gettler — ryan inc.

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July 16, 1991

County of Alameda
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

STID 413

94609

Reference: Former Shell Service Station
2800 Telegraph Avenue
Oakland, California
WIC 204-5508-2303

Gentlemen:

As requested by Mr. Jack Brastad of Shell Oil Company, we are forwarding a copy of the Aquifer Test Report dated July 12, 1991. The enclosed report presents the second quarter 1991 ground-water sampling and aquifer test conducted at the above referenced location.

Please do not hesitate to call should you have any questions or comments.

Sincerely,

John P. Werfal
Project Manager

enclosure

cc: Mr. Jack Brastad, Shell Oil Company
Mr. Tom Callaghan, Regional Water Quality Control Board
Mr. Rick Schroder, Shell Oil Company

2150 west winton avenue • hayward, california 94545-1210 • (415) 783-7500

GeoStrategies Inc.

AQUIFER TEST REPORT

Former Shell Service Station
2800 Telegraph Avenue
Oakland, California
WIC 204-5508-2303

761003-14

July 12, 1991

GeoStrategies Inc.
2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545

July 12, 1991

Gettler-Ryan Inc.
2150 West Winton Avenue
Hayward, California 94545

Attn: Mr. John Werfal

Re: AQUIFER TEST REPORT
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

Gentlemen:

This report presents the field procedures and data analysis of the aquifer test performed by GeoStrategies Inc. (GSI) at the above referenced location (Plate 1). Quarterly monitoring and sampling data and results are also presented in this document. The aquifer test was performed to estimate hydraulic properties of the shallow aquifer and evaluate potential hydrocarbon pathways. Currently, the site is an inactive service station located on the northwest corner of the intersection of Telegraph Avenue and 28th Street. There are three on-site monitoring wells, eight off-site monitoring wells, and one on-site recovery well (Plate 2). Commercial and residential properties are adjacent to and across from the site.

EXECUTIVE SUMMARY

Results and conclusions of the step and constant-rate discharge tests are summarized below:

- Water-level drawdowns were observed in three on-site and eight off-site wells. Maximum observed drawdowns ranged from 21.92 feet (Well SR-1) to 0.03 feet (Well S-5).

- On-site Wells S-1, S-2, and S-3 appear to be within the area of influence of pumping Well SR-1 at an average discharge rate of 2.0 gpm for a period of 1080 minutes.

- Off-site Wells S-4 through S-11 appear to be within the area of hydraulic influence of pumping Well SR-1 at a discharge rate of 2.0 gpm for a period of 1080 minutes.

- The cone of depression created by pumping Well SR-1 at 2.0 gpm did not equilibrate during the aquifer test. This suggests that during long-term pumping the area of influence may extend beyond the areal extent observed during this test.

- The observed influence of pumping at the site is based on a relatively short duration aquifer test. Hydrogeologic boundary conditions may be present that would not be evident during an aquifer test of this duration. Therefore, long-term pumping influence and potential area of capture for an operating recovery well will need to be evaluated on an on-going basis.

- Transmissivity values ranged from 310 to 4,591 gpd/ft using the Jacob Method, and from 338.9 to 1,231 gpd/ft using the Neuman Method. These values reflect the subsurface heterogeneity and suspected variations in hydraulic conductivity.

- Storativity values ranged from 1.367×10^{-3} to 5.38×10^{-2} (Jacob) and from 1.50×10^{-2} to 3.957×10^{-2} (Neuman). For the most part, the tested aquifer appears to exhibit unconfined to semi-confined conditions.

HYDROGEOLOGIC SETTING

The site is situated on the western portion of the Temescal Formation. This formation is comprised of alluvial fan deposits with interfingering lenses of clayey gravel, sandy silty clay, and sandy-clay-silt mixtures (Radbruch, 1957). Previous investigations at this site by Pacific Environmental Group Inc. (PACIFIC) and Woodward-Clyde Consultants (WCC) identified a shallow water-bearing zone consisting of sand with varying amounts of clay and gravel. The shallow water-bearing zone was encountered between 5 and 13 feet below grade. Observed saturated thickness ranges from approximately 5 feet to greater than 23 feet. Exploratory boring log information indicate that the uppermost water-bearing zone is unconfined to semi-confined in nature and may be laterally continuous beneath the site. This water-bearing zone is underlain in some borings by a less permeable clay and silt unit, which may locally act as a basal aquitard. However, the lateral continuity and thickness of the possible aquitard is not known.

Water-level measurements were collected in the pumping well (Recovery Well SR-1) and selected observation wells using an electronic oil-water interface probe prior to the aquifer test to establish baseline data (Plate 3). Static ground-water was measured between 7.32 and 10.21 feet below grade, which corresponds to 21.59 to 26.30 feet above Mean Sea Level (MSL). The local hydraulic gradient was calculated to be 0.01 with ground-water flow generally to the southwest.

FIELD ACTIVITIES AND DATA ANALYTICAL TECHNIQUES

A step-drawdown test and constant-rate test were performed in Well SR-1 on April 16 and 22, 1991, respectively. The tests were performed to evaluate the feasibility of groundwater pumping from Well SR-1 to hydrodynamically control the hydrocarbon plume and select and design the appropriate ground-water treatment system.

During each test, drawdown and water-level recovery data were continuously recorded in pumping well SR-1 and three selected observation wells (S-1, S-2, and S-3) with pressure transducers connected to a Hermit SE2000 data logger. Water-levels in Wells S-5 through S-11 were measured with an interface probe at selected time intervals throughout the duration of pumping and recovery phases of the tests. Aquifer test procedures are presented in Appendix A.

AQUIFER TEST RESULTS

Specific aquifer parameters evaluated were Transmissivity (T), Storativity (S) and hydraulic conductivity. Transmissivity quantifies the ability of water to move through an aquifer in a given time. Transmissivity is also affected by aquifer heterogeneity. Storativity quantifies the amount of water which can be released from or added to an aquifer. Storativity values are also used to classify aquifers as confined or unconfined. Permeability is related to transmissivity, but quantifies the water-flow through a unit area of soil. Permeability can be used to calculate ground-water velocity within the pore space (i.e. pore velocity). Additional aquifer characteristics evaluated included radius of influence and well yield. Aquifer test data were also evaluated for the identification of potential preferential pathways, assess the effects of pumping in a heterogeneous aquifer (especially the effects of lateral facies changes), and identification of boundary conditions (flow and no flow conditions).

Step-Test: Well SR-1

Well SR-1 was pumped at variable discharge rates to establish an optimum long-term discharge rate for the constant-rate test and evaluate drawdown potentials in observation wells in hydraulic communication with Recovery Well SR-1. The step-test was performed prior to the constant-rate test. Well SR-1 was pumped for 105.5 minutes for the first test, and for 85.5 minutes for the second test at variable pumping rates (steps). The step-test consisted of five steps: Step 1 ran for 31 minutes at a pumping rate of 5 gallons per minute (gpm), Step 2 ran for 31 minutes at a pumping rate of 10 gpm, Step 3 ran for 31 minutes at a pumping rate of 20 gpm, Step 4 ran for 2.5 minutes at a pumping rate of 40 gpm, and Step 5 (well recovery) ran for 5 minutes. The time vs. drawdown plot for the step-test for Well SR-1 is presented on Plate 4.

Well SR-1 appears to be hydraulically connected to the nearby tank backfill area. As a result, higher initial flow rates were encountered until the tank backfill area was dewatered. The step-test performed prior to constant-rate test removed approximately 3,000 gallons of water during the test. It is suspected that most of the water was removed from the tank backfill area. Hydraulic characteristics were not calculated from the step-test because the extent of the excavation (both vertical and horizontal) and type and size of the fill material were not known. An evaluation of step-test data indicated that a pumping rate from Recovery Well SR-1 between 2 and 5 gpm would not dewater the well during the constant-rate test. A conservative pumping rate of 2 gpm was selected for the constant-rate test.

Constant-Rate Test: Well SR-1

Well SR-1 was pumped until it nearly dewatered for 1080 minutes at a constant discharge rate of 2.0 gpm. Well recovery was monitored for 240 minutes. A time versus drawdown plot for Well SR-1 is presented on Plate 5. Maximum observed drawdown in Well SR-1 was 21.92 feet after 1080 minutes of pumping. Maximum observed drawdowns in the pumping well and observation wells are summarized in Table 1. Well-recovery data were collected and recorded as the pumping well water-level recovered to greater than 90% of initial static water level before the test was terminated.

Time versus drawdown data were plotted for Observation Wells S-1, S-2, S-3, and S-6. Transmissivity (T) and Storativity (S) values were calculated from field data plots using the Jacob Straight-line Method (1946). Plots of drawdown vs. time for Wells S-1, S-2, S-3, and S-6 are presented in Appendix B. These data results are summarized in Table 1. Calculated transmissivity from field plots using Jacob's Method ranged from 310 to 4,591 gallons per day per foot (gpd/ft). Storativity values varied from 1.367×10^{-3} to 5.38×10^{-2}. These storativity values are indicative of heterogeneous environment beneath the site. Storativity values also indicate that the aquifer's unconfined to semi-confined.

To evaluate the potential effects of delayed drainage in an unconfined aquifer, GSI used Graphical Well Analysis Package (GWAP) software to analyze test data using the Neuman Method (1975) for unconfined elastic conditions. These data plots are presented in Appendix B and are considered to be most representative of actual subsurface conditions. Transmissivity values using the Neuman Method ranged from 338.9 to 1,231 gpd/ft. Specific yield values ranged from 1.50×10^{-2} to 3.957×10^{-2}. These data are summarized in Table 1 and presented in Appendix B.

Well Influence

Observed drawdown in the observation wells were used to evaluate radius of influence during a test. The maximum drawdown during the constant-rate test was used to construct a well influence map for SR-1 after 1080 minutes of pumping (Plate 6). Radius of influence appeared to vary from 70 to 150 feet from the pumping well for the constant-rate test. Directional variations may be due to aquifer heterogeneity and/or preferred ground-water flow paths and the tank backfill excavation. The drawdown cone of depression configuration is typical of a low transmissivity aquifer. The slope of the drawdown cone is elliptical with the long axis oriented toward the south-southeast. Elongation is parallel to the ground-water flow direction.

DISCUSSION

Well SR-1 was able to maintain a pumping rate of 2 gpm for 1080 minutes. However, the suspected long-term flow rate may be less than 2 gpm.

The elongation of the drawdown cone in the downgradient direction may indicate that higher permeability materials (potential pathways) are oriented in that direction. In addition, the tank backfill excavation appears to have had an affect on the shape of the drawdown cone. The cone of depression created by pumping Well SR-1 did not equilibrate during the constant-rate test. Due to the relatively short duration of the test, additional heterogeneities and boundary conditions may not have been encountered. Therefore, long-term pumping influence and potential area of capture for an operating recovery well will need to be evaluated on an on-going basis.

The potential area of capture for an operating recovery well is expected to be less than the observed well influence area (see Plate 6). To assess the effects of the calculated area hydraulic gradient, a Water-Level Map after pumping Well SR-1 for 1080 minutes is presented on Plate 7. This map indicates that the potential stagnation point for downgradient capture of hydrocarbons is less than the observed radius of influence. Given the relatively short duration of the constant-rate test, computer-simulated modeling may be necessary to evaluate the long-term pumping effects and extent of the potential capture zone.

CURRENT QUARTERLY SAMPLING RESULTS

Quarterly sampling results have been included in this document. These results are presented below.

Potentiometric Data

Prior to ground-water sampling, depth to water-level measurements were obtained in each monitoring well using an electronic oil-water interface probe. Static ground-water levels were measured from the surveyed top of well box and recorded to the nearest ± 0.01 foot. Corresponding elevations referenced to MSL datum are presented in Table 2. Water-level data were used to construct a potentiometric map (Plate 8). Shallow ground-water flow throughout the quarter was to the southwest at a calculated gradient of 0.02.

Floating Product Measurements

Each well was checked for the presence of floating product using an electronic oil-water interface probe. A clear acrylic bailer was used to confirm probe results. On April 30, 1991, floating product was observed in Well S-3 at a measured thickness of 0.13 feet.

Ground-water Analytical Data

Ground-water samples were collected on April 30, 1991. The samples were analyzed for Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) according to EPA Method 8015 (Modified) and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) according to EPA Method 8020 by International Technology (IT), a State of California certified laboratory located in San Jose, California.

TPH-Gasoline was detected in Wells S-2, S-6, S-7, S-8, and S-11 at concentrations of 0.24 to 5.4 parts per million (ppm). Benzene concentrations detected in these wells were 0.0032 and 0.64 ppm. These data are summarized in Table 3 and included in Appendix C. Chemical isoconcentration maps for TPH-Gasoline and benzene are presented on Plates 9 and 10. Historical chemical analytical data are presented on Table 4.

Quality Control

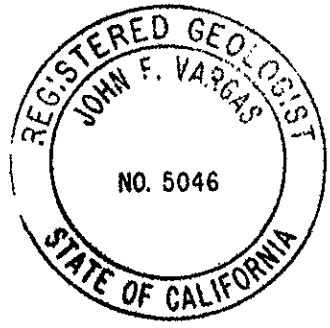
The Quality Control (QC) samples for this quarter's sampling included a trip blank, duplicate (SD-1) and field blank. These samples were prepared in the laboratory and field using organic-free water to evaluate laboratory and field handling procedures of samples and assess analytical precision. The results of QC sample analyses are presented in Table 3.

If you have any questions, please call.

GeoStrategies Inc. by,

Ellen C. Fostersmith
Geologist

John F. Vargas
Senior Geologist
R.G. 5046



ECF/JFV/kjj

Plate 1. Vicinity Map
Plate 2. Site Plan
Plate 3. Potentiometric Map - Prior to pumping Well SR-1
Plate 4. Drawdown vs. Time - Step-Test
Plate 5. Drawdown vs. Time - Constant-Rate Test
Plate 6. Well Influence Map - Well SR-1
Plate 7. Water-Level Map - After pumping Well SR-1
Plate 8. Potentiometric Map - April 30, 1991
Plate 9. TPH-G Isoconcentration Map
Plate 10. Benzene Isoconcentration Map

Appendix A: Aquifer Test Procedures
Appendix B: Jacob Field Data Plots and GWAP Data Plots
Appendix C: Analytical Laboratory Report and Chain-of-Custody

QC Review: _____

761003-14

References Cited

Groundwater Graphics, 1986, Graphics Well Analysis Package, Version 2.0, Oceanside California.

