Chevron U.S.A. Inc.
2 Annabel Lane, Suite 200, San Ramon, CA 94583 • Phone (415) 838-5000

Marketing Operations
D. Mollier
Division Manager, Operations
J. O. Powers
Area Manager, Operations
W. R. Lawrence
Manager, Operations Staff
C. G. Trimbach
Manager, Engineering

December 17, ~~1985~~

Mr. Kazami
RWQCB
1111 Jackson Street
Room 6040
Oakland, CA 94607

CALIFORNIA REGIONAL WATER

DEC 19 1985

QUALITY CONTROL BOARD

Re: Fuel Leak Investigation and Recovery
Chevron SS #5607
5269 Crow Canyon Road
Castro Valley, CA

Dear Mr. Kazami:

In March of 1985 Chevron reported to your agency a suspected loss of 673 gallons of Regular product from an underground storage tank at the referenced site. Subsequent investigation well installations confirmed an inadvertent loss had occurred and free floating product was present on the ground water. Enclosed is our consultants April 1, 1985 report summarizing the initial investigative steps and findings.

To prevent migration and to recover this product our consultant designed and installed a recovery system. Also enclosed is their report outlining the installation of this system and a summary of the recovery progress through September of 1985.

We will continue to operate this system until the lost product is recovered and periodic updates of this recovery progress will be submitted to your agency.

If you have any questions or require additional information, please feel free to call John Randall at (415) 838-5339.

Very truly yours,

C. G. TRIMBACH

By _____
John Randall, Engineer

JR/cag:VK2-111
Enclosure

GROUNDWATER
TECHNOLOGY
Consulting Groundwater Geologists
A Division of Oil Recovery Systems, Inc.
5047 CLAYTON ROAD • CONCORD, CA 94521 • (415) 671-2387

Data ?

FALL/WINTER
19[illegible]

GASOLINE RECOVERY
AT
CHEVRON SERVICE STATION
5269 CROW CANYON ROAD
CASTRO VALLEY, CALIFORNIA

Prepared for:

John Randall
Chevron U.S.A.,Inc.
2 Annabel Lane, Suite 200
San Ramon, Ca. 94583

Prepared by:

Groundwater Technology
5047 Clayton Rd.
Concord, Ca. 94521

Bill Channell
Project Geologist

Gary B. Taggart
Certified Engineering
Geologist No. 1061

TABLE OF CONTENTS

INTRODUCTION

The following is an update report on Groundwater Technology's activities and observations at the Chevron Castro Valley Service Station since the April 1, 1985 report. This report mainly deals with the installation and operation of the recovery system.

BACKGROUND - PHASE I MONITORING WELL INSTALLATION

In March 1985 Groundwater Technology was contacted by Chevron U.S.A. to investigate the possibility of a small inadvertant release of unleaded gasoline to the subsurface at the Castro Valley site. Eight monitoring wells were drilled during Phase I to define the extent and magnitude of the contamination. Wells 1, 3 and 6 were, over time, impacted with free floating product (See Monitoring Data in Appendix I). Because of continued recharge of product in the three monitoring wells after bailing and due to the close proximity of a housing sub-division it was recommended that a recovery well be installed near MW-6 to prevent any further migration of the free floating product toward the housing area (See Figure 1).

PHASE II RECOVERY

On May 25, 1985 Groundwater Technology installed the recovery well using an 18-inch bucket auger. The well was constructed of 25 feet of 10-inch johnson well screen and 10 feet of 10-inch blank carbon steel pipe (See Appendix I for Well Log).

To prevent the migration of the free floating product a 1/2 hp water table depression pump (WTDP) was installed to create a cone of depression, thus causing the product to flow

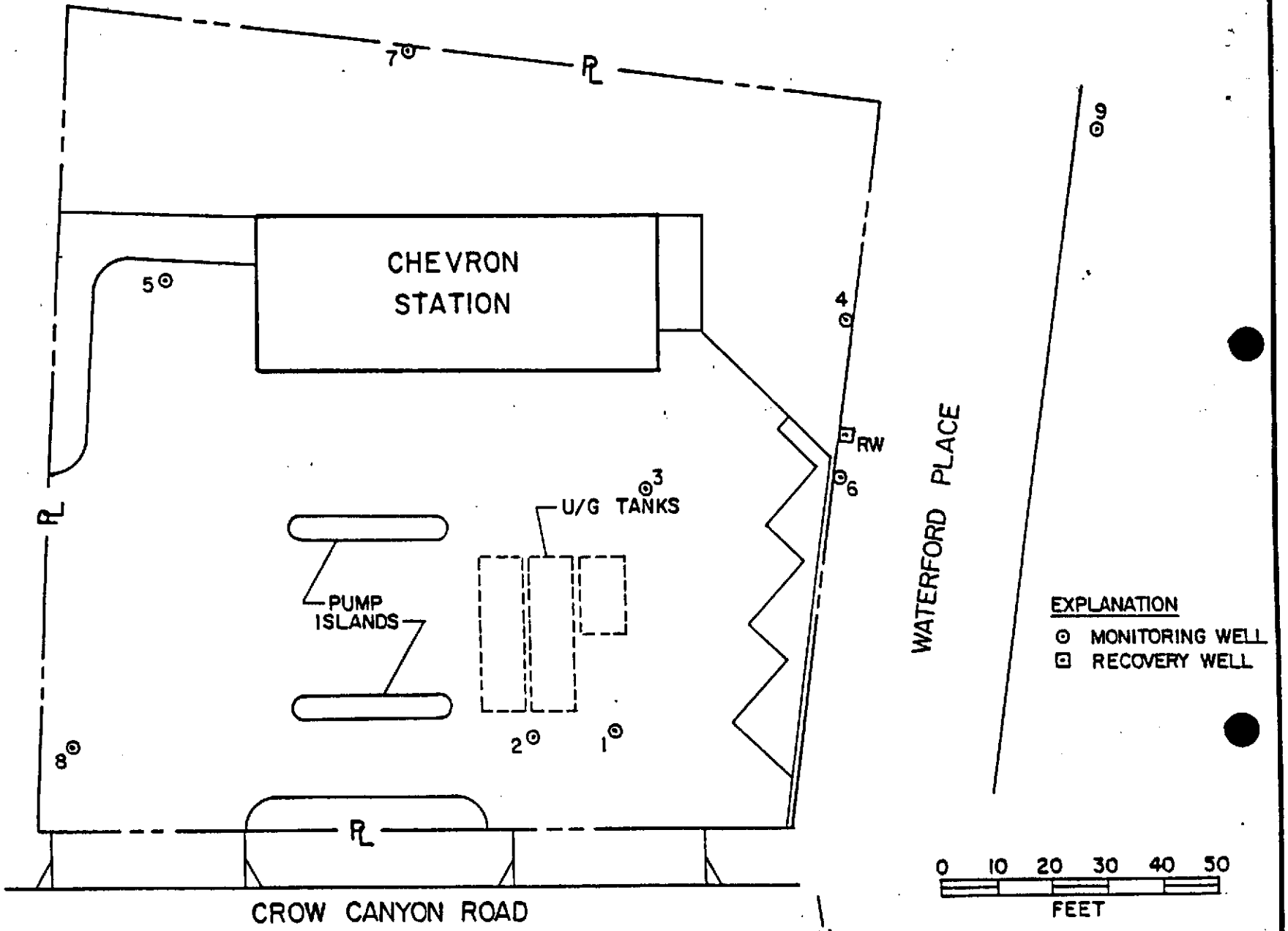

FIGURE 1

SITE PLAN

CHEVRON SERVICE STATION
CASTRO VALLEY, CALIFORNIA

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

into the recovery well from the surrounding area. Because the amount of product lost was considered small a probe scavenger product recovery pump was considered unnecessary. A twice a week program of bailing of free product from the wells and monitoring of the wells was set up to monitor the effectiveness of the recovery system.

To remove any dissolved hydrocarbons being pumped by the WTDP a 200 gallon carbon tank was installed. As required by the San Francisco Regional Water Quality Control Board water samples were taken from the effluent discharge weekly to insure that discharge concentrations were below 100 parts per billion (See Appendix II for Laboratory Data).

To determine the effectiveness of the recovery well, a short pump test was run to evaluate the aquifer characteristics (See Appendix III). From the information obtained from the pump test a Theoretical Zone of Capture was calculated for the well pumping at 1 gpm. The zone of capture for the recovery well is about 18.5 feet in radius. If it is possible to increase the flow rate during the upcoming rainy season the size of the capture zone would increase (See Figure 2).

While it appears that the recovery well has lowered the water table approximately 6 feet adjacent to the well and about 2 feet at Well 8, some portion of the drop is undoubtedly attributable to the natural dry season decline in the water table. Figure 3 shows the groundwater gradient at the site before start up of the recovery system. Figures 4 and 5 show that, over time, the gradient has steepened and the water table elevation has been lowered.

Figures 6, 7 and 8 show product thickness on the same days as the Gradient Maps. Figure 8 suggests that the recovery well has been effective in reducing product thickness. Product thickness has been reduced from a high of 1.10 feet to

