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Job No. 22192
Written Response Required: NO
Due Date: N/A
Actionee: N/A
Closes CCN: N/A
OU: 200-ZP-1, 200-ZP-2
TSD: N/A
ERA: CC14
Subject Code: 8220

Environmental Restoration Contractor **ERC Team**

Meeting Minutes

FEB 1999 RECEIVED EDMC

SUBJECT 200-ZP-1/2 UNIT MANAGERS MEETING

TO Distribution

FROM M. A. Buckmaster 1/11/99

DATE January 11, 1999

ATTENDEES	DISTRIBUTION
J. G. April H0-05	Attendees
M. A. Buckmaster H0-19	R. L. Jackson H9-02
C. Cameron B5-01	L. C. Swanson H9-02
D. A. Faulk B5-01	C. Ward H9-01
V. J. Rohay H9-02	Administrative Record c/o H0-09
A. C. Tortoso H0-12	Document and Information Services H0-09

A 200-ZP-1 and 200-ZP-2 Unit Managers Meeting was held on November 18, 1998, at 3350 George Washington Way, conference room 2C58. The agenda is included as Attachment 1.

200-ZP-2 Soil Vapor Extraction System

A. C. Tortoso and D. A. Faulk formally approved the 200-ZP-2 Operating Plan for Fiscal Year (FY) 1999 by signing the approval page on 11/18/98. The signed approval page and operating plan were then included together as Attachment 9 in the Meeting Minutes for the 10/8/98 200-ZP-1/2 Unit Managers Meeting (CCN 063605). The 10/8/98 meeting minutes were then transmitted to the Administrative Record.

A. C. Tortoso and D. A. Faulk agreed that the 200-ZP-1/2 Unit Managers Meeting Minutes should be entered routinely into the Administrative Record. Therefore, all subsequent 200-ZP-1/2 Unit Managers Meeting Minutes will be formatted for transmittal to the Administrative Record. The Unit Managers will indicate their approval of the subject meeting minutes by signing the last page of the minutes at the next meeting, and the minutes will then be documented and distributed.

Soil vapor monitoring near the groundwater, the lower permeability silt/caliche zone, and the ground surface is being conducted at the Z-1A/Z-18/Z-12 and Z-9 sites from October 1998 through March 1999 while the soil vapor extraction (SVE) system is shut down for the winter. V. J. Rohay provided a table comparing the maximum concentration at each monitoring location to the maximum observed at that location during the rebound study (November 1996 through July 1997) and during FY 1998 (October 1997 through September 1998) and a table of all the non-operational monitoring data for FY 1999 (Attachment 2). Monthly monitoring data from July through September 1998 are included with the FY 1999 data for monitoring locations at the Z-1A/18/12 site, where SVE operations were discontinued in June 1998.

A. C. Tortoso gave D. A. Faulk a copy of the management plan for a proof-of-concept study funded by the U.S. Department of Energy (DOE) Federal Energy Technology Center to determine the location and

distribution of subsurface dense nonaqueous phase liquid (DNAPL) contamination at the Hanford carbon tetrachloride site. Geophysicists from the University of South Carolina will use high resolution seismic reflection at the Z-9 site to look for DNAPL, a technique that was successful at the Savannah River Site (SRS). The investigation will include both the vadose zone and groundwater. The field work is tentatively scheduled for January 1999.

The draft scope of work to be funded through the Consortium for Risk Evaluation and Stakeholder Participation (CRESP) for FY 1999 in support of carbon tetrachloride site remediation was prepared by J. W. Massmann, University of Washington, and provided to the Unit Managers for review prior to the Unit Managers meeting (Attachment 3). The proposed activities are aimed at addressing (1) the extent of carbon tetrachloride migration within the vadose zone, (2) the amount of carbon tetrachloride currently in the vadose zone, and (3) the amount of carbon tetrachloride that can be left in the vadose zone without posing an unacceptable risk to on-site workers. The approach that will be used to evaluate these issues involves combining field data with a numerical model that simulates subsurface vapor transport. A large-scale model will be used to address the first question, and a smaller-scale model will be used to address the second and third questions. The discussion focused on the smaller-scale model, primarily on two points: (1) The description of the work to be conducted is not clear (there was some confusion over how the two smaller-scale model tasks are different and what is actually being done in the first task). (2) In the second task (the second paragraph), there needs to be a more explicit tie to risk ... "allowable" will be based on a discussion of risk. These comments were transmitted to Dr. Massmann on 11/22/98 by V. J. Rohay.

A. C. Tortoso announced that the DOE Office of Technology Development has initiated an Innovative Treatment Remediation Demonstration (ITRD) program for the Hanford carbon tetrachloride site to evaluate state-of-the-art characterization, modeling, and remediation technologies for the vadose zone and groundwater plumes. A draft Statement of Work (SOW) summarizing the project was provided by A. C. Tortoso to D. A. Faulk prior to the Unit Managers meeting. D. A. Faulk made the following comments regarding the SOW: (1) the decision makers need to be identified and need to be recognized as the decision makers; (2) other interested participants need to be added; (3) a five-year review needs to be added to indicate the importance of the regulators in the process; (4) why are no cleanup criteria for carbon tetrachloride included? A. C. Tortoso gave D. A. Faulk a list of suggested participants for his review. She noted that the current activities being conducted by CRESP and the University of South Carolina will be added to the background information package being prepared for the ITRD participants.

Field tests of a cone penetrometer-based Raman spectroscopy DNAPL characterization system were conducted at the SRS in June 1998 and described at the 7/6/98 Unit Managers meeting by Dib Goswami, Washington Department of Ecology. V. J. Rohay reported that the evaluation report on the demonstration of this technology is being prepared by SRS staff but has not been finalized.

V. J. Rohay provided copies of the 11/94 Record of Decision for the carbon tetrachloride contamination at the Idaho National Environmental and Engineering Laboratory (INEEL) to A. C. Tortoso and D. A. Faulk as background information. INEEL is also using soil vapor extraction to remediate the vadose zone.

200-ZP-1 Pump and Treat System

M. A. Buckmaster reported that although the Remedial Design/Remedial Action (RD/RA) document specifies analytical method U.S. Environmental Protection Agency (EPA) 8240, the laboratories actually use method EPA 8260. The method performance parameters (precision, accuracy, and detection limits) for the ZP-1 analytes are essentially identical for the two methods. The primary difference between the two methods is that EPA 8260 specifies that the lab use capillary columns whereas EPA 8240 does not specify the column type. However, virtually all laboratories (including the one used for analysis of ZP-1 water samples) routinely use capillary columns for EPA 8240 analyses. The RD/RA document will be amended to specify use of analytical method EPA 8260.

The FY 1998 annual summary report for 200-ZP-1 operations will be transmitted to RL in December and to EPA in January. The annual report includes concentration trend plots for both extraction and monitoring wells. M. A. Buckmaster provided draft copies of these trend plots to A. C. Tortoso and D. A. Faulk (Attachment 4). Preparation of annual reports will be continued because they provide a mechanism to document the pump-and-treat activities. In addition, quarterly evaluations will be prepared as internal memoranda to provide updates of trends and activities.

M. A. Buckmaster reported that the 200-ZP-1 pump-and-treat system is operating with no known problems. The pumping rate continues to be highest from well W15-35, east of the 231-Z building and north of the Z-9 trench. Carbon tetrachloride concentrations continue to be highest at wells W15-33, near the northwest corner of the 231-Z building at PFP, and W15-32, at the northeast corner of the Z-9 trench. Between August 1994 and September 1998, the pump-and-treat system removed 2,099 kg of carbon tetrachloride and treated 600,000,000 liters of water (Attachment 4).

VJR:cw

Attachment(s):
(1) Agenda
(2) Carbon Tetrachloride Rebound Concentrations Monitored at 200-ZP-2
(3) Consortium for Risk Evaluation and Stakeholder Participation Draft of Carbon Tetrachloride in the Vadose Zone at Hanford Scope of Work and Activities for 1998 – 1999
(4) Carbon Tetrachloride Groundwater Concentrations Monitored at 200-ZP-1

065171

Meeting Minutes Approval

The undersigned indicate by their signatures that these meeting minutes reflect the actual occurrences of the above-dated Unit Managers Meeting.