Helley, E.J. and Lajoie, K.R., 1979, Flatland deposits of the San Francisco Bay Region, California - Their geology and engineering properties, and their importance to comprehensive planning, U.S. Geological Survey Professional Paper 943, U.S. Geological Survey, Washington D.C.

Jacob, C.E., 1946, "Drawdown test to determine screen loss and effective radius of an artesian well", Proc. Amer. Soc. Civil Engrs., 1946.

Neuman, S.P., 1975, "Analysis of pumping test data from an anisotropic unconfined aquifer considering delayed gravity response". Water Resources Res., 11 pp. 329-342.

Radbruch, Dorothy H., 1957, Areal and Engineering Geology of the Oakland West Quadrangle, California, Miscellaneous Geologic Investigations Map I-239, U.S. Geological Survey Washington D.C.

TABLES

TABLE 1

WELL SR-1 PUMP TEST RESULTS

WELL NO.	PUMP RATE (gpm)	PUMPING DURATION (Min.)	MAXIMUM DRAWDOWN (Ft.)	JACOB METHOD		NEUMAN METHOD	
				T	S	T	S
S-1	2.0	1080	0.085	4591	5.38×10^{-2}	1231	1.50×10^{-2}
S-2	2.0	1080	0.259	1676	2.10×10^{-2}	524.9	2.321×10^{-2}
S-3	2.0	1080	1.243	310	2.89×10^{-2}	338.9	3.957×10^{-2}
S-6	2.0	1080	0.46	78	1.367×10^{-3}	457.2	2.584×10^{-2}
SR-1	2.0	1080	21.923	(3)	(3)	(3)	(3)

1. T = Transmissivity (gpd/ft)
2. S = Storativity (dimensionless)
3. Jacob and Neuman Methods are valid for observation wells only.

TABLE 2

FIELD MONITORING DATA

WELL NO.	MONITORING DATE	CASING DIA. (IN)	TOTAL WELL DEPTH (FT)	WELL ELEV. (FT)	DEPTH TO WATER (FT)	PRODUCT THICKNESS (FT)	STATIC WATER ELEV. (FT)	PURGED WELL VOLUMES	pH	TEMPERATURE (F)	CONDUCTIVITY (uMHOS/cm)
S-1	30-Apr-91	3	27.8	35.31	9.27	----	26.04	5	6.15	63.5	427
S-2	30-Apr-91	3	25.4	33.91	9.15	----	24.76	2	6.18	65.2	548
S-3	30-Apr-91	3	----	33.56	10.04	0.13	23.62	----	----	----	----
S-4	30-Apr-91	3	29.1	34.08	10.36	----	23.72	3	6.38	67.2	364
S-5	30-Apr-91	3	30.6	33.42	10.12	----	23.30	5	6.93	67.4	118
S-6	30-Apr-91	3	22.1	32.59	9.13	----	23.46	3	6.24	67.3	593
S-7	30-Apr-91	3	30.7	33.33	10.70	----	22.63	5	6.54	67.8	519
S-8	30-Apr-91	3	19.2	31.97	10.00	----	21.97	4	6.48	67.7	503
S-9	30-Apr-91	3	30.0	31.86	9.68	----	22.18	5	6.82	65.8	521
S-10	30-Apr-91	3	24.2	32.95	8.33	----	24.62	3	6.79	65.7	210
S-11	30-Apr-91	3	19.2	30.78	9.38	----	21.40	3	6.34	65.1	426
SR-1	30-Apr-91	6	34.7	----	8.57	----	----	----	----	----	----

Notes:
1. Static water elevations referenced to Mean Sea Level (MSL).
2. Physical parameter measurements represent stabilized values.
3. pH values reported in pH units.
4. Static water-levels corrected for floating product (conversion factor = 0.80).
5. Recovery well, SR-1 was monitored but not sampled.

TABLE 3

GROUND-WATER ANALYSIS DATA

WELL NO	SAMPLE DATE	ANALYSIS DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
S-1	30-Apr-91	08-May-91	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
S-2	30-Apr-91	08-May-91	0.60	0.060	0.0036	0.016	0.015
S-4	30-Apr-91	08-May-91	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
S-5	30-Apr-91	08-May-91	<0.05	<0.0005	<0.0005	<0.0005	0.0008
S-6	30-Apr-91	09-May-91	4.8	0.64	0.15	0.17	0.48
S-7	30-Apr-91	09-May-91	0.24	0.0032	0.0023	0.0036	0.010
S-8	30-Apr-91	10-May-91	2.9	0.046	0.11	0.12	0.33
S-9	30-Apr-91	09-May-91	<0.05	<0.0005	<0.0005	<0.0005	0.0006
S-10	30-Apr-91	10-May-91	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
S-11	30-Apr-91	10-May-91	5.4	0.048	0.026	0.080	0.37

CURRENT REGIONAL WATER QUALITY CONTROL BOARD MAXIMUM CONTAMINANT LEVELS
Benzene 0.001 ppm Xylenes 1.750 ppm Ethylbenzene 0.680 ppm

CURRENT DHS ACTION LEVELS
Toluene 0.1000 ppm

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPM = Parts Per Million

SD = Duplicate Sample
SF = Field Blank
TB = Trip Blank

Note: 1. All data shown as <x are reported as ND (none detected).
2. DHS Action Levels and MCLs are subject to change pending State review.

TABLE 3

GROUND-WATER ANALYSIS DATA

WELL NO	SAMPLE DATE	ANALYSIS DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
SD-1	30-Apr-91	08-May-91	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
SF-2	30-Apr-91	08-May-91	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
TB	----	08-May-91	<0.05	<0.0005	<0.0005	<0.0005	<0.0005

TABLE 4

HISTORICAL GROUND WATER QUALITY DATABASE

SAMPLE DATE	SAMPLE POINT	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
02-May-88	S-1	<0.05	0.5	<0.001	----	<0.004
08-Nov-88	S-1	<0.05	<0.0005	<0.001	<0.001	<0.003
02-May-89	S-1	<0.05	<0.0005	<0.001	<0.001	<0.003
03-Aug-89	S-1	<0.05	<0.0005	<0.001	<0.001	<0.003
03-Oct-89	S-1	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Jan-90	S-1	<0.050	<0.0005	<0.0005	<0.0005	<0.001
13-Apr-90	S-1	<0.050	<0.0005	0.0006	<0.0005	<0.001
05-Jul-90	S-1	<0.05	<0.0005	<0.0005	<0.0005	<0.001
12-Oct-90	S-1	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
22-Jan-91	S-1	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
30-Apr-91	S-1	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
02-May-88	S-2	1.6	0.079	0.089	----	0.048
08-Nov-88	S-2	0.2	0.022	0.001	0.016	0.008
02-May-89	S-2	2.2	0.5	0.052	0.12	0.18
03-Aug-89	S-2	0.43	0.073	0.001	0.014	0.007
03-Oct-89	S-2	0.37	0.012	0.019	0.013	0.078
16-Jan-90	S-2	0.42	0.075	0.0099	0.032	0.052
13-Apr-90	S-2	0.34	0.063	0.0025	0.019	0.015
05-Jul-90	S-2	0.10	0.01	<0.0005	0.0018	0.002
12-Oct-90	S-2	<0.05	0.0020	<0.0005	<0.0005	<0.0005
22-Jan-91	S-2	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
30-Apr-91	S-2	0.60	0.060	0.0036	0.016	0.015
02-May-88	S-3	46.	2.7	10.	----	10.
02-May-89	S-3	47.	2.0	6.0	1.7	7.2
13-Apr-90	S-3	16.	0.54	2.4	0.81	3.9
05-Jul-90	S-3	16.	0.42	1.7	0.64	3.1
08-Nov-88	S-4	<0.05	<0.0005	<0.001	<0.001	<0.003

TABLE 4

HISTORICAL GROUND WATER QUALITY DATABASE

SAMPLE DATE	SAMPLE POINT	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
22-Feb-89	S-4	<0.05	<0.0005	<0.001	<0.001	<0.003
02-May-89	S-4	<0.05	<0.0005	<0.001	<0.001	<0.003
03-Aug-89	S-4	<0.05	<0.0005	<0.001	<0.001	<0.003
03-Oct-89	S-4	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Jan-90	S-4	<0.050	<0.0005	<0.0005	<0.0005	0.001
13-Apr-90	S-4	<0.050	<0.0005	<0.0005	<0.0005	<0.001
05-Jul-90	S-4	<0.05	<0.0005	<0.0005	<0.0005	<0.001
12-Oct-90	S-4	<0.05	0.0010	0.0047	0.0010	0.0032
22-Jan-91	S-4	<0.05	<0.0005	<0.0005	<0.0005	0.0029
30-Apr-91	S-4	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
08-Nov-88	S-5	<0.05	<0.0005	<0.001	<0.001	<0.003
22-Feb-89	S-5	<0.05	<0.0005	<0.001	<0.001	<0.003
02-May-89	S-5	<0.05	<0.0005	<0.001	<0.001	<0.003
03-Aug-89	S-5	<0.05	<0.0005	<0.001	<0.001	<0.003
03-Oct-89	S-5	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Jan-90	S-5	<0.050	<0.0005	<0.0005	<0.0005	0.001
13-Apr-90	S-5	<0.050	<0.0005	<0.0005	<0.0005	<0.001
05-Jul-90	S-5	<0.050	<0.0005	<0.0005	<0.0005	<0.001
12-Oct-90	S-5	<0.05	0.0005	0.0026	0.0005	0.0017
22-Jan-91	S-5	<0.05	<0.0005	<0.0005	<0.0005	0.0010
30-Apr-91	S-5	<0.05	<0.0005	<0.0005	<0.0005	0.0008
08-Nov-88	S-6	5.5	1.7	0.02	0.02	0.12
22-Feb-89	S-6	6.0	2.4	0.05	0.11	0.3
02-May-89	S-6	9.1	3.7	0.12	0.28	0.3
03-Aug-89	S-6	7.1	2.4	<0.05	0.07	<0.2
03-Oct-89	S-6	5.9	1.6	0.033	0.058	0.10
16-Jan-90	S-6	5.9	1.8	0.15	0.16	0.41
13-Apr-90	S-6	5.9	1.8	0.07	0.02	0.16
05-Jul-90	S-6	4.2	1.2	0.02	0.03	0.08

TABLE 4

HISTORICAL GROUND WATER QUALITY DATABASE

SAMPLE DATE	SAMPLE POINT	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
12-Oct-90	S-6	1.7	0.39	0.0065	0.0036	0.016
22-Jan-91	S-6	2.2	0.44	0.015	<0.01	0.059
30-Apr-91	S-6	4.8	0.64	0.15	0.17	0.48
08-Nov-88	S-7	2.6	0.088	0.43	0.086	0.43
22-Feb-89	S-7	0.8	0.025	0.027	0.029	0.17
02-May-89	S-7	0.8	0.032	0.014	0.021	0.11
03-Aug-89	S-7	5.0	0.66	0.38	0.23	0.71
03-Oct-89	S-7	0.96	0.11	0.008	0.013	0.046
16-Jan-90	S-7	0.23	0.0010	0.0018	0.0031	0.017
13-Apr-90	S-7	0.32	0.0051	0.0008	0.0023	0.012
05-Jul-90	S-7	0.27	0.0055	0.001	0.0006	0.005
12-Oct-90	S-7	0.63	0.043	0.0053	0.0048	0.012
22-Jan-91	S-7	1.2	0.077	0.027	0.057	0.16
30-Apr-91	S-7	0.24	0.0032	0.0023	0.0036	0.010
03-Aug-89	S-8	<0.05	<0.0005	<0.001	<0.001	<0.003
03-Oct-89	S-8	1.6	0.022	0.11	0.053	0.24
16-Jan-90	S-8	2.0	0.040	0.15	0.090	0.40
13-Apr-90	S-8	1.6	0.027	0.071	0.048	0.21
05-Jul-90	S-8	1.5	0.025	0.075	0.067	0.25
12-Oct-90	S-8	1.0	0.017	0.031	0.034	0.12
22-Jan-91	S-8	0.82	0.017	0.037	0.030	0.12
30-Apr-91	S-8	2.9	0.046	0.11	0.12	0.33
03-Aug-89	S-9	1.6	0.032	0.12	0.052	0.25
03-Oct-89	S-9	<0.05	<0.0005	0.001	<0.001	0.003
16-Jan-90	S-9	<0.050	<0.0005	<0.0005	<0.0005	0.001
13-Apr-90	S-9	<0.050	0.0007	0.0023	<0.0005	0.003
05-Jul-90	S-9	<0.05	<0.0005	<0.0005	<0.0005	<0.001
12-Oct-90	S-9	<0.05	<0.0005	<0.0005	<0.0005	<0.0005

TABLE 4

HISTORICAL GROUND WATER QUALITY DATABASE

SAMPLE DATE	SAMPLE POINT	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
22-Jan-91	S-9	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
30-Apr-91	S-9	<0.05	<0.0005	<0.0005	<0.0005	0.0006
03-Aug-89	S-10	<0.05	<0.0005	<0.001	<0.001	<0.003
03-Oct-89	S-10	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Jan-90	S-10	<0.050	<0.0005	<0.0005	<0.0005	0.001
13-Apr-90	S-10	<0.050	<0.0005	<0.0005	<0.0005	<0.001
05-Jul-90	S-10	<0.05	<0.0005	<0.0005	<0.0005	<0.001
12-Oct-90	S-10	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
22-Jan-91	S-10	<0.05	0.0007	0.0082	0.0022	0.014
30-Apr-91	S-10	<0.05	<0.0005	<0.0005	<0.0005	<0.0005
16-Oct-89	S-11	0.65	0.042	0.047	0.024	0.16
16-Jan-90	S-11	0.35	0.027	0.035	0.020	0.11
13-Apr-90	S-11	0.90	0.057	0.11	0.037	0.24
05-Jul-90	S-11	2.0	0.11	0.21	0.093	0.53
12-Oct-90	S-11	1.2	0.14	0.10	0.064	0.22
22-Jan-91	S-11	1.4	0.085	0.093	0.088	0.30
30-Apr-91	S-11	5.4	0.048	0.026	0.080	0.37

