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

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REPORT
SUPPLEMENTAL SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
Exxon Station No. 7-3006
720 High Street
Oakland, California

MAY '91

AGS Job No. 87042-9R

Report prepared for

Exxon Company U.S.A.
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by
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May 21, 1991

TABLE 1
RESULTS OF SOIL ANALYSES

Sample No.	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	TPHd
S-3-MW14	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-8-MW14	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-18-MW14	837	0.10	1.6	6.0	34	<10
S-6-MW15	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-8.5-MW15	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-13.5-MW15	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-3-B21	433	9.0	0.90	7.5	13	1,125
S-8-B21	1,084	22	3.5	31	100	2,112
S-5.5-B22	423	6.9	1.0	19	18	2,570
S-8-B22	3,232	31	123	137	493	210
S-3-B23	20	0.50	0.08	0.41	0.70	<10
S-8-B23	277	2.4	3.5	7.2	28	<10
S-5.5-B24	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-8-B24	80	0.70	0.26	<0.005	0.70	<10
S-5.5-B25	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-8-B25	15	0.27	0.05	0.17	0.75	<10
S-5.5-B26	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-8-B26	<1.0	<0.005	<0.005	<0.005	<0.007	<10
S-5.5-B27	12	0.17	0.05	1.7	0.91	<10
S-8-B27	608	8.1	2.7	19	30	<10
S-3-B28	22	1.0	1.0	0.43	2.5	<10
S-8-B28	1,295	10	45	52	150	<10
S-5.5-B29	1,931	31	122	84	240	<10
S-8-B29	1,262	14	68	49	153	<10
S-5.5-B30	1,069	20	39	44	116	<10
S-8-B30	1,118	9.3	62	47	143	<10

Results in parts per million (ppm).
TPHg: total petroleum hydrocarbons as gasoline.
TPHd: total petroleum hydrocarbons as diesel.
<: less than the laboratory method detection limit or nondetectable.
Sample designation: S-8-B30 = soil sample - depth below grade in feet - boring number

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1.0 INTRODUCTION

At the request of Exxon Company, U.S.A. (Exxon), Applied GeoSystems (AGS) conducted a supplemental subsurface environmental investigation at Exxon Station No. 7-3006 to evaluate the extent of diesel and gasoline hydrocarbons in shallow soil and ground water. This report presents the results of the investigation, which included reviewing data regarding an environmental investigation at an adjacent property, investigating two former product lines exposed in an excavation, drilling 12 soil borings, installing ground-water monitoring wells in two of the borings, and sampling and analysis of soil and ground water. The purpose of the work was to evaluate the onsite impact of diesel and gasoline hydrocarbons in soil and ground water.

1.1 Site Description

The site is at 720 High Street in Oakland, California, as shown on the Site Map, Plate P-1. The site is located on the western edge of an alluvial fan, less than 1/2 mile northwest of a tidal canal and 3/4 mile north of San Leandro Bay (Plate P-1). The station is in a

predominantly industrial area. It is bounded on the northwest by High Street, on the southwest by Coliseum Way, and on the south by Alameda Avenue. Pertinent site features are shown on Plate P-2.

1.2 Previous Work

The following sections describe previous phases of environmental work conducted at the site.

1.2.1 First Phase of Investigation

In April 1987, four underground storage tanks (USTs) were removed by Exxon's contractor. The 6,000-, 8,000-, and 10,000-gallon USTs held super-unleaded, regular leaded, and regular unleaded gasoline, respectively, and were located in the southern corner of the site (Plate P-2). A 1,000-gallon waste-oil UST located east of and behind the station building was also removed (Plate P-2). AGS collected soil samples from the UST excavations in April 1987 (AGS Report No. 87042-1, May 13, 1987). Five of the six soil samples collected from 5 feet below grade in the gasoline UST pit contained levels of total volatile hydrocarbons greater than 1,000 parts per million (ppm). A sample collected from soil excavated from the waste-oil UST pit contained no total extractable hydrocarbons (TEH).

As part of the investigation, an AGS representative was present during excavation and removal of the product piping by Exxon's contractor. An organic vapor meter (OVM) was used to evaluate relative hydrocarbon-vapor concentrations in soil from the trenches, and areas were found with hydrocarbon-vapor concentrations greater than 1,000 ppm. Further sampling and analyses of soil in the trenches was recommended. A black soil layer that appeared to contain petroleum hydrocarbons was exposed in the trenches and in the

gasoline UST pit at a depth of approximately 3 feet. A soil sample from this layer, submitted for laboratory analysis, contained 434 ppm TEH.

In June 1987, Exxon contracted with EA Engineering, Science, and Technology, Inc., of Lafayette, California, to perform a soil-vapor survey. The results of the survey indicated that the highest hydrocarbon-vapor concentrations were between the former gasoline UST pit and the southern pump islands, and extended southwestward toward Coliseum Way.

1.2.2 Second Phase of Investigation

AGS performed a second phase of work at the site to evaluate the extent of hydrocarbons in the backfill and native soil of the gasoline UST pit and beneath the former product piping. During excavation in the former tank pit, a lens of black soil that appeared to contain hydrocarbons was observed at approximately 14 feet below the ground surface in the southwestern wall of the pit, and free product was later observed seeping into the pit from this lens. Further excavation to remove this material indicated that this lens became larger southwest of the tank pit (AGS Report No. 87042-2, July 10, 1987).

1.2.3 Third Phase of Investigation

Ground-water monitoring wells MW-2 through MW-9 were installed in September 1987, and MW-1 was installed in May 1988 (Plate P-2). The wells were installed to evaluate the impact of hydrocarbons on ground water. Soil samples from the borings for wells MW-1 through MW-9 contained up to 2,689 ppm of total petroleum hydrocarbons as gasoline (TPHg) and up to 4,261 ppm of total petroleum hydrocarbons as diesel (TPHd). Soon after the wells were installed, floating product up to 30 inches thick was measured in wells MW-2,

MW-4, and MW-5 in the area of the former gasoline USTs and in well MW-8 in the former area of the product piping (AGS Report No. 87042-5, August 5, 1988).

1.2.4 Fourth Phase of Investigation

In May 1989, Exxon contracted with AGS to excavate additional soil from the southern part of the existing gasoline UST pit (AGS Report No. 87042-6, October 16, 1989). On July 18, 1989, well MW-5 was properly destroyed because the well was the area planned for excavation. Excavation began on July 20, 1989. Along the southern boundary of the existing pit, soil was excavated to a depth of about 10 feet (just above the first encountered ground-water level). Soil with debris (bricks, lumber, etc.) was found in the southern part of the pit, and soil in this area contained the most evidence of hydrocarbons. In addition, two metal pipes were exposed in the southern wall of the excavation that appeared to be former product lines. The pipes appeared to run southwest toward Coliseum Way. Soil was excavated from the southern and southwestern sides of the pit as far towards Coliseum Way as possible.

On the northwestern side of the pit, two exploratory trenches were excavated to evaluate the extent of hydrocarbons while minimizing the volume of excavated soil. Moderate OVM readings (200 to 500 ppm) were taken from the soil along both trenches. Four samples were collected for laboratory analysis from just above ground water (9 feet below grade) from the trenches and southwestern walls, and excavation was halted pending laboratory results. The laboratory results showed 3.8 to 290 ppm TPHg. One sample from 9 feet below grade in the southern part of the pit was analyzed for TPHd and contained 4,200 ppm.

An estimated 300 cubic yards of soil were excavated and stockpiled on the site. Analytical results of six composite samples showed 63 to 330 ppm TPHg and 250 to 3,800 ppm TPHd. Exxon subsequently arranged to have the soil hauled to an appropriate disposal facility.

1.2.5 Fifth Phase of Investigation

Because soil from the southern boundary of the gasoline UST pit contained TPHd, and it was our understanding that Exxon stored no diesel fuel on the site, AGS recommended that the history of the site be investigated and that soil borings be drilled to help delineate the extent of diesel fuel in soil (AGS Report 87042-6, dated October 16, 1989). The records review revealed that the Exxon site was used as an oil-storage and distribution facility by Standard Oil Company between approximately 1912 and 1934. Up to five aboveground oil-storage tanks were onsite during this period. Between 1953 and 1969, the northeastern part of the site was part of an automobile wrecking yard. The existing Exxon Station was built in 1970.

Several nearby sites were identified as potential sources of hydrocarbons. These sites include a former dry-cleaning plant and automobile wrecking yard (Ed's Auto Parts) to the northeast of the Exxon site; a former sheet-metal foundry owned by Southern Pacific Transit Company further to the northeast of the Exxon site; two gasoline pipelines owned by Southern Pacific Pipeline to the southeast of the Exxon site; and a former oil-distribution business (Norwalk Oil Sales Company) to the east of the Exxon site (AGS Report 87042-6R, January 30, 1990).

At Exxon's request, samples of the free product in two of the monitoring wells at the site were collected and analyzed by a fuel-fingerprint analysis. The results indicated that the

free product from well MW-3 is diesel fuel, and free product from MW-8 is predominantly diesel fuel with some gasoline (AGS Report 87042-6R, January 30, 1990).

On November 16, 1989, Exxon authorized the drilling of 11 borings and requested the installation of four additional wells. In soil analyzed from the borings, the highest concentrations of TPHd (up to 4,000 ppm) were found in the southwestern part of the site, and the highest concentrations of TPHg (3,400 ppm) were found adjacent to the excavation at Ed's Auto Parts, which is adjacent to the northeastern property line of the Exxon site (AGS Report 87042-6R, January 30, 1990).

Based on the results of this investigation, AGS recommended additional delineation of hydrocarbons in soil in the southwestern part of the site, adjacent to the excavation at Ed's Auto Parts, and near the former waste-oil UST. AGS also recommended further delineation of hydrocarbons in ground water near the excavation at Ed's Auto Parts and east of the location of the former fuel USTs.

1.2.6 Ground-Water Monitoring and Sampling Program

At the request of Exxon, AGS is currently performing monthly monitoring and quarterly sampling and analysis of wells at the site. The most recent results indicate that the ground water beneath the site continues to show elevated concentrations of TPHg and TPHd. In addition, thin layers of free product were observed in wells, MW-2, MW-3, MW-4, and MW-8 (AGS Report No. 87042-9, January 30, 1991).

2.0 STATUS OF ENVIRONMENTAL INVESTIGATION AT ED'S AUTO PARTS

AGS reviewed information pertaining to the environmental investigation at Ed's Auto Parts, which is adjacent to the Exxon site (Plate P-2). According to a report provided by the property owners' consultant, Earth Metrics, Inc., three 3,000-gallon USTs and a redwood tank of unknown size were removed from the site in April 1989 (Earth Metrics, Inc., 1990). The three USTs were grouped adjacent to the northeastern boundary of the Exxon site, and the redwood tank was further to the north of the USTs (Plate P-2). The report does not state whether the redwood tank was underground or aboveground.

The USTs were used to store stoddard solvent while the site was used as a dry cleaning facility. The redwood tank was used to store spent solvent and sludge. Stoddard solvent is a high-boiling-point hydrocarbon that falls in the diesel range of the chromatogram, has a specific gravity of 1.0, and is insoluble in water (Sax, 1984).

According to the Earth Metrics report, the original contractor who performed the tank removal, soil excavation, and initial soil sampling at Ed's Auto Parts did not provide the laboratory results. Earth Metrics resampled the walls of the two tank pits in August 1990 and found that TPHd concentrations ranged from nondetectable to 17 ppm. Earth Metrics also sampled the stockpiled soil from the excavations (an estimated 400 cubic yards), which had been aerated onsite by the original consultant. The samples contained 3.5 to 410 ppm TPHd.

3.0 FIELD INVESTIGATION

Field work during this project phase included (1) locating the paths of two underground pipes exposed in the former UST excavation; (2) drilling 10 soil borings (B-21 through B-30); (3) drilling two more borings and constructing ground-water monitoring wells in the borings; (4) collecting soil samples from the borings for laboratory analyses; and (5) collecting ground-water samples from the new and existing monitoring wells for laboratory analyses. Work was performed in accordance with guidelines established by the California Regional Water Quality Control Board. The following sections describe the work performed. A detailed discussion of the field procedures is presented in Appendix A.

3.1 Preparation for Field Work

Field work was performed in accordance with a Site Safety Plan (AGS Site Safety Plan No. 87042-6S, July 8, 1989) and AGS Field Procedures (Appendix A). Before field work began, AGS acquired a drilling permit from the Alameda County Flood Control and Water Conservation District, Zone 7 (Appendix B). AGS notified Underground Service Alert to request delineation of public underground utilities. As a further precaution, each boring location was probed to a depth of 5 feet with a hand auger before drilling.

3.2 Location of Old Piping

On October 31, 1990, a representative of West Coast Locators of San Jose, California, located two metal pipes that were exposed during excavation in the vicinity of the former USTs. To locate the lines, a signal generator was attached to the exposed ends of the pipes, and a receiver was used to trace their path. The signal was traced for 30 feet west of the

excavation. The signal ceased at the property line, which suggests that the pipes end at that point. The approximate location of the piping is shown on Plate P-3.

3.3 Drilling of Borings

From October 31 through November 1, 1990, AGS drilled and sampled 12 onsite borings (Plate 2). The locations of the borings were chosen to further delineate hydrocarbons in soil in the area of the former main service island and near the southwestern property line. [redacted] locations of monitoring wells MW-14 and MW-15 were chosen to delineate hydrocarbons in the vicinity of the excavation at Ed's Auto Parts and east of the former fuel USTs, respectively.

Two borings were drilled to depths of 17 and 25 feet for the installation of monitoring wells MW-14 and MW-15. The other 10 borings (B-21 through B-30) were approximately 14 feet deep and were drilled to evaluate the extent of hydrocarbons in the upper clay layer. Ground water was encountered at 8 to 10 feet below the ground surface in each boring in a sand or gravel layer.

During drilling, soil from each boring was described and classified under the Unified Soil Classification System (Appendix C, Plate C-1). Soil samples were collected from the borings at 2-1/2- to 5-foot intervals and screened with an OVM for presence of volatile hydrocarbons. Descriptions of the soils encountered while logging the borings are presented on the Logs of Borings (Appendix C), which also show field OVM readings under the column entitled "P.I.D." (photoionization detector).

