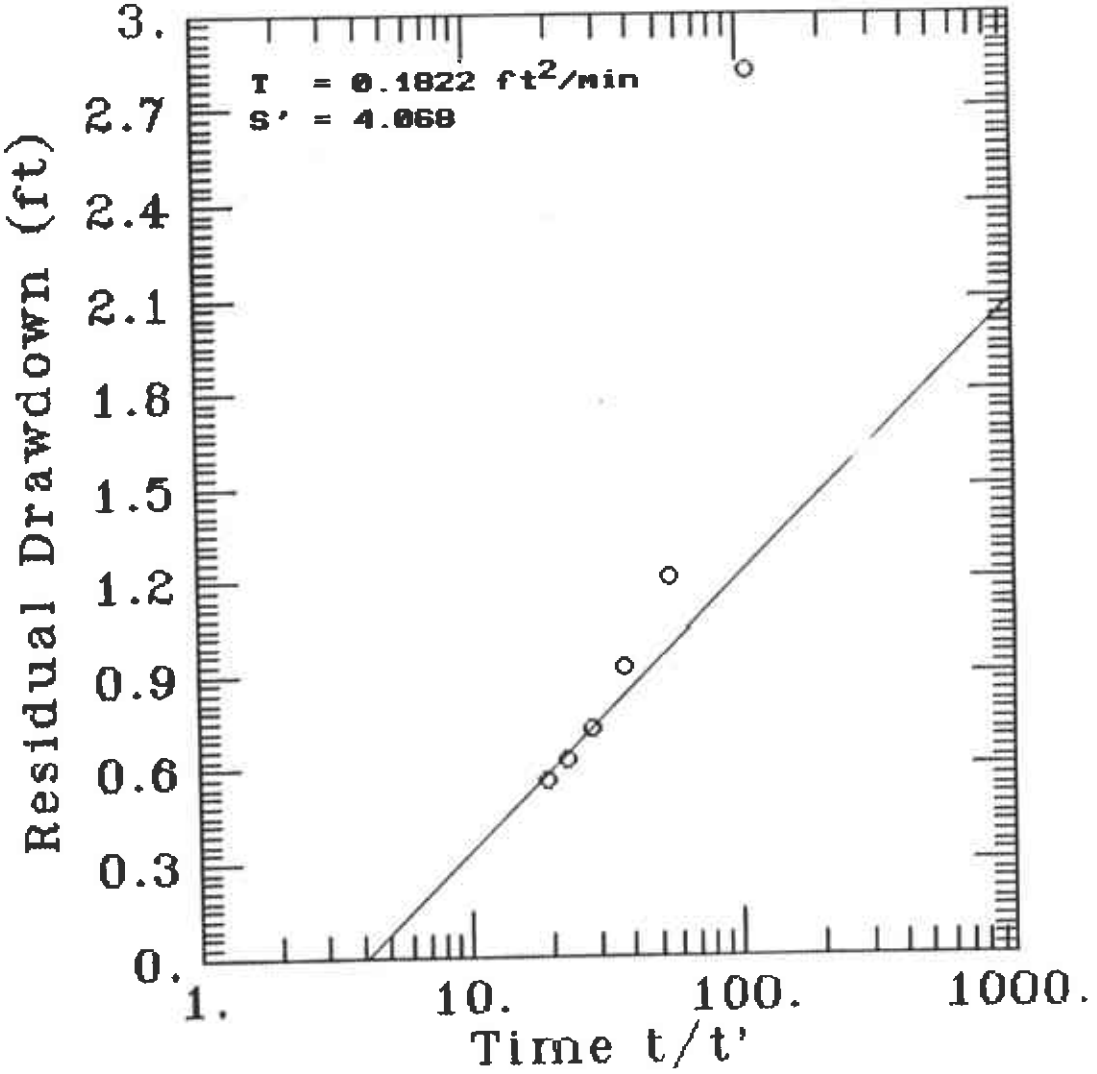

Observ MW-5, Pumping, Arco 2185
T = 0.4108 ft²/min
S = 0.00612
Corrected Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
0.01 0.1 1. 10. 100. 1000 10000.
Time (min)

