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October 2, 1989
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AGS 18034-4

Mr. Steven Cusenza
City of Pleasanton Public Works
Department
200 Old Bernal Avenue
Pleasanton, California 94566-08092

Subject: Transmittal of Progress Report on Ground-Water and Soil-Vapor Extraction and Treatment at Exxon Station No. 7-3399, 2991 Hopyard Road, Pleasanton, California.

Mr. Cusenza:

At the request of Exxon Company, U.S.A., we submit one copy of the above-referenced progress report in accordance with Cleanup and Abatement Order No. 89-132, issued by the California Regional Water Quality Control Board, San Francisco Bay Region on August 11, 1989.

Sincerely,
Applied GeoSystems

Rodger C. Witham

Rodger C. Witham
Senior Project Geologist

cc: Mr. Jerry Killingstad, Zone 7, w/report
Mr. Rick Mueller, Pleasanton Fire Department w/report
Mr. Kevin Hunter, Exxon, Houston, w/o report

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PROGRESS REPORT
ON
GROUND-WATER AND SOIL-VAPOR EXTRACTION AND TREATMENT
at
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

9-30-89 AGS Job No. 18034-4

Report prepared for

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

by
Applied GeoSystems

Rodger C. Witham
Senior Project Geologist

Thomas E. Lindemuth
P.E. 3510

September 30, 1989

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

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PROGRESS REPORT ON GROUND-WATER AND SOIL-VAPOR EXTRACTION AND TREATMENT at Exxon Station No. 7-3399 2991 Hopyard Road Pleasanton, California

For Exxon Company, U.S.A.

INTRODUCTION

This report describes the steps taken to cleanup soil and ground water containing gasoline hydrocarbons and to minimize further contamination of ground-water and migration of this contamination at Exxon Station No. 7-3399, 2991 Hopyard Road, Pleasanton, California. Applied GeoSystems performed work at the site to install and operate ground-water and soil hydrocarbon-vapor extraction and remediation systems. Exxon Company, U.S.A. (Exxon) authorized the subject work, which we conducted between August 1988 and August 1989. In addition to installing the two extraction and treatment systems, we also destroyed ground-water monitoring wells MW-3 and MW-6 during this time. Our purpose for installing those systems was to continue remediating gasoline hydrocarbon contamination in soil and ground water beneath the site and to minimize the potential for this

contamination to affect ground water being extracted by nearby City of Pleasanton Municipal Well No. 7 (Municipal Well No. 7).

In this report, we provide a summary of the previous work we performed in 1988 to delineate and remediate hydrocarbon contamination in soil and ground water; describe the installation and operation of the ground-water and soil-vapor extraction and treatment systems; and provide information on the volume of ground water pumped and treated and the concentrations of soil hydrocarbon vapor extracted. Information on ground-water monitoring and testing is included in our Letter Reports, Nos. 18034-4 (Applied GeoSystems, August 28, 1989) and 18034-6 (Applied GeoSystems, August 29, 1989).

Our cleanup efforts since April 1988 included removing floating gasoline product from the ground water within 3 months of the reported product release; excavating and treating approximately 1,900 cubic yards of soil from the former tank pit area and backfilling the excavation with clean materials; pumping approximately 7.33 million gallons of ground water from the site; and extracting approximately 160 pounds of hydrocarbon vapors from the unsaturated zone near the former tank pit. Concentrations of hydrocarbons in the effluent from the ground-water recovery well decreased to within or just above drinking-water standards in August 1989. During five sampling events from June through August 1989, no detectable concentrations of benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) were found in the other ground-water monitoring wells at and near the

site. Concentrations of extracted hydrocarbon vapors decreased from approximately 2,300 to 300 parts per million (ppm) during vapor extraction efforts in August 1989. We continue to pump ground water and extract soil hydrocarbon vapors.

LOCATION AND BACKGROUND

Exxon Station No. 7-3399 is at 2991 Hopyard Road in Pleasanton, California. The station is on the southeast corner of the intersection of Hopyard Road and Valley Avenue as shown on the Site Vicinity Map, Plate P-1. Exxon temporarily closed the service station on July 15, 1988, to remove the former underground gasoline-storage tanks, to install new tanks, and to demolish and rebuild station facilities. The former station facilities (both aboveground and underground) and station pad were removed and the entire property was regraded for the new station pad and buildings. The renovated service station opened for business in early February 1989. The Generalized Site Plan, Plate P-2, shows the approximate orientation of the station facilities.

Municipal Well No. 7 is northwest of Valley Avenue approximately 275 feet from the station site. The Site Vicinity Map shows this well relative to Exxon Station No. 7-3399.

PREVIOUS ENVIRONMENTAL WORK

Applied GeoSystems conducted three earlier phases of work at the site to evaluate the extent and magnitude of hydrocarbon contamination in the soil and ground water, to evaluate the potential of the contamination to migrate toward Municipal Well No. 7 when this well was pumping ground water, and to monitor and test soil during excavation and aeration. We installed ground-water monitoring wells MW-1 through MW-4, had boring B-4 drilled, performed a soil-vapor survey, sampled and tested ground water, and began removing floating hydrocarbon product during our initial investigation (Applied GeoSystems, April 22, 1988). During our second investigation (Applied GeoSystems, July 15, 1988; August 17, 1988), we drilled and installed ground-water monitoring wells MW-5 (5s and 5d) through MW-7, conducted two pump tests, sampled and tested ground water, and commenced ground-water extraction. The third investigation (Applied GeoSystems, August 22, 1988; September 23, 1988) included sampling and testing both insitu and excavated (after aeration) soil.

Installing Wells and Sampling Soil

In April, May, and July 1988, Applied GeoSystems installed seven wells (MW-1 through MW-4, MW-5s, MW-6, and MW-7) to depths of 53 to 57 feet and one well (MW-5d) to a

depth of 77-1/2 feet. The uppermost aquifer, which includes predominantly sand and gravel, was encountered during drilling at depths of approximately 36 to 41 feet. Silty clay was encountered at depths of 53-1/2 to 59-1/2 feet during drilling for five of the eight wells (MW-3, MW-5d, MW-5s, MW-6, and MW-7). That clay unit, which we interpret to be an aquitard, was found to be 12 feet thick (from 55 to 67-1/2 feet deep) in the borehole for MW-5d. We also found a second sand unit (aquifer) from 67-1/2 to at least 82 feet deep in the borehole drilled for MW-5d. In our reports, Nos. 18034-1 (Applied GeoSystems, April 22, 1988), 18034-2 (Applied GeoSystems, July 15, 1988), and 18034-2A (Applied GeoSystems, August 17, 1988), we interpreted the drilling data to indicate that the uppermost aquifer is from 15 to 20 feet thick and that the clay unit that separates the uppermost and second aquifers appears to be laterally extensive beneath the area we investigated. We also stated in Report No. 18034-2 that this clay unit probably is not regionally extensive.

Applied GeoSystems collected unsaturated soil samples for laboratory testing when the boreholes were being drilled for ground-water monitoring wells MW-1 through MW-6. One soil sample from each boring, collected within the interval between 34-1/2 and 40 feet, was submitted for testing for total petroleum hydrocarbons as gasoline (TPHg). No detectable TPHg was found. We also had boring B-4 drilled adjacent to the tank from which the gasoline release occurred. Boring B-4 was drilled to 40 feet deep to evaluate possible hydrocarbon contamination beneath the reported release point. We submitted soil samples

from depths of 19-1/2, 29-1/2, and 34-1/2 feet for laboratory testing for TPHg; the results showed 965 ppm, 3 ppm, and no detectable TPHg at the three respective depths.

Recovering Floating Hydrocarbon Product

We found approximately 3 inches of floating hydrocarbon product in MW-2 when this well was installed on April 2, 1988, and this thickness increased to a maximum of 38.4 inches on April 6, 1988. Our field personnel installed a product skimmer-pump that removed product from the well between April 7 and June 1, 1988. Approximately 55 gallons of product were skimmed from the water in well MW-2 during this time. We bailed minor amounts of product from well MW-2 between June 1 and June 17, 1988, performed a preliminary pump test on June 17, and performed a 21-hour pump test in the well on June 23 through 24, 1988. Floating product was last measured at a thickness of 1-1/2 inches in the well on June 23, 1988. Approximately 2 weeks after the pump test (July 6, 1988), we noted only a slight sheen on the water in well MW-2, which suggests that free floating product was removed. No floating product was found in any other well.

Soil-Vapor Survey

During our first investigation (Applied GeoSystems, April 22, 1988), we performed a soil-vapor survey on the site to evaluate the extent of hydrocarbon vapors in the unsaturated

soil. We performed the survey on April 7 and 14, 1988, and it included testing soil-vapor concentrations from depths of 10, 20, and 33 feet at 17 points on the site. We measured the vapor concentrations of benzene and toluene (in ppm), and the sum of vapor compounds lighter than benzene (i.e., pre-benzene in volt-seconds; 1 volt-second pre-benzene equals 0.7 ppm benzene), and the results are presented in Table 1. We found vapor concentrations greater than 1,000 ppm of benzene and toluene, and volt-seconds of pre-benzene only at the 10-foot depth near the former tank pit. Vapor concentrations between 242 and 614 ppm or volt-seconds were also found at the 10-foot depth near product pipelines to the former locations of the fuel dispensers. The vapor concentrations decreased to less than 100 ppm or volt-seconds at 33 feet deep except at two locations near the former tank pit. Plates P-3, P-4, and P-5 show the sampling locations and the concentrations of benzene, toluene, and pre-benzene, respectively, at the different depths.

[redacted]

We performed two pump tests in June 1988 (Applied GeoSystems, July 15, 1988). The first test (June 23 through 24, 1988) involved pumping water from well MW-2 for over 21 hours and monitoring the water levels in wells MW-1, MW-3 through MW-6, and Municipal Well No. 7. The drawdown we measured in Municipal Well No. 7 during the first pump test did not correspond to the drawdown we measured in the shallow observation wells, and we concluded that this was due to pumping from other deeper municipal wells. We [redacted]

that the uppermost aquifer was isolated from the deeper aquifer(s) from which water is drawn by well No. 7. We also calculated that the radius of influence of pumping from well MW-2 was approximately 680 feet.

The second test (June 28 through 29, 1988) involved pumping from Municipal Well No. 7 for slightly more than 29 hours while monitoring water levels in wells MW-1 through MW-6. We analyzed from the resulting water-level data that fluctuations in the water level which occurred among the six wells were probably related to changes in the barometric pressure during the day and night and not related to pumping Municipal Well No. 7. This information supported data from the first pump test indicating that the two uppermost aquifers were not hydraulically connected to the deeper aquifers penetrated by Municipal Well No. 7 in our area of investigation.

