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SUBSURFACE ENVIRONMENTAL INVESTIGATION AND PUMP TEST

at

ARCO Station 2035
1001 San Pablo Avenue
Albany, California

3-6-91

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Report prepared for

ARCO Products Company
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by

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For ARCO Products Company

INTRODUCTION

At the request of ARCO Products Company (ARCO), RESNA Industries, Inc. (RESNA) performed a subsurface environmental investigation and aquifer pump test at ARCO Station 2035, located at 1001 San Pablo Avenue in Albany, California. This investigation was initiated in response to the results of previous investigations conducted at the site. The purpose of this investigation was to further delineate the lateral and vertical extent of hydrocarbons in the subsurface soil, to investigate the possible impact to first-encountered groundwater, to evaluate the gradient of the first encountered groundwater beneath the site, and to collect hydrologic data necessary for evaluation of the feasibility and design of future remediation systems.

The work performed for this investigation included performing research for water supply and monitoring wells within a ½-mile radius of the site, performing a records research to identify potential secondary sources for hydrocarbons detected in soil and groundwater at the site, drilling four soil borings, collecting and describing soil samples from the borings, installing and developing one 6-inch and three 4-inch diameter groundwater monitoring wells in the borings, measuring groundwater levels, sampling groundwater from the monitoring wells, laboratory analysis of selected soil and groundwater samples, surveying wellhead elevations, performing an aquifer pump test, and preparing this report presenting field procedures, results and conclusions. This work was performed as outlined in the RESNA/Applied

GeoSystems (AGS) Work Plan (AGS, April 29, 1991), and Addendum Two to Work Plan (RESNA/AGS, September 24, 1991).

SITE DESCRIPTION AND BACKGROUND

General

ARCO Station 2035 is an operating service station located southeast of the intersection of Marin and San Pablo Avenues at 1001 San Pablo Avenue, Albany, California. The location of the site is shown on Plate 1, Site Vicinity Map. The site is a relatively flat, asphalt-and concrete-covered lot.

Four underground gasoline-storage tanks were excavated and removed from the site in July and August 1991, including one 6,000-gallon underground gasoline-storage tank (T1), two 4,000-gallon underground gasoline-storage tanks (T2 and T3), and one 10,000-gallon underground gasoline-storage tank (T4). A 550-gallon waste-oil tank was removed from the site in 1977 during ARCO's conversion of the station to a mini-market. The removed gasoline-storage tanks were replaced with four 10,000 gallon gasoline-storage tanks (T1 through T4). The approximate locations of the underground storage tanks (USTs), former waste-oil tank, and other pertinent features at the site are shown on Plate 2, Generalized Site Plan.

Regional and Local Hydrogeology

ARCO Station 2035 is located within the East Bay Plain in the north-central portion of the Berkeley Alluvial Plain (Hickenbottom and Muir, 1988). The active Hayward Fault is approximately 2 miles east of the site. Helley et al. (1979) mapped the earth materials underlying the site area as older Quaternary alluvium deposits composed of a heterogeneous mixture of poorly consolidated to unconsolidated clay, silt, sand and gravel. The site is less than 1,200 feet north of the Codornices Creek and approximately 1 mile east of Fleming Point on the eastern shoreline of the San Francisco Bay. The direction of groundwater flow

in the vicinity of the site is inferred to be to the west-southwest, based on regional and local topography and drainage patterns.

WELL RESEARCH

Information regarding water wells in the vicinity of the site has been researched and was provided to RESNA by the Alameda County Flood Control and Water Conservation District (ACFCWCD).

The research was performed for the area within ½-mile radius of the site in order to evaluate groundwater usage in the vicinity of the site. Records exist with ACFCWCD for 10 wells within ½-mile of the site; three cathodic protection wells, three monitoring wells, and four test wells. Locations of wells within the ½-mile radius of the site are shown on Plate 3, Well Location Map.

Two of the cathodic protection wells belong to Pacific Gas and Electric (PG&E) and are 120 feet deep. One is located ½-mile north of the site and the other ½-mile southeast of the site. The third cathodic protection well belongs to Exxon Oil Company. It is approximately 50 feet deep and is located approximately 1,500 feet north of the site. All monitoring and test wells belong to Shell Oil Company, and are located approximately 500 feet north and directly across Marin Avenue from the site. Monitoring wells are approximately 12 feet deep and depth-to-water (DTW) in the wells is approximately 8 feet. Test wells range in depth from 14 to 16 feet below ground surface and DTW is approximately 6 to 12 feet.

PRELIMINARY RECORDS RESEARCH

A records research of the City of Albany Fire Department and ACFCWCD files to locate possible secondary sources for hydrocarbons detected in the soil and groundwater at the site was performed. The information gathered from the record research identified four facilities upgradient, crossgradient and downgradient from the subject site. The closest secondary sources to the subject site are: (1) Shell service station located at 999 San Pablo Avenue, Albany, California, (2) Nickson Auto Repair located at 1111 San Pablo Avenue, Albany,

California, and (3) Foreign Auto Center, 1197 San Pablo Avenue, Berkeley, California. The fourth secondary source is E.C. Buehrer and Associates, Inc. located on the Eastshore Highway, Albany, California. These potential sources of petroleum hydrocarbon impact are all within 1,500 feet of the subject site, and have a history of known leaks or spills. This information was gathered from verbal communication, file, and record researches and is presented in the References portion of this report.

PREVIOUS WORK

Previous subsurface environmental investigations which were performed at the site are summarized in Appendix A.

FIELD WORK

Drilling

Field work at the site was conducted in accordance with the field protocol and the Site Safety Plan (RESNA, June 24, 1991). A description of the field methods is included in Appendix B, Field Methods. A well construction permit was acquired from the Alameda County Flood Control and Water Conservation District (ACFCWCD) prior to drilling at the site. A copy of the permit is included in Appendix C, Well Construction Permit. On October 14 through 16, 1991, four soil borings (B-8 through B-11) were drilled and four groundwater wells (RW-1, and MW-1 through MW-3) were constructed in the borings to further evaluate the presence and extent of gasoline hydrocarbons in soil and groundwater beneath the site and to collect hydrologic data necessary for evaluation of aquifer characteristics. Soil boring B-8 was drilled northwest (downgradient) of the former underground gasoline-storage tanks and converted to a 6-inch diameter groundwater monitoring/recovery well (RW-1). Soil boring B-9 was drilled northeast (crossgradient) of the former gasoline-storage tanks and converted to a 4-inch diameter groundwater monitoring well (MW-1). Soil boring B-10 was drilled northwest (downgradient) of the northern end of the western service island where the concentration of 4,200 parts per million (ppm) of total petroleum hydrocarbons as gasoline (TPHg) was encountered in the soil sample collected from the product line trench during a previous investigation, and a 4-inch

diameter groundwater monitoring well (MW-2) was constructed in the boring. Soil boring B-11 was drilled in the location of the former waste-oil tank and converted to a 4-inch diameter monitoring well (MW-3) to evaluate the presence and extent of possible gasoline and waste-oil impaction in the soil and groundwater at this location. The locations of the borings/wells are indicated on Plate 2.

Soil Sampling and Description

A total of 27 soil samples were collected from the soil borings B-8 through B-11 for description and possible laboratory analysis. A summary of the Unified Soil Classification System used to identify the soil encountered during drilling is presented on Plate 4, and the description of the soil encountered in the borings is presented on the Logs of Borings, Plates 5 through 12. Soil samples from borings were collected at intervals of 5 feet or less from the ground surface to a depth of 30.5 feet in boring B-8, 31½ feet in boring B-9, 33 feet in B-10, and 34½ feet in B-11. Sampling procedures are described in Appendix B. Field measure of organic vapors were also measured with an organic vapor meter (OVM) which provides a qualitative only field analysis of organic vapor content from selected soil samples. OVM readings are also shown on the boring logs.

Monitoring and Extraction Well Construction and Development

A recovery well (RW-1) was constructed in boring B-8, and three groundwater monitoring wells (MW-1 through MW-3) were constructed in borings B-9 through B-11, respectively. The recovery well RW-1 was completed with 6-inch-diameter, Schedule 80, polyvinyl chloride (PVC) casing. The groundwater monitoring wells MW-1 through MW-3 were completed with 4-inch-diameter, Schedule 40, PVC casing. Well casings were set in the wells RW-1, and MW-1 through MW-3 to depths of approximately 26, 30, 29, and 32.5 feet below ground surface, respectively. The screened casings for the monitoring wells consist of 6-inch-diameter (RW-1) and 4-inch-diameter (MW-1 through MW-3), 0.020 inch-wide machine-slotted PVC set from the total depth of the well to approximately 11, 15, 20, and 12.5 feet below the ground surface in RW-1, and MW-1 through MW-3, respectively. Blank PVC casing was set from the top of the screened casing to within a few inches below the ground surface. The monitoring wells were developed on October 25, 1991, to remove fine-

grained sediments and allow better communication between the water-bearing zone and the groundwater monitoring well. Details regarding well construction and development are described in Appendix B.

Groundwater Level Measurement and Sampling

Recovery well RW-1 and groundwater monitoring wells MW-1 through MW-3 were monitored on October 29, November 7, and November 14, 1991. DTW were measured in the groundwater monitoring wells and water samples were collected and visually inspected for floating product. Groundwater monitoring wells MW-1 through MW-3 were purged and sampled on October 29, 1991. Samples were submitted to a State-certified laboratory in accordance with Chain of Custody protocol. Recovery well RW-1 was not sampled due to the presence of a sheen of floating product in the well. Appendix B contains a description of subjective analyses and groundwater sampling procedures.

On October 29, 1991, the wellheads for the new and existing groundwater monitoring wells were surveyed to a local National Geodetic Vertical Datum benchmark by John E. Koch, a licensed surveyor. The results of this wellhead survey are included in Appendix D, Wellhead Survey. Groundwater elevations for the wells without floating product were calculated by subtracting the measured depth-to-water from the elevation of the wellhead top of casing. Groundwater elevation for the recovery well RW-1, which contained product, was calculated by multiplying the product thickness in feet by an average product to water conversion factor of 0.8. The result is then subtracted from the original DTW measurement. The groundwater elevation in the recovery well RW-1 was then calculated by subtracting the corrected DTW from the wellhead elevation.

Pumping and Recovery Tests Methods

A step-drawdown test was performed on November 7, 1991, to determine the optimum pumping rate at which to perform the aquifer pump test. The well could easily sustain a pumping rate of 1 gallon per minute (gpm), with a drawdown of 2.7 ft after one hour of pumping. At 2 gpm, the drawdown in well RW-1 was 8.7 ft after 1 hour. It was proposed that this rate would be slightly too high for the long-term test and a pumping rate of 1.7

gpm was selected for the constant discharge pumping test. The pumped water was stored in a 4,000 gallon Baker tank which remained onsite for the duration of the aquifer pump test.

An 18-hour pump test and 6-hour recovery test were conducted on November 14 and 15, 1991. Water levels and thickness of free product were measured prior to start of the test. Recovery well RW-1 was used as the pumping well, and wells MW-1 through MW-3 were used as observation wells. Well RW-1 was chosen as the well to be pumped because of its location within the area just downgradient of the former gasoline-storage tanks. It is the proposed well to be used for future groundwater extraction at the site. A submersible pump was utilized for the test and the pumping rate was adjusted by a valve on the discharge hose. The discharge rate was checked with the use of a calibrated 1-gallon bucket and stopwatch. The discharge water was contained in the 4,000 gallon Baker tank temporarily placed onsite. Pumping continued approximately 18 hours, with a total discharge of 2,500 gallons, which were properly disposed by a licensed waste hauler under manifest and the 4,000 gallon Baker tank was removed within one day after the end of the pumping test. A copy of the manifest is included in Appendix E, Waste Manifest Forms.

Water level readings were measured at 30-minute intervals during the duration of the test and during the recovery portion of the test. As a check on the manual readings, water levels were also recorded at five-minute intervals with an In-Situ Hermit Datalogger attached to pressure transducers in monitoring wells RW-1, and MW-1 through MW-3. Well RW-1 was initially pumped at a rate of 1.64 gpm. However, clogging of the valve and flowmeter caused the time-weighted average for the pumping rate to be closer to 1.58 gpm. Greatly increased drawdown was temporarily observed in RW-1 after 335 minutes of pumping when petroleum product was being pumped temporarily from the well. The water level in the well recovered after a few minutes when the product had cleared the pump and line. This free product presumably came from within the confined aquifer because floating product on the free water surface within the well casing was at least 6 feet above the pump intake.

LABORATORY METHODS

All soil and water samples were preserved as required by the applicable analytical method, as proposed in the Addendum Two to Work Plan, and delivered with Chain of Custody Records to Sequoia Analytical Laboratories of Redwood City, California, a state-certified laboratory (Hazardous Waste Testing Laboratory Certification #1210) for soil and water analyses.

Soil Samples

Soil samples collected from borings B-8 through B-11 were analyzed in accordance with ACHCSA requirements for the gasoline constituents benzene, toluene, ethylbenzene, total xylenes (BTEX) and TPHg using modified Environmental Protection Agency (EPA) Methods 5030/8015/8020. Soil boring B-11 was drilled in the vicinity of the former waste-oil tank and soil samples collected from B-11 were also analyzed for cadmium, chromium, lead, nickel, and zinc using EPA Methods 6010 and 7421, halogenated volatile organics using EPA Method 5030/8010, total petroleum hydrocarbons as diesel (TPHd) using EPA Method 3550/8015, and total oil and grease (TOG) using Standard Method (SM) 5520 E&F. The soil samples were selected for laboratory analysis based on:

- Location above first-encountered groundwater;
- Location in a potential confining or perching layer below first-encountered groundwater;
- Areas where the presence of gasoline or waste oil hydrocarbons was suspected;
- At 5-foot intervals and/or change in stratigraphic units, as recommended by California Department of Health Services (DHS) guidelines.

Water Samples

Water samples obtained from the wells MW-1 through MW-3 and RW-1 were analyzed in accordance with Alameda County Health requirements for BTEX and TPHg by modified

EPA Methods 5030/8015/8020. Monitoring well MW-3 was also sampled for lead by EPA Method 3010, cadmium, chromium, nickel, and zinc by EPA Method 200.7; volatile organic compounds (VOC) by EPA Method 624, and total oil and grease by SM 5520 B&F.

FIELD WORK RESULTS

Drilling Observation

The earth materials encountered at the site consisted primarily of silty to gravelly clay and silt interbedded with clayey to silty sand and silty to sandy gravel. Silty to sandy clay and gravelly silt was encountered in the borings B-8 through B-11 immediately below the baserock and extended to the depths of approximately 12 to 15 feet. Below this material clayey to silty sand (interbedded with silty to sandy gravel in borings B-9 and B-10) was present in all borings to the depths of approximately 26 to 30 feet. The groundwater in borings B-8 through B-11 was first encountered within this clayey to silty sand at a depth of 19 to 23 feet below ground surface and stabilized at a depth of approximately 11 to 11½ feet below the ground surface. A stratum of silty clay which can be a perching or confining layer, was encountered in boring B-8 between 26 and 29 feet below ground surface and in borings B-9 and B-10 at the depths 29 and 28 feet, respectively and extended to the total depths of the borings (31½ and 33 feet, respectively). In boring B-11, clayey to silty sand was underlain by silty to sandy gravel with only a small (½ foot thickness) lens of silty clay. Boring B-11 terminated at the depth of 34½ feet below ground surface. These data are summarized in the logs of borings, Plates 5 through 12. Graphic interpretation of the soil encountered beneath the site during this investigation and previous investigations is shown on the geologic Cross Sections A-A', B-B', C-C', and D-D' (Plates 13 through 16). The locations of the geologic sections are shown on Plate 2.

Field OVM measurements of soil samples from boring B-8 ranged from nondetectable up to 5,681 ppm. OVM readings for soil samples collected from boring B-9 ranged from nondetectable to 3,232 ppm. The OVM malfunctioned at 15 feet below ground surface in B-9 and did not function during the drilling of B-11. OVM readings for soil samples collected from boring B-10 ranged from nondetectable to 274 ppm. OVM readings are shown on the boring logs (Plates 5 through 12) in the column labeled PID (photoionization

detector). Field observation of product odor or stain was used to help determine the selection of soil samples for laboratory analysis during the interval the OVM malfunctioned.

Subjective Groundwater Analyses

Monitoring well RW-1 contained a sheen and after development, 0.06 feet of floating product was observed on October 29, 1991. The remaining wells contained no floating product or hydrocarbon sheen. Subjective analyses results for floating product in groundwater are included in Table 1, Cumulative Groundwater Monitoring Data.

Groundwater Gradient

The groundwater gradient evaluated for the first-encountered groundwater at the site and based on groundwater elevations obtained from wells MW-1 through MW-3, and RW-1, is approximately 0.01 (1 foot vertical drop in 100 feet horizontal distance) with the potentiometric surface diverging to the northwest and southwest along a potentiometric axis trending to the northwest. Depths to groundwater and groundwater elevations are reported in Table 1. Plate 17, Groundwater Gradient Map, is a graphic interpretation of the groundwater elevations measured on October 29, 1991. This interpreted gradient is consistent with the gradient on November 14, 1991, in respect to approximate groundwater flow direction. The groundwater elevation contours diverged from the axis on October 29, 1991, and converged on November 14, 1991. Local commercial pumping could influence the fluctuation of the gradient.

Pumping and Recovery Test Results

Prior to the pump test on November 14, 1991, groundwater elevations were again monitored and are reported for time zero in Table 2, Groundwater Level Measurements During The Pump Test. A sheen of floating product was found in monitoring well RW-1 prior to starting the test. Floating product was encountered in RW-1 during the course of the test.

After the step-drawdown test was completed on November 7, 1991, and an initial pumping rate and pump size was determined, an 18-hour pump test and 6-hour recovery test were

conducted on November 14 and 15, 1991. Groundwater recovery well RW-1 was used as the pumping well, and monitoring wells MW-1 through MW-3 were used as the observation wells. Based on the step-drawdown test, well RW-1 was initially set to pump at a rate of 1.7 gpm (= 327 ft^3/d). However, the problems which appeared to be related to clogging of the valve and flowmeter caused the pumping rate to decline necessitating readjustment of the valve. The time-weighted average for the pumping rate was 1.58 gpm. The time-weighted average for the pumping rate for the early portion (first 330 minutes) of the test was 1.64 gpm. During times when the pumping rate would decrease, the water level in RW-1 would slightly recover. The pressure response to water level rise in RW-1 was transmitted quickly to the surrounding observations wells due to the confining nature of the aquifer, and small rises could be seen in those wells also. Increased drawdown was temporarily observed in RW-1 after 335 minutes of pumping when petroleum product was being pumped temporarily from the well. The water level in the well recovered after a few minutes when the product had cleared the pump and line. This free product presumably came from within the confined aquifer because floating product on the free water surface within the well casing was at least 6 feet above the pump intake.

Data from manual measurements for drawdown as a function of time from RW-1 for the pumping portion of the test are reported in Table 2, Groundwater Level Measurements During Pump Test. The values obtained with the pressure transducer/datalogger were close to the values obtained manually, with the exception of the pressure transducer in well MW-3 which gave readings which were 15-20% greater than the manual readings. Manually obtained data as a function of time for the three observation wells are presented on plates 18 through 20. Because of a decline in pumping rate later in the test, the semilogarithmic plots do not produce straight lines. The pumping rate was relatively constant for the first 330 minutes of the test. When only the early data are plotted (Plates 21 through 22), the data more closely define straight lines on a semilogarithmic plot. Table 3, Groundwater Level Measurements During Recovery Test, presents groundwater elevations during the recovery test. Plates 24 through 26, Groundwater Gradient Maps, are graphic interpretations of groundwater elevations prior to the pump test, at the end of the pump test, and at the end of the recovery test. Table 4, Groundwater Elevations Prior To The Pump Test, At End of The Pump Test, And At End of Recovery Test, summarizes

groundwater elevations at the beginning and end of the pump test and at the end of the recovery test.

Data Analysis

The drawdown data for the observation wells were analyzed using the Jacob Method (1950) approximation for the Theis (1935) equation.

For the Jacob approximation, the transmissivity (T) was calculated as

$$T = 2.3\ Q\ /\ [4\ \pi\ s]$$

where the discharge (Q) was 1.64 gpm and "s" is the drawdown per log cycle, for both the pumping and the recovery data. The value of "s" for each well is given in Table 5, Parameters used in Calculations, Transmissivity and Storativity Values Obtained. The storativity (S) was calculated as

$$S = 2.25\ Tt_o\ /\ r^2$$

where "t_o" is the x-intercept for the pumping data and "r" is the radial distance from the pumping well to the observation well (Table 5). The drawdown data for the observation wells MW-1 through MW-3 analyzed using the above equations yielded approximations of the transmissivity values from 107 to 164 square feet per day (ft^2/d) and storativity values from 0.00026 to 0.000065 (Table 5).

Recovery data for the pumping well indicated that the well recovered to close to its initial water level (96% recovery) at the end of the recovery test. Water levels recovered approximately 80% in the observation wells. The piezometric surface of the confined aquifer had returned to a configuration very similar to the configuration prior to the commencement of pumping, with the hydraulic gradient and flow direction almost identical, as seen in Plates 24 (before pumping) and Plate 26 (after recovery).

The thickness of the shallow, confined, water-bearing zone appears to be on the order of eight feet. This was determined from depth to first encountered water down to the underlying clay layer for wells RW-1, MW-1, and MW-2. The limits of the water-bearing zone are less clear in the boring log for well MW-3. The average transmissivity, 91 ft^2/d, when divided by the aquifer thickness of 8 ft gives a hydraulic conductivity of 12 ft/d. This is typical of a fine to medium sand aquifer and appears somewhat too high for the clayey sand material found at the site. The average storage coefficient determined with the observation well data is what might be expected for a confined aquifer, further substantiating that the aquifer is confined.

As observed at one point in the course of the test, well RW-1 should be capable of recovering free petroleum product which may be trapped within the confined water-bearing zone, as depicted by the Groundwater Drawdown Map At End Of Pump Test, Plate 27.

The steady-state zone of capture (Bear, 1979) for this well can be estimated for a pumping rate (Q) of 2.0 gpm (= 385 ft^3/d), a transmissivity (T) of 91 ft^2/d, and the observed hydraulic gradient (dh/dl) of 1.2×10^{-2}. The width (w) of the zone of capture up-gradient of the recovery well location is 353 ft and the distance to the down-gradient stagnation point (r) is 56 ft.

$$w = Q/T(dh/dl) = 385\ ft^3/d\ /\ [91\ ft^2/d\ (1.2 \times 10^{-2})] = 353\ ft$$

$$r = Q/2\pi T(dh/dl)$$
$$= 385\ ft^3/d\ /\ [2\ (3.1416)\ 91\ ft^2/d\ (1.2 \times 10^{-2})]$$
$$= 56\ ft$$

This predicted zone of capture is depicted in Plate 28, Predicted Zone of Capture For RW-1. It is sufficiently large to capture the majority of the impacted groundwater and floating product at the site, primarily in the northern half of the site and offsite at the north and northwest property lines.

RESULTS OF LABORATORY ANALYSES

Soil Samples

Table 6, Results of Laboratory Analysis of Soil Samples, summarizes laboratory analytical results of selected soil samples. Concentrations of TPHg and BTEX in the soil samples collected from the soil boring B-8 ranged from nondetectable (collected from the depth of 6 feet below ground surface) to 240 ppm of TPHg and 16 ppm of total xylenes in the sample collected at a depth of 30 feet below ground surface in boring B-8. Laboratory analyses of soil samples collected from boring B-9 reported nondetectable concentrations of TPHg and TEX for samples collected from the depths of 16 and 31 feet below ground surface, and up to 25 ppm of TPHg and low concentrations of BTEX (up to 1.8 ppm) in the samples collected at the depths of 6 and 10½ feet below ground surface. Laboratory analyses of soil samples collected from soil boring B-10 reported nondetectable concentrations of TPHg and BTEX with the exception of the sample collected at the depth of 13 feet, which contained 4 ppm TPHg and up to 0.16 ppm of BTEX. Laboratory analyses of soil samples collected from soil boring B-11 adjacent to the former waste-oil tank pit reported nondetectable concentrations of TPHg and BTEX, with the exception of the sample collected at the depth of 11 feet below ground surface, which contained 110 ppm of TPHg and 0.27 ppm total xylenes. Concentrations of TPHd in the soil samples collected from this boring ranged from nondetectable to 71 ppm, and TOG ranged from 43 to 80 ppm. Of the 29 VOCs tested in the four samples collected from B-11, all were nondetectable. Soil samples from boring B-11 also reported nondetectable concentrations of cadmium, and background concentrations up to 80 ppm chromium, up to 7.7 ppm total lead, up to 97 ppm nickel, and up to 69 ppm of zinc. The determination of background heavy metals concentrations are based on data contained in Lindsay, 1979 and Scott, 1991. Chain of Custody forms and copies of laboratory reports for soil samples are included in Appendix F of this report.