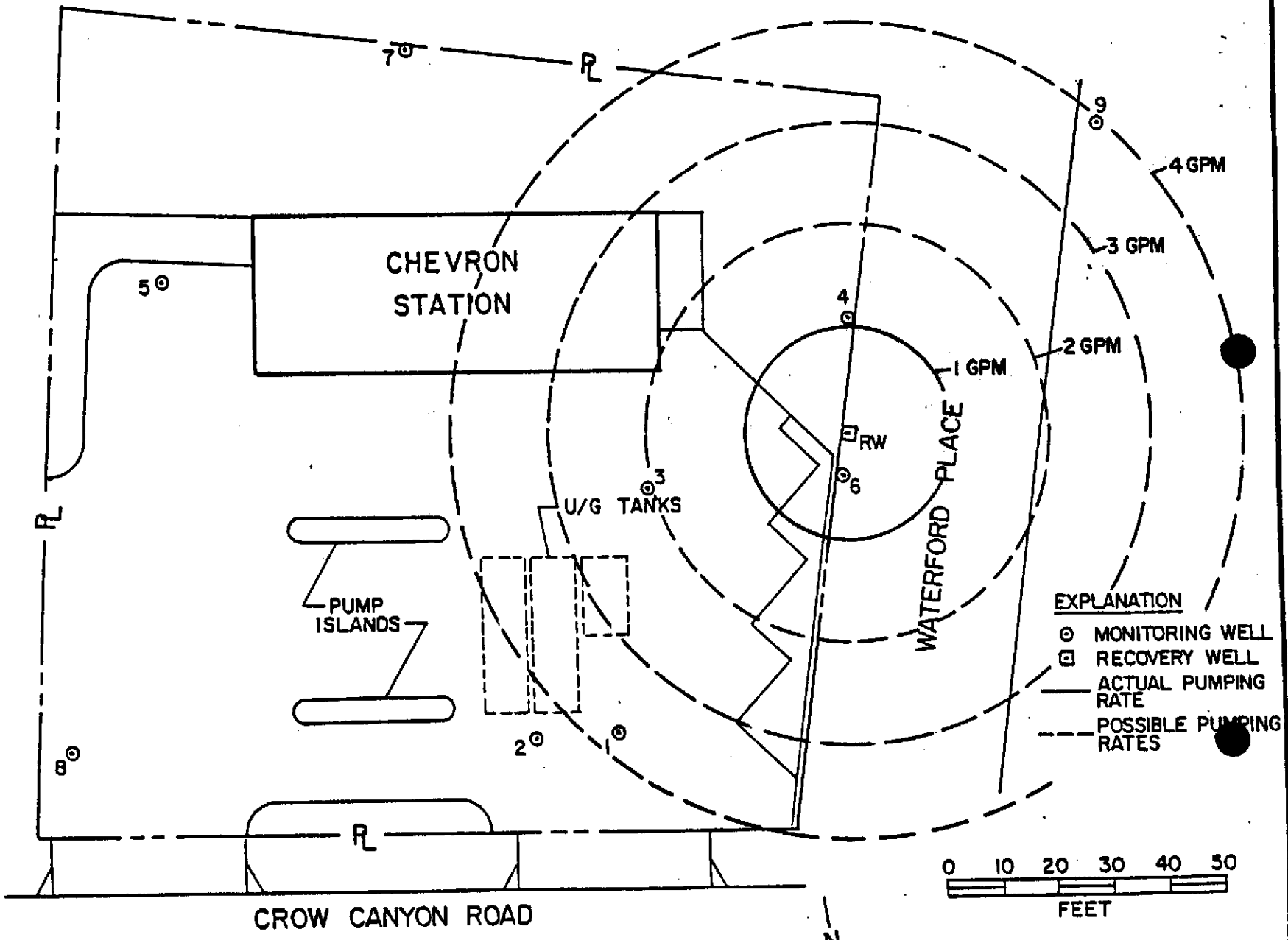

FIGURE 2
THEORETICAL CAPTURE ZONE
FOR ACTUAL AND POSSIBLE PUMPING RATES

CHEVRON SERVICE STATION
CASTRO VALLEY, CALIFORNIA

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

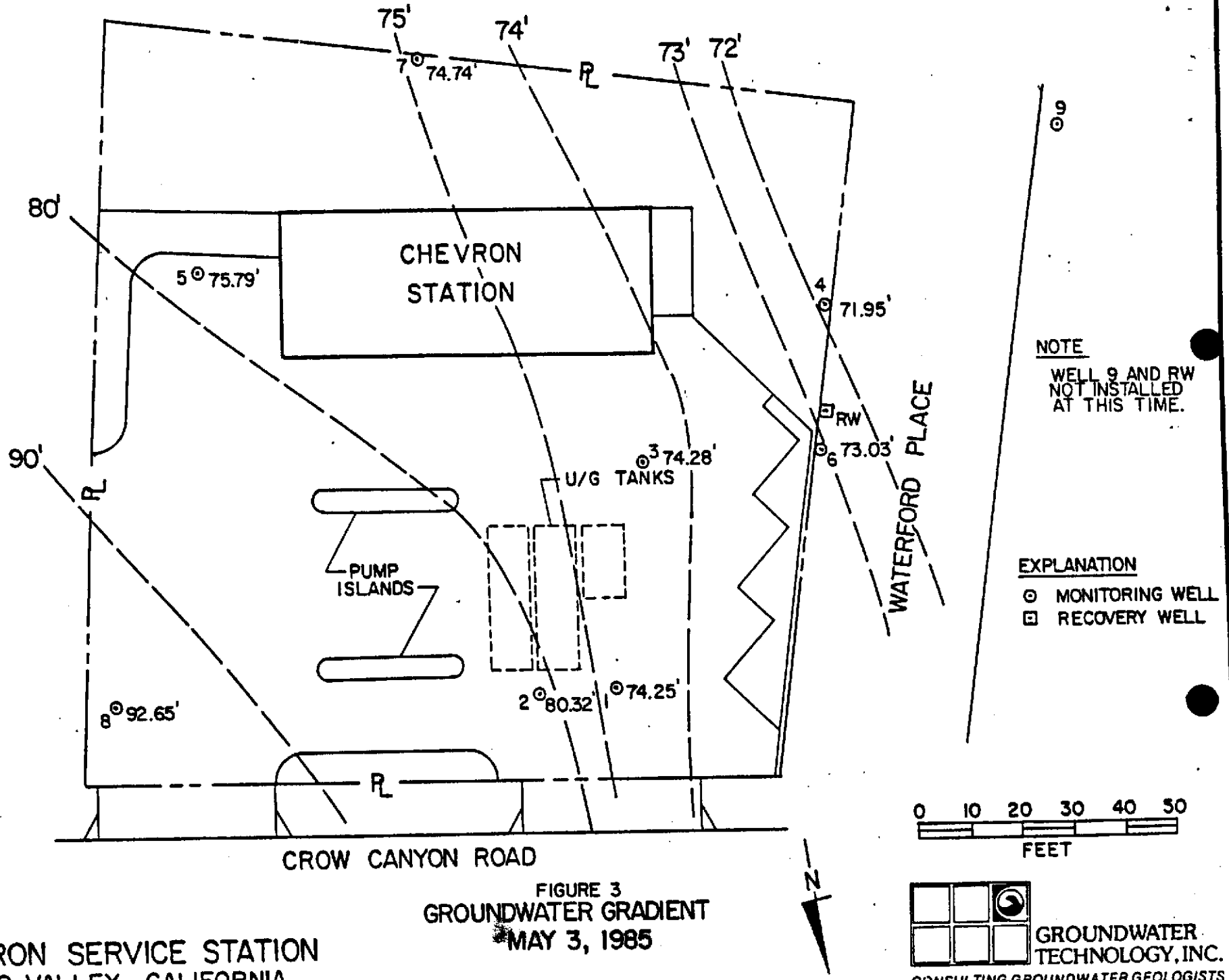

FIGURE 3
GROUNDWATER GRADIENT
MAY 3, 1985

CHEVRON SERVICE STATION
CASTRO VALLEY, CALIFORNIA

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

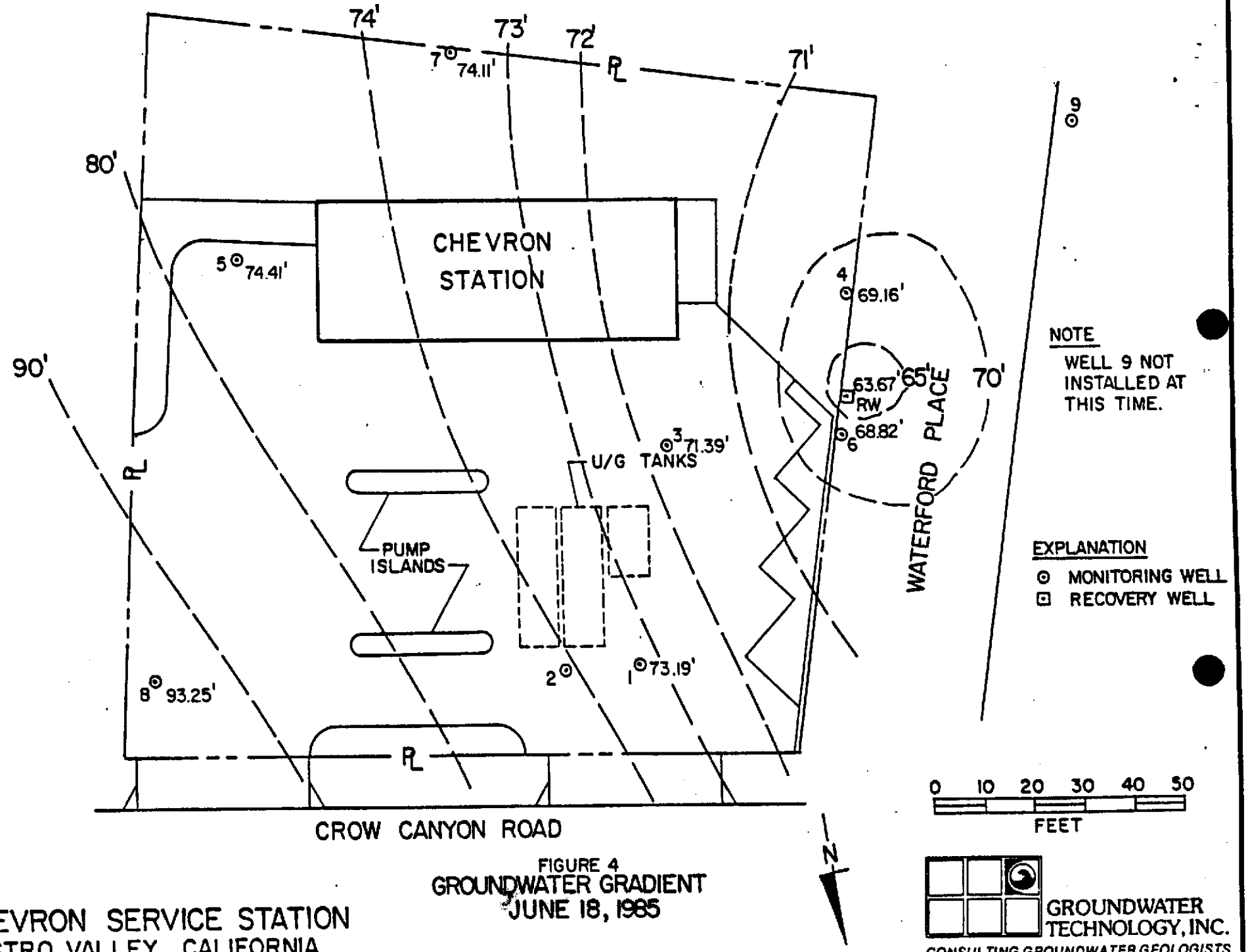

FIGURE 4
GROUNDWATER GRADIENT
JUNE 18, 1985

CHEVRON SERVICE STATION
CASTRO VALLEY, CALIFORNIA

GROUNDWATER
TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

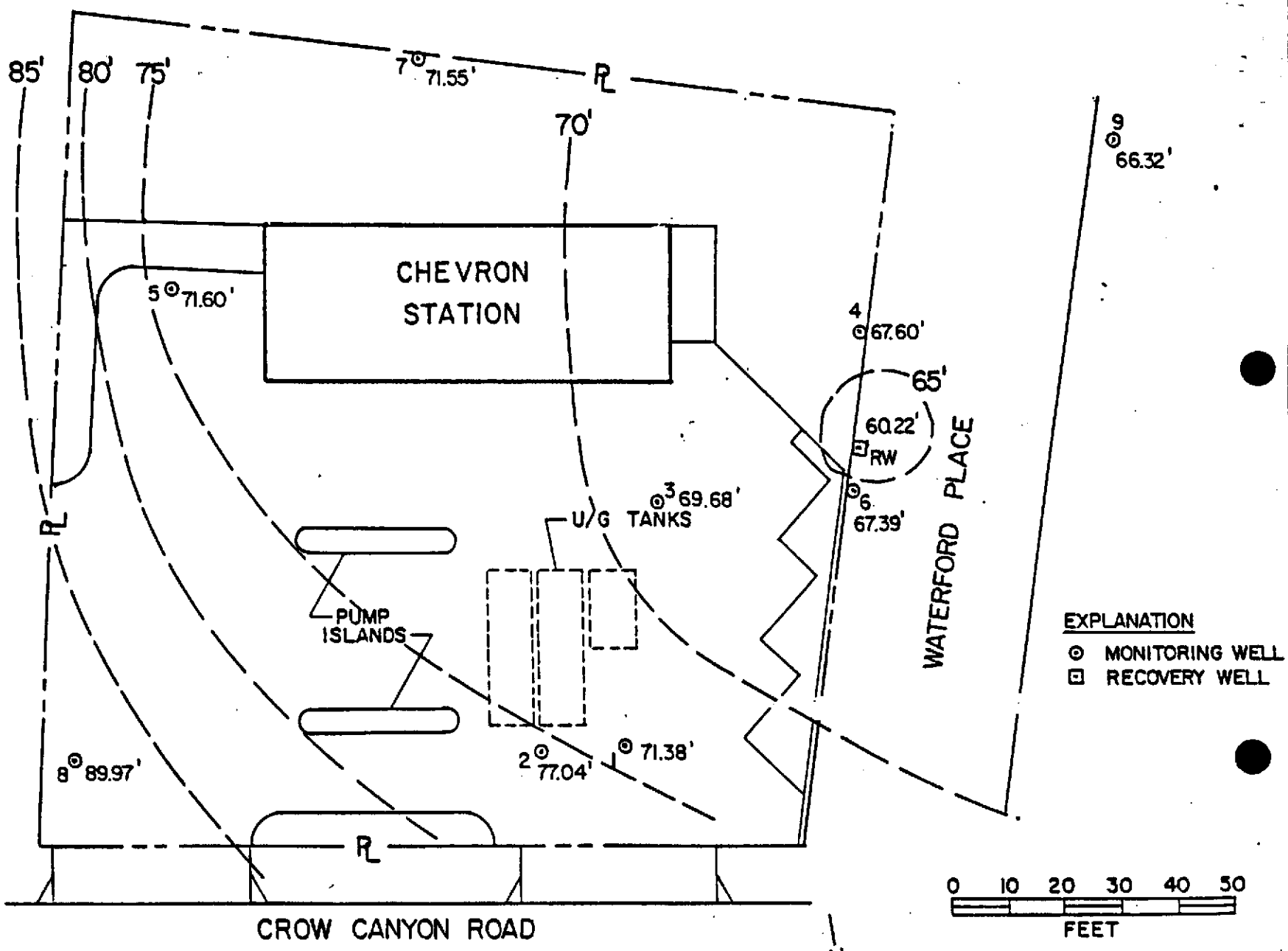

FIGURE 5
GROUNDWATER GRADIENT
SEPT. 16, 1985

CHEVRON SERVICE STATION
CASTRO VALLEY, CALIFORNIA

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

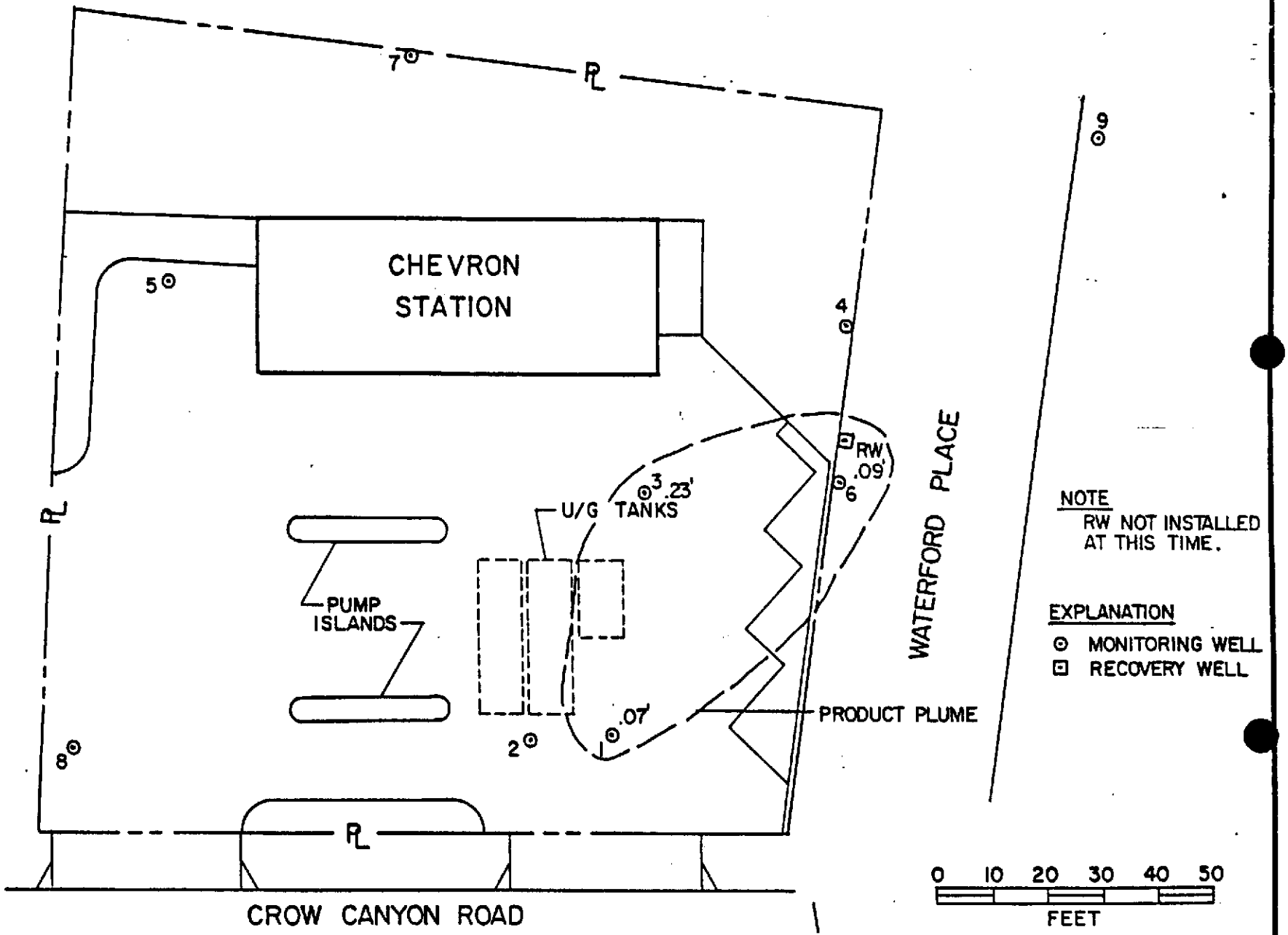

FIGURE 6
PRODUCT THICKNESS
MAY 3, 1985

CHEVRON SERVICE STATION
CASTRO VALLEY, CALIFORNIA

GROUNDWATER
TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

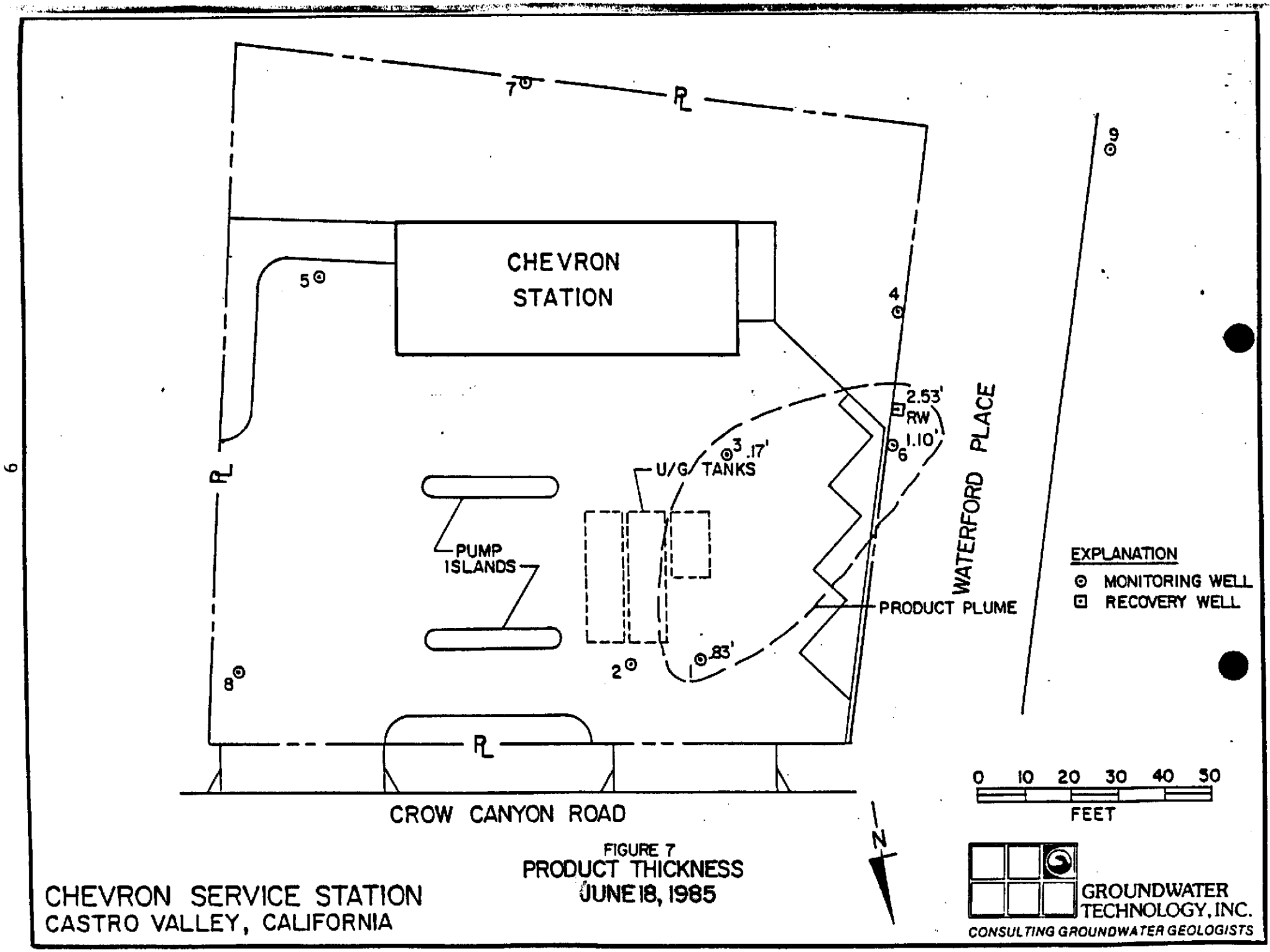

FIGURE 7
PRODUCT THICKNESS
JUNE 18, 1985

CHEVRON SERVICE STATION
CASTRO VALLEY, CALIFORNIA

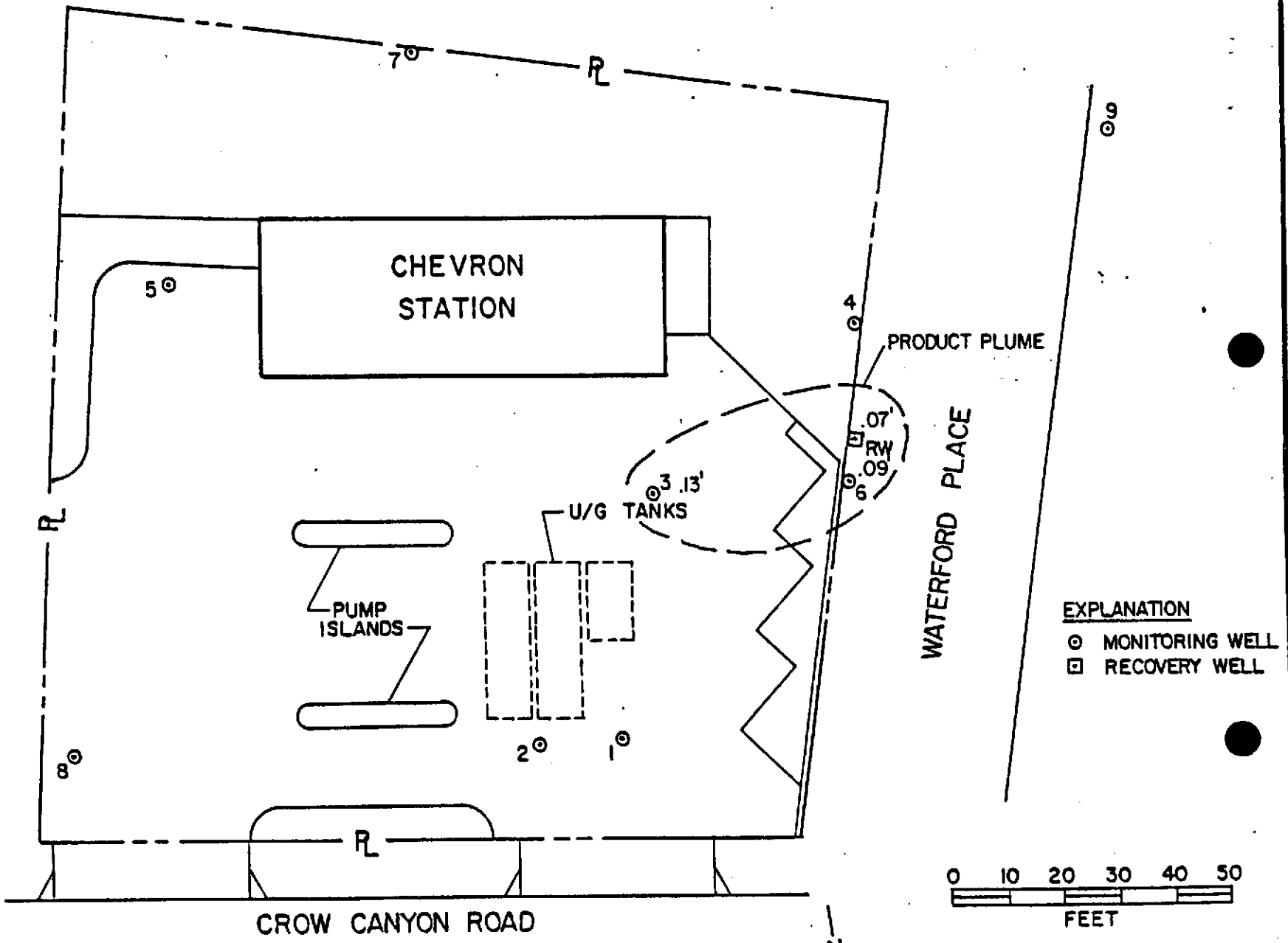

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FIGURE 8
PRODUCT THICKNESS
SEPT. 16, 1985

CHEVRON SERVICE STATION
CASTRO VALLEY, CALIFORNIA

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

.14 feet in Well 6 and 0.23 feet in Well 3 to 0.13 feet. Free product is no longer visible in Well 1.

To monitor any possibility of free product migrating toward the adjacent sub-division, Monitoring Well 9 was drilled down gradient of the recovery well (See Appendix I for Well Log). Free product has not been observed in this well to date. Water samples were taken on July 29, 1985 and September 9, 1985 and analyzed for dissolved hydrocarbons (See Appendix II). The September 9th analysis indicated that concentrations were higher than those found in July. This increase could be caused by the decreasing water table, thus decreasing the amount of clean water available to mix with the contaminated water. Since thorough mixing isn't possible due to the lower water table the concentrations will increase.

SUMMARY AND CONCLUSIONS