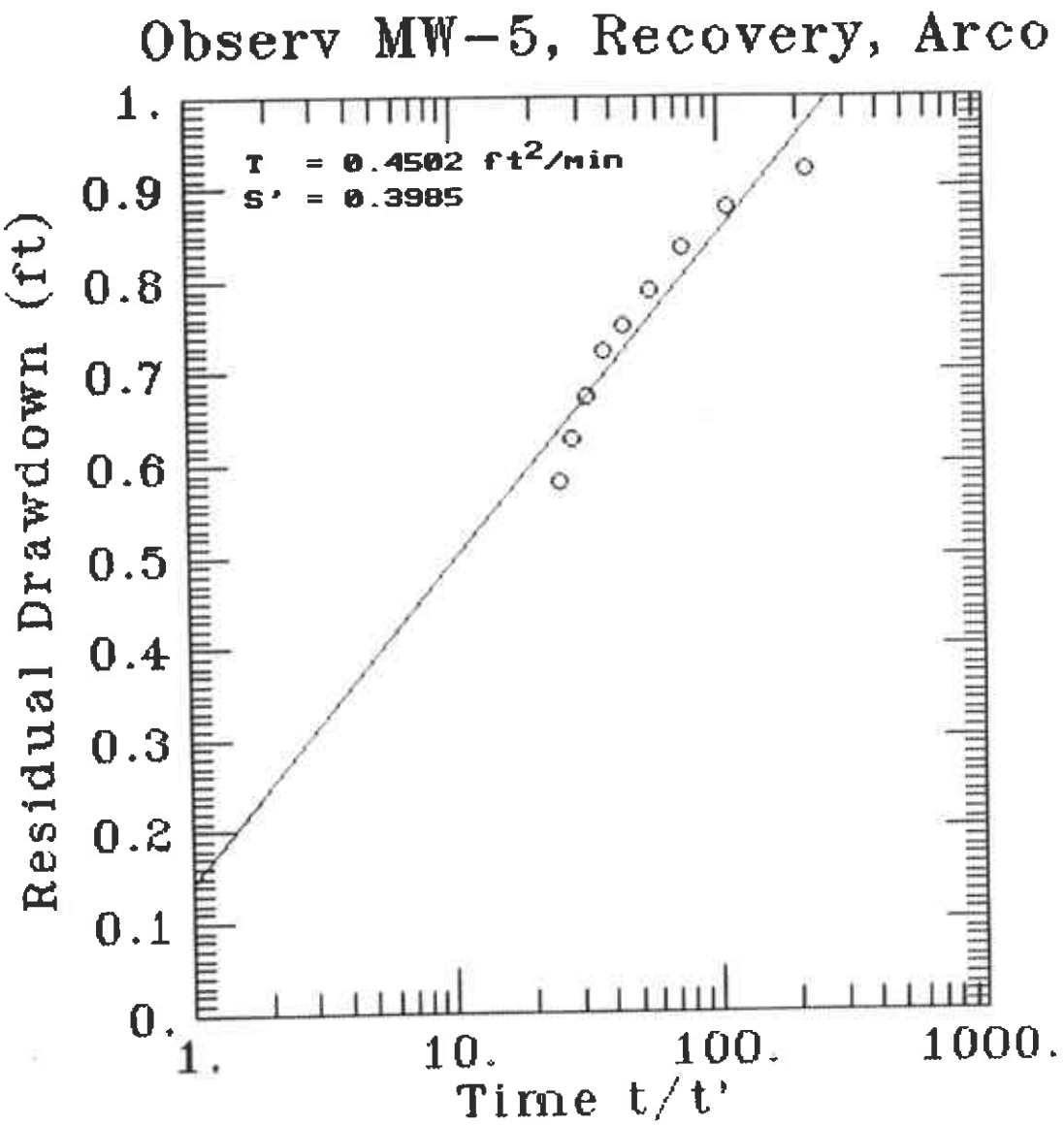

Observ MW-5, Pumping, Arco 2185
T = 0.4146 ft²/min
S = 0.00708
Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
10.
100.
1000.
10000.
Time (min)

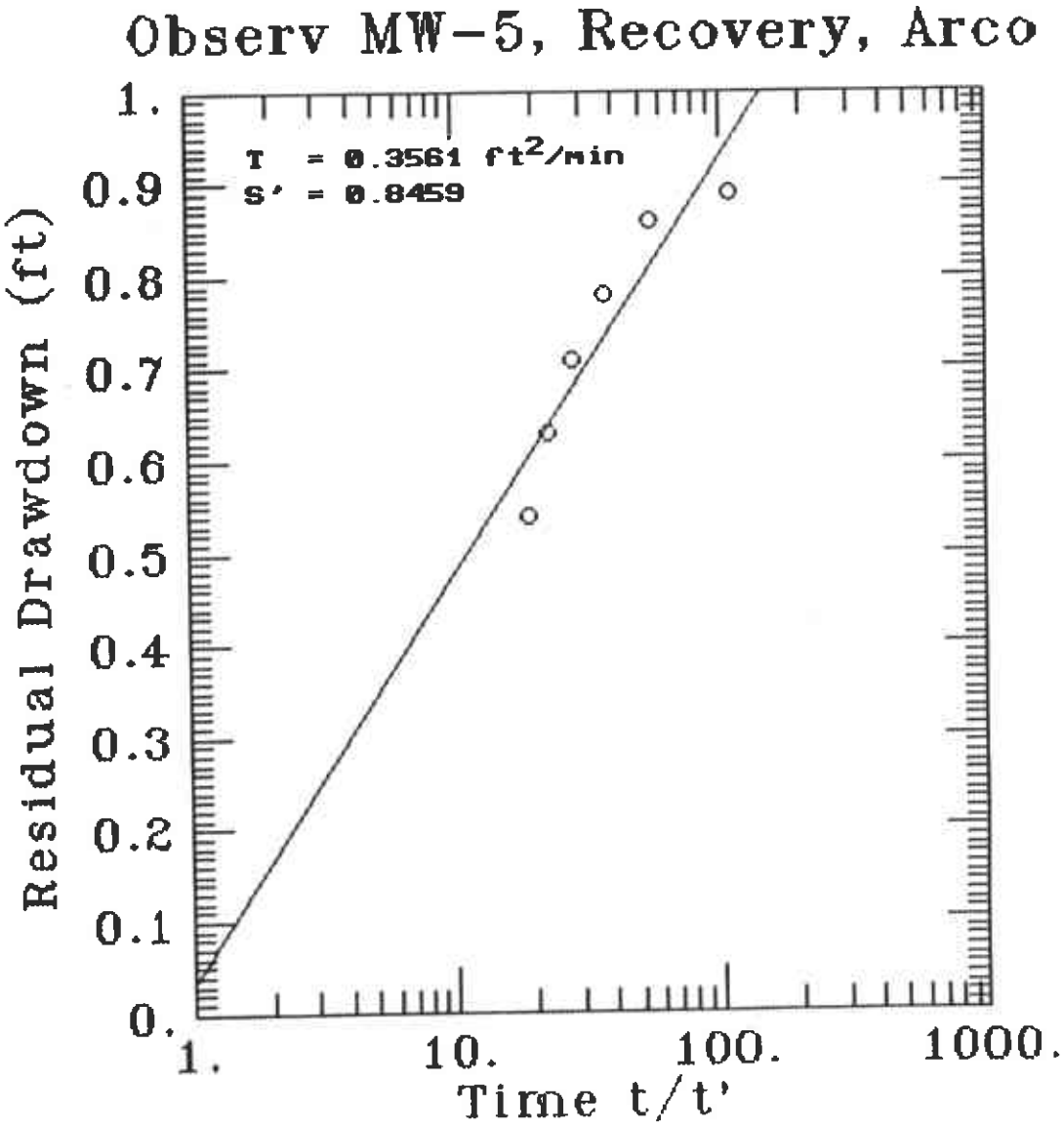

Observ MW6, Pumping, Arco 2185
T = 0.4877 ft²/min
S = 0.003587
Corrected Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
0.01
0.1
1.
10.
100.
1000
10000.
Time (min)

