Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

REPORT
PHASE II DRILLING OF SOIL BORINGS, INSTALLATION OF GROUND-WATER MONITORING WELLS, AND AQUIFER TESTING
at
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

7-15-88 AGS Job No. 18034-2

Report prepared for

Exxon Company, U.S.A.
P.O. Box 4415
Houston, Texas

by
Applied GeoSystems

Rodger C. Witham
Project Geologist

Gillian S. Holmes
G.E. 2023

July 15, 1988

CONTENTS

LIST OF TABLES

LIST OF PLATES

CONTENTS (continued)

LIST OF PLATES (continued)

LIST OF APPENDICES

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

REPORT
PHASE II DRILLING OF SOIL BORINGS, INSTALLATION OF GROUND-WATER MONITORING WELLS, AND AQUIFER TESTING
at
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

For: Exxon Company, U.S.A.

INTRODUCTION

At the request of Exxon Company, U.S.A., Applied GeoSystems conducted an investigation which involved drilling soil borings, installing ground-water monitoring wells, and performing aquifer testing. The work was conducted subsequent to our initial investigation to delineate hydrocarbon contamination of ground water after a release of gasoline was reported by the service station manager. The purpose of this second investigation was to evaluate more precisely the extent of hydrocarbon contamination, the hydraulic characteristics of the uppermost aquifer beneath the site, and whether or not a hydraulic relationship exists between the uppermost and deeper aquifers. Nearby municipal well No. 7, which provides water during peak demand periods, draws water from depths greater than 120 feet. Data

collected during this investigation are used to evaluate whether or not use of well No. 7 will influence the migration of hydrocarbon contamination and affect efforts to mitigate this contamination.

This report describes the work conducted to drill three boreholes and install three ground-water monitoring wells at the site, sample soil and ground water, conduct an onsite pump test, and monitor wells during pumping of municipal well No. 7. The results of laboratory analyses of soil and water sampling, our interpretations of chemical and hydraulic data, and our conclusions are also presented.

LOCATION AND BACKGROUND

Exxon Station No. 7-3399 is located at 2991 Hopyard Road in Pleasanton, California. The station is situated on the southeast corner of the intersection of Hopyard Road and Valley Avenue. The location of the site is shown on the Site Vicinity Map, Plate P-1. Facilities at the site include a station building with an auto maintenance bay, two dispenser islands, three underground gasoline storage tanks, and one underground waste-oil storage tank. The 6,000-, 8,000-, and 10,000-gallon gasoline storage tanks are used to store premium unleaded, regular leaded, and

regular unleaded gasoline, respectively, and are located on the south edge of the property. The 500-gallon waste-oil tank is located adjacent to and south of the station building. The relative locations of these facilities are shown on the Generalized Site Plan, Plate P-2.

On March 31, 1988, representatives of Exxon requested that Applied GeoSystems perform a Phase I environmental investigation after approximately 639 gallons of regular leaded gasoline was released sometime during March 1988. The Phase I investigation included drilling four boreholes and installing four ground-water monitoring wells (wells MW-1 through MW-4) to depths of 56 to 57 feet and drilling a fifth borehole (B-4) approximately 40 feet deep. The locations of the wells and borehole B-4 are shown on the Generalized Site Plan. A soil vapor survey was also conducted to evaluate the extent of hydrocarbon vapors in unsaturated soil near the top of the saturated zone. Vapor probe locations are also shown on the Generalized Site Plan.

Sediments encountered during drilling were predominantly units of relatively impermeable, silty clay and clayey silt to approximate depths of 37 to 39 feet. These sediments are underlain by sand and gravel units, interpreted to be the uppermost aquifer, to a depth of approximately 60 feet. Clay was encountered at 59.5

feet in one borehole. The sediments encountered appear to be relatively continuous across the site.

No detectable concentrations of hydrocarbons were found in soil samples collected from the borings at depths just above the potentiometric surface of the ground water. In [redacted] parts per million (ppm) of hydrocarbons were found at a depth of 19.5 feet and 3 ppm of hydrocarbons were found at a depth of 23.5 feet. Approximately 3 feet of floating hydrocarbon product were initially encountered in well MW-2 located near the underground gasoline storage tanks. No subjective evidence of hydrocarbons was found in water from wells MW-1, MW-3, and MW-4 or in water found in boring B-4. No detectable concentrations of benzene were found in water from wells MW-1 and MW-3; 0.[redacted] of benzene was found in water from well MW-4 and was probably related to introduction of hydrocarbons by [redacted]. Data from the soil vapor survey showed that, at the 33-foot depth, [redacted] hydrocarbons which [redacted] the ground water had not migrated more than [redacted] from the gasoline storage tanks.

By April 21, 1988, approximately 37 gallons of hydrocarbon product that appeared to be fresh had been removed from well

MW-2. This product was removed both by bailing and pumping with an automatic skimmer pump. We concluded from the data collected that 1) the product found in well MW-2 had not migrated far from the source area; 2) a large percentage of the [illegible] product has probably adsorbed to the particles of the finer-grained silt and clay between the gasoline storage tanks and the ground water; and 3) the volume of product that has migrated to the ground water is small.

SOIL BORINGS AND MONITORING WELLS

Exxon's letter to the California Regional Water Quality Control Board, San Francisco Bay Region, on April 27, 1988, indicated that three additional ground-water monitoring wells would be installed during the second phase of the investigation. Exxon stated that two wells would be installed offsite and one well would be installed onsite.

The City of Pleasanton requested that Applied GeoSystems first pursue permission to install the two offsite wells on private property. We found, however, that authorization would not be allowed by the private landowners without a time-consuming legal process. The City of Pleasanton then allowed drilling within the city easement that exists along Valley Avenue by issuing an

encroachment permit on May 1, 1988. The Zone 7 office of the Alameda County Flood Control and Water Conservation District granted permission to install the three ground-water monitoring wells on May 3, 1988. Copies of the two permits are included in Appendix A of this report. Representatives of both the City of Pleasanton and Zone 7 were at the site to witness drilling and well installation activities.

Locations of Borings

The two offsite borings were drilled northwest of the station property at locations within the easement that bounds the northwest side of Valley Avenue. Borings B-5d (deep) and B-5s (shallow) were placed on a line approximately midway between ground-water monitoring well MW-1 and municipal No. 7 (See Generalized Site Plan). Two 2-inch-diameter nested wells were first intended to be installed in one borehole at the B-5 location. Two boreholes were drilled; however, difficulties were encountered during drilling with hollow-stem augers. The onsite boring, B-6, was placed approximately midway between wells MW-1 and MW-2 (See Generalized Site Plan). Ground-water monitoring wells were constructed in the borings. The three locations were selected to evaluate aquifer characteristics during pump tests

and the extent of hydrocarbon contamination downgradient of the gasoline storage tanks.

Drilling Methods

Drilling and well construction took place between May 3 and 11, 1988. Boring B-5d was initially drilled using a Mobile B-57 truck-mounted drill rig operated by Datum Exploration, Inc., of Pittsburg, California. Steam-cleaned, 8-inch-diameter, continuous-flight, hollow-stem augers were used to drill this borehole to a depth of 78 feet. The hole was then reamed with 10-inch-diameter augers; however, the wells could not be completed to the total depth of the boring because of severe problems with saturated formation material seeping through the auger joints into the borehole. With Exxon's concurrence, mud-rotary drilling was used to complete the wells. The redrilling was begun by Datum Exploration using a Gardner-Denver drill rig and a 12-1/4-inch-diameter tricone drill bit and completed by Exploration Drilling Services of Redwood City, California, using a Failing F-1250 drill rig and the same sized drill bit. The hole was redrilled to 82 feet in depth to install the deeper well. A second well was not installed in the first borehole because of the possibility that the boring could collapse during the additional time necessary to install the second well casing.

Boring B-5s was drilled by Exploration Drilling Services approximately 5 feet northeast of boring B-5d. The 10-inch-diameter boring was drilled to a depth of 58 feet using the Failing F-1250 mud-rotary drill rig. Boring B-6 was drilled using a CME-55 truck-mounted drill rig operated by HEW Drilling Company, Inc., of East Palo Alto, California. Steam-cleaned, 10-inch-diameter, continuous-flight, hollow-stem augers were used to drill this borehole to a depth of 59 feet. Drilling was terminated in the second aquitard encountered in boring B-5d and at the bottom of the first aquifer in borings B-5s and B-6. Ground water was noted during drilling at depths between 38 and 41.5 feet.

Cuttings generated during drilling were stockpiled at the site. On May 13, 1988, Applied GeoSystems collected samples at three representative locations of the stockpiled soil. These samples were composited in the laboratory and tested for total petroleum hydrocarbons (TPH) using Environmental Protection Agency (EPA) Method 8015 (modified for gasoline hydrocarbons). No detectable hydrocarbons were found by the laboratory testing. Copies of the Chain of Custody Record and the laboratory Analysis Report are included in Appendix B of this report. The soil was removed from the site on May 25, 1988, by Green Brothers Truck and Tractor

Service and transported to a Class III landfill. Drilling mud is currently contained in a lined bin at the site.

Sampling and Description of Soil

Soil samples were collected and described from borings B-5d and B-6 during drilling. Soil from boring B-5s was not sampled and described because this hole was drilled adjacent to boring B-5d. The soil was continuously sampled in boring B-5d to evaluate in detail the lithology underlying the area to a depth of 80 feet. Samples were collected at 5-foot intervals from the 5-foot depth to the total depth of boring B-6.

The augers were advanced to a point immediately above the sampling depth in each boring and a California-modified, split-spoon sampler (2-1/2-inch-inside-diameter) containing either two or three 6-inch-long brass sleeves, was driven into the soil through the hollow center of the augers. The sampler was driven either 12 or 18 inches with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each 6-inch increment was counted and recorded to evaluate the relative consistency of soil materials. The samples were removed from the sampler, and the lowermost brass sleeve was immediately sealed with aluminum foil, plastic caps, and plastic

tape. The sleeves were then labeled and placed in iced storage for transport to Applied GeoSystems' laboratory in Fremont, California, for analysis.

An organic vapor meter (OVM) was used to measure relative vapor concentrations of the samples in boring B-5d. Readings were collected by placing the rubber cup that skirts the intake probe flush with the soil at the top of the lower brass sleeve. The OVM readings indicate relative organic vapor concentrations but cannot be used to assess directly the concentrations of hydrocarbon contaminants in the soil. No detectable concentrations of hydrocarbon vapor were encountered in boring B-5d. **No detectable concentrations of hydrocarbon vapor were found in boring B-6 except at the 10-foot depth.**

what ppm levels? not on boring log...

Soil contained in the middle and upper brass sleeves at each sample interval was removed from the sleeves and identified using the Unified Soil Classification System. A summary of this system is presented on Plate P-3. Descriptions of the earth materials encountered in the boreholes are shown on the Logs of Borings, Plates P-4 through P-6 and P-9 through P-10. The depth at which the samples were collected for possible laboratory analysis, the number of hammer blows required to drive the

sampler a distance of 12 inches, and the OVM readings are also shown on these logs.

Construction of Monitoring Wells

Ground-water monitoring wells MW-5d, MW-5s, and MW-6 were constructed in borings B-5d, B-5s, and B-6, respectively. The wells were constructed of 4-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing. The casing consists of screened sections with 0.020-inch-wide slots set from approximately 77.5 to 67.5 feet in well MW-5d and 55 to 40 feet in wells MW-5s and MW-6. The screened casing in well MW-5d was set across the second aquifer encountered, whereas the screened casings in wells MW-5s and MW-6 were set across the uppermost aquifer to the approximate depth of the base of the unsaturated silty clay. Well centralizers were placed near the bottoms of wells MW-5d and MW-5s. Blank casing was set from the top of the screened casing to a few inches below the ground surface. All casing joints are flush-threaded; no glues, chemical cements, or solvents were used in well construction. The top of each casing is plugged with a locking cap that contains an expandable rubber seal; the bottom of each casing has a threaded end plug.

The annular space of each well was backfilled with No. 3 size sand from the total depth of the well to approximately 1 to 3 feet above the top of the screened casing. Bentonite pellet plugs approximately 1 to 3 feet thick, were placed above the sand as seals against cement entering the sand pack, and the remaining annulus of each well was backfilled with neat cement (mixed with approximately 5 percent bentonite powder) to a few inches below the ground surface. Details of these and previous well constructions are shown in Table 1 at the end of this report. Graphic representations of the constructions of wells MW-5d, MW-5s, and MW-6 are shown in the right columns of the boring logs (Plates P-4 through P-10), and a key to the symbols used to illustrate the well constructions is shown on Plate P-3.

A cast-aluminum utility box with a PVC apron was placed over each well head and secured in place with concrete set flush with the surrounding ground surface. The utility box has a watertight seal to protect the ground-water well from infiltration of surface water and requires a specially designed wrench to open. The utility box is designed to discourage vandalism and reduce possible accidental disturbance of the well.

Development and Sampling of Wells

Wells MW-5d and MW-5s were developed on May 11, 1988, by bailing with a 20-foot-long Smeal 5T bailer operated by Exploration Drilling Services; and well MW-6 was developed on May 13, 1988, by Applied GeoSystems using air-jetting and pumping. Development was conducted to pack the annular sand and remove fine-grained materials from the wells. The wells were allowed to recharge before collecting water samples for subjective inspection. The depth to water in each well was measured to the nearest 0.01-foot with a Solinst electric water-level indicator. Samples were then collected from each well by gently lowering approximately half the length of a Teflon bailer past the air/liquid interface. The bailer was washed with Alconox (a commercial laboratory soap) and rinsed with water before use in each well. The samples were retrieved and examined for floating product, sheen, and product color. None was encountered in water from the three wells.

Wells MW-5d, MW-5s, and MW-6 were then purged by pumping to allow sampling of water that was representative of the formation. After purging, the water in each well was allowed to recharge to near static level before sampling for laboratory analyses.

Water samples were collected with a Teflon bailer that was washed with Alconox and rinsed with deionized water before use. The bailer was lowered to a point just below the air/water interface in each well to retrieve a sample of the water. The samples were slowly transferred to laboratory-cleaned, 40-milliliter, volatile organic analysis (VOA) glass sample vials; hydrochloric acid was added to minimize bacterial degradation of any hydrocarbons. The samples were immediately sealed in the vials with Teflon-lined caps, labeled, and placed in iced storage for transport to Applied GeoSystems' laboratory for testing.

LABORATORY ANALYSES AND RESULTS

Chain of Custody Records for soil and water samples were initiated during sample collection and accompanied the samples to the laboratory. Copies of these forms, which document the transfer of the soil and water samples, are included in Appendix C of this report.

The soil samples were collected from just above the water table in borings B-5d and B-6 for testing by Applied GeoSystems' laboratory. The soil samples were analyzed for TPH by EPA Method 8015 (modified for gasoline) and the hydrocarbon constituents benzene, toluene, ethylbenzene, and total xylene isomers (BTEX)

by EPA Method 8020. The analyses were performed by gas chromatography with photoionization and flame-ionization detection. The results of analyses are presented in Table 2, at the end of this report, and in the laboratory Analysis Reports in Appendix C. **The analyses show no detectable concentrations of hydrocarbons in the soil samples.**

The water samples were analyzed for TPH by EPA Method 8015 (modified for gasoline) and BTEX by EPA Method 602. The results of analyses are also presented in Table 2 and in the laboratory Analysis Reports in Appendix C. **Detectable concentrations of toluene were found in water from wells MW-5d (0.0031-ppm) and MW-5s (0.0009-ppm). These concentrations appear to be related to the introduction of hydrocarbons by the sampling equipment because no detectable concentrations of benzene, ethylbenzene, or xylenes were detected.** As discussed later in this report, no detectable hydrocarbons were found in water from these two wells during sampling in July 1988.

PRODUCT RECOVERY

Product removal from well MW-2 continued from April 21 (the last day reported in Applied GeoSystems' Report No. 018034-1) until June 1, 1988, using an automatic product-skimmer pump. (A

centrifugal pump was installed in the well on June 1 in preparation for a pump test.) Eighteen additional gallons of product were removed from well MW-2 during this time and placed in a 55-gallon drum located onsite. Approximately 1/4-gallon of product was bailed from the well on June 6, 1988. Minor amounts of product were also bailed from the well until June 17, 1988, when pump testing began. A cumulative total of slightly less than 55 gallons of hydrocarbon product have been removed since April 4, 1988, which is approximately 8.5 percent of the estimated amount (639 gallons) of product released. This product and water purged from the ground-water monitoring wells was removed from the site by Armour Petroleum Service and Equipment Corporation of Vacaville, California, on June 9, 1988.

GRADIENT AND DIRECTION OF GROUND-WATER FLOW

Wells MW-1 through MW-6 and municipal well No. 7 were surveyed using a Wild NA-24 automatic leveling instrument. The wells were surveyed to locate the wells with reference to each other and other station facilities and measure the relative differences in elevation between the leveling instrument, the top of the casing of each well, and a City of Pleasanton benchmark located on the concrete support for the pump motor of municipal well No. 7. Leveling measurements were recorded to the nearest 0.01-foot.

The depth to the static water level in each well was also measured to the nearest 0.01-foot using a Solinst electric water-level indicator. The leveling and depth-to-water measurements were combined to calculate the elevation of the water table above mean sea level and estimate the potentiometric surface of the ground water between wells MW-2 and MW-5s. The water elevation data for July 6, 1988, are presented in Table 3 at the end of this report, and the potentiometric surface is shown on the Ground-Water Potentiometric Surface Map, Plate P-11. The approximate average direction of ground-water flow on July 6 was south 63 degrees west, and the calculated gradient ranged from 0.02- to 0.05-foot per 100 feet.

PUMP TESTS

The California Regional Water Quality Control Board, San Francisco Bay Region, requested in a letter dated April 7, 1988, to Exxon that an analysis be conducted of the potential effect that pumping municipal well No. 7 would have on the migration of dissolved and free-floating hydrocarbon product and on efforts to contain and mitigate the presently detected contamination. Exxon responded in a letter dated April 27, 1988, that two pump tests would be performed: one at an onsite well and one at municipal well No. 7.

The purpose of the two pump tests was to provide information on the hydraulic properties of the aquifer system(s) including any boundary conditions, fluid transport characteristics, and basic parameters for designing an appropriate extraction system to contain and remove the hydrocarbon contamination. Well MW-2 was selected as the pumping well for the onsite pump test because this well is upgradient of the product release and contained the only hydrocarbon concentrations of concern when installed. This well was also selected for pumping to avoid drawing contamination toward municipal well No. 7. The pump test of well No. 7 was conducted to evaluate if 1) a hydraulic relationship exists between the shallowest aquifer, in which hydrocarbon contamination occurs beneath the Exxon site, and deeper aquifers penetrated by well No. 7 and 2) pumping of well No. 7 would induce vertical and lateral migration of hydrocarbon contaminants toward the well.

Authorization to discharge to the sanitary sewer was required before the pump test on well MW-2 could be conducted. The application process required some negotiation of permit conditions; however, approval was granted by the Dublin-San Ramon Services District (DSRSD) on June 15, 1988, and the temporary permit was effective until June 30, 1988. A copy of the

Wastewater Discharge Permit with conditions of approval is included Appendix D.

As a result of the negotiations on the discharge permit conditions, the originally installed system to treat the pumped fluids had to be modified. The treatment system for the pump test of well MW-2 included a 250-gallon oil/water separator tank followed by two 1,000-pound carbon filtration units connected in series. The oil/water separator was intended to remove free-floating product that may be pumped, and the carbon units were used to remove dissolved hydrocarbons to a level below the maximum concentrations allowed by the DSRSD for discharge to the sanitary sewer. Two sump pumps were installed in the oil/water separator tank to pump fluids through the carbon filtration units. The treatment system also included a flow meter and fluid sampling ports placed between the well and the oil/water separator, between the separator and first carbon unit, and between the first and second carbon units.

Pump Test of Well MW-2

Startup Pumping Phase

The pump test of well MW-2 involved two phases: a startup pumping phase and the pump test phase. The startup pumping phase was conducted on June 17, 1988, to estimate an appropriate pump rate and collect effluent samples for the laboratory testing required by conditions of the Wastewater Discharge Permit. The discharge fluid from the carbon filtration units was pumped into a 6,500-gallon holding tank. At the end of the pumping period, this effluent was sampled from the tank outlet. Representatives of the DSRSD were also present to collect duplicate samples of effluent from the holding tank.

The samples were collected in containers with preservatives appropriate for the types of analyses required. The containers were filled slowly and completely, sealed with appropriately lined caps, and labeled. The samples were placed on ice and transported to the laboratories of Clayton Environmental Consultants, Inc., in Pleasanton, California, and Applied GeoSystems in Fremont, California, for testing. Chain of Custody Records were initiated in the field and accompanied the samples

to the laboratories. Copies of these forms are included in Appendix D.

The analytical results of the compounds and the maximum concentrations allowed by the DSRSD are shown in Table 4 at the end of this report, and the laboratory reports are included in Appendix D. Concentrations of the tested constituents in the treated effluent were less than the maximum concentrations defined in the Wastewater Discharge Permit. These results were verbally transmitted to personnel of the DSRSD on June 22, 1988, who verbally gave authorization to discharge the treated fluids into the sanitary sewer.

Pump Test Phase

The pump test of well MW-2 was conducted from 8:20 p.m. on June 23, 1988, to 5:42 p.m. on June 24, 1988, a period of 21 hours and 22 minutes. A 5-horsepower submersible pump was set at an approximate depth of 50 feet, and the well was pumped at a rate of approximately 20 gallons per minute (gpm). Exxon requested that drawdown in well MW-2 be limited to minimize 1) migration of hydrocarbon vapors through the unsaturated portion of the aquifer within the cone of depression and 2) pellicular contamination in the dewatered unsaturated zone. The pump rate was gradually

reduced during the test to limit this drawdown, and was approximately 15.2 gpm by the end of the test. Wells MW-1 through MW-6 and municipal well No. 7 were used as observation wells and were monitored to record the water level during pumping. The water level was measured to the nearest 0.01-foot with a Solinst water-level indicator; measurements were made at time intervals ranging from 1/2-minute to 2 hours.

The data from municipal well No. 7 indicated that drawdown in this well may be related to pumping of nearby water supply-wells. Applied GeoSystems later confirmed that Hopyard well No. 4 (well D2 on Plate P-1), approximately 800 feet northeast of municipal well No. 7, was operating during June 23 and 24. This well, operated by Zone 7 of the Alameda County Flood Control and Water Conservation District, pumps approximately 700 gpm (daily field records provided by G. DeWitt, July 1988). The water level in well No. 7 was measured for an additional 6 hours (until 11:42 p.m. on June 24) after pumping was stopped in well MW-2. Measurements of water levels in the pumping and observation wells are presented on the pump test field data sheets in Appendix E.

Four samples were collected of the effluent from well MW-2 during the pump test to evaluate the effectiveness of the treatment system. Approximately 3 hours after pumping started, the

effluent was sampled using procedures described earlier in this report. Samples were collected immediately after the effluent exited the well, after it exited the oil/water separator, after it passed through the first carbon filtration unit, and after the effluent passed through the second carbon filtration unit. The samples were transported on ice to Applied GeoSystems' laboratory. A copy of the Chain of Custody Record is included in Appendix F.

The water samples were analyzed for TPH by EPA Method 8015 (modified for gasoline) and BTEX by EPA Method 602. The analytical results are presented in Table 5 at the end of this report, and in the laboratory Analysis Reports included in Appendix F. The analytical results indicate that relatively low concentrations of hydrocarbons were in the water pumped from the well and no detectable concentrations of hydrocarbons were contained in effluent entering the sanitary sewer system.

A total of 25,547 gallons was pumped and treated during the two phases of pumping. No free-floating product was observed in the oil/water separator during pumping, and no free-floating product or product sheen were found in well MW-2 when the pump test was concluded.

Pump Test of Municipal Well No. 7

The pump test of municipal well No. 7 was conducted from 1:05 p.m. on June 28, 1988, to 6:10 p.m. on June 29, 1988, a period of 29 hours and 5 minutes. The pump in Hopyard well No. 4 was turned off several hours before conducting the pump test to eliminate possible influences from pumping this well. Well No. 7 contains a single bowl suction-type pump set at a depth of approximately 200 feet (J. Taylor, verbal communication., July 1988). After 25 minutes of pumping, the extraction rate stabilized at approximately 1,630 gpm. This rate increased gradually to 1,900 gpm after 960 minutes of pumping and then decreased gradually to 1,720 gpm at the end of pumping. The average pumping rate was approximately 1,775 gpm. The water levels in this well and observation wells MW-1 through MW-4, MW-5d, MW-5s, and MW-6 were monitored for the 29-hour period at the same time intervals as for the pump test of well MW-2. Measurements of water levels are presented on the pump test field data sheets in Appendix G.

Subsequent to the pump test, a recovery test was performed to collect additional data for analysis. The rate of recovery was monitored in well No. 7 and observation wells MW-5d and MW-5s, the closest observation wells. Measurements were made at time

intervals ranging from 1/2- to 15 minutes, for a total of 45 minutes, at which time the water level in well No. 7 had recovered to approximately 87 percent of the initial static water level. No change in the water level was observed in wells MW-5d and MW-5s during the 45-minute recovery period. Measurements made during recovery are presented on pump test field data sheets in Appendix G.

Analysis of Pump Test Results for Well MW-2

The elapsed time and related drawdown measurements collected during the pump test of well MW-2 were reviewed to evaluate aquifer characteristics and potential boundary conditions. The data set from this pump test shows no elastic relationship between drawdown and elapsed time, but does reflect a time-lag response commonly observed in an unconfined aquifer; therefore, a curve matching method was used to analyze aquifer parameters. Type A (early yield) and type B (late yield) curves developed by Boulton (1963) and the type curve developed by Stallman (1965) for wells perforated through approximately 90 percent of the aquifer were used to calculate transmissivity (Lohman, 1972).

Data for the first 360 minutes were used for analysis of drawdown at well MW-2 because a constant pump rate was maintained during

this time. The maximum drawdown observed during this time was 5.69 feet. An average transmissivity value of 575 gallons per day per foot of aquifer was calculated using Boulton's and Stallman's type curves. This value appears to be low for an aquifer providing a yield of 20 gpm or more. The time-versus-drawdown plot, appropriate type curves, and calculations for transmissivity are presented on Plate P-12.

Time and drawdown data in observation wells MW-1, MW-3, MW-4, MW-5d, MW-5s, and MW-6 reflect a delay yield response in an unconfined aquifer. Among these observation wells, only well MW-6 provides useful data for analysis. Maximum drawdown in this well was 0.15-foot. Analysis of the data from the other wells was not possible because of the short response time, the slight amount of drawdown, and the fluctuation of the water level observed in these wells.

