RESNA
Working To Restore Nature

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

ADDITIONAL ONSITE SUBSURFACE INVESTIGATION AND VAPOR EXTRACTION TEST at ARCO Station 6041 7249 Village Parkway Dublin, California

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Report prepared for

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

by
RESNA Industries Inc.

Barbara Sieminski
Assistant Project Geologist

Dana Weiss
Assistant Project Engineer

Joan E. Tiernan, Ph.D., P.E.
Engineering Manager

REGISTERED PROFESSIONAL ENGINEER
JOAN E. TIERNAN
No. C 044600
Exp. 3-31-94
CIVIL
STATE OF CALIFORNIA

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For ARCO Products Company

INTRODUCTION

At the request of ARCO Products Company (ARCO), RESNA Industries Inc. (RESNA) performed an additional onsite subsurface investigation and vapor extraction test (VET) at ARCO Station 6041 located at 7249 Village Parkway in Dublin, 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 extent of gasoline hydrocarbons in the soil and groundwater at the site; to confirm the gradient of the first encountered groundwater beneath the site; to identify potential offsite sources of hydrocarbons detected in the soil and groundwater at the site; and to evaluate the feasibility and engineering design criteria for a soil vapor extraction system. The work performed for this investigation was proposed in the Work Plan for Initial Offsite and Additional Onsite Subsurface Investigations (RESNA, September 29, 1992), with the exception of the proposed installation of offsite wells, recovery well, and performing a pumping test, which were not included in this scope of work. According to information provided by Mr. Scott Seery of the Alameda County Health Care Services Agency (ACHCSA) at the meeting held on September 30, 1992, the groundwater beneath the properties located in the immediate vicinity of ARCO Station 6041 is impacted by gasoline hydrocarbons at a greater degree than at the ARCO site. Therefore it was agreed during the above-mentioned meeting, that the offsite portion of the work would not proceed until some other responsible parties were contacted by the ACHCSA. It was also agreed, that the recovery well (RW-1) will be installed and the aquifer test will be performed after three months of monitoring of the new

and pre-existing wells at the site to determine optimal positioning of a groundwater recovery well. The report including results of the installation of the recovery well and aquifer test will be prepared after completion of the field work.

The work performed for this investigation included drilling seven soil borings (B-4 through B-10); collecting and describing soil samples from the borings; constructing three groundwater monitoring wells (MW-4 through MW-6), and four vapor extraction wells (VW-1 through VW-4) in soil borings B-4 through B-10, respectively; developing groundwater monitoring wells; surveying wellhead elevations; measuring groundwater levels and sampling groundwater from the monitoring wells; submitting selected soil and groundwater samples for laboratory analyses; performing a VET and submitting air samples for laboratory analysis; performing an environmental record search; and preparing this report presenting field procedures, results and conclusions. This work was performed as outlined in the Work Plan (RESNA, September 29, 1992), which was approved by the ACHCSA prior to commencement of the investigation.

SITE DESCRIPTION AND BACKGROUND

General

ARCO Station 6041 is located at the northeastern corner of the intersection of Village Parkway and Amador Valley Boulevard in Dublin, California. The location is shown on Plate 1, Site Vicinity Map. The site is on a relatively flat, predominantly asphalt- and concrete-covered lot at an elevation of approximately 335 feet above mean sea level. Pertinent site features include four service islands (two located in the northwestern portion of the site and two located in the southeastern portion of the site), a station building, four underground gasoline-storage tanks (USTs) in the southern part of the site, and the former waste-oil tank pit adjacent to the northern wall of the station building in the northern portion of the site. Pertinent site features are shown on Plate 2, Generalized Site Plan.

Regional and Local Hydrogeology

ARCO Station 6041 is located in the northwestern end of the Livermore Valley, within the Coast Ranges Geomorphic Province of Northern California. The Livermore Valley is approximately 13 miles long oriented in an east-west direction, approximately 4 miles wide, and is surrounded by hills of the Diablo Range. In the vicinity of the site, the valley floor slopes gently to the south-southeast. Soil in the vicinity of the subject site is mapped as Holocene alluvium that consists of unconsolidated, moderately to poorly sorted silt and clay rich in organic material, interfingered with and graded into coarser grained stream deposits toward higher elevations (Helley and others, 1979). Holocene alluvium (estimated to be 10 to 50 feet thick) overlies Pleistocene alluvium, which consists of weakly consolidated, poorly sorted, irregularly interbedded clay, silt, sand and gravel, and older sedimentary deposits. The Calaveras Fault is situated approximately 1/2-mile west of the site.

The Livermore Valley groundwater basin is divided into subbasins on the basis of fault traces or other hydrogeologic discontinuities (California Department of Water Resources, 1974). The groundwater system in Livermore Valley is a multi-layered system with an unconfined aquifer overlying a sequence of leaky or semi-confined aquifers. The subject site is located within the Dublin groundwater subbasin. The groundwater in this subbasin has been reported to be at depths ranging from 10 to 60 feet below ground surface (Alameda County Flood Control and Water Conservation District [ACFCWCD]), January 16, 1991). The groundwater gradient is generally toward the south-southeast (ACFCWCD, January 16, 1991). The principal streams in the vicinity of the site are Alamo Canal situated about 2/3 of a mile southeast of the site, and Dublin Creek which joins Alamo Canal about 2/3 of a mile south of the site.

PRELIMINARY RECORDS RESEARCH

A Radius Status Report containing a compilation of Federal and California State Agencies environmental data which identifies environmental problem sites and activities in the vicinity of ARCO Station 6041 was obtained from VISTA Environmental Information, Inc. This data was collected to identify potential secondary sources of hydrocarbons detected in the soil and groundwater at the site. The report listed information on the following databases:

National Priorities List (NPL) for January 1992; Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list for January 1991; California Annual Work Plan (AWP) list for October 1991; Leaking Underground Storage Tanks (LUST) for various years; Solid Waste Information System (SWIS) list for July 1991; Abandoned Site Program/AWP (CASITES) list for October 1991. The records search indicated that 13 environmentally impacted sites are present within approximately ½-mile radius of ARCO Station 6041. Three sites with leaking underground storage tanks (LUST list) are located in the immediate vicinity of ARCO Station 6041 (across Village Parkway and Amador Valley Boulevard). These sites are: BP Station 1116 (former Mobil Station) at 7197 Village Parkway; former Shell (currently Oil Changers) at 7194 Village Parkway; and Unocal Station at 7375 Amador Valley Boulevard. RESNA's review of aerial photographs obtained from Pacific Aerial Surveys of Oakland, California, indicated that these properties had been active gasoline stations since some time between 1957 and 1968 (Pacific, 1957, 1968, 1978, 1988). According to information provided by Mr. Scott Seery of the ACHCSA at the meeting held on September 30, 1992, the groundwater beneath these properties is impacted by gasoline hydrocarbons at a greater degree than at the subject ARCO site. Therefore, tank leaks at these sites might have contributed to the hydrocarbons detected in the soil and/or groundwater beneath the subject site.

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 RESNA field protocol and the Site Safety Plan (RESNA, October 23, 1992). A description of the field methods and Site Safety Plan 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. On October

26 and 27, 1992, seven soil borings (B-4 through B-10) were drilled at the subject site, and three 4-inch-diameter groundwater monitoring wells (MW-4 through MW-6) and four 4-inch-diameter vapor extraction wells (VW-1 through VW-4) were constructed in borings B-4 through B-10, respectively. The locations of these borings/wells are shown on Plate 2.

Soil borings B-4, B-5 and B-6 were drilled in the eastern, northern, and western corners of the property, respectively, to further delineate the extent of hydrocarbons in the soil and groundwater beneath the site, and to confirm the gradient direction of the first encountered water bearing zone beneath the site. Soil boring B-7 was drilled southwest of the northwestern service islands. Soil borings B-8 and B-9 were drilled in the southern vicinity of the existing gasoline USTs, and soil boring B-10 was drilled in the southeastern vicinity of the existing gasoline USTs. Vapor extraction wells VW-1 through VW-4 were constructed in soil borings B-7 through B-10, respectively, in order to perform a VET and collect data necessary for evaluation of the feasibility of vapor extraction as a soil remediation alternative.

Soil Sampling and Description

A total of 28 soil samples were collected from soil borings B-4 through B-10. A summary of the Unified Soil Classification System used to identify the soil encountered during drilling is presented on Plate 3, and the description of the soil encountered in the borings is presented on the Logs of Borings, Plates 4 through 10. Soil samples from the borings were collected at intervals of 5 feet or less from the ground surface to total depth in the borings. Sampling procedures are described in Appendix B. Field monitoring of organic vapor concentrations in soil samples was performed during drilling of borings B-7 through B-10 using an organic vapor meter (OVM). Field monitoring of organic vapor concentrations in soil samples was not performed during drilling of borings B-4 through B-6 due to the OVM failure. Field OVM readings are considered order of magnitude readings, and are subject to the results of laboratory analyses.

Soil cuttings generated from the borings were temporarily stockpiled onsite in two separate piles. The first soil pile (SP1) contained soil cuttings with OVM measurements below 100 parts per million [ppm], and the second pile (SP2) contained soil cuttings with OVM

measurements over 100 ppm. These soil stockpiles were placed on and covered with plastic sheeting in the northern corner of the property. After the completion of drilling on October 27, 1992, four soil samples were collected from each stockpile and submitted for compositing and laboratory analyses. The method used to obtain these samples is described in Appendix B.

Well Construction and Development

Three groundwater monitoring wells (MW-4 through MW-6) were constructed in borings B-4 through B-6, respectively, and four vapor extraction wells (VW-1 through VW-4) were constructed in borings B-7 through B-10, respectively,. The wells were completed with 4-inch-diameter, Schedule 40, polyvinyl chloride (PVC) casing. Well casings were set in the groundwater monitoring wells (MW-4 through MW-6) to depths of approximately 15 to 18 feet below ground surface, and in the vapor extraction wells (VW-1 through VW-4) to depths of approximately 9½ feet below ground surface. The screened casings for the groundwater monitoring wells (MW-4 through MW-6) consist of 4-inch-diameter, 0.020 inch-wide machine-slotted PVC set from the total depths of the wells to approximately 8½ to 11 feet below the ground surface. The screened casings for the vapor extraction wells (VW-1 through VW-4) consist of 4-inch-diameter, 0.100 inch-wide machine-slotted PVC set from the total depths of the wells to approximately 4 feet below ground surface. Screened intervals for vapor extraction wells were based on the OVM readings. Blank PVC casing was set from the top of the screened casing to within a few inches below the ground surface.

Groundwater monitoring wells MW-4 through MW-6 were developed on November 5, 1992, 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 Measuring and Sampling

Pre-existing groundwater monitoring wells (MW-1 through MW-3) were monitored on October 26, 1992, by RESNA field personnel prior to drilling. New groundwater monitoring wells (MW-4 through MW-6) were monitored in conjunction with monthly monitoring of

pre-existing wells on November 10 and December 14, 1992, by EMCON Associates of San Jose, California, under contract with ARCO. Depths-to-water (DTW) were measured in groundwater monitoring wells and water samples were collected and visually inspected for floating product. Groundwater monitoring wells MW-1 through MW-6 were also purged and sampled on November 10, 1992. Appendix B contains a description of subjective analyses and groundwater sampling procedures.

On November 10, 1992, monitoring of the wells at the ARCO site was coordinated with monitoring of the wells at three other sites located at the intersection of Village Parkway and Amador Valley Boulevard (BP, former Shell, and Unocal Stations) to obtain more complete data for gradient evaluation.

Evaluation of Groundwater Elevations

On November 12, 1992, the wellheads for the newly installed and pre-existing 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 were calculated by subtracting the measured DTW from the elevation of the wellhead.

Vapor Extraction Test

RESNA performed a one day onsite vapor extraction test (VET) on November 10, 1992, to collect site specific data and evaluate the feasibility of using vapor-extraction as a soil remediation alternative. The VET had three main objectives: (1) to determine the vapor flow rates that can be extracted from the vapor extraction wells and the design vacuums; (2) to determine the hydrocarbon concentration of extracted vapors; and (3) to estimate an effective radius of influence for the vapor extraction wells for future engineering design, if applicable. Notification was given to the Bay Area Air Quality Management District (BAAQMD) prior to conducting the test (RESNA, November 3, 1992). A copy of the notification letter is included in Appendix J.

VET Equipment and Protocol

The vapor-extraction equipment consisted of a six-cylinder internal combustion (I.C.) engine with a motor-driven vacuum blower, and instrumentation for measuring air velocity, air pressure, temperature, and organic vapor concentrations. The I.C. engine was also equipped with a three way catalytic converter which destroys nitrogen oxides (NOx), carbon monoxide (CO), and petroleum hydrocarbon emissions. The vapor extraction wells were connected to the I.C. engine using polyvinyl chloride (PVC) piping, fittings, and wellhead connections.

Four vapor extraction wells, VW-1 through VW-4, were evaluated during the VET. The location of these wells, as well as other pertinent site features, are shown on Plate 2. The I.C. engine and blower were used to apply a vacuum to the vapor extraction wells and induce air flow through the soils. Extracted hydrocarbon vapor was abated through the I.C. engine by combustion and additional treatment through a catalytic converter.

The VET was conducted in two phases. Three short-term tests of 45, 50, and 90 minutes duration were first performed using vapor wells VW-1, VW-2, and VW-4, respectively to collect representative influent vapor samples. A longer-term test (150 minutes) was then performed on well VW-3 to collect radius of influence data. The tests were performed in the following order: VW-4, VW-2, VW-1, and VW-3.

In addition to the four vapor extraction wells, monitoring wells MW-1, MW-2, and MW-3, and tank pit observation wells TP-1, and TP-2 were used as observation wells to measure induced vacuum. Monitoring wells MW-1, MW-2, and MW-3 are four-inch diameter wells, screened 14 to 17.5 feet, 10.5 to 14 feet, and 12 to 15 feet, respectively, below grade surface. Tank pit observation wells TP-1 and TP-2, located in the northeast and southwest corners of the tank area, have six-inch diameter casings, with depths to approximately 15 feet below grade. No other information, such as screen interval was available on these tank pit wells.

Short-Term VET

For the short-term tests, the IC engine was separately connected to vapor extraction wells VW-4, VW-2, and VW-1. The engine was operated on each well for at least 45 minutes at

the highest flow rate sustainable. Vapor samples were then collected from a sample port on the influent side of the I.C. engine using a sample pump and ultra-violet (UV) rated, mylar sample bags. Air flow rates were measured from each wellhead using an averaging pitot tube velocity-meter installed within the 2-inch PVC pipe manifold connecting the wellhead and the I.C. engine. Applied vacuum at the wellhead was measured using a magnehelic pressure gauge placed within the manifold piping. Extracted vapors were screened for percent oxygen and organic vapor concentrations using a combination oxygen meter and Lower Explosive Limit (LEL) meter calibrated to methane. Throughout the short term test, induced vacuum at nearby observation wells was monitored with a magnehelic pressure gauge as a secondary indicator of subsurface airflow. At the end of each short term test and the long-term test, the well was subjected to different applied vacuums and the resulting extracted air flow rates were measured to determine well characteristics.

Long-Term VET

A long-term VET of 150 minutes duration was performed on vapor extraction well VW-3 to collect vacuum influence data used to estimate a radius of influence for the well. Well VW-3 was selected for the long-term test since it allowed vacuum impact to be observed within a wide range, 21 and 72 feet. These distances appeared to be consistent with achievable radius of influence for the generally silty to clayey sand soils encountered beneath the site.

Induced vacuum was measured from observation wells VW-1, VW-2, VW-4, MW-3, and TP-2 using magnehelic gauges capable of measuring differential pressures as low as 0.01 inches Water Column (WC). Wellhead air velocity, applied vacuum, percent oxygen content and organic vapor concentrations were measured every 15 to 30 minutes. Air samples were collected from well VW-3 after 30 and 150 minutes of operation. An effluent air sample was also collected from the stack of the I.C. engine to evaluate destruction efficiency of the I.C. engine.

Air Sampling

Air samples were collected in opaque UV-rated Mylar air sample bags using a sample pump with ¼-inch Tygon tubing connected to a brass wellhead fitting. Tygon tubing was used to minimize sample loss through adsorption and the possibility of distorted results from a sample line contaminated by a previous test run. The samples were sealed in the bags and labeled with the sample number, date, time, and sampler's name. The samples were immediately stored in a cool place for transport to a State Certified analytical laboratory under Chain of Custody documentation.

During the long-term test, air samples were also collected from well VW-3 for laboratory analysis to determine lead content. Three duplicate air samples were collected by passing well-head vapors through charcoal-filled glass sample tubes. An air sampling pump, labcock valve, and in-line flow meter were used to adjust sample air flows to 2.5 cubic feet per hour. The ends of the charcoal-filled tube were clipped off, the charcoal tube placed in-line between Tygon tubing, and sealed with duct tape. The charcoal filter was left in place for a sample time of 17 minutes. As requested by the laboratory, three duplicate sets of charcoal-tubes were collected for analysis. The charcoal-filled tubes were capped, labeled, and sent to a State Certified analytical laboratory under Chain of Custody documentation.

LABORATORY METHODS

All soil, water and air samples selected for laboratory analyses were preserved as required by the applicable analytical method, and delivered with Chain of Custody Records to selected State-certified laboratories. Soil Samples were delivered to Sequoia Analytical Laboratories of Redwood City, California; water samples to Columbia Analytical Services Inc., of San Jose, California; air samples to GTEL Analytical Laboratory of Concord, California; and charcoal air sampling tubes for lead analyses to BC Analytical of Emeryville, California.

Soil Samples

Soil samples collected from borings B-4 through B-10 were analyzed in accordance with ACHCSA requirements for the gasoline constituents benzene, toluene, ethylbenzene, total xylenes (BTEX), and total petroleum hydrocarbons as gasoline (TPHg) using modified Environmental Protection Agency (EPA) Methods 5030/8015/8020. Soil samples were selected for laboratory analyses based on:

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

Soil samples collected from the soil stockpiles were composited in the laboratory and analyzed for TPHg and BTEX by EPA Method 5030/8015/8020. In addition composite soil sample from the stockpile containing soil cuttings with OVM readings exceeding 100 ppm, was analyzed for STLC lead by EPA 7421, and corrosivity by EPA 9045, ignitability by EPA 1010, and reactivity by EPA 9010 and 9030.

Water Samples

Water samples obtained from monitoring wells MW-1 through MW-6 were analyzed in accordance with ACHCSA requirements for BTEX and TPHg by EPA Methods 5030/8020 and DHS LUFT Method.

Air Samples

Air samples collected during the VET were analyzed within 72 hours of collection for BTEX and TPHg using modified EPA method 8015/8020, and volatile organic compounds (VOCs) including BTEX by EPA Method 8240. Charcoal air-sampling tubes were analyzed for lead using EPA Method 7420/7421.

FIELD WORK RESULTS

Drilling Observations

The earth materials encountered at the site consisted primarily of sandy to silty clay interbedded with clayey to silty sand.

Sandy clay was encountered at the site below the baserock and extended to depths of approximately 3 to 6 feet below the ground surface throughout most of the site, and to 1½ feet in the eastern corner of the site (B-4). Below this sandy clay a layer of damp clayey to medium-grained sand was present to depths of approximately 6½ to 9½ feet below the ground surface. This clayey to medium-grained sand was underlain by silty to sandy clay, which extended to depths of 9½ to 12½ feet. The water-bearing layer, composed of clayey sand (in B-4 sand composed of gypsum crystals), was encountered below silty to sandy clay. Groundwater was encountered and stabilized in borings B-4 and B-6 at depths of approximately 10 and 11½ feet, respectively, and was encountered at a depth of 12½ feet and stabilized at 11½ feet in boring B-5. A stratum of sandy clay with some gravel, which may be a perching or confining layer was encountered beneath the water-bearing zone at approximately 15 to 17 feet below the ground surface in borings B-4 through B-6 and extended to the bottoms of these borings. Borings B-7 through B-10 were terminated in silty to sandy clay at depths of 11 feet below the ground surface. Drilling observations are summarized in the logs of borings, Plates 4 through 10. 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 11 through 14). The locations of the cross sections are shown on Plate 2.

A product odor was noted for all soil samples collected from borings B-7 through B-10. OVM measurements of soil samples from these borings ranged from 11 ppm to 880 ppm. No product odor was noted for soil samples collected from borings B-4 through B-6. OVM readings are shown on the boring logs (Plates 4 through 10) in the column labeled PID (photoionization detector).

Subjective Groundwater Analyses

No floating product was observed in monitoring wells MW-1 through MW-3 by RESNA field personnel on October 26, 1992, and in monitoring wells MW-1 through MW-6 by EMCON field personnel on November 10 and December 14, 1992. DTW measurements and subjective analyses results for floating product in groundwater are included in Table 1, Cumulative Monitoring Data. The results of EMCON's and RESNA's field work on the site, including DTW measurements, well purge data sheets, and subjective analyses for the presence of floating product in the groundwater in the onsite wells are included in Appendix E.

Groundwater Gradient

The groundwater gradient evaluated for the first-encountered groundwater at ARCO Station 6041, based on groundwater elevations obtained from wells MW-1 through MW-3 on October 26, 1992, and from wells MW-1 through MW-6 on November 10, and December 14, 1992, is approximately 0.002. The gradient direction fluctuated from the south/southeast in October, to east/southeast in November, and east in December. DTW measurements obtained on November 10, 1992, from wells located at BP, former Shell, and Unocal Stations were used to evaluate the gradient in the vicinity of ARCO Station 6041. The gradient in the vicinity of ARCO Station on November 10, 1992, was approximately 0.002 toward east/southeast. This interpreted gradient is generally consistent with regional gradient direction presented by Maslonkowski (1984). Depths to groundwater and groundwater elevations for groundwater monitoring wells MW-1 through MW-6 at ARCO site are reported in Table 1. Depths to groundwater and groundwater elevations for groundwater monitoring wells at BP, former Shell, and Unocal Stations are reported in Appendix F (Table 1F, Groundwater Monitoring Data; BP, Former Shell, and Unocal Stations). Plates 15 through 18, Groundwater Gradient Maps, are graphic interpretations of the groundwater elevations measured on October 26, November 10, and December 14, 1992. Plates 15 through 17 depict the groundwater gradient at the ARCO site, and Plate 18 depicts the groundwater gradient in the vicinity of the ARCO site.

Vapor Extraction Test Field Results

VET Air Flow Rate Measurements

Vacuum and air flow rate data collected during the VET is summarized in Table 2, Vapor Extraction Test Field Monitoring Data. Utilizing the blower and I.C. engine, peak air flow rates ranging from 55 to 92 standard cubic feet per minute (SCFM) could be extracted from wells VW-1 through VW-4 at applied vacuums ranging from 48 to 52 inches of water column (WC). Air flow rates as high as 92 SCFM could be achieved in well VW-2 at an applied wellhead vacuum of 48 inches WC.

VET Radius of Influence Measurements

Induced vacuum data collected during the VET is summarized in Table 2. For extraction well vacuums of 48 to 52 inches WC, induced vacuum readings at the observation wells ranged from less than 0.01 inches WC to a high of 2.2 inches WC. All vapor wells were screened in the same interval (4.5 to 9.5 feet below grade), while monitoring wells were not.

During the short-term (45 minute) testing on well VW-1, induced vacuum was monitored at four observation wells located 35 to 94 feet away (VW-2, VW-3, VW-4, and MW-1). At an applied vacuum of 52 inches WC and a well-head air flow rate of 57 SCFM, induced vacuum measurements at the observation wells ranged from less than 0.01 to 0.18 inches WC. No influence was observed at the closest well, MW-1, since no common screen interval was available for venting at MW-1 due to the high water table. Well VW-2 showed the highest influence (0.18 inches WC) at a distance of 54 feet from the extraction well. The closer the observation well to the extraction well, the greater the vacuum impact, with the exception of MW-1.

During the short-term (50 minute) testing on well VW-2, induced vacuum was monitored at four observation wells located 21 to 60 feet away (VW-1, VW-3, VW-4, and TP-1). At an applied vacuum of 48 inches WC and a well-head air flow rate of 92 SCFM, induced vacuum measurements at the observation wells ranged from less than 0.01 to 1.45 inches WC. No vacuum influence was observed in tank pit observation well TP-1 due the great

distance from VW-2 (60 feet), and possibly due to a lack of common screen interval between VW-2 and TP-1. No information was available on the screen interval of TP-1. All observation wells within a 54-foot radius showed some vacuum impact, the highest (1.45 inches WC) occurring at VW-3, located 21 feet away.

During the long-term (150 minute) test on VW-3, vacuum impact was measured using five observation wells located 21 to 72 feet away. At an applied vacuum of 52 inches WC and a well-head air flow rate of 81 SCFM, induced vacuum at the observation wells ranged from less than 0.01 to 2.2 inches WC. No induced vacuum was observed in groundwater monitoring well MW-3 due to a lack of exposed screen interval above the water table. No induced vacuum was observed in tank pit observation well TP-2. This is likely due to lack of common screen interval between this well and the observation well, however, no information was available on the screen interval of TP-2. Maximum influence was observed at VW-2 (2.2 inches WC) at a distance of 21 feet away. Only a small induced vacuum influence (0.02 inches WC) was seen at VW-4 at a distance of 33 feet away, in comparison to the vacuum influence seen on VW-2 located a similar distance away. This may be due to discontinuous layers of silty sands between VW-3 and VW-4, or short circuiting of the tank pit, which lies between these wells.

During the short-term (90 minute) test on well VW-4, induced vacuum was monitored at five observation wells located 8 to 53 feet away (MW-2, MW-3, VW-2, VW-3, and TP-1). At an applied vacuum of 42 inches WC and a well-head air flow rate of 63 SCFM, induced vacuum measurements at the observation wells ranged from less than 0.01 to 0.11 inches WC. No vacuum influence was observed in MW-2, VW-2, VW-3, and TP-1. This is most likely attributable to the lack of common screen interval, and/or short circuiting through the tank pit, and/or the distances from VW-4. MW-3 is located only 8 feet away, however, no screen was exposed above the water table at the time of the test.

Water Samples

Laboratory analytical results for water samples reported TPHg concentrations of [illegible] parts per billion (ppb) and 1,100 ppb in the samples collected from monitoring wells MW-1 and MW-3, respectively, and nondetectable concentrations (less than 50 ppb) in the samples collected from monitoring wells MW-2, and MW-4 through MW-6. Benzene was detected in concentrations of 93 ppb and [illegible] ppb in the samples collected from monitoring wells MW-1 and MW-3, respectively, and was nondetectable (less than 0.5 ppb) in the samples collected from monitoring wells MW-2, and MW-4 through MW-6. Toluene, ethylbenzene and total xylenes were detected in the sample from monitoring well MW-1 in concentrations of 56 ppb, 190 ppb, and 390 ppb, respectively, and were nondetectable in the samples collected from monitoring wells MW-2 through MW-6, with the exception of ethylbenzene detected in MW-3 at 100 ppb. The results of laboratory analyses are summarized in Table 4, Cumulative Results of Laboratory Analyses of Groundwater. Chain of Custody records and laboratory analyses reports for groundwater samples are included in Appendix E. Graphic interpretations of the extent of TPHg and benzene in the groundwater are shown on Plate 21, TPHg Concentrations in Groundwater, and Plate 22, Benzene Concentrations in Groundwater.

Benzene concentrations exceeded the State Maximum Contaminant Level (MCL) of 1 ppb in wells MW-1 and MW-3. Ethylbenzene and total xylene concentrations were below MCLs of 680 ppb and 1,750 ppb, respectively, in all wells. Toluene concentrations were below the recommended drinking water action level (DWAL) of 100 ppb in all wells.

Air Samples

Air samples collected after a minimum of 30 minutes of operation from wells VW-1 through VW-4 contained reported TPHg concentrations ranging from 6,600 to 110,000 milligrams per cubic meter (mg/m^3), respectively, as reported in Table 5. Air samples analyzed for BTEX components from wells VW-1 through VW-4 ranged from less than the detection limit of 0.5 mg/m^3 to 2,700 mg/m^3 benzene, 33 to 2,100 mg/m^3 toluene, 16 to 370 mg/m^3 ethylbenzene, and 49 to 1,600 mg/m^3 total xylenes. With the exception of BTEX

RESULTS OF LABORATORY ANALYSES

Soil Samples

Laboratory analyses of soil samples are reported in Table 3. Samples collected from borings B-4, B-5 and B-6, located in the eastern, northern and western corners of the site, respectively, and from boring B-7 located southwest of the northwestern service islands, reported nondetectable concentrations of TPHg (less than 1 ppm) and BTEX (less than 0.0050 ppm). Laboratory analyses of soil samples collected from borings B-8 and B-9, located in the immediate southern vicinity of the existing gasoline USTs reported nondetectable concentrations of TPHg and BTEX in the samples collected at the depth of 10 feet, and minor concentrations of TPHg (up to 4.1 ppm), and nondetectable or minor concentrations of BTEX (up to 0.26 ppm) in the samples collected at the depth of 5½ feet. Laboratory analyses of soil samples collected from boring B-10, located in the immediate southeastern vicinity of the existing USTs reported 3,200 ppm of TPHg and up to 390 ppm of BTEX in the sample collected at the depth of 10 feet, and 16 ppm TPHg and up to 2.1 ppm of BTEX in the sample collected at the depth of 5½ below the ground surface.