TABLE 4

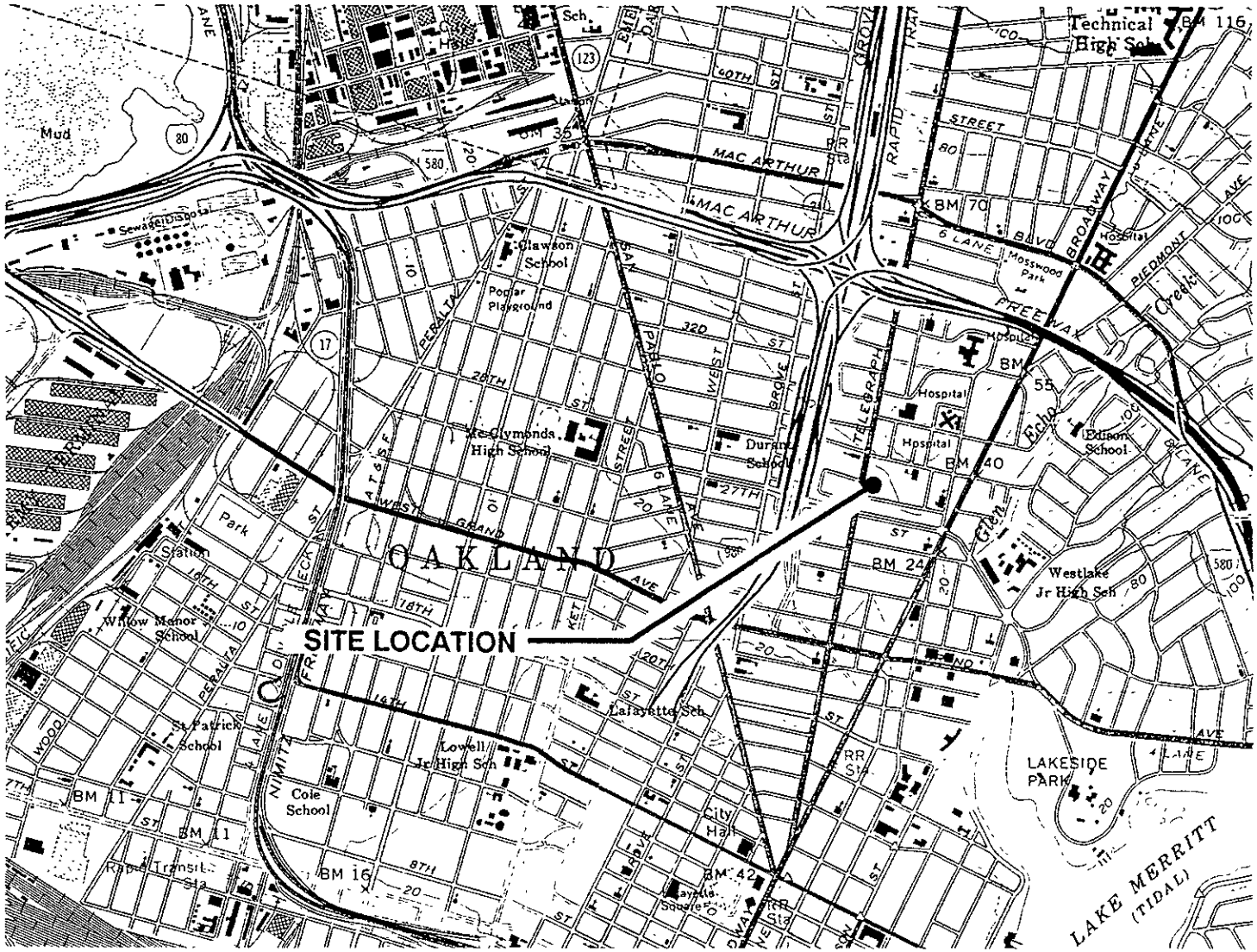
HISTORICAL GROUND WATER QUALITY DATABASE

Current Regional Water Quality Control Board Maximum Contaminant Levels
Benzene 0.001 ppm Xylenes 1.750 ppm Ethylbenzene 0.680 ppm

Current DHS Action Levels Toluene 0.1000 ppm

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPM = Parts Per Million
NOTE: 1. DHS Action levels and MCL's are subject to change pending State of California review.
2. All data shown as <X are reported as ND (none detected).
3. Ethylbenzene and Xylenes were combined prior to May 1989.

ILLUSTRATIONS



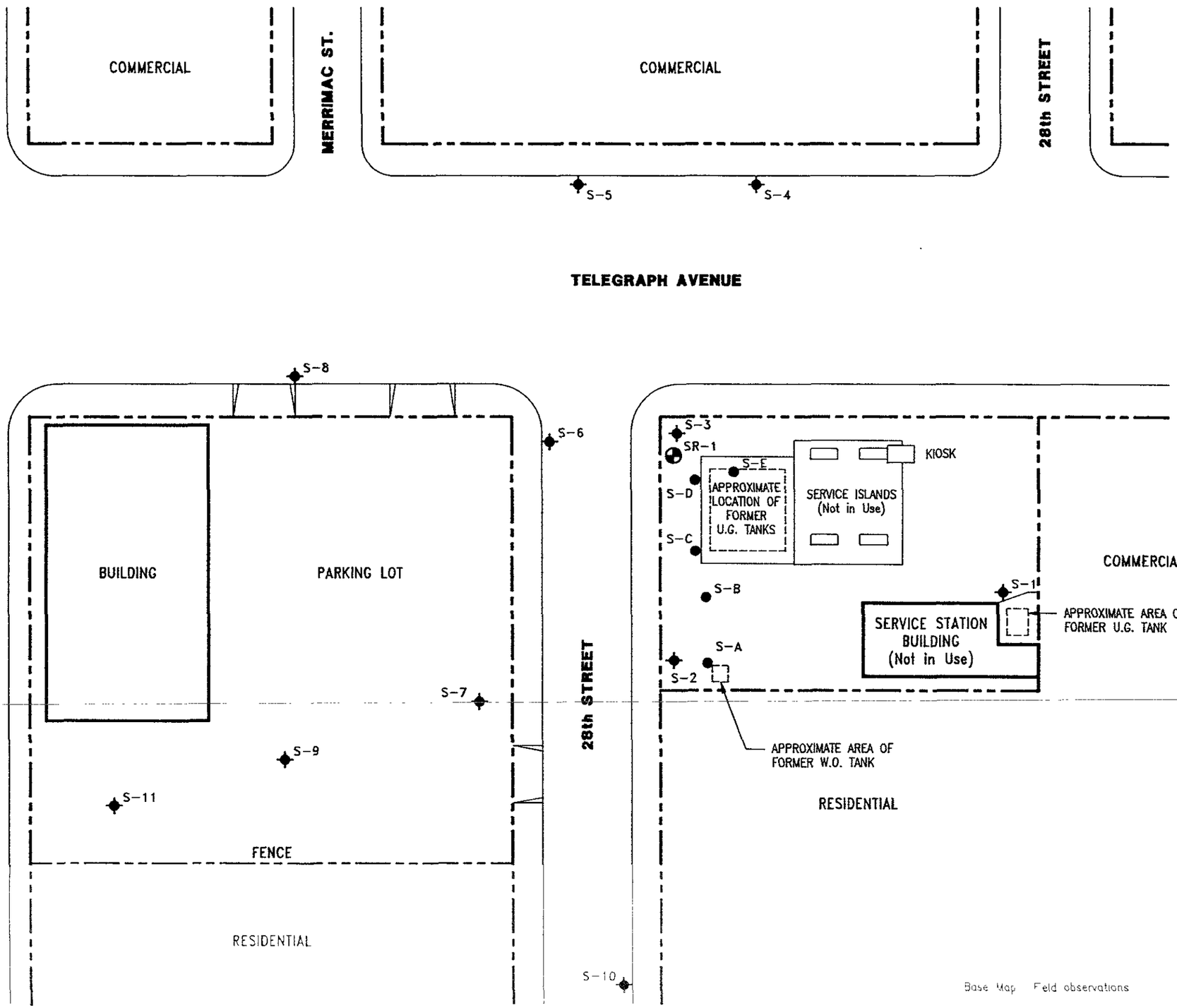
Base Map: USGS Topographic Map

GeoStrategies Inc.

VICINITY MAP
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE 1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7610		3/91	



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- Soil boring

PLATE 2

SITE PLAN
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

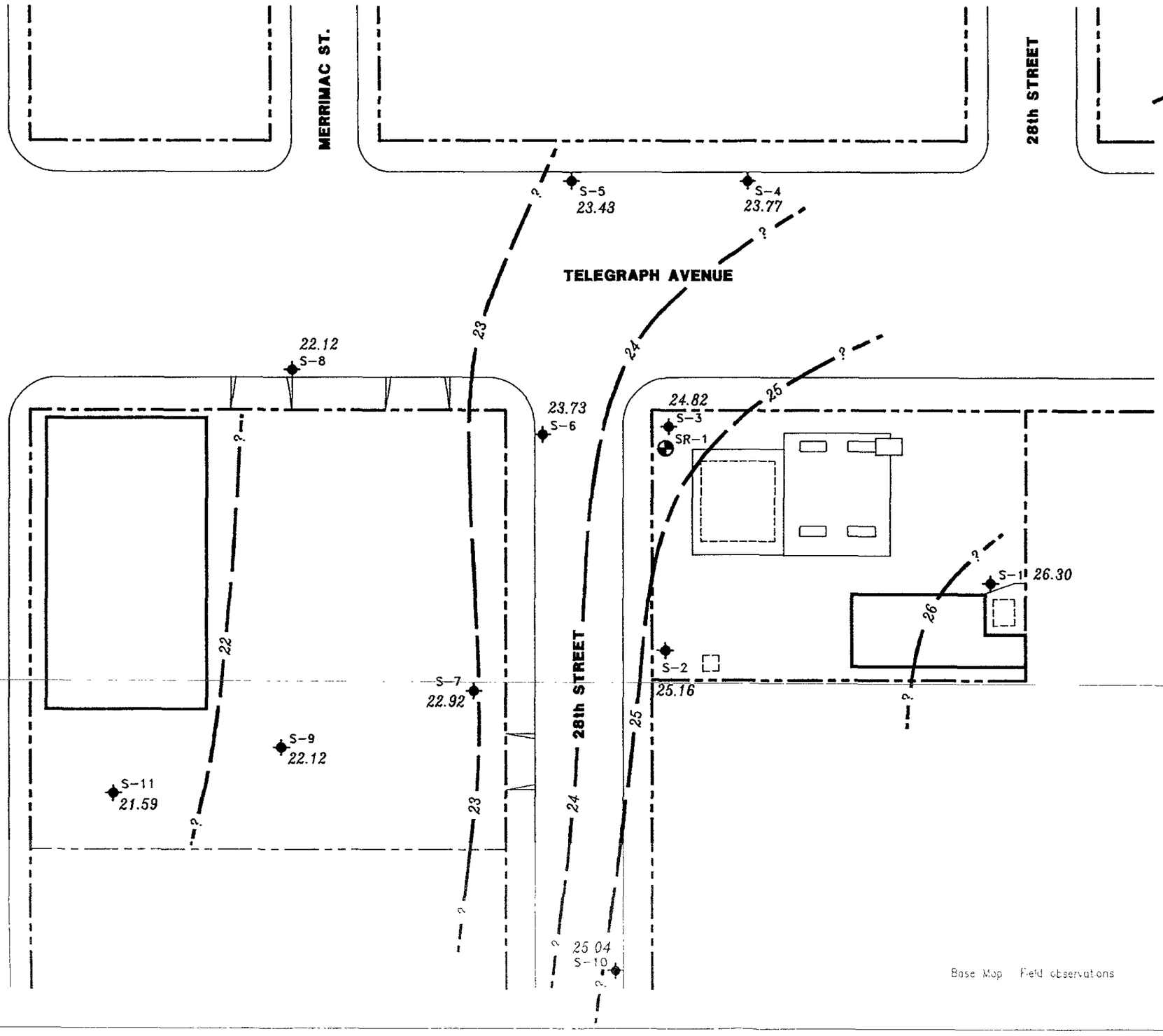
DATE 7/91

REVISED DATE

GeoStrategies Inc.

REVIEWED BY CPS

JOB NUMBER 761003-14



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- 99.99 — Ground-water elevation contour Approximate Gradient = 0.01
- *99.99* — Ground-water elevation in feet referenced to Mean Sea Level (MSL) measured on April 22, 1991

Note: Contours may be influenced by irrigation practices and/or site construction activities.