3.4 Installation of Ground-Water Monitoring Wells

The construction of ground-water monitoring wells MW-14 and MW-15 is shown on the Logs of Borings (Appendix C). The boring for MW-14 was drilled to a depth of 17 feet, and well MW-14 was installed with a screened interval between 7 and 17 feet below grade. The boring for well MW-15 was drilled to a total depth of 25 feet to evaluate the vertical extent of the clay layer encountered at 17 feet below grade. The clay extended from 17 feet to the depth explored (25 feet), and the boring was backfilled with tremied bentonite pellets to a depth of 17 feet below grade. Well MW-15 was installed with a screened interval between 7 and 17 feet below grade. The wells were constructed with 4-inch-diameter polyvinyl chloride (PVC) casing. The perforated intervals were constructed with 0.010-inch machine-slotted screen.

Wells MW-14 and MW-15 were developed on November 10, 1990. The wells were developed by surging and pumping until the discharged ground water was relatively free of sediment.

3.5 Monitoring and Sampling of Ground Water

On November 27, 1990, ground-water levels were measured, subjective evaluations were performed, and ground-water samples were collected for laboratory analyses from monitoring wells.

4.0 ANALYTICAL METHODS

Chemical analyses were performed on selected soil samples from each boring and ground-water samples from each well, as described in the following sections.

4.1 Soil

Soil samples representing the shallow clay and the material just above the ground-water level were chosen for analysis from each boring. For the borings for wells MW-14 and MW-15, a deeper sample representing the clay layer below the uppermost saturated zone was also analyzed. Soil samples were analyzed for TPHg and TPHd by modified Environmental Protection Agency (EPA) Method 8015 and BTEX by EPA Method 8020. The analyses were performed at Applied Analytical Environmental Laboratories of Fremont and Irvine, California (Hazardous Waste Testing Laboratory Certificate Nos. 1211 and E678, respectively). Copies of Chain of Custody Records and certified laboratory analysis reports are included in Appendix D.

4.2 Ground Water

Ground-water samples were analyzed for TPHg and TPHd by EPA Method 8015 and for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 602. Samples from wells MW-7 and MW-9, near the former waste-oil tank, were also analyzed for volatile organic compounds (VOCs) by EPA Method 601. Samples were analyzed for TPHg, TPHd, and BTEX at Applied Analytical in Fremont, California (Hazardous Waste Testing Laboratory Certification No. 1211), and for VOCs by Chromalab, Inc. in San Ramon, California (Hazardous Waste Testing Laboratory Certification No. E694). Copies of Chain

of Custody Records and certified laboratory analysis reports are included in AGS Report No. 87042-9, dated January 30, 1991.

5.0 RESULTS OF INVESTIGATION

5.1 Site Geology and Hydrogeology

During this and previous phases of drilling, the materials encountered were interbedded layers of silty clay, silt, clayey gravel to gravel, and clayey sand to sand. An upper 6 to 12 feet of silty clay were encountered, which is underlain by saturated clayey gravel or clayey sand that appears to vary in thickness and extent. The permeable layer is underlain by silty clay.

The data from borings drilled to date at the site were used to construct generalized cross sections A - A' through D - D' (Plates P-4 and P-5); the reference locations of the sections are shown on Plate P-2. The sections suggest that there are two permeable units beneath the site, one at 7 to 12 feet below grade and one at 20 to 30 feet below grade. In the central part of the site, the two units appear to merge, as shown on Section D - D' (Plate P-5). In other areas, one or both permeable units appear to pinch out, as shown in Sections A - A' and B - B' (Plate P-4).

Ground water was encountered at 8 to 12 feet below grade in most of the borings. However, in the northern corner of the site (MW-10 and MW-11), ground water was encountered at 20 to 24 feet below grade in the lower permeable unit. Water levels in MW-10 and MW-11 stabilized at approximately 10 feet below grade. Ground water in both permeable units is confined by a silty clay layer.

5.2 Soil Analyses

A summary of laboratory results for soil samples is presented in Table 1, and the results are discussed in the following sections. Copies of Chain of Custody Records and laboratory analysis reports are presented in Appendix D.

5.2.1 TPHg and BTEX

During this phase of drilling, concentrations of TPHg in the soil samples ranged from nondetectable to 3,232 ppm. Benzene concentrations ranged from nondetectable to 31 ppm; toluene from nondetectable to 123 ppm; ethylbenzene from nondetectable to 137 ppm; and total xylenes from nondetectable to 493 ppm. The highest concentrations of gasoline hydrocarbons were detected in the soil sample from 8 feet below grade in boring B-22, which was drilled adjacent to the sidewalk south of the former dispenser islands and west of the original tank pit excavation.

Concentrations of TPHg were also detected in the boring adjacent to the excavation at Ed's Auto Parts. At 18 feet below grade, in the boring for MW-14, 837 ppm TPHg were detected in the clay beneath the uppermost water-bearing gravel.

Concentration maps were constructed for TPHg at two depth intervals, 3- to 5-feet and 7-1/2- to 10-feet, using the soil analyses from the most recent and previous borings (Plates P-6 and P-7). These intervals were chosen to represent the upper clay layer and the permeable unsaturated soil just above the water level. At the 3- to 5-foot depth interval, concentrations of TPHg greater than 100 ppm are found along the western property boundary. At the 7-1/2- to 10-foot depth interval, concentrations of TPHg greater than 100 ppm are found along the western property boundary, in the southwestern corner of the

station, near the former location of the waste-oil UST, and at the northern property line adjacent to the excavation at Ed's Auto Parts.

5.2.2 TPHd

In soil samples analyzed during the most recent phase of drilling, TPHd concentrations were nondetectable, except for samples from two borings, B-21 and B-22, which are in the southwestern part of the site. A TPHd concentration of 1,125 ppm was detected at 3 feet below grade in B-21 and 2,570 ppm was detected at 5-1/2 feet in B-22. At 8 feet below grade, concentrations of 2,112 ppm were detected in B-21 and 210 ppm were detected in B-2.

Using data from the most recent and previous borings drilled at the site, TPHd concentration maps were prepared for the 3- to 5-foot and 7-1/2- to 10-foot depth intervals (Plates P-8 and P-9). Concentrations of TPHd greater than 100 ppm at 3 to 5 feet in depth are found in the southwestern part of the site, south of the former main dispenser island. At 7-1/2 to 10 feet below grade, TPHd concentrations greater than 100 ppm are found in the southwestern corner of the site, adjacent to the former location of the waste-oil UST, and at the northern property line adjacent to the excavation at Ed's Auto Parts.

5.3 Results of Ground-Water Monitoring and Analyses

The results of ground-water monitoring and sampling performed through November 1990 were reported in AGS Report No. 87042-9, dated January 30, 1991. The laboratory analysis reports and Chain-of-Custody Records are included in the January report. The cumulative ground-water monitoring and analyses data are in Appendix E of this report. The results of the November 1990 monitoring episode are summarized here.

Between July 1990 and November 1990, the ground-water level fell an average of 1.64 feet, and product thicknesses in wells MW-2 through MW-4 and MW-8 generally increased (Table E-1). Ground-water elevation maps prepared using the data for September, October, and November suggest that ground water flows toward the southwest with an average gradient of 0.017, which is consistent with previous results.

Results of the ground-water analyses indicate that hydrocarbon concentrations are similar to previous results. Detectable concentrations of TPHg and TPHd in ground water ranged from 0.39 to 69 ppm and 0.12 to 31 ppm, respectively. In general, the highest concentrations of dissolved TPHg and TPHd were detected in ground water from the western part of the site. Floating product is concentrated in the southwestern part of the site. No TPHg, BTEX, or TPHd were detected in ground water from wells MW-9, MW-10, and MW-11 at the northern and eastern site perimeters.

Benzene concentrations ranged from nondetectable to 11 ppm in the ground-water samples. Up to 10 ppm toluene, 3.1 ppm ethylbenzene, and 12 ppm total xylenes were also detected.

Chloromethane (0.0024 ppm) was the only volatile organic compound detected in the ground-water sample from well MW-7 on the northeastern site perimeter next to the former waste-oil tank and adjacent to the former dry-cleaning facility. This is the first occurrence of VOCs in ground water since the quarterly monitoring program was initiated in 1987. No VOCs were detected in the water sample from MW-9. Cumulative results of ground-water analyses are presented in Table E-2.

In the two newly installed wells, MW-14 and MW-15, low concentrations of TPHg, TPHd, and BTEX were detected. In MW-14, adjacent to the excavation at Ed's Auto Parts, 0.39 ppm TPHg and 0.12 ppm TPHd were detected. No benzene or toluene were detected, but

low concentrations of ethylbenzene and xylenes (0.0036 and 0.0037 ppm, respectively) were detected. In MW-15, adjacent to the former fuel UST excavation, 2.7 ppm TPHg and 0.34 ppm TPHd were detected. Benzene, toluene, ethylbenzene, and xylenes were detected at concentrations of 0.21, 0.0055, 0.6, and 0.25 ppm, respectively.

6.0 CONCLUSIONS

Based on the results of this and previous investigations, AGS concludes:

- Results of soil sampling at the adjacent Ed's Auto Parts suggest that the tanks have released high-boiling-point hydrocarbons (stoddard solvent) to the subsurface.
- The piping exposed in the southern part of the fuel UST excavation appears to end at the southwestern property line.
- Water-bearing sand and gravel units with varying amounts of silt and clay occur in two distinct horizons, which appear to be discontinuous and vary in thickness across the site.
- In near-surface soil (less than 5 feet deep), concentrations of TPHg greater than 100 ppm are found along the western property boundary and beneath the area of the former main service islands. Concentrations of TPHd greater than 100 ppm in near-surface soil are limited to the area just southwest of the main service islands, near the western property line.
- Soil just above ground water (less than 10 feet deep) with TPHg and TPHd concentrations greater than 100 ppm is predominantly in the southern and western parts of the site, except for an area adjacent to the former waste-oil UST and an area adjacent to the excavation at Ed's Auto Parts. These results suggest at least three separate sources of hydrocarbons: one or more sources along the southwestern property boundary near the original tank excavation, the former waste-oil UST, and the former tanks at Ed's Auto Parts.
- Hydrocarbons were detected in the clay below the uppermost saturated gravel in the boring adjacent to the excavation at Ed's Auto Parts. The sample from 18 feet below

grade in the boring for MW-14 contained 837 ppm TPHg, although no detectable hydrocarbons were found in two other samples from above the water level.

- Results of ground-water analyses suggest that the highest concentrations of dissolved TPHg and TPHd are in the western and southwestern part of the site. Dissolved hydrocarbon concentrations have been relatively stable during the course of the monitoring program (1987 through 1990).

- The presence of dissolved hydrocarbons in well MW-14, which is upgradient of the Exxon facilities and adjacent to the excavation at Ed's Auto Parts, also suggests that a source on the adjacent site is contributing hydrocarbons to the subsurface.

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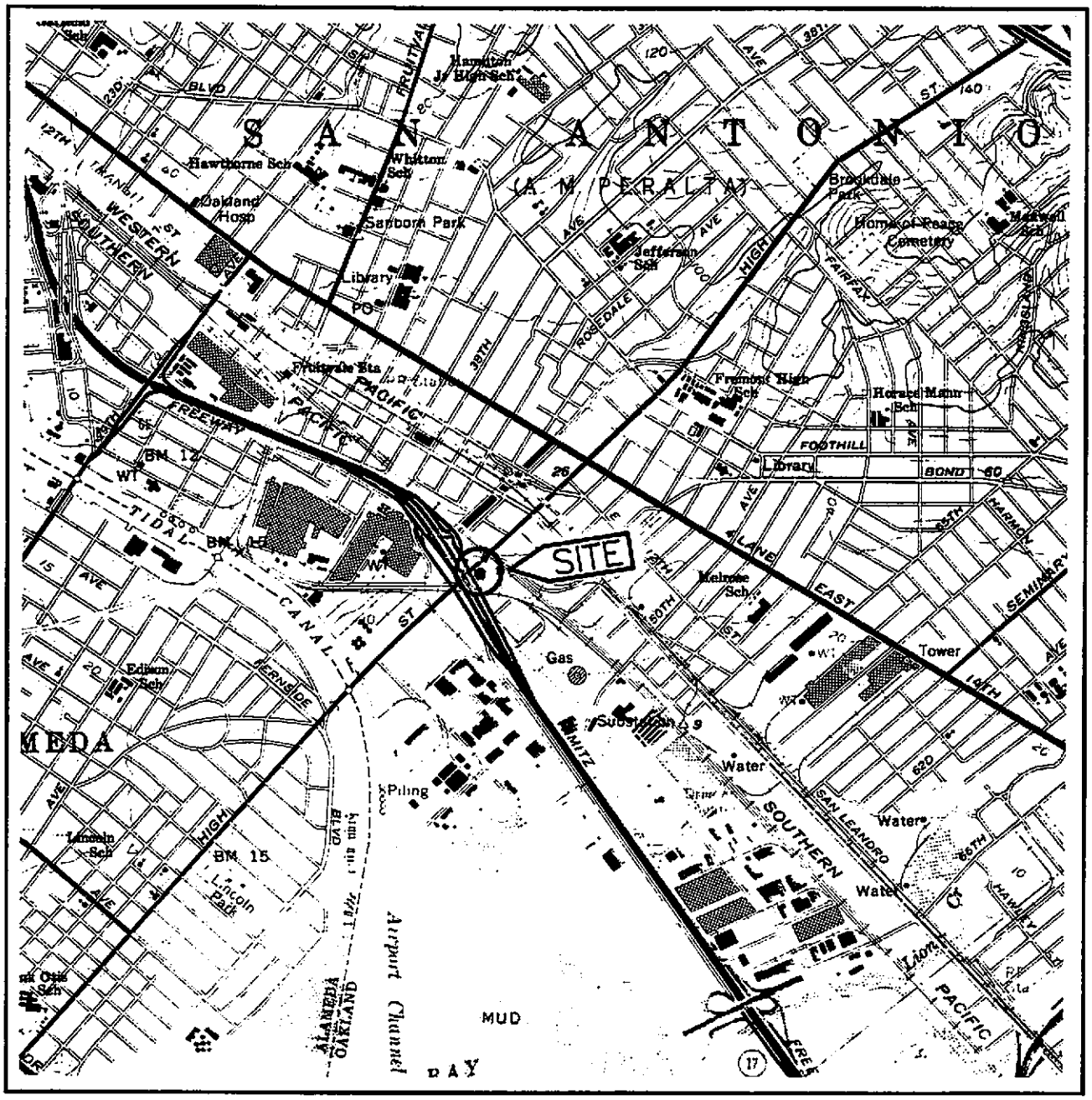