Type curves of Boulton and Stallman (Lohman, 1972) were used to analyze drawdown in well MW-6 and calculate transmissivity and specific yield. Average values for these parameters are 5.4×10^4 gallons per day per foot and 0.16, respectively. The time-versus-drawdown plot, appropriate type curves, and calculations for transmissivity and specific yield are presented on Plate P-13. These values appear realistic for the sand and

from the pump test and recovery data is 3.77×10^5 gallons per day per foot. A value of the coefficient of storage is not readily calculated from data collected from a single well (No. 7) because storage coefficient is a volumetric parameter. None of the project-related observation wells, which could provide the data for such a calculation, penetrate the deep aquifer(s). The plot of residual drawdown versus t/t' and calculation of transmissivity are shown on Plate P-17.

A drop in water level in the observation wells was first recorded 5 hours after pumping started. A slight increase in drawdown was observed in these wells (MW-1 through MW-4, MW-5d, MW-5s, and MW-6) for the initial 22 hours of pumping, and a decrease in drawdown was observed during the final 7 hours of pumping. Water levels in the wells were nearly the same at the end of pumping as at the start of the test. Maximum drawdown was 0.1-foot in observation wells MW-1, MW-3, and MW-5s; 0.09-foot in wells MW-2 and MW-5d; and 0.08-foot in wells MW-4 and MW-6. A hydrograph showing the water levels in wells MW-1 through MW-4, MW-5d, and MW-5s during the pump test is shown on Plate P-18.

The fluctuation of water levels in the above-mentioned wells indicates no apparent hydraulic response of the uppermost aquifer to pumping the deeper aquifer(s). Changes in the water

gravel materials of the uppermost aquifer. Typical values of transmissivity for sand and gravel aquifers range from 1 x 10^3 to 1 x 10^4 gallons per day per foot (Heath, 1983). Typical values for specific yield of unconfined sand and gravel aquifers range from 0.15 to 0.25 (Driscoll, 1986).

Drawdown in well No. 7 did not correspond with drawdown in the shallow observation wells. Approximately 1.02 feet of drawdown was observed during the pump test, and an additional drop of 0.27-foot occurred after the pump test. The total drop in water level in well No. 7 during the 28 hours of measurement was 1.29 feet. On a semi-logarithmic plot, the data indicate that a linear relationship exists between time and drawdown in well No. 7 and implies an elastic response in the aquifer(s) penetrated by well No. 7. The aquifer(s) also appears to be under a confined condition, and a possible impermeable boundary was encountered at approximately 13 hours into the test. The data indicate that the aquifer monitored in well No. 7 appears to be isolated from the aquifer pumped from well MW-2. The time-versus-drawdown plot for well No. 7 is presented on Plate P-14.

Data of the drawdown and distance from the pumped well are shown on a semi-logarithmic plot on Plate P-15. Drawdown after 720 minutes of pumping are shown for observation wells MW-1, MW-3,

MW-4, MW-5s, and MW-6. The drawdown at this time likely occurred during the last stage of the delay yield response, which reflects pumping from the aquifer. The plot shows that the projected distance to zero drawdown, or the radius of influence, is approximately 680 feet from well MW-2.

As noted above, the drop in water level in well No. 7 during and after pumping in well MW-2 was possibly related to pumping of nearby Hopyard well No. 4. This well was pumped continuously from June 11, 1988, through the 2 days of the pump test. Values for transmissivity and the coefficient of storage would most likely not be meaningful because information on lithology and well construction of Hopyard well No. 4 was not available within the time constraints of this investigation.

The theoretical drawdown in well MW-2 (i.e., well efficiency) at an elapsed time of 300 minutes was calculated using the transmissivity and specific yield data generated from observation well MW-6. Drawdown observed in well MW-2 was caused by pumping from the aquifer, turbulent flow in the well bore (i.e., skin effect) as a result of a higher pumping rate, and frictional loss through the discharge piping connected to the submersible pump. The drawdown in well MW-2 because of pumping from the aquifer was calculated to be 0.49-foot (see calculation in

Appendix H). This value, when compared to the observed 5.69 feet of drawdown, indicates a low efficiency (9 percent) of well performance. Approximately 91 percent of the observed drawdown in well MW-2 was related to the skin effect and frictional loss and also resulted in apparently unrealistically low values of transmissivity.

Analysis of Pump Test Results for Well No. 7

Maximum drawdown in well No. 7 was 7.6 feet after 18 hours, when the maximum discharge rate was reached. This drawdown decreased gradually after this time. The time and drawdown data collected from the pumping well (No. 7) show a nearly linear relationship on a semi-logarithmic plot. Cooper and Jacob's (1946) straight-line method was used to calculate the transmissivity of the deep aquifer(s) which is approximately 2.34×10^5 gallons per day per foot. The time-versus-drawdown plot and calculation for transmissivity are shown on Plate P-16.

Residual drawdown in well No. 7 during the recovery test was plotted versus the ratio of the time since pumping started to the elapsed time since pumping stopped (t/t'). Transmissivity calculated from the recovery test is approximately 5.2×10^5 gallons per day per foot. The average value for transmissivity

level in the observation wells appear to have been affected by variation in barometric pressure (which is dependent on the daily variation in temperature) rather than by pumping well No. 7. Plate P-18 illustrates the minimal fluctuation of water levels in the wells and the correlative fluctuation in the water levels in wells at various distances from the pumped well. The test results indicate that the deep aquifer(s) pumped by well No. 7 do not appear to be in hydraulic communication with the uppermost aquifer that is affected by the hydrocarbon contamination.

SEE pg. 37

DESCRIPTION OF LOCAL HYDROGEOLOGY

The sediments encountered during drilling for our Phase I investigation (wells MW-1 through MW-4 and boring B-4) included unsaturated silty clay and clayey silt from the ground surface to approximate depths of 37 to 39 feet. A relatively thin silty sand unit was also found in the five boreholes at depths between 7 and 12 feet, which indicated that this unit appears to be relatively continuous across the site. No other sandy units were encountered in the boreholes until the uppermost aquifer was encountered between 37 to 39 feet. The aquifer materials found between 40 and 60 feet deep included clayey and gravelly sand, sand, clayey gravel, and gravel. Clay was encountered at

approximately 59.5 feet in the borehole drilled for well MW-3 (AGS Report No. 018034-1, dated April 22, 1988).

A similar lithologic sequence was encountered in the borehole drilled for well MW-6 during this Phase II investigation. The silty clay was found to be 40 feet deep; a thin sand unit occurs at the 10- to 15-foot depths; and the aquifer consists of gravel to 57 feet. Silty clay was found in this borehole from 57 feet to the total depth of the borehole at 59 feet.

Boring B-5d was continuously cored to a depth of 78 feet. Silty clay was found in this borehole to 41 feet deep. The aquifer materials below this unit include clayey sand, which grades to medium-grained sand with depth, and clayey gravel, which grades with depth to fine- to coarse-grained gravel to a depth of 55 feet. A second unit of silty clay and clayey silt was found between 55 and 67 feet; and a second aquifer consisting of clayey sand, sand, and silty sand was encountered between 67 feet and the total depth of the borehole at 82 feet. The lithologic description of [redacted] (AGS Report No. 018034-1) also indicates clayey sediments to a depth of approximately 47 feet, clay and gravel units to a depth of 59 feet, and gravel to 81 feet. Clay and gravel units were reported between 81 and 116 feet, and gravel was reported between 116 and 134 feet.

Based on the drilling conducted thus far, the relatively impermeable clay and silt appears areally continuous across the site and north to the area of municipal well No. 7. The thickness of this unit ranges from 37 to 47 feet. [redacted] aquifer that underlies the clay and silt also appears to be areally continuous on and off the site. This unit is up to 20 feet thick beneath the site and may be 30 feet thick in the area of well No. 7. Ground water in this aquifer may at times be under slightly confined conditions. The top of the second silty clay was found at approximately 55 to 60 feet in borings drilled for wells MW-3, MW-5d, and MW-6. The thickness of this unit is approximately 12 feet in the area of well MW-5d. The thickness of the second aquifer encountered in well MW-5d is at least 15 feet.

The areal extent of the second silty clay unit cannot be fully evaluated based on the drilling conducted to date, but also appears continuous in the area of investigation. The water levels in wells MW-5d, which is screened across a deeper aquifer, and MW-5s, which is screened across the uppermost aquifer, are nearly equal. The similar water level may indicate that the second silty clay unit may not be laterally extensive outside the area of this study, and that the first and second aquifers encountered in well MW-5d are probably connected

somewhere in the basin. The distribution of geologic units between well MW-2 and municipal well No. 7 is shown on Hydrogeologic Cross Section A-A' in Plate P-19.

PERIODIC SAMPLING OF WELLS

Periodic sampling of the water in the ground-water monitoring wells has been performed since April 1988. This sampling has been conducted for both subjective and laboratory analyses. Subjective analyses include measurements of the depth to water in wells and inspection of the water for floating hydrocarbon product and sheen following procedures described earlier in this report. Cumulative results of the subjective analyses conducted between April 6 and July 6, 1988 are presented in Table 6 at the end of this report.

Exxon indicated in a letter dated June 17, 1988, to the California Regional Water Quality Control Board that periodic sampling for analytical testing will be conducted on a weekly basis for 4 weeks. Subsequent sampling intervals will be selected based on the results of this weekly sampling. Water samples were collected from well MW-6 on June 28, 1988, and from wells MW-1 through MW-4, MW-5d, and MW-5s on July 6, 1988. Well

MW-6 was purged by Applied GeoSystems using a submersible pump; the remaining wells were purged with a Smeal 5T bailer operated by Exploration Drilling Services. The procedures used to purge, sample, and analyze the water samples are described earlier in this report; the analytical results are presented in Table 7 at the end of this report. Copies of the Chain of Custody Records and Analysis Reports from Applied GeoSystems' laboratory are included in Appendix I.

The results of subjective monitoring show that no floating product or sheen has been detected in wells MW-1, MW-3, MW-4, MW-5d, MW-5s, and MW-6. More than 3 feet of product was found in well MW-2 on April 6, 1988; however, free-floating product no longer occurs in this well as a result of product removal between April 4 and June 1, 1988, and pump testing of this well on June 17 and 23 through 24, 1988. No product sheen was found in this well on June 28, 1988, and only a slight product sheen was found on July 6, 1988.

Analytical results of the sampling event on July 6 show no detectable concentrations of the aromatic hydrocarbon compounds or gasoline-related total petroleum hydrocarbons except in water from wells MW-2 (as expected) and MW-6. The ratio of benzene to other constituents in water from MW-6 indicates the contamination

is most likely present as a result of vapor transport rather than liquid transport. The distribution of dissolved concentrations of benzene, toluene, and total petroleum hydrocarbons are shown on Plates P-20 through P-22, respectively. The plates illustrate the relatively restricted extent of the contamination beneath the site.

SUMMARY AND CONCLUSIONS

A total of seven ground-water monitoring wells have been installed at and near the site during two investigations. Based on the soil boring data, an unsaturated unit extends from the ground surface to a depth of approximately 40 feet and comprises predominantly silty clay. This unit is underlain by the uppermost aquifer, which is approximately 15 to 20 feet thick and consists mostly of sand and gravel. These two units appear to be areally extensive in the vicinity of the site. Beneath the aquifer (between the 55- and 67-foot depths), a 12-foot-thick layer of silty clay was found in boring B-5d. A clay unit was also found in boring B-3 at 59 feet below grade. A second aquifer was encountered immediately below the clay (67-foot depth) in boring B-5d. The areal extent of this second aquifer and the overlying clay is not known because of a lack of deeper lithologic data, but may be continuous in the area of the site.

The general direction of ground-water flow between early April and early July 1988 has varied from northwest to southwest, and the ground-water gradient has ranged from 0.02- to 0.19-foot per 100 feet. Static water levels in wells MW-1 through MW-6 have fallen 2 to 3 feet between April and July, which is probably caused by excess withdrawal of ground water from municipal and other water-supply wells in the vicinity of the site. The first aquifer may be under a slightly confined condition when the potentiometric surface in wells is above the base of the unsaturated silty clay (37 to 39 feet below the ground surface), but it is probably unconfined during periods of greater ground-water withdrawal and lower water levels.

SEE PG. 31

Wells MW-5s and MW-5d are perforated in the intervals of the uppermost and second aquifers, respectively. Static water levels in these wells, however, are nearly the same, indicating that these two aquifers are probably connected outside the area of this investigation. The clay unit separating the two aquifers is probably not regionally extensive and does not behave as an aquitard within the ground-water basin. Such phenomena are commonly encountered in heterogeneous water-bearing formations.

Approximately 55 gallons of floating hydrocarbon product was removed from well MW-2 between April 6 and June 17, 1988. The

thickness of product in this well was reduced from more than 3 feet to 1.5 inches during this time, and the remainder of this product was removed during pumping of well MW-2. Only a slight product sheen was found on the water in well MW-2 approximately 2 weeks after pumping stopped. In our Report No. 018034-1, we concluded that the majority of the estimated 639 gallons of product released is adsorbed to the particles of the unsaturated, silty clay that occurs between the underground storage tanks and the uppermost aquifer. The elimination of free-floating product from well MW-2 by removing only 8.5 percent of the estimated amount released supports this conclusion.

In our opinion, the extent of detectable concentrations of dissolved hydrocarbons in ground water is restricted to the area between wells MW-2 and MW-6. The concentrations detected in water in well MW-6 may be the result of hydrocarbons migrating either in dissolved form in ground water or as soil vapor with subsequent dissolution into the ground water. The latter method of transport may be more likely because hydrocarbons in soil vapor were found at the 33-foot depth in mid-April; no detectable hydrocarbons were found in water from well MW-6 when sampled on May 13; and pumping of well MW-2 on June 17, 23, and 24 would have helped slow or temporarily reverse the migration of the dissolved hydrocarbons.

The pump test of well MW-2 was conducted for 21 hours and 22 minutes on June 23 and 24, 1988, approximately 6 hours of which was at a constant pumping rate of 20 gpm. The drawdown and time relationship in the uppermost aquifer exhibited a delay yield from storage-type response which is commonly observed in an unconfined aquifer. Data from this pump test were analyzed using a curve-matching technique because the data show no elastic relationship between drawdown and elapsed time. The average value of transmissivity of the uppermost aquifer calculated from drawdown in well MW-2 is 575 gallons per day per foot. This value appears unrealistically low and, in our opinion, is the result of head losses from turbulent flow in the well and friction in the piping of the discharge system. The theoretical drawdown in well MW-2 because of pumping from the aquifer is calculated to have been 0.49-foot after 300 minutes of pumping, whereas the observed drawdown in the well was 5.69 feet. A comparison of these values indicates a low efficiency (9 percent) of well performance and that 91 percent of the observed drawdown is due to frictional losses.

Drawdown and time data from observation well MW-6 were used to calculate both transmissivity and specific yield of the uppermost aquifer. Average values for these parameters are 5.4×10^5 gallons per day per foot and 0.16, respectively. These values

correspond to typical values for sand and gravel aquifers. Responses were measured in observation wells MW-1, MW-3, MW-4, MW-5d, and MW-5s, but these data could not be analyzed because of the short time of response and slight amount of drawdown. Distance and drawdown data from the observation wells after 720 minutes of pumping indicate a radius of influence of approximately 680 feet. Such a radius would be more than adequate to reverse the direction of migration of any potential hydrocarbon contamination detected so far.

Drawdown in municipal well No. 7 did not correspond to drawdown in the other observation wells and, in our opinion, was related to pumping of nearby Hopyard well No. 4. The water level in well No. 7 continued to decrease for at least 6 hours after pumping in well MW-2 stopped. The time and drawdown data from well MW-7 indicate an elastic response from the aquifer(s) penetrated by this well and that the aquifer(s) appears to be confined. The data from the pump test of well MW-2 indicate that the uppermost aquifer penetrated by wells MW-1 through MW-6 is isolated from the deeper aquifer(s) from which water is withdrawn in well No. 7.

The pump test of municipal well No. 7 was conducted for 29 hours and 5 minutes on June 28 and 29, 1988. The average discharge

rate during the test was 1,775 gpm. The drawdown and time measured in well No. 7 during both the pumping and recovery tests show a nearly linear relationship on a semi-logarithmic plot and transmissivities were calculated using the straight-line method. Average transmissivity of the deeper aquifer(s) is 3.77×10^5 gallons per day per foot.

Changes in the water level in observation wells MW-1 through MW-6 showed no relationship to pumping in well No. 7; rather, water-level fluctuations appear to be related to normal changes in the barometric pressure (in turn, dependent on variation in temperature) during the day and night. The fluctuation in water level in the observation wells at various distances from well No. 7 was minimal and correlative during the test.

The results of the pump test of well No. 7 corroborate the results of the pump test of well MW-2 to support the conclusion that the uppermost aquifer is not in hydraulic communication with the deeper aquifer(s) penetrated by municipal well No. 7. In our opinion, the hydrocarbon contamination detected in the uppermost aquifer is unlikely to pose a threat to this deeper aquifer(s), and use of well No. 7 is unlikely to affect efforts to mitigate ground-water contamination in the uppermost aquifer.

REFERENCES CITED

Boulton, N. S., 1963, Analysis of data from non-equilibrium pumping tests allowing for delayed yield from storage: Inst. Civil Engineers Proc. [London], v. 26 p., 469-482.

Cooper, H. H., Jr., and Jacob, C. E., 1946, A generalized graphical method for evaluating formation constants and summarizing well-field history: Am. Geophys. Union Trans., v. 27, no. 4, p. 526-534.

Driscoll, F. G., 1986, Groundwater and wells: 2nd ed., St. Paul, Johnson Division, 1089 p.

Heath, R. C., 1983, Basic ground-water hydrology: U.S. Geological Survey Water-Supply Paper 2220, 84 p.

Lohman, S. W., 1972, Ground-water hydraulics: U.S. Geological Survey Professional Paper 708, 70 p.

Stallman, R. W., 1965, Effects of water-table conditions on water-level changes near pumping wells: Water Resources Research, v. 1, no. 2, p. 295-312.

TABLE 1
DETAILS OF WELL CONSTRUCTIONS
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

Well	Diameter	Total Depth	Top of Screen	Top of Sand Pack	Top of Bentonite
MW-1	4	57	32	30	28
MW-2	4	57	37	34	32
MW-3	4	56	36	35	34
MW-4	4	57	37	36	35
MW-5d	4	77.5	67.5	64	61
MW-5s	4	55	40	37.5	34
MW-6	4	55	40	36	35

Wells MW-5d, MW-5s, and MW-6 were installed during this phase. The diameter of each well is in inches; all other values are in feet below the existing ground surface.

TABLE 2
ANALYTICAL RESULTS OF SOIL AND WATER SAMPLES
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California
(Collected during May 1988)

Sample No.	TPH	B	T	E	X
SOIL					
S-40-B5*	<2	<0.05	<0.05	<0.05	<0.05
S-36-B6	<2	<0.05	<0.05	<0.05	<0.05
WATER					
W-39-MW5a	<0.02	<0.0005	0.0031	<0.0005	<0.0005
W-39-MW5b	<0.02	<0.0005	0.0009	<0.0005	<0.0005
W-40-MW6	<0.02	<0.0005	<0.0005	<0.0005	<0.0005

Results in parts per million (ppm)
TPH = Total petroleum hydrocarbons; B = benzene; T = toluene; E = ethylbenzene; X = total xylene isomers
* = Sample collected from borehole drilled for well MW-5d
< = Less than the laboratory detection limit for the method of analysis
Well MW-5a = MW-5d; well MW-5b = MW-5s

TABLE 3
DIFFERENCES IN GROUND-WATER ELEVATIONS
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California
(Measured on July 6, 1988)

Monitoring Well	Elevation of Top of Casing	Static Water Level	Elevation of Static Water
MW-1	321.72	39.73	281.99
MW-2	322.29	40.31	281.98
MW-3	322.56	40.60	281.96
MW-4	321.85	39.85	282.00
MW-5d	322.07	40.69	281.38
MW-5s	322.42	40.45	281.97
MW-6	322.28	--	--

Measurements are in feet.
Static water level is in feet below top of casing.
Elevations are in feet above mean sea level.
-- = Not measured

TABLE 4
ANALYTICAL RESULTS OF TREATED EFFLUENT
(Sample W-Effluent)
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California
(Sampled June 17, 1988)

Analyte	Concentration	DSRSD Concentration
Arsenic	0.06	1.0
Cadmium	0.007	1.0
Chromium (total)	0.016	5.0
Copper	<0.05	10.0
Lead	<0.1	2.0
Mercury	<0.0005	0.5
Nickel	0.41	5.0
Silver	<0.01	2.0
Zinc	<0.01	10.0
Cyanide	0.04	1.0
Phenols	<0.005	5.0
Fluoride	0.12	5.0
Oil and grease	2.0	200.0
Organochlorine pesticides and PCBs	<0.001	0.01
Chlorinated hydrocarbons	<0.0039	0.02
Total petroleum hydrocarbons*	<0.02	2.0
Benzene*	<0.0005	
Toluene*	<0.0005	NA
Ethylbenzene*	<0.0005	NA
Total xylene isomers*	<0.0005	NA
pH	8.0	11.0 maximum/6.0 minimum

Results in milligrams per liter (mg/l) = parts per million (ppm); pH value is in pH units
DSRSD Concentration = Dublin-San Ramon Services District maximum concentration allowed for wastewater discharge
< = less than the method detection limit of the laboratory
* Analyses performed by Applied GeoSystems; other analyses performed by Clayton Environmental Consultants, Inc.
NA = Not available

TABLE 5
ANALYTICAL RESULTS OF PUMPED FLUIDS
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California
(Sampled during pump test of MW-2 on June 23, 1988)

Sample No.	TPH	B	T	E	X
W-Initial	2.35	0.194	0.307	0.051	0.270
W-Separator	2.03	0.160	0.251	0.042	0.237
W-C1	<0.02	<0.0005	<0.0005	<0.0005	<0.0005
W-Effluent	<0.02	<0.0005	<0.0005	<0.0005	<0.0005

Results in milligrams per liter (mg/l) = parts per million (ppm)
TPH = Total petroleum hydrocarbons; B = benzene; T = toluene; E = ethylbenzene; X = total xylene isomers
W-Initial = untreated well water; W-Separator = water exiting oil/water separator; W-C1 = water exiting the first carbon filtration unit; W-Effluent = water exiting the second carbon filtration unit

TABLE 6
SUBJECTIVE ANALYTICAL RESULTS OF WATER IN WELLS
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California
(page 1 of 2)

Well/Boring	Date	Depth to Water	Floating Product	Sheen
MW-1	4/6/88	36.34	None	None
	4/8/88	36.29	None	None
	4/19/88	36.36	None	None
	6/6/88	38.16	None	None
	6/23/88	38.71	None	None
	6/28/88	39.16	--	--
	7/6/88	39.73	None	None
MW-2	4/2/88	--	3.0	Heavy
	4/4/88	--	18.0	Heavy
	4/5/88	--	18.0	Heavy
	4/6/88	39.31	38.4	Heavy
	4/8/88	--*	--*	--*
	4/19/88	38.90	29.76**	Heavy
	6/6/88	38.78	3.12	Heavy
	6/23/88	39.23	1.50	Heavy
	6/28/88	39.72	--	--
	7/6/88	40.31	None	Slight
MW-3	4/6/88	37.19	None	None
	4/8/88	37.14	None	None
	4/19/88	37.22	None	None
	6/6/88	39.02	None	None
	6/23/88	39.58	None	None
	6/28/88	40.04	--	--
	7/6/88	40.60	None	None
MW-4	4/8/88	36.41	None	None
	4/19/88	36.51	None	None
	6/6/88	38.26	None	None
	6/23/88	38.83	None	None
	6/28/88	39.28	--	--
(continued)	7/6/88	39.85	None	None

TABLE 6
SUBJECTIVE ANALYTICAL RESULTS OF WATER IN WELLS
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California
(page 2 of 2)

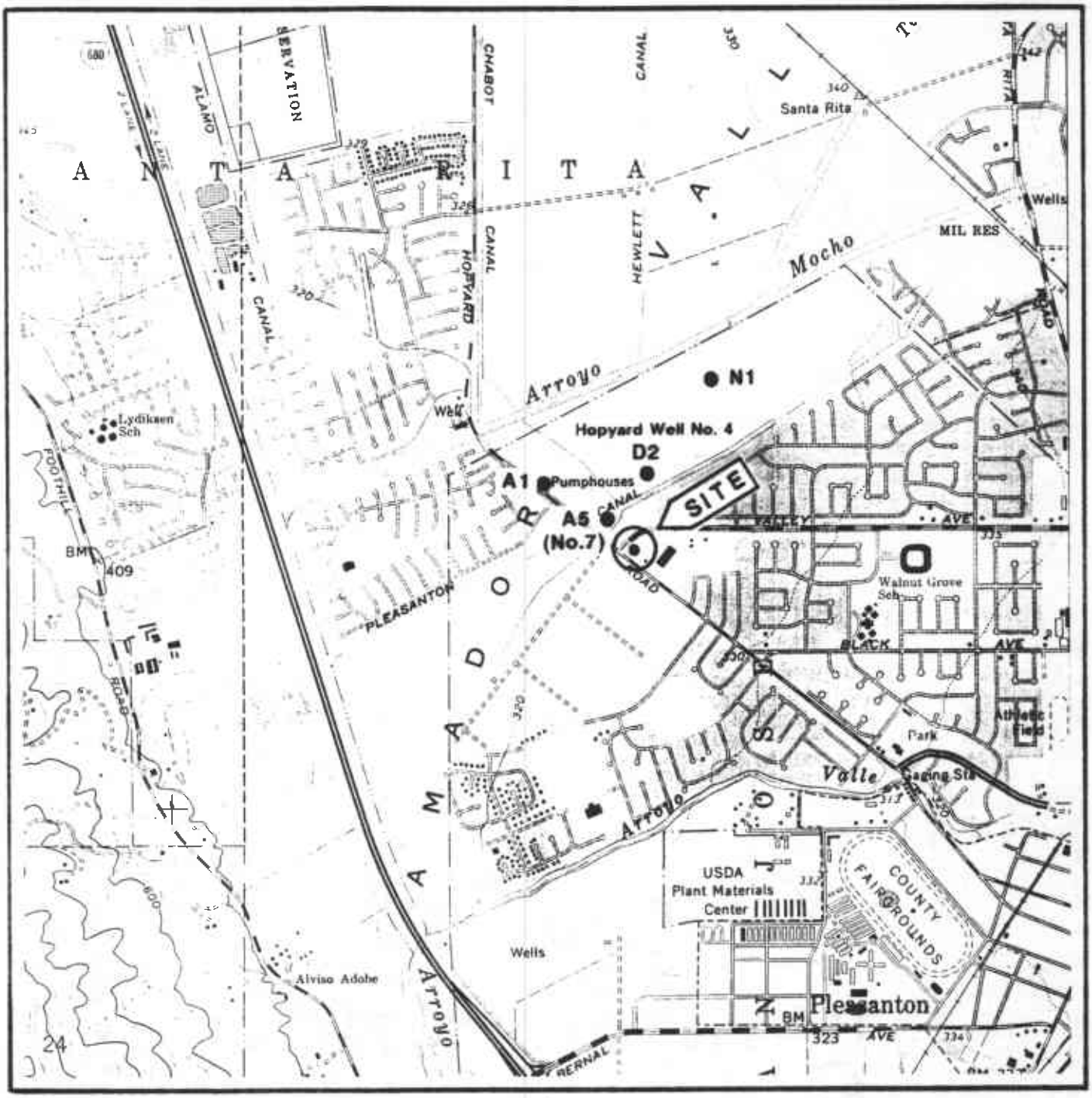
Well/Boring	Date	Depth to Water	Floating Product	Sheen
B-4	4/2/88	--	None	None
MW-5d	5/25/88	38.55	None	None
	6/6/88	38.90	None	None
	6/23/88	39.56	None	None
	6/28/88	40.23	--	--
	7/6/88	40.69	None	None
MW-5s	5/25/88	38.46	None	None
	6/6/88	38.86	None	None
	6/23/88	39.52	None	None
	6/28/88	39.84	--	--
	7/6/88	40.45	None	None
MW-6	5/11/88	37.71	None	None
	6/6/88	38.70	None	None
	6/23/88	39.23	None	None
	6/28/88	39.74	None	None

Depth to water is in feet below top of casing.
Thickness of floating product is in inches.
-- = Not measured
* = Not measured because of installed product-skimmer pump
** = Thickness of floating product after the well was allowed to recharge for approximately 3 hours.