PLATE **3**

POTENTIOMETRIC MAP – PRIOR TO PUMPING WELL SR-1
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

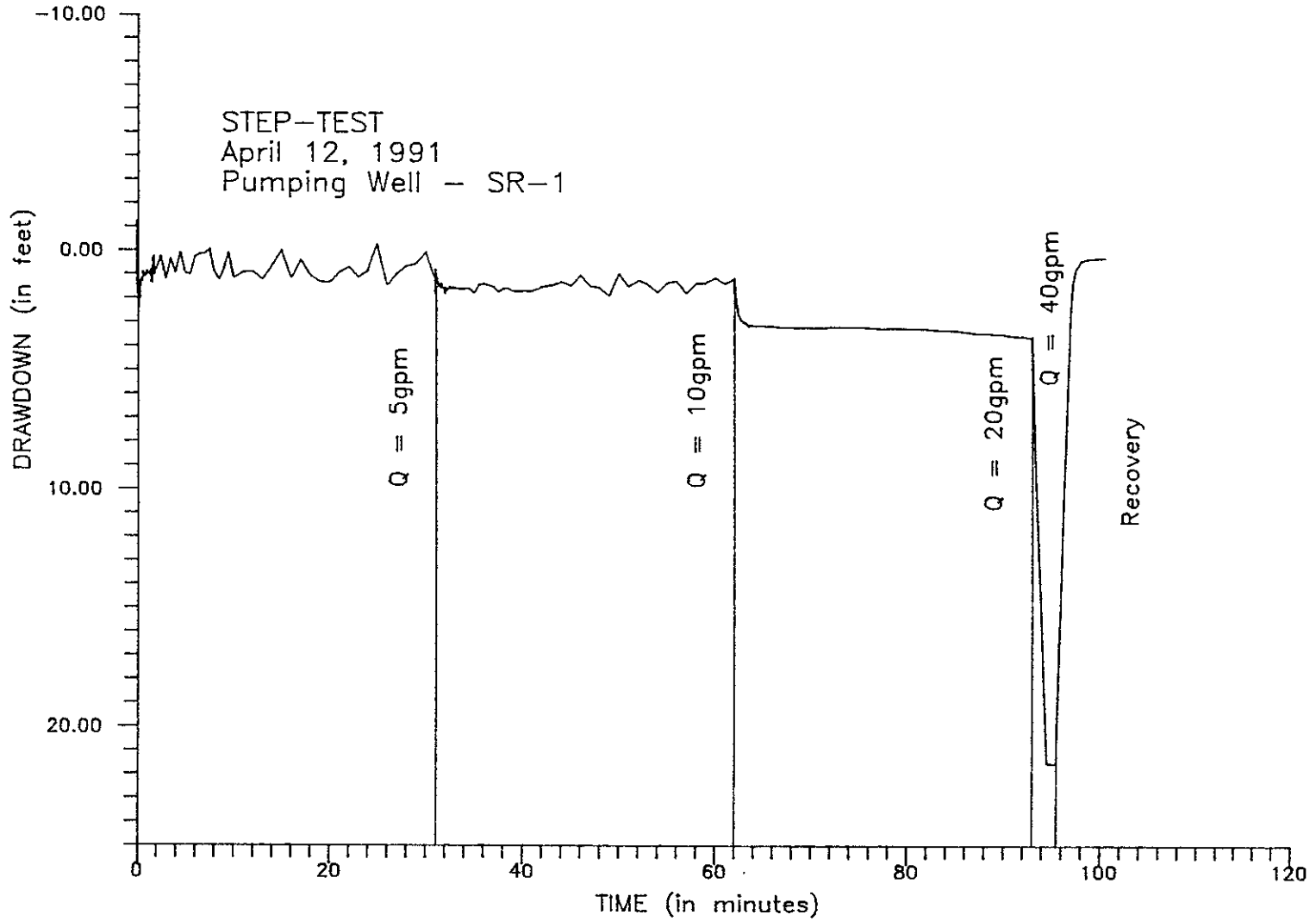
DATE 7/91

REVISED DATE

REVIEWED BY

JOB NUMBER 761003-14

GeoStrategies Inc.

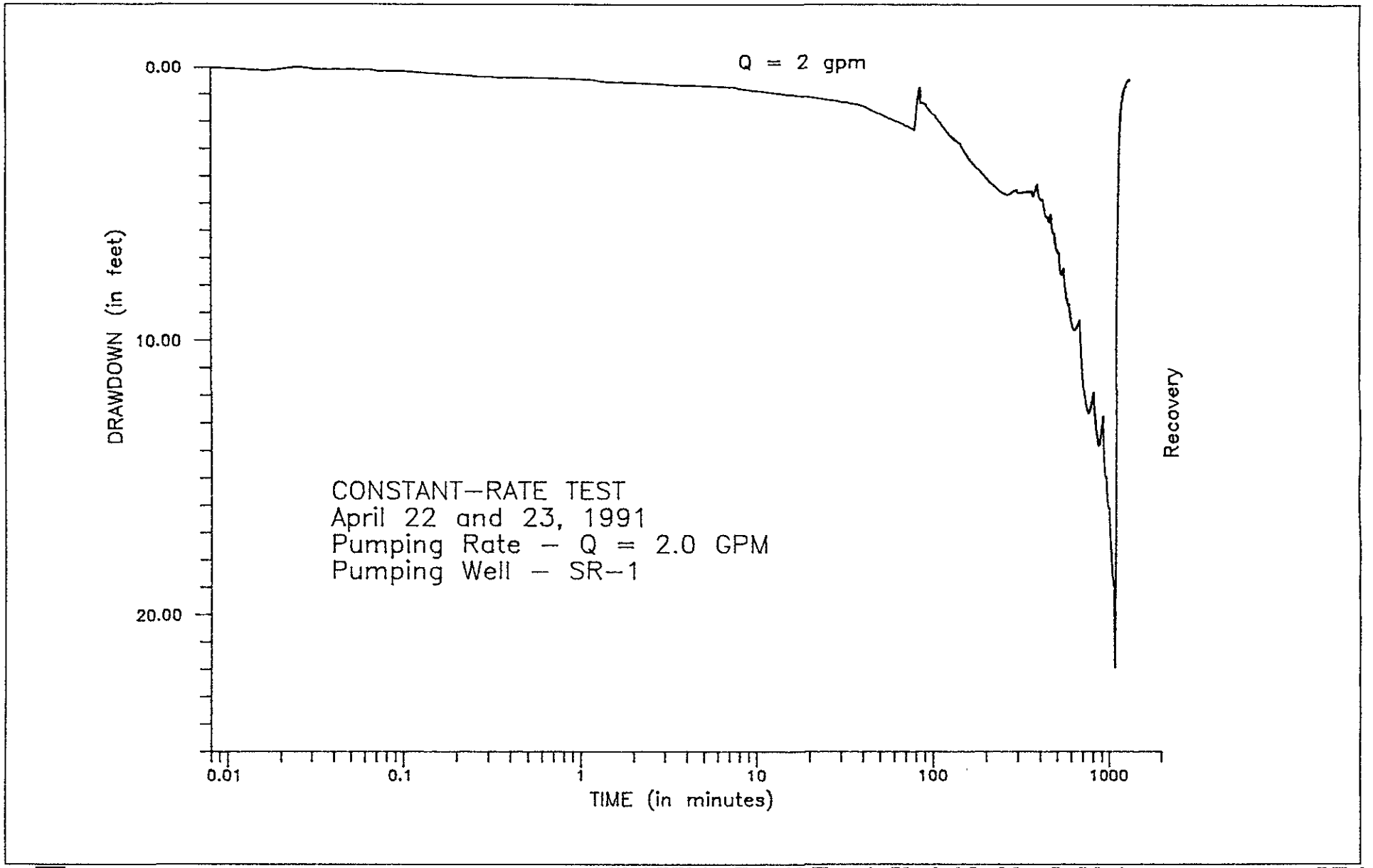


GeoStrategies Inc.

DRAWDOWN VS. TIME – STEP TEST
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE
4

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
761003–14	EFS	7/91	

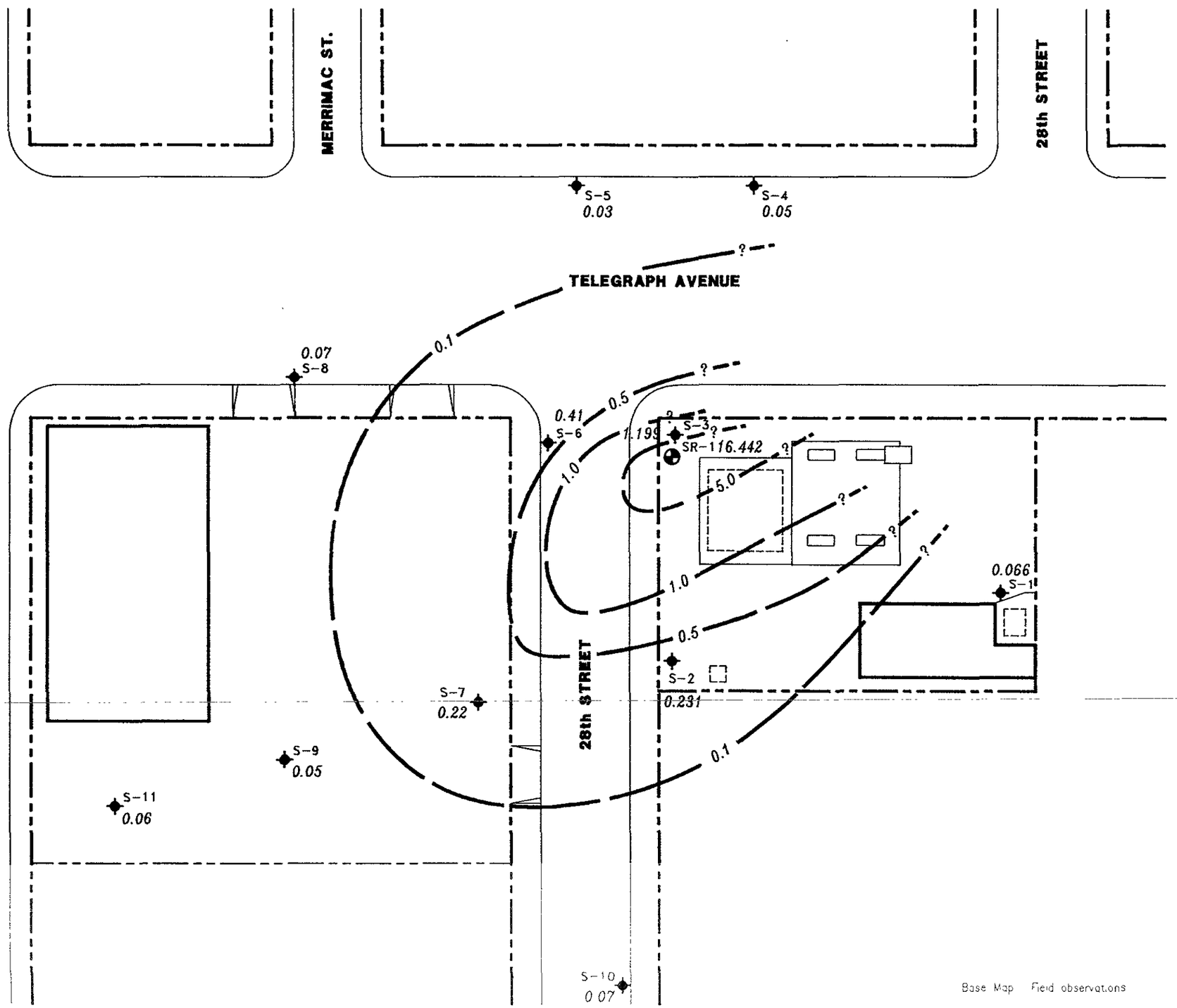


GeoStrategies Inc.

DRAWDOWN VS. TIME - CONSTANT RATE TEST
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE
5

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
761003-14	CFS	7/91	



EXPLANATION

- Ground–water monitoring well
- Ground–water recovery well
- 9.99 — Drawdown contour
- 9.99 — Drawdown in feet relative to static water level after pumping Well SR–1 for 1080 minutes at 2 gpm on April 22, 1991

Base Map Field observations

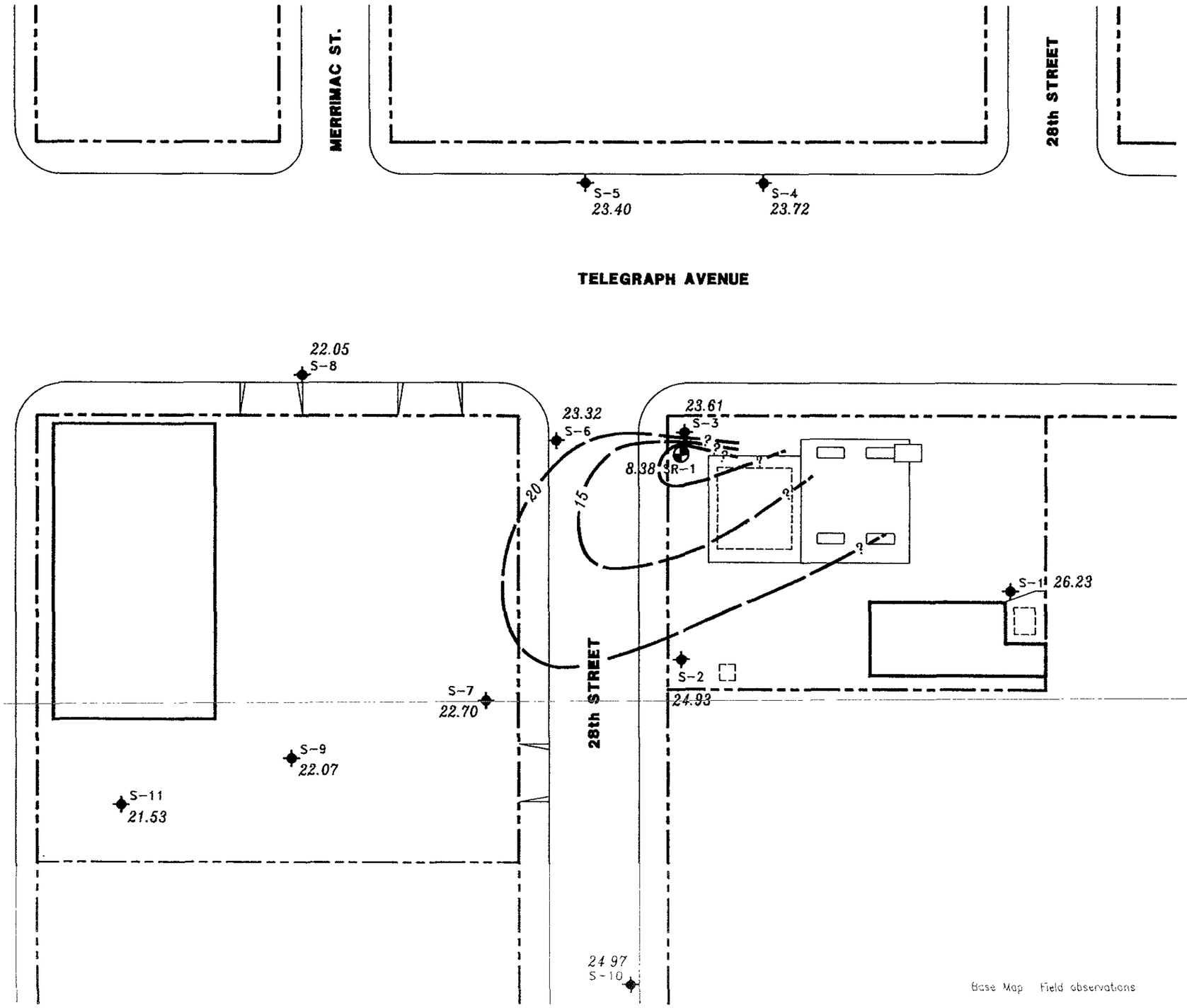
0 40
Scale in Feet

PLATE 6

WELL INFLUENCE MAP – WELL SR–1
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

GeoStrategies Inc.