The site assessment (Phase I) consisted of the installation of 8 monitoring wells monitoring of all wells and bailing of any free product three times a week. Based on observation well monitoring data it was determined that the free product plume was moving in the direction of a housing sub-division.

To prevent the further migration of the product plume Groundwater Technology designed a recovery/abatement program (Phase II). A ninth monitoring well was installed at this time to monitor the effectiveness of the recovery system.

The following conclusions are based on the information collected from the recovery well and monitoring wells and from observations made at the Chevron Service Station in Castro Valley:

- The groundwater gradient slopes to the southwest.

- The product plume appeared to be moving toward a housing sub-division.

- No free product has been observed in Monitoring Well 9 which is down gradient of the recovery system.

- The recovery system has reduced product thickness in all wells that have had observable product thickness.

RECOMMENDATIONS

The following recommendations are based on Groundwater Technology's observations and present knowledge of the Castro Valley site and are intended to maintain the effectiveness of the current abatement/recovery program:

- Continue to operate the recovery system until the product has been removed from the subsurface.

- Weekly monitoring of observation and recovery wells to check for changes in the product plume and hydrogeologic changes.

- Weekly water samples from the carbon tank effluent as required by RWQCB to check for the carbon break through point.

- Monthly water sample from Monitoring Well 9 to check on the level of dissolved hydrocarbons in the down gradient direction.

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

PROJECT: CHEVRON
JOB NUMBER: Castro Valley
DATE: 3-26-85

DATE	ELEV. (ft.)	WELL 1	WELL 2	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7	WELL 8	WELL	WELL
03-14-85	DTW	21.49	16.88	24.76	13.89	24.28	-	-	-		
	DTP	-	-	24.67	-	-	-	-	-		
	PT	0	0	0.09	0	0	0	0	0		
03-18-85	DTW	21.63	17.22	bailed	14.05	car	15.70	-	-		
	DTP	-	-	twice	-	parked	-	-	-		
	PT	0	0	daily	0	over it	0	0	0		
03-21-85	DTW	21.81	11.51	24.76	14.20	24.30	15.81	-	-		
	DTP	-	-	-	-	-	-	-	-		
	PT	0	0	0	0	0	0	0	0		
03-22-85	DTW	21.83	17.57	24.75	14.20	24.31	15.79	9.39	7.47		
	DTP	-	-	-	-	-	-	-	-		
	PT	0	0	0	0	0	0	0	0		
03-26-85	DTW	22.83	18.69	25.68	15.14	25.33	16.74	9.61	8.68		