Excavation of Former Tank Pit

Exxon removed the old gasoline tanks and expanded the excavation to remove contaminated soil between July 15 and July 29, 1988. Exxon's subcontractor excavated approximately 1,900 cubic yards of soil. Exxon performed the work as part of their planned reconstruction of station facilities and to attempt to remove soil that might be a future source of contaminants to the ground water. Exxon requested that we estimate the extent of hydrocarbon contamination that might provide a future threat to the ground water, and

they placed shoring for expansion of the excavation using data gathered during our soil-vapor investigation. The former station building and dispenser-island canopy slightly constrained the limit of excavation toward the north and west. Plates P-3 through P-5 show the extent of the excavation relative to the vapor concentrations we detected during our soil-vapor survey. We destroyed well MW-2 on July 12, 1988, because the planned excavation would extend beyond the location of this well (Applied GeoSystems, August 17, 1988).

Exxon's subcontractors excavated the pit to a depth of approximately 31 feet below existing grade and continued excavating an 8-foot by 8-foot section in the western part of the pit (beneath the tank where the gasoline release occurred) to 39 feet deep. We used an organic vapor meter (OVM) during excavation to monitor relative hydrocarbon vapor concentrations. The OVM readings of soil were several hundred ppm to a depth of approximately 18 feet, greater than 1,000 ppm between 18 and 21 feet deep, from 100 to 1,000 ppm between 21 and 27 feet deep, and 10 to 20 ppm from 27 feet deep to the bottom of the excavation.

The soil from depths between 18 and 21 feet below grade, where we measured the highest concentrations of hydrocarbon vapors, was discolored. This zone of contamination coincides with the soil sampled from the 19-1/2-foot depth in boring B-4 (drilled during our first investigation adjacent to the point of the product release), which was tested and found

to have a concentration of 965 ppm TPHg. No discolored soil was found below 21 feet deep and laboratory analyses of soil from the bottom of the excavation showed no detectable concentrations of TPHg (See Applied GeoSystems, August 22, 1988). Soil from 29-1/2 feet deep in boring B-4 was tested in the laboratory for TPHg and had a concentration of 3 ppm.

At 31 feet deep, the excavation was 10 feet deeper than the zone where the hydrocarbon contamination occurred. We concluded that the downward migration of contamination in the silty clay was slowed substantially at the 18- to 21-foot depth interval and that the majority of the soil contaminated with hydrocarbons from the product released in April 1988 was removed.

Installing Initial Ground-Water Treatment System

We installed a ground-water treatment system at the station in June 1988 to treat ground water pumped from well MW-2 during the first pump test. Approximately 25,550 gallons were pumped, treated, and discharged to the sanitary sewer. The treatment system was relocated near the recovery well (MW-7) on July 13 through 14, 1988, to avoid the planned excavation. The initial treatment system included an oil/water separator followed by two 1,000-pound carbon canisters placed in series.

We began longer-term pumping of the ground water on July 14, 1988, and continued until September 1, 1988, when electrical power to the site was disconnected so that the old station facilities could be demolished. Temporary disruptions of pumping occurred from July 18 to 20 and on August 5, 1988, when the sewer line was broken by Exxon's contractors during excavation of the tank pit. Ground water was pumped at approximately 20 gallons per minute (gpm) between July 14 and September 1, 1988, for a total of approximately 975,000 gallons.

Ground water was discharged to the sewer under Wastewater Discharge Permit No. 5541-001 issued by the Dublin-San Ramon Services District (DSRSD). Details of this work are presented in our report No. 18034-2A (Applied GeoSystems, August 17, 1988).

Backfilling of Former Tank Pit

In early August 1988, Exxon's excavation subcontractor backfilled the former gasoline storage-tank pit with pea gravel. The pea gravel was placed from total depth to approximately 12 feet below grade. After Exxon's subcontractor aerated and removed soil from the station, a new tank pit was excavated near the west corner of the station property. Soil excavated from the new tank pit was used to backfill the upper 12 feet of the former tank pit. Applied GeoSystems watched Exxon's subcontractor backfill the former tank pit between August 29 and September 2, 1988 (Applied GeoSystems, October 10, 1988).

WORK BETWEEN AUGUST 1988 AND AUGUST 1989

The remediation activities planned at the time the electrical power to the service station was disconnected on September 1, 1988, included continued removal of ground water and extraction and treatment of residual hydrocarbon vapors that remained in the unsaturated soil near the former locations of the underground storage tanks. Other work included destroying ground-water monitoring wells MW-3 and MW-6. Applied GeoSystems performed this work between August 1988 and August 1989.

Installing and Destroying Wells

Installation of Vapor-Recovery Well VR-1

Vapor-recovery well VR-1 was installed in the former tank pit to recover residual gasoline hydrocarbon contamination that remained in the unsaturated soil near the former tank pit. In our opinion, one vapor-extraction well is adequate to evacuate hydrocarbon vapors from the former pit, because the former pit was backfilled with permeable pea gravel from 12 to 30 feet. Evacuating the pit would also induce a flow of residual hydrocarbons in the surrounding soil toward the pit. Plate P-6 shows the well relative to the former tank pit. Applied GeoSystems obtained a permit from the Alameda County Flood Control and

Water Conservation District (ACFCWCD), Zone 7, to install the well, and a copy of this permit is in Appendix A.

A geologist from Applied GeoSystems observed the drilling for and installation of vapor-recovery well VR-1 on October 24, 1988. Datum Exploration, Inc., of Pittsburg, California, used a Mobile B-57, truck-mounted drill rig and 10-inch-diameter, continuous-flight, hollow stem augers to drill the borehole to approximately 30 feet deep (the depth to the base of the excavated pit). The augers penetrated silty clay fill to 12 feet deep and pea gravel fill to the total depth of the boring.

The well was constructed of 4-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing. The casing consists of factory-perforated sections with 0.020-inch-wide slots, which were set from 30 feet to 10 feet below the ground surface. We set blank casing from the top of the screen to approximately 2 feet below grade. The casing joints are flush-threaded and we used no glues, chemical cements, or solvents in constructing the well. The bottom of the casing has a threaded end plug and the top was fitted with a slip cap. The pea gravel of the former pit filled the annular space around the well as the drillers removed the hollow-stem augers. Additional pea gravel was placed to the top of the screen at 10 feet deep. Approximately 1 foot of bentonite pellets was placed above the pea gravel as a seal against cement entering the pea gravel. The remaining annulus was backfilled to a depth of approximately 3 feet with a neat cement slurry mixed with approximately 5 percent

bentonite powder. A cast-iron utility box with a steel apron was placed over the wellhead and Exxon's construction contractor later secured the utility box flush with the surface when they placed the concrete for the new station's pad. The box's lid is secured with screws. Plate P-7 is a key to symbols used to illustrate well construction, and the right columns of Plates P-8 and P-9, Log of Boring, show graphic representations of the well construction. Plate P-7 also shows the materials encountered during drilling.

Destruction of Wells MW-3 and MW-6

Well MW-3 was destroyed on August 29, 1988, because the planned excavation of the new underground gasoline-storage tank pit would encompass the area of the well. Well MW-6 was destroyed on October 24, 1988, because this well was located where the footing of the new dispenser-island canopy was to be constructed. We obtained permits from the ACFCWCD to destroy the wells, and copies of these permits are included in Appendix A. A geologist from Applied GeoSystems watched Datum Exploration, Inc., overdrill the wells using a Mobile B-57 truck-mounted drill rig with 10-inch-diameter hollow-stem augers. The wells were overdrilled to a depth of 60 feet to remove the casing, and a slurry of neat cement and bentonite (5 percent) was placed from this depth to the ground surface. The two former ground-water monitoring wells are shown on Plate P-6.

Reassembly and Operation of Ground-Water Recovery System

Obtaining Permits

Between July 14 and September 1, 1988, we discharged treated ground water to the sewer system operated by the Dublin-San Ramon Services District (DSRSD). We discharged water under conditions presented in Wastewater Discharge Permit No. 5541-001, issued on June 15, 1988 (see Applied GeoSystems, July, 15, 1988, Appendix D). That permit was renewed by the DSRSD on July 1 and July 29, 1988, for the months of July and August 1988, respectively (Applied GeoSystems, August 17, 1988). On behalf of Exxon, we requested an extension of the permit and a change in discharge requirements. The DSRSD extended the term of the permit, effective September 1, 1988, through March 31, 1989, with revised conditions allowing both the carbon filtration system to be removed and a maximum concentration of 15 ppm total petroleum hydrocarbons in the water to be discharged. The DSRSD again extended the permit from April 1 through September 30, 1989. Appendix A contains copies of the letters authorizing the permit extensions. Exxon recently requested a 2-year extension of the discharge permit.

Description and Construction

The ground-water treatment system was shut down on September 1, 1988, when electrical power to the station site was disconnected. We disassembled the system on October 17, 1988, and moved the materials off the station site to avoid damage when Exxon's construction subcontractor graded the site. We coordinated installation of this system with the schedule of Exxon's construction subcontractor. Accordingly, we dug the trenches and installed the ground-water discharge and electrical lines on December 16, 1988, and built the form for the concrete remediation-equipment pad on January 9 and 10, 1989. Exxon's construction subcontractor placed concrete for the remediation-equipment pad sometime between January 10 and 26 when they placed concrete for the station pad. L & L Construction of Antioch, California, installed the ground-water remediation system on the approximately 14-foot-square concrete pad between January 25 and 27, 1989. We started pumping ground water at approximately 11:00 a.m. on February 9, 1989.

The ground-water recovery system includes a 5-horsepower, 3 1/2-inch-diameter submersible pump (capacity rating of approximately 60 gallons per minute), which is suspended in recovery well MW-7. Ground water is directed through a 2-inch-diameter PVC line into a 250-gallon oil-water separator tank and this water drains into the sewer system by gravity feed. We removed the carbon canisters that had been used before

September 1, 1988, because of the changed discharge requirements of the DSRSD and because the effluent is within the permit limitations. An in-line orifice, a flowmeter, and a sampling valve are installed upstream of the separator tank. Electrical power is supplied by a line from the service station building. The pump is operated by a control panel that includes a low-water-level shutoff sensor to the pump and a high-water-level shutoff sensor to the separator tank. Plate P-10 shows the configuration of the ground-water remediation system.