Laboratory analyses of composite soil samples collected from the soil stockpile SP1 reported nondetectable concentrations of TPHg and BTEX. Laboratory analyses of composite soil samples collected from the soil stockpile SP2 reported 110 ppm of TPHg, up to 12 ppm of BTEX, and 0.13 ppm STLC lead. Corrosivity, ignitability and reactivity results were within acceptable limits for disposal at BFI landfill. RESNA understands that, the soil stockpiles were removed from the site and transported to BFI Landfill in Livermore, California by ARCO's contractor, Dillard Trucking Inc. of Byron, California, on November 16, 1992.

The results of soil samples analyses are summarized in Table 3, Cumulative Results of Laboratory Analyses of Soil Samples from Borings. Graphic interpretations of TPHg in soil at depths 4½-5½ and 9½-10 feet are shown on Plates 19 and 20, respectively. Soil concentrations of TPHg are also summarized in the geologic cross sections on Plates 11 through 14. Chain of Custody forms and copies of laboratory reports for soil samples are included in Appendix G of this report.

components, no volatile organic compounds (VOCs) were reported in air samples collected during the long term test on VW-3, analyzed by EPA Method 8240.

During the long-term test on well VW-3, air samples were collected after 30 and 150 minutes of operation. Two samples were collected each time: one undiluted sample from the extraction well on the vacuum side of the blower, and one sample diluted with fresh air on the pressure side of the blower. The air samples collected after 30 minutes contained a reported TPHg concentration of 12,000 mg/m^3, and 3,500 mg/m^3, respectively. The air samples collected after 150 minutes contained a reported TPHg concentration of 15,000 mg/m^3, and 3,400 mg/m^3, respectively.

Analyses for organic lead, which were performed on the charcoal air-sampling tubes reported an average lead concentration of 0.067 micrograms per sample tube. For an air sample volume of 0.71 cubic feet, this mass corresponds to a calculated vapor-phase lead concentration of about 3.3×10^{-3} mg/m^3 lead.

Laboratory results for the air samples collected during the VET are summarized in Table 5, Laboratory Analyses of Air Samples. Individual laboratory reports and chain of custody records are contained in Appendix H.

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 11 through 14, and TPHg Concentrations in Soil Contours, Plates 19 and 20. The gasoline impacted soil appears to be limited to the southern portion of the site. The highest concentrations of hydrocarbons in soil appear to be in the immediate southeastern vicinity of the existing UST pit, and in the southern vicinity of the northwestern service islands.

Hydrocarbon-Impacted Groundwater

Groundwater in the shallow aquifer beneath the southern and southwestern portions of the site has been impacted by gasoline-related hydrocarbons as evidenced by laboratory analytical results of water samples collected from groundwater monitoring wells MW-1 and MW-3.

Soil Vapor Extraction Test

VET Air Flow Rate Results

Based upon VET data, relatively moderate to large air flow rates (55 to 92 SCFM) could be extracted from vapor extraction wells VW-1 through VW-4 at moderate peak applied vacuums of 48 to 52 inches WC. This data appears to be indicative of air flow through relatively moderate to low permeability soils (clayey sands to silty clays) encountered at the site.

To evaluate air flow characteristics from each well, air flow rates were converted to standardized flow conditions (scfm, atmospheric pressure and temperature) and plotted versus wellhead vacuum. Wellhead air flow characteristic graphs are presented in Appendix I. Using linear regression techniques, a straight-line was fit to the data from each well. Correlation coefficients (R-SQ) for these regression equations were about 0.99 (optimum is 1.0) suggesting a good fit, however, the graph would most likely exhibit an exponential curve if there was more data in the higher vacuum range. These linear regression lines generally overestimate air flow rate data at higher applied vacuums. However, in general, the graphs can be used to predict if higher applied vacuums will achieve higher air flow rates, or if air flow from the well has reached a plateau with respect to further increases in applied vacuum.

All vapor extraction wells tested (VW-1 through VW-4) continued to exhibit an increase in extracted air flow rates with an increase in the applied vacuum. These results indicate greater air flow rates can be extracted by applying a higher vacuum on the well, however, the maximum sustainable well field could not be determined due to the limitations of the

I.C. engine and the blower. Engine efficiency is dependent on an optimum air to fuel ratio (approximately 14:1). Fresh air dilution of extracted vapor will occur to achieve the optimum ratio. This reduces the amount of air flow that can be extracted from the well.

Wells VW-2, VW-3, and VW-4 exhibited similar wellhead air flow characteristic curves, indicating that the wells were screened in similar soils (clayey sands). Well VW-1 exhibited lower air flow rates (55 scfm) at similar applied vacuums (50 inches WC), in comparison to 75 to 91 scfm at other wells.

VET Air Sample Results

Low to moderate concentrations of TPHg in extracted vapor (6,600 mg/m^3, 14,000, and 15,000 mg/m3) from wells VW-1, VW-2, and VW-3 appear to be consistent with the nondetectable (< 1ppm TPHg in soil in VW-1) to low concentration of TPHg in soil borings B-7/VW-1, B-8/VW-2, and B-9/VW-3. Air samples collected from VW-4 reported the highest concentrations of TPHg (110,000 mg/m^3). This result is consistent with the high concentrations of TPHg in soil samples (3,200 ppm) collected from soil boring B-10/VW-4.

The diluted influent samples collected at well VW-3 after 30 and 150 minutes of engine operation reported similar concentrations (3,500 and 3,400 mg/m^3, respectively). Based upon undiluted influent concentrations of 12,000 and 15,000 mg/m^3, respectively, the dilution ratio ranged form 1:2.43 to 1:3.41 (volume of vapor to volume of dilution air), respectively, for the engine to achieve the required air to fuel ratio.

Reported benzene concentrations from vapor extraction wells VW-1 through VW-4 ranged from less than the detection limit of 0.5 mg/m^3 from well VW-1, to 2,700 mg/m^3 from well VW-4. The percentage of benzene to TPHg in extracted vapor was on the order of 2.5 to 3 percent in most cases. The exceptions to this were samples collected from VW-1 after 60 minutes (less than 0.1 percent), and the effluent sample from VW-3 after 30 minutes (4 percent). The low percentage of benzene extracted from VW-1 may indicate a more weathered source of hydrocarbon. Effluent samples collected at the outlet of the I.C. engine after abatement indicate a 98.9% destruction efficiency for TPHg, and 98.5% destruction efficiency for benzene.

VET Hydrocarbon Removal Rate Estimates

Initial hydrocarbon removal rates were estimated from well-head flow rate and vapor concentration data obtained during the VET. These removal rates are summarized for each well in Table 6. Based upon vapor-phase TPHg concentrations of 6,600 to 110,000 mg/m^3, and corresponding well-head air flow rates ranging from 60 to 81 scfm, initial TPHg removal rates from wells VW-1 through VW-4 were projected at 35 to 741 pounds per day (approximately 5.7 to 119 gallons per day), respectively. These initial removal rates typically decrease rapidly with time, depending on site-specific conditions.

VET Radius of Influence Estimates

Utilizing induced vacuum and distance measurements obtained during the VET, an effective radius of influence (ROI) was estimated for the vapor wells at the site. The effective radius of influence has been defined as the radial distance from a vapor extraction well at which recorded vacuum levels suggest that subsurface air flow occurs and is presumed to be sufficient for remediation. Most radius of influence concepts assume that subsurface air flows through homogeneous and isotropic soils and that short-circuiting effects are neglected.

Methods for estimating an effective radius of influence vary due to the complexity of modeling the vapor extraction process, subsurface stratigraphy and changes, and limited case-study information. Air-modeling studies conducted by others suggest that the distance from the extraction well at which 1 percent of the applied well-head vacuum occurs can be interpreted as an effective radius of influence [Chevron, 1991]. This method is based upon theoretical model predictions which project that roughly 90 percent of the total air extracted from the well flows through soils within the radius of influence when a 1% cut-off is used.

Moderate well-head vacuums (48 to 52 inches WC) were applied to the vapor extraction wells VW-1 through VW-4 during the VET. Using predictions from the Chevron theoretical air flow models, the radius of influence would be estimated as the distance at which an induced vacuum of about 0.4 to 0.5 inches WC (1% of the extraction well vacuum) is measured at the observation well. For this site, radius of influence was interpreted using

the Chevron method: 1% of the applied well vacuum in estimating ROI. Graphical representation of the radius of influence data is shown in Attachment I.

Normalized induced vacuum impact, i.e., percent of applied vacuum is equal to the ratio of the observation well vacuum to the applied vacuum at the extraction well, multiplied by 100, is plotted as a function of distance from the extraction well. The effective ROI is then computed for each well by fitting a straight line to the plotted data using regression techniques and interpolating radial distance at which the cut-off vacuum (1 percent of the applied vacuum) is observed on the straight line. Table 6 summarizes the estimated effective ROI for each vapor extraction well.

For vapor well VW-1, since all observed induced vacuums were less than 0.5 inches WC, data interpretation using a 1% cut-off indicates no reasonable radius of influence can be determined from this information. MW-1, the closest observation well (35 feet away) saw no vacuum impact due to lack of exposed screen above the water table. At best, this data suggests that the radius of influence at VW-1 is less than 54 feet. Based on the soils encountered at this site, and extrapolating from the data, the effective radius of influence at VW-1 is most likely on the order of 10 to 30 feet.

For vapor well VW-2, data interpretation using a 1% cut-off would suggest an effective radius of influence of approximately 40 feet. For vapor well VW-3, data interpretation using a 1% cut-off would suggest an effective radius of influence of approximately 30 feet.

For vapor well VW-4, since all observed induced vacuums were non-detectable, or barely detectable, no reasonable radius of influence can be determined from this information. MW-3, the closest observation well (8 feet away) saw little vacuum impact due to lack of exposed screen above the water table. At best, this data suggests that the radius of influence at VW-4 is less than 33 feet, probably due to short curcuiting of air flow through the tank pit.

SUMMARY AND CONCLUSIONS

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

- The presence of gasoline impacted soil appears to be limited to the southern portion of the site. The majority of hydrocarbon impacted soil at concentrations greater than 100 ppm of TPHg appear to be in the southeastern vicinity of the existing UST pit, and in the southern vicinity of the northwestern service islands, directly above the local water table (approximately 7 to 12 feet below the ground surface) within capillary fringe. The soil at the shallower depths (approximately 3 to 7 feet below the ground surface) appears to contain low levels of gasoline hydrocarbons (1.6 ppm to 16 ppm).

- The lateral extent of gasoline hydrocarbons in the soil at the subject site has been delineated to nondetectable levels of TPHg (less than 1 ppm), with the exception of the southeastern portion of the site. The vertical extent of gasoline hydrocarbons in the soil at the site has been delineated to nondetectable levels of TPHg at the depths of approximately 10 to 19½ feet below the ground surface.

- Shallow groundwater, encountered at the site at depths of approximately 10 to 15 feet appears to be partially confined. Groundwater appears to be present in a relatively thin (2 - 5½ feet thick) layer composed of clayey sand underlain by sandy clay.

- The lateral extent of gasoline hydrocarbons in the groundwater has been delineated at the site to less than 50 ppb of TPHg with the exception of the southern and southwestern portions of the site.

- Information obtained through the environmental records search indicated that 13 impacted sites exist within a ½-mile radius of the site. Tank leaks were reported at BP, former Shell and Unocal sites located in the immediate vicinity of ARCO Station 6041 (across Village Parkway and Amador Valley Boulevard), which might

have contributed to the petroleum hydrocarbons detected in the soil or groundwater beneath the subject site.

- Laboratory results of air samples and field organic vapor measurements collected from vapor extraction wells VW-1 through VW-4 during the VET indicate that petroleum hydrocarbons exist in the area of the northwest service islands and south of the tank pit. The highest vapor concentrations were found in the vicinity of VW-4.

- Vapor extraction appears to be a viable soil remediation alternative for the remediation of gasoline hydrocarbons from onsite soils. Effective ROI's ranged from approximately 10 to 40 feet during the VET. These ROI's are consistent with the clayey sands known to exist at the site. These ROI's can be achieved at a moderate applied vacuum of 50 inches WC and an air flow ranging from about 60 to 81 scfm at each vapor extraction well.

- Air samples collected from the wells contained TPHg concentrations ranging from 6,600 to 110,000 mg/m^3. Benzene comprises roughly 2.5% to 3% of gasoline volume.

- Initial hydrocarbon removal rates were estimated to range from 35 pounds per day (lb/day) in VW-1 at 55 scfm to 741 lb/day in VW-4 at 75 scfm (6 to 119 gallons per day), based upon wellhead flow rate and vapor concentration data obtained during the VET. These initial removal rates typically decrease rapidly with time, depending on site specific conditions.

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.

DISTRIBUTION

It is recommended that copies of this report be sent to the following regulatory agencies:

Mr. Scott Seery
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

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

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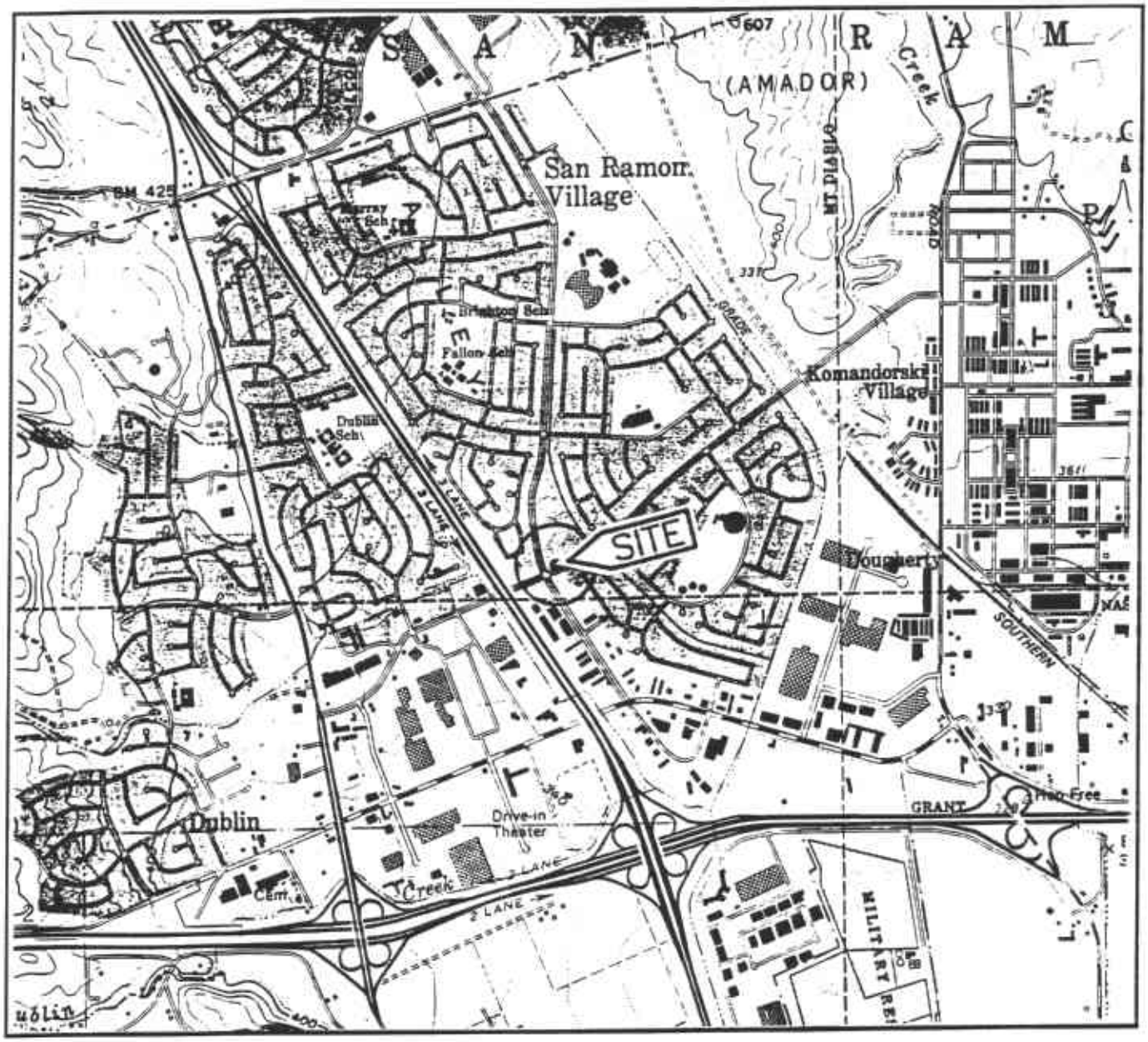

Base: U.S. Geological Survey
7.5–Minute Quadrangle
Dublin, California.
Photorevised 1980

LEGEND

⊙ = Site Location

N

Approximate Scale

2000 1000 0 2000 4000

feet

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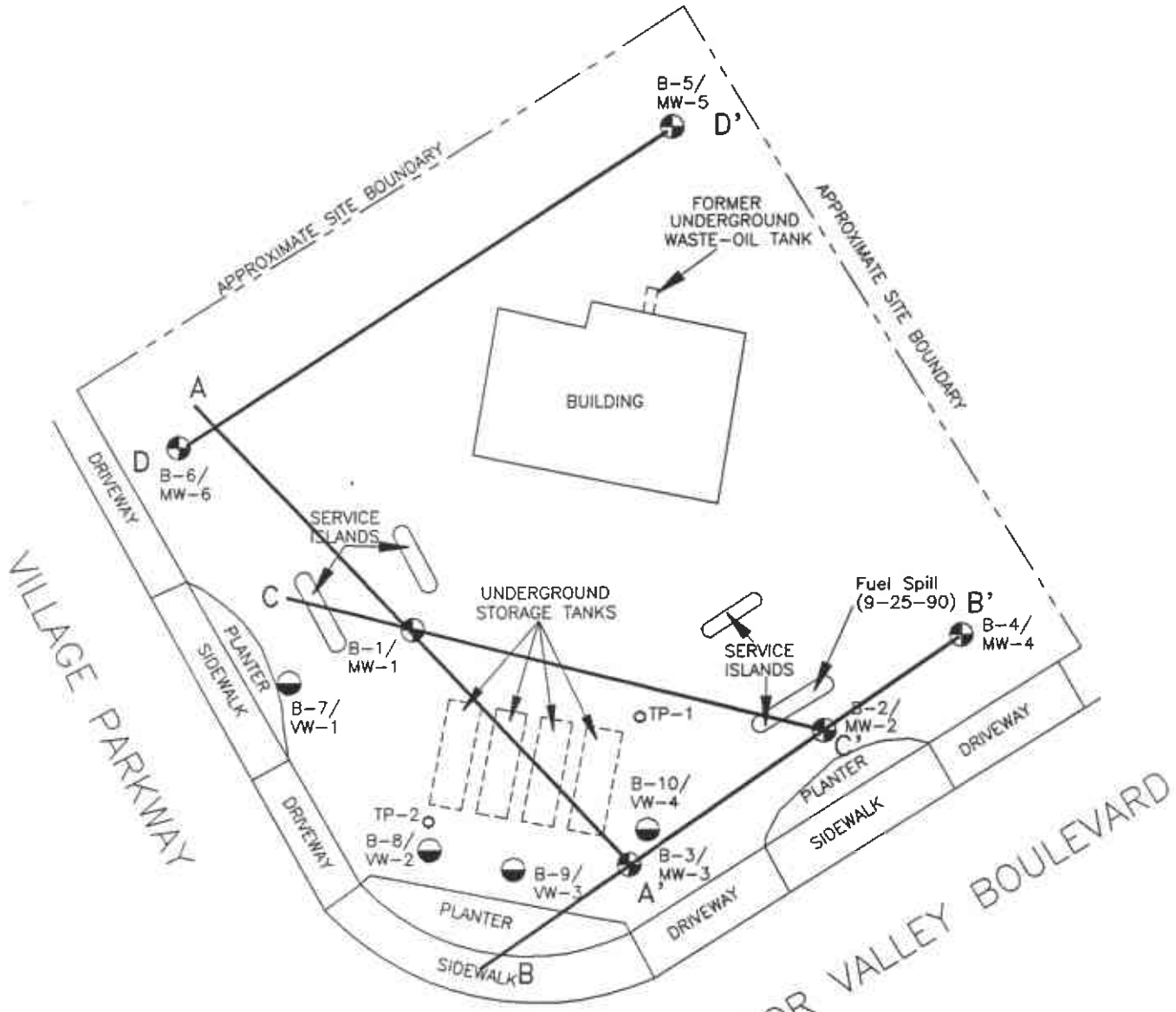
SITE VICINITY MAP
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
1



EXPLANATION

B-10/VW-4 = Boring/vapor extraction well (RESNA, October 1992)

B-6/MW-6 = Boring/groundwater monitoring well (RESNA, September 1991 and October 1992)

TP-2 = Tank pit observation well

D–D' = Geologic cross section

N

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plan supplied by ARCO.

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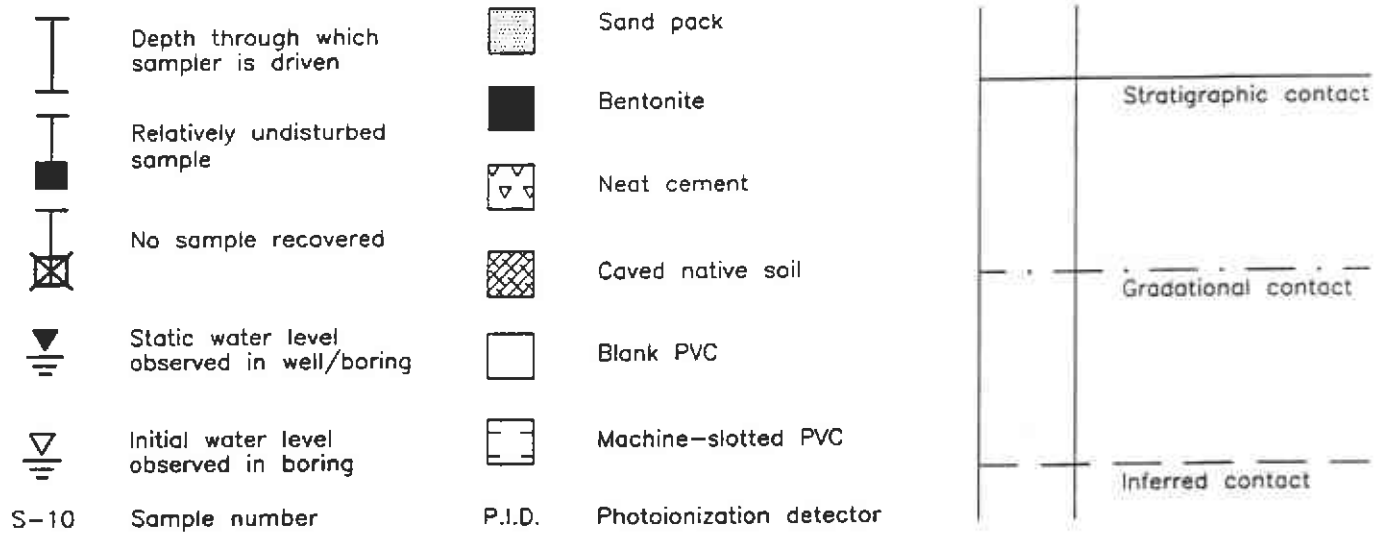
GENERALIZED SITE PLAN
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION		LTR	DESCRIPTION
COARSE-GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, grave-sand-silt mixtures.
		GC	Clayey gravel, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sand or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.

MAJOR DIVISION		LTR	DESCRIPTION
FINE-GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS LL>50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils.



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.

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

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UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 3

Depth of boring: 18 feet Diameter of boring: 12 inches Date drilled: 10/26/92

Well depth: 15 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 8-1/2 to 15 feet Filter pack: #3 Sand Slot size: 0.020-inch

Drilling Company: Exploration GeoServices Driller: John, Mike, and Dan

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional: ~~/E Tauxe~~

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt-covered surface.	
					Asphalt (4 inches).	
				GP	Sandy gravel, gray, damp, dense: baserock.	
				CL	Sandy clay, brown, damp, medium plasticity, stiff.	
2				SP	Sand, fine- to medium-grained, light brown, damp, medium dense; with roots.	
4						
6	S-5.5	6 6 6	NM			
				CL	Sandy clay, brown, damp, medium plasticity, stiff.	
8						
10	S-9.5	4 7 8	NM ▽	▼SC	Clayey sand, fine- to coarse-grained, dark gray mottled white, moist to wet, medium dense; sand composed of gypsum crystals.	
	S-11	5 6 8	NM			
12						
14	S-13.5	5 4 4	NM		Decreasing clay.	
				CL	Sandy clay, trace gravel, brownish-gray, damp, medium plasticity, stiff.	
16	S-15.5	5 7 8	NM			
		7 8 11	NM			
18					Total depth = 18 feet.	
					NM = Not measured due to OVM failure	
20						

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LOG OF BORING B-4/MW-4
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 4

Depth of boring: 20-1/2 feet Diameter of boring: 12 inches Date drilled: 10/26/92

Well depth: 18 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 11 to 18 feet Filter pack: #3 Sand Slot size: 0.020-inch

Drilling Company: Exploration GeoServices Driller: John, Mike and Dan

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional: JE Tamm

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt-covered surface.	
0					Asphalt (4 inches).	
				GP	Sandy gravel, gray, damp, dense: baserock.	
				CL	Sandy clay, dark brown, damp, medium plasticity, hard.	
2						
4						
	S-5.5	8 18 25	NM		Increasing sand.	
6				SC	Clayey sand, fine-grained, dark gray, damp to moist, dense.	
8					Moist.	
	S-8.5	8 10 13	NM	CL	Silty clay, black, damp, medium plasticity, very stiff.	
10	S-10	8 10 11	NM		Moist, with gypsum crystals.	
	S-11.5	8 10 15	NM	▽	Color change to dark gray.	
12				SC/CL	Clayey sand, fine- to medium-grained, trace gravel, brown, wet, dense; interbedded with sandy clay, brown, moist, medium plasticity, very stiff.	
	S-13.5	8 10 20	NM			
14	S-15	7 8 13	NM			
16						
				CL	Sandy clay, trace gravel, damp, brownish-gray, medium plasticity, very stiff.	
18						
	S-19.5	5 9 15	NM			
20						
					Total depth = 20-1/2 feet.	
					NM = Not measured due to OVM failure	

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LOG OF BORING B-5/MW-5
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 5

Depth of boring: 19-1/2 feet Diameter of boring: 12 inches Date drilled: 10/26/92

Well depth: 16 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 10 to 16 feet Filter pack: #3 Sand Slot size: 0.020-inch

Drilling Company: Exploration GeoServices Driller: John, Mike, and Dan

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional: [signature]

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt-covered surface.	
0					Asphalt (4 inches).	
				GP	Sandy gravel, gray, damp, dense: baserock.	
2				CL	Sandy clay, dark gray, damp, medium plasticity, stiff.	
4				SM	Silty sand, fine- to medium-grained, gray, damp, medium dense.	
6	S-5.5	6 6 6	NM			
8				CL	Silty clay, black, damp, medium plasticity, very stiff; with gypsum crystals.	
10	S-10.5	9 12 18	NM		With sand. Moist.	
12	S-12.5	4 5 6	NM	SC/CL	Clayey sand, fine- to medium-grained, brownish-gray, wet, medium dense, interbedded with sandy clay, brownish-gray, moist, medium plasticity, stiff.	
14						
16	S-15.5	8 9 15	NM	CL	Sandy clay, trace fine gravel, brownish-gray, damp, medium plasticity, very stiff.	
18	S-18.5	6 12 13	NM			
20					Total depth = 19-1/2 feet. NM = Not measured due to OVM failure	

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LOG OF BORING B-6/MW-6
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 6

Depth of boring: 11 feet Diameter of boring: 12 inches Date drilled: 10/27/92

Well depth: 9-1/2 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 4 to 9-1/2 feet Filter pack: 3/8" Pea Gravel Slot size: 0.100-inch

Drilling Company: Exploration GeoServices Driller: John and Mike

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional:

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt-covered surface.	
0					Asphalt (4 inches).	
				GP	Sandy gravel, gray, damp, dense: baserock.	
2				CL	Sandy clay, dark gray, damp, medium plasticity, stiff.	
4				SC	Clayey sand, fine-grained, dark gray, damp, medium dense; obvious product odor.	
6	S-5.5	5 8 8	151			
8	S-8.5	10 15 18	18	CL	Silty clay, black, damp, medium plasticity, hard; noticeable product odor.	
10	S-10	5 8 11	26		Color change to dark gray, with gypsum crystals, moist.	
12					Total depth = 11 feet.	
14						
16						
18						
20						

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LOG OF BORING B-7/VW-1
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 7