TABLE 7
ANALYTICAL RESULTS OF WATER SAMPLES
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California
Sampled July 6, 1988

Sample No.	TPH	B	T	E	X
W-40-MW1	<0.02	<0.0005	<0.0005	<0.0005	<0.0005
W-41-MW2	62	5.7	18.5	2.9	21.4
W-41-MW3	<0.02	<0.0005	<0.0005	<0.0005	<0.0005
W-41-MW4	<0.02	<0.0005	<0.0005	<0.0005	<0.0005
W-41-MW5d	<0.02	<0.0005	<0.0005	<0.0005	<0.0005
W-41-MW5s	<0.02	<0.0005	<0.0005	<0.0005	<0.0005
W-38-MW6	0.44	0.0318	0.0075	0.0054	0.0067

Results in parts per million (ppm).
TPH = Total petroleum hydrocarbons; B = benzene; T = toluene; E = ethylbenzene; X = total xylene isomers
< = Less than the laboratory detection limit for the method of analysis



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

● = Water-supply well

N

Approximate Scale

2000 1000 0 2000 4000

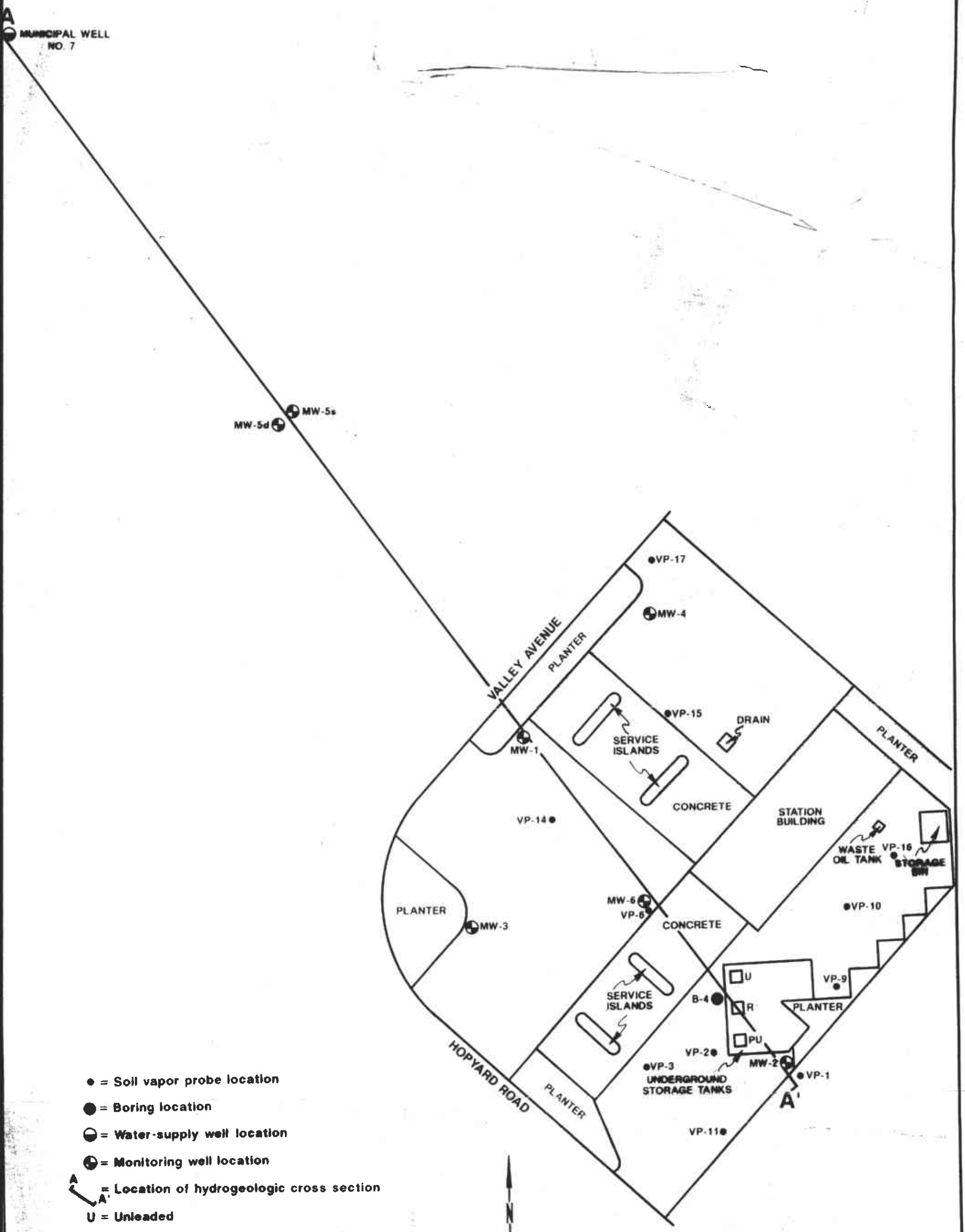
feet

Applied GeoSystems

PROJECT NO. 18034-2

SITE VICINITY MAP
Exxon Station No. 7-3399
2001 Hopyard Road
Pleasanton, California

PLATE
P - 1



● = Soil vapor probe location

● = Boring location

◒ = Water-supply well location

◔ = Monitoring well location

A — A' = Location of hydrogeologic cross section

U = Unleaded

R = Regular

PU = Premium Unleaded

Source: Measured by transit, compass and stadia

PLATE	GENERALIZED SITE PLAN	Applied GeoSystems
P - 2	Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California	PROJECT NO. 18034-2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		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 mixture, little or no fines
		GM	Silty gravels, gravel-sand-clay mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands 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 DIVISIONS		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.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.

Depth through which sampler is driven

Relatively undisturbed sample

Missed sample

Ground water level observed in boring

S-10 Sample number

< > Centralizer

Sand pack

Bentonite annular seal

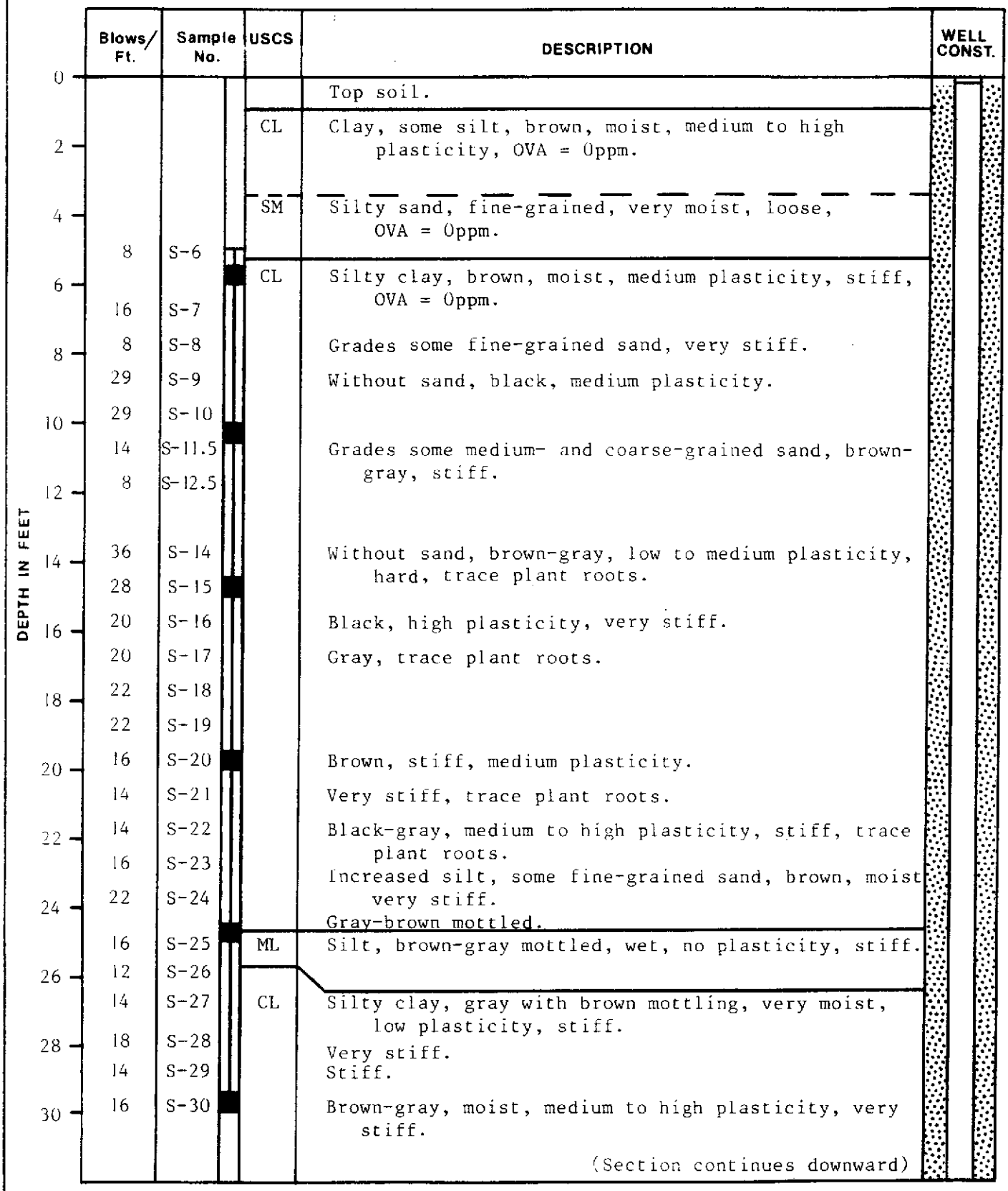
Neat cement annular seal

Blank PVC

Machine-slotted PVC

BLOW/FT. REPRESENTS THE NUMBER OF BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES TO DRIVE THE SAMPLER THROUGH THE LAST 12 INCHES OF AN 18 INCH PENETRATION.

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



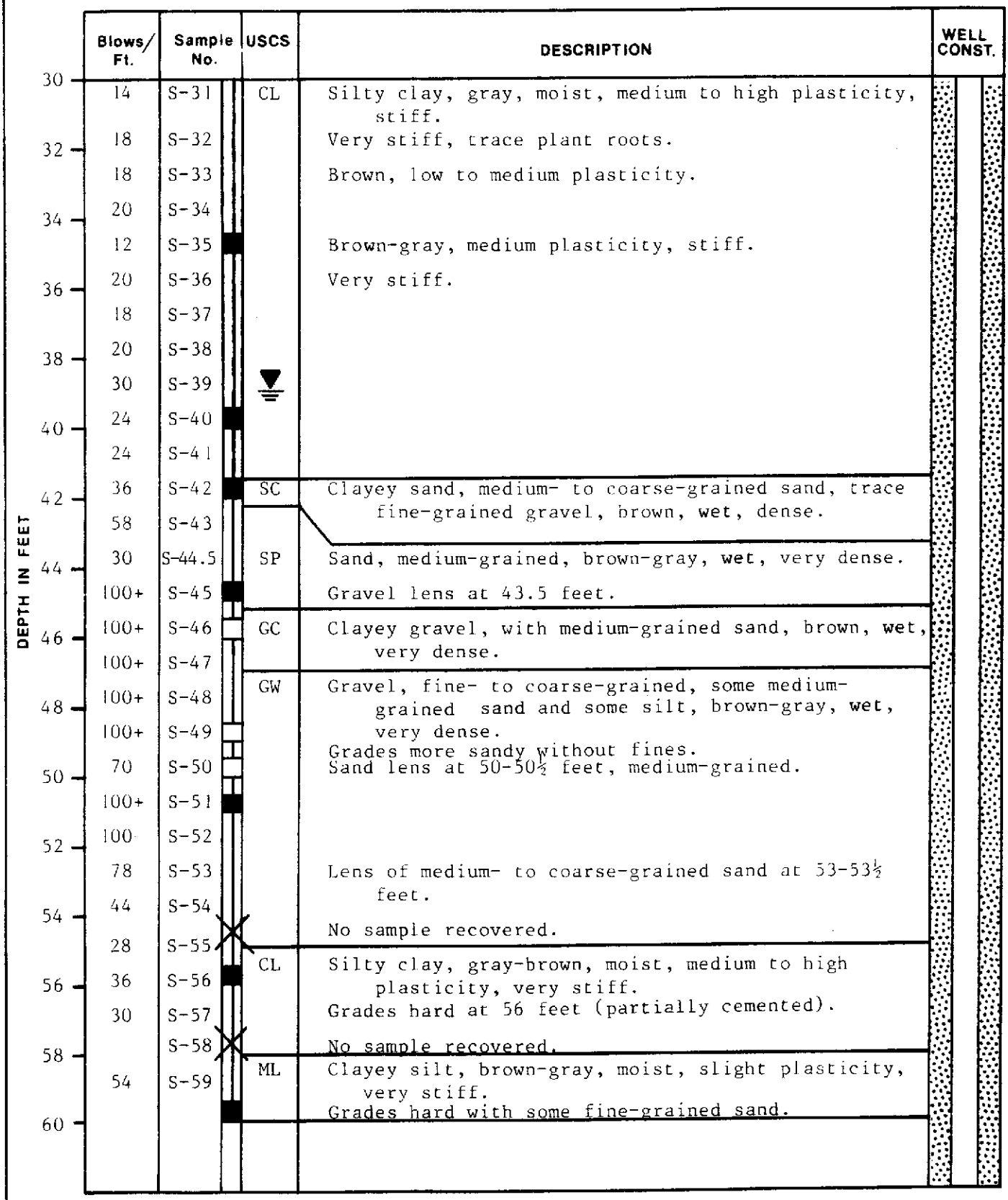
Applied GeoSystems
43255 Mission Blvd. Suite B Fremont, CA 94539 (415) 651-2906

PROJECT NO. 18034-2

LOG OF BORING B-5

PLATE P - 4

Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California



Applied GeoSystems

PROJECT NO. 18034-2

LOG OF BORING B-5d/MW-5d

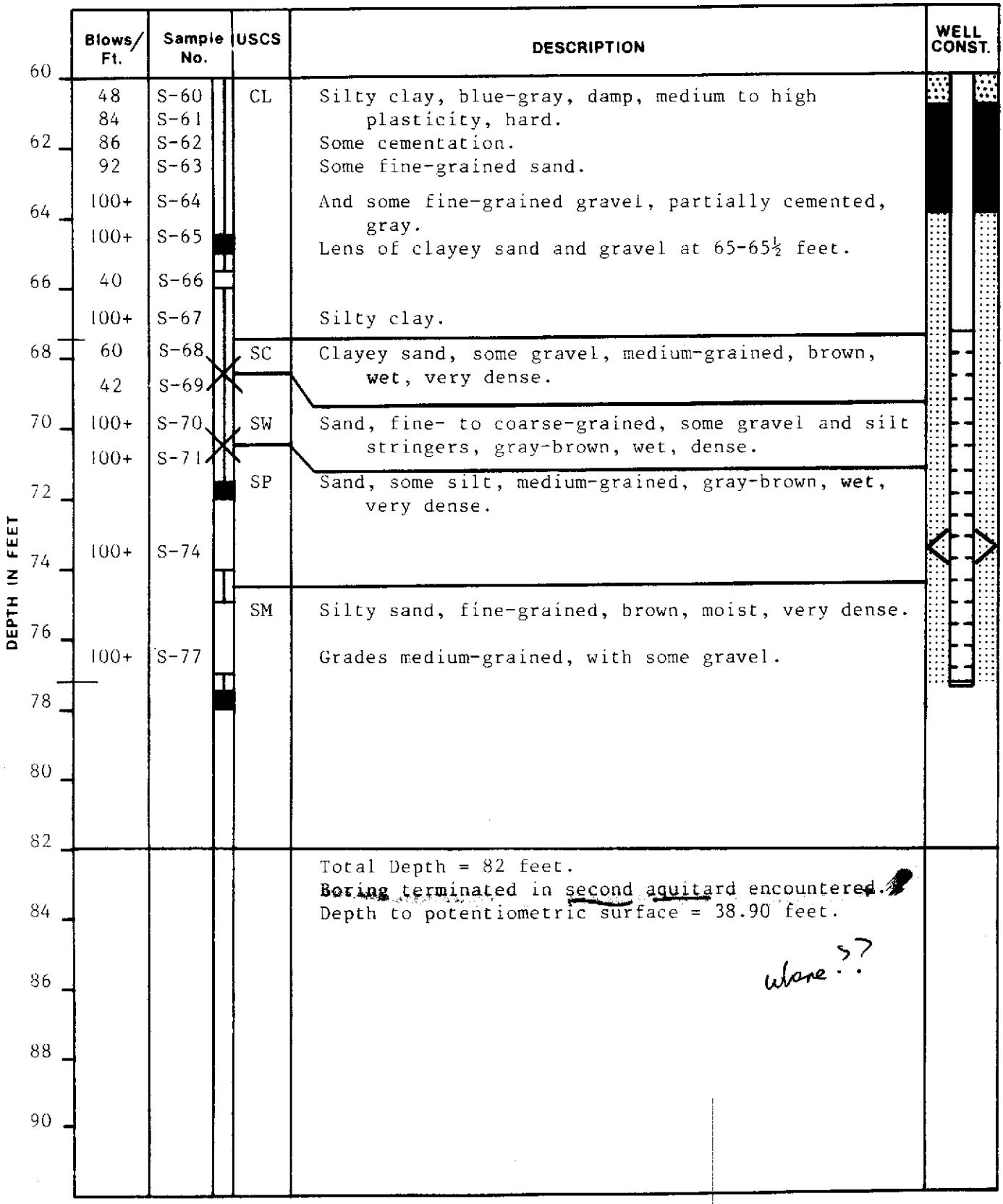
Exxon Station No. 7-3399

2991 Hopyard Road

Pleasanton, California

PLATE

P - 5



Applied GeoSystems
4235 Mission Blvd. Suite B Fremont, CA 94539 (415) 651-1906

PROJECT NO. 18034-2

LOG OF BORING B-5d/MW-5d

Exxon Station No. 7-3399

2991 Hopyard Road

Pleasanton, California

PLATE

P - 6

Blows/ Ft.	Sample No.	USCS	DESCRIPTION	WELL CONST.
			Not logged due to proximity to boring B-5d. See lithologic description of boring B-5d.	

DEPTH IN FEET

0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30

Applied GeoSystems
41255 Mission Blvd Suite B Fremont CA 94539 (415) 651-3906

PROJECT NO. 18034-2

LOG OF BORING B-5s/[redacted]

Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

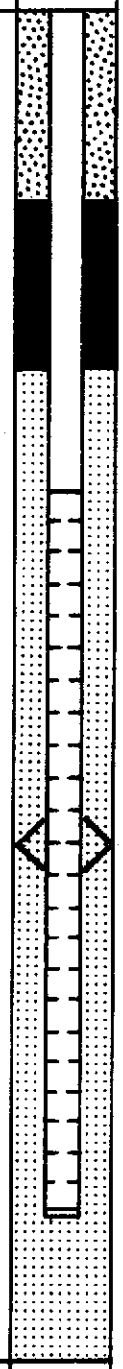
PLATE
P - 7

Blows/ Ft.	Sample No.	USCS	DESCRIPTION	WELL CONST.
			Not logged due to proximity to boring B-5d. See lithologic description of boring B-5d.	
			Total Depth = 58 feet. Boring terminated approximately 20 feet below top of the zone of saturation. Depth to potentiometric surface = 38.86 feet.	

DEPTH IN FEET

30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60

Screened ~ 40-54'



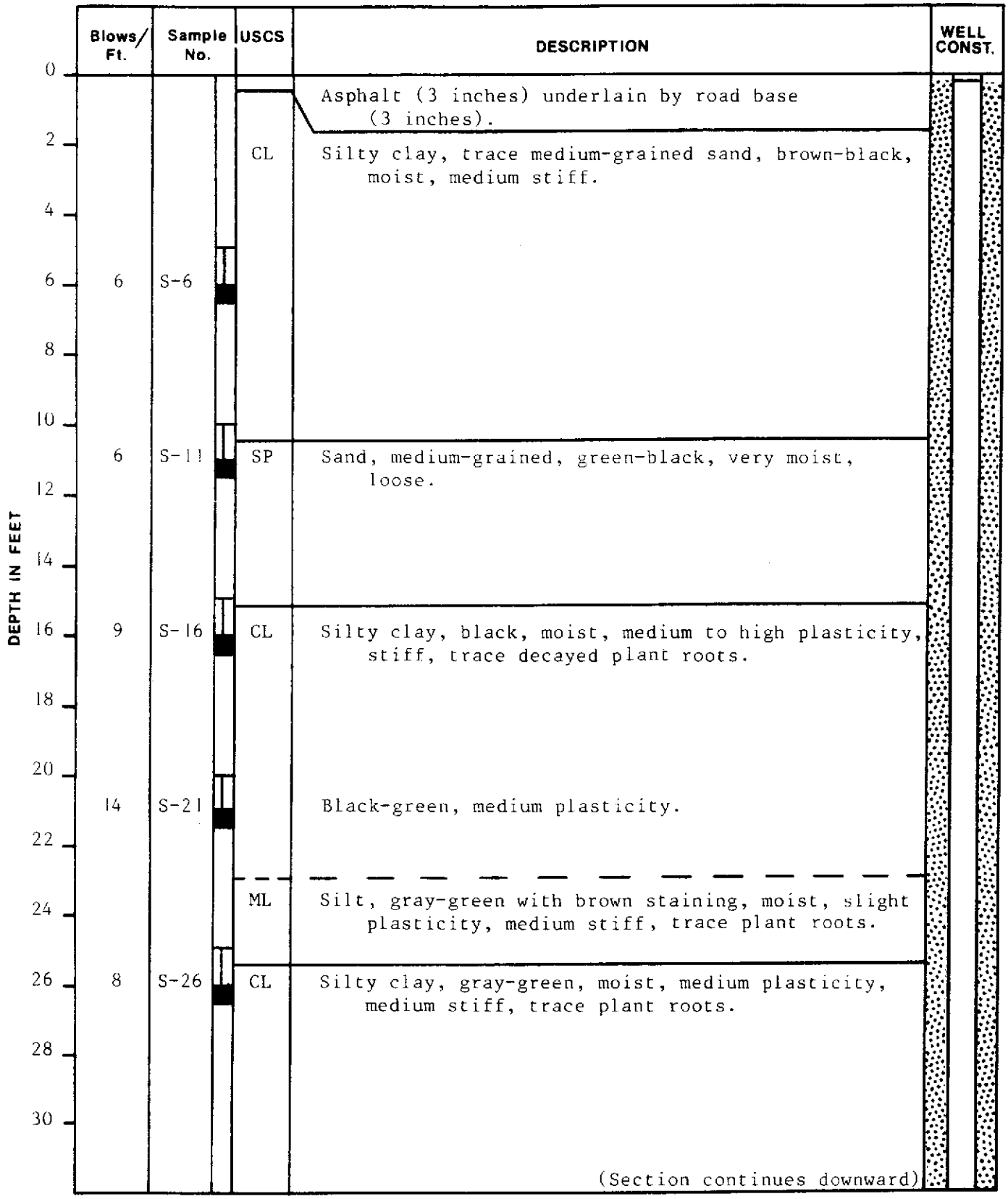
Applied GeoSystems
41255 Mission Blvd. Suite B Fremont, CA 94539 (415) 651-1906

PROJECT NO. 18034-2

LOG OF BORING B-5s/MW-5s

Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

PLATE
P - 8



Applied GeoSystems

PROJECT NO. 18034-2

LOG OF BORING B-6/[redacted]

