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SITE CLOSURE PLAN

Abandoned Chevron Asphalt Plant
1520 Powell Street
Emeryville, California

Prepared for

Chevron USA
2410 Camino Ramon
San Ramon, California

June 1990

COLORADO SPRINGS
SALT LAKE CITY
SAN DIEGO
VENTURA

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Prepared for

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Prepared by

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June 1990

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CONTENTS

EXECUTIVE SUMMARY

Closure is proposed for the former Chevron Asphalt Plant and Terminal located at 1520 Powell Street, Emeryville, California. Water chemistry data from 18 on- and off-site groundwater monitor wells installed since 1985, soil chemistry data from over 150 soil borings, and excavation of over 10,500 cubic yards of soil on-site, indicates that further soil and/or groundwater remediation will not enhance the condition of the site. Contaminant concentrations above detection in groundwater samples collected from monitor wells are now limited to areas directly adjacent to the former research laboratory building. Other moderate to high hydrocarbon concentration areas were remediated by soil excavation during the summer of 1989. Data from off-site, downgradient monitor wells indicate that most contaminants found in groundwater on-site have not migrated substantially off-site. It is proposed that groundwater sampling and analysis be continued for the next year on a quarterly basis. Once initial review of this closure plan and related documents have been completed by Alameda County Hazardous Materials Division Staff, a Risk Assessment can be prepared if required.

1 INTRODUCTION

The former Chevron Asphalt Plant and Terminal located at 1520 Powell Street, Emeryville, California, operated for several tens of years, prior to closure of the facility in 1987 (Figure 1). The facility researched and marketed various pavement products, batched and marketed various solvents and fuels in drums, and bulk distributed fuels from storage tanks located in the northwest corner of the site. The facility is presently vacant, with two office/laboratory buildings located on the south edge of the property, and three garages along the eastern edge (Figure 2). The above ground tanks have been removed, along with the associated piping and fueling island.

2 BACKGROUND

2.1 SITE SETTING

The site is located less than 1 mile east of San Francisco Bay in a heavily industrialized area (Figure 1). The Powell Street overpass superstructure is directly south of the facility buildings, with manufacturing and trade buildings located across old Powell Street and Landregan Street to the south and east, respectively (Figure2). The Southern Pacific Railroad and gas pipeline bound the site to the west. The elevation of the site is approximately 10 feet above mean sea level (msl) and the local topography slopes gently to the west, toward San Francisco Bay. Groundwater has been found between 1 and 5 feet below grade at the site and probably is under a tidal influence, but the degree of influence has not been determined.

The site is immediately underlain by a wedge of imported, random fill which thickens from less than 2 feet near Powell Street to over 6 feet in the northwest corner. This loose fill is predominately low-permeability silty clay, with few, isolated lenses of coarse gravel and manmade debris. Below the fill is a sequence of low-permeability silty clay, with minor interbeds of gravelly clay. In the northwest portion of the site in boring B-1, near well MW-13 thin stringers of clast-support gravels were encountered between 8 and 14 feet. Below, a dry, dense clay was encountered at an approximate depth of 19 feet. This clay unit is considered the primary aquitard for the shallow

groundwater encountered in the area, with the overlaying clayey units further minimizing the permeability of the subsurface.

2.2 PREVIOUS INVESTIGATIONS

March 1985

Nine on-site groundwater monitoring wells were installed by McKesson Environmental Services (MES). Low concentrations of hydrocarbons were found in groundwater samples (ref: Chevron Memorandum 21 June 1985).

October 1987

The above-ground fuel storage tanks and associated piping were removed.

July 1988

Three additional on-site wells were installed by Harding Lawson Associates (HLA). Trichloroethene (TCE) and fuel hydrocarbons were found in soil. Fuel hydrocarbons and other regulated compounds were found in the groundwater. Soil borings were also installed at 18 locations. All composites and individual soil samples were analyzed for gasoline, kerosene, diesel and other hydrocarbons. Soil samples from two borings were also analyzed for purgeable priority pollutants. Samples were all below detection for

gasoline, kerosene, and diesel hydrocarbons. Other hydrocarbons were reported at concentrations from below the detection limit to 7,500 parts-per-million (ppm). The samples from borings 17 and 18 contained TCE at 1.4 ppm and 1.5 ppm, respectively (ref: Preliminary Findings--Hazardous Materials Site Assessment, 1520 Powell Street, Emeryville, California; Harding Lawson Associates, 1 September 1988).

August/September 1988

The loading dock and barrel storage area were removed to allow for additional subsurface investigation.

September 1988

WGR drilled 42 soil borings on-site, near the old barrel storage area, and off-site to determine the vertical and horizontal extent of fuel hydrocarbons in shallow soil at and adjacent to the facility (ref: Soil Sampling Report--Chevron Asphalt Plant, 1520 Powell Street, Emeryville, California: Western Geologic Resources, Inc., 27 February 1989).

Laboratory analysis of soil samples collected from the borings indicated fuel hydrocarbon concentrations ranging from below the detection limit to 2,700 ppm.

December 1988

Groundwater Technology, Inc. (GTI) drilled 33 additional soil borings to further investigate the vertical and horizontal extent of fuel hydrocarbons and halocarbons in the unsaturated zone and to perform a preliminary feasibility study for bioreclamation. The sampling depths ranged from 1.5 feet to 10 feet below grade. Samples were collected in the saturated zone to determine bacteria population size and moisture/dry weight analysis (ref: Subsurface Soil Investigation--1520 Powell Street, Emeryville, California: Groundwater Technology Inc., December 1988).

Twenty-seven soil samples were analyzed for fuel hydrocarbons (gasoline, diesel and "waste oil"), 31 were analyzed for halocarbons, 2 were analyzed for purgeable priority pollutants (fuels, halocarbons plus other regulated purgeable compounds), 5 were tested for moisture/dry weight analysis and 9 were tested for bacterial population count. Gasoline was detected in one of the samples analyzed for fuel hydrocarbons, while diesel compounds were detected in 9 of these samples and "waste oil" was identified in 3 of these samples. The term "waste oil" refers to compounds GTI detected as heavier hydrocarbons or degraded gasolines, diesel fuels or fuel oils. Halocarbons were detected in three of the 27 samples analyzed for these compounds.

April/September 1989

Approximately 10,400 cubic yards (cy) of soils containing hydrocarbons were excavated to a depth averaging 6 feet. The approximate limits of the excavation are indicated on Figure 2. The lateral extent of the excavation was determined in the field using a photoionization detector (PID). For most of the subject area, soils were excavated until the PID did not detect any concentrations of hydrocarbons. Existing buildings and property lines determined the boundaries for the excavation in some locations. The excavation was lined with 10-mil Visqueen plastic sheeting, backfilled with 1-1/2 inch (in) diameter clean crushed rock, and covered with graded subbase material. The backfill was then wetted and compacted. Monitor wells MW-4, MW-5, and MW-6 were abandoned and excavated during this phase (ref: Preliminary Site Remediation Report--Chevron Asphalt Plant and Terminal, 1520 Powell Street, Emeryville, California: Western Geologic Resources, Inc., August 1989.)

Approximately 256 cy of additional soil containing halocarbons were excavated and removed from four separate locations (Figure 3). Three of these were under the southwest office/lab building and one was just outside that building. Soil containing halocarbons outside the building was excavated to an average depth of 6 feet, at which point field analysis of the soil using a portable gas chromatograph did not show detectable concentrations of halocarbons. The area was subsequently backfilled in the same manner as the larger excavation. The soils containing halocarbons under the building were excavated to approximately 14 inches below the surface. The excavation was lined with two

layers of 10-mil Visqueen plastic sheeting, and backfilled with six inches of 1-1/2 in diameter clean crushed rock, and overlain by two inches of sand. A six-inch steel-reinforced concrete slab was poured to match the existing concrete floor.

February/March 1990

An additional subsurface investigation was performed to determine if petroleum hydrocarbons and halocarbons are present in the shallow soil and groundwater off-site and replace on-site monitor wells destroyed during the soil excavation. Three exploratory borings were drilled on-site beyond the perimeter of the excavation backfill, with 2 completed as groundwater monitor wells. Five off-site exploratory borings were drilled in the estimated downgradient or crossgradient direction from the site and completed as groundwater monitor wells. Depths to first water ranged from 6.0 ft to 10.5 ft below grade. Groundwater samples were collected from all wells and analyzed.

TPPH and aromatic hydrocarbons were detected in groundwater samples collected from the two on-site wells with maximum concentrations of 480 parts-per-billion (ppb) TPPH and 5 ppb total xylenes. Halocarbons were detected in groundwater samples collected from the five off-site wells with maximum concentrations of up to 41 ppb trichloroethene (TCE), 53 ppb tetrachloroethene (PCE), and up to 10 ppb 1,2-dichloroethene (1,2-DCE) in the groundwater sample collected from well MW-19. Soluble metals were detected in groundwater samples collected from the four wells located across Powell Street at maximum concentrations of 150 ppb Pb, 340 ppb Cd, 20,000 ppb Cr and 5900 ppb Zn.

These four wells are located in front of an old machine shop across the street from the Chevron facility. The existence of the shop was discovered during a search through city benchmark records for a survey datum point.

March/April 1990

43 shallow soil borings were drilled around the northern edge of the excavation backfill and along the western edge of the property. Soil samples were collected at depths between 4 and 5 feet below the ground surface, and analyzed for oil and grease by Standard Method 503A and EPA method 418.1, BTEX and halocarbons by EPA method 8240, TPH by EPA method 8015, and total soluble lead by EPA method 6010.

TPH as gasoline and diesel was below or near the detection limit in most soil borings. Those soil borings with any appreciable concentrations of TPH were those taken from the western property line. Four of those soil borings had TPH concentrations as gasoline above 100 ppm but not exceeding 1900 ppm. Petoleum oil and grease (O&G) was identified in nearly all soil borings. However, only five soil borings exceed 100 ppm and of those five, two exceed 1000 ppm. SB-25 exhibited the highest concentration of petroleum oil & grease at 2300 ppm. TCE was detected in one soil boring, SB-42, at a concentration of 15 ppm.

3 CONTAMINANT TRENDS

3.1 GROUNDWATER

A complete compilation of analytic results from groundwater sampling is presented in Tables 1 and 2. Concentration trends for all wells and contaminants above detection are presented in Appendix 1.

TPH concentrations above detection have appeared at least once in groundwater samples collected from wells MW-1, MW-4 through MW-9, MW-13 and MW-14. TPH has been consistently present in well MW-1 at concentrations from 7,000 ppb in July 1989 to 3,500 ppb in March 1990, and in MW-7 at concentrations from 17,000 ppb in July 1988 to below detection in March 1990.

Benzene has been present at levels above detection only in samples collected from well MW-1, with concentrations up to 120 ppb in March 1990.

Chlorinated halocarbons and aromatic hydrocarbons have been detected in wells located adjacent to the laboratory building, and in recently installed downgradient off-site wells MW-15 through MW-19. TCE, 1,2-DCE, and vinyl chloride (VC) have been detected in samples collected from wells MW-1, MW-10, and MW-11. The greatest concentration of TCE was found in the sample

from well MW-1 at 160 ppb in April 1985. From April 1985 to April 1989, well MW-1 showed a trend of decline in TCE concentration with the lowest concentration of <10 ppb for the September 1987 sampling. For the March 1990 sampling, the concentration has returned to 130 ppb. Wells MW-10 and MW-11 have remained relatively constant in TCE concentration. 1,2-DCE was most prevalent in well MW-1 at 7 ppm in March 1990. This well has shown an overall trend of increase in 1,2-DCE concentration from initial sampling where the concentration was 1.2 ppm in April 1985. The concentrations for the other two wells, MW-10 and MW-11, have remained relatively constant. VC is found in greatest concentration at 1.5 ppm in well MW-1 in April 1985. Well MW-1 shows fluctuation in concentration of VC with a marginal trend of decline. The concentration of VC in the other two wells, MW-10 and MW-11, have remained relatively constant.

3.2 SOIL

The removal of soil in accordance with the WGR workplan for site remediation has greatly reduced the extent of contaminants at the site. Soils which contain TPH are located in three main areas of the vadose zone: 1) Beneath the loading dock; 2) possibly beneath the laboratory building; and 3) in portions of the narrow strip of land between the railroad and the fence on the west edge of the site. Figures 4 and 5 were originally prepared to accompany the WGR Soil Sampling letter report dated 24 April 1990, and are included here to locate the soil samples collected and analyzed along the west edge of the site.

Halocarbons and aromatic hydrocarbons in soil, specifically TCE, 1,2-DCE, ethylbenzene, xylene, and toluene have only been detected after the excavation in soils adjacent to wells MW-10 and MW-11. Figure 5 details concentrations of these compounds.

4 DISCUSSION

Concentrations of contaminants in groundwater have remained consistent, or decreased, over the time of monitoring. All contaminant source areas in soil have been removed to the maximum practical extent down to the depth of static groundwater, except where structures remain standing on site or limited access has prohibited excavation. Monitor wells MW-1, MW-10, and MW-11, which consistently exhibit hydrocarbon and halocarbon concentrations in the groundwater are located immediately adjacent to the laboratory building. MW-1 generally records the highest concentrations in groundwater, although soil sampling and excavation indicate that all contaminated soils have been removed in the open areas adjacent to the well. Wells MW-10 and MW-11 are located in the strip of property sandwiched between the laboratory building and the Southern Pacific (SP) high pressure pipelines and railroad tracks. Removal of contaminated soils adjacent to the two wells would be difficult due to the close proximity of the SP property, compounded by the presence of the deep foundation of a multi-story billboard located in between the laboratory and the SP lines. Excavation of any soil near this structure could possibly initiate failure of the billboard. In order to adequately address soils in this area, steps are being taken to remove the building and possibly, the billboard. Exposed soils will then be evaluated for remediation.

Dynamic groundwater remediation, based on well pumping and treatment, was evaluated as a method to further remove hydrocarbon and halocarbons from the soil and groundwater.

Alternatives were discussed in the WGR Groundwater Remediation Workplan, dated 19 April 1990. A 24-hour duration, constant drawdown pumping test was performed to evaluate aquifer parameters. The test indicated that the maximum sustainable pumping rate was 0.26 gallons-per-minute (GPM). Based on analysis of the aquifer recovery after termination of pumping, a transmissivity of 11 gallons-per-day (GPD) per foot was calculated (Figure 6). A radius of influence of 358 feet can be estimated from these values, and is included as Figure 7. Rough estimates suggest that over 500 days of pumping would be required to pump one volume of interstitial groundwater contained within the downgradient influence area. The workplan concluded that pumping rates will be so low that a time period for clean-up achievement would be excessive and unreasonable.

In addition, the high clay content of the soils will decrease the efficiency of any groundwater pumping cleanup approach to remove halocarbons from the soil and groundwater, because these compounds (TCE, 1,2-DCE) preferentially attach to clays and do not have an affinity for water.