Depth of boring: 11 feet Diameter of boring: 12 inches Date drilled: 10/27/92

Well depth: 9-1/2 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 4 to 9-1/2 feet Filter pack: 3/8" Pea Gravel Slot size: 0.100-inch

Drilling Company: Exploration GeoServices Driller: John and Mike

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional:

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt-covered surface.	
0					Asphalt (4 inches).	
				GP	Sandy gravel, gray, damp, dense: baserock.	
2				CL	Sandy clay, dark gray, damp, medium plasticity, stiff.	
4				SC	Clayey sand, fine-grained, dark gray, damp, medium dense; obvious product odor.	
6	S-5.5	3 6 6	749			
				CL	Silty clay with gypsum crystals, black, damp, medium plasticity, hard; noticeable product odor.	
8	S-8.5	10 16 23	41			
10	S-10	6 10 11	11		Increasing gypsum crystals, moist.	
					Total depth = 11 feet.	
12						
14						
16						
18						
20						

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LOG OF BORING B-8/VW-2
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 8

Depth of boring: 11 feet Diameter of boring: 12 inches Date drilled: 10/27/92

Well depth: 9-1/2 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 4 to 9-1/2 feet Filter pack: 3/8" Pea Gravel Slot size: 0.100-inch

Drilling Company: Exploration GeoServices Driller: John and Mike

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt-covered surface.	
					Asphalt (4 inches).	
				GP	Sandy gravel, gray, damp, dense: baserock.	
2				CL	Sandy clay, brownish-gray, damp, medium plasticity, stiff.	
4				SC	Clayey sand, fine-grained, dark gray, damp, medium dense; obvious product odor.	
6	S-5.5	4 7 11	329			
8				CL	Silty clay, dark gray, damp, medium plasticity, very stiff; noticeable product odor.	
10	S-10	8 9 12	55		With gypsum crystals, moist.	
					Total depth = 11 feet.	
12						
14						
16						
18						
20						

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LOG OF BORING B-9/VW-3
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 9

Depth of boring: 11 feet Diameter of boring: 12 inches Date drilled: 10/27/92

Well depth: 9-1/2 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 4 to 9-1/2 feet Filter pack: 3/8" Pea Gravel Slot size: 0.100-inch

Drilling Company: Exploration GeoServices Driller: John and Mike

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional:

Registration No.: RCE 044600 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt-covered surface.	
0					Asphalt (4 inches).	
				GP	Sandy gravel, gray, damp, dense; baserock.	
				CL	Sandy clay, dark gray, damp, medium plasticity, stiff.	
2						
4						
				SC	Clayey sand, dark gray, damp, medium dense; obvious product odor.	
6	S-5.5	5 6 10	880			
8						
				CL	Sandy clay with gypsum crystals, dark gray, damp, low plasticity, very stiff; obvious product odor.	
10	S-10	8 10 11	556		Increasing gypsum crystals, moist.	
					Total depth = 11 feet.	
12						
14						
16						
18						
20						

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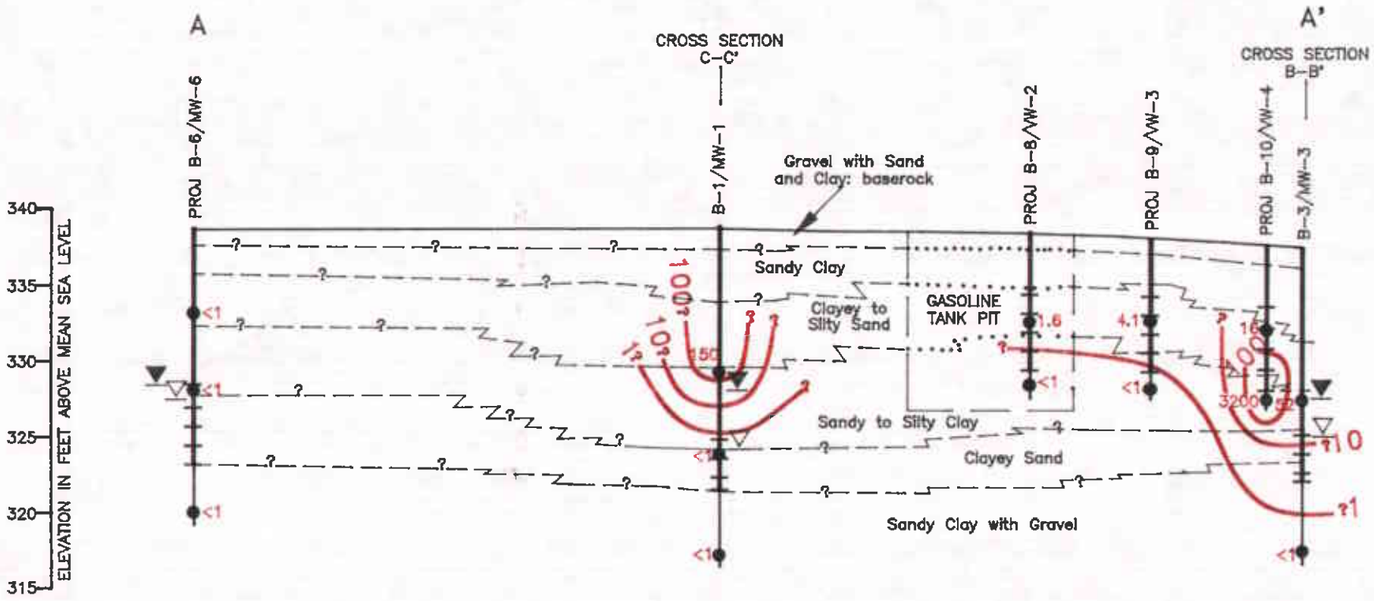
LOG OF BORING B-10/VW-4
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
10



EXPLANATION

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

3,200 = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (12/14/92)

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

feet

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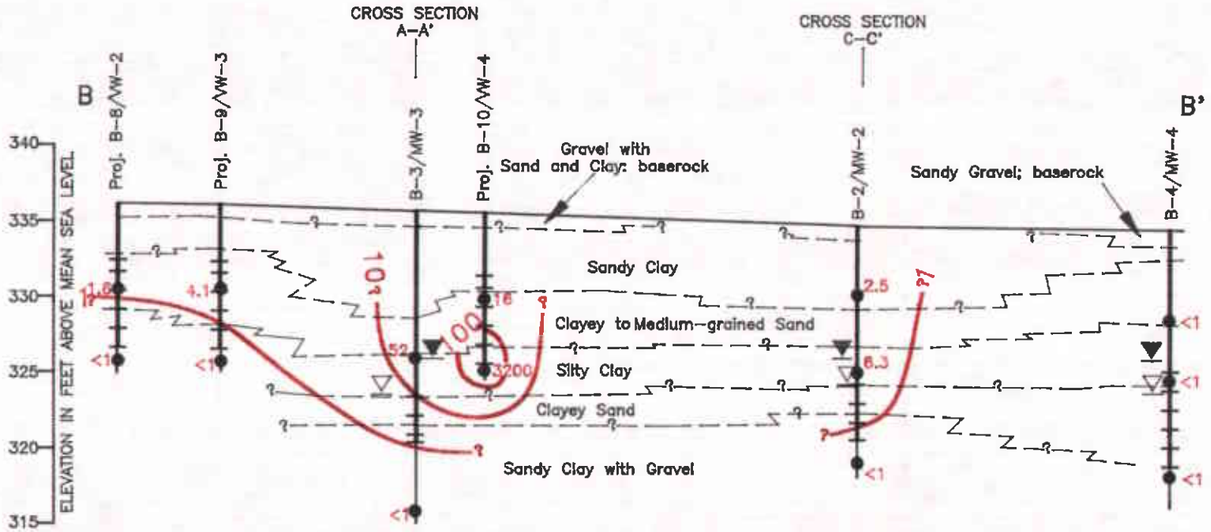
GEOLOGIC CROSS SECTION A-A'
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
11



EXPLANATION

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

3,200 = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (12/14/92)

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

feet

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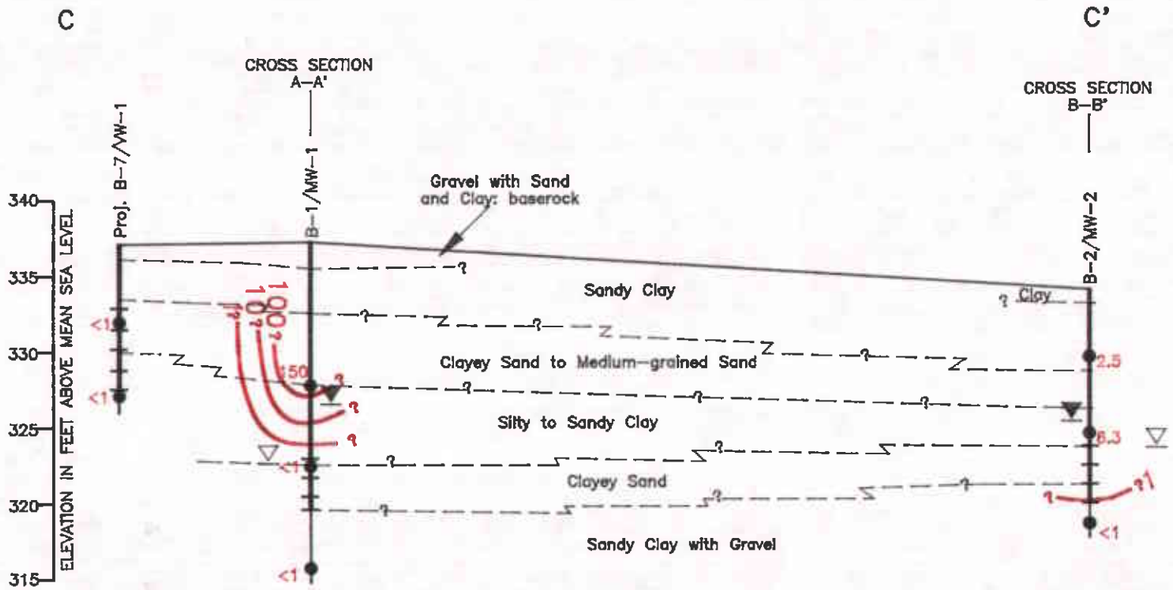
GEOLOGIC CROSS SECTIONS B-B'
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
12



EXPLANATION

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

150 = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (12/14/92)

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

feet

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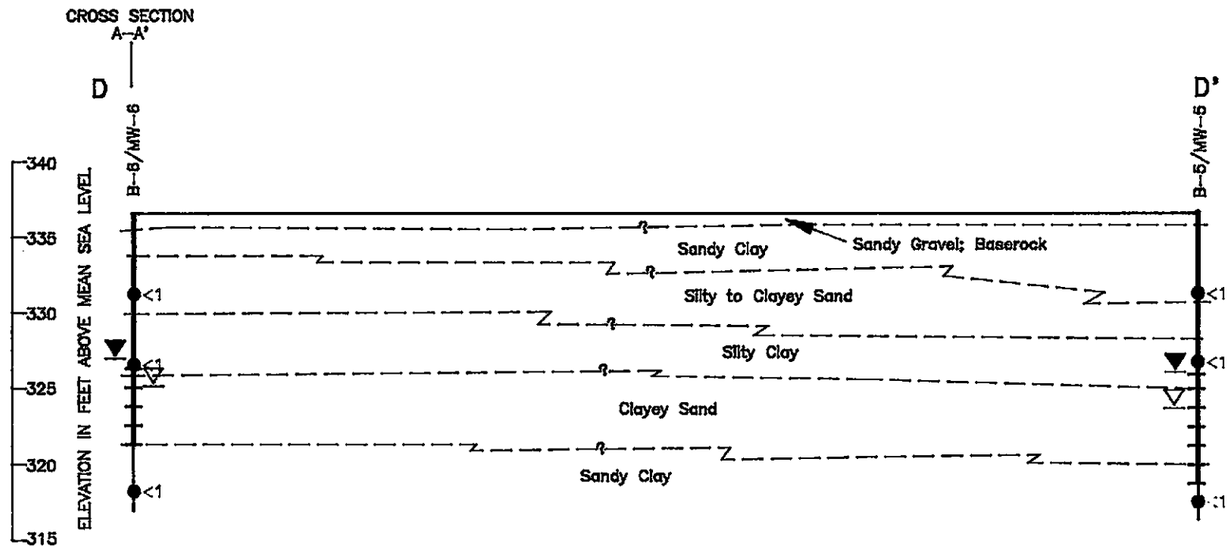
GEOLOGIC CROSS SECTION C-C'
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
13



EXPLANATION

<1 = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (12/14/92)

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

feet

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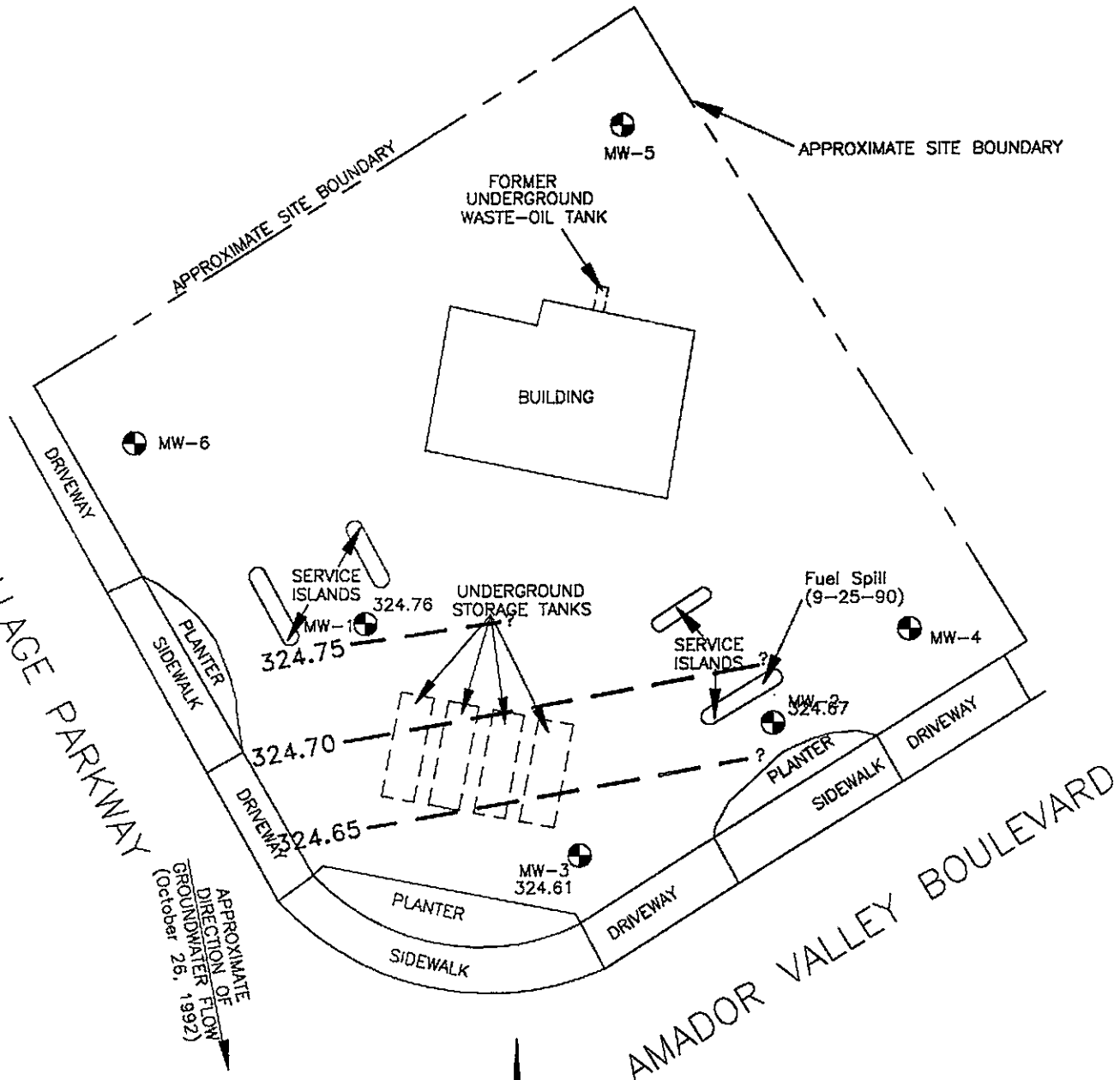
GEOLOGIC CROSS SECTION D-D'
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
14



EXPLANATION

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

324.76 = Elevation of groundwater in feet above MSL, October 26, 1992

MW-6 = Groundwater monitoring well (RESNA, September 1991 and October 1992)

N

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plan supplied by ARCO.

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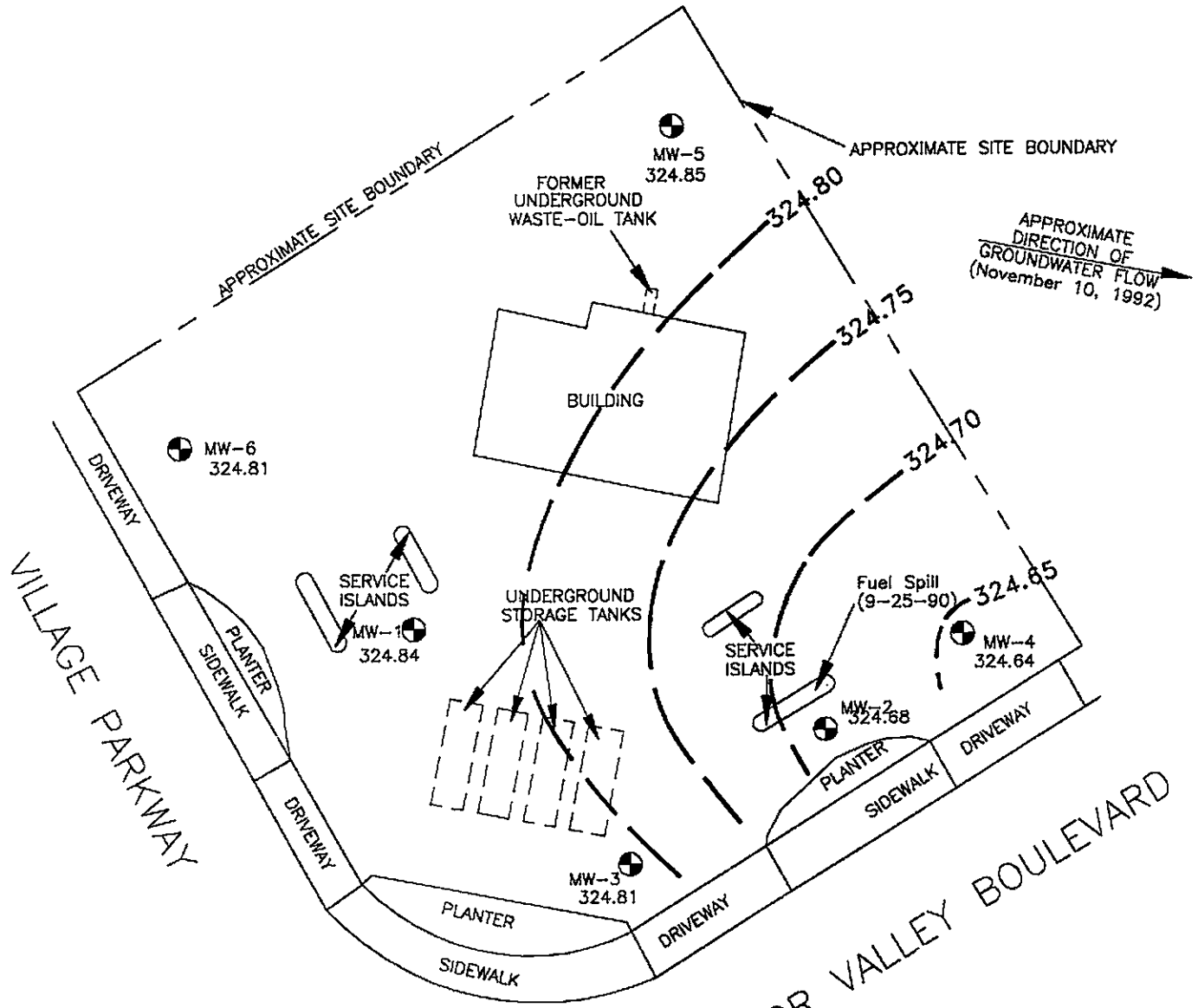
GROUNDWATER GRADIENT MAP
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 15



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

324.85 = Elevation of groundwater in feet above MSL, November 10, 1992

MW-6 = Groundwater monitoring well (RESNA, September 1991 and October 1992)

N

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plan supplied by ARCO.

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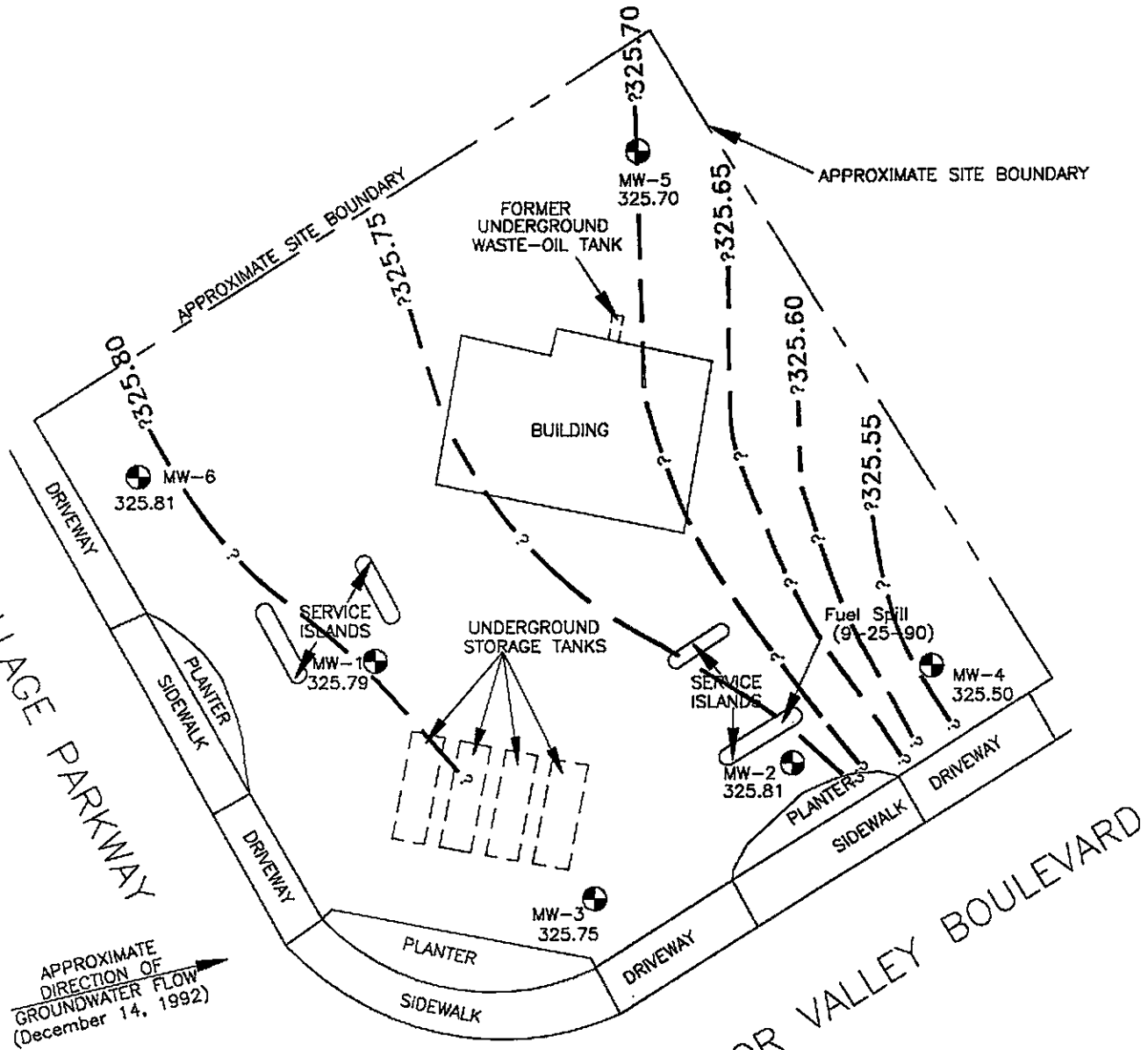
GROUNDWATER GRADIENT MAP
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 16



EXPLANATION

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

325.81 = Elevation of groundwater in feet above MSL, December 14, 1992

MW-6 = Groundwater monitoring well (RESNA, September 1991 and October 1992)

Source: Modified from plan supplied by ARCO.

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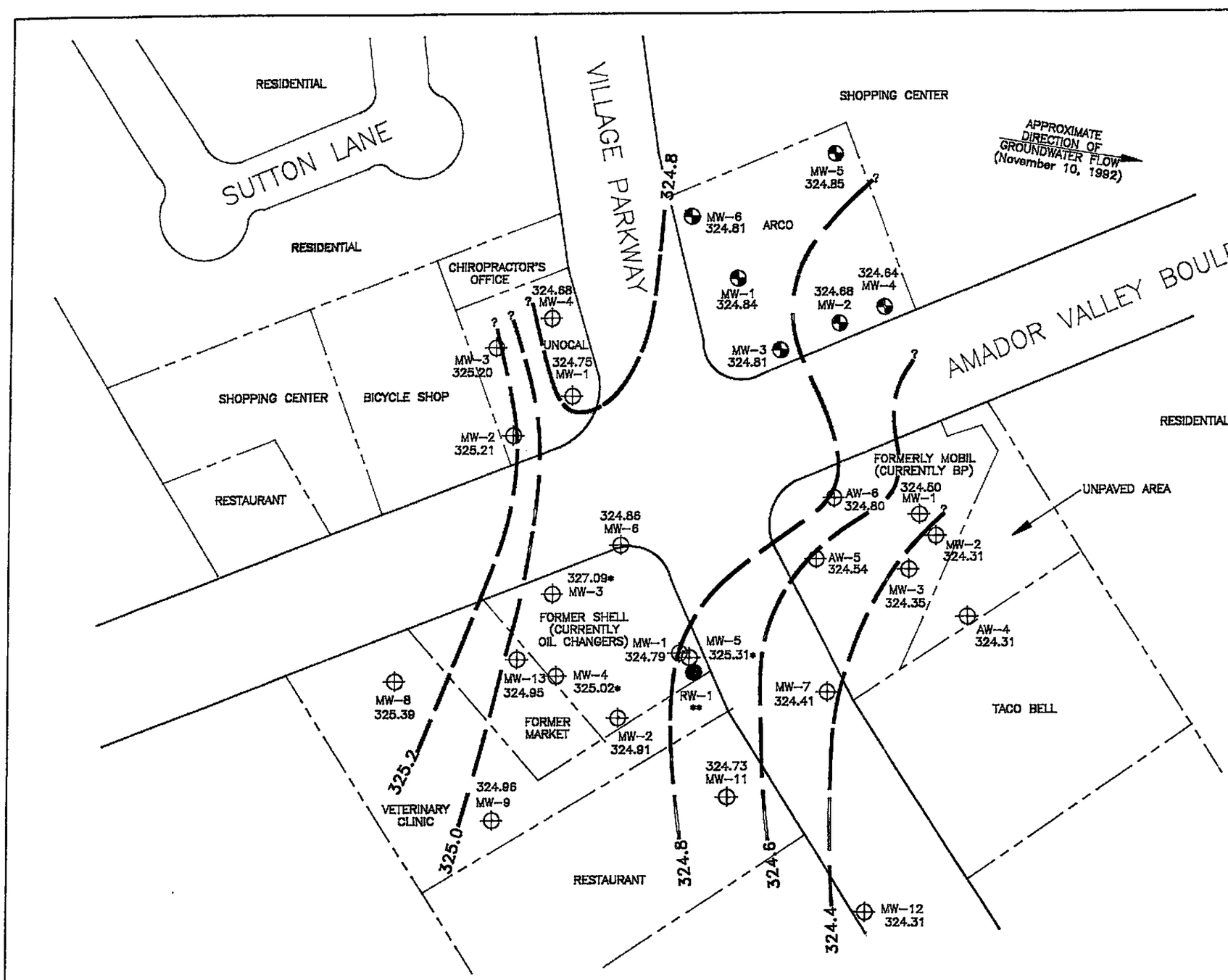
GROUNDWATER GRADIENT MAP
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 17



EXPLANATION

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

327.09 = Elevation of groundwater in feet above MSL, November 10, 1992

= Groundwater monitoring well installed by RESNA

= Groundwater monitoring well installed by OTHERS

= Recovery well

* = groundwater elevations for MW-3 and MW-4 were not used due to anomalous water level readings

** = RW-1 was not measured

All property lines & well locations are approximate

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plan supplied by ALTON GEOSCIENCE.