Water Samples

Laboratory analytical results for water samples reported TPHg concentrations of 620 parts per billion (ppb) in the sample collected from monitoring well MW-1, 32 ppb in the sample collected from MW-3, and nondetectable concentrations in monitoring well MW-2. BTEX

was detected in concentrations of 76 ppb, 69 ppb, 15 ppb, and 60 ppb, respectively in the sample collected from monitoring well MW-1 and at lower concentrations in the samples collected from wells MW-2 and MW-3. Benzene concentrations exceeded the State Maximum Contaminant Level (MCL) in wells MW-1 through MW-3, and most likely in RW-1 which exhibited a hydrocarbon sheen and was not sampled. Ethylbenzene and total xylenes concentrations were within MCLs, and toluene concentrations were below recommended drinking water action level (DWAL) in all wells. A nondetectable concentration of TOG (less than 5,000 ppb) was reported in the groundwater sample collected from groundwater monitoring well MW-3 located near the former waste-oil-storage tank. All 37 VOCs tested were nondetectable in well MW-3. The results of laboratory analyses of water samples are summarized in Table 7, Results of Laboratory Analyses of Water Samples. Chain of Custody records and laboratory analyses reports are included in Appendix F.

DISCUSSION OF RESULTS

Hydrocarbon Impacted Soil

The presently interpreted extent of hydrocarbon impacted soil beneath the site is presented on the Geologic Cross Sections, Plates 13 through 16. The majority of gasoline hydrocarbons in the soil at the site appear to be concentrated 10 to 15 feet below ground surface, except in B-8/RW-1 where TPHg was detected down to more than 30 feet within the saturated zone. The soil at the site appears to be impacted by waste-oil related hydrocarbons as levels of TPHd and TOG were reported for the soil samples collected from the boring B-11, located near the former waste-oil tank pit. However, waste-oil related hydrocarbons in soil may be limited to depths of approximately 11 feet below ground surface due to the absence of TPHd and BTEX in samples collected from depths of 16 and 21 feet in B-11. The laboratory method used to detect TOG (EPA method 5520 E&F) is a gravimetric method and is far less accurate than the EPA method 8015 used to detect TPHd and BTEX, especially at concentrations near the TOG detection limit (30 ppm). Since the TOG analysis (EPA 5520 E&F) detects many types of petroleum hydrocarbons, a battery of tests would need to be concucted to determine the specific oil being detected in the TOG test.

Hydrocarbon Impacted Groundwater

Groundwater in the shallow aquifer beneath the site has been impacted by gasoline-related hydrocarbons. The groundwater in MW-3 had no detectable waste-oil related hydrocarbons, based on the analytical results.

Pumping and Recovery Test

Data obtained from this pumping test permit an estimation of the sustainable pumping rate from the pumping well, storativity of the aquifer, and transmissivity of the aquifer used to estimate the zone of capture of the extraction well. The first-encountered water bearing zone was determined to be confined, and to have a thickness of about 8 feet.

The well appeared to stabilize at a pumping rate of 2.0 gpm, however, with time, that rate declined. The long-term extraction rate from this well is most likely around 1.58 gpm or less.

The transmissivities determined with the observation well data are in good agreement, varying by only a factor of less than three. The storage coefficients determined with the observation well data vary within a factor of four. The values determined vary from on the low and the high ends of what might be expected for a confined aquifer. The average hydraulic conductivity of 17.75 ft/d calculated from obtained data is typical of a silty sand to clean sand aquifer at the site.

The predicted zone of capture is sufficiently large to capture a portion of the impacted groundwater and floating product at the site. The lower transmissivity value calculated for the site yields a larger zone of capture.

Fluctuations in the pumping rate made interpretation difficult and therefore only the data from the first portion of the test was confidently used in determining the aquifer characteristics.

CONCLUSIONS

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

- The majority of gasoline hydrocarbons in the soil at the site appears to be at the depth between approximately 10 to 15 feet below ground surface, within the layer of sandy clays and gravely silts, with the exception of B-8/RW-1 which contains hydrocarbons down to more than 30 feet below ground surface in a sample collected from within the saturated zone.

- The lateral extent of gasoline hydrocarbons in the soil has been delineated below 100 parts per million (ppm) only in the northwestern (B-10) and northeastern (B-9) portions of the site, and to nondetectable level (less than 1 ppm) in the southern portion of the site (B-6 and B-7). The vertical extent of gasoline hydrocarbons in the soil at the site has been delineated to nondetectable level (less than 1.0 ppm) at a depth of approximately 16 to 20½ feet below the ground surface with the exception of boring B-8, where 240 ppm of TPHg was detected at a depth of 30 feet below ground surface within the saturated zone. The lateral extent of waste-oil related hydrocarbons in the soil in the area of the former waste-oil tank at the site has not been delineated.

- The lateral and vertical extent of hydrocarbons in the groundwater have not been delineated at the site with the exception of the northwestern part of the site where TPHg concentrations were below laboratory detection limit (less than 60) ppb for TPHg in MW-2.

- Nondetectable concentrations of TOG, TPHd, VOC's, and the metals cadmium, chromium, lead, and nickel in groundwater samples collected from monitoring well MW-3 suggests that the hydrocarbons associated with the waste-oil tank have not impacted groundwater beneath the site.

- Results of the pump test estimated a long term pumping rate from the recovery well RW-1 around 1.5 to 1.7 gpm. The predicted zone of capture is sufficiently large to capture a portion of the impacted groundwater and floating product at the site; however additional recovery wells may become necessary. The first-encountered water bearing zone was determined to be an 8-foot thick confined zone, with relatively high transmissivity.

LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological and engineering practice in California at the time this investigation was performed. This assessment was conducted solely for the purpose of evaluating environmental conditions of the soil and groundwater with respect to gasoline and waste-oil related hydrocarbons at the site. 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. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of assessment.

FUTURE WORK

Future work to be proposed at the site includes design and permitting of a groundwater remediation system and installation of three onsite vapor extraction wells for use in a future vapor extraction test (VET). Data collected from the VET will be used to evaluate use of vapor extraction as a remediation alternative at the site. Additionally, after offsite access is obtained, offsite monitoring wells are planned to be installed to delineate the horizonal extent of groundwater impacted by hydrocarbons downgradient of the site. Soil borings will be drilled and sampled to evaluate the extent of waste-oil hydrocarbons near the former waste-oil tank and a report of the results will be prepared. Proposed work will be presented to the California Regional Water Quality Control Board (RWQCB), Alameda County Health Care Services Agency (ACHCSA), and ARCO for review and approval in future addenda to the Work Plan. Quarterly Groundwater monitoring will be initiated at the site.

DISTRIBUTION

It is recommended that copies of this report be forwarded to:

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

Mr. Larry Seto
Alameda County Health Care Services Agency
80 Swan Way, Room 200
Oakland, California 94621

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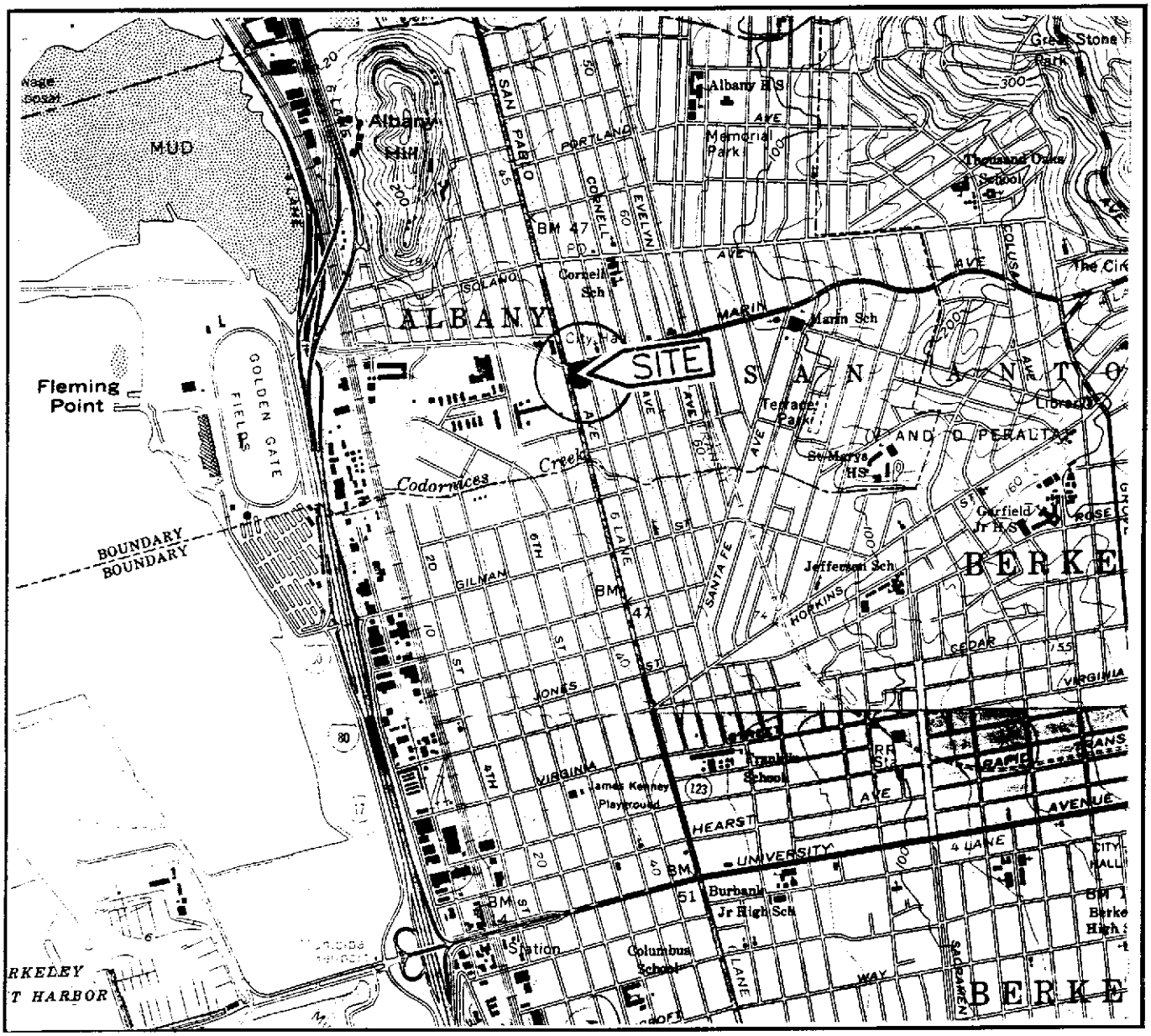


Base: U.S. Geological Survey
7.5-Minute Quadrangle
Richmond/Oakland West, California
Photorevised 1980

LEGEND

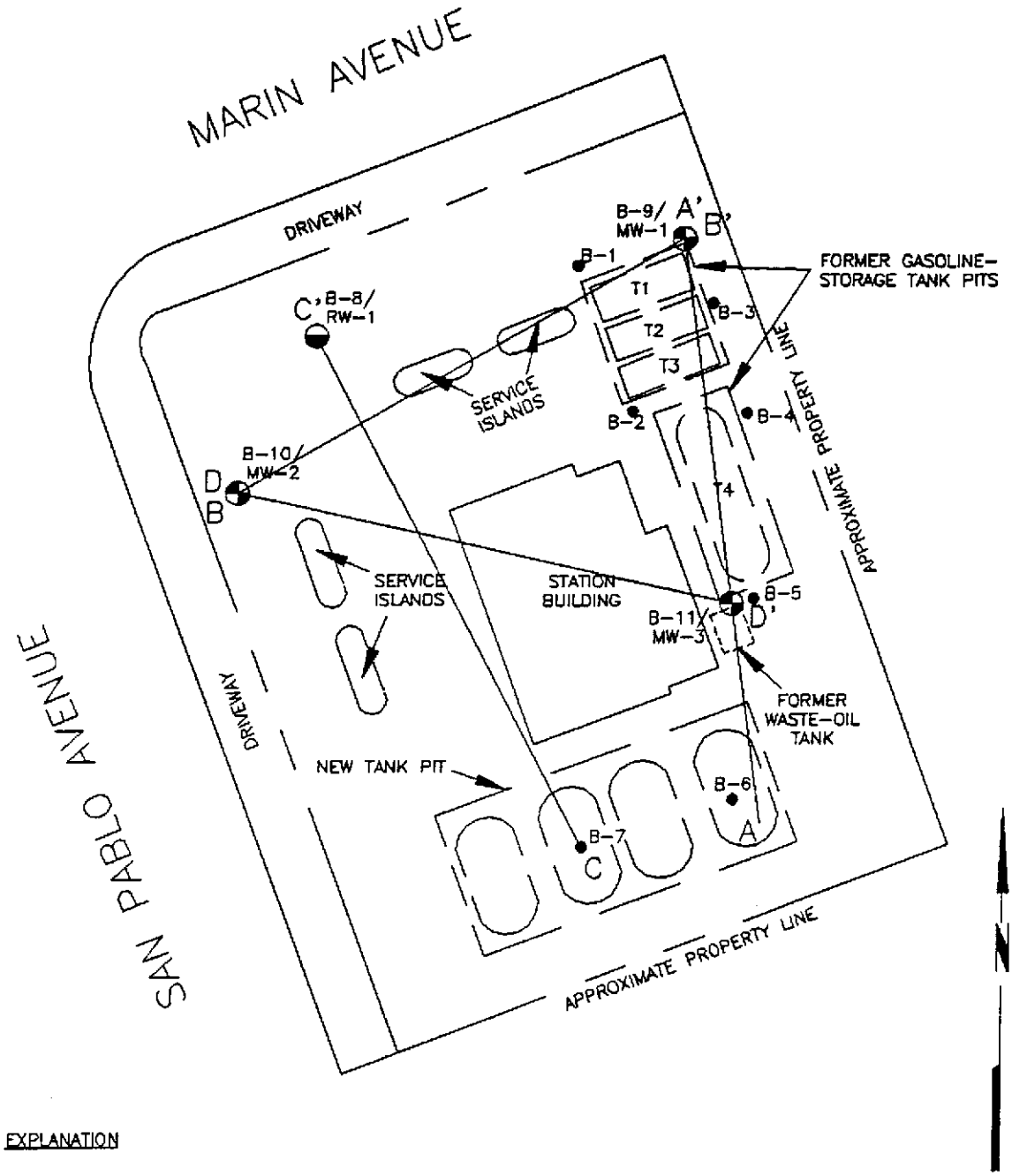
= Site Location

Approximate Scale

2000 1000 0 2000 4000

feet

RESNA	**SITE VICINITY MAP** **ARCO Station 2035** **1001 San Pablo Avenue** **Albany, California**	**PLATE** **1**
PROJECT 69036.02		



EXPLANATION

RW-1 = Recovery well (Exceltech, October 1991)

MW-3 = Monitoring well (Exceltech, October 1991)

B-5 = Soil boring (RESNA, August 1989 and June 1991)

D — D' = Geologic cross sections

Approximate Scale

30 15 0 30 60

feet

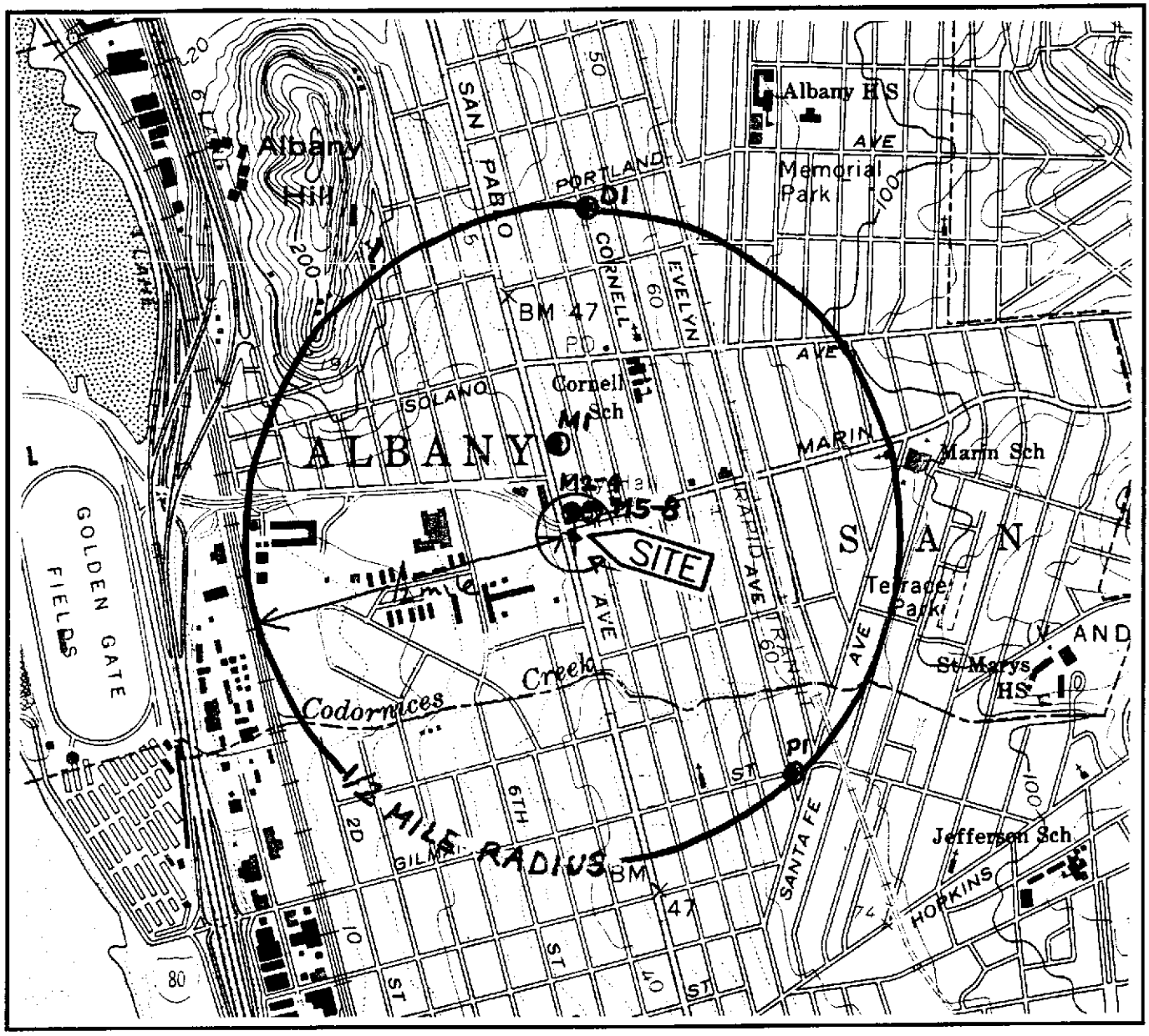
Source: Surveyed by John E. Koch, Land Surveyor.

RESNA

PROJECT 69036.02

GENERALIZED SITE PLAN
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE
2



Source: U.S. Geological Survey
7.5-Minute Quadrangle
Richmond, California.
Photorevised 1980

● = Monitoring well (3)

◐ = Cathodic protection well (3)

◓ = Test well (4)

Note: Monitoring and test wells are very close together; therefore, the corresponding symbols represent the wells.

N

Approximate Scale

2250 1125 0 2250 4500

feet

RESNA	**WELL LOCATION MAP** **ARCO Station 2035** **1001 San Pablo Avenue** **Albany, California**	**PLATE** **3**
PROJECT 69036.02		

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION		LTR	DESCRIPTION	MAJOR DIVISION		LTR	DESCRIPTION
COARSE-GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded Gravels or Gravel-Sand mixtures, little or no fines.	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.
		GP	Poorly-graded Gravels or Gravel-Sand mixtures, little or no fines.			CL	Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
		GM	Silty Gravels, Gravel-Sand-Silt mixtures.			OL	Organic Silts and Organic Silt-Clays of low plasticity.
		GC	Clayey Gravel, Gravel-Sand-Clay mixtures.		SILTS AND CLAYS LL>50	MH	Inorganic Silts, micaceous or diatomaceous fine Sandy or Silty Soils, Elastic Silts.
	SAND AND SANDY SOILS	SW	Well-graded Sand or Gravelly Sands, little or no fines.			CH	Inorganic Clays of high plasticity, fat Clays.
		SP	Poorly-graded Sands or Gravelly Sands, little or no fines.			OH	Organic Clays of medium to high plasticity, organic Silts.
		SM	Silty Sands, Sand-Silt mixtures.				
		SC	Clayey Sands, Sand-Clay mixtures.	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

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.

RESNA	UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY ARCO Station 2035 1001 San Pablo Avenue Albany, California	PLATE 4
PROJECT 69036.02		

Depth of boring: 30-1/2 feet Diameter of boring: 13 inches Date drilled: 10/15/91

Well depth: 29 feet Material type: Sch 80 PVC Casing diameter: 6 inches

Screen interval: 11 to 26 feet Slot size: 0.020-inch

Drilling Company: Exceltech Drilling Driller: Don and Kenny

Method Used: Hollow-Stem Auger Field Geologist: Rob Campbell

Signature of Registered Professional:

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Paved area.	
0					Asphalt (3 inches) and baserock (9 inches).	
2				CH	Silty clay, black, moist, high plasticity; obvious product odor, abundant organics.	
4					PID alarm at 4 feet.	
6	S-6	7 15 20	5681	CL	Silty clay, dark gray mottled with green, moist, medium plasticity, hard; obvious product odor.	
8					Gradational color change from gray to brown.	
10	S-11	11 11 11	*	ML	(10/29/91) Gravelly silt, brown mottled with green, damp, low plasticity, very stiff; obvious product odor. Large caliche clasts.	
12						
14						
16	S-16	15 21 28	*	SC	Clayey sand with some gravel, brown mottled with orange, damp, dense; noticeable product odor.	
18					Encountered water at 19 feet (10/15/91). Increasing sand.	
20	S-21	19 32 45	0	SM	Silty sand with gravel, brown, damp, very dense.	
					(Section continues downward)	

*Hydrocarbon vapors overloaded OVM.

RESNA

PROJECT: 69036.02

LOG OF BORING B-8/RW-1

ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE 5

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				SM	Silty sand with gravel, brown, damp, very dense.	
24						
26	S-26	11 18 25	10			
				CL	Silty clay, gray with brown streaks, damp to moist, medium, plasticity, hard; noticeable product odor.	
28						
30	S-30	30 50	0	SM	Silty sand with gravel, brown, damp to wet, very dense, no odor.	
					Total depth = 30-1/2 feet.	
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

RESNA

PROJECT 69036.02

LOG OF BORING B-8/RW-1
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE
6

Depth of boring: 31-1/2 feet Diameter of boring: 13 inches Date drilled: 10/14/91

Well depth: 30 feet Material type: Sch 40 PVC Casing diameter: 4 inches

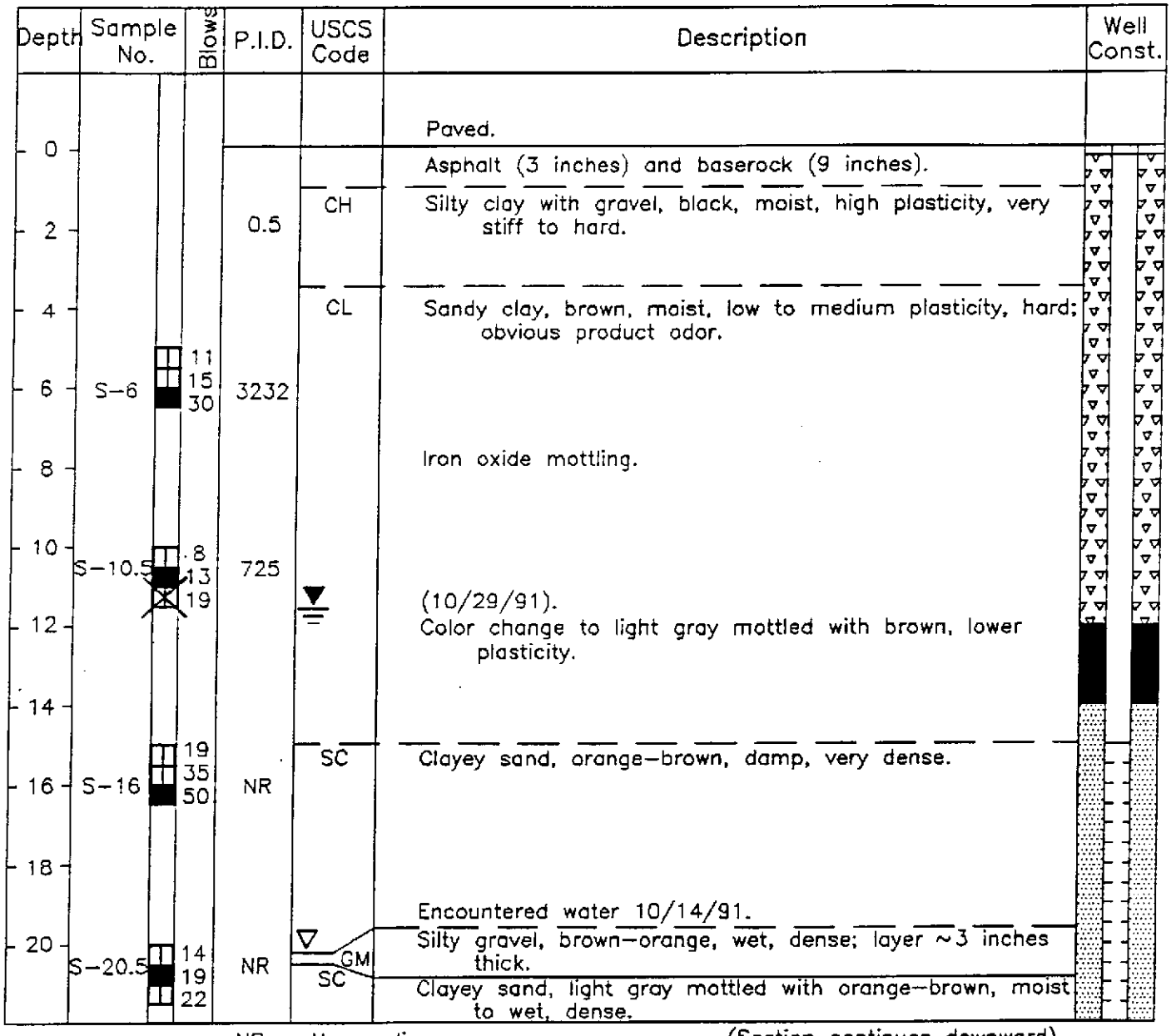
Screen interval: 15 to 30 feet Slot size: 0.020-inch

Drilling Company: Exceltech Drilling Driller: Don and Kenny

Method Used: Hollow-Stem Auger Field Geologist: Rob Campbell

Signature of Registered Professional:

Registration No.: RCE 044600 State: CA



NR = No reading. (Section continues downward)

RESNA

PROJECT: 69036.02

LOG OF BORING B-9/MW-1

ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE 7

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				SC	Clayey sand, light gray mottled with orange–brown, moist to wet, dense.	
24						
26	S–26	19 35 40	NR		Alternating seams of wet and moist.	
28						
30	S–31	9 12 19	NR	CL	Smoother drilling at 29 feet. Silty clay, gray, damp, medium plasticity, very stiff.	
32					Total depth = 31–1/2 feet. NR = No reading.	
34						
36						
38						
40						
42						
44						
46						
48						
50						

RESNA

PROJECT 69036.02

LOG OF BORING B–9/MW–1
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE
8

Depth of boring: 33 feet Diameter of boring: 10 inches Date drilled: 10/16/91

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

Screen interval: 20 to 29 feet Slot size: 0.020-inch

Drilling Company: Exceltech Drilling Driller: Don and Kenny

Method Used: Hollow-Stem Auger Field Geologist: Steve Strausz

Signature of Registered Professional:

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt surface.	
0					Asphalt (2 inches) and baserock (6 inches).	
				CL	Silty clay, dark brown, damp, medium plasticity, stiff.	
2					Color change to lighter gray at 3 feet.	
4					Very stiff.	
	S-5.5	18 23 26	11.8			
6				GM	Silty gravel with minor clay, fine gravel, dark blue-gray, damp, very dense; noticeable product odor.	
8					Smooth drilling at 8 feet.	
				CL	Sandy clay, gray, damp to moist, medium plasticity, hard; minor fine gravel; noticeable product odor.	
10	S-10.5	9 13 19	73.4		(10/29/91).	
12					Rougher drilling at 12 feet.	
	S-13	11 26 30	274	GP	Sandy gravel with clay, brown, moist, dense; obvious product odor.	
14				SC	Clayey sand, gray, moist, very dense.	
		7		ML	Clayey silt, light brown, very moist, medium plasticity,	
	S-15.5	11 12	31.9		very stiff; noticeable product odor.	
16						
18						
20	S-20.5	8 12 17	2.3		Encountered water 10/16/91.	
				SM	Silty sand, fine-grained, light gray, wet, dense.	