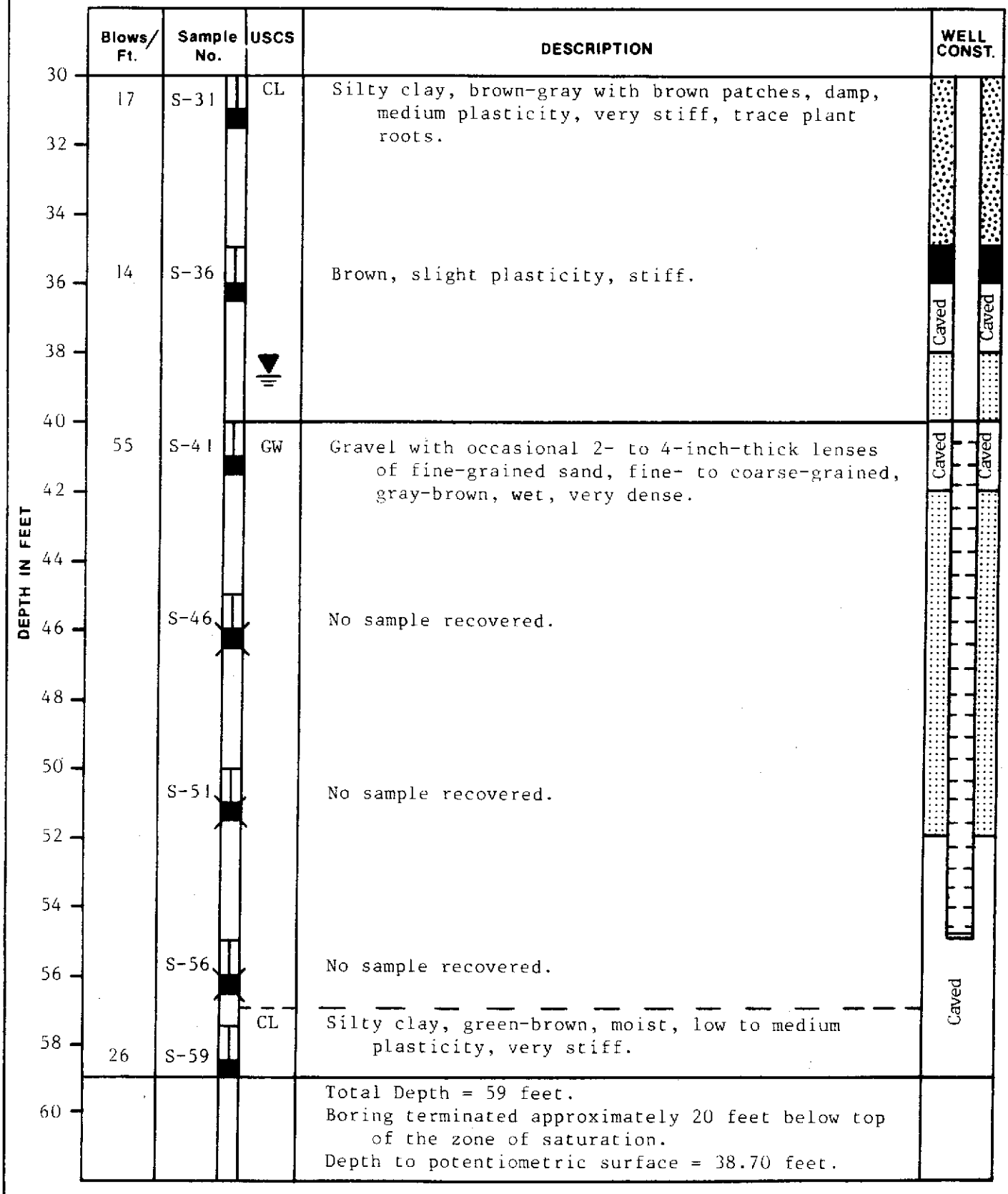
Exxon Station No. 7-3399

2991 Hopyard Road

Pleasanton, California

PLATE

P - 9



Applied GeoSystems

LOG OF BORING B-6/MW-6

Exxon Station No. 7-3399

2991 Hopyard Road

Pleasanton, California

PLATE

P - 10

PROJECT NO. 18034-2

MUNICIPAL WELL
NO. 7

Ground-water gradient = 0.02- to 0.05-foot per 100 feet

● = Boring location

◒ = Water supply well

◒ = Monitoring well location

U = Unleaded

R = Regular

PU = Premium Unleaded

Source: Measured by transit, compass and stadia

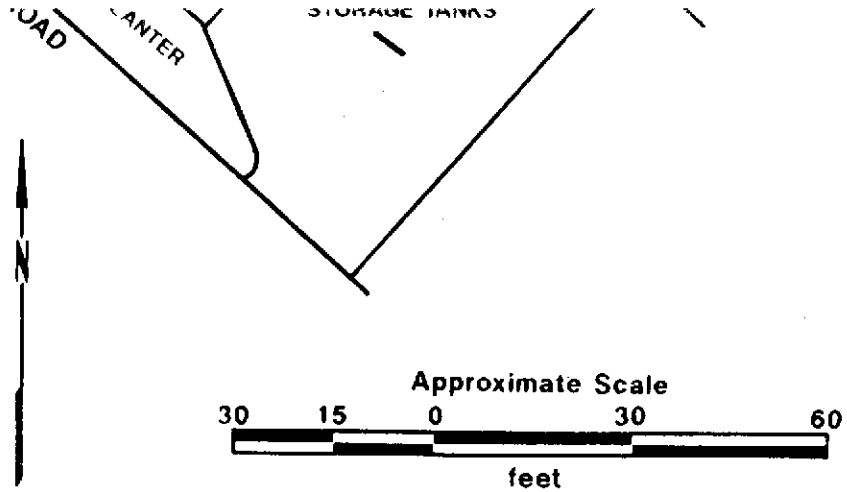
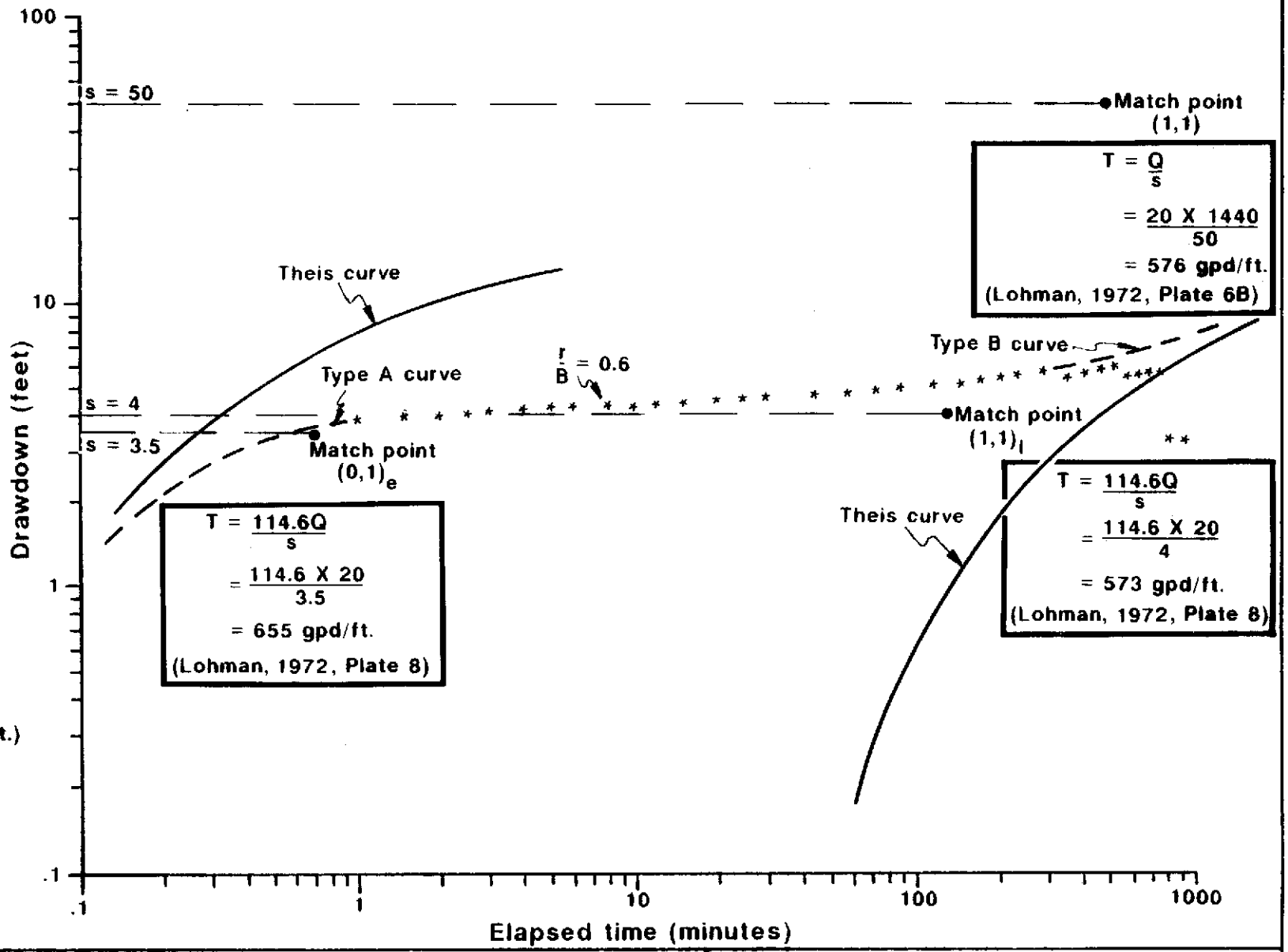


PLATE	GROUND-WATER POTENTIOMETRIC SURFACE MAP (July 6, 1988) Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California	Applied GeoSystems
P - 11		PROJECT NO. 18034-2

Date of test: 6/23/88



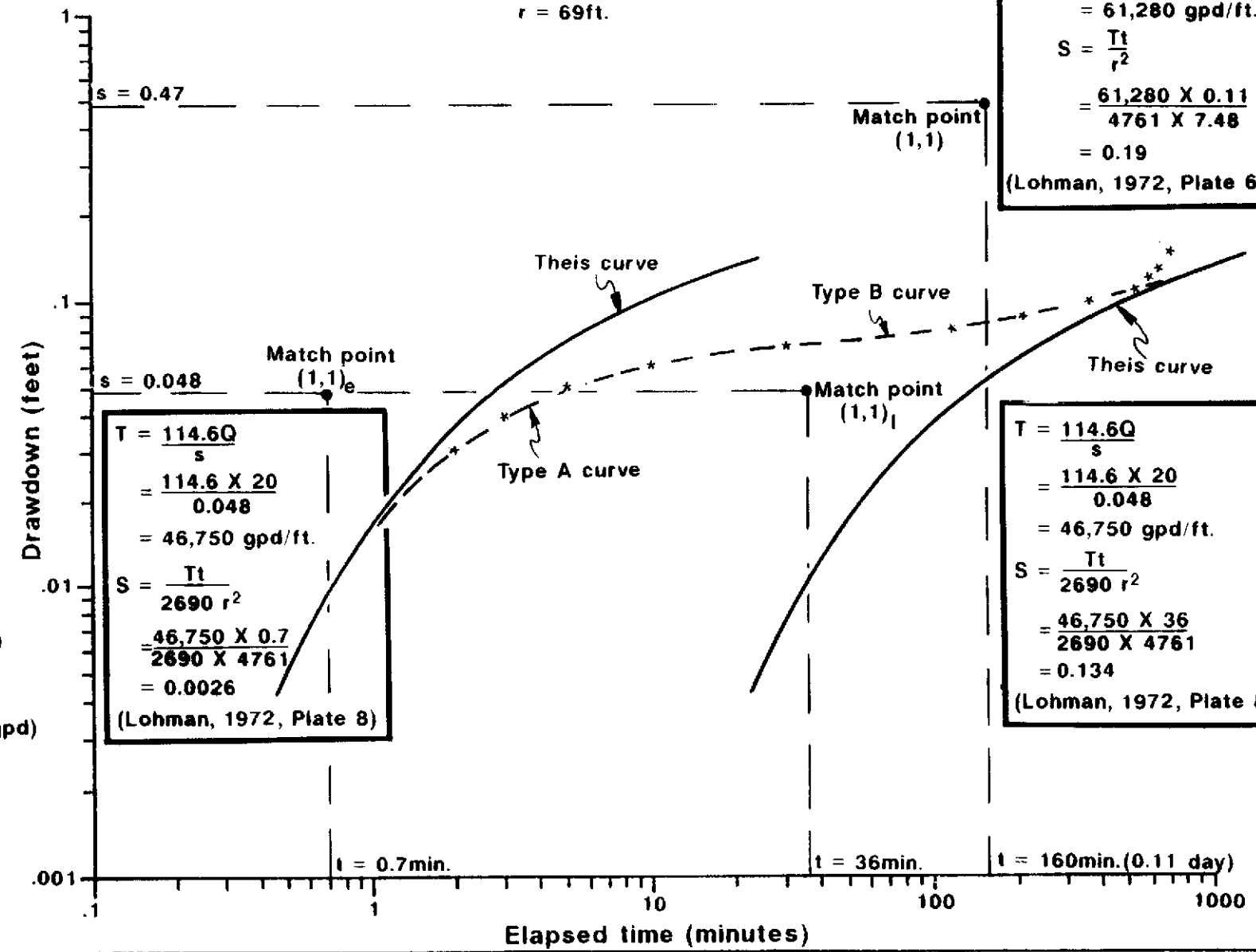
T = Transmissivity (gpd/ft.)

s = Drawdown (ft.)

Q = Discharge rate (gpm)

PLATE P - 12	TIME-DRAWDOWN PLOT OF PUMPING WELL MW-2 Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California	Applied GeoSystems PROJECT NO. 18034-2

Date of test: 6/23/88



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

$= \frac{20 \times 1440}{0.47}$

$= 61{,}280$ gpd/ft.

$S = \frac{Tt}{r^2}$

$= \frac{61{,}280 \times 0.11}{4761 \times 7.48}$

$= 0.19$

(Lohman, 1972, Plate 6B)

$T = \frac{114.6Q}{s}$

$= \frac{114.6 \times 20}{0.048}$

$= 46{,}750$ gpd/ft.

$S = \frac{Tt}{2690\ r^2}$

$= \frac{46{,}750 \times 0.7}{2690 \times 4761}$

$= 0.0026$

(Lohman, 1972, Plate 8)

$T = \frac{114.6Q}{s}$

$= \frac{114.6 \times 20}{0.048}$

$= 46{,}750$ gpd/ft.

$S = \frac{Tt}{2690\ r^2}$

$= \frac{46{,}750 \times 36}{2690 \times 4761}$

$= 0.134$

(Lohman, 1972, Plate 8)

T = Transmissivity (gpd/ft.)

s = Drawdown (ft.)

Q = Discharge rate (gpm, gpd)

S= Specific yield

t = Time (minutes, day)

r = Radial distance (ft.)

PLATE
P - 13

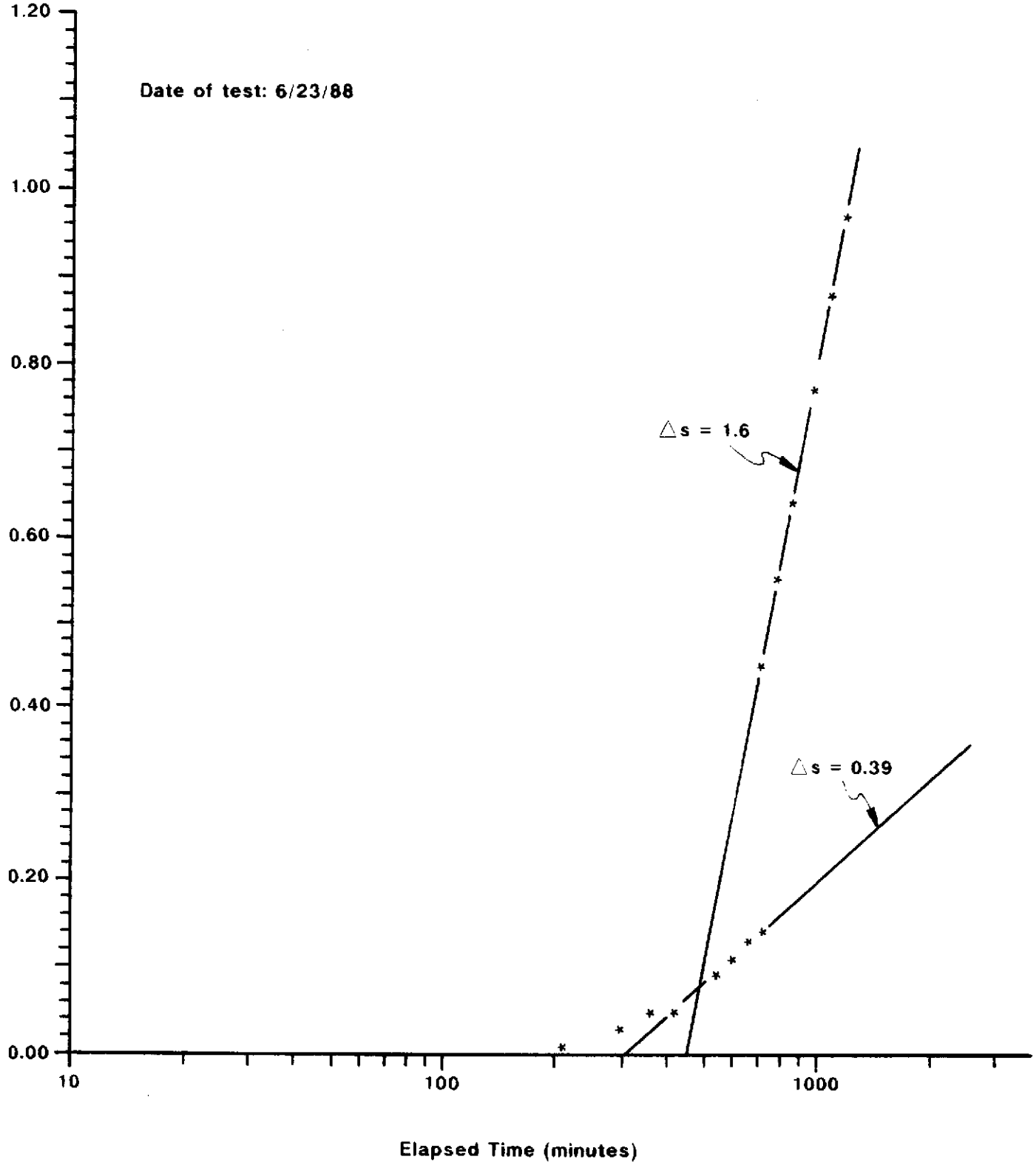
TIME-DRAWDOWN PLOT OF OBSERVATION WELL MW-6

Exxon Station No. 7-3399

2991 Hopyard Road
Pleasanton, California

Applied GeoSystems

PROJECT NO. 18034-2



Applied GeoSystems

PROJECT NO. 18034-2

TIME-DRAWDOWN PLOT OF OBSERVATION WELL NO. 7
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

PLATE
P - 14

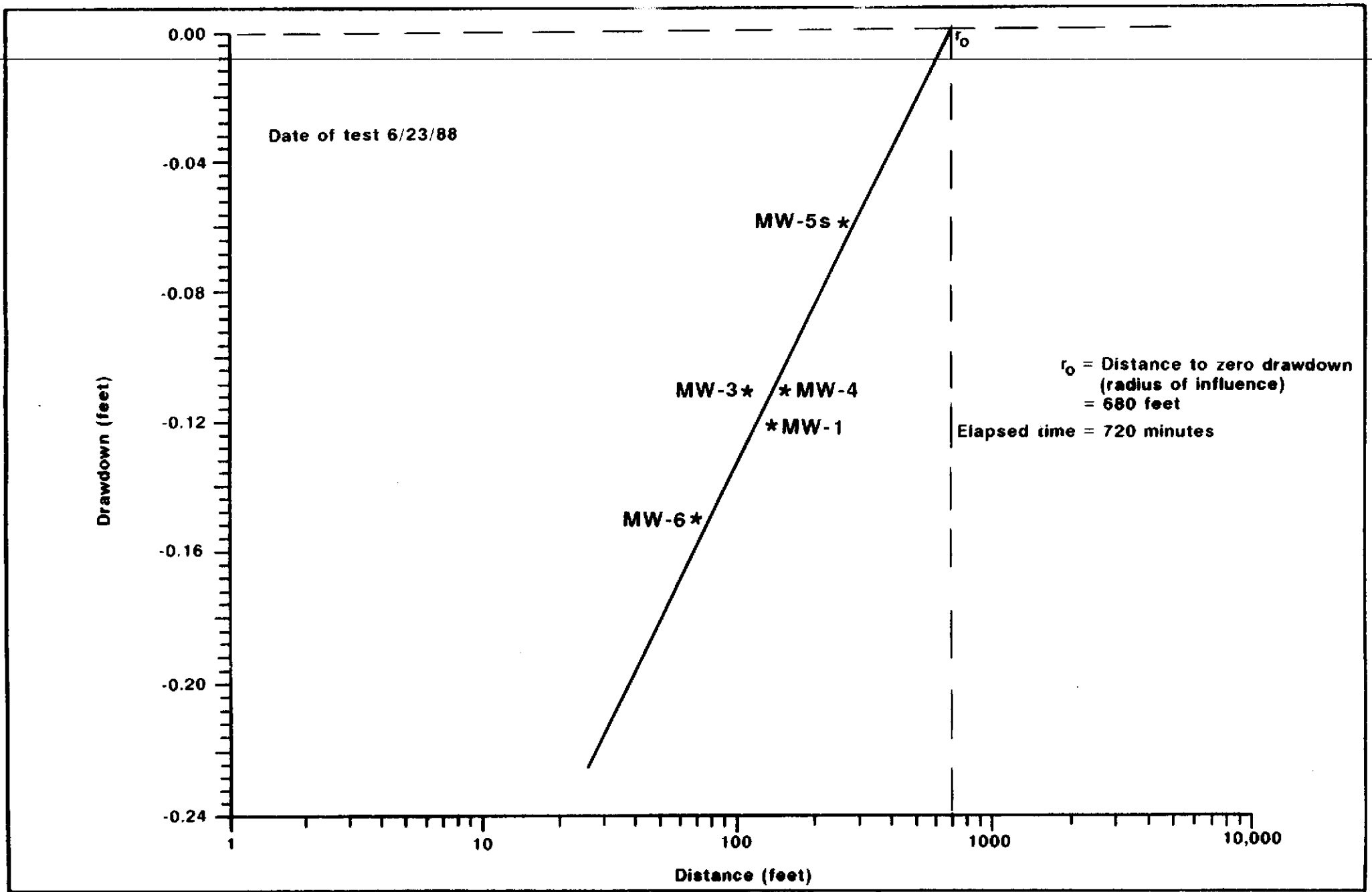


PLATE	DISTANCE-DRAWDOWN PLOT FOR OBSERVATION WELLS	
P - 15	MW-1, MW-3, MW-4, MW-5s, and MW-6 Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California	Applied GeoSystems PROJECT NO. 18034-2

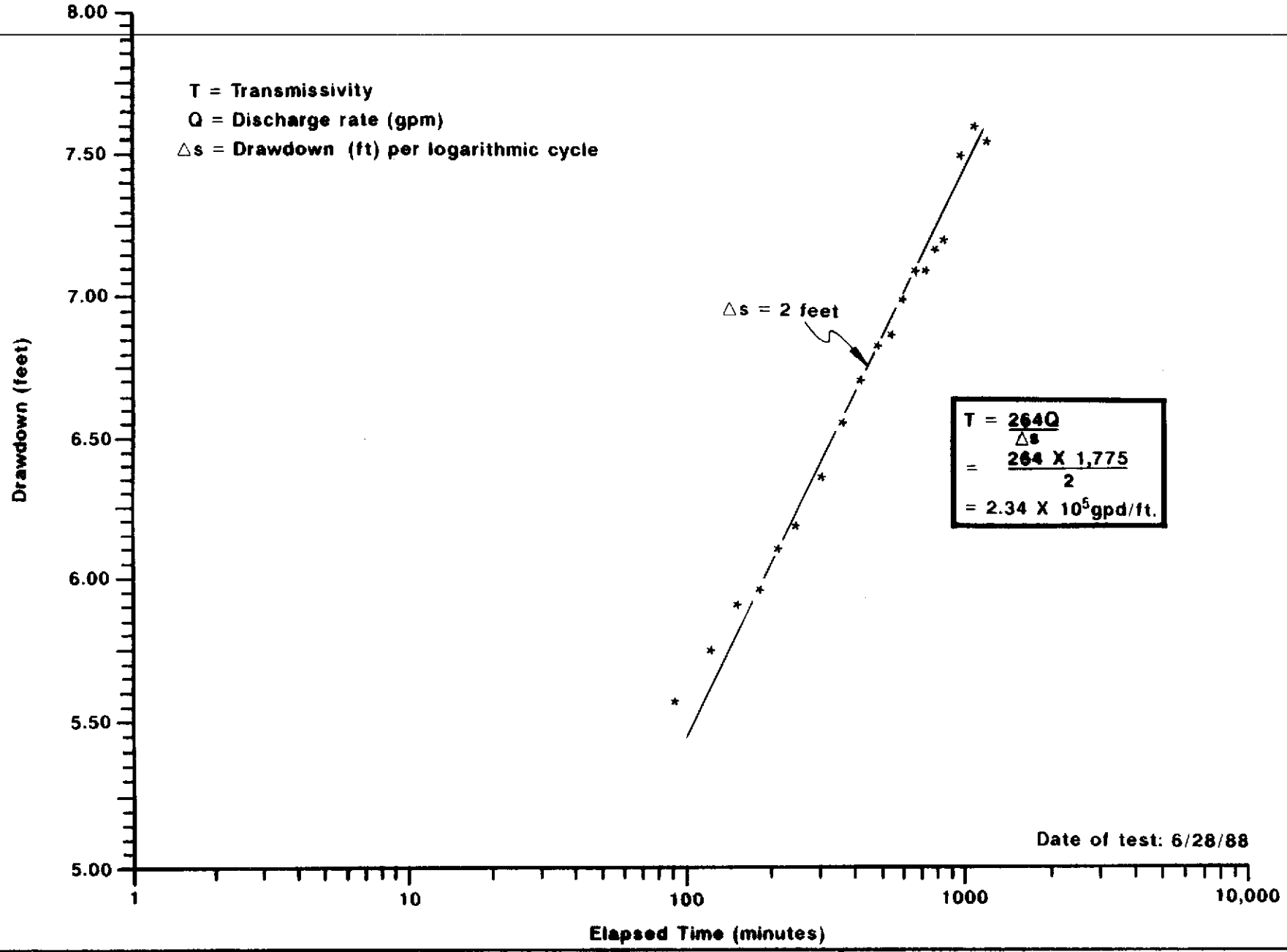
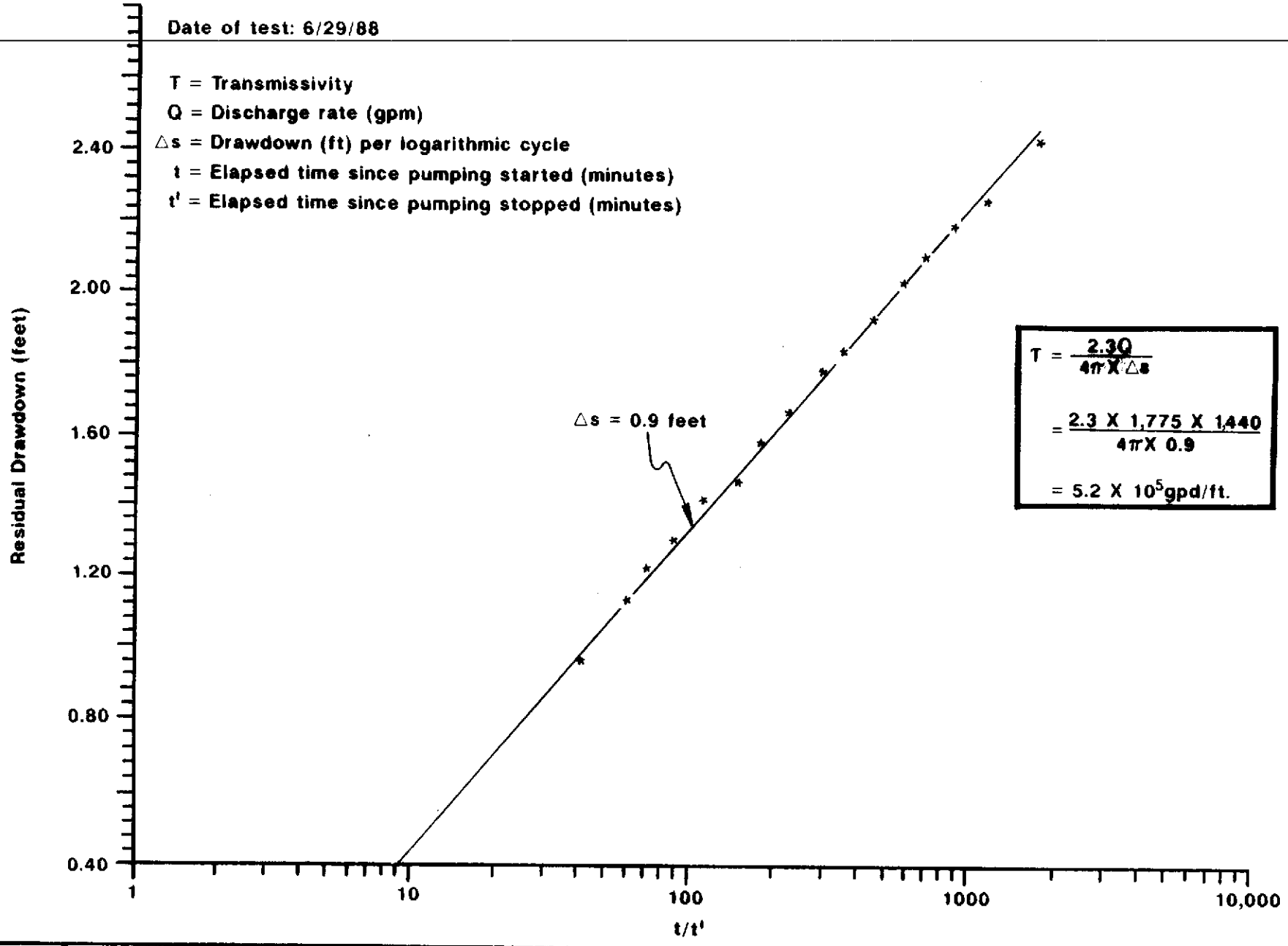