Operation

Ground water was pumped between February 9 and June 3, 1989, when a leak developed in the discharge pipe connection at the recovery wellhead. Pumping was resumed on June 30, 1989, and has continued. Based on flowmeter readings, the average pumping rate from February 9 through June 3, 1989, was approximately 24.4 gallons per minute, for a total quantity pumped of approximately 4.12 million gallons. The flowmeter became inoperable during June, was repaired, and again became inoperable in July; therefore, we projected a pump rate of 24.4 gpm between June 30 and August 31, 1989, to equal approximately 2.21 million gallons pumped. A total of approximately 7.33 million gallons of ground water have been pumped during our pump test in 1988 (25,000 gallons), ground-water remediation in 1988 (975,000 gallons), and ground-water remediation through August 1989 (6.33 million gallons). During this time, hydrocarbon concentrations in the extracted ground water have

decreased to near or within drinking water standards (Applied GeoSystems, August 28, 1989; August 29, 1989).

Assembly and Operation of Vapor-Extraction System

Obtaining Permits

The Bay Area Air Quality Management District (BAAQMD) requires a permit to operate an active vapor-extraction system. Applied GeoSystems submitted an Application for Authority to Construct and Permit to Operate Industrial Sources to the BAAQMD on April 13, 1989. Included with the application was supporting information on the design and components of the proposed vapor-extraction system. The BAAQMD issued an Authority to Construct (Application No. 2821) the system by letter of July 20, 1989. A copy of the Authority to Construct is presented in Appendix A.

Equipment Description and Construction

The vapor-extraction system consists of 4-inch-diameter vapor-recovery well No. VR-1; 4-inch-diameter PVC discharge piping from the well to the remediation equipment pad; a liquid-ring vacuum pump with an air-liquid separator; a flame-ionization hydrocarbon analyzer; and two 200-pound activated carbon canisters arranged in series. The liquid-ring

vacuum pump is 5 horsepower and is capable of generating a vacuum of up to 28 inches of mercury at 75 cubic feet per minute. Water is cycled from the oil-water separator tank (ground-water remediation system) to provide the sealing action between the pump rotor and housing. The extracted vapor is passed through a knockout drum (air-water separator) that removes moisture picked up from the soil and liquid-ring pump. The dry vapor then is passed through the activated carbon drums, which are designed to remove hydrocarbons with a calculated efficiency of 99.68 percent.

Three vapor-sample valves are installed in the system. One valve is upstream of the vacuum pump, one valve is at the inlet to the first carbon unit, and one valve is at the outlet of the first carbon unit. Treated vapors are vented from the second carbon canister. The flame-ionization hydrocarbon analyzer continuously monitors vapor influent to and effluent from the first activated carbon canister. The analyzer is connected to the effluent line from the first carbon canister and is designed to automatically shut down the vacuum pump when hydrocarbons in vapor exiting the first carbon unit exceed 6 ppm (i.e., breakthrough). A separate electrical line from the station building provides power for the vapor-extraction system. L & L Construction installed the components of the system between July 5 and 31, 1989. Plate P-10 shows the configuration of the vapor-extraction system.

Operation

Applied GeoSystems initially started the vapor-extraction system on August 7, 1989. (In Applied GeoSystems Report No. 18034-6, dated August 29, 1989, we mistakenly stated that we started the system on July 28, 1989). The vacuum pump was run for approximately 1 hour, after which samples of influent and effluent vapors were collected for laboratory testing. The system was shut down for a few hours for minor repairs and then restarted. We operated the system from August 7 through 22, 1989, when breakthrough was noted in the second carbon canister. We found that the hydrocarbon analyzer was not operating properly, so we disconnected the instrument and shipped it to the manufacturer for repair. The manufacturer returned the analyzer in early September and it was installed on September 1, 1989. Two new carbon canisters also were installed during the time the system was shut down. We resumed vapor extraction on September 11, 1989, and continued until September 15, 1989, when breakthrough occurred in the second series of carbon canisters. We shut down the system on September 15, 1989, pending modifications to further reduce water vapor entering the carbon units.

Sampling Hydrocarbon Vapors

We sampled vapor influent and effluent on August 7, 15, and 22, 1989, to evaluate the concentrations of hydrocarbon compounds and their trends with time. Influent samples were collected by attaching a sample tube to the sample valve upstream of the vacuum pump and effluent samples were collected by dropping a sample tube into the outlet vent on the second canister. The samples were extracted with a small vacuum pump and directed into 3/4 liter Tedlar sample bags. We collected duplicate samples of both the influent and effluent on August 7 to confirm the initial vapor concentrations. The sampler initiated a Chain of Custody Record during each sampling visit and this form accompanied the samples to the analytical laboratory. Copies of these forms are included in Appendix B. We also collected influent and effluent vapor samples on September 11 and 15, 1989, but laboratory results are not yet available.

We submitted vapor samples to Trace Analysis Laboratory, Inc., of Hayward, California, for testing for TPHg and BTEX. The samples were tested by modified method CA-ADDL004 following guidelines issued by the State of California Air Resources Board. The results of analyses are presented in Table 2 and in the laboratory reports included in Appendix B.

Discussion of Results

We started hydrocarbon-vapor extraction on August 7, 1989, and vacuum pumping continued from August 7 through 22, and September 11 through 15, 1989. Between August 7 and 22, influent hydrocarbon concentrations decreased from 2,274 ppm (9,300 milligrams per cubic meter [mg/m^3]) to 293 ppm (1,200 mg/m^3). Approximately 800 pounds of activated carbon have been spent and we calculate that approximately 160 pounds of TPHg have been extracted from the area of the former gasoline-storage tank pit. Concentrations of TPH decreased approximately 87 percent between August 7 and 15 and showed no decrease between August 15 and 22, 1989.

Table 2 shows a decrease of 98 percent between influent and effluent samples on August 7, which is near the calculated efficiency of the activated carbon. The concentrations of TPHg in the effluent sampled on August 15 and 22 indicate that breakthrough occurred in the second carbon canister.

SUMMARY AND CONCLUSIONS

Applied GeoSystems drilled and installed eight ground-water monitoring wells (MW-1 through MW-4, MW-5d, MW-5s, and MW-6 through MW-7) in 1988. We encountered sand

and gravel (uppermost aquifer) between the depths of 36 and 60 feet in the various boreholes, and silty clay below the sand and gravel. The silty clay is 12 feet thick in the area of well MW-5d, which was drilled to a depth of 82 feet. A second sand and gravel unit occurs from 68 to 82 feet in the area of well MW-5d. We interpreted the drilling data to indicate that the uppermost ground-water aquifer is from 15 to 20 feet thick and that the clay unit that separates the uppermost and second aquifers appears to be laterally extensive beneath the area we investigated.

We performed two pump tests in June 1988 to evaluate the hydraulic character of the uppermost aquifer and whether pumping Municipal Well No. 7 would induce hydrocarbon contaminants to flow toward this well. The results of the two tests suggested that the uppermost aquifer and the deeper aquifers that are penetrated by Municipal Well No. 7 did not appear to be in hydraulic connection in the area of investigation.

We found floating gasoline product in well MW-2 when we installed this well in April 1988, and the maximum thickness of the product reached approximately 38.4 inches during the same month. We pumped and bailed product from this well between April and June 1988, and we removed approximately 55 gallons of gasoline. We used well MW-2 for the first pump test in June 1988 and after this test no more product was measured in the well. In our opinion, the floating product had been removed from the area of this well. We have found no floating product in any of the existing or former ground-water monitoring wells.

Applied GeoSystems also performed a soil-vapor survey in April 1988 to evaluate the extent of benzene, toluene, and pre-benzene hydrocarbon vapors in the unsaturated soil, which is predominantly silty clay. The results showed concentrations of several hundred to greater than 1,000 ppm either at the 10-foot-depth, or at the 20-foot depth near the former gasoline-storage tank pit. Only two locations had one or more individual compound concentrations greater than 100 ppm at the 33-foot depth, and these were near the former tank pit.

In July 1988 Exxon excavated the former tank pit to a depth of approximately 31 feet. The extent of excavation was based on the results of the soil-vapor survey. Sediments with hydrocarbon vapor concentrations greater than 1,000 ppm (measured with an OVM) were found at the 18- to 21-foot depth interval. The vapor concentrations declined to less than 20 ppm below the 27-foot depth, and laboratory testing of soil from the 31-foot depth showed no detectable concentrations of TPHg. We concluded that most of the soil contaminated with hydrocarbons had been removed and that little contamination that would later affect the ground water likely remains in the soil. The former tank pit was backfilled in August 1988.

Approximately 7.33 million gallons of ground water have been pumped from wells MW-2 and MW-7 between June 1988 and August 1989. We discussed the details of our ground-

water monitoring and testing activities between August 1988 and August 1989 in our reports, Nos. 18034-4 and 18034-6 (dated August 28 and August 29, 1989, respectively). Concentrations of hydrocarbons in the ground water pumped from well MW-7 have decreased to near drinking-water standards during this time, and we concluded in these reports that the decreases resulted from ground-water extraction and a lowering of the regional ground-water level between 1988 and 1989.

Since we began sampling ground water in April 1988 the concentrations of TPHg and BTEX predominantly have been less than the detection limits of the laboratory test method in water from wells MW-1, MW-3, MW-4, MW-5d, and MW-5s (Applied GeoSystems, August 28, 1989; August 29, 1989). Those are the perimeter and offsite wells that we installed between the former gasoline-storage tank pit and Municipal Well No. 7 to monitor migration of hydrocarbon contaminants toward the municipal well. No benzene has been detected in offsite wells MW-5d and MW-5s except once, in July 1988 (benzene at 0.0009 ppm in well MW-5s, which, in our opinion, was likely introduced by sampling equipment). No BTEX has been detected in water from perimeter onsite wells MW-1 and MW-4 or the offsite wells in samples collected on June 30, July 17, 20, 26, and August 2, 1989.

The direction of ground-water flow between August 1988 and August 1989 has been either to the southwest, south, or southeast; away from Municipal Well No. 7. This direction of ground-water flow was not reversed during 18 days of pumping Municipal Well No. 7 from

July 17 through August 3, 1989. The water-level information we collected during July and August 1989 supports our 1988 pump test results (Applied GeoSystems, July 15, 1988) by indicating that the uppermost and the deeper aquifers are not hydraulically connected in the area of our investigation. We concluded from the water-level data presented in our reports, Nos. 18034-4 (Applied GeoSystems, August 28, 1989) and 18034-6 (Applied GeoSystems, August 29, 1989) that, since August 1988, the ground water was migrating away from Municipal Well No. 7, including during the time Municipal Well No. 7 was operating.