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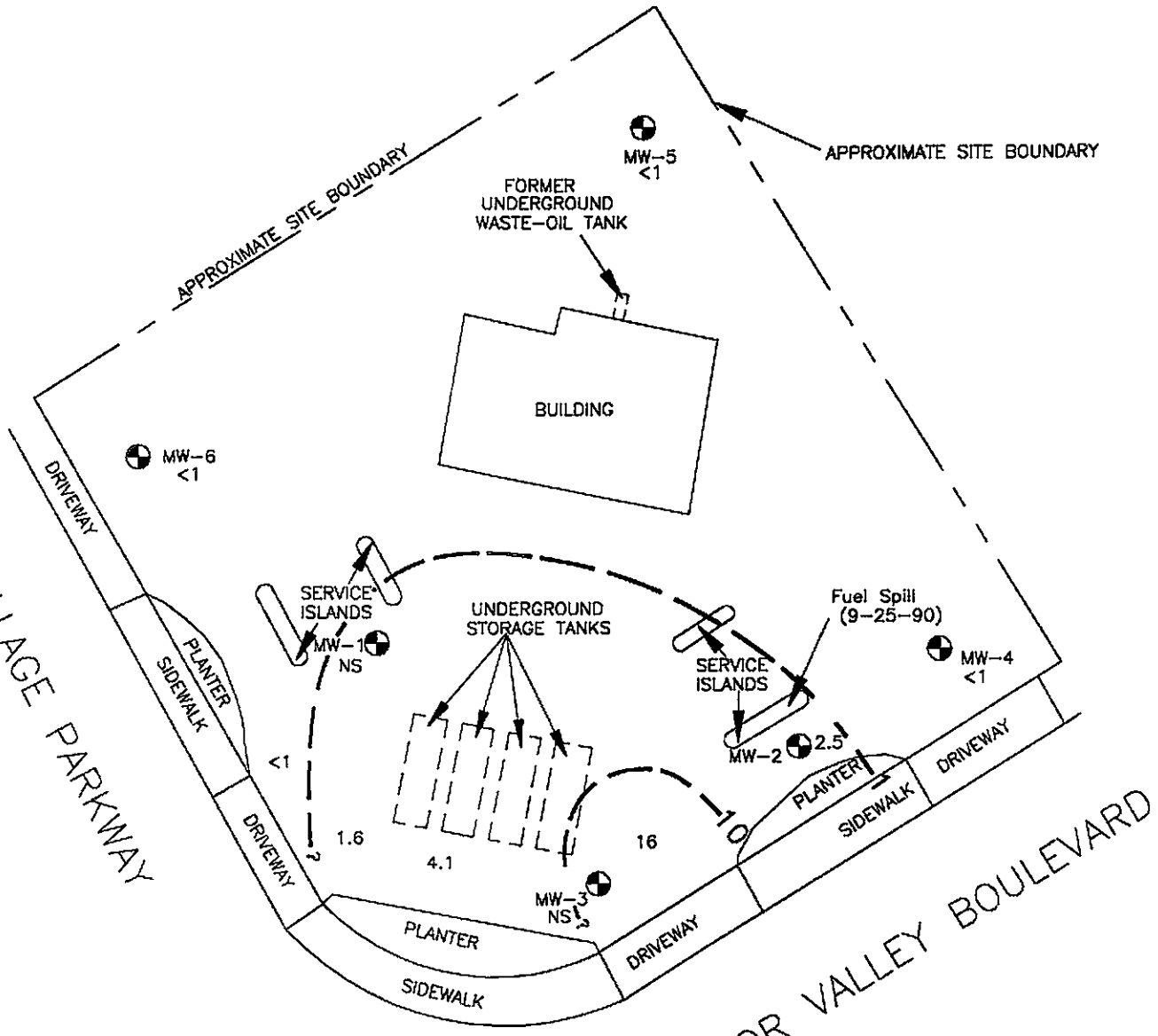
LOCAL GROUNDWATER GRADIENT MAP
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
18



EXPLANATION

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

16 = Concentration of TPHg in soil at depths between 4.5 and 5.5 feet, in ppm

MW-6 = Groundwater monitoring well (RESNA, September 1991 and October 1992)

NS = Not sampled

N

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plan supplied by ARCO.

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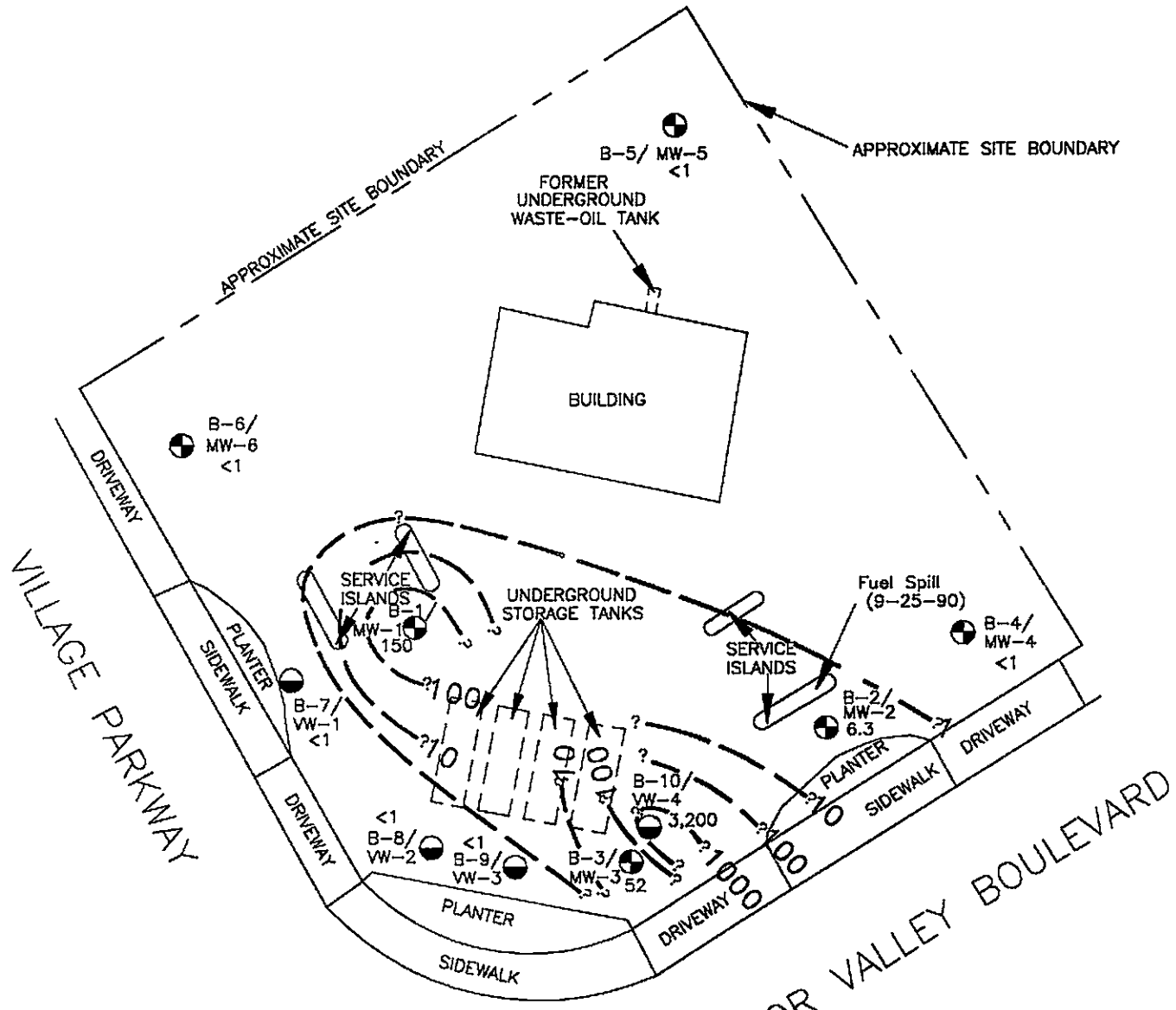
CONCENTRATIONS OF TPHg IN SOIL AT DEPTHS OF 4.5 TO 5.5 FEET
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
19



EXPLANATION

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

3,200 = Concentration of TPHg in soil at depths between 9.5 and 10 feet, in ppm

B-10/VW-4 = Boring/vapor extraction well (RESNA, October 1992)

B-6/MW-6 = Groundwater monitoring well (RESNA, September 1991 and October 1992)

NS = Not sampled

N

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plan supplied by ARCO.

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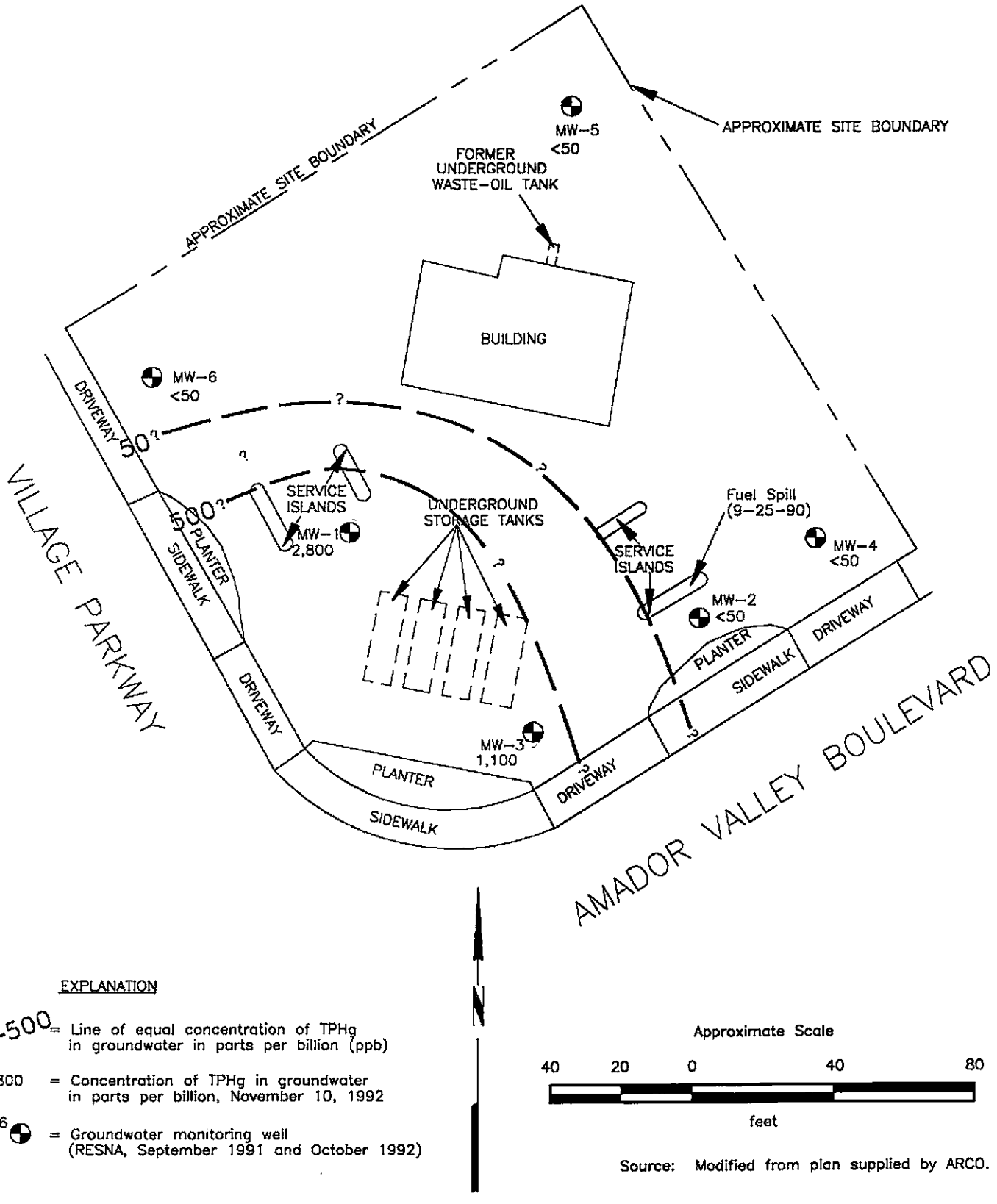
CONCENTRATION OF TPHg IN SOIL AT DEPTHS OF 9.5 TO 10 FEET
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
20



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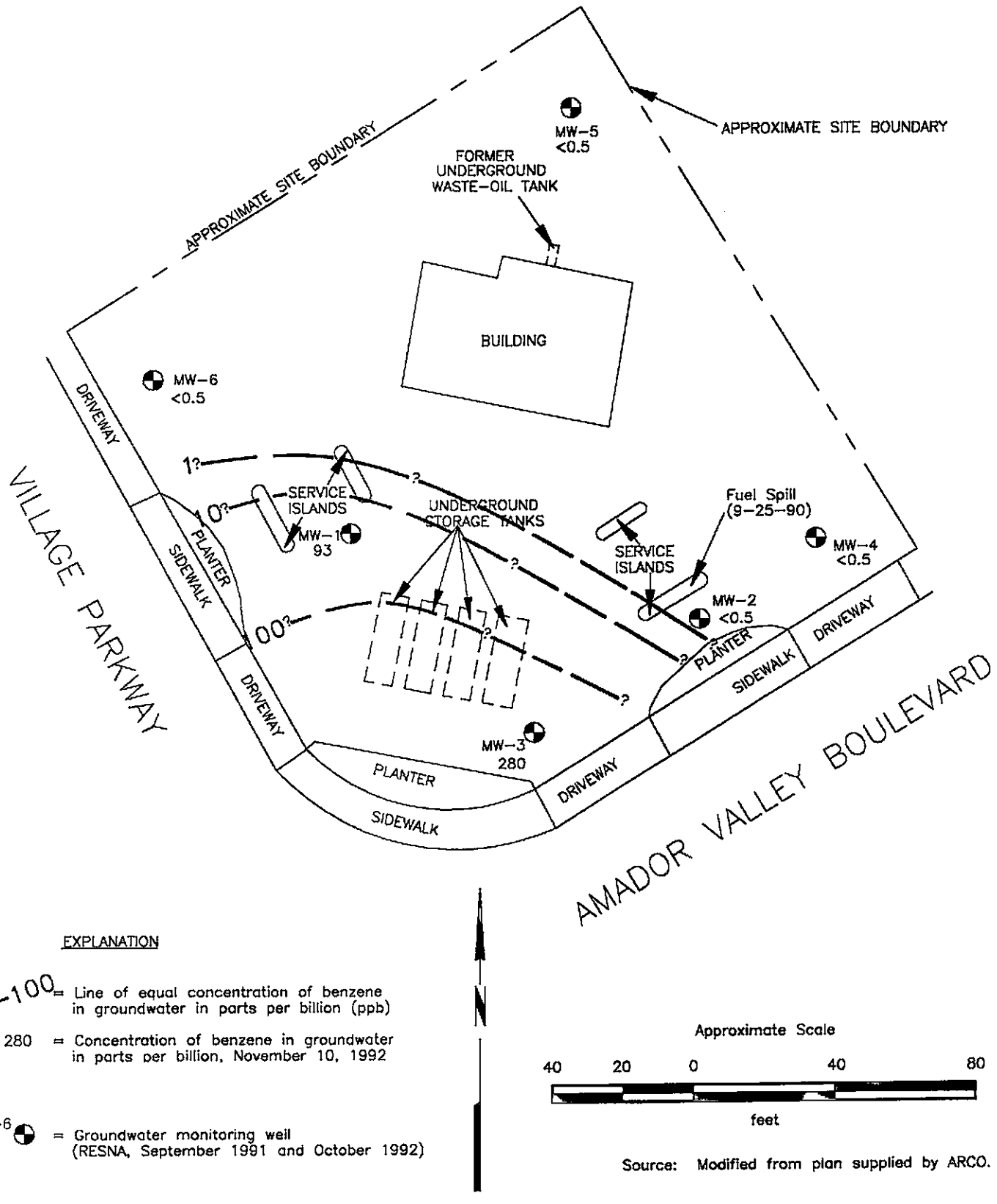
TPHg CONCENTRATIONS IN GROUNDWATER
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
21



EXPLANATION

100 = Line of equal concentration of benzene in groundwater in parts per billion (ppb)

280 = Concentration of benzene in groundwater in parts per billion, November 10, 1992

MW-6 = Groundwater monitoring well (RESNA, September 1991 and October 1992)

N

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plan supplied by ARCO.

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BENZENE CONCENTRATIONS IN GROUNDWATER
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
22

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 6041
Dublin, California
(Page 1 of 2)

Date Measured	Well Elevation	Depth to Water	Water Elevation	Floating Product
MW-1				
09-20-91	336.56	11.20	325.36	None
10-22-91		11.48	325.08	None
11-27-91		11.27	325.29	None
12-16-91		11.55	325.01	None
01-18-92		11.37	325.19	None
02-21-92		9.13	327.43	None
03-16-92		9.70	326.86	None
04-24-92		10.20	326.36	None
05-15-92		10.46	326.10	None
06-09-92		10.73	325.83	None
07-28-92		11.04	325.52	None
08-24-92		11.32	325.24	None
09-09-92		11.54	325.02	None
10-26-92		11.80	324.76	None
11-10-92		11.74	324.84	None
12-14-92		10.77	325.79	None
MW-2				
09-20-91	334.80	9.22	325.58	None
10-22-91		9.66	325.14	None
11-27-91		9.48	325.32	None
12-16-91		9.76	325.04	None
01-18-92		9.47	325.33	None
02-21-92		7.62	327.18	None
03-16-92		7.84	326.96	None
04-24-92		8.34	326.46	None
05-15-92		8.62	326.18	None
06-09-92		8.88	325.92	None
07-28-92		9.38	325.42	None
08-24-92		9.81	324.99	None
09-09-92		9.92	324.88	None
10-26-92		10.13	324.67	None
11-10-92		10.12	324.68	None
12-14-92		8.99	325.81	None
MW-3				
09-20-91	335.53	10.16	325.37	None
10-22-91		10.48	325.05	None
11-27-91		10.17	325.36	None
12-16-91		10.25	325.28	None

See notes on Page 2 of 2

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 6041
Dublin, California
(Page 2 of 2)

Date Measured	Well Elevation	Depth to Water	Water Elevation	Floating Product
MW-3 cont.				
01-18-92	335.53	10.71	324.82	None
02-21-92		8.68	326.85	None
03-16-92		8.91	326.62	None
04-24-92		9.14	326.39	None
05-15-92		9.54	325.99	None
06-09-92		9.72	325.81	None
07-28-92		10.15	325.38	None
08-24-92		10.42	325.11	None
09-09-92		10.53	325.00	None
10-26-92		10.92	324.61	None
11-10-92		10.72	324.81	None
12-14-92		9.78	325.75	None
MW-4				
11-10-92	334.22	9.58	324.64	None
12-14-92		8.72	325.50	None
MW-5				
11-10-92	335.87	11.02	324.85	None
12-14-92		10.17	325.70	None
MW-6				
11-10-92	335.84	11.03	324.81	None
12-14-92		10.03	325.81	None

Measurements in feet.
Wells MW1-through MW-3 surveyed on October 11, 1991. Wells MW-4 through MW-6 surveyed on November 12, 1992. Datum is City of Dublin = (USGS)

TABLE 2
VAPOR EXTRACTION TEST FIELD MONITORING DATA
ARCO Station 6041
Dublin, California
Test Performed on November 10, 1992

Influent Air Stream from VW-1						Observation Wells			
Flow (scfm)	Percent Oxygen	Concentration (% LEL)	Applied Vacuum (at wellhead)	Influent Temp. (°F)	Elapsed Time (min)	VW-2 Induced Vacuum	VW-3 Induced Vacuum	VW-4 Induced Vacuum	MW-1 Induced Vacuum
55	15	30	50	50	0	0.175	0.05	0.015	<0.01
57	15	30	52	50	15	0.18	0.05	0.015	<0.01
NM	13	40	52	50	30	0.18	0.04	0.015	<0.01
NM	15	25	52	50	45	0.18	0.06	0.015	<0.01
49	NM	NM	40	NM	NM	NM	NM	NM	NM
42	NM	NM	29	NM	NM	NM	NM	NM	NM
34	NM	NM	20	NM	NM	NM	NM	NM	NM
26	NM	NM	10	NM	NM	NM	NM	NM	NM
DTW: (VW-1 DRY)						DRY	DRY	DRY	11.74
Distance from Extraction Well VW-1 (Feet):						54	72	94	35
Well Screen Interval (FT BGS): 4.5-9.5						4.5-9.5	4.5-9.5	4.5-9.5	14-17.5
Approximate Exposed Well Screen (Feet): 5						5	5	5	0

NOTES:
Applied vacuum at wellhead measured in inches of water column.
SCFM : Air flow rate in cubic feet per minute standardized to atmospheric temperature and pressure.
%LEL : Concentration measured as a percentage of the lower explosive limit of gasoline (62,500 mg/m^3).
* : Blower Disengaged
NM : Not Measured or Recorded
FT BGS : Feet Below Ground Surface

TABLE 2
VAPOR EXTRACTION TEST FIELD MONITORING DATA
ARCO Station 6041
Dublin, California
Test Performed on November 10, 1992

Influent Air Stream from VW-2						Observation Wells			
Flow (scfm)	Percent Oxygen	Concentration (% LEL)	Applied Vacuum (at wellhead)	Influent Temp. (°F)	Elapsed Time (min)	VW-4 Induced Vacuum	VW-3 Induced Vacuum	VW-1 Induced Vacuum	TP-1 Induced Vacuum
92	9	20	48	50	0	0.02	1.25	0.11	<0.01
92	12	30	48	50	20	0.015	1.45	0.13	<0.01
81	12	30	42	50	35	0.015	1.40	0.13	<0.01
NM	7	20	44	50	50	0.02	1.40	0.12	<0.01
69	NM	NM	30	50	NM	NM	NM	NM	NM
54	NM	NM	20	50	NM	NM	NM	NM	NM
35	NM	NM	10	50	NM	NM	NM	NM	NM
DTW: (VW-2 DRY)						DRY	DRY	DRY	DRY
Distance from Extraction Well VW-2 (Feet):						53	21	54	60
Well Screen Interval (FT BGS): 4.5-9.5						4.5-9.5	4.5-9.5	4.5-9.5	?
Approximate Exposed Well Screen (Feet): 5						5	5	5	0

NOTES:
Applied vacuum at wellhead measured in inches of water column.
SCFM : Air flow rate in cubic feet per minute standardized to atmospheric temperature and pressure.
%LEL : Concentration measured as a percentage of the lower explosive limit of gasoline (62,500 mg/m^3).
* : Blower Disengaged
NM : Not Measured or Recorded
FT BGS : Feet Below Ground Surface
? : No information available

TABLE 2
VAPOR EXTRACTION TEST FIELD MONITORING DATA
ARCO Station 6041
Dublin, California
Test Performed on November 10, 1992

Influent Air Stream from VW-3						Observation Wells				
Flow (scfm)	Percent Oxygen	Concentration (% LEL)	Applied Vacuum (at wellhead)	Influent Temp. (°F)	Elapsed Time (min)	VW-4 Induced Vacuum	MW-3 Induced Vacuum	TP-2 Induced Vacuum	VW-2 Induced Vacuum	VW-1 Induced Vacuum
79	10	40	50	50	0	0.02	<0.01	<0.01	1.65	0.04
81	9.5	25	52	50	30	0.02	0.01	0.005	1.90	0.04
81	10	25	52	50	55	0.025	<0.01	0.005	1.95	0.04
81	NM	NM	52	50	85	0.02	<0.01	<0.01	2.2	0.04
81	8	25	52	50	150	0.02	<0.01	<0.01	2.2	0.05
65	NM	NM	40	NM	NM	NM	NM	NM	NM	NM
54	NM	NM	30	NM	NM	NM	NM	NM	NM	NM
41	NM	NM	20	NM	NM	NM	NM	NM	NM	NM
22	NM	NM	10	NM	NM	NM	NM	NM	NM	NM
DTW: (VW-3 DRY)						DRY	10.72	DRY	DRY	DRY
Distance from Extraction Well VW-3 (Feet):						33	29	22	21	72
Well Screen Interval (FT BGS): 4.5-9.5						4.5-9.5	12-15	?	4.5-9.5	4.5-9.5
Approximate Exposed Well Screen: 5						5	0	0	5	5

NOTES:
Applied vacuum at wellhead measured in inches of water column.
SCFM : Air flow rate in cubic feet per minute standardized to atmospheric temperature and pressure.
%LEL : Concentration measured as a percentage of the lower explosive limit of gasoline (62,500 mg/m³).
* : Blower Disengaged
NM : Not Measured or Recorded
FT BGS : Feet Below Ground Surface
? : No information available

TABLE 2
VAPOR EXTRACTION TEST FIELD MONITORING DATA
ARCO Station 6041
Dublin, California
Test Performed on November 10, 1992

Influent Air Stream from VW-4						Observation Wells				
Flow (scfm)	Percent Oxygen	Concentration (% LEL)	Applied Vacuum (at wellhead)	Influent Temp. (°F)	Elapsed Time (min)	VW-3 Induced Vacuum	VW-2 Induced Vacuum	MW-2 Induced Vacuum	TP-1 Induced Vacuum	MW-3 Induced Vacuum
NM	9	70	25*	50	25	<0.01	<0.01	<0.01	<0.01	0.07
63	NM	NM	40	50	30	<0.01	<0.01	<0.01	<0.01	0.07
75	9	75	50	50	60	NM	NM	NM	NM	NM
63	12	75	42	50	90	<0.01	0.01	<0.01	<0.01	0.11
52	NM	NM	30	50	NM	NM	NM	NM	NM	NM
39	NM	NM	20	50	NM	NM	NM	NM	NM	NM
22	NM	NM	10	50	NM	NM	NM	NM	NM	NM
DTW: (VW-4 DRY)						DRY	DRY	10.12	DRY	10.72
Distance from Extraction Well VW-4 (Feet):						33	53	47	30	8
Well Screen Interval (FT BGS): 4.5-9.5						4.5-9.5	4.5-9.5	10.5-14	?	12-15
Approximate Exposed Well Screen (Feet): 5						5	5	0	0	0

NOTES:
Applied vacuum at wellhead measured in inches of water column.
SCFM : Air flow rate in cubic feet per minute standardized to atmospheric temperature and pressure.
%LEL : Concentration measured as a percentage of the lower explosive limit of gasoline (62,500 mg/m^3).
* : Blower Disengaged
NM : Not Measured or Recorded
FT BGS : Feet Below Grade Surface
? : No information available

TABLE 3
CUMULATIVE RESULTS OF LABORATORY ANALYSES
OF SOIL SAMPLES FROM BORINGS
ARCO Station 6041
Dublin, California
(Page 1 of 2)

Sample Identification	TPHg	B	T	E	X
September 1991					
S-9½-B1	150	0.90	4.2	2.4	13
S-14½-B1	< 1.0	0.0060	0.019	0.0090	0.060
S-21½-B1	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-4½-B2	2.5	0.071	< 0.0050	0.093	0.017
S-9½-B2	6.3	0.30	0.011	0.30	0.060
S-15½-B2	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-9½-B3	52	1.2	2.5	1.4	8.5
S-19½-B3	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-0913-SP1(A-D)	1.9	0.027	< 0.0050	0.035	0.0070
S-0913-SP2(A-D)	18	0.045	0.43	0.29	1.8
October 1992					
S-5½-B4	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-9½-B4	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-15½-B4	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-5½-B5	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-10-B5	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-19½-B5	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-5½-B6	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-10½-B6	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-18½-B6	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-5½-B7	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-10-B7	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-5½-B8	1.6	0.091	< 0.0050	0.060	0.14
S-10-B8	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-5½-B9	4.1	0.21	0.018	0.11	0.26
S-10-B9	< 1.0	< 0.0050	< 0.0050	< 0.0050	< 0.0050
S-5½-B10	16	0.26	0.69	0.30	2.1
S-10½-B10	**3,200**	**12**	74	59	390

See Notes on Page 2 of 2

ppm

TABLE 3
CUMULATIVE RESULTS OF LABORATORY ANALYSES
OF SOIL SAMPLES FROM BORINGS
ARCO Station 6041
Dublin, California
(Page 2 of 2)

Sample Identification	TPHg	B	T	E	X
October 1992 cont.					
S-1027-SP1(A-D)	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-1027-SP2(A-D)*	110	0.42	2.9	2.1	12

Results measured in part per million (ppm).
TPHg: Total petroleum hydrocarbons as gasoline (analyzed by EPA Method 5030/8015/8020).
B: benzene; T: toluene; E: ethylbenzene; X: total xylenes.
BTEX: Analyzed by EPA Method 5030/8015/8020.
<: Less than the laboratory detection limit.
*: Additional analyses were performed for soil disposal. Results were as follows:
STLC lead by EPA Method 7421: 0.13 mg/L;
corrosivity by EPA 9045; pH=8.5;
ignitability by EPA 1010; flashpoint >100°C;
reactivity by EPA 9010 and 9030; below detection limit.