	DTP	-	-	-	-	-	-	-	-		
	PT	0	0	0	0	0	0	0	0		
04-02-85	DTW	20.85	16.39	23.97	13.35	23.41	15.00	7.89	6.79		
	DTP	-	-	-	-	-	-	-	-		
	PT	0	0	0	0	0	0	0	0		

DTW = Depth To Water
DTP = Depth To Product
PT = Product Thickness

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

PROJECT: CHEVRON
JOB NUMBER: Castro Valley
DATE: 04-02-85

DATE	ELEV. (ft.)	WELL 1	WELL 2	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7	WELL 8	WELL	WELL
04-12-85	DTW	21.05	16.72	23.40	13.55	23.42	15.54	8.33	7.02		
	DTP	-	-	trace	-	-	-	-	-		
	PT	0	0	0	0	0	0	0	0		
04-26-85	DTW	22.31	17.47	24.15	14.20	24.68	16.13	9.37	8.48		
	DTP	21.49	-	trace	-	-	-	-	-		
	PT	0.82	0	0	0	0	0	0	0		
05-03-85	DTW	22.22	18.11	24.88	14.70	25.63	16.70	10.00	8.95		
	DTP	22.15	-	24.65	-	-	16.61	-	-		
	PT	0.07	0	0.23	0	0	0.09	0	0		
05-05-85	DTW	22.21	18.51	24.72	14.54	25.50	16.66	9.90	9.01		
	DTP	22.14	-	24.65	-	-	16.90	-	-		
	PT	0.07	0	0.07	0	0	0.26	0	0		
05-08-85	DTW	22.48	covered	25.99	14.78	26.89	17.15	10.24	9.18		
	DTP	22.39	-	25.95	-	-	16.62	-	-		
	PT	0.09	0	0.04	0	0	0.53	0	0		
05-10-85	DTW	covered	covered	25.72	14.83	26.00	17.21	10.33	9.32		
	DTP	-	-	25.65	-	-	16.68	-	-		
	PT	0	0	0.07	0	0	0.53	0	0		

DTW = Depth To Water
DTP = Depth To Product
PT = Product Thickness

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

PROJECT: CHEVRON
JOB NUMBER: Castro Valley
DATE: 04-02-85

DATE		WELL 1	WELL 2	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7	WELL 8	WELL 9	WELL RW
	ELEV. (ft.)	96.88	98.43	98.99	86.65	101.42	89.06	84.74	101.60	82.14	88.55
05-14-85	DTW	covered	covered	25.08	14.79	26.06	17.50	0.36	9.37		
	DTP	-	-	25.65	-	-	16.51	-	-		
	PT	0	0	0.05	0	0	0.99	0	0		
06-12-85	DTW	23.22	covered	26.12	15.27	26.69	no	10.09	9.18		
	DTP	22.74	-	sheen	-	-	reading	-	-		
	PT	0.48	0	0	0	0	0	0	0		
06-13-85	DTW	24.85	covered	27.73	17.49	27.44	no	10.27	8.31		24.01
	DTP	23.95	-	27.55	-	-	reading	-	-		23.44
	PT	0.90	0	0.18	0	0	0.00	0	0		0.57
06-18-85	DTW	24.35	covered	27.35	17.52	27.01	21.12	10.63	8.34		26.90
	DTP	23.52	-	27.15	-	-	20.02	-	-		24.37
	PT	0.83	0	0.20	0	0	0.26	0	0		2.53
06-26-85	DTW	24.85	covered	27.73	17.49	27.44	no	11.09	9.18		22.54
	DTP	23.95	-	27.55	-	-	reading	-	-		20.45
	PT	0.90	0	0.18	0	0	0	0	0		2.09
07-03-85	DTW	24.47	covered	28.02	17.40	27.28	20.11	11.48	9.27	14.68	23.48
	DTP	23.61	-	27.86	-	-	19.68	-	-	-	23.12
	PT	0.86	0	0.16	0	0	0.43	0			0.36