Arlene C. Tortoso — Date: 1/19/99
Arlene C. Tortoso, Project Manager, RL

Dennis A. Faulk — Date: 1-19-99
Dennis A. Faulk, Project Manager, EPA

AGENDA

UNIT MANAGERS MEETING

200-ZP-1 AND 200-ZP-2

NOVEMBER 18, 1998

200-ZP-2 SOIL VAPOR EXTRACTION REMEDIATION

- UMM Minutes from 10/8/98 and FY 99 Operating Plan
- Summary of Non-Operational Monitoring
- Other

  CRESP Statement of Work

  ITRD Statement of Work

  High Resolution Seismic Profiling

  Raman Cone Penetrometer Report

  INEEL Record of Decision and Status

200-ZP-1 PUMP-AND-TREAT REMEDIATION

- Status of Pump-and-Treat Operations

Comparison of Maximum Carbon Tetrachloride Rebound Concentrations Monitored at 200-ZP-2 Soil Vapor Extraction Sites FY 1997 - FY 1999

ATTACHMENT 2

200-ZP-2 Location (Well or Probe) /feet bgs	Site	Zone	November 1996 - July 1997 Maximum Rebound Carbon Tetrachloride (ppmv)	months* of rebound	October 1997 - September 1998 Maximum Rebound Carbon Tetrachloride (ppmv)	months* of rebound	July 1998 - November 1998 Maximum Rebound Carbon Tetrachloride (ppmv)	months* of rebound
79-06/ 5 ft	Z-1A	1	not measured		not measured		0	5
79-11/ 5 ft	Z-1A	1	0	8	0	6	2.8	5
86-06/ 5 ft	Z-9	1	1.3	8	0	9	0	2
87-09/ 5 ft	Z-1A	1	not measured		1.5	3	1.5	5
95-11/ 5 ft	Z-9	1	0	8	2.1	9	0	2
95-12/ 5 ft	Z-9	1	1.1	8	1.5	9	1.2	2
CPT-16/ 10 ft	Z-9	2	not measured		0	9	1.5	2
CPT-17/ 10 ft	Z-9	2	not measured		4.2	9	3.2	2
CPT-18/ 15 ft	Z-9	2	not measured		6.5	9	0	2
CPT-32/ 25 ft	Z-1A	2	not measured		9.1	6	2.1	5
CPT-30/ 28 ft	Z-18	2	not measured		not measured		0	5
CPT-7A/ 32	Z-1A	2	not measured		2.3	6	2.4	5
W15-82/ 82 ft	Z-9	2	28.9	8	5.5	9	46.4	2
W15-95/ 82 ft	Z-9	2	not measured		15.3	9	39.4	2
CPT-21A/ 86 ft	Z-9	2	221	8	206	9	126	2
CPT-28/ 87 ft	Z-9	2	280	8	230	9	184	2
CPT-9A/ 91 ft	Z-9	2	103	8	34.5	9	39.0	2
W18-252SST/ 100 ft	Z-1A	2	38.2	8	17.8	3	18.2	5
W18-152/ 113 ft	Z-12	2	46.8	8	11.1	3	27.9	5
W15-217/ 115 ft	Z-9	3	797	8	630	9	26.8	2
CPT-24/ 118 ft	Z-9	3	44.6	8	37.7	9	37.3	2
W18-158L/ 123 ft	Z-1A	3	not measured		143	3	172	5
W18-167/ 123 ft	Z-1A	3	322.8	8	79.7	3	205	5
W18-249/ 134 ft	Z-18	3	206	8	20.4	3	215	5
W18-248/ 136 ft	Z-1A	3	288	8	86.3	3	98	5
W15-6L/ 189 ft	Z-9	6	22.6	8	17.8	9	0	2
W15-9L/ 189 ft	Z-9	6	18.3	8	15.0	9	14.6	2
W18-7/ 200 ft	Z-1A	6	28.5	8	17.3	3	22.5	5
W18-6L/ 208 ft	Z-1A	6	36	8	31.3	6	14.5	5
W18-12/ 210 ft	Z-18	6	not measured		3.8	3	12.0	5

* - based on location (Z-1A/18/12 or Z-9) of monitoring point; specific points may be beyond SVE zone of influence during particular operating configurations

- Z-18 and Z-12 wells off-line Oct 96 - Apr 98
- CPT-1A, CPT-9A, and possibly CPT-7A appeared to be beyond SVE zone of influence in Oct 96 based on differential pressure (BHI-01105, p. 6-1)
- CPT-9A, CPT-21A, CPT-28 beyond SVE zone of influence in May 96 based on CCl4 concentrations and airflow modeling based on measured vacuums (BHI-01105, p. 6-1)

Carbon Tetrachloride Rebound Concentrations Monitored at 200-ZP-2 Soil Vapor Extraction Sites July 1998 - November 1998

200-ZP-2 Location (Well or Probe) /feet bgs	Zone	8/14/98 (a) CCl4 (ppmv)	9/29/98 CCl4 (ppmv)	11/5/98 CCl4 (ppmv)	12/1/98 CCl4 (ppmv)
79-06/ 5 ft	1			0	0
79-11/ 5 ft	1	0	0	2.8	0
86-06/ 5 ft	1			---- (b)	0
87-09/ 5 ft	1	0	1.5	0	0
95-11/ 5 ft	1			0	0
95-12/ 5 ft	1			1.2	0
CPT-16/ 10 ft	2			1.5	0
CPT-17/ 10 ft	2			3.2	1.7
CPT-18/ 15 ft	2			0	0
CPT-32/ 25 ft	2	0	0	1.0	2.1
CPT-30/ 28 ft	2			0	0
CPT-7A/ 32	2	1.4	1.7	1.7	2.4
W15-82/ 82 ft	2			46.4	19.2
W15-95/ 82 ft	2			39.4	25.4
CPT-21A/ 86 ft	2			126	74.6
CPT-28/ 87 ft	2			184	66.2
CPT-9A/ 91 ft	2			39.0	38.6
W18-252SST/ 100 ft	2	8.9	17.8	18.2	13.3
W18-152/ 113 ft	2	11.1	0	27.9	3.4
W15-217/ 115 ft	3			---- (c)	26.8
CPT-24/ 118 ft	3			37.1	37.3
W18-158L/ 123 ft	3	---- (d)	143	172	172
W18-167/ 123 ft	3	---- (d)	79.7	127	205
W18-249/ 134 ft	3	---- (c)	20.4	215	23.3
W18-248/ 136 ft	3	7.1	86.3	93.5	98.0
W15-6L/ 189 ft	6			---- (c)	0
W15-9L/ 189 ft	6			---- (c)	14.6
W18-7/ 200 ft	6	0	17.3	22.5	21.8
W18-6L/ 208 ft	6	4.3	14.5	---- (c)	---- (c)
W18-12/ 210 ft	6	1.2	3.8	7.5	12.0

(a) sampled 8/14/98; analyzed 8/15/98
(b) probe 86-07R destroyed; substitute probe 86-06 after 11/98
(c) not in service
(d) access to Z-1A unavailable (no key)

DRAFT
Carbon Tetrachloride in the Vadose Zone at Hanford
Scope of Work and Activities for 1998-1999

A Cooperative Effort among Bechtel, CH2M Hill, DOE, EPA and CRESP

A. Introduction

The scope of work and proposed activities for the period September 1998 to March 2000 are aimed at addressing the following three questions:

1. How extensive of an area within the vadose zone of the 200 West area may have been impacted by carbon tetrachloride migration?
2. How much carbon tetrachloride is currently in the vadose zone in the 200 West area?
3. How much carbon tetrachloride can be left in the vadose zone without posing an unacceptable risk to on-site workers?

Carbon tetrachloride was contained in aqueous and organic liquid wastes that were discharged to the subsurface in the 200 West area from 1955 to 1973. The carbon tetrachloride migrated in the liquid phase within the vadose zone due to the effects of gravity and also in the vapor phase through the effects of diffusion and air advection. The first question sited above concerns the extent of this migration over the past 43 years. The goal is to identify the areas that are were likely affected by the carbon tetrachloride migration. This information will be useful to evaluate future monitoring or remediation activities.

A soil vapor extraction system has been operating on the site since 1991. Over 75,000 kilograms of carbon tetrachloride have been removed by this system. This represents roughly 10 to 15% of the total carbon tetrachloride that was discharged to the subsurface (Rohay, 1998). Other processes that have reduced the amount of carbon tetrachloride remaining in the vadose zone include evaporation to the atmosphere, leaching due to water infiltration, biological degradation, and transport by groundwater flow. The second question listed above is aimed at updating estimates of the amount of carbon tetrachloride that remains in the vadose zone in the 200 West area.

The concentration of carbon tetrachloride in the effluent from the soil vapor extraction system has dropped from over 30,000 ppm in 1991 to less than 30 ppm in 1998 (Rohay, 1998). As the efficiency of the system continues to decline, there is interest in setting a clean-up goal for the extraction system. This goal or clean-up level will depend at least in part on human health risk. The third question listed above addresses this issue of allowable soil concentration.