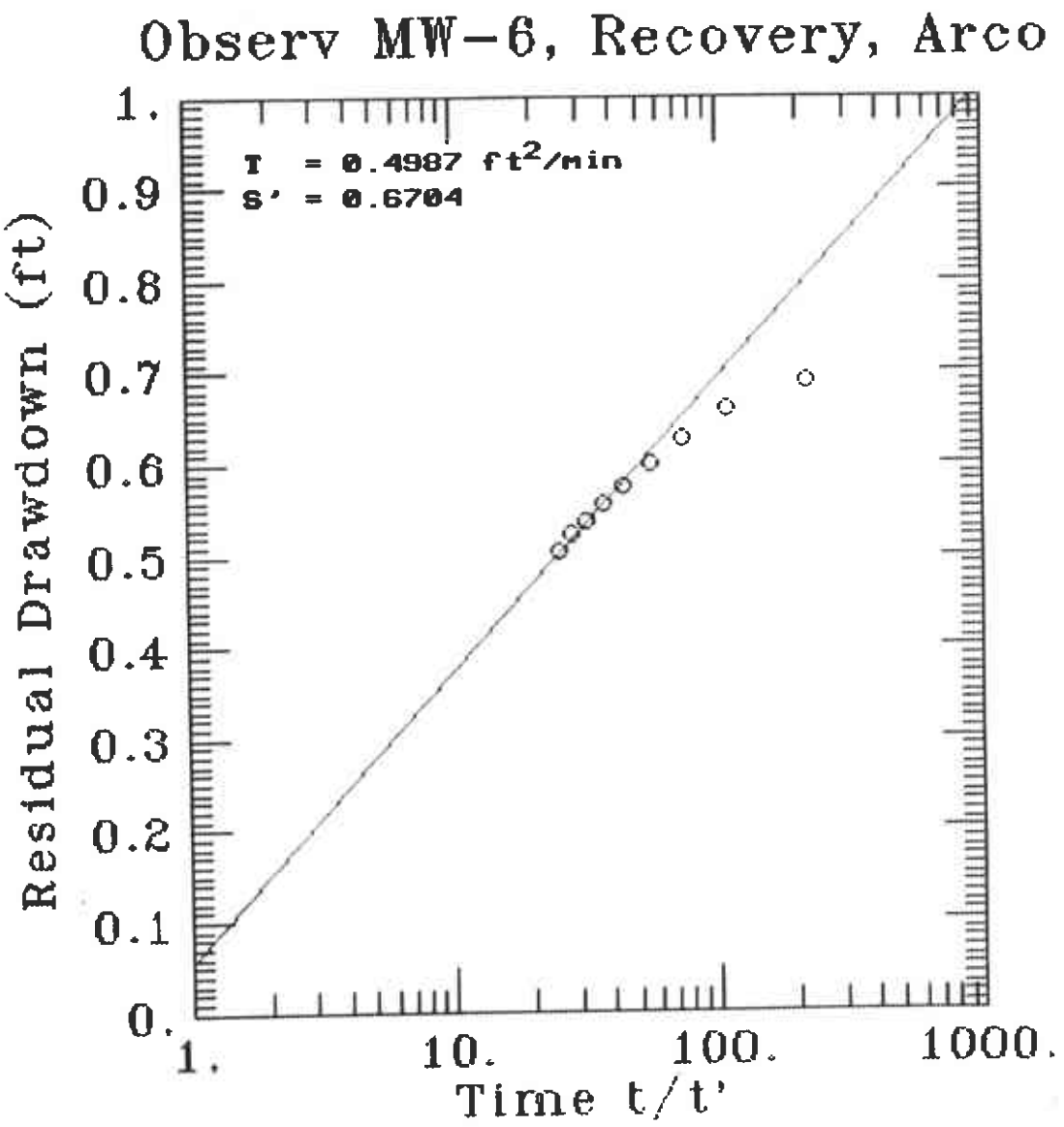

Obser MW-6, Pumping, Arco 2185
T = 0.5052 ft²/min
S = 0.003979
Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
10.
100.
1000.
10000.
Time (min)

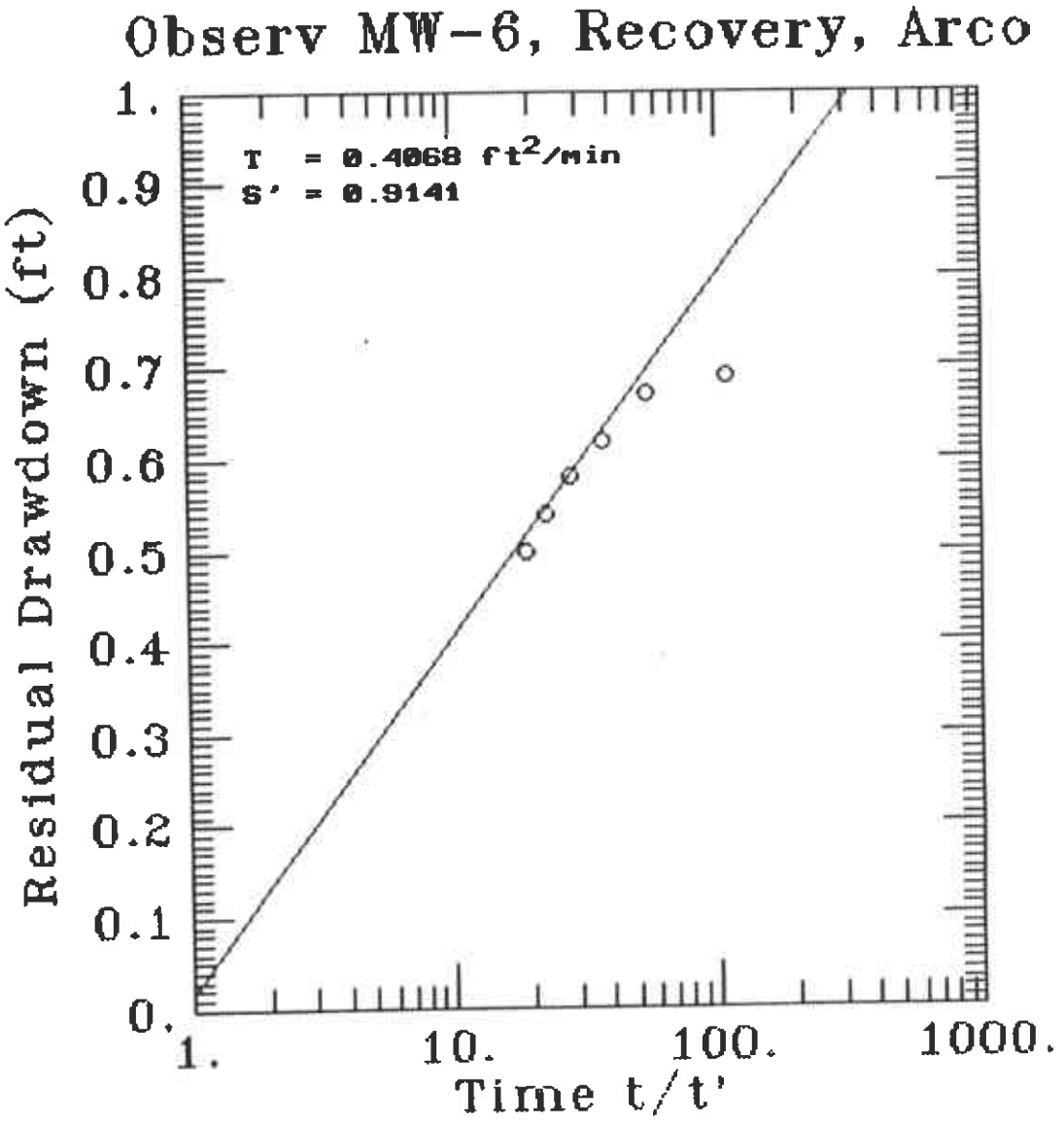
Pumping MW-3, Recovery, Arco 2185




Observ MW-5, Recovery, Arco 2185
T = 0.4502 ft²/min
S' = 0.3985
Residual Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
1.
10.
100.
1000.
Time t/t'