Source: U.S. Geological Survey
7.5–Minute Quadrangle
Oakland East, California

N

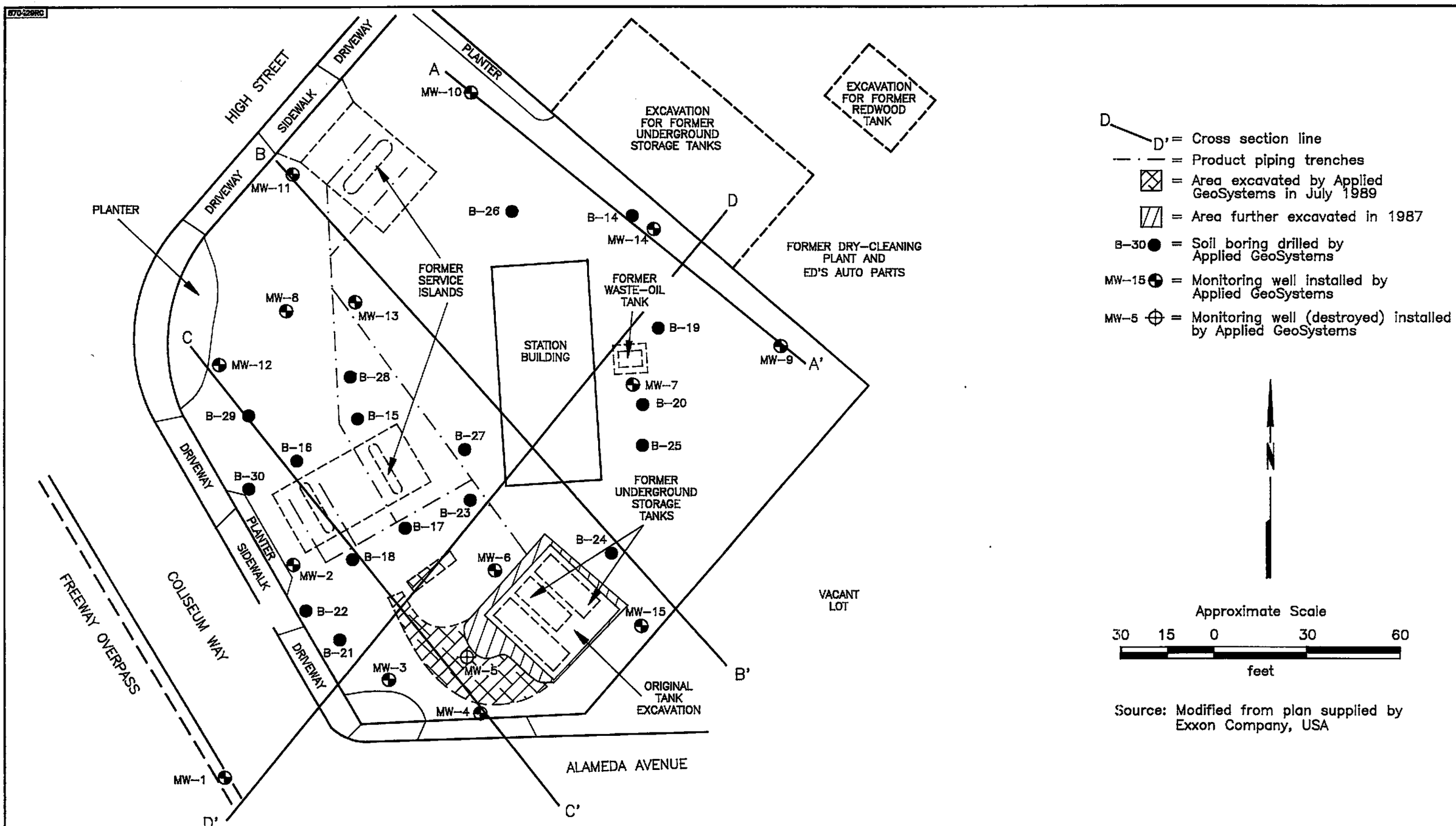
Approximate Scale
2000 1000 0 2000 4000
feet

Applied GeoSystems

PROJECT NO. 87042-9R

SITE VICINITY MAP
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE
P - 1



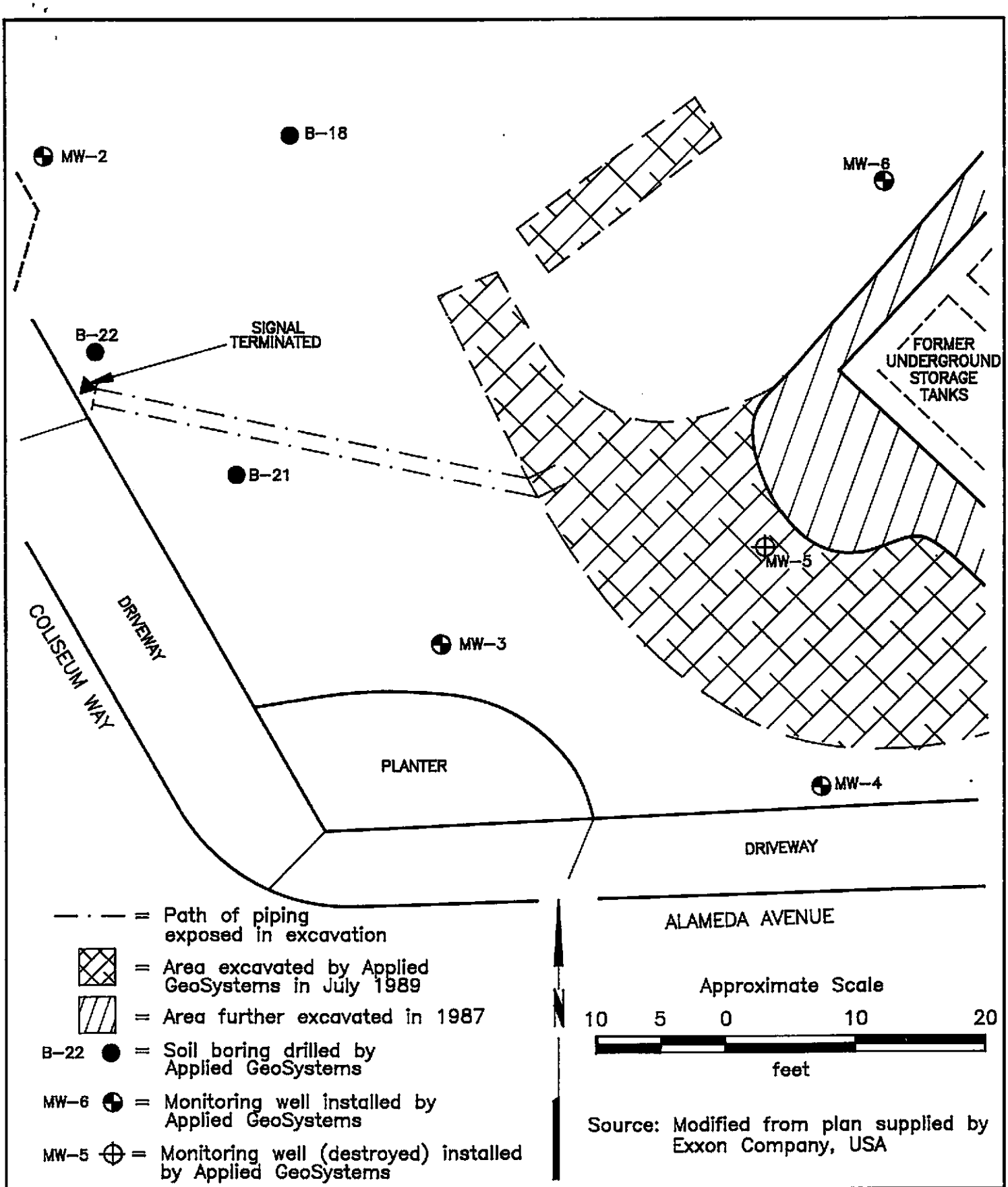
Source: Modified from plan supplied by Exxon Company, USA

Applied GeoSystems

PROJECT NO. 87042-9R

GENERALIZED SITE PLAN
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE
P - 2



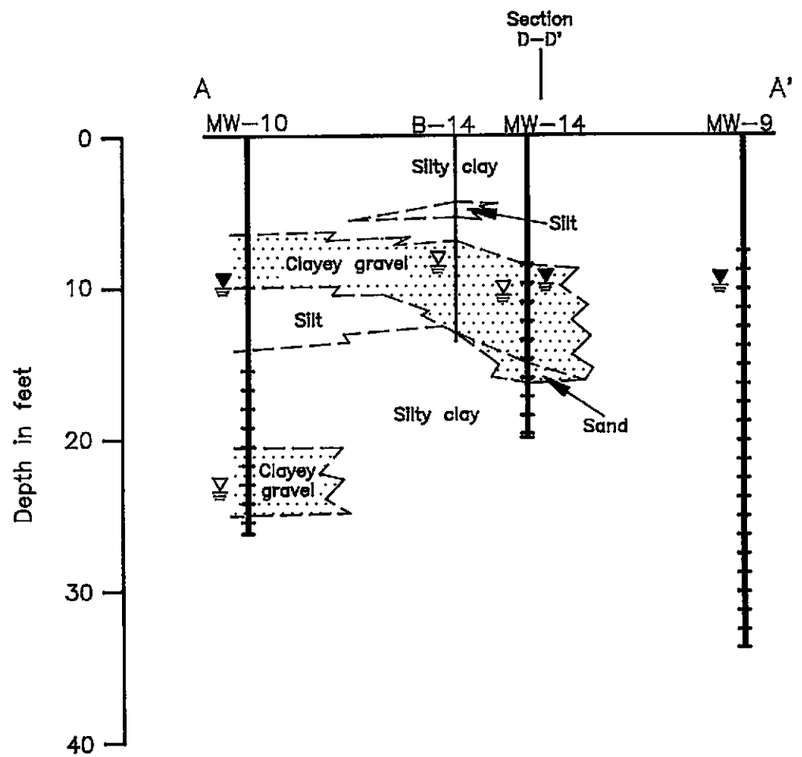
Applied GeoSystems

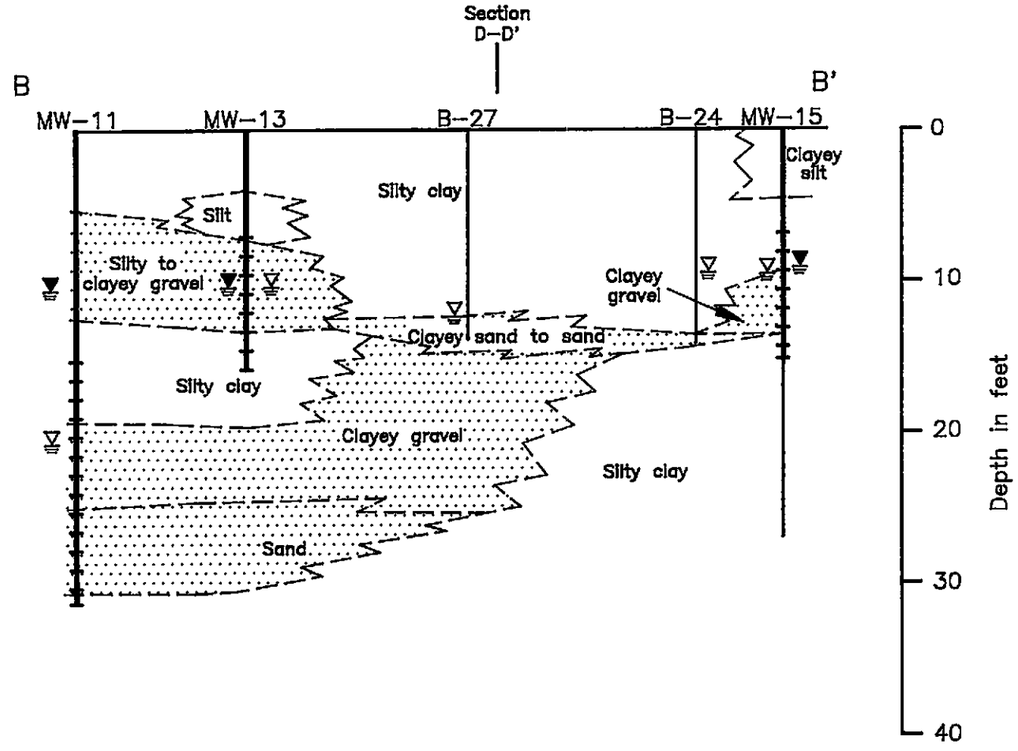
PROJECT NO. 87042-9R

LOCATION OF PIPING
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE
P - 3

87042990A





= Well casing

= Well screen

= Boring

= Initial water level

= Static water level (11/27/90)

Approximate Horizontal Scale

40 20 0 40 80

feet

Applied GeoSystems

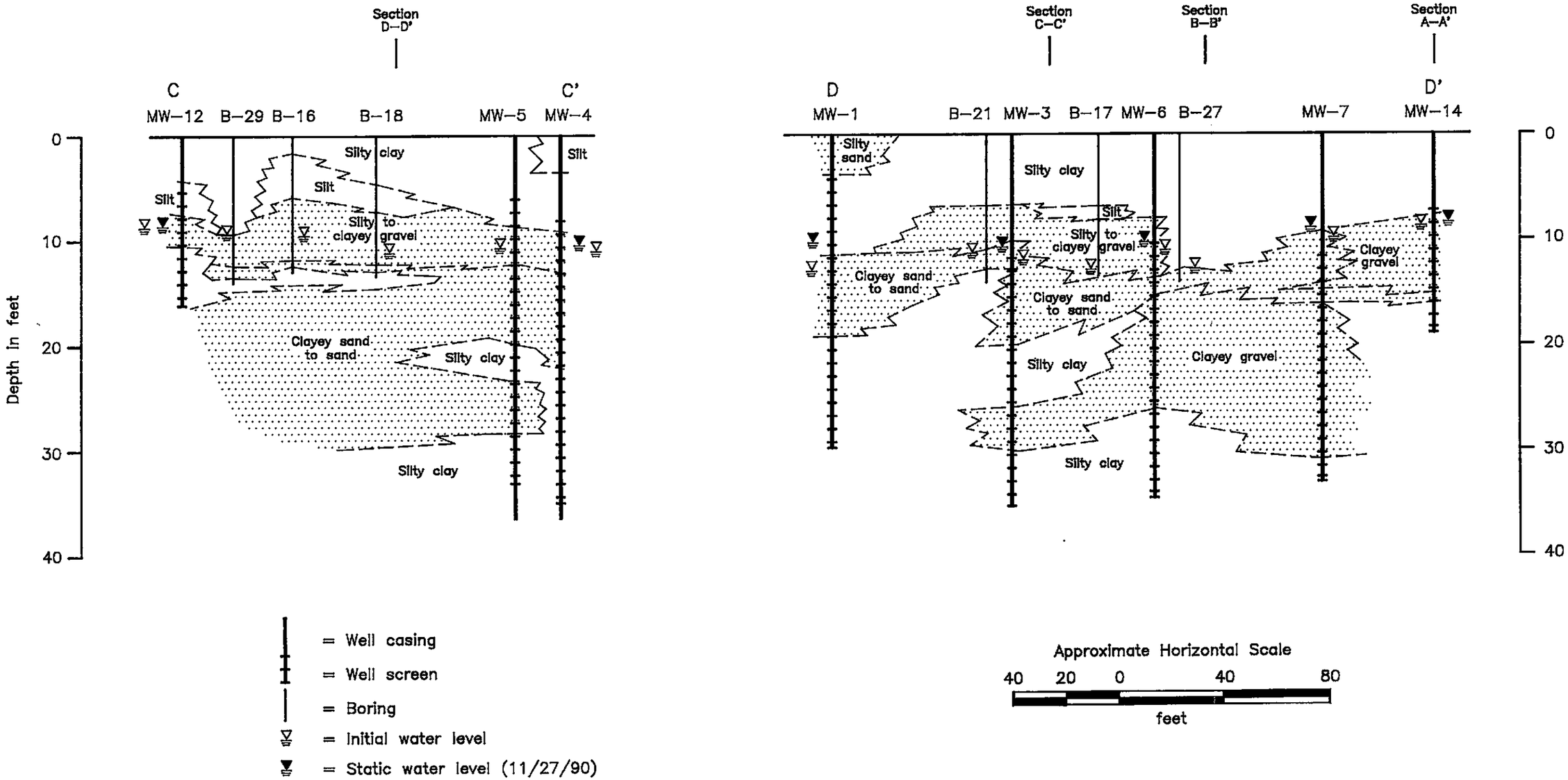
PROJECT NO. 87042-9R

GEOLOGIC CROSS SECTIONS A-A' AND B-B'
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