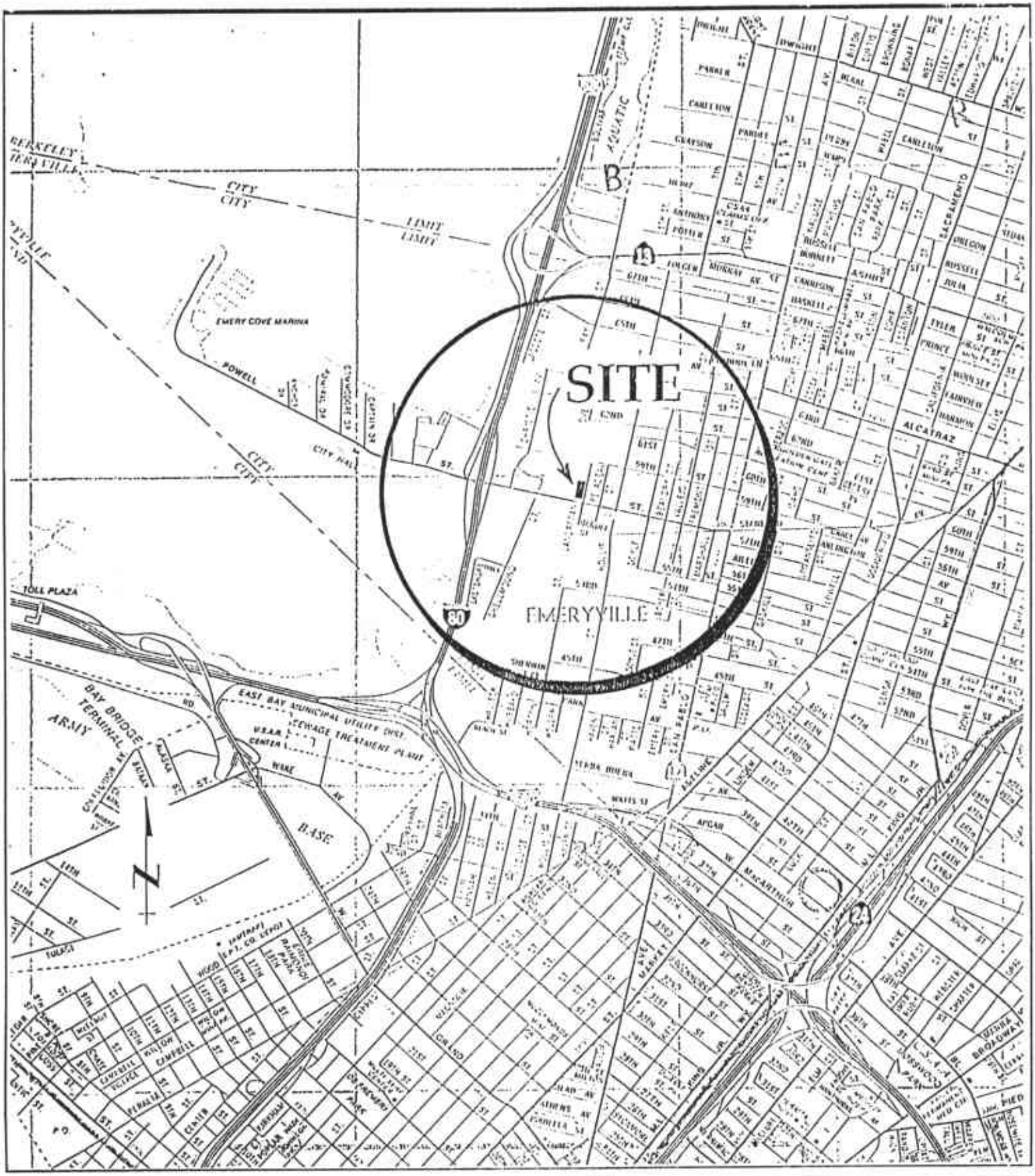
5 PROPOSED CLOSURE

A final year of groundwater monitoring for hydrocarbons and halocarbons on a quarterly basis is proposed to complete the data acquitision and analysis for the site. Sampling will include a one time analysis to address water quality on- and off-site as a whole. Water samples will be tested for total dissolved solids, soluble metals, salinity, and pH.

Preparation of a risk assessment (RA) is proposed to be prepared for the site, once evaluation of the closure plan has been completed by the county. The RA will address the present and future impact the site will have on the shallow groundwater in the Emeryville industrial area. It is our opinion that no further site remediation is practical or feasible.

Aquifer analysis indicates that pump and treat methods for groundwater remediation would be ineffective and costly due to the low flow rates observed at the site. Pump test data indicates that several tens of years would be required to pump a minimum volume of water through the soil to draw contaminants from the soil matrix. The compounds TCE and 1,2-DCE do not respond well to removal by pumping. They are slightly soluble in water and do not readily desorb from soil.

FIGURES



NOT TO SCALE

Reference: 1989 CSAA Road Map

Site Location Map
Former Chevron Asphalt Plant and Terminal
Emeryville, California

FIGURE

1

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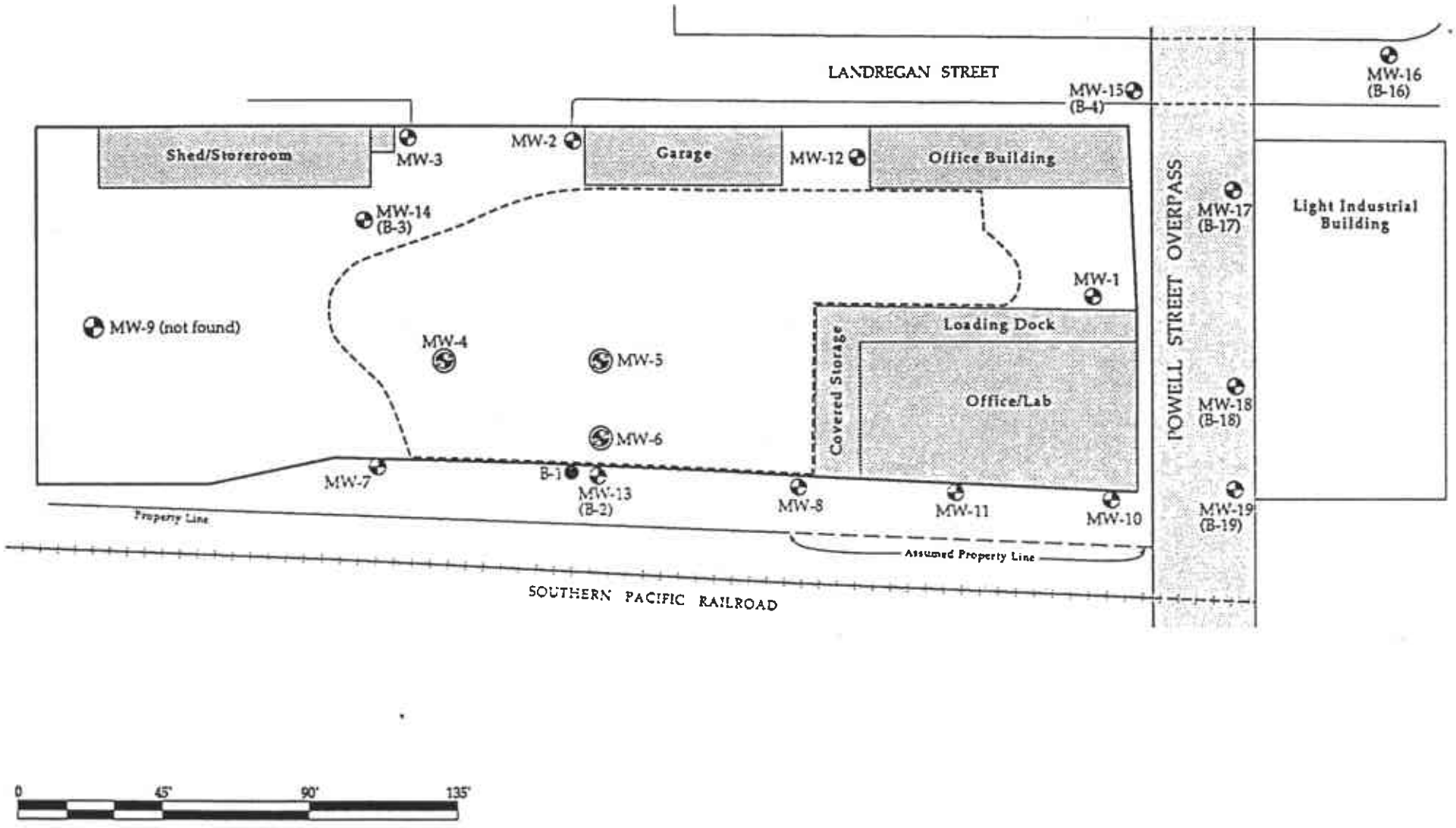


LEGEND

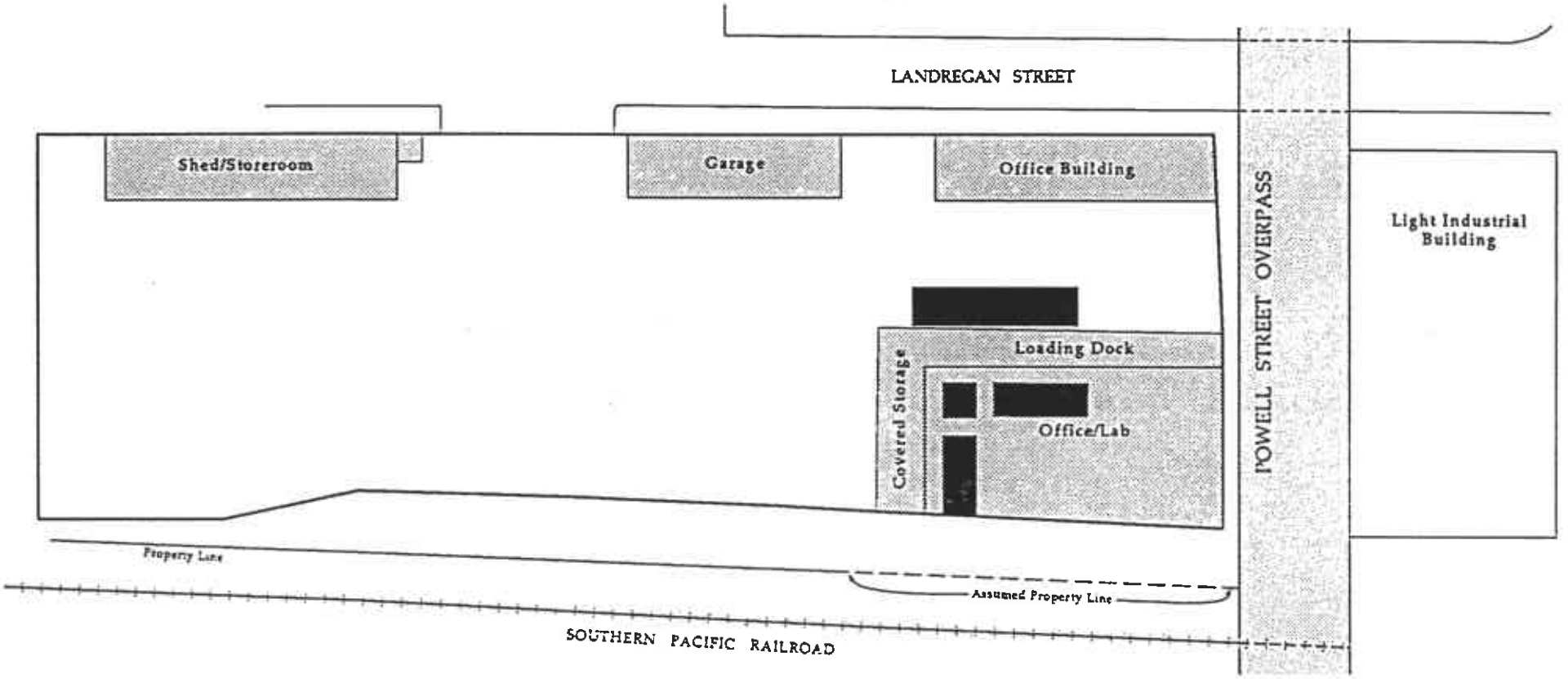
- Monitor Well (and Soil Boring) Location
- Soil Boring Location
- Destroyed or Abandoned Monitor Well Location
- ---------- Boundry of Excavation

Site Map with Soil Boring and Monitor Well Locations
Former Chevron Asphalt Plant and Terminal
Emeryville, California

FIGURE
2

WESTERN GEOLOGIC RESOURCES, INC.

1-045.44



LEGEND

Excavated area of trichloroethylene (TCE) contaminated soils

Excavation of Soils Containing Halocarbons
Former Chevron Asphalt Plant and Terminal
Emeryville, California

FIGURE 3

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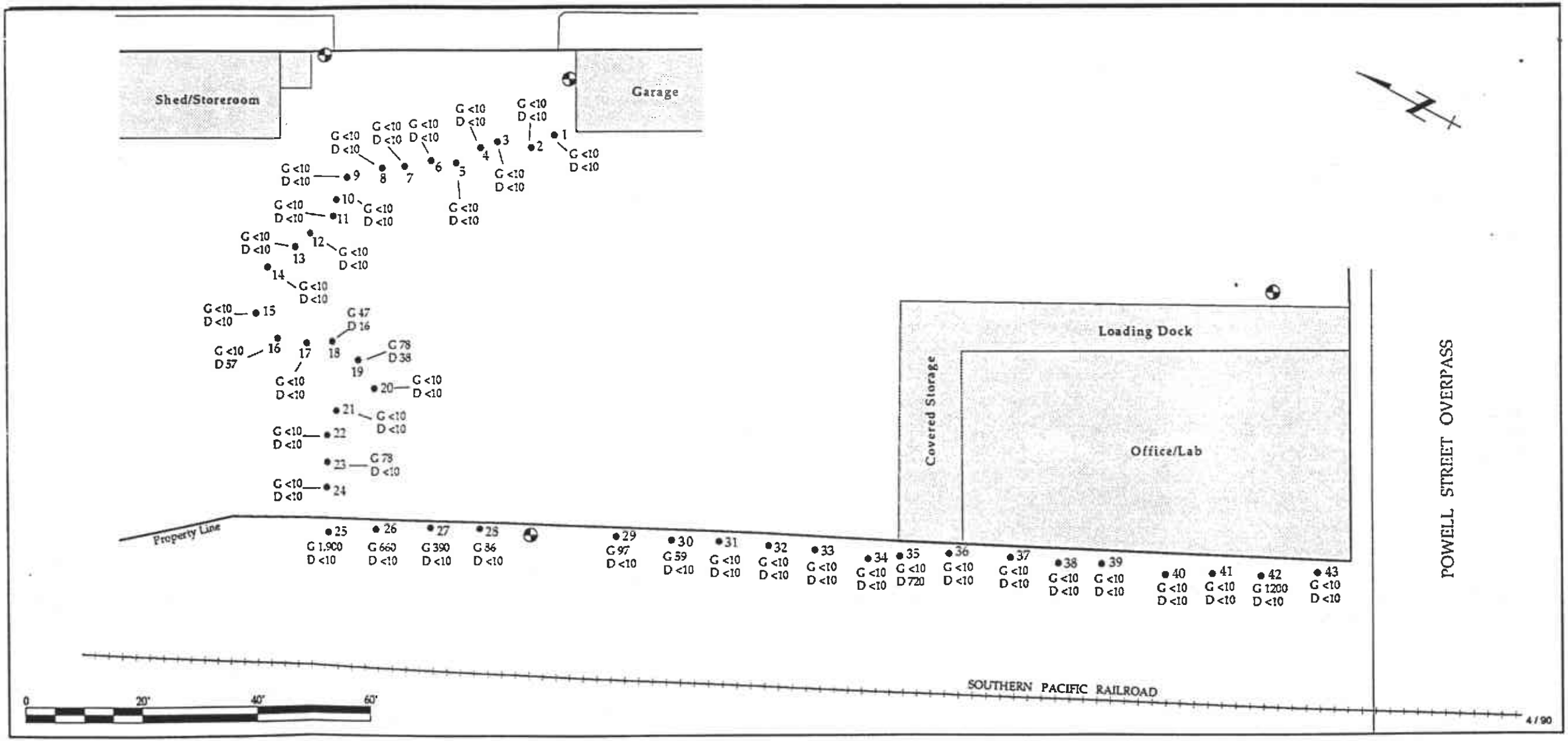