APPLIED GEOSYSTEMS REFERENCES

Applied GeoSystems. April 22, 1988. Report, Soil Vapor Investigation, Drilling of Soil Borings, and Installation of Ground-Water Monitoring Wells at Exxon Station No. 7-3399, 2991 Hopyard Road, Pleasanton, California. Report No. 018034-1.

Applied GeoSystems. July 15, 1988. 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. Report No. 18034-2.

Applied GeoSystems. August 17, 1988. Report, Installation of Temporary Recovery Well, Periodic Monitoring, and Remediation of Ground Water at Exxon Station No. 7-3399, 2991 Hopyard Road, Pleasanton, California. Report No. 18034-2A.

Applied GeoSystems. August 22, 1988. Report, Removal of Underground Gasoline Storage Tanks and Excavation of Hydrocarbon-Contaminated Soil at Exxon Station No. 7-3399, 2991 Hopyard Road, Pleasanton, California. Report No. 18034-3.

Applied GeoSystems. September 23, 1988. Letter Report, Aeration of Excavated Soil at Exxon Station No. 7-3399, 2991 Hopyard Road, Pleasanton, California. Report No. 18034-3A.

Applied GeoSystems. October 10, 1988. Letter Report, Testing and Observation Services during Backfilling of a Former Gasoline Tank Pit at Exxon Station No. 7-3399, 2991 Hopyard Road,m Pleasanton, California. Report No. 18081-1.

Applied GeoSystems. August 28, 1989. Letter Report, Periodic Ground-Water Monitoring at Exxon Station No. 7-3399, 2991 Hopyard Road, Pleasanton, California. Report No. 18034-4.

Applied GeoSystems. August 29, 1989. Letter Report, Ground-Water Monitoring and Testing at Exxon Station No. 7-3399, 2991 Hopyard Road, Pleasanton, California. Report No. 18034-6.

TABLE 1
SOIL-VAPOR SURVEY DATA
Exxon Station Number 7-3399
2991 Hopyard Road
Pleasanton, California
(page 1 of 2)

Sample No.	Depth	Benzene	Toluene	Pre-benzene
VP-1	10	369	ND	680
VP-1	20	45	ND	151
VP-1	33	30	12	62
VP-2	10	3183	2348	1315
VP-2	20	86	82	235
VP-2	33	54	41	129
VP-3	10	623	ND	1088
VP-3	20	52	ND	106
VP-3	33	26	ND	58
VP-4	10	485	21	53
VP-4	20	40	27	14
VP-5	10	563	ND	242
VP-6	10	338	ND	614
VP-6	33	ND	ND	3
VP-7	10	5092	844	2990
VP-8	10	403	ND	522
VP-9	10	1315	704	1050
VP-9	33	208	109	39
VP-10	10	176	ND	330
VP-10	33	35	9	18
VP-11	10	679	ND	462
VP-11	33	ND	ND	3
VP-12	10	435	ND	249
VP-13	10	41	ND	25

See notes on page 2 of 2.

TABLE 1
SOIL-VAPOR SURVEY DATA
Exxon Station Number 7-3399
2991 Hopyard Road
Pleasanton, California
(page 2 of 2)

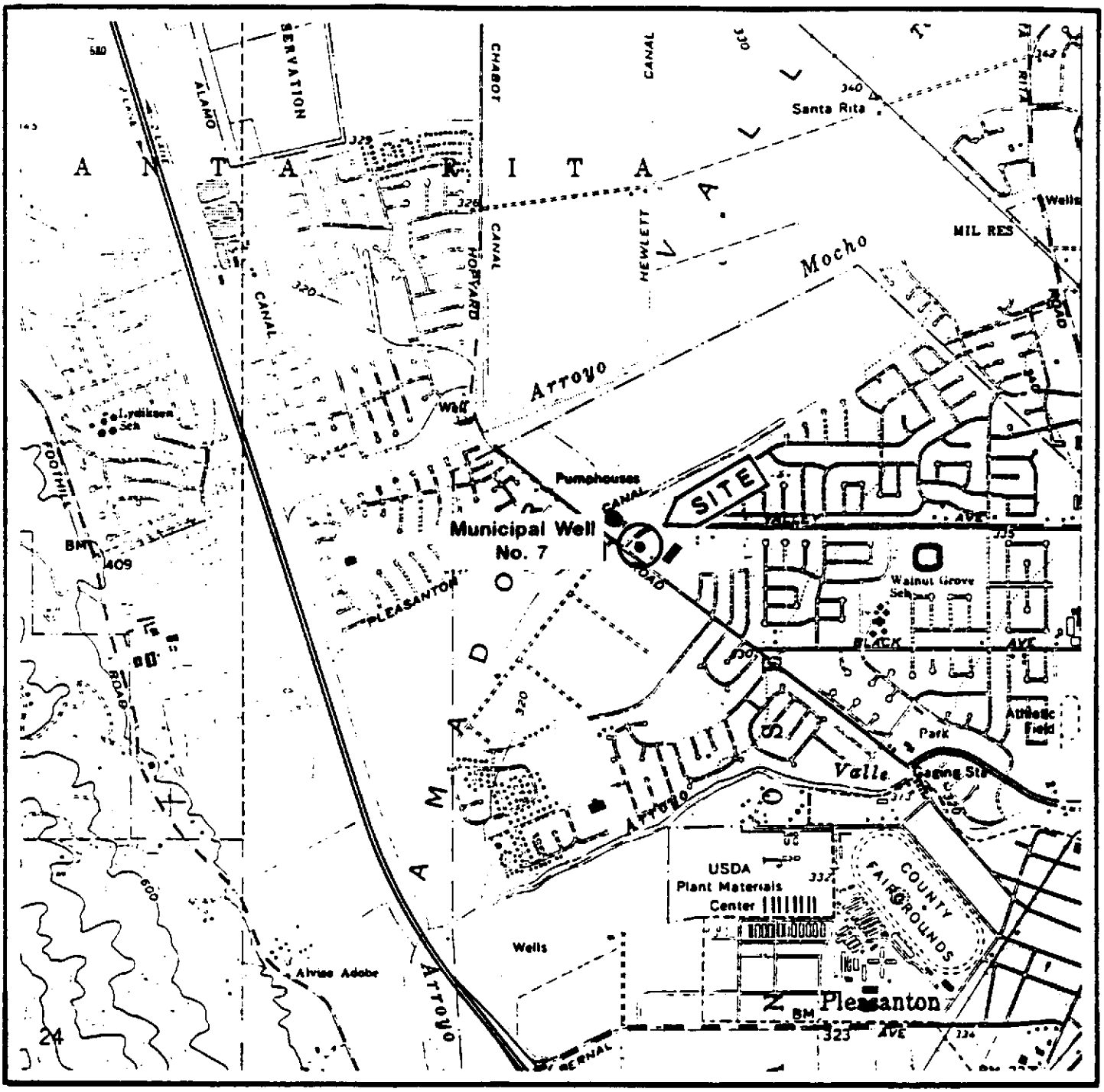
Sample No.	Depth	Benzene	Toluene	Pre-benzene
VP-14	10	176	ND	334
VP-14	33	ND	ND	ND
VP-15	10	129	ND	106
VP-15	33	ND	ND	ND
VP-16	10	ND	ND	4
VP-16	33	ND	ND	3
VP-17	10	ND	ND	ND
VP-17	33	ND	ND	ND

Benzene and toluene concentrations are in parts per million (ppm).
Pre-benzene concentrations are in volt-seconds (VS);
1 ppm benzene = approx. 0.7 VS benzene.
ND = None detected (detection limits at 1 ppm)
Measurements made with a Photovac 10S70

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSES
OF VAPOR SAMPLES
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

Date	Sample No.	B	T	E	X	TPHg
Influent:						
8/7/89	Inlet #1	25	7.1	<2	<7	9,300
8/7/89	Inlet #2*	18	<2	<2	<7	8,200
8/15/89	No. 5	6.3	2.1	<2	6.7	1,200
8/22/89	7 Inlet	6.0	6.5	1.8	20	1,200
Effluent:						
8/7/89	Outlet #1	0.79	0.32	0.46	1.5	150
8/7/89	Outlet #2*	0.44	0.13	0.45	0.89	110
8/15/89	No. 6	3.5	<2	<3	<8	1,400
8/22/89	8 Outlet	4.3	<0.4	<0.5	1.7	1,300

Results in milligrams per cubic meter (mg/m^3)
* = duplicate sample
< = less than the method detection limit of the laboratory



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

N

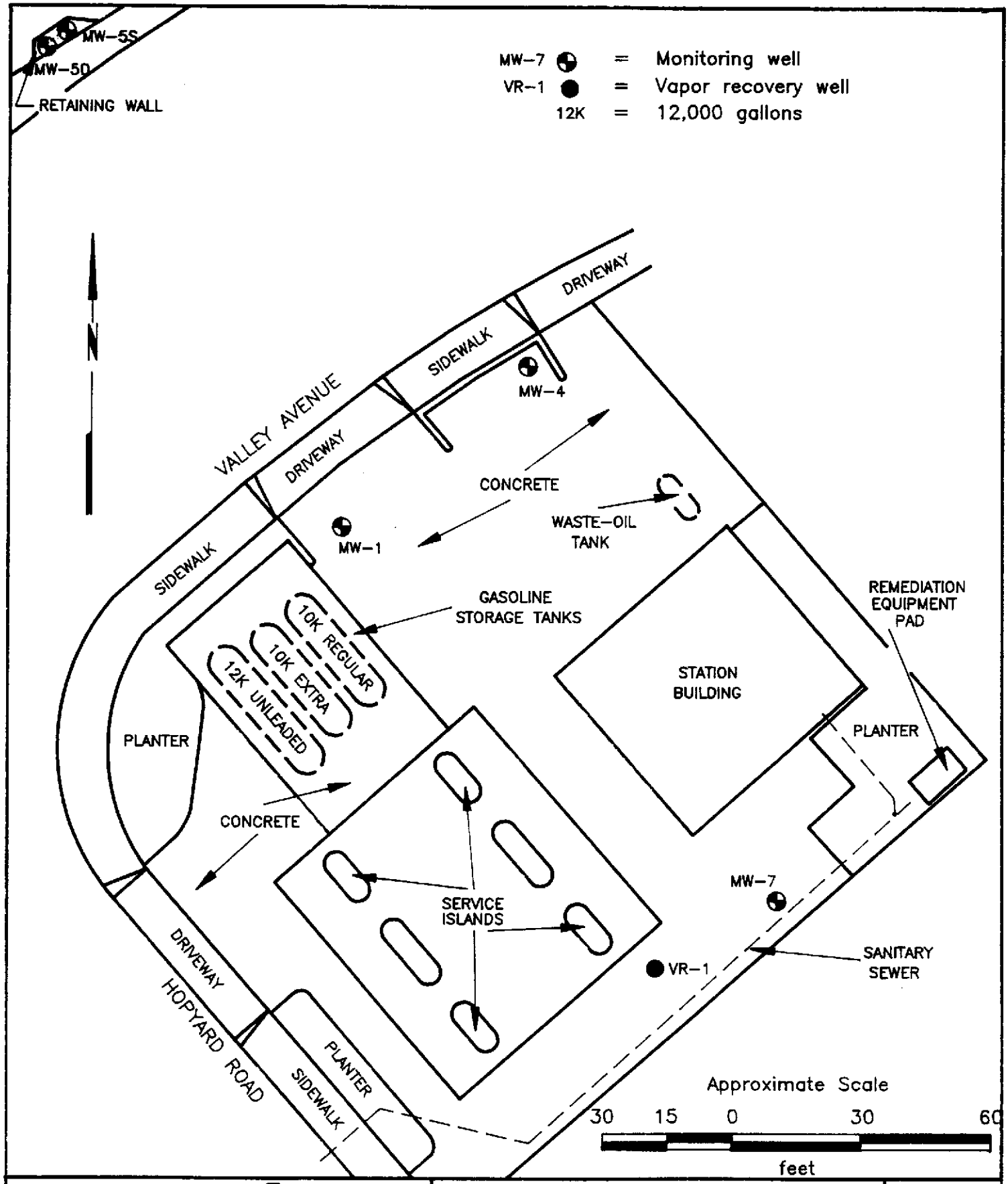
Approximate Scale
2000 1000 0 2000 4000
feet