(Section continues downward)

RESNA

PROJECT: 69036.02

LOG OF BORING B-10/MW-2

ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE 9

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				SM	Silty sand, fine-grained, light gray, wet, dense.	
24						
26	S-25.5	22 34 35	NR	SW	Gravelly sand with silt, rusty-brown, wet, very dense.	
28					Smoother drilling at 28 feet.	
30	S-30.5	9 17 29	NR	CL	Silty clay, light gray-brown, moist, medium plasticity, hard.	
32		6 11 12			With some gravelly sand interbedded.	
34					Total depth = 33 feet.	
36					NR = No reading.	
38						
40						
42						
44						
46						
48						
50						

RESNA

PROJECT 69036.02

LOG OF BORING B-10/MW-2
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE
10

Depth of boring: 34-1/2 feet Diameter of boring: 10 inches Date drilled: 10/16/91

Well depth: 32-1/2 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 12-1/2 to 32-1/2 feet Slot size: 0.020-inch

Drilling Company: Exceltech Drilling Driller: Don and Kenny

Method Used: Hollow-Stem Auger Field Geologist: Rob Campbell

Signature of Registered Professional:

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt surface.	
0					Asphalt (3 inches) and baserock (9 inches).	
2				CH	Silty clay, black, moist, high plasticity, stiff to very stiff; noticeable product odor.	
4						
6	S-6	5 13 14	NR	CL	Silty clay with some gravel, brown with green mottling, moist, low to medium plasticity, very stiff; noticeable product odor.	
8						
10	S-11	6 8 10	NR		(10/29/92).	
12				ML	Clayey silt with medium-grained sand, brown with green mottling, moist, medium plasticity, very stiff, noticeable product odor.	
14						
16	S-16	6 8 10	NR	SC	Clayey sand, gray with orange mottling, damp, medium dense, noticeable product odor.	
18						
20	S-21	8 11 23	NR		(Section continues downward)	

NR = No reading.

RESNA

PROJECT: 69036.02

LOG OF BORING B-11/MW-3

ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE 11

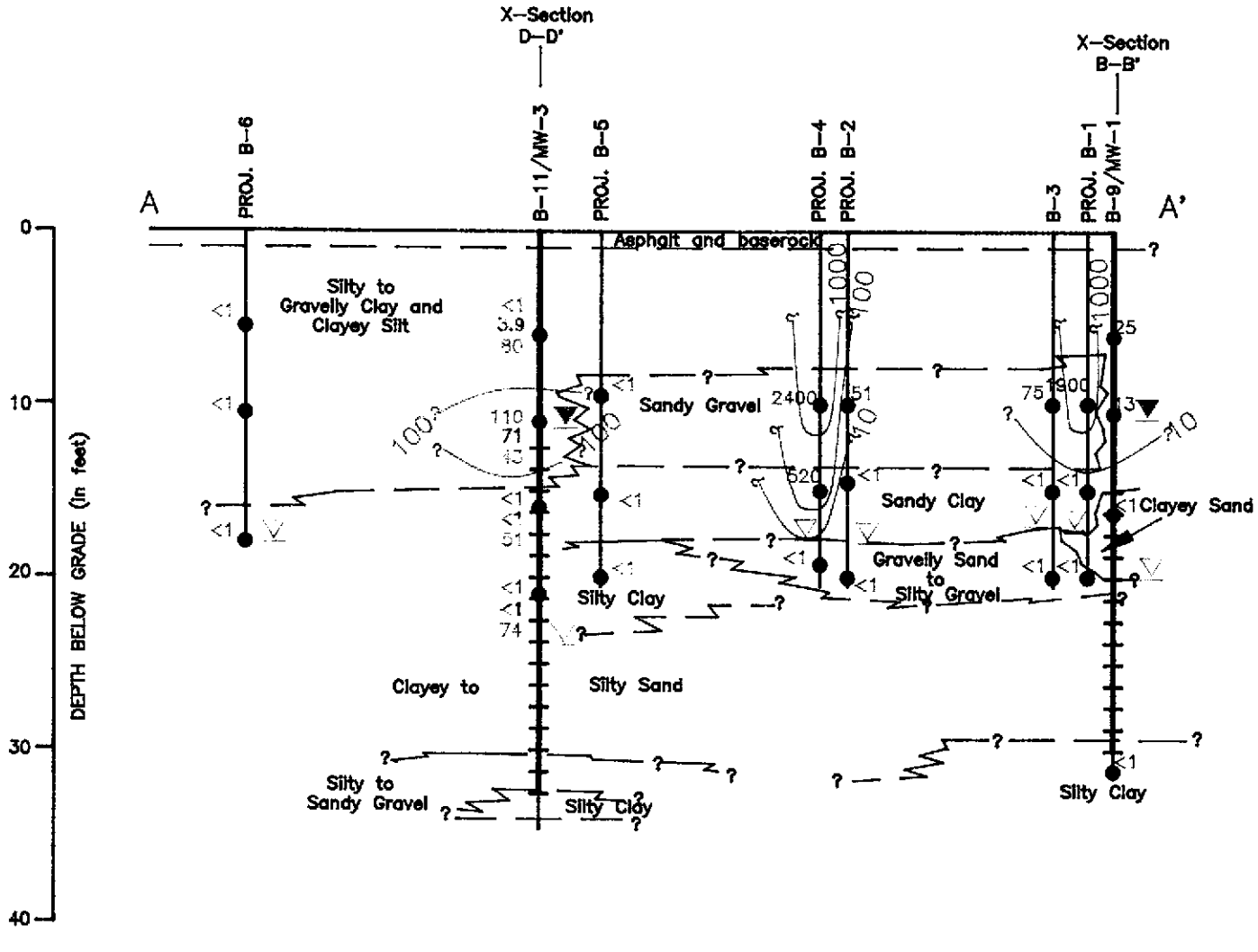
Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				SC	Clayey sand, gray with orange mottling, damp, medium dense, noticeable product odor.	
24				▽	Encountered water 10/15/91.	
26	S-26	7 8 12	NR			
28						
30	S-30	21 26 17 11	NR	GM	Silty gravel, brown, wet, dense.	
32	S-32.5	19 28		CL	Minor interbedded silty clay, light brown, very moist, medium plasticity.	
34	S-34	29 50/6"			Sandy gravel with silt, fine sand to fine gravel, brown, wet, very dense.	
					Total depth = 34-1/2 feet. NR = No reading.	
36						
38						
40						
42						
44						
46						
48						
50						

RESNA

PROJECT 69036.02

LOG OF BORING B-11/MW-3
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE
12



EXPLANATION

1000 = Line of equal concentration of TPHg in soil, in ppm

2400 / 71 / 74 = Laboratory analyzed soil sample showing concentration of TPHg (red) TPHd (green), and TOG (blue) in parts per million (ppm)

= Well casing

= Well screen

= Boring

▽ = Initial water level in boring

▼ = Static water level in well (10/29/91)

N

Approximate Horizontal Scale

20 10 0 20 40

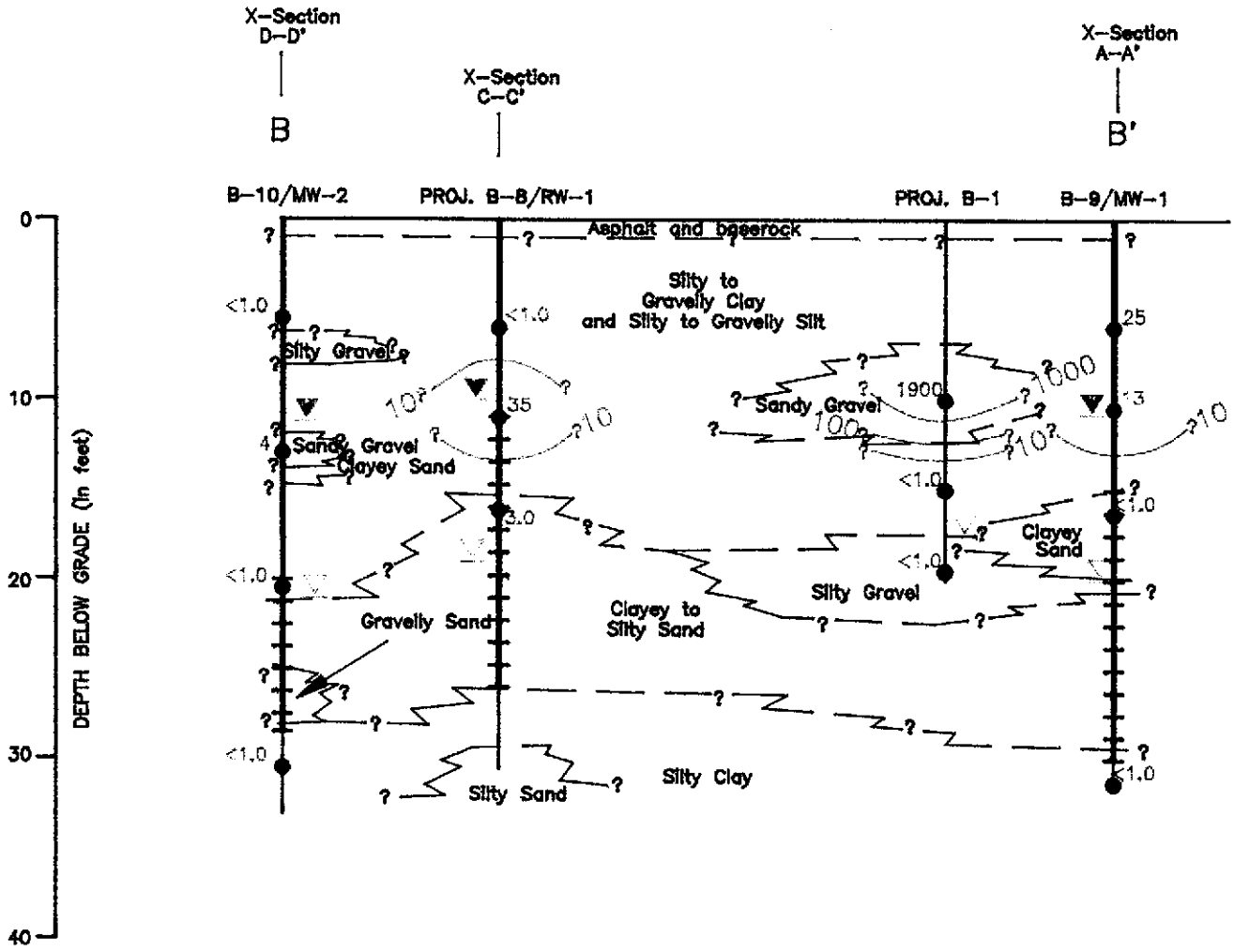
feet

Approximate Vertical Scale

10 5 0 10 20

feet

RESNA	GEOLOGIC CROSS SECTION A-A' ARCO Station 2035 1001 San Pablo Avenue Albany, California	PLATE 13
PROJECT 69036.02		



EXPLANATION

1000 = Line of equal concentration of TPHg in soil, in ppm

1900 = Laboratory analyzed soil sample showing concentration of TPHg in parts per million (ppm)

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (10/29/91)

N

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

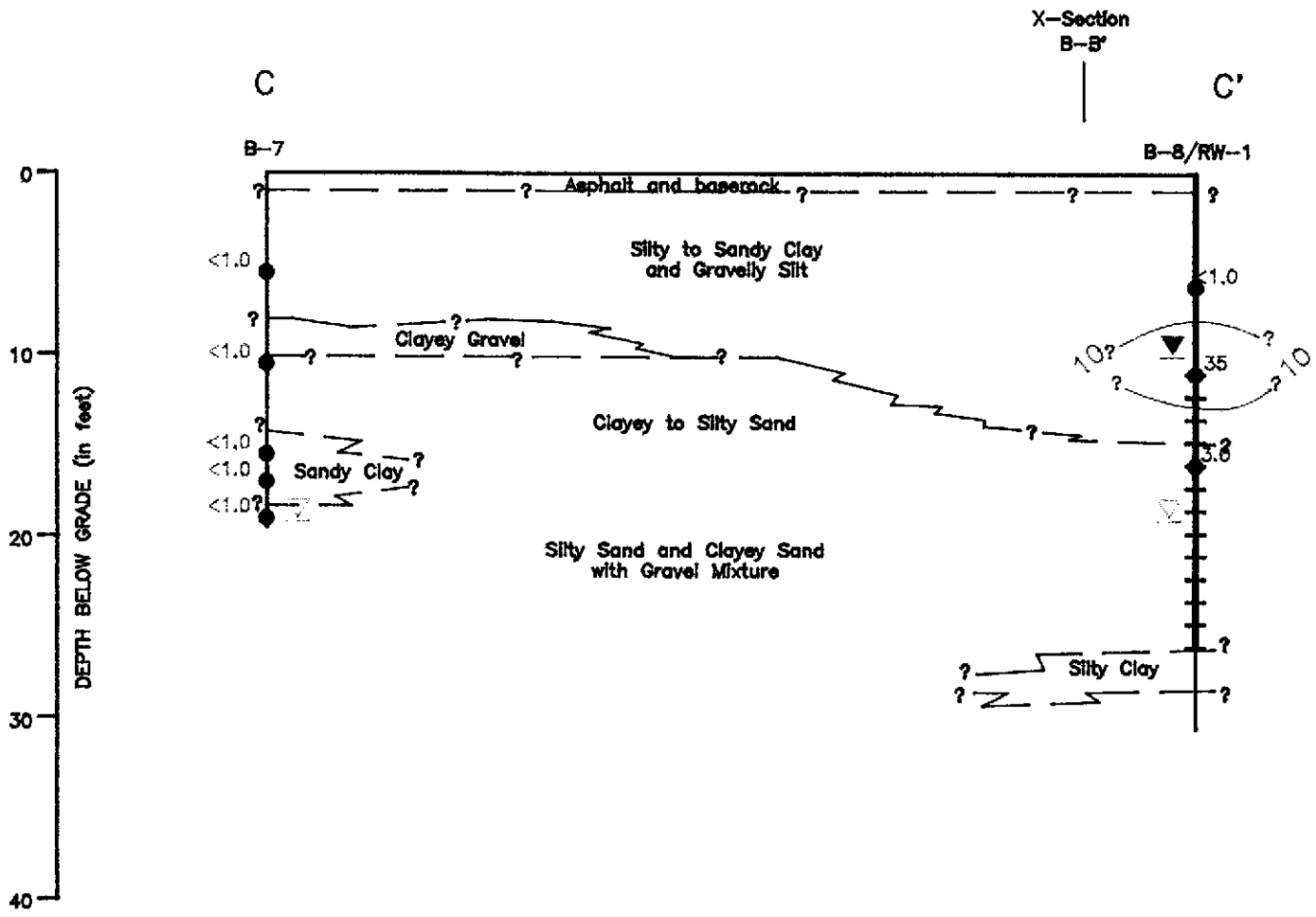
feet

RESNA

PROJECT 69036.02

GEOLOGIC CROSS SECTION B-B'
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE
14



EXPLANATION

10 = Line of equal concentration of TPHg in soil, in ppm

240 = Laboratory analyzed soil sample showing concentration of TPHg in parts per million (ppm)

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (10/29/91)

N

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

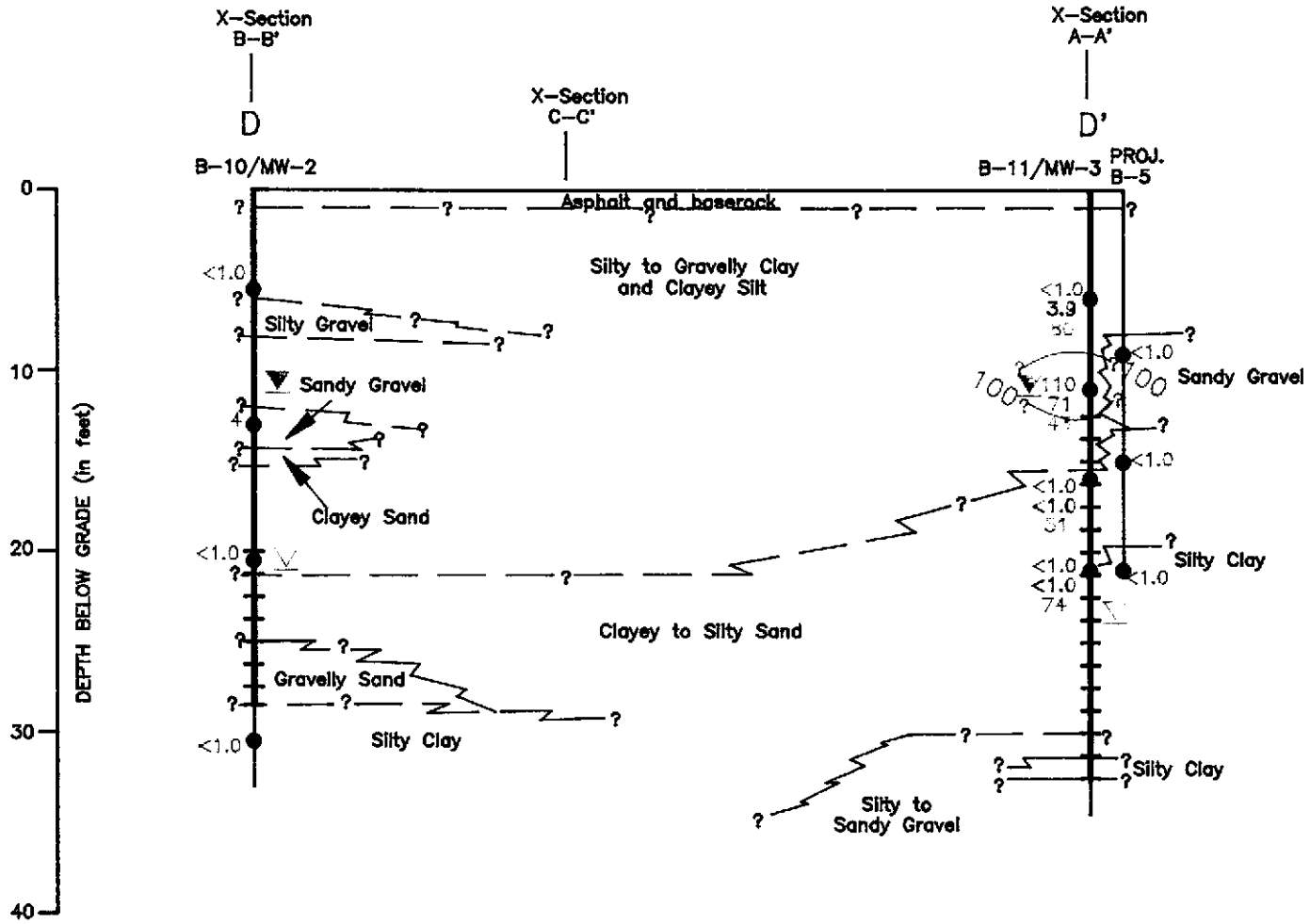
feet

RESNA

PROJECT 69036.02

GEOLOGIC CROSS SECTION C-C'
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE
15



EXPLANATION

100 = Line of equal concentration of TPHg in soil, in ppm

110 / 71 / 80 = Laboratory analyzed soil sample showing concentration of TPHg (red), TPHd (green), and TOG (blue) in parts per million (ppm)

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (10/29/91)

N

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

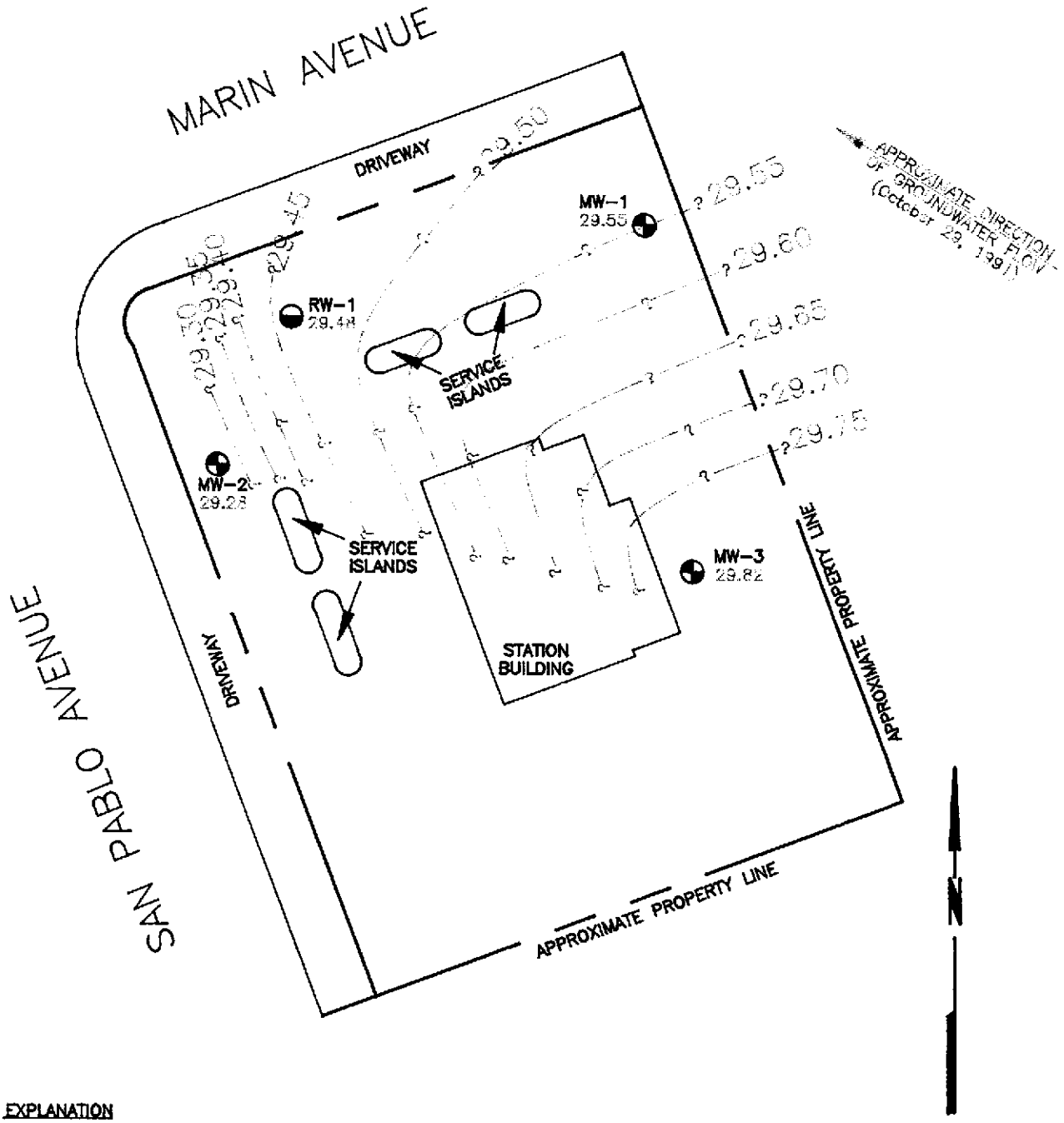
feet

RESNA

PROJECT 69036.02

GEOLOGIC CROSS SECTION D-D'
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE 16