B. Approach

The approach that will be used to evaluate each of these three questions involves combining field data with a numerical model that simulates subsurface vapor transport. An existing model will be used. This numerical model, which was developed at the University of Washington (Poulsen et al., 1996, 1998), simulates the combined effects of vapor diffusion, vapor advection, sorption, biological degradation, and leaching due to soil water infiltration. The model considers three-dimensional flow and transport under steady-state and transient conditions.

Two systems will be modeled. A larger-scale model will be used to address the first question listed above regarding the likely extent of carbon tetrachloride migration. A smaller-scale model will be used to address the second and third questions regarding current and allowable carbon tetrachloride concentrations. These are described in more detail below.

1. The larger-scale model

The larger-scale model will focus on vapor diffusion over time scales on the order of 45 years. Preliminary calculations suggest that transport by diffusion alone may result in migration on the order of 500 meters. (If the concentration at the source is 1, the concentration 500 meters from the source after 50 years is estimated to be 10^{-5}). Because the detailed distribution of the carbon tetrachloride on a local scale will not likely affect the large-scale distribution of contaminant vapors. Several scenarios will be considered for the source term in the model. Each scenario will assume a different spatial extent for the source term to reflect the uncertainty in the initial source distribution.

2. The smaller-scale model

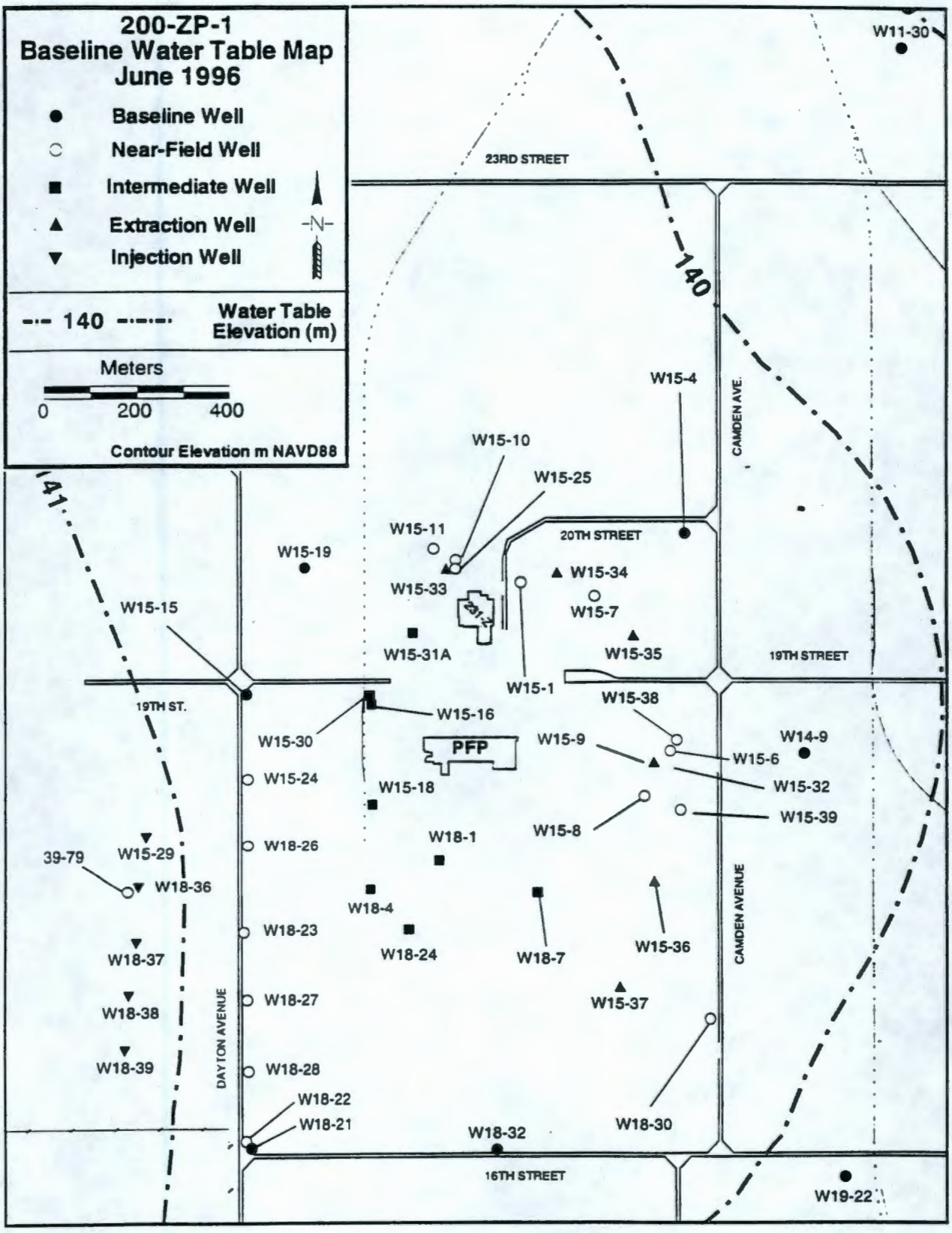
The smaller-scale model will be used in conjunction with field data describing vapor extraction operations to estimate the current distribution of carbon tetrachloride in the vadose zone. This will build on the work of Riley (1998). Riley used field data collected while the vapor extraction system was shut down to evaluate likely source distributions in the subsurface. This "rebound" data was used in conjunction with the three-dimensional transport model to simulate vapor diffusion. In the next phase of the work, the model will also be used to evaluate data collected while the vapor extraction system is operating. The effects of gas advection will be included in the model simulations.

The smaller scale model will also be used to "back-calculate" an allowable soil concentration. This estimate will be based on human health considerations and will focus on exposure to a worker under an industrial setting. The allowable concentration at the exposure point will be used to calculate an allowable concentration within the vadose zone.

The transport processes that will be simulated will include diffusion, advection due to barometric pressure fluctuations, reversible and irreversible sorption, biodegradation, and dissolution in soil water. The effects of density variations due to carbon tetrachloride concentrations will be included in the model if evaluations suggest they are significant.

C. Interactions with Hanford Personnel

Mark Buckmaster at Bechtel Hanford and Virginia Rohay at CH2M Hill Hanford will be the primary contacts for field data. They will also provide suggestions on and review of our work. Dennis Faulk at the EPA and Arlene Tortoso at DOE will also provide suggestions and review. We will give monthly progress reports and will meet at the site several times over the course of the year.


200-ZP-1
Baseline Water Table Map
June 1996
Baseline Well
Near-Field Well
Intermediate Well
Extraction Well
Injection Well
N
140
Water Table Elevation (m)
Meters
0
200
400
Contour Elevation m NAVD88
141
140
23RD STREET
20TH STREET
19TH STREET
16TH STREET
19TH ST.
CAMDEN AVE.
CAMDEN AVENUE
DAYTON AVENUE
PFP
W11-30
W15-4
W15-10
W15-25
W15-11
W15-19
W15-33
W15-34
W15-7
W15-15
W15-31A
W15-35
W15-1
W15-38
W15-16
W15-30
W15-9
W14-9
W15-6
W15-24
W15-18
W15-32
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W15-8
W18-1
39-79
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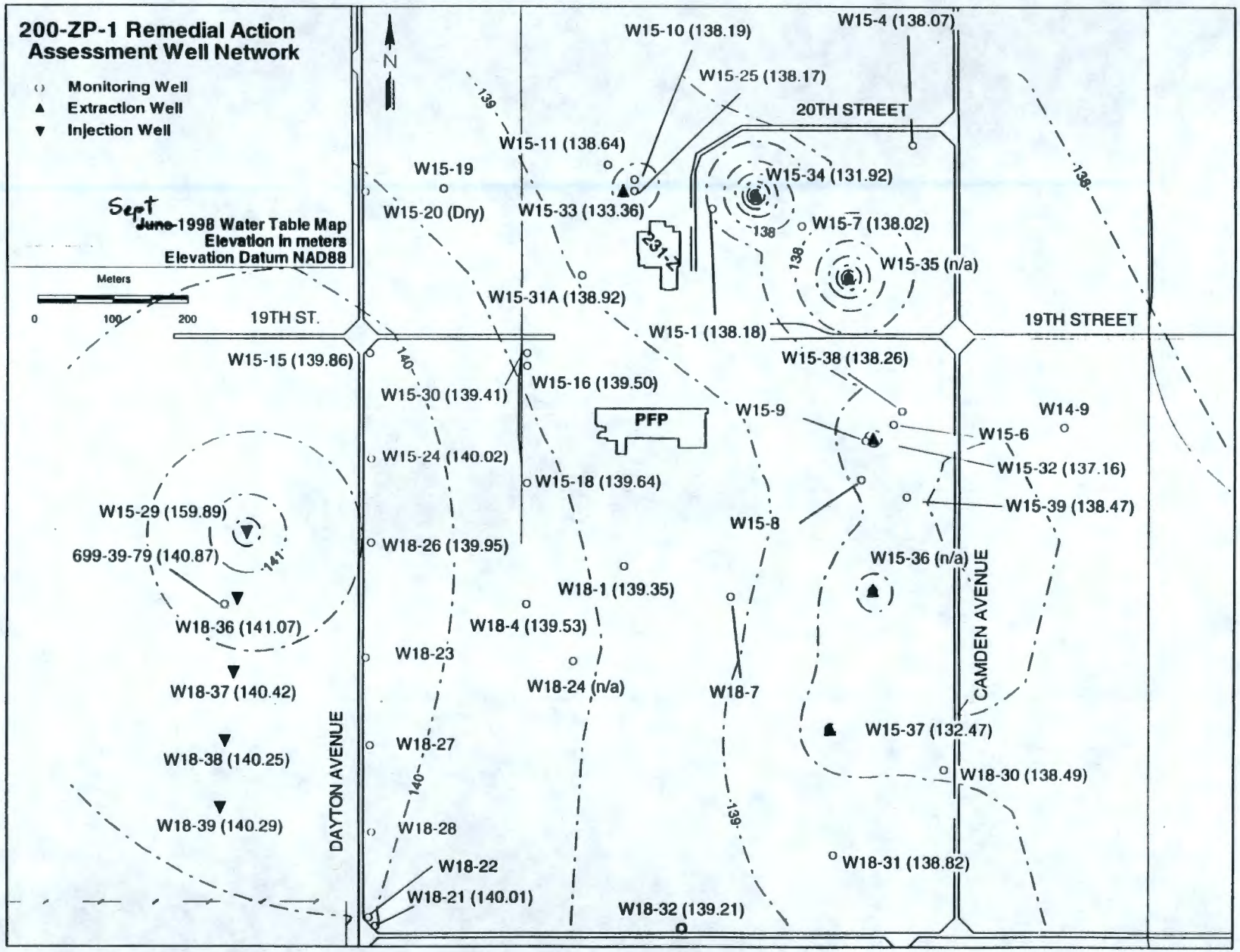
W18-32
W18-30
W19-22