Applied GeoSystems

PROJECT NO. 18034-4

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

PLATE
P - 1

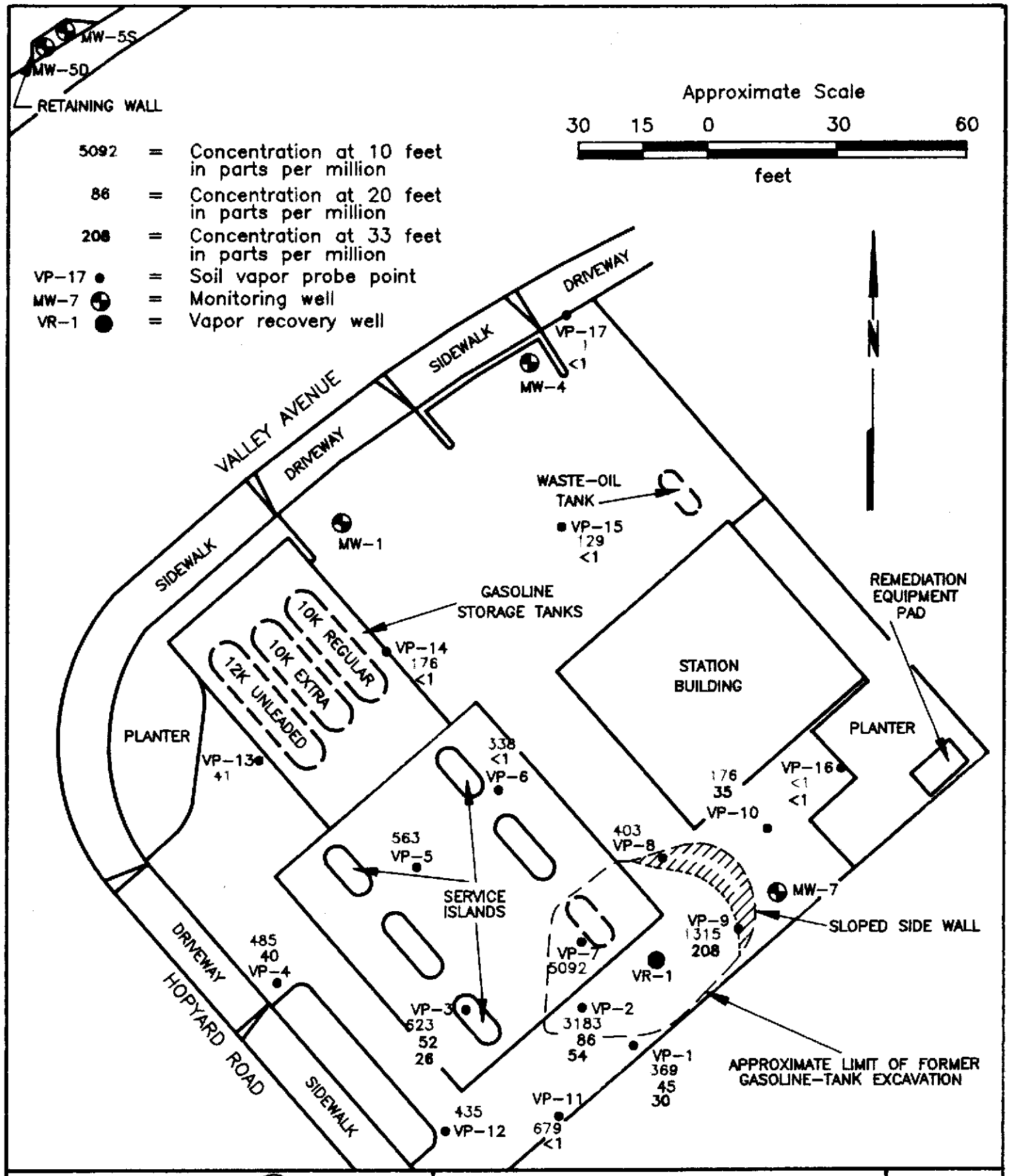


Applied GeoSystems

PROJECT NO. 18034-4

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

PLATE
P - 2

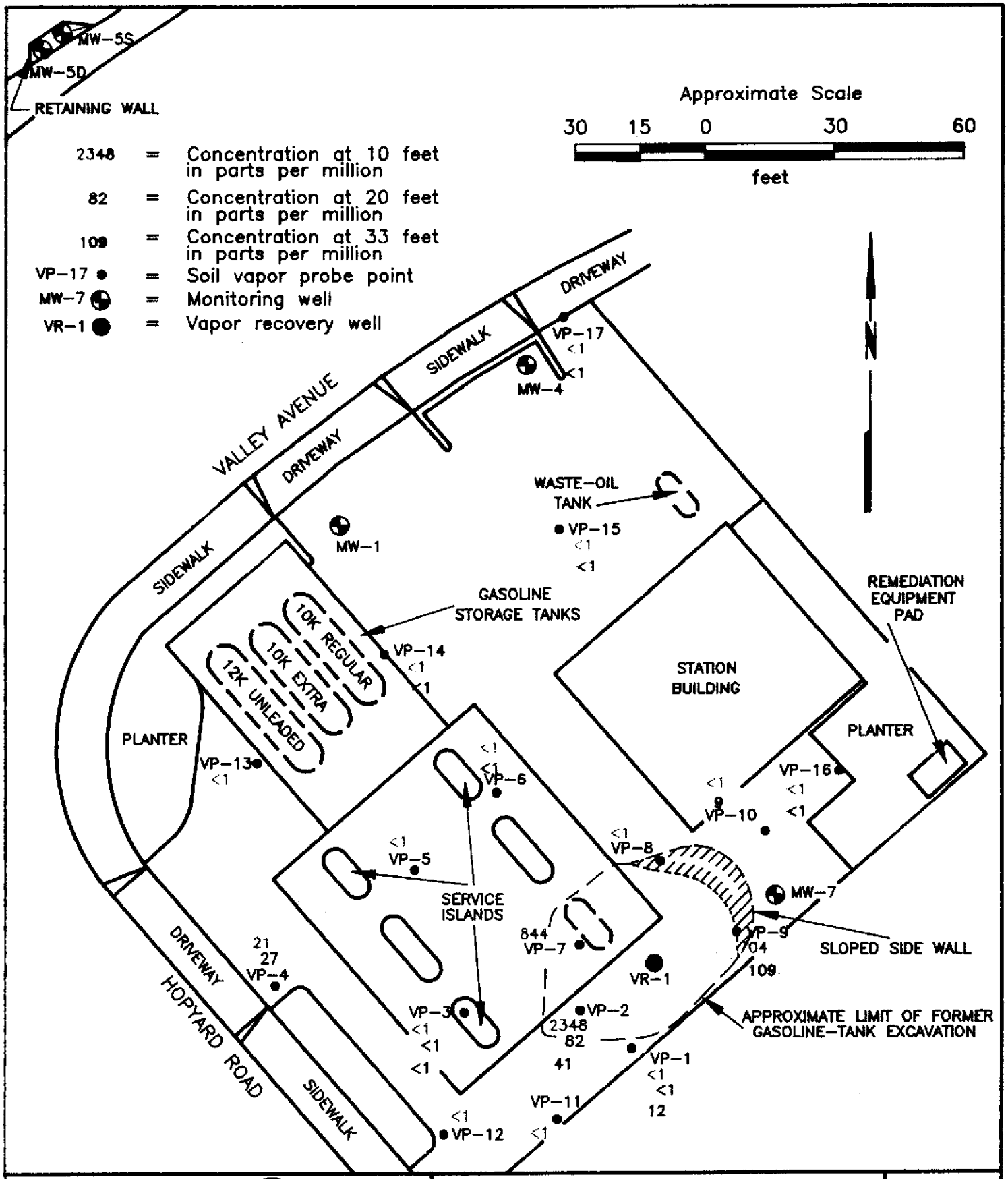


Applied GeoSystems

PROJECT NO. 18034-4

CONCENTRATION OF BENZENE IN SOIL VAPOR
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