JOB NUMBER 761003–14
REVIEWED BY EAS
DATE 7/91
REVISED DATE



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- 9.99 Ground-water elevation contour
- 9.99 Ground-water elevation in feet referenced to mean sea level (MSL) after pumping Well SR-1 for 1080 minutes at 2 gpm. on April 22, 1991

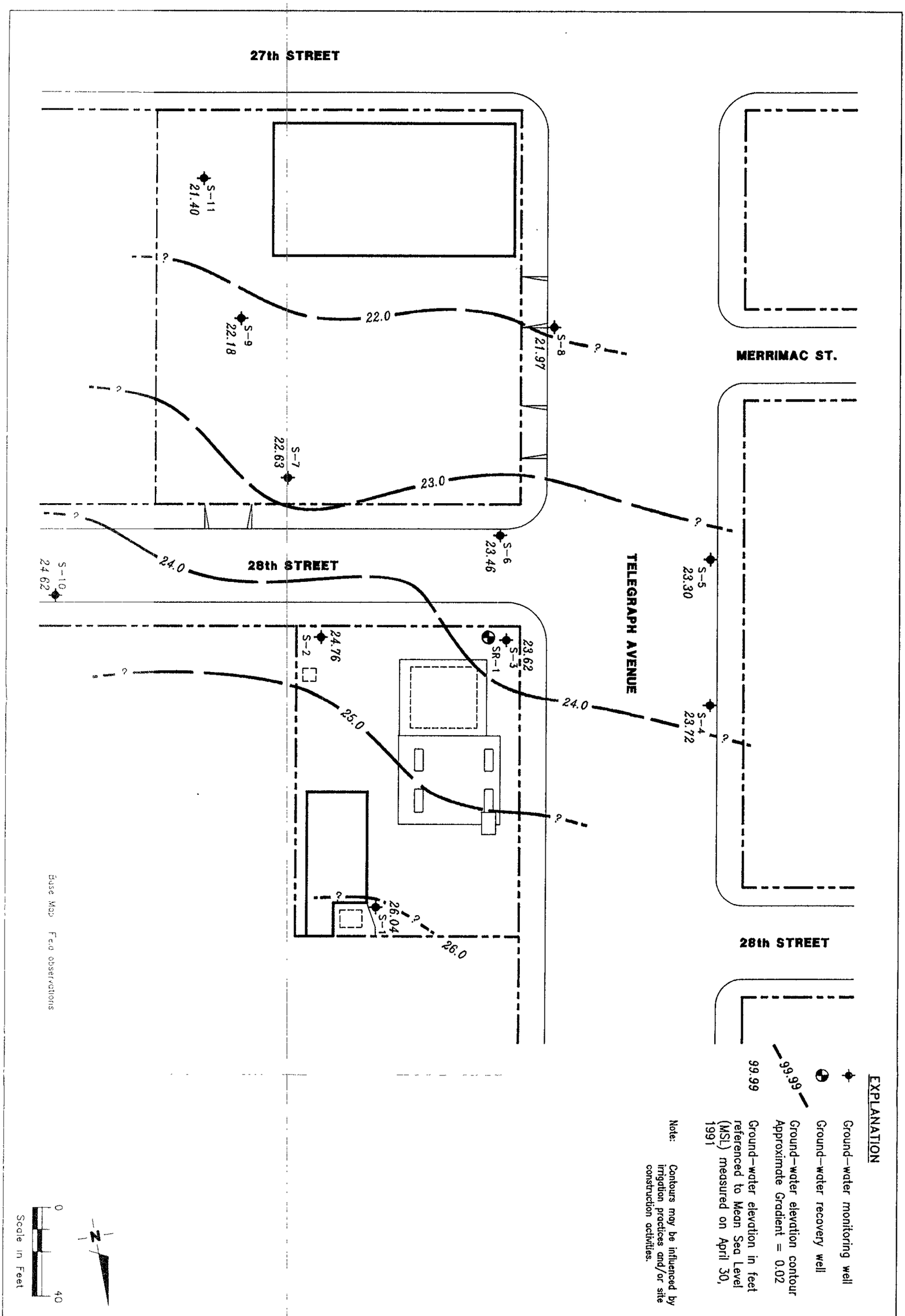
Base Map Field observations

PLATE 7

WATER LEVEL MAP - AFTER PUMPING WELL SR-1
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

GeoStrategies Inc.

JOB NUMBER 761003-14
REVIEWED BY
DATE 7/91
REVISED DATE



GeoStrategies Inc.

POTENTIOMETRIC MAP
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE **8**

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
761003-14	CFS	7/91	

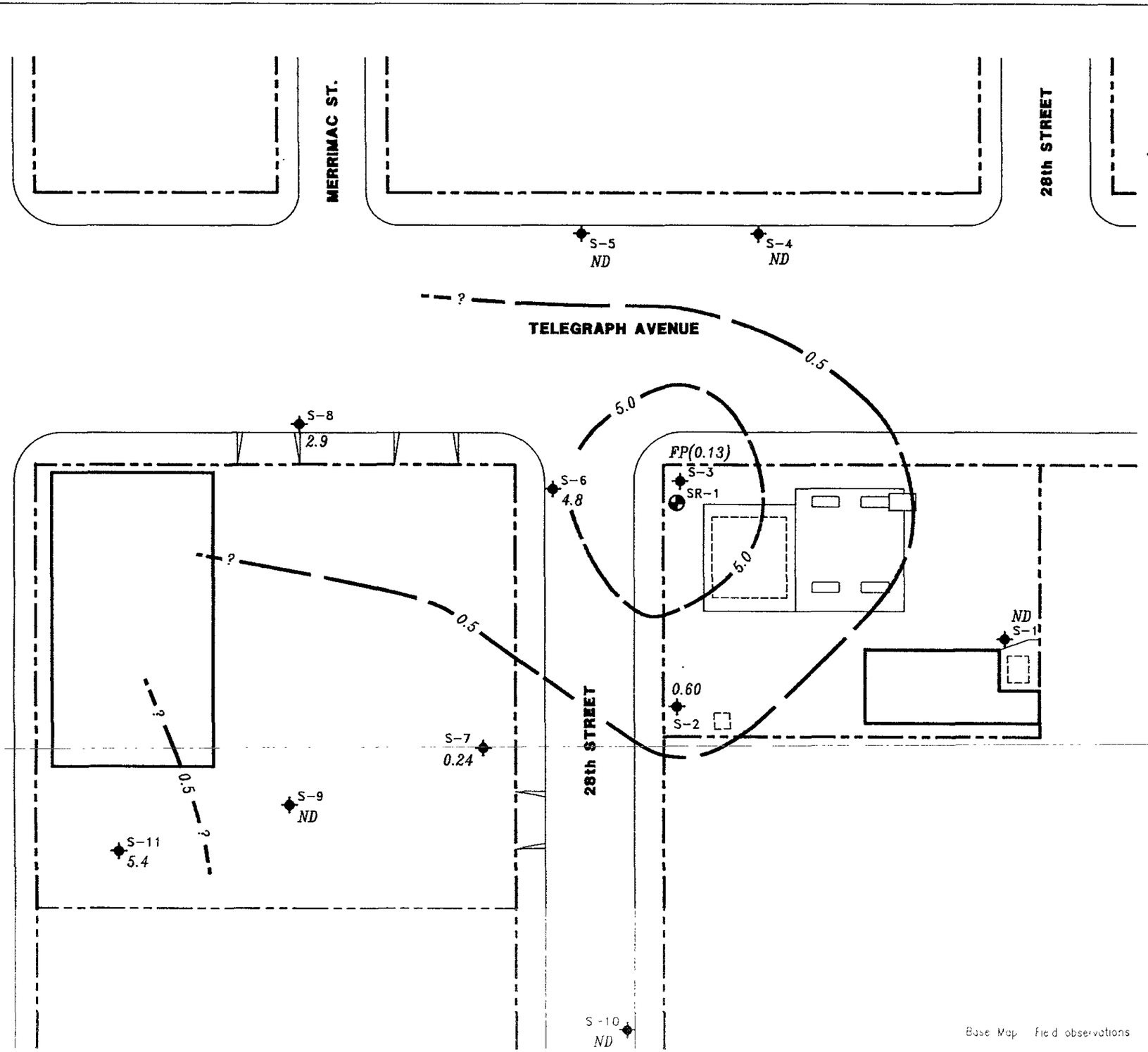


PLATE 9

TPH-G ISOCONCENTRATION MAP
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

REVISED DATE

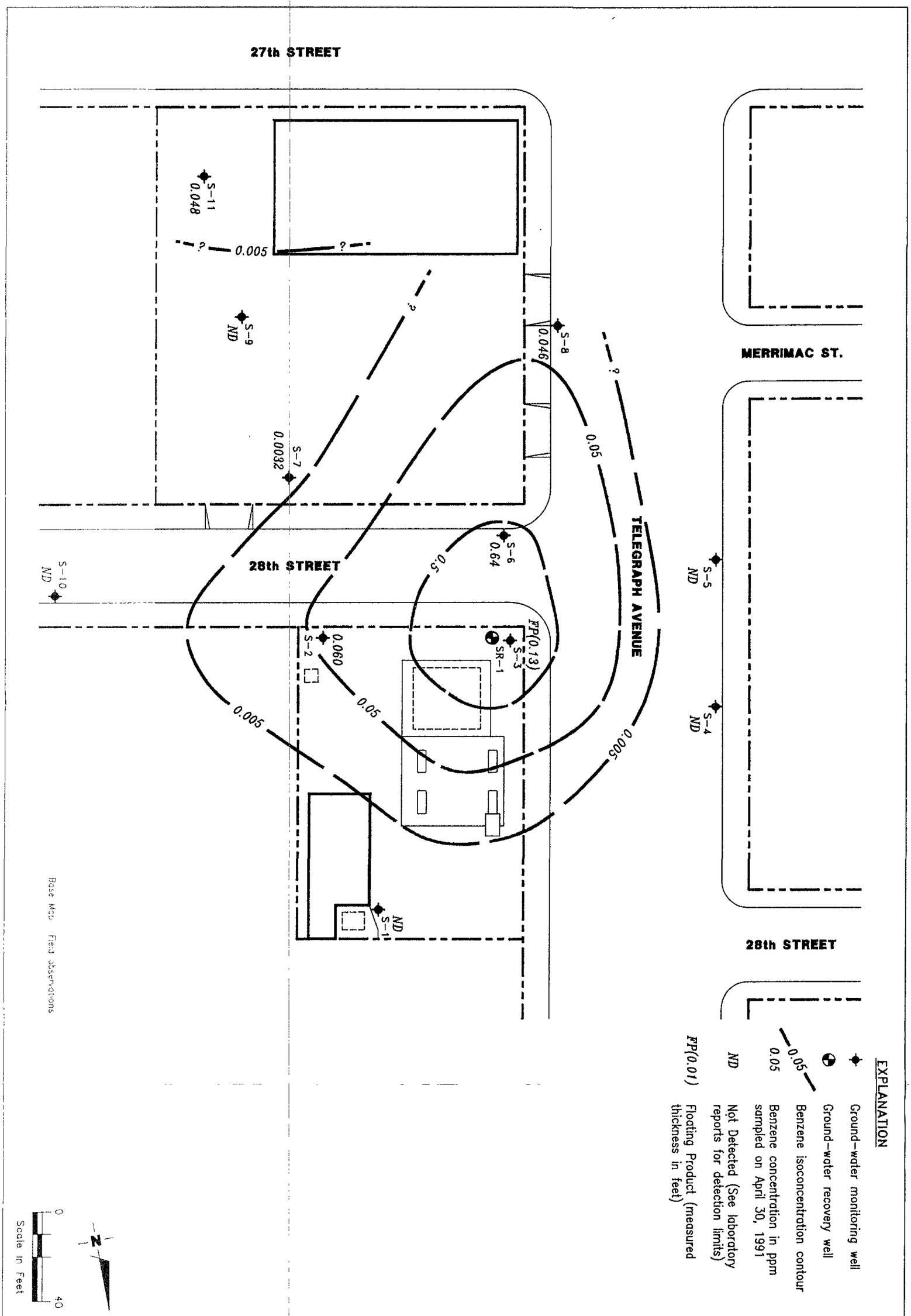
GeoStrategies Inc.

GSI

JOB NUMBER 761003-14

REVIEWED BY

DATE 7/91



GeoStrategies Inc.

BENZENE ISOCONCENTRATION MAP
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE **10**

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
761003-14	ES	7/91	

APPENDIX A
AQUIFER TEST PROCEDURES

AQUIFER TEST PROCEDURES

Aquifer properties will be calculated by measuring water-level drawdowns and recoveries in selected wells and matching graphed data plots to type-curves or use in numerical formulas based on theoretical predictions. Background information will be obtained and reviewed to achieve the best possible data before a test is scheduled. Data review will include the construction details and location of the proposed pumping well(s) and observation wells, subsurface lithology, suspected or known aquifer extent and thickness, aquifer/aquitard relationships, and the anticipated degree of homogeneity and isotrophy of the aquifer to be tested.

STEP-DRAWDOWN TEST

The purpose of performing a step - drawdown test (step - test) is to 1) estimate transmissivity in the pumping well 2) establish an optimum pumping rate for the constant-rate discharge test, and 3) evaluate wells in hydraulic communication with the test well(s).

Before the step-test is begun, background water-levels will be measured in all wells to be included in the test. After pump activation, drawdown measurements will be obtained and recorded primarily in the pumping well and selected observation wells monitored by pressure transducers attached to a datalogger. Water-level measurements will be measured by a steel tape or electronics interface probe in the remaining observation wells. Measurements will be taken over short time intervals and time between readings and measurements will increase as the test progresses. The observation well data are useful in qualitatively evaluating the radius of influence of the pumping wells. The initial pumping rate (Q1) will be conservative to assess drawdown potential in the pumping well and impacts to surrounding observation wells. Ideally, a minimum of three pumping steps (Q1, Q2, and Q3) will be the goal, with each step incrementally increasing the pumping discharge rate.