LEGEND

- Monitor Well Location
- 17 / G <10 / D <10 — Soil Boring Location and Total Petroleum Hydrocarbons as Gas (G) and Diesel (D) Concentrations in parts-per-million

Concentrations of Total Petroleum Hydrocarbons as Gas and Diesel
Former Chevron Asphalt Plant and Terminal
Emeryville, California

FIGURE 4

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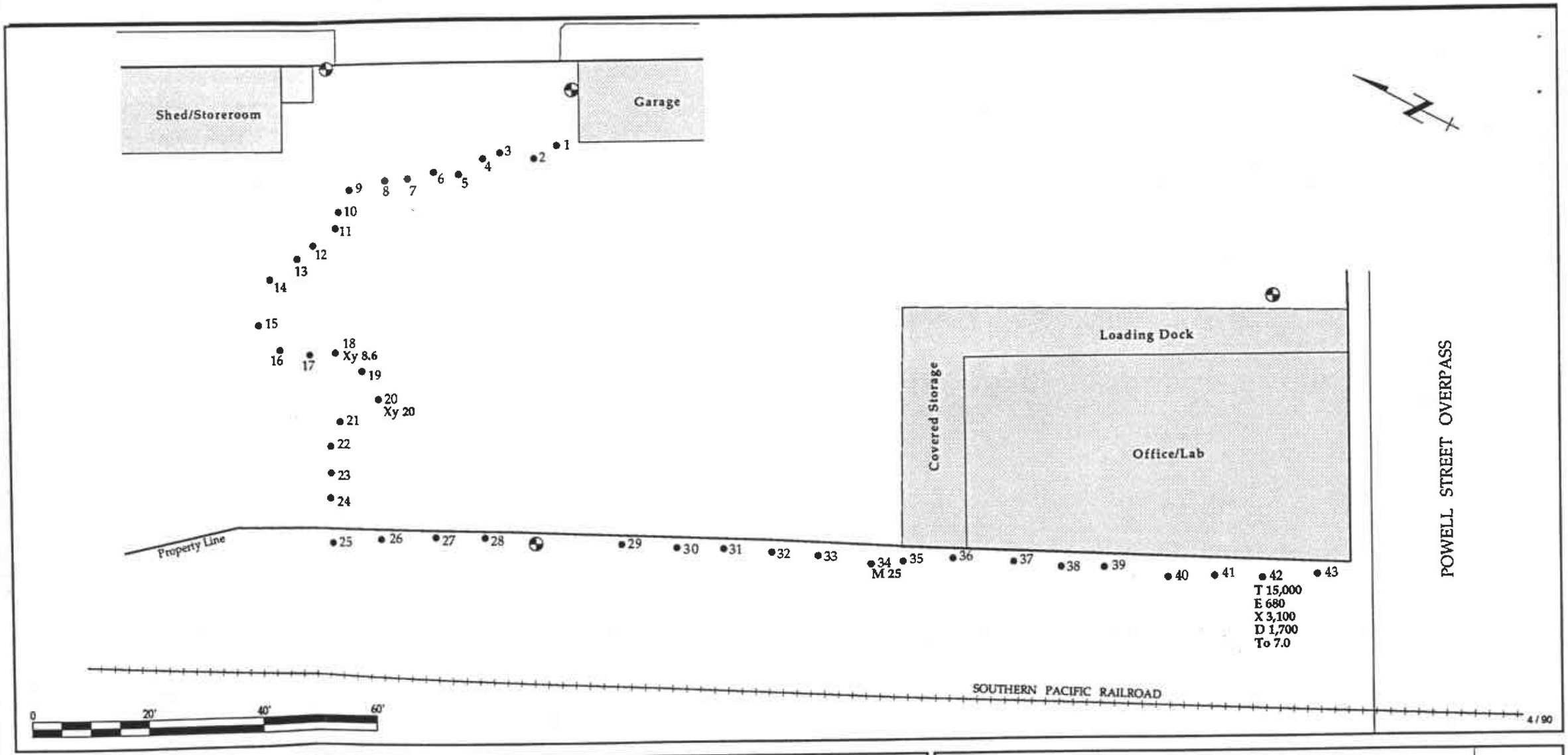

LEGEND

- Monitor Well Location
- 34 / M 25 — Soil Boring Location and BTEX and Halocarbons, in parts per billion.

M = Methylene Chloride
D = Trans 1,2 Dichloroethene
E = Ethylbenzene
Xy = Xylene
T = Trichloroethene
To = Toluene
B = Benzene

Concentrations of BTEX and Halocarbons in Soil
Former Chevron Asphalt Plant and Terminal
Emeryville, California

FIGURE 5

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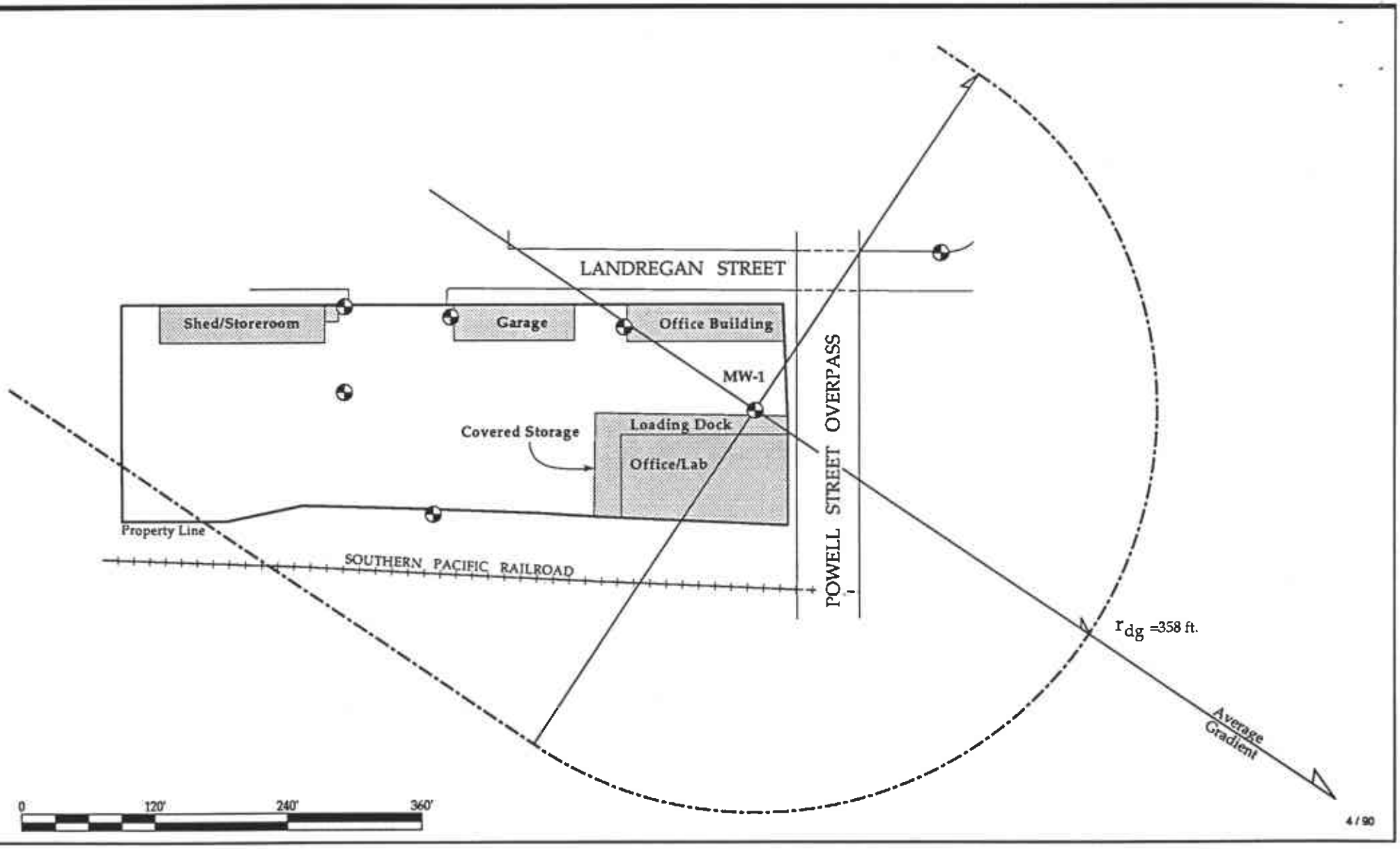

LEGEND

r_{dg} Downgradient Zone of Capture

$$r_{dg} = \frac{Q}{2\pi T\, dh/dl}^{*} \qquad \frac{50.06\ ft^3/Day}{2\pi T\ (0.015)}$$

MW-1 Monitor Well Location

* Keely and Tsang, 1983, "Velocity Plots and Capture Zones of Pumping Centers for Groundwater Investigations"; Groundwater, Vol. 21, No. 6, pp. 701-714.

Calculated Zone of Capture
Former Chevron Asphalt Plant and Terminal
Emeryville, California

FIGURE
6

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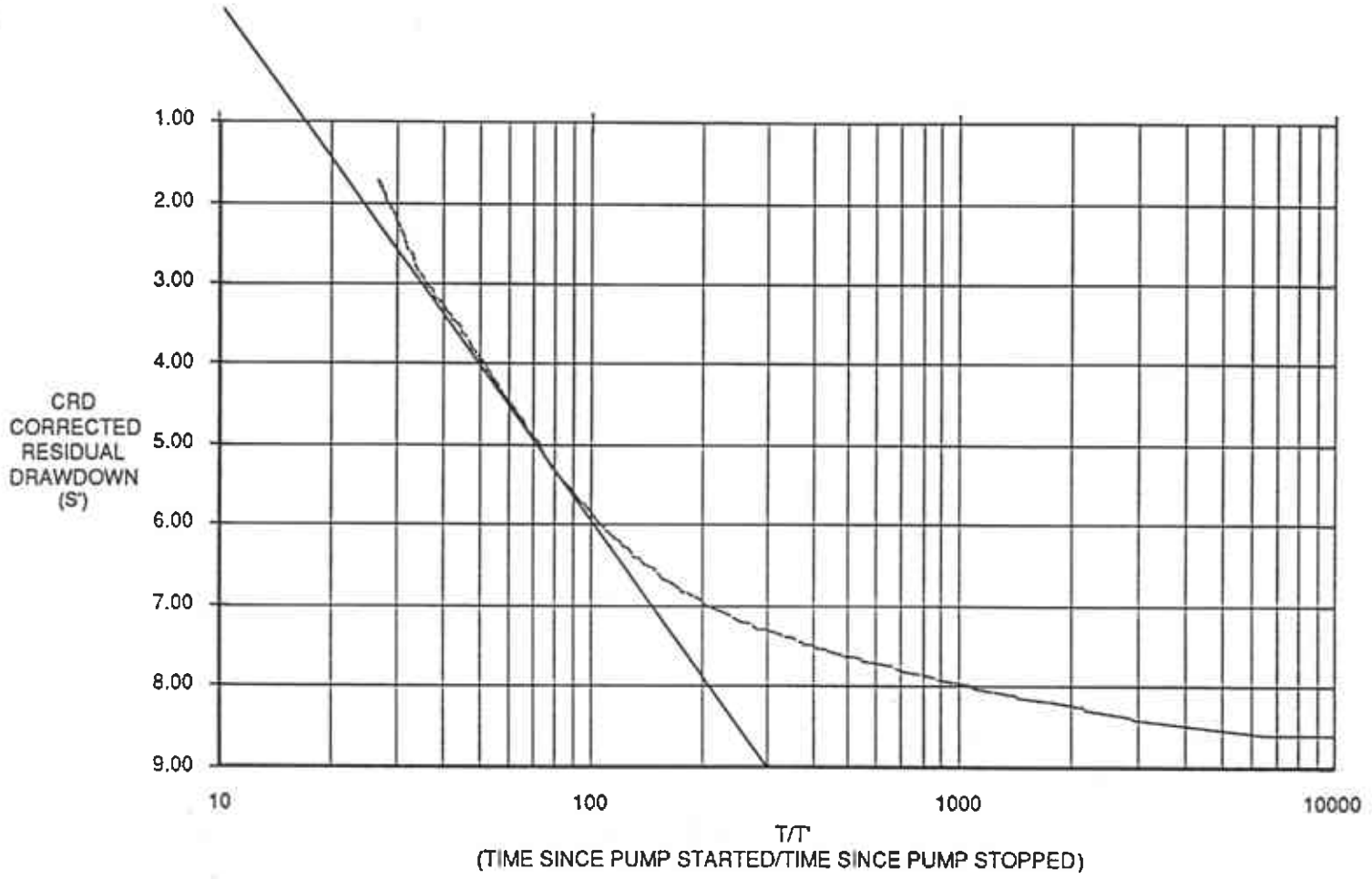

Reference: Driscoll, R.F., 1986 ed., Groundwater and Wells: Johnson Division, Pubs., St. Paul, Minnesota, p. 257

LEGEND

$$T = \frac{264Q}{\Delta s'}$$

where $Q = 0.26\text{gpm} = 50\ \text{ft}^3/\text{day}$

$\Delta s' = 7.9 - 1.4 = 6.5$

$T = 11$ gpd/ft.