PLATE
P - 3

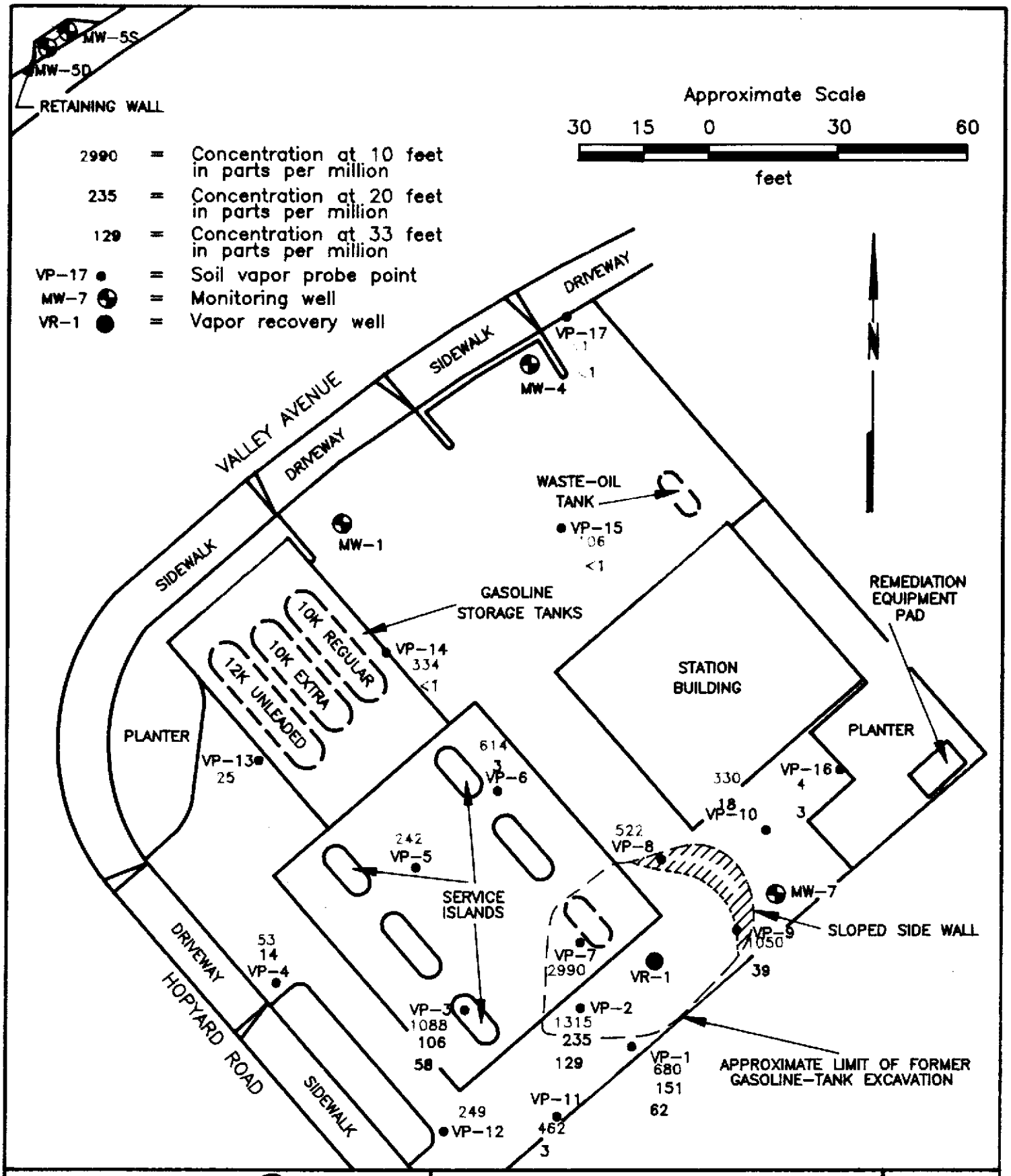


Applied GeoSystems

PROJECT NO. 18034-4

CONCENTRATION OF TOLUENE IN SOIL VAPOR
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

PLATE
P - 4

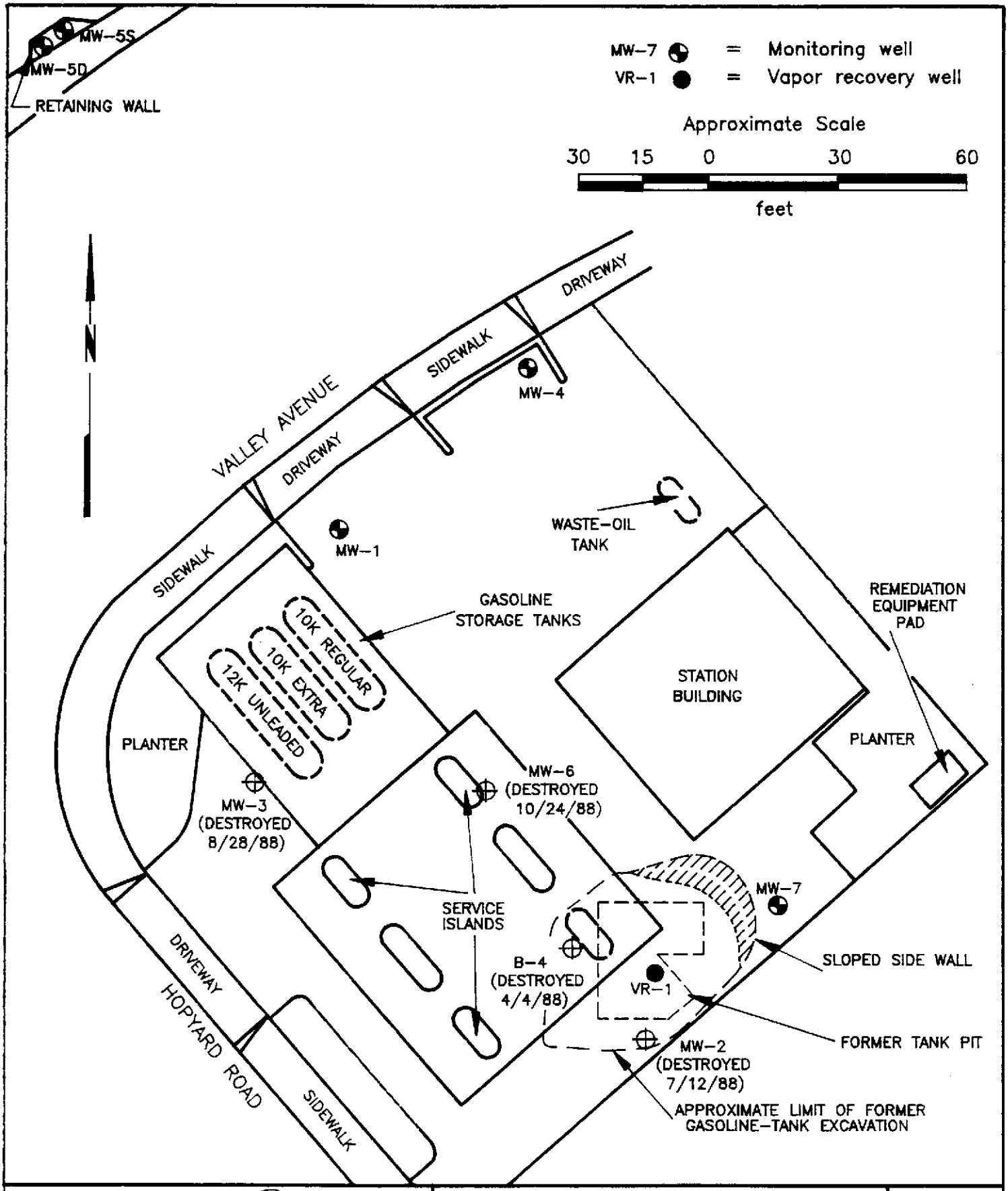


Applied GeoSystems

PROJECT NO. 18034-4

CONCENTRATION OF PREBENZENE IN SOIL VAPOR
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

PLATE
P - 5



Applied GeoSystems

PROJECT NO. 18034-4

WELL VR-1 AND FORMER TANK PIT
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

PLATE
P - 6

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	DESCRIPTION
Coarse-grained soils	Gravel and gravelly soils	GW	Well-graded gravels of gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sand and sandy soils	SW	Well-graded sand of 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, organic silts
Highly organic soils		PT	Peat and other highly organic soils


Depth through which sampler is driven


Relatively undisturbed sample


No sample recovered


Static water level observed in well


Initial water level observed in boring

S-10 Sample number


Sand pack


Bentonite annular seal


Neat cement annular seal


Caved native soil


Blank PVC


Machine-slotted PVC

P.I.D. Photoionization detector

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

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

Applied GeoSystems

PROJECT NO. 18034-4

UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY
Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

PLATE
P - 7

Total depth of boring: 30 feet **Diameter of boring:** 10 inches **Date drilled:** 10-24-88

Casing diameter: 4 inches **Length:** 30 feet **Slot size:** 0.020-inch

Screen diameter: 4 inches **Length:** 20 feet **Material type:** Sch 40 PVC

Drilling Company: Datum Exploration **Driller:**

Method Used: Hollow-Stem Auger **Field Geologist:** Jim Cline

Signature of Registered Professional:

Registration No.: R.G. 730 **State:** CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Concrete.	
2				Fill	Silty clay.	
4						
6						
8						
10						
12				Fill	Pea gravel.	
14						
16						
18						
20					(Section continues downward)	

Applied GeoSystems

PROJECT NO. 18034-4

LOG OF BORING VR - 1

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

PLATE

P - 8

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
				Fill	Pea gravel.	
22						
24						
26						
28						
30					Total Depth = 30 feet.	
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