Sample Identification:

S-19½-B3
| | └ Boring number
| └── Depth in feet
└──── Soil sample

S-1027-SP2(A-D)
| | | └ Composite sample A through D
| | └── Stockpile number
| └──── Sampling date
└────── Stockpile sample

TABLE 4
CUMULATIVE RESULTS OF LABORATORY ANALYSES
OF GROUNDWATER
ARCO Station 6041
Dublin, California
(Page 1 of 1)

Well Date	TPHg	Benzene	Toluene	Ethyl- Benzene	Total Xylenes
MW-1					
09-20-91	410	28	36	4.3	89
12-16-91	840	50	50	3.9	12
03-16-92	780	22	12	45	22
06-09-92	700	8.8	15	16	18
09-09-92	400	5.4	8.4	4.6	6.7
11-10-92	2,800	93	56	190	390
MW-2					
09-20-91	130	6.6	0.96	1.4	1.5
12-16-91	83	0.96	<0.30	<0.30	<0.30
03-16-92	430	130	<2.5*	37	5.0
06-09-92	120	3.7	<0.5	5.7	<0.5
09-09-92	<50	<0.5	<0.5	<0.5	<0.5
11-10-92	<50	<0.5	<0.5	<0.5	<0.5
MW-3					
09-20-91	990	50	100	11	200
12-16-91	1,000	180	5.1	23	4.3
03-16-92	430	86	<1.0*	22	3.4
06-09-92	1,800	290	2.4	49	17
09-09-92	2,600	550	<5*	120	12
11-10-92	1,100	280	<5*	100	<5*
MW-4					
11-10-92	<50	<0.5	<0.5	<0.5	<0.5
MW-5					
11-10-92	<50	<0.5	<0.5	<0.5	<0.5
MW-6					
11-10-92	<50	<0.5	<0.5	<0.5	<0.5
MCL	---	1	---	680	1,750
DWAL	---	---	100	---	---

Results in parts per billion (ppb)
Benzene, toluene, ethylbenzene, and total xylenes analyzed by EPA Method 5030/8020/DHS LUFT Methods.
TPHg: Total petroleum hydrocarbons as gasoline (analyzed by EPA Method 5030/8020/DHS LUFT Methods).
MCL: Maximum contaminant level in drinking water (DHS, October 1990)
DWAL: Department of Health Services Recommended Drinking Water Action Level (DHS, October 1990).
*: Raised method reporting limit due to high analyte concentration requiring sample dilution, as reported by Columbia Analytical Services, Inc.
Sample Identification: MW-3

TABLE 5
LABORATORY ANALYSIS OF AIR SAMPLES
ARCO Station 6041
Dublin, California
Samples Collected November 10, 1992
(Page 1 of 1)

Sample ID	Sample Location	Elapsed Time of Sample (minutes)	TPHg (mg/m^3)	B (mg/m^3)	T (mg/m^3)	E (mg/m^3)	X (mg/m^3)	Pb (mg/m^3)
A-VW1-60	VW-1	60	6600	<0.5	33	16	49	NA
A-VW2-60	VW-2	60	14,000	320	69	64	160	NA
A-VW3-30-WF	VW-3	30	12,000	340	98	65	170	NA
A-VW3-30 CI	VW-3	30	3500	88	15	16	39	NA
A-VW3-30-EFF	EFFLUENT	30	130	5	4	3	15	NA
A-VW3-150-WF	VW-3	150	15,000	370 210 **	42 12 **	73 44 **	160 90 **	0.0033+
A-VW3-150 CI	VW-3	150	3400	85	10	14	30	NA
A-VW4-90	VW-4	90	110,000	2700	2100	370	1600	NA

Concentrations reported in milligrams per cubic meter (mg/m^3), which is equivalent to ($\mu g/\ell$).
<: Below the minimum laboratory detection limit for air.
NA: Not analyzed.
TPHg: Total Petroleum Hydrocarbons as gasoline (analyzed by EPA Method 8015).
B: benzene T: toluene E: ethylbenzene X: total xylene isomers
BTEX: Analyzed by EPA Method 8020 and 8240 (**, All other VOC concentrations below the detection limit).
Pb: Samples analyzed for lead by EPA Method 7420/7421.
+: Average of 3 samples with reported concentrations of <0.10, 0.10, and 0.10 $\mu g/\ell$, with air sample volume of 0.71 cubic feet (0.02 m^3).

Sample Identification: A-VW3-30-WF

- A — Air Sample
- VW3 — Vapor Well Number
- 30 — Sample Time
- WF — Sample Location

Sample Location:
WF: Well Field Influent (Sample prior to dilution air inlet)
CI: Combined Influent (Sample contains dilution air, after blower)
EFF: Effluent vapors sampled after abatement by the internal combustion engine.

TABLE 5
LABORATORY ANALYSIS OF AIR SAMPLES
ARCO Station 6041
Dublin, California
Samples Collected November 10, 1992
(Page 1 of 1)

Sample ID	Sample Location	Elapsed Time of Sample (minutes)	TPHg (mg/m^3)	B (mg/m^3)	T (mg/m^3)	E (mg/m^3)	X (mg/m^3)	Pb (mg/m^3)
A-VW1-60	VW-1	60	6600	<0.5	33	16	49	NA
A-VW2-60	VW-2	60	14,000	320	69	64	160	NA
A-VW3-30-WF	VW-3	30	12,000	340	98	65	170	NA
A-VW3-30 CI	VW-3	30	3500	88	15	16	39	NA
A-VW3-30-EFF	EFFLUENT	30	130	5	4	3	15	NA
A-VW3-150-WF	VW-3	150	15,000	370 210 **	42 12 **	73 44 **	160 90 **	0.0033+
A-VW3-150 CI	VW-3	150	3400	85	10	14	30	NA
A-VW4-90	VW-4	90	110,000	2700	2100	370	1600	NA

Concentrations reported in milligrams per cubic meter (mg/m^3), which is equivalent to ($\mu g/\ell$).
<: Below the minimum laboratory detection limit for air.
NA: Not analyzed.
TPHg: Total Petroleum Hydrocarbons as gasoline (analyzed by EPA Method 8015).
B: benzene T: toluene E: ethylbenzene X: total xylene isomers
BTEX: Analyzed by EPA Method 8020 and 8240 (**, All other VOC concentrations below the detection limit).
Pb: Samples analyzed for lead by EPA Method 7420/7421.
+: Average of 3 samples with reported concentrations of <0.10, 0.10, and 0.10 $\mu g/\ell$, with air sample volume of 0.71 cubic feet (0.02 m^3).

Sample Identification: A-VW3-30-WF

- Sample Location
- Sample Time
- Vapor Well Number
- Air Sample

Sample Location:
WF: Well Field Influent (Sample prior to dilution air inlet)
CI: Combined Influent (Sample contains dilution air, after blower)
EFF: Effluent vapors sampled after abatement by the internal combustion engine.

TABLE 6
ESTIMATED RADIUS OF INFLUENCE AND PROJECTED INITIAL HYDROCARBON EXTRACTION RATES DURING VAPOR EXTRACTION
ARCO Station 6041
Dublin, California
(VET Performed November 10, 1992)

VAPOR WELL	APPLIED VACUUM (Inches WC)	AIR FLOW RATE (SCFM)	INITIAL TPHg VAPOR CONCEN. (mg/m^3)	INITIAL TPHg REMOVAL RATE (lb/day)	INITIAL TPHg REMOVAL RATE (gal/day)	ESTIMATED ROI (Feet)
VW-1	52	55	6,600	35.5	5.7	<54
VW-2	48	92	14,000	102.0	15.6	40
VW-3	52	81	12,000	85.2	13.1	30
VW-4	50	75	110,000	741.4	119.0	<33

NOTES:
Applied vacuum measured in inches of water column.
scfm : air flow rate standardized to atmospheric temperature and pressure.
mg/m^3 : concentration in milligrams per cubic meter
TPHg : Total petroleum hydrocarbons as gasoline (analyzed by EPA Method 8015/8020).
ROI : Effective radius of influence
lb/day : Removal rate measured in pounds per day
gal/day : Removal rate measured in gallons per day
TPHg Removal Rate = Air flow rate (scfm) x TPHg Concentration (mg/m^3) x $\frac{[1440 \text{ minutes/day}] \times [0.02832 \text{ } m^3/ft]}{454{,}000 \text{ mg/lb}}$

PREVIOUS WORK

Waste-Oil Tank Removal

On June 6 and 7, 1990, one 550-gallon waste-oil tank of single wall steel construction was excavated and removed from its location adjacent to the northern wall of the station building at the site. A RESNA geologist examined the outer surface of the tank for signs of leakage, holes, pitting, and areas of weakness. The tank appeared to be in very good condition; the geologist observed light localized rusting on the surface of the tank, but no pitting, holes or cracks were observed. No signs of overfill staining were observed on the top and sides of the tank (Applied GeoSystems, September 19, 1990). Information supplied by the station manager indicated that the tank was at least 13 years old.

Soil excavated from the tank pit was screened for evidence of volatile hydrocarbon compounds, both visually and with a portable Organic Vapor Meter (OVM). Initial random screening of backfill material excavated from around the tank yielded OVM readings ranging from nondetectable to 0.8 parts per million (ppm). Excavation proceeded beneath the former tank location to a final depth of approximately 10-1/2 feet. At the limits of the excavation, random grab samples yielded nondetectable readings from the north, south, east and west walls and an OVM reading of 3.25 ppm from the center of the tank pit. No subjective evidence of hydrocarbons such as product odor or soil discoloration was noted in the backfill material or native soil during the excavation process.

Ten soil samples were collected from the tank pit excavation. Two samples were collected from each of the four sidewalls of the tank pit, and two samples were collected from the center of the tank pit floor at the limits of the excavation. The samples were divided into two sets, A and B, with each set consisting of five samples: one from each of the sidewalls, and one from the floor of the tank pit. The samples in set A were analyzed for total oil and grease (TOG) and halogenated volatile organic compounds (HVOCs). The samples in set B were analyzed for TPHg, TPHd, and the gasoline constituents benzene, toluene, ethylbenzene, and total xylenes (BTEX). Four soil samples for compositing and laboratory analyses were collected from the soil stockpile. Analyses of the soil samples collected from the waste-oil tank pit indicated nondetectable levels of TOG, HVOCs, TPHg, TPHd, and BTEX. Approximately 15 to 20 cubic yards of soil were excavated from the tank pit. According to information obtained from ARCO, the soil stockpile was removed from the site by Dillard Trucking, Inc. of Hayward, California and admitted to Chem-Waste Management's facility in Kettleman City on June 12, 1990. On the basis of field observations and the results of analyses of tank pit soil samples, RESNA concluded that no further excavation in the vicinity of the former waste-oil tank was necessary.

Fuel Spill Sampling

On September 25, 1990, a RESNA geologist attempted to collect a soil sample at a reported fuel spill beneath a dispenser pump in the southeastern portion of the site at the approximate location shown on Plate 2. We understand that the spill occurred when a station customer failed to remove the hose from the vehicle after use. The vehicle drove off pulling the hose from the pump. This in turn caused a filter in the pump to fail resulting in a relatively small release of gasoline from the pump. The dispenser pump made collection of a soil sample impractical; however, pea gravel beneath the pump was removed. The OVM reading for the pea gravel sample collected from the depth of ½-foot beneath the pump where the spillage occurred was 750 ppm. Mr. Tom Hathcox of the Dogherty Regional Fire Department estimated that approximately 10 gallons of fuel spilled on the ground. We understand from the station manager that the pump was turned off shortly after the hose was pulled off the pump.

Subsurface Environmental Investigation

In September 1991, RESNA performed a subsurface environmental investigation to evaluate the impact of hydrocarbons released during the fuel spill, which occurred in September 1990, on the soil and groundwater beneath the subject site (RESNA, February 12, 1992). Work performed for this investigation included drilling three soil borings (B-1 through B-3), collecting and describing soil samples from the borings, installing and developing three 4-inch-diameter groundwater monitoring wells (MW-1 through MW-3) in the borings, sampling groundwater from the monitoring wells, performing laboratory analyses on selected soil and groundwater samples, measuring groundwater levels, surveying wellhead elevations, and preparing the report presenting field procedures, results, and conclusions.

Results of the investigation indicated that the soil beneath the site has been impacted by gasoline hydrocarbons, however TPHg concentrations over 100 ppm were not reported in the soil samples collected from the borings, with the exception of one sample from a depth of 9-1/2 feet in B-1 (150 ppm) located near the southwestern service islands. The soil in the vicinity of the southeastern service islands, where the unauthorized fuel spill reportedly occurred in September 1990, has been impacted by low levels of gasoline hydrocarbons (less than 10 ppm of TPHg). The lateral extent of gasoline hydrocarbons in the soil at the site has not been delineated below 10 ppm except in the southeastern part of the site. However, the vertical extent of gasoline hydrocarbons in the soil has been delineated to nondetectable levels (less than 1 ppm) at the depth of approximately 14-1/2 to 19-1/2 feet below ground surface. Results of laboratory analyses of soil samples from the borings are summarized in Table 3 in the main body of this report.

Shallow groundwater was encountered at the site in a relatively thin (2 to 3 feet thick) clayey sand layer at a depth of approximately 10-1/2 to 15 feet and stabilized in the wells at depths of approximately 9 to 11 feet. Groundwater gradient direction was interpreted to be toward the southwest. The DTW measurements, wellhead elevations, and groundwater elevations are summarized in Table 1 in the main body of this report.

Results of the investigation indicated that the first encountered groundwater beneath the site has been impacted by gasoline hydrocarbons at concentrations up to 990 ppb TPHg and up to 50 ppb benzene. The benzene concentrations in all three wells exceeded the State of California Maximum Contaminant Level (MCL). Ethylbenzene and total xylene concentrations were below MCLs in the wells, and toluene concentrations were below the recommended Drinking Water Action Level (DWAL) in wells MW-1 and MW-2 and at the DWAL in well MW-3. The extent of gasoline hydrocarbons in the groundwater was not delineated. The results of laboratory analyses of water samples are summarized in Table 4 in the main body of this report.

Based on the results of the investigation, RESNA concluded that the fuel spill which occurred on September 25, 1990, did not appear to be the sole source of gasoline hydrocarbons detected beneath the site.

Groundwater Monitoring and Sampling

RESNA began monthly groundwater monitoring in October 1991 and quarterly sampling in December 1992 at the site. Data from these and subsequent groundwater monitoring and sampling episodes are reported in Tables 1 and 4, and summarized in the reports listed in the References section. Groundwater monitoring wells MW-1 and MW-3 continued to contain significant concentrations of TPHg (up to 2,600 ppb), however concentration of TPHg in well MW-2 decreased to nondetectable level in September 1992. The interpreted local groundwater gradient was relatively flat (0.01 - 0.02); groundwater was interpreted as flowing toward the southwest during September and October 1991, north-northwest during November and December 1991, south-southwest during January through June 1992, south-southeast during July 1992, east during August 1992, and east-northeast during September 1992.

FIELD METHODS

Site Safety Plan

The Site Safety Plan (RESNA, January 14, 1992) 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, a permit was acquired from the appropriate regulatory agency. A copy of the permit is included in Appendix C 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 analyses 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 analyses 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 analyses, 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.

Well Construction

Monitoring wells were constructed in selected borings using clean 4-inch-diameter, thread-jointed, Schedule 40 PVC casing. No chemical cements, glues, or solvents were used in well construction. Each casing bottom was sealed with a threaded end-plug, and each casing top with a locking plug. The screened portions of the wells were constructed of machine-slotted PVC casing with 0.020-inch-wide slots for initial site wells. The screened sections in

groundwater monitoring wells were placed to allow monitoring during seasonal fluctuations of groundwater levels. Vapor extraction wells were constructed using the same protocol for monitoring wells mentioned above, however the screened portion of the wells were constructed with much-slotted PVC casing with 0.100-inch-wide slots. This is to allow greater air-flow communication between the stratigraphic units and the well.

The annular space of each well was backfilled with No. 3 sand (groundwater monitoring wells), or pea gravel (vapor extraction wells) to approximately two feet above the top of the screened casing. 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 by an ARCO-contracted, State-certified waste hauler.

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 of by an ARCO-contracted, State-certified waste hauler.

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.

APPENDIX C

WELL CONSTRUCTION PERMIT

ZONE 7 WATER AGENCY

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

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT ARCO 6041
7249 VILLAGE PARKWAY
DUBLIN, CA

CLIENT
Name ARCO PRODUCTS CO.
Address P.O. BOX 5811 Phone (415) 571-2434
City SAN MATEO, CA Zip 94402

APPLICANT
Name RESNA
LOU LEET 2 EXPRESSWAY, SUITE 34
Address 3315 ALMADEN Phone (408) 264-7723
City SAN JOSE, CA Zip 95118

TYPE OF PROJECT

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

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

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

DRILLER'S LICENSE NO. 484288 (C-57)

WELL PROJECTS
Drill Hole Diameter 10 in. Maximum (15')*
Casing Diameter 4 in. Depth 30 ft.
Surface Seal Depth 5 ft. Number 3 (4)*
* ADD 4 VAPOR EXTRACTION WELLS

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

ESTIMATED STARTING DATE 10-13-92 26OCT92
ESTIMATED COMPLETION DATE 10-15-92

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

APPLICANT'S

FOR OFFICE USE

PERMIT NUMBER 92489
LOCATION NUMBER ___

PERMIT CONDITIONS

Circled Permit Requirements Apply

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

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

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

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

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 1 Oct 92
Wyman Hong

APPENDIX D

WELLHEAD SURVEY

JOHN E. KOCH
Land Surveyor
CA State Lic. No. LS4811
5427 Telegraph Ave., Suite A
Oakland, CA 94609
(415) 655-9956
FAX (415) 655-9745

TRANSMITTAL LETTER

TO:Lou Leet/Joel Coffman

FROM:John Koch

Job No.:92089

COMPANY:RESNA

Re:RESNA Project #60006.04

FAX NO:(408) 264-2435

SUBJECT:Arco Station #6041
7249 Village Parkway
@ Amador Valley Boulevard
Dublin, 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): 4

MESSAGE:

THANK YOU

JOHN E. KOCH, P. L. S. RESNA PROJ. #60006.04 JEK JOB #92089

VW-1	335.91	Top of PVC Casing
	336.46	Top of Box
VW-2	336.14	Top of PVC Casing
	336.58	Top of Box
VW-3	335.99	Top of PVC Casing
	336.35	Top of Box
VW-4	335.47	Top of PVC Casing
	335.74	Top of Box

* INDICATES WELLS SURVEYED ON 10\11\91 (JEK JOB #91063)

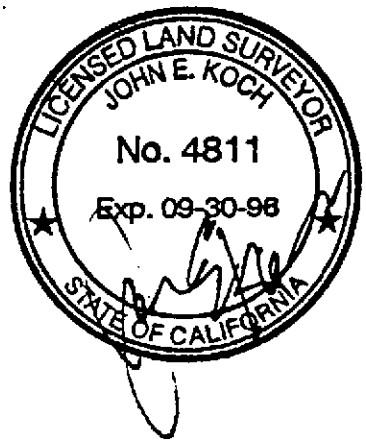
NOTES:

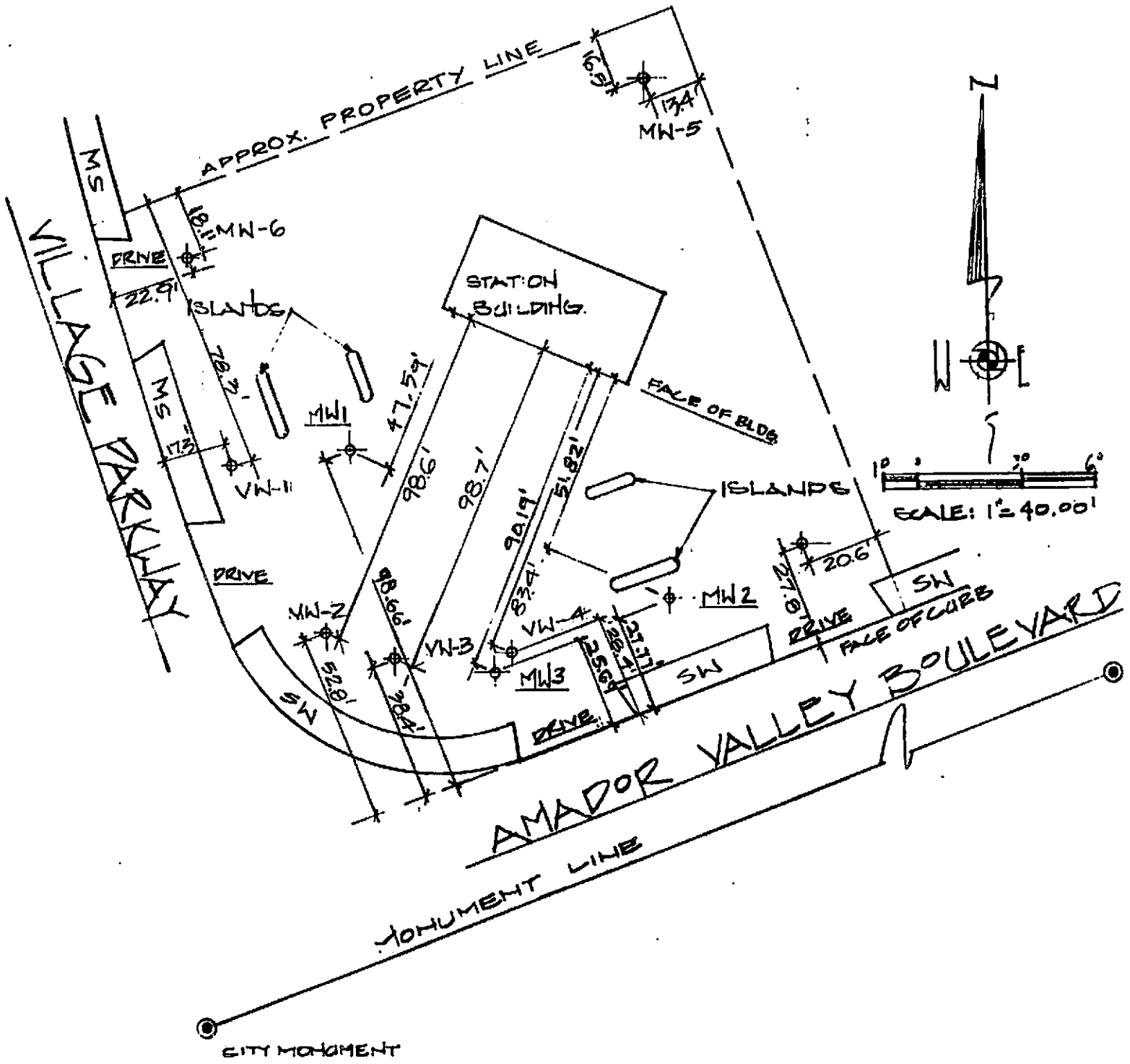
1. Datum is City of Dublin = (USGS)

2. Top of PVC Casing Elevation is at mark at top of 4" PVC for all wells. Mark bearing North for wells MW-2 through MW-4 and VW-1 through VW-4. Mark on MW-1 on East side.

3. Top of Box Elevation is at mark on rim for all wells. Mark bearing North for wells MW-2 through MW-4 and VW-1 through VW-4 side. Mark on MW-1 on East side.

4. MW-3 was checked and found to be within 0.01' of previous report of 10\11\91.





LEGEND

SW - SIDEWALK

WELL NUMBER	TOP OF CASING	TOP OF BOX
MW-1	336.56	336.80
MW-2	334.80	335.02
MW-3	335.53	335.85
MW-4	334.22	334.58
MW-5	335.87	336.20
MW-6	335.84	336.15
VW-1	335.91	336.46
VW-2	336.14	336.58
VW-3	335.99	336.35
VW-4	335.47	335.74

LICENSED LAND SURVEYOR
JOHN E. KOCH
No. 4811
Exp. 09-30-96
STATE OF CALIFORNIA

SITE:

ARCO STATION 6041
7249 VILLAGE PARKWAY
DUBLIN, CA
RESNA PROJECT 60006.04

CLIENT:
RESNA
3315 ALMADEN EXPRESSWAY
SUITE 34
SAN JOSE, CA 95118

JOHN E. KOCH
Land Surveyor
CA State Lic. No. LS4811
5427 Telegraph Ave., Suite A
Oakland, CA 94609
(510) 655-8956
FAX (510) 655-9745

JOB#	DRAWN BY	DATE
92089	T. ROSU	11/20/92

APPENDIX E

GROUNDWATER MONITORING REPORT

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

RECEIVED
DEC 4 - 1992
RESNA SAN JOSE

Date December 3, 1992
Project 0G70-035.01

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

We are enclosing:

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

For your: X Information Sent by: X Mail

Comments:

Enclosed are the data from the fourth quarter 1992 monitoring event at ARCO service station 6041, 7249 Village Parkway, Dublin, California. Groundwater monitoring is conducted consistent with applicable regulatory guidelines. Please call if you have any questions: (408) 453-2266.

Reviewed by

Jim Butera JB

Robert Porter, Senior Project Engineer.

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

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 0G70-035.01 STATION ADDRESS : 7249 Village Parkway, Dublin, CA DATE : 11-10-92

ARCO STATION # : 6041 FIELD TECHNICIAN : Jim Graham DAY : Tuesday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	**MW-4**	OK	YES	YES	3259	OK	9.58	9.58	ND	NR	14.5	—
2	**MW-5**	OK	YES	YES	3259	OK	11.02	11.02	ND	NR	17.5	—
3	**MW-6**	OK	YES	YES	3259	OK	11.03	11.03	ND	NR	15.8	—
4	**MW-2**	OK	YES	YES	3259	OK	10.12	10.12	ND	NR	14.1	—
5	**MW-1**	OK	YES	YES	3259	OK	11.74	11.74	ND	NR	17.6	—
6	**MW-3**	OK	YES	YES	3259	OK	10.72	10.72	ND	NR	14.7	—

SURVEY POINTS ARE TOP OF WELL CASINGS

Summary of Groundwater Monitoring Data
Fourth Quarter 1992
ARCO Service Station 6041
7249 Village Parkway, Dublin, California
micrograms per liter (µg/l) or parts per billion (ppb)

Well ID and Sample Depth	Sampling Date	Depth To Water (feet)	Floating Product Thickness (feet)	TPH[1] as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Total Xylenes (ppb)
MW-1(16)	11/12/92	11.74	ND.[2]	2,800.	93.	56.	190.	390.
MW-2(13)	11/12/92	10.12	ND.	<50.	<0.5	<0.5	<0.5	<0.5
MW-3(13)	11/12/92	10.72	ND.	1,100.	280.	<5.	100.	<5.
MW-4(13)	11/12/92	9.58	ND.	<50.	<0.5	<0.5	<0.5	<0.5
MW-5(16)	11/12/92	11.02	ND.	<50.	<0.5	<0.5	<0.5	<0.5
MW-6(14)	11/12/92	11.03	ND.	<50.	<0.5	<0.5	<0.5	<0.5
FB-1[3]	11/12/92	NA.[4]	NA.	<50	<0.5	<0.5	<0.5	<0.5

1. TPH. = Total petroleum hydrocarbons
2. ND. = Not detected
3. FB. = Field blank
4. NA. = Not applicable

Columbia Analytical Services inc.

November 30, 1992

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

Re: **EMCON Project No. 0G70-035.01**
Arco Facility No. 6041

Dear Mr. Butera:

Enclosed are the results of the water samples submitted to our lab on November 11, 1992. For your reference, our service request number for this work is SJ92-1414.

All analyses were performed in accordance with the laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Keoni A. Murphy
Laboratory Manager

Annelise J. Bazar
Regional QA Coordinator

KAM/ajb

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	11/11/92
Project:	EMCON Project No. 0G70-035.01	**Work Order No.:**	SJ92-1414
	ARCO Facility No. 6041	**Sample Matrix:**	Water

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

Sample Name:		MW-1 (16)	MW-2 (13)	MW-3 (13)
Date Analyzed:		11/18/92	11/17/92 *	11/17/92 *
Analyte	**MRL**			
Benzene	0.5	93.	ND	280.
Toluene	0.5	56.	ND	<5. **
Ethylbenzene	0.5	190.	ND	100.
Total Xylenes	0.5	390.	ND	<5. **
TPH as Gasoline	50	2,800.	ND	1,100.

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* This sample was part of the analytical batch started on November 17, 1992. However, it was analyzed after midnight so the actual date analyzed is November 18, 1992.
** Raised MRL due to high analyte concentration requiring sample dilution.

Approved by: Kevin A Murphy Date: December 30, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	11/11/92
Project:	EMCON Project No. 0G70-035.01	**Work Order No.:**	SJ92-1414
	ARCO Facility No. 6041	**Sample Matrix:**	Water

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

Sample Name:		MW-4 (13)	MW-5 (16)	MW-6 (14)
Date Analyzed:		11/17/92 *	11/17/92 *	11/18/92
Analyte	**MRL**			
Benzene	0.5	ND	ND	ND
Toluene	0.5	ND	ND	ND
Ethylbenzene	0.5	ND	ND	ND
Total Xylenes	0.5	ND	ND	ND
TPH as Gasoline	50	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* This sample was part of the analytical batch started on November 17, 1992. However, it was analyzed after midnight so the actual date analyzed is November 18, 1992.