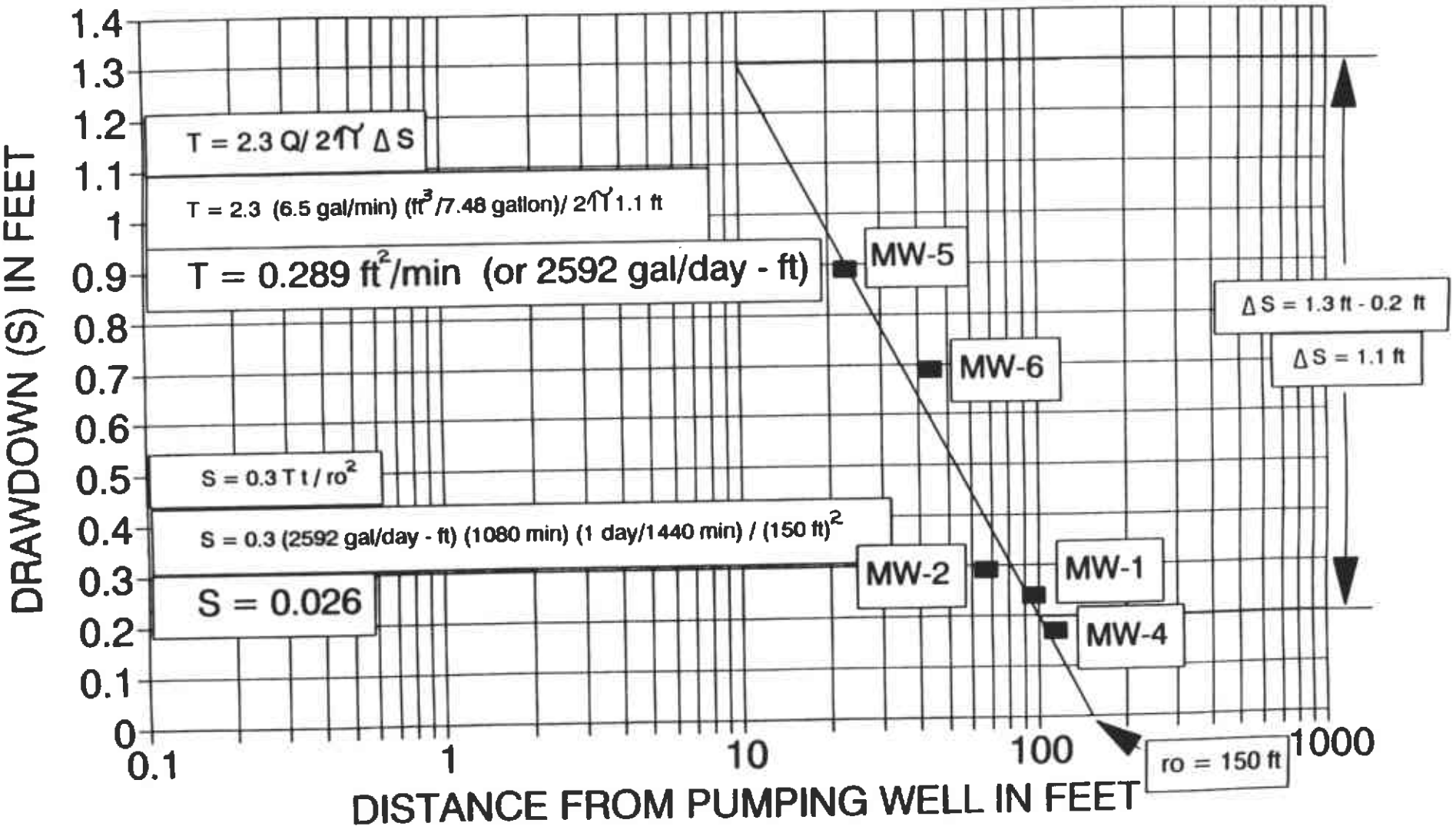

Observ MW-5, Recovery, Arco 2185
T = 0.3561 ft²/min
S' = 0.8459
Residual Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
1.
10.
100.
1000.
Time t/t'


Observ MW-6, Recovery, Arco 2185
T = 0.4987 ft²/min
S' = 0.6704
Residual Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
1.
10.
100.
1000.
Time t/t'


Observ MW-6, Recovery, Arco 2185
T = 0.4068 ft²/min
S' = 0.9141
Residual Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
1.
10.
100.
1000.
Time t/t'