P - 4

87042900

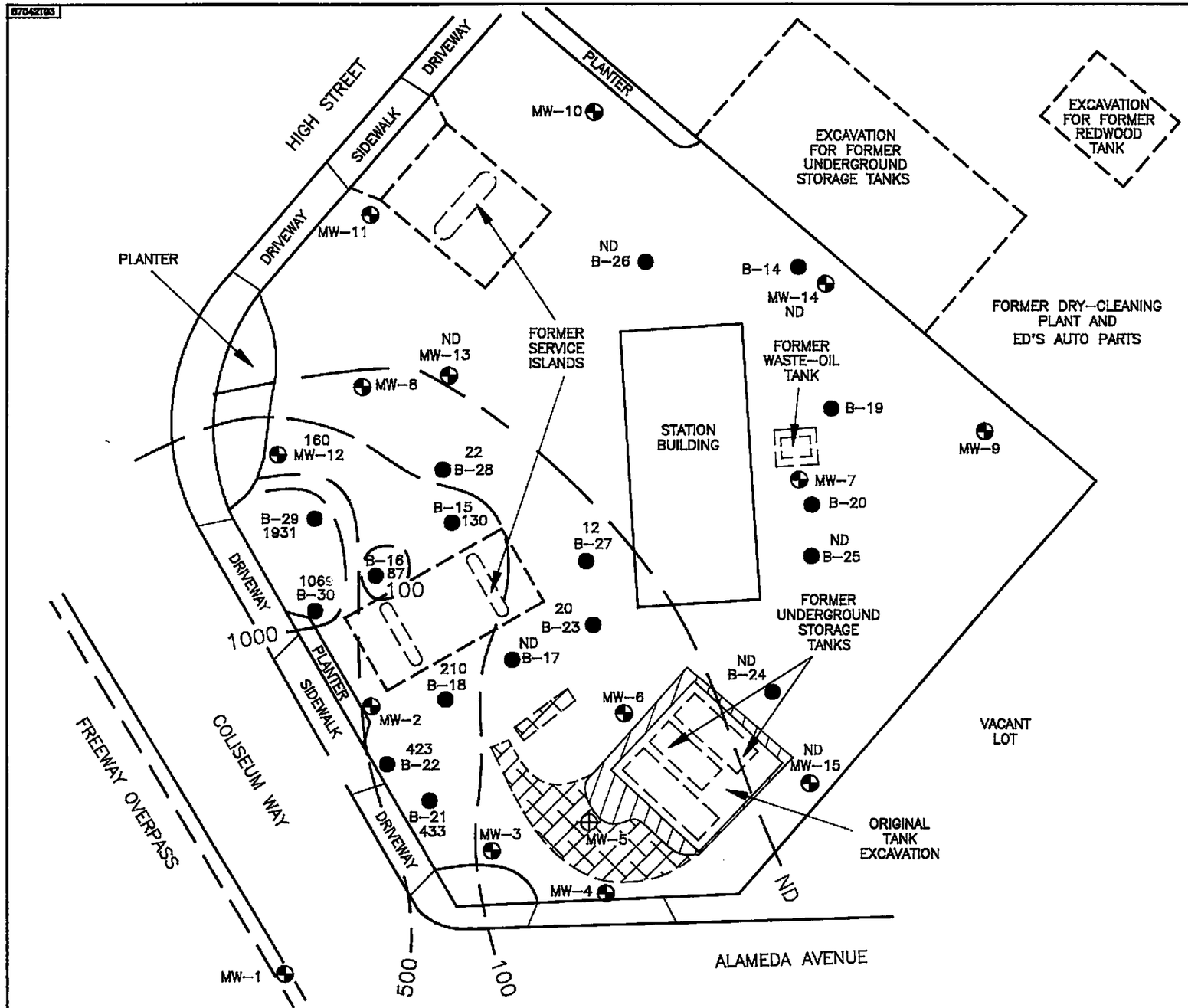


Applied GeoSystems

PROJECT NO. 87042-9R

GEOLOGIC CROSS SECTIONS C-C' AND D-D'
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE
P - 5



1000 = Line of equal concentration in parts per million

1931 = Concentration in parts per million

ND = Nondetectable

= Area excavated by Applied GeoSystems in July 1989

= Area further excavated in 1987

B-30 = Soil boring drilled by Applied GeoSystems

MW-15 = Monitoring well installed by Applied GeoSystems

MW-5 = Monitoring well (destroyed) installed by Applied GeoSystems

N

Approximate Scale

30 15 0 30 60

feet

Source: Modified from plan supplied by Exxon Company, USA

Applied GeoSystems

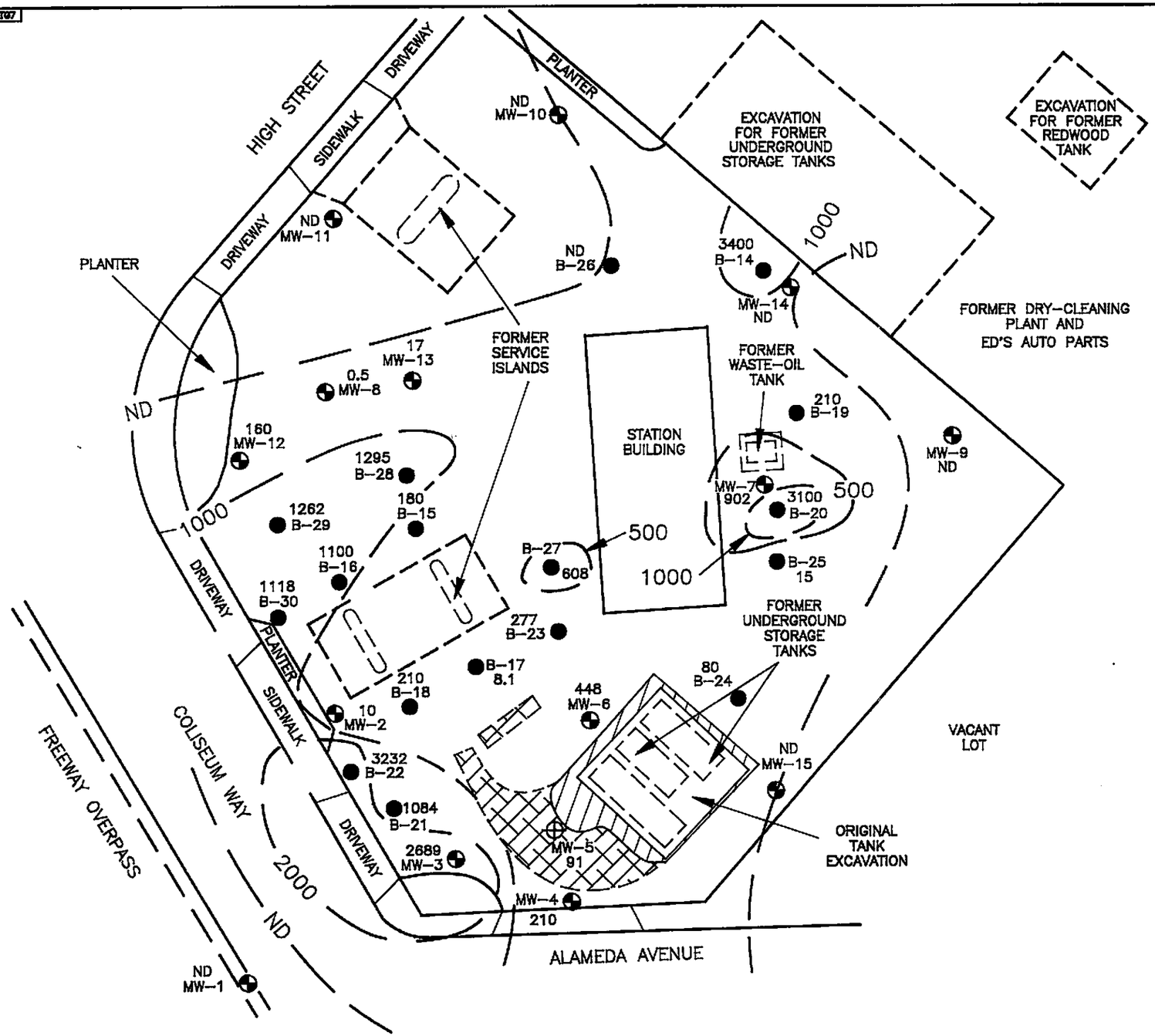
PROJECT NO. 87042-9R

CONCENTRATION OF TPHg IN SOIL
(3- to 5-foot depth interval)
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

P - 6

87042707



2000 = Line of equal concentration in parts per million

3400 = Concentration in parts per million

ND = Nondetectable

= Area excavated by Applied GeoSystems in July 1989

= Area further excavated in 1987

B–30 = Soil boring drilled by Applied GeoSystems

MW–15 = Monitoring well installed by Applied GeoSystems

MW–5 = Monitoring well (destroyed) installed by Applied GeoSystems

N

Approximate Scale

30 15 0 30 60

feet

Source: Modified from plan supplied by Exxon Company, USA

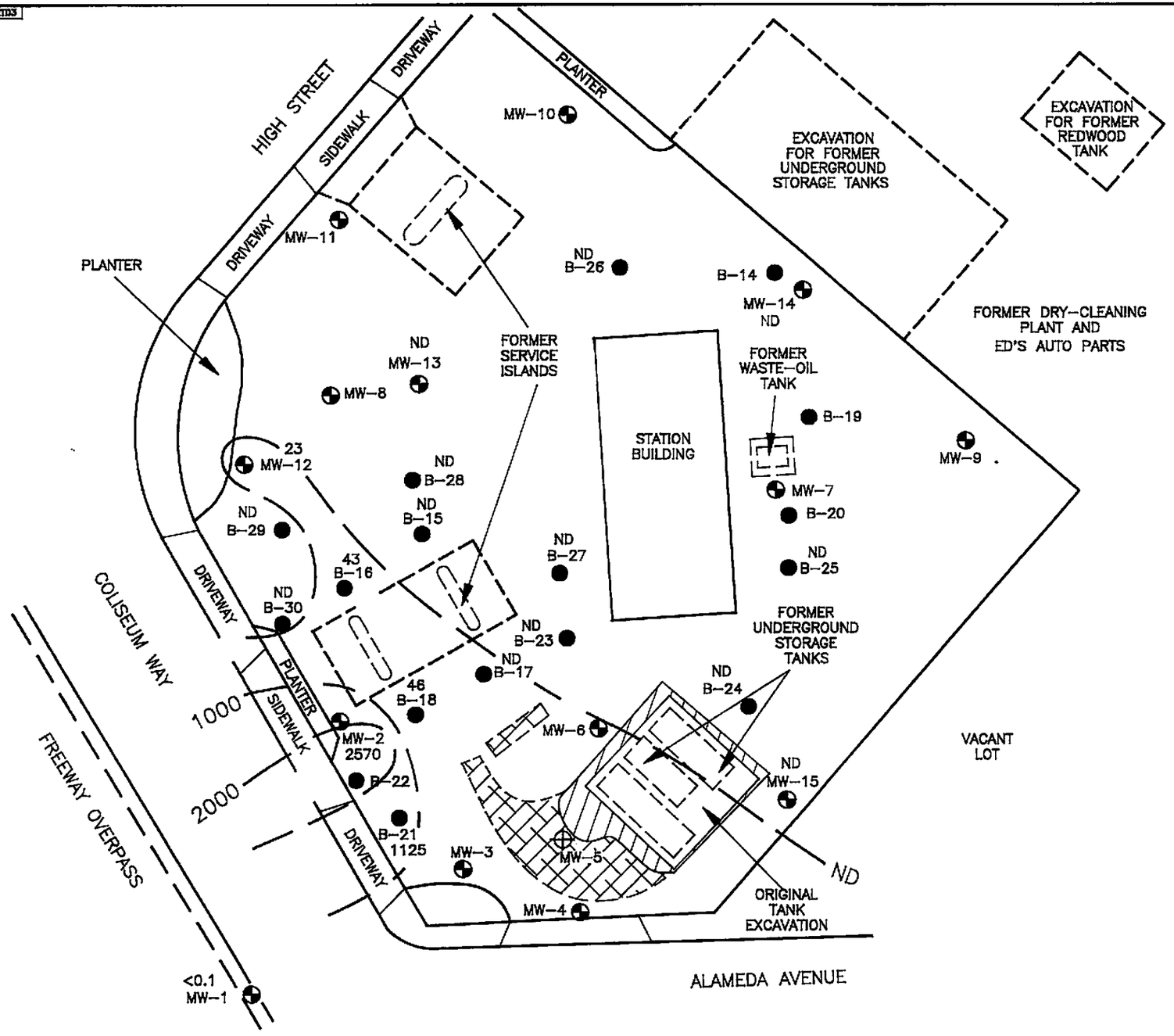
Applied GeoSystems

PROJECT NO. 87042-9R

CONCENTRATION OF TPHg IN SOIL
(7-1/2- to 10-foot depth interval)
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