PLATE	TIME-DRAWDOWN PLOT OF PUMPING MUNICIPAL WELL NO. 7	
P - 16	Exxon Station No. 7-3399 2199 Hopyard Road Pleasanton, California	Applied GeoSystems PROJECT NO. 18034-2

Date of test: 6/29/88

T = Transmissivity
Q = Discharge rate (gpm)
△s = Drawdown (ft) per logarithmic cycle
t = Elapsed time since pumping started (minutes)
t' = Elapsed time since pumping stopped (minutes)



$$T = \frac{2.30}{4\pi \times \triangle s}$$

$$= \frac{2.3 \times 1{,}775 \times 1{,}440}{4\pi \times 0.9}$$

$$= 5.2 \times 10^5 \text{ gpd/ft.}$$

PLATE	TIME-DRAWDOWN PLOT OF RECOVERY TEST AT MUNICIPAL WELL NO. 7 Exxon Station No. 7-3399 2199 Hopyard Road Pleasanton, California	Applied GeoSystems
P - 17		PROJECT NO. 18034-2

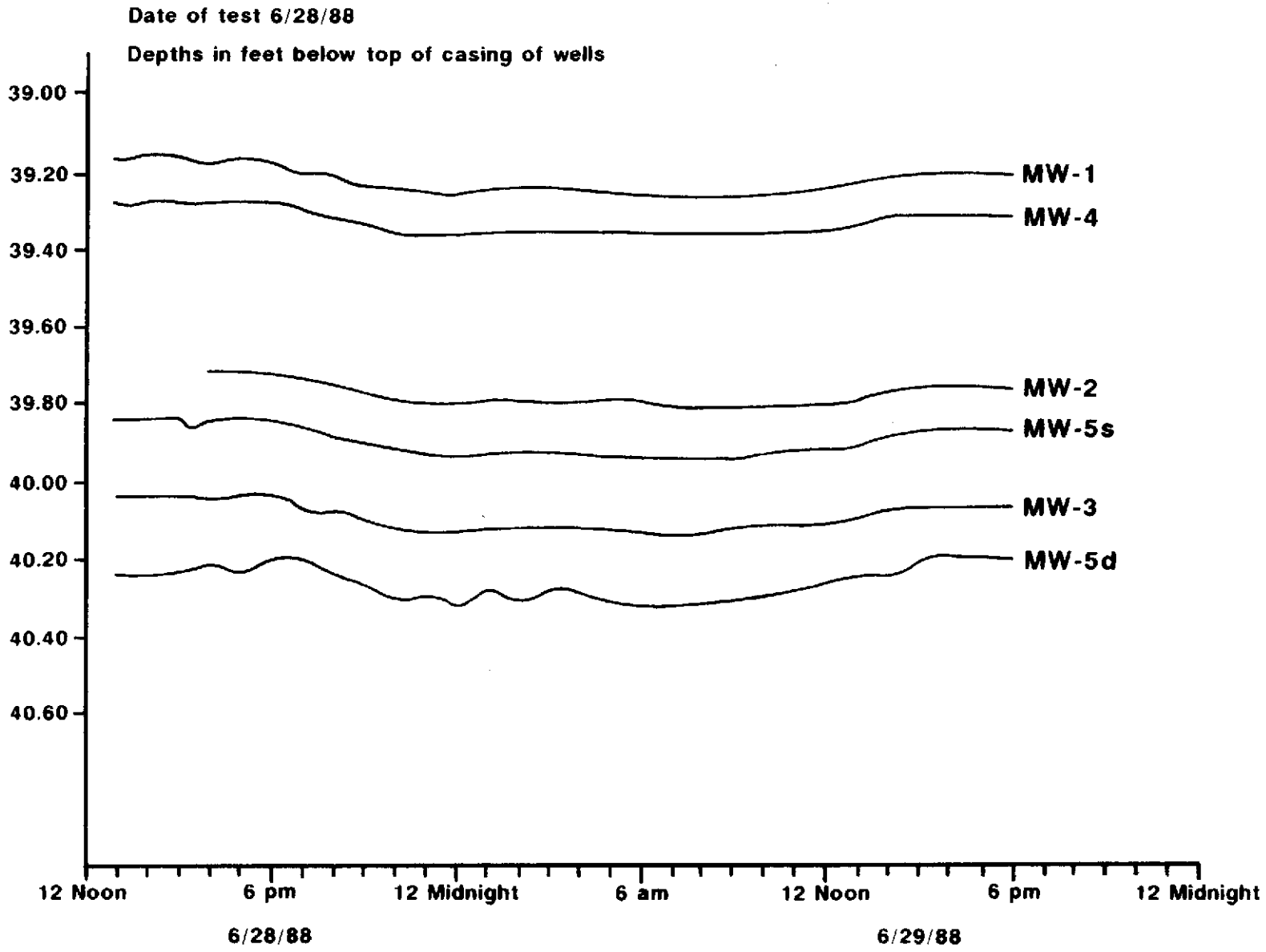
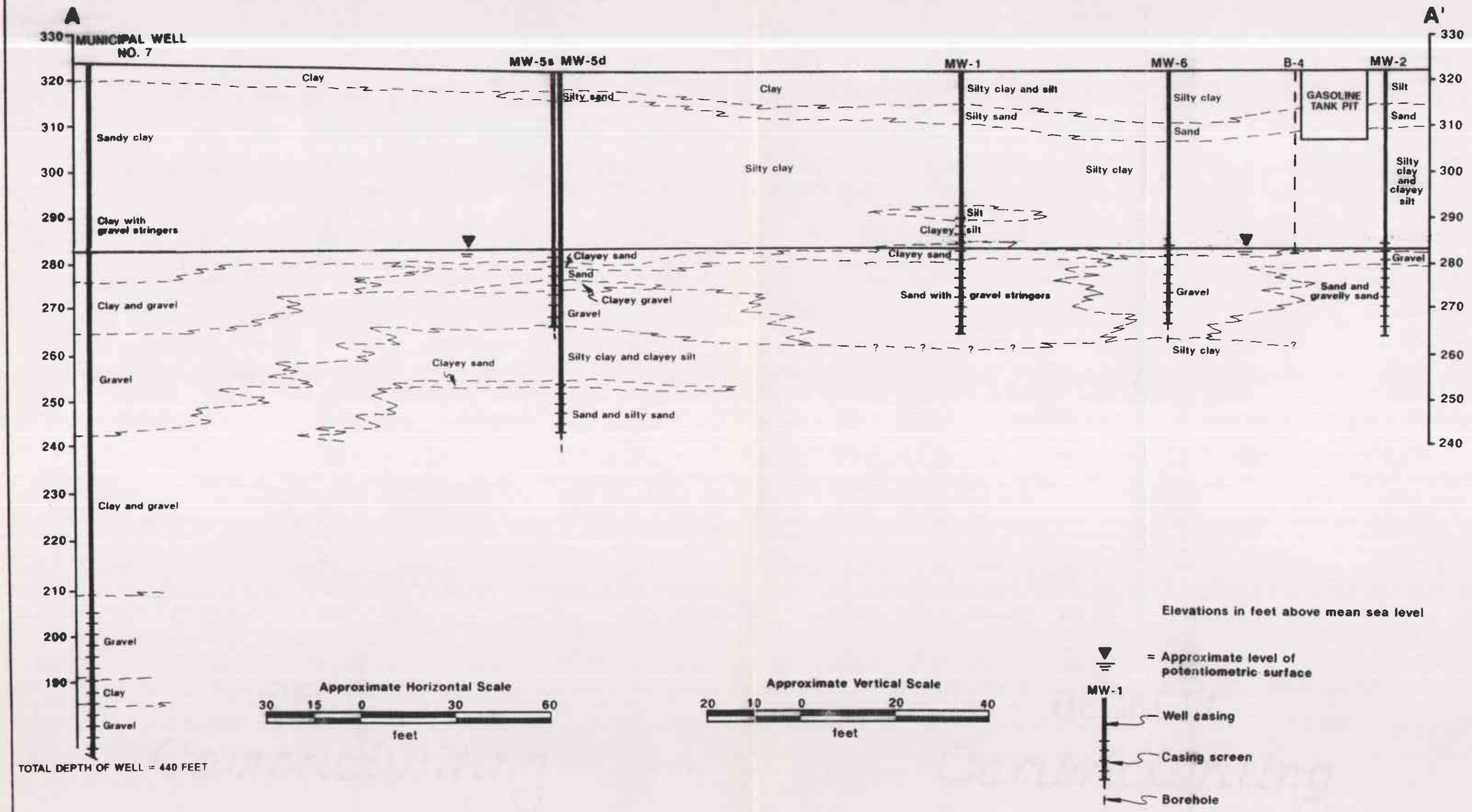


PLATE	HYDROGRAPH SHOWING WATER LEVEL IN WELLS	
P - 18	Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California	Applied GeoSystems PROJECT NO. 18034-2



Applied GeoSystems

PROJECT NO. 18034-2

HYDROGEOLOGIC CROSS SECTION A - A'

2199 Hopyard Road
Exxon Station No. 7-3399
Pleasanton, California

PLATE
P - 19

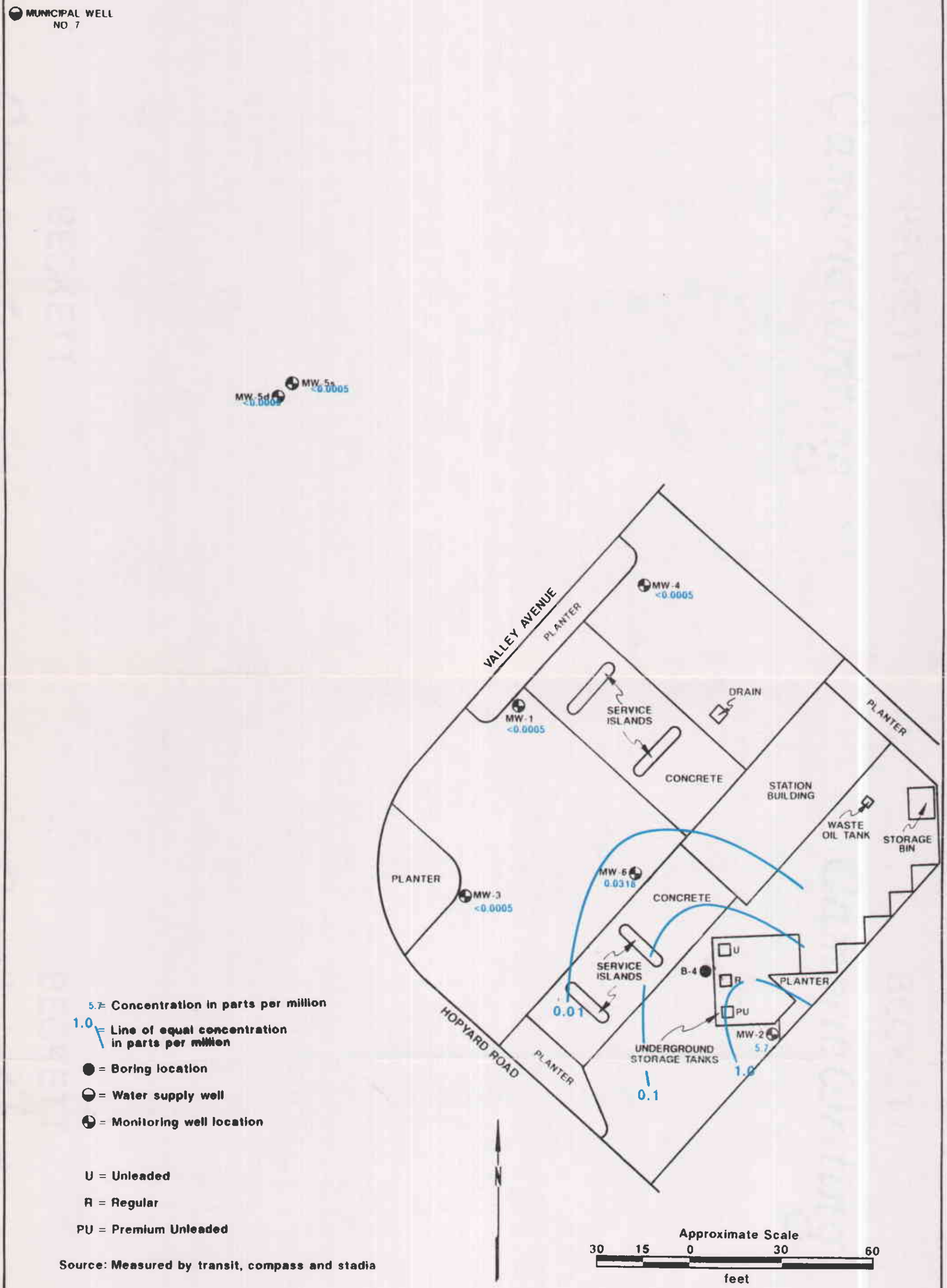
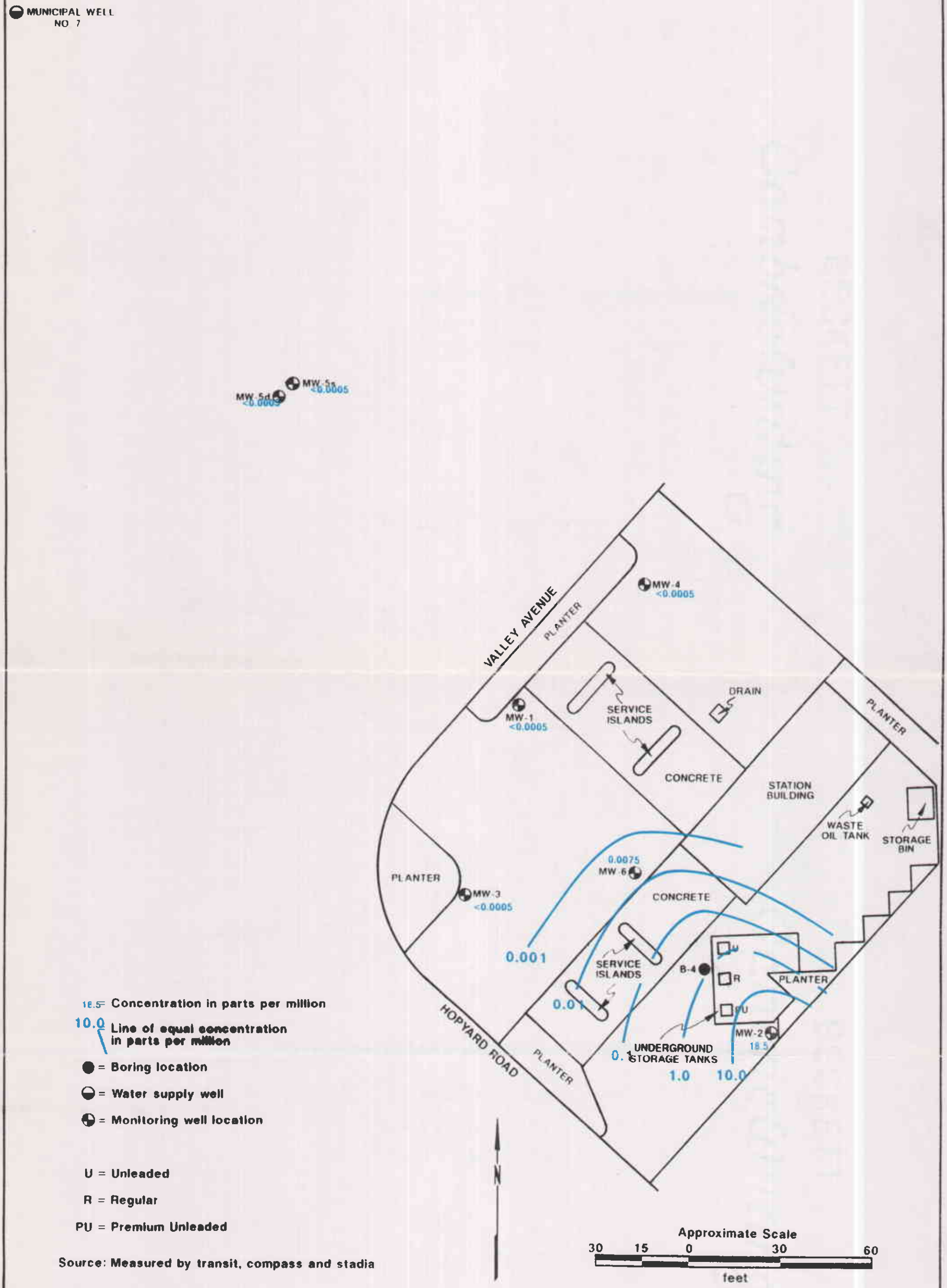


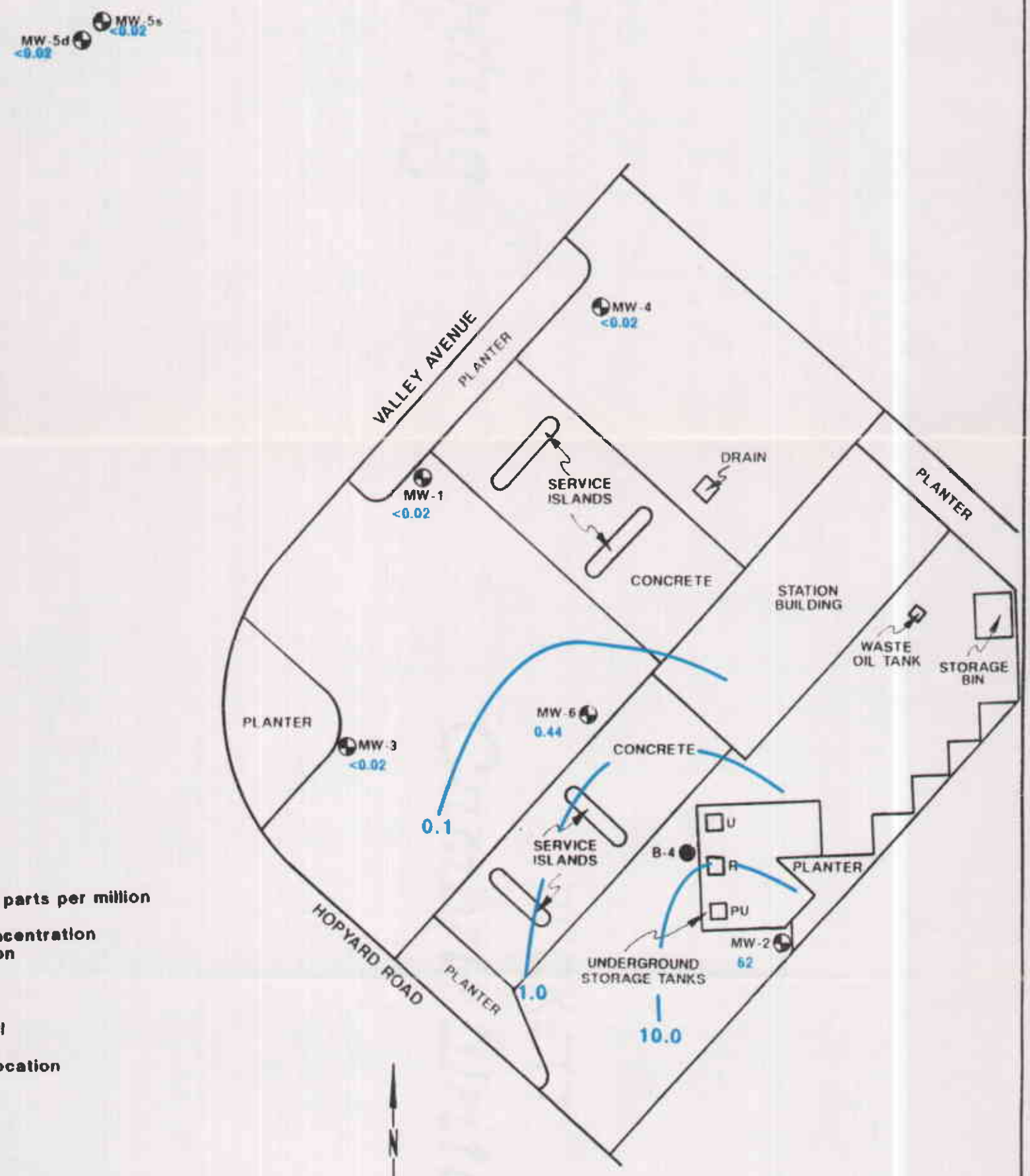
PLATE	CONCRETE OF BENZENE IN GROUND WATER (July 6, 1988) Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California	Applied GeoSystems
P - 20		PROJECT NO. 18034-2



Source: Measured by transit, compass and stadia

PLATE	CONCENTRATION OF TOLUENE IN GROUND WATER (July 6, 1988) Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California	Applied GeoSystems
P - 21		PROJECT NO. 18034-2

MUNICIPAL WELL
NO 7



62 = Concentration in parts per million

10.0 = Line of equal concentration in parts per million

● = Boring location

◒ = Water supply well

◕ = Monitoring well location

U = Unleaded

R = Regular

PU = Premium Unleaded

Source: Measured by transit, compass and stadia

Approximate Scale

30 15 0 30 60

feet

PLATE	CONCENTRATION OF TOTAL HYDROCARBONS IN GROUND WATER (July 6, 1988) Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California	Applied GeoSystems
P - 22		PROJECT NO. 18034-2

APPENDIX A

PLANNING 847-8023 ENGINEERING 847-8041 BUILDING 847-8066 WATER 847-8071

CITY OF PLEASANTON

P.O. BOX 520 • PLEASANTON, CALIFORNIA 94566-0802

847-8195 FIRE 847-8114

(415) 847-8015 • (415) 847-8149 (Office) (Recorder)

STREET ADDRESS 765 VALLEY	SUITE AV	RECEIPT NO. 0005998	DATE 05/02/88	PROJECT 00104084	
CITY PLEASANTON	STATE CA	TRACT NAME HOPYARD SHOPPING VILLAGE			
USE OF PERMIT/APPLICATION CONSTRUCT MONITORING WELL IN PUBLIC R.O.W.		APN 946-3215-00012	BLDGS-UNITS	STORIES	
OCCUPANT NAME COMMUNITY FIRST NATIONAL BANK		MAP # 1925 00	BLOCK-LOT 005	MOD # 003 -N	
APPLICANT NAME WETHAM ROGER	APPLICANT PHONE 415-651-1906				
CONTRACTOR DATUM EXPLORATION INC.	STATE LICENSE 480802 C57	ENCROACHMENT Per $22.00			
STREET ADDRESS 4300 EUORA	SUITE RD	CITY LICENSE 00011111			
CITY PITTSBURG	STATE CA ZIP 945650000	CONTRACTOR PHONE 415-682-5560			
BLDG OWNER					
STREET ADDRESS	SUITE				
CITY	STATE ZIP	OWNER PHONE			
ZONING	GEN PLAN	TRS	PUD		
LOT SIZE / F/A	CENS TRACT	SIC	CFIRS	GEO REF	
FSB / LSB / RSB / BSB	PLANNING INT	ENGINEERING INT	PLANS RECEIVED INT	PAID BY CK 7588	FEES $22.00

ENCROACHMENT PERMIT

P R O J E C T C O M M E N T S

Date	Department	Comment
04/29/88	ENGINEERING	PERMISSION IS HEREBY GRANTED TO CONSTRUCT A MONITORIN
04/29/88	ENGINEERING	WELL PER SKETCH SUBMITTED TO THE CITY OF PLEASANTON
04/29/88	ENGINEERING	PERMITTEE TO PROVIDE TRAFFIC CONTROL AS NEEDED TO PERFOR
04/29/88	ENGINEERING	WORK. ALL WORK TO BE PERFORMED TO CITY OF PLEASANTON
04/29/88	ENGINEERING	STANDARD DETAILS AND SPECIFICATIONS. NOTIFY INSPECTION
04/29/88	ENGINEERING	24 HRS PRIOR TO STARTING ANY WORK AT 415-847-8195
04/29/88	ENGINEERING	COLLECTED $500 CASH BOND ON RECEIPT # 74894

ENCROACHMENT TOTAL FEE $22.00

1 OTHER FEE Appl/Permit Fee $22.00

CITY OF PLEASANTON 1894 PLACE OF PLANNED PROGRESS

This permit is hereby issued under the applicable provisions of the City of Pleasanton Code and/or resolution to do work indicated below for which fees have been paid.