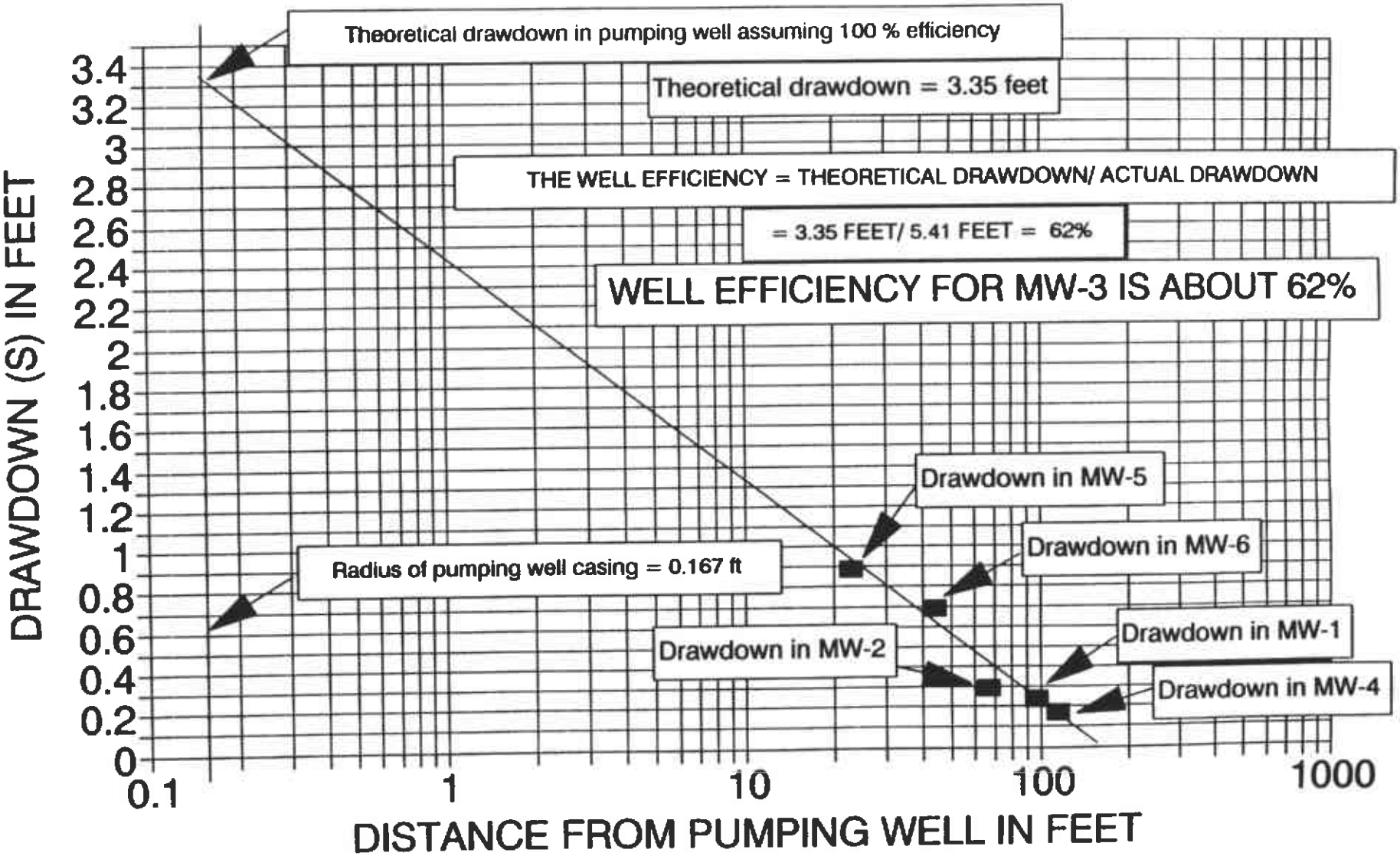
DISTANCE VERSUS DRAWDOWN PLOT

ARCO 2185, OAKLAND, CALIFORNIA



ESTIMATION OF WELL EFFICIENCY

ARCO 2185, OAKLAND, CALIFORNIA



RESNA
Working to Restore Nature

APPENDIX H

LABORATORY ANALYSES REPORTS AND CHAIN OF CUSTODY RECORDS FOR SOIL SAMPLES

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Project: 2185-92-2A/Arco 2185, Oakland

Enclosed are the results from 1 soil sample received at Sequoia Analytical on January 25,1993. The requested analyses are listed below:

3A15501	Soil, 0121-SPA	1/21/93	EPA 5030/8015/8020 TCLP Metals TCLP Extract STLC Lead Flashpoint pH Reactivity

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

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	2185-92-2A/Arco 2185, Oakland	Sampled:	Jan 21, 1993
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil composite, 0121-SPA-D	Relogged:	Jan 25, 1993
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	Jan 26, 1993
Attention: Joel Coffman	First Sample #:	3A15501		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 3A15501 0121-SPA-D
Purgeable Hydrocarbons	1.0	14
Benzene	0.0050	0.021
Toluene	0.0050	0.022
Ethyl Benzene	0.0050	0.10
Total Xylenes	0.0050	0.13
Chromatogram Pattern:		Gas _ Non-gas C4 - C12

Quality Control Data

Report Limit Multiplication Factor:	1.0
Date Analyzed:	1/22/93
Instrument Identification:	GCHP-7
Surrogate Recovery, %: (QC Limits = 70-130%)	120

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	2185-92-2A/Arco 2185, Oakland	Sampled:	Jan 21, 1993
3315 Almaden Expwy., Suite 34	Sample Matrix:	TCLP Extract of Soil composite	Relogged:	Jan 25, 1993
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	Jan 26, 1993
Attention: Joel Coffman	First Sample #:	3A15501	Revised:	May 19, 1993

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 3A15501 0121-SPA-D
Purgeable Hydrocarbons	50.0	N.D.
Benzene	0.50	N.D.
Toluene	0.50	N.D.
Ethyl Benzene	0.50	N.D.
Total Xylenes	0.50	11
Chromatogram Pattern:		Weathered gas

Quality Control Data

Report Limit Multiplication Factor:	20
Date Analyzed:	1/26/93
Instrument Identification:	GCHP-2
Surrogate Recovery, %: (QC Limits = 70-130%)	100

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	2185-92-2A/Arco 2185, Oakland	Sampled:	Jan 21, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Extract of Soil Sample	Relogged:	Jan 25, 1993
San Jose, CA 95118		0121-SPA		
Attention: Joel Coffman	Lab Number:	3A15501	Analyzed:	Jan 25, 1993
			Reported:	Jan 26, 1993

TCLP METALS

Analyte	EPA HW No.	Detection Limit	Chronic Toxicity Reference Level	Regulatory Level	Sample Results
		mg/L (ppm)	mg/L (ppm)	mg/L (ppm)	mg/L (ppm)
Arsenic	D004	0.0050	0.05	5.0	N.D.
Barium	**D005**	**0.10**	**1**	**100**	**1.5**
Cadmium	D006	0.010	0.01	1.0	N.D.
Chromium	D007	0.010	0.05	5.0	N.D.
Lead	D008	0.0050	0.05	5.0	N.D.
Mercury	D009	0.00020	0.002	0.2	N.D.
Selenium	D010	0.0050	0.01	1.0	N.D.
Silver	D011	0.010	0.05	5.0	N.D.

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	2185-92-2A/Arco 2185, Oakland	Sampled:	Jan 21, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, composite	Relogged:	Jan 25, 1993
San Jose, CA 95118		0121-SPA-D	Extracted:	Jan 22, 1993
Attention: Joel Coffman	Lab Number:	3A15501	Reported:	Jan 26, 1993

INORGANIC PERSISTENT AND BIOACCUMULATIVE TOXIC SUBSTANCES

	Soluble Threshold Limit Concentration (Waste Extraction Test)			Total Threshold Limit Concentration		
Analyte	STLC Max. Limit (mg/L)	Detection Limit (mg/L)	Analysis Result (mg/L)	TTLC Max. Limit (mg/kg)	Detection Limit (mg/kg)	Analysis Result (mg/kg)
Antimony	15	0.10	-	500	5.0	-
Arsenic	5.0	0.10	-	500	5.0	-
Barium	100	0.10	-	10,000	5.0	-
Beryllium	0.75	0.010	-	75	0.50	-
Cadmium	1.0	0.010	-	100	0.50	-
Chromium (VI)	5.0	0.0050	-	500	0.050	-
Chromium (III)	560	0.010	-	2,500	0.50	-
Cobalt	80	0.050	-	8,000	2.5	-
Copper	25	0.010	-	2,500	0.50	-
Lead	5.0	0.10	-	1,000	5.0	-
Mercury	0.20	0.00020	N.D.	20	0.010	-
Molybdenum	350	0.050	-	3,500	2.5	-
Nickel	20	0.050	-	2,000	2.5	-
Selenium	1.0	0.10	-	100	5.0	-
Silver	5.0	0.010	-	500	0.50	-
Thallium	7.0	0.10	-	700	5.0	-
Vanadium	24	0.050	-	2,400	2.5	-
Zinc	250	0.010	-	5,000	0.50	-
Asbestos	-	10	-	10,000	100	-
Fluoride	180	0.10	-	18,000	1.0	-

TTLC results are reported as mg/kg of wet weight. Asbestos results are reported as fibers/g.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	2185-92-2A/Arco 2185, Oakland	Sampled:	Jan 21, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, 0121-SPA	Relogged:	Jan 25, 1993
San Jose, CA 95118			Analyzed:	see below
Attention: Joel Coffman	Lab Number:	3A15501	Reported:	Jan 26, 1993

LABORATORY ANALYSIS

Analyte	Date Analyzed	Detection Limit	Sample Result
Flashpoint, ° C	1/26/93	N.A.	>100
pH, units	1/22/93	N.A.	7.4

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	2185-92-2A/Arco 2185, Oakland	Sampled:	Jan 21, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, 0121-SPA	Relogged:	Jan 25, 1993
San Jose, CA 95118			Analyzed:	Jan 25, 1993
Attention: Joel Coffman	Lab Number:	3A15501	Reported:	Jan 26, 1993