EXPLANATION

29.75 = Line of equal elevation of groundwater above mean sea level (MSL)

29.82 = Elevation of groundwater in feet MSL, October 29, 1991

RW-1 = Recovery well (Exceltech, October 1991)

MW-3 = Monitoring well (Exceltech, October 1991)

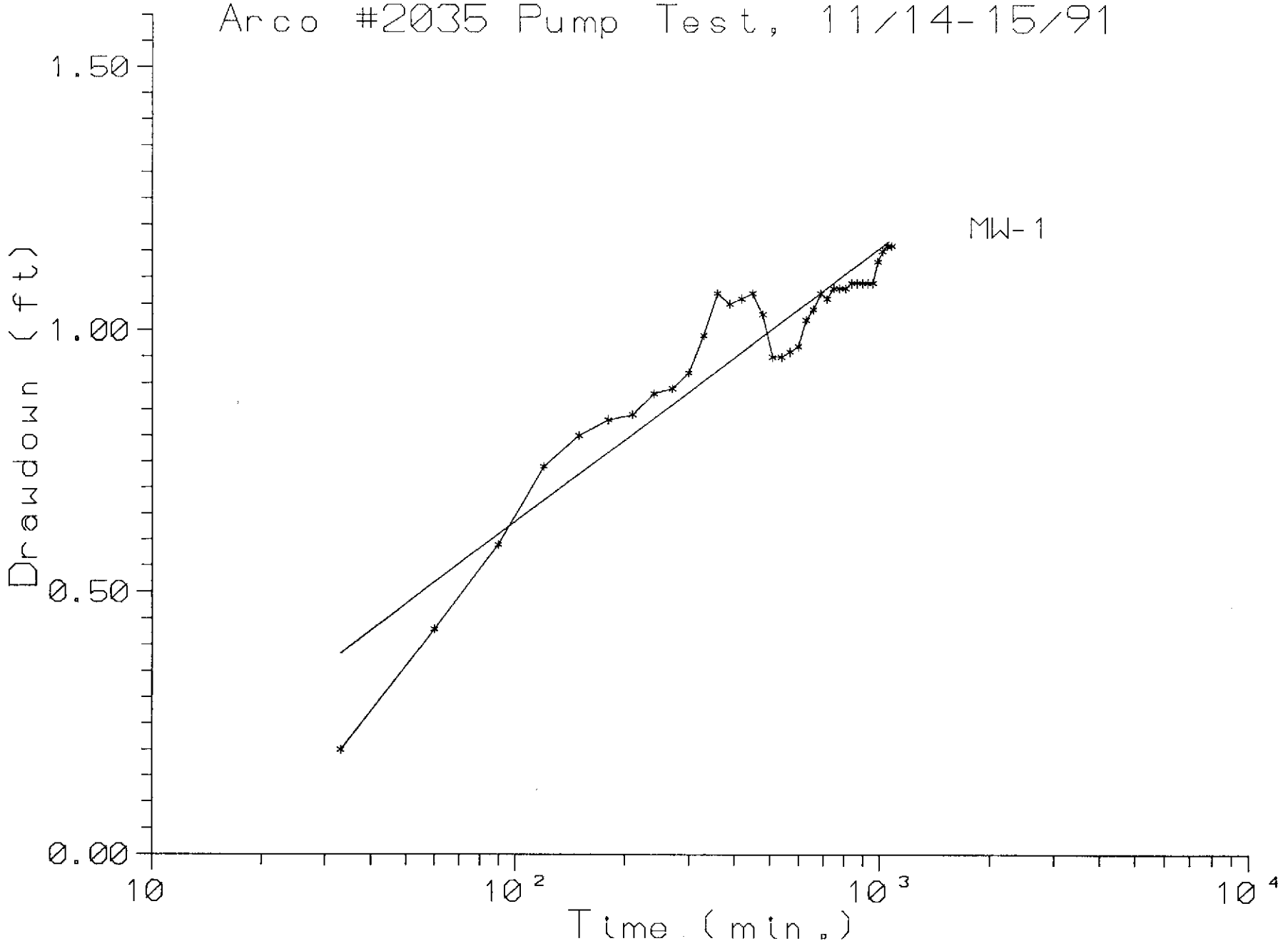
Approximate Scale

30 15 0 30 60

feet

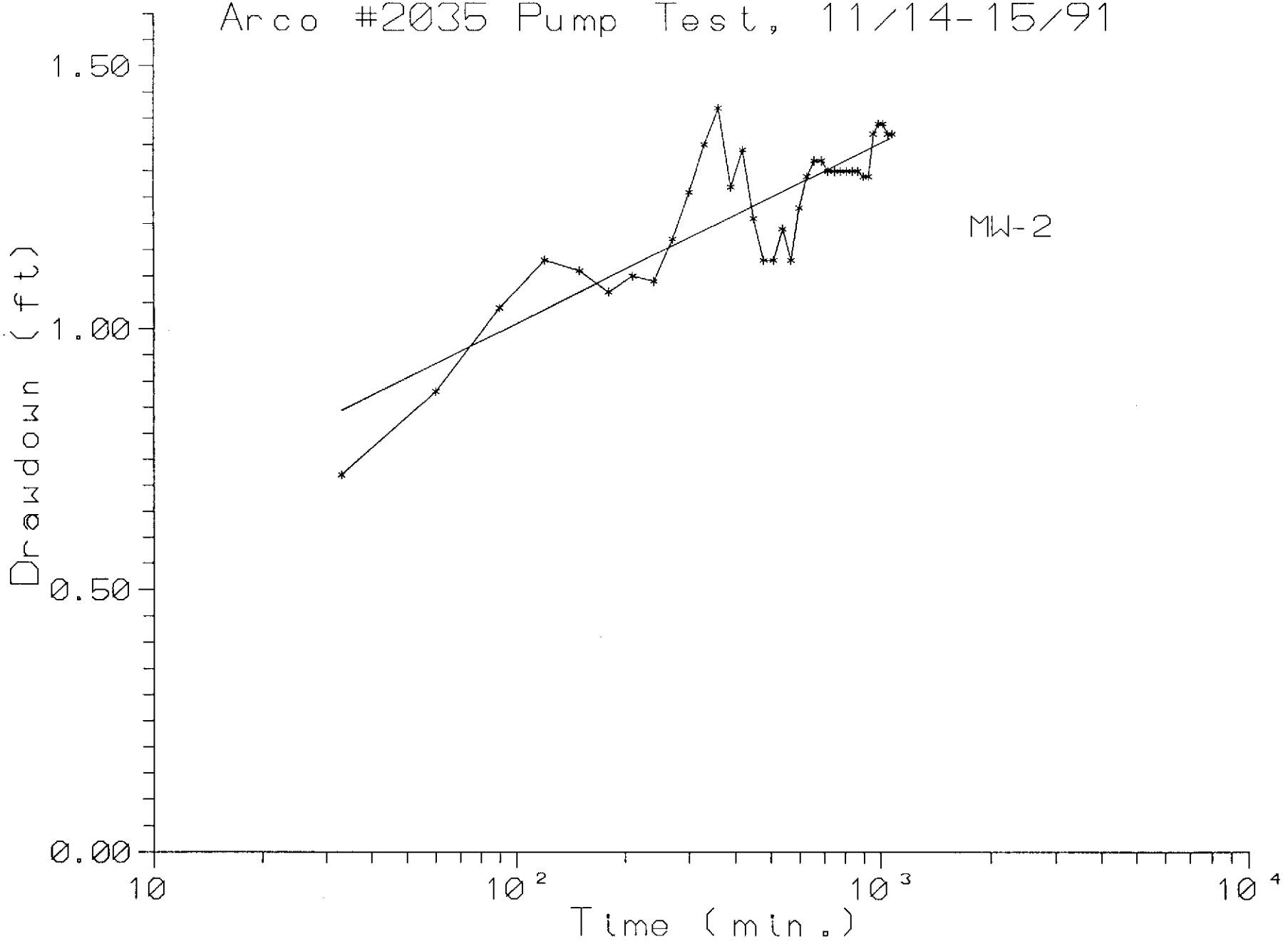
Source: Surveyed by John E. Koch, Land Surveyor.

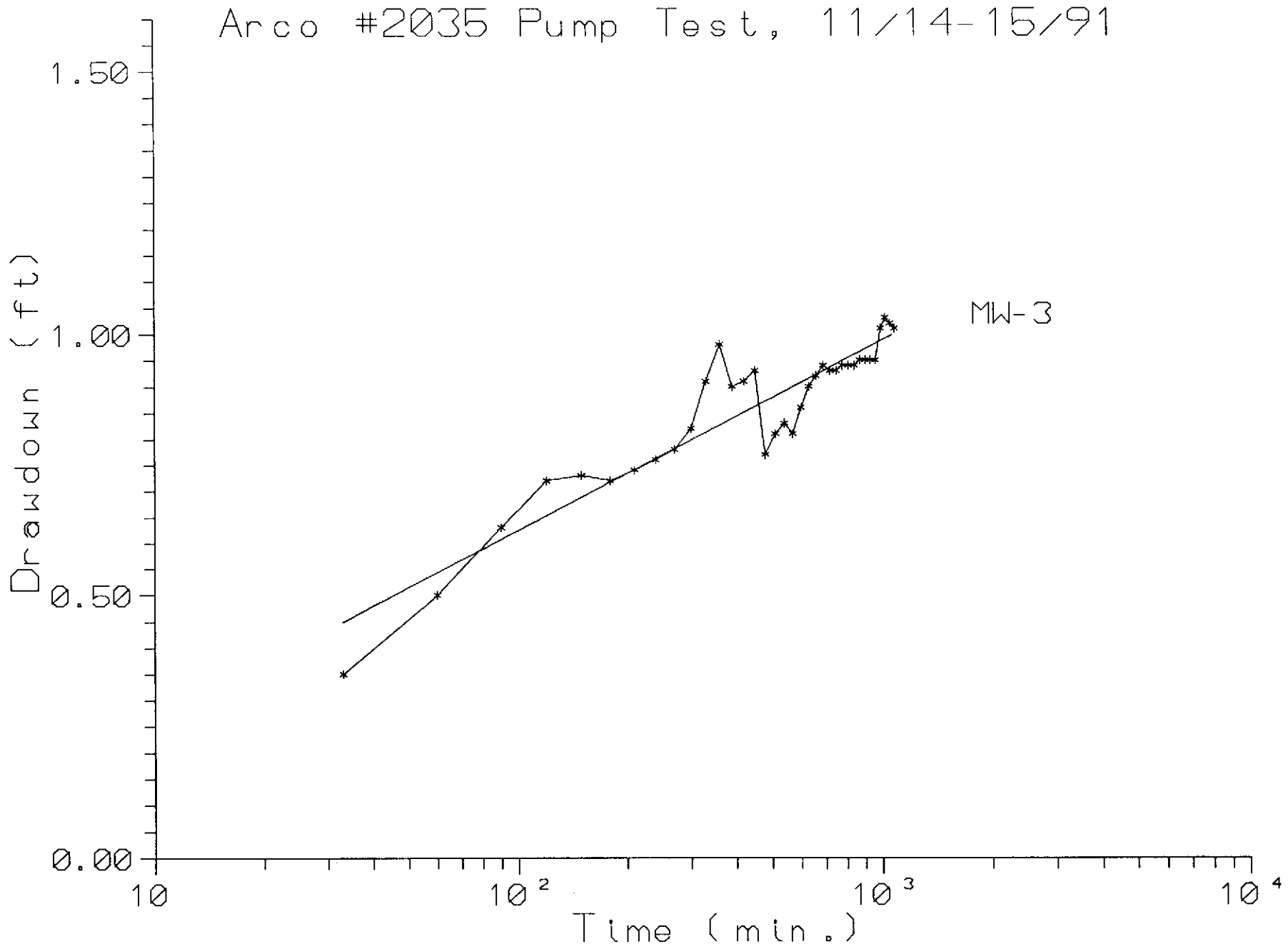
RESNA	**GROUNDWATER GRADIENT MAP** **ARCO Station 2035** **1001 San Pablo Avenue** **Albany, California**	**PLATE** **17**
PROJECT **69036.02**		



PROJECT 69036.02

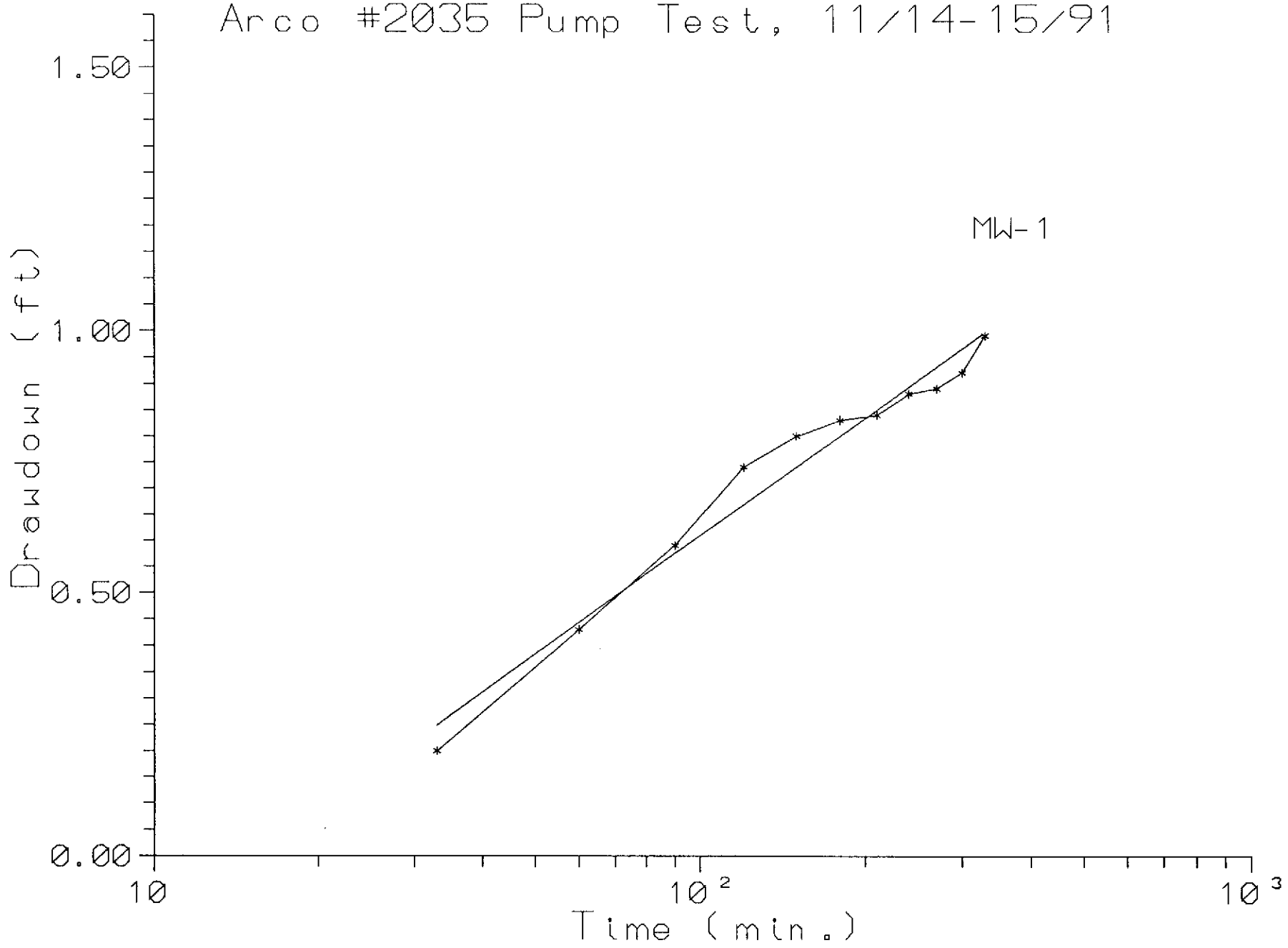
PLATE 18


Arco #2035 Pump Test, 11/14-15/91
1.50
1.00
0.50
0.00
Drawdown (ft)
MW-2
10
10 2
10 3
10 4
Time (min.)



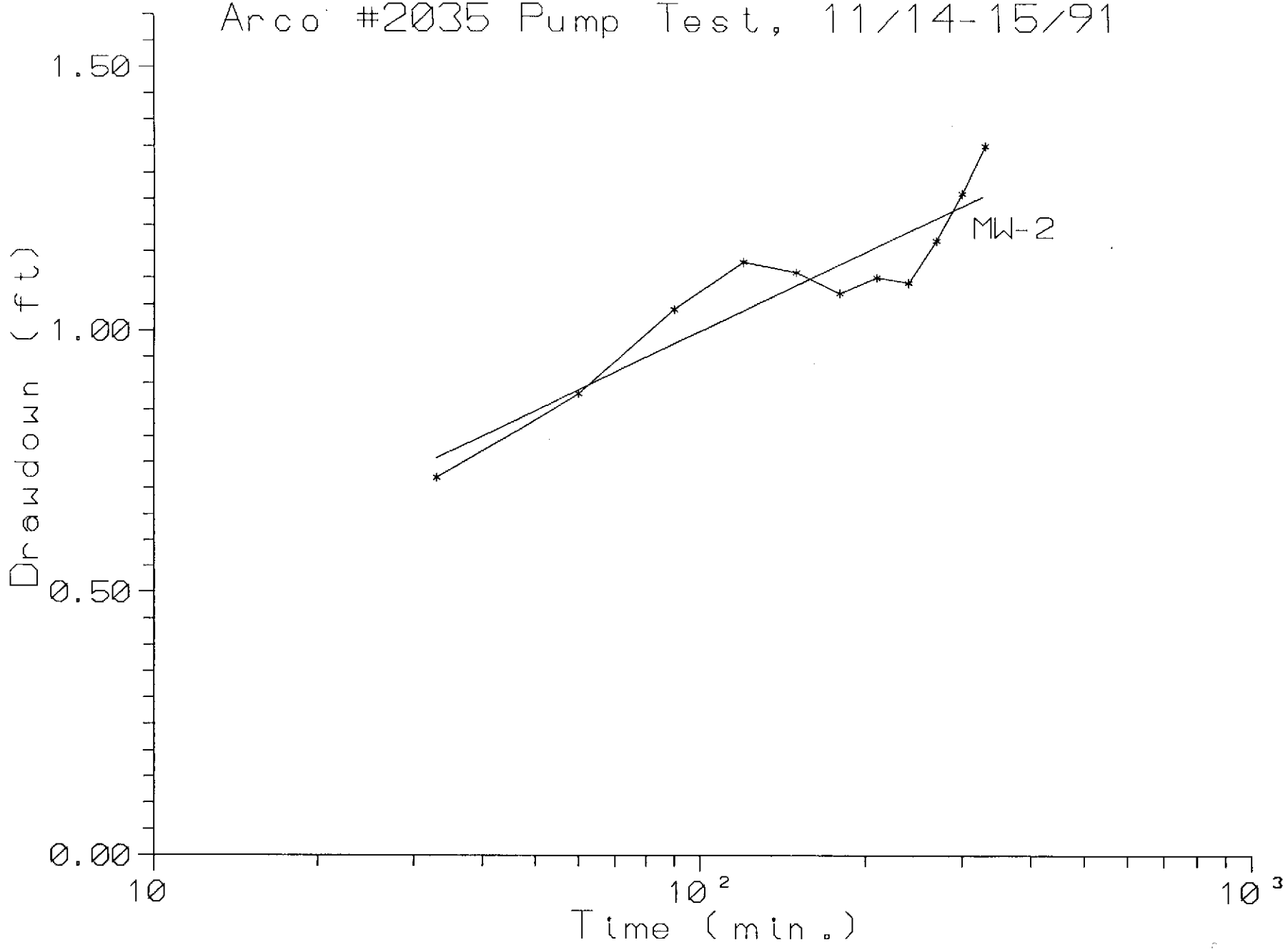
ROJECT 69036.02

PLATE 20



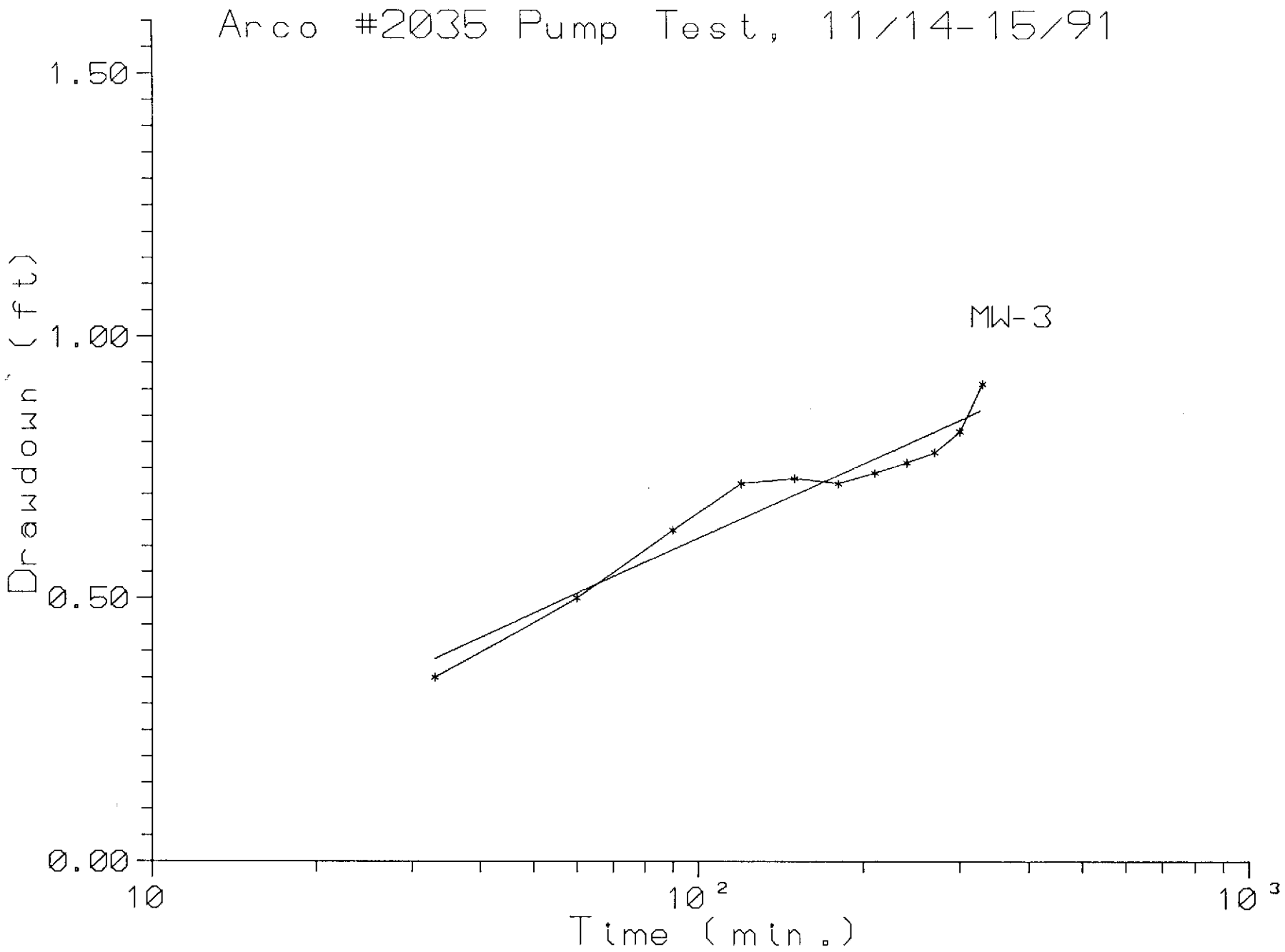
ROJECT 69036.02

PLATE 21



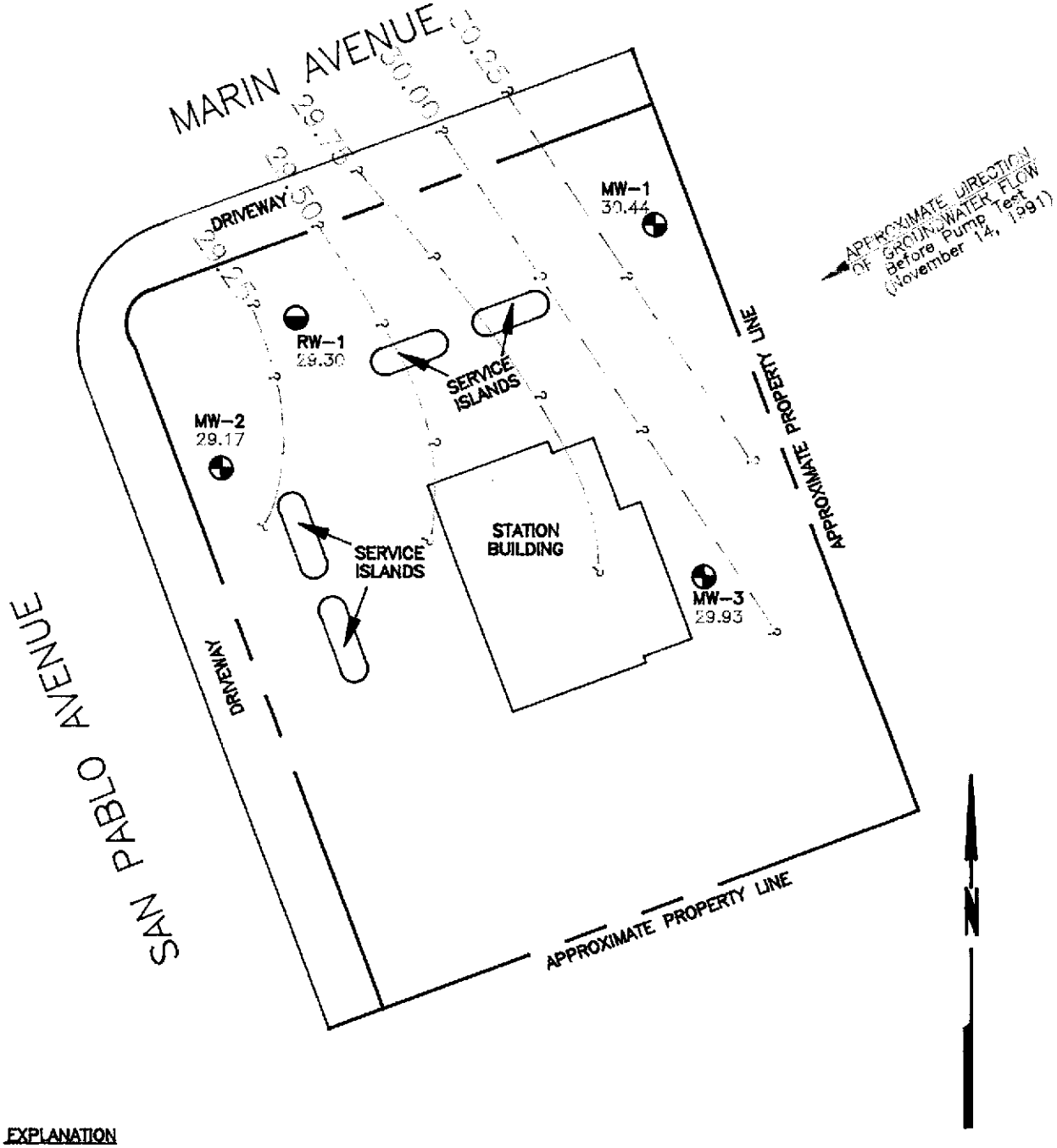
ROJECT 69036.02

PLATE 22



ROJECT 69036.02

PLATE 23



EXPLANATION

30.25 = Line of equal elevation of groundwater above mean sea level (MSL)