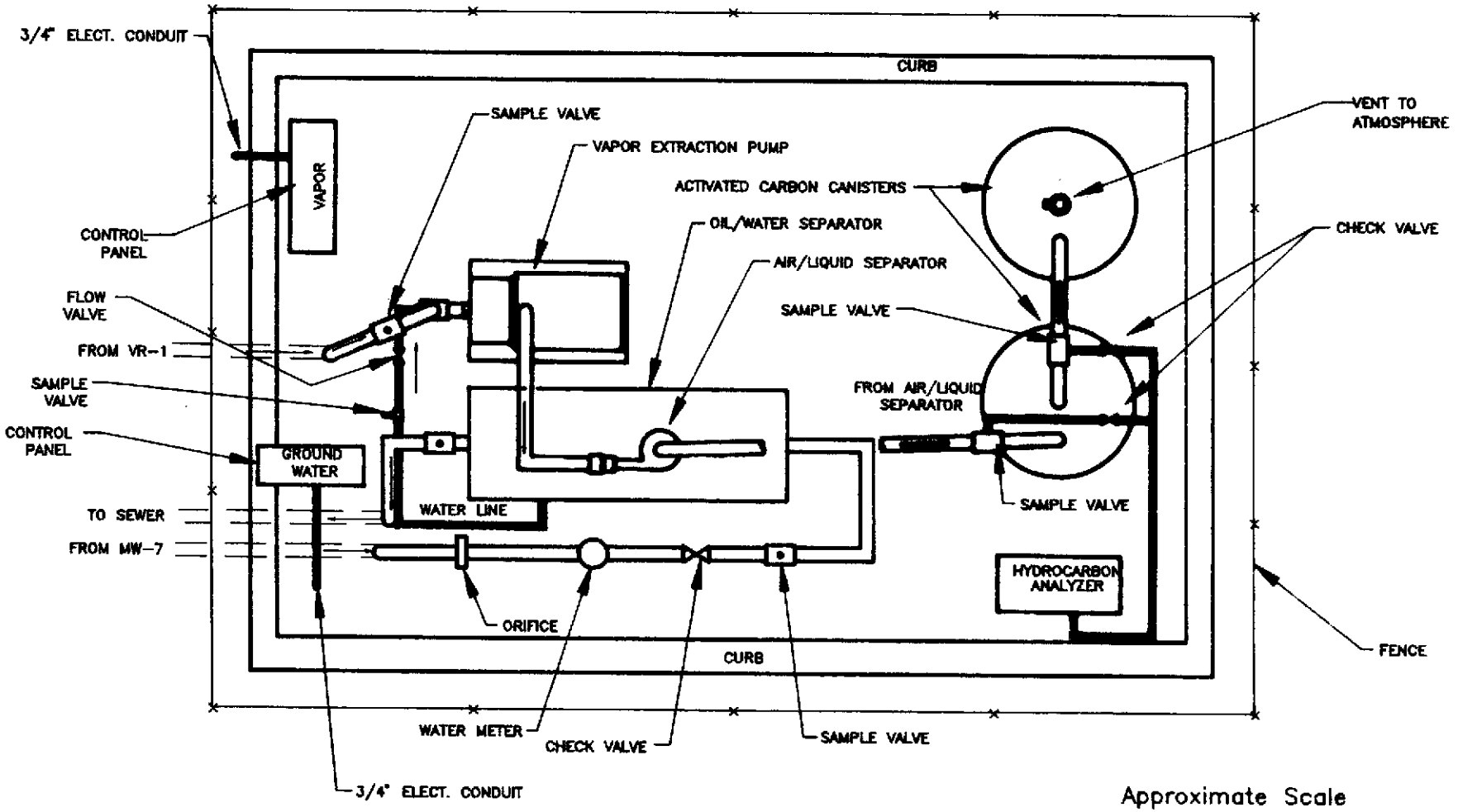
Applied GeoSystems

PROJECT NO. 18034-4

LOG OF BORING VR - 1

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

PLATE
P - 9



= Vapor extraction system

Approximate Scale

2 1 0 2 4

feet

PLATE

P - 10

REMEDIATION EQUIPMENT & PIPING LAYOUT

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

Applied GeoSystems

PROJECT NO. 18034-4

APPENDIX A

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 • (415) 484-2600

7 September 1988

Mr. Gillian Holmes
Applied Geosystems
43255 Mission Boulevard, Suite B
Fremont, CA 94539

Dear Mr. Holmes:

Enclosed is Groundwater Protection Ordinance permit 88448 for the destruction of monitoring well 3S/1E 18H8 at 2991 Hopyard Road in Pleasanton for Exxon Company.

Please note that condition A-3 requires that a well destruction report, consisting of a description of methods and materials used to destroy the well, location sketch and date of well destruction, and permit number be submitted after completion of the work.

If you have any questions, please contact Wyman Hong or Craig Mayfield at 484-2600.

Very truly yours,

Mun J. Mar
General Manager

By J. Killingstad
J. Killingstad, Chief
Water Resources Engineering

CM:bkm
Enc.

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

(1) LOCATION OF PROJECT Exxon Station No. 7-3399
7991 Hopyard Road
Pleasanton, California

(2) CLIENT
Name Exxon Company U.S.A.
Address P.O. Box 4415 Phone (713) 656-7755
City Houston, Texas Zip 77210-4415

(3) APPLICANT
Name Applied GeoSystems
Address 43255 Mission Blvd. Phone (415) 651-1906
City Fremont, California Zip 94539

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

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

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

WELL PROJECTS
Drill Hole Diameter ___ in. Depth(s) ___ ft.
Casing Diameter ___ in. Number
Surface Seal Depth ___ ft. of Wells ___
Driller's License No. 480802

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

(7) ESTIMATED STARTING DATE August 29, 1988
ESTIMATED COMPLETION DATE August 29, 1988

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

APPLICANT'S SIGNATURE Gillian E. Holmes Date 9/1/88

FOR OFFICE USE

PERMIT NUMBER 88448
LOCATION NUMBER 3S/1E 18H8

Approved Craig A. Mayfield Date 29 Aug 88
Craig A. Mayfield

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.

Well MW-3 to be overdrilled ~~and~~ to total depth and casing removed. Borehole to be backfilled with a neat cement/bentonite slurry mix from total depth to the surface

91987

7 September 1988

ZONE 7
WATER RESOURCES ENGINEERING
GROUNDWATER PROTECTION ORDINANCE

EXXON COMPANY
2991 HOPYARD ROAD
PLEASANTON
WELL 3S/1E 18H8

Destruction Requirements

1. Drill out the well so that casing, seal, and gravel pack are removed to the bottom of the well.

2. Using a tremie pipe, fill the hole to 2 feet below the lower of finished grade or original ground with neat cement.

3. After seal has set, backfill the remaining hole with compacted material.

These destruction requirements as proposed by Roger Witham of Applied Geosystems meet or exceed the Zone 7 minimum requirements.

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 • (415) 484-2600

25 October 1988

Mr. Roger Witham
Applied Geosystems
43255 Mission Boulevard, Suite B
Fremont, CA 94539

Dear Mr. Witham:

Enclosed are Groundwater Protection Ordinance permits 88536 and 88537 for the destruction of well 3S/1E 18H10 and a monitoring well construction project at 2991 Hopyard Road in Pleasanton for Exxon Company U.S.A.

Please note that permit condition A-3 requires that the well construction report, consisting of drilling and completion logs, location sketch, and permit number, be submitted after completion of the work.

If you have any questions, please contact Wyman Hong or Craig Mayfield at 484-2600.

Very truly yours,

Mun J. Mar
General Manager

By Craig A. Mayfield
Craig A. Mayfield
Water Resources Engineer III

WH:bkm
Enc.

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

(1) LOCATION OF PROJECT Exxon Station No. 7-3399
2991 Hopyard Road
Pleasanton, California

(2) CLIENT
Name Exxon Company U.S.A.
Address P.O. Box 4415 Phone (713) 656-7755
City Houston, Texas Zip 77210-4415

(3) APPLICANT
Name Applied GeoSystems
Address 43255 Mission Blvd. Phone (415) 651-1906
City Fremont, California Zip 94539

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

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

(6) PROPOSED CONSTRUCTION
Drilling Method:
Mud Rotary ___ Air Rotary ___ Auger X
Cable ___ Other ___

WELL PROJECTS
Drill Hole Diameter ___ in. Depth(s) ___ ft.
Casing Diameter ___ in. Number
Surface Seal Depth ___ ft. of Wells ___
Driller's License No. 480802

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

(7) ESTIMATED STARTING DATE October 24, 1988
ESTIMATED COMPLETION DATE October 24, 1988

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

APPLICANT'S SIGNATURE Rodger C. Witham Date 10/21/88

FOR OFFICE USE

PERMIT NUMBER 88536
LOCATION NUMBER 3S/1E 18H10

Approved Wyman Hong Date 21 Oct 88
Wyman Hong

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.
Well MW-6 to be overdrilled to total depth and the casing removed. Borehole to be backfilled with a neat cement/bentonite slurry mix from total depth to the surface.

91987

25 October 1988

ZONE 7
WATER RESOURCES ENGINEERING
GROUNDWATER PROTECTION ORDINANCE

EXXON
2991 HOPYARD ROAD
PLEASANTON
WELL 3S/1E 18H10

Destruction Requirements

1. Drill out the well so that casing, seal, and gravel pack are removed to the bottom of the well.

2. Using a tremie pipe, fill the hole to 2 feet below the lower of finished grade or original ground with neat cement.

3. After seal has set, backfill the remaining hole with compacted material.

These destruction requirements as proposed by Roger Witham of Applied Geosystems meet or exceed the Zone 7 minimum requirements.

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

(1) LOCATION OF PROJECT Exxon Station No. 7-3399
3991 Hopyard Road
Pleasanton, California

(2) CLIENT
Name Exxon Company U.S.A.
Address P.O. Box 4915 Phone (713) 656-7755
City Houston, Texas Zip 77210-4415

(3) APPLICANT
Name Applied GeoSystems
Address 4325 Mission Blvd. Phone (415) 651-1906
City Fremont, CA Zip 94539

(4) DESCRIPTION OF PROJECT
Vapor Extraction 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 X
Cable ___ Other ___

WELL PROJECTS
Drill Hole Diameter 10 in. Depth(s) 30 ft.
Casing Diameter 4 in. Number
Surface Seal Depth 12 ft. of Wells 1
Driller's License No. 480802

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

(7) ESTIMATED STARTING DATE October 24, 1988
ESTIMATED COMPLETION DATE October 24, 1988

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

APPLICANT'S SIGNATURE Rodger C. Witham Date 10/21/88

FOR OFFICE USE

PERMIT NUMBER 88537
LOCATION NUMBER

Approved Wyman Hong Date 21 Oct 88
Wyman Hong

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.

Well VR-1

91987

DUBLIN SAN RAMON SERVICES DISTRICT

General Offices: 7051 Dublin Boulevard • Dublin, California 94568 • (415) 828-0515

September 9, 1988

Mr. Jim Kerr
Exxon Co. U. S. A.
P. O. Box 4415
Houston, Texas 77210-4415

Dear Mr. Kerr:

In response to the August 25, 1988 letter from Mr. Rodger C. Witham of Applied Geosystems on your behalf, the following changes have been approved for your Wastewater Discharge Permit #5541-001:

Page 1

1. Expiration date for the permit is 31 March 1989.

Page 2

No changes.

Page 3.

1. Date due for Self Monitoring Report is now monthly.

Page 4

1. POTW Monitoring: The total petroleum hydrocarbon concentration shall not exceed 15 mg/L at any time.

Page 5

1. General Condition #8: Exxon shall use an oil/water separator system to process the ground water. The carbon columns originally installed to process the water may be removed.

All the conditions of the existing permit shall continue to remain in effect.