Recovery Curve
Pump Test for MW-12, February 21, 1990
Former Chevron Asphalt Plant and Terminal

FIGURE
7

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TABLES

TABLE 1. Analytic Results: Groundwater
Former Chevron Asphalt Plant
Emeryville, California

Well ID#	Date	Lab	FC	TH	TPH/TPPH	B	T	E	X	O&G
				<-ppb->						<-ppm->
MW-1	26 Apr 85	MES	---	---	---	99	---	---	6	---
MW-1	11 Sep 87	SEQ	---	---	---	63	---	---	---	---
MW-1	07 Jul 88	C&T	---	---	<100	55	---	---	---	---
MW-1	14 Apr 89	CCAS	---	---	<5,000	34.0	<5.0	<5.0	<10.0	---
MW-1	31 Jul 89	CCAS	Gas	---	7,000	57.0	1.2	<0.2	1.6	---
MW-1	08 Dec 89	GTEL	---	---	---	26.0	0.4	0.9	2.0	---
MW-1	21 Mar 90	GTEL	Gas	---	3,500	120.0	9.0	3.0	3.0	---
MW-2	26 Apr 85	MES	---	---	---	<10	---	---	---	---
MW-2	11 Sep 87	---	---	---	---	---	---	---	---	---
MW-2	07 Jul 88	C&T	---	---	<100	<5	---	---	---	---
MW-2	14 Apr 89	CCAS	---	---	<100	<0.2	<0.2	<0.2	<0.4	<3.0
MW-2	31 Jul 89	CCAS	---	---	<100	<0.2	<1.0	<0.2	<0.4	---
MW-2	08 Dec 89	GTEL	---	---	---	<0.3	<0.3	<0.3	<0.6	---
MW-2	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-3	26 Apr 85	MES	---	---	---	<10	---	---	---	---
MW-3	11 Sep 87	SEQ	---	---	---	<0.5	---	---	---	---
MW-3	07 Jul 88	C&T	---	---	<100	<5	---	---	---	---
MW-3	14 Apr 89	CCAS	---	---	<100	<0.2	<0.2	<0.2	<0.4	<3.0
MW-3	31 Jul 89	CCAS	---	---	<100	<0.2	<1.0	<0.2	<0.4	---
MW-3	08 Dec 89	GTEL	---	---	---	<0.3	<0.3	<0.3	<0.6	---
MW-3	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-4	26 Apr 85	MES	---	3,100	---	<10	---	---	---	---
MW-4	11 Sep 87	SEQ	---	---	---	<0.5	---	---	---	---
MW-4	07 Jul 88	C&T	---	---	<100	<5	---	---	---	---
MW-4*	14 Apr 89	CCAS	DSL 2	---	380	<0.5	<1.0	<1.0	<1.0	<3.0
MW-4	08 Dec 89	GTEL	---	---	---	---	---	---	---	---
MW-5	26 Apr 85	MES	---	1,600	---	<100	---	---	---	---
MW-5	11 Sep 87	SEQ	---	---	---	<10	---	---	---	---
MW-5	07 Jul 88	C&T	---	---	<100	<5	---	---	---	---
MW-5*	14 Apr 89	CCAS	DSL 2	---	4,300	<0.5	<1.0	<1.0	<1.0	<3.0
MW-5	08 Dec 89	GTEL	---	---	---	---	---	---	---	---
MW-6	26 Apr 85	MES	---	580	---	<100	---	---	---	---
MW-6	11 Sep 87	SEQ	---	---	---	<10	---	---	---	---
MW-6	07 Jul 88	C&T	---	---	8,000	<5	---	---	---	---
MW-6*	14 Apr 89	CCAS	DSL 2	---	3,300	<0.5	<1.0	<1.0	<1.0	<3.0
MW-6	08 Dec 89	GTEL	---	---	---	---	---	---	---	---

TABLE 1. Analytic Results: Groundwater (continued)
Former Chevron Asphalt Plant
Emeryville, California

Well ID#	Date	Lab	FC	TH	TPH/TPPH	B	T	E	X	O&G
				<-ppb->						<-ppm->
MW-7	26 Apr 85	MES	---	700	---	ND	---	---	---	---
MW-7	11 Sep 87	SEQ	---	---	---	<10	---	---	---	---
MW-7	07 Jul 88	C&T	---	---	17,000	<5	---	---	---	---
MW-7	14 Apr 89	CCAS	---	---	<50	<0.5	<1.0	<1.0	<1.0	<3.0
MW-7	31 Jul 89	CCAS	DSL 2	---	160.0	<0.1	<0.5	<0.1	<0.2	---
MW-7D	31 Jul 89	CCAS	DSL 2	---	100.0	<0.1	<0.5	<0.1	<0.1	---
MW-7	08 Dec 89	GTEL	---	---	---	<0.3	<0.3	<0.3	<0.6	---
MW-7	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-8	26 Apr 85	MES	---	---	---	ND	---	---	---	---
MW-8	11 Sep 87	SEQ	---	---	---	<10	---	---	---	---
MW-8	07 Jul 88	C&T	---	---	20,000	<5	---	---	---	---
MW-8	14 Apr 89	CCAS	---	---	<50	<0.5	<1.0	<1.0	<1.0	<3.0
MW-8	31 Jul 89	CCAS	---	---	<50	<0.1	<0.5	<0.1	<0.2	---
MW-8	08 Dec 89	GTEL	---	---	---	<0.3	<0.3	<0.3	<0.6	---
MW-8	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-9	26 Apr 85	MES	---	---	---	---	---	---	---	---
MW-9	11 Sep 87	SEQ	---	---	---	---	---	---	---	---
MW-9	07 Jul 88	C&T	Gas	---	400	---	---	---	---	---
MW-9	14 Apr 89	---	---	---	---	---	---	---	---	---
MW-9	31 Jul 89	---	---	---	---	---	---	---	---	---
MW-10	07 Jul 88	C&T	---	---	---	<5	---	---	---	---
MW-10	14 Apr 89	CCAS	---	---	<50	<0.5	<1.0	<1.0	<1.0	<3.0
MW-10	31 Jul 89	CCAS	---	---	<50	<0.1	<0.5	<0.1	<0.2	---
MW-10	08 Dec 89	GTEL	---	---	---	<0.3	<0.3	<0.3	<0.6	---
MW-10	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-11	07 Jul 88	C&T	---	---	---	<5	---	---	---	---
MW-11	14 Apr 89	CCAS	---	---	<50	<0.5	<1.0	<1.0	<1.0	<3.0
MW-11	31 Jul 89	CCAS	---	---	<100	<0.2	<0.2	<0.2	<0.2	---
MW-11	08 Dec 89	GTEL	---	---	---	<0.3	<0.3	<0.3	<0.6	---
MW-11	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-12	07 Jul 88	C&T	---	---	<100	<5	---	---	---	---
MW-12	14 Apr 89	CCAS	---	---	<50	<0.5	<1.0	<1.0	<1.0	<3.0
MW-12	31 Jul 89	CCAS	---	---	<100	<0.1	<0.5	<0.1	<0.2	---
MW-12	08 Dec 89	GTEL	---	---	---	<0.3	<0.3	<0.3	<0.6	---
MW-12	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-13	21 Mar 90	GTEL	---	---	480	<0.3	<0.3	1.0	5.0	---

TABLE 1. Analytic Results: Groundwater (continued)
Former Chevron Asphalt Plant
Emeryville, California

Well ID#	Date	Lab	FC	TH	TPH/TPPH	B	T	E	X	O&G
				<-ppb->						<-ppm->
MW-14	21 Mar 90	GTEL	---	---	170	<0.3	<0.3	0.4	2.0	---
MW-15	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-16	26 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-17	26 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-18	26 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
MW-19	26 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
TB	14 Apr 89	CCAS	---	---	<50	<0.1	<0.1	<0.1	<0.2	---
TB	31 Jul 89	CCAS	---	---	<50	<0.1	<0.5	<0.1	<0.2	---
TB	08 Dec 89	GTEL	---	---	---	<0.3	<0.3	<0.3	<0.6	---
TB	21 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---
TB	26 Mar 90	GTEL	---	---	<50	<0.3	<0.3	<0.3	<0.6	---

NOTES:

- D = Duplicate Sample
- MES = McKesson Environmental Services
- SEQ = Sequoia Analytical Laboratory
- C&T = Curtis & Tompkins, Ltd.
- CCAS = Central Coast Analytical Services
- GTEL = Groundwater Technology & Environmental Laboratories
- FC = Fuel Characterization
- TH = Total Hydrocarbons
- TPH/TPPH = Total Petroleum Hydrocabrons/Total Purgeable Petroleum Hydrocarbons
- B = Benzene
- T = Toluene
- E = Ethylbenzene
- X = Total Xylenes
- O&G = Oil and Grease
- ppm = parts-per-million
- ppb = parts-per-billion
- Gas = Gasoline
- DSL 2 = Diesel #2
- TB = Travel Blank
- --- = Not Analyzed
- * = Destroyed Monitor Wells - 1989
- ND = Not Detected; Detection Limited Not Given

TABLE 2. Analytic Results: Groundwater
Former Chevron Asphalt Plant
Emeryville, California

Well ID#	Date	Lab	1,1-DCE	1,2-DCE	1,1-DCA	TCA	TCE	PCE	PCB	VC	CB	AB	Other
			<--------				ppb						-------->
MW-1	26 Apr 85	MES	3	1,200.0	---	---	160.0	---	---	1,500.0	20	---	---
MW-1	11 Sep 87	SEQ	---	700.0	---	---	<10	---	---	990.0	---	---	---
MW-1	07 Jul 88	C&T	---	1,050.0	---	---	45.0	---	---	560.0	---	---	---
MW-1	14 Apr 89	CCAS	<5.0	739.0	<5.0	<5.0	11.0	---	---	340.0	---	---	I
MW-1	31 Jul 89	CCAS	6.8	2,654.0	2.7	7.2	57.0	---	---	760.0	---	---	II
MW-1	8 Dec 89	GTEL	4.3	2,700.0	1.7	1.4	59.0	---	---	520.0	---	---	---
MW-1	21 Mar 90	GTEL	7.1	7,000.0	2.1	1.1	130.0	<0.5	---	1,100.0	---	---	---
MW-2	26 Apr 85	MES	---	<10.0	---	---	<10.0	---	<0.5	<10.0	---	---	---
MW-2	11 Sep 87	SEQ	---	---	---	---	---	---	---	---	---	---	---
MW-2	07 Jul 88	C&T	---	<5.0	---	---	<5.0	---	---	<5.0	---	---	---
MW-2	14 Apr 89	CCAS	<0.2	<0.2	<0.2	<0.2	<0.2	---	---	<0.2	---	---	---
MW-2	31 Jul 89	CCAS	<0.2	<0.2	<0.4	0.5	<0.2	---	---	<0.2	---	---	---
MW-2	8 Dec 89	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	---	---	<1.0	---	---	---
MW-2	21 Mar 90	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	---	<1.0	---	---	---
MW-3	26 Apr 85	MES	---	<10.0	---	---	<10.0	---	---	<10.0	---	---	---
MW-3	11 Sep 87	SEQ	---	<0.5	---	---	<0.5	---	---	<0.5	---	---	---
MW-3	07 Jul 88	C&T	---	<0.5	---	---	<5.0	---	---	<5.0	---	---	---
MW-3	14 Apr 89	CCAS	<0.2	<0.2	<0.2	<0.2	<0.2	---	---	<0.2	---	---	---
MW-3	31 Jul 89	CCAS	<0.2	<0.2	<0.4	0.5	<0.2	---	---	<0.2	---	---	---
MW-3	8 Dec 89	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	---	---	<1.0	---	---	---
MW-3	21 Mar 90	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	---	<1.0	---	---	---
MW-4	26 Apr 85	MES	---	<10.0	21.0	---	<10.0	---	---	<10.0	---	~15	---
MW-4	11 Sep 87	SEQ	---	<0.5	---	---	<0.5	---	---	<0.5	---	---	---
MW-4	07 Jul 88	C&T	---	<5.0	---	---	<5.0	---	---	<5.0	---	---	---

TABLE 2. Analytic Results: Groundwater (Continued)
Former Chevron Asphalt Plant
Emeryville, California

Well ID#	Date	Lab	1,1-DCE	1,2-DCE	1,1-DCA	TCA	TCE	PCE	PCB	VC	CB	AB	Other
			<--------				ppb						-------->
MW-4*	14 Apr 89	CCAS	<1.0	<2.0	<1.0	<1.0	<1.0	---	---	<1.0	---	---	---
MW-4*	8 Dec 89	GTEL	---	---	---	---	---	---	---	---	---	---	---
MW-5	26 Apr 85	MES	---	<100.0	---	---	<100.0	---	---	<100.0	---	~210.0	---
MW-5	11 Sep 87	SEQ	---	<10.0	---	---	<10.0	---	---	<10.0	---	---	---
MW-5	07 Jul 88	C&T	---	<5.0	---	---	<5.0	---	---	<5.0	---	---	---
MW-5*	14 Apr 89	CCAS	<1.0	<1.0	<1.0	<1.0	<1.0	---	---	<1.0	---	---	---
MW-5*	8 Dec 89	GTEL	---	---	---	---	---	---	---	---	---	---	---
MW-6	26 Apr 85	MES	---	<100.0	---	---	<100.0	---	---	<100.0	---	---	---
MW-6	11 Sep 87	SEQ	---	<10.0	---	---	<10.0	---	---	<10.0	---	---	---
MW-6	07 Jul 88	C&T	---	<5.0	---	---	<5.0	---	---	<5.0	---	---	---
MW-6*	14 Apr 89	CCAS	<1.0	<1.0	<1.0	<1.0	<1.0	---	---	<1.0	---	---	---
MW-6*	8 Dec 89	GTEL	---	---	---	---	---	---	---	---	---	---	---
MW-7	26 Apr 85	MES	---	ND	---	---	ND	---	---	ND	---	---	---
MW-7	11 Sep 87	SEQ	---	<10.0	---	---	<10.0	---	---	<10.0	---	---	---
MW-7	07 Jul 88	C&T	---	<5.0	---	---	<5.0	---	---	<5.0	---	---	---
MW-7	14 Apr 89	CCAS	<1.0	<1.0	1.0	<1.0	<1.0	---	---	<1.0	---	---	---
MW-7	31 Jul 89	CCAS	<0.1	0.3	<0.1	4.5	<0.1	---	---	<0.1	---	---	III
MW-7D	31 Jul 89	CCAS	<0.1	0.4	0.2	2.6	<0.1	---	---	<0.1	---	---	III
MW-7	8 Dec 89	GTEL	<0.2	<0.5	<0.5	0.67	<0.5	---	---	<1.0	---	---	---
MW-7	21 Mar 90	GTEL	<0.2	<0.5	<0.5	1.4	<0.5	<0.5	---	<1.0	---	---	---
MW-8	26 Apr 85	MES	---	ND	---	---	ND	---	---	ND	---	---	---
MW-8	11 Sep 87	SEQ	---	<10.0	---	---	<10.0	---	---	<10.0	---	---	---
MW-8	07 Jul 88	C&T	---	<5.0	---	---	<5.0	---	---	<5.0	---	---	---

TABLE 2. Analytic Results: Groundwater (Continued)
Former Chevron Asphalt Plant
Emeryville, California