200-ZP-1 Remedial Action Assessment Well Network
Monitoring Well
Extraction Well
Injection Well
Sept ~~June~~ 1998 Water Table Map
Elevation in meters
Elevation Datum NAD88
Meters
0
100
200
N
W15-10 (138.19)
W15-4 (138.07)
W15-25 (138.17)
20TH STREET
W15-11 (138.64)
W15-19
W15-34 (131.92)
W15-20 (Dry)
W15-33 (133.36)
W15-7 (138.02)
W15-35 (n/a)
W15-31A (138.92)
19TH ST.
W15-1 (138.18)
19TH STREET
W15-15 (139.86)
W15-38 (138.26)
W15-30 (139.41)
W15-16 (139.50)
PFP
W15-9
W14-9
W15-6
W15-24 (140.02)
W15-32 (137.16)
W15-18 (139.64)
W15-39 (138.47)
W15-29 (159.89)
W15-8
699-39-79 (140.87)
W18-26 (139.95)
W15-36 (n/a)
W18-1 (139.35)
W18-36 (141.07)
W18-4 (139.53)
W18-23
W18-24 (n/a)
W18-7
W18-37 (140.42)
CAMDEN AVENUE
W15-37 (132.47)
W18-27
W18-38 (140.25)
W18-30 (138.49)
W18-39 (140.29)
DAYTON AVENUE
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139
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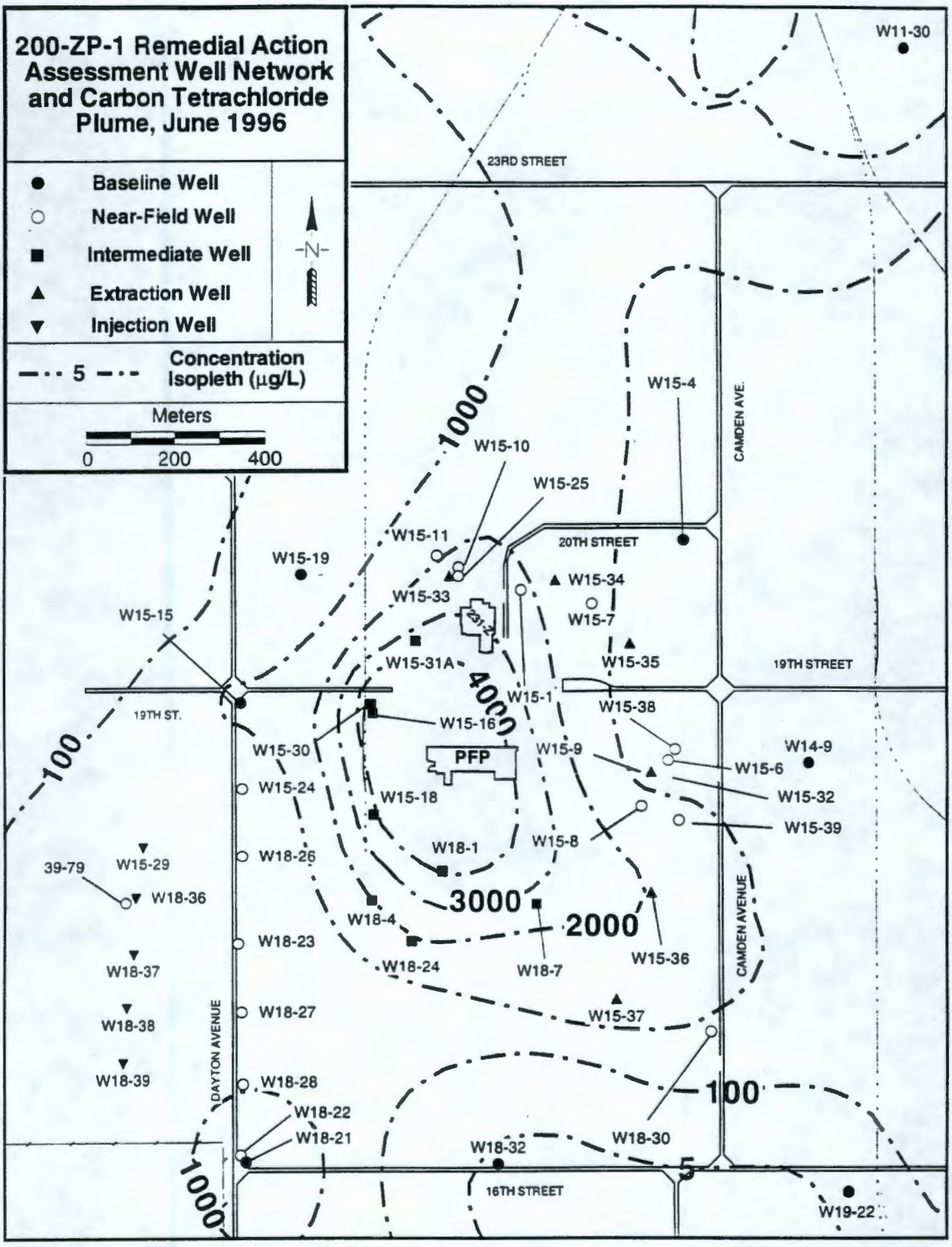
200-ZP-1 Remedial Action Assessment Well Network and Carbon Tetrachloride Plume, June 1996
Baseline Well
Near-Field Well
Intermediate Well
Extraction Well
Injection Well
Concentration Isopleth (µg/L)
Meters
0 200 400
N
23RD STREET
20TH STREET
19TH STREET
19TH ST.
16TH STREET
CAMDEN AVE.
CAMDEN AVENUE
DAYTON AVENUE
PFP
W11-30
W15-4
W15-10
W15-25
W15-11
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W15-33
W15-34
W15-7
W15-15
W15-31A
W15-35
W15-1
W15-38
W15-16
W15-30
W15-9
W14-9
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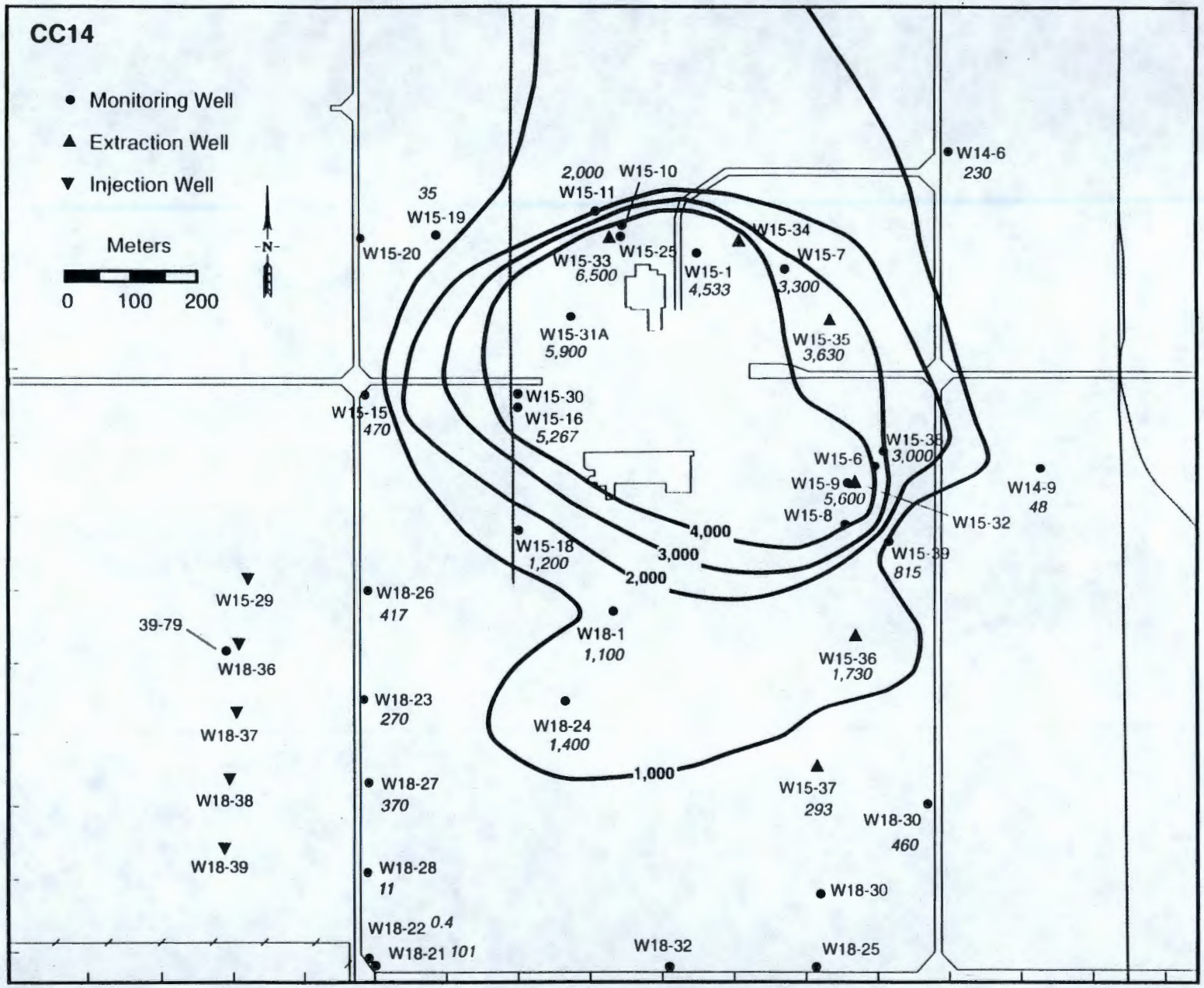
200-ZP-1