P - 7



2000 = Line of equal concentration in parts per million

2570 = Concentration in parts per million

ND = Nondetectable

= Area excavated by Applied GeoSystems in July 1989

= Area further excavated in 1987

B-30 = Soil boring drilled by Applied GeoSystems

MW-15 = Monitoring well installed by Applied GeoSystems

MW-5 = Monitoring well (destroyed) installed by Applied GeoSystems

N

Approximate Scale

30 15 0 30 60

feet

Source: Modified from plan supplied by Exxon Company, USA

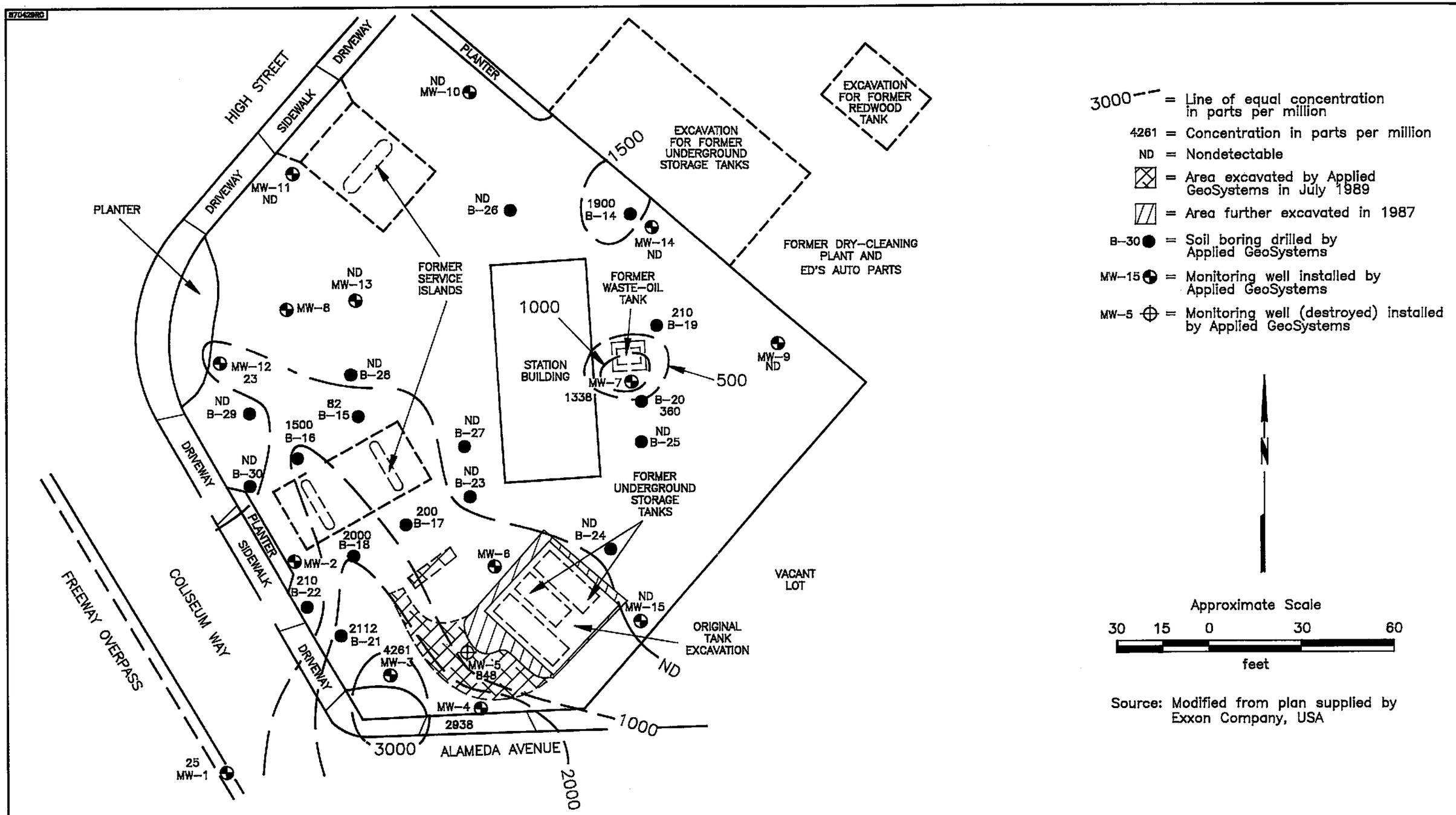
Applied GeoSystems

PROJECT NO. 87042-9R

CONCENTRATION OF TPHd IN SOIL
(3- to 5-foot depth interval)
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

P - 8



Source: Modified from plan supplied by Exxon Company, USA

Applied GeoSystems

PROJECT NO. 87042-9R

CONCENTRATION OF TPHd IN SOIL
(7-1/2- to 10-foot depth interval)
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

P - 9

APPENDIX A

FIELD PROCEDURES

FIELD PROCEDURES

Site Safety Plan

Field work performed at the site by AGS on behalf of Exxon was conducted in accordance with AGS' Site Safety Plan No. 87042-6S (July 8, 1989). This plan describes the basic safety requirements for the subsurface environmental investigation and drilling of soil borings at the site. Personnel and subcontractors of AGS scheduled to perform work at the site were briefed on the contents of the Site Safety Plan before work began. A copy of the Site Safety Plan was kept at the site and was available for reference by appropriate parties during work.

Drilling of Borings

Kvilhaug Well Drilling of Concord, California, drilled the borings with a B-53 truck-mounted drill rig and steam-cleaned, continuous-flight, hollow-stem augers. The cuttings from the borings were stored onsite on plastic sheeting. Borings not used for monitoring well construction were backfilled with tremied neat cement.

Soil Sampling

Soil samples were collected from the borings with a 2-1/2-inch-inside-diameter, California-modified, split-spoon sampler lined with clean brass sleeves. Soil was sampled at 2-1/2 to 5-foot intervals from the ground surface to total depth. Samples were collected by advancing the augers to a point just above the sampling depth and then driving the sampler into the earth material through the hollow center of the auger. The sampler was driven a maximum of 18 inches with a standard 140-pound hammer repeatedly dropped 30 inches. The sampler was retrieved and the soil samples removed. The samples were sealed in their brass sleeves with aluminum foil, plastic caps, and duct tape. The samples were labeled and promptly placed into iced storage for transport to an analytical laboratory for testing.

A Chain of Custody Record was initiated for the soil samples and AGS personnel observed chain-of-custody protocol throughout subsequent handling of the soil samples.

The Unified Soil Classification System was used to identify soil encountered in the boreholes. A copy of this classification system is presented as Plate C-1 in Appendix C. Descriptions of the earth materials encountered in the borings are presented on the Logs of Borings (see Appendix C).

The relative consistency of the earth materials encountered in the soil borings at the sampling depths was evaluated during sampling. The sampler was driven 18 inches with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows required to drive the soil sampler each 6-inch increment was counted and is shown on the Logs of Borings.

Head-Space Analysis of Soil Samples

A photoionization detector (PID) headspace analysis was conducted on samples recovered from the boreholes, using an organic vapor meter (OVM) to analyze organic vapor concentrations. Readings were taken by placing the rubber cup skirting the intake probe of the OVM flush against the end of the brass tube containing the soil sample just after the tube was removed from the sampler. Field instruments such as the OVM indicate relative organic vapor concentrations in soil but cannot assess the concentrations of hydrocarbon contaminants in the soil with the precision of laboratory analyses. Results of the headspace analysis are shown on the Logs of Borings (Appendix C).

Installation of Monitoring Wells

The monitoring wells were completed with 4-inch-inside-diameter, Schedule 40, polyvinyl chloride (PVC) casing. The slotted interval consists of machine-slotted PVC with 0.010-inch-wide slots. Blank PVC casing was set from the top of the screened casing to a few inches below the ground surface. All casing joints are flush threaded, and no glues, chemical cements, or solvents were used in well construction. The top of the well casing is covered with a locking cap and the bottom has a threaded end-plug.

The annular space of the well was backfilled with No. 2 sorted sand from the total depth to approximately 1 foot above the top of the screened casing. A bentonite plug, approximately 1 foot thick, was placed above the sand as a seal against cement entering the sand pack. The remaining annulus was backfilled with a slurry of neat cement to a few inches below the ground surface. A graphic representation of the well construction is shown in the right column of the Logs of Borings (see Appendix C). A key to symbols used to illustrate well construction is also shown on Plate C-1 in Appendix C.

An aluminum utility box with a PVC apron was placed over the wellhead and set in place with concrete flush with the surrounding ground surface. The utility box has a watertight seal to prevent surface-water infiltration and, to discourage unauthorized entry, must be opened with a special wrench.

Monitoring and Subjective Evaluation of Ground Water

The depth to static water level was measured to the nearest 0.01 foot with a Solinst electronic water-level indicator. In wells with free product, an Oil Recovery Systems oil-water interface probe was used to measure the depth of the product and the depth of the product-water interface. Ground-water samples were collected for subjective evaluation from each well by gently lowering approximately half the length of a Teflon bailer past the air-water interface. The bailer was washed with Alconox (a commercial biodegradable detergent) and rinsed with deionized water before each use. The samples were retrieved and examined for evidence of floating product and sheen.

Water for Laboratory Analyses

Before collecting ground-water samples, the wells were purged of approximately 3 well volumes of water. A water sample was collected from each well after the well had recharged to more than 80 percent of the static level. Half the length of a Teflon bailer was lowered past the air-water interface to retrieve the water sample. The bailer was retrieved and the water samples slowly decanted into laboratory-cleaned sample containers. For TPHg, BTEX, and VOC analyses, 40-milliliter, volatile organic analysis glass sample vials with Teflon-lined caps were used. Hydrochloric acid was added to the samples as a preservative. For TPHd analyses, 1-liter glass bottles were used. The sample containers were promptly capped, labeled, and placed in iced storage for transport to a State-certified analytical laboratory for testing. A Chain of Custody Record was initiated and AGS personnel observed chain-of-custody protocol throughout subsequent handling of the samples.

The purged ground water was stored onsite in sealed, properly labeled, 17E, 55-gallon, liquid-waste drums approved for this use by the Department of Transportation.

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

FOR OFFICE USE

(1) LOCATION OF PROJECT Exxon Station No. 7-3006
720 High Street
Oakland, CA

PERMIT NUMBER 90657
LOCATION NUMBER

(2) CLIENT
Name Exxon Company U.S.A.
Address 2300 Clayton Rd. Phone (415) 246-8768
City Concord, CA Zip 94520

(3) APPLICANT
Name JoEllen Kusemaul
Applied GeoSystems
Address 42501 Albrae St. Phone (415) 651-1906
City Fremont, CA Zip 94538

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

(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 ___

DRILLER'S LICENSE NO. 432390

WELL PROJECTS
Drill Hole Diameter 10 in. Maximum
Casing Diameter 4 in. Depth 25 ft.
Surface Seal Depth 5 ft. Number 2
DTW = 8 to 10 feet

GEOTECHNICAL PROJECTS
Number of Borings 10 Maximum
Hole Diameter 8 in. Depth 10 ft.

(7) ESTIMATED STARTING DATE 10/31/90
ESTIMATED COMPLETION DATE 11/2/90

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

APPLICANT'S SIGNATURE JoEllen Kusemaul Date 10/29/90

PERMIT CONDITIONS

Circled Permit Requirements Apply

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

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

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

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

E. WELL DESTRUCTION. See attached.

Approved Todd N. Wendler Date 1 Nov 90

21989

APPENDIX C

LOGS OF BORINGS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		LTR	DESCRIPTION
Coarse-grained soils	Gravel and gravelly soils	GW	Well-graded gravels or gravel-sand mixtures, little or no fines	Fine-grained soils	Silts and clays LL<50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		GM	Silty gravels, gravel-sand-silt mixtures			OL	Organic silts and organic silt-clays of low plasticity
		GC	Clayey gravels, gravel-sand-clay mixtures		Silts and clays LL>50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils. Elastic silts
	Sand and sandy soils	SW	Well-graded sand or gravelly sands, little or no fines			CH	Inorganic clays of high plasticity, fat clays
		SP	Poorly-graded sands or gravelly sands, little or no fines			OH	Organic clays of medium to high plasticity, organic silts
		SM	Silty sands, sand-silt mixtures				
		SC	Clayey sands, sand-clay mixtures	Highly organic soils		PT	Peat and other highly organic soils


Depth through which sampler is driven


Relatively undisturbed sample


No sample recovered


Static water level observed in well


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. 87042-9R

UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY
Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE
C-1

Total depth of boring: 18-1/2 feet **Diameter of boring:** 10 inches **Date drilled:** 10-31-90

Casing diameter: 4 inches **Length:** 17 feet **Slot size:** 0.010-inch

Screen diameter: 4 inches **Length:** 10 feet **Material type:** Sch 40 PVC

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow-Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
2		5 4		CL	Silty clay, dark brown to black, damp, medium plasticity, medium stiff.	
4	S-3	5	0			
6		4 8				
	S-5.5	15	500		Brown, moist, stiff, obvious odor.	
8		7 14		▽ GC	Clayey gravel with some sand, dark brown and gray, moist, low to medium plasticity, medium dense.	
	S-8	23	200			
10		6 14				
	S-10.5	21	>1000		Obvious odor.	
12		14 25				
	S-13	18	466			
14		13		SP	Coarse sand with some gravel and trace clay, orange, wet.	
16		6				
	S-15.5	6	333	CL	Silty clay, brown, moist, medium plasticity, medium stiff.	
18		3 4				
	S-18	5	>1000		Green discoloration, obvious odor.	
20					Total Depth = 18-1/2 feet.	