Each step of the pump test will be allowed to run until equilibrium within the step is indicated. Equilibrium is defined as a minimum of 20 minutes where little to no change in drawdown in the pumping well is observed. The target time interval per step is 60-120 minutes. Drawdown data will be continually collected during each test step and plotted on semi-logarithmic graph paper. The semi-logarithmic plot will be drawdown versus time. The semi-logarithmic data plot will be used to confirm the completion of a step, and will be used to estimate the increase in the discharge rate for the next step. Field data plots will be evaluated for conducting the constant-rate discharge test. If a step-test is performed without a follow-up constant-rate test, data will be evaluated using analysis techniques developed by Harrill (1970).

Following the completion of a step-test, the aquifer being pumped will be allowed to recover for a period of no less than 12 hours or until aquifer recovery has been achieved before a constant-rate pump test is begun. This recovery period is particularly important because the cone of depression recovery may not be complete for outlying wells if a test is initiated immediately after the step-test. Consequently, the data may be invalid or difficult to evaluate.

CONSTANT-RATE DISCHARGE TEST

Prior to starting a constant-rate discharge test, background water-level measurements will be made in all wells to be included in the test. After pump activation, drawdown measurements will be made primarily in the pumping well. The pumping rate will be constant throughout the test. Selection of the pumping rate shall be made from assessment of step-drawdown test data. Water-level measurements may be made by using an electric sounder, weighted steel tape, or pressure transducer. Initial measurements will be taken over short time intervals and time between readings and measurements will increase as the test progresses.

Drawdown and well recovery data will be plotted for the pumping well and selected observation wells on semi-logarithmic graph paper. Data plots will be maintained throughout the duration of a test. The semi-logarithmic plots will be drawdown versus time. The field data plots will be used to calculate specific aquifer characteristics using the Jacob's Method. Additional data interpretations may be performed based on the requirements of the test results. Examples of additional data analyses may include use of the the residual drawdown method (Theis, 1935), leaky aquifer type curve method (Walton, 1970), and the distance drawdown method. Computer models may be used to estimate hydraulic properties and aid in the selection of remedial action for a site.

PUMP TEST EQUIPMENT

Step-drawdown and constant-rate discharge pump tests will be performed by lowering and securing a submersible pump in the test well. Typically, the pump intake will be placed within the screened interval of the test well. The size of the pump and diameter of discharge piping will be sufficient to accommodate expected pump rates. Flow rates during the tests will be controlled and measured using the in-line portable hydrotest manifold system. Pump discharge rates will be regulated using a main-flow adjustable valve located ahead of the flowmeter system. Flow rates are monitored frequently during a test.

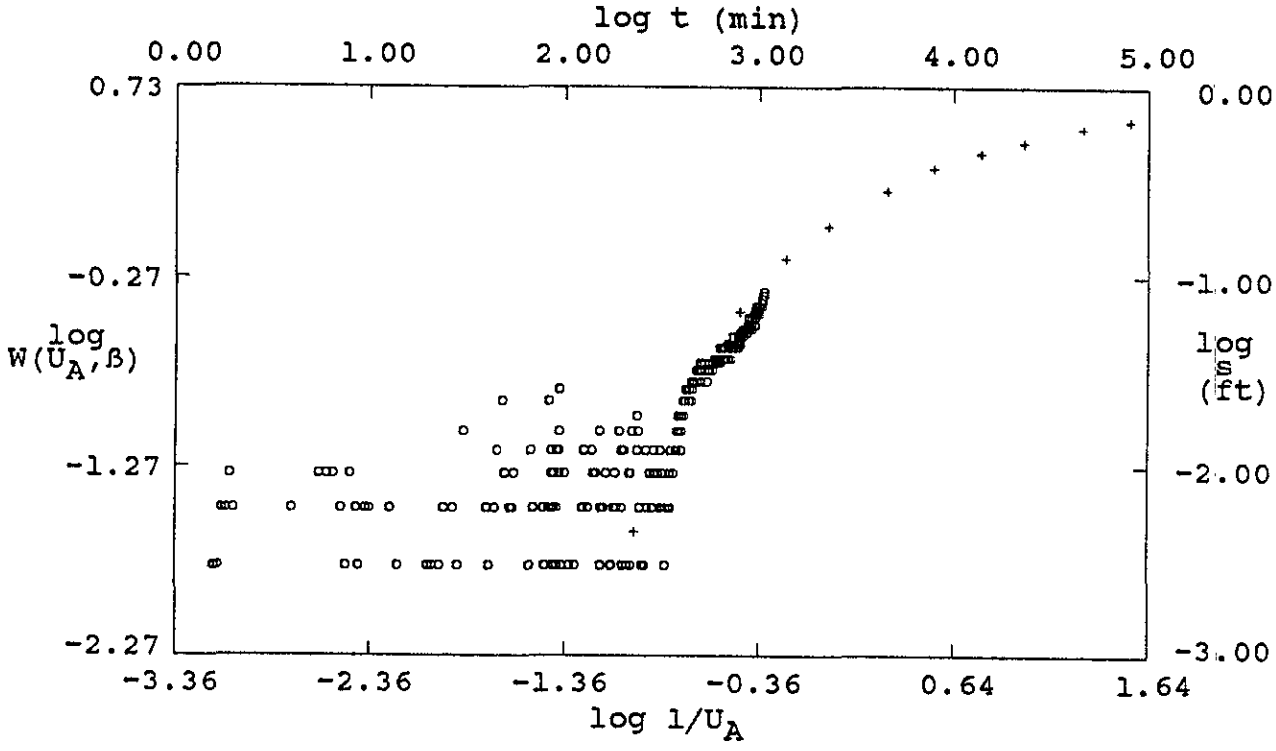
Whenever possible, data from the test well, and selected observation wells will be collected using data loggers and pressure transducers. Water levels in wells not equipped with pressure transducers will be measured using either an electronic interface probe or an incremented steel tape.

Discharge of pumped water will be to an approved location. All necessary permits for discharge to a sanitary or storm sewer will be obtained before a test is scheduled. If present, discharge may be routed through an on-site remedial system.

All pump test equipment will be decontaminated prior to use using either Alconox or an equivalent detergent, and/or a steam cleaner. If more than one well is to be tested, all equipment will be decontaminated between wells. Maintenance of pump test equipment will be performed on a routine basis. Any required calibrations of equipment will be performed to manufacturer's specifications.

APPENDIX B
JACOB FIELD DATA PLOTS
AND GWAP DATA PLOTS

7610 Aquifer Test Well S-1



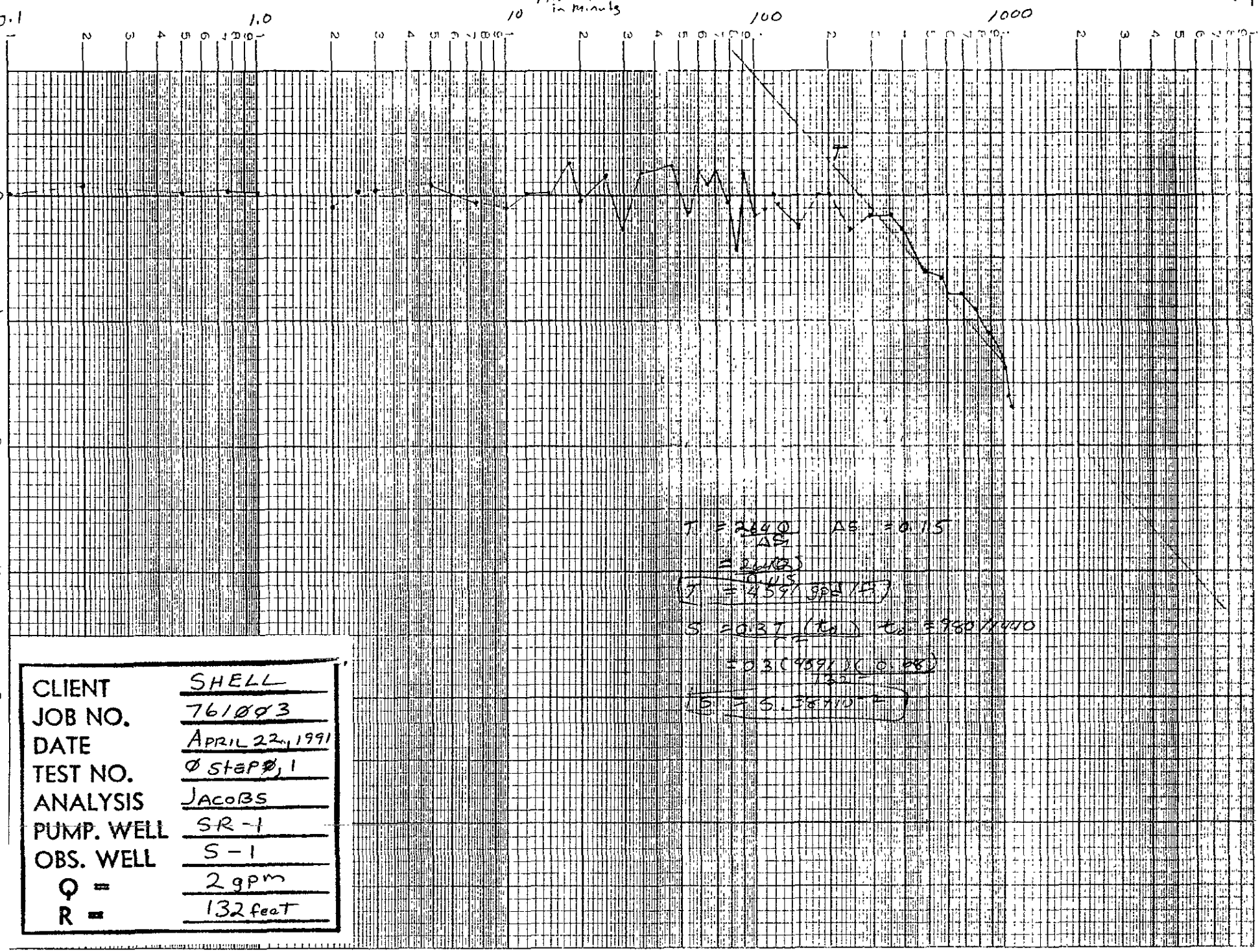
o - Data

\+ - Type Curve
Unconfined Elastic: beta = 0.004

SOLUTION

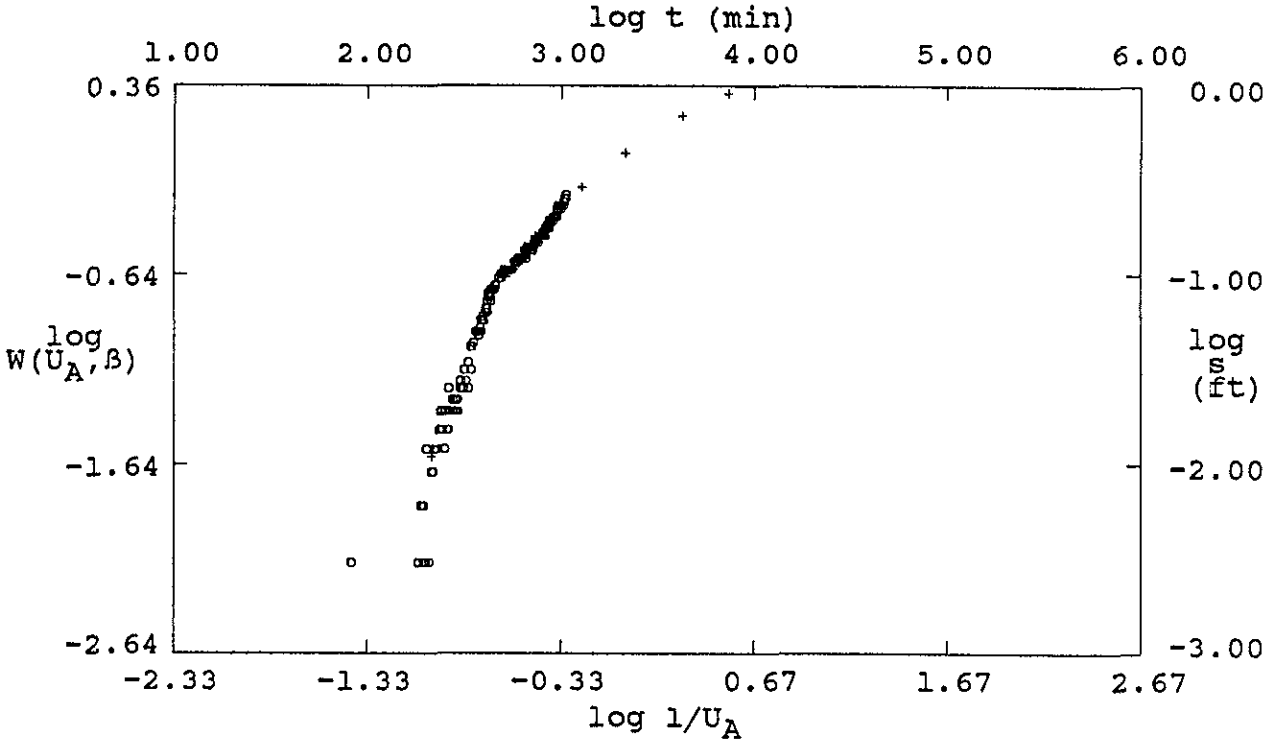
Transmissivity	=	1.231E+0003 gpd/ft
Aquifer Thick.	=	2.200E+0001 ft
Hydraulic Cond.	=	5.593E+0001 gpd/sq ft
Storativity	=	1.502E-0002

WELL S-1 2gpm 761003



CLIENT	SHELL
JOB NO.	761003
DATE	APRIL 22, 1991
TEST NO.	0 step 0, 1
ANALYSIS	JACOBS
PUMP. WELL	SR-1
OBS. WELL	S-1
Q =	2 gpm
R =	132 feet