Well ID#	Date	Lab	1,1-DCE	1,2-DCE	1,1-DCA	TCA	TCE	PCE	PCB	VC	CB	AB	Other
			<--------				ppb						-------->
MW-8	14 Apr 89	CCAS	<1.0	<1.0	<1.0	<1.0	<1.0	---	---	<1.0	---	---	---
MW-8	31 Jul 89	CCAS	<0.1	2.5	1.7	1.7	0.4	---	---	1.2	---	---	---
MW-8	8 Dec 89	GTEL	<0.02	0.53	<0.5	0.89	<0.5	---	---	<1.0	---	---	---
MW-8	21 Mar 90	GTEL	<0.2	0.96	<0.5	0.72	<0.5	<0.5	---	<1.0	---	---	---
MW-9	26 Apr 85	MES	---	ND	---	---	ND	---	<0.5	ND	---	---	---
MW-9	11 Sep 87	SEQ	---	---	---	---	---	---	---	---	---	---	---
MW-9	07 Jul 88	C&T	---	---	---	---	---	---	---	---	---	---	---
MW-10	07 Jul 88	C&T	---	21.0	---	---	5.0	---	---	<10	---	---	---
MW-10	14 Apr 89	CCAS	<1.0	15.0	2.0	<1.0	5.0	---	---	<1.0	---	---	---
MW-10	31 Jul 89	CCAS	0.7	33.3	2.9	<0.1	5.3	---	---	<0.1	---	---	---
MW-10	8 Dec 89	GTEL	<0.2	24.0	3.1	<0.5	4.9	---	---	<1.0	---	---	IV
MW-10	21 Mar 90	GTEL	0.7	30.0	2.5	<0.5	3.5	<0.5	---	<1.0	---	---	---
MW-11	07 Jul 88	C&T	---	180.0	---	---	Trace	---	---	<10.0	---	---	---
MW-11	14 Apr 89	CCAS	1.0	120.0	<1.0	<1.0	4.0	---	---	10.0	---	---	---
MW-11	31 Jul 89	CCAS	0.9	150.0	2.2	1.4	2.9	---	---	<0.2	---	---	---
MW-11	8 Dec 89	GTEL	0.5	120.0	2.1	1.2	4.1	---	---	2.4	---	---	---
MW-11	21 Mar 90	GTEL	1.3	150.0	1.2	1.7	3.5	<0.5	---	4.3	---	---	V
MW-12	07 Jul 88	C&T	---	Trace	---	---	<5.0	---	---	<10.0	---	---	---
MW-12	14 Apr 89	CCAS	<1.0	1.0	<1.0	<1.0	<1.0	---	---	<1.0	---	---	---
MW-12	31 Jul 89	CCAS	<0.1	1.7	<0.1	<0.1	0.8	---	---	<0.1	---	---	---
MW-12	8 Dec 89	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	---	---	<1.0	---	---	---
MW-12	21 Mar 90	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	---	<1.0	---	---	---
MW-13	21 Mar 90	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5		<1.0			---

TABLE 2. Analytic Results: Groundwater (Continued)
Former Chevron Asphalt Plant
Emeryville, California

Well ID#	Date	Lab	1,1-DCE	1,2-DCE	1,1-DCA	TCA	TCE	PCE	PCB	VC	CB	AB	Other
			<--------				ppb						-------->
MW-14	21 Mar 90	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5		<1.0			---
MW-15	21 Mar 90	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5		<1.0			---
MW-16	26 Mar 90	GTEL	<0.2	0.8	<0.5	<0.5	27.0	8.0		<1.0			---
MW-17	26 Mar 90	GTEL	<0.2	5.2	0.7	1.3	32.0	11.0		<1.0			---
MW-18	26 Mar 90	GTEL	<0.2	1.7	<0.5	2.4	33.0	20.0		<1.0			---
MW-19	26 Mar 90	GTEL	<0.2	10.0	<0.5	2.5	41.0	53.0		<1.0			---
TB	14 Apr 89	CCAS	<0.1	<0.1	<0.1	<0.1	<0.1	---		<0.1			---
TB	31 Jul 89	CCAS	<0.1	<0.1	<0.1	<0.1	<0.1	---		<0.1			---
TB	8 Dec 89	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	---		<1.0			---
TB	21 Mar 90	GTEL	<0.2	<0.5	<0.5	<0.5	<0.5	---		<1.0			---
TB	26 Mar 90	GTEL	<0.2	<0.5	<0.5	<0.5	0.5	<0.5		<1.0			---

TABLE 2. Analytic Results: Groundwater (Continued)
Former Chevron Asphalt Plant
Emeryville, California

NOTES:

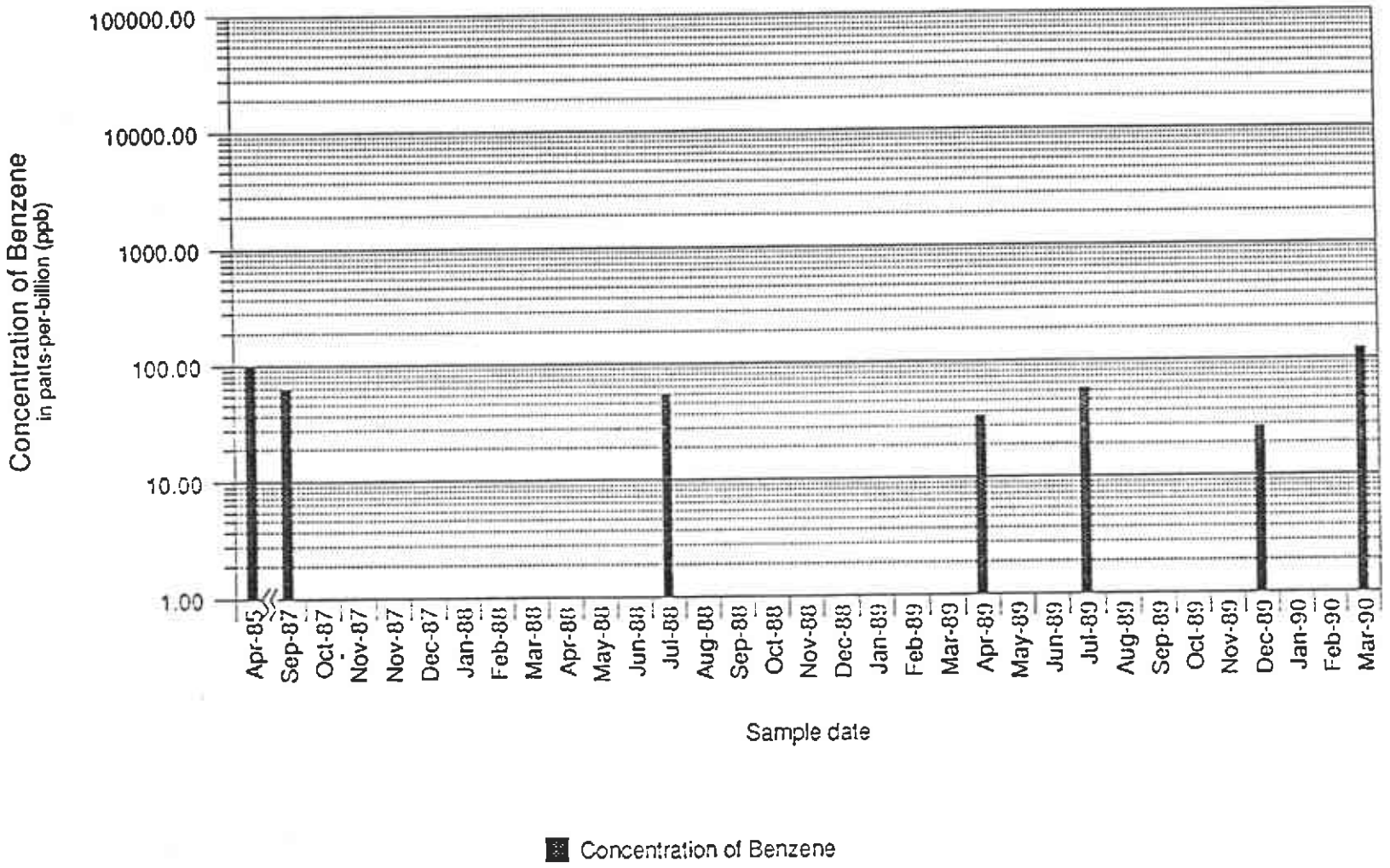
D = Duplicate Sample
MES = McKesson Environmental Services
SEQ = Sequoia Analytical Laboratory
C&T = Curtis & Tompkins, Ltd.
CCAS = Central Coast Analytical Services
GTEL = Groundwater Technology & Environmental Laboratories
FC = Fuel Characterization
ppm = parts-per-million
ppb = parts-per-billion
1,1-DCE = 1,1-Dichloroethane
1,2-DCE = cis- and trans-1,2-dichloroethane
1,1-DCA = 1,1-Dichloroethane
TCA = Trichloroethane
TCE = Trichloroethene
PCE = Tetrachloroethene
PCB = Polychlorobiphenyl
VC = Vinyl Chloride
CB = Chlorobenzene
AB = Alkylbenzene
I = 6 ppb 1,2-dichloropropane
II = 0.6 ppb 1,2-dichloroethane
III = 0.1 ppb 1,2-dichlorobenzene
IV = 0.6 ppb Chloroform
V = 1.8 ppb 1,2-dichloroethane
TB = Travel Blank
--- = Not Analyzed
* = Destroyed Monitor Wells - 1989