CC14
Monitoring Well
Extraction Well
Injection Well
Meters
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W14-6
230
2,000
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W15-19
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W15-34
W15-7
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W18-21 101
W18-32
W18-25
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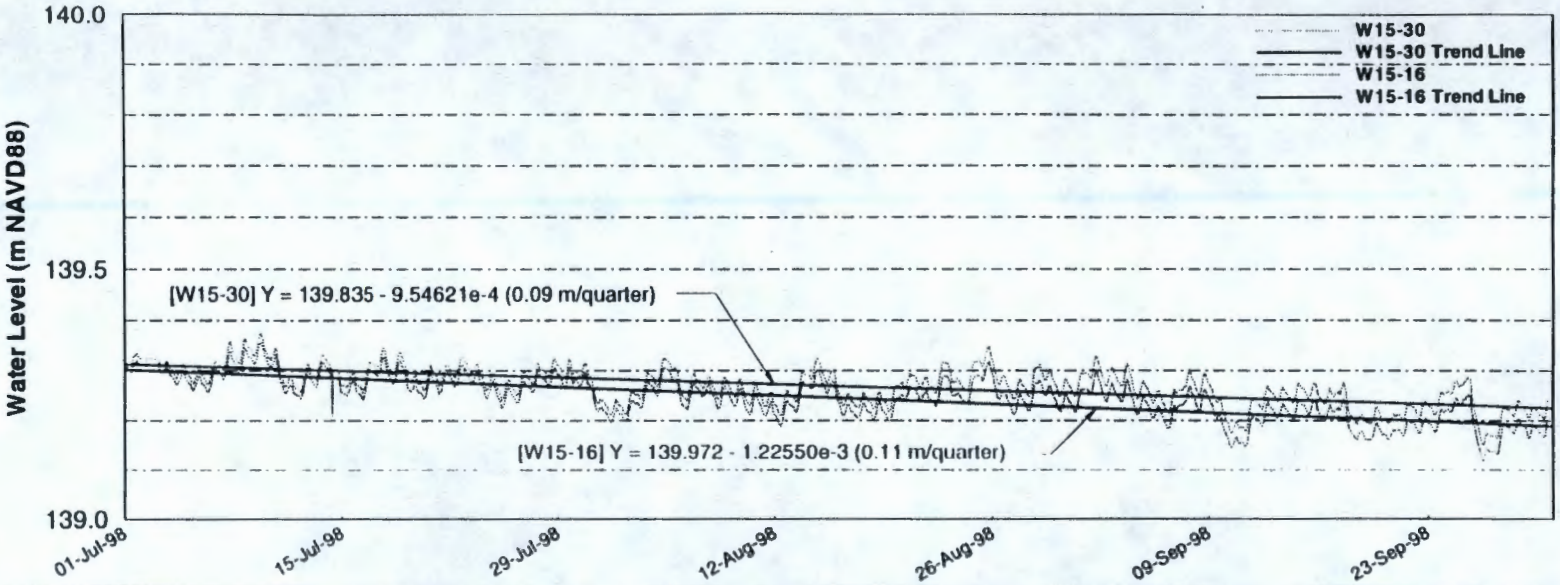
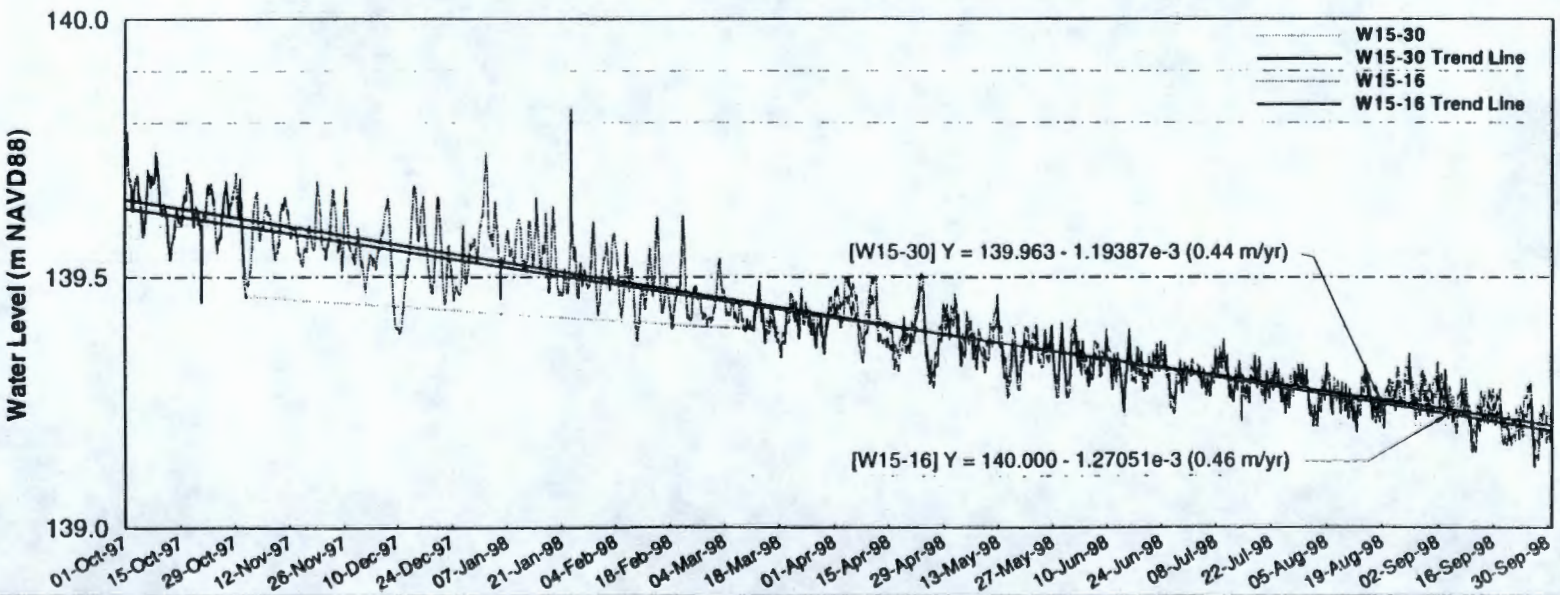
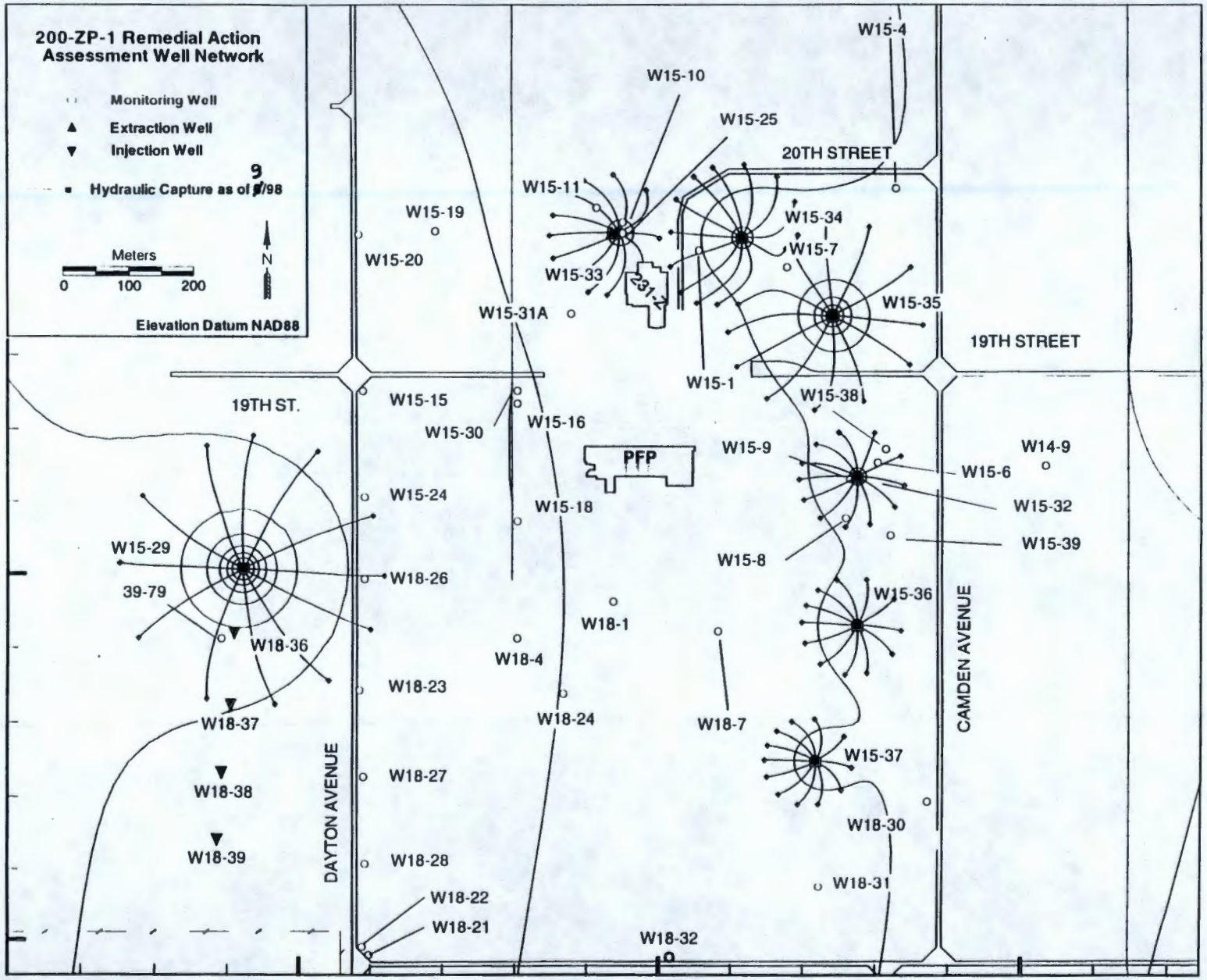