DTW = Depth To Water
DTP = Depth To Product
PT = Product Thickness

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

PROJECT: CHEVRON
JOB NUMBER: Castro Valley
DATE: 04-02-85

DATE		WELL 1	WELL 2	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7	WELL 8	WELL 9	WELL RW
	ELEV. (ft.)	96.88	98.43	98.99	86.65	101.42	89.06	84.74	101.60	82.14	88.55
07-08-85	DTW	24.40	19.84	26.73	16.46	27.32	18.81	11.50	8.88	14.60	19.98
	DTP	23.64	-	26.64	-	-	18.70	-	-	-	19.40
	PT	0.76	0	0.09	0	0	0.11	0	0	0	0.58
07-15-85	DTW	24.10	20.12	27.43	8.00	27.45	21.23	11.63	8.62	14.73	28.02
	DTP	24.01	-	27.25	-	-	21.30	-	-	-	27.75
	PT	0.09	0	0.18	0	0	0.20	0	0	0	0.27
07-17-85	DTW	24.02	20.09	27.44	18.13	27.55	21.22	11.68	8.90	4.74	27.94
	DTP	23.95	-	27.24	-	-	20.98	-	-	-	27.60
	PT	0.07	0	0.20	0	0	0.24	0	0	0	0.34
07-23-85	DTW	23.47	18.94	27.05	17.73	27.60	20.75	11.47	10.45	14.39	28.46
	DTP	-	-	26.97	-	-	20.49	-	-	-	27.51
	PT	0	0	0.08	0	0	0.26	0	0	0	0.15
07-25-85	DTW	23.98	20.56	27.93	18.12	covered	20.98	covered	covered	14.80	27.97
	DTP	-	-	27.84	-	-	20.94	-	-	-	27.84
	PT	0	0	0.09	0	0	0.04	0	0	0	0.13
07-29-85	DTW	24.31	20.82	28.17	18.23	28.30	21.07	11.79	11.05	14.82	27.97
	DTP	-	-	28.03	-	-	21.01	-	-	-	27.42
	PT	0	0	0.14	0	0	0.06	0	0	0	0.55

DTW = Depth To Water
DTP = Depth To Product
PT = Product Thickness

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

PROJECT: CHEVRON/CASTRO VALLE
JOB NUMBER: 20-3231
DATE: July and August 1985

DATE	ELEV. (ft.)	WELL 1	WELL 2	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7	WELL 8	WELL 9	WELL RW
07-31-85	DTW	24.34	20.85	28.27	18.31	28.35	20.91	11.83	11.17	14.91	27.28
	DTP	24.31	-	28.09	-	-	20.70	-	-	-	27.06
	PT	0.03	0	0.18	0	0	0.21	0	0	0	0.22
08-06-85	DTW	23.60	20.09	27.04	17.90	27.73	20.65	covered	covered	14.73	27.80
	DTP	23.58	-	26.96	-	-	20.58	-	-	-	26.84
	PT	0.02	0	0.08	0	0	0.07	-	-	0	0.96
08-08-85	DTW	24.39	20.96	28.36	18.54	28.65	20.77	12.15	11.11	15.20	28.10
	DTP	24.35	-	28.22	-	-	20.76	-	-	-	27.08
	PT	0.04	0	0.14	0	0	0.01	0	0	0	1.02
08-12-85	DTW	24.69	21.09	24.39	18.19	28.84	20.93	12.32	11.38	15.39	27.35
	DTP	24.65	-	-	-	-	20.81	-	-	-	26.82
	PT	0.04	0	0	0	0	0.12	0	0	0	0.53
08-16-85	DTW	24.72	21.16	28.56	18.90	28.92	21.04	12.39	11.60	15.41	28.43
	DTP	24.65	-	28.49	-	-	20.96	-	-	-	27.69
	PT	0.07	0	0.07	0	0	0.08	0	0	0	0.74
08-19-85	DTW	24.92	21.28	28.32	17.31	covered	18.77	covered	covered	15.49	18.71
	DTP	-	-	-	-	-	-	-	-	-	18.63
	PT	0	0	0	0	-	0	-	-	0	0.08

DTW = Depth To Water
DTP = Depth To Product
PT = Product Thickness

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

PROJECT: CHEVRON/CASTRO VALLEY
JOB NUMBER: 20-3231
DATE: August & September 1985

DATE	ELEV. (ft.)	WELL 1	WELL 2	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7	WELL 8	WELL 9	WELL RW
08-21-85	DTW	25.10	21.38	28.32	17.13	29.17	18.69	12.59	11.84	15.45	18.57
	DTP	25.01	-	28.28	-	-	-	-	-	-	18.49
	PT	0.09	0	0.04	0	0	0	0	0	0	0.08
08-26-85	DTW	25.35	21.55	29.10	18.91	29.31	21.31	12.79	11.99	15.72	25.35
	DTP	25.33	-	28.89	-	-	-	-	-	-	25.28
	PT	0.02	0	0.21	0	0	0	0	0	0	0.07
08-29-85	DTW	21.22	21.60	29.09	19.14	29.44	21.46	12.91	11.99	15.77	28.74
	DTP	21.21	-	29.00	-	-	21.42	-	-	-	28.62
	PT	0.01	0	0.09	0	0	0.04	0	0	0	0.12
09-09-85	DTW	25.46	21.57	29.47	19.13	29.72	21.89	13.12	11.83	15.88	28.49
	DTP	25.45	-	29.25	-	-	21.85	-	-	-	28.44
	PT	0.01	0	0.22	0	0	0.04	0	0	0	0.05
09-16-85	DTW	25.52	21.39	29.43	19.05	29.82	21.76	13.19	11.63	15.82	28.40
	DTP	-	-	29.27	-	-	21.65	-	-	-	28.31
	PT	0	0	0.16	0	0	0.11	0	0	0	0.09
09-23-85	DTW	25.78	21.73	29.69	19.16	30.03	21.92	13.40	11.64	15.98	28.63
	DTP	25.75	-	29.45	-	-	21.78	-	-	-	28.50
	PT	0.03	0	0.24	0	0	0.14	0	0	0	0.13

DTW = Depth To Water
DTP = Depth To Product
PT = Product Thickness

GROUNDWATER TECHNOLOGY
Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number RW-1

Project Chevron/Castro Valley Owner Chevron U.S.A., Inc.
Location Crow Canyon Rd. Project Number 20-3231
Date Drilled 5-31-85 Total Depth of Hole 35 ft Diameter 18-inch
Surface Elevation _____ Water Level, Initial _____ 24-hrs. _____
Screen: Dia. 10-inch Length 25 ft. Slot Size .020
Casing: Dia. 10-inch Length 10 ft. Type Steel
Drilling Company M&M Drilling Drilling Method Auger
Driller Bob Log by Cori Condon

Sketch Map

Notes
Aquarium Sand 36-22 feet
Roofing Gravel 22-8 feet

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
5					Brown sandy clay fill, occasional gravel, moist, no odor.
10					Yellow-brown sandstone, friable, moist, no odor.
13					Dark silty clay, dense, moist, high organic odor.
16					Dark clay, moist, gas odor.
18					Mottled silty clay, moist, gas odor.
20					Red-brown silty clay, occasional pebbles, moist, gas odor.
22					Red sandy clay, moist, gas odor.
31					Mottled clayey silty sand, wet, gas odor.
33					Blue fine sand, occasional cobble, moist, organic odor.
36					Blue sand and gravels, loose, wet, no odor.

02100144

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 9

Project Chevron/Castro Valley Owner Chevron U.S.A.

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 6-24-85 Total Depth of Hole 30 ft. Diameter 6-inch

Surface Elevation _____ Water Level, Initial _____ 24-hrs. _____

Screen: Dia. 4-inch Length 25-feet Slot Size .020 in.

Casing: Dia. 4-inch Length 5-feet Type PVC

Drilling Company Sierra Pacific Drilling Method H.S. Auger

Driller Lynn/Gary Log by B. Channell

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0					0-6" top soil.
2					Brown silty sand and gravel.
4					
6					
8					
10					Brown silty clay with small gravel.
12					
14					
16					
18					
20					Dark grey silty clay, gas odor.
22					
24					Green sandy clay, with gravel.
26					
28					Weathered grey shale, very hard in parts.
30					

02100144

SAMPLE ANALYSES SUMMARY SHEET

PROJECT: CHEVRON STATION LOCATION: CASTRO VALLEY YEAR: 1985

GROUNDWATER TECHNOLOGY, INC.
CONSULTING GROUNDWATER GEOLOGISTS

		June 19	June 21	June 22	July 1	July 8	July 12	July 15	July 23	July 29	August 6	August19	September4	September9	September16			
CARBON TANK INFLUENT	Benzene	10,600					12,400											
	Toluene	10,400					12,400											
	Ethyl Benzene	519					1,450											
	Total Xylenes	3,980	-	-	-	-	6,860	-	-	-	-	-	-	-	-			
	Aliphatic Hydro.	19,600					20,200											
	Misc. Aromatics	1,000					2,480											
	Total Hydro.	46.100					55.900											
CARBON TANK-EFFLUENT	Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
	Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
	Ethyl Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
	Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
	Aliphatic Hydro.	39	16	46	19	22	9	8	3	40	1	3	22	1	ND			
	Misc. Aromatics	ND	ND	ND	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
	Total Hydro.	39	16	46	71	22	9	8	3	40	1	3	22	1	ND			
WELL #9	Benzene									[redacted]				5,700				
	Toluene													1,850				
	Ethyl Benzene													2,030				
	Total Xylenes	-	-	-	-	-	-	-	-		-	-	-	4,220	-			
	Aliphatic Hydro.													40,400				
	Misc. Aromatics													5,980				
	Total Hydro.									11.400				60,200				
	Benzene																	
	Toluene																	
	Ethyl Benzene																	
	Total Xylenes																	
	Aliphatic Hydro.																	
	Misc. Aromatics																	
	Total Hydro.																	