7610 Aquifer Test Well S-2



o - Data

\+ - Type Curve
Unconfined Elastic: beta = 0.001

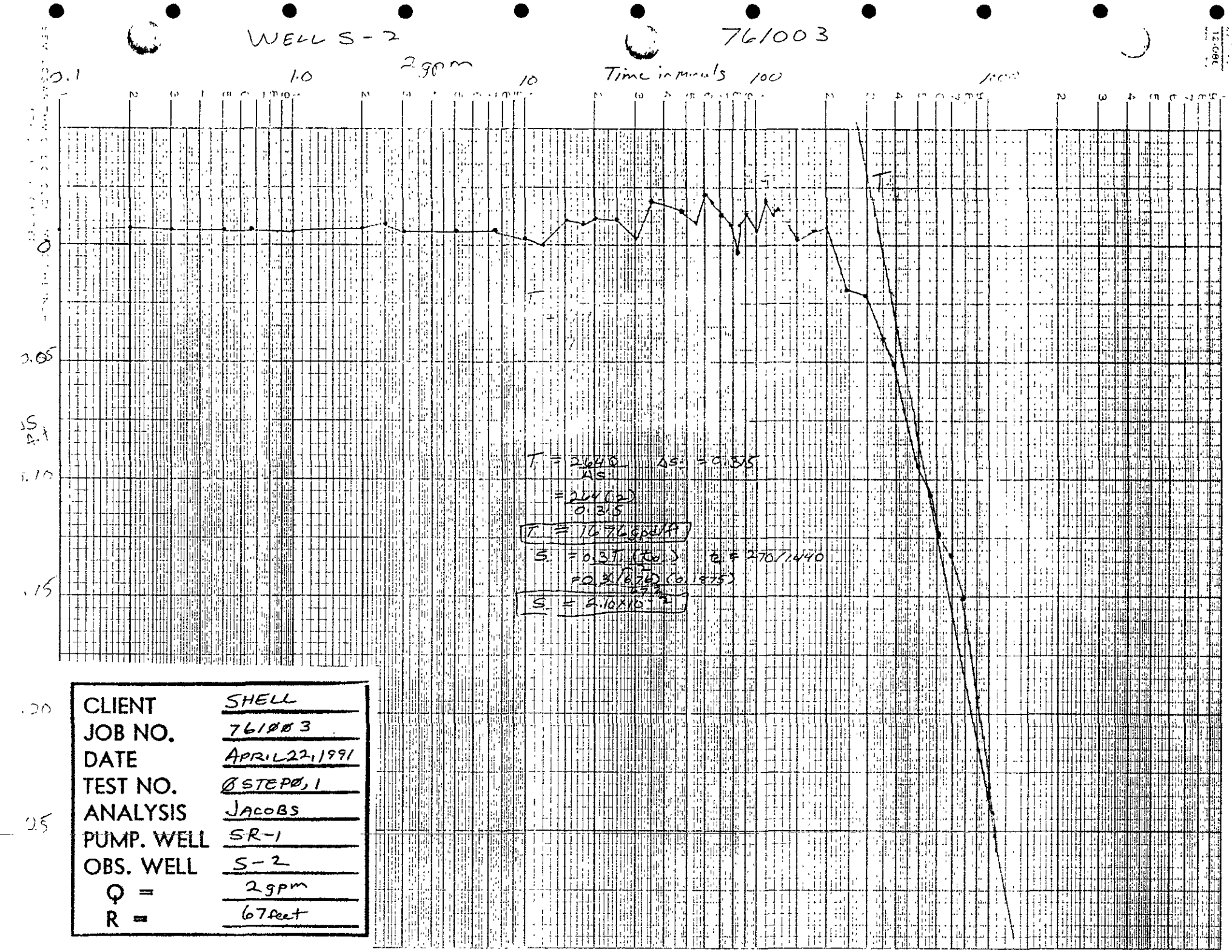
SOLUTION

Transmissivity	=	5.249E+0002 gpd/ft
Aquifer Thick.	=	2.200E+0001 ft
Hydraulic Cond.	=	2.386E+0001 gpd/sq ft
Storativity	=	2.321E-0002

WELL S-2 761003

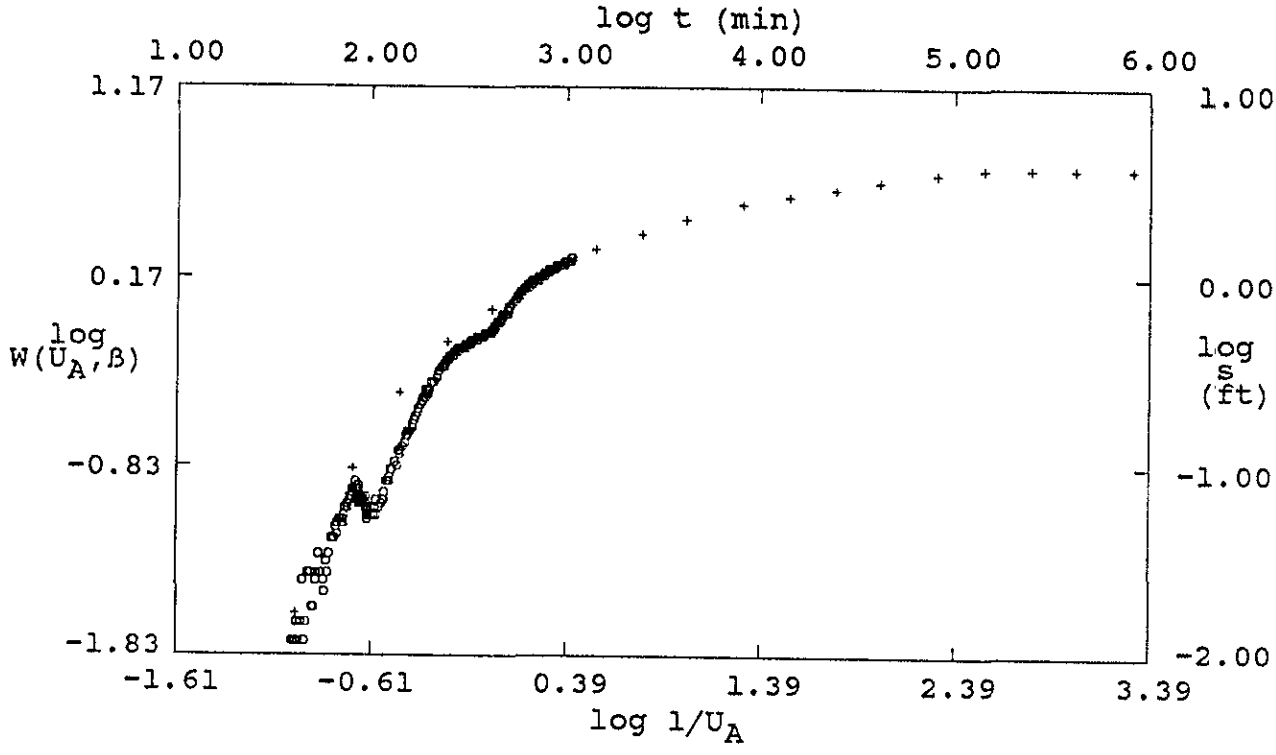
2 gpm

Time in minutes



CLIENT	SHELL
JOB NO.	761003
DATE	APRIL 22, 1991
TEST NO.	ØSTEPØ, 1
ANALYSIS	JACOBS
PUMP. WELL	SR-1
OBS. WELL	S-2
Q =	2 gpm
R =	67 feet

7610 Aquifer Test Well S-3



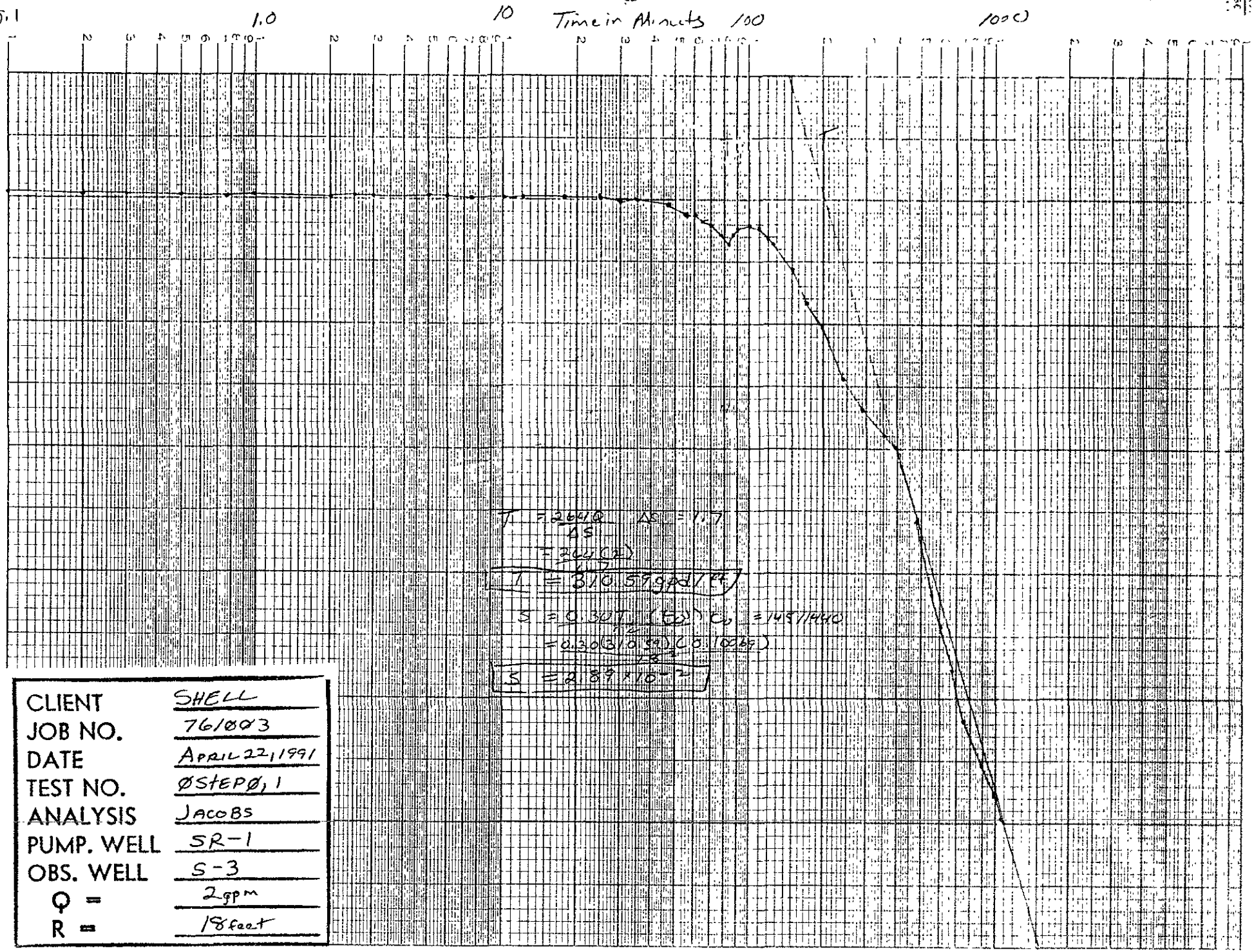
o - Data

\+ - Type Curve
Unconfined Elastic: beta = 0.001

SOLUTION

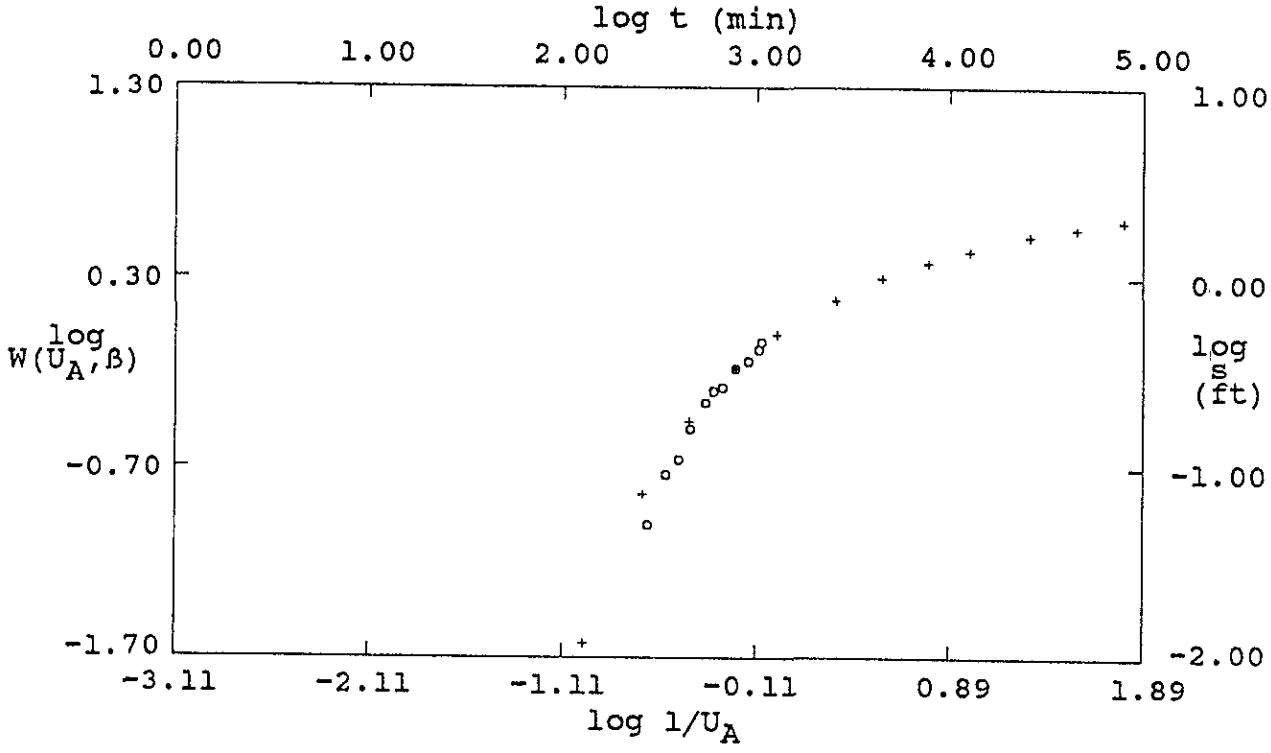
Transmissivity	=	3.389E+0002 gpd/ft
Aquifer Thick.	=	2.200E+0001 ft
Hydraulic Cond.	=	1.541E+0001 gpd/sq ft
Storativity	=	3.957E-0002

WELL S-3 761003



CLIENT	SHELL
JOB NO.	761003
DATE	APRIL 22, 1991
TEST NO.	ØSTEPØ, 1
ANALYSIS	JACOBS
PUMP. WELL	SR-1
OBS. WELL	S-3
Q =	2 gpm
R =	18 feet