Approved by: Kevin Murphy Date: November 30, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	11/11/92
Project:	EMCON Project No. 0G70-035.01	**Work Order No.:**	SJ92-1414
	ARCO Facility No. 6041	**Sample Matrix:**	Water

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

Sample Name:		FB-1	Method Blank	Method Blank
Date Analyzed:		11/17/92 *	11/17/92	11/18/92
Analyte	**MRL**			
Benzene	0.5	ND	ND	ND
Toluene	0.5	ND	ND	ND
Ethylbenzene	0.5	ND	ND	ND
Total Xylenes	0.5	ND	ND	ND
TPH as Gasoline	50	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* This sample was part of the analytical batch started on November 17, 1992. However, it was analyzed after midnight so the actual date analyzed is November 18, 1992.

Approved by: Kevin Murphy Date: November 30, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Associates
Project: EMCON Project No. 0G70-035.01
ARCO Facility No. 6041

Date Received: 11/11/92
Work Order No.: SJ92-1414

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

Date Analyzed: 11/17/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	258.	103.	85-115
Toluene	250.	269.	108.	85-115
Ethylbenzene	250.	258.	103.	85-115
Total Xylenes	750.	766.	102.	85-115
TPH as Gasoline	2,500.	2,414.	97.	90-110

Date Analyzed: 11/18/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	272.	109.	85-115
Toluene	250.	275.	110.	85-115
Ethylbenzene	250.	260.	104.	85-115
Total Xylenes	750.	741.	99.	85-115
TPH as Gasoline	2,500.	2,467.	99.	90-110

TPH Total Petroleum Hydrocarbons

Approved by: Kevin A Murphy Date: November 30, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Associates	**Date Received:**	11/11/92
Project:	EMCON Project No. 0G70-035.01	**Work Order No.:**	SJ92-1414
	ARCO Facility No. 6041	**Sample Matrix:**	Water

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

Sample Name	Date Analyzed	Percent Recovery α,α,α-Trifluorotoluene
MW-1 (16)	11/18/92	96.
MW-2 (13)	11/17/92	80.
MW-3 (13)	11/17/92	90.
MW-4 (13)	11/17/92	86.
MW-5 (16)	11/17/92	84.
MW-6 (14)	11/18/92	97.
FB-1	11/17/92	79.
MS	11/17/92	90.
DMS	11/17/92	93.
Method Blank	11/17/92	84.
Method Blank	11/18/92	88.
	CAS Acceptance Criteria	70-130

TPH Total Petroleum Hydrocarbons

Approved by: Reviewed Murphy Date: November 30, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Associates	**Date Received:**	11/11/92
Project:	EMCON Project No. 0G70-035.01	**Work Order No.:**	SJ92-1414
	ARCO Facility No. 6041	**Sample Matrix:**	Water

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

Date Analyzed: 11/17/92

			Spike Result		Percent Recovery		CAS Acceptance
Analyte	Spike Level	Sample Result	MS	DMS	MS	DMS	Criteria
TPH as Gasoline	5,000.	3,420.	7,970.	8,040.	91.	92.	70-130

TPH Total Petroleum Hydrocarbons

Approved by: _____ Date: November 30, 1992

SEQUOIA ANALYTICAL

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

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

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 2104612-28

Reported: Nov 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	B. Ali	B. Ali	B. Ali	B. Ali
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992
QC Sample #:	GBLK103092 MS/MSD	GBLK103092 MS/MSD	GBLK103092 MS/MSD	GBLK103092 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:	0.18	0.18	0.18	0.52
Matrix Spike % Recovery:	90	90	90	87
Conc. Matrix Spike Dup.:	0.18	0.18	0.18	0.53
Matrix Spike Duplicate % Recovery:	90	90	90	88
Relative % Difference:	0.0	0.0	0.0	1.9

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

SEQUOIA ANALYTICAL

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

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 2104612-28

Reported: Nov 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	C. Donohue	C. Donohue	C. Donohue	C. Donohue
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992
QC Sample #:	GBLK103092 MS/MSD	GBLK103092 MS/MSD	GBLK103092 MS/MSD	GBLK103092 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:	0.18	0.18	0.18	0.53
Matrix Spike % Recovery:	90	90	90	88
Conc. Matrix Spike Dup.:	0.18	0.18	0.17	0.52
Matrix Spike Duplicate % Recovery:	90	90	85	87
Relative % Difference:	0.0	0.0	5.7	1.9

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

SEQUOIA ANALYTICAL

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

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

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 2104612-28

Reported: Nov 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R. Lee	R. Lee	R. Lee	R. Lee
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992
QC Sample #:	GBLK103092	GBLK103092	GBLK103092	GBLK103092
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.19	0.19	0.19	0.56
Matrix Spike % Recovery:	95	95	95	93
Conc. Matrix Spike Dup.:	0.19	0.20	0.19	0.58
Matrix Spike Duplicate % Recovery:	95	100	95	97
Relative % Difference:	0.0	5.1	0.0	3.5

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

SEQUOIA ANALYTICAL

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

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 2104612-28

Reported: Nov 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R. Lee	R. Lee	R. Lee	R. Lee
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Nov 2, 1992	Nov 2, 1992	Nov 2, 1992	Nov 2, 1992
QC Sample #:	GBLK110292	GBLK110292	GBLK110292	GBLK110292
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	0.66
Matrix Spike % Recovery:	110	110	110	110
Conc. Matrix Spike Dup.:	0.23	0.23	0.22	0.67
Matrix Spike Duplicate % Recovery:	115	115	110	112
Relative % Difference:	4.4	4.4	0.0	1.5

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

ARCO Products Company — Division of AtlanticRichfieldCompany

Task Order No. 6041-92-2

Chain of Custody

ARCO Facility no. 6041	City (Facility) Dublin	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Michael Whelan	Telephone no. (ARCO) (415) 571-2434	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA	Address (Consultant) 3315 Almaden Exp. Suite 34, San Jose, CA 95118		Contract number 07-073

Method of shipment: Sequoia Courier

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH: Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		Hold
S-5.5-B4	X	1	V			V		10/26/92			X											
S-9.5-B4	X	1	V			V		10/26/92			X											
S-11-B4	X	1	V			V		10/26/92														X
S-13.5-B4	X	1	V			V		10/26/92														X
S-15.5-B4	X	1	V			V		10/26/92			X											
S-5.5-B5	X	1	V			V		10/26/92			X											
S-8.5-B5	X	1	V			V		10/26/92														X
S-10-B5	X	1	V			V		10/26/92			X											
S-11.5-B5	X	1	V			V		10/26/92														X
S-13.5-B5	X	1	V			V		10/26/92														X
S-15-B5	X	1	V			V		10/26/92														X
S-19.5-B5	X	1	V			V		10/26/92			X											
S-5.5-B6	X	1	V			V		10/26/92			X											
S-10.5-B6	X	1	V			V		10/26/92			X											
S-12.5-B6	X	1	V			V		10/26/92														X
S-15.5-B6	X	1	V			V		10/26/92														X

Remarks: RESNA will call regarding samples to be analyzed

Lab number:

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

Special detection Limit/reporting:

Special QA/QC:

Condition of sample:

Temperature received:

	Date	Time	
Relinquished by sampler: Barbara Sieminski	10/27/92	4 DO PM	Received by:
Relinquished by:	10/27/92	5:20	Received by:
Relinquished by:	Date	Time	Received by laboratory: Date: 10/27/92 Time: 1720

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

APPC-3292 (2-91)

ARCO Products Company Division of AtlanticRichfieldCompany

Task Order No. 6041-92-2

Chain of Custody

ARCO Facility no. 6041	City (Facility) Dublin	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Michael Whelan	Telephone no. (ARCO) (415) 571-2434	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435	Contract number 07-073.1
Consultant name RESNA	Address (Consultant) 3315 Almaden Expy, San Jose, CA 95118, Suite 34			Method of shipment Sequoia courier

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		HOLD
S-18.5-B6	1	1	✓			✓		10/26/92			X											
S-5.5-B7		1	✓			✓		10/27/92			X									21		
S-8.5-B7		1	✓			✓		10/27/92														X
S-10-B7		1	✓			✓		10/27/92			X									12		
S-5.5-B8		1	✓			✓		10/27/92			X									15		
S-8.5-B8		1	✓			✓		10/27/92														X
S-10-B8		1	✓			✓		10/27/92			X									24		
S-5.5-B9		1	✓			✓		10/27/92			X									25		
S-10-B9		1	✓			✓		10/27/92			X									26		
S-5.5-B10		1	✓			✓		10/27/92			X									27		
S-10-B10		1	✓			✓		10/27/92			X									28		

Special detection Limit/reporting

Special QA/QC

Remarks

RESNA will call regarding samples to be analyzed

Lab number

Turnaround time

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

Condition of sample:		Temperature received:	
Relinquished by sampler Barbara Sieminski	Date 10/27/92	Time 4:00 PM	Received by
Relinquished by	Date 10/27/92	Time 5:20	Received by
Relinquished by	Date	Time	Received by laboratory Date 10-27-92 Time 1720

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

APPC-3292 (2-91)

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no. 6041	City (Facility) Dublin	Project manager (Consultant) Jim Butera	Laboratory name CAS
ARCO engineer Kyle Christie	Telephone no. (ARCO) 571-2434	Telephone no. (Consultant) 453-0719	Fax no. (Consultant) 453-0452
Consultant name EMCON Associates	Address (Consultant) 1938 Junction Ave San Jose		Contract number 6077

Method of shipment: Sampler will deliver

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH GAS EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-1 (16)	1-2	2		X		X	HCl	11-10-92	1422		X											
MW-2 (13)	3-4	2		X		X	HCl		1338		X											
MW-3 (13)	5-6	2		X		X	HCl		1450		X											
MW-4 (13)	7-8	2		X		X	HCl		1047		X											
MW-5 (16)	9-10	2		X		X	HCl		1222		X											
MW-6 (14)	11-12	2		X		X	HCl		1248		X											
FB-1	13-14	2		X		X	HCl		1455		X											

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2-40 ml HCl VOA's

Lab number: 5292-1414

Turnaround time

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

Condition of sample: OK		Temperature received: cool	
Relinquished by sampler	Date 11-11-92 Time 0815	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date 11-11-92 Time 8:15

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

PPC-3292 (2-91)

Rev. 2, 5/91

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: OG70-035.01 SAMPLE ID: MW-1 (16)

PURGED BY: IAN GRAHAM CLIENT NAME: ARCO # 6041

SAMPLED BY: IAN GRAHAM LOCATION: 7249 VILLAGE PKWY. DUBLIN, CA.

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 3.81

DEPTH TO WATER (feet): 11.78 CALCULATED PURGE (gal.): 19.08

DEPTH OF WELL (feet): 17.6 − 5.82 ACTUAL PURGE VOL (gal.): 7.5

DATE PURGED: 11-10-92 Start (2400 Hr) 1400 End (2400 Hr) 1405

DATE SAMPLED: 11-10-92 Start (2400 Hr) 1422 End (2400 Hr) 1422

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1403	4.0	6.61	3030	69.7	LT. GREY	HEAVY
1405	DRIED @	7.5 GAL.				
1420	RECHARGE	6.82	3020	70.6	"	"

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

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

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NONE

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

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: 11-10-92 Time: 1015 Meter Serial #: 9105 Temperature °F: ___

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

Location of previous calibration: MW-4

Signature: [signature] Reviewed By: JB Page 1 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 0670-035.01 SAMPLE ID: MW-2(13)

PURGED BY: IAN GRAHAM CLIENT NAME: ARCO # 6041

SAMPLED BY: IAN GRAHAM LOCATION: 7249 VILLAGE PKWY, DUBLIN, CA.

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 2.81

DEPTH TO WATER (feet): 10.12 CALCULATED PURGE (gal.): 13.05

DEPTH OF WELL (feet): 14.1 (3.95) ACTUAL PURGE VOL (gal.): 14.0

DATE PURGED: 11-10-92 Start (2400 Hr) 1311 End (2400 Hr) 1335

DATE SAMPLED: 11-10-92 Start (2400 Hr) 1338 End (2400 Hr) 1338

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1316	3.0	6.78	3670	67.1	LT. GREY	HEAVY
1320	6.0	6.77	3500	68.5	"	"
1325	9.0	6.75	3390	69.4	"	"
1330	12.0	6.95	3380	68.7	"	"
1335	14.0	6.88	3440	69.5	"	"

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

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NONE

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

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: 11-10-92 Time: 1015 Meter Serial #: 9105 Temperature °F: ___

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

Location of previous calibration: MW-4

Signature: ___ Reviewed By: JB Page 2 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: OG70-035.01 SAMPLE ID: MW-3(13)

PURGED BY: IAN GRAHAM CLIENT NAME: ARCO # 6041

SAMPLED BY: IAN GRAHAM LOCATION: 7249 VILLAGE PKWY. DUBLIN, CA.

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 2.59

DEPTH TO WATER (feet): 10.75 CALCULATED PURGE (gal.): 12.95

DEPTH OF WELL (feet): 14.7 / 3.95 ACTUAL PURGE VOL. (gal.): 5.0

DATE PURGED: 11-10-92 Start (2400 Hr) 1430 End (2400 Hr) 1435

DATE SAMPLED: 11-10-92 Start (2400 Hr) 1450 End (2400 Hr) 1450

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1433	3.0	6.63	2360	70.4	LT. GREY	HEAVY
1435	WELL DRIED @		5.0 GAL.	W/L @	14.60	
1445	RECHARGE	6.67	2400	70.4	"	"

D. O. (ppm): NR ODOR: MODERATE COLOR (visual): NR (COBALT 0 - 100) TURBIDITY (visual): NR (NTU 0 - 200)

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

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

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: 11-10-92 Time: 1015 Meter Serial #: 9105 Temperature °F: 71.0

(EC 1000 1010 / 1000) (DI 26.00) (pH 7 7.02 / 7.00) (pH 10 9.98 / 10.00) (pH 4 3.95 / ___)

Location of previous calibration: ___

Signature: ___ Reviewed By: JB Page 3 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: OG70-035.01 SAMPLE ID: MW-4(13)

PURGED BY: IAN GRAHAM CLIENT NAME: ARCO # 6041

SAMPLED BY: IAN GRAHAM LOCATION: 7249 VILLAGE PKWY. DUBLIN, CA.

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 3.22

DEPTH TO WATER (feet): 9.58 CALCULATED PURGE (gal.): 16.13

DEPTH OF WELL (feet): 14.5 / 4.92 ACTUAL PURGE VOL. (gal.): 8.5

DATE PURGED: 11-10-92 Start (2400 Hr) 1022 End (2400 Hr) 1029

DATE SAMPLED: 11-10-92 Start (2400 Hr) 1047 End (2400 Hr) 1047

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1025	3.5	6.93	5570	67.4	LT. GREY	HEAVY
1029	7.0	6.99	5450	67.2	BROWN	"
~	WELL DRIED @ 8.5 GAL W/L @ 14.20				~	~
1045	RECHARG				"	"

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

COLOR (COBALT 0 - 100): NR

TURBIDITY (NTU 0 - 200): NR

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NONE

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

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: 11-10-92 Time: 1015 Meter Serial #: 9105 Temperature °F: 60.9

(EC 1000 1062 / 1000) (DI 25.00) (pH 7 6.98 / 7.00) (pH 10 10.05 / 10.00) (pH 4 3.91 / ___)

Location of previous calibration: MW-4

Signature: ___ Reviewed By: JB Page 4 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: OG70-035.01 SAMPLE ID: MW-5(16)

PURGED BY: IAN GRAHAM CLIENT NAME: ARCO # 6041

SAMPLED BY: IAN GRAHAM LOCATION: 7249 VILLAGE PKWY. DUBLIN, CA.

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 4.25

DEPTH TO WATER (feet): 11.02 CALCULATED PURGE (gal.): 21.25

DEPTH OF WELL (feet): 17.5 / 6.48 ACTUAL PURGE VOL. (gal.): 12.5

DATE PURGED: 11-10-92 Start (2400 Hr) 1202 End (2400 Hr) 1225

DATE SAMPLED: 11-10-92 Start (2400 Hr) 1222 End (2400 Hr) 1222

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1203	4.5	7.07	4360	68.4	BEIGE	HEAVY
1206	9.0	7.02	4570	66.5	BROWN	"
1208	WELL DRIED @ 12.5 GAL W/L			@ 17:32		
1225	RECHARGE	6.97	4590	66.5	"	"

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

COLOR (COBALT 0 - 100): NR

TURBIDITY (NTU 0 - 200): NR

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NONE

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

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: 11-10-92 Time: 1015 Meter Serial #: 9105 Temperature °F: ___

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

Location of previous calibration: MW-4

Signature: ___ Reviewed By: JB Page 5 of 6

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 0670-035.01 SAMPLE ID: MW-6(14)

PURGED BY: IAN GRAHAM CLIENT NAME: ARCO # 6041

SAMPLED BY: IAN GRAHAM LOCATION: 7249 VILLAGE PKWY. DUBLIN, CA.

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 3.13

DEPTH TO WATER (feet): 11.02 CALCULATED PURGE (gal.): 15.67

DEPTH OF WELL (feet): 15.8 / 4.78 ACTUAL PURGE VOL (gal.): 16.0

DATE PURGED: 11-10-92 Start (2400 Hr) 1230 End (2400 Hr) 1245

DATE SAMPLED: 11-10-92 Start (2400 Hr) 1248 End (2400 Hr) 1248

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1233	3.5	6.93	6220	70.9	BROWN	HEAVY
1236	7.0	7.05	6190	70.9	"	"
1239	10.5	7.04	6210	69.2	"	"
1241	14.0	7.06	6330	68.5	"	"
1245	16.0	7.07	6410	68.0	"	"

D. O. (ppm): NR ODOR: ND COLOR (COBALT 0 - 100): NR TURBIDITY (NTU 0 - 200): NR

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NONE

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

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: LAST TWO CASINGS WERE SLOW

Meter Calibration: Date: 11-10-92 Time: 1015 Meter Serial #: 9105 Temperature °F: ___

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

Location of previous calibration: MW-4

Signature: ___ Reviewed By: JB Page 6 of 6

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

JAN 1993
RESNA
SAN JOSE

Date December 18, 1992
Project 0G70-035.01

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

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	December 1992 monthly water level survey, ARCO
	station 6041, 7249 Village Parkway, Dublin, CA

For your: X Information Sent by: X Mail

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

Reviewed by:

Jim Butera JB

Robert Porter, Senior Project Engineer.

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

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 0G70-035.01 STATION ADDRESS : 7249 Village Parkway, Dublin, CA DATE : 12-14-92

ARCO STATION # : 6041 FIELD TECHNICIAN : MADLEK DAY : Monday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-4	OK	yes	OK	3259	OK	8.72	8.72	ND	ND	14.5	—
2	MW-5	OK	yes	OK	3259	OK	10.16	10.18	ND	ND	17.5	—
3	MW-6	OK	Yes	OK	3259	OK	10.03	10.03	ND	ND	15.8	water in box had to wait 10min for wl (*)
4	MW-2	OK	Yes	OK	3259	OK	8.99	8.99	ND	ND	14.1	water in box (*)
5	MW-1	OK	Yes	OK	3259	OK	10.77	10.77	ND	ND	17.6	— (*)
6	MW-3	OK	Yes	OK	3259	OK	9.78	9.78	ND	ND	14.7	—

(*) MW-6 - water level was rising, had to wait 10min for stable reading
MW-2
MW-1

SURVEY POINTS ARE TOP OF WELL CASINGS

DATE: 10/26/92

SITE: ARCO 6041

JOB: 60006.05

WELL NO/ TIME	ODOR (OBS)	SHEEN (H,M,S-EMUL., COLOR)	PROD(FRESH (TRANSCLU-SCENT), DEGRADED(DK.BR.),ASPHALTINE(DK,VISCOUS)	WELL ELEV	DTP	DTW	TOT. DET.	WAT. EL.
MW-1	no	no				11.80		
MW-2	no	no				10.13		
MW-3	yes	no				10.92		
PRODUCT REMOVED *								

*PRODUCT LAST TIME

APPENDIX F

GROUNDWATER MONITORING DATA:
BP, FORMER SHELL, AND UNOCAL STATIONS

TABLE 1F
GROUNDWATER MONITORING DATA
BP Station 11116, 7197 Village Parkway,
Former Shell Station, 7194 Amador Valley Boulevard,
and Unocal Station, 7375 Amador Valley Boulevard,
Dublin, California
Page 1 of 2

Date Measured	Well Elevation	Depth to Water	Water Elevation
BP Station 1116			
MW-1			
11-10-92	335.17	10.67	324.50
MW-2			
11-10-92	334.58	10.27	324.31
MW-3			
11-10-92	335.13	10.78	324.35
AW-4			
11-10-92	333.41	9.10	324.31
AW-5			
11-10-92	334.81	10.27	324.54
AW-6			
11-10-92	334.90	10.10	324.80
Former Shell Station			
MW-1			
11-10-92	334.83	10.04	324.79
MW-2			
11-10-92	336.96	12.05	324.91
MW-3			
11-10-92	338.93	11.84	327.09
MW-4			
11-10-92	337.14	12.12	325.02
MW-5			
11-10-92	334.96	9.65	325.31
MW-6			
11-10-92	335.42	10.56	324.86

See Notes on Page 2 of 2.

TABLE 1F
GROUNDWATER MONITORING DATA
BP Station 11116, 7197 Village Parkway,
Former Shell Station, 7194 Amador Valley Boulevard,
and UNOCAL Station, 7375 Amador Valley Boulevard,
Dublin, California
Page 2 of 2

Date Measured	Well Elevation	Depth to Water	Water Elevation
Former Shell Station cont.			
MW-7			
11-10-92	333.23	8.82	324.41
MW-8			
11-10-92	335.80	10.41	325.39
MW-9			
11-10-92	334.57	9.61	324.96
MW-11			
11-10-92	334.20	9.47	324.73
MW-12			
11-10-92	332.53	8.32	324.31
MW-13			
11-10-92	335.64	10.69	324.95
UNOCAL Station			
MW-1			
11-10-92	336.72	11.97	324.75
MW-2			
11-10-92	337.36	12.15	325.21
MW-3			
11-10-92	337.53	12.33	325.20
MW-4			
11-10-92	337.00	12.32	324.68

Measurements in feet.
Datum is City of Dublin = (USGS)

APPENDIX G

LABORATORY ANALYSES REPORTS AND CHAIN OF CUSTODY RECORDS FOR SOIL SAMPLES

SEQUOIA ANALYTICAL

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

RECEIVED
NOV 5 - 1992
RESNA
SAN JOSE

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

Project: ARCO 6041, Dublin

Enclosed are the results from 17 soil samples received at Sequoia Analytical on October 27,1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2104612	Soil, S-5.5-B4	10/26/92	EPA 5030/8015/8020
2104613	Soil, S-9.5-B4	10/26/92	EPA 5030/8015/8020
2104614	Soil, S-15.5-B4	10/26/92	EPA 5030/8015/8020
2104615	Soil, S-5.5-B5	10/26/92	EPA 5030/8015/8020
2104616	Soil, S-10-B5	10/26/92	EPA 5030/8015/8020
2104617	Soil, S-19.5-B5	10/26/92	EPA 5030/8015/8020
2104618	Soil, S-5.5-B6	10/26/92	EPA 5030/8015/8020
2104619	Soil, S-10.5-B6	10/26/92	EPA 5030/8015/8020
2104620	Soil, S-18.5-B6	10/26/92	EPA 5030/8015/8020
2104621	Soil, S-5.5-B7	10/27/92	EPA 5030/8015/8020
2104622	Soil, S-10-B7	10/27/92	EPA 5030/8015/8020
2104623	Soil, S-5.5-B8	10/27/92	EPA 5030/8015/8020
2104624	Soil, S-10-B8	10/27/92	EPA 5030/8015/8020
2104625	Soil, S-5.5-B9	10/27/92	EPA 5030/8015/8020
2104626	Soil, S-10-B9	10/27/92	EPA 5030/8015/8020
2104627	Soil, S-5.5-B10	10/27/92	EPA 5030/8015/8020
2104628	Soil, S-10-B10	10/27/92	EPA 5030/8015/8020

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

Very truly yours,

SEQUOIA ANALYTICAL

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 6041, Dublin	Sampled:	Oct 26, 1992
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil	Received:	Oct 27, 1992
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	Nov 3, 1992
Attention: Joel Coffman	First Sample #:	210-4612		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 210-4612 S-5.5-B4	Sample I.D. 210-4613 S-9.5-B4	Sample I.D. 210-4614 S-15.5-B4	Sample I.D. 210-4615 S-5.5-B5	Sample I.D. 210-4616 S-10-B5	Sample I.D. 210-4617 S-19.5-B5
Purgeable Hydrocarbons	1.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Benzene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Toluene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Ethyl Benzene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Total Xylenes	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Chromatogram Pattern:		--	--	--	--	--	--

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0	1.0	1.0
Date Analyzed:	10/30/92	10/30/92	10/30/92	10/30/92	10/30/92	10/30/92
Instrument Identification:	GCHP-7	GCHP-7	GCHP-7	GCHP-7	GCHP-7	GCHP-7
Surrogate Recovery, %: (QC Limits = 70-130%)	102	105	106	91	91	92

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 6041, Dublin	Sampled:	10/26-27/92
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil	Received:	Oct 27, 1992
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	Nov 3, 1992
Attention: Joel Coffman	First Sample #:	210-4618		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 210-4618 S-5.5-B6	Sample I.D. 210-4619 S-10.5-B6	Sample I.D. 210-4620 S-18.5-B6	Sample I.D. 210-4621 S-5.5-B7	Sample I.D. 210-4622 S-10-B7	Sample I.D. 210-4623 S-5.5-B8
Purgeable Hydrocarbons	1.0	N.D.	N.D.	N.D.	N.D.	N.D.	1.6
Benzene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	0.091
Toluene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Ethyl Benzene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	0.060
Total Xylenes	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	0.14
Chromatogram Pattern:		--	--	--	--	--	Gas

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0	1.0	1.0
Date Analyzed:	10/30/92	10/30/92	10/30/92	10/30/92	10/30/92	10/30/92
Instrument Identification:	GCHP-7	GCHP-7	GCHP-7	GCHP-7	GCHP-7	GCHP-7
Surrogate Recovery, %: (QC Limits = 70-130%)	85	89	90	92	91	95

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 6041, Dublin	Sampled:	Oct 27, 1992
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil	Received:	Oct 27, 1992
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	Nov 3, 1992
Attention: Joel Coffman	First Sample #:	210-4624		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 210-4624 S-10-B8	Sample I.D. 210-4625 S-5.5-B9	Sample I.D. 210-4626 S-10-B9	Sample I.D. 210-4627 S-5.5-B10	Sample I.D. 210-4628 S-10-B10
Purgeable Hydrocarbons	1.0	N.D.	4.1	N.D.	16	3,200
Benzene	0.0050	N.D.	0.21	N.D.	0.26	12
Toluene	0.0050	N.D.	0.018	N.D.	0.69	74
Ethyl Benzene	0.0050	N.D.	0.11	N.D.	0.30	59
Total Xylenes	0.0050	N.D.	0.26	N.D.	2.1	390
Chromatogram Pattern:		--	Gas	--	Gas	Gas

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	2.0	250
Date Analyzed:	10/30/92	10/30/92	10/30/92	10/30/92	11/2/92
Instrument Identification:	GCHP-7	GCHP-1	GCHP-6	GCHP-1	GCHP-6
Surrogate Recovery, %: (QC Limits = 70-130%)	91	113	104	116	130

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

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

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 2104612-28

Reported: Nov 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	B. Ali	B. Ali	B. Ali	B. Ali
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992
QC Sample #:	GBLK103092 MS/MSD	GBLK103092 MS/MSD	GBLK103092 MS/MSD	GBLK103092 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:	0.18	0.18	0.18	0.52
Matrix Spike % Recovery:	90	90	90	87
Conc. Matrix Spike Dup.:	0.18	0.18	0.18	0.53
Matrix Spike Duplicate % Recovery:	90	90	90	88
Relative % Difference:	0.0	0.0	0.0	1.9

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

SEQUOIA ANALYTICAL

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

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

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 2104612-28

Reported: Nov 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	C. Donohue	C. Donohue	C. Donohue	C. Donohue
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992	Oct 30, 1992
QC Sample #:	GBLK103092 MS/MSD	GBLK103092 MS/MSD	GBLK103092 MS/MSD	GBLK103092 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:	0.18	0.18	0.18	0.53
Matrix Spike % Recovery:	90	90	90	88
Conc. Matrix Spike Dup.:	0.18	0.18	0.17	0.52
Matrix Spike Duplicate % Recovery:	90	90	85	87
Relative % Difference:	0.0	0.0	5.7	1.9

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

SEQUOIA ANALYTICAL

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

RECEIVED
NOV 5 - 1992
RESNA
SAN JOSE

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

Project: ARCO 6041, Dublin

Enclosed are the results from 1 soil sample received at Sequoia Analytical on October 30,1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2104739	Soil, S-1027-SP1A-D Comp.	10/27/92	STLC Lead Corrosivity, Ignitability and Reactivity

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

Very truly yours,

SEQUOIA ANALYTICAL

Maria Lee

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 6041, Dublin	Sampled:	Oct 27, 1992
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-1027-SP1A-D Comp.	Relogged:	Oct 30, 1992
San Jose, CA 95118			Analyzed:	see below
Attention: Joel Coffman	Lab Number:	210-4739	Reported:	Nov 3, 1992

LABORATORY ANALYSIS by STLC

Analyte	Date Analyzed	Detection Limit mg/L	Sample Result mg/L
Lead	11/2/92	0.10	0.13

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 6041, Dublin	Sampled:	Oct 27, 1992
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-1027-SP1A-D Comp.	Received:	Oct 30, 1992
San Jose, CA 95118			Analyzed:	10/30, 11/2/92
Attention: Joel Coffman	Lab Number:	210-4739	Reported:	Nov 3, 1992

CORROSIVITY, IGNITABILITY, AND REACTIVITY

Analyte	Detection Limit	Sample Results
Corrosivity:		
pH	N.A.	8.5
Ignitability:		
Flashpoint (Pensky-Martens), °C	N.A.	> 100 °C
Reactivity:		
Sulfide, mg/kg	10	N.D.
Cyanide, mg/kg	0.50	N.D.
Reaction with water	N.A.	Negative

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

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

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 210-4739

Reported: Nov 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Lead STLC	pH	Cyanide	Flashpoint	Reactive Sulfide
Method:	EPA 7421	EPA 9045	EPA 9010	EPA 1010	EPA 9030
Analyst:	S. Chin	Y. Arteaga	N. Zahedi	K. Follett	K. Follett
Reporting Units:	mg/L	N.A.	mg/kg	°C	mg/kg
Date Analyzed:	Nov 2, 1992	Oct 30, 1992	Oct 27, 1992	Oct 28, 1992	Nov 2, 1992
QC Sample #:	210-4390	210-4334	210-3565	210-3713	210-4739
Sample Conc.:	0.12	8.5	1.1	>100	N.D.
Spike Conc. Added:	0.50	N.A.	2.9	N.A.	1300
Conc. Matrix Spike:	0.56	N.A.	3.9	N.A.	1500
Matrix Spike % Recovery:	88	N.A.	97	N.A.	115
Conc. Matrix Spike Dup.:	0.54	8.5	4.2	>100	1400
Matrix Spike Duplicate % Recovery:	84	N.A.	107	N.A.	108
Relative % Difference:	3.6	0.0	2.4	0.0	6.9

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

ARCO Products Company

Division of AtlanticRichfieldCompany

Chain of Custody

Task Order No.