GTI: Groundwater Technology Lab Analysis in ppb

- Not Sampled

GROUNDWATER TECHNOLOGY LABORATORY

ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
4 Mill St., Greenville, NH 03048
Tel: (603) 878-2500

Consulting Offices:
Needham, MA — Redondo Beach, CA
Chadds Ford, PA — Concord, CA
Novi, MI

5/9/85
Report No. 20-3231-1
Submitted to: Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 15697-15698 taken by Bill Channell at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst J.P.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL
15697	W-4	5/7/85	5/8/85	613	274	69	300	749	147	2250
15698	W-5	5/7/85	5/8/85	125	5	ND	16	4740	428	5310

*NOTES:

ND = NONE DETECTED

REPORT NO. 20-3231-1

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY

4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY LABORATORY

ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
4 Mill St., Greenville, NH 03048
Tel: (603) 878-2500

Consulting Offices:
Needham, MA — Redondo Beach, CA
Chadds Ford, PA — Concord, CA
Novi, MI

Quality Assurance Documentation.

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report has been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

6/25/85
Report No. 20-3231-2
Submitted to: Jan Jacobson
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 16594-16595 taken by F. Seiler at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst S.B.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER ug/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL	
16594	CT-INF	6/19/85	6/25/85	10600	10400	519	3980	19600	1000	46100	*3
16595	CT-EFF	6/19/85	6/25/85	ND	ND	ND	ND	39	ND	39	*2

*NOTES:

2 = METHANE DETECTED AT 100-1000 PPB.
3 = METHANE DETECTED AT 1000-10000 PPB.

ND = BELOW DETECTION LIMIT

CT-INF = CARBON TANK INFLUENT
CT-EFF = CARBON TANK EFFLUENT

REPORT NO. 20-3231-2

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858

Quality Assurance Documentation LABORATORY SERVICES

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Exceptions: Samples were received at 13°C.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

6/25/85
Report No. 20-3231-3
Submitted to: Bill Channelle
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 16623-16624 taken by J. Jacobson at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analysts S.E.B./M.J.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL
16623	CT-EFF	6/21/85	6/25/85	ND	ND	ND	ND	16	ND	16 *2
16624	CT-EFF	6/22/85	6/25/85	ND	ND	ND	6	22	18	46 *2

*NOTES:

2 = METHANE DETECTED AT 100-1000 PPB.

ND = BELOW DETECTION LIMIT

CT-EFF = CARBON TANK EFFLUENT

REPORT NO. 20-3231-3

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY

4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Exceptions: Samples were received at 19°C.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Laboratory Test Results

7/5/85
Report No. 20-3231-4
Submitted to:

Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 16863 taken by K. Greenfield site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst M.J.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL
16863	CT	7/1/85	7/3/85	ND	ND	ND	ND	19	52	71 *2

*NOTES:

2 = METHANE DETECTED AT 100-1000 PPB.

ND = BELOW DETECTION LIMIT

CT = CARBON TANK DISCHARGE

REPORT NO. 20-3231-4

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY

4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb

Michael D. Webb EMF
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

7/10/85
Report No. 20-3231-5
Submitted to: Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water sample 16895 taken by C. Carmel site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst M.J.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL
16895	CT-EFF	7/8/85	7/9/85	ND	ND	ND	ND	22	ND	22 *2

*NOTES:

2 = METHANE DETECTED AT 100-1000 PPB.
CT-EFF = CARBON TANK EFFLUENT
ND = BELOW DETECTION LIMIT

REPORT NO. 20-3231-5

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Exceptions: Sample was received at 25°C.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

7/17/85
Report No. 20-3231-6
Submitted to: Bill Channel
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 16969-16970 taken by F. Sieler at site 20-3231, Castro Valley, California, and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analysts S.E.B./M.J.

Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL	
16969	CT-EFF	7/12/85	7/16/85	ND	ND	ND	ND	9	ND	9	*2
16970	CT-INF	7/12/85	7/16/85	12400	12400	1450	6860	20200	2480	55900	*3,

NOTES:
2 = METHANE DETECTED AT 100-1000 PPB
3 = METHANE DETECTED AT 1000-10000 PPB
4 = SAMPLE DILUTED; MDL TIMES 44

ND = BELOW DETECTION LIMIT

INF = INFLUENT
EFF = EFFLUENT

REPORT NO. 20-3231-6

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Exception: Samples were recieved at 21'C.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

7/18/85
Report No. 20-3231-7
Submitted to: Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 16972 taken by Chuck Carmel at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst M.J.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL
16972	C-EFF	7/15/85	7/17/85	ND	ND	ND	ND	8	ND	8.*2

NOTES:
2 = METHANE DETECTED AT 100-1000 PPB

ND = BELOW DETECTION LIMIT

C-EFF = CARBON EFFLUENT

REPORT NO. 20-3231-7

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Exceptions: Samples received at 28'C.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Laboratory Test Results

7/26/85
Report No. 20-3231-8
Submitted to:

Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 17122 taken by K. S. at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst J.P.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL
17122	CT-EFF	7/23/85	7/25/85	ND	ND	ND	ND	3	ND	3 *2

NOTES:

2 = METHANE DETECTED AT 100-1000 PPB.
CT = CARBON TANK
EFF = EFFLUENT

REPORT NO. 20-3231-8

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Quality Assurance Specifications:
The data in this set conforms to the GTL Quality Assurance program and provisions specified in EPA Method 602 including daily calibration with freshly made standards, blanks before trace level samples, surrogate spikes, spikes in untested matrices, a minimum of 10% duplicates and a minimum of 6% reference samples traceable to the U.S. EPA.

Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Laboratory Test Results

8/5/85
Report No. 20-3231-9
Submitted to:

Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 17297-17298 taken by D. Jones at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst L.L.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL	
17297	MW-9	7/29/85	8/2/85	515	748	232	945	7550	1420	11400	
17298	CTD	7/29/85	8/2/85	ND	ND	ND	ND	40	ND	40	*1

NOTES:

ND = BELOW DETECTION LIMIT
CTD = CARBON TANK DISCHARGE
1 = METHANE DETECTED AT 10-100 PPB

REPORT NO. 20-3231-9

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

Statement of Sample Integrity:
The samples in this data set meet the Groundwater Technology Laboratory criteria for physical integrity as per GTL Method Code 103 throughout the sampling, handling and analytical process.

Quality Assurance Specifications:
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Certification:
The data in this report have been checked for accuracy and completeness.

Respectfully Submitted,

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Laboratory Test Results

8/9/85
Report No. 20-3231-10
Submitted to:

Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples 17426 taken by Bill Channell at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst P.E.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC AROMATICS C8-C12	TOTAL
17426	CTD	8/6/85	8/9/85	ND	ND	ND	ND	1	ND	1 *2

NOTES:

ND = BELOW DETECTION LIMIT
CTD = CARBON TANK DISCHARGE
2 = METHANE DETECTED AT 100-1000 PPB.

REPORT NO. 20-3231-10

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

Statement of Sample Integrity:
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Certification:
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Respectfully Submitted,

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Laboratory Test Results

8/22/85
Report No. 20-3231-11
Submitted to:

Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water sample 17646 taken by D. Jones at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst M.J.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER ug/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL	
17646	CT-EFF	8/19/85	8/21/85	ND	ND	ND	ND	3	ND	3	*2

NOTES:

ND = BELOW DETECTION LIMIT
CT = CARBON TANK
EFF = EFFLUENT
2 = METHANE DETECTED AT 100-1000 PPB.

REPORT NO. 20-3231-11

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
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GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858

Quality Assurance Documentation LABORATORY SERVICES

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Certification:
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Respectfully Submitted,

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Laboratory Test Results

9/13/85
Report No. 20-3231-12
Submitted to:

Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water sample #18051 taken by F. Seiler at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analysts M.J./J.B.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL
18051	CT-EFF	9/4/85	9/11/85	ND	ND	ND	ND	22	ND	22 *5

*NOTES:

ND = BELOW DETECTION LIMIT
CT-EFF = CARBON TANK EFFLUENT
5 = UNCATEGORIZED COMPOUND DETECTED BELOW 10 PPB.

REPORT NO. 20-3231-12

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Quality Assurance Documentation

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Certification:
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Respectfully Submitted,

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY
4 Mill Street, Greenville, NH 03048 (603) 878-2500, Telex 752858
LABORATORY SERVICES

Laboratory Test Results

9/17/85
Report No. 20-3231-13
Submitted to: Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water samples # 18184-18185 taken by D.Jones at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst L.L.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

HYDROCARBONS IN WATER µg/L (ppb)

SAMPLE NO.	I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	C4-C12 ALIPHATIC HYDROCARBONS	MISC. AROMATICS C8-C12	TOTAL	
18184	C-EFF	9/9/85	9/14/85	ND	ND	ND	ND	1	ND	1	*2
18185	W-9	9/9/85	9/14/85	5700	1850	2030	4220	40400	5980	60200	*1,4

NOTES:

ND = BELOW DETECTION LIMIT
1 = METHANE DETECTED AT 10-100 PPB.
2 = METHANE DETECTED AT 100-1000 PPB.
4 = SAMPLE DILUTED; MDL TIMES 44
C-EFF = CARBON TANK EFFLUENT

REPORT NO. 20-3231-13

Oil Recovery Systems

GROUNDWATER TECHNOLOGY LABORATORY
4 MILL STREET, GREENVILLE, NEW HAMPSHIRE 03048

GROUNDWATER TECHNOLOGY
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LABORATORY SERVICES

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Certification:
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Respectfully Submitted,

Michael D. Webb

Michael D. Webb
Technical Director

GROUNDWATER TECHNOLOGY LABORATORY
ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
4 Mill St., Greenville, NH 03048
Tel: (603) 878-2500

Laboratory Test Results

9/19/85
Report No. 20-3231-14
Submitted to: Bill Channell
Groundwater Technology
5047 Clayton Rd.
Concord, CA 94519

The attached report covers water sample # 18217 taken by D.Jones at site 20-3231, Castro Valley, California and analyzed by GC/FID Static Headspace Analysis for volatile hydrocarbons, analyst S.E.B.

Method Detection Limits (MDL) listed are the levels above which quantitation is considered reliable: benzene and toluene 1 ppb, ethylbenzene 2 ppb, total xylenes 6 ppb. The level for reliable quantitation for total aliphatic hydrocarbons and miscellaneous aromatics is 20 ppb.

If noted on report, MDL is increased by a factor of 44 for dilutions made in order to maintain calibrated range. Precision for levels above 10 times MDL is 10%. Precision at MDL equals 30%. Hexane and ortho-xylene used as calibration standards for aliphatic hydrocarbons and miscellaneous aromatics, respectively.

GROUNDWATER TECHNOLOGY LABORATORY
ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
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Tel: (603) 878-2500

HYDROCARBONS IN WATER ug/L (ppb)
REPORT NO. 20-3231-14

Sample I.D.	DATE SAMPLED	DATE RUN	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	TOTAL BTEX
18217 CT-EFF	9/16/85	9/18/85	ND	ND	ND	ND	ND

*NOTES:

ND = BELOW DETECTION LIMIT
CT-EFF = CARBON TANK EFFLUENT

TOTAL BTEX = THE SUM OF BENZENE, TOLUENE, ETHYL BENZENE, AND XYLENES, ROUNDED TO THREE SIGNIGICANT FIGURES.