APPENDIX 1

CONCENTRATION TRENDS

GROUNDWATER MONITOR WELL MW-1

Former Chevron Asphalt Plant and Terminal Emeryville, California

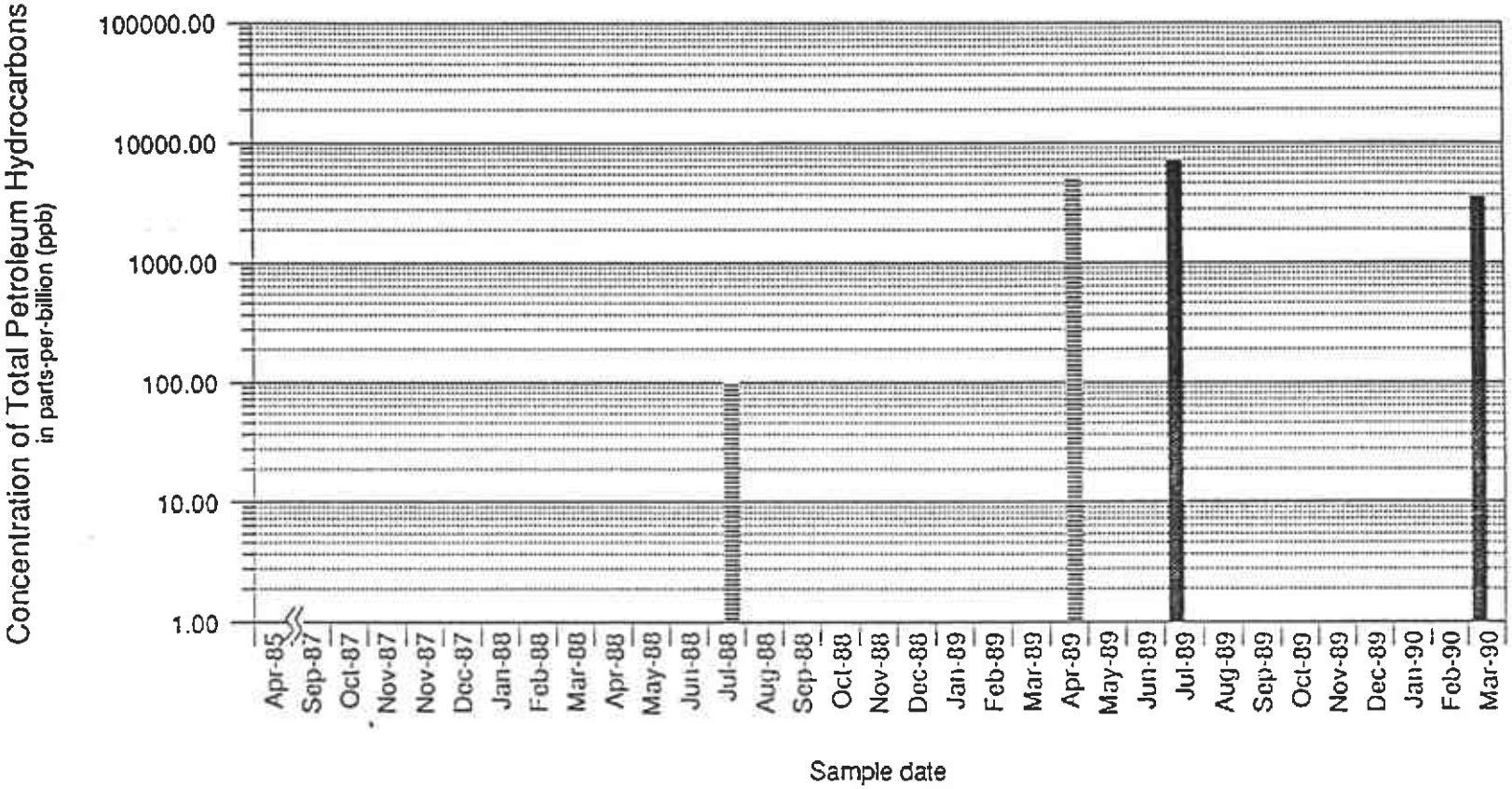


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-1

Former Chevron Asphalt Plant and Terminal Emeryville, California

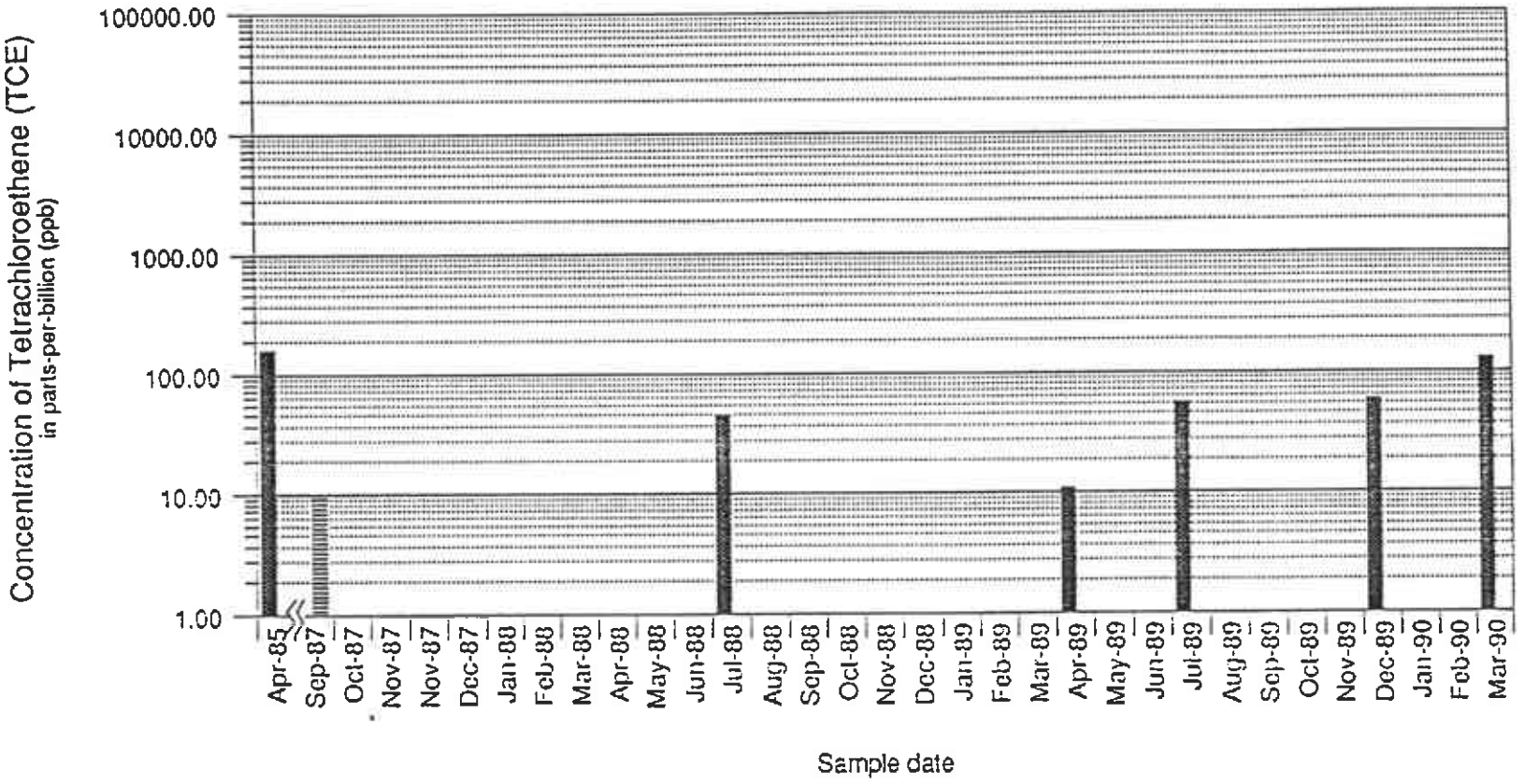


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-1

Former Chevron Asphalt Plant and Terminal Emeryville, California

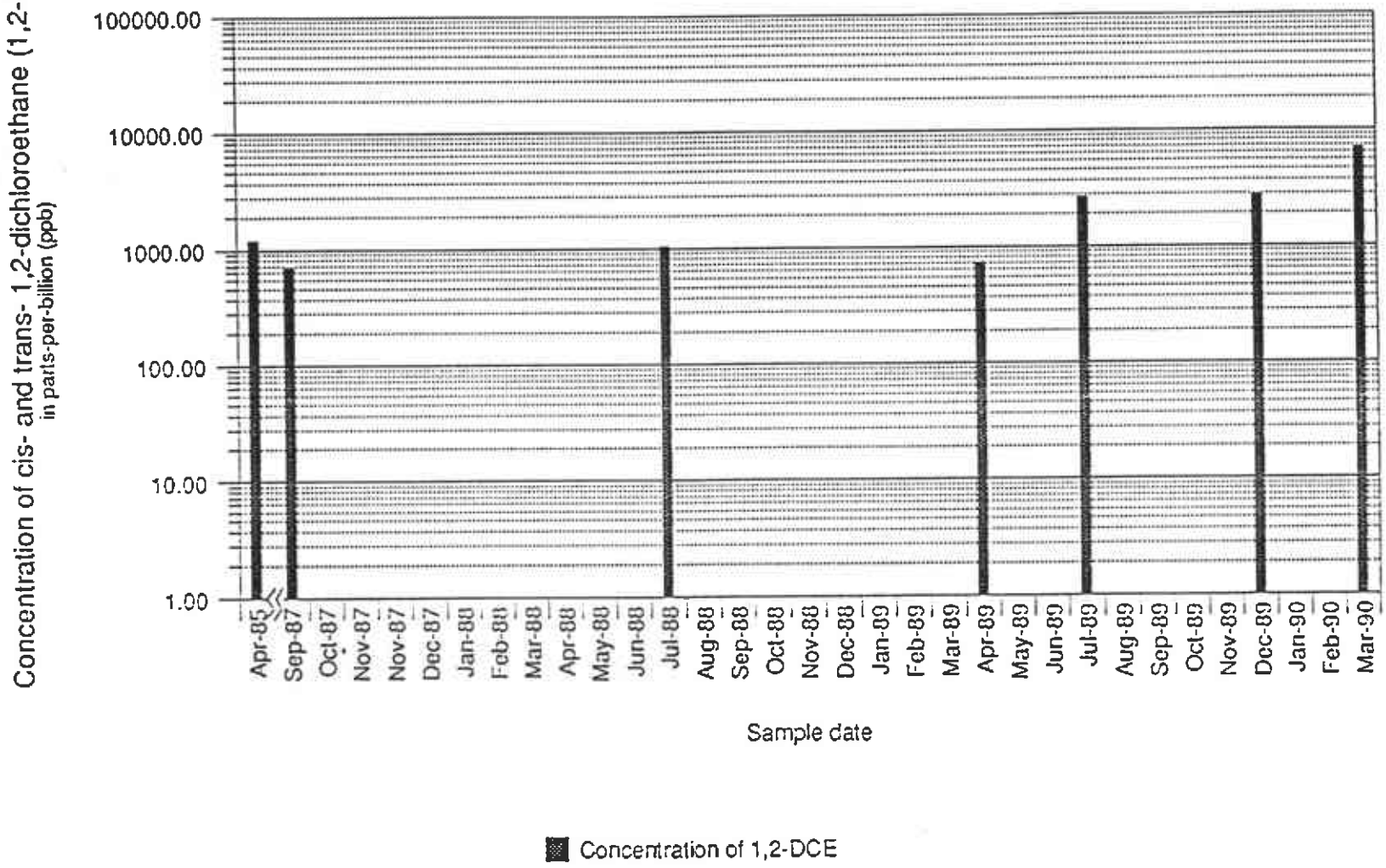


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-1

Former Chevron Asphalt Plant and Terminal Emeryville, California

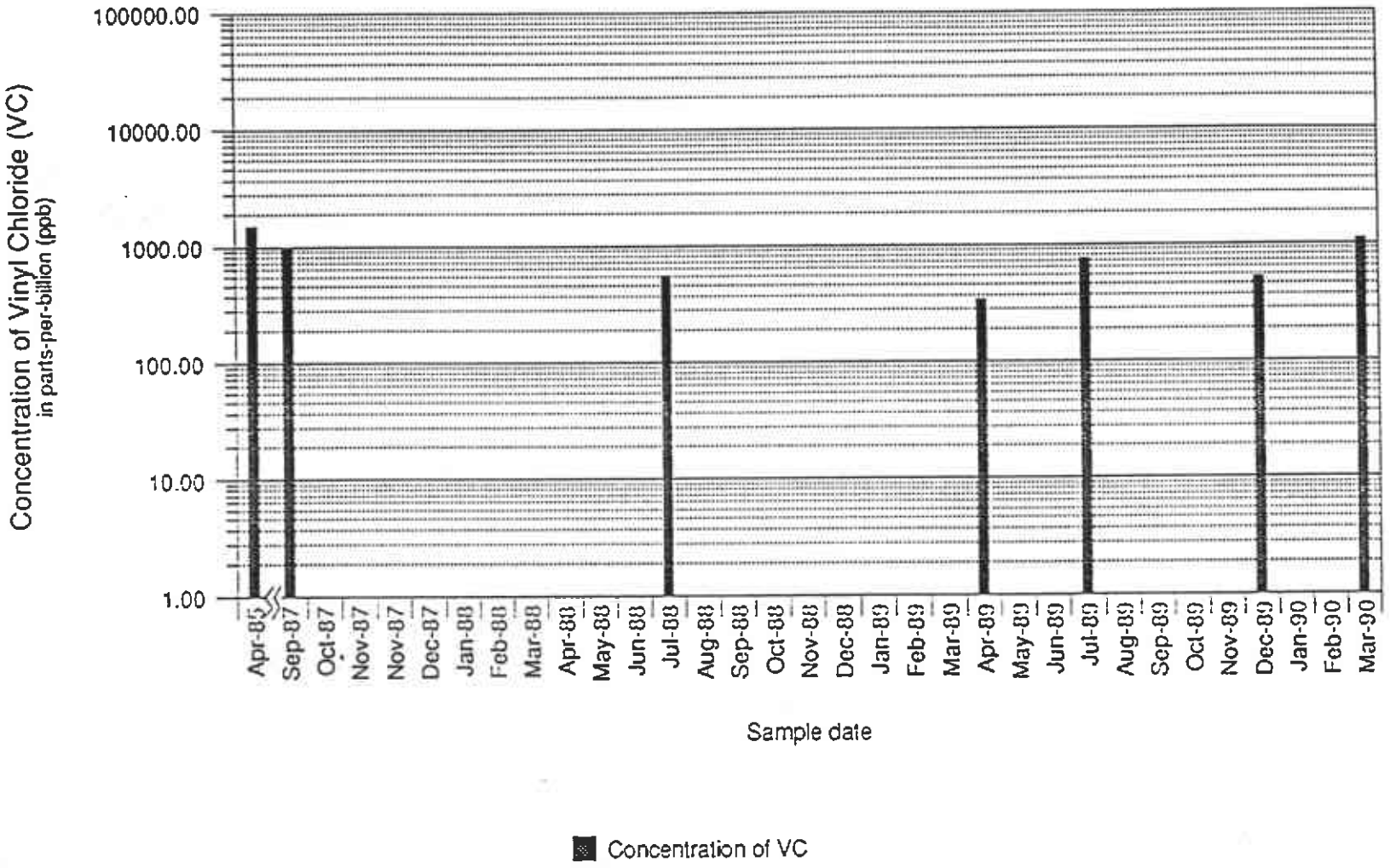


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-1

Former Chevron Asphalt Plant and Terminal Emeryville, California

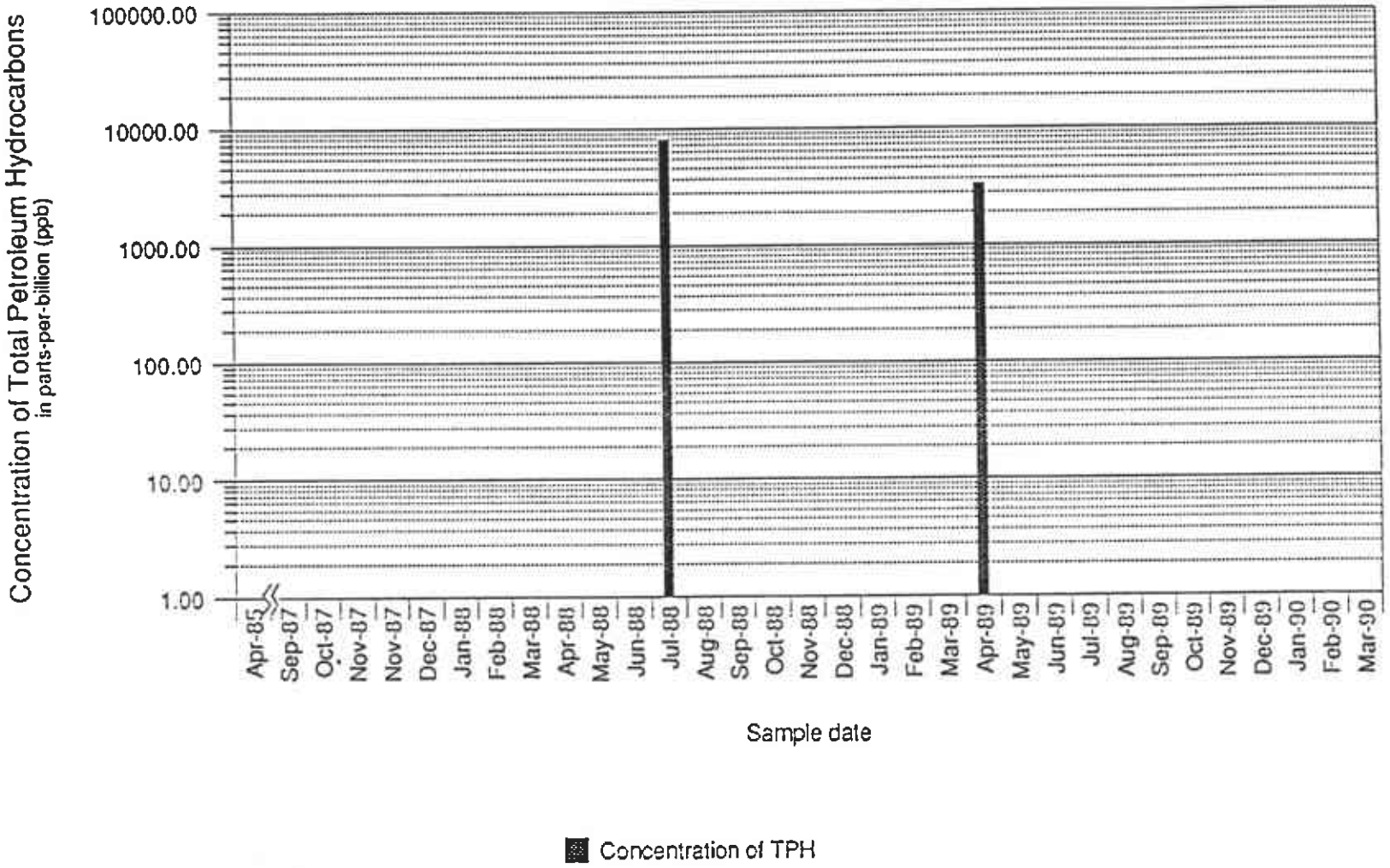