140.0
139.5
139.0
Water Level (m NAVD88)
W15-30
W15-30 Trend Line
W15-16
W15-16 Trend Line
[W15-30] Y = 139.835 - 9.54621e-4 (0.09 m/quarter)
[W15-16] Y = 139.972 - 1.22550e-3 (0.11 m/quarter)
01-Jul-98
15-Jul-98
29-Jul-98
12-Aug-98
26-Aug-98
09-Sep-98
23-Sep-98


140.0
139.5
139.0
Water Level (m NAVD88)
W15-30
W15-30 Trend Line
W15-16
W15-16 Trend Line
[W15-30] Y = 139.963 - 1.19387e-3 (0.44 m/yr)
[W15-16] Y = 140.000 - 1.27051e-3 (0.46 m/yr)
01-Oct-97
15-Oct-97
29-Oct-97
12-Nov-97
26-Nov-97
10-Dec-97
24-Dec-97
07-Jan-98
21-Jan-98
04-Feb-98
18-Feb-98
04-Mar-98
18-Mar-98
01-Apr-98
15-Apr-98
29-Apr-98
13-May-98
27-May-98
10-Jun-98
24-Jun-98
08-Jul-98
22-Jul-98
05-Aug-98
19-Aug-98
02-Sep-98
16-Sep-98
30-Sep-98


200-ZP-1 Remedial Action
Assessment Well Network
Monitoring Well
Extraction Well
Injection Well
Hydraulic Capture as of 9/98
Meters
0
100
200
N
Elevation Datum NAD88
W15-4
W15-10
W15-25
20TH STREET
W15-11
W15-19
W15-34
W15-7
W15-20
W15-33
231-Z
W15-35
W15-31A
19TH STREET
W15-1
W15-38
19TH ST.
W15-15
W15-30
W15-16
PFP
W15-9
W14-9
W15-6
W15-24
W15-18
W15-32
W15-39
W15-29
W15-8
W18-26
39-79
W15-36
W18-1
W18-36
W18-4
W18-23
W18-24
W18-7
W18-37
W15-37
W18-38
W18-27
W18-30
W18-39
W18-28
W18-31
W18-22
W18-21
W18-32
DAYTON AVENUE
CAMDEN AVENUE