GROUNDWATER TECHNOLOGY LABORATORY
ANALYTICAL & CONSULTING SERVICES
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HYDROCARBONS IN WATER ug/1
REPORT NO. 20-3231-14

SAMPLE NO.	I.D.	C4-C12 ALIPHATIC HYDROCARBONS	MISC AROMATICS C8-C12	TOTAL
18217	CT-EFF	ND	ND	ND *2

NOTES:

TOTAL = THE SUM OF THE TOTAL BTEX AND THE ABOVE PARAMETERS.

ND = BELOW DETECTION LIMIT
CT-EFF = CARBON TANK EFFLUENT
2 = METHANE DETECTED AT 100-1000 PPB.

GROUNDWATER TECHNOLOGY LABORATORY

ANALYTICAL & CONSULTING SERVICES
Division of Oil Recovery Systems, Inc.
4 Mill St., Greenville, NH 03048
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Quality Assurance Documentation

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Certification:
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Respectfully Submitted,

Michael D. Webb

Michael D. Webb
Technical Director

PUMP TEST - DRAWDOWN DATA

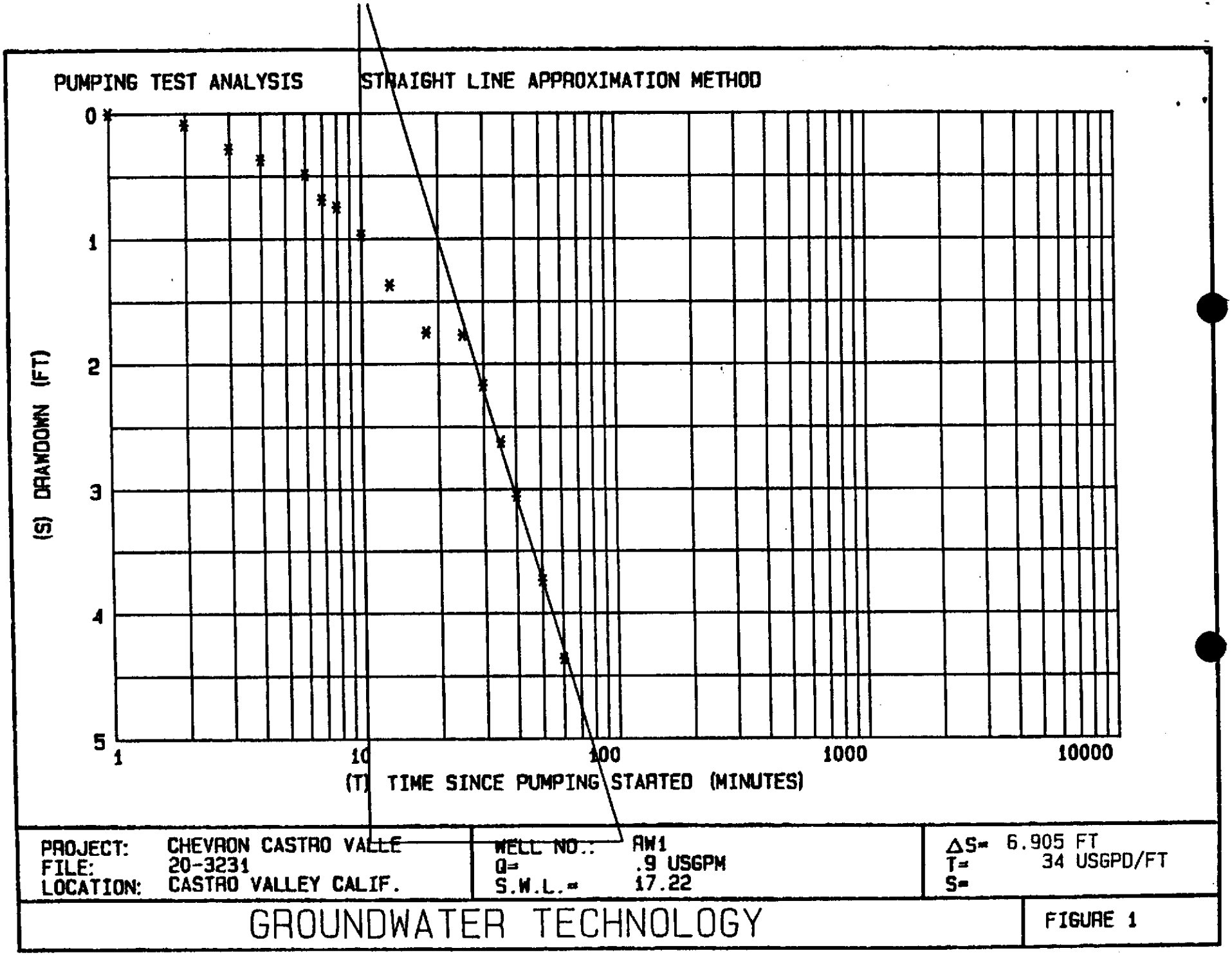
PROJECT: CHEVRON CASTRO VALLEY
LOCATION: CASTRO VALLEY CALIF.
DATUM POINT:
PUMPING RATE: .9 USGPM
AQUIFER THICKNESS: 18
CONDITIONS: UNCONFINED

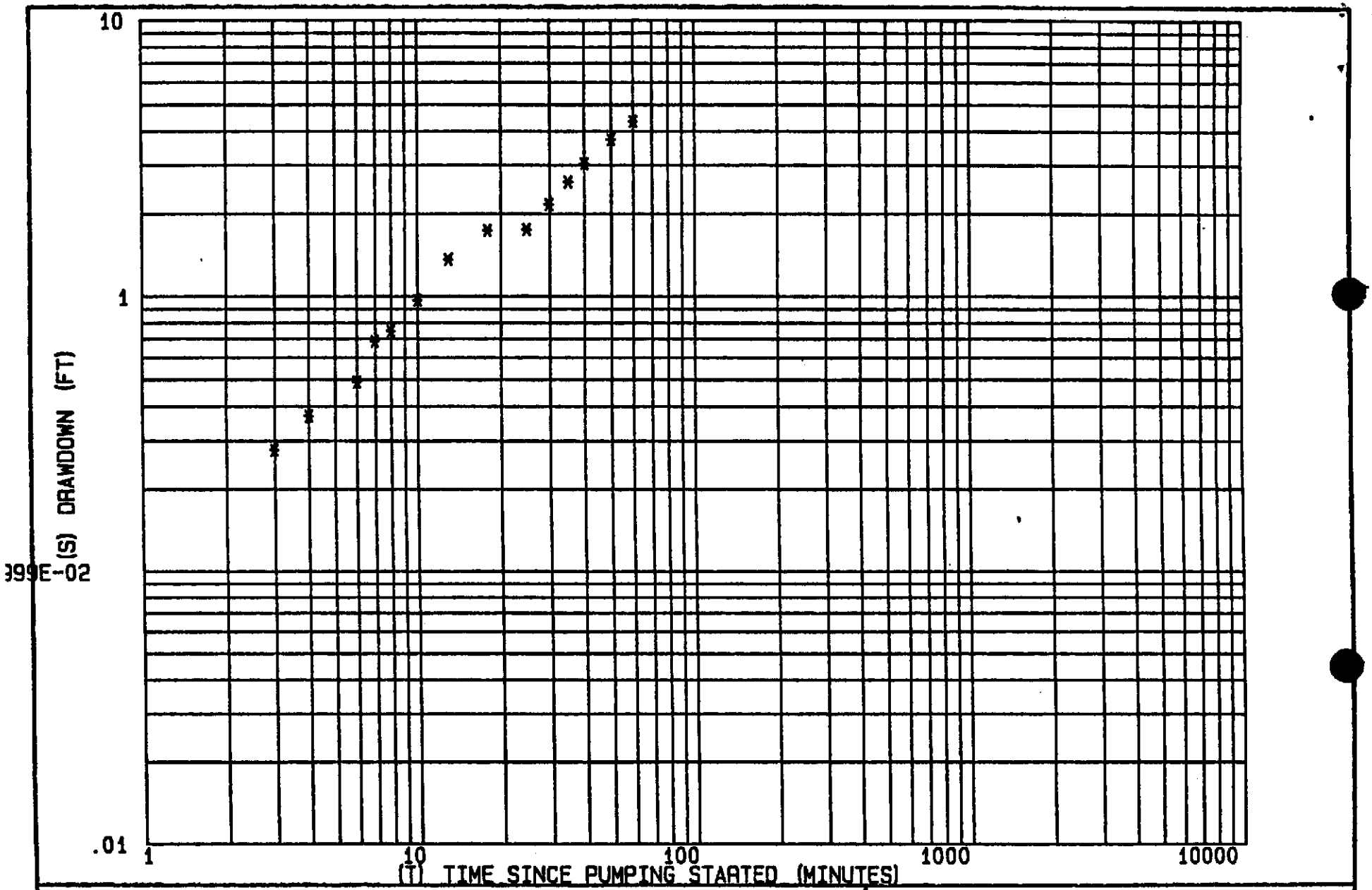
FILE NO.: 20-3231
WELL NO.: RW1
ELEV. OF DATUM POINT:
STATIC WATER LEVEL: 17.22
R = ----- FROM
SCREEN INTERVAL: 10 TO 35

TIME			ELAPSED TIME	WATER LEVEL	DRAWDOWN	(Q)
DY	HR	MN	t (MIN)	(ft)	s (ft)	(USGPM)
1	0	1	1.00	17.510	0.000	0.9000
1	0	2	2.00	17.600	0.090	0.9000
1	0	3	3.00	17.790	0.280	0.9000
1	0	4	4.00	17.880	0.370	0.9000
1	0	6	6.00	18.000	0.490	0.9000
1	0	7	7.00	18.200	0.690	0.9000
1	0	8	8.00	18.260	0.750	0.9000
1	0	10	10.00	18.480	0.970	0.9000
1	0	13	13.00	18.880	1.370	0.9000
1	0	18	18.00	19.260	1.750	0.9000
1	0	25	25.00	19.280	1.770	0.9000
1	0	30	30.00	19.680	2.170	0.9000
1	0	35	35.00	20.130	2.620	0.9000
1	0	40	40.00	20.570	3.060	0.9000
1	0	50	50.00	21.250	3.740	0.9000
1	1	0	60.00	21.870	4.360	0.9000

VALUE USED
0.9000

GROUNDWATER TECHNOLOGY


PUMPING TEST ANALYSIS
STRAIGHT LINE APPROXIMATION METHOD
0
1
2
3
4
5
(S) DRAWDOWN (FT)
1
10
100
1000
10000
(T) TIME SINCE PUMPING STARTED (MINUTES)
PROJECT: CHEVRON CASTRO VALLE
FILE: 20-3231
LOCATION: CASTRO VALLEY CALIF.
WELL NO.: AW1
Q= .9 USGPM
S.W.L.= 17.22
ΔS= 6.905 FT
T= 34 USGPD/FT
S=
GROUNDWATER TECHNOLOGY
FIGURE 1