30.44 = Elevation of groundwater in feet MSL, before pump test, November 14, 1991

RW-1 = Recovery well (Exceltech, October 1991)

MW-3 = Monitoring well (Exceltech, October 1991)

Approximate Scale

30 15 0 30 60

feet

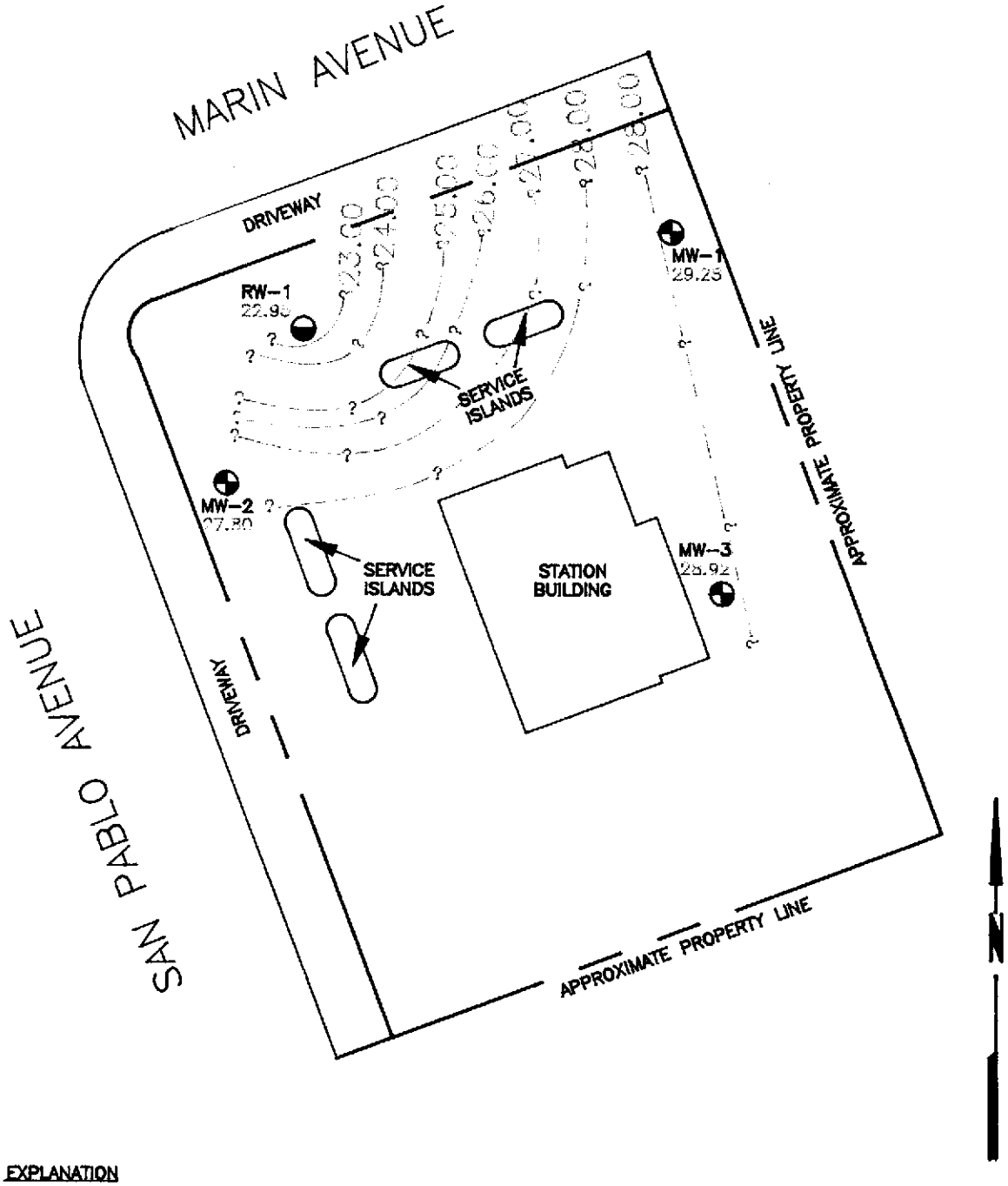
Source: Surveyed by John E. Koch, Land Surveyor.

RESNA

PROJECT 69036.02

GROUNDWATER GRADIENT MAP
BEFORE PUMP TEST
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE
24



EXPLANATION

29.00 = Line of equal elevation of groundwater above mean sea level (MSL)

29.25 = Elevation of groundwater in feet MSL, end of pump test, November 15, 1991

RW-1 = Recovery well (Exceltech, October 1991)

MW-3 = Monitoring well (Exceltech, October 1991)

Approximate Scale

30 15 0 30 60

feet

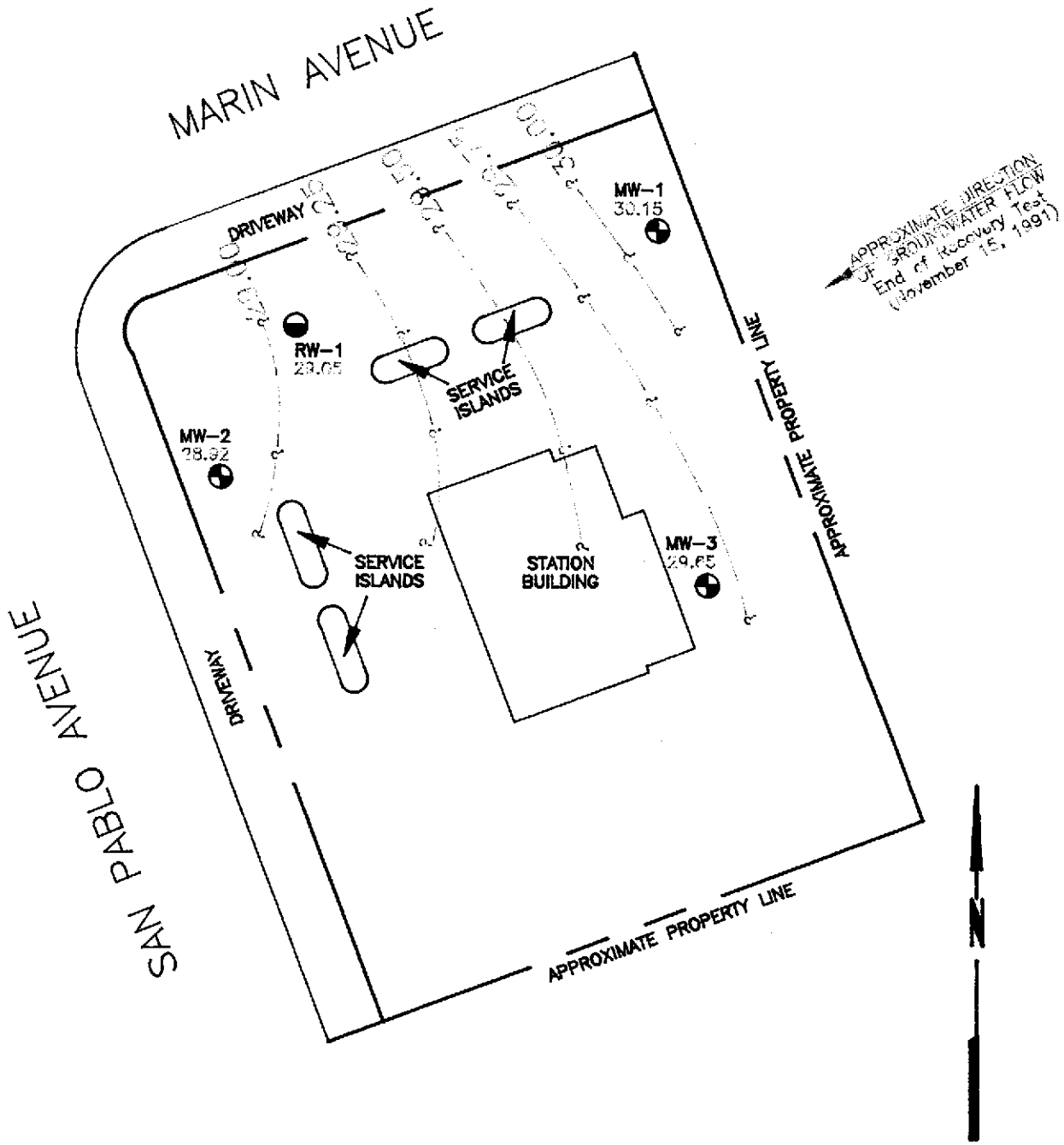
Source: Surveyed by John E. Koch, Land Surveyor.

RESNA

PROJECT 69036.02

GROUNDWATER GRADIENT MAP
END OF PUMP TEST
ARCO Station 2035
1001 San Pablo Avenue
Albany, California

PLATE 25



EXPLANATION

30.00 = Line of equal elevation of groundwater above mean sea level (MSL)

30.15 = Elevation of groundwater in feet MSL, end of recovery test, November 15, 1991

RW-1 = Recovery well (Exceltech, October 1991)

MW-3 = Monitoring well (Exceltech, October 1991)

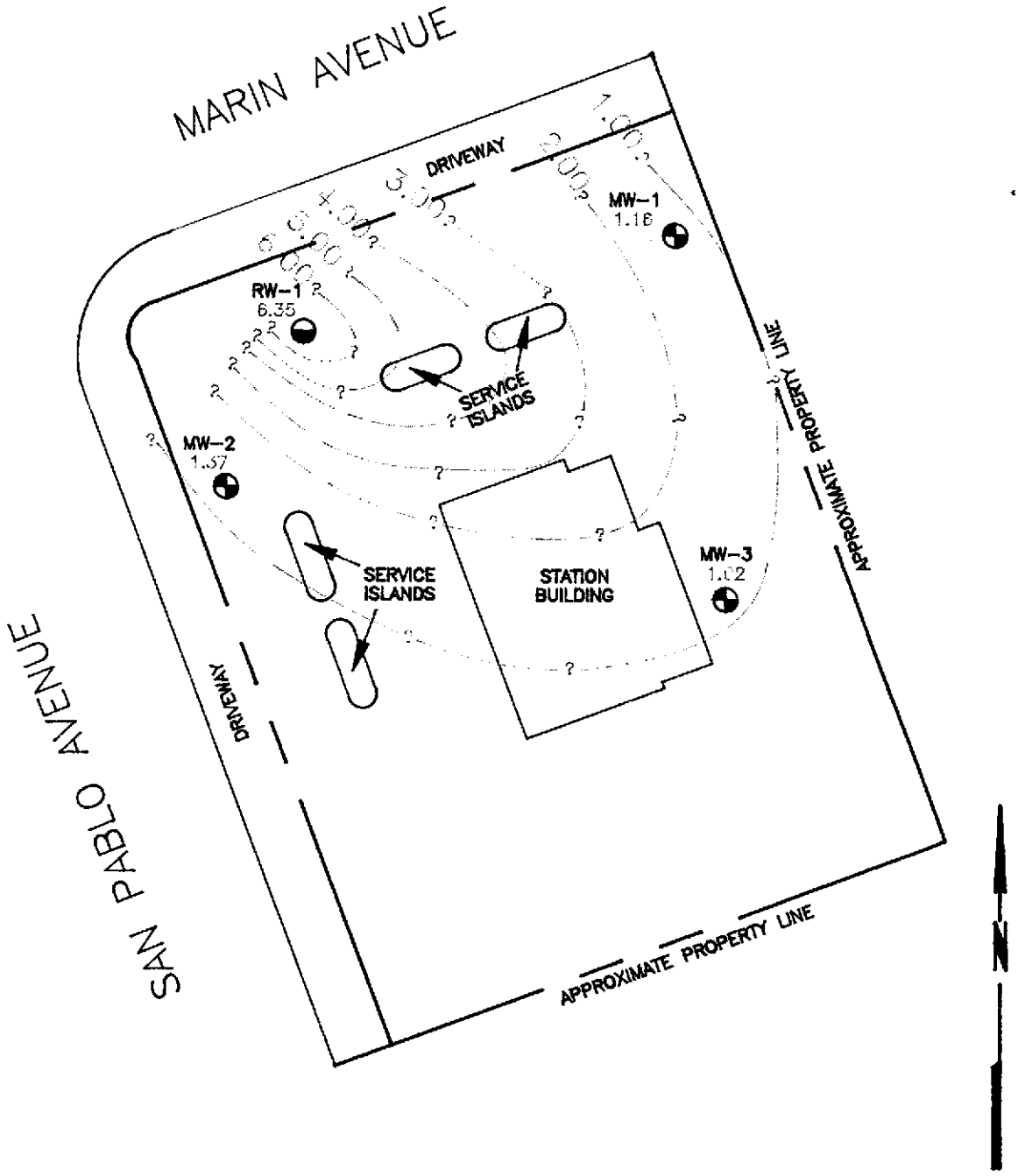
Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John E. Koch, Land Surveyor.

RESNA	**GROUNDWATER GRADIENT MAP END OF RECOVERY TEST ARCO Station 2035 1001 San Pablo Avenue Albany, California**	**PLATE 26**
PROJECT 69036.02		



EXPLANATION

6.00 = Line of equal groundwater drawdown in feet

6.44 = Drawdown of groundwater in feet end of pump test, November 15, 1991

RW-1 = Recovery well (Exceltech, October 1991)

MW-3 = Monitoring well (Exceltech, October 1991)

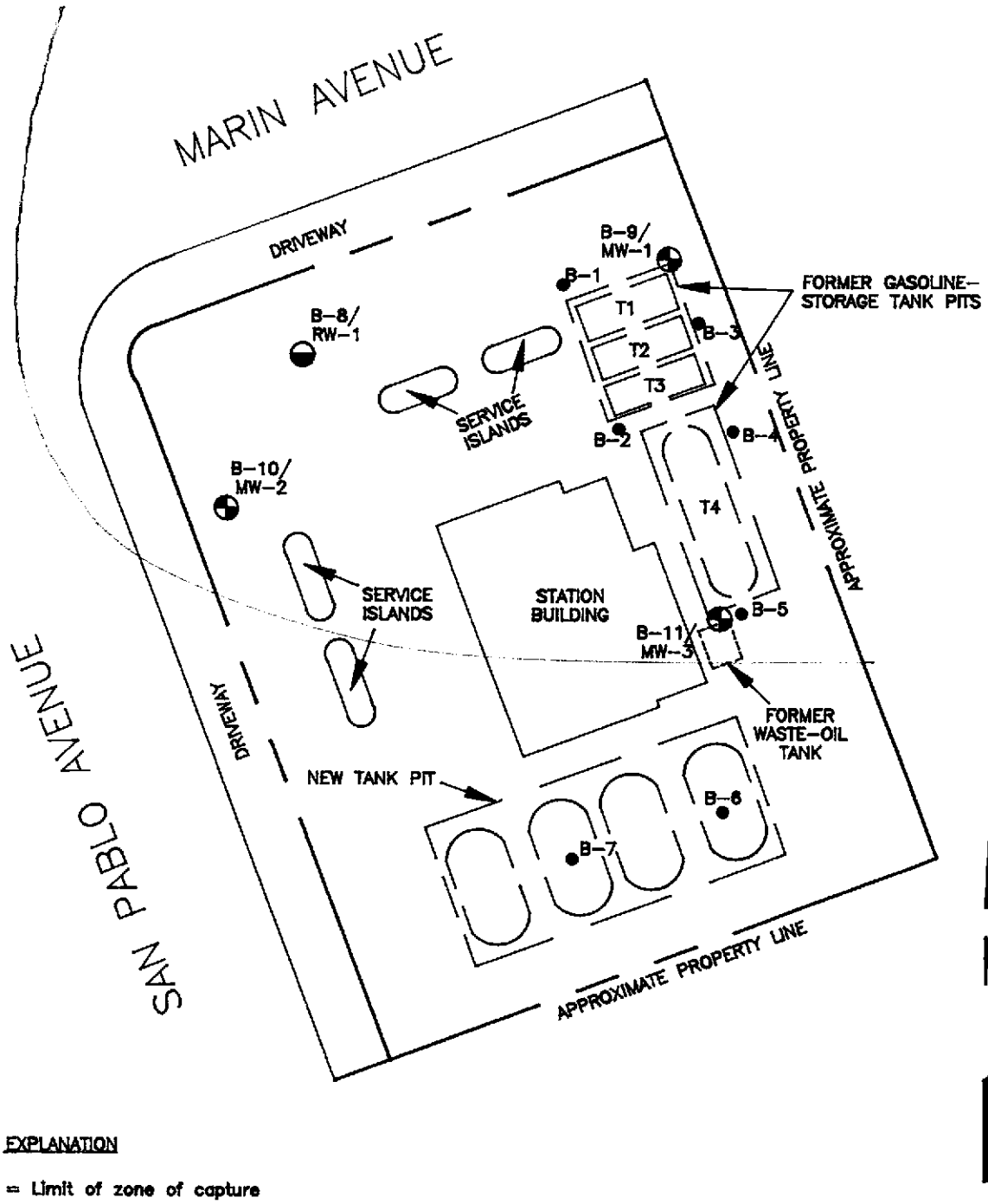
Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John E. Koch, Land Surveyor.

RESNA	GROUNDWATER DRAWDOWN MAP AT END OF PUMP TEST ARCO Station 2035 1001 San Pablo Avenue Albany, California	PLATE 27
PROJECT 69036.02		



EXPLANATION

= Limit of zone of capture

RW-1 = Recovery well (Exceltech, October 1991)

MW-3 = Monitoring well (Exceltech, October 1991)

B-5 = Soil boring (RESNA, August 1989 and June 1991)

Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John E. Koch, Land Surveyor.

RESNA	**PREDICTED ZONE OF CAPTURE FOR RW-1 ARCO Station 2035 1001 San Pablo Avenue Albany, California**	**PLATE 28**
PROJECT 69036.02		

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 2035
Albany, California

Well / Date	Elevation of Wellhead	Depth to Water	Elevation of Groundwater	Evidence of Product
MW-1				
10/29/91	41.41	11.86	29.55	NONE
11/07/91		10.94	30.47	NONE
11/14/91		10.97	30.44	NONE
MW-2				
10/29/91	40.38	11.10	29.28	NONE
11/07/91		11.20	29.18	NONE
11/14/91		11.21	29.17	NONE
MW-3				
10/29/91	41.44	11.62	29.82	NONE
11/07/91		11.52	29.92	NONE
11/14/91		11.50	29.94	NONE
RW-1				
10/29/91	40.33	10.85	29.48	SHEEN
11/07/91		11.97	28.36	0.01
11/14/91		11.03	29.30	0.01

Wellhead Elevation based on benchmark (B1198): A standard Bronze Disk in the sidewalk 0.8' behind the face of curb on the northerly side of Marin Avenue 6' +/- westerly of the curb return at the northeast corner of Marin Avenue and San Pablo Avenue at an elevation of 40.426 feet above mean sea level, City of Albany, California.
Depth-to-water measurements in feet below the top of the well casing.

TABLE 2
GROUNDWATER LEVEL MEASUREMENTS
DURING PUMP TEST
ARCO Station 2035
Albany, California

	MW-1		MW-2		MW-3		RW-1	
TIME	DTW	GROUNDWATER ELEVATION	DTW	GROUNDWATER ELEVATION	DTW	GROUNDWATER ELEVATION	DTW*	GROUNDWATER ELEVATION
0	10.97	30.44	11.21	29.17	11.51	29.93	11.03	29.30
30	11.17	30.24	11.93	28.45	11.86	29.58	16.43	23.90
60	11.40	30.01	12.09	28.29	12.01	29.43	16.39	23.93
90	11.56	29.85	12.25	28.13	12.14	29.30	17.28	23.04
120	11.71	29.70	12.34	28.04	12.23	29.21	17.40	22.92
150	11.77	29.64	12.32	28.06	12.24	29.20	16.96	23.37
180	11.80	29.61	12.28	28.10	12.23	29.21	19.99	24.34
210	11.81	29.60	21.31	19.07	12.25	29.19	16.72	23.61
240	11.85	29.56	12.30	28.08	12.27	29.17	15.43	24.90
270	11.86	29.55	12.38	29.17	12.29	29.15	17.18	23.15
300	11.89	29.52	12.47	27.91	12.33	29.11	18.54	21.79
330	11.96	29.45	12.56	27.82	12.42	29.02	19.98	20.34
360	12.04	29.37	12.63	27.75	12.49	28.95	18.04	22.29
390	12.02	29.39	12.48	27.90	12.41	29.03	18.45	21.87
420	12.03	29.38	12.55	27.83	12.42	29.02	19.09	21.23
450	12.04	29.37	12.42	19.76	12.44	29.00	16.51	23.81
480	12.00	29.41	12.34	28.04	12.28	29.16	14.76	25.56
510	11.92	29.49	12.34	28.04	12.32	29.12	16.89	23.44
540	11.92	29.49	12.40	27.65	12.34	29.10	16.38	23.94
570	11.93	29.48	12.34	28.04	12.32	29.12	15.79	24.53
600	11.94	29.47	12.44	27.94	12.37	29.07	17.51	22.81
630	11.99	29.42	12.50	27.88	12.41	29.03	17.76	22.71
660	12.01	29.40	12.53	27.85	12.43	29.01	17.76	22.56
690	12.04	29.37	12.53	27.85	12.45	28.99	17.39	22.93
720	12.03	29.38	12.51	27.87	12.44	29.00	17.23	23.10
750	12.05	29.36	12.51	27.87	12.44	29.00	17.08	23.24
780	12.05	29.36	12.51	27.87	12.45	28.99	17.06	23.26
810	12.05	29.36	12.51	27.87	12.45	28.99	17.05	23.28
840	12.06	29.35	12.51	27.87	12.45	29.99	17.09	23.23
870	12.06	29.35	12.51	27.87	12.46	28.98	17.08	23.24
900	12.06	29.35	12.50	27.88	12.46	28.98	16.90	23.42
930	12.06	29.35	12.50	27.88	12.46	28.98	16.72	23.60
960	12.06	29.35	12.58	27.80	12.46	28.98	18.02	22.30
990	12.10	29.31	12.58	27.80	12.46	28.98	17.95	22.38
1020	12.12	29.29	12.60	27.78	12.54	28.90	17.92	22.41
1050	12.13	29.28	12.58	27.80	12.53	28.91	17.41	22.92
1080	12.13	29.28	12.58	27.80	12.52	28.92	17.38	22.95

DTW: Depth to water. Time is measured in minutes.
Top of casing elevation for RW-1 is 40.33 feet. Top of casing elevation for MW-1 is 41.41 feet.
Top of casing elevation for MW-2 is 40.38 feet. Top of casing elevation for MW-3 is 41.44 feet.