REACTIVITY

Analyte	Detection Limit	Sample Results
Reactivity:		
Sulfide, mg/kg	10	N.D.
Cyanide, mg/kg	0.50	N.D.
Reaction with water	N.A.	Negative

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: 2185-92-2A/Arco 2185, Oakland

QC Sample Group: 3A15501A-D

Reported: Jan 26, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	E. Cunanan	E. Cunanan	E. Cunanan	E. Cunanan
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jan 22, 1993	Jan 22, 1993	Jan 22, 1993	Jan 22, 1993
QC Sample #:	G9301220-01A	G9301220-01A	G9301220-01A	G9301220-01A
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.15	0.15	0.16	0.45
Matrix Spike % Recovery:	75	75	80	75
Conc. Matrix Spike Dup.:	0.15	0.15	0.15	0.43
Matrix Spike Duplicate % Recovery:	75	75	75	72
Relative % Difference:	0.0	0.0	6.5	4.5

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: 2185-92-2A/Arco 2185, Oakland

QC Sample Group: 3A15501A-D

Reported: Jan 26, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M. Nipp	M. Nipp	M. Nipp	M. Nipp
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Jan 26, 1993	Jan 26, 1993	Jan 26, 1993	Jan 26, 1993
QC Sample #:	G9301137-01C	G9301137-01C	G9301137-01C	G9301137-01C
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	10	11	10	31
Matrix Spike % Recovery:	100	110	100	103
Conc. Matrix Spike Dup.:	10	11	10	31
Matrix Spike Duplicate % Recovery:	100	110	100	103
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

Maria Lee
Project Manager

$$\text{\% Recovery:} \quad \frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}} \times 100$$

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: 2185-92-2A/Arco 2185, Oakland

QC Sample Group: 3A15501A-D

Reported: Jan 26, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	STLC Lead	TCLP Lead	TCLP Mercury	TCLP Arsenic	TCLP Selenium
Method:	EPA 239.2	EPA 7421	EPA 7471	EPA 7060	EPA 7740
Analyst:	S. Chin	S. Chin	J. Martinez	F. Contreras	f. Contreras
Reporting Units:	mg/L	mg/L	mg/L	mg/L	mg/L
Date Analyzed:	Jan 25, 1993	Jan 25, 1993	Jan 26, 1993	Jan 26, 1993	Jan 26, 1993
QC Sample #:	93010991A	9301121-01A	9301194018	9301155-01A	9301155-01A
Sample Conc.:	N.D.	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.50	0.50	0.0020	0.50	0.50
Conc. Matrix Spike:	0.38	0.42	0.0018	0.56	0.50
Matrix Spike % Recovery:	76	84	90	112	100
Conc. Matrix Spike Dup.:	0.38	0.42	0.0018	0.54	0.51
Matrix Spike Duplicate % Recovery:	76	84	90	108	100
Relative % Difference:	0.0	0.0	0.0	3.6	2.0

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: 2185-92-2A/Arco 2185, Oakland

QC Sample Group: 3A15501A-D

Reported: Jan 26, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	TCLP Beryllium	TCLP Cadmium	TCLP Chromium	TCLP Nickel
Method:	EPA 6010	EPA 6010	EPA 6010	EPA 6010
Analyst:	C. Medefesser	C. Medefesser	C. Medefesser	C. Medefesser
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jan 26, 1993	Jan 26, 1993	Jan 26, 1993	Jan 26, 1993
QC Sample #:	301-1506	301-1506	301-1506	301-1506
Sample Conc.:	N.D.	N.D.	N.D.	0.73
Spike Conc. Added:	1.0	1.0	1.0	1.0
Conc. Matrix Spike:	1.1	1.1	1.0	1.8
Matrix Spike % Recovery:	110	110	100	107
Conc. Matrix Spike Dup.:	1.1	1.1	1.0	1.8
Matrix Spike Duplicate % Recovery:	110	110	100	107
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

Maria Lee
Project Manager

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

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: 2185-92-2A/Arco 2185, Oakland

QC Sample Group: 3A15501A-D

Reported: Jan 26, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Sulfide	Flashpoint	Cyanide	pH
Method:	EPA 9030	EPA 1010	EPA 9010	EPA 9045
Analyst:	K. Follett	K. Follett	A. Savva	Y. Arteaga
Reporting Units:	mg/kg	°C	mg/kg	units
Date Analyzed:	Jan 25, 1993	Jan 26, 1993	Jan 25, 1993	Jan 22, 1993
QC Sample #:	930-1177	930-1155	93011451A	9301121-05A
Sample Conc.:	N.D.	>100	N.D.	6.4
Spike Conc. Added:	1300	N.A.	10	N.A.
Conc. Matrix Spike:	1600	N.A.	9.4	N.A.
Matrix Spike % Recovery:	123	N.A.	94	N.A.
Conc. Matrix Spike Dup.:	1500	>100	9.9	6.5
Matrix Spike Duplicate % Recovery:	115	N.A.	99	N.A.
Relative % Difference:	6.5	0.0	5.2	1.6

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

$$\text{\% Recovery:} \quad \frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}} \times 100$$

ARCO Products Company
Division of Atlantic Richfield Company

Chain of Custody

Task Order No. 2185-92-AH

ARCO Facility no. 2185	City (Facility) OAKLAND	Project manager (Consultant) JOEL COFFMAN	Laboratory name SEQUOIA
ARCO engineer Mike WHELAN	Telephone no. (ARCO) (415) 571-7555	Telephone no. (Consultant) (408) 261-7723	Fax no. (Consultant) (408) 261-2435
Consultant name RESNA INDUSTRIES INC	Address (Consultant) 3315 ALMADEN EXPY, SUITE 34, S.J. 95118		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX / TCLP 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☒ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	RCI	STLC Pb
0121-SP-A			✓			✓		1/21	Composite				9302		1554-01						✓	
0121-SP-B			✓			✓		1/21		4 to 1	✓							✓			✓	✓
0121-SP-C			✓			✓		1/21														
0121-SP-D			✓			✓		1/21							↓							

Special detection Limit/reporting

Special QA/QC

Remarks: Composite 4 to 1 for Analysis

Lab number

Method of shipment

Turnaround time
- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☒
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

Condition of sample:

Temperature received:

	Date	Time	
Relinquished by sampler: Robert D. Schaff	1-21-93	1045	Received by: Patrick Wilk
Relinquished by: [illegible]	1-21-93	1140	Received by:
Relinquished by:	Date	Time	Received by laboratory: [signature] Date 1-22-93 Time 1140

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

APPC-3292 (2-91)

SEQUOIA ANALYTICAL

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

FEB

RESNA - San Jose
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Project: ARCO 2185, Oakland