Very truly yours,

Robert D. Whitley
District Engineer

RDW:ahn

cc: Ms. Lisa McCann, R.W.Q.C.B.
Mr. Roger Witham, Applied Geosystems
Mr. Joe Elliott, City of Pleasanton
Mr. Bob Swanson, D.S.R.S.D.

cc: Mark Thomson
Alameda Co. Office of the District Attorney

Jerry Taylor
City of Pleasanton Water Laboratory

Jerry Killingstad
Alameda Co. Flood Control and Water Conservation District, Zone 7

Rodger Witham
Applied Geosystems

Rafat Shahid
Alameda County Hazardous Materials Management Program

Rick Meuller
City of Pleasanton Fire Department

DUBLIN SAN RAMON SERVICES DISTRICT

General Offices: 7051 Dublin Blvd. • Dublin, California 94568 • (415) 828-0515 • Fax: 829-1180

March 23, 1989

Mr. Rodger C. Witham
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539

Re: **Extension of Wastewater Discharge Permit #5541-001**

Dear Mr. Witham:

Your request for an extension to your Wastewater permit has been approved. The expiration date of the current permit is now September 30, 1989. A new permit will be sent to you for your authorized signiture on or about September 1, 1989. That permit will be in force until September 30, 1990 (1 year).

If you have any questions concerning your permit, sampling, billing, or other aspects of the District's Pretreatment Program, please contact our Industrial Waste Inspector, Tom DeHollander, at 846-4565.

Yours very truly,

Robert Whitley
District Engineer

cc: Ms. Lisa McCann, R.W.Q.C.B.
Mr. Joe Elliot, City of Pleasanton
Mr. Bob Swanson, D.S.R.S.D.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

July 20, 1989

Exxon Company, U. S. A.
c/o Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539

Attention: James Rios

Application Number: *2821*
Equipment Location:
2991 Hopyard Rd.
Pleasanton, CA

Gentlemen:

This is your Authority to Construct the following:

S-1 **Soil Vapor Extraction System**
(Liquid Ring Vacuum Pump, Model A-75, 75 CFM; abated by A-1 and A-2, each abatement device consists of a Carbtrol Corp. Carbon cannister, Model G-1, 200 lbs each)

Operation of this equipment will be subject to the following specific conditions:

1) **This source shall be vented at all times to at least two 200 lb activated carbon vessels (A-1 & A-2) arranged in series.**

2) **The operator of this source shall monitor, as necessary, the inlet and outlet to the carbon vessels, A-1 and A-2, to determine the time of organic (as total carbon on a dry basis) breakthrough and carbon changeout of the vessels. The operator of this source shall monitor, with a FID-OVA monitor, or other monitor approved by the APCO.**

3) **The carbon vessel prior to the last vessel in series, A-1, shall be changed out with fresh or unspent carbon before the breakthrough of 6 ppm of total carbon on a dry basis. The last vessel, A-2, shall be maintained at a non-detectable monitor reading of organics (as total carbon on a dry basis).**

4) **The blower shall be turned off during the carbon changeout procedure unless the exhaust is routed to activated carbon vessels in series which have not experienced organic (as carbon on a dry basis) breakthrough.**

Fees

District Regulation 3 requires a fee for each new Permit to Operate. You will be invoiced upon receipt of your start-up letter. No permits will be issued until all outstanding fees are paid.

Implied Conditions

In the absence of specific permit conditions to the contrary, the throughputs, fuel and material consumptions, capacities, and hours of operation described in your permit application will be considered maximum allowable limits. A new permit will be required before any increase in these parameters, or change in raw material handled, may be made.

Expiration

In accordance with Regulation 2-1-407, this Authority to Construct expires two years from the date of issuance unless substantial use of the authority has begun.

Correspondence

Please include your application number with any correspondence with the District regarding this matter. If you have any questions on this matter, please call **Alexander V. Saschin, Air Quality Engineer at (415)771-6000, extension 190.**

Very truly yours,

Milton Feldstein
Air Pollution Control Officer

by John A Swanson
Permit Services Division

JAS:AVS:es

5) **The operator of this source shall maintain the following records for each day of operation of the source:**

   a) **The hours and time of operation.**
   b) **Each monitor reading or analysis result logged in for the day of operation they were taken.**
   c) **The calculation for organic compound (as carbon on a dry basis) breakthrough.**
   d) **The number of carbon vessels removed from service.**

   These records shall be retained for at least two years from date of entry and be made available to the BAAQMD upon request.

6) **Upon final completion of the remediation project the operator of S-1 shall notify the District within two weeks after decommissioning the operation.**

Notification

Please notify the District by letter at least **three days** before the initial operation of the equipment is to take place so that we may observe the equipment in operation and verify conformance with the Authority to Construct. Operation includes any **start-up** of the source for testing or other purposes. Operation of equipment without prior written notification to the District or beyond the start-up period without a Permit to Operate may result in enforcement action.

Start-Up Period

After receipt of the start-up letter required above, this Authority to Construct authorizes operation during the start-up period from the date of initial operation noted in your start-up letter until the Permit to Operate is issued, up to a maximum of 60 days. **All conditions (specific or implied) of the Authority to Construct are in effect during the start-up period.**

APPENDIX B

CHAIN OF CUSTODY RECORD

Applied GeoSystems

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

SAMPLER (signature): Ben Teheranian / B Teheranian.

Phone: 415-651-1906

LABORATORY: TRACE ANALYSIS LAB.

TURNAROUND TIME: 8/9/89

Project Leader: RODGER WITHAM.

Phone No. 415-651-1906.

SHIPPING INFORMATION:

Shipper APPLIED GEO SYSTEM.

Address 43255 MISSION BLVD. Fremont Ca.

Date Shipped 8/7/89

Service Used

Airbill No. _____ Cooler No. _____

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Ben Teheranian.	Corrine Decker	8/7/89	2:55
	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
INLET #1	18034-4	8/7/89	TPH, BTEX	VAPOR PHASE
INLET #2	18034-4	8/7/89	TPH, BTEX	VAPOR PHASE
OUTLET #1	18034-4	8/7/89	TPH, BTEX	VAPOR PHASE.
OUTLET #2	18034-4	8/7/89	TPH, BTEX	VAPOR PHASE.

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545 (415) 783-6960

TAL

DATE: 8/22/89

LOG NO.: 7694

DATE SAMPLED: 8/7/89

DATE RECEIVED: 8/7/89

CUSTOMER: Applied GeoSystems

REQUESTER: Ben Teheranian

PROJECT: No. 18034-4

Sample Type: Air

Method and Constituent	Units	Inlet #1 Concentration	Inlet #1 Detection Limit	Inlet #2 Concentration	Inlet #2 Detection Limit	Outlet #1 Concentration	Outlet #1 Detection Limit
Modified Method CA-ADDL004:							
Total Petroleum Hydrocarbons as Gasoline	mg/m^3	9,300	30	8,200	30	150	3
Benzene	mg/m^3	25	2	18	2	0.79	0.2
Toluene	mg/m^3	7.1	2	< 2	2	0.32	0.2
Xylenes	mg/m^3	< 7	7	< 7	7	1.5	0.7
Ethyl Benzene	mg/m^3	< 2	2	< 2	2	0.46	0.2

DATE: 8/22/89
LOG NO.: 7694
DATE SAMPLED: 8/7/89
DATE RECEIVED: 8/7/89
PAGE: Two

Sample Type: Air

Method and Constituent	Units	Outlet #2 Concentration	Detection Limit
Modified Method CA-ADDL004:			
Total Petroleum Hyfrocarbons as Gasoline	mg/m^3	110	0.6
Benzene	mg/m^3	0.44	0.04
Toluene	mg/m^3	0.13	0.04
Xylenes	mg/m^3	0.89	0.1
Ethyl Benzene	mg/m^3	0.45	0.05

Dan Farah

Dan Farah, Ph.D.
Supervisory Chemist

DF:slr

CHAIN OF CUSTODY RECORD

Applied GeoSystems

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

SAMPLER (signature):

Phone:

LABORATORY: TRACE ANALYSIS LABS,

TURNAROUND TIME:

Project Leader:

Phone No.

SHIPPING INFORMATION:

Shipper Applied GeoSystems.

Address 43255 Mission Blvd, Fremont.

Date Shipped 8/16/89

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
BEN TEHERANIAN.	Manuel Flores	8/16/89	2:60 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
5	1803A-4	8/15/89	TPH-G BTEX	VAPOR PHASE
6	1803A-4	8/15/89	TPH-G, BTEX.	VAPOR PHASE

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545 *(415) 783-6960*

TAL

DATE: 8/30/89

LOG NO.: 7734

DATE SAMPLED: 8/15/89

DATE RECEIVED: 8/16/89

CUSTOMER: Applied GeoSystems

REQUESTER: Ben Teheranian

PROJECT: No. 18034-4

Sample Type: Air

Method and Constituent	Units	No.5 Concentration	No.5 Detection Limit	No.6 Concentration	No.6 Detection Limit
Modified Method CA-ADDL004:					
Total Petroleum Hydrocarbons as Gasoline	mg/m^3	1,200	10	1,400	20
Benzene	mg/m^3	6.3	1	3.5	2
Toluene	mg/m^3	2.1	1	< 2	2
Xylenes	mg/m^3	6.7	4	< 8	8
Ethyl Benzene	mg/m^3	< 2	2	< 3	3

Dan Farah

Dan Farah, Ph.D.
Supervisory Chemist

DF:sam

CHAIN OF CUSTODY RECORD

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

SAMPLER (signature): BEN TEHERANIAN
Phone: 415 - 651 - 1906

LABORATORY: TRACE ANALYSIS

TURNAROUND TIME: NORMAL

Project Leader: BEN TEHERANIAN
Phone No. 651 - 1906.

SHIPPING INFORMATION:
Shipper Applied GeoSystems.
Address 43255 mission Blvd.
Date Shipped 8/23/89
Service Used
Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
B Teheranian.		8/23/89	
	Received for laboratory by: Denise Deeler / THL	8/23/89	11:50

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
T INLET	18034-4	8/22/89	TPH Gasoline, BTEX.	Vapor Phase
B OUTLET	18034-4	8/22/89	TPH Gasoline, BTEX	Vapor Phase.

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545 *(415) 783-6960*

TAL

DATE: 9/11/89

LOG NO.: 7759

DATE SAMPLED: 8/22/89

DATE RECEIVED: 8/23/89

CUSTOMER: Applied GeoSystems

REQUESTER: Ben Teheranian

PROJECT: No. 18034-4

Sample Type: Air

Method and Constituent	Units	7 Inlet Concentration	7 Inlet Detection Limit	8 Outlet Concentration	8 Outlet Detection Limit
Modified Method CA-ADDL004:					
Total Petroleum Hydrocarbons as Gasoline	mg/m^3	1,200	20	1,300	20
Benzene	mg/m^3	6.0	0.4	4.3	0.4
Toluene	mg/m^3	6.5	0.4	< 0.4	0.4
Xylenes	mg/m^3	20	1	1.7	1
Ethyl Benzene	mg/m^3	1.8	0.5	< 0.5	0.5

Dan Farah

Dan Farah, Ph.D.
Supervisory Chemist

DF:sam