*: Estimated from data logger transducer data, unable to manually measure DTW in RW-1 because RW-1 was the pumping well.

TABLE 3
GROUNDWATER LEVEL MEASUREMENTS
DURING RECOVERY TEST
ARCO Station 2035
Albany, California

	MW-1		MW-2		MW-3		RW-1	
	GROUNDWATER		GROUNDWATER		GROUNDWATER			
GROUNDWATER TIME ELEVATION	DTW	ELEVATION	DTW	ELEVATION	DTW	ELEVATION	DTW*	
1110	12.08	29.33	12.2	28.18	12.36	29.08	12.14	28.19
1140	11.91	29.5	11.94	28.44	12.18	29.26	11.75	28.58
1170	11.74	29.67	11.82	28.56	12.06	29.38	11.59	28.74
1200	11.57	29.84	11.75	28.68	11.97	29.47	11.49	28.84
1230	11.5	29.91	11.66	11.44	28.72	29.5	11.44	28.89
1260	11.44	29.97	11.61	28.77	11.89	29.55	11.39	28.94
1290	11.4	30.01	11.58	28.8	11.87	29.57	11.36	28.97
1320	11.36	30.05	11.53	28.85	11.85	28.59	11.33	29
1350	11.34	30.07	11.51	28.87	11.83	29.61	11.31	29.02
1380	11.31	30.1	11.46	28.92	11.81	29.63	11.29	29.04
1410	11.28	30.13	11.46	28.92	11.8	29.64	11.28	29.05
1440	11.26	30.15	11.46	28.92	11.79	29.65	11.27	29.06

DTW: Depth to water.
Time is measured in minutes.
Top of casing elevation for MW-1 is 41.41 feet.
Top of casing elevation for MW-2 is 40.38 feet.
Top of casing elevation for MW-3 is 41.44 feet.
Top of casing elevation for RW-1 is 40.33 feet.
*: Estimated from data logger transducer data, unable to manually measure DTW in RW-1 because RW-1 was the pumping well.

TABLE 4
GROUNDWATER ELEVATIONS PRIOR TO THE PUMP TEST,
AT END OF THE PUMP TEST, AND AT END OF RECOVERY TEST
ARCO Station 2035
Albany, California

WELL ID	MW-1	MW-2	MW-3	RW-1*
Before Pump Test				
DTW	10.97	11.21	11.51	11.03
Groundwater Elevation	30.44	29.17	29.93	29.30
After Pump Test				
DTW	12.13	12.58	12.52	17.38
Groundwater Elevation	29.28	27.80	28.92	22.95
Drawdown (ft)	1.16	1.37	1.01	6.36
After Recovery Test				
DTW	11.31	11.46	11.79	11.27
Groundwater Elevation	30.15	28.92	29.65	29.05
Recovery (%)	98.0	98.5	98.0	99.1

DTW: Depth to water.
Top of casing elevation for RW-1 is 40.33 feet.
Top of casing elevation for MW-1 is 41.41 feet.
Top of casing elevation for MW-2 is 40.38 feet.
Top of casing elevation for MW-3 is 41.44 feet.
*: Estimated from data logger transducer data, unable to manually measure DTW in RW-1 because RW-1 was the pumping well.

TABLE 5
PARAMETERS USED IN CALCULATIONS,
TRANSMISSIVITY, AND STORATIVITY VALUES OBTAINED
ARCO Station 2035
Albany, California

WELL	s(ft)	t(min)	r(ft)	T(ft^2/d)	S
MW-1					
All Pumping	0.52	6.0	62	107	2.6×10^{-4}
Early Pumping	0.74	15	62	78	4.6×10^{-4}
Recovery	0.89	-	-	63	-
MW-2					
All Pumping	0.34	0.11	30	164	3.1×10^{-5}
Early Pumping	0.50	1.00	30	115	1.9×10^{-4}
Recovery	0.77	-	-	72	-
MW-3					
All Pumping	0.36	1.9	84	155	6.5×10^{-5}
Early Pumping	0.50	1.00	84	122	1.3×10^{-4}
Recovery	0.77	-	-	94	-

s = Drawdown per log cycle
T = Transmissivity
t = Time in minutes
r = Radial distance from pumping well to observation well
S = Storativity

TABLE 6
RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
ARCO Station 2035
Albany, California
October 1991

Date / Sample ID	TPHg	B	T	E	X	TPHd	TOG	VOC	Cd	Cr	Pb	Ni	Z
S-6-B8	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	NA	NA	NA	NA	NA	NA	NA	NA
S-11-B8	35	1.2	1.7	0.42	2.0	NA	NA	NA	NA	NA	NA	NA	NA
S-16-B8	3.0	0.45	0.13	0.11	0.47	NA	NA	NA	NA	NA	NA	NA	NA
*S-30-B8	240	3.6	5.0	4.1	16	NA	NA	NA	NA	NA	NA	NA	NA
S-6-B9	25	0.60	0.58	0.44	1.8	NA	NA	NA	NA	NA	NA	NA	NA
S-10¼-B9	13	0.74	0.72	0.18	0.95	NA	NA	NA	NA	NA	NA	NA	NA
S-16-B9	<1.0	0.015	<0.0050	<0.0050	<0.0050	NA	NA	NA	NA	NA	NA	NA	NA
S-31-B9	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	NA	NA	NA	NA	NA	NA	NA	NA
S-5½-B10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	NA	NA	NA	NA	NA	NA	NA	NA
S-13-B10	4.0	0.13	0.15	0.041	0.16	NA	NA	NA	NA	NA	NA	NA	NA
S-20½-B10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	NA	NA	NA	NA	NA	NA	NA	NA
S-30½-B10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	NA	NA	NA	NA	NA	NA	NA	NA
S-6-B11	<1.0	0.010	<0.0050	<0.0050	<0.0050	3.9	80	ND	<0.50	49	7.7	97	41
S-11-B11	110	<0.0050	<0.0050	<0.0050	0.27	71	43	ND	<0.50	80	5.8	77	69
S-16-B11	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	57	ND	<0.50	33	7.5	25	45
S-21-B11	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	74	ND	<0.50	39	7.2	32	56

Results in parts per million (ppm).
TPHg: Total petroleum hydrocarbons as gasoline by EPA method 5030/8015/8020.
B: benzene, T: toluene, E: ethylbenzene, X: total xylenes isomers
BTEX: Analyzed by EPA method 5030/8015/8020.
TPHd: Total Petroleum Hydrocarbons as diesel by EPA method 3350/8015.
TOG: Total oil and grease by Standard method 5520 E&F.
VOC: Volatile organic compounds by EPA method 5030/8010.
Cd: Cadmium by EPA method 6010.
Cr: Chromium by EPA method 6010.
Ni: Nickel by EPA method 6010.
Zn: Zinc by EPA method 6010.
Pb: Lead by EPA method 7421.
NA: Not analyzed.
<: Results reported below the laboratory detection limit.
ND: All 29 compounds tested were nondetectable. Detection limits varied for different compounds.
*: Sample collected from the saturated zone, analyzed for site characterization purposes only.

Sample Identification: S-21-B11
- Boring number
- Depth in feet
- Soil Sample

RESNA

TABLE 7
RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES
ARCO Station 2035
Albany, California

WELL ID	TPHg	B	T	E	X	TOG	VOC	Cd	Cr	Pb	Ni	Zn
10/29/91												
MW-1	620	76	69	15	60	NA	NA	NA	NA	NA	NA	NA
MW-2	<60	2.4	4.6	0.48	2.3	NA	ND	NA	NA	NA	NA	NA
MW-3	32	2.1	2.8	0.35	1.8	<5.0	ND*	<0.010	<0.010	<0.0050	<0.050	0.045
RW-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MCL:		1		680	1,750							
DWAL:			100									

Results in parts per billion (ppb).
TPHg: Total petroleum hydrocarbons as gasoline by EPA method 5030/8015/8020.
B: benzene, T: toluene, E: ethylbenzene, X: total xylenes isomers
BTEX: Analyzed by EPA method 5030/8015/8020.
TOG: Total oil and grease by Standard method 5520 B&F.
VOC: Volatile organic compounds by EPA method 624.
*: All compounds were nondetectable except for toluene (3.0 ppb).
Cd: Cadmium by EPA method 200.7.
Cr: Chromium by EPA method 200.7.
Ni: Nickel by EPA method 200.7.
Zn: Zinc by EPA method 200.7.
Pb: Lead by EPA method 3010.
NA: Not analyzed.
<: Results reported below the laboratory detection limit.
ND: Not detected.
NS: Not sampled, due to a sheen in the well.

Sample Identification: W-11-MW3
- W- : Monitoring well number
- 11- : Depth in feet
- MW3 : Water Sample

APPENDIX A

PREVIOUS WORK

PREVIOUS WORK

Limited Site Assessment

On August 9, 1989, Applied GeoSystems (AGS) performed a limited environmental site assessment to evaluate possible gasoline hydrocarbons in the vicinity of the four underground gasoline-storage tanks (AGS, 1990). Five soil borings (B-1 through B-5) were drilled as shown on Plate 1A, Soil Boring Locations.

Groundwater was encountered in the borings at depths between 17 and 18 feet below ground surface, except in boring B-5 where groundwater was not encountered to a total depth of 20-½ feet below ground surface. A hydrocarbon sheen was noted on the surface of water samples obtained from borings B-1 through B-4.

Laboratory analyses of selected soil samples from borings B-1 through B-5 reported concentrations of TPHg ranging from nondetectable (less than 1 parts per million [ppm]) to 2,400 ppm, See Table A-1, Results of Laboratory Analysis of Soil Samples. AGS concluded that shallow soils (at 10-15 feet depths) near the four underground gasoline storage tanks had been impacted by gasoline hydrocarbons, and shallow groundwater beneath the site appeared to have been impacted by gasoline hydrocarbons.

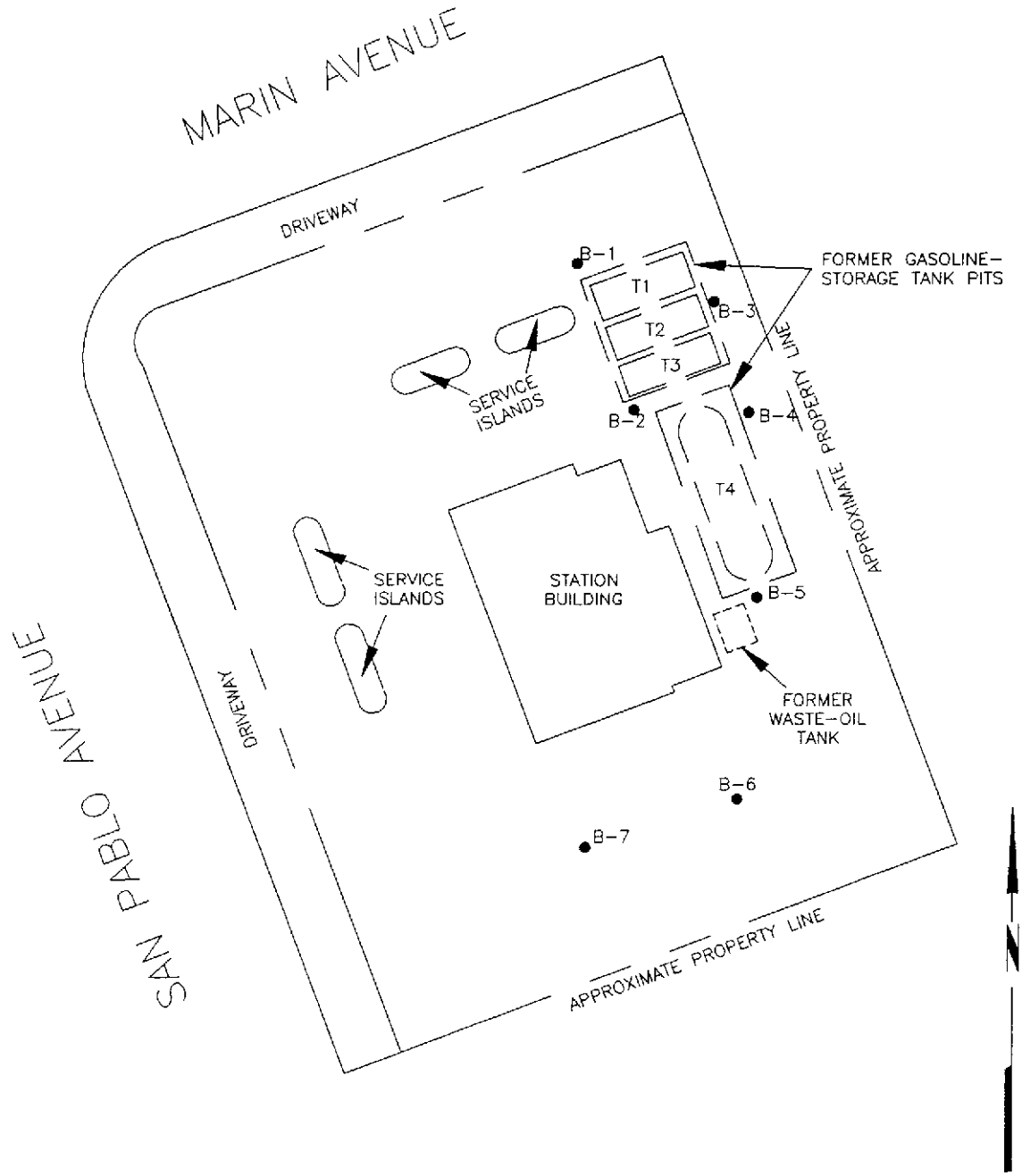
Underground Storage Tank Removal

An Addendum One to the Work Plan and Site Safety Plan were prepared by RESNA in June 1991 outlining work to be performed in a limited subsurface investigation at the subject site. Before work proposed in Addendum One to the Work Plan, removal and replacement of underground gasoline-storage tanks and product delivery lines commenced in July 1991.

On June 25, 1991, RESNA personnel supervised the drilling of two soil borings, (B-6 and B-7) to depths of 18 and 19-½ feet below ground surface in the area of the proposed new tank pit location as shown on Plate 2A, Soil Sampling.

Groundwater was first encountered at 17-½ feet in B-6 and 19-½ feet in B-7. Selected soil samples collected from borings B-6 and B-7 were submitted for laboratory analysis for TPHg and BTEX by EPA Methods 8015/8020. TPHg and BTEX concentrations were not detected from any soil sample submitted. The laboratory results are depicted on Table A-2, Laboratory Analyses of New Tank Pit Soil Samples.

In July and August 1991, four gasoline USTs (T1 through T4) and associated product lines were excavated and removed. Soil samples were collected from the side walls, bottom of the excavation, and beneath the product lines as shown on plate 2A. Selected soil samples were submitted for laboratory analysis for TPHg and BTEX by EPA Method 8015/8020. The analytical results are shown on Table A-3, Laboratory Analyses of Former Gasoline Tank Pit Soil Samples, and Table A-4, Laboratory Analyses of Product-Line and Product-Dispenser Soil Samples. The tank removal and environmental subsurface investigation concluded that gasoline hydrocarbons over 100 ppm have not impacted the shallow soils (ground surface to 13 feet below grade) in the vicinity of the former underground steel gasoline-storage tanks; gasoline hydrocarbons over 1,000 ppm have impacted the shallow soils (one foot below grade) in the vicinity of the product dispensers adjacent to the former steel gasoline-storage tanks; and a water "grab" sample collected from the former tank pit and submitted for laboratory analysis showed a concentration of 190 ppb TPHg.



EXPLANATION

B-5 ● = Soil boring (RESNA, August 1989 and June 1991)

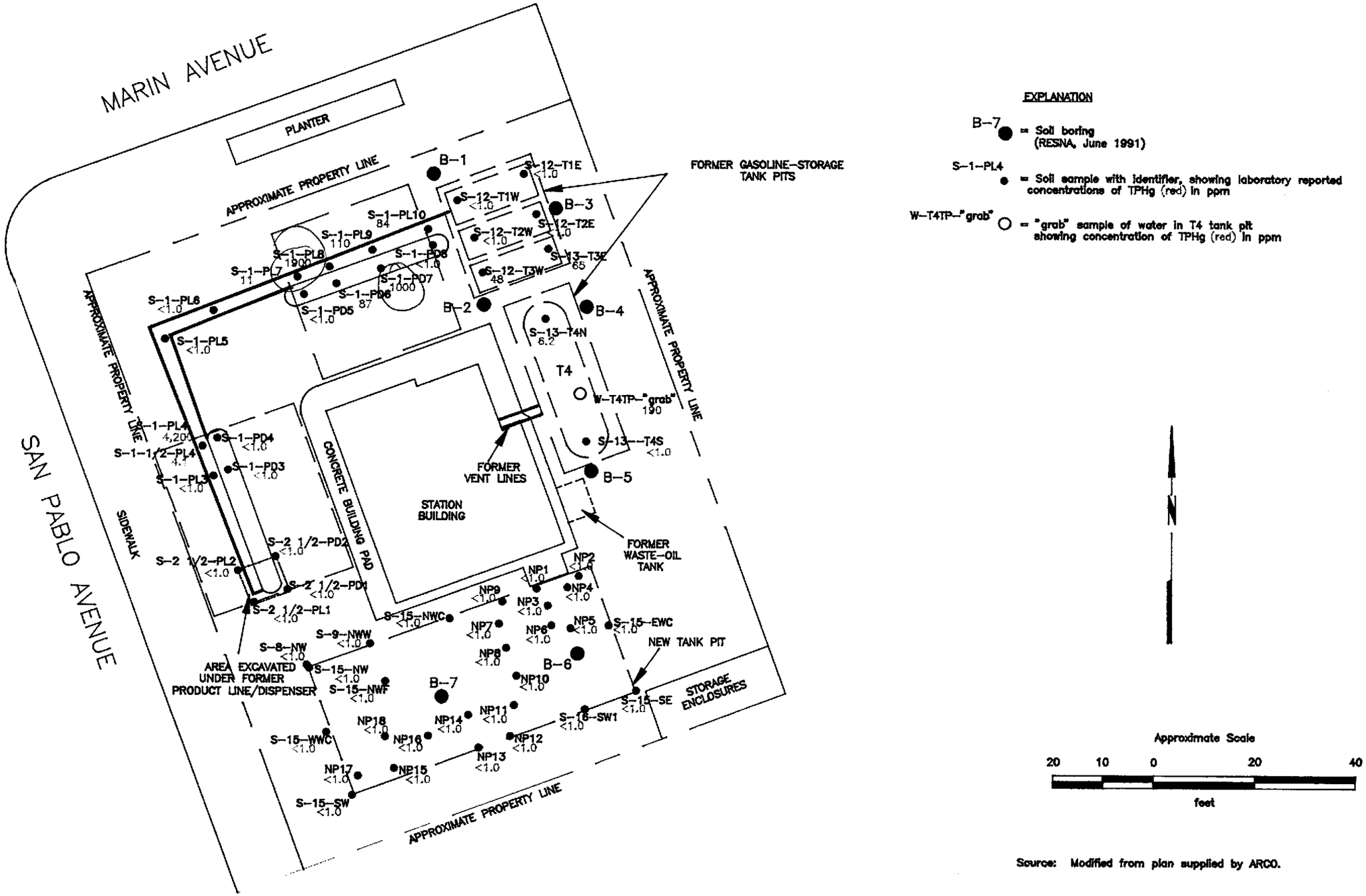
Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John E. Koch, Land Surveyor.

RESNA	**SOIL BORING LOCATIONS** **ARCO Station 2035** **1001 San Pablo Avenue** **Albany, California**	**PLATE** **1A**
PROJECT 69036.02		



EXPLANATION

B-7 ● = Soil boring (RESNA, June 1991)

S-1-PL4 ● = Soil sample with identifier, showing laboratory reported concentrations of TPHg (red) in ppm

W-T4TP-"grab" ○ = "grab" sample of water in T4 tank pit showing concentration of TPHg (red) in ppm

Source: Modified from plan supplied by ARCO.

RESNA PROJECT 69036.02	**SOIL SAMPLING** **ARCO Station 2035** **1001 San Pablo Avenue** **Albany, California**	**PLATE** **2A**

TABLE A-1
RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
ARCO Station 2035
Albany, California

Sample ID	TPHg	B	T	E	X
S-10-B1	1,900	<4	15	8	53
S-15-B1	<1	<0.005	0.006	0.006	<0.005
S-19-1/2-B1	<1	<0.005	<0.005	<0.005	<0.005
S-10-B2	51	1.9	0.35	0.81	4.0
S-14-1/2-B2	<1	0.063	<0.005	<0.005	<0.005
S-20-B2	<1	0.039	0.044	0.007	0.041
S-10-B3	75	3.1	8.2	1.8	11.0
S-14-1/2-B3	<1	0.21	<0.025	<0.025	0.039
S-20-B3	<1	<0.005	<0.005	<0.005	<0.005
S-10-B4	2,400	33	140	40	220
S-15-B4	520	<1	6.9	6.2	6.3
S-19-B4	<1	<0.005	0.007	<0.005	<0.005
S-9-1/2-B5	<1	0.007	0.006	<0.005	<0.005
S-15-B5	<1	<0.005	0.006	<0.005	<0.005
S-20-B5	<1	<0.005	<0.005	<0.005	<0.005

Results in milligrams per kilogram (mg/kg), or parts per million (ppm).
TPHg: Total petroleum hydrocarbons as gasoline
B:benzene E:ethylbenzene T:toluene X:total xylene isomers
<: Indicates less than the reported limit.
Sample identification:

S-10-B5

- S-10-B5 — Soil sample
- S-10-B5 — Approximate sample depth in feet
- S-10-B5 — Boring number

TABLE A-2
LABORATORY ANALYSES OF NEW TANK PIT SOIL SAMPLES
ARCO Station 2035
Albany, California
(Page 1 of 2)

Sample ID	B	T	E	X	TPHg
June 25, 1991					
S-5½-B6	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-10½-B6	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-15½-B6	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-17-B6	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-5½-B7	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-10½-B7	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-15½-B7	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-17-B7	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-18½-B7	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
July 8, 1991					
S-15-EWC	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-15-SE	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-16-SW1	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-15-SW	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-15-NWC	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-15-WWC	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-15-NWF	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-9-NWW	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-8-NW	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-15-NW	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
July 9, 1991					
S-0709-NP1(10')	0.025	0.027	0.0060	0.024	<1.0
S-0709-NP2(14')	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-0709-NP3(10')	<0.0050	0.0050	<0.0050	0.018	<1.0
S-0709-NP4(15)	0.0050	0.0050	<0.0050	<0.0050	<1.0
S-0709-NP5(5')	0.012	0.013	<0.0050	0.0080	<1.0
S-0709-NP6(15')	0.017	0.021	0.014	0.056	<1.0
S-0709-NP7(3')	0.0060	0.0060	<0.0050	<0.0050	<1.0
S-0709-NP8(14')	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-0709-NP9(9')	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-0709-NP10(10')	0.0090	0.0060	<0.0050	<0.0050	<1.0

See notes on page 2 of 2.

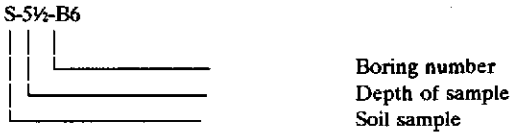
TABLE A-2
LABORATORY ANALYSES OF NEW TANK PIT SOIL SAMPLES
ARCO Station 2035
Albany, California
(Page 2 of 2)

Sample ID	B	T	E	X	TPHg
S-0709-NP11(8')	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-0709-NP12(14')	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-0709-NP13(2')	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
S-0709-NP14(6')	<0.0050	<0.0050	0.0050	0.0080	<1.0
S-0709-NP15(5')	<0.0060	<0.0050	<0.0050	0.0060	<1.0
S-0709-NP16(16')	<0.0050	<0.0050	0.0050	0.0080	<1.0
S-0709-NP17(10')	<0.0050	<0.0050	0.0050	0.0080	<1.0
S-0709-NP18(11')	<0.0050	<0.0050	0.0050	0.0080	<1.0

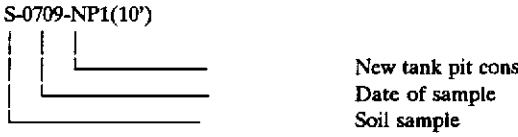
Results in parts per million (ppm).
B: benzene, T: toluene, E: ethylbenzene, X: total xylenes
TPHg: Total petroleum hydrocarbons as gasoline (TPHg with BTEX distinction measured by EPA Methods 5030/8015/8020)
<: Less than the indicated laboratory detection limit.