Enclosed are the results from 4 soil samples received at Sequoia Analytical on January 22.1993. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
3A27101	Soil, S-6-B13	1/20/93	EPA 5030/8015/8020
3A27102	Soil, S-11-813	1/20/93	EPA 5030/8015/8020
3A27103	Soil, S-6-B14	1/20/93	EPA 5030/8015/8020
3A27104	Soil, S-11.5-B14	1/20/93	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

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA - San Jose
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: ARCO 2185, Oakland
Sample Matrix: Soil
Analysis Method: EPA 5030/8015/8020
First Sample #: 3A27101

Sampled: Jan 20, 1993
Received: Jan 22, 1993
Reported: Feb 2, 1993

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 3A27101 S-6-B13	Sample I.D. 3A27102 S-11-813	Sample I.D. 3A27103 S-6-B14	Sample I.D. 3A27104 S-11.5-B14	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	1.0	N.D.	N.D.	N.D.	43		
Benzene	0.0050	N.D.	N.D.	N.D.	0.12		
Toluene	0.0050	N.D.	N.D.	N.D.	0.062		
Ethyl Benzene	0.0050	N.D.	N.D.	N.D.	0.48		
Total Xylenes	0.0050	N.D.	N.D.	N.D.	0.58		
Chromatogram Pattern:		--	--	--	Gas		

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0
Date Analyzed:	1/26/93	1/26/93	1/26/93	1/27/93
Instrument Identification:	GCHP-7	GCHP-7	GCHP-7	GCHP-7
Surrogate Recovery, %: (QC Limits = 70-130%)	95	99	96	115

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA - San Jose
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: ARCO 2185, Oakland

QC Sample Group: 3A27101-04

Reported: Feb 2, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R. Geckler	R. Geckler	R. Geckler	R. Geckler
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jan 26, 1993	Jan 26, 1993	Jan 26, 1993	Jan 26, 1993
QC Sample #:	3A21301	3A21301	3A21301	3A21301
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.17	0.16	0.16	0.48
Matrix Spike % Recovery:	85	80	80	80
Conc. Matrix Spike Dup.:	0.16	0.16	0.16	0.47
Matrix Spike Duplicate % Recovery:	80	80	80	78
Relative % Difference:	6.1	0.0	0.0	2.1

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

$$\%\ \text{Recovery:} = \frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$$

$$\text{Relative \% Difference:} = \frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}} \times 100$$

ARCO Products Company — Division of AtlanticRichfieldCompany

Task Order No. 2185-92-2A

Chain of Custody

ARCO Facility no: 2185 | City (Facility): OAKLAND | Project manager (Consultant): JOEL COFFMAN | Laboratory name: SEQUOIA

ARCO engineer: MIKE WHELAN | Telephone no. (ARCO): (415) 571-7435 | Telephone no. (Consultant): (408) 264-7723 | Fax no. (Consultant): (408) 264-2435 | Contract number: 07-073

Consultant name: RESNA INDUSTRIES INC | Address (Consultant): 3315 ALMADEN EXPY, SUITE 34, SAN JOSE 95118

Method of shipment:

Sample I.D.	Lab no.	Container no	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH Gas EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		HOLD
S-6-B13			✓			✓		1/20			✓					9301271 01						
S-15-B13			✓			✓		1/20														X
S-11-B13			✓			✓		1/20			✓					02						
S-16-B13			✓			✓		1/20														X
S-17.5-B13			✓			✓		1/20														X
S-26-B13			✓			✓		1/20														X
S-31-B13			✓			✓		1/20														X
S-6-B14			✓			✓		1/21			✓					03						
S-10-B14			✓			✓		1/21														X
S-11.5-B14			✓			✓		1/21			✓					04						
S-13-B14			✓			✓		1/21														X
S-16-B14			✓			✓		1/21														X
S-21-B14			✓			✓		1/21														X
S-26-B14			✓			✓		1/21														X
S-30-B14			✓			✓		1/21														X

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Condition of sample: GOOD | Temperature received: COOL

Relinquished by sampler	Date	Time	Received by
Robert B. Campbell	1-22-93	1045	Patrick Wilk
Relinquished by	**Date**	**Time**	**Received by**
Patrick Wilk	1-22-93	1140	
Relinquished by	**Date**	**Time**	**Received by laboratory**
			[illegible] — Date 1/22/93 — Time 1140

Turnaround time

- Priority Rush 1 Business Day [ ]
- Rush 2 Business Days [ ]
- Expedited 5 Business Days [ ]
- Standard 10 Business Days [X]

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

APPC-3292 (2-91)

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Erin McLucas

Project: Arco 2185, Oakland

Enclosed are the results from 1 soil composite sample received at Sequoia Analytical on May 5,1993. The requested analyses are listed below:

3E10901	Soil, 0504-SP (A-D)	5/4/93	STLC Lead Corrosivity Ignitability Reactivity TCLP - EPA 5030/8020 EPA 5030/8015

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

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco 2185, Oakland	Sampled: May 4, 1993
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil Composite, TCLP Extract	Received: May 5, 1993
San Jose, CA 95118	Analysis Method:	EPA 5030/8020	Reported: May 10, 1993
Attention: Erin McLucas	First Sample #:	3E10901	

BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 3E10901 0504-SP (A-D)
Benzene	50	N.D.
Toluene	0.50	N.D.
Ethyl Benzene	0.50	N.D.
Total Xylenes	0.50	N.D.

Quality Control Data

Report Limit Multiplication Factor:	20
Date Analyzed:	5/7/93
Instrument Identification:	GCHP-3
Surrogate Recovery, %: (QC Limits = 70-130%)	84

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco 2185, Oakland	Sampled:	May 4, 1993
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil Composite	Received:	May 5, 1993
San Jose, CA 95118	Analysis Method:	EPA 5030/8015	Reported:	May 17, 1993
Attention: Erin McLucas	First Sample #:	3E10901		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS

Analyte	Reporting Limit mg/kg	Sample I.D. 3E10901 0504-SP (A-D)	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	1.0	N.D.					
Chromatogram Pattern:		--					

Quality Control Data

Report Limit Multiplication Factor:	1.0
Date Analyzed:	5/13/93
Instrument Identification:	GCHP-7
Surrogate Recovery: (QC Limits = 70-130%)	100

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
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RESNA	Client Project ID:	Arco 2185, Oakland	Sampled:	May 4, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	STLC Extract of Soil	Received:	May 5, 1993
San Jose, CA 95118			Analyzed:	see below
Attention: Erin McLucas	Lab Number:	3E10901	Reported:	May 10, 1993

LABORATORY ANALYSIS

Analyte	Date Analyzed	Detection Limit mg/L	Sample Result mg/L
Lead	5/10/93	0.10	0.16

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco 2185, Oakland	Sampled:	May 4, 1993
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil Composite	Received:	May 5, 1993
San Jose, CA 95118			Analyzed:	5/5, 5/6/93
Attention: Erin McLucas	Lab Number:	3E10901	Reported:	May 10, 1993