By: Al Bray Date: 5-1-88

PERMIT EXPIRES: _____

Chapter 3 U.B.C. or 180 days

APPLICANT

4002200

GENERAL PROVISIONS

1. **ACCEPTANCE OF PROVISIONS:** It is understood and agreed by the permittee that the doing of any work under this permit shall constitute an acceptance of the provisions.
2. **INSPECTION AND APPROVAL:** All work shall be subject to inspection and approval by the City Engineer.
3. **INSPECTION:** A minimum of twenty-four (24) hours notice shall be required for inspecting prior to the placing of any backfill, connection to any existing facility, or the placement of any concrete or paving work. No additional charge will be made for occasional routine inspections.
4. **PERMITS FROM OTHER AGENCIES:** The permittee shall, whenever necessary or required by law, secure the written order or consent to do work affecting other agencies, from such agency affected. This permit shall not be valid until such order or consent is obtained. A permit may be required for this work from the following agency or agencies:
   - ☐ a. State of California Division of Highways.
   - ☐ b. Alameda County Flood Control and Water Conservation District.
   - ☐ c. Alameda County Road Department.
   - ☐ d. Valley Community Services District.
   - ☐ e. Other .....
5. **STANDARDS OF CONSTRUCTION:** All work shall conform to recognized standards of construction. All street cuts shall further conform to the provisions of the "Specifications for Trench Backfill".
6. **REPAIRS:** In every case the permittee shall be responsible for restoring to its former condition any portion of the street, sidewalk area or other encroachment which has been excavated or otherwise disturbed by permittee. Permittee shall be responsible for said work for a period of one year after completion and acceptance of the work by the City Engineer.
7. **MINIMUM INTERFERENCE WITH AND PROTECTION OF TRAFFIC:** All work shall be planned and carried out so there shall be the least possible inconvenience to the traveling public. Permittee is authorized to place flagmen to stop and warn or direct traffic, but traffic shall not be unreasonably delayed. Two way traffic shall be maintained at all times. Adequate provisions shall be made for the protection of the traveling public. Placing of lights, barricades, warning signs and other safety devices and other measures required for the public safety shall be the responsibility of the permittee.
8. **MAINTENANCE:** The permittee agrees to maintain properly any encroachment placed by him and to exercise reasonable care in inspecting for and preventing any damage to any portion of the street or sidewalk area resulting from the encroachment.
9. **KEEP PERMIT ON THE JOBSITE:** This permit shall be kept on the jobsite and must be shown to any representative of the Department of Public Works or any law enforcement officer of the City of Pleasanton on demand.
10. **CARE OF DRAINAGE:** If the work herein contemplated shall interfere with the established drainage, ample provisions shall be made by the permittee to provide for such drainage as directed by the City Engineer.
11. **STORAGE OF MATERIALS:** Unless otherwise approved by the City Engineer, no material shall be stored within five (5) feet of a public street. Any excess materials from trenching or other operations shall be removed from the pavement, traveled way, or shoulders as the trench is back-filled or other work carried forward.
12. **CLEANUP OF JOBSITE:** Upon completion of work the jobsite shall be restored to a condition of order and cleanliness.

SPECIAL PROVISIONS

1. **TRENCHING, BACKFILL, AND RESURFACING:** All trenches shall be cut either at right angles to the street or right-of-way within which the work is authorized or in the case of a main extension in the street or right-of-way, parallel to the lines of same and shall comply with "Specifications for Trench Backfill."
2. **PORTLAND CEMENT CURBS, SIDEWALKS AND DRIVEWAYS:** Existing concrete work shall be removed to the nearest score mark or construction joint. Sidewalk and/or curb and gutter shall be cut cleanly and removed for the entire width. Concrete work shall be replaced on subgrade consisting of four (4) inches of clean, graded, select base, thoroughly watered, graded and rolled or tampered to a solid bearing and true to grade and cross section. All concrete used shall be Class "A" Portland Cement concrete. All concrete curb, sidewalk and/or driveways shall conform to the form and dimensions shown on the City of Pleasanton Standard Detail Sheets. All sidewalks shall be a minimum of four (4) feet wide and four (4) inches in thickness except at driveways where it shall be a minimum of six (6) inches in thickness. All concrete work placed shall be scored, colored and made to conform to any adjacent existing concrete work. Type and location of expansion joints shall be as directed by the City Engineer.
3. **NO LATERAL STREET CUTS PERMITTED:** No lateral street cut will be permitted in connection with this permit. A street cut of thirty (30x30) inches shall be made for connection to main. Connecting pipe shall be jacked completely under the street paving, curb and/or gutter and sidewalk. If a sidewalk cut is necessary, the sidewalk shall be replaced in conformance with Section 2 above. The street cut shall be backfilled and repaved in conformance with Section 1 above.
4. **FRIDAY WORK:** No work shall be started on any Friday of any week if the work to be done is of such nature as to cause pedestrian or vehicular traffic interruption over the weekend if incompleted.
5. **TIME ELAPSED PRIOR TO TEMPORARY AND PERMANENT REPAVING:** Temporary or permanent surfacing shall be installed on the same working day after the backfilling has been completed or when directed by the City Engineer. The time limit for the replacement of temporary with final pavement shall not exceed ten (10) days.

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

#88122

FOR APPLICANT TO COMPLETE

(1) LOCATION OF PROJECT EXXON STATION #7-3399
2991 HOPYARD ROAD
PLEASANTON, CA

(2) CLIENT
Name EXXON COMPANY, U.S.A.
Address P.O. BOX 4415 Phone 713-656-7755
City HOUSTON, TX Zip 77210-4415

(3) APPLICANT
Name APPLIED GEOSYSTEMS
Address 43255 MISSION BLVD Phone 415-651-1906
City FREMONT, CA Zip 94539

(4) DESCRIPTION OF PROJECT
Water Well Construction X Geotechnical ___
Cathodic Protection ___ Well Destruction ___

(5) PROPOSED WATER WELL USE
Domestic ___ Industrial ___ Irrigation ___
Municipal ___ Monitoring X Other ___

(6) PROPOSED CONSTRUCTION
Drilling Method:
Mud Rotary ___ Air Rotary ___ Auger ___
Cable ___ Other HOLLOW STEM AUGER

WELL PROJECTS MONITORING WELL # 5
Drill Hole Diameter 10 in. Depth 80 ft.
Casing Diameter 2 in. Number ___
Surface Seal Depth 30 ft.
Driller's License No. 480802

GEOTECHNICAL PROJECTS
Number ___
Diameter ___ in. Maximum Depth ___ ft.

(7) ESTIMATED STARTING DATE 5/3/88
ESTIMATED COMPLETION DATE 5/3/88

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

APPLICANT'S SIGNATURE [signature] Date 5-3-88

FOR OFFICE USE

PERMIT NUMBER ___
LOCATION NUMBER ___

Approved ___ Date ___

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. Notify this office (484-2600) at least one day prior to starting work on permitted work and before placing well seals.
3. 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 bore hole logs and location sketch for geotechnical projects. Permitted work is completed when the last surface seal is placed or the last boring is completed.
4. 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, or equivalent.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic, irrigation, and monitoring wells unless a lesser depth is specially approved.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material.

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

E. WELL DESTRUCTION. See attached.

91986

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

#86122

FOR APPLICANT TO COMPLETE

(1) LOCATION OF PROJECT EXXON STATION #7-3399
2991 HOPYARD ROAD
PLEASANTON, CA

(2) CLIENT
Name EXXON COMPANY, U.S.A.
Address P.O. BOX 4415 Phone 713-656-7755
City HOUSTON, TX Zip 77210-4415

(3) APPLICANT
Name APPLIED GEOSYSTEMS
Address 43255 MISSION BLVD Phone 415-651-1906
City FREMONT, CA Zip 94539

(4) DESCRIPTION OF PROJECT
Water Well Construction X Geotechnical ___
Cathodic Protection ___ Well Destruction ___

(5) PROPOSED WATER WELL USE
Domestic ___ Industrial ___ Irrigation ___
Municipal ___ Monitoring X Other ___

(6) PROPOSED CONSTRUCTION
Drilling Method:
Mud Rotary ___ Air Rotary ___ Auger ___
Cable ___ Other HOLLOW STEM AUGER

WELL PROJECTS MONITORING WELL #6
Drill Hole Diameter 10 in. Depth 60 ft.
Casing Diameter 4 in. Number ___
Surface Seal Depth 30 ft.
Driller's License No. 480802

GEOTECHNICAL PROJECTS
Number ___
Diameter ___ in. Maximum Depth ___ ft.

(7) ESTIMATED STARTING DATE 5/4/88
ESTIMATED COMPLETION DATE 5/4/88

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

APPLICANT'S SIGNATURE [signature] Date 5-3-88

FOR OFFICE USE

PERMIT NUMBER ___
LOCATION NUMBER ___

Approved ___ Date ___

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. Notify this office (484-2600) at least one day prior to starting work on permitted work and before placing well seals.
3. 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 bore hole logs and location sketch for geotechnical projects. Permitted work is completed when the last surface seal is placed or the last boring is completed.
4. 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, or equivalent.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic, irrigation, and monitoring wells unless a lesser depth is specially approved.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material.

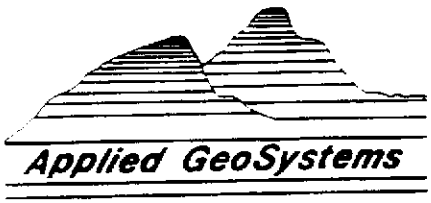
D. CATHODIC. Fill hole above anode zone with concrete placed by tremie, or equivalent.

E. WELL DESTRUCTION. See attached.

91986

APPENDIX B

CHAIN OF CUSTODY RECORD



43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): William Given

Phone: (415) 651-1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 1 week

Project Leader: Rodger Witham

Phone No. (415) 651-1906

SHIPPING INFORMATION:

Shipper _____

Address _____

Date Shipped _____

Service Used _____

Airbill No. _____ Cooler No. _____

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
William Given			
	Received for laboratory by:	5-13-88	1540

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S0513 1A	018034-2	5/13/88	TPH	ICED
S0513 1B	018034-2	5/13/88	TPH	ICED
S0513 1C	018034-2	5/13/88	TPH	ICED.

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 5-13-88
Laboratory Number: 05036S01
Project: 018034-2
Sample: S0513-1(ABC)
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline	ND		2		05-20-88	NR
TPH as Gasoline						
TEH as Diesel						NR
Benzene						NR
Toluene						NR
Ethylbenzene						NR
Total Xylenes						NR

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

5-25-88
Date Reported

APPENDIX C

CHAIN OF CUSTODY RECORD

Applied GeoSystems
43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): James R. Cline
Phone: (415) 651-1906

LABORATORY: APPLIED GEOSYSTEMS

TURNAROUND TIME: 1 WEEK

Project Leader: RODGER WITHAM
Phone No. (415) 651-1906

SHIPPING INFORMATION:
Shipper
Address
Date Shipped
Service Used
Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
James R. Cline		5/5/88	842
	Received for laboratory by:	5-5-88	900

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-40-B5	018034-7	5-3-88	TPH, BTEX	ICED

CHAIN OF CUSTODY RECORD

Applied GeoSystems

43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): William [signature]

Phone: (415) 651-1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 1 week

Project Leader: Rodger Witham

Phone No. (415) 651-1906

SHIPPING INFORMATION:

Shipper ______

Address ______

Date Shipped ______

Service Used ______

Airbill No. ______ Cooler No. ______

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
William [signature]			
	Received for laboratory by: [signature]	5-13-88	930

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S36 B6	018034-2	5/11/88	TPH & BETX	ICED.

CHAIN OF CUSTODY RECORD

Applied GeoSystems
43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): Tim O'Brien

Phone: 415 651 1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 1 week

Project Leader: Rodger Witham

Phone No. 415 651 1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Tim O'Brien			
	Received for laboratory by:	5-26-88	900

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W-39-MW5A	080034-2	5-25-88	TPH & BTEX	iced
W-39-MW5B	080034-2	5-25-88	TPH & BTEX	iced

CHAIN OF CUSTODY RECORD

Applied GeoSystems
43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): William Rivera
Phone: (415) 651-1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 1 week

Project Leader: Rodger Luthans
Phone No. (415) 651-1906

SHIPPING INFORMATION:
Shipper
Address
Date Shipped
Service Used
Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
William Rivera		5/18/88	0805
	Received for laboratory by:	5-18-88	0900

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W40MW6	018034-2	5/17/88	TPH, BTEX	ICE HCL

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 5-5-88
Laboratory Number: 05010S01
Project: 018034-2
Sample: S-40-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2		05-10-88	
TEH as Diesel						NR
Benzene	ND		0.05		05-10-88	
Toluene	ND		0.05		05-10-88	
Ethylbenzene	ND		0.05		05-10-88	
Total Xylenes	ND		0.05		05-10-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

5-16-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 5-13-88
Laboratory Number: 05027S01
Project: 018034-2
Sample: S-36-B6
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2		05-18-88	
TEH as Diesel						NR
Benzene	ND		0.05		05-18-88	
Toluene	ND		0.05		05-18-88	
Ethylbenzene	ND		0.05		05-18-88	
Total Xylenes	ND		0.05		05-18-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

5-25-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 5-26-88
Laboratory Number: 05071W01
Project: 018034-2
Sample: W-39-MW5A
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	05-31-88	
TEH as Diesel						NR
Benzene		ND		0.0005	05-31-88	
Toluene		0.0031		0.0005	05-31-88	
Ethylbenzene		ND		0.0005	05-31-88	
Total Xylenes		ND		0.0005	05-31-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

6-03-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 5-26-88
Laboratory Number: 05071W02
Project: 018034-2
Sample: W-39-MW5B
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	05-31-88	
TEH as Diesel						NR
Benzene		ND		0.0005	05-31-88	
Toluene		0.0009		0.0005	05-31-88	
Ethylbenzene		ND		0.0005	05-31-88	
Total Xylenes		ND		0.0005	05-31-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

6-03-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 5-18-88
Laboratory Number: 05044W01
Project: 018034-2
Sample: W-40-MW6
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	05-23-88	
TEH as Diesel						NR
Benzene		ND		0.0005	05-23-88	
Toluene		ND		0.0005	05-23-88	
Ethylbenzene		ND		0.0005	05-23-88	
Total Xylenes		ND		0.0005	05-23-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

5-31-88
Date Reported

APPENDIX D

DUBLIN SAN RAMON SERVICES DISTRICT
7051 Dublin Boulevard - Dublin, CA 94568
828-0515 - FAX 829-1180

FACSIMILE INFORMATION TRANSMITTAL

NO. OF PAGES (including transmittal page) 6

From: BOB SWANSON, D.S.R.S.D.

To: ROGER WITHAM, APPLIED GEOSYSTEMS FAX 415-651-8647

Regarding: Wastewater Discharge Permit for treated groundwater at 2991 Hopyard Rd. Pleasanton, CA

Remarks:

cc: Jim Keer, Exxon USA
Greg Zentner, R.W.Q.C.B.
Joe Elliott, City of Pleasanton
Bob Whitley, D.S.R.S.D.

DUBLIN SAN RAMON SERVICES DISTRICT

PRETREATMENT PROGRAM

WASTEWATER DISCHARGE PERMIT

PERMIT NO. 5541-001

IN ACCORDANCE WITH ALL TERMS AND CONDITIONS OF THE:

X D.S.R.S.D. CODE, CHAPTER 7 ARTICLE 3

X CITY OF PLEASANTON CODE, CHAPTER 8 ARTICLES 5,7

AND ALSO WITH ANY APPLICABLE PROVISIONS OF FEDERAL OR STATE LAW OR REGULATION;

PERMISSION IS HEREBY GRANTED TO EXXON COMPANY USA

P.O. Box 4415, HOUSTON, TEXAS 77210-4415

CLASSIFIED BY SIC NO. 5541

FOR THE CONTRIBUTION OF TREATED GROUNDWATER

INTO THE CITY OF PLEASANTON SEWER LINES AT

2991 HOPYARD RD. PLEASANTON, CALIFORNIA

EFFECTIVE THIS 15th DAY OF JUNE , 1988

TO EXPIRE 30th DAY OF JUNE , 1988

Robert D. Whitt

DIRECTOR OF PUBLIC WORKS

SIGNATURE OF PERMITTEE

PERMIT NO. 5541-001 LIMITATIONS ON WASTEWATER STRENGTH

PARAMETERS	Max. Concentration mg/l
Arsenic (As)	1.0
Cadmium (Cd)	1.0
Chromium - total (Cr)	5.0
Copper (Cu)	10.0
Cyanide (Cn)	1.0
Fluoride (F)	5.0
Lead (Pb)	2.0
Mercury (Hg)	0.5
Nickel (Ni)	5.0
Phenols	5.0
Silver (Ag)	2.0
Zinc (Zn)	10.0
PCB's	0.01
Total Identifiable Chlorinated Hydrocarbons	0.02
Oil and Grease (Freon Extractable)	200

SEE ADDITIONAL PAGES FOR FURTHER SPECIFIC LIMITS

Temperature - Maximum (Degrees C)	140° F
pH - Maximum (pH Units)	11.0
pH - Minimum (pH Units)	6.0

BIMONTHLY DEMAND LIMIT	Bimonthly Pounds/Day
Biochemical Oxygen Demand	
Suspended Solids	NA
Flow - (MGD)	.043

SAMPLING SCHEDULE AND LOCATION
SEE PAGE 4

GENERAL CONDITIONS

1. [illegible] NA

2. The industry is required to submit the following reports to the District:

Type of Report	Date Due
Self-Monitoring Data Compilation	Weekly

3. This permit is non-transferable and valid only to the industry and owner to whom it is originally issued. Transfer of ownership, changes to industrial processes or significant change of wastewater quality or quantity shall void the permit.

4. This permit may be modified only by the Dublin San Ramon Services District.

5. This permit and all sewer discharge rights may be revoked by the District if the industrial user falsifies information submitted to the District, tampers with monitoring equipment, refuses access to premises for inspection, or any other activity that is detrimental to the integrity of the pretreatment program.

SEE PAGE 5 FOR FURTHER CONDITIONS.

5541-001

SAMPLING

POTW MONITORING: District reserves rights to sample at will for any constituents it deems necessary on the well clean up operation at both pre and post treatment sites.

Exxon shall supply the sampling points needed to obtain samples at above sights.

SELF MONITORING: During the initial 3-hour start up pumping period, the effluent discharge from the treatment process shall be held in a holding tank large enough to contain the total volume of the discharge. At that point, the system shall be shut down and analyses performed. Further processing shall only be allowed to continue after analyses indicate that the contents of the tank have met all permit conditions.

Daily samples will be taken during daytime operations for the first 5 days of operation.

Weekly sampling on a single grab sample basis will be done after the first week for the next three weeks and monthly thereafter, until completion of the cleanup operation.

Exxon shall analyze for total petroleum hydrocarbons and total xylene isomers (BTEX) (EPA Methods 8015 and 602) on all samples.

The total petroleum hydrocarbon concentration shall not exceed 2 mg/l at any time.

5541-001

GENERAL CONDITIONS CONT.

5. Exxon shall notify the District and the City 1 hour prior to commencement of any operations.

6. Initial constituents to be analyzed are all parameters listed on Page 2 of this permit plus EPA Methods 8015 and 602.

7. Exxon assumes full responsibility for any and all damages which may occur to the collection system or to the publicly owned treatment works (POTW) i.e. Dublin San Ramon Services District Regional Wastewater Treatment Facility that can be attributed to the discharge of treated groundwater from the clean up operation at the Exxon Staion on Hopyard and Valley Avenue in Pleasanton, CA.

8. Exxon shall use oil/water separator and two carbon columns as a part of the process.

9. There shall not be any bypassing of any treatment unit at anytime.

10. The City of Pleasanton Fire Dept. must be notified in advance of ongoing cleanup operation.

11. Exxon will pay all District fees, monitoring, inspection and related District expenses prior to the expiration of this permit.

The District will not consider extension of a permit until all fees and reimbursable costs have been paid by Exxon.

12. In the event of any alarm or explosive condition, notify the District at 846-4564 immediately.

13. This permit supersedes the previous permit and 2 addendums which shall be considered null and void.

CHAIN OF CUSTODY RECORD

Applied GeoSystems

43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): Tim O'Brien

Phone: 415 651 1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 24 hour

Project Leader: Rodger Witham

Phone No. 415 651 1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Tim O'Brien			
	Received for laboratory by: [signature]	6-17-88	1700

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W-Effluent	018034Z	6-17-88	TPH & BTEX	iced

CHAIN OF CUSTODY RECORD

RUSH - ASAP!

Applied GeoSystems
43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): Rodger C. Witham

Phone: (415) 651-1906

LABORATORY:
Clayton Environmental
1252 Quarry Lane
Pleasanton, CA 94566

TURNAROUND TIME: 24 hours

Project Leader: Rodger Witham

Phone No. (415) 651-1906

SHIPPING INFORMATION:

Shipper _____

Address _____

Date Shipped _____

Service Used _____

Airbill No. _____ Cooler No. _____

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Rodger C. Witham	Tracy B Bullock	6/17/88	4:25 pm
	Received for laboratory by:		

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W-Effluent	18034-2	6/17/88	Arsenic	HNO_3 + Ice
			Cadmium	HNO_3 + Ice
			Total Chromium	HNO_3 + Ice
			Copper	HNO_3 + Ice
			Cyanide	NaOH + Ice
			Fluoride	Ice
			Lead	HNO_3 + Ice
			Mercury	HNO_3 + Ice
			Nickel	HNO_3 + Ice
			Phenols	H_2SO_4 + Ice
			Silver	HNO_3 + Ice
			Zinc	HNO_3 + Ice
			PCB's	Ice
			Chlorinated Hydrocarbons	Ice
			Oil and Grease	H_2SO_4 + Ice
			pH	

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 6-17-88
Laboratory Number: 06052W01
Project: 018034-2
Sample: W-EFFLUENT
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	06-17-88	
TEH as Diesel						NR
Benzene		ND		0.0005	06-17-88	
Toluene		ND		0.0005	06-17-88	
Ethylbenzene		ND		0.0005	06-17-88	
Total Xylenes		ND		0.0005	06-17-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

6-20-88
Date Reported

Clayton Environmental Consultants, Inc.

P.O. Box 9019 • 1252 Quarry Lane • Pleasanton, CA 94566 • (415) 426-2600

June 29, 1988

Mr. Rodger C. Witham
APPLIED GEOSYSTEMS
43225 Mission Blvd., Suite B
Fremont, CA 94539

Laboratory Client Code No. 0445

Dear Mr. Witham:

Attached are the results of the following samples. The sample and analysis information is as follows:

Date Sample Received	Clayton Lab Batch No.	Client Sample I.D.	Matrix	Analysis/ Method No.
06/17/88	880693	W-Effluent	Water	Metals/See result page for method no.'s. Cyanide/ 335.2, Phenols/ EPA 420.1, pH/ EPA 150.1, Fluoride/EPA 340.2, Oil & Grease/EPA 413.1 Organochlorine Pesticides and PCBs/EPA 608 Purgeable Halo-carbons/EPA 601

A copy of the Chain of Custody form is attached for your information.

If you have any questions regarding this information, please do not hesitate to call.

Sincerely,

Mary Beck for
Tony Blake
Client Services Supervisor

TB/ewq
Attachment/Enclosure
L3028.REP

Approved by: Mary D. Beck
Mary D. Beck
Quality Assurance Supervisor

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

INORGANIC LAB/METALS ANALYSIS

Sample I.D.: W-Effluent Lab Batch No.: 880693

Samples Received: 06/17/88

Sample Matrix: Water

Analysis Date	Method No.	Batch Sub No.	Metal	Concentration in mg/L	Detection Limits mg/L
	200.7	-01	Aluminum (Al)	NA	
	200.7	-01	Antimony (Sb)	NA	
06/21/88	206.2	-01	Arsenic (As)	0.06	0.01
	200.7	-01	Barium (Ba)	NA	
	200.7	-01	Beryllium (Be)	NA	
	200.7	-01	Boron (B)	NA	
06/21/88	200.7	-01	Cadmium (Cd)	0.007	0.005
	200.7	-01	Calcium (Ca)	NA	
	7196	-01	Chromium VI (Cr^{+6})	NA	
06/21/88	200.7	-01	Chromium (Cr)	0.016	0.01
	200.7	-01	Cobalt (Co)	NA	
06/21/88	200.7	-01	Copper (Cu)	<0.05	0.05
	200.7	-01	Iron (Fe)	NA	
06/21/88	200.7	-01	Lead (Pb)	<0.1	0.1
	200.7	-01	Lithium (Li)	NA	
	200.7	-01	Magnesium (Mg)	NA	
	200.7	-01	Manganese (Mn)	NA	
06/21/88	245.1	-01	Mercury (Hg)	<0.0005	0.0005
	200.7	-01	Molybdenum (Mo)	NA	
06/21/88	200.7	-01	Nickel (Ni)	0.41	0.05
	200.7	-01	Potassium (K)	NA	
	270.2	-01	Selenium (Se)	NA	
06/21/88	200.7	-01	Silver (Ag)	<0.01	0.01
	200.7	-01	Sodium (Na)	NA	
	200.7	-01	Thallium (Tl)	NA	
	200.7	-01	Tin (Sn)	NA	
	200.7	-01	Vanadium (V)	NA	
06/21/88	200.7	-01	Zinc (Zn)	<0.01	0.01

*All units of concentration in mg/L or mg/kg unless otherwise noted.

NA = Not Analyzed

L3028.REP

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

INORGANIC LAB/METALS ANALYSIS

Sample I.D.: Method Blank Lab Batch No.: 880693

Samples Received:

Sample Matrix: Water

Analysis Date	Method No.	Batch Sub No.	Metal	Concentration in mg/L	Detection Limits mg/L
	200.7		Aluminum (Al)	NA	
	200.7		Antimony (Sb)	NA	
06/21/88	206.2	-MB	Arsenic (As)	<0.01	0.01
	200.7		Barium (Ba)	NA	
	200.7		Beryllium (Be)	NA	
	200.7		Boron (B)	NA	
06/21/88	200.7	-MB	Cadmium (Cd)	<0.005	0.005
	200.7		Calcium (Ca)	NA	
	7196		Chromium VI (Cr^{+6})	NA	
06/21/88	200.7	-MB	Chromium (Cr)	<0.01	0.01
	200.7		Cobalt (Co)	NA	
06/21/88	200.7	-MB	Copper (Cu)	<0.05	0.05
	200.7		Iron (Fe)	NA	
06/21/88	200.7	-MB	Lead (Pb)	<0.1	0.1
	200.7		Lithium (Li)	NA	
	200.7		Magnesium (Mg)	NA	
	200.7		Manganese (Mn)	NA	
06/21/88	245.1	-MB	Mercury (Hg)	<0.0005	0.0005
	200.7		Molybdenum (Mo)	NA	
06/21/88	200.7	-MB	Nickel (Ni)	<0.05	0.05
	200.7		Potassium (K)	NA	
	270.2		Selenium (Se)	NA	
06/21/88	200.7	-MB	Silver (Ag)	<0.01	0.01
	200.7		Sodium (Na)	NA	
	200.7		Thallium (Tl)	NA	
	200.7		Tin (Sn)	NA	
	200.7		Vanadium (V)	NA	
06/21/88	200.7	-MB	Zinc (Zn)	<0.01	0.01

*All units of concentration in mg/L or mg/kg unless otherwise noted.

NA = Not Analyzed

L3028.REP

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

EXTRACTION LAB ANALYSIS

Method No. 413.1

Lab Batch No. 880693

Samples Received: 06/17/88

Date Analyzed: 06/21/88

Sample Matrix: Water

Batch Sub. No.	Sample Identification	Oil & Grease Concentration in ppm
-03	W-Effluent	2.0
B1	Blank	<1.0

ND = Not Detected above Limit of Detection.