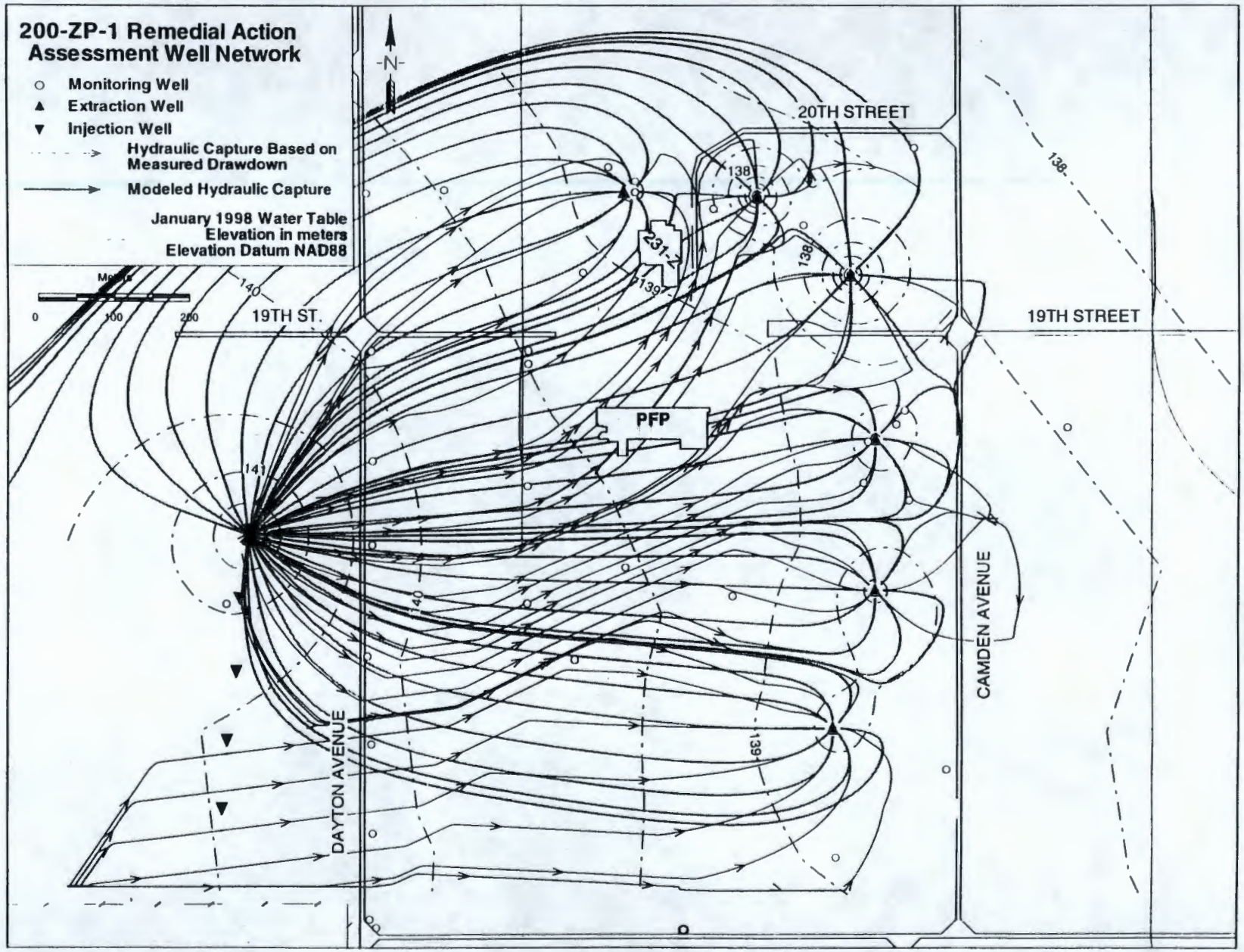

200-ZP-1 Remedial Action
Assessment Well Network
Monitoring Well
Extraction Well
Injection Well
Hydraulic Capture Based on
Measured Drawdown
Modeled Hydraulic Capture
January 1998 Water Table
Elevation in meters
Elevation Datum NAD88
Meters
0
100
200
-N-
20TH STREET
19TH STREET
19TH ST.
DAYTON AVENUE
CAMDEN AVENUE
PFP
231-Z
138
139
140
141

Table 3-1. Volume of Groundwater Treated and Mass of Carbon Tetrachloride Removed Since Startup of Operations at 200-ZP-1.

Reporting Period	Liters Treated	Mass of Carbon Tetrachloride Removed (kg)
August 1994 – July 1996	26,676,000	75.85
August 1996 – September 1996	33,232,327	60.96
October 1996 – December 1996	44,583,715	143.54
January 1997 – March 1997	69,869,604	237.2
April 1997 – June 1997	41,877,094	140.8
July 1997 – September 1997	62,469,305	228.8
October 1997 – December 1997	81,629,000	245.7
January 1998 – March 1998	72,791,000	279.5
April 1998 – June 1998	90,842,900	348.9
July 1998 – September 1998	90,899,200	338.1
Total	614,870,100	2,099.2

Table 3-2. Average Concentrations for Each of the Phase III Extractions Wells and the Influent Tank at 200-ZP-1 During Fiscal Year 1998.

Well Name*	Minimum Value (µg/L)	Maximum Value (µg/L)	Mean Concentration FY 98 (µg/L)	Mean Concentration FY 97 (µg/L)	Mean Flow Rate** (lpm; gpm)	Overall Change
299-W15-33	4,700	7,200	6,000	5,058	66 (18)	Higher
299-W15-34	2,800	4,700	3,770	2,900	101 (27)	Higher
299-W15-35	2,800	4,500	3,660	3,351	310 (82)	Higher
299-W15-32	4,800	7,800	6,560	7,120	81 (22)	Lower
299-W15-36	1,600	2,600	2040	2,820	112 (30)	Lower
299-W15-37	140	320	235	280	63 (17)	Lower
Influent Tank	-	4,400	3,530	3,270	-	Higher

* Wells listed from north to south.

** Some discrepancies in discharge rate at the different measurement locations were observed. These are still being resolved. Flow rates may actually be higher by about 15-20%.

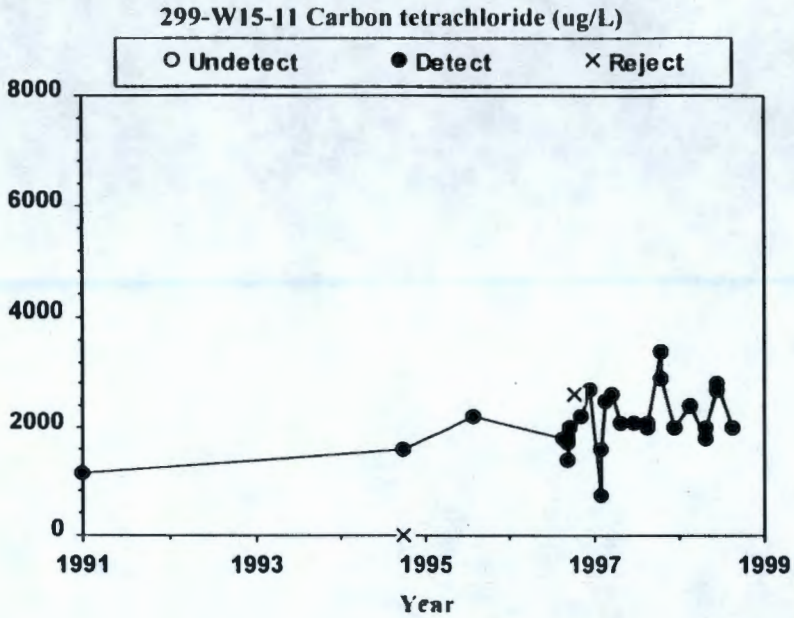
Well	Cons.	Units	Aug 1998	July 1998	May 1998	April 1998	Oct 97 - Mar 98 (Average)	FY 1997 (Average)	Trend
299-W14-9	CCl_4	ug/l	48		10 / 30 / 14		58	247	Stable but declining
299-W15-1	CCl_4	ug/l			3900**	4800	4567	2800	Stabilizing
299-W15-10	CCl_4	ug/l						2989	No data collected in FY 1998
299-W15-11	CCl_4	ug/l	2000		2700** / 2800**	1800 / 2000	2668	2112	Stable
299-W15-15	CCl_4	ug/l		540 / 470	670 / 330		818	1304	Continuing downward trend
299-W15-16	CCl_4	ug/l		2900		6400	7186	5175	Stable; last measurement shows decline
299-W15-18	CCl_4	ug/l		1200		1900 / 2100	1679	2500	Continuing downward trend
299-W15-19	CCl_4	ug/l					35	193	Down from previous fiscal year
299-W15-20	CCl_4	ug/l						40	No data collected in FY 1998
299-W15-24	CCl_4	ug/l						300	No data collected in FY 1998
299-W15-25	CCl_4	ug/l						2367	No data collected in FY 1998
299-W15-30	CCl_4	ug/l						5858	No data collected in FY 1998
299-W15-31A	CCl_4	ug/l	5900*	6000	5100		5239	4915	Stable but slight upward trend
299-W15-38	CCl_4	ug/l			2600** / 3000**	3000	2936	2338	Stable but slight upward trend
299-W15-39	CCl_4	ug/l	800 / 830		1200		1374	733	Stable; overall trend difficult to identify
299-W15-4	CCl_4	ug/l	390		510 / 380		358	430	Stable
299-W15-7	CCl_4	ug/l	2400		3300**	2700	2450	2489	Stable
299-W18-1	CCl_4	ug/l	1100		2200 / 770		1565	1333	Stable; overall trend difficult to identify
299-W18-21	CCl_4	ug/l		82 / 120 / 60	130		234	811	Continuing downward trend
299-W18-23	CCl_4	ug/l		270			290	430	Stable but declining
299-W18-24	CCl_4	ug/l		770		1400	1640	1112	Stabilizing
299-W18-26	CCl_4	ug/l	30* / 29*	360 / 330	560 / 590		435	173	Stable; last measurement shows decline
299-W18-27	CCl_4	ug/l		370 / 240	300		299	292	Stable
299-W18-28	CCl_4	ug/l		11			3	15	Stable
299-W18-30	CCl_4	ug/l	460		670		595	846	Continuing downward trend
299-W18-32	CCl_4	ug/l		3 / 2	2		12	2.3	Stable
299-W19-15	CCl_4	ug/l					360	360	Stable
699-39-79	CCl_4	ug/l	2*	2 / 2	2		2.4	292	No CCl_4 detected since November 1997