ARCO Facility no. 6041	City (Facility) Dublin	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Michael Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA	Address (Consultant) 3315 Almaden Expy, Suite 34, San Jose, CA 95118		Contract number 07-073

Method of shipment: Sequoia Courier

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 601/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
S-1027-SP1A	1	1	✓			✓		10/27/92			X									
S-1027-SP1B	1	1	✓			✓		10/27/92			X									
S-1027-SP1C	1	1	✓			✓		10/27/92			X									
S-1027-SP1D	1	1	✓			✓		10/27/92			X									
S-1027-SP2A	1	1	✓			✓		10/27/92			X									
S-1027-SP2B	1	1	✓			✓		10/27/92			X									
S-1027-SP2C	1	1	✓			✓		10/27/92			X									
S-1027-SP2D	1	1	✓			✓		10/27/92			X									

COMPOSITE 210-4063

COMPOSITE 210-4064

Special detection Limit/reporting: Specify QA/QC/SG

Remarks: composite samples; 48 hr turnaround

Lab number:

Turnaround time

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

Condition of sample: Good		Temperature received: Cool	
Relinquished by sampler: Barbara DeGennaro	Date 10/27/92	Time 4:00	Received by
Relinquished by	Date 10/27/92	Time 5:20	Received by
Relinquished by	Date	Time	Received by laboratory: Date 10.27.92 Time 1770

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

APPENDIX H

LABORATORY ANALYSES REPORTS AND CHAIN OF CUSTODY RECORDS FOR AIR SAMPLES

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Northwest Region
4080-C Pike Lane
Concord, CA 94520
(510) 685-7852
(800) 544-3422 *from inside California*
(800) 423-7143 *from outside California*
(510) 825-0720 (FAX)

RECEIVED
NOV 25 1992
RESNA
SAN JOSE

Client Number: RSN04ARC01
Facility Number: 6041
Arco Representative: Mike Whelan
Work Order Number: C2-11-242

November 24, 1992

Valli Voruganti
RESNA Industries
3315 Almaden Expressway, #34
San Jose, CA 95118

Enclosed please find the analytical results for samples received by GTEL Environmental Laboratories, Inc. on 11/11/92, under task order number 6041-92-2.

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria, unless otherwise stated in the footnotes.

GTEL is certified by the California State Department of Health Services to perform analyses for drinking water, wastewater, and hazardous waste materials according to EPA protocols.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,
GTEL Environmental Laboratories, Inc.

Eileen F. Bullen
Laboratory Director

Client Number: RSN04ARC01
Facility Number: 6041
Arco Representative: Mike Whelan
Work Order Number: C2-11-242

Table 1

ANALYTICAL RESULTS

Aromatic Volatile Organics and Total Petroleum Hydrocarbons as Gasoline in Air

Modified EPA Methods 8020 and 8015[a]

GTEL Sample Number		01	02	03	04
Client Identification		AVW330 EFF	AVW3150 WF	AVW330 COMB INF	AVW3-150 CI
Date Sampled		11/10/92	11/10/92	11/10/92	11/10/92
Date Analyzed		11/11/92	11/11/92	11/11/92	11/11/92
Analyte	Detection Limit, mg/m^3	Concentration, mg/m^3			
Benzene	0.5	5	370	88	85
Toluene	0.5	4	42	15	10
Ethylbenzene	0.5	3	73	16	14
Xylene, total	0.5	15	160	39	30
BTEX, total	--	27	650	160	140
Gasoline	10	130	15000	3500	3400
Detection Limit Multiplier		1	1	1	1
BFB surrogate, % recovery		102	99	94	100

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision.

Client Number: RSN04ARC01
Facility Number: 6041
Arco Representative: Mike Whelan
Work Order Number: C2-11-242

Table 1 (Continued)

ANALYTICAL RESULTS

Aromatic Volatile Organics and Total Petroleum Hydrocarbons as Gasoline in Air

Modified EPA Methods 8020 and 8015[a]

GTEL Sample Number		05	06	07	08
Client Identification		AVW4-90	AVW3-30 WF	AVW2-60	AVW1-60
Date Sampled		11/10/92	11/10/92	11/10/92	11/10/92
Date Analyzed		11/11/92	11/11/92	11/11/92	11/11/92
Analyte	Detection Limit, mg/m^3	Concentration, mg/m^3			
Benzene	0.5	2700	340	320	<0.5
Toluene	0.5	2100	98	69	33
Ethylbenzene	0.5	370	65	64	16
Xylene, total	0.5	1600	170	160	49
BTEX, total	--	6800	670	610	98
Gasoline	10	110000	12000	14000	6600
Detection Limit Multiplier		25	1	1	1
BFB surrogate, % recovery		104	112	112	100

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision.

Client Number: RSN04ARC01
Facility Number: 6041
Arco Representative: Mike Whelan
Work Order Number: C2-11-242

Table 1 (Continued)

ANALYTICAL RESULTS

Aromatic Volatile Organics and
Total Petroleum Hydrocarbons as Gasoline in Air

Modified EPA Methods 8020 and 8015[a]

GTEL Sample Number		09			
Client Identification		METHOD BLANK			
Date Sampled		--			
Date Analyzed		11/11/92			
Analyte	Detection Limit, mg/m^3	Concentration, mg/m^3			
Benzene	0.5	<0.5			
Toluene	0.5	<0.5			
Ethylbenzene	0.5	<0.5			
Xylene, total	0.5	<0.5			
BTEX, total	--	--			
Gasoline	10	<10			
Detection Limit Multiplier		1			
BFB surrogate, % recovery		100			

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986. Modification for TPH as gasoline as per California State Water Resources Control Board LUFT Manual protocols, May 1988 revision.

Client Number: RSN04ARC01
Facility Number: 6041
Arco Representative: Mike Whelan
Work Order Number: C2-11-242

Sample and Sample Duplicate Results

Matrix: Air

Analyte	Sample ID	Date of Analysis	Sample Results	Sample Duplicate Results	Units	RPD[a], %
Modified EPA 8020:						
Benzene	SITE #2894	11/11/92	7.12	6.97	ug/L	2.1
Toluene	SITE #2894	11/11/92	5.50	5.35	ug/L	2.8
Ethylbenzene	SITE #2894	11/11/92	0.612	0.823	ug/L	2.9
Xylene, total	SITE #2894	11/11/92	8.28	6.27	ug/L	28

a. See attached table for acceptability limits.

QC Acceptability Limits

Analyte	QC Check Sample Recovery (%)	Duplicate Water Sample RPD (%)	Duplicate Soil Sample RPD (%)	Water Matrix Spike Recovery (%)	Soil Matrix Spike Recovery (%)	Reagent Water Spike Recovery (%)
Modified EPA 8020:						
Benzene	80 - 120	30	30	55 - 129	24 - 127	70 - 147
Toluene	80 - 120	30	30	72 - 149	17 - 124	67 - 150
Ethylbenzene	80 - 120	30	30	75 - 138	19 - 129	69 - 145
Xylene, total	80 - 120	30	30	74 - 147	23 - 124	71 - 152
Modified EPA 8015:						
Gasoline	---	30	30	---	---	---
Analyte	**QC Check Sample Recovery (%)**	**Duplicate Water Sample RPD (%)**	**Duplicate Soil Sample RPD (%)**	**Water Matrix Spike Recovery (%)**	**Soil Matrix Spike Recovery (%)**	**Reagent Water Spike Recovery (%)**
Diesel	---	30	30	63 - 127	58 - 144	48 - 134
EPA 8010/8020:						
Chlorobenzene	80 - 120	30	---	34 - 134	58 - 126	62 - 111
Benzene	80 - 120	30	---	66 - 118	24 - 127	58 - 127
Toluene	80 - 120	30	---	53 - 115	17 - 124	60 - 120
Ethylbenzene	80 - 120	30	---	43 - 131	19 - 129	58 - 126
Xylene, total	80 - 120	30	---	55 - 115	23 - 124	63 - 128
1,1-Dichloroethene	80 - 120	30	---	30 - 160	72 - 116	56 - 138
Trichloroethene	80 - 120	30	---	78 - 184	79 - 120	82 - 187
EPA 8080:						
Heptachlor	80 - 120	30	---	---	34 - 111	34 - 111
Aldrin	80 - 120	30	---	---	42 - 122	42 - 122
DDE	80 - 120	30	---	---	30 - 145	30 - 145
Dieldrin	80 - 120	30	---	---	36 - 146	36 - 146
Endrin	80 - 120	30	---	---	30 - 147	30 - 147
DDD	80 - 120	30	---	---	31 - 141	31 - 114
DDT	80 - 120	30	---	---	10 - 180	10 - 180
Arochlor 1260	45 - 127	30	---	---	53 - 128	53 - 128

QC Acceptability Limits

Analyte	QC Check Sample Recovery (%)	Duplicate Water Sample RPD (%)	Duplicate Soil Sample RPD (%)	Water Matrix Spike Recovery (%)	Soil Matrix Spike Recovery (%)	Reagent Water Spike Recovery (%)
EPA 8310:						
Fluorene	80 - 120	68	---	---	---	49 - 116
Anthracene	80 - 120	41.7	---	---	---	24 - 116
Chrysene	80 - 120	65.2	---	---	---	44 - 128
Benzo(a)pyrene	80 - 120	52.8	---	---	---	26 - 126
Naphthalene	80 - 120	42.3	---	---	---	51 - 106
EPA 8240:						
All 8240 Compounds	60 - 140	---	---	---	---	---
Trichloroethene	---	14	24	71 - 120	62 - 137	71 - 120
Toluene	---	13	21	76 - 125	59 - 139	76 - 125
Chlorobenzene	---	13	21	75 - 130	60 - 133	75 - 130
1,1-Dichloroethene	---	14	22	61 - 145	59 - 172	61 - 145
Benzene	---	11	21	76 - 127	66 - 142	76 - 127
TPH/IR:	80 - 120	20	20	70 - 130	70 - 130	70 - 130
Metals:						
Arsenic	90 - 110	20	20	80 - 120	80 - 120	80 - 120
Barium	90 - 110	20	20	80 - 120	80 - 120	80 - 120
Cadmium	90 - 110	20	20	80 - 120	80 - 120	80 - 120
Chromium	90 - 110	20	20	80 - 120	80 - 120	80 - 120
Iron	90 - 110	20	20	80 - 120	80 - 120	80 - 120
Lead	90 - 110	20	20	80 - 120	80 - 120	80 - 120
Manganese	90 - 110	20	20	80 - 120	80 - 120	80 - 120
Mercury	90 - 110	20	20	80 - 120	80 - 120	80 - 120
Selenium	90 - 110	20	20	80 - 120	80 - 120	90 - 110
Silver	90 - 110	20	20	80 - 120	80 - 120	90 - 110
Wet Chemistry:						
TOC	90 - 110	20	NA	90 - 110	NA	90 -110

NA = Not Applicable.

QC Acceptability Limits

Analyte	QC Check Sample Recovery (%)	Duplicate Air Sample RPD (%)	Matrix Spike Recovery (%)
Modified EPA 8020:			
Benzene	---	38	---
Toluene	---	34	---
Ethylbenzene	---	48	---
Xylene, total	---	34	---
Modified EPA 8015:			
Gasoline	---	---	---

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Northwest Region
4080-C Pike Lane
Concord, CA 94520
(510) 685-7852
(800) 544-3422 *from inside California*
(800) 423-7143 *from outside California*
(510) 825-0720 (FAX)

Client Number: RSN04ARC01
Facility Number: 6041
Arco Representative: Mike Whelan
Work Order Number: C2-11-243

November 19, 1992

Valli Voruganti
RESNA Industries
3315 Almaden Expressway, #34
San Jose, CA 95118

Enclosed please find the analytical results for samples received by GTEL Environmental Laboratories, Inc. on 11/11/92, under task order number 6041-92-2.

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria, unless otherwise stated in the footnotes.

GTEL is certified by the California State Department of Health Services to perform analyses for drinking water, wastewater, and hazardous waste materials according to EPA protocols.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,
GTEL Environmental Laboratories, Inc.

Eileen F. Bullen
Laboratory Director

Client Number: RSN04ARC01
Facility Number: 6041
Arco Representative: Mike Whelan
Work Order Number: C2-11-243

Table 1

ANALYTICAL RESULTS

Volatile Organics in Air

EPA Method 624 and 8240[a]

GTEL Sample Number		01*	02		
Client Identification		AVW3150 WF	METHOD BLANK		
Date Sampled		11/10/92	--		
Date Analyzed		11/12/92	11/12/92		
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Chloromethane	10	<10	<10		
Bromomethane	10	<10	<10		
Vinyl chloride	10	<10	<10		
Chloroethane	10	<10	<10		
Methylene chloride	5	<5	<5		
Acetone	100	<100	<100		
Carbon disulfide	5	<5	<5		
1,1-Dichloroethene	5	<5	<5		
1,1-Dichloroethane	5	<5	<5		
1,2-Dichloroethene, total	5	<5	<5		
Chloroform	5	<5	<5		
1,2-Dichloroethane	5	<5	<5		
2-Butanone	100	<100	<100		
1,1,1-Trichloroethane	5	<5	<5		
Carbon tetrachloride	5	<5	<5		
Vinyl acetate	50	<50	<50		
Bromodichloromethane	5	<5	<5		
1,2-Dichloropropane	5	<5	<5		
cis-1,3-Dichloropropene	5	<5	<5		
Trichloroethene	5	<5	<5		

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986 (method modified for additional compounds). Sample introduction by EPA Method 5030.
* A sample duplicate was not analyzed as per method 8240.

Table 1 (Continued)

ANALYTICAL RESULTS

Volatile Organics in Air

EPA Method 624 and 8240[a]

GTEL Sample Number		01*	02		
Client Identification		AVW3150 WF	METHOD BLANK		
Date Sampled		11/10/92	--		
Date Analyzed		11/12/92	11/12/92		
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Dibromochloromethane	5	<5	<5		
1,1,2-Trichloroethane	5	<5	<5		
Benzene	5	210	<5		
trans-1,3-Dichloropropene	5	<5	<5		
2-Chloroethylvinyl ether	10	<10	<10		
Bromoform	5	<5	<5		
4-Methyl-2-pentanone	50	<50	<50		
2-Hexanone	50	<50	<50		
Tetrachloroethene	5	<5	<5		
1,1,2,2-Tetrachloroethane	5	<5	<5		
Toluene	5	12	<5		
Chlorobenzene	5	<5	<5		
Ethylbenzene	5	44	<5		
Styrene	5	<5	<5		
1,2-Dichlorobenzene	5	<5	<5		
1,3-Dichlorobenzene	5	<5	<5		
1,4-Dichlorobenzene	5	<5	<5		
Xylene, total	5	90	<5		
Trichlorofluoromethane	5	<5	<5		
Quantitation Limit Multiplier		1	1		

a. Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986 (method modified for additional compounds). Sample introduction by EPA Method 5030.
* A sample duplicate was not analyzed as per method 8240.

ARCO Products Company — Division of Atlantic Richfield Company — Task Order No. — Chain of Custody

ARCO Facility no. 6041	City (Facility) DUBLIN	Project manager (Consultant) VALLI VORUGANTI / ~~RESNA~~ DANA WEISS	Laboratory name GTEL
ARCO engineer Mike Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) 800-926-0815	Fax no. (Consultant) 408-264-2435
Consultant name RESNA Industries	Address (Consultant) 3315 Almaden Expy., Ste 34; San Jose, CA 95118		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Water	Other: AIR	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☒ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
AVW 330 EFF	01				✓			11-10-92	4:55	✓		✓										
AVW3150 WF	02				✓			11-10-92	6:55	✓		✓				✓						
AVW330 comb INF	03				✓			11-10-92	4:55	✓		✓										
AVW3-150 CI	04				✓			11-10-92	6:55	✓		✓										
AVW4-90	05				✓			11-10-92	11:10	✓		✓										
AVW3-30 WF	06				✓			11-10-92	5:00	✓		✓										
AVW2-60	07				✓			11-10-92		✓		✓										
AVW1-60	08				✓			11-10-92	16:05	✓		✓										
METHOD Blank																						

Special detection Limit/reporting

Special QA/QC

Remarks: Report in mg/m³

Analyze with 72 hour

BOX 10

C211

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:	
Relinquished by sampler: Dana Weiss	Date 11/11/93	Time 10:35	Received by: James Pencoal
Relinquished by: James Pencoal	Date 11/11/93	Time 12:15	Received by:
Relinquished by:	Date	Time	Received by laboratory: Jamie Davis — Date 11/11/92 — Time 12:15

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

APPC-3292 (2-91)

B C Analytical

1255 Powell Street
Emeryville, CA 94608
510/428-2300
Fax: 510/547-3643

ANALYTICAL REPORT

DEC 1 - 1992

LOG NO: E92-11-293

Received: 12 NOV 92

Mailed:

Ms. Valli Voruganti
Resna Industries
3315 Almaden Expressway, Suite 34
San Jose, California 95118

Project: 6041

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, VAPOR OR AIR SAMPLES	DATE SAMPLED
11-293-1	AVW3 Pb1	10 NOV 92
11-293-2	AVW3 Pb2	10 NOV 92
11-293-3	AVW3 Pb3	10 NOV 92

PARAMETER	11-293-1	11-293-2	11-293-3
Charcoal Digestion, Date	11.18.92	11.18.92	11.18.92
Lead, ug	<0.1	0.10	0.10

Edward Wilson, Laboratory Director

BCA

BATCH QC REPORT: Definitions and Terms

Accuracy	The ability of a procedure to determine the "true" concentration of an analyte
Precision	The reproducibility of a procedure demonstrated by the agreement between analyses performed on either duplicates of the same sample or a pair of duplicate spikes
Batch	A group of samples prepared together using the same reagents and equipment, and/or analyzed sequentially using the same calibration curve, reagents, and instrument
Laboratory Control Standard (LCS)	Laboratory reagent water spiked with known compounds and subjected to the same procedures as the samples. The LCS thus indicates the accuracy of the analytical method and, because it is prepared from a different source than the standard used to calibrate the instrument, it also serves to double-check the calibration.
Matrix QC	Quality control tests performed on actual client samples. For most analyses, the laboratory uses a pair of spiked samples (duplicate spikes). The laboratory may also use a pair of duplicate samples and a spiked sample.
LC Result	Laboratory result of an LCS analysis
LT Result	Expected result, or true value, of the LCS analysis
R1, R2 Result	Result of the analysis of replicate aliquots of a sample, with R1 indicating the first analysis of the sample and R2 its corresponding duplicate; used to determine precision
S1, S2 Result	Result of the analysis of replicate spiked aliquots, with S1 indicating one spike of the sample and S2 the second spike; used to determine precision and accuracy.
R Bar Result	The average of replicate analysis results
S Bar Result	The average of spike analysis results
True value	The theoretical, or expected, result of a spike sample analysis. Calculated using one of the following: Sample Concentration + Spike Amount R Bar + Spike Amount
Percent Recovery	The percentage of analyte recovered. For LCS, the percent recovery calculation is: LC ÷ LT x 100 For spike recoveries, the percent recovery calculation is: $\frac{(\text{S Bar} - \text{Sample Concentration}) \times 100}{\text{Spike Amount}}$
Relative Percent Difference (RPD)	Calculated using one of the following: $\frac{(R1 - R2) \times 100}{(R1 + R2) \div 2}$ $\frac{(S1 - S2) \times 100}{(S1 + S2) \div 2}$
Blank Result	The result of the analysis of a method blank, which is reagent water that is analyzed using the same reagents, instruments and procedures as the samples in a batch; used to determine laboratory contamination
Reporting Detection Limit (RDL)	BCA–assigned limit based on, but not the same as, method detection limits (MDLs) determined using EPA guidelines

: ORDER PLACED FOR CLIENT: Resna Industries 9211293 :
: BC ANALYTICAL : EMVL LAB : 08:25:43 30 NOV 1992 - P. 1 :

SAMPLES...	SAMPLE DESCRIPTION..	DETERM.....	DATE.... ANALYZED	METHOD.....	EQUIP.	BATCH	ID.NO
9211293*1	AVW3 Pb1	PB,DIG	11.18.92			92395	9999
		PB,GFA	11.18.92	7421	514-01	92395	7701
9211293*2	AVW3 Pb2	PB,DIG	11.18.92			92395	9999
		PB,GFA	11.18.92		514-05	92395	7036
9211293*3	AVW3 Pb3	PB,DIG	11.18.92			92395	9999
		PB,GFA	11.18.92		514-05	92395	7036

***

Notes: Equipment = BC Analytical identification number for a particular piece of analytical equipment.

ID.NO = BC Analytical employee identification number of analyst.

BC ANALYTICAL

BATCH QC REPORT
ORDER: E9211293

ATE REPORTED : 11/30/92

LABORATORY CONTROL STANDARDS

PARAMETER	DATE ANALYZED	BATCH NUMBER	LC RESULT	LT RESULT	UNIT	PERCENT RECOVERY
ead	11.18.92	92395	0.0496	0.0420	mg/L	118

BC ANALYTICAL

BATCH QC REPORT
ORDER: E9211293

ATE REPORTED : 11/30/92

METHOD BLANKS AND REPORTING DETECTION LIMIT (RDL)

PARAMETER	DATE ANALYZED	BATCH NUMBER	BLANK RESULT	RDL	UNIT	METHOD
ead	11.18.92	92395	0	NA	mg/L	

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No.

Chain of Custody

ARCO Facility no. 6041	City (Facility) DUBLIN	Project manager (Consultant) WALT VOELGANTI / DANA WEISS RESNA Industries	Laboratory name BC Analytical
ARCO engineer MIKE Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) 800 926-0815	Fax no. (Consultant) 408-264-2435
Consultant name RESNA Industries	Address (Consultant) 3315 Almaden Exp, Ste 34, San Jose, CA 95118		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
AVW3 Pb1								11-10-92	5:55													
AVW3 Pb2								11-10-92	6:20													
AVW3 Pb3								11-10-92	6:40													

Special detection Limit/reporting

Special QA/QC

Remarks
Please include indiv. results
Analyze within 72 hours

Lab number

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

Condition of sample:		Temperature received:	
Relinquished by sampler: Dana Weiss	Date 11-11-92 Time 1350	Received by: Bill Lyons	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date 11/12/92 Time 1530

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

SEQUOIA ANALYTICAL

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

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

Project: ARCO 6041, Dublin

Enclosed are the results from 2 soil samples received at Sequoia Analytical on October 27,1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2104063	Soil, S-1027-SP1A-D	10/27/92	EPA 5030/8015/8020
2104064	Soil, S-1027-SP2A-D	10/27/92	EPA 5030/8015/8020

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

Very truly yours,

SEQUOIA ANALYTICAL

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 6041, Dublin	Sampled:	Oct 27, 1992
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil	Received:	Oct 27, 1992
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	Oct 29, 1992
Attention: Joel Coffman	First Sample #:	210-4063		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 210-4063 S-1027 SP1A-D	Sample I.D. 210-4064 S-1027 SP2A-D
Purgeable Hydrocarbons	1.0	N.D.	110
Benzene	0.0050	N.D.	0.42
Toluene	0.0050	N.D.	2.9
Ethyl Benzene	0.0050	N.D.	2.1
Total Xylenes	0.0050	N.D.	12
Chromatogram Pattern:		--	Gas

Quality Control Data

Report Limit Multiplication Factor:	1.0	50
Date Analyzed:	10/28/92	10/28/92
Instrument Identification:	GCHP-6	GCHP-6
Surrogate Recovery, %: (QC Limits = 70-130%)	104	104

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

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

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 2104063-4

Reported: Oct 29, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	B. Ali	B. Ali	B. Ali	B. Ali
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Oct 28, 1992	Oct 28, 1992	Oct 28, 1992	Oct 28, 1992
QC Sample #:	GBLK102892	GBLK102892	GBLK102892	GBLK102892
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	0.19	0.20	0.58
Matrix Spike % Recovery:	100	95	100	97
Conc. Matrix Spike Dup.:	0.20	0.20	0.21	0.61
Matrix Spike Duplicate % Recovery:	100	100	105	102
Relative % Difference:	0.0	5.1	4.9	5.0

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

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No.