Detection Limits = 1.0 ppm

L3028.REP

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

INORGANIC LAB/WET CHEMISTRY ANALYSIS

Sample I.D.: W-Effluent Lab Batch No.: 880693

Samples Received: 06/17/88

Sample Matrix: Water

Date Analyzed	Method No.	Batch Sub No.	Additional Parameters	Concentration in mg/L
06/21/88	335.3	-02	Cyanide	0.04
06/20/88	420.1	-03	Phenols	<0.005
06/21/88	150.1	-04	pH, units	8.0
06/17/88	340.2	-04	Fluoride	0.12

*All units of concentration in mg/L or mg/kg unless otherwise noted.

Detection Limit for Cyanide = 0.01
Detection Limit for Phenols = 0.005
Detection Limit for Fluoride = 0.05

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

INORGANIC LAB/WET CHEMISTRY ANALYSIS

Sample I.D.: Method Blank Lab Batch No.: 880693

Samples Received:

Sample Matrix: Water

Date Analyzed	Method No.	Batch Sub No.	Additional Parameters	Concentration in mg/L
06/21/88	335.3	-MB	Cyanide	<0.01
06/20/88	420.1	-MB	Phenols	<0.005
06/17/88	340.2	-MB	Fluoride	<0.05

*All units of concentration in mg/L or mg/kg unless otherwise noted.

Detection Limit for Cyanide = 0.01
Detection Limit for Phenols = 0.005
Detection Limit for Fluoride = 0.05

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

EPA METHOD 608
ORGANOCHLORINE PESTICIDES AND PCBs

Sample I.D.: W-Effluent Lab No. 880693-04

Samples Received: 06/17/88

Samples Analyzed: 06/20/88

Sample Matrix: Water Detection Limit Factor = 2

Compound	Concentration µg/L (ppb)
alpha-BHC	ND
gamma-BHC (Lindane)	ND
beta-BHC	ND
Heptachlor	ND
delta-BHC	ND
Aldrin	ND
Heptachlor epoxide	ND
Endosulfan I	ND
4,4'-DDE	ND
Dieldrin	ND
Endrin	ND
4,4'-DDD	ND
Endosulfan II	ND
4,4'-DDT	ND
Endrin aldehyde	ND
Endosulfan sulfate	0.02
Chlordane	ND
Toxaphene	ND
PCB-1016	ND
PCB-1221	ND
PCB-1232	ND
PCB-1242	ND
PCB-1248	ND
PCB-1254	ND
PCB-1260	ND

ND = Not Detected above Limit of Detection.

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

EPA METHOD 608
ORGANOCHLORINE PESTICIDES AND PCBs

Sample I.D.: Method Blank Lab No. 880693-MB

Samples Received: ----

Samples Analyzed: 06/20/88

Sample Matrix: Water Detection Limit Factor = 2

Compound	Concentration µg/L (ppb)
alpha-BHC	ND
gamma-BHC (Lindane)	ND
beta-BHC	ND
Heptachlor	ND
delta-BHC	ND
Aldrin	ND
Heptachlor epoxide	ND
Endosulfan I	ND
4,4'-DDE	ND
Dieldrin	ND
Endrin	ND
4,4'-DDD	ND
Endosulfan II	ND
4,4'-DDT	ND
Endrin aldehyde	ND
Endosulfan sulfate	ND
Chlordane	ND
Toxaphene	ND
PCB-1016	ND
PCB-1221	ND
PCB-1232	ND
PCB-1242	ND
PCB-1248	ND
PCB-1254	ND
PCB-1260	ND

ND = Not Detected above Limit of Detection.

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

EPA METHOD 608
ORGANOCHLORINE PESTICIDES AND PCBs

DETECTION LIMITS

DETECTION LIMITS = Detection Limit Factor X Concentration

1 Liter Sample to 1 mL Extract

Compound	Concentration µg/L (ppb)
alpha-BHC	0.01
gamma-BHC (Lindane)	0.01
beta-BHC	0.01
Heptachlor	0.01
delta-BHC	0.01
Aldrin	0.01
Heptachlor epoxide	0.01
Endosulfan I	0.01
4,4'-DDE	0.01
Dieldrin	0.01
Endrin	0.01
4,4'-DDD	0.01
Endosulfan II	0.01
4,4'-DDT	0.01
Endrin aldehyde	0.01
Endosulfan sulfate	0.01
Chlordane	0.1
Toxaphene	0.5
PCB-1016	0.1
PCB-1221	0.1
PCB-1232	0.1
PCB-1242	0.1
PCB-1248	0.1
PCB-1254	0.1
PCB-1260	0.1

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

EPA METHOD 601
PURGEABLE HALOCARBONS

Sample I.D.: W-Effluent Lab No. 880693-05

Samples Received: 06/17/88

Samples Analyzed: 06/20/88

Sample Matrix: Water Detection Limit Factor = 1

Compound	Concentration µg/L (ppb)	Additional Compound	Concentration µg/L (ppb)
Chloromethane	ND	Freon 113	ND
Bromomethane	ND		
Vinyl chloride	ND		
Chloroethane	ND		
Methylene chloride	ND		
1,1-dichloroethene	ND		
1,1-dichloroethane	ND		
Trans-1,2-dichloroethene	ND		
Trans-/Cis-1,2-dichloroethene (Total)	ND		
Chloroform	ND		
1,2-dichloroethane	ND		
1,1,1-trichloroethane	ND		
Carbon tetrachloride	ND		
Bromodichloromethane	ND		
1,2-dichloropropane	ND		
Cis-1,3-dichloropropene	ND		
Trichloroethene	ND		
Dibromochloromethane	ND		
1,1,2-trichloroethane	ND		
Trans-1,3-dichloropropene	ND		
2-chloroethylvinylether	ND		
Bromoform	ND		
Tetrachloroethene	ND		
1,1,2,2-tetrachloroethane	ND		
Chlorobenzene	ND		
1,3-dichlorobenzene	ND		
1,2-dichlorobenzene	ND		
1,4-dichlorobenzene	ND		
Dichlorodifluoromethane	ND		
Trichlorofluoromethane	ND		

ND = Not detected above Limit of Detection.

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

EPA METHOD 601
PURGEABLE HALOCARBONS

Sample I.D.: Method Blank Lab No. 880693-MB

Samples Received: ----

Samples Analyzed: 06/20/88

Sample Matrix: Water Detection Limit Factor = 1

Compound	Concentration µg/L (ppb)	Additional Compound	Concentration µg/L (ppb)
Chloromethane	ND	Freon 113	ND
Bromomethane	ND		
Vinyl chloride	ND		
Chloroethane	ND		
Methylene chloride	ND		
1,1-dichloroethene	ND		
1,1-dichloroethane	ND		
Trans-1,2-dichloroethene	ND		
Trans-/Cis-1,2-dichloroethene (Total)	ND		
Chloroform	ND		
1,2-dichloroethane	ND		
1,1,1-trichloroethane	ND		
Carbon tetrachloride	ND		
Bromodichloromethane	ND		
1,2-dichloropropane	ND		
Cis-1,3-dichloropropene	ND		
Trichloroethene	ND		
Dibromochloromethane	ND		
1,1,2-trichloroethane	ND		
Trans-1,3-dichloropropene	ND		
2-chloroethylvinylether	ND		
Bromoform	ND		
Tetrachloroethene	ND		
1,1,2,2-tetrachloroethane	ND		
Chlorobenzene	ND		
1,3-dichlorobenzene	ND		
1,2-dichlorobenzene	ND		
1,4-dichlorobenzene	ND		
Dichlorodifluoromethane	ND		
Trichlorofluoromethane	ND		

ND = Not detected above Limit of Detection.

Laboratory Client Code No. 0445

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

EPA METHOD 601
PURGEABLE HALOCARBONS

DETECTION LIMITS

DETECTION LIMITS = Detection Limit Factor X Concentration

5 mL Sample

Compound	Concentration µg/L (ppb)	Additional Compound	Concentration µg/L (ppb)
Chloromethane	0.6	Freon 113	0.6
Bromomethane	0.7		
Vinyl Chloride	0.5		
Chloroethane	0.5		
Methylene chloride	1.4		
1,1-dichloroethene	0.2		
1,1-dichloroethane	0.4		
Trans-1,2-dichloroethene	0.4		
Trans-/Cis-1,2-dichloroethene (Total)	0.4		
Chloroform	0.5		
1,2-dichloroethane	0.3		
1,1,1-trichloroethane	0.5		
Carbon tetrachloride	0.6		
Bromodichloromethane	0.7		
1,2-dichloropropane	0.5		
Cis-1,3-dichloropropene	0.5		
Trichloroethene	0.3		
Dibromochloromethane	0.6		
1,1,2-trichloroethane	0.6		
Trans-1,3-dichloropropene	0.6		
2-chloroethylvinylether	1.0		
Bromoform	0.7		
Tetrachloroethene	0.5		
1,1,2,2-tetrachloroethane	0.5		
Chlorobenzene	0.7		
1,3-dichlorobenzene	2.1		
1,2-dichlorobenzene	3.9		
1,4-dichlorobenzene	3.9		
Dichlorodifluoromethane	1.0		
Trichlorofluoromethane	0.4		

APPENDIX E

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton Job No.: 18034-2
Date begun: 6/23/88 Time begun: 8:20 p.m.

Well No.: MW-1 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Rodger Witham Time On: 8:20 p.m. Time Off: 8:20 a.m.
Geologist: Tim O'Brien Time On: 8:20 a.m. Time Off: 6:15 p.m.
Geologist: ____ Time On: ____ Time Off: ____
Geologist: ____ Time On: ____ Time Off: ____

Initial water level measurement: 38.71 Pump Rate: ≈ 20 gpm

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
8:20 p.m.	0.0	38.71	0	
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15 9			
	20 4			
	25			
	30			
	45 7	38.72	.01	
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150	38.74	.03	
	180 (3-hour)	38.73	.02	
	210	38.73	.02	
12:20 a.m.	240 (4-hour)	38.74	.03	
	300 (5-hour)	38.76	.05	
	360 (6-hour)	38.76	.05	
	420 (7-hour)	38.74	.03	
	480 (8-hour)	38.74	.03	
5:20 a.m.	540 (9-hour)	38.76	.05	

6/23/88

MW-1

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:20 a.m.	600 (10-hour)	38.77	.06	
	660 (11-hour)	38.83	.12	
	720 (12-hour)	38.83	.12	
	780 (13-hour)	38.83	.12	
	840 (14-hour)	38.80	.09	
12:20 p.m.	960 (16-hour)	38.78	.07	
	1080 (18-hour)	38.79	.08	
4:20 p.m.	1200 (20-hour)	38.78	.07	
	1320 (22-hour)			
	1440 (24-hour)			
	1800 (30-hour)			
	2160 (36-hour)			
	2520 (42-hour)			
	2880 (48-hour)			
	3360 (56-hour)			
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton
Date begun: 6/23/88
Job No.: 18034-2
Time begun: 8:20 p.m.

Well No.: MW-2 Observation Well: _____ Pumped Well: X
Drawdown Measurements: X Recovery Measurements: _____

Geologist: I-sen Wang — Time On: 8:20 p.m. Time Off: 12:30 a.m.
Geologist: Rodger Witham — Time On: 12:30 a.m. Time Off: 8:20 a.m.
Geologist: Tim O'Brien — Time On: 8:20 a.m. Time Off: 6:15 p.m.
Geologist: _____ Time On: _____ Time Off: _____

Initial water level measurement: 39.45 Pump Rate: ≈ 20 gpm

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
8:20 p.m.	0.0	39.45	0	
	1.0	43.36	3.91	
	1.5	.46	4.01	
	2.0	.48	4.03	
	2.5	.51	4.06	
	3.0	.64	4.19	
	4.0	.71	4.26	
	5.0	.75	4.30	
	6.0	.76	4.31	20 gpm
	8.0	.80	4.35	
	10	.85	4.40	
	12	.89	4.44	
	15	.92	4.47	20 gpm
	20	44.00	4.55	
	25	.06	4.61	
	30	.11	4.66	19.8 gpm
	45	.25	4.80	20 gpm
	60 (1-hour)	.32	4.87	20 gpm
	75	.41	4.96	20 gpm
	90	.48	5.03	
	120 (2-hour)	.60	5.15	
	150	.74	5.29	20 gpm
	180 (3-hour)	.80	5.35	20 gpm
	210	.92	5.47	20 gpm
12:20 a.m.	240 (4-hour)	.97	5.52	20 gpm
	300 (5-hour)	45.14	5.69	19.8 gpm
	360 (6-hour)	44.83	5.38	
	420 (7-hour)	45.08	5.63	19.2 gpm
	480 (8-hour)	.20	5.75	19 gpm
5:20 a.m.	540 (9-hour)	.37	5.92	19 gpm

6/23/88

MW-2

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:20 a.m.	600 (10-hour)	44.95	5.50	17.5 gpm
	660 (11-hour)	45.06	5.61	17.5 gpm
	720 (12-hour)	.14	5.69	17.5 gpm
	780 (13-hour)	.09	5.64	17.3 gpm
	840 (14-hour)	42.74	3.29	15 gpm
12:20 p.m.	960 (16-hour)	42.77	3.32	16 gpm
	1080 (18-hour)	.76	3.31	15.5 gpm
4:20 p.m.	1200 (20-hour)	.61	3.16	15.2 gpm
	1320 (22-hour)			
	1440 (24-hour)			
	1800 (30-hour)			
	2160 (36-hour)			
	2520 (42-hour)			
	2880 (48-hour)			
	3360 (56-hour)			
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton
Date begun: 6/23/88
Job No.: 18034-2
Time begun: 8:20 p.m

Well No.: MW-3 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Rodger Witham
Geologist: Tim O'Brien
Geologist: ____
Geologist: ____

Time On: 8:20 p.m. Time Off: 8:20 a.m.
Time On: 8:20 a.m. Time Off: 6:15 p.m.
Time On: ____ Time Off: ____
Time On: ____ Time Off: ____

Initial water level measurement: 39.58 Pump Rate: ≈ 20 gpm

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
8:20 p.m.	0.0	39.58	0	
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12 4			
	15 7	39.59	.01	
	20 2			
	25 7.5			
	30			
	45 6	39.60	.02	
	60 (1-hour)	39.59	.01	
	75			
	90			
	120 (2-hour)			
	150	39.61	.03	
	180 (3-hour)			
	210			
12:20 a.m.	240 (4-hour)	39.62	.04	
	300 (5-hour)	39.64	.06	
	360 (6-hour)	39.63	.05	
	420 (7-hour)	39.61	.03	
	480 (8-hour)	39.62	.04	
5:20 a.m.	540 (9-hour)	39.63	.05	

6/23/88

MW-3

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:20 a.m.	600 (10-hour)	39.65	.07	
	660 (11-hour)	39.65	.07	
	720 (12-hour)	39.69	.11	
	780 (13-hour)	39.68	.10	
	840 (14-hour)	39.67	.09	
12:20 p.m.	960 (16-hour)	39.63	.05	
	1080 (18-hour)	39.63	.05	
4:20 p.m.	1200 (20-hour)	39.63	.05	
	1320 (22-hour)			
	1440 (24-hour)			
	1800 (30-hour)			
	2160 (36-hour)			
	2520 (42-hour)			
	2880 (48-hour)			
	3360 (56-hour)			
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton
Date begun: 6/23/88
Job No.: 18034-2
Time begun: 8:20 p.m.

Well No.: MW-4 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Rodger Witham
Geologist: Tim O'Brien
Geologist: ____
Geologist: ____

Time On: 8:20 p.m. Time Off: 8:20 a.m.
Time On: 8:20 a.m. Time Off: 6:15 p.m.
Time On: ____ Time Off: ____
Time On: ____ Time Off: ____

Initial water level measurement: 38.83 Pump Rate: ~20 gpm

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
8:20 p.m.	0.0	38.83	0	
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20			
	25			
	30			
	45			
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150	38.85	.02	
	180 (3-hour)	38.84	.01	
	210	38.84	.01	
12:20 a.m.	240 (4-hour)	38.85	.02	
	300 (5-hour)	38.87	.04	
	360 (6-hour)	38.86	.03	
	420 (7-hour)	38.85	.02	
	480 (8-hour)	38.86	.03	
5:20 a.m.	540 (9-hour)	38.86	.03	

6/23/88 MW-4

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:20 a.m.	600 (10-hour)	38.88	.05	
	660 (11-hour)	38.94	.11	
	720 (12-hour)	38.94	.11	
	780 (13-hour)	38.94	.11	
	840 (14-hour)	38.92	.09	
12:20 p.m.	960 (16-hour)	38.90	.07	
	1080 (18-hour)	38.91	.08	
4:20 p.m.	1200 (20-hour)	38.92	.09	
	1320 (22-hour)			
	1440 (24-hour)			
	1800 (30-hour)			
	2160 (36-hour)			
	2520 (42-hour)			
	2880 (48-hour)			
	3360 (56-hour)			
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton
Date begun: 6/23/88

Job No.: 18034-2
Time begun: 8:20 p.m.

Well No.: MW-5d Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Rodger Witham Time On: 8:20 p.m. Time Off: 8:20 a.m.
Geologist: Tim O'Brien Time On: 8:20 a.m. Time Off: 6:15 p.m.
Geologist: ____ Time On: ____ Time Off: ____
Geologist: ____ Time On: ____ Time Off: ____

Initial water level measurement: 39.56 Pump Rate: ≈ 20 gpm

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
8:20 p.m.	0.0	39.56	0	
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20			
	25			
	30			
	45			
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150			
	180 (3-hour)			
	210	39.64	.08	
12:20 a.m.	240 (4-hour)	39.62	.06	
	300 (5-hour)	39.64	.08	
	360 (6-hour)	39.66	.10	
	420 (7-hour)	39.65	.09	
	480 (8-hour)	39.65	.09	
5:20 a.m.	540 (9-hour)	39.65	.09	

6/23/88

MW-5d

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:20 a.m	600 (10-hour)	39.68	.12	
	660 (11-hour)	39.69	.13	
	720 (12-hour)	39.70	.14	
	780 (13-hour)	39.69	.13	
	840 (14-hour)	39.66	.10	
12:20 p.m	960 (16-hour)	39.64	.08	
	1080 (18-hour)	39.68	.12	
4:20 p.m.	1200 (20-hour)	39.69	.13	
	1320 (22-hour)			
	1440 (24-hour)			
	1800 (30-hour)			
	2160 (36-hour)			
	2520 (42-hour)			
	2880 (48-hour)			
	3360 (56-hour)			
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton Job No.: 18034-2
Date begun: 6/23/88 Time begun: 8:20 p.m.

Well No.: MW-5s Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Rodger Witham Time On: 8:20 p.m. Time Off: 8:20 a.m.
Geologist: Tim O'Brien Time On: 8:20 a.m. Time Off: 6:15 p.m.
Geologist: ____ Time On: ____ Time Off: ____
Geologist: ____ Time On: ____ Time Off: ____

Initial water level measurement: 39.52 Pump Rate: ≈ 20 gpm

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
8:20 p.m.	0.0	39.52	0	
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20			
	25			
	30			
	45			
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150			
	180 (3-hour)	↓	↓	
	210	39.53	.01	
12:20 a.m.	240 (4-hour)	39.52	0	
	300 (5-hour)	39.54	.02	
	360 (6-hour)	39.54	.02	
	420 (7-hour)	39.52	0	
	480 (8-hour)	39.54	.02	
5:20 a.m.	540 (9-hour)	39.55	.03	

6/23/88 MW-5s

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:20 a.m.	600 (10-hour)	39.55	.03	
	660 (11-hour)	39.56	.04	
	720 (12-hour)	39.58	.06	
	780 (13-hour)	39.57	.05	
	840 (14-hour)	39.52	0	
12:20 p.m.	960 (16-hour)	39.51	-.01	
	1080 (18-hour)	39.52	0	
4:20 pm	1200 (20-hour)	39.54	.02	
	1320 (22-hour)			
	1440 (24-hour)			
	1800 (30-hour)			
	2160 (36-hour)			
	2520 (42-hour)			
	2880 (48-hour)			
	3360 (56-hour)			
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon Pleasanton Job No.: 18034-2
Date begun: 6/23/88 Time begun: 8:20 p.m.

Well No.: MW-6 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Rodger Witham Time On: 8:20 p.m. Time Off: 8:20 a.m.
Geologist: Tim O'Brien Time On: 8:20 a.m. Time Off: 6:15 p.m.
Geologist: ____ Time On: ____ Time Off: ____
Geologist: ____ Time On: ____ Time Off: ____

Initial water level measurement: 39.23 Pump Rate: ≈ 30 gpm.

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
8:20 p.m.	0.0	39.23	0	
	1.0	39.24	.01	
	1.5	39.24	.01	
	2.0	39.26	.03	
	2.5	39.27	.04	
	3.0	39.27	.04	
	4.0	39.28	.05	
	5.0	39.28	.05	
	6.0	39.28	.05	
	8.0	39.28	.05	
	10	39.29	.06	
	12	39.30	.07	
	15	39.30	.07	
	20	39.29	.06	
	25	39.29	.06	
	30	39.30	.07	
	45	39.31	.08	
	60 (1-hour)	39.31	.08	
	75	39.30	.07	
	90	39.30	.07	
	120 (2-hour)	39.31	.08	
	150	39.32	.09	
	180 (3-hour)	39.33	.10	
	210	39.32	.09	
12:20 a.m.	240 (4-hour)	39.34	.11	
	300 (5-hour)	39.34	.11	
	360 (6-hour)	39.33	.10	
	420 (7-hour)	39.33	.10	
	480 (8-hour)	39.32	.09	
5:20 a.m.	540 (9-hour)	39.34	.11	

6/23/88 MW-6

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:20 a.m.	600 (10-hour)	39.35	.12	
	660 (11-hour)	39.36	.13	
	720 (12-hour)	39.38	.15	
	780 (13-hour)	39.38	.15	
	840 (14-hour)	39.35	.12	
12:20 p.m.	960 (16-hour)	39.33	.10	
	1080 (18-hour)	39.34	.11	
4:20 p.m.	1200 (20-hour)	39.37	.14	
	1320 (22-hour)			
	1440 (24-hour)			
	1800 (30-hour)			
	2160 (36-hour)			
	2520 (42-hour)			
	2880 (48-hour)			
	3360 (56-hour)			
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton
Date begun: 6/23/88
Job No.: 18034-2
Time begun: 8:20 p.m.

Well No.: City Well 7 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Rodger Witham — Time On: 8:20 p.m. — Time Off: 8:20 a.m.
Geologist: Tim O'Brien — Time On: 8:20 a.m. — Time Off: 6:15 p.m.
Geologist: Rodger Witham — Time On: 6:15 p.m. — Time Off: 12:00 a.m.
Geologist: ____ — Time On: ____ — Time Off: ____

Initial water level measurement: 49.59 Pump Rate: ≈ 20 gpm

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
8:20 p.m.	0.0	49.59	0	
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20			
	25			
	30			
	45			
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150			
	180 (3-hour)			
	210	49.60	.01	
12:20 a.m.	240 (4-hour)			
	300 (5-hour)	49.62	.03	
	360 (6-hour)	49.64	.05	
	420 (7-hour)	49.64	.05	
	480 (8-hour)	49.66	.07	
5:20 a.m.	540 (9-hour)	49.68	.09	

6/23/88

City Well 7

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:20 a.m.	600 (10-hour)	49.70	.11	
	660 (11-hour)	49.72	.13	
	720 (12-hour)	49.73	.14	
	780 (13-hour)	50.04	.45	
	840 (14-hour)	50.23	.64	
12:20 p.m.	960 (16-hour)	50.36	.77	
	1080 (18-hour)	50.47	.88	
4:20 p.m.	1200 (20-hour)	50.56	.97	1282 minutes
5:42 p.m.	~~1320~~ (22-hour)	50.61	1.02	1282 minutes
6:42 p.m.	~~1440~~ (24-hour)	50.65	1.06	1342 minutes
7:42 p.m.	~~1800~~ (30-hour)	50.71	1.12	1402 minutes
8:42 p.m.	~~2160~~ (36-hour)	50.75	1.16	1462 minutes
9:42 p.m.	~~2580~~ (42-hour)	50.78	1.19	1522 minutes
10:42 p.m.	~~2880~~ (48-hour)	50.83	1.24	1582 minutes
27 hr. 22 min. 11:42 p.m.	~~3360~~ (56-hour)	50.88	1.29	1642 minutes
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

APPENDIX F

CHAIN OF CUSTODY RECORD

Applied GeoSystems
43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): Rodger C. Witham

Phone: (415) 651-1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: less than 24 hours

Project Leader: Rodger Witham

Phone No. (415) 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Rodger C. Witham	Tim O'Brien	6-23-88	12:00 PM
Tim O'Brien			
	Received for laboratory by:	6-24-88	8:00

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W-Initial	AGS 18034-2	6/23/88	TPH + BTEX ~~EPA 8015 EPA 602~~ RUN	Iced
W-Separator	AGS 18034-2	6/23/88	TPH + BTEX	Iced
W-C1	AGS 18034-2	6/23/88	TPH + BTEX	Iced
W-Effluent	AGS 18034-2	6/23/88	TPH + BTEX	Iced
			EPA 8015 as gasoline	
			EPA 602	

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 6-24-88
Laboratory Number: 06064W01
Project: 18034-2
Sample: W-INITIAL
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		2.35		0.02	06-24-88	
TEH as Diesel						NR
Benzene		0.194		0.005	06-24-88	
Toluene		0.307		0.005	06-24-88	
Ethylbenzene		0.051		0.005	06-24-88	
Total Xylenes		0.270		0.005	06-24-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

6-28-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 6-24-88
Laboratory Number: 06064W02
Project: 18034-2
Sample: W-SEPARATOR
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		2.03		0.02	06-24-88	
TEH as Diesel						NR
Benzene		0.160		0.005	06-24-88	
Toluene		0.251		0.005	06-24-88	
Ethylbenzene		0.042		0.005	06-24-88	
Total Xylenes		0.237		0.005	06-24-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

6-28-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 6-24-88
Laboratory Number: 06064W03
Project: 18034-2
Sample: W-C1
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	06-24-88	
TEH as Diesel						NR
Benzene		ND		0.0005	06-24-88	
Toluene		ND		0.0005	06-24-88	
Ethylbenzene		ND		0.0005	06-24-88	
Total Xylenes		ND		0.0005	06-24-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

6-28-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 6-24-88
Laboratory Number: 06064W04
Project: 18034-2
Sample: W-EFFLUENT
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	06-24-88	
TEH as Diesel						NR
Benzene		ND		0.0005	06-24-88	
Toluene		ND		0.0005	06-24-88	
Ethylbenzene		ND		0.0005	06-24-88	
Total Xylenes		ND		0.0005	06-24-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

6-28-88
Date Reported

APPENDIX G

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon Pleasanton
Date begun: 6/28/88
Job No.: 18134-2
Time begun: 1:05 p.m.