Sample Identification:

Soil Borings:



Excavation Samples:



Sidewall and Floor Samples:

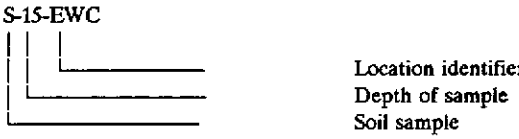


TABLE A-3
LABORATORY ANALYSES OF FORMER GASOLINE TANK PIT SOIL SAMPLES
ARCO Station 2035
Albany, California

Sample ID	B	T	E	X	TPHg	TOG	VOC	Pb
July 3, 1991								
S-12-T1W	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	NA	NA	NA
S-12-T1E	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	NA	NA	NA
S-12-T2W	0.031	<0.0050	0.0080	<0.0050	<1.0	NA	NA	NA
S-12-T2E	0.019	<0.0050	<0.0050	<0.0050	<1.0	NA	NA	NA
S-12-T3W	1.2	2.4	1.0	3.8	48	NA	NA	<0.05
S-12-T3E	0.2	0.51	0.97	3.9	65	NA	NA	<0.05
S-13-T4N	0.45	0.039	0.18	0.33	6.2	NA	NA	NA
S-13-T4S	0.061	0.034	0.0080	0.15	<1.0	<30	ND	NA
	(0.160)			(0.430)				

Results in parts per million (ppm).
NA: Not analyzed.
<: Less than the indicated laboratory detection limit
ND: Less than laboratory limit for each compound, except benzene and total xylenes
( ): Indicates results measured by EPA Method 8240
B: benzene, T: toluene, E: ethylbenzene, X: total xylenes
TPHg: Total petroleum hydrocarbons as gasoline
(TPHg with BTEX distinction measured by EPA Methods 5030/8015/8020)
TOG: Total oil and grease (measured by Standard Method 5520 E and F)
VOC: Volatile organic compounds (measured by EPA Method 8240)
Pb: Organic lead (measured by California LUFT Manual Method, 12/87)

Sample Identification: S-12-T1W

- Tank number and locator
- Depth of sample
- Soil sample

RESNA

TABLE A-4
LABORATORY ANALYSES OF PRODUCT-LINE
AND PRODUCT-DISPENSER SOIL SAMPLES
ARCO Station 2035
Albany, California

Sample ID	B	T	E	X	TPHg
July 19, 1991					
S-2½-PL1	<0.005	<0.005	<0.005	<0.005	<1.0
S-2½-PL2	<0.005	<0.005	<0.005	<0.005	<1.0
S-1-PL3	0.005	0.02	0.016	0.12	17
S-1-PL4	36	320	100	640	4,200
S-1-PL5	<0.005	<0.005	<0.005	<0.005	<1.0
S-1-PL6	<0.005	<0.005	<0.005	<0.005	<1.0
S-1-PL7	0.10	0.37	0.16	1.2	11
S-1-PL8	3.6	28	29	200	1,900
S-1-PL9	0.2	0.78	0.36	3.1	110
S-1-PL10	0.09	0.43	0.72	2.8	84
S-2½-PD1	<0.005	<0.005	<0.005	<0.005	<1.0
S-2½-PD2	<0.005	<0.005	<0.005	<0.005	<1.0
S-1-PD3	<0.005	<0.005	<0.005	<0.005	<1.0
S-1-PD4	<0.005	<0.005	<0.005	12	330
S-1-PD5	<0.005	<0.005	<0.005	<0.005	<1.0
S-1-PD6	0.13	0.28	0.48	3.8	87
S-1-PD7	0.35	2.1	1.1	47	1,000
S-1-PD8	<0.005	<0.005	<0.005	<0.005	<1.0
August 9, 1991					
S-1½-PL4	0.21	0.040	0.15	0.12	4.1

Results in parts per million (ppm).
<: Less than the laboratory detection limit.
B: benzene, T: toluene, E: ethylbenzene, X: total xylenes
BTEX: Measured by EPA Method.
TPHg: Total petroleum hydrocarbons as gasoline (measured by EPA Method).
Sample Identification: S-1½-PL1

- Product-line number
- Depth of sample
- Soil sample

RESNA

APPENDIX B

FIELD METHODS

FIELD METHODS

Site Safety Plan

The Site Safety Plan (RESNA, June 24, 1991) describes the safety requirements for the evaluation of gasoline hydrocarbons in soil and groundwater at the site. The site Safety Plan is applicable to personnel of RESNA and its subcontractors. RESNA personnel and subcontractors of RESNA scheduled to perform the work at the site were briefed on the contents of the Site Safety Plan before work began. A copy of the Site Safety Plan was available for reference by appropriate parties during the work. The Staff Geologist of RESNA was Site Safety Officer for the project.

Soil Borings

Prior to the drilling of borings and construction of monitoring wells, permits were acquired from the appropriate regulatory agency. Copies of the permits are included in Appendix A of this report. Prior to drilling, Underground Services Alert was notified of our intent to drill, and known underground utility lines and structures were marked. The borings were drilled by a truck-mounted drill rig equipped with 10- or 12-inch-diameter, hollow-stem augers. The augers were steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. After the borings were drilled, monitoring wells were constructed in the borings, or the borings were backfilled to the ground surface with neat-cement grout and bentonite.

Borings for groundwater monitoring wells were drilled to a depth of no more than 20 feet below the depth at which a saturated zone was first encountered, or a short distance into a stratum beneath the saturated zone which was of moisture content and consistency to be judged as a perching layer by the field geologist, whichever was shallower.

Drill Cuttings

Drill cuttings subjectively evaluated for hydrocarbons at levels greater than 100 parts per million (ppm) were separated from those subjectively evaluated for hydrocarbons at levels less than 100 ppm. Evaluation was based either on subjective evidence of soil discoloration, or on measurements made using a field calibrated organic vapor meter (OVM). Readings were taken by placing a soil sample into a ziplock-type plastic bag and allowing volatilization to occur. The intake probe of the OVM was then inserted into the headspace created in the plastic bag immediately after opening it. The drill cuttings from the borings were placed on plastic at the site, and covered with plastic. The cuttings were removed to a Sanitary Landfill by ARCO.

Soil Sampling in Borings

Soil samples were collected at no greater than 5-foot intervals from the ground surface to the total depth of the borings. The soil samples were 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. The sampler and brass sleeves were laboratory-cleaned, steam-cleaned, or washed thoroughly with Alconox® and water, prior to each use. The sampler was driven with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive six inches was counted and recorded to evaluate the relative consistency of the soil.

The samples selected for laboratory analysis were removed from the sampler and quickly sealed in their brass sleeves with aluminum foil, plastic caps, and aluminized duct tape. The samples were 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 was tested in the field using an OVM that was field calibrated at the beginning of each day it was used. This testing was performed by inserting the intake probe of the OVM into the headspace created 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 report.

Logging of Borings

A geologist was 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, were 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 hydrocarbons, such as soil staining, noticeable or obvious product odor, and OVM readings.

Monitoring Well Construction

Monitoring wells were constructed in selected borings using clean 6- and 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 0.020-inch-wide slots for initial site wells. Slot size for subsequent wells will be based on sieve analysis and/or well development data. The screened sections in groundwater monitoring wells were placed to allow monitoring during seasonal fluctuations of groundwater levels.

The annular space of each well was backfilled with No. 2 by 12 sand, to approximately two feet above the top of the screened casing for initial site wells. The sand pack grain size for subsequent wells will be based on sieve analysis and/or well development data. 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 monitoring 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.

Groundwater Monitoring Well Development

The monitoring wells were developed by bailing or over-pumping and surge-block techniques. The wells were either bailed or pumped, allowed to recharge, and bailed or pumped again until the water removed from the wells was subjectively evaluated to be clear by the field geologist. The wells were allowed to equilibrate for at least 48 hours after development prior to sampling. Water generated by well development was stored in 17E Department of Transportation (DOT) 55-gallon drums on site and was removed in October 1991 by a state-licensed and ARCO contracted waste hauler under manifest. A copy of the manifest is included in Appendix E, Waste Manifest Forms.

Groundwater Sampling

The static water level in each well was measured to the nearest 0.01-foot using a Solinst® electric water-level sounder cleaned with Alconox® and water before use in each well. The liquid in the onsite wells was examined for visual evidence of hydrocarbons by gently

lowering approximately half the length of a Teflon® bailer (cleaned with Alconox® and water) past the air/water interface. The sample was then retrieved and inspected for floating product, sheen, emulsion, color, and clarity. The thickness of floating product detected was recorded to the nearest 0.1-inch.

Wells which did not contain floating product were purged using a submersible pump. The pump, cables, and hoses were cleaned with Alconox® and water prior to use in each well. The wells were purged until withdrawal was of sufficient volume to result in stabilized Ph, temperature, and electrical conductivity of the water, as measured using portable meters calibrated to standard water solutions. If a purged well became de-watered, the water level was allowed to recover to at least 80 percent of the initial water level. Prior to the collection of each groundwater sample, the Teflon® bailer was cleaned with Alconox® and rinsed with tap water and deionized water, and the latex gloves worn by the sampler changed. Hydrochloric acid was added to the sample vials as a preservative (as required for specific laboratory analysis). A sample-method blank was collected by pouring distilled water into the bailer and then into sample vials. A sample of the groundwater was then collected from the surface of the water in each of the wells using the Teflon® bailer. The water samples were then gently poured into laboratory-cleaned, 40-milliliter (ml) glass vials, 500 ml plastic bottles, or 1-liter glass bottles (as required for specific laboratory analysis) and sealed with Teflon®-lined caps, and inspected for air bubbles to check for headspace, which would allow volatilization to occur. The samples were then labeled and promptly placed in iced storage. A field log of well purging procedures and parameter monitoring was maintained. Water generated by the purging of wells was stored in 17E DOT 55-gallon drums onsite, and was removed and disposed by a state-certified and ARCO approved contractor.

Vadose-Zone Sampling

Vapor readings are made with a field calibrated OVM, which has a lower detection limit of 0.1 ppm. Prior to purging each vadose-zone monitoring well, an initial reading is taken inside the well by connecting the tubing of the OVM to a tight fitting at the top of the well. Each vadose-zone monitoring well is then purged for approximately 60 seconds using an electric vacuum pump connected to the tight fitting. Ambient readings of the air at the site are taken with the OVM after each well is purged. The OVM is then connected to the well fitting, and the reading recorded. The well is then again purged for approximately 30 seconds, and again measured using the OVM. These purging and measuring procedures are repeated until two consecutive OVM readings are within ten percent of each other.

Sample Labeling and Handling

Sample containers are labeled in the field with the job number, sample location and 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

Pumping Test

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 was recorded. Drawdowns in observation wells are recorded at intervals throughout pumping using pressure transducers. Evacuated water is stored in a temporary storage tank at the site and remains the responsibility of the client until removed. After the pump test is completed, recovery measurements are taken in the wells until recovery is at least 80 percent of the initial water level.

APPENDIX C

WELL CONSTRUCTION PERMIT

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE ♦ PLEASANTON, CALIFORNIA 94566 ♦ (415) 484-2600

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT Arco Station 2035
1001 San Pablo Avenue
Albany, California

CLIENT
Name Arco Products Company
Address P.O. Box 5811 Phone (415) 571-2434
City San Mateo Zip 94402

APPLICANT
Name RESNA/Applied GeoSystems
Address 3315 Almaden Expr. Ste. 34 Phone (408) 264-7723
City San Jose Zip 95118

DESCRIPTION OF PROJECT
Water Well Construction √ Geotechnical Investigation
Cathodic Protection ___ General ___
Well Destruction ___ Contamination ___

PROPOSED WATER WELL USE
Domestic ___ Industrial ___ Irrigation ___
Municipal ___ Monitoring √ Other ___

PROPOSED CONSTRUCTION
Drilling Method:
Mud Rotary ___ Air Rotary ___ Auger √
Cable ___ Other ___

DRILLER'S LICENSE NO. C57596545

WELL PROJECTS
Drill Hole Diameter 10¼ in. Maximum
Casing Diameter 4 in. Depth 40 ft.
Surface Seal Depth 10 ft. Number 4

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

ESTIMATED STARTING DATE 15 Sep 91
ESTIMATED COMPLETION DATE 17 Sep 91

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

APPLICANT'S SIGNATURE Joel Coffman Date 6-6-91

FOR OFFICE USE

PERMIT NUMBER 91497
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, irrigation, and monitoring wells unless a lesser depth is specially approved.

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 30 Aug 91
Wyman Hong

21989

APPENDIX D

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

TRANSMITTAL LETTER

TO:Joel Coffman

FROM:John Koch

Job No.:91072

COMPANY:Applied GeoSystems

Re:AGS Project #69036.02

FAX NO:(408) 264-2435

SUBJECT:Arco Station #2035
1001 San Pablo Avenue
@ Marin Ave.
Albany, CA

PER: _X_ Your request.

___ Our telephone conversation of:

___Other:

FIND ENCLOSED:

1. Report of monitor well data table.
2. Plot plan of site.

NO. OF PAGES (including transmittal): 3

MESSAGE:

91072.LTR

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

11/04/91

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

Tabulation of Elevations as of 01:00 p.m. 10/29/91

Job #91072
AGS Project 69036.02
Project Geologist:Joel Coffman
Site: ARCO Station # 2035
1001 San Pablo Avenue
@ Marin Ave.
Albany, CA

BENCHMARK: (B1198) A standard Bronze Disk in the sidewalk 0.8' behind the face of curb on the northerly side of Marin Avenue 6' +/- westerly of the curb return at the northeast corner of Marin Ave. and San Pablo Ave. (El. = 40.426').

MONITOR WELL DATA TABLE

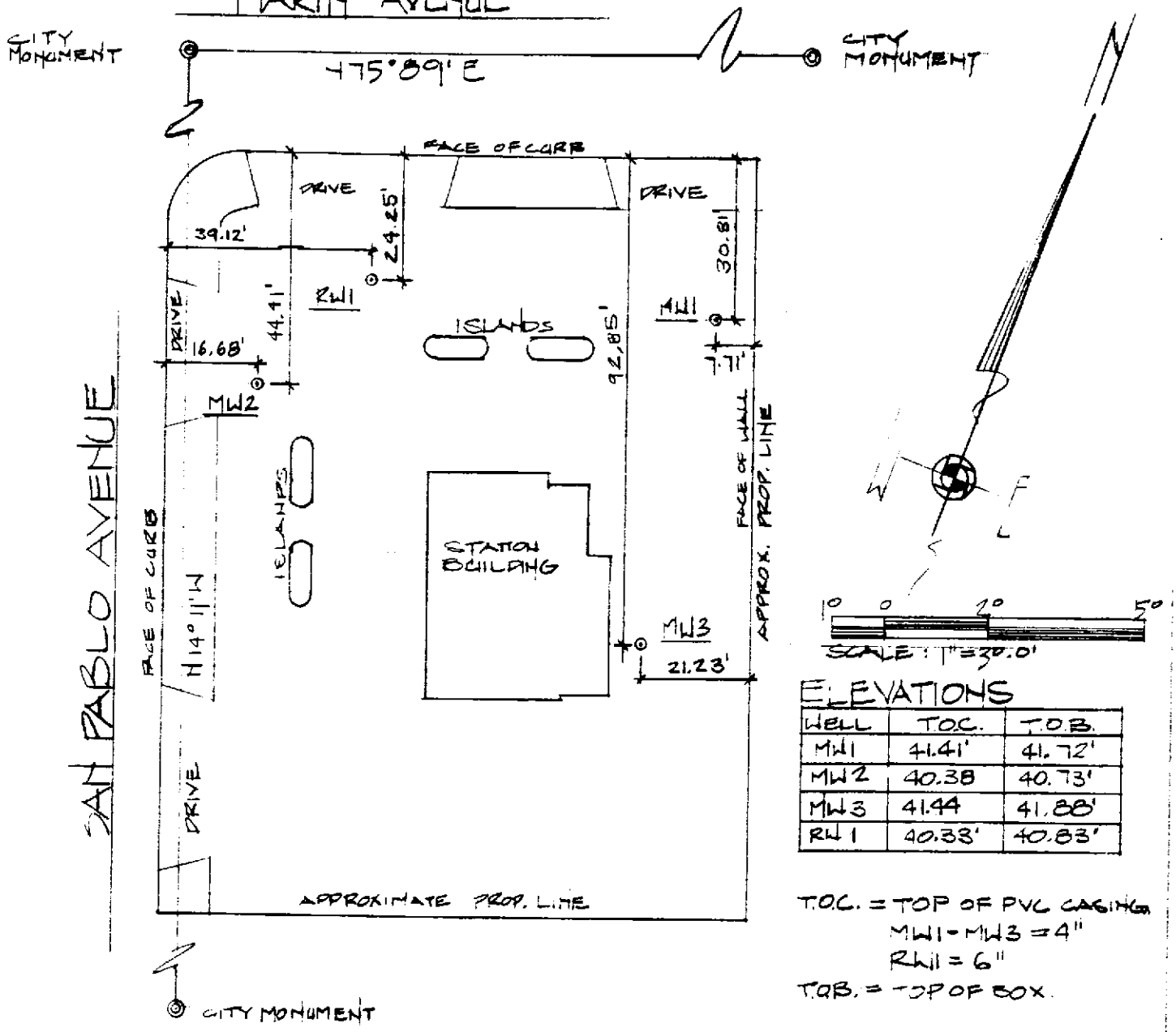
Well Designation	Elevation	Description
MW-1	41.41	Top of PVC Casing
	41.72	Top of Box
MW-2	40.38	Top of PVC Casing
	40.73	Top of Box
MW-3	41.44	Top of PVC Casing
	41.88	Top of Box
RW-1	40.33	Top of PVC Casing
	40.83	Top of Box

NOTES:

1. Datum is USC&GS '29

2. Top of PVC Casing Elevation is at mark at top of 4" PVC for all MW's & 6" PVC for RW-1. Mark bearing North for wells MW-2 & MW-3. Mark on MW-1 & RW-1 on West side.

3. Top of Box Elevation is at mark on rim for all wells.



ELEVATIONS

WELL	T.O.C.	T.O.B.
MW1	41.41'	41.72'
MW2	40.38	40.73'
MW3	41.44	41.88'
RW1	40.33'	40.83'

T.O.C. = TOP OF PVC CASING
MW1 - MW3 = 4"
RW1 = 6"
T.O.B. = TOP OF BOX.

LICENSED LAND SURVEYOR
JOHN E. KOCH
NO. 4811
Exp. 09/30/92
STATE OF CALIFORNIA

FILE # 91072

CLIENT: AGS/RESYA
JOB# 69036.02

SITE: ARCO STATION 2035
1061 SAN PABLO AVENUE
@MARIN AVE.
ALBANY, CA.

JOHN E KOCH
LAND SURVEYOR
CA STATE LIC. NO. LS 4811
5427 TELEGRAPH AVE. SUITE A
OAKLAND, CA. 94609
PHONE (415) 655 9956
FAX (415) 655 9745

APPENDIX E

WASTE MANIFEST FORMS

State of California—Health and Welfare Agency

Please print or type. *Form designed for use on elite (12-pitch typewriter).*

See instructions on back of page 6.

Department of Health Se
Toxic Substances Control Pro
Sacramento, Calif

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	Information in the shaded areas is not required by Federal law.
CA D 0 0 8 2 8 7 2 1 6	0 1 0 1 0 1 2		

GENERATOR

3. Generator's Name and Mailing Address
ARCO
P. O. Box 5811, San Mateo, CA 94402
4. Generator's Phone (415) 571-2434/571-2428

A. State Manifest Document Number: 9150732
B. State Generator's ID:
C. State Transporter's ID:
D. Transporter's Phone: (415) 543-4035
E. State Transporter's ID:
F. Transporter's Phone:
G. State Facility's ID:
H. Facility's Phone: (415) 543-4035

5. Transporter 1 Company Name: H & H Ship Service Company
6. US EPA ID Number: CAD 0 0 8 2 8 7 2 1 6
7. Transporter 2 Company Name:
8. US EPA ID Number:
9. Designated Facility Name and Site Address: H & H Ship Service Company, 320 China Basin Street, San Francisco, CA 94107
10. US EPA ID Number: CAD 0 0 8 2 8 7 2 1 6

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste Number
a. OIL AND WATER NON-RCRA HAZARDOUS WASTE LIQUID	001	TT	03000	G	State: 134.211 EPA/Other:
b.					State: EPA/Other:
c.					State: EPA/Other:
d.					State: EPA/Other:

J. Additional Descriptions for Materials Listed Above: PUMP OIL AND WATER
ERP FILE #21312

K. Handling Codes for Wastes Listed Above: a. H1 b. c. d.

15. Special Handling Instructions and Additional Information
JOB #9631
24 Hr. Emergency Contact: H & H #(415) 543-4035
APPROPRIATE PROTECTIVE CLOTHING AND RESPIRATOR.

JOB SITE: ARCO STATION #2035
1001 San Pablo Avenue
Albany, California

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	Month	Day	Year
Robert D. Campbell	Robert D. Campbell	1 1	1 5	9 1

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
WAYNE H. MC DONALD		1 1	1 5	9 1

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Month	Day	Year

DO NOT WRITE BELOW THIS LINE.

IN CASE OF EMERGENCY OR SPILL, CALL THE NATIONAL RESPONSE CENTER 1-800-424-8802; WITHIN CALIFORNIA, CALL 1-800-852-7550

9150732

DHS 8022A (12/90)

GENERATOR RETAINS

See instructions on back of page 6.

Please print or type. Form designed for use on elite (12-pitch) typewriter.

Shaded areas are required by Federal law.

1. Generator's Name and Mailing Address ARCO [redacted]	2. Manifest Document No. [redacted]	
3. Generator's Phone ( ) [redacted]	4. State Generator's ID [redacted]	
5. Transporter 1 Company Name [redacted]	6. US EPA ID Number [redacted]	
7. Transporter 2 Company Name	8. US EPA ID Number	
9. Designated Facility Name and Site Address H & H Ship Service Company 220 China Basin Street San Francisco, CA 94107	10. US EPA ID Number C A D 0 1 0 6 7 7 1 1 6	C. State Facility's ID [redacted]
		E. Facility's Phone (415) [redacted]

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	Waste Number
a. OIL AND WATER NON-RCRA HAZARDOUS WASTE LIQUID	001	TT	00350	G	[redacted]
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above
FUEL, OIL AND WATER
PROFILE #08351

K. Handling Codes for Wastes Listed Above
a. 01 b.
c. d.

15. Special Handling Instructions and Additional Information
JOB #9557
24 Hr. Emergency Contact: H & H #(415) 543-4835
APPROPRIATE PROTECTIVE CLOTHING AND RESPIRATOR.

JOB SITE: ARCO STATION, #2035
1001 San Pablo Avenue
Albany, California

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	Month	Day	Year
EZEQUIEL Cardona	[signature] AGENT for ARCO	11	19	1

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
AGENT for ARCO LANCE D. SMITH	[signature]	11	19	1

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Month	Day	Year

DO NOT WRITE BELOW THIS LINE.

DHS 8022A (12/90)
8700—22

Blue: GENERATOR SENDS THIS COPY TO DHS WITHIN 30 DAYS.
To: P.O. Box 400, Sacramento, CA 95812-0400

69056

APPENDIX F

LABORATORY ANALYSES REPORTS
CHAIN OF CUSTODY RECORDS

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 95112
Attention: Joel Coffman

Project: ARCO 2035, Albany

Enclosed are the results from 6 soil samples received at Sequoia Analytical on October 16,1991. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1103175	Soil, S-6-B9	10/15/91	EPA 5030/8015/8020
1103176	Soil, S-16-B9	10/15/91	EPA 5030/8015/8020
1103177	Soil, S-31-B9	10/15/91	EPA 5030/8015/8020
1103178	Soil, S-6-B8	10/15/91	EPA 5030/8015/8020
1103179	Soil, S-16-B8	10/15/91	EPA 5030/8015/8020
1103180	Soil, S-30-B8	10/15/91	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

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled: Oct 15, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received: Oct 16, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8015/8020	Analyzed: Oct 18-28, 1991
Attention: Joel Coffman	First Sample #:	110-3175	Reported: Oct 29, 1991

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
110-3175	S-6-B9	25	0.60	0.58	0.44	1.8
110-3176	S-16-B9	N.D.	0.015	N.D.	N.D.	N.D.
110-3177	S-31-B9	N.D.	N.D.	N.D.	N.D.	N.D.
110-3178	S-6-B8	N.D.	N.D.	N.D.	N.D.	N.D.
110-3179	S-16-B8	3.0	0.45	0.13	0.11	0.47
110-3180	S-30-B8	240	3.6	5.0	4.1	16
Detection Limits:		**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

1103175.RRR <1>

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 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany

QC Sample Group: 1103175-77, 80

Reported: Oct 29, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	A. Maralit	A. Maralit	A. Maralit	A. Maralit
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 18, 1991	Oct 18, 1991	Oct 18, 1991	Oct 18, 1991
QC Sample #:	GBLK101791	GBLK101791	GBLK101791	GBLK101791
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.20	0.20	0.20	0.60
Matrix Spike % Recovery:	100	100	100	100
Conc. Matrix Spike Dup.:	0.19	0.19	0.19	0.57
Matrix Spike Duplicate % Recovery:	95	95	95	95
Relative % Difference:	5.1	5.1	5.1	5.1

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
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 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany

QC Sample Group: 110-3179

Reported: Oct 29, 1991

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
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 19, 1991	Oct 19, 1991	Oct 19, 1991	Oct 19, 1991
QC Sample #:	GBLK101791	GBLK101791	GBLK101791	GBLK101791
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.20	0.20	0.20	0.60
Matrix Spike % Recovery:	100	100	100	100
Conc. Matrix Spike Dup.:	0.21	0.21	0.21	0.62
Matrix Spike Duplicate % Recovery:	105	105	105	103
Relative % Difference:	4.9	4.9	4.9	3.3

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
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 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany

QC Sample Group: 110-3178

Reported: Oct 29, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	A. Maralit	A. Maralit	A. Maralit	A. Maralit
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 28, 1991	Oct 28, 1991	Oct 28, 1991	Oct 28, 1991
QC Sample #:	GBLK102891	GBLK102891	GBLK102891	GBLK102891
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.23	0.23	0.23	0.69
Matrix Spike % Recovery:	115	115	115	115
Conc. Matrix Spike Dup.:	0.24	0.24	0.24	0.71
Matrix Spike Duplicate % Recovery:	120	120	120	118
Relative % Difference:	4.3	4.3	4.3	2.9

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

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

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 2035-91-2

Chain of Custody

ARCO Facility no. 2035	City (Facility) Albany	Project manager (Consultant) Joel Coffman	Laboratory name SEQUOIA
ARCO engineer	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA		Address (Consultant) 3315 Almaden Expressway Suite 34 SJ, 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 GAS	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 ☐
S-6-BS			✓			✓		10/14/91			X									
S-16-BS			✓			✓		10/14/91			X									
S-31-BS			✓			✓		10/14/91			X									
S-6-BS			✓			✓		10/15/91			X									
S-16-BS			✓			✓		10/15/91			X									
S-30-BS			✓			✓		10/15/91			X									

Method of shipment

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

Condition of sample:

Temperature received:

	Date	Time		Date	Time
Relinquished by sampler: Robert D Campbell	10/16/91	1220	Received by: Alex Kamara	10/16/91	12:20
Relinquished by: Alex Kamara	10/16/91	1:45PM	Received by:		
Relinquished by:			Received by laboratory: Sophia Fabiga	10-16	1:05

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

RECEIVED

OCT 31 1991

RESNA
SAN JOSE

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Project: ARCO 2035, Albany

Enclosed are the results from 1 soil sample relogged at Sequoia Analytical on October 28,1991. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1103180	Soil, S-30-B8	10/15/91	California LUFT Manual, 12/87

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

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil	Relogged:	Oct 28, 1991
San Jose, CA 95112	Analysis Method:	California LUFT Manual, 12/87	Extracted:	Oct 29, 1991
Attention: Joel Coffman	First Sample #:	110-3180	Analyzed:	Oct 30, 1991
			Reported:	Oct 30, 1991

ORGANIC LEAD

Sample Number	Sample Description	Sample Results mg/kg (ppm)
110-3180	S-30-B8	N.D.