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-6

Former Chevron Asphalt Plant and Terminal Emeryville, California

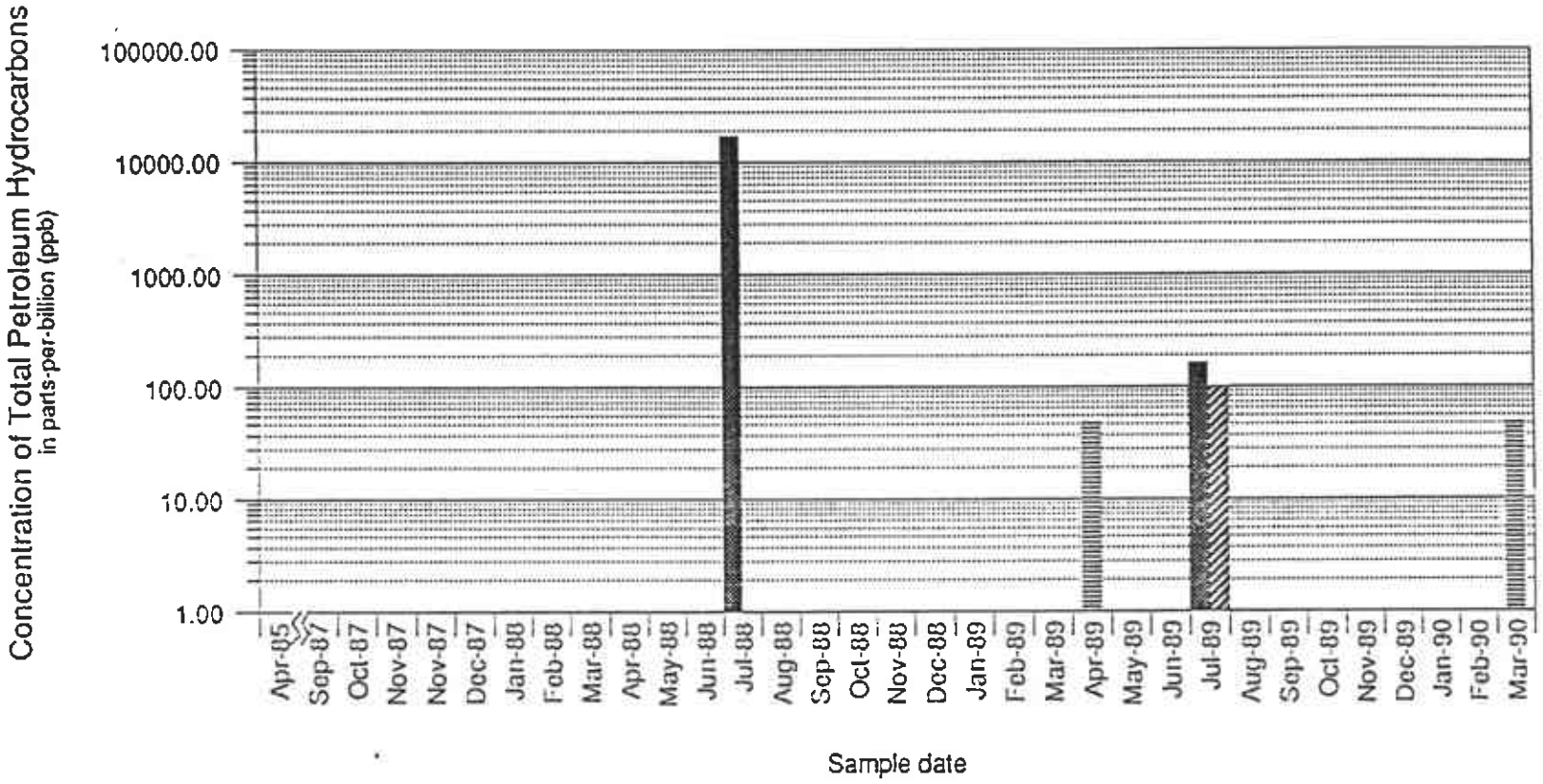


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-7

Former Chevron Asphalt Plant and Terminal Emeryville, California



Concentration of TPH

Concentration unknown, column represents detection limit

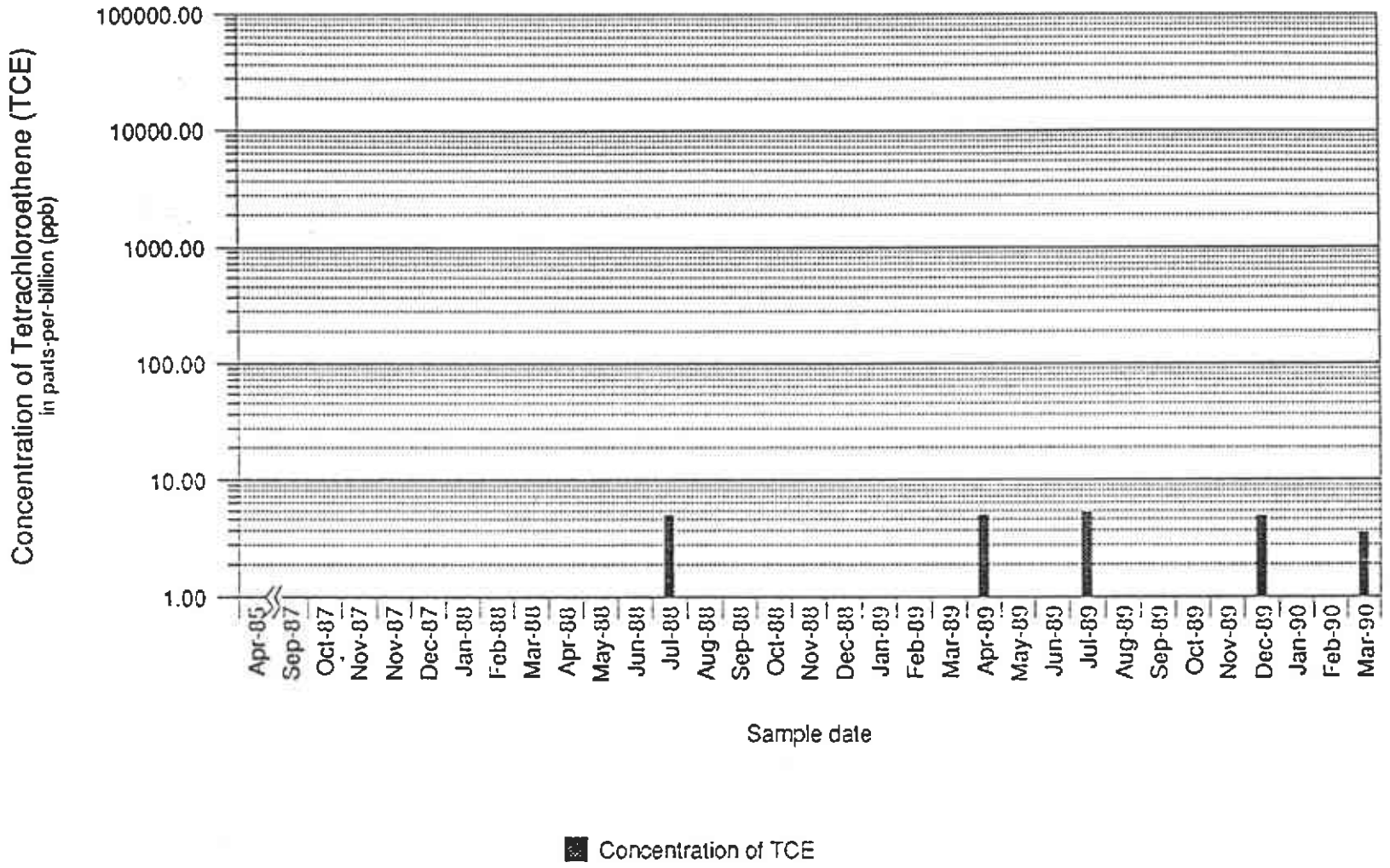
Concentration of TPH, MW-7D

WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-10

Former Chevron Asphalt Plant and Terminal Emeryville, California

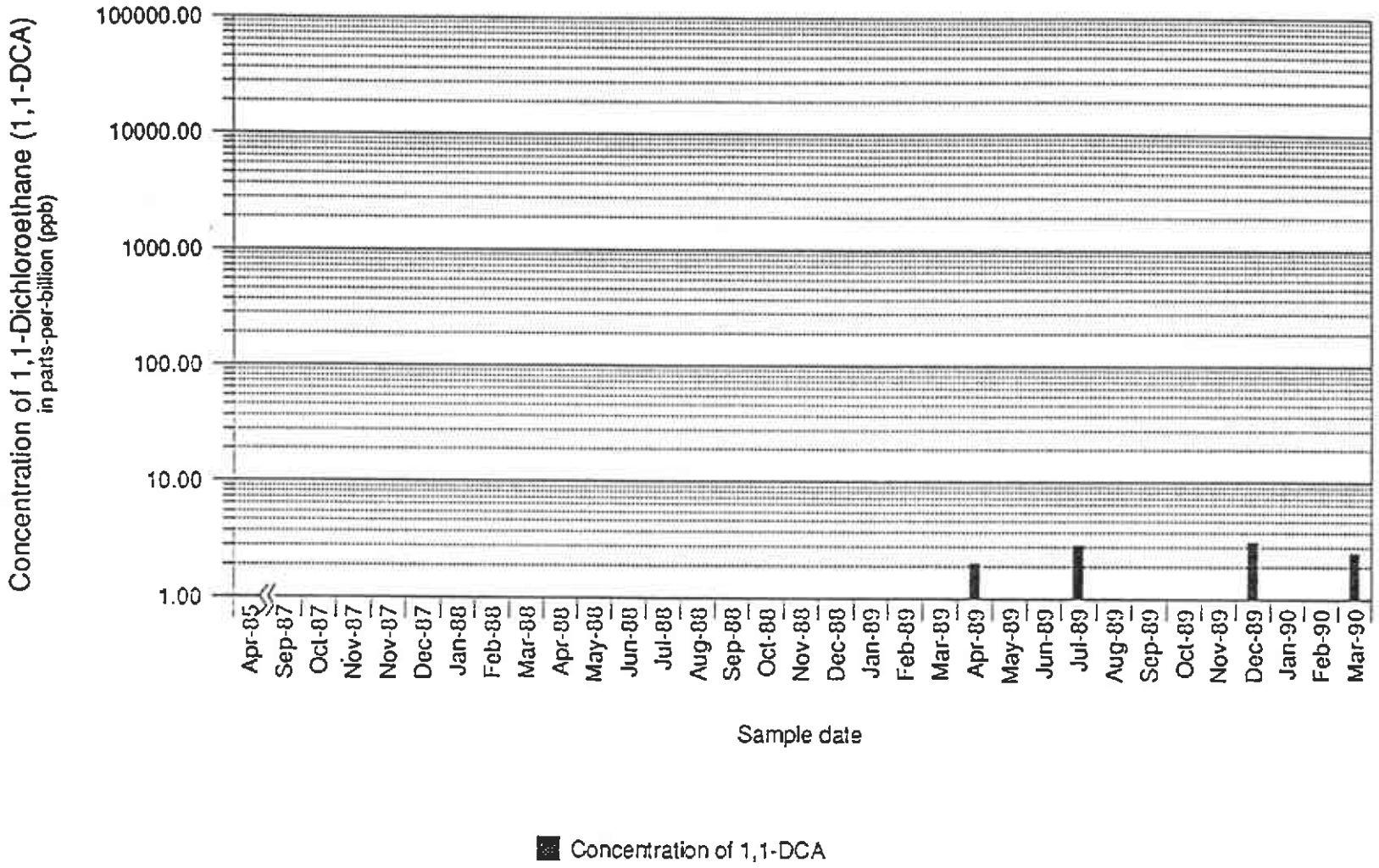


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-10

Former Chevron Asphalt Plant and Terminal Emeryville, California

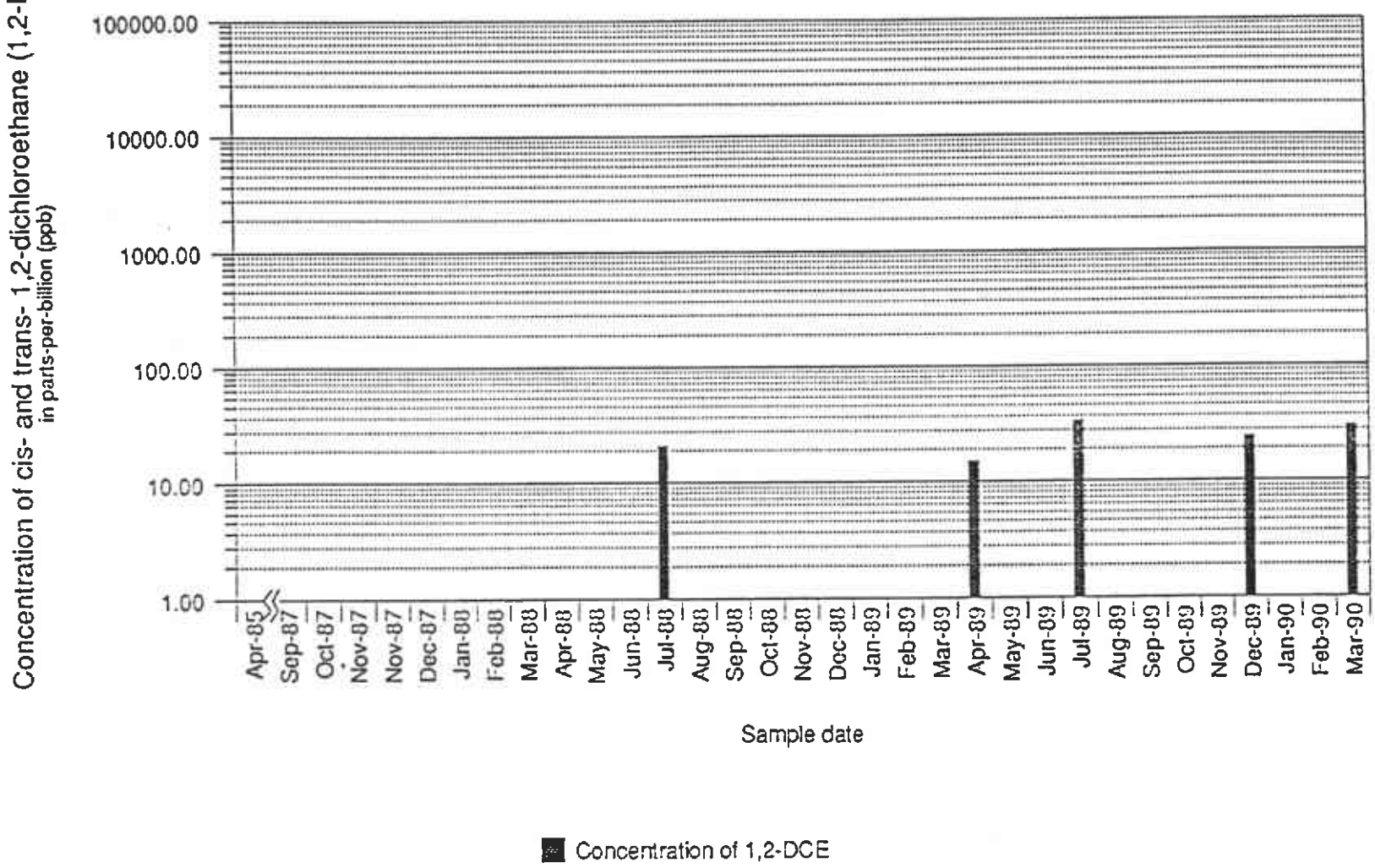


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-10