Well No.: MW-1 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Tim O'Brien/Ed Westphal Time On: 1:05 p.m. Time Off: 10:05 p.m.
Geologist: Rodger Witham Time On: 10:05 p.m. Time Off: 8:00 a.m.
Geologist: Tim O'Brien Time On: 8:00 a.m. Time Off: 6:45 p.m.
Geologist: ____ Time On: ____ Time Off: ____

Initial water level measurement: 39.16 Pump Rate: ≈ 1,775

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
1:05 p.m.	0.0			
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20	39.16	0	
	25	39.17	.01	
	30	39.17	.01	
	45	39.15	-.01	
	60 (1-hour)	39.16	0	
	75	39.16	0	
	90	39.16	0	
	120 (2-hour)	39.16	0	
	150	39.18	.02	
	180 (3-hour)	39.18	.02	
	210	39.18	.02	
	240 (4-hour)	39.17	.01	
	300 (5-hour)	39.17	.01	
	360 (6-hour)	39.20	.04	
	420 (7-hour)	39.21	.05	
	480 (8-hour)	39.23	.07	
10:05 p.m.	540 (9-hour)	39.25	.09	

6/28/88 MW-1

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
11:05 p.m.	600 (10-hour)	39.25	.09	
12:05 a.m.	660 (11-hour)	39.26	.10	
	720 (12-hour)	39.24	.08	
	780 (13-hour)	39.24	.08	
	840 (14-hour)	39.24	.08	
	960 (16-hour)	39.25	.09	
	1080 (18-hour)	39.26	.10	
	1200 (20-hour)	39.26	.10	
	1320 (22-hour)	39.25	.09	
1:05 p.m.	1440 (24-hour)	39.23	.07	
	1800 25 (30-hour)	39.22	.06	
	2160 26 (36-hour)	39.21	.05	
	2520 27 (42-hour)	39.21	.05	
	2880 28 (48-hour)	39.21	.05	
6:05 p.m.	3360 29 (56-hour)	39.21	.05	
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton Job No.: 18034-2
Date begun: 6/28/88 Time begun: 1:05 p.m.

Well No.: MW-2 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Tim O'Brien/Ed Westphal Time On: 1:05 p.m. Time Off: 10:05 p.m.
Geologist: Rodger Witham Time On: 10:05 p.m. Time Off: 8:00 a.m.
Geologist: Tim O'Brien Time On: 8:00 a.m. Time Off: 6:45 p.m.
Geologist: ____ Time On: ____ Time Off: ____

Initial water level measurement: 39.72 Pump Rate: ≈ 1,775

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
1:05 p.m.	0.0			
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20			
	25			
	30			
	45			
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150			
	180 (3-hour)			
	210	39.72	0	
	240 (4-hour)	39.72	0	
	300 (5-hour)	39.725	.005	
	360 (6-hour)	39.73	.01	
	420 (7-hour)	39.75	.03	
	480 (8-hour)	39.77	.05	
10:05 p.m.	540 (9-hour)	39.79	.07	

6/28/88

MW-2

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
11:05 p.m.	600 (10-hour)	39.80	.08	
12:05 a.m.	660 (11-hour)	39.80	.08	
	720 (12-hour)	39.79	.07	
	780 (13-hour)	39.79	.07	
	840 (14-hour)	39.79	.07	
	960 (16-hour)	39.79	.07	
	1080 (18-hour)	39.81	.09	
	1200 (20-hour)	39.81	.09	
	1320 (22-hour)	39.81	.09	
1:05 p.m.	1440 (24-hour)	39.80	.08	
	1800 25 (30-hour)	39.77	.05	
	2160 26 (36-hour)	39.76	.04	
	2520 27 (42-hour)	39.76	.04	
	2880 28 (48-hour)	39.76	.04	
6:05 p.m.	3360 29 (56-hour)	39.76	.04	
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon Pleasanton Job No.: 18034-2
Date begun: 6/28/88 Time begun: 1:05 p.m.

Well No.: MW-3 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Ed Westphal Time On: 1:05 p.m. Time Off: 5:00 p.m.
Geologist: Tim O'Brien Time On: 5:00 p.m. Time Off: 10:05 p.m.
Geologist: Rodger Witham Time On: 10:05 p.m. Time Off: 8:00 a.m.
Geologist: Tim O'Brien Time On: 8:00 a.m. Time Off: 6:45 p.m.

Initial water level measurement: 40.04 Pump Rate: ≈ 1,775

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
1:05 p.m.	0.0			
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20	40.04	0	
	25	↓	↓	
	30			
	45	↓	↓	
	60 (1-hour)	40.03	-.01	
	75	↓	↓	
	90			
	120 (2-hour)	↓	↓	
	150			
	180 (3-hour)	40.05	.01	
	210	40.05	.01	
	240 (4-hour)	40.04	0	
	300 (5-hour)	40.04	0	
	360 (6-hour)	40.07	.03	
	420 (7-hour)	40.08	.04	
	480 (8-hour)	40.10	.06	
10:05 p.m.	540 (9-hour)	40.12	.08	

6/28/88 MW-3

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
11:05p.m.	600 (10-hour)	40.13	.09	
12:05a.m.	660 (11-hour)	40.13	.09	
	720 (12-hour)	40.12	.08	
	780 (13-hour)	40.12	.08	
	840 (14-hour)	40.12	.08	
	960 (16-hour)	40.12	.08	
	1080 (18-hour)	40.14	.10	
	1200 (20-hour)	40.12	.08	
	1320 (22-hour)	40.12	.08	
1:05p.m	1440 (24-hour)	40.10	.06	
	1800 (30-hour)	40.08	.04	
	2160 (36-hour)	40.08	.03	
	2520 (42-hour)	40.07	.03	
	2880 (48-hour)	40.07	.03	
6:05p.m.	3360 (56-hour)	40.07	.03	
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton
Date begun: 6/28/88
Job No.: 18034-2
Time begun: 1:05 p.m.

Well No.: MW-4 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Ed Westphal — Time On: 1:05 p.m. — Time Off: 5:00 p.m.
Geologist: Tim O'Brien — Time On: 5:00 p.m. — Time Off: 10:05 p.m.
Geologist: Rodger Witham — Time On: 10:05 p.m. — Time Off: 8:00 a.m.
Geologist: Tim O'Brien — Time On: 8:00 a.m. — Time Off: 6:45 p.m.

Initial water level measurement: 39.28 Pump Rate: ≈ 1,775

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
1:05 p.m.	0.0			
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20	39.29	.01	
	25			
	30			
	45			
	60 (1-hour)	39.27	-.01	
	75			
	90			
	120 (2-hour)	39.28	0	
	150			
	180 (3-hour)			
	210			
	240 (4-hour)			
	300 (5-hour)			
	360 (6-hour)	39.30	.02	
	420 (7-hour)	39.32	.04	
	480 (8-hour)	39.33	.05	
10:05 p.m.	540 (9-hour)	39.35	.07	

6/28/88 MW-4

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
11:05 a.m.	600 (10-hour)	39.36	.08	
12:05 a.m.	660 (11-hour)	39.36	.08	
	720 (12-hour)	39.35	.07	
	780 (13-hour)	↓	.07	
	840 (14-hour)	↓	.07	
	960 (16-hour)	39.36	.08	
	1080 (18-hour)	↓	.08	
	1200 (20-hour)	↓	.08	
	1320 (22-hour)	↓	.08	
1:05 p.m.	1440 (24-hour)	39.34	.06	
	1800 25 (30-hour)	39.32	.04	
	2160 26 (36-hour)	↓	.04	
	2520 27 (42-hour)	↓	.04	
	2880 28 (48-hour)	↓	.04	
6:05 p.m.	3360 29 (56-hour)	↓	.04	
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton
Job No.: 18034-2
Date begun: 6/28/88
Time begun: 1:05 p.m.

Well No.: MW-5d Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Ed Westphal Time On: 1:05 p.m. Time Off: 5:00 p.m.
Geologist: Tim O'Brien Time On: 5:00 p.m. Time Off: 10:05 p.m.
Geologist: Rodger Witham Time On: 10:05 p.m. Time Off: 8:00 a.m.
Geologist: Tim O'Brien Time On: 8:00 a.m. Time Off: 6:45 p.m.

Initial water level measurement: 40.23 Pump Rate: ≈ 1,775

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
1:05 p.m.	0.0	40.23	0	
	1.0	40.22	-.01	
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15	↓	↓	
	20	40.23	0	
	25	40.22	-.01	
	30	40.24	.01	
	45	40.25	.02	
	60 (1-hour)	40.24	.01	
	75	40.23	0	
	90	40.22	-.01	
	120 (2-hour)	40.23	0	
	150	40.24	.01	
	180 (3-hour)	40.22	-.01	
	210	40.23	0	
	240 (4-hour)	40.23	0	
	300 (5-hour)	40.20	-.03	
	360 (6-hour)	40.20	-.03	
	420 (7-hour)	40.24	.01	
	480 (8-hour)	40.26	.03	
10:05 p.m.	540 (9-hour)	40.30	.07	

6/28/88 MW-5I

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
11:05 p.m.	600 (10-hour)	40.30	.07	
12:05 a.m.	660 (11-hour)	40.32	.09	
	720 (12-hour)	40.28	.05	
	780 (13-hour)	40.31	.08	
	840 (14-hour)	40.28	.05	
	960 (16-hour)	40.31	.08	
	1080 (18-hour)	40.32	.09	
	1200 (20-hour)	40.31	.08	
	1320 (22-hour)	40.28	.05	
1:05 p.m.	1440 (24-hour)	40.25	.02	
	1800 25 (30-hour)	40.25	.02	
	2160 26 (36-hour)	40.21	-.02	
	2520 27 (42-hour)	40.20	-.03	
	2880 28 (48-hour)	40.20	-.03	
6:05 p.m.	3360 29 (56-hour)	40.20	-.03	
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton Job No.: 18034-2
Date begun: 6/28/88 Time begun: 1:05 p.m.

Well No.: MW-5s Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Ed Westgard Time On: 1:05 p.m. Time Off: 5:00 p.m.
Geologist: Tim O'Brien Time On: 5:00 p.m. Time Off: 10:05 p.m.
Geologist: Rodger Witham Time On: 10:05 p.m. Time Off: 8:00 a.m.
Geologist: Tim O'Brien Time On: 8:00 a.m. Time Off: 6:45 p.m.

Initial water level measurement: 39.84 Pump Rate: ~ 1,775

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
1:05 p.m.	0.0	39.84	0	
	1.0	39.82	-.02	
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20	39.83	-.01	
	25			
	30	39.84	0	
	45			
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150	39.86	.02	
	180 (3-hour)	39.85	.01	
	210	39.83	-.01	
	240 (4-hour)	39.84	0	
	300 (5-hour)	39.85	.01	
	360 (6-hour)	39.86	.02	
	420 (7-hour)	39.89	.05	
	480 (8-hour)	39.90	.06	
10:05 p.m.	540 (9-hour)	39.92	.08	

6/28/88

MW-5s

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
11:05 p.m.	600 (10-hour)	39.93	.09	
12:05 a.m.	660 (11-hour)	39.94	.10	
	720 (12-hour)	39.93	.09	
	780 (13-hour)	↓	.09	
	840 (14-hour)	↓	.09	
	960 (16-hour)	39.94	.10	
	1080 (18-hour)	↓	.10	
	1200 (20-hour)	↓	.10	
	1320 (22-hour)	39.92	.08	
1:05 p.m.	1440 (24-hour)	39.91	.07	
	1800 (30-hour)	39.88	.04	
	2160 (36-hour)	39.87	.03	
	2520 (42-hour)	39.86	.02	
	2880 (48-hour)	39.87	.03	
6:05 p.m.	3360 (56-hour)	39.87	.03	
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton Job No.: 18034-2
Date begun: 6/28/88 Time begun: 1:05 p.m.

Well No.: MW-6 Observation Well: X Pumped Well: ____
Drawdown Measurements: X Recovery Measurements: ____

Geologist: Ed Westfall Time On: 1:05 p.m. Time Off: 5:00 p.m.
Geologist: Tim O'Brien Time On: 5:00 p.m. Time Off: 10:05 p.m.
Geologist: Ridge Witham Time On: 10:05 p.m. Time Off: 8:00 a.m.
Geologist: Tim O'Brien Time On: 8:00 a.m. Time Off: 6:45 p.m.

Initial water level measurement: 39.74 Pump Rate: ≈ 1,775

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
1:05 p.m.	0.0			
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20			
	25			
	30			
	45			
	60 (1-hour)	39.74	0	
	75	↓	↓	
	90			
	120 (2-hour)			
	150			
	180 (3-hour)			
	210	↓	↓	
	240 (4-hour)	39.73	-.01	
	300 (5-hour)	39.73	-.01	
	360 (6-hour)	39.75	.01	
	420 (7-hour)	39.76	.02	
	480 (8-hour)	39.78	.04	
10:05 p.m.	540 (9-hour)	39.80	.06	

7

6/28/88

MW-6

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
11:05 p.m.	600 (10-hour)	39.81	.07	
12:05 a.m.	660 (11-hour)	39.81	.07	
	720 (12-hour)	39.81	.07	
	780 (13-hour)	39.80	.06	
	840 (14-hour)	39.80	.06	
	960 (16-hour)	39.81	.07	
	1080 (18-hour)	39.82	.08	
	1200 (20-hour)	39.81	.07	
	1320 (22-hour)	39.81	.07	
1:05 p.m.	1440 (24-hour)	39.79	.05	
	1800 25 (30-hour)	39.78	.03	
	2160 26 (36-hour)	39.78	.02	
	2520 27 (42-hour)	39.77	.03	
	2880 28 (48-hour)	39.77	.03	
6:05 p.m.	3360 29 (56-hour)	39.77	.03	
	3840 (64-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton — Job No.: 18034-2
Date begun: _____ — Time begun: 1:05 p.m.

Well No.: City Well 7 — Observation Well: _____ — Pumped Well: X
Drawdown Measurements: X — Recovery Measurements: _____

Geologist: Jim O'Brien	Time On: 1:05 p.m.	Time Off: 10:05 p.m.
Geologist: Rodger Witham	Time On: 10:05 p.m.	Time Off: 8:00 a.m.
Geologist: Jim O'Brien	Time On: 8:00 a.m.	Time Off: 6:45 p.m.
Geologist: _____	Time On: _____	Time Off: _____

Initial water level measurement: 50.07 — Pump Rate: ≈ 1,775

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
1:05 p.m.	0.0	50.07	0	
	1.0	56.48	6.41	
	1.5	56.73	6.66	
	2.0	56.88	6.81	
	2.5	56.96	6.89	
	3.0	57.03	6.96	
	4.0	57.14	7.07	
	5.0	57.22	7.15	
	6.0	57.30	7.23	
	8.0	57.41	7.34	
	10	57.49	7.42	
	12	57.56	7.49	
	15	57.65	7.58	
	20	57.79	7.72	
	25	55.89	5.82	
	30	55.68	5.61	
	45	55.74	5.67	1,640 gpm
	60 (1-hour)	55.73	5.66	1,640 gpm
	75	55.70	5.63	1,640 gpm
	90	55.64	5.57	1,630 gpm
	120 (2-hour)	55.82	5.75	1,630 gpm
	150	55.98	5.91	1,630 gpm
	180 (3-hour)	56.03	5.96	1,700 gpm
	210	56.18	6.11	1,700 gpm
	240 (4-hour)	56.26	6.19	1,700 gpm
	300 (5-hour)	56.43	6.36	1,760 gpm
	360 (6-hour)	56.63	6.56	1,780 gpm
	420 (7-hour)	56.78	6.71	1,810 gpm
	480 (8-hour)	56.90	6.83	1,840 gpm
10:05 p.m.	540 (9-hour)	56.94	6.87	1,800 gpm

6/28/88

City Well 7

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
11:05 p.m.	600 (10-hour)	57.06	6.99	1,830 gpm
12:05 a.m.	660 (11-hour)	57.16	7.03	1,840 gpm
	720 (12-hour)	57.16	7.03	1,840 gpm
	780 (13-hour)	57.24	7.17	1,840-50 gpm
	840 (14-hour)	57.27	7.20	1,840 gpm
	960 (16-hour)	57.57	7.50	1,900 gpm
	1080 (18-hour)	57.67	7.60	1,890-1900 gpm
	1200 (20-hour)	57.62	7.55	1,880 gpm
	1320 (22-hour)	57.46	7.39	1,850 gpm
1:05 p.m.	1440 (24-hour)	57.33	7.26	1,810 gpm
	1800 ~~25~~ (~~30~~-hour)	57.36	7.29	1,830 gpm
	2160 26 (~~36~~-hour)	57.23	7.16	1,780 gpm
	2520 27 (~~42~~-hour)	57.21	7.14	1,790 gpm
	2880 ~~28~~ (~~48~~-hour)	57.34	7.27	1,750 gpm
6:05 p.m.	3360 ~~1~~ (~~56~~-hour)	57.30	7.23	1,720 gpm
	3840 30 (~~64~~-hour)			
	4320 (72-hour)			
	5040 (84-hour)			
	5760 (96-hour)			
	7200 (5-day)			
	8640 (6-day)			
	10080 (7-day)			
	11520 (8-day)			
	12960 (9-day)			
	14400 (10-day)			
	15840 (11-day)			
	17280 (12-day)			
	18720 (13-day)			
	20160 (14-day)			
	21600 (15-day)			
	23040 (16-day)			
	24480 (17-day)			
	25920 (18-day)			
	27360 (19-day)			
	28800 (20-day)			
	30240 (21-day)			
	31680 (22-day)			
	33120 (23-day)			
	34560 (24-day)			
	36000 (25-day)			
	37440 (26-day)			
	38880 (27-day)			
	40320 (28-day)			
	41760 (29-day)			
	43200 (30-day)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton Job No.: 18034-2
Date begun: 6/29/88 Time begun: 6:10 p.m.

Well No.: City Well 7 Observation Well: ____ Pumped Well: X
Drawdown Measurements: ____ Recovery Measurements: X

Geologist: Tim O'Brien Time On: 8:00 a.m. Time Off: 7:00 p.m.
Geologist: ____ Time On: ____ Time Off: ____
Geologist: ____ Time On: ____ Time Off: ____
Geologist: ____ Time On: ____ Time Off: ____

Initial water level measurement: 50.07 Pump Rate: ____

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:10 p.m.	0.0	57.32	7.25	
	1.0	52.44	2.37	
	1.5	52.31	2.24	
	2.0	52.23	2.16	
	2.5	52.14	2.07	
	3.0	52.07	2.00	
	4.0	51.97	1.90	
	5.0	51.88	1.81	
	6.0	51.82	1.75	
	8.0	51.71	1.64	
	10	51.63	1.56	
	12	51.51	1.44	
	15	51.46	1.39	
	20	51.35	1.28	
	25	51.25	1.18	
	30	51.19	1.12	
6:55 p.m.	45	51.02	0.95	
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150			
	180 (3-hour)			
	210			
	240 (4-hour)			
	300 (5-hour)			
	360 (6-hour)			
	420 (7-hour)			
	480 (8-hour)			
	540 (9-hour)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton
Date begun: 6/29/88
Job No.: 18034-2
Time begun: 6:10 p.m.

Well No.: MW-5d Observation Well: X Pumped Well: ____
Drawdown Measurements: ____ Recovery Measurements: X

Geologist: Rodger Witham
Geologist: ____
Geologist: ____
Geologist: ____

Time On: 5:00 p.m. Time Off: 7:00 p.m.
Time On: ____ Time Off: ____
Time On: ____ Time Off: ____
Time On: ____ Time Off: ____

Initial water level measurement: 40.23 Pump Rate: ____

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:10 p.m.	0.0	40.22		
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20			
	25			
	30			
6:55 p.m.	45	40.22		
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150			
	180 (3-hour)			
	210			
	240 (4-hour)			
	300 (5-hour)			
	360 (6-hour)			
	420 (7-hour)			
	480 (8-hour)			
	540 (9-hour)			

D. Field Data Sheet

PUMP TEST FIELD DATA SHEET

Project Name: Exxon, Pleasanton Job No.: 18034-2
Date begun: 6/29/88 Time begun: 6:10 p.m.

Well No.: MW-5S Observation Well: X Pumped Well: ____
Drawdown Measurements: ____ Recovery Measurements: X

Geologist: Rodger Witham Time On: 5:00 p.m. Time Off: 7:00 p.m.
Geologist: ____ Time On: ____ Time Off: ____
Geologist: ____ Time On: ____ Time Off: ____
Geologist: ____ Time On: ____ Time Off: ____

Initial water level measurement: 39.84 Pump Rate: ____

Time	Elapsed Time (minutes)	Depth To Water level (feet)	Drawdown (feet)	Remarks
6:10 p.m.	0.0	39.91		
	1.0			
	1.5			
	2.0			
	2.5			
	3.0			
	4.0			
	5.0			
	6.0			
	8.0			
	10			
	12			
	15			
	20			
	25			
	30	↓		
6:55 p.m.	45	39.91		
	60 (1-hour)			
	75			
	90			
	120 (2-hour)			
	150			
	180 (3-hour)			
	210			
	240 (4-hour)			
	300 (5-hour)			
	360 (6-hour)			
	420 (7-hour)			
	480 (8-hour)			
	540 (9-hour)			

APPENDIX H

CALCULATION OF WELL EFFICIENCY
(Pump test of well MW-2, June 23-24, 1988)

The theoretical drawdown in the formation near well MW-2 and the well efficiency during pumping may be calculated from the observed drawdown and the values for transmissivity and specific yield.

Well and aquifer data:

Transmissivity (T)	= 5.4×10^4 gallons per day per foot
Specific yield (S)	= 0.16
Discharge rate (Q)	= 20 gallons per minute
Time since pumping started (t)	= 300 minutes
Wellbore radius (r)	= 0.5 feet
Aquifer thickness (b)	= 17 feet

Equations:

$$(1)\quad s' = \frac{Q}{4\pi T} W(u) \qquad (2)\quad u = \frac{r^2 S}{4Tt} \qquad (3)\quad s' = s - \frac{(s^2)}{(2b)}$$

Where: s' = corrected drawdown
W(u) = well function of u
u = exponential integral defined by equation (2)
s = actual drawdown

Calculation:

Equation (2):

$$u = \frac{(0.5)^2\ (0.16)}{4\ (5.4 \times 10^4)\ (1\ \text{day}/1440\ \text{min})\ (1\ \text{ft}^3/7.48\ \text{gal})\ 300}$$

$$= 6.65 \times 10^{-6}$$

W(u) = 11.34 (Driscoll, 1986, Appendix 9.E.)

Equation (1):

$$s' = \frac{(20)\ (1440\ \text{min/day})}{4\ \pi\ (54{,}000)}\ (11.34)$$

$$= 0.48\ \text{feet}$$

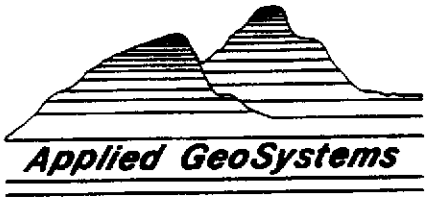
Equation (3):

$$0.48 = s - \frac{(s^2)}{(34)}$$

$$s = 0.49\ \text{feet}$$

APPENDIX I

CHAIN OF CUSTODY RECORD



43255 Mission Blvd. Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): Tim O'Brien

Phone: 415 651 1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 48 hours

Project Leader: Rodger Witham

Phone No. 415 651 1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Tim O'Brien	Rodger C. Witham	9/6/88	5:15 p.m.
Rodger C. Witham	Received for laboratory by: [illegible]	9/6/88	5:30 pm

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W-40-MW1	080342 TROB	7-6-88 TROB	TPH (8015) + BTEX TROB	iced TROB
W-41-MW2				
W-41-MW3				
W-40-MW4				
W-41-MW5D				
W-41-MW5S	TROB	TROB	TROB	TROB

CHAIN OF CUSTODY RECORD

Applied GeoSystems

43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): Tim O'Brien

Phone: 415 651 1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: less than 24 hrs

Project Leader: Rodger Witham

Phone No. 415 651 1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Tim O'Brien	Rodger C. Witham	6/28/88	10:50 a.m.
Rodger C. Witham	Received for laboratory by: [signature]	6-28-88	1050

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W-38-MW6	018034-2	6-28-88	TPH & BTEX	iced

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 7-06-88
Laboratory Number: 07009W01
Project: 018034-2
Sample: W-40-MW1
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	07-07-88	
TEH as Diesel						NR
Benzene		ND		0.0005	07-07-88	
Toluene		ND		0.0005	07-07-88	
Ethylbenzene		ND		0.0005	07-07-88	
Total Xylenes		ND		0.0005	07-07-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

7-12-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 7-06-88
Laboratory Number: 07009W02
Project: 018034-2
Sample: W-41-MW2
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		62		1	07-07-88	
TEH as Diesel						NR
Benzene		5.7		0.1	07-07-88	
Toluene		18.5		0.1	07-07-88	
Ethylbenzene		2.9		0.1	07-07-88	
Total Xylenes		21.4		0.1	07-07-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

7-12-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 7-06-88
Laboratory Number: 07009W03
Project: 018034-2
Sample: W-41-MW3
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	07-07-88	
TEH as Diesel						NR
Benzene		ND		0.0005	07-07-88	
Toluene		ND		0.0005	07-07-88	
Ethylbenzene		ND		0.0005	07-07-88	
Total Xylenes		ND		0.0005	07-07-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

7-12-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 7-06-88
Laboratory Number: 07009W04
Project: 018034-2
Sample: W-41-MW4
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	07-07-88	
TEH as Diesel						NR
Benzene		ND		0.0005	07-07-88	
Toluene		ND		0.0005	07-07-88	
Ethylbenzene		ND		0.0005	07-07-88	
Total Xylenes		ND		0.0005	07-07-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

7-12-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 7-06-88
Laboratory Number: 07009W05
Project: 018034-2
Sample: W-41-MW5D
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	07-07-88	
TEH as Diesel						NR
Benzene		ND		0.0005	07-07-88	
Toluene		ND		0.0005	07-07-88	
Ethylbenzene		ND		0.0005	07-07-88	
Total Xylenes		ND		0.0005	07-07-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

7-12-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 7-06-88
Laboratory Number: 07009W06
Project: 018034-2
Sample: W-41-MW5S
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.02	07-07-88	
TEH as Diesel						NR
Benzene		ND		0.0005	07-07-88	
Toluene		ND		0.0005	07-07-88	
Ethylbenzene		ND		0.0005	07-07-88	
Total Xylenes		ND		0.0005	07-07-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

7-12-88
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Rodger C. Witham

Date Received: 6-28-88
Laboratory Number: 06072W01
Project: 18034-2
Sample: W-38-MW6
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		0.44		0.02	06-28-88	
TEH as Diesel						NR
Benzene		0.0318		0.0005	06-28-88	
Toluene		0.0075		0.0005	06-28-88	
Ethylbenzene		0.0054		0.0005	06-28-88	
Total Xylenes		0.0067		0.0005	06-28-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

7-01-88
Date Reported