7610 Aquifer Test Well S-6



o - Data

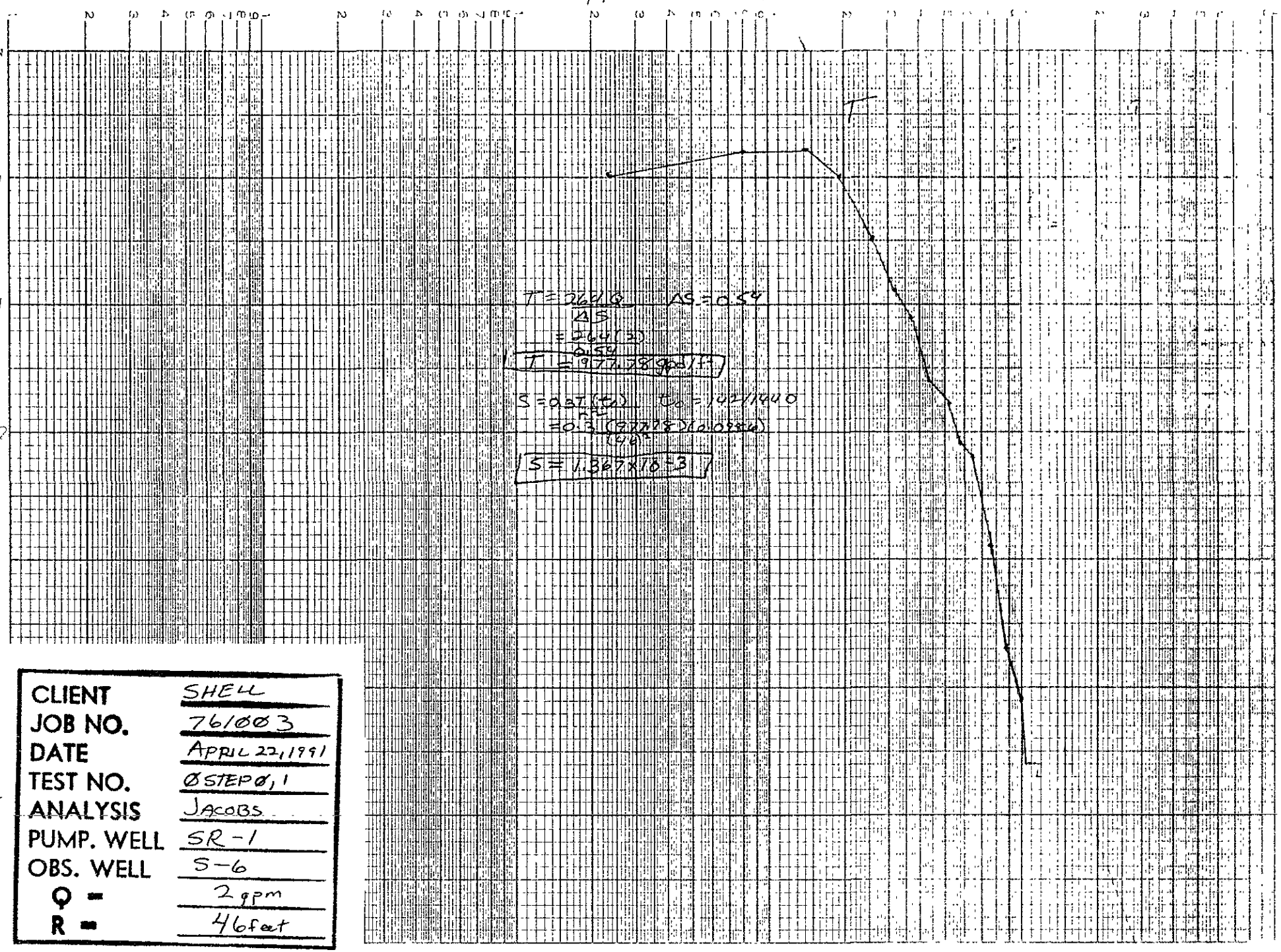
\+ - Type Curve
Unconfined Elastic: beta = 0.004

SOLUTION

Transmissivity = 4.572E+0002 gpd/ft
Aquifer Thick. = 2.200E+0001 ft
Hydraulic Cond.= 2.078E+0001 gpd/sq ft
Storativity = 2.584E-0002

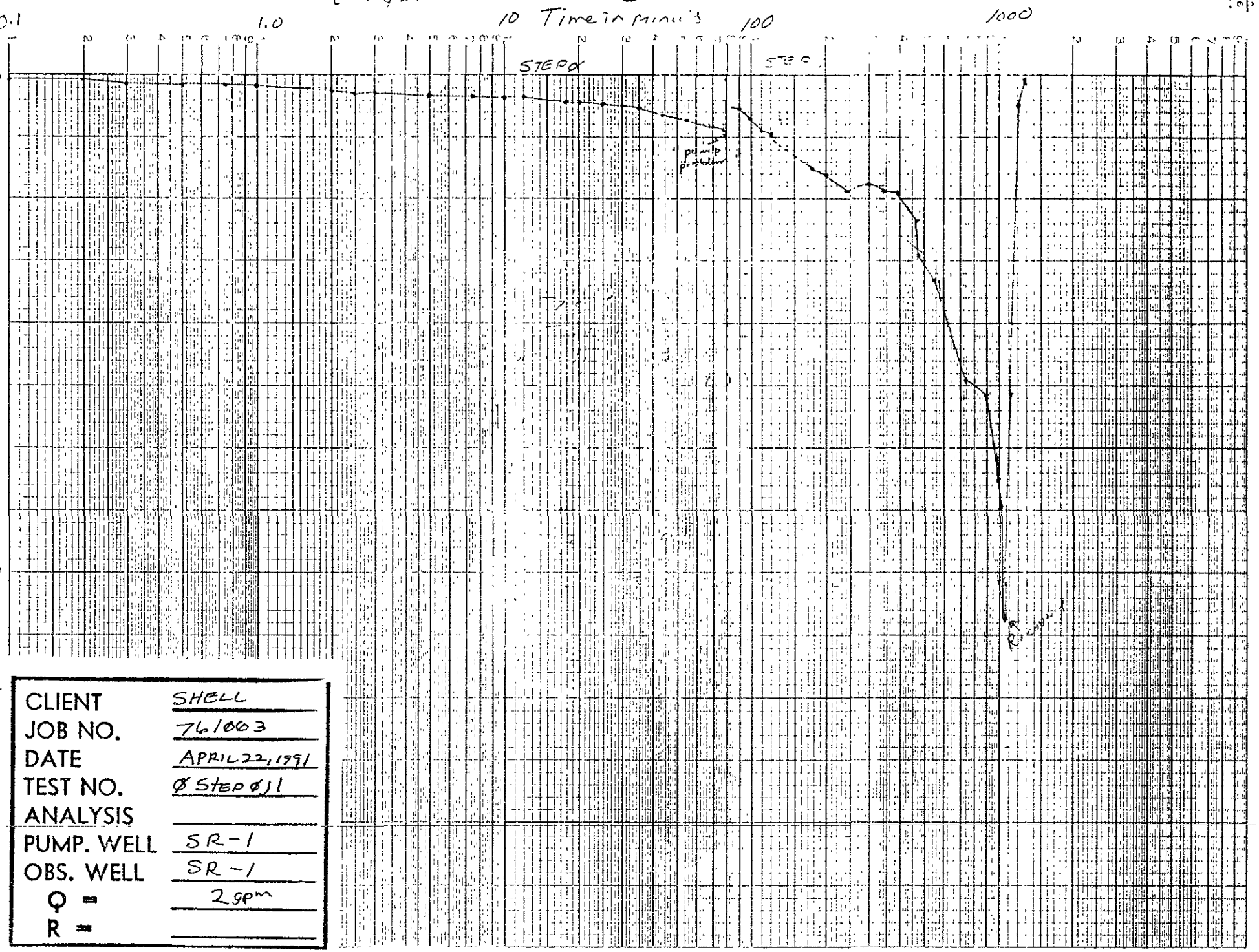
WELL S-6 2gpm - 761003

Time in minutes



CLIENT	SHELL
JOB NO.	761003
DATE	APRIL 22, 1991
TEST NO.	ØSTEPØ,1
ANALYSIS	JACOBS
PUMP. WELL	SR-1
OBS. WELL	S-6
Q =	2 gpm
R =	46 feet

Well SR-1 Q=2gpm 76/003



CLIENT	SHELL
JOB NO.	76/003
DATE	APRIL 22, 1991
TEST NO.	Ø STEP ØJ1
ANALYSIS	
PUMP. WELL	SR-1
OBS. WELL	SR-1
Q =	2 gpm
R =	

APPENDIX C
ANALYTICAL LABORATORY REPORT
AND CHAIN-OF-CUSTODY

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Shell Oil Company
Gettler-Ryan
2150 West Winton
Hayward, CA 94545
Tom Paulson

Date: 05/15/91

Work Order: T1-05-026 P.O. Number: MOH 880-021 Vendor #I0002402

This is the Certificate of Analysis for the following samples:

Client Work ID: GR3610, 2800 Telegraph, Oklnd
Date Received: 05/02/91
Number of Samples: 13
Sample Type: aqueous

TABLE OF CONTENTS FOR ANALYTICAL RESULTS

Reviewed and Approved:

Suzanne Veaudry
Project Manager

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

Work Order: T1-05-026

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: S-1
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-01
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/08/91
Low Boiling Hydrocarbons	Mod.8015		05/08/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-2
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-02
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/08/91
Low Boiling Hydrocarbons	Mod.801		05/08/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	0.60
BTEX		
Benzene	0.0005	0.060
Toluene	0.0005	0.0036
Ethylbenzene	0.0005	0.016
Xylenes (total)	0.0005	0.015

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-4
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-03
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/08/91
Low Boiling Hydrocarbons	Mod.8015		05/08/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-5
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-04
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/08/91
Low Boiling Hydrocarbons	Mod.8015		05/08/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	0.0008

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-6
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-05
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/09/91
Low Boiling Hydrocarbons	Mod.8015		05/09/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	1.0	4.8
BTEX		
Benzene	0.01	0.64
Toluene	0.01	0.15
Ethylbenzene	0.01	0.17
Xylenes (total)	0.01	0.48

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-7
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-06
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/09/91
Low Boiling Hydrocarbons	Mod.8015		05/09/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	0.24
BTEX		
Benzene	0.0005	0.0032
Toluene	0.0005	0.0023
Ethylbenzene	0.0005	0.0036
Xylenes (total)	0.0005	0.010

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-8
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-07
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/10/91
Low Boiling Hydrocarbons	Mod.8015		05/10/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.25	2.9
BTEX		
Benzene	0.0025	0.046
Toluene	0.0025	0.11
Ethylbenzene	0.0025	0.12
Xylenes (total)	0.0025	0.33

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-9
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-08
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/09/91
Low Boiling Hydrocarbons	Mod.8015		05/09/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	0.0006

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-10
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-09
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/10/91
Low Boiling Hydrocarbons	Mod.8015		05/10/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-11
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-10
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/10/91
Low Boiling Hydrocarbons	Mod.8015		05/10/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.25	5.4
BTEX		
Benzene	0.0025	0.048
Toluene	0.0025	0.026
Ethylbenzene	0.0025	0.080
Xylenes (total)	0.0025	0.37

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: SD-1
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-11
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/08/91
Low Boiling Hydrocarbons	Mod.8015		05/08/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: SP-2
SAMPLE DATE: 04/30/91
LAB SAMPLE ID: T105026-12
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/08/91
Low Boiling Hydrocarbons	Mod.8015		05/08/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: Trip Blank
SAMPLE DATE: not spec
LAB SAMPLE ID: T105026-13
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		05/08/91
Low Boiling Hydrocarbons	Mod.8015		05/08/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-05-026

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control
SAMPLE DATE: not spec
LAB SAMPLE ID: T105026-14A
EXTRACTION DATE:
ANALYSIS DATE: 05/07/91
ANALYSIS METHOD: Mod. 8015

QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Gasoline	ND<50.	500.	577.	559.	115.	112.	3.

SURROGATES	MS %Rec	MSD %Rec
1,3-Dichlorobenzene	87.	84.

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

Work Order: T1-05-026

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control
SAMPLE DATE: not spec
LAB SAMPLE ID: T105026-14B
EXTRACTION DATE:
ANALYSIS DATE: 05/09/91
ANALYSIS METHOD: 8020

QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Benzene	nd 0.5	50.0	46.9	46.5	94.	93.	1.
Toluene	nd 0.5	50.0	49.5	50.3	99.	101.	2.
Ethylbenzene	nd 0.5	50.0	48.3	47.9	97.	96.	1.
Xylenes	nd 0.5	150.	129.	130.	86.	87.	1.

SURROGATES	MS %Rec	MSD %Rec
1,3-Dichlorobenzene	97.	119.

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 05/15/91
Client Work ID: GR3610, 2800 Telegraph, Oklnd

Work Order: T1-05-026

TEST CODE TPHVB TEST NAME TPH Gas,BTEX by 8015/8020

The method of analysis for low boiling hydrocarbons is taken from EPA Methods modified 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography using a flame ionization detector in series with a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.

ENVIRONMENTAL DIVISION

COMPANY Shell JOB NO.

JOB LOCATION 2800 Telegraph

CITY Oakland PHONE NO. 783-7500

AUTHORIZED Tom Paulson DATE 4-30-91 P.O. NO. 3610.01

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID
S-1	3	H_2O	4-30-91/1230	THC (gas) BTXE	
S-2			/1343		
S-4			/1039		
S-5			/951		
S-6			/1127		
S-7			/855		
S-8			/1115		
S-9			/835		
S-10			/1145		
S-11			/1025		
SD-1			/—		
SF-2	↓		/1343		
Trip Blank	1	↓	—	↓	

RELINQUISHED BY: 4/30/91 1400

RECEIVED BY: ReTrig #1 4-30-91 14:00

RELINQUISHED BY: ReTrig #1 5-2-91 09:00

RECEIVED BY: ah 5-2-91 09:00

RELINQUISHED BY: ah 5-2-91 13:45

RECEIVED BY LAB:

DESIGNATED LABORATORY: IT (Sou) DHS #: 137

REMARKS: NORMAL TAT Eng: JACK BRASTAD

EXP 5461

WIC 204-5502 2303

DATE COMPLETED 4-30-91 FOREMAN

ORIGINAL