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING MW-14

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-2

Total depth of boring: 26–1/2 feet **Diameter of boring:** 10 inches **Date drilled:** 10–31–90

Casing diameter: 4 inches **Length:** 17 feet **Slot size:** 0.010–inch

Screen diameter: 4 inches **Length:** 10 feet **Material type:** Sch 40 PVC

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow–Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
2		5 6		ML	Clayey silt, dark brown to black, damp, low plasticity, medium stiff.	
4	S–3.5	6	0			
		3 9		CL	Silty clay, brown with gray mottling, damp, medium plasticity, stiff.	
6	S–6	12	0			
8		7 11				
	S–8.5	17	800	▽	Very moist, obvious odor.	
10		15 21		GP	Gravel, sand and clay, medium to coarse gravel, brown–gray with red–orange inclusions, wet, medium dense, obvious odor.	
	S–11	25	>1000			
12		4 11		CL	Silty clay with trace gravel and sand, brown, moist, medium plasticity, stiff.	
14	S–13.5	11	0			
		3 4				
16	S–16	5	0		No gravel.	
18		4 7				
	S–18.5	12	0			
20		3 13				
	S–21	13	0		With trace gravel. (Section continues downward)	

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING MW-15

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE
C-3

Depth	Sample No.	BLOWS	OVM	USCS Code	Description	Well Const.
22		7		CL	Silty clay with trace gravel and sand, brown, moist, medium plasticity, stiff.	
		15				
24	S-23.5	17	0		No gravel.	
		6				
26		11				
	S-26	18	0			
					Total Depth = 26-1/2 feet.	
28						
30						
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING MW-15

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-4

Total depth of boring: 13-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11-1-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow-Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
2	S-3	3, 6, 10	>10,000	CL	Silty clay, abundant organic material, black-brown with green gray mottling, damp, medium plasticity, stiff, obvious odor.	
4		8, 18				
6	S-5.5	23	>10,000		With silt, green mottling, very stiff.	
8	S-8	13, 18, 22	>10,000	GC	Gravel and clay with some sand, green-gray, damp, medium dense, obvious odor.	
10	S-10.5	18, 16, 15	>10,000	SP	Coarse sand with some clay and trace gravel, gray-green, moist to very moist, medium dense, obvious odor.	
12	S-13	3, 7, 7	0	CL	Silty clay with some sand, brown, wet, medium plasticity, medium stiff, obvious odor.	
14					Total Depth = 13-1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-21

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-5

Total depth of boring: 13–1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11–1–90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow–Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
				CL	Silty clay, abundant organic material, obvious odor.	
2						
4		4 7				
6	S–5.5	9	>10,000		Green, damp, medium plasticity, stiff.	
		8 17				
8	S–8	22	>10,000		With some gravel and sand, gray and rust with green discoloration, damp.	
		8 15		▼		
10	S–10.5	17	>10,000			
				SC	Coarse sand and clay, green–gray, wet, medium dense, obvious odor.	
12		3 3		CL	Silty clay, trace sand, brown, wet, medium plasticity, medium stiff, noticeable odor.	
	S–13	6	250			
14					Total Depth = 13–1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-22

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-6

Total depth of boring: 13-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11-1-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow-Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
				ML	Silt, black, damp.	
2		4				
		4				
	S-3	4	270	CL	Silty clay, green-gray, damp, medium plasticity, soft.	
4		3				
		5				
6	S-5.5	7	700			
		7				
8		14				
	S-8	15	700		▼ With some gravel, brown, moist, stiff, obvious odor.	
		11		SC	Coarse sand and clay, with some gravel, brown-green, wet, medium dense, obvious odor.	
10		15				
	S-10.5	18	>10,000			
12		11				
		17				
	S-13	20	>1000		Sand-gravel-clay, brown.	
14					Total Depth = 13-1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-23

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-7

Total depth of boring: 13–1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11–1–90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow–Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
0				CL	Silty clay, gray–brown, damp, medium plasticity, medium stiff.	
2						
4		3				
		5				
6	S–5.5	7	0			
		7				
8		12				
	S–8	19	>10,000		With trace gravel, red–brown with green discoloration, damp, medium plasticity, very stiff.	
10		6		▽		
		7				
	S–10.5	11	>10,000		With some sand, wet, obvious odor.	
12		18				
		32				
	S–13	27	133	SP	Sand, gravel and clay, brown, medium dense.	
14					Total Depth = 13–1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-24

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-8

Total depth of boring: 13-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11-1-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow-Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
				CL	Silty clay, gray-brown, damp, medium plasticity, soft. obvious odor.	
2		3 3				
	S-3	3	0			
4		3 4				
6	S-5.5	4	0		Red-brown.	
		4 8				
8	S-8	15	>1000		Brown with green mottling, stiff.	
		5 7				
10	S-10.5	15	>10,000	▽	Moist, obvious odor.	
12		33 35		SC	Clayey sand, with trace gravel, brown, wet, dense.	
	S-13	35	0			
14					Total Depth = 13-1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-25

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-9

Total depth of boring: 13–1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11–1–90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow–Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0				CL	Silty clay, abundant organic material, dark brown to black, damp, medium plasticity, stiff, obvious odor.	
2						
4		4 8				
6	S–5.5	16	0		Brown, damp, medium plasticity, stiff.	
8	S–8	18 35 35	>1000		With some gravel and sand, brown–gray with green discoloration, hard.	
10	S–10.5	8 18 20	200	GP	Gravel, sand and clay, brown–gray with green discoloration, wet, medium dense, noticeable odor.	
12	S–13	11 12 8	0	CL	Silty clay, brown, moist, medium plasticity, medium stiff.	
14					Total Depth = 13–1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-26

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-10

Total depth of boring: 13-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11-1-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow-Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
2				CL	Silty clay, brown with green discoloration, damp, medium plasticity, medium stiff, noticeable odor.	
4		4 7				
6	S-5.5	10	>1000			
8	S-8	8 20 23	>10,000		Trace gravel and sand, moist, obvious odor.	
10		9 25				
12	S-10.5	24	>10,000	▽		
		8 18		SP	Coarse sand with trace gravel and clay, brown, wet, medium dense.	
14	S-13	25	>1000		Total Depth = 13-1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-27

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-11

Total depth of boring: 13-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11-2-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow-Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
2		3 6		CL	Silty clay, brown, damp, medium plasticity, medium stiff.	
4	S-3	5	270			
6	S-5.5	3 7 12	>10,000		Stiff, obvious odor.	
8	S-8	8 23 23	>10,000	▼	With some gravel with trace swith, brown with brown-green discoloration, moist, medium plasticity, hard.	
10	S-10.5	8 23 23	>10,000	GP	Gravel, swith with clay, brown with green discoloration, wet, medium dense, obvious odor.	
12	S-13	12 17 10	>10,000	SP	Coarse sand with some gravel and trace clay, gray, wet, medium dense, obvious odor.	
14					Total Depth = 13-1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-28

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-12

Total depth of boring: 13–1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11–2–90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow–Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
2				CL	Silty clay, trace gravel, brown with green discoloration, damp, medium plasticity, stiff, obvious odor.	
4		4				
		10				
6	S–5.5	12	>1000			
		6				
8		17				
	S–8	27	>10,000		With some gravel and trace clay, red– brown with green discoloration, damp to moist, very stiff.	
10		8		GC	Gravel, sand and clay, brown–green, wet, medium dense, obvious odor.	
		12				
	S–10.5	17	>10,000			
12		7		SP	Coarse sand with some gravel, wet.	
		5				
	S–13	5	0	CL	Silty clay, brown, moist, medium plasticity, medium stiff.	
14					Total Depth = 13–1/2 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-29

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-13

Total depth of boring: 13-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 11-2-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Kvilhaug Well Drilling, Inc. **Driller:** Mike and Joel

Method Used: Hollow-Stem Auger **Field Geologist:** Eric Twitty

Depth	Sample No.	Blows	OVM	USCS Code	Description	Well Const.
0						
2				CL	Silty clay, brown with green discoloration, damp, medium plasticity, medium stiff, obvious odor.	
4		5				
6	S-5.5	7 7	>1000			
8	S-8	8 23 36	>10,000	CL	Sandy clay with some gravel, brown, moist, low plasticity, hard, obvious odor.	
10		7 12		CL		
12	S-10.5	18	>10,000	GP	Gravel, sand and clay, brown with green discoloration, wet, medium dense, obvious odor.	
14		9 4				
16	S-13	4	>1000	CL	Silty clay, brown, moist, medium plasticity, medium stiff.	
18					Total Depth = 13-1/2 feet.	
20						

Applied GeoSystems

PROJECT NO. 87042-9R

LOG OF BORING B-30

Exxon Station No. 7-3006
720 High Street
Oakland, California

PLATE

C-14

APPENDIX D

CHAIN OF CUSTODY RECORDS

AND CERTIFIED ANALYTICAL REPORTS

FOR SOIL

Applied GeoSystems

CHAIN-OF-CUSTODY RECORD

PROJ. NO: 870429 | PROJECT NAME: EXXON-OAKLAND-HIGUST.

PO NO: | SAMPLERS (Signature):

DATE (MM/DD/YY)	TIME		No of Containers	TPHgasoline (8015)	BTEX (602/8020)	TPHdiesel (8015)	Preserved?	REMARKS	LABORATORY I.D. NUMBER
11/1/90		S - 3 - MW14	1	X	X	X	ICE		2011034
		S - 8 - MW14	1						2011035
		S - 18 - MW14	1						2011036
		S - 6 - MW15	1						2011037
		S - 8.5 - MW15	1						2011038
		S - 3 - B21	1						2011039
		S - 8 - B21	1						2011040
		S - 5.5 - B22	1						2011041
		S - 8 - B22	1						2011042
		S - 3 - B23	1						2011043
		S - 8 - B23	1						2011044
		S - 5.5 - B24	1						2011045
		S - 8 - B24	1						2011046
		S - 5.5 - B25	1						2011047
		S - 8 - B25	1						2011048
		S - 5.5 - B26	1						2011049
		S - 8 - B26	1						2011050
		S - 5.5 - B27	1						2011051

RELINQUISHED BY (Signature): | DATE / TIME: 11/5/90 8:00 | RECEIVED BY (Signature): Jo Ellen Kuszmaul

RELINQUISHED BY (Signature): Jo Ellen Kuszmaul | DATE / TIME: | RECEIVED BY (Signature):

DATE / TIME: | RECEIVED BY (Signature):

Laboratory: Applied Analytical

Turn Around: 2 Week

SUBMITTED TO:
Applied GeoSystems
42501 Albrae Street
Suite 100
Fremont, California 94639
(415) 651-1906

Proj. Mgr.: Rodger Witham

Applied GeoSystems

CHAIN-OF-CUSTODY RECORD

PROJECT NO.: 870429 | PROJECT NAME: EXXON-OAKLAND-HIGHST.

PO #:

SAMPLER'S (Signature):

DATE	TIME		No. of Containers	TPHgasoline (8015)	BTEX (602/8020)	TPHdiesel (8015)	Preserved?	REMARKS	LABORATORY I.D. NUMBER
11/1/90		S-8-B27	1	X	X	X	ICE		2011052
		S-3-B28	1						2011053
		S-5.5-B29	1						2011054
		S-8-B29	1						2011055
		S-5.5-B30	1						2011056
		S-8-B30	1						2011057
		S-8-B28	1						2011058
		S-135-MW5	1						2011059

ANALYSIS

RELINQUISHED BY (Signature): Jo Ellen Kuszmaul
RELINQUISHED BY (Printed): Jo Ellen Kuszmaul
DATE / TIME: 11/5/90 8:00

RECEIVED BY (Printed): Jo Ellen Kuszmaul
RECEIVED BY (Signature):

RELINQUISHED BY (Signature):
RELINQUISHED BY (Printed):
DATE / TIME:

RECEIVED BY (Printed):
RECEIVED BY (Signature):

Laboratory: Applied Analytical

Turn Around: 2 week

SUBMITTED TO:
Applied GeoSystems
42501 Albrae Street
Suite 100
Fremont, California 94639
(415) 651 1906

Proj. Mgr.: Rodger Witham

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

Project Name:EXXON/Oakland
Project No.: 87042-9

November 14, 1990

Rodger Witham
APPLIED GEOSYSTEMS
42501 Albrae Street
Fremont, CA 94639

Dear Mr. Witham:

Enclosed please find the analytical results for the soil samples received by Applied Analytical Environmental Laboratory on 11-05-90.

Applied Analytical maintains a strict Quality Assurance/Quality Control (QA/QC) program designed to meet or exceed EPA requirements. Analytical data presented in this report met QA/QC criteria. Please find the QA/QC parameters enclosed.

The specific analytical methods used and cited in this report are approved by the State of California's Department of Health Services (DOHS) under certificate number E678.

If you have any questions regarding these analyses, or if we can be of further assistance, please give us a call.

Sincerely,
Applied Analytical

F.A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

Submitted by : Applied GeoSystems
Matrix : Soil
Lab I.D. No. : 2011035

Date extracted: 11-11-90
Date analyzed: 11-12-90
Units: mg/kg

Parameter	Sample Result	Conc. Spiked	Spiked Sample	% Recovery	Duplicate Spiked Sample	Duplicate % Recovery	RPD
Benzene	<0.005	0.20	0.19	95	0.18	90	5.0
Toluene	<0.005	0.20	0.20	100	0.19	95	5.0
E-Benzene	<0.005	0.10	0.10	100	0.90	90	11
m+p-Xylene	<0.007	0.20	0.19	95	0.20	100	5.0
o-Xylene	<0.007	0.20	0.18	90	0.18	90	0.0
TPHg	<1.0	50	49	98	46	92	6.0
TPHd	<10	100	78	78	81	81	4.0

LABORATORY'S QA/QC ACCEPTANCE CRITERIA

Parameter	Spike % Recovery	Duplicate % Difference
Benzene	80-120	0-14
Toluene	80-120	0-14
E-benzene	80-120	0-14
m+p-Xylene	80-120	0-14
o-Xylene	80-120	0-14
TPHg	70-120	0-15
TPHd	70-120	0-15

TPHg = Total petroleum hydrocarbons as gasoline
TPHd = Total petroleum hydrocarbons as diesel #2
mg/kg = Miligrams per kilogram = parts per million (ppm)

$$\text{RPD (Relative \% Difference)} = \frac{\text{(Spiked Sample - Duplicate Spiked Sample)}}{\text{Average of Spike Sample}} \times 100$$

$$\text{Spike \% Recovery} = \frac{\text{(Spiked Sample Result - Sample Result)}}{\text{Spike Concentration}} \times 100$$

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention: Rodger Witham
Applied GeoSystems
42501 Albrae Street
Fremont, CA 94639

Date Sampled: 11-01-90
Date Received: 11-05-90
Date Analyzed: 11-12-90
Date Reported: 11-14-90

Project: 87042-9

Matrix: Soil

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH
Detection limit (mg/kg)	0.005	0.005	0.005	0.007	1.0
Sample description					
S-3-MW14 2011034*	<0.005	<0.005	<0.005	<0.007	<1.0
S-8-MW14 2011035*	<0.005	<0.005	<0.005	<0.007	<1.0
S-18-MW14 2011036*	0.10	1.6	6.0	34	837
S-6-MW15 2011037*	<0.005	<0.005	<0.005	<0.007	<1.0

TPH = Total petroleum hydrocarbons as gasoline.
mg/kg = Miligrams per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

BTEX– Benzene, toluene ethylbenzene, and total Xylene isomers are measured in accordance with EPA Method 5030 (low level), followed by analysis using EPA Method 8020.

TPH– Total petroleum hydrocarbons as gasoline are measured in accordance with EPA Method 5030 (low level), followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention: Rodger Witham
Applied GeoSystems
42501 Albrae Street
Fremont, CA 94639

Date Sampled: 11-01-90
Date Received: 11-05-90
Date Analyzed: 11-12-90
Date Reported: 11-14-90

Project: 87042-9

Matrix: Soil

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH
Detection limit (mg/kg)	0.005	0.005	0.005	0.007	1.0
Sample description					
S-8.5-MW15 2011038*	<0.005	<0.005	<0.005	<0.007	<1.0
S-3-B21 2011039*	9.0	0.90	7.5	13	433
S-8-B21 2011040*	22	3.5	31	100	1,084
S-5.5-B22 2011041*	6.9	1.0	19	18	423

TPH = Total petroleum hydrocarbons as gasoline.
mg/kg = Miligrams per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

BTEX-- Benzene, toluene ethylbenzene, and total Xylene isomers are measured in accordance with EPA Method 5030 (low level), followed by analysis using EPA Method 8020.

TPH– Total petroleum hydrocarbons as gasoline are measured in accordance with EPA Method 5030 (low level), followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH
Detection limit (mg/kg)	0.005	0.005	0.005	0.007	1.0
Sample description					
S-8-B22 2011042*	31	123	137	493	3,232
S-3-B23 2011043*	0.50	0.08	0.41	0.70	20
S-8-B23 2011044*	2.4	3.5	7.2	28	277
S-5.5-B24 2011045*	<0.005	<0.005	<0.005	<0.007	<1.0

TPH = Total petroleum hydrocarbons as gasoline.
mg/kg = Miliograms per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

BTEX– Benzene, toluene ethylbenzene, and total Xylene isomers are measured in accordance with EPA Method 5030 (low level), followed by analysis using EPA Method 8020.

TPH– Total petroleum hydrocarbons as gasoline are measured in accordance with EPA Method 5030 (low level), followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention: Rodger Witham
Applied GeoSystems
42501 Albrae Street
Fremont, CA 94639

Date Sampled: 11-01-90
Date Received: 11-05-90
Date Analyzed: 11-12-90
Date Reported: 11-14-90

Project: 87042-9

Matrix: Soil

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH
Detection limit (mg/kg)	0.005	0.005	0.005	0.007	1.0
Sample description					
S-8-B24 2011046*	0.70	0.26	<0.005	0.70	80
S-5.5-B25 2011047*	<0.005	<0.005	<0.005	<0.007	<1.0
S-8-B25 2011048*	0.27	0.05	0.17	0.75	15
S-5.5-B26 2011049*	<0.005	<0.005	<0.005	<0.007	<1.0

TPH = Total petroleum hydrocarbons as gasoline.
mg/kg = Miliograms per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

BTEX– Benzene, toluene ethylbenzene, and total Xylene isomers are measured in accordance with EPA Method 5030 (low level), followed by analysis using EPA Method 8020.
TPH– Total petroleum hydrocarbons as gasoline are measured in accordance with EPA Method 5030 (low level), followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention: Rodger Witham
Applied GeoSystems
42501 Albrae Street
Fremont, CA 94639

Date Sampled: 11-01-90
Date Received: 11-05-90
Date Analyzed: 11-12-90
Date Reported: 11-14-90

Project: 87042-9

Matrix: Soil

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH
Detection limit (mg/kg)	0.005	0.005	0.005	0.007	1.0
Sample description					
S-8-B26 2011050*	<0.005	<0.005	<0.005	<0.007	<1.0
S-5.5-B27 2011051*	0.17	0.05	1.7	0.91	12

TPH = Total petroleum hydrocarbons as gasoline.
mg/kg = Miligrams per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

BTEX-- Benzene, toluene ethylbenzene, and total Xylene isomers are measured in accordance with EPA Method 5030 (low level), followed by analysis using EPA Method 8020.

TPH-- Total petroleum hydrocarbons as gasoline are measured in accordance with EPA Method 5030 (low level), followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories
13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

Analysis: Total Petroleum Hydrocarbons as diesel #2

Detection limit (mg/kg)	TPHd 10
Sample description	
S-3-MW14 2011034*	<10
S-8-MW14 2011035*	<10
S-18-MW14 2011036*	<10
S-6-MW15 2011037*	<10

TPHd = Total petroleum hydrocarbons as diesel #2.
mg/kg = Miliograms per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

TPHd– Total petroleum hydrocarbons as diesel #2 are measured by extraction in accordance with EPA Method 3550, followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
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ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

Analysis: Total Petroleum Hydrocarbons as diesel #2

Detection limit (mg/kg)	TPHd 10
Sample description	
S-8-B22 2011042*	210
S-3-B23 2011043*	<10
S-8-B23 2011044*	<10
S-5.5-B24 2011045*	<10

TPHd = Total petroleum hydrocarbons as diesel #2.
mg/kg = Miligrams per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

TPHd-- Total petroleum hydrocarbons as diesel #2 are measured by extraction in accordance with EPA Method 3550, followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

Analysis: Total Petroleum Hydrocarbons as diesel #2

Detection limit (mg/kg)	TPHd 10
Sample description	
S-8-B24 2011046*	<10
S-5.5-B25 2011047*	<10
S-8-B25 2011048*	<10
S-5.5-B26 2011049*	<10

TPHd = Total petroleum hydrocarbons as diesel #2.
mg/kg = Miliograms per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

TPHd– Total petroleum hydrocarbons as diesel #2 are measured by extraction in accordance with EPA Method 3550, followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

Analysis: Total Petroleum Hydrocarbons as diesel #2

	TPHd
Detection limit (mg/kg)	10
Sample description	
S-8-B26 2011050*	<10
S-5.5-B27 2011051*	<10

TPHd = Total petroleum hydrocarbons as diesel #2.
mg/kg = Miligrams per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

TPHd-- Total petroleum hydrocarbons as diesel #2 are measured by extraction in accordance with EPA Method 3550, followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories
13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

Analysis: Total Petroleum Hydrocarbons as diesel #2

Detection limit (mg/kg)	TPHd 10
Sample description	
S-8.5-MW15 2011038*	< 10
S-3-B21 2011039*	1,125
S-8-B21 2011040*	2,112
S-5.5-B22 2011041*	2,570

TPHd = Total petroleum hydrocarbons as diesel #2.
mg/kg = Miliograms per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

TPHd– Total petroleum hydrocarbons as diesel #2 are measured by extraction in accordance with EPA Method 3550, followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention: Rodger Witham
Applied GeoSystems
42501 Albrae Street
Fremont, CA 94639

Date Sampled: 11-01-90
Date Received: 11-05-90
Date Analyzed: 11-12-90
Date Reported: 11-14-90

Project: 87042-9

Matrix: Soil

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH
Detection limit (mg/kg)	0.005	0.005	0.005	0.007	1.0
Sample description					
S-8-B27 2011052*	8.1	2.7	19	30	608
S-3-B28 2011053*	1.0	1.0	0.43	2.5	22
S-5.5-B29 2011054*	31	122	84	240	1,931
S-8-B29 2011055*	14	68	49	153	1,262

TPH = Total petroleum hydrocarbons as gasoline.
mg/kg = Miligrams per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

BTEX– Benzene, toluene ethylbenzene, and total Xylene isomers are measured in accordance with EPA Method 5030 (low level), followed by analysis using EPA Method 8020.

TPH– Total petroleum hydrocarbons as gasoline are measured in accordance with EPA Method 5030 (low level), followed by modified EPA Method 8015.

F. A. Jaime
Lab[redacted] Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH
Detection limit (mg/kg)	0.005	0.005	0.005	0.007	1.0
Sample description					
S-5.5-B30 2011056*	20	39	44	116	1,069
S-8-B30 2011057*	9.3	62	47	143	1,118
S-8-B28 2011058*	10	45	52	156	1,295
S-13.5-MW15 2011059*	<0.005	<0.005	<0.005	<0.007	<1.0

TPH = Total petroleum hydrocarbons as gasoline.
mg/kg = Miliograms per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

BTEX– Benzene, toluene ethylbenzene, and total Xylene isomers are measured in accordance with EPA Method 5030 (low level), followed by analysis using EPA Method 8020.

TPH– Total petroleum hydrocarbons as gasoline are measured in accordance with EPA Method 5030 (low level), followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

Analysis: Total Petroleum Hydrocarbons as diesel #2

	TPHd
Detection limit (mg/kg)	10
Sample description	
S-8-B27 2011052*	<10
S-3-B28 2011053*	<10
S-5.5-B29 2011054*	<10
S-8-B29 2011055*	<10

TPHd = Total petroleum hydrocarbons as diesel #2.
mg/kg = Miliograms per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

TPHd– Total petroleum hydrocarbons as diesel #2 are measured by extraction in accordance with EPA Method 3550, followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

APPLIED ANALYTICAL

Environmental Laboratories

13844 Alton Pkwy.-Suite 140
Irvine, CA 92718
(714) 472-1020

ANALYSIS REPORT

Attention:	Rodger Witham	Date Sampled:	11-01-90
	Applied GeoSystems	Date Received:	11-05-90
	42501 Albrae Street	Date Analyzed:	11-12-90
	Fremont, CA 94639	Date Reported:	11-14-90
Project:	87042-9	Matrix:	Soil

Analysis: Total Petroleum Hydrocarbons as diesel #2

Detection limit (mg/kg)	TPHd 10
Sample description	
S-5.5-B30 2011056*	<10
S-8-B30 2011057*	<10
S-8-B28 2011058*	<10
S-13.5-MW15 2011059*	<10

TPHd = Total petroleum hydrocarbons as diesel #2.
mg/kg = Miliograms per kilogram = ppm = parts per million.
* = Laboratory identification number.

ANALYTICAL PROCEDURES

TPHd– Total petroleum hydrocarbons as diesel #2 are measured by extraction in accordance with EPA Method 3550, followed by modified EPA Method 8015.

F. A. Jaime
Laboratory Supervisor

Applied GeoSystems

CHAIN-OF-CUSTODY RECORD

CHROMALAB FILE # 1290015

PROJ. NO.	PROJECT NAME
87042-9	EXXON - OAKLAND
P.O. NO.	SAMPLERS (Signature)

DATE MM/DD/YY	TIME		No. of Containers	ANALYSIS: TPHgasoline (8015)	BTEX (602/8020)	TPHdiesel (8015)	601	601 Pb				Preserved?	REMARKS	LABORATORY I.D. NUMBER
11/27/90		W-9-MW9	2				X							
		W-9-MW7	2				X							
↓		S-112790-SP1 (ABCD)	4					X						

RELINQUISHED BY (Signature):	DATE / TIME	RECEIVED BY (Signature):	Laboratory:	SEND RESULTS TO: Applied GeoSystems, 42501 Albrae Street, Fremont, CA 94538, (415) 651-1906
RELINQUISHED BY (Signature):	DATE / TIME	RECEIVED BY (Signature):		
RELINQUISHED BY (Signature):	DATE / TIME	RECEIVED FOR LABORATORY BY (Signature): 12:5:90 14:30	Turn Around: Normal	Proj. Mgr.: JoEllen Kuszmaul

APPLIED ANALYTICAL

Environmental Laboratories

42501 Albrae St., Suite 100
Fremont, CA 94538
Bus: (415) 623-0775
Fax: (415) 651-8647

ANALYSIS REPORT

1020lab.frm

Attention:	Ms. JoEllen Kuszmaul	Date Sampled:	11-27-90
	Applied GeoSystems	Date Received:	11-27-90
	42501 Albrae Street	BTEX Analyzed:	11-28-90
	Fremont, CA 94538	TPHg Analyzed:	11-28-90
Project:	AGS 87042-9	TPHd Analyzed:	11-29-90
		Matrix:	Soil

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPHg	TPHd
	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit:	0.005	0.005	0.005	0.005	1.0	10
SAMPLE Laboratory Identification						
S-112790-1(ABCD) S1011390	ND	0.011	0.014	0.033	ND	340

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

ANALYTICAL PROCEDURES

BTEX– Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction using EPA Method 5030 followed by analysis using EPA Method 8020/602, which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID) and a flame-ionization detector (FID) in series.

TPHg–Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are measured by extraction using EPA Method 5030, followed by analysis using modified EPA Method 8015, which utilizes a GC equipped with an FID.

TPHd–Total petroleum hydrocarbons as diesel (high boiling points) are measured by extraction using EPA Method 3550 for soils and EPA Method 3510 for water, followed by modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

R. Kuck
Laboratory Representative

December 4, 1990
Date Reported

APPLIED ANALYTICAL LABORATORY IS CERTIFIED BY THE STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES AS A HAZARDOUS WASTE TESTING LABORATORY
(Certification No. 1211)

MOBILE CHEM LABS INC.

5021 Blum Road, Suite 3 • Martinez, CA 94553
Phone (415) 372-3700 • Fax (415) 372-6955

1290015/011601

Chromalab, Inc.
2239 Omega Road, #1
San Ramon, CA 94583
ATTN: Eric Tam
Project Manager

Date Sampled: 12-06-90
Date Received: 12-06-90
Date Reported: 12-11-90

ORGANIC LEAD

Sample Number	Sample Description	Detection Limit ppm	SOIL RESULTS ppm
	Project No.: 1290015		
B120019	S-112790 SP1(A-D) 0.5		<0.5

Note: California LUFT 12/87

MOBILE CHEM LABS

Ronald G. Evans
Lab Director

APPENDIX E

RESULTS OF GROUND-WATER MONITORING AND ANALYSES

TABLE E-1
RESULTS OF SUBJECTIVE EVALUATION OF WATER SAMPLES
(page 1 of 4)

Date	Depth to Water (ft)	Floating Product (ft)	Sheen	Emulsion
MW-1				
05/24/88	8.33	NONE	NONE	NONE
07/13/88	9.20	NONE	NONE	NONE
04/25/89	7.55	NONE	NONE	NONE
04/27/89	10.16	NONE	SLIGHT	NONE
09/06/89	10.88	NONE	V.SLIGHT	NONE
09/22/89	11.06	NONE	NONE	NONE
11/01/89	10.82	NONE	NONE	NONE
11/15/89	11.07	NONE	NONE	NONE
12/06/89	10.33	NONE	NONE	NONE
02/20/90	8.81	NONE	NONE	NONE
04/19/90	9.33	NONE	NONE	NONE
07/03/90	8.44	NONE	NONE	NONE
07/26/90	8.99	NONE	NONE	NONE
08/20/90	9.50	NONE	NONE	NONE
09/19/90	9.99	NONE	NONE	NONE
11/27/90	10.62	NONE	NONE	NONE
MW-2				
09/15/87	12.07	NONE	NONE	NONE
07/13/88	10.80	2.00	NA	NONE
04/25/89	9.27	2.16	NA	NONE
07/19/89	10.81	1.56	NA	NONE
07/27/89	10.18	0.13	NA	HEAVY
09/06/89	10.89	0.09	NA	SLIGHT
09/22/89	11.56	0.56	NA	SLIGHT
11/01/89	10.85	0.09	NA	NONE
11/15/89	11.05	0.07	NA	NONE
12/06/89	10.23	0.13	NA	NONE
02/20/90	8.86	0.29	NA	NONE
04/19/90	9.09	0.10	NA	NONE
07/03/90	8.75	0.05	NA	NONE
07/26/90	8.71	0.10	NA	NONE
08/20/90	9.25	0.02	NA	NONE
09/19/90	9.79	0.02	NA	NONE
11/27/90	10.40	0.07	NA	NONE
MW-3				
09/15/87	11.95	NONE	NONE	NONE
05/31/88	8.42	TRACE	MODERATE	NONE
07/13/88	9.17	TRACE	MODERATE	NONE
04/25/89	7.57	0.08	NA	NONE
07/19/89	10.33	0.66	NA	NONE
09/06/89	11.22	0.07	NA	SLIGHT
09/22/89	11.38	0.28	NA	SLIGHT
11/01/89	10.90	0.01	NA	NONE
11/15/89	11.18	0.11	NA	NONE
12/06/89	10.29	NONE	SLIGHT	NONE
02/20/90	8.73	0.04	NA	NONE
04/19/90	9.20	0.09	NA	NONE
07/03/90	8.50	0.03	NA	NONE
07/26/90	8.58	0.04	NA	NONE
08/20/90	9.21	0.01	NA	NONE
09/19/90	10.02	0.35	NA	NONE
11/27/90	10.72	0.42	NA	NONE

NA = Not Applicable

TABLE E-1
RESULTS OF SUBJECTIVE EVALUATION OF WATER SAMPLES
(page 2 of 4)

Date	Depth to Water (ft)	Floating Product (ft)	Sheen	Emulsion
MW-4				
09/15/87	11.12	NONE	NONE	NONE
07/13/88	9.30	0.08	NA	NONE
04/25/89	7.26	0.16	NA	NONE
07/19/89	10.32	0.72	NA	NONE
09/06/89	11.40	0.07	NA	SLIGHT
09/22/89	11.64	0.19	NA	SLIGHT
11/01/89	11.00	NONE	SLIGHT	NONE
11/15/89	11.18	0.10	NA	NONE
12/06/89	10.25	NONE	SLIGHT	NONE
02/20/90	8.40	NONE	NONE	NONE
04/19/90	9.04	0.03	NA	NONE
07/03/90	8.00	NONE	NONE	MODERATE
07/26/90	8.57	0.04	NA	NONE
08/20/90	9.08	0.01	NA	NONE
09/19/90	9.76	0.03	NA	NONE
11/27/90	10.83	0.09	NA	NONE
MW-5				
09/15/87	11.38	0.02	NA	NONE
07/13/88	9.18	0.01	NA	NONE
04/25/89	8.06	0.32	NA	NONE
07/18/89		well destroyed		
MW-6				
09/15/87	18.22	NONE	NONE	NONE
05/31/88	8.90	NONE	NONE	NONE
07/13/88	10.70	NONE	NONE	NONE
04/25/89	8.02	NONE	NONE	NONE
09/06/89	13.64	0.08	NA	SLIGHT
09/22/89	13.79	0.07	NA	SLIGHT
11/01/89	12.78	NONE	SLIGHT	NONE
11/15/89	12.91	NONE	SLIGHT	NONE
12/06/89	11.84	NONE	NONE	NONE
02/20/90	9.08	NONE	NONE	NONE
04/19/90	9.72	NONE	NONE	NONE
07/03/90	8.00	NONE	NONE	NONE
07/26/90	8.70	NONE	NONE	NONE
08/20/90	9.62	NONE	NONE	NONE
09/19/90	10.25	NONE	MODERATE	NONE
11/27/90	10.82	NONE	SLIGHT	NONE
MW-7				
09/15/87	11.43	NONE	NONE	NONE
05/31/88	8.88	NONE	NONE	NONE
07/13/88	9.52	NONE	NONE	NONE
04/25/89	8.66	NONE	NONE	NONE
09/06/89	11.72	NONE	SLIGHT	NONE
09/22/89	11.89	NONE	NONE	NONE
12/06/89	10.46	NONE	NONE	NONE
02/20/90	8.44	NONE	NONE	NONE
04/19/90	9.54	NONE	NONE	NONE
07/03/90	7.45	NONE	NONE	NONE
07/26/90	8.08	NONE	NONE	NONE
08/20/90	8.82	NONE	NONE	NONE
09/19/90	9.01	NONE	NONE	NONE
11/27/90	9.54	NONE	NONE	NONE

NA = Not Applicable

TABLE E-1
RESULTS OF SUBJECTIVE EVALUATION OF WATER SAMPLES
(page 3 of 4)

Date	Depth to Water (ft)	Floating Product (ft)	Sheen	Emulsion
MW-8				
09/15/87	11.00	0.02	NA	NONE
07/13/88	9.26	NONE	NONE	NONE
04/25/89	8.31	0.66	NA	NONE
07/19/89	10.97	1.25	NA	NONE
07/27/89	10.34	0.08	NA	HEAVY
09/06/89	11.09	0.17	NA	SLIGHT
09/22/89	11.58	0.36	NA	SLIGHT
11/01/89	11.03	NONE	NA	NONE
11/15/89	11.25	0.01	NA	NONE
12/06/89	10.30	NONE	SLIGHT	NONE
02/20/90	8.00	0.01	NA	NONE
04/19/90	8.50	NONE	NA	NONE
07/03/90	7.55	NONE	NONE	NONE
07/26/90	7.86	NONE	NONE	NONE
08/20/90	8.92	NONE	NONE	NONE
09/19/90	9.55	NONE	NONE	NONE
11/27/90	10.29	0.01	NONE	NONE
MW-9				
05/24/88	8.45	NONE	NONE	NONE
7/13/88	9.26	NONE	NONE	NONE
04/25/89	8.25	NONE	NONE	NONE
12/06/89	10.12	NONE	NONE	NONE
02/20/90	9.38	NONE	NONE	NONE
04/19/90	9.40	NONE	NONE	NONE
07/03/90	8.79	NONE	NONE	NONE
07/26/90	8.70	NONE	NONE	NONE
08/20/90	9.09	NONE	NONE	NONE
09/19/90	9.52	NONE	NONE	NONE
11/27/90	9.89	NONE	NONE	NONE
MW-10				
12/06/89	10.46	NONE	NONE	NONE
02/20/90	8.12	NONE	NONE	NONE
04/19/90	8.54	NONE	NONE	NONE
07/03/90	7.88	NONE	NONE	NONE
07/26/90	8.19	NONE	NONE	NONE
08/20/90	10.33	NONE	NONE	NONE
09/19/90	9.49	NONE	NONE	NONE
11/27/90	9.89	NONE	NONE	NONE
MW-11				
12/06/89	10.62	NONE	NONE	NONE
02/20/90	9.20	NONE	NONE	NONE
04/19/90	9.80	NONE	NONE	NONE
07/03/90	8.90	NONE	NONE	NONE
07/26/90	9.36	NONE	NONE	NONE
08/20/90	9.90	NONE	NONE	NONE
09/19/90	10.39	NONE	NONE	NONE
11/27/90	10.97	NONE	NONE	NONE
MW-12				
12/06/89	8.00	NONE	NONE	NONE
02/20/90	6.33	NONE	NONE	NONE
04/19/90	7.18	NONE	NONE	NONE
07/03/90	7.41	NONE	NONE	NONE
07/26/90	6.54	NONE	NONE	NONE
08/20/90	7.23	NONE	NONE	NONE
09/19/90	7.77	NONE	NONE	NONE
11/27/90	8.15	NONE	NONE	NONE

NA = Not Applicable

TABLE E-1
RESULTS OF SUBJECTIVE EVALUATION OF WATER SAMPLES
(page 4 of 4)

Date	Depth to Water (ft)	Floating Product (ft)	Sheen	Emulsion
MW-13				
12/06/89	9.35	NONE	NONE	NONE
02/20/90	7.73	NONE	NONE	NONE
04/19/90	8.68	NONE	NONE	NONE
07/03/90	8.00	NONE	NONE	NONE
07/26/90	7.95	NONE	NONE	NONE
08/20/90	8.66	NONE	NONE	NONE
09/19/90	9.13	NONE	NONE	NONE
11/27/90	9.49	NONE	NONE	NONE
MW-14				
11/27/90	9.88	NONE	NONE	NONE
MW-15				
11/27/90	8.67	NONE	NONE	NONE

NA = Not Applicable

TABLE E-2
RESULTS OF GROUND-WATER ANALYSES
(page 1 of 2)

Date	Sample No.	TPHg (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)	TPHd (ppm)	TOG (ppm)	VOC (ppm)
5/88	W-11-MW1*	0.240	0.090	0.005	0.015	0.025	--	--	ND
12/89	W-11-MW1	0.63	0.012	0.0056	0.0037	0.025	0.24	--	--
4/90	W-9-MW1	<0.020	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	--	--
7/90	W-11-MW1	0.13	0.006	<0.00050	<0.00050	<0.00050	0.16	--	--
11/90	W-10-MW1	<0.050	0.0007	<0.00050	<0.00050	<0.00050	<0.10	--	--
9/87	W-25-MW2	1.445	0.233	0.81	0.056	0.209	--	--	--
5/88	free product								
12/89	free product								
4/90	free product								
7/90	free product								
11/90	free product								
9/87	W-25-MW3	2.101	0.360	1.062	0.068	0.298	0.66	--	--
5/88	W-14-MW3	8.7	3.98	0.28	0.24	0.65	--	--	--
12/89	free product encountered during purging								
4/90	free product								
7/90	free product								
11/90	free product								
9/87	W-25-MW4	0.925	0.070	0.007	0.010	0.016	0.74	--	--
5/88	free product								
12/89	free product encountered during purging								
4/90	free product								
7/90	emulsion								
11/90	free product								
9/87	W-25-MW5	26.66	0.56	1.71	1.58	7.15	37.22	--	--
5/88	free product								
7/89	well destroyed								
5/88	W-15-MW6	29.3	12.82	0.55	1.44	5.50	--	--	--
12/89	W-18-MW6	9.0	0.37	0.013	0.0026	0.43	4.8	--	--
4/90	W-30-MW6	27	3.0	0.12	0.49	2.1	26	--	--
7/90	W-30-MW6	30	5.5	1.4	1.2	3.1	13	--	--
11/90	W-10-MW6	15	4.4	0.12	0.8	2.3	7.6	--	--
9/87	W-25-MW7	1.531	0.258	0.002	<0.002	0.042	2.79	--	ND
5/88	W-15-MW7	--	0.300**	<0.010**	<0.010**	<0.010**	0.190	--	ND
12/89	W-11-MW7	1.70	0.22	0.0053	0.0050	0.0086	2.5	<5	ND
4/90	W-10-MW7	2.7	0.22	0.0086	0.0070	0.020	3.5	--	ND
7/90	W-17-MW7	2.5	0.38	0.013	0.016	0.035	0.91	--	ND
11/90	W-9-MW7	2.3	0.63	0.016	0.032	0.029	1.3	--	0.0024■

See notes on page 2 of 2.

TABLE E-2
RESULTS OF GROUND-WATER ANALYSES
(page 2 of 2)

Date	Sample No.	TPHg (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)	TPHd (ppm)	TOG (ppm)	VOC (ppm)
9/87	W-25-MW8	1.325	0.081	0.074	0.042	0.182	--	--	--
5/88	free product								
12/89	W-11-MW8	42	2.6	0.63	0.21	3.7	34	--	--
4/90	W-14-MW8	49	2.1	0.82	1.1	4.8	53	--	--
7/90	W-23-MW8	44	4.0	1.5	2.0	6.3	32	--	--
11/90	free product								
5/88	W-14-MW9	<0.05	<0.0005	0.001	<0.001	<0.001	--	--	ND
12/89	W-14-MW9	0.1	0.0018	0.0037	0.0014	0.0088	0.11	<5	ND
4/90	W-10-MW9	<0.020	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	--	ND
7/90	W-10-MW9	<0.020	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	--	ND
11/90	W-9-MW9	<0.050	<0.00050	<0.0005	<0.0005	<0.0005	<0.10	--	ND
12/89	W-12-MW10	0.32	0.0037	0.014	0.0056	0.032	<0.10	--	--
4/90	W-9-MW10	<0.020	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	--	ND
7/90	W-11-MW10	<0.020	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	--	--
11/90	W-9-MW10	<0.050	<0.0005	<0.0005	<0.0005	<0.0005	<0.10	--	--
12/89	W-11-MW11	0.078	0.0059	0.00063	<0.0005	48	<0.10	--	--
4/90	W-12-MW11	<0.020	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	--	--
7/90	W-12-MW11	<0.020	<0.00050	<0.00050	<0.00050	<0.00050	<0.10	--	--
11/90	W-10-MW11	<0.050	<0.0005	<0.0005	<0.0005	<0.0005	<0.10	--	--
12/89	W-8-MW12	85	6.7	6.3	1.8	7.8	40	--	--
4/90	W-7-MW12	110	6.6	7.4	1.8	11	97	--	--
7/90	W-8-MW12	92	11	11	3.1	13	50	--	--
11/90	W-8-MW12	69	11	10	3.1	12	31	--	--
12/89	W-10-MW13	52	2.1	2.0	1.4	6.1	31	--	--
4/90	W-9-MW13	59	1.8	1.5	1.4	7.2	54	--	--
7/90	W-10-MW13	53	4.5	3.1	2.2	7.8	26	--	--
11/90	W-9-MW13	20	4.5	1.1	0.88	3.3	1.6	--	--
11/90	W-9-MW14	0.39	<0.0005	<0.0005	0.0036	0.0037	0.12	--	--
11/90	W-8-MW15	2.7	0.21	0.0055	0.6	0.25	0.34	--	--

<: Not detected at method detection limit
■: Chloromethane
ND: No VOC detected other than BTEX
*: W-11-MW1 = water sample - depth - well number
**: Analyzed by Environmental Protection Agency Method 624 (volatile organic compounds)