Detection Limits:	**0.050**

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
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 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany

QC Sample Group: 110-3180

Reported: Oct 30, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Organic Lead

Method:	LUFT
Analyst:	V. Patel
Reporting Units:	mg/kg
Date Analyzed:	Oct 30, 1991
QC Sample #:	110-3180

Sample Conc.:	N.D.
Spike Conc. Added:	0.60
Conc. Matrix Spike:	0.46
Matrix Spike % Recovery:	77
Conc. Matrix Spike Dup.:	0.45
Matrix Spike Duplicate % Recovery:	75
Relative % Difference:	2.2

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

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

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 2035-91-2

Chain of Custody

ARCO Facility no. 2035	City (Facility) Albany	Project manager (Consultant) Joel Coffman	Laboratory name SEQUOIA
ARCO engineer	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA	Address (Consultant) 3315 Almaden Expressway Suite 34 S.J. 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 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 Semi Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
S-6-B9			✓			✓		10/14/91			X											
S-16-B9			✓			✓		10/14/91			X											
S-31-B9			✓			✓		10/14/91			X											
S-6-B8			✓			✓		10/15/91			X											
S-16-B8			✓			✓		10/15/91			X											
S-30-B8			✓			✓		10/15/91			X											

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

Method of shipment

Condition of sample:

Temperature received:

	Date	Time		Date	Time
Relinquished by sampler: Robert D. Campbell	10/16/91	1220	Received by: Alex Sauva	10/16/91	12:20
Relinquished by: Alex Sauva	10/16/91	1:05pm	Received by:		
Relinquished by:	Date	Time	Received by laboratory: Sophia Patiz	10-16	1:05

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 95112
Attention: Joel Coffman

Project: ARCO 2035, Albany

Enclosed are the results from 9 soil samples received at Sequoia Analytical on October 18,1991. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1103780	Soil, S-5½-B10	10/16/91	EPA 5030/8015/8020
1103781	Soil, S-13-B10	10/16/91	EPA 5030/8015/8020
1103782	Soil, S-20½-B10	10/16/91	EPA 5030/8015/8020
1103783	Soil, S-30½-B10	10/16/91	EPA 5030/8015/8020
1103784	Soil, S-6-B11	10/15/91	Cd, Cr, Pb, Ni, Zn EPA 3550/8015 EPA 5030/8010 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1103785	Soil, S-11-B11	10/15/91	Cd, Cr, Pb, Ni, Zn EPA 3550/8015 EPA 5030/8010 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1103786	Soil, S-16-B11	10/15/91	Cd, Cr, Pb, Ni, Zn EPA 3550/8015 EPA 5030/8010 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1103787	Soil, S-21-B11	10/15/91	Cd, Cr, Pb, Ni, Zn EPA 3550/8015 EPA 5030/8010 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1103788	Soil, S-11-B8	10/15/91	EPA 5030/8015/8020

SEQUOIA ANALYTICAL

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

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1103789	Soil, S-10½-B19	10/14/91	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

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled: Oct 14-16, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received: Oct 18, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8015/8020	Analyzed: Oct 22-26, 1991
Attention: Joel Coffman	First Sample #:	110-3780	Reported: Nov 4, 1991

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
110-3780	S-5½-B10	N.D.	N.D.	N.D.	N.D.	N.D.
110-3781	S-13-B10	4.0	0.13	0.15	0.041	0.16
110-3782	S-20½-B10	N.D.	N.D.	N.D.	N.D.	N.D.
110-3783	S-30½-B10	N.D.	N.D.	N.D.	N.D.	N.D.
110-3784	S-6-B11	N.D.	0.010	N.D.	N.D.	N.D.
110-3786	S-16-B11	N.D.	N.D.	N.D.	N.D.	N.D.
110-3787	S-21-B11	N.D.	N.D.	N.D.	N.D.	N.D.
110-3788	S-11-B8	35	1.2	1.7	0.42	2.0
110-3789	S-10½-B9	13	0.74	0.72	0.18	0.95
Detection Limits:		**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Oct 18, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Oct 26, 1991
Attention: Joel Coffman	First Sample #:	110-3785	Reported:	Nov 4, 1991

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
110-3785	S-11-B11	110	N.D.	N.D.	N.D.	0.27
Detection Limits:		**10**	0.050	0.050	0.050	0.050

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

1103780.RRR <2>

SEQUOIA ANALYTICAL

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany

QC Sample Group: 1103780-84, 86-87

Reported: Nov 4, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M. Laikhtman	M. Laikhtman	M. Laikhtman	M. Laikhtman
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 22, 1991	Oct 22, 1991	Oct 22, 1991	Oct 22, 1991
QC Sample #:	GBLK101791	GBLK101791	GBLK101791	GBLK101791
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.22	0.22	0.22	0.64
Matrix Spike % Recovery:	110	110	110	107
Conc. Matrix Spike Dup.:	0.21	0.20	0.20	0.60
Matrix Spike Duplicate % Recovery:	105	100	100	100
Relative % Difference:	4.7	9.5	9.5	6.6

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
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

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany

QC Sample Group: 1103785, 88-89

Reported: Nov 4, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	D. Dreblow	D. Dreblow	D. Dreblow	D. Dreblow
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 26, 1991	Oct 26, 1991	Oct 26, 1991	Oct 26, 1991
QC Sample #:	GBLK102291 MS/MSD	GBLK102291 MS/MSD	GBLK102291 MS/MSD	GBLK102291 MS/MSD
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.21	0.20	0.20	0.60
Matrix Spike % Recovery:	105	100	100	100
Conc. Matrix Spike Dup.:	0.21	0.20	0.20	0.59
Matrix Spike Duplicate % Recovery:	105	100	100	98
Relative % Difference:	0.0	0.0	0.0	1.7

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Elizabeth W. Hackl
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

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RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Oct 18, 1991
San Jose, CA 95112	Analysis Method:	EPA 3550/8015	Extracted:	Oct 23, 1991
Attention: Joel Coffman	First Sample #:	110-3784	Analyzed:	Oct 24, 1991
			Reported:	Nov 4, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
110-3784	S-6-B11	3.9
110-3785	S-11-B11	71
110-3786	S-16-B11	N.D.
110-3787	S-21-B11	N.D.

Detection Limits:	**1.0**

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

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Elizabeth W. Hackl
Project Manager

1103780.RRR <5>

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany
QC Sample Group: 1103784-87
Reported: Nov 4, 1991

QUALITY CONTROL DATA REPORT

ANALYTE
Diesel

Method:	EPA 8015
Analyst:	R. Lee
Reporting Units:	mg/kg
Date Analyzed:	Oct 24, 1991
QC Sample #:	DBLK102391-B

Sample Conc.:	N.D.
Spike Conc. Added:	15
Conc. Matrix Spike:	13
Matrix Spike % Recovery:	87
Conc. Matrix Spike Dup.:	12
Matrix Spike Duplicate % Recovery:	80
Relative % Difference:	8.0

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Elizabeth W. Hackl
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

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RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Oct 18, 1991
San Jose, CA 95112	Analysis Method:	SM 5520 E&F (Gravimetric)	Extracted:	Oct 24, 1991
Attention: Joel Coffman	First Sample #:	110-3784	Analyzed:	Oct 24, 1991
			Reported:	Nov 4, 1991

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/kg (ppm)
110-3784	S-6-B11	80
110-3785	S-11-B11	43
110-3786	S-16-B11	57
110-3787	S-21-B11	74

Detection Limits:	**30**

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

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Elizabeth W. Hackl
Project Manager

1103780.RRR <7>

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany

QC Sample Group: 1103784-87

Reported: Nov 4, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Total Oil & Grease

Method:	SM 5520 E&F
Analyst:	A. Do
Reporting Units:	mg/kg
Date Analyzed:	Oct 23, 1991
QC Sample #:	BLK102391
Sample Conc.:	N.D.
Spike Conc. Added:	5,000
Conc. Matrix Spike:	4,300
Matrix Spike % Recovery:	86
Conc. Matrix Spike Dup.:	4,400
Matrix Spike Duplicate % Recovery:	88
Relative % Difference:	2.3

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Elizabeth W. Hackl
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

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-6-B11	Received:	Oct 18, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8010	Analyzed:	Oct 28, 1991
Attention: Joel Coffman	Lab Number:	110-3784	Reported:	Nov 4, 1991

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	10	N.D.
Bromomethane	10	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	10	N.D.
2-Chloroethylvinyl ether	10	N.D.
Chloroform	5.0	N.D.
Chloromethane	10	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	5.0	N.D.
1,3-Dichlorobenzene	5.0	N.D.
1,4-Dichlorobenzene	5.0	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
cis-1,2-Dichloroethene	5.0	N.D.
trans-1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	10	N.D.
trans-1,3-Dichloropropene	10	N.D.
Methylene chloride	20	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	10	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

1103780.RRR <9>

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RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-11-B11	Received:	Oct 18, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8010	Analyzed:	Oct 28, 1991
Attention: Joel Coffman	Lab Number:	110-3785	Reported:	Nov 4, 1991

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	10	N.D.
Bromomethane	10	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	10	N.D.
2-Chloroethylvinyl ether	10	N.D.
Chloroform	5.0	N.D.
Chloromethane	10	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	5.0	N.D.
1,3-Dichlorobenzene	5.0	N.D.
1,4-Dichlorobenzene	5.0	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
cis-1,2-Dichloroethene	5.0	N.D.
trans-1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	10	N.D.
trans-1,3-Dichloropropene	10	N.D.
Methylene chloride	20	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	10	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

1103780.RRR <10>

SEQUOIA ANALYTICAL

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-16-B11	Received:	Oct 18, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8010	Analyzed:	Oct 28, 1991
Attention: Joel Coffman	Lab Number:	110-3786	Reported:	Nov 4, 1991

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	10	N.D.
Bromomethane	10	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	10	N.D.
2-Chloroethylvinyl ether	10	N.D.
Chloroform	5.0	N.D.
Chloromethane	10	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	5.0	N.D.
1,3-Dichlorobenzene	5.0	N.D.
1,4-Dichlorobenzene	5.0	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
cis-1,2-Dichloroethene	5.0	N.D.
trans-1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	10	N.D.
trans-1,3-Dichloropropene	10	N.D.
Methylene chloride	20	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	10	N.D.
Vinyl chloride	10	N.D.

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

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Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-21-B11	Received:	Oct 18, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8010	Analyzed:	Oct 28, 1991
Attention: Joel Coffman	Lab Number:	110-3787	Reported:	Nov 4, 1991

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	10	N.D.
Bromomethane	10	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	10	N.D.
2-Chloroethylvinyl ether	10	N.D.
Chloroform	5.0	N.D.
Chloromethane	10	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	5.0	N.D.
1,3-Dichlorobenzene	5.0	N.D.
1,4-Dichlorobenzene	5.0	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
cis-1,2-Dichloroethene	5.0	N.D.
trans-1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	10	N.D.
trans-1,3-Dichloropropene	10	N.D.
Methylene chloride	20	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	10	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

1103780.RRR <12>

SEQUOIA ANALYTICAL

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany

QC Sample Group: 1103784-87

Reported: Nov 4, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	1,1-Dichloro-ethene	Trichloro-ethene	Chloro-benzene
Method:	EPA 8010	EPA 8010	EPA 8010
Analyst:	J. Villar	J. Villar	J. Villar
Reporting Units:	µg/kg	µg/kg	µg/kg
Date Analyzed:	Oct 29, 1991	Oct 29, 1991	Oct 29, 1991
QC Sample #:	110-4506	110-4506	110-4506
Sample Conc.:	N.D.	N.D.	N.D.
Spike Conc. Added:	50	50	50
Conc. Matrix Spike:	45	49	43
Matrix Spike % Recovery:	90	98	86
Conc. Matrix Spike Dup.:	45	49	42
Matrix Spike Duplicate % Recovery:	90	98	84
Relative % Difference:	0.0	0.0	2.4

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

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

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

SEQUOIA ANALYTICAL

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-6-B11	Received:	Oct 18, 1991
San Jose, CA 95112			Extracted:	Oct 22, 1991
Attention: Joel Coffman	Lab Number:	110-3784	Analyzed:	Oct 25-31, 1991
			Reported:	Nov 4, 1991

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	N.D.
Chromium	0.50	49
Lead	0.25	7.7
Nickel	2.5	97
Zinc	0.50	41

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-11-B11	Received:	Oct 18, 1991
San Jose, CA 95112			Extracted:	Oct 22, 1991
Attention: Joel Coffman	Lab Number:	110-3785	Analyzed:	Oct 25-31, 1991
			Reported:	Nov 4, 1991

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	N.D.
Chromium	0.50	80
Lead	0.25	5.8
Nickel	2.5	77
Zinc	0.50	69

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

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RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-16-B11	Received:	Oct 18, 1991
San Jose, CA 95112			Extracted:	Oct 22, 1991
Attention: Joel Coffman	Lab Number:	110-3786	Analyzed:	Oct 25-31, 1991
			Reported:	Nov 4, 1991

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	N.D.
Chromium	0.50	33
Lead	0.25	7.5
Nickel	2.5	25
Zinc	0.50	45

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled: Oct 15, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-21-B11	Received: Oct 18, 1991
San Jose, CA 95112			Extracted: Oct 22, 1991
Attention: Joel Coffman	Lab Number:	110-3787	Analyzed: Oct 25-31, 1991
			Reported: Nov 4, 1991

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	N.D.
Chromium	0.50	39
Lead	0.25	7.2
Nickel	2.5	32
Zinc	0.50	56

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
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 95112
Attention: Joel Coffman

Client Project ID: ARCO 2035, Albany
QC Sample Group: 1103784-87
Reported: Nov 4, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Cadmium	Chromium	Nickel	Zinc	Lead
Method:	EPA 6010	EPA 6010	EPA 6010	EPA 6010	EPA 7421
Analyst:	C. Medefesser	C. Medefesser	C. Medefesser	C. Medefesser	K. Newberry
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 25, 1991	Oct 25, 1991	Oct 25, 1991	Oct 25, 1991	Oct 31, 1991
QC Sample #:	110-3151	110-3151	110-3151	110-3151	110-5179
Sample Conc.:	ND.	48	81	77	5.9
Spike Conc. Added:	50	50	50	50	10
Conc. Matrix Spike:	53	97	130	130	16
Matrix Spike % Recovery:	106	98	98	106	101
Conc. Matrix Spike Dup.:	55	98	130	130	15
Matrix Spike Duplicate % Recovery:	110	100	98	106	91
Relative % Difference:	3.7	1.0	0.0	0.0	6.5

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
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. 2035-91-1

Chain of Custody

ARCO Facility no. Station 2035	City (Facility) Albany, CA	Project manager (Consultant) Joel Coffman	Laboratory name
ARCO engineer Chuck Carmel	Telephone no. (ARCO)	Telephone no. (Consultant) 408 264-7723	Fax no. (Consultant) 408 264-2435	Contract number
Consultant name RESNA	Address (Consultant) 3315 Almaden Expy #34, San Jose, CA 95118			Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Water	Other	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015 GAS	TPH Modified 8015 Gas ☐ Diesel ✓	Oil and Grease 413.1 ☐ 413.2 ☐ $526 CF	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 ☐	Cd, Cr, Pb, Zn, Ni
S-3½-B10		1	✓			✓		10-16-91	1245		✓										
S-13-B10		1	✓			✓		10-16-91	1320		✓										
S-20½-B10		1	✓			✓		10-16-91	1400		✓										
S-30½-B10		1	✓			✓		10-16-91	1435		✓										
S-C-B11		1	✓			✓		10-15-91			✓	✓	✓		✓						✓
S-11-B11		1	✓			✓		10-15-91			✓	✓	✓		✓						✓
S-16-B11		1	✓			✓		10-15-91			✓	✓	✓		✓						✓
S-21-B11		1	✓			✓		10-15-91			✓	✓	✓		✓						✓
S-11-B8		1	✓			✓		10-15-91			✓										
S-10½-B9		1	✓			✓		10-14-91			✓										

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

Condition of sample:

Temperature received:

	Date	Time	
Relinquished by sampler: Steve Strawn	10/17/91	12:20	Received by: Ben Foltz
Relinquished by: Ben Foltz	10/18/91	1:20	Received by: Jonathan Patrick
Relinquished by:	Date	Time	Received by laboratory: Date 10-18 Time 1:35

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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 95112
Attention: Robert Campbell

Project: ARCO 2035, Albany

Enclosed are the results from 3 water samples received at Sequoia Analytical on October 30,1991. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1105538	Water, W-11-MW1	10/29/91	EPA 5030/8015/8020 Hazardous Waste Bioassay
1105539	Water, W-11-MW2	10/29/91	EPA 5030/8015/8020
1105540	Water, W-11-MW3	10/29/91	Cd, Cr, Pb, Ni, Zn EPA 5030/8015/8020 EPA 624 SM 5520 B&F (Gravimetric)

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

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 2035, Albany	Sampled:	Oct 29, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Water	Received:	Oct 30, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Nov 1, 1991
Attention: Robert Campbell	First Sample #:	110-5538	Reported:	Nov 12, 1991

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
110-5538	W-11-MW1	620	76	69	15	60
Detection Limits:		**60**	**0.60**	**0.60**	**0.60**	**0.60**

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

1105538.RRR <1>

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

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 29, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Water	Received:	Oct 30, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8015/8020	Analyzed:	10/30 - 11/1/91
Attention: Robert Campbell	First Sample #:	110-5539	Reported:	Nov 12, 1991

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
110-5539	W-11-MW2	N.D.	2.4	4.6	0.48	2.3
110-5540	W-11-MW3	32	2.1	2.8	0.35	1.8
Detection Limits:		**60**	**0.60**	**0.60**	**0.60**	**0.60**

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

1105538.RRR <2>

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 95112
Attention: Robert Campbell

Client Project ID: ARCO 2035, Albany
QC Sample Group: 1105538-40
Reported: Nov 12, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	S. Gill	S. Gill	S. Gill	S. Gill
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Oct 31, 1991	Oct 31, 1991	Oct 31, 1991	Oct 31, 1991
QC Sample #:	GBLK103191	GBLK103191	GBLK103191	GBLK103191
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	9.8	10	10	30
Matrix Spike % Recovery:	98	100	100	100
Conc. Matrix Spike Dup.:	10	11	11	32
Matrix Spike Duplicate % Recovery:	100	110	110	107
Relative % Difference:	2.0	9.5	9.5	6.5

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 95112
Attention: Robert Campbell

Client Project ID: ARCO 2035, Albany

QC Sample Group: 1105538-40

Reported: Nov 12, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	S. Gill	S. Gill	S. Gill	S. Gill
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Nov 1, 1991	Nov 1, 1991	Nov 1, 1991	Nov 1, 1991
QC Sample #:	GBLK110191	GBLK110191	GBLK110191	GBLK110191
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	12	12	12	35
Matrix Spike % Recovery:	120	120	120	117
Conc. Matrix Spike Dup.:	12	12	12	35
Matrix Spike Duplicate % Recovery:	120	120	120	117
Relative % Difference:	0.0	0.0	0.0	0.0

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	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 29, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Water	Received:	Oct 30, 1991
San Jose, CA 95112	Analysis Method:	SM 5520 B&F (Gravimetric)	Extracted:	Nov 5, 1991
Attention: Robert Campbell	First Sample #:	110-5540	Analyzed:	Nov 6, 1991
			Reported:	Nov 12, 1991

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/L (ppm)
110-5540	W-11-MW3	N.D.

Detection Limits:	**5.0**

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

1105538.RRR <5>

SEQUOIA ANALYTICAL

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Robert Campbell

Client Project ID: ARCO 2035, Albany
QC Sample Group: 110-9940

Reported: Nov 12, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	TRPH
Method:	SM 5520 B&F
Analyst:	A. Do
Reporting Units:	mg/L
Date Analyzed:	Nov 6, 1991
QC Sample #:	BLK110691
Sample Conc.:	N.D.
Spike Conc. Added:	200
Conc. Matrix Spike:	180
Matrix Spike % Recovery:	90
Conc. Matrix Spike Dup.:	180
Matrix Spike Duplicate % Recovery:	90
Relative % Difference:	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

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	ARCO 2035, Albany	Sampled:	Oct 29, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Water, W-11-MW3	Received:	Oct 30, 1991
San Jose, CA 95112	Analysis Method:	EPA 624	Analyzed:	Nov 11, 1991
Attention: Robert Campbell	Lab Number:	110-5540	Reported:	Nov 12, 1991

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	10	N.D.
Benzene	2.0	N.D.
Bromodichloromethane	2.0	N.D.
Bromoform	2.0	N.D.
Bromomethane	2.0	N.D.
2-Butanone	10	N.D.
Carbon disulfide	2.0	N.D.
Carbon tetrachloride	2.0	N.D.
Chlorobenzene	2.0	N.D.
Chloroethane	2.0	N.D.
2-Chloroethyl vinyl ether	10	N.D.
Chloroform	2.0	N.D.
Chloromethane	2.0	N.D.
Dibromochloromethane	2.0	N.D.
1,1-Dichloroethane	2.0	N.D.
1,2-Dichloroethane	2.0	N.D.
1,1-Dichloroethene	2.0	N.D.
cis-1,2-Dichloroethene	2.0	N.D.
trans-1,2-Dichloroethene	2.0	N.D.
1,2-Dichloropropane	2.0	N.D.
cis-1,3-Dichloropropene	2.0	N.D.
trans-1,3-Dichloropropene	2.0	N.D.
Ethylbenzene	2.0	N.D.
2-Hexanone	10	N.D.
Methylene chloride	2.0	N.D.
4-Methyl-2-pentanone	10	N.D.
Styrene	2.0	N.D.
1,1,2,2-Tetrachloroethane	2.0	N.D.
Tetrachloroethene	2.0	N.D.
Toluene	**2.0**	**3.0**
1,1,1-Trichloroethane	2.0	N.D.
1,1,2-Trichloroethane	2.0	N.D.
Trichloroethene	2.0	N.D.
Trichlorofluoromethane	2.0	N.D.
Vinyl acetate	2.0	N.D.
Vinyl chloride	2.0	N.D.
Total Xylenes	2.0	N.D.

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 2035-91-2 Robert Campbell

Chain of Custody

ARCO Facility no. 2035-6903602	City (Facility) ALBANY	Project manager (Consultant) ~~JOEL COFFMAN~~/LOU LEET	Laboratory name SEQUOIA
ARCO engineer CHUCK CARMEL	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 964-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA	Address (Consultant) 3315 ALMADEN EXPRESSWAY, SUITE 34 SAN JOSE, CA		Contract number 57-073

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease ~~5520~~ 5520 ~~413.1~~ 413.2	TPH EPA 418.1/SM503E	EPA ~~8010~~ 8010	EPA 624/8240	EPA 625/8270	~~TCLP~~ Semi-Metals ~~☐~~ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	METALS 7130/7190/7420/7450
W-11-MW1	3			X		X	X	10-29-91	15:12		X								10	55	38
W-11-MW2	3			X		X	X	10-29-91	13:20		X										39
W-11-MW3	3			X		X	X	10-29-91	14:55		X										40
W-11-MW3	3			X		X		10-29-91	14:46						X						X
W-11-MW3	1			X		X	HNO_3	10-29-91	14:43									X			X
W-11-MW3	2			X		X		10-29-91	14:50				X								Cd, Cr, Pb, Ni, Zn

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

Condition of sample: Good		Temperature received: Cool	
Relinquished by sampler K. J. Zeit	Date 10-30-91	Time 15:25	Received by Ken Follett
Relinquished by Ken Follett	Date 10-30-91	Time 16:30	Received by
Relinquished by	Date	Time	Received by laboratory K. Dallas
			Date 10/30/91 Time 1605

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