CORROSIVITY, IGNITABILITY, AND REACTIVITY

Analyte	Detection Limit	Sample Results
Corrosivity:		
pH	N.A.	7.4
Ignitability:		
Flashpoint (Pensky-Martens), °C	N.A.	> 100 °C
Reactivity:		
Sulfide, mg/kg	13	N.D.
Cyanide, mg/kg	0.50	N.D.
Reaction with water	N.A.	Negative

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Erin McLucas

Client Project ID: Arco 2185, Oakland
Matrix: TCLP Extract of Soil

QC Sample Group 3E10901

Reported: May 10, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M. Nipp	M. Nipp	M. Nipp	M. Nipp
Conc. Spiked:	10	10	10	30
Units:	µg/L	µg/L	µg/L	µg/L
LCS Batch#:	BLK050793	BLK050793	BLK050793	BLK050793
Date Prepared:	N/A	N/A	N/A	N/A
Date Analyzed:	5/7/93	5/7/93	5/7/93	5/7/93
Instrument I.D.#:	GCHP-3	GCHP-3	GCHP-3	GCHP-3
LCS % Recovery:	80	83	81	80
Control Limits:	80-120	80-120	80-120	80-120
MS/MSD Batch #:	3E15402	3E15402	3E15402	3E15402
Date Prepared:	N/A	N/A	N/A	N/A
Date Analyzed:	5/7/93	5/7/93	5/7/93	5/7/93
Instrument I.D.#:	GCHP-3	GCHP-3	GCHP-3	GCHP-3
Matrix Spike % Recovery:	94	95	93	93
Matrix Spike Duplicate % Recovery:	95	96	94	93
Relative % Difference:	1.1	1.0	1.1	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Erin McLucas

Client Project ID: Arco 2185, Oakland
Matrix: Soil

QC Sample Group 3E10901

Reported: May 10, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Lead STLC	Cyanide	R-Sulfide
Method:	EPA 7421	EPA 9010	EPA 9030
Analyst:	S. Chin	A. Savva	K. Follett
Conc. Spiked:	0.030	3.4	10
Units:	mg/L	mg/kg	mg/kg
LCS Batch#:	ICV051093	LCS050693	LCS050693
Date Prepared:	5/7/93	5/6/93	5/6/93
Date Analyzed:	5/10/93	5/6/93	5/6/93
Instrument I.D.#:	MV-1	N/A	N/A
LCS % Recovery:	97	91	87
Control Limits:	75-125	80-120	80-120
MS/MSD Batch #:	3E10901	3E00901	3E00901
Date Prepared:	5/10/93	5/5/93	5/5/93
Date Analyzed:	5/10/93	5/5/93	5/5/93
Instrument I.D.#:	MV-1	N/A	N/A
Matrix Spike % Recovery:	95	90	100
Matrix Spike Duplicate % Recovery:	95	91	100
Relative % Difference:	0.0	1.1	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Erin McLucas

Client Project ID: Arco 2185, Oakland
Matrix: Soil

QC Sample Goup: 3E10901

Reported: May 10, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	pH	Flashpoint
Method:	EPA 9040	EPA 1010
Analyst:	Y. Arteaga	K. Follett
Units:	N/A	N/A
Date:	5/5/93	5/6/93
Sample #:	3E04001	3E09901
Sample Concentration:	77	> 100 °C
Sample Duplicate Concentration:	77	> 100 °C
% RPD:	0.0	0.0
Control Limits:	0-30	± 5 °C

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Erin McLucas

Client Project ID: Arco 2185, Oakland
Matrix: Soil Composite

QC Sample Group: 3E10901

Reported: May 17, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M. Nipp	M. Nipp	M. Nipp	M. Nipp
Conc. Spiked:	10	10	10	30
Units:	µg/L	µg/L	µg/L	µg/L
LCS Batch#:	BLK051793	BLK051793	BLK051793	BLK051793
Date Prepared:	N/A	N/A	N/A	N/A
Date Analyzed:	5/17/93	5/17/93	5/17/93	5/17/93
Instrument I.D.#:	GCHP-2	GCHP-2	GCHP-2	GCHP-2
LCS % Recovery:	100	100	100	100
Control Limits:	80-120	80-120	80-120	80-120
MS/MSD Batch #:	3E37003	3E37003	3E37003	3E37003
Date Prepared:	N/A	N/A	N/A	N/A
Date Analyzed:	5/17/93	5/17/93	5/17/93	5/17/93
Instrument I.D.#:	GCHP-2	GCHP-2	GCHP-2	GCHP-2
Matrix Spike % Recovery:	97	95	98	93
Matrix Spike Duplicate % Recovery:	100	100	100	100
Relative % Difference:	3.0	5.1	2.0	6.9

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

ARCO Products Company

Division of AtlanticRichfieldCompany

Chain of Custody

Task Order No. 2185-92-2A

ARCO Facility no. 2185	City (Facility) OAKLAND	Project manager (Consultant) ERIN MCLUCAS	Laboratory name SEQUOIA
ARCO engineer MIKE WHELAN	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 441-7723	Fax no. (Consultant) (408) 261-2435
Consultant name RESNA INDUSTRIES	Address (Consultant) 3315 ALMADEN EXPY, SUITE 34, SAN JOSE CA 95118		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☒ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	Lead STLC	RCI
SB04-SP-A			✓			✓		5-1-93	(composite 4 to 1)					13	05	09	01A				✓	
SB04-SP-B			✓			✓		5-1-93				✓					01B				✓	✓
SB04-SP-C			✓			✓		5-1-93									01C					
SB04-SP-D			✓			✓		5-1-93									01D					

Special detection Limit/reporting

Special QA/QC

Remarks

Composite 4 to 1

Lab number

Turnaround time

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

Condition of sample:

Temperature received:

	Date	Time	
Relinquished by sampler: Erin D. McLucas	5-5-93		Received by: R. Schick 5/5/93 1015
Relinquished by: R. Schick	5/5/93	1015	Received by:
Relinquished by:	Date	Time	Received by laboratory: Date: Time:

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

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SEQUOIA ANALYTICAL

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Erin McLucas

Project: Arco 2185, Oakland

Enclosed are the results from 2 soil samples received at Sequoia Analytical on May 5,1993. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
3E26801	Soil, S-5-B15	5/4/93	EPA 5030/8015/8020
3E26802	Soil, S-10.5-B15	5/4/93	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

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	Arco 2185, Oakland	Sampled:	May 4, 1993
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil	Received:	May 5, 1993
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	May 16, 1993
Attention: Erin McLucas	First Sample #:	3E26801		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 3E26801 S-5-B15	Sample I.D. 3E26802 S-10.5-B15	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	1.0	N.D.	N.D.				
Benzene	0.0050	N.D.	N.D.				
Toluene	0.0050	N.D.	N.D.				
Ethyl Benzene	0.0050	N.D.	N.D.				
Total Xylenes	0.0050	N.D.	N.D.				
Chromatogram Pattern:		--	--				

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0
Date Analyzed:	5/11/93	5/11/93
Instrument Identification:	GCHP-6	GCHP-6
Surrogate Recovery, %: (QC Limits = 70-130%)	100	79

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

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager