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PHASE III - SUPPLEMENTAL SITE INVESTIGATION STUDY

BP Oil Service Station No. 11132
3201 35th Avenue
Oakland, California

Project No. 30-081-01

ALTON GEOSCIENCE

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3201 35th Avenue
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Project No. 30-081-01

Prepared for:

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August 21, 1991

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1.0 INTRODUCTION AND BACKGROUND

BP Oil Company retained Alton Geoscience, Inc. to conduct a Phase III - Supplemental Site Investigation Study related to subsurface contamination at BP Oil Company Service Station No. 11132, 3201 35th Avenue, Oakland, California. The site location is shown in Figure 1, while a site plan is shown in Figure 2.

1.1 Purpose and Scope

This Phase III - Supplemental Site Investigation Study was performed to: (1) address the concerns of the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) and the Alameda County Department of Environmental Health (ACDEH) regarding petroleum hydrocarbon contamination at the site; and (2) determine the extent of hydrocarbon concentrations in the subsurface soil and ground water.

Alton Geoscience supervised and/or performed the following tasks during this investigation:

1. Drilled three soil borings for conversion into offsite ground water monitoring wells.
2. Collected and analyzed soil and ground water samples.
3. Analyzed field data and laboratory results.
4. Prepared this technical report presenting the results, findings, and recommendations of the investigation.

The results of these tasks provide the basis for evaluating the remedial planning and feasibility study.

1.2 Site Description

The site is currently an operating BP Oil service station located on the northeast corner of the intersection of 35th Avenue and Suter Street, Oakland, California. The adjacent properties are residential and commercial developments. The site is located at an elevation of approximately 160 feet above mean sea level. The location and layout of the underground storage tanks are shown in Figure 2, Site Plan.

A sensitive receptors survey was conducted to identify nearby environmental elements and land uses that may be affected by

or affect the subsurface environment at the site. The findings of the survey are as follows:

- The properties adjacent to the site are a mixture of residential and commercial developments. The site is surrounded by residential property except to the south across 35th avenue where a Quik Stop store is located. The Quik Stop has underground gasoline storage tanks but there are no records of any unauthorized release reported.

- A review of RWQCB files indicate that there are three confirmed fuel releases within a 1/2-mile radius of the site. Two of the confirmed releases are upgradient of the site. These release are separated from the site by Highway 580, a topographic low.

- There are no known municipal or private water supply wells within a 1/2-mile radius of the site.

- Peralta Creek is the nearest surface body of water located approximately 500 feet north of the site.

- Allandale School is the nearest school, located approximately 1,000 feet south of the site.

A copy of the sensitive receptors survey is presented in Appendix A.

1.3 Project Background

On July 30, 1986, Kaprealian Engineering, Inc. (KEI) was retained by Mobil Oil Corporation to install three 2-inch-diameter monitoring wells (MW-1, MW-2, and MW-3) at the former Mobil Oil service station. Monitoring and sampling of the wells, performed by KEI, detected concentrations of total petroleum hydrocarbons (TPH) in both MW-1 and MW-2 at concentrations up to 210 parts per million (ppm), (Alton Geoscience 1990).

On January 26 and February 1, 1990, as part of a qualitative shallow ground water survey, Alton Geoscience supervised the drilling of 10 soil borings to various depths, ranging from 25 to 33 feet below grade. The borings were advanced 3 to 4 feet beyond the depth at which ground water was encountered. Following drilling, the borings were converted into temporary wells (TW-1 through TW-10) by inserting clean, 2-inch-diameter, schedule 40 polyvinyl chloride (PVC) casing with 0.020-inch slots. Ground water samples were collected from each temporary well, then the temporary casing was removed from each boring, backfilled with grout slurry and capped with asphalt. Additionally, ground water samples were collected from the three existing monitoring wells.

The sample from Monitoring Well MW-1 contained 0.1 foot of free product and Monitoring Well MW-2 contained 0.05 foot. Samples from the other monitoring and temporary wells contained concentrations of dissolved-phase total petroleum hydrocarbons as gasoline (TPH-G) and benzene, toluene, ethylbenzene and xylenes (BTEX) ranging from nondetectable (ND) to 240,000 parts per billion (ppb), (Alton Geoscience, 1990).

On May 16, 1990, Alton Geoscience supervised the drilling of two soil borings which were converted into one 4-inch-diameter ground water monitoring well (MW-4) and one 6-inch-diameter recovery well (RW-1). On June 25, 1990, Alton Geoscience supervised the drilling of three offsite soil borings which were converted into 2-inch-diameter ground water monitoring wells (MW-5, MW-6, and MW-7).

Laboratory analysis of water samples indicated TPH-G concentrations ranging from nondetectable in Monitoring Wells MW-4, MW-6, and MW-7, to 140 and 280 ppb detected in MW-3 and MW-5, respectively. The laboratory analysis for BTEX in Monitoring Wells MW-4, MW-6, and MW-7 indicated nondetectable concentrations. However, the laboratory analysis indicated 5.3 and 200 ppb of benzene in MW-3 and MW-5, respectively (Alton Geoscience, 1990).

1.4 Regional Geology and Hydrogeology

The site is located approximately 160 feet above mean sea level in Oakland, California (USGS Topographic Map, Oakland East Quadrangle - 7.5 Minute Series) as shown in Figure 1.

The topography of the surrounding area is characterized by rolling hills, gentle slopes, and broad valleys. Undivided Quaternary deposits (QU) form the underling unit in this region. The composition and physical properties of QU vary. The QU unit consists predominantly of Temescal Formation, probably including covered or unrecognized San Antonio Formation and gravel, sand, and clay (Qg), as well as recent alluvium and colluvium, and artificial fill. The site is located in a 580-square-mile basin drained by the Guadalupe River, and Alameda, Coyote, Redwood and San Francisquito Creeks.

The water-bearing material is comprised of younger and older alluvium. Regional surface and ground water flow in the region is to the southwest, towards San Francisco Bay. The nearest surface water drainage is Peralta Creek, about 500 feet north of the site. The water supply of the City of Oakland is obtained from Pardee Dam, which receives water from the Sierra snow melt.

2.0 FIELD METHODS

This investigation included the drilling of three soil borings, as outlined in the drilling and sampling protocol shown in Appendix B. The borings were used to install Monitoring Wells MW-8, MW-9, and MW-10, following the design and installation procedures shown in Appendix B.

2.1 Soil Borings and Sampling

On January 31, 1991, prior to commencement of offsite drilling activities, Ground Water Protection Ordinance Permit No. 91057 was obtained from the Alameda County Flood Control and Water Conservation District. Additionally, on February 15, 1991, Street Excavation Permit Nos. 9100232 and 9100234 were obtained from the City of Oakland Department of Public Works. Copies of the ground water protection ordinance permit and street excavation permits are presented in Appendix D.

On February 25 and 26, 1991, Alton Geoscience supervised the drilling of three offsite soil borings (SB-8, SB-9, and SB-10), which were converted into ground water monitoring wells (MW-8, MW-9, and MW-10). The borings were drilled using an 8-inch-diameter, hollow-stem augers to total depths of approximately 35 to 40 feet below grade, respectively.

During drilling, soil samples were collected from the soil borings at 5-foot intervals below grade and at significant lithologic changes until the first ground water was encountered at a depth of approximately 25 feet below grade in each well.

Drilling activities were performed by Soils Exploration Services, Inc. of Vacaville, California, using a high-torque CME-55 drilling rig. The soil samples were collected using a split-spoon sampler lined with brass tubes. The samples recovered for laboratory analysis were covered with aluminum foil, capped with polyurethane caps, wrapped with clear tape, labeled, and placed immediately in an iced cooler. A description of drilling procedures and soil sampling protocol, and copies of boring logs, are presented in Appendix B.

2.2 Ground Water Monitoring Well Construction

The soil borings were completed as Ground Water Monitoring Wells MW-8, MW-9, and MW-10. The monitoring wells were constructed of clean, 2-inch-diameter, flush-threaded, Schedule 40 PVC blank casing and 0.020-inch, slotted casing to a total depth of approximately 35 to 40 feet below grade. Well installation procedures and construction details are presented in Appendix B.

2.3 Monitoring Well Development and Sampling

Well development and sampling procedures were conducted in accordance with the RWQCB and ACDEH guidelines. A description of Alton Geoscience general field procedures for well development and sampling is presented in Appendix C.

Monitoring wells were developed by removing approximately 47.7 gallons from MW-8, 23.2 gallons from MW-9, and 33 gallons from MW-10. Development of the monitoring wells was conducted on March 6, 1991. Prior to well development, a clear PVC bailer was used in each well to check for the presence of floating product.

Prior to sampling of the wells on March 7, 1991, a minimum of 3 casing volumes of water was purged from each well. Water samples were collected after stabilization of temperature, pH, and conductivity readings in the purged water was observed. Each well was observed for the presence of free product and sheen. The water samples were decanted from a bailer into clean containers. Samples were immediately placed in an iced cooler prior to and during transportation to a California-certified laboratory for analysis following proper chain of custody procedures. Water sampling field survey forms documenting field observations during well development, purging, and sampling are presented in Appendix C. Analytical methods, official laboratory reports and chain of custody records are presented in Appendix E.

2.4 Ground Water Level Monitoring and Surveying

Permanent reference marks at the top of each well casing of Monitoring Wells MW-8, MW-9, and MW-10 were surveyed on April 5, 1991, to the nearest 0.01 foot in reference to Monitoring Well MW-2 which has a top of casing elevation of 168.14 feet above mean sea level. The purpose of the survey was to determine the relative top of casing elevations of the monitoring wells for use in calculating the ground water elevation at each well. The water table elevation data is used to estimate the general direction of ground water flow and average hydraulic gradient beneath the site. The survey data field notes are presented in Appendix D.

Ground water level monitoring and survey data collected on April 5, 1991 is presented in Table 1. A ground water elevation contour map based on interpretation of the monitoring data is shown in Figure 3.

2.5 Aquifer Analysis by Pumping Test

A pumping test was performed at the site on April 25, 1991. The purpose of the test was to estimate aquifer parameters which are used for remedial engineering design.

Prior to initiating the pumping test, transducers were placed in the pumping well (RW-1) and two observation wells (MW-1 and MW-2). An Instrumentation Northwest TERRA 8 data logger was programed to record readings from the transducers every 15 seconds for the first 30 minutes after pumping began, every minute for the next 2 hours, and then every 2 minutes for the duration of the test. Depth to water Measurements were taken every hour from MW-3, MW-4, MW-5, and MW-6 using an electronic probe.

A 2-inch diameter, variable flow rate pump was submersed in the well. The water was pumped into 55 gallon drums prior to proper offsite disposal.

The test began at 10:13 a.m. on April 25, 1991. Flow rates were measured using a stopwatch and a 5-gallon bucket marked with 1/4-gallon increments. The flow rate was maintained at 0.9 gallons per minute (GPM) to 1 GPM. Drawdown was observed in MW-1 and MW-2 after 20 minutes of pumping, and in all the monitored wells within an hour of the onset of the test.

After approximately 8 hours of continuous pumping 5.5 feet of drawdown had occurred in the pumping well, and between 0.27 and 1.38 feet of drawdown was recorded in the observation wells. The pump was then turned off and removed from the well. Ground water elevation readings continued after pump removal until ground water levels had recovered to approximately the initial static water level.

3.0 ANALYTICAL METHODS

All laboratory analyses of soil and ground water samples were performed by Superior Analytical Laboratories, Inc., a California-certified analytical laboratory, using standard test methods of the U.S. Environmental Protection Agency (EPA) and the California Department of Health Services (DHS). The laboratory reports and listing of the analytical methods used are presented in Appendix E.

3.1 Soil Analysis

Soil samples from the three borings were analyzed for the following constituents:

- o TPH-G using EPA Methods 5030/8015
- o BTEX constituents using EPA Methods 5030/8020

The results of the laboratory analyses of the soil samples are presented in Table 2; the official laboratory reports and chain of custody records are included in Appendix E.

3.2 Water Analysis

Ground water samples collected from all monitoring wells except MW-1 and MW-2, which exhibited sheen, were analyzed for the following constituents:

- o TPH-G using EPA Methods 5030/8015
- o BTEX constituents using EPA Methods 5030/8020

The results of the laboratory analyses of the ground water samples are presented in Table 3; the official laboratory reports and chain of custody records are included in Appendix E.

4.0 SITE GEOLOGY AND HYDROGEOLOGY

A brief description of the pertinent information on the site geology and hydrogeology is presented below.

4.1 Site Geology

A review of the boring logs generated during this phase, and previous phases, of the investigation indicated that the stratigraphy beneath the site is relatively consistent. Silty clay was the predominant soil type encountered throughout each new boring to a depth of approximately 35 to 40 feet below grade and is generally consistent with the results of previous investigations at the site.

4.2 Site Hydrogeology

As presented in Table 1, the depth to ground water in MW-1 through MW-5 and MW-7 through MW-10, as measured from the top of casing on April 5, 1991, ranged from 12 to 18 feet below grade. The depth to water in MW-6 could not be obtained due to the presence of an abandoned vehicle over the well box. The depth to water was not measured in RW-1 due to the presence of an oily substance on the water surface.

The ground water elevations as measured on April 5, 1991, were used to develop the ground water elevation contour map shown in Figure 3. The data indicates a southeasterly ground water flow direction at the site, with an average hydraulic gradient of approximately 0.003 foot per foot across the site.

5.0 DISCUSSION OF RESULTS

The results of the field activities and laboratory analysis of soil and ground water samples collected during this investigation are presented in Tables 2 and 3, and are discussed below.

5.1 Soil

A total of 21 soil samples was collected, 9 of which were analyzed as part of this site investigation study to assess the extent of subsurface soil contamination. The results are discussed below.

- Laboratory analysis indicates low to nondetectable levels of TPH-G and BTEX constituents detected in soil samples collected from Soil Borings SB-8, SB-9, and SB-10 at the 10.5 to 11.0 foot interval below grade.

- The highest levels of TPH-G in the soil samples were detected at 20.5 to 21.0 feet below grade, with levels ranging from 73 to 390 ppm.

5.2 Ground Water

Results of the field survey and laboratory analysis of the ground water samples collected from the new and existing monitoring wells were used to assess the extent of ground water contamination. The results of the laboratory analysis are discussed below and summarized in Table 3.

- Ground water samples collected from MW-1 and MW-2 exhibited sheen and were not analyzed. Recovery Well RW-1 was not sampled due to the presence of an oily substance on the water surface. Monitoring Well MW-6 was not sampled due to the presence of an abandoned vehicle parked over the monitoring well.

- Laboratory analysis of ground water samples indicated TPH-G concentrations ranging from nondetectable in Monitoring Wells MW-4, MW-5, and MW-7, with concentrations of 400, 1,600, 2,700, and 7,100 ppb detected in ground water samples collected from MW-3, MW-10, MW-8, and MW-9, respectively.

- The laboratory analysis of ground water samples for benzene revealed concentrations ranging from nondetectable in Monitoring Well MW-7 to 780 ppb detected in MW-8.

- The laboratory analysis of ground water samples for toluene revealed concentrations ranging from 0.9 ppb detected in MW-5 to 450 ppb detected in MW-8.

- The laboratory analysis of ground water samples analyzed for ethylbenzene revealed concentrations ranging from 0.7 ppb detected in MW-5 to 64 ppb detected in MW-8.

- The laboratory analysis of ground water samples for total xylenes revealed concentrations ranging from 1.6 ppb detected in MW-5 to 2,400 ppb detected in MW-9.

5.3 Analysis of Aquifer Parameters by Pumping Test

As described in section 2.5, an aquifer pumping test was performed on well RW-1 with six observation wells located between 30 and 200 feet from the pumping well. After pumping for about 8 hours, measurable drawdown was observed in all the wells.

Storativity (S) and transmissivity (T) were calculated using the computer program AQTESOLV, (Geraghty & Miller Modelling Group), based on the Theis (1935) solutions. Storativity (S) and transmissivity (T) values are indicated below:

Well ID	S	T (ft^2/min)
MW-1	0.0027	0.239
MW-2	0.0030	0.276
MW-3	0.0032	0.221
MW-4	0.0013	0.302
MW-5	0.0011	0.966
MW-6	0.0026	0.348

These values will be used to calculate the parameters for the design of the remediation system. A graphical representation of the drawdown curve is presented in Appendix F.

6.0 FINDINGS AND CONCLUSIONS

The findings and conclusions of this site investigation study are summarized below:

- The concentrations of TPH-G and BTEX constituents detected in the soil samples from the offsite soil borings ranged from nondetectable to 390 ppm. The adsorbed phase petroleum hydrocarbon constituents in the soil extends offsite to the south.

- Samples from two of the monitoring wells (MW-1 and MW-2) exhibited free product and therefore were not sampled. Recovery Well RW-1 was not sampled due to the presence of an oily substance.

- The shallow ground water beneath the site has been impacted by free-floating and dissolved-phase

hydrocarbon constituents, the extent of which can be defined generally to the north, east, and west of the site.

4. The dissolved-phase hydrocarbon plume has migrated offsite south of the property. This is consistent with the general flow direction of the shallow ground water.

5. The average equilibrated depth to ground water in the monitoring wells at the site is 15 feet below grade.

6. The ground water elevation contour map, developed from the water level and survey data, indicates an overall southeasterly ground water flow direction beneath the site, with an average hydraulic gradient of approximately 0.003 foot per foot.

7. Based on the pumping test data, the average transmissivity of the aquifer beneath the site was calculated to be 0.392 ft^2/min. The calculated average hydraulic conductivity beneath the site was determined to be 0.016 ft/min. The average linear velocity of the aquifer beneath the site was determined to be approximately 4.80×10^{-5} ft/min.

8. Soil types encountered at the site during drilling generally consisted of silty clay.

9. There are no existing domestic water supply wells in the immediate vicinity or within a 1/2-mile radius of the site.

This report was based on currently available data and was developed in accordance with current hydrogeologic and engineering practices.

ALTON GEOSCIENCE

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Staff Engineer

Matthew Hopwood
Project Manager

Jefferey W. Wiegand, C.E.G. 331
Vice President

REFERENCES

Alton Geoscience, A., 1990. Phase II - Supplemental Site Investigation Report

Geraghty & Miller Modeling Group, AQTESOLV: Aquifer Test Solver, by G. M. Duffield and J. O. Rumbaugh, 1989.

Theis, C. V., 1935. "The Relation Between the Lowering of the Piezometric Surface and Duration of Discharge of a Well using Ground Water Storage", American Geophysical Union Transactions, Vol. 16, pp. 519-524.

FIGURES

Source: U.S.G.S. Map, East Oakland, California Quadrangle

7.5 minute series. 1959. Photorvised 1980.

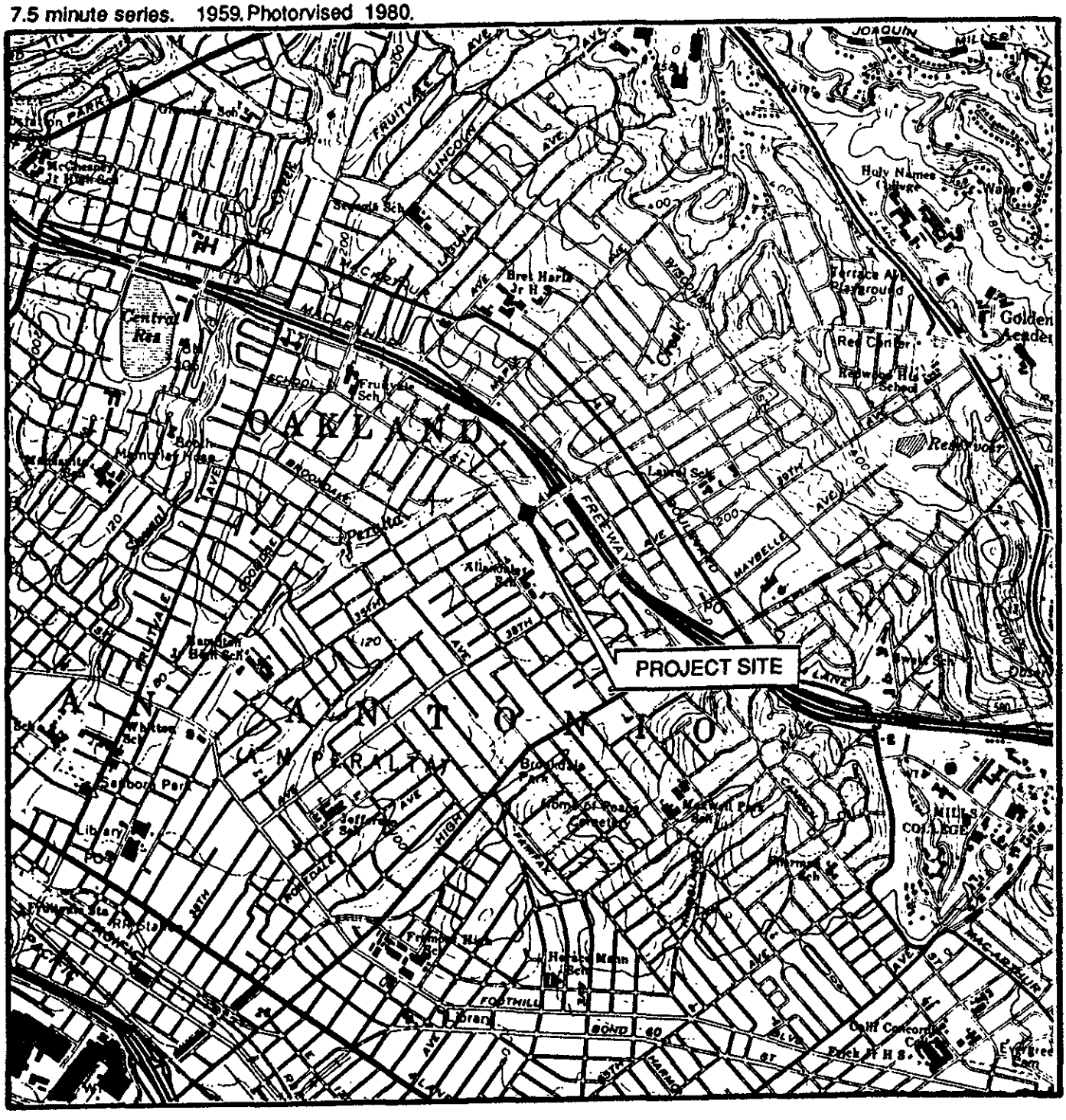


FIGURE 1

SITE VICINITY MAP

0 1000 2000

SCALE IN FEET

B P SERVICE STATION NO. 11132
3201 35TH AVENUE
OAKLAND, CALIFORNIA

PROJECT NO. 30-081-01

ALTON GEOSCIENCE
1000 Burnett Ave., Ste 140
Concord, CA 94520

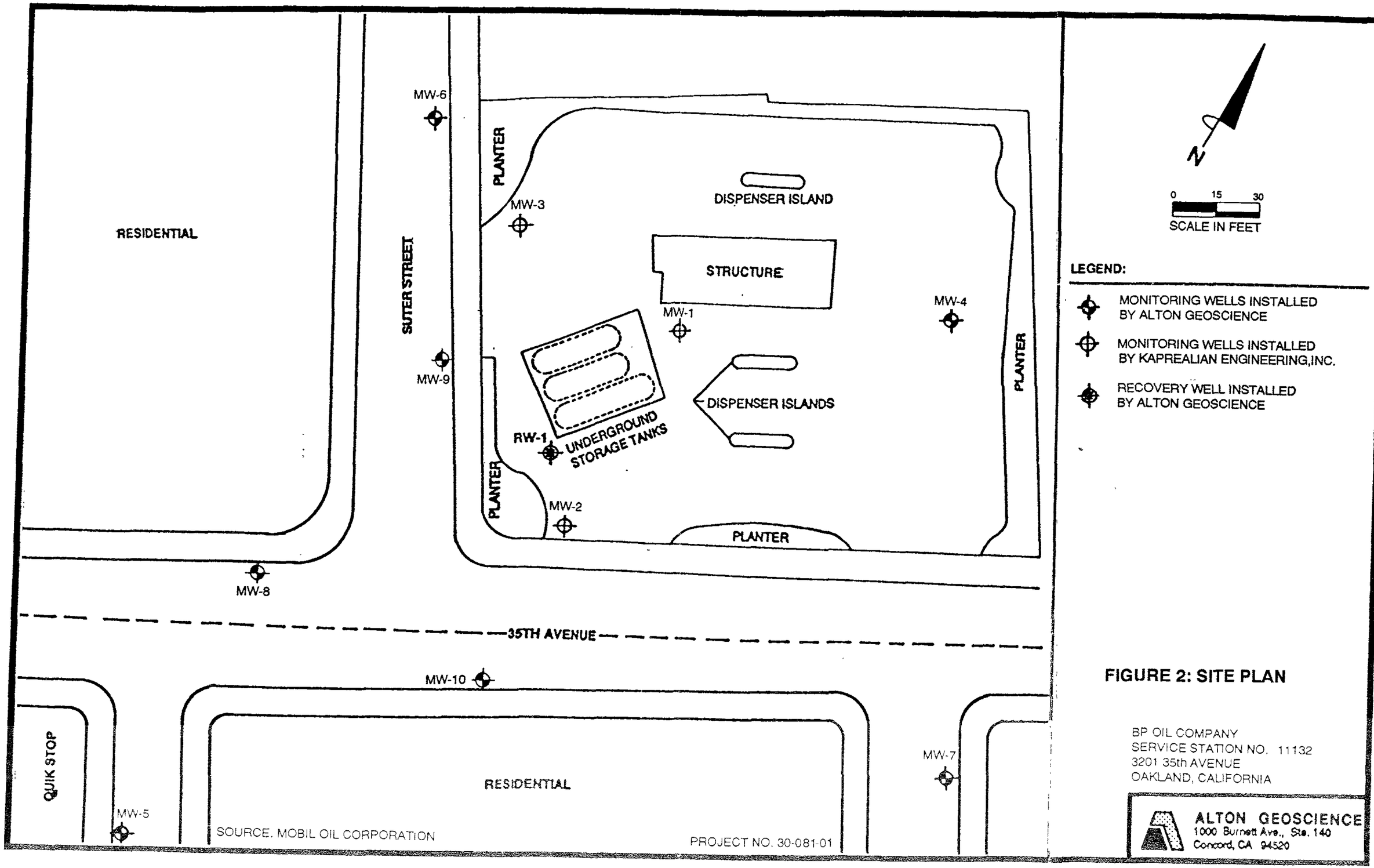
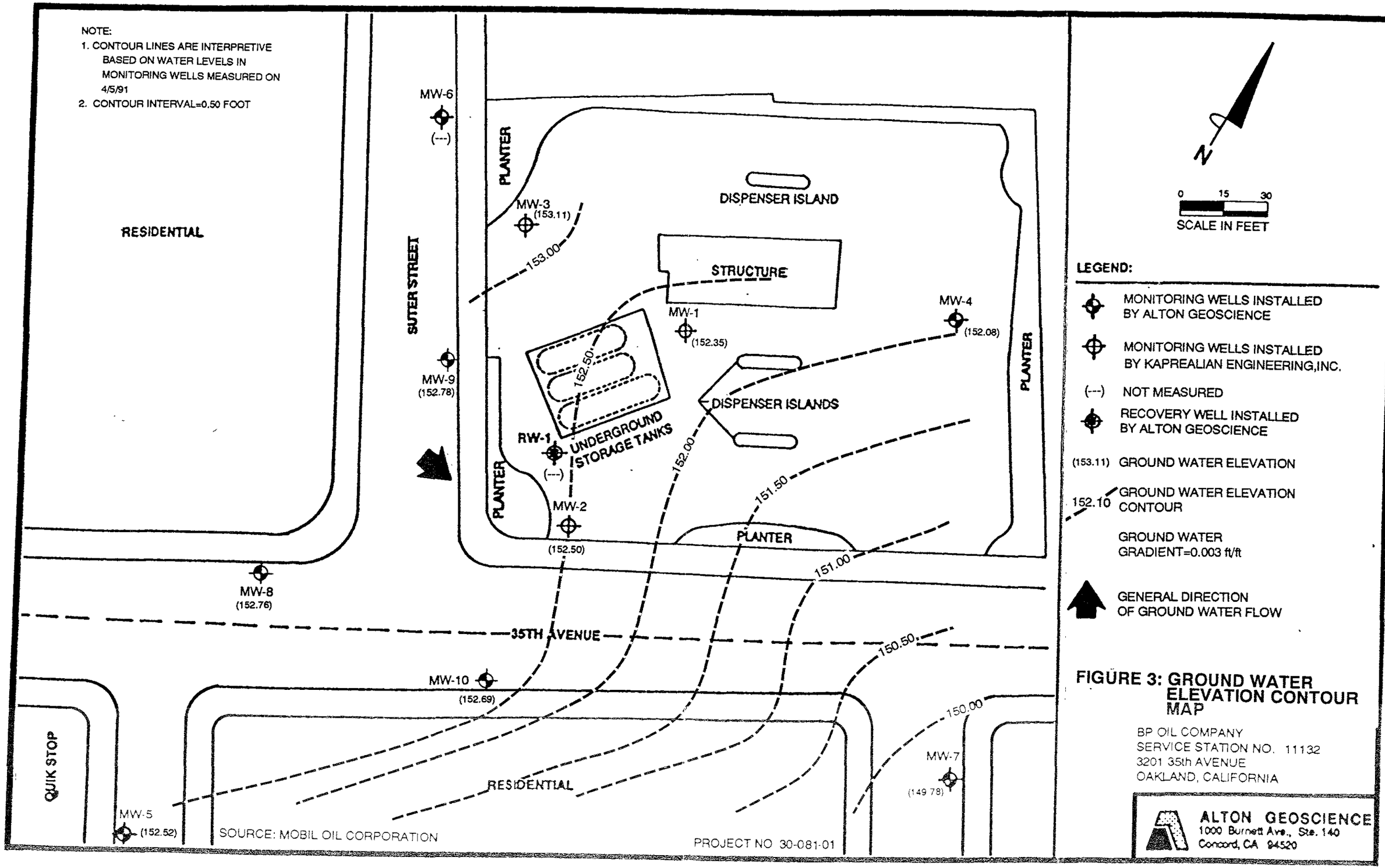


FIGURE 2: SITE PLAN

BP OIL COMPANY
SERVICE STATION NO. 11132
3201 35th AVENUE
OAKLAND, CALIFORNIA

ALTON GEOSCIENCE
1000 Burnett Ave., Ste. 140
Concord, CA 94520

NOTE:
1. CONTOUR LINES ARE INTERPRETIVE BASED ON WATER LEVELS IN MONITORING WELLS MEASURED ON 4/5/91
2. CONTOUR INTERVAL=0.50 FOOT



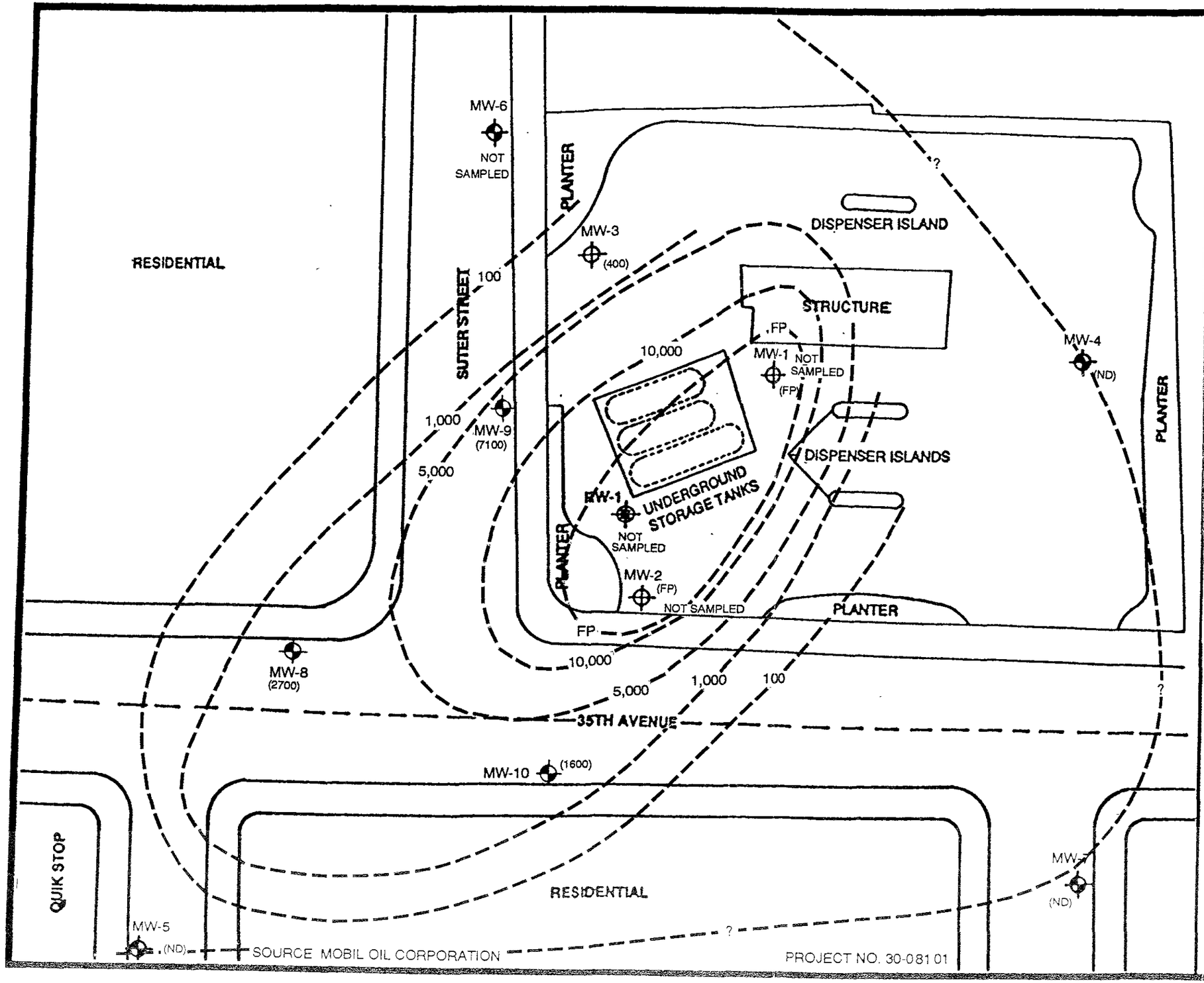
LEGEND:

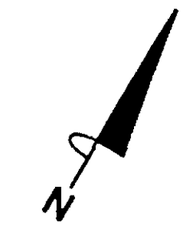
- MONITORING WELLS INSTALLED BY ALTON GEOSCIENCE
- MONITORING WELLS INSTALLED BY KAPREALIAN ENGINEERING,INC.
- (---) NOT MEASURED
- RECOVERY WELL INSTALLED BY ALTON GEOSCIENCE
- (153.11) GROUND WATER ELEVATION
- 152.10 GROUND WATER ELEVATION CONTOUR
- GROUND WATER GRADIENT=0.003 ft/ft
- GENERAL DIRECTION OF GROUND WATER FLOW

FIGURE 3: GROUND WATER ELEVATION CONTOUR MAP

BP OIL COMPANY
SERVICE STATION NO. 11132
3201 35th AVENUE
OAKLAND, CALIFORNIA

ALTON GEOSCIENCE
1000 Burnett Ave., Ste. 140
Concord, CA 94520





LEGEND:

- MONITORING WELLS INSTALLED BY ALTON GEOSCIENCE
- MONITORING WELLS INSTALLED BY KAPREALIAN ENGINEERING,INC.
- RECOVERY WELL INSTALLED BY ALTON GEOSCIENCE
- (400) TOTAL PETROLEUM HYDROCARBON AS GASOLINE (TPH-G) CONCENTRATION IN PARTS PER BILLION (ppb)
- TOTAL PETROLEUM HYDROCARBON AS GASOLINE ISOCONCENTRATION CONTOUR LINE

FIGURE 4: TOTAL PATROLEUM HYDROCARBONS AS GASOLINE (TPH-G) ISOCONCENTRATION MAP (ppb)

BP OIL COMPANY
SERVICE STATION NO. 11132
3201 35th AVENUE
OAKLAND, CALIFORNIA

ALTON GEOSCIENCE
1000 Burnett Ave., Ste. 140
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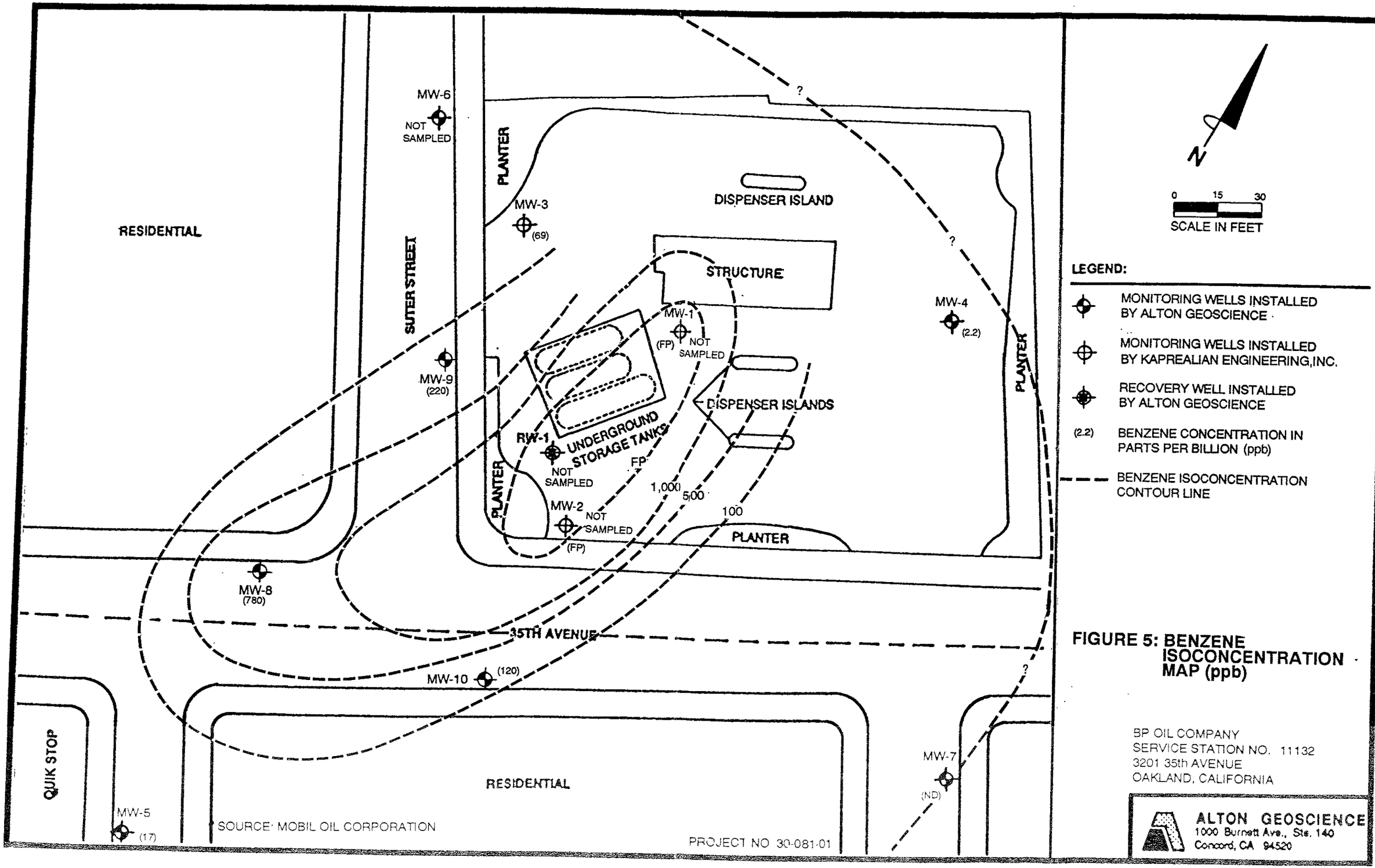


FIGURE 5: BENZENE ISOCONCENTRATION MAP (ppb)

BP OIL COMPANY
SERVICE STATION NO. 11132
3201 35th AVENUE
OAKLAND, CALIFORNIA

ALTON GEOSCIENCE
1000 Burnett Ave., Ste. 140
Concord, CA 94520

TABLES

TABLE 1

SURVEY AND WATER LEVEL MONITORING DATA
April 1991

Well Number	Elevation (Feet)	Depth to Water (Feet)	Free Product Thickness (Feet)	Ground Water Elevation (Feet)*
MW-1	169.75	17.18	----	152.35
MW-2	168.14	15.64	----	152.50
MW-3	167.17	14.06	----	153.11
MW-4	170.36	18.28	----	152.08
MW-5	165.14	12.62	----	152.52
MW-6	165.40	**	----	**
MW-7	167.61	17.82	----	149.78
MW-8	165.74	12.98	----	152.76
MW-9	166.20	13.42	----	152.78
MW-10	167.01	14.32	----	152.69
RW-1	168.01	***	***	***

Note:

* Elevation in feet relative to a common datum (MW-2) with an elevation of 168.14 feet above mean sea level, as measured on July 5, 1990 by Alton Geoscience.

** MW-6 could not be accessed due to the presence of an abandoned vehicle over the well.

*** Depth to water in the recovery well was not recorded due to the presence of an oily substance.

TABLE 2

1132

RESULTS OF
LABORATORY ANALYSIS OF SOIL SAMPLES
March 1991

Boring	Sample Depth (ft)	TPH-G	B	T	E	X
		(Concentrations in Parts Per Million)				
SB-8	10.5-11.0	ND<1	ND<0.003	0.004	ND<0.003	ND<0.003
	20.5-21.0	390	1.8	16	6.7	37
	25.5-26.0	ND<1	0.013	0.028	0.009	0.05
SB-9	10.5-11.0	ND<1	ND<0.003	0.004	ND<0.003	0.006
	20.5-21.0	120	1.7	7.1	1.7	11
	25.5-26.0	130	0.47	3.9	1.6	12
SB-10	10.5-11.0	ND<1	ND<0.003	0.007	ND<0.003	0.017
	20.5-21.0	73	0.49	3.3	1.3	6.9
	25.5-26.0	1	0.41	0.009	0.007	0.019

Notes:

TPH-G = Total Petroleum Hydrocarbons as Gasoline
B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
ND = Not Detected at Method Detection Limit shown

TABLE 3

RESULTS OF
LABORATORY ANALYSIS OF GROUND WATER SAMPLES
April 1990

Monitoring Well	TPH-G	B	T	E	X
	(Concentrations in Parts per Billion)				
MW-1	*	*	*	*	*
MW-2	*	*	*	*	*
MW-3	400	69	22	6.1	57
MW-4	ND<50	2.2	3.8	1.5	2.8
MW-5	ND<50	17	0.9	0.7	1.6
MW-6	**	**	**	**	**
MW-7	ND<50	ND<0.3	0.4	0.3	2.4
MW-8	2700	780	450	64	310
MW-9	7100	220	4	2.4	2400
MW-10	1600	120	190	32	230
RW-1	***	***	***	***	***

Notes:

TPH-G = Total Petroleum Hydrocarbons as Gasoline
B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
ND = Not Detected at Method Detection Limit
* = No sample collected due to the presence of free product
** = No sample collected due to the presence of an abandoned vehicle located over the well
*** = The recovery well was not sampled due to the presence of an oily substance

APPENDIX A

SENSITIVE RECEPTORS SURVEY

SENSITIVE RECEPTORS SURVEY
SITE SURVEY AND LITERATURE SEARCH

Client: BP Oil Company Project No.: 30-081-01

Station No.: 11132

Location: 3201 35TH Ave. Oa

City/State: Oakland CA

I. Provide answers to the following questions:

A. Is there a public water supply well within 2500 feet? Y/N N
If Yes, Distance — ft.

B. Is there a private water supply well within 1000 feet? Y/N N
If Yes, Distance — ft.

C. Is there a subway within 1000 feet? Y/N N
If Yes, Distance — ft.

D. Is there a basement within 1000 feet? Y/N N
If Yes, Distance — ft.

E. Is there a school within 1000 feet? Y/N Yes
If Yes, Distance 1000 ft.

F. Is there a surface body of water within 1000 feet? Y/N Yes
If Yes, Distance 500 ft.
Name Peralta Creek

II. Describe type of local water supply.

Public: X

- Suppliers Name: East Bay Municipal Water District
- Suppliers Source: Sierra Snow Melt, Pardee Dam
- Distance to Site:

Private:

SENSITIVE RECEPTORS SURVEY
SITE SURVEY AND LITERATURE SEARCH

III. Distance to Nearest Adjacent Properties:

Residential	50 ft.
Commercial	.00 ft.
Industrial	— ft.
Hospital	11,000 ft.
School (Allandale School)	1000 ft.
Name	

IV. Aquifer Classification, if available.

Class I - Special Ground Waters	
- Irreplaceable Drinking Water Source	
- Ecologically Vital	
Class II - Current and Potential Drinking Water Sources	
Class III - Not Potential Source of Drinking Water	X

V. Describe observation wells, if any.

Number	11
Free Product? Y/N	yes

VI. Signature of Preparer: Matthew A. Taylor

Date: 2-20-91

VII. Sketch of Site

APPENDIX B

GENERAL FIELD PROCEDURES
AND
BORING LOGS

APPENDIX B

GENERAL FIELD PROCEDURES

A description of general field procedures conducted during drilling activities is presented below.

Drilling and Soil Sampling

Soil borings/monitoring wells were drilled utilizing 10-inch-diameter, continuous-flight, hollow-stem augers. To avoid cross-contamination, the augers were steam-cleaned prior to drilling each boring.

Soil samples were obtained for soil description, field, and laboratory analysis. Soil samples collected at 5-foot intervals were retrieved ahead of the lead auger utilizing an 18-inch-long by 2-inch-diameter, split spoon sampler lined with 1.5-inch-diameter, stainless steel sample tube inserts. The sampler and sample tubes were washed with a sodium tripolyphosphate solution and rinsed before each sampling event. The sampler was driven by a 30-inch free fall of a 140-pound hammer. Blow counts were recorded for three successive 6-inch intervals.

Upon retrieval from the sampler, the sample tubes were removed and securely sealed with Teflon sheeting and polyurethane caps. The samples were labeled with sample identification, sample depth, geologist's initials, and date of collection. The soil samples were kept on ice prior to and during transport to a state-certified laboratory.

The soil recovered was described in accordance with the Unified Soil Classification System. For each soil type, field estimates of density/consistency, moisture, color, grading, and soil type were recorded on the boring logs.

Monitoring Well Installation and Construction Details

Included in this appendix are monitoring well installation and construction details for monitoring wells installed as part of this study.

Monitoring wells were constructed of 4-inch-diameter, flush-threaded, Schedule 40 PVC blank and screened (0.020-inch slot size) casing. The annular space surrounding the screened portion was backfilled with No. 3 Monterey sand (filter pack) to approximately 2 feet above the top of the screened section. A 1-foot-thick bentonite annular seal was placed above the filter pack and the remaining annulus was grouted with neat cement to the surface. Utility boxes were

installed slightly above grade to minimize infiltration of surface waters. Locking, watertight well caps were installed to ensure the integrity of the well.

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2-25-91
CLIENT BP Oil Company
LOCATION 3201 35th Ave, Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-8
WELL NO. MW-8
Page 1 of 2

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 165.74'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction details
DRILLER Soils Exploration Services , Inc.

BLOWS PER FOOT(ft)	CGI (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE	DESCRIPTION
							WATER LEVEL / DATE / TIME
			0	Christy Box			10" Concrete
5,13,25			6	2" sch. 40 PVC Casing	GM		GRAVELLY SILT: green, damp, hard, low plasticity
7,14,11			10		ML		SANDY SILT: greenish brown, damp, very stiff, low plasticity, gravelly
5,14,16			16				SILTY CLAY: brownish green, damp, very stiff, low to medium plasticity, with fine sand
2,6,10			20		CL		Same, becomes moist, stiff, medium plasticity, with medium sand
5,9,12			26	2" sch. 40 PVC 0.020" Slot			Same, becomes brown, moist to wet, very stiff, medium plasticity ▽ 27'
3,9,14			30				Same, becomes brownish green, wet, with medium sand and gravel
			34				

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2/25/91
CLIENT BP Oil Company
LOCATION 3201 35th Ave., Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-8
WELL NO. MW-8
Page 2 of 2

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 165.74'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction detail
DRILLER Soils Explorations Services, Inc.

BLOWS PER FOOT(ft)	CGI (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE	WATER LEVEL			
							DATE			
							TIME			
							DESCRIPTION			
7,11,14			36				SILTY CLAY: brown, wet, very stiff, medium to high plasticity, with medium sand and gravel			
			38		CL					
11,20, 20			40	End Cap			Same, becomes moist to wet, hard, medium plasticity			
			42				BORING TERMINATED AT 41.5 FEET BELOW GRADE			
			44							
			46							
			48							
			50							
			52							
			54							
			56							
			58							
			60							

Portland Cement
Sand #3 Lonestar
Bentonite Pellets
Sample
Driven interval
Water level encountered during drilling

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2-26-91
CLIENT BP Oil Company
LOCATION 3201 35th Ave, Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-9
WELL NO. MW-9
Page 1 of 2

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 166.20

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction details
DRILLER Soils Exploration Services , Inc.

BLOWS PER FOOT(ft)	CGI (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE	DESCRIPTION
							WATER LEVEL / DATE / TIME
			0	Christy Box			6" Asphalt (street)
6,11,14			6	2" sch. 40 PVC Casing	ML		SANDY SILT: reddish brown, damp, very stiff, low plasticity, with gravel
4,5,13			10				Same, becomes brown, no gravel
5,12,14			16				SILTY CLAY: brown with green streaks, moist, very stiff, medium plasticity
2,6,9			20		CL		Same, becomes moist to wet, stiff
5,8,10			26	2" sch. 40 PVC 0.020" Slot			Same, becomes brown, wet to saturated, very stiff ▽ 26'
3,5,10			30				Same, becomes saturated, stiff, with fine to medium sand
			34	End Cap			

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2/26/91
CLIENT BP Oil Company
LOCATION 3201 35th Ave., Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-9
WELL NO. MW-9

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 166.20'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction detail
DRILLER Soils Explorations Services, Inc.

BLOWS PER FOOT(ft)	CGI (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE				
							WATER LEVEL			
							DATE			
							TIME			
							DESCRIPTION			
6,12,17			36		CL		SILTY CLAY: reddish brown, saturated to wet, very stiff, medium plasticity			
							BORING TERMINATED AT 36.5 FEET BELOW GRADE			
			38							
			40							
			42							
			44							
			46							
			48							
			50							
			52							
			54							
			56							
			58							
			60							

Portland Cement
Sand #3 Lonestar
Bentonite Pellets
Sample
Driven interval
Water level encountered during drilling

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2-27-91
CLIENT BP Oil Company
LOCATION 3201 35th Ave, Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

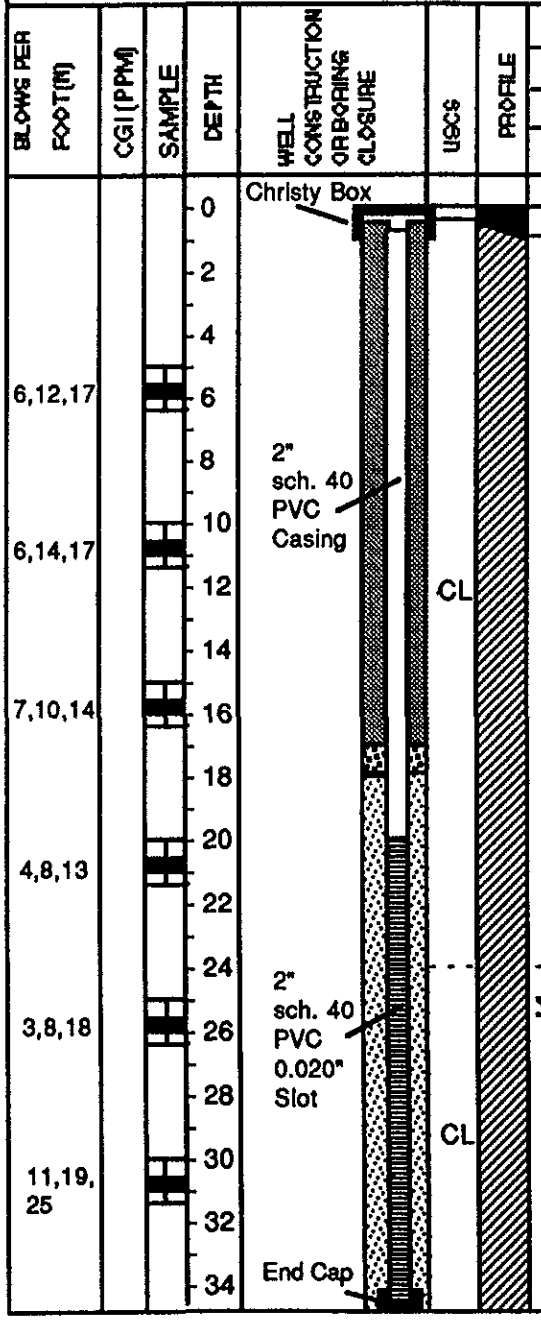
BORING NO. SB-10
WELL NO. MW-10

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 167.01'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction details
DRILLER Soils Exploration Services, Inc.

WATER LEVEL			
DATE			
TIME			



DESCRIPTION

10" Concrete

SILTY CLAY: tan, damp, very stiff, low plasticity, with gravel

Same, becomes tan to brown

Same, becomes brown with green streaks, moist, medium plasticity, with gravel

Same, becomes moist to wet, with fine sand and gravel

25'

SANDY CLAY: brownish white, wet to saturated, very stiff, low to medium plasticity, with slight gravel

Same, becomes brown, wet, hard, medium plasticity, with slight gravel

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2/27/91
CLIENT BP Oil Company
LOCATION 3201 35th Ave., Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-10
WELL NO. MW-10

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 167.01'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction detail
DRILLER Soils Explorations Services, Inc.

BLOWS PER FOOT(ft)	OVA (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE	WATER LEVEL			
							DATE			
							TIME			
							DESCRIPTION			
7,8,11			36		CL		SILTY CLAY: brown, wet, very stiff, medium plasticity, with some fine sand			
							BORING TERMINATED AT 36.5 FEET BELOW GRADE			
			38							
			40							
			42							
			44							
			46							
			48							
			50							
			52							
			54							
			56							
			58							
			60							

Portland Cement
Sand #3 Lonestar
Bentonite Pellets
Sample
Driven interval
Water level encountered during drilling

APPENDIX C

PERMITS

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 3201 35th Avenue
Oakland CA

CLIENT
Name BP Oil Company
Address 2868 Prospect Dr Phone 916 631 0733
City Rancho Drive Zip 95670

APPLICANT
Name AITON Geoscience, Inc
Address 1000 Burnett Ave St. 140 Phone 415 682 1582
City Concord CA Zip 94520

TYPE OF PROJECT

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

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

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger X
Cable ___ Other ___

DRILLER'S LICENSE NO. C-57 582696

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 40 ft.
Surface Seal Depth 15 ft. Number 3

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

ESTIMATED STARTING DATE 2-25-91
ESTIMATED COMPLETION DATE 2-27-91

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

APPLICANT'S SIGNATURE Matthew A. Taylor Date 1-30-91

FOR OFFICE USE

PERMIT NUMBER 91057
LOCATION NUMBER

PERMIT CONDITIONS

Circled Permit Requirements Apply

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

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

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

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

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 31 Jan 91
Wyman Hong

121989

CONFIDENTIAL

STATE OF CALIFORNIA DWR
WELL COMPLETION REPORT
(WELL LOGS)

REMOVED

CONFIDENTIAL

STATE OF CALIFORNIA DWR
WELL COMPLETION REPORT
(WELL LOGS)

REMOVED

CONFIDENTIAL

STATE OF CALIFORNIA DWR
WELL COMPLETION REPORT
(WELL LOGS)

REMOVED

300-2 (REV. 8/90)

RIGHT # X9102234

CITY OF OAKLAND

PERMIT TO EXCAVATE IN STREETS OR OTHER WORK AS SPECIFIED

EXC 135.00
App Fee 30.00
TOTAL 165.00

LOCATION OF WORK: Suter BETWEEN 35th AND Laurel
(Street or Address) (Specify)

PERMISSION TO EXCAVATE IN THE PUBLIC RIGHT-OF-WAY IS ...

APPLICANT: Soils Exploration S...

ADDRESS: 561 Buckeye St. Vacaville ... 707 451 9213

TYPE OF WORK: GAS ___ ELECTRIC ___ ... (Specify)

NATURE OF WORK: Monitoring wells

APPL	30.00
EXCV	135.00
SUBTL	165.00
CHECK	165.00

OWNER/BUILDER

I hereby affirm that I am exempt from the Contractor's License Law ... (Sec. 7031.5, Business and Professions Code: Any city or county ... to construct, alter, improve, demolish, or repair any structure, prior to its issuance, also requires the applicant for such permit to file a signed statement that he is licensed pursuant to the provisions of the Contractor's License Law Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, or that he is exempt therefrom and the basis for the alleged exemption. Any violation of Section ... a permit subjects the applicant to a civil penalty of not more than ...

☐ I, as owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044, Business and Professions Code: The Contractor's License Law does not apply to an owner of property who builds or improves thereon, and who does such work himself or through his own employees, provided that such improvements are not intended or offered for sale. If, however, the building or improvement is sold within one year of completion, the owner-builder will have the burden of proving that he did not build or improve for the purpose of sale.)

☐ I, as owner of the property, am exempt from the sale requirements of the above due to: (1) I am improving my principal place of residence or appurtenances thereto, (2) the work will be performed prior to sale, (3) I have resided in the residence for the 12 months prior to completion of the work, and (4) I have not claimed exemption ... more than two structures more than once during any three-year period (Sec. 7044, Business and Professions Code).

☐ I, as owner of the property, am exclusively contracting with licensed contractors to construct the project (Sec. 7044, Business and Professions Code: The Contractor's License Law does not apply to an owner of property who builds or improves thereon, and who contracts for such projects with a contractor(s) licensed pursuant to the Contractor's License Law.

☐ I am exempt under Sec. ________, B&PC for this reason ________

Signature ________ Date ________

WORKER'S COMPENSATION

I hereby affirm that I have a certificate of consent to self-insure, or a certificate of Workers' Compensation Insurance, or a certified copy thereof (Sec. 3800, Lab. C).

Policy # ________ Company Name: Star Comp Ins Fund

☐ Certified copy is hereby furnished.

☒ Certified copy is filed with the city building inspection dept.

Signature: [signature] Date: 2/15/91

(This section need not be completed if the permit is for ... dollars ($100) or less.)

I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Workers' Compensation Laws of California.

Signature ________ Date ________

NOTICE TO APPLICANT. If, after making this Certificate of Exemption, you should become subject to the Workers' Compensation provisions of the Labor Code, you must forthwith comply with such provisions or this permit shall be deemed revoked.

... EXTENSION GRANTED BY DIRECTOR OF PUBLIC WORKS

DATE 2-15-91

2-26-91

NO X

LIMITED OPERATION ... (7 AM-9 AM/4 PM-6 PM) ... NO X

DATE STREET LAST RESURFACED ... DATE

SPECIAL ... NO X

24-HOUR EMERGENCY PHONE NUMBER

... 24 HOUR NUMBER ... CONSTRUCTION.

... Underground Service Alert two working days before excavating ... This permit is not valid unless ... identification number issued by Underground Service Alert.

223416

Call Toll Free: 800-642-2444

This permit ... Article ... of the Oakland Municipal Code.

This permit ... shall be responsible for ... all damage ... the permit or arising out of ... The permittee ... hold harmless the City ...

...

... Section 7000 of Division 3 of the Business and Professions Code and my license is in full force and effect.

License ... 2/15/91

☐ Agent for ... ☐ Owner

OFFICIAL USE ONLY

UTILITY COMPANY REPORT

#2 1CL 9661 11:28TM

Supervisor ________

Completion Date ________

CITY INSPECTOR'S REPORT

BACKFILL PAVING

Initials ________
Hours ________
Date ________
Concrete ________
Asphalt ________
... ________
Size of Cut ... Sq. Ft. ... Inches
... Type ________
...

Charges: Backfill ________
Paving ________
Paving Insp. ________
Traffic Striping Replaced ________ Date

APPROVED

Engineering Services: JW Date 2-15-91

________ Date ________

________ Date ________

________ Date ________

________ Date ________

________ Date ________

DIRECTOR OF PUBLIC WORKS

By ... 2-15-91

... DATE

EXTENSION GRANTED BY ________

DATE ________

Rem. # X9100232
2-15-91

CITY OF OAKLAND

PERMIT TO EXCAVATE IN STREETS OR OTHER WORK AS SPECIFIED

EXC. 135.00
APP FEE 30.00
TOTAL $165.00

LOCATION OF WORK: 3201 35TH AVE (Street or Address) BETWEEN [illegible] (Street) AND Mon[illegible] (Specify)

PERMISSION TO EXCAVATE IN THE PUBLIC RIGHT-OF-WAY IS HEREBY GRANTED TO:

APPLICANT: Soils Exploration Services Inc

ADDRESS: 561 Buckeye st Vacaville Ca PHONE # (707) 451-9213

TYPE OF WORK: GAS ___ ELECTRIC ___ WATER ___ TELEPHONE ___ CABLE TV ___ SEWER ___ OTHER X (Specify)

NATURE OF WORK: Monitoring well installation

OWNER/BUILDER

I hereby affirm that I am exempt from the Contractor's License Law for the following reason (Sec. 7031.5, Business and Professions Code: Any city or county which requires a permit to construct, alter, improve, demolish, or repair any structure, prior to it's issuance, also requires the applicant for such permit to file a signed statement that he is licensed pursuant to the provisions of the Contractor's License Law Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, or that he is exempt therefrom and the basis for the alleged exemption. Any violation of Section 7031.5 by any applicant for a permit subjects the applicant to a civil penalty of not more than $500).

☐ I, as owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044, Business and Professions Code: The Contractor's License Law does not apply to an owner of property who builds or improves thereon, and who does such work himself or through his own employees, provided that such improvements are not intended or offered for sale. If, however, the building or improvement is sold within one year of completion, the owner-builder will have the burden of proving that he did not build or improve for the purpose of sale).

☐ I, as owner of the property, am exempt from the sale requirements of the above due to: (1) I am improving my principal place of residence or appurtenances thereto, (2) the work will be performed prior to sale, (3) I have resided in the residence for the 12 months prior to completion of the work, and (4) I have not claimed exemption in this subdivision on more than two structures more than once during any three-year period. (Sec. 7044, Business and Professions Code).

☐ I, as owner of the property, am exclusively contracting with licensed contractors to construct the project (Sec. 7044, Business and Professions Code: The Contractor's License Law does not apply to an owner of property who builds or improves thereon, and who contracts for such projects with a contractor(s) licensed pursuant to the Contractor's License Law).

☐ I am exempt under Sec. ________, B&PC for this reason ________

Signature ________ Date ________

WORKER'S COMPENSATION

I hereby affirm that I have a certificate of consent to self-insure, or a certificate of Workers' Compensation Insurance, or a certified copy thereof (Sec. 3800, Lab C).

Policy # ________ Company Name STATE COMP INS FUND

☐ Certified copy is hereby furnished.

☑ Certified copy is filed with the city building inspection dept.

Signature [signature] Date Feb/15/1991

(This section need not be completed if the permit is for one hundred dollars ($100) or less.)

I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Workers' Compensation Laws of California.

Signature ________ Date ________

NOTICE TO APPLICANT: If, after making this Certificate of Exemption, you should become subject to the Workers' Compensation provisions of the Labor Code, you must forthwith comply with such provisions or this permit shall be deemed revoked.

PERMIT VOID 90 DAYS FROM DATE OF ISSUE UNLESS EXTENSION GRANTED BY DIRECTOR OF PUBLIC WORKS.

Approximate Starting Date — DATE 2/25th
Approximate Completion Date — DATE 2/26th
HOLIDAY RESTRICTION (1 NOV. — 1 JAN) — YES ___ NO X
LIMITED OPERATION AREA (7AM - 9AM / 4PM - 6PM) — YES ___ NO ___
DATE STREET LAST RESURFACED — DATE 66
SPECIAL PAVING DETAIL REQUIRED — YES ___ NO X

24-HOUR EMERGENCY PHONE NUMBER ________

PERMIT NOT VALID WITHOUT 24 HOUR NUMBER.

Telephone 273-3668 Forty-eight (48) HOURS BEFORE ACTUAL CONSTRUCTION.

ATTENTION

State law requires that contractor/owner call Underground Service Alert two working days before excavating to have below-ground utilities located. This permit is not valid unless applicant has secured an inquiry identification number issued by Underground Service Alert.

Call Toll Free: 800-642-2444 USA ID Number 123785

This permit issued pursuant to all provisions of Chapter 6, Article 2 of the Oakland Municipal Code.

This permit is granted upon the express condition that the permittee shall be responsible for all claims and liabilities arising out of work performed under this permit or arising out of permittee's failure to perform the obligations with respect to street maintenance. The permittee shall, and by acceptance of the permit agrees to, defend, indemnify, save and hold harmless the City, its officers and employees, from and against any and all suits, claims or actions brought by any person for or on account of any bodily injuries, disease or illness or damage to persons and/or property sustained or arising in the construction of the work performed under the permit or in consequence of permittee's failure to perform the obligations with respect to street maintenance.

CONTRACTOR

I hereby affirm that I am licensed under provisions of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code, and my license is in full force and effect.

LICENSE # AND CLASS C57-5[illegible] CITY BUSINESS TAX # ________

X [signature] Date FEB 15 1991

Signature of Contractor, Owner or Agent

☐ Agent for ☐ Contractor ☐ Owner

CHECK 165.00

OFFICIAL USE ONLY

ITEM 2

UTILITY COMPANY REPORT

02-15-91 #2 1CL 9663 11:30TM

Supervisor ________

Completion Date ________

CITY INSPECTOR'S REPORT

	BACKFILL	PAVING
Initials		
Hours		
Date		
Concrete		
Asphalt		
Sidewalk		

Size of Cut: Sq. Ft. ____ Inches ____

Paved by ________ Type ________

Bill No. ________

Charges: Backfill ________ Paving ________ Paving Insp. ________

Traffic Striping Replaced ________ Date ________

APPROVED:

Engineering Services ________ Date ________

Planning ________ Date ________

Field Services ________ Date ________

Construction ________ Date ________

Traffic Engineering ________ Date ________

Electrical Engineering ________ Date ________

DIRECTOR OF PUBLIC WORKS

APPROVED BY: [signature]

DATE: 2-15-91

EXTENSION GRANTED BY: ________

DATE: ________

APPENDIX D

WELL DEVELOPMENT AND WATER SAMPLING PROCEDURES, FIELD SURVEY FORMS, AND SURVEY DATA FIELD NOTES

APPENDIX D

WELL DEVELOPMENT AND WATER SAMPLING PROCEDURES AND FIELD SURVEY FORMS

All purging and ground water sampling equipment was cleaned prior to use to minimize cross-contamination between wells. All equipment in contact with ground water was triple-rinsed prior to each sampling event in successive baths consisting of tripolyphosphate solution, tap water, and deionized water. Prior to sampling, the well was developed and purged in accordance with EPA protocol. During purging, pH, temperature, and conductivity were measured periodically until these parameters stabilized, indicating formation water had entered the well casing. The purged water was pumped into 55-gallon D.O.T. approved drums prior to disposal or recycling at an appropriate waste disposal facility.

Ground water samples were collected by lowering a 4-inch-diameter, bottom-fill, Teflon bailer just below the water level in the well. The samples were carefully transferred from the check-valve-equipped Teflon bailer to zero-headspace 1-liter and 40-milliliter glass containers fitted with Teflon -sealed caps. All samples were inverted to ensure that entrapped air was not present. Each sample was labeled with sample number, well number, sample date, and engineer's/geologist's initials. The samples remained on ice prior to laboratory analysis.

ALTON GEOSCIENCE, INC
1170 Burnett Ave., Ste. S
Concord, CA 94520

JOB NUMBER 30-081-01 TECHNICIAN Donnie Burcl

JOB LOCATION OAKLAND DATE 3/6/91

PUMPOUT ☐ YES ☐ NO	DATE OF LAST PUMPOUT:			WEATHER: SUNNY TIME:		COMMENTS (Notes, conditions, etc.)
	HOLD	CUT	LEVEL			
WELL #	DEPTH TO WATER	DEPTH TO PRODUCT	PROD. THICKNESS (FT)	TOTAL DEPTH	DEPTH TO PUMP	
mw-8	15.72			39.00		
	15.72			39.00		
	15.72			39.00		
mw-9	17.23			27.99		
	17.23			27.99		
	17.23			27.99		
mw-10	18.19			34.04		
	18.19			34.04		
	18.19			34.04		

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/6/91

Well: MW-8 Sampling Team: Dennie Burel

Well Development Method: Bailer

Sampling Method: _____

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 39.00 feet Time: _____ Water level Before Pumping: 15.72

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
23.28 feet x	(0.16)	0.65	3.7	10	37.2

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity X1000	T	Notes
1:31	7.5	6.95	1.98	62.3	LT BROWN / SILTY
1:45	15	7.34	1.46	64.8	" "
1:49	22.5	7.11	1.41	63.8	" "
1:58	30	7.01	1.38	64.2	" "
2:06	37.5	7.36	1.33	65.5	" "

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 37.5

Time Sample Collection Begins: _____

Time Sample Collection Ends: _____

Total Gallons Purged: 37.5

Comments: _____

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/6/91

Well: mw-9 Sampling Team: Donnie Burel

Well Development Method: Bailer

Sampling Method: _____

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 27.99 feet Time: _____ Water level Before Pumping: 17.23

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
10.76 feet x	(0.16)	0.65	1.7	10	17.2

Depth Purging From: ____ feet: Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity X1000	T	Notes
3:14	3.5	7.74	2.38	63.2	LT BROWN /SILTY (mud)
3:22	7	7.58	1.55	64.9	" "
3:28	10.5	7.45	1.59	63.2	" "
3:32	14	7.34	1.48	64.9	" "
3:39	17.5	7.20	1.30	65.3	" "

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 17.5

Time Sample Collection Begins: _____

Time Sample Collection Ends: _____

Total Gallons Purged: 17.5

Comments: _____

ALTON GEOSCIENCE, Inc.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/6/91

Well: MW-10 Sampling Team: Dennie Burel
Baeler

Well Development Method: _____

Sampling Method: _____

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 34.04 feet Time: _____ Water level Before Pumping: 18.19

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
15.85 feet x	(0.16)	0.65	2.5	10	25

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity (X1000)	T	Notes
2:26	5	7.28	1.23	59.7	CT BOWN/ SILTY
2:33	10	7.47	1.11	62.7	" "
2:41	15	7.17	1.11	58.9	" "
2:49	20	6.90	1.09	60.3	" "
2:55	25	6.92	1.03	61.2	" "

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 25

Time Sample Collection Begins: _____

Time Sample Collection Ends: _____

Total Gallons Purged: 25

Comments: _____

ALTON GEOSCIENCE, INC
1170 Burnett Ave., Ste. S
Concord, CA 94520

JOB NUMBER 30-081-01 TECHNICIAN Donnie Burel

JOB LOCATION OAKIAND DATE 3/7/91

PUMPOUT ☐ YES ☐ NO	DATE OF LAST PUMPOUT:			WEATHER: SUNNY TIME:		COMMENTS (Notes, conditions, etc.)
	HOLD	CUT	LEVEL			
WELL #	DEPTH TO WATER	DEPTH TO PRODUCT	PROD. THICKNESS (FT)	TOTAL DEPTH	DEPTH TO PUMP	
mw-3	17.40			34.33		
mw-4	20.12			38.52		
mw-5	16.60			31.30		
? mw-6						
mw-7	19.04			34.30		
mw-8	16.72			38.80		
mw-9	16.79			29.00		
mw-10	19.09			34.01		
mw-2	17.88			37.19		
mw-1	20.59			44.10		
RW-1	17.62			38.40		
						* MW-6 CAR OVER WELL CAN NOT SAMPLE
						* MW-1 HAS SOME GAS SMELL IN IT AND THE TAP HAD SOME F.P ON IT
						* RW-1 HAS SOME BLACK OIL IN IT AND A GAS SMELL
						* MW-2 HAS F.P A SMALL SHEEN AT THE TOP OF BAILER

ALTON GEOSCIENCE, Inc.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/2/91

Well: mw-1 Sampling Team: Donnie Durel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 44.10 feet Time: ____ Water level Before Pumping: 20.59

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
23.51 feet x	(0.16)	0.65	3.7	3	11

Depth Purging From: ____ feet. Time Purging Begins: ____

Notes on Initial Discharge: ____

Time	Volume	pH	Conductivity	T	Notes
____	2.2	____	____	____	____
____	4.4	____	____	____	____
____	6.6	____	____	____	____
____	8.8	____	____	____	____
____	11	____	____	____	____

Time Field Parameter Measurement Begins: ____

	Rep #1	Rep #2	Rep #3	Rep #4
pH	____	____	____	____
Conductivity	____	____	____	____
Temperature (F)	____	____	____	____

Presample Collection Gallons Purged: ____

Time Sample Collection Begins: ____

Time Sample Collection Ends: ____

Total Gallons Purged: ____

FREE PRODUCT I DID NOT SAMPLE

ALTON GEOSCIENCE, Inc.
Well Development and
Water Sampling Field Survey

Project #: 30-08101 Site: B-1 Date: 3/2/91

Well: mw-2 Sampling Team: Donnie Burel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 34.19 feet Time: ____ Water level Before Pumping: 19.19

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
15.01 feet x	(0.16)	0.65	2.4	3	7

Depth Purging From: ____ feet. Time Purging Begins: ____

Notes on Initial Discharge: ____

Time	Volume	pH	Conductivity	T	Notes
____	1.4	____	____	____	____
____	2.8	____	____	____	____
____	4.2	____	____	____	____
____	5.6	____	____	____	____
____	7	____	____	____	____

Time Field Parameter Measurement Begins: ____

	Rep #1	Rep #2	Rep #3	Rep #4
pH	____	____	____	____
Conductivity	____	____	____	____
Temperature (F)	____	____	____	____

Presample Collection Gallons Purged: ____

Time Sample Collection Begins: ____

Time Sample Collection Ends: ____

Total Gallons Purged: ____

PRODUCT (DID NOT SAMPLE

ALTON GEOSCIENCE, Inc.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 mw-3 Site: B-P Date: 3/7/91

Well: MW-3 Sampling Team: Donnie Burrel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 34.33 feet Time: _____ Water level Before Pumping: 17.40

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
16.93 feet x	(0.16)	0.65	2.7	3	8

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity X100	T	Notes
2:07	1.6	7.55	10.34	71.9	CLEAR
2:08	3.2	7.42	9.40	70.3	" "
2:09	4.8	7.35	9.05	69.3	" "
2:11	6.4	7.25	7.82	68.3	" "
2:12	8	6.35	7.15	68.6	" "

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 8

Time Sample Collection Begins: 3:32

Time Sample Collection Ends: 3:35

Total Gallons Purged: 85

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/7/91

Well: MW-4 Sampling Team: Donnie Borel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinsed

Well Development/ Well Sampling Data

Total Well Depth: 39.52 feet Time: ____ Water level Before Pumping: 20.72

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
17.8 feet x	(0.16)	0.65	2.8	3	8.5

Depth Purging From: ____ feet. Time Purging Begins: ____

Notes on Initial Discharge: ____

Time	Volume	pH	Conductivity X100	T	Notes
2:46	1.7	8.19	6.29	67.2	LT. Brown
2:48	3.4	7.86	6.06	69.3	" "
2:49	5.1	7.82	6.23	69.1	
2:50	6.9	7.63	5.60	68.5	
2:52	8.5	7.48	6.21	68.8	

Time Field Parameter Measurement Begins: ____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 8.5

Time Sample Collection Begins: 3:42

Time Sample Collection Ends: 3:45

Total Gallons Purged: 9

Remarks: ____

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/7/91

Well: MW-5 Sampling Team: Donnie Burel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 31.30 feet Time: ____ Water level Before Pumping: 16.60

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
14.7 feet x	(0.16)	0.65	2.3	3	7

Depth Purging From: ____ feet. Time Purging Begins: ____

Notes on Initial Discharge: ____

Time	Volume	pH	Conductivity X1000	T	Notes
12:18	1.4	7.08	1.54	69.9	LT BROWN / SLIT
12:19	2.8	7.04	1.18	67.8	" "
12:20	4.2	7.00	1.12	66.9	" "
12:24	5.6	7.21	1.05	66.1	" "
12:25	7	7.20	1.01	66.3	" "

Time Field Parameter Measurement Begins: ____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 7

Time Sample Collection Begins: 3:00

Time Sample Collection Ends: 3:10

Total Gallons Purged: 7.5

Comments: ____

ALTON GEOSCIENCE, Inc.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/7/91

Well: mw-6 Sampling Team: Dennie Burel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: ____ feet Time: ____ Water level Before Pumping: ____

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
____ feet x	0.16	0.65	____	____	____

Depth Purging From: ____ feet. Time Purging Begins: ____

Notes on Initial Discharge: ____

Time	Volume	pH	Conductivity	T	Notes
____	____	____	____	____	____
____	____	____	____	____	____
____	____	____	____	____	____
____	____	____	____	____	____
____	____	____	____	____	____
____	____	____	____	____	____

Time Field Parameter Measurement Begins: ____

	Rep #1	Rep #2	Rep #3	Rep #4
pH	____	____	____	____
Conductivity	____	____	____	____
Temperature (F)	____	____	____	____

Presample Collection Gallons Purged: ____

Time Sample Collection Begins: ____

Time Sample Collection Ends: ____

Total Gallons Purged: ____

CAP IS OVER WELL CAN NOT SAMPLE

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/7/91

Well: mw-7 Sampling Team: Dennis Burel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 34.30 feet Time: _____ Water level Before Pumping: 19.04

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
15.26 feet x	(0.16)	0.65	2.4	3	7

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity X100	T	Notes
1:06	1.4	7.37	10.36	70.5	CLEAR
1:08	2.8	7.34	9.76	68.8	" "
1:11	4.2	7.35	9.99	67.5	
1:12	5.6	7.46	10.26	67.6	
1:14	7	7.31	9.91	67.9	

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 7

Time Sample Collection Begins: 3:20

Time Sample Collection Ends: 3:25

Total Gallons Purged: 7.5

Comments: _____

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: BP Date: 3/7/91

Well: mw-8 Sampling Team: Donnie Burel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 38.80 feet Time: ____ Water level Before Pumping: 16.72

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
22.08 feet x	(0.16)	0.65	3.5	3	10.5

Depth Purging From: ____ feet. Time Purging Begins: ____

Notes on Initial Discharge: ____

Time	Volume	pH	Conductivity X100	T	Notes
1:40	2.1	7.45	17.71	71.5	LT Brown /SILTS
1:42	4.2	7.29	12.80	68.9	" "
1:45	6.3	7.25	12.45	67.2	" "
1:48	8.4	7.25	11.43	66.1	" "
1:50	10.5	7.15	11.31	66.5	

Time Field Parameter Measurement Begins: ____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 10.5

Time Sample Collection Begins: 3:25

Time Sample Collection Ends: 3:30

Total Gallons Purged: 11

Comments: ____

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/7/91

Well: MW-9 Sampling Team: Donnie Burch

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinsed

Well Development/ Well Sampling Data

Total Well Depth: 29.00 feet Time: ____ Water level Before Pumping: 16.79

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
12.21 feet x	0.16	0.65	1.9	3	6

Depth Purging From: ____ feet. Time Purging Begins: ____

Notes on Initial Discharge: ____

Time	Volume	pH	Conductivity (x100)	T	Notes
2:26	1.2	7.45	12.95	68.3	LT Brown / Silty
2:28	2.4	7.43	10.82	69.2	" "
2:29	3.6	7.36	10.36	68.9	" "
2:30	4.8	7.36	10.26	67.6	
2:31	6	7.32	10.02	67.9	

Time Field Parameter Measurement Begins: ____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 6

Time Sample Collection Begins: 3:37

Time Sample Collection Ends: 3:40

Total Gallons Purged: 6.5

Comments: ____

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/7/91

Well: MW-10 Sampling Team: Donnie Burch

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 34.01 feet Time: _____ Water level Before Pumping: 18.09

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
15.92 feet x	(0.16)	0.65	2.5	3	8.

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity X100	T	Notes
12:40	1.6	7.86	7.23	69.5	LT BROWN/SILTY
12:42	3.2	7.56	7.71	68.0	
12:43	4.8	7.48	7.62	67.0	
12:45	6.4	7.37	7.09	66.3	
12:47	8	7.34	6.99	66.0	

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 8

Time Sample Collection Begins: 3:15

Time Sample Collection Ends: 3:20

Total Gallons Purged: 8.5

Comments: _____

ALTON GEOSCIENCE, Inc.
Well Development and
Water Sampling Field Survey

Project #30-081-01 Site: B-8 Date: 3/7/91

Well: RW-1 Sampling Team: Donnie Burel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Bung

Well Development/ Well Sampling Data

Total Well Depth: 38.40 feet Time: _____ Water level Before Pumping: 17.62

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
_____ feet x	0.16	0.65	_____	_____	_____

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity	T	Notes

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: _____

Time Sample Collection Begins: _____

Time Sample Collection Ends: _____

Total Gallons Purged: _____

ALTON GEOSCIENCE, INC
1170 Burnett Ave., Ste. S
Concord, CA 94520

JOB NUMBER 30-081-01 TECHNICIAN AWWAD & TAYLOR

JOB LOCATION Oakland 35TH AVE DATE 4-5-91

PUMPOUT ☐ YES ☐ NO	DATE OF LAST PUMPOUT:			WEATHER: TIME:		COMMENTS (Notes, conditions, etc.)
	HOLD	CUT	LEVEL			
WELL #	DEPTH TO WATER	DEPTH TO PRODUCT	PROD. THICKNESS (FT)	TOTAL DEPTH	DEPTH TO PUMP	
MW-1	17.18					
MW-2	15.64					
MW-3	14.06					
MW-4	18.28					
MW-5	12.62					
MW-6	No Access					
MW-7	17.82					
MW-8	12.98					
MW-9	13.42					
MW-10	14.32					Floating Product
RW-1	—					

SURVEY DATA

DATE: 4-5-91

SURVEY BY: AWWAD & TAYLOR

PROJECT NUMBER: 30-081-01

ADDRESS: 3201 35TH AVENUE
Oakland, CA

ELEVATION REFERENCE DESCRIPTION: MW-2 (168.14')

REFERENCE SOURCE: B.M. : MW-2 = 168.14 ft above Mean Sea Level

STA.	(+) B.S.	H.I.	(-) F.S.	ELEV.
MW-2				168.14
	4.54	172.68		
MW-9			6.48	166.20
MW-8			6.94	165.74
MW-10			5.67	167.01

NOTES:

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: BP Date: 3/7/91

Well: mw-8 Sampling Team: Ronnie Borel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 38.80 feet Time: ____ Water level Before Pumping: 16.72

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
22.06 feet x	(0.16)	0.65	3.5	3	10.5

Depth Purging From: ____ feet. Time Purging Begins: ____

Notes on Initial Discharge: ____

Time	Volume	pH	Conductivity X100	T	Notes
1:40	2.1	7.45	17.71	71.5	LT Brown /SILTS
1:42	4.2	7.29	12.80	68.9	" "
1:45	6.3	7.25	12.45	67.2	" "
1:48	8.4	7.25	11.43	66.1	" "
1:50	10.5	7.19	11.31	66.5	

Time Field Parameter Measurement Begins: ____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 10.5

Time Sample Collection Begins: 3:25

Time Sample Collection Ends: 3:30

Total Gallons Purged: 11

Comments: ____

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/7/91

Well: MW-9 Sampling Team: Donnie Burch

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinsed

Well Development/ Well Sampling Data

Total Well Depth: 29.00 feet Time: _____ Water level Before Pumping: 16.79

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
12.21 feet x	(0.16)	0.65	1.9	3	6

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity (x100)	T	Notes
2:26	1.2	7.45	12.95	68.3	LT BROWN / SILTY
2:28	2.4	7.43	10.82	69.2	" "
2:29	3.6	7.36	10.36	68.9	" "
2:30	4.8	7.36	10.26	67.6	
2:31	6	7.32	10.02	67.9	

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 6

Time Sample Collection Begins: 3:37

Time Sample Collection Ends: 3:40

Total Gallons Purged: 6.5

Comments: _____

ALTON GEOSCIENCE, INC.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-P Date: 3/7/91

Well: MW-10 Sampling Team: Donnie Burch

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Rinse

Well Development/ Well Sampling Data

Total Well Depth: 34.01 feet Time: _____ Water level Before Pumping: 18.09

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
15.92 feet x	(0.16)	0.65	2.5	3	8.

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity (X100)	T	Notes
12:40	1.6	7.86	7.23	69.5	LT BROWN/SILTY
12:42	3.2	7.56	7.71	68.0	" "
12:43	4.8	7.48	7.62	67.0	
12:45	6.4	7.37	7.09	66.3	
12:47	8	7.34	6.99	66.0	

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: 8

Time Sample Collection Begins: 3:15

Time Sample Collection Ends: 3:20

Total Gallons Purged: 8.5

Comments: _____

ALTON GEOSCIENCE, Inc.
Well Development and
Water Sampling Field Survey

Project # 30-081-01 Site: B-8 Date: 3/7/91

Well: RW-1 Sampling Team: Donnie Borel

Well Development Method: Pump

Sampling Method: Bailer

Describe Equipment Before Sampling This Well: Triple Bung

Well Development/ Well Sampling Data

Total Well Depth: 38.40 feet Time: _____ Water level Before Pumping: 17.62

Water Column	Casing Diameter 2-inch	4-inch	Volume	Factor	Volume to Purge
_____ feet x	0.16	0.65	_____	_____	_____

Depth Purging From: ____ feet. Time Purging Begins: _____

Notes on Initial Discharge: _____

Time	Volume	pH	Conductivity	T	Notes

Time Field Parameter Measurement Begins: _____

	Rep #1	Rep #2	Rep #3	Rep #4
pH				
Conductivity				
Temperature (F)				

Presample Collection Gallons Purged: _____

Time Sample Collection Begins: _____

Time Sample Collection Ends: _____

Total Gallons Purged: _____

ALTON GEOSCIENCE, INC
1170 Burnett Ave., Ste. S
Concord, CA 94520

JOB NUMBER 30-081-01 TECHNICIAN AWWAD & TAYlor

JOB LOCATION Oakland 35TH AVE DATE 4-5-91

PUMPOUT ☐ YES ☐ NO	DATE OF LAST PUMPOUT:			WEATHER: TIME:		COMMENTS (Notes, conditions, etc.)
	HOLD	CUT	LEVEL			
WELL #	DEPTH TO WATER	DEPTH TO PRODUCT	PROD. THICKNESS (FT)	TOTAL DEPTH	DEPTH TO PUMP	
MW-1	17.18					
MW-2	15.64					
MW-3	14.06					
MW-4	18.28					
MW-5	12.62					
MW-6	No Access					
MW-7	17.82					
MW-8	12.98					
MW-9	13.42					
MW-10	14.32					Floating Product
RW-1	—					

SURVEY DATA

DATE: 4-5-91

SURVEY BY: AWWAD & TAYLOR

PROJECT NUMBER: 30-081-01

ADDRESS: 3201 35TH AVENUE
Oakland, CA

ELEVATION REFERENCE DESCRIPTION: MW-2 (168.14')

REFERENCE SOURCE: B.M. : MW-2 = 168.14 ft
above Mean Sea Level

STA.	(+) B.S.	H.I.	(-) F.S.	ELEV.
MW-2				168.14
	4.54	172.68		
MW-9			6.48	166.20
MW-8			6.94	165.74
MW-10			5.67	167.01

NOTES:

APPENDIX E

ANALYTICAL METHODS, OFFICIAL LABORATORY REPORTS AND CHAIN OF CUSTODY RECORDS

APPENDIX E

ANALYTICAL METHODS, OFFICIAL LABORATORY REPORTS, AND CHAIN OF CUSTODY RECORDS

This appendix includes copies of the official laboratory reports and chain of custody records for soil and ground water samples selected for laboratory analysis.

Chain of custody protocol was followed for all samples. The chain of custody forms accompanies the samples from the sampling locality to the laboratory, providing a continuous record of possession prior to actual analysis.

SUPERIOR ANALYTICAL LABORATORIES, INC.
825 ARNOLD, STE. 114 • MARTINEZ, CALIFORNIA 94553 • (415) 229-1512
DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 82571
CLIENT: Alton Geoscience
CLIENT JOB NO.: 30-081-01

DATE RECEIVED: 03/04/91
DATE REPORTED: 03/11/91

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/Kg) Benzene	Toluene	Ethyl Benzene	Xylenes
1	SB-8-10.5-11	ND<3	4	ND<3	ND<3
2	SB-8-20.5-21	1800	16000	6700	37000
3	SB-8-25.5-26	13	28	9.0	50
4	SB-9-10.5-11	ND<3	4	ND<3	6
5	SB-9-20.5-21	1700	7100	1700	11000
6	SB-9-25.5-26	470	3900	1600	12000
7	SB-10-10.5-11	ND<3	7	ND<3	17
8	SB-10-20.5-11	490	3300	1300	6900
9	SB-10-25.5-26	410	9	7	19

ug/Kg - parts per billion (ppb)

Method Detection Limit in Soil: 3 ug/Kg

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery =93%: Duplicate RPD = <4

Richard Srna, Ph.D.

Laboratory Manager

OUTSTANDING QUALITY AND SERVICE

MAR 15 1991

SUPERIOR ANALYTICAL LABORATORIES, INC.
825 ARNOLD, STE. 114 • MARTINEZ, CALIFORNIA 94553 • (415) 229-1512
DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 82571
CLIENT: Alton Geoscience
CLIENT JOB NO.: 30-081-01

DATE RECEIVED: 03/04/91
DATE REPORTED: 03/11/91

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 5030 and 8015

LAB #	Sample Identification	Concentration (mg/Kg) Gasoline Range
1	SB-8-10.5-11	ND<1
2	SB-8-20.5-21	390
3	SB-8-25.5-26	ND<1
4	SB-9-10.5-11	ND<1
5	SB-9-20.5-21	120
6	SB-9-25.5-26	130
7	SB-10-10.5-11	ND<1
8	SB-10-20.5-11	73
9	SB-10-25.5-26	1

mg/kg - parts per million (ppm)

Method Detection Limit for Gasoline in Soil: 1 mg/Kg

QAQC Summary:

Daily Standard run at 2mg/L: RPD Gasoline = <15
MS/MSD Average Recovery =94%: Duplicate RPD = 0

Richard Srna, Ph.D.
Laboratory Manager

OUTSTANDING QUALITY AND SERVICE

MAR 15 '991

SUPERIOR ANALYTICAL LABORATORIES, INC.
825 ARNOLD, STE. 114 • MARTINEZ, CALIFORNIA 94553 • (415) 229-1512
DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 82613
CLIENT: Alton Geoscience
CLIENT JOB NO.: 30-081-01

DATE RECEIVED: 03/08/91
DATE REPORTED: 03/15/91

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 5030 and 8015

LAB #	Sample Identification	Concentration (mg/L) Gasoline Range
1	MW-5	ND<0.05
2	MW-10	1.6
3	MW-7	ND<0.05
4	MW-8	2.7
5	MW-3	0.4
6	MW-9	7.1
7	MW-4	ND<0.05

mg/L - parts per million (ppm)

Method Detection Limit for Gasoline in Water: 0.05 mg/L

QAQC Summary:

Daily Standard run at 2mg/L: RPD Gasoline = <15
MS/MSD Average Recovery = 92%: Duplicate RPD = 3%

Richard Srna, Ph.D.

Laboratory Manager

MAR 2 0 1991

OUTSTANDING QUALITY AND SERVICE

SUPERIOR ANALYTICAL LABORATORIES, INC.
825 ARNOLD, STE. 114 • MARTINEZ, CALIFORNIA 94553 • (415) 229-1512
DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 82613
CLIENT: Alton Geoscience
CLIENT JOB NO.: 30-081-01

DATE RECEIVED: 03/08/91
DATE REPORTED: 03/15/91

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/L) Benzene	Toluene	Ethyl Benzene	Xylenes
1	MW-5	17	0.9	0.7	1.6
2	MW-10	120	190	32	230
3	MW-7	ND<0.3	0.4	0.3	2.4
4	MW-8	780	450	64	310
5	MW-3	69	22	6.1	57
6	MW-9	220	4	2.4	2400
7	MW-4	2.2	3.8	1.5	2.8

ug/L - parts per billion (ppb)

Method Detection Limit in Water: 0.3 ug/L

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 88%: Duplicate RPD = <1%

Richard Srna, Ph.D.

Laboratory Manager

MAR 20 1991

OUTSTANDING QUALITY AND SERVICE

ALTON GEOSCIENCE
1000 BURNETT ST., #140
CONCORD, CA 94520 (415) 682-1582

CHAIN of CUSTODY RECORD

PAGE 1 of 1

DATE: 3/7/91

RESULTS DUE BY:

PROJECT NUMBER: 30-091-01

PROJECT NAME AND ADDRESS: 3201 35th Ave OAKLAND, CA

PROJECT MANAGER: MATT HOPWOOD

SAMPLER'S SIGNATURE:

LABORATORY: SUPERIOR

REMARKS OR SPECIAL INSTRUCTIONS:

NOTE: PLEASE INDICATE VERBAL REQUESTS FOR ADDITIONAL ANALYSES IN THIS BOX.

SAMPLE NUMBER	SAMPLE DATE/TIME	LOCATION/ DESCRIPTION	SAMPLE MATERIAL	SAMPLE TYPE: GRAB	SAMPLE TYPE: COMP.	NUMBER OF CONTAINERS	SAMPLE PREP. 3510: SOLV. EXTR.	SAMPLE PREP. 3810: HEAD SPACE	SAMPLE PREP. 5030: PURGE & TRAP	SOIL ANALYSIS 418.1: TPHC (IR)	SOIL ANALYSIS 8010: HALOCARBONS	SOIL ANALYSIS 8020: BTXE	SOIL ANALYSIS DHS METHOD: TPHC (GC)	SOIL ANALYSIS 7420: TOTAL Pb	WATER ANALYSIS 418.1: TPHC (IR)	WATER ANALYSIS 601: HALOCARBONS	WATER ANALYSIS 602: BTXE	WATER ANALYSIS DHS METHOD: TPHC (GC)	WATER ANALYSIS 7421: TOTAL Pb
MW-5	3/7/91 3:10		WATER	X		3											X		X
MW-10	3/7/91 3:20					3													
MW-7	3/7/91 3:25					3													
MW-8	3/7/91 3:30					3													
MW-3	3/7/91 3:35					3													
MW-9	3/7/91 3:40					3													
MW-4	3/7/91 3:45					3													
				TOTAL NO. OF CONTAINERS:		21													

Please initial
Samples stored on ice.
Appropriate containers
Samples preserved
VOA's without headspace
Comments:

MAR 20 1991

RELINQUISHED BY:	RECEIVED BY: Express-IT	DATE/TIME: 3-8-91 12:30	METHOD OF SHIPMENT:
RELINQUISHED BY: Express-IT	RECEIVED BY:	DATE/TIME:	SHIPPED BY:
RELINQUISHED BY:	RECEIVED BY:	DATE/TIME: 3/8/91 1100	COURIER:

APPENDIX F

PUMP TEST DATA

AQUIFER TESTING AND ANALYSIS

The analysis of aquifer characteristics for the purpose of estimating the fate and transport characteristics of contaminants in ground water involves several steps. The first step is the exploratory stage, using surface and subsurface geological and geophysical techniques to define the water-bearing formation. Next is the evaluation stage to determine the hydrogeologic parameters and physical characteristics of the aquifer necessary for the proper design and construction of recovery or extraction wells, and for the control of contaminant migration. The last step is the confirmation stage to optimize the design and operation of each well for the management and remediation of ground water.

Literature Review and Basis of Analysis

The hydraulic properties of aquifers and unsaturated soil materials that define the rate of water movement into, through, and out of subsurface materials, and its effect on the piezometric surfaces or water tables, are hydraulic conductivity (K), transmissivity (T), and the storage coefficient (S) or specific yield for unconfined aquifer.

Hydraulic conductivity is defined as the rate at which water moves through a porous media under a unit hydraulic gradient. It is primarily dependent upon the porosity and permeability of the soil and the density and viscosity of the water. However, not all water occupying pore spaces in a saturated aquifer will be readily move through the aquifer. One measure of the water-yielding ability of an aquifer is the storage coefficient (S). The storage coefficient of an aquifer is defined as the volume of water produced per unit horizontal area by a unit drop in the water table level (unconfined aquifers) or the piezometric surface (confined aquifers). Another term indicative of the water yielding capacity of an aquifer is its transmissivity or transmissibility. The transmissivity of an aquifer is the product of the hydraulic conductivity (K) in feet/day and the saturated thickness (b) in feet, or :

$$T = Kb$$

The movement or yielding capabilities of the water-bearing formation is important to understand aquifer characteristics. It is necessary to obtain values for one or more of the aquifer properties to determine these parameters. Various techniques have been developed for obtaining values for these properties or parameters.

The pumping test technique is generally used to evaluate the hydraulic properties of aquifers. The results of this test

are used to predict well yields, position of water tables and piezometric surfaces, and recharge rates of aquifers. Other techniques, such as the auger-hole and slug test methods (rate-of-rise or rate-of-fall techniques), have been developed to measure the localized hydraulic conductivity (K) of the soil profile in shallow ground water.

Pumped-Well Technique or Pumping Test

With the pumped-well technique, often called pumping test, hydraulic properties of the aquifer are calculated by pumping a well at a constant rate and observing the drawdown of the piezometric surfaces or water table in observation wells at some distance from the pumped well. Two types of tests are used; the steady-state and the non-steady or transient-state test. With the steady-state test, pumping is conducted for a sufficient period of time for the water levels in the observation wells to approach equilibrium. The equilibrium drawdown then enables the calculation of transmissivity (T). With the transient pumping tests, the change in water level in the observation wells is measured in relation to time to calculate the properties T and S.

Due to time constraints transient-state pumping tests are more commonly used than steady-state tests. Certain assumptions have to be made in calculating T and S from the pumping-test data, such as whether the aquifer is homogeneous or isotropic. In this study, only the transient-state method was used. A Theis curve matching procedure was used to evaluate T and S.

The transient flow differential equation developed by Theis is:

$$s = Q\,W(u)/(4\,T)$$

where: s = Drawdown of piezometric surface
Q = Pumping rate

$$W(u) = \text{Well function} = \int_{Y}^{\infty} \frac{e^{-y}}{y}\,dy$$

and:

$$u = r^2\,S/(4Tt)$$

where: r = Distance between the pumping and observation wells
t = time

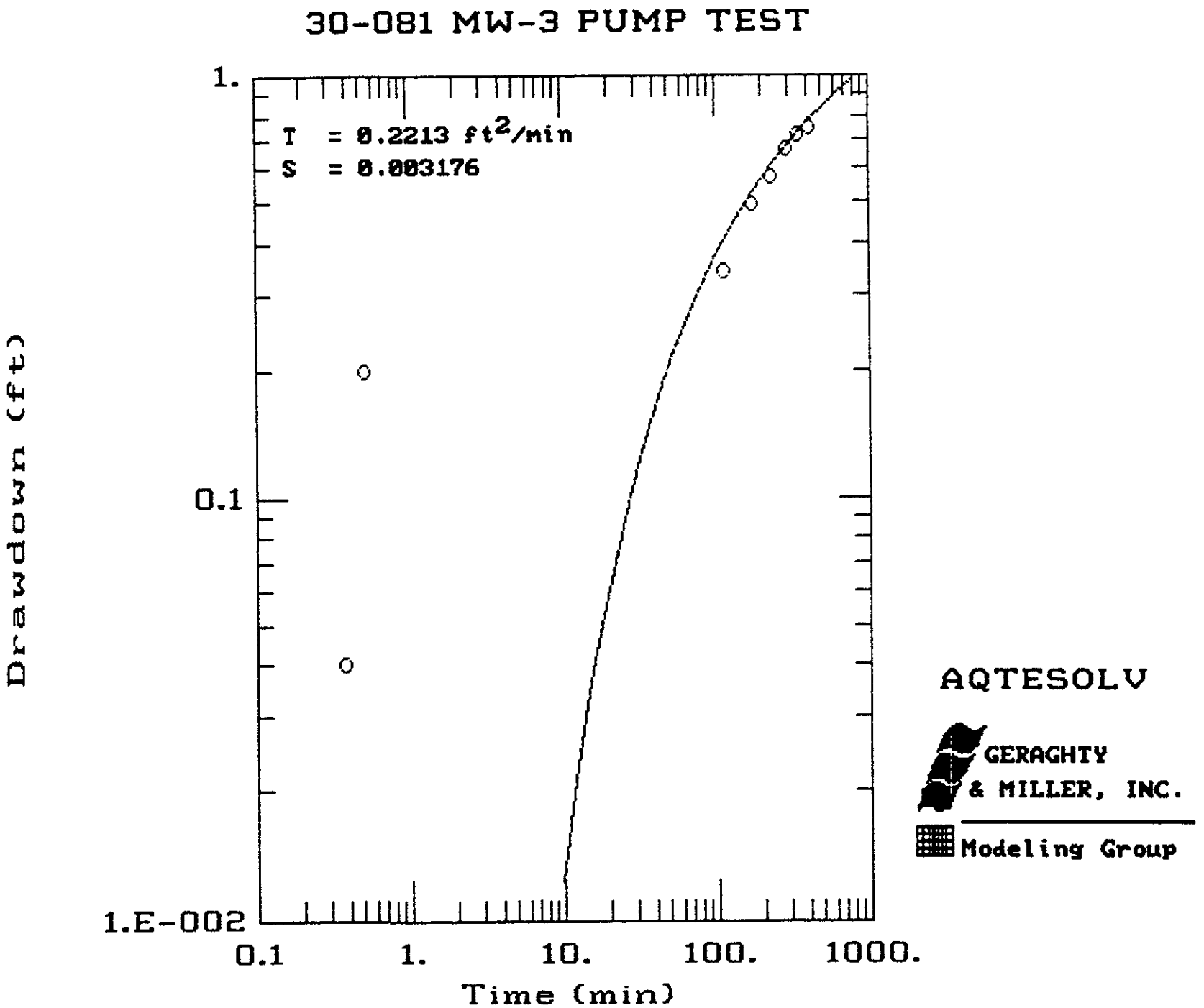
Rearranging and taking logarithms of both equations yields:

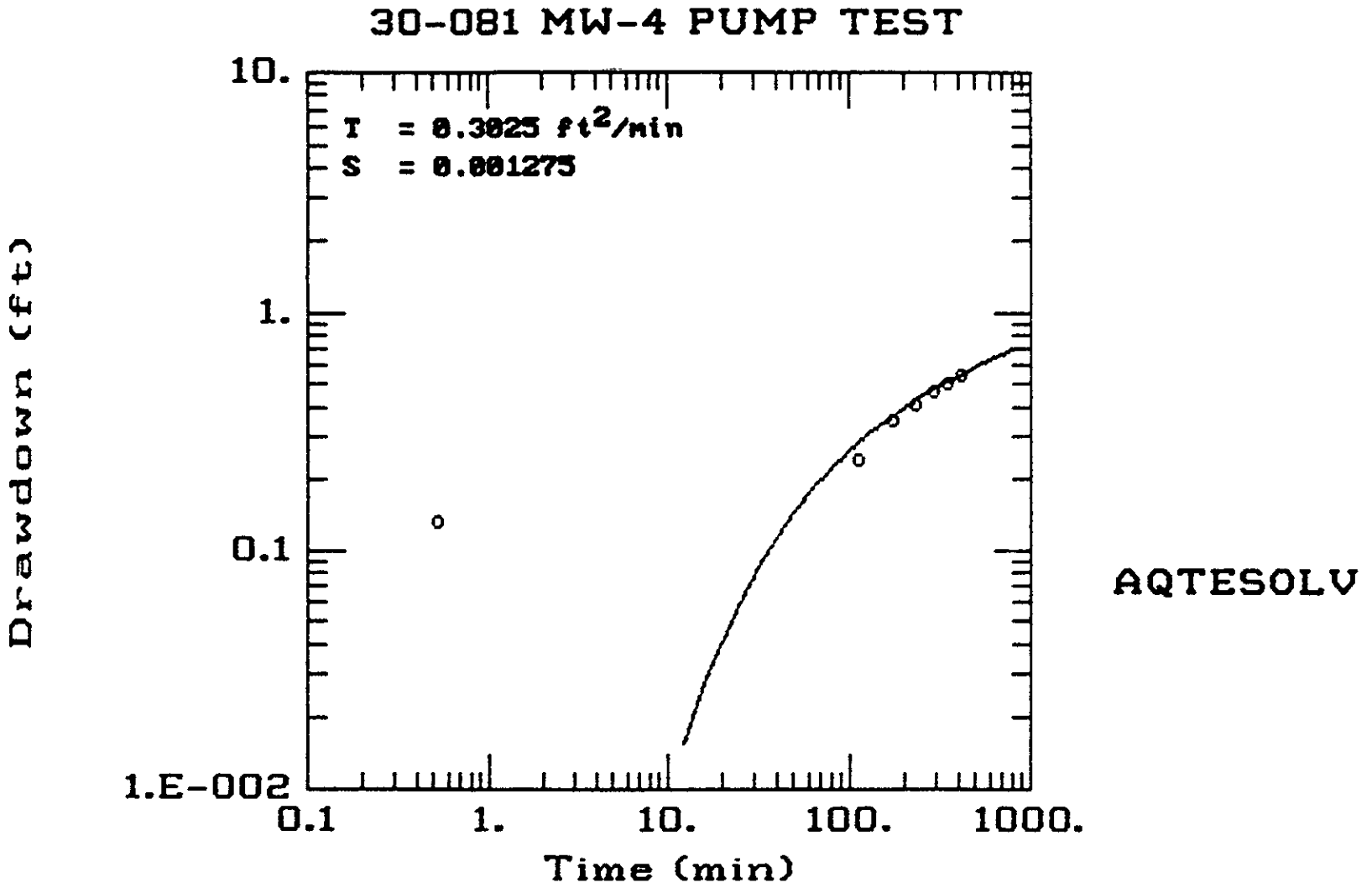
$$\log (s) = \log (Q/4\ T) + \log W(u)$$

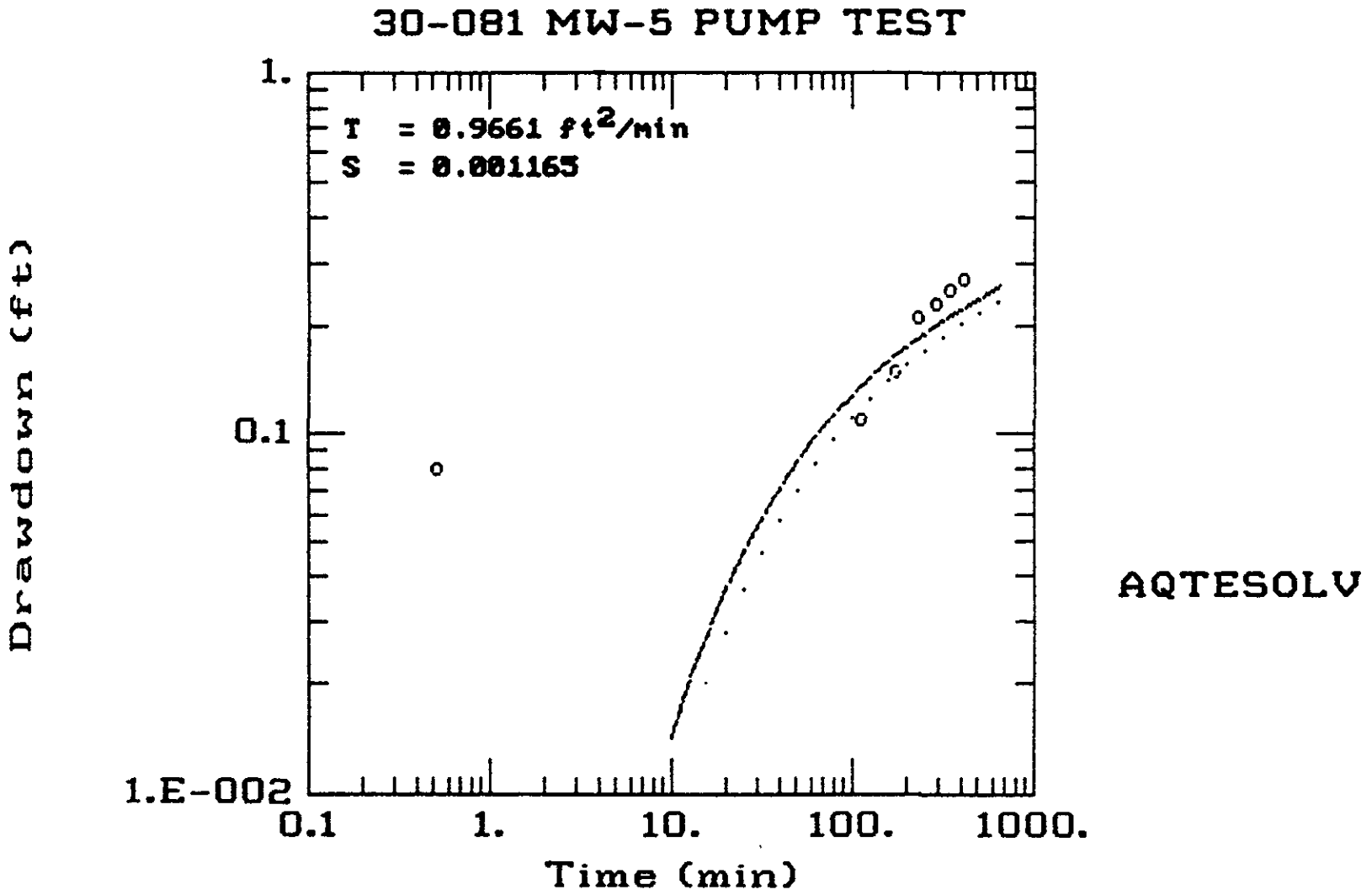
and:

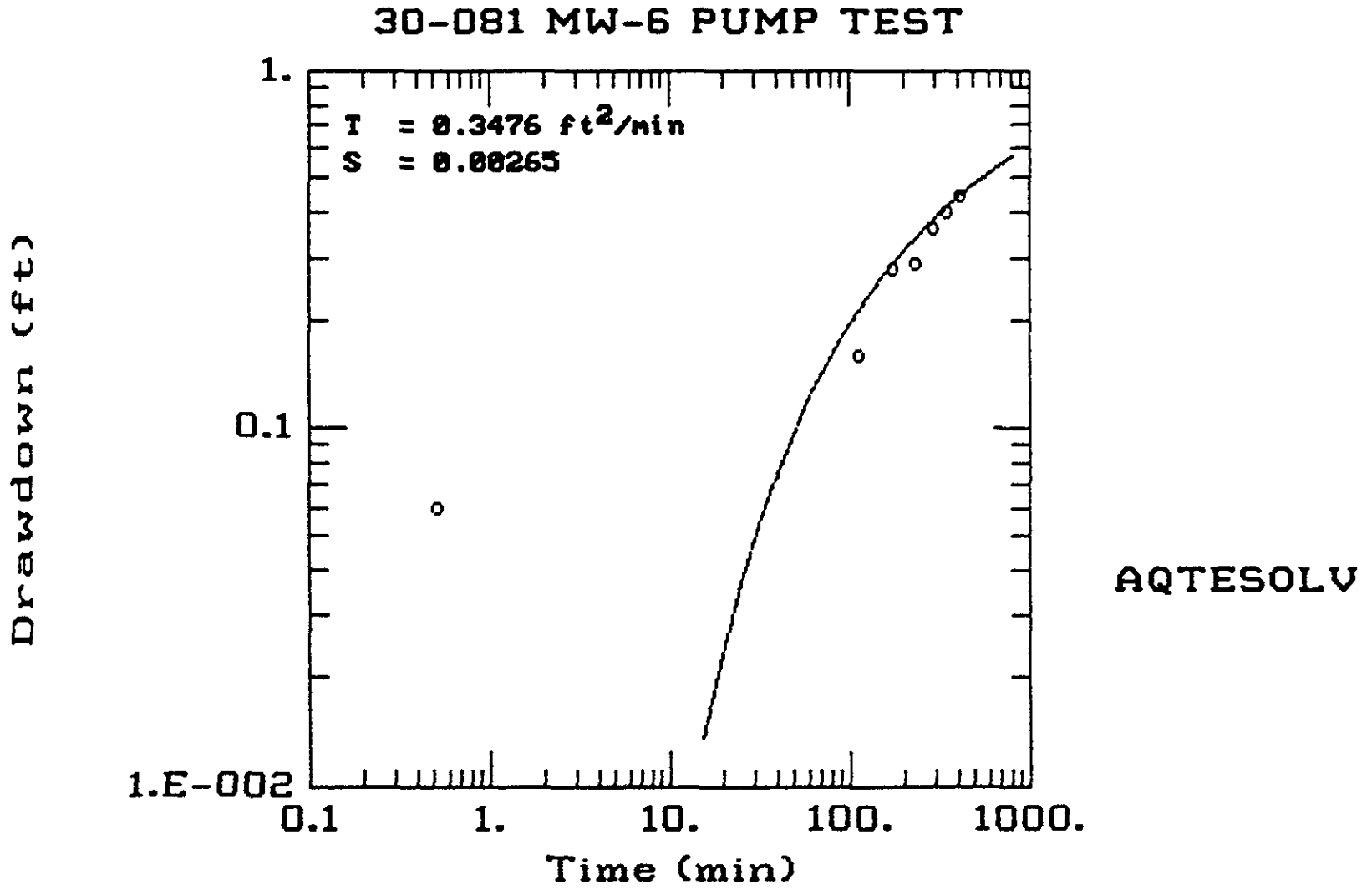
$$\log r^2/t = \log (4T/S) + \log (u)$$

Given the above relationships, a logarithmic plot of s versus $r^{2/t}$ and a log-log plot of W(u) versus u will be similar. A match point is determined by superimposing these two plots. Using the four coordinates of the match point and the above equations, the transmissivity (T) and storage coefficient (S) of the aquifer can then be determined.


30-081 MW-3 PUMP TEST
T = 0.2213 ft²/min
S = 0.003176
Drawdown (ft)
1.
0.1
1.E-002
0.1
1.
10.
100.
1000.
Time (min)
AQTESOLV
GERAGHTY
& MILLER, INC.
Modeling Group


30-081 MW-4 PUMP TEST
T = 0.3023 ft²/min
S = 0.001275
10.
1.
0.1
1.E-002
0.1
1.
10.
100.
1000.
Drawdown (ft)
Time (min)
AQTESOLV


30-081 MW-5 PUMP TEST
T = 0.9661 ft²/min
S = 0.001165
1.
0.1
1.E-002
0.1
1.
10.
100.
1000.
Drawdown (ft)
Time (min)
AQTESOLV


30-081 MW-6 PUMP TEST
T = 0.3476 ft²/min
S = 0.00265
1.
0.1
1.E-002
0.1
1.
10.
100.
1000.
Drawdown (ft)
Time (min)
AQTESOLV

PHASE III - SUPPLEMENTAL SITE INVESTIGATION STUDY

BP Oil Service Station No. 11132
3201 35th Avenue
Oakland, California

Project No. 30-081-01

Prepared for:

BP Oil Company
2868 Prospect Park Drive, Suite 360
Rancho Cordova, California

Prepared by:

Alton Geoscience
1000 Burnett Avenue, Suite 140
Concord, California

August 21, 1991

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(continued)

FIGURES

APPENDICES

1.0 INTRODUCTION AND BACKGROUND

BP Oil Company retained Alton Geoscience, Inc. to conduct a Phase III - Supplemental Site Investigation Study related to subsurface contamination at BP Oil Company Service Station No. 11132, 3201 35th Avenue, Oakland, California. The site location is shown in Figure 1, while a site plan is shown in Figure 2.

1.1 Purpose and Scope

This Phase III - Supplemental Site Investigation Study was performed to: (1) address the concerns of the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) and the Alameda County Department of Environmental Health (ACDEH) regarding petroleum hydrocarbon contamination at the site; and (2) determine the extent of hydrocarbon concentrations in the subsurface soil and ground water.

Alton Geoscience supervised and/or performed the following tasks during this investigation:

1. Drilled three soil borings for conversion into offsite ground water monitoring wells.
2. Collected and analyzed soil and ground water samples.
3. Analyzed field data and laboratory results.
4. Prepared this technical report presenting the results, findings, and recommendations of the investigation.

The results of these tasks provide the basis for evaluating the remedial planning and feasibility study.

1.2 Site Description

The site is currently an operating BP Oil service station located on the northeast corner of the intersection of 35th Avenue and Suter Street, Oakland, California. The adjacent properties are residential and commercial developments. The site is located at an elevation of approximately 160 feet above mean sea level. The location and layout of the underground storage tanks are shown in Figure 2, Site Plan.

A sensitive receptors survey was conducted to identify nearby environmental elements and land uses that may be affected by

or affect the subsurface environment at the site. The findings of the survey are as follows:

- The properties adjacent to the site are a mixture of residential and commercial developments. The site is surrounded by residential property except to the south across 35th avenue where a Quik Stop store is located. The Quik Stop has underground gasoline storage tanks but there are no records of any unauthorized release reported.

- A review of RWQCB files indicate that there are three confirmed fuel releases within a 1/2-mile radius of the site. Two of the confirmed releases are upgradient of the site. These release are separated from the site by Highway 580, a topographic low.

- There are no known municipal or private water supply wells within a 1/2-mile radius of the site.

- Peralta Creek is the nearest surface body of water located approximately 500 feet north of the site.

- Allandale School is the nearest school, located approximately 1,000 feet south of the site.

A copy of the sensitive receptors survey is presented in Appendix A.

1.3 Project Background

On July 30, 1986, Kaprealian Engineering, Inc. (KEI) was retained by Mobil Oil Corporation to install three 2-inch-diameter monitoring wells (MW-1, MW-2, and MW-3) at the former Mobil Oil service station. Monitoring and sampling of the wells, performed by KEI, detected concentrations of total petroleum hydrocarbons (TPH) in both MW-1 and MW-2 at concentrations up to 210 parts per million (ppm), (Alton Geoscience 1990).

On January 26 and February 1, 1990, as part of a qualitative shallow ground water survey, Alton Geoscience supervised the drilling of 10 soil borings to various depths, ranging from 25 to 33 feet below grade. The borings were advanced 3 to 4 feet beyond the depth at which ground water was encountered. Following drilling, the borings were converted into temporary wells (TW-1 through TW-10) by inserting clean, 2-inch-diameter, schedule 40 polyvinyl chloride (PVC) casing with 0.020-inch slots. Ground water samples were collected from each temporary well, then the temporary casing was removed from each boring, backfilled with grout slurry and capped with asphalt. Additionally, ground water samples were collected from the three existing monitoring wells.

The sample from Monitoring Well MW-1 contained 0.1 foot of free product and Monitoring Well MW-2 contained 0.05 foot. Samples from the other monitoring and temporary wells contained concentrations of dissolved-phase total petroleum hydrocarbons as gasoline (TPH-G) and benzene, toluene, ethylbenzene and xylenes (BTEX) ranging from nondetectable (ND) to 240,000 parts per billion (ppb), (Alton Geoscience, 1990).

On May 16, 1990, Alton Geoscience supervised the drilling of two soil borings which were converted into one 4-inch-diameter ground water monitoring well (MW-4) and one 6-inch-diameter recovery well (RW-1). On June 25, 1990, Alton Geoscience supervised the drilling of three offsite soil borings which were converted into 2-inch-diameter ground water monitoring wells (MW-5, MW-6, and MW-7).

Laboratory analysis of water samples indicated TPH-G concentrations ranging from nondetectable in Monitoring Wells MW-4, MW-6, and MW-7, to 140 and 280 ppb detected in MW-3 and MW-5, respectively. The laboratory analysis for BTEX in Monitoring Wells MW-4, MW-6, and MW-7 indicated nondetectable concentrations. However, the laboratory analysis indicated 5.3 and 200 ppb of benzene in MW-3 and MW-5, respectively (Alton Geoscience, 1990).

1.4 Regional Geology and Hydrogeology

The site is located approximately 160 feet above mean sea level in Oakland, California (USGS Topographic Map, Oakland East Quadrangle - 7.5 Minute Series) as shown in Figure 1.

The topography of the surrounding area is characterized by rolling hills, gentle slopes, and broad valleys. Undivided Quaternary deposits (QU) form the underling unit in this region. The composition and physical properties of QU vary. The QU unit consists predominantly of Temescal Formation, probably including covered or unrecognized San Antonio Formation and gravel, sand, and clay (Qg), as well as recent alluvium and colluvium, and artificial fill. The site is located in a 580-square-mile basin drained by the Guadalupe River, and Alameda, Coyote, Redwood and San Francisquito Creeks.

The water-bearing material is comprised of younger and older alluvium. Regional surface and ground water flow in the region is to the southwest, towards San Francisco Bay. The nearest surface water drainage is Peralta Creek, about 500 feet north of the site. The water supply of the City of Oakland is obtained from Pardee Dam, which receives water from the Sierra snow melt.

2.0 FIELD METHODS

This investigation included the drilling of three soil borings, as outlined in the drilling and sampling protocol shown in Appendix B. The borings were used to install Monitoring Wells MW-8, MW-9, and MW-10, following the design and installation procedures shown in Appendix B.

2.1 Soil Borings and Sampling

On January 31, 1991, prior to commencement of offsite drilling activities, Ground Water Protection Ordinance Permit No. 91057 was obtained from the Alameda County Flood Control and Water Conservation District. Additionally, on February 15, 1991, Street Excavation Permit Nos. 9100232 and 9100234 were obtained from the City of Oakland Department of Public Works. Copies of the ground water protection ordinance permit and street excavation permits are presented in Appendix D.

On February 25 and 26, 1991, Alton Geoscience supervised the drilling of three offsite soil borings (SB-8, SB-9, and SB-10), which were converted into ground water monitoring wells (MW-8, MW-9, and MW-10). The borings were drilled using an 8-inch-diameter, hollow-stem augers to total depths of approximately 35 to 40 feet below grade, respectively.

During drilling, soil samples were collected from the soil borings at 5-foot intervals below grade and at significant lithologic changes until the first ground water was encountered at a depth of approximately 25 feet below grade in each well.

Drilling activities were performed by Soils Exploration Services, Inc. of Vacaville, California, using a high-torque CME-55 drilling rig. The soil samples were collected using a split-spoon sampler lined with brass tubes. The samples recovered for laboratory analysis were covered with aluminum foil, capped with polyurethane caps, wrapped with clear tape, labeled, and placed immediately in an iced cooler. A description of drilling procedures and soil sampling protocol, and copies of boring logs, are presented in Appendix B.

2.2 Ground Water Monitoring Well Construction

The soil borings were completed as Ground Water Monitoring Wells MW-8, MW-9, and MW-10. The monitoring wells were constructed of clean, 2-inch-diameter, flush-threaded, Schedule 40 PVC blank casing and 0.020-inch, slotted casing to a total depth of approximately 35 to 40 feet below grade. Well installation procedures and construction details are presented in Appendix B.

2.3 Monitoring Well Development and Sampling

Well development and sampling procedures were conducted in accordance with the RWQCB and ACDEH guidelines. A description of Alton Geoscience general field procedures for well development and sampling is presented in Appendix C.

Monitoring wells were developed by removing approximately 47.7 gallons from MW-8, 23.2 gallons from MW-9, and 33 gallons from MW-10. Development of the monitoring wells was conducted on March 6, 1991. Prior to well development, a clear PVC bailer was used in each well to check for the presence of floating product.

Prior to sampling of the wells on March 7, 1991, a minimum of 3 casing volumes of water was purged from each well. Water samples were collected after stabilization of temperature, pH, and conductivity readings in the purged water was observed. Each well was observed for the presence of free product and sheen. The water samples were decanted from a bailer into clean containers. Samples were immediately placed in an iced cooler prior to and during transportation to a California-certified laboratory for analysis following proper chain of custody procedures. Water sampling field survey forms documenting field observations during well development, purging, and sampling are presented in Appendix C. Analytical methods, official laboratory reports and chain of custody records are presented in Appendix E.

2.4 Ground Water Level Monitoring and Surveying

Permanent reference marks at the top of each well casing of Monitoring Wells MW-8, MW-9, and MW-10 were surveyed on April 5, 1991, to the nearest 0.01 foot in reference to Monitoring Well MW-2 which has a top of casing elevation of 168.14 feet above mean sea level. The purpose of the survey was to determine the relative top of casing elevations of the monitoring wells for use in calculating the ground water elevation at each well. The water table elevation data is used to estimate the general direction of ground water flow and average hydraulic gradient beneath the site. The survey data field notes are presented in Appendix D.

Ground water level monitoring and survey data collected on April 5, 1991 is presented in Table 1. A ground water elevation contour map based on interpretation of the monitoring data is shown in Figure 3.

2.5 Aquifer Analysis by Pumping Test

A pumping test was performed at the site on April 25, 1991. The purpose of the test was to estimate aquifer parameters which are used for remedial engineering design.

Prior to initiating the pumping test, transducers were placed in the pumping well (RW-1) and two observation wells (MW-1 and MW-2). An Instrumentation Northwest TERRA 8 data logger was programed to record readings from the transducers every 15 seconds for the first 30 minutes after pumping began, every minute for the next 2 hours, and then every 2 minutes for the duration of the test. Depth to water measurements were taken every hour from MW-3, MW-4, MW-5, and MW-6 using an electronic probe.

A 2-inch diameter, variable flow rate pump was submersed in the well. The water was pumped into 55 gallon drums prior to proper offsite disposal.

The test began at 10:13 a.m. on April 25, 1991. Flow rates were measured using a stopwatch and a 5-gallon bucket marked with 1/4-gallon increments. The flow rate was maintained at 0.9 gallons per minute (GPM) to 1 GPM. Drawdown was observed in MW-1 and MW-2 after 20 minutes of pumping, and in all the monitored wells within an hour of the onset of the test.

After approximately 8 hours of continuous pumping 5.5 feet of drawdown had occurred in the pumping well, and between 0.27 and 1.38 feet of drawdown was recorded in the observation wells. The pump was then turned off and removed from the well. Ground water elevation readings continued after pump removal until ground water levels had recovered to approximately the initial static water level.

3.0 ANALYTICAL METHODS

All laboratory analyses of soil and ground water samples were performed by Superior Analytical Laboratories, Inc., a California-certified analytical laboratory, using standard test methods of the U.S. Environmental Protection Agency (EPA) and the California Department of Health Services (DHS). The laboratory reports and listing of the analytical methods used are presented in Appendix E.

3.1 Soil Analysis

Soil samples from the three borings were analyzed for the following constituents:

- o TPH-G using EPA Methods 5030/8015
- o BTEX constituents using EPA Methods 5030/8020

The results of the laboratory analyses of the soil samples are presented in Table 2; the official laboratory reports and chain of custody records are included in Appendix E.

3.2 Water Analysis

Ground water samples collected from all monitoring wells except MW-1 and MW-2, which exhibited sheen, were analyzed for the following constituents:

- o TPH-G using EPA Methods 5030/8015
- o BTEX constituents using EPA Methods 5030/8020

The results of the laboratory analyses of the ground water samples are presented in Table 3; the official laboratory reports and chain of custody records are included in Appendix E.

4.0 SITE GEOLOGY AND HYDROGEOLOGY

A brief description of the pertinent information on the site geology and hydrogeology is presented below.

4.1 Site Geology

A review of the boring logs generated during this phase, and previous phases, of the investigation indicated that the stratigraphy beneath the site is relatively consistent. Silty clay was the predominant soil type encountered throughout each new boring to a depth of approximately 35 to 40 feet below grade and is generally consistent with the results of previous investigations at the site.

4.2 Site Hydrogeology

As presented in Table 1, the depth to ground water in MW-1 through MW-5 and MW-7 through MW-10, as measured from the top of casing on April 5, 1991, ranged from 12 to 18 feet below grade. The depth to water in MW-6 could not be obtained due to the presence of an abandoned vehicle over the well box. The depth to water was not measured in RW-1 due to the presence of an oily substance on the water surface.

The ground water elevations as measured on April 5, 1991, were used to develop the ground water elevation contour map shown in Figure 3. The data indicates a southeasterly ground water flow direction at the site, with an average hydraulic gradient of approximately 0.003 foot per foot across the site.

5.0 DISCUSSION OF RESULTS

The results of the field activities and laboratory analysis of soil and ground water samples collected during this investigation are presented in Tables 2 and 3, and are discussed below.

5.1 Soil

A total of 21 soil samples was collected, 9 of which were analyzed as part of this site investigation study to assess the extent of subsurface soil contamination. The results are discussed below.

- Laboratory analysis indicates low to nondetectable levels of TPH-G and BTEX constituents detected in soil samples collected from Soil Borings SB-8, SB-9, and SB-10 at the 10.5 to 11.0 foot interval below grade.

- The highest levels of TPH-G in the soil samples were detected at 20.5 to 21.0 feet below grade, with levels ranging from 73 to 390 ppm.

5.2 Ground Water

Results of the field survey and laboratory analysis of the ground water samples collected from the new and existing monitoring wells were used to assess the extent of ground water contamination. The results of the laboratory analysis are discussed below and summarized in Table 3.

- Ground water samples collected from MW-1 and MW-2 exhibited sheen and were not analyzed. Recovery Well RW-1 was not sampled due to the presence of an oily substance on the water surface. Monitoring Well MW-6 was not sampled due to the presence of an abandoned vehicle parked over the monitoring well.

- Laboratory analysis of ground water samples indicated TPH-G concentrations ranging from nondetectable in Monitoring Wells MW-4, MW-5, and MW-7, with concentrations of 400, 1,600, 2,700, and 7,100 ppb detected in ground water samples collected from MW-3, MW-10, MW-8, and MW-9, respectively.

- The laboratory analysis of ground water samples for benzene revealed concentrations ranging from nondetectable in Monitoring Well MW-7 to 780 ppb detected in MW-8.

- The laboratory analysis of ground water samples for toluene revealed concentrations ranging from 0.9 ppb detected in MW-5 to 450 ppb detected in MW-8.

- The laboratory analysis of ground water samples analyzed for ethylbenzene revealed concentrations ranging from 0.7 ppb detected in MW-5 to 64 ppb detected in MW-8.

- The laboratory analysis of ground water samples for total xylenes revealed concentrations ranging from 1.6 ppb detected in MW-5 to 2,400 ppb detected in MW-9.

5.3 Analysis of Aquifer Parameters by Pumping Test

As described in section 2.5, an aquifer pumping test was performed on well RW-1 with six observation wells located between 30 and 200 feet from the pumping well. After pumping for about 8 hours, measurable drawdown was observed in all the wells.

Storativity (S) and transmissivity (T) were calculated using the computer program AQTESOLV, (Geraghty & Miller Modelling Group), based on the Theis (1935) solutions. Storativity (S) and transmissivity (T) values are indicated below:

Well ID	S	T (ft^2/min)
MW-1	0.0027	0.239
MW-2	0.0030	0.276
MW-3	0.0032	0.221
MW-4	0.0013	0.302
MW-5	0.0011	0.966
MW-6	0.0026	0.348

These values will be used to calculate the parameters for the design of the remediation system. A graphical representation of the drawdown curve is presented in Appendix F.

6.0 FINDINGS AND CONCLUSIONS

The findings and conclusions of this site investigation study are summarized below:

- The concentrations of TPH-G and BTEX constituents detected in the soil samples from the offsite soil borings ranged from nondetectable to 390 ppm. The adsorbed phase petroleum hydrocarbon constituents in the soil extends offsite to the south.

- Samples from two of the monitoring wells (MW-1 and MW-2) exhibited free product and therefore were not sampled. Recovery well RW-1 was not sampled due to the presence of an oily substance.

- The shallow ground water beneath the site has been impacted by free-floating and dissolved-phase

hydrocarbon constituents, the extent of which can be defined generally to the north, east, and west of the site.

4. The dissolved-phase hydrocarbon plume has migrated offsite south of the property. This is consistent with the general flow direction of the shallow ground water.

5. The average equilibrated depth to ground water in the monitoring wells at the site is 15 feet below grade.

6. The ground water elevation contour map, developed from the water level and survey data, indicates an overall southeasterly ground water flow direction beneath the site, with an average hydraulic gradient of approximately 0.003 foot per foot.

7. Based on the pumping test data, the average transmissivity of the aquifer beneath the site was calculated to be 0.392 ft^2/min. The calculated average hydraulic conductivity beneath the site was determined to be 0.016 ft/min. The average linear velocity of the aquifer beneath the site was determined to be approximately 4.80×10^{-5} ft/min.

8. Soil types encountered at the site during drilling generally consisted of silty clay.

9. There are no existing domestic water supply wells in the immediate vicinity or within a 1/2-mile radius of the site.

This report was based on currently available data and was developed in accordance with current hydrogeologic and engineering practices.

ALTON GEOSCIENCE

Matthew A. Taylor
Staff Engineer

Matthew Hopwood
Project Manager

Jefferey W. Wiegand, C.E.G. 331
Vice President

REFERENCES

Alton Geoscience, A., 1990. Phase II - Supplemental Site Investigation Report

Geraghty & Miller Modeling Group, AQTESOLV: Aquifer Test Solver, by G. M. Duffield and J. O. Rumbaugh, 1989.

Theis, C. V., 1935. "The Relation Between the Lowering of the Piezometric Surface and Duration of Discharge of a Well using Ground Water Storage", American Geophysical Union Transactions, Vol. 16, pp. 519-524.

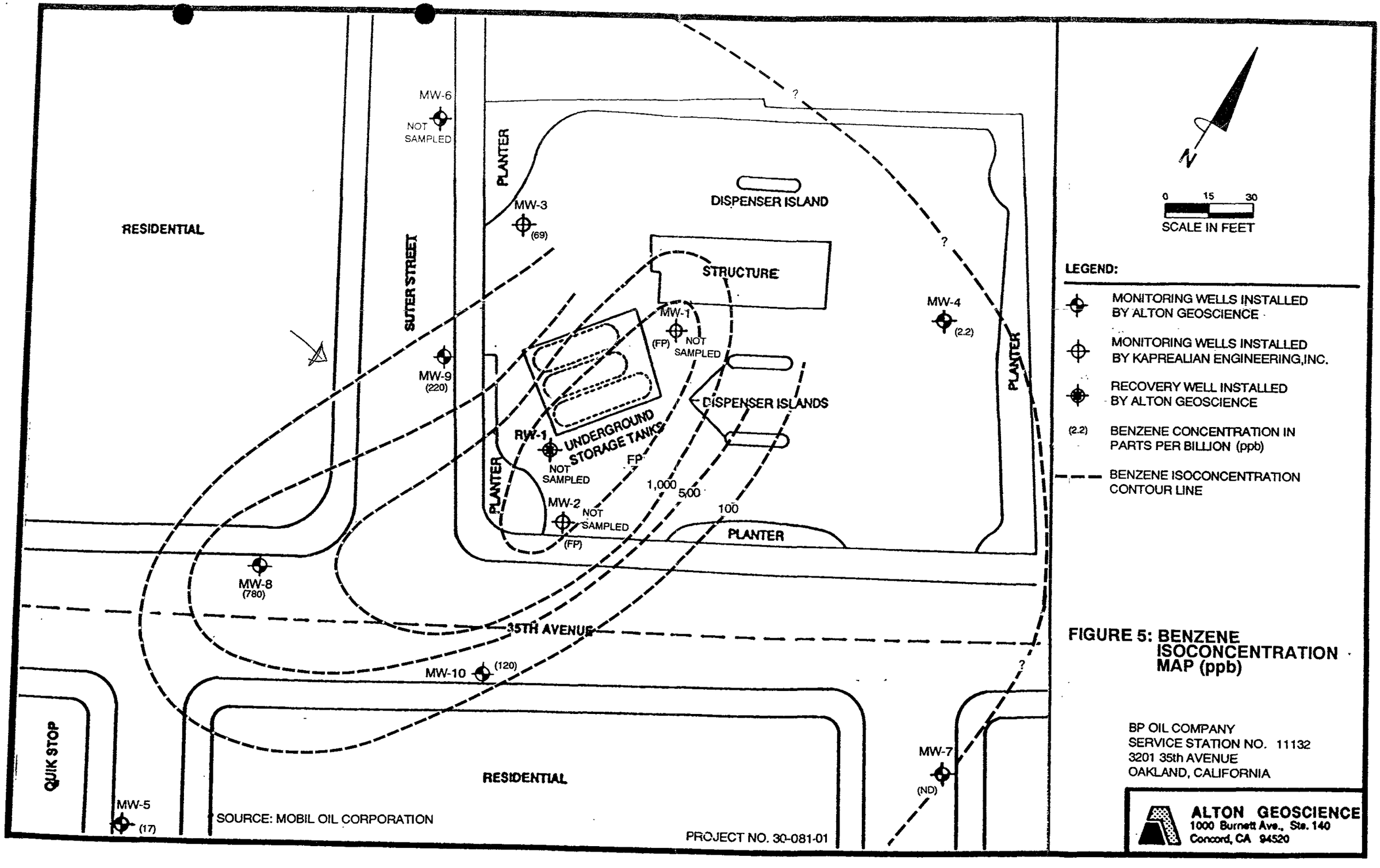


FIGURE 5: BENZENE ISOCONCENTRATION MAP (ppb)

BP OIL COMPANY
SERVICE STATION NO. 11132
3201 35th AVENUE
OAKLAND, CALIFORNIA

ALTON GEOSCIENCE
1000 Burnett Ave., Ste. 140
Concord, CA 94520

TABLE 1

SURVEY AND WATER LEVEL MONITORING DATA
April 1991

Well Number	Elevation (Feet)	Depth to Water (Feet)	Free Product Thickness (Feet)	Ground Water Elevation (Feet)*
MW-1	169.75	17.18	----	152.35
MW-2	168.14	15.64	----	152.50
MW-3	167.17	14.06	----	153.11
MW-4	170.36	18.28	----	152.08
MW-5	165.14	12.62	----	152.52
MW-6	165.40	**	----	**
MW-7	167.61	17.82	----	149.78
MW-8	165.74	12.98	----	152.76
MW-9	166.20	13.42	----	152.78
MW-10	167.01	14.32	----	152.69
RW-1	168.01	***	***	***

Note:

* Elevation in feet relative to a common datum (MW-2) with an elevation of 168.14 feet above mean sea level, as measured on July 5, 1990 by Alton Geoscience.

** MW-6 could not be accessed due to the presence of an abandoned vehicle over the well.

*** Depth to water in the recovery well was not recorded due to the presence of an oily substance.

TABLE 2

RESULTS OF
LABORATORY ANALYSIS OF SOIL SAMPLES
March 1991

Boring	Sample Depth (ft)	TPH-G	B	T	E	X
		(Concentrations in Parts Per Million)				
SB-8	10.5-11.0	ND<1	ND<0.003	0.004	ND<0.003	ND<0.003
	20.5-21.0	390	1.8	16	6.7	37
	25.5-26.0	ND<1	0.013	0.028	0.009	0.05
SB-9	10.5-11.0	ND<1	ND<0.003	0.004	ND<0.003	0.006
	20.5-21.0	120	1.7	7.1	1.7	11
	25.5-26.0	130	0.47	3.9	1.6	12
SB-10	10.5-11.0	ND<1	ND<0.003	0.007	ND<0.003	0.017
	20.5-21.0	73	0.49	3.3	1.3	6.9
	25.5-26.0	1	0.41	0.009	0.007	0.019

Notes:

TPH-G = Total Petroleum Hydrocarbons as Gasoline
B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
ND = Not Detected at Method Detection Limit shown

TABLE 3

RESULTS OF
LABORATORY ANALYSIS OF GROUND WATER SAMPLES
April ~~1990~~ 1991

Monitoring Well	TPH-G	B	T	E	X
	(Concentrations in Parts per Billion)				
MW-1	*	*	*	*	*
MW-2	*	*	*	*	*
MW-3	400	69	22	6.1	57
MW-4	ND<50	2.2	3.8	1.5	2.8
MW-5	ND<50	17	0.9	0.7	1.6
MW-6	**	**	**	**	**
MW-7	ND<50	ND<0.3	0.4	0.3	2.4
MW-8	2700	780	450	64	310
MW-9	7100	220	4	2.4	2400
MW-10	1600	120	190	32	230
RW-1	***	***	***	***	***

Notes:

TPH-G = Total Petroleum Hydrocarbons as Gasoline
B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
ND = Not Detected at Method Detection Limit
* = No sample collected due to the presence of free product
** = No sample collected due to the presence of an abandoned vehicle located over the well
*** = The recovery well was not sampled due to the presence of an oily substance

SENSITIVE RECEPTORS SURVEY
SITE SURVEY AND LITERATURE SEARCH

Client: BP Oil Company Project No.: 30-081-01

Station No.: 11132

Location: 3201 35TH Ave. Oa

City/State: Oakland CA

I. Provide answers to the following questions:

A. Is there a public water supply well within 2500 feet? Y/N N
If Yes, Distance — ft.

B. Is there a private water supply well within 1000 feet? Y/N N
If Yes, Distance — ft.

C. Is there a subway within 1000 feet? Y/N N
If Yes, Distance — ft.

D. Is there a basement within 1000 feet? Y/N N
If Yes, Distance — ft.

E. Is there a school within 1000 feet? Y/N Yes
If Yes, Distance 1000 ft.

F. Is there a surface body of water within 1000 feet? Y/N Yes
If Yes, Distance 500 ft.
Name Peralta Creek

II. Describe type of local water supply.

Public: X

- Suppliers Name: East Bay Municipal Water District
- Suppliers Source: Sierra Snow Melt, Pardee Dam
- Distance to Site:

Private:

SENSITIVE RECEPTORS SURVEY
SITE SURVEY AND LITERATURE SEARCH

III. Distance to Nearest Adjacent Properties:

Residential	50 ft.
Commercial	00 ft.
Industrial	— ft.
Hospital	11,000 ft.
School (Allandale School)	1000 ft.
Name	

IV. Aquifer Classification, if available.

Class I - Special Ground Waters	
- Irreplaceable Drinking Water Source	
- Ecologically Vital	
Class II - Current and Potential Drinking Water Sources	
Class III - Not Potential Source of Drinking Water	X

V. Describe observation wells, if any.

Number	11
Free Product? Y/N	yes

VI. Signature of Preparer: Matthew A. Taylor

Date: 2-20-91

VII. Sketch of Site

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2-25-91
CLIENT BP Oil Company
LOCATION 3201 35th Ave, Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-8
WELL NO. MW-8

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 165.74'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction details
DRILLER Soils Exploration Services , Inc.

BLOWS PER FOOT(ft)	CGI (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE	DESCRIPTION
							WATER LEVEL / DATE / TIME
			0	Christy Box			10" Concrete
			2				
			4		GM		GRAVELLY SILT: green, damp, hard, low plasticity
5,13,25			6	2" sch. 40 PVC Casing			
			8				
			10		ML		SANDY SILT: greenish brown, damp, very stiff, low plasticity, gravelly
7,14,11			12				
			14				
5,14,16			16				SILTY CLAY: brownish green, damp, very stiff, low to medium plasticity, with fine sand
			18				
			20				
2,6,10			22		CL		Same, becomes moist, stiff, medium plasticity, with medium sand
			24	2" sch. 40 PVC 0.020" Slot			Same, becomes brown, moist to wet, very stiff, medium plasticity
5,9,12			26				▽ 27'
			28				
			30				
3,9,14			32				Same, becomes brownish green, wet, with medium sand and gravel
			34				

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2/25/91
CLIENT BP Oil Company
LOCATION 3201 35th Ave., Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-8
WELL NO. MW-8
Page 2 of 2

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 165.74'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction detail
DRILLER Soils Explorations Services, Inc.

BLOWS PER FOOT(N)	CGI (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE				
							WATER LEVEL			
							DATE			
							TIME			
							DESCRIPTION			
7,11,14			36		CL		SILTY CLAY: brown, wet, very stiff, medium to high plasticity, with medium sand and gravel			
			38							
11,20, 20			40	End Cap			Same, becomes moist to wet, hard, medium plasticity			
			42				BORING TERMINATED AT 41.5 FEET BELOW GRADE			
			44							
			46							
			48							
			50							
			52							
			54							
			56							
			58							
			60							

Portland Cement
Sand #3 Lonestar
Bentonite Pellets
Sample
Driven interval
Water level encountered during drilling

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2-26-91
CLIENT BP Oil Company
LOCATION 3201 35th Ave, Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-9
WELL NO. MW-9

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 166.20

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction details
DRILLER Soils Exploration Services , Inc.

BLOWS PER FOOT(ft)	OVA (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE	WATER LEVEL / DATE / TIME	DESCRIPTION
			0	Christy Box				6" Asphalt (street)
			2					
			4					
6,11,14			6					SANDY SILT: reddish brown, damp, very stiff, low plasticity, with gravel
			8	2" sch. 40 PVC Casing	ML			
4,5,13			10					Same, becomes brown, no gravel
			12					
			14					
5,12,14			16					SILTY CLAY: brown with green streaks, moist, very stiff, medium plasticity
			18					
2,6,9			20					Same, becomes moist to wet, stiff
			22		CL			
			24	2" sch. 40 PVC 0.020" Slot				Same, becomes brown, wet to saturated, very stiff
5,8,10			26				▽ 26'	
			28					
			30					
3,5,10			32					Same, becomes saturated, stiff, with fine to medium sand
			34	End Cap				

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2/26/91
CLIENT BP Oil Company
LOCATION 3201 35th Ave., Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-9
WELL NO. MW-9

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 166.20'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction detail
DRILLER Soils Explorations Services, Inc.

BLOWS PER FOOT(N)	OVA (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE				
							WATER LEVEL			
							DATE			
							TIME			
							DESCRIPTION			
6,12,17			36		CL		*SILTY CLAY*: reddish brown, saturated to wet, very stiff, medium plasticity			
							BORING TERMINATED AT 36.5 FEET BELOW GRADE			
			38							
			40							
			42							
			44							
			46							
			48							
			50							
			52							
			54							
			56							
			58							
			60							

Portland Cement
Sand #3 Lonestar
Bentonite Pellets
Sample
Driven interval
Water level encountered during drilling

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2-27-91
CLIENT BP Oil Company
LOCATION 3201 35th Ave, Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

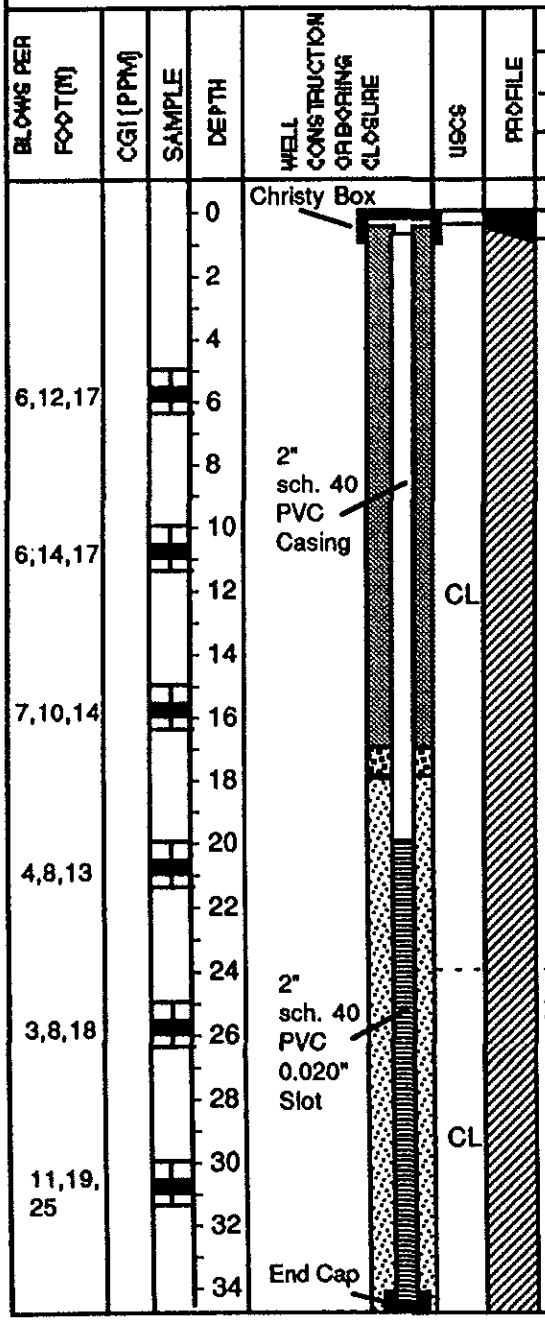
BORING NO. SB-10
WELL NO.. MW-10

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 167.01'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction details
DRILLER *Soils Exploration Services , Inc.*

WATER LEVEL			
DATE			
TIME			



DESCRIPTION

10" Concrete

SILTY CLAY: tan, damp, very stiff, low plasticity, with gravel

Same, becomes tan to brown

Same, becomes brown with green streaks, moist, medium plasticity, with gravel

Same, becomes moist to wet, with fine sand and gravel

▽ 25'

SANDY CLAY: brownish white, wet to saturated, very stiff, low to medium plasticity, with slight gravel

Same, becomes brown, wet, hard, medium plasticity, with slight gravel

ALTON GEOSCIENCE, Inc.
LOG OF EXPLORATORY BORING

PROJECT NO. 30-081-01 DATE DRILLED 2/27/91
CLIENT BP Oil Company
LOCATION 3201 35th Ave., Oakland
LOGGED BY M. Taylor APPROVED BY M. Hopwood

BORING NO. SB-10
WELL NO. MW-10

FIELD SKETCH OF BORING LOCATION

TOP OF CASING ELEVATION 167.01'

DRILLING METHOD Hollow stem auger HOLE DIAM. 8"
SAMPLER TYPE Modified split spoon
CASING DATA See well construction detail
DRILLER Soils Exlplorations Services, Inc.

BLOWS PER FOOT(N)	OVA (PPM)	SAMPLE	DEPTH	WELL CONSTRUCTION OR BORING CLOSURE	USCS	PROFILE				
							WATER LEVEL			
							DATE			
							TIME			
							DESCRIPTION			
7,8,11			36		CL		SILTY CLAY: brown, wet, very stiff, medium plasticity, with some fine sand			
							BORING TERMINATED AT 36.5 FEET BELOW GRADE			
			38							
			40							
			42							
			44							
			46							
			48							
			50							
			52							
			54							
			56							
			58							
			60							

Portland Cement
Sand #3 Lonestar
Bentonite Pellets
Sample
Driven interval
Water level encountered during drilling

SURVEY DATA

DATE: 4-5-91

SURVEY BY: AWWAD & TAYLOR

PROJECT NUMBER: 30-081-01

ADDRESS: 3201 35TH AVENUE
Oakland, CA

ELEVATION REFERENCE DESCRIPTION: MW-2 (168.14')

REFERENCE SOURCE: B.M. : MW-2 = 168.14 ft
above Mean Sea Level

STA.	(+) B.S.	H.I.	(-) F.S.	ELEV.
MW-2				168.14
	4.54	172.68		
MW-9			6.48	166.20
MW-8			6.94	165.74
MW-10			5.67	167.01

NOTES:

ALTON GEOSCIENCE, INC
1170 Burnett Ave., Ste. S
Concord, CA 94520

JOB NUMBER 30-081-01 TECHNICIAN AWWAD & TAYlor

JOB LOCATION Oakland 35TH AVE DATE 4-5-91

PUMPOUT ☐ YES ☐ NO	DATE OF LAST PUMPOUT:			WEATHER: TIME:		COMMENTS (Notes, conditions, etc.)
	HOLD	CUT	LEVEL			
WELL #	DEPTH TO WATER	DEPTH TO PRODUCT	PROD. THICKNESS (FT)	TOTAL DEPTH	DEPTH TO PUMP	
MW-1	17.18					
MW-2	15.64					
MW-3	14.06					
MW-4	18.28					
MW-5	12.62					
MW-6	No Access					
MW-7	17.82					
MW-8	12.98					
MW-9	13.42					
MW-10	14.32					Floating Product
RW-1	—					

AQUIFER TESTING AND ANALYSIS

The analysis of aquifer characteristics for the purpose of estimating the fate and transport characteristics of contaminants in ground water involves several steps. The first step is the exploratory stage, using surface and subsurface geological and geophysical techniques to define the water-bearing formation. Next is the evaluation stage to determine the hydrogeologic parameters and physical characteristics of the aquifer necessary for the proper design and construction of recovery or extraction wells, and for the control of contaminant migration. The last step is the confirmation stage to optimize the design and operation of each well for the management and remediation of ground water.

Literature Review and Basis of Analysis

The hydraulic properties of aquifers and unsaturated soil materials that define the rate of water movement into, through, and out of subsurface materials, and its effect on the piezometric surfaces or water tables, are hydraulic conductivity (K), transmissivity (T), and the storage coefficient (S) or specific yield for unconfined aquifer.

Hydraulic conductivity is defined as the rate at which water moves through a porous media under a unit hydraulic gradient. It is primarily dependent upon the porosity and permeability of the soil and the density and viscosity of the water. However, not all water occupying pore spaces in a saturated aquifer will be readily move through the aquifer. One measure of the water-yielding ability of an aquifer is the storage coefficient (S). The storage coefficient of an aquifer is defined as the volume of water produced per unit horizontal area by a unit drop in the water table level (unconfined aquifers) or the piezometric surface (confined aquifers). Another term indicative of the water yielding capacity of an aquifer is its transmissivity or transmissibility. The transmissivity of an aquifer is the product of the hydraulic conductivity (K) in feet/day and the saturated thickness (b) in feet, or :

$$T = Kb$$

The movement or yielding capabilities of the water-bearing formation is important to understand aquifer characteristics. It is necessary to obtain values for one or more of the aquifer properties to determine these parameters. Various techniques have been developed for obtaining values for these properties or parameters.

The pumping test technique is generally used to evaluate the hydraulic properties of aquifers. The results of this test

are used to predict well yields, position of water tables and piezometric surfaces, and recharge rates of aquifers. Other techniques, such as the auger-hole and slug test methods (rate-of-rise or rate-of-fall techniques), have been developed to measure the localized hydraulic conductivity (K) of the soil profile in shallow ground water.

Pumped-Well Technique or Pumping Test

With the pumped-well technique, often called pumping test, hydraulic properties of the aquifer are calculated by pumping a well at a constant rate and observing the drawdown of the piezometric surfaces or water table in observation wells at some distance from the pumped well. Two types of tests are used; the steady-state and the non-steady or transient-state test. With the steady-state test, pumping is conducted for a sufficient period of time for the water levels in the observation wells to approach equilibrium. The equilibrium drawdown then enables the calculation of transmissivity (T). With the transient pumping tests, the change in water level in the observation wells is measured in relation to time to calculate the properties T and S.

Due to time constraints transient-state pumping tests are more commonly used than steady-state tests. Certain assumptions have to be made in calculating T and S from the pumping-test data, such as whether the aquifer is homogeneous or isotropic. In this study, only the transient-state method was used. A Theis curve matching procedure was used to evaluate T and S.

The transient flow differential equation developed by Theis is:

$$s = Q\,W(u)/(4\,T)$$

where: s = Drawdown of piezometric surface
Q = Pumping rate

$$W(u) = \text{Well function} = \int_{Y}^{\infty} \frac{e^{-y}}{y}\,dy$$

and:

$$u = r^2\,S/(4Tt)$$

where: r = Distance between the pumping and observation wells
t = time

Rearranging and taking logarithms of both equations yields:

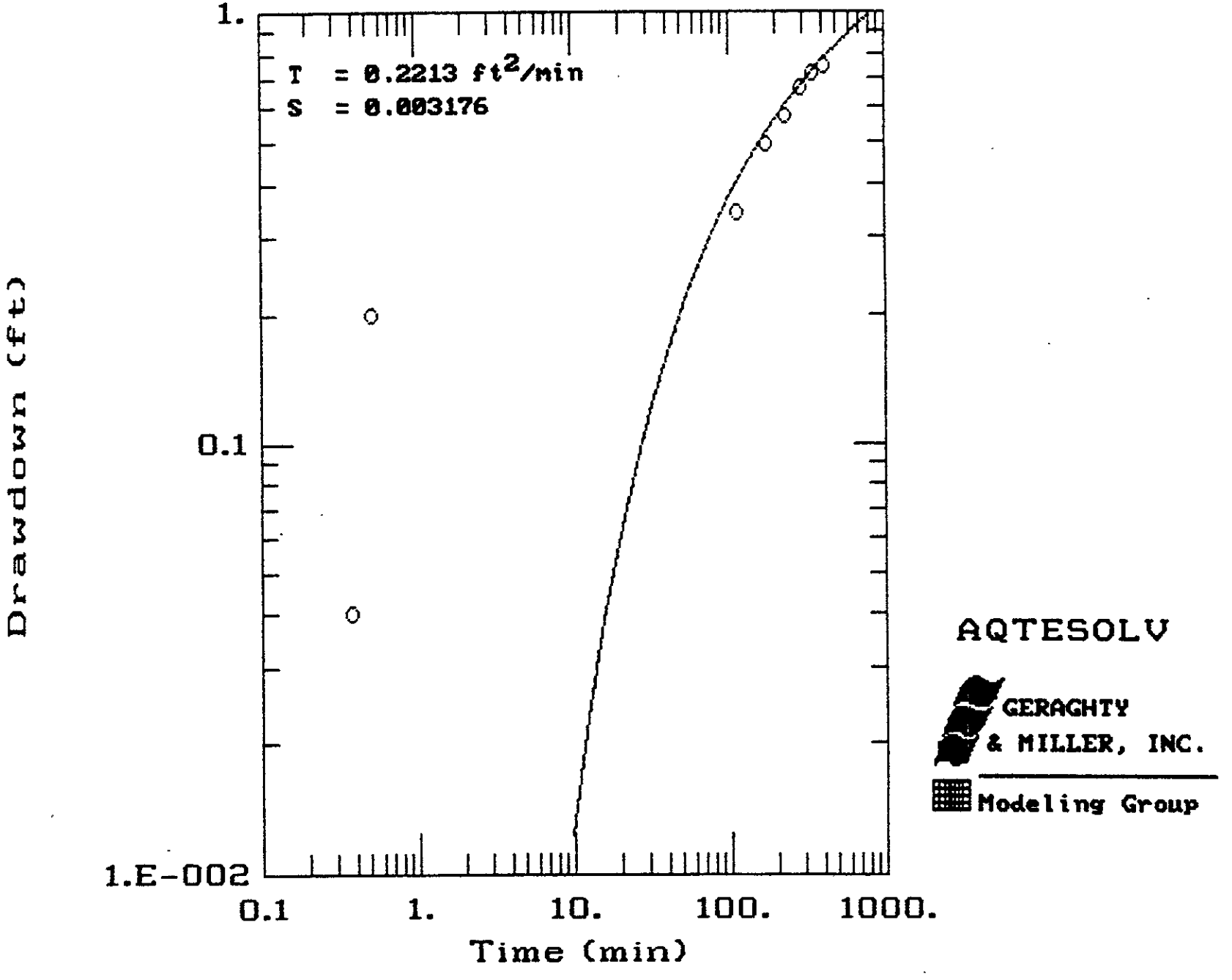
$$\log (s) = \log (Q/4\ T) + \log W(u)$$

and:

$$\log r^2/t = \log (4T/S) + \log (u)$$

Given the above relationships, a logarithmic plot of s versus $r^{2/t}$ and a log-log plot of W(u) versus u will be similar. A match point is determined by superimposing these two plots. Using the four coordinates of the match point and the above equations, the transmissivity (T) and storage coefficient (S) of the aquifer can then be determined.

30-081 MW-3 PUMP TEST



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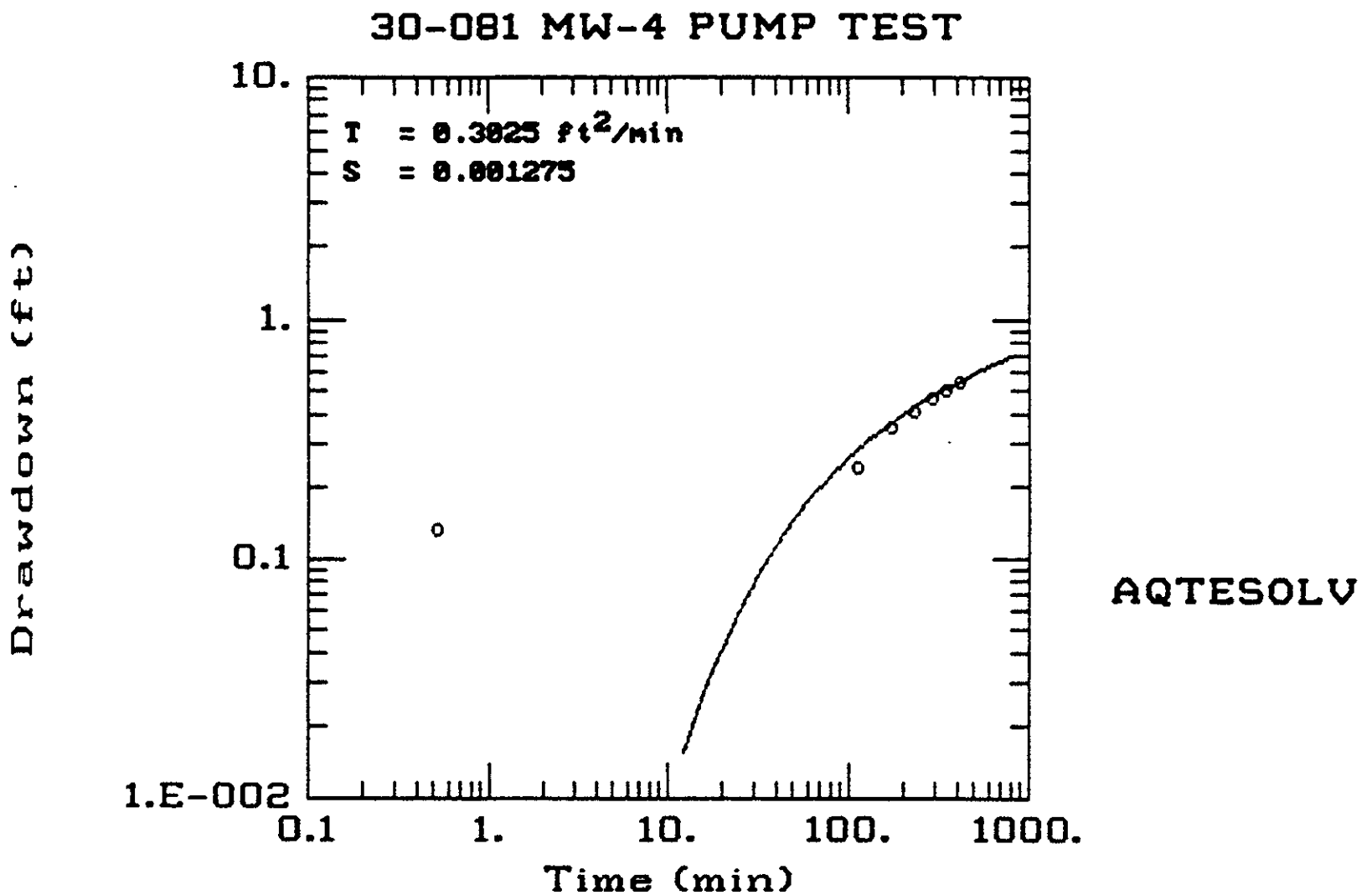
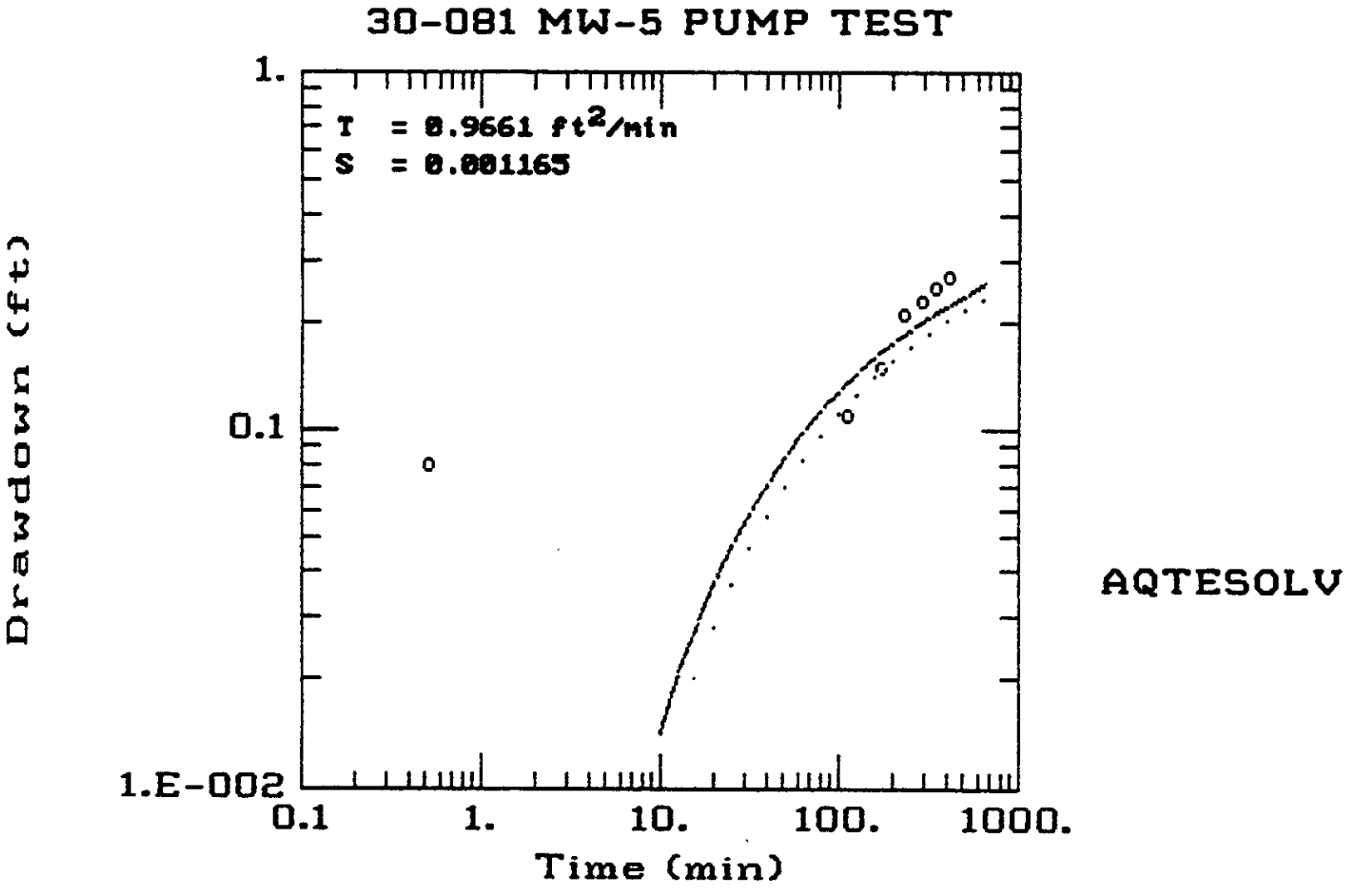
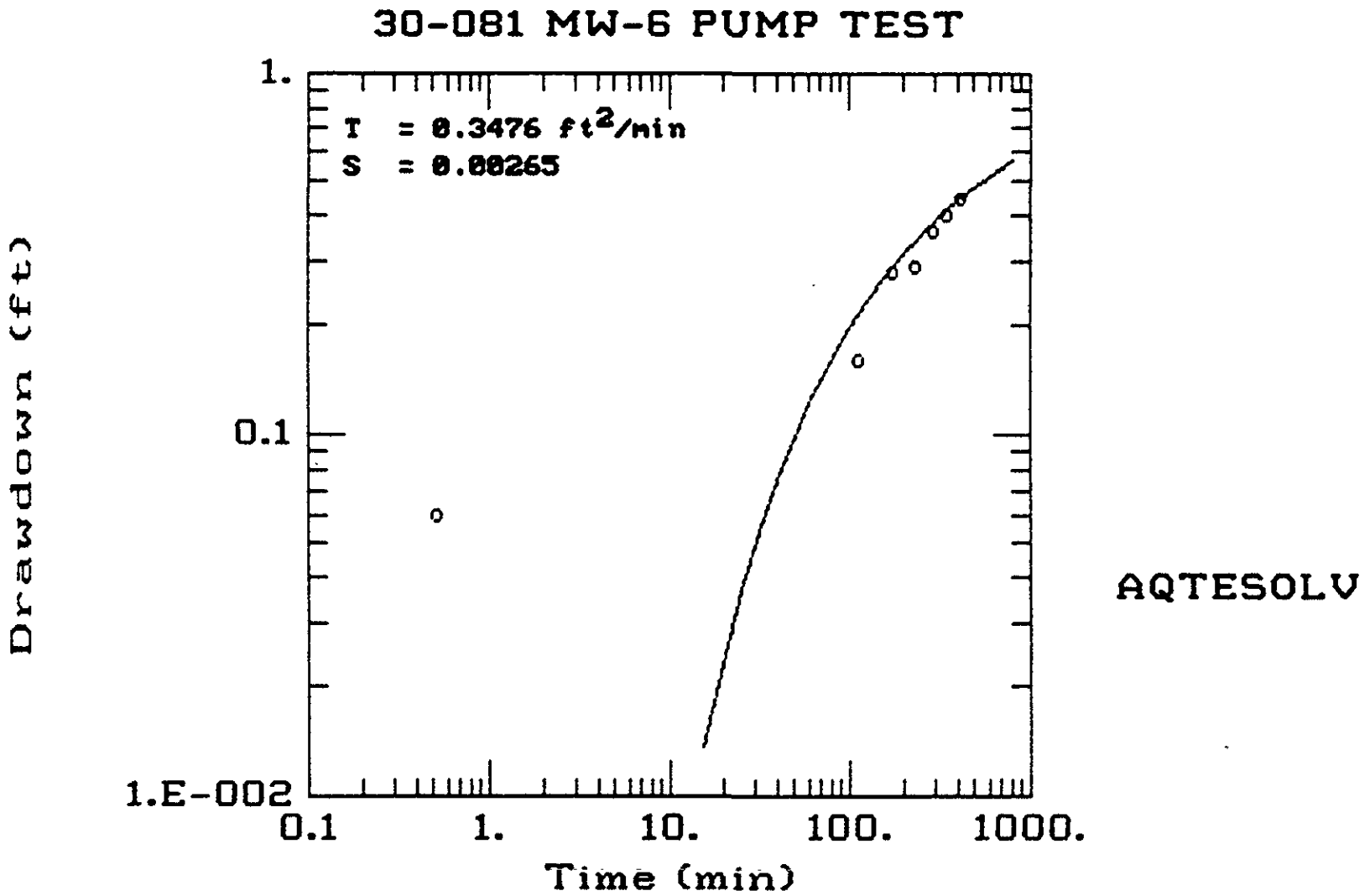

30-081 MW-4 PUMP TEST
T = 0.3025 ft²/min
S = 0.001275
10.
1.
0.1
1.E-002
0.1
1.
10.
100.
1000.
Drawdown (ft)
Time (min)
AQTESOLV


30-081 MW-5 PUMP TEST
T = 0.9661 ft²/min
S = 0.001165
Drawdown (ft)
1.
0.1
1.E-002
0.1
1.
10.
100.
1000.
Time (min)
AQTESOLV


30-081 MW-6 PUMP TEST
T = 0.3476 ft²/min
S = 0.00265
1.
0.1
1.E-002
0.1
1.
10.
100.
1000.
Drawdown (ft)
Time (min)
AQTESOLV