Chain of Custody

ARCO Facility no. 6041	City (Facility) Dublin	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Michael Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA	Address (Consultant) 3315 Almaden Exp., Suite 34, San Jose, CA 95118		Contract number 07-073

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH gas EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
S-1027-SP1A	SP1A	1	✓			✓		10/27/92			X											
S-1027-SP1B	SP1B	1	✓			✓		10/27/92			X											
S-1027-SP1C	SP1C	1	✓			✓		10/27/92			X											
S-1027-SP1D	SP1D	1	✓			✓		10/27/92			X											
S-1027-SP2A	SP2A	1	✓			✓		10/27/92			X											
S-1027-SP2B	SP2B	1	✓			✓		10/27/92			X											
S-1027-SP2C	SP2C	1	✓			✓		10/27/92			X											
S-1027-SP2D	SP2D	1	✓			✓		10/27/92			X											

Laboratory name: Sequoia
Contract number: 07-073
Method of shipment: Sequoia Courier
Special detection Limit/reporting: 210 - 418632
Special QA/QC:
Remarks: Composite Samples 48 hr turnaround
Lab number:

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

Condition of sample: Good		Temperature received: Cool	
Relinquished by sampler: Barbara Sieminski	Date: 10/27/92	Time: 1624	Received by:
Relinquished by:	Date: 10/27/92	Time: 5:20	Received by:
Relinquished by:	Date:	Time:	Received by laboratory: Date: 10/27/92 Time: 1720

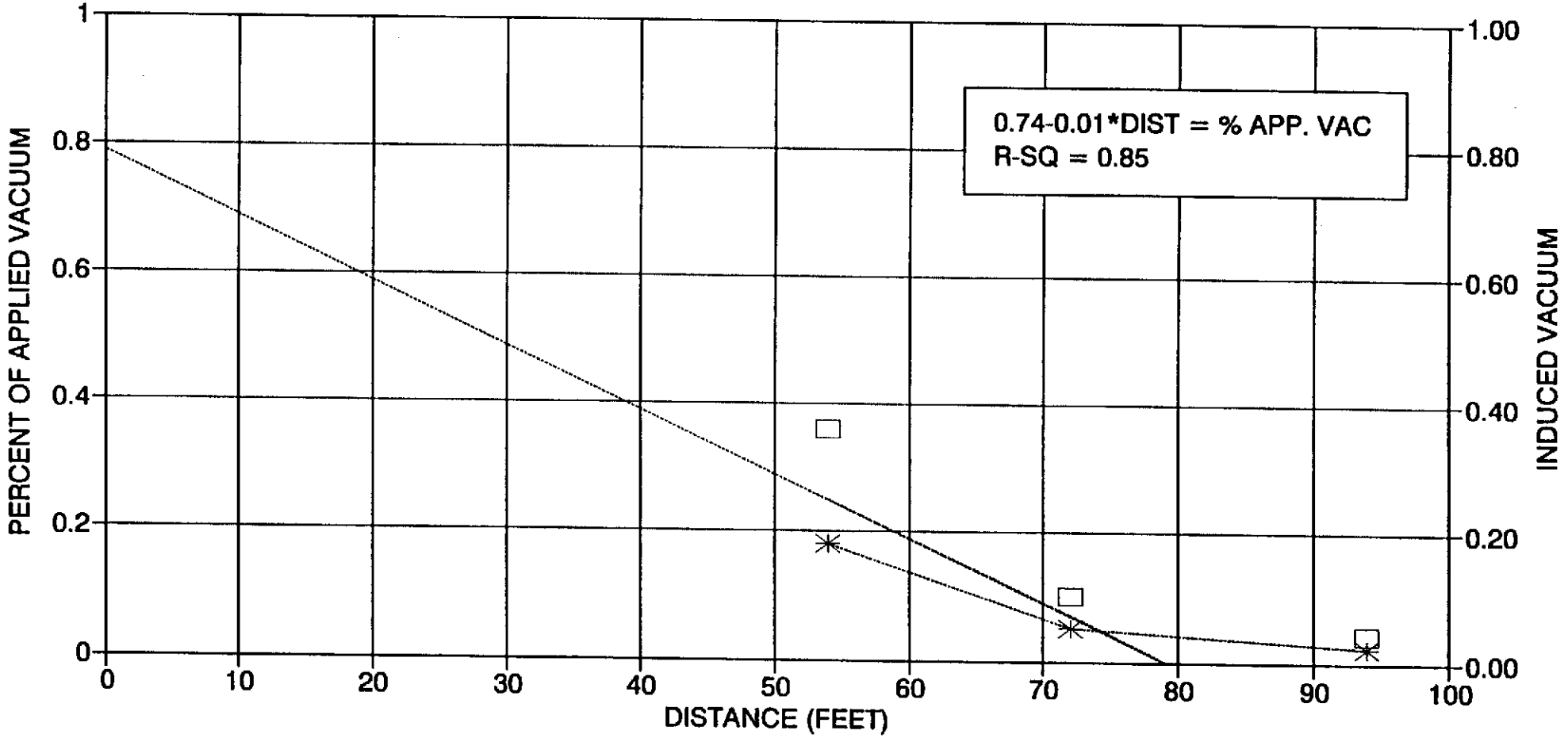
Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

APPENDIX I

FLOW CHARACTERISTICS AND RADIUS OF INFLUENCE GRAPHS

RADIUS OF INFLUENCE

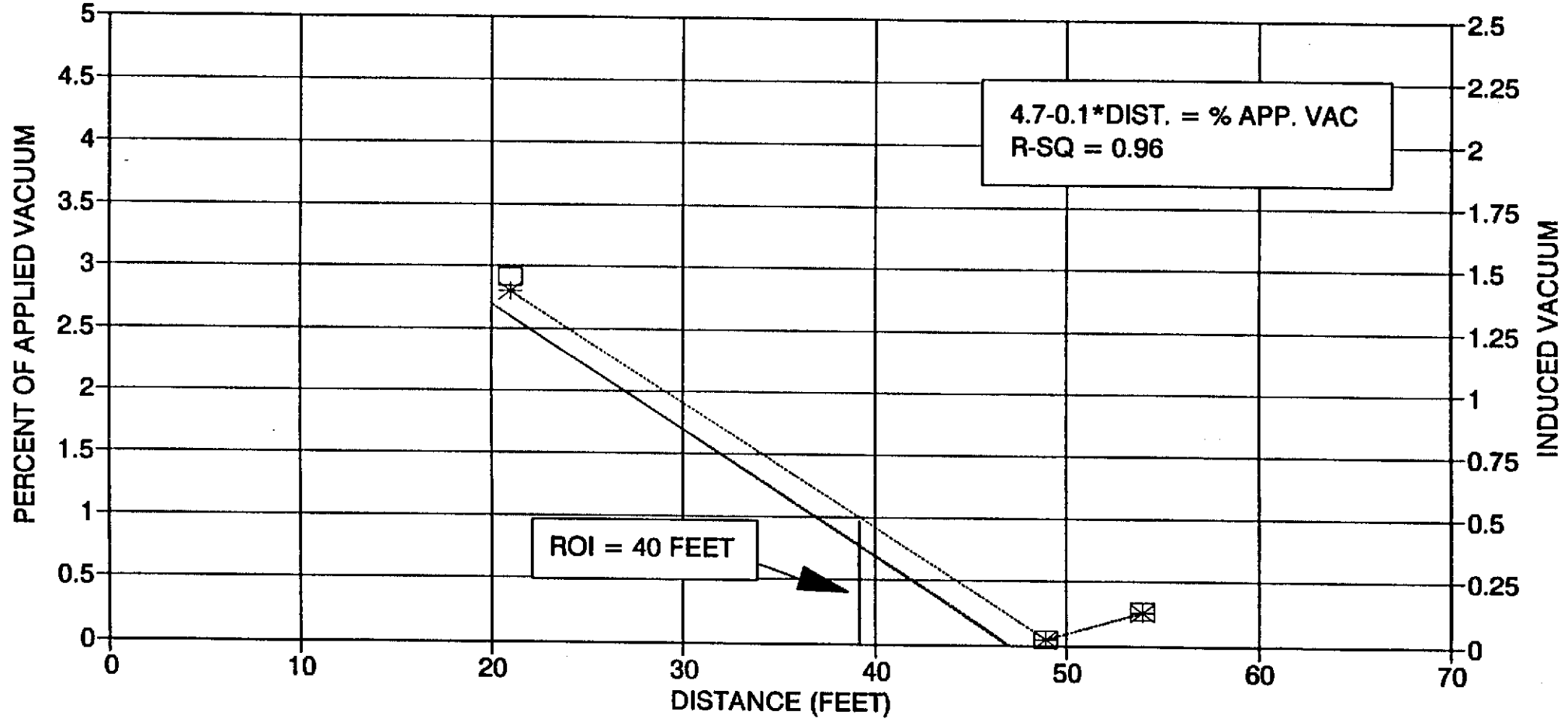
VAPOR WELL VW-1



□ % ACTUAL APP. VAC —— CALC. % APP. VAC —✳— INDUCED VACUUM

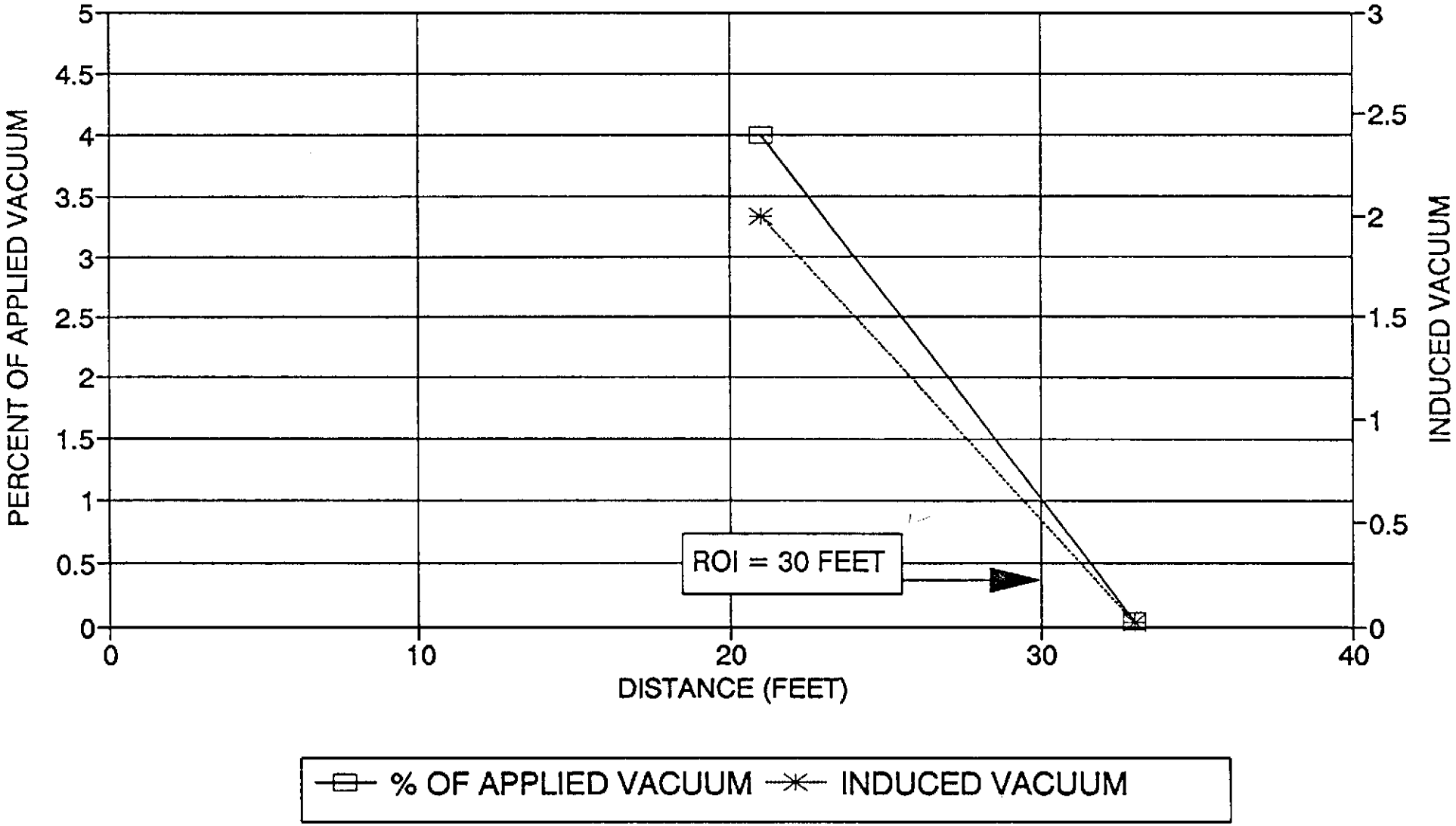
RADIUS OF INFLUENCE

VAPOR WELL VW-2



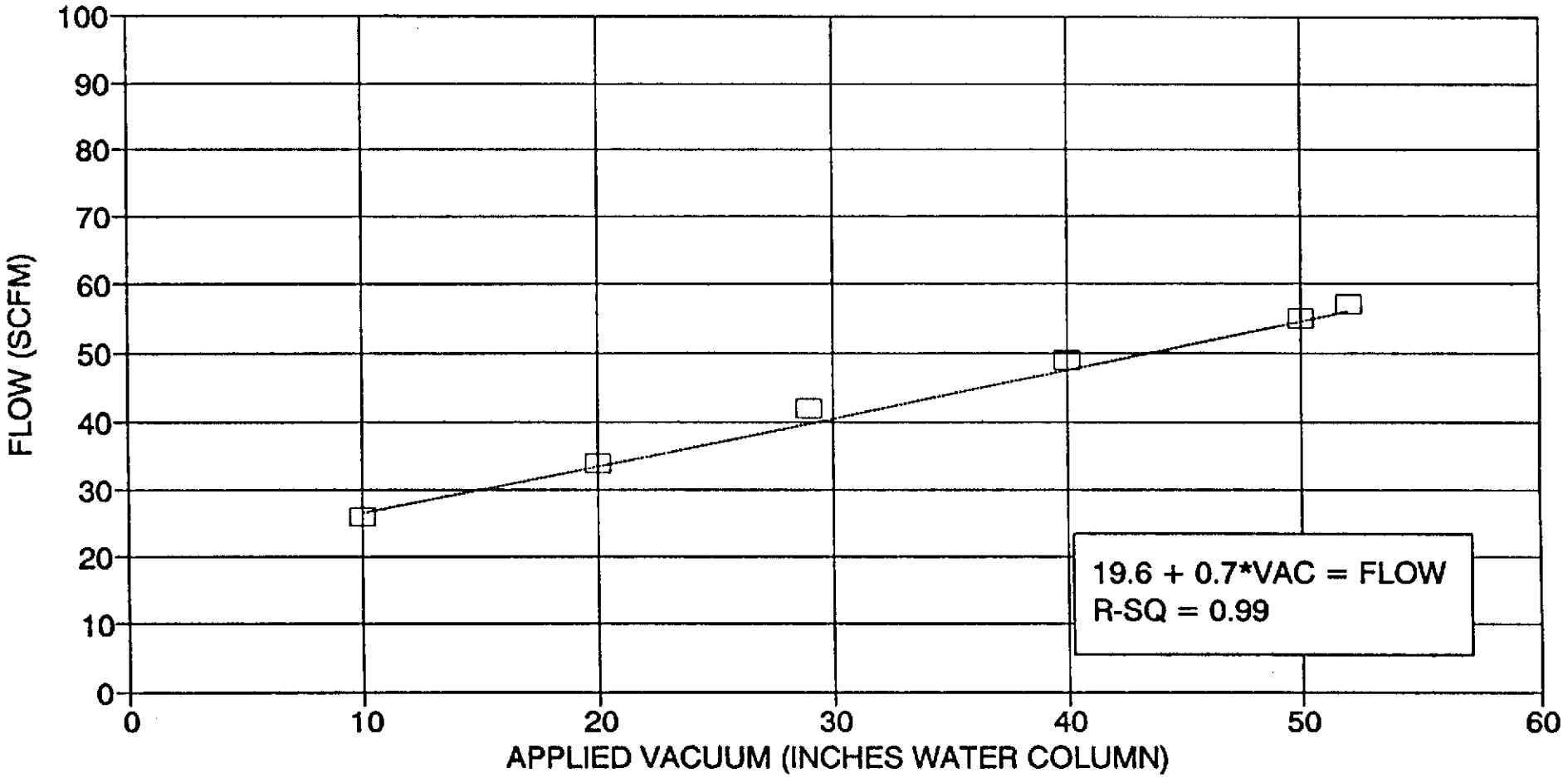
RADIUS OF INFLUENCE

VAPOR WELL VW-3



FLOW CHARACTERISTICS

VAPOR WELL VW-1



FLOW CHARACTERISTICS

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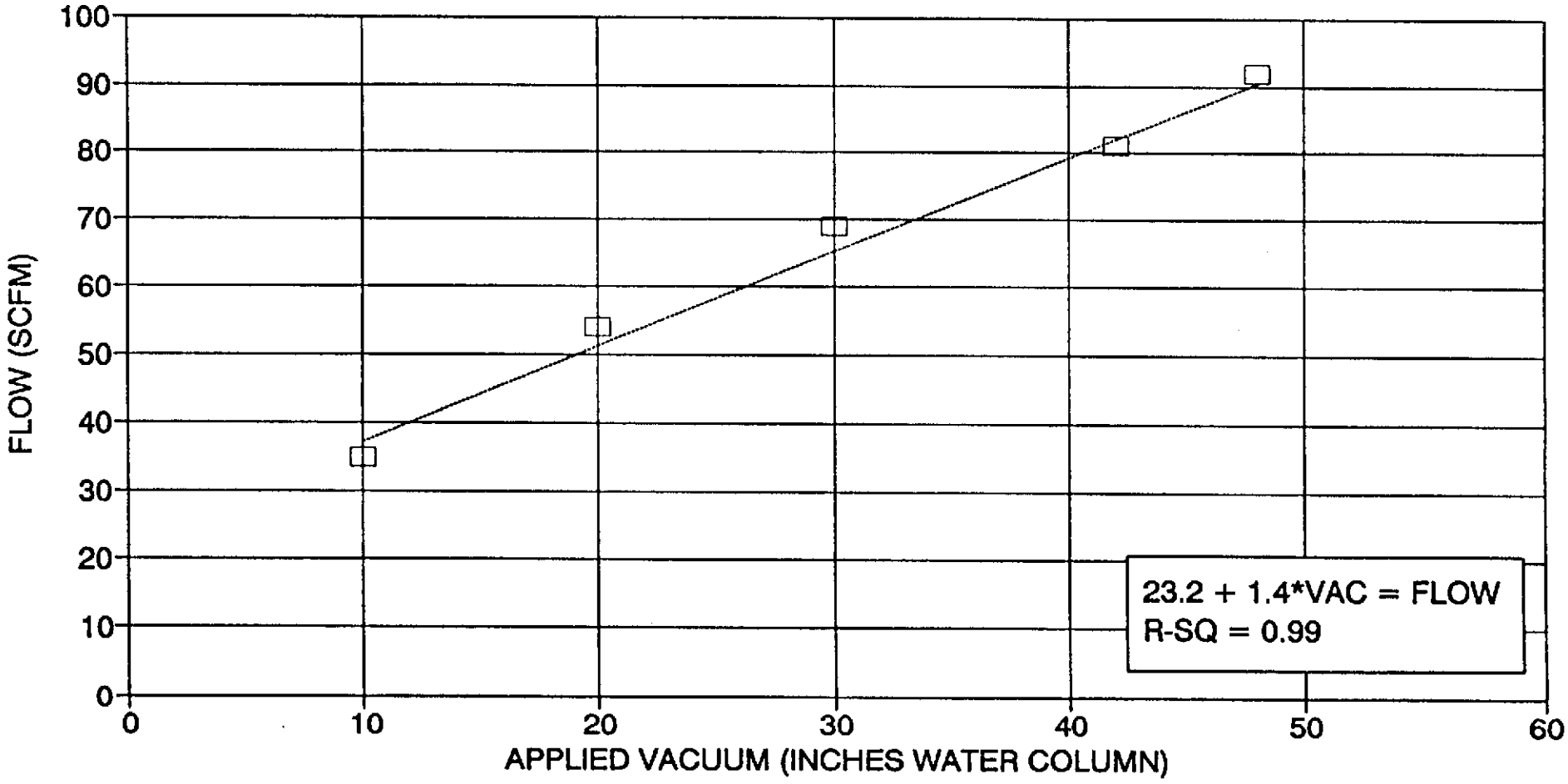
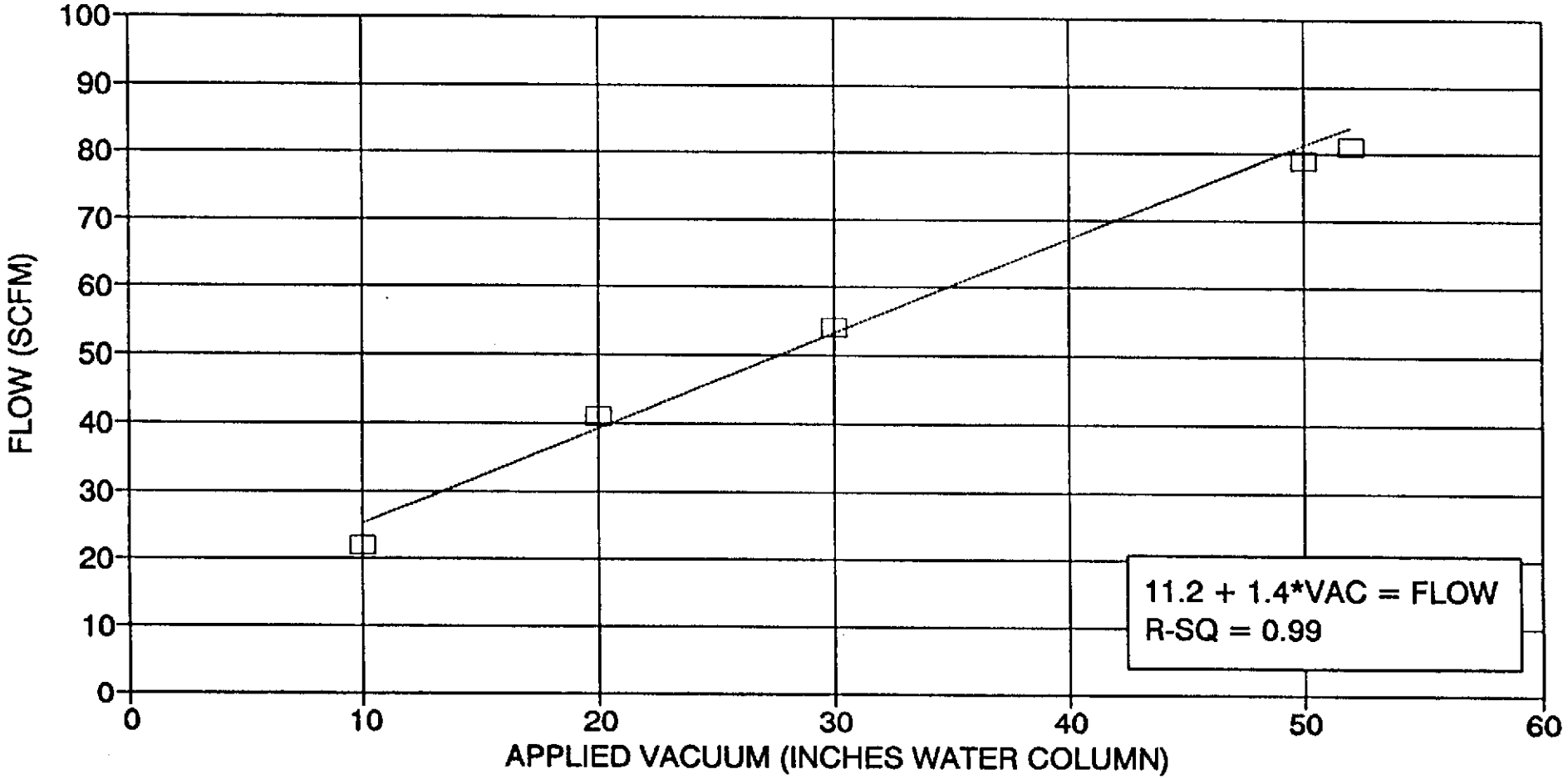


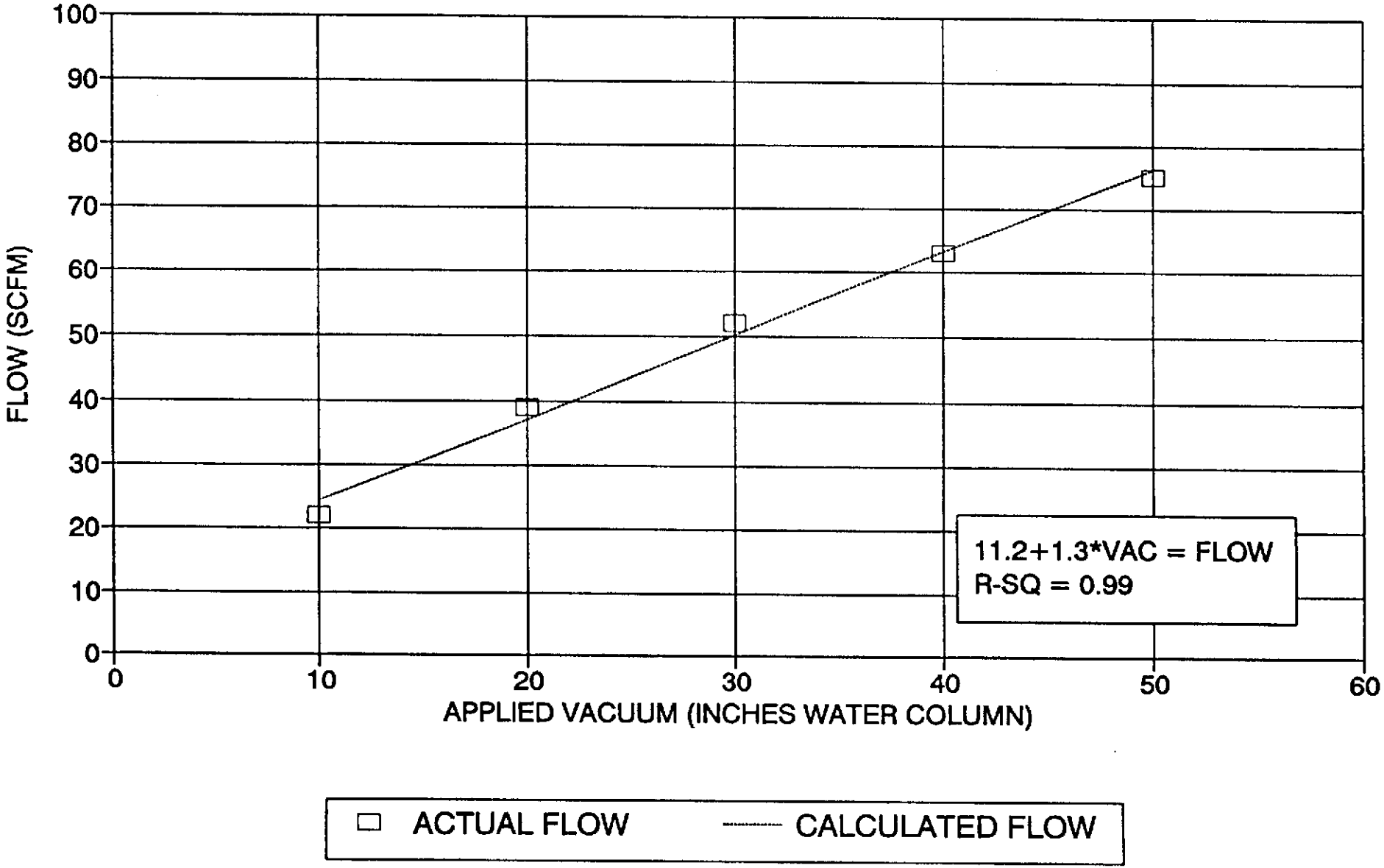
FLOW CHARACTERISTICS

VAPOR WELL VW-3



FLOW CHARACTERISTICS

VAPOR WELL VW-4



APPENDIX J

BAAQMD NOTIFICATION LETTER

A RESNA Company

RESNA
Working To Restore Nature

3315 Almaden Expressway, Suite 34
San Jose, CA 95118
Phone: (408) 264-7723
Fax: (408) 264-2435

November 3, 1992
1102BAQM
60006.04

Mr. John Swanson
Permit Services Division
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, California 94109

Subject: Notification of Vapor Extraction Test to be performed at ARCO Station 6041, located at 7249 Village Parkway in Dublin, California 94568.

Mr. Swanson:

This is to notify the Bay Area Air Quality Management District (BAAQMD) of a vapor extraction test (VET) to be performed by RESNA Industries Inc. (RESNA) at the above subject site on Tuesday, November 10, 1992. The one-day test will be performed using an internal (IC) combustion engine. In event of a delay or an advance of the test date, RESNA will notify the BAAQMD immediately.

The VET has two objectives: (1) to collect operational data to evaluate the efficiency and practicality of vapor extraction as a soil remediation alternative; and (2) to select the most appropriate off-gas treatment alternative, if the operational data suggest that vapor extraction is recommended.

The major components of the trailer-mounted IC engine are: (1) A Ford industrial engine (six cylinder, 300 cubic inch displacement engine, model number CS6-6491-6007-ZB), with a catalytic converter, mounted on a 3/4 ton trailer. Four propane fuel cylinders, with a total capacity of 40 gallons are also attached to the trailer to provide supplemental fuel to the engine. An instrument panel is incorporated into the engine housing; (2) a microprocessor-based control system for automatically controlling the flow rates of dilution air, process air, and supplemental fuel; (3) a condensate-removal system for removing trapped condensate in the vapor-extraction piping; and (4) a set of associated piping, control valves, and instrumentation.

RESNA
Working To Restore Nature

Notification of Vapor Extraction Test
ARCO Station 6041, Dublin, California

November 3, 1992
60006.04

During the test, extracted hydrocarbon vapor from impacted soil is pulled into the engine by applying a vacuum to a test well. This vacuum can be applied by the engine alone, or with the use of a vacuum blower in combination with the engine. Propane and extracted hydrocarbon vapor supply fuel to the engine. Dilution air is bled into the engine to achieve an optimum air to fuel ratio for the combustion process. A catalytic converter is used to provide additional abatement to the exhaust gases prior to discharge to the atmosphere.

Typical destruction efficiencies for this type of IC engine are above 95%, which is in compliance with the BAAQMD Regulation 8, Rule 47. The portability, high destruction efficiency and the vacuum and flow rates that this IC engine is capable of producing, make it an attractive choice for performing VETs.

Please call us at (800) 926-0815 to provide verbal approval for the vapor extraction test, and if you have any questions or comments.

Sincerely,
RESNA

Dana Weiss
Staff Engineer

Valli Voruganti
Project Engineer

cc: Mike Whelan, ARCO Products Company
Joel Coffman, RESNA
Valli Voruganti, RESNA

Approving Engineer: Barry Young
to ddw

Date: 11/9/92