PROJECT	CHEVRON CASTRO VALLE	FILE	20-3231	PUMPING TEST ANALYSIS
LOCATION	CASTRO VALLEY CALIF.	WELL No.	RW1	TYPE CURVE SOLUTION

GROUNDWATER TECHNOLOGY

FIGURE 2

GROUNDWATER TECHNOLOGY
Consulting Groundwater Geologists
A Division of Oil Recovery Systems, Inc.
5047 CLAYTON ROAD • CONCORD, CA 94521 • (415) 671-2387

PUMP TEST - DRAWDOWN DATA

PROJECT: CHEVRON CASTRO VALLEY
LOCATION: CASTRO VALLEY CALIF.
DATUM POINT:
PUMPING RATE: .9 USGPM
AQUIFER THICKNESS: 20.0
CONDITIONS: UNCONFINED

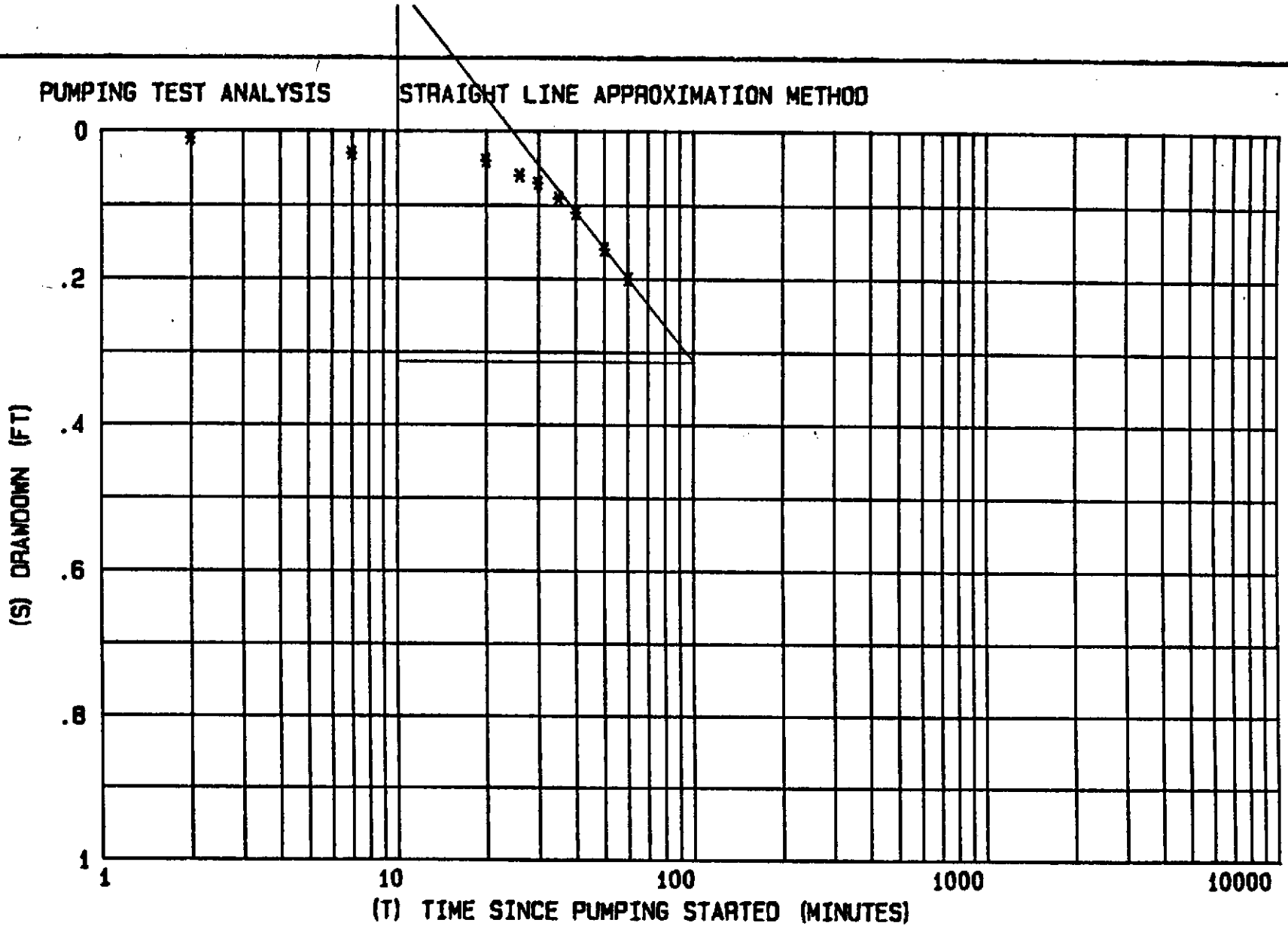
FILE NO.: 20-3231
WELL NO.: 4
ELEV. OF DATUM POINT:
STATIC WATER LEVEL: 15.26
R = 20 FT FROM RW1
SCREEN INTERVAL: 10 TO 35

TIME			ELAPSED TIME	WATER LEVEL	DRAWDOWN	(Q)
DY	HR	MN	t (MIN)	(ft)	s (ft)	(USGPM)
1	0	0	0.00	15.260	0.000	0.9000
1	0	2	2.00	15.270	0.010	0.9000
1	0	7	7.00	15.290	0.030	0.9000
1	0	20	20.00	15.300	0.040	0.9000
1	0	26	26.00	15.320	0.060	0.9000
1	0	30	30.00	15.330	0.070	0.9000
1	0	35	35.00	15.350	0.090	0.9000
1	0	40	40.00	15.370	0.110	0.9000
1	0	50	50.00	15.420	0.160	0.9000
1	1	0	60.00	15.460	0.200	0.9000

VALUE USED
0.9000

GROUNDWATER TECHNOLOGY

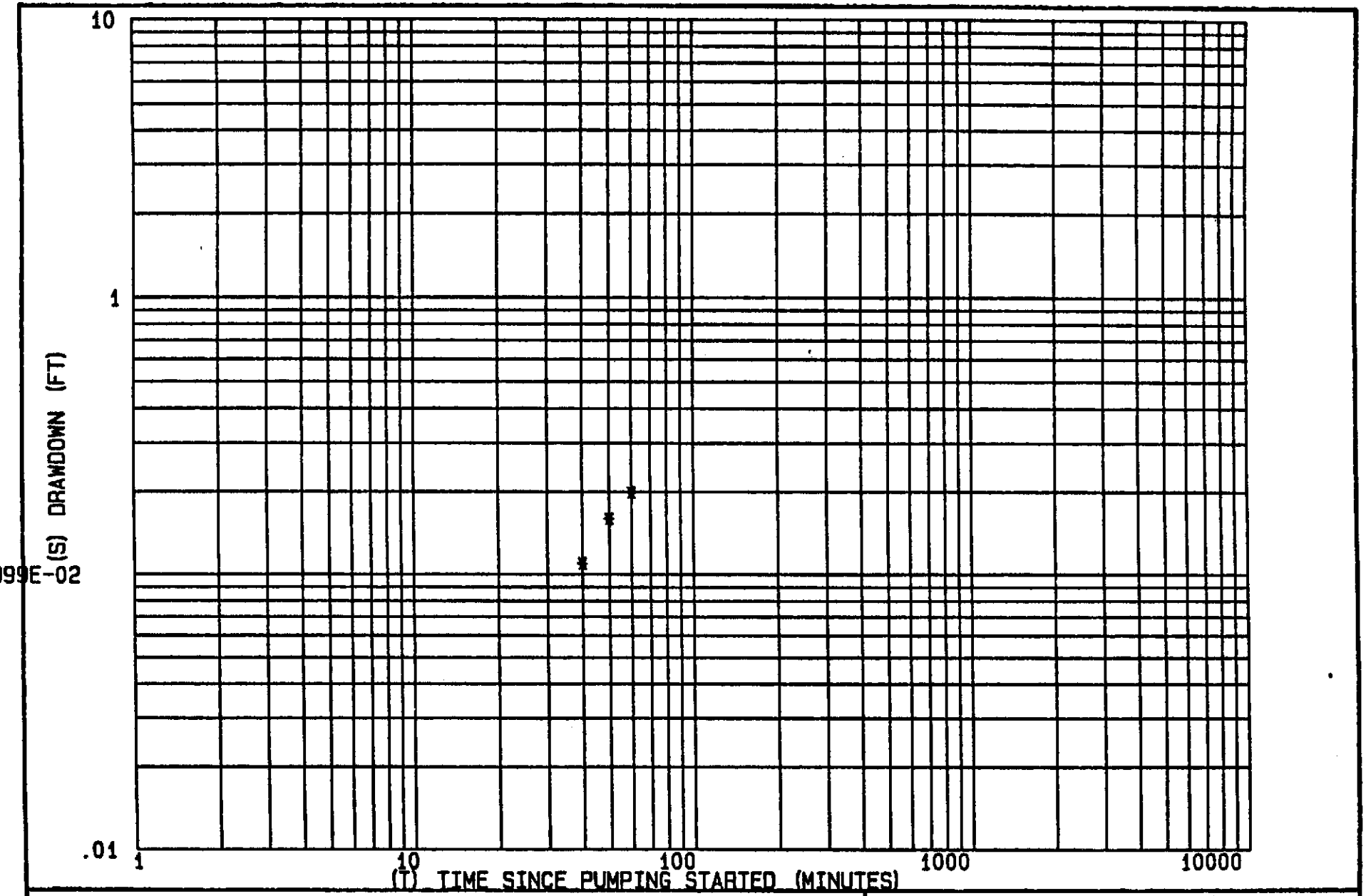
PUMPING TEST ANALYSIS STRAIGHT LINE APPROXIMATION METHOD



PROJECT: CHEVRON CASTRO VALLE FILE: 20-3231 LOCATION: CASTRO VALLEY CALIF.	WELL NO.: 4 Q= .9 USGPM S.W.L.= 15.26	ΔS= 0.511 FT T= 465 USGPD/FT S= .00591

GROUNDWATER TECHNOLOGY

FIGURE 1



PROJECT	CHEVRON CASTRO VALLE	FILE	20-3231	PUMPING TEST ANALYSIS
LOCATION	CASTRO VALLEY CALIF.	WELL No.	4	TYPE CURVE SOLUTION

GROUNDWATER TECHNOLOGY

FIGURE 2

ZONE OF CAPTURE - STAGNATION POINT

$$r = \frac{Q}{2\,(O_e)(T)\frac{(dh)}{(de)}}$$

r = Stagnation Point

q = Pumping Rate (gpm)

O = Effective Porosity Silty Sand

T = Transmissivity (gpm/ft)

$\frac{dh}{de}$ = Hydraulic Gradient

ZONE OF CAPTURE RADII FOR RECOVERY WELL

Q (gpm)	r (ft)
1	18
2	37
3	55
4	74