Former Chevron Asphalt Plant and Terminal Emeryville, California

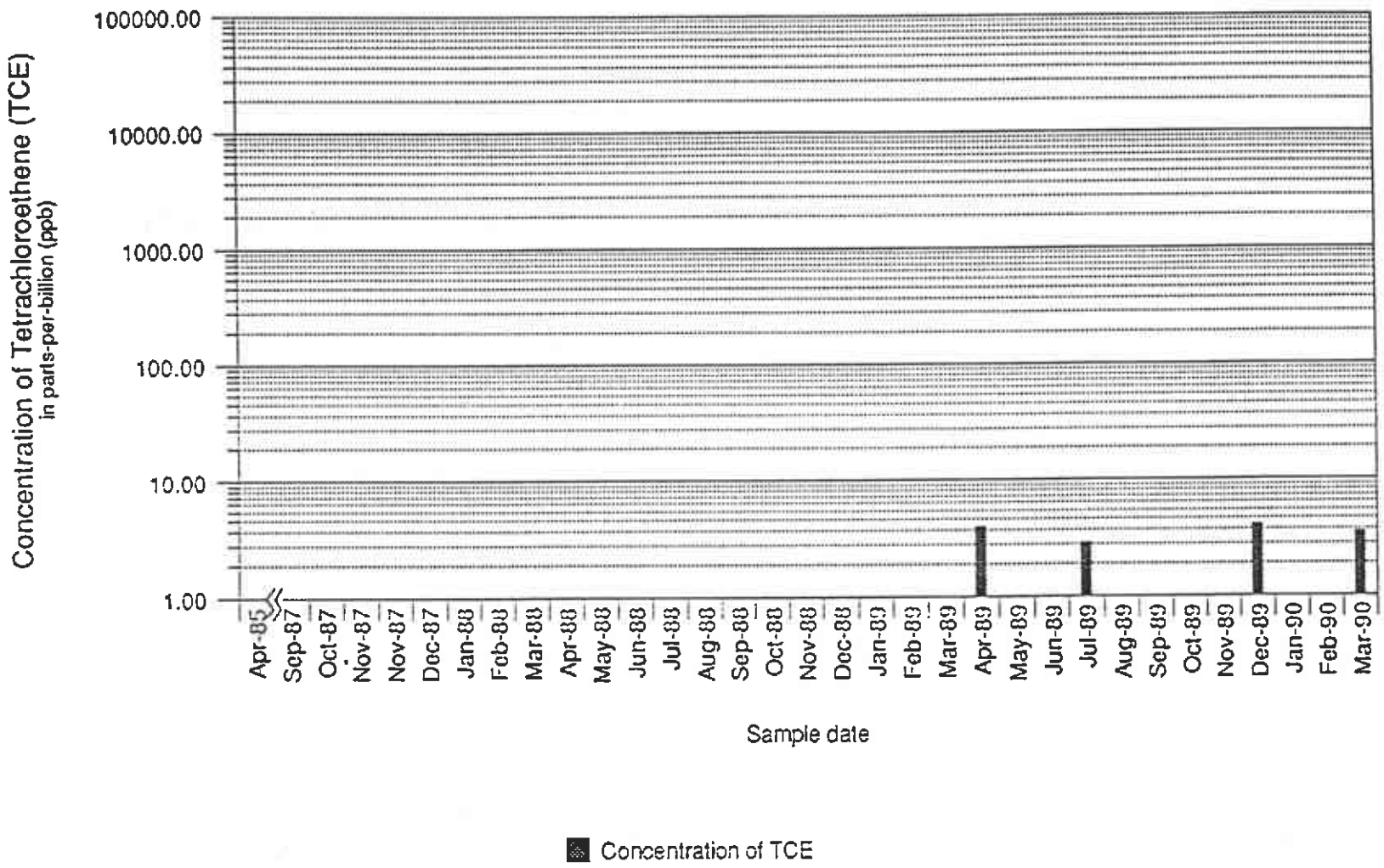


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-11

Former Chevron Asphalt Plant and Terminal Emeryville, California

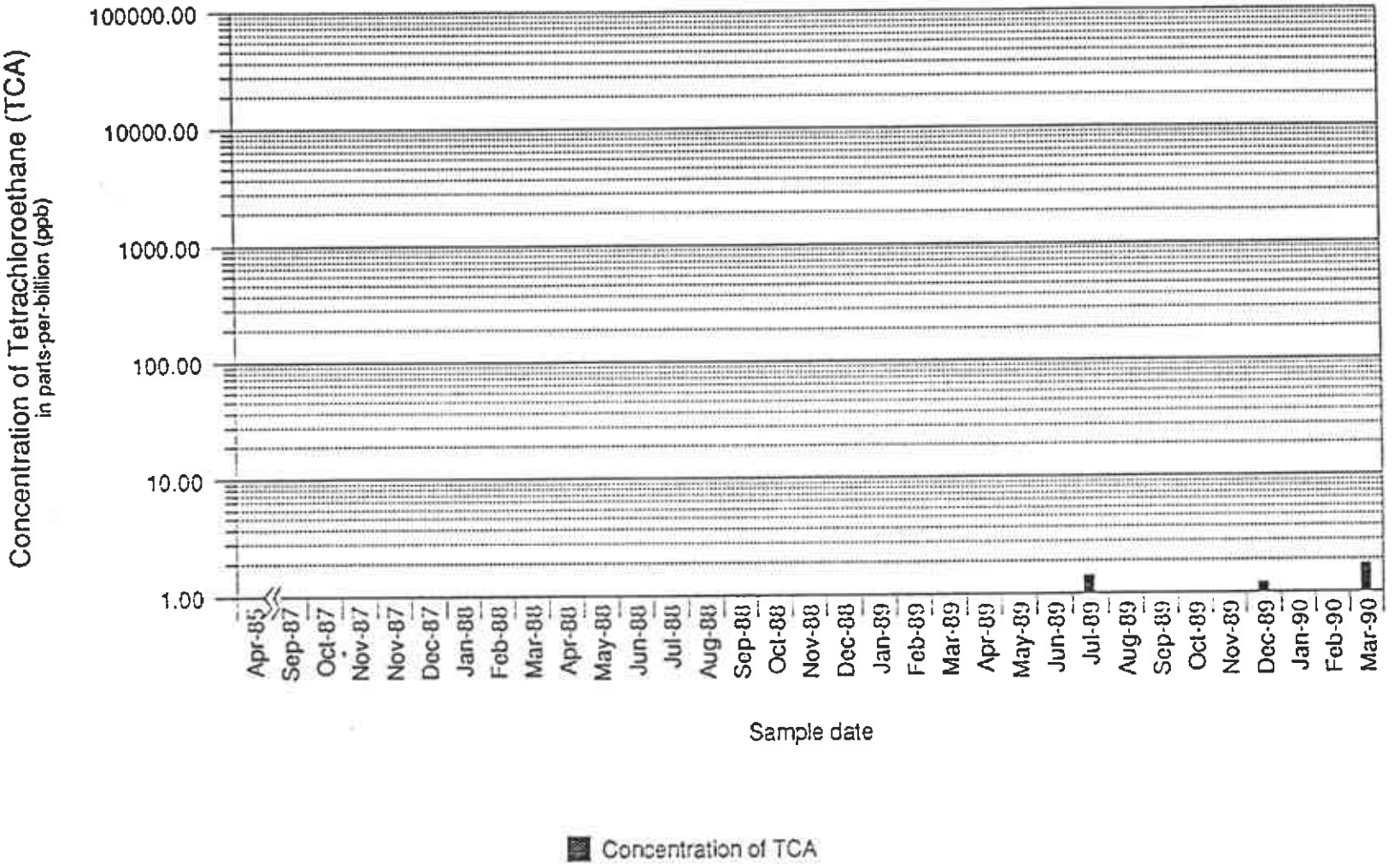


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-11

Former Chevron Asphalt Plant and Terminal Emeryville, California

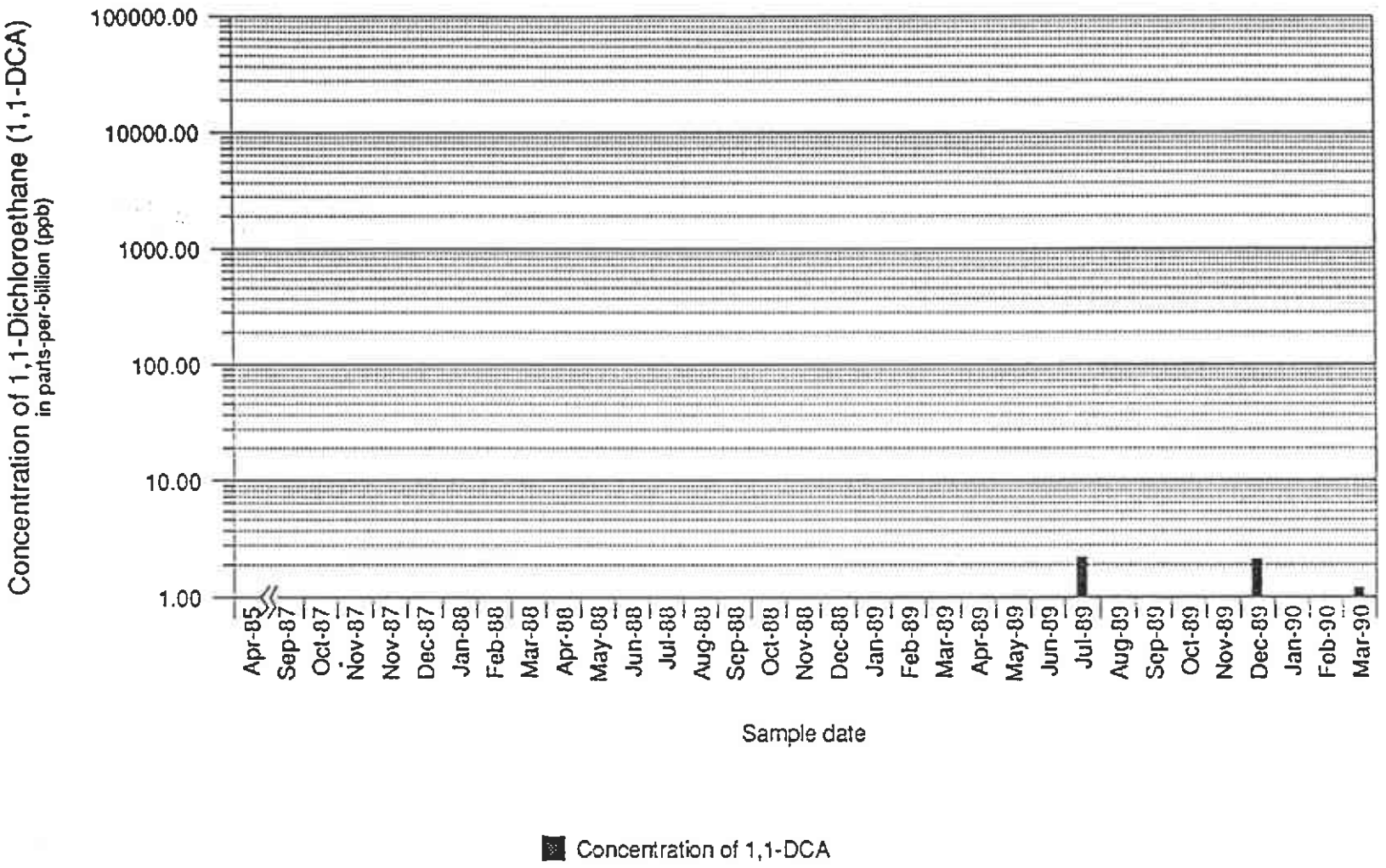


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-11

Former Chevron Asphalt Plant and Terminal Emeryville, California

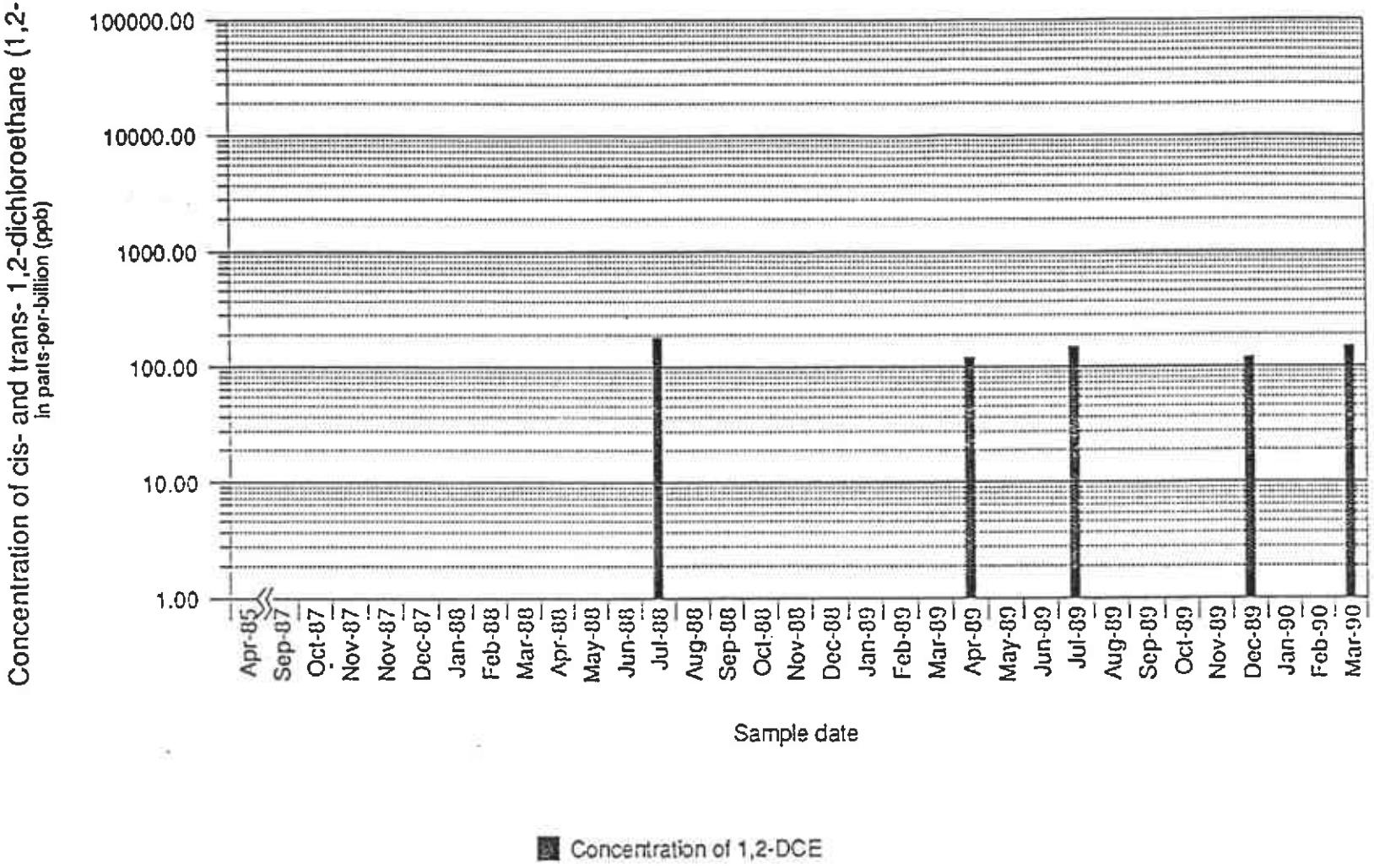


WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.

GROUNDWATER MONITOR WELL MW-11

Former Chevron Asphalt Plant and Terminal Emeryville, California



WGR #1-045.44

WESTERN GEOLOGIC RESOURCES, INC.