*Sampled in September

**Sampled in June

APPENDIX B

200-ZP-1 CONTAMINANT TREND PLOTS


299-W15-11 Carbon tetrachloride (ug/L)
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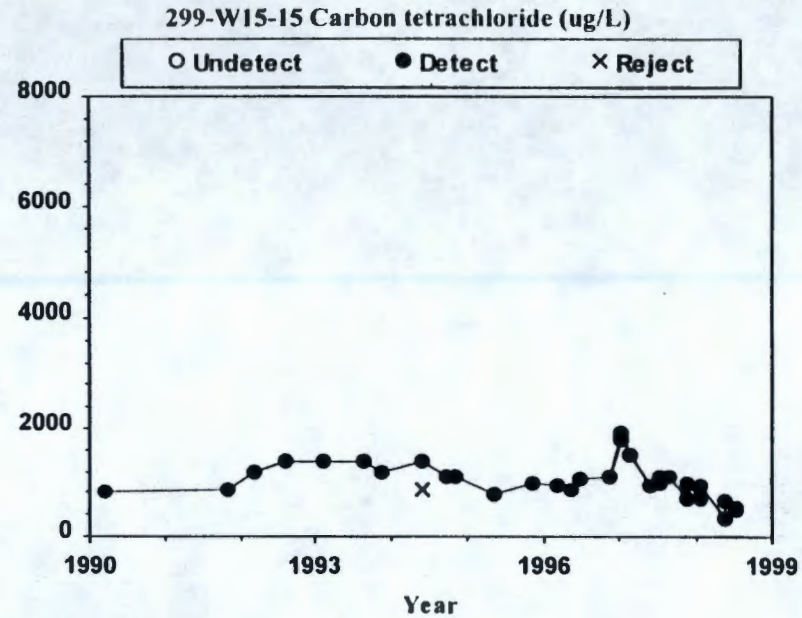
1991
1993
1995
1997
1999
Year


299-W15-15 Carbon tetrachloride (ug/L)
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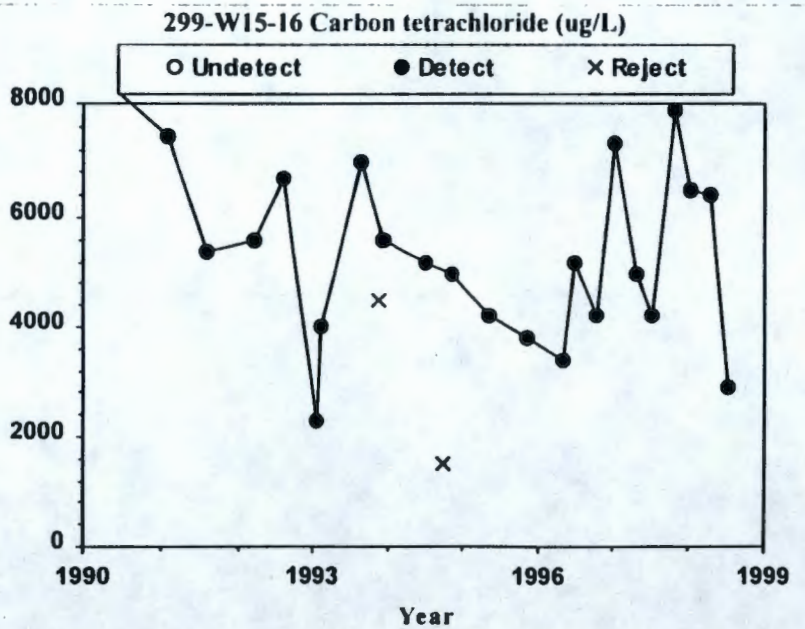
1993
1996
1999
Year


299-W15-16 Carbon tetrachloride (ug/L)
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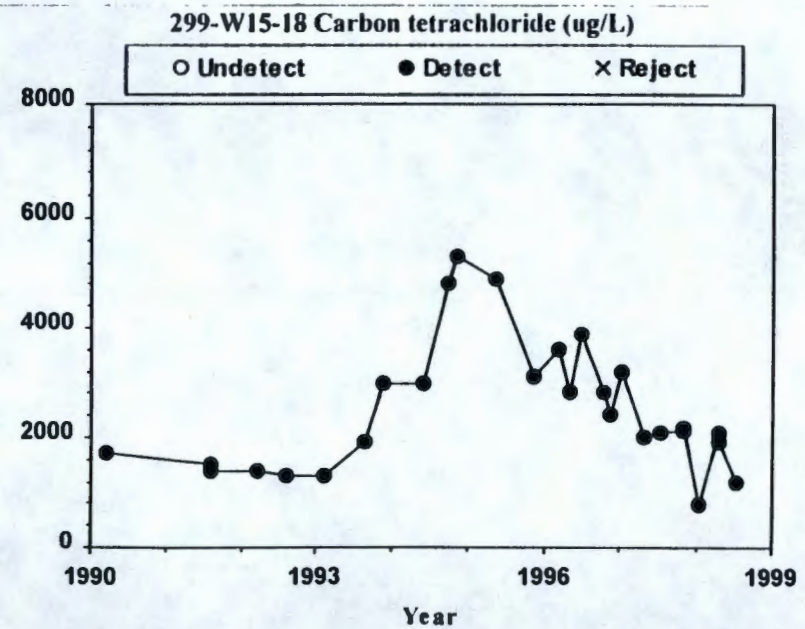
1993
1996
1999
Year


299-W15-18 Carbon tetrachloride (ug/L)
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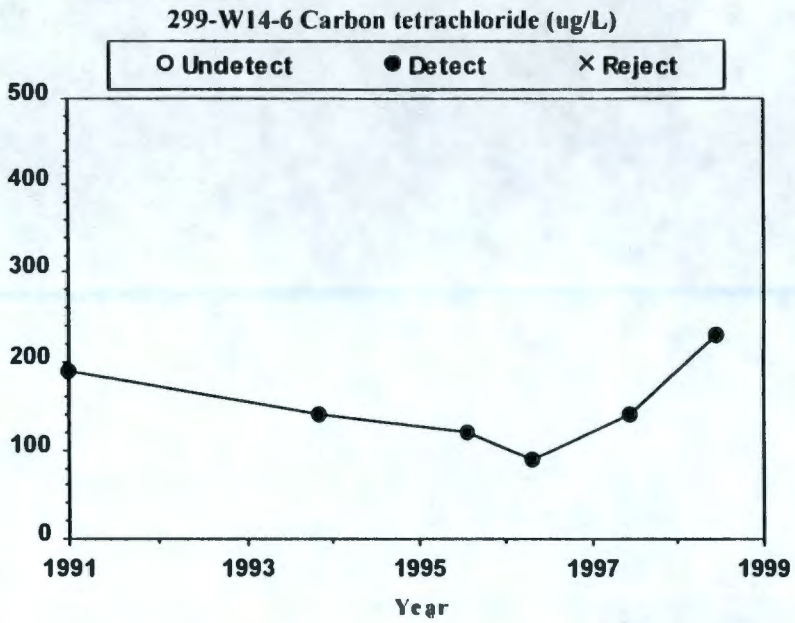
1996
1999
Year


299-W14-6 Carbon tetrachloride (ug/L)
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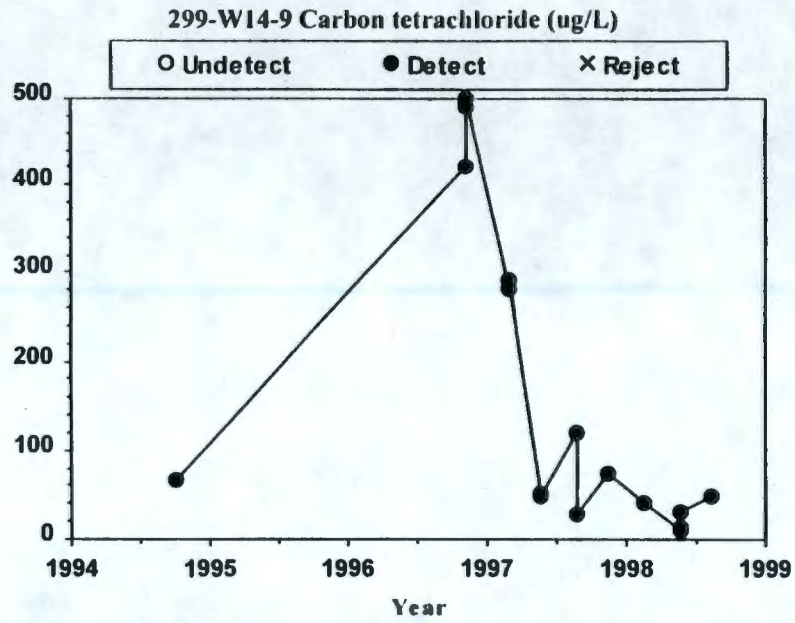
1997
1999
Year


299-W14-9 Carbon tetrachloride (ug/L)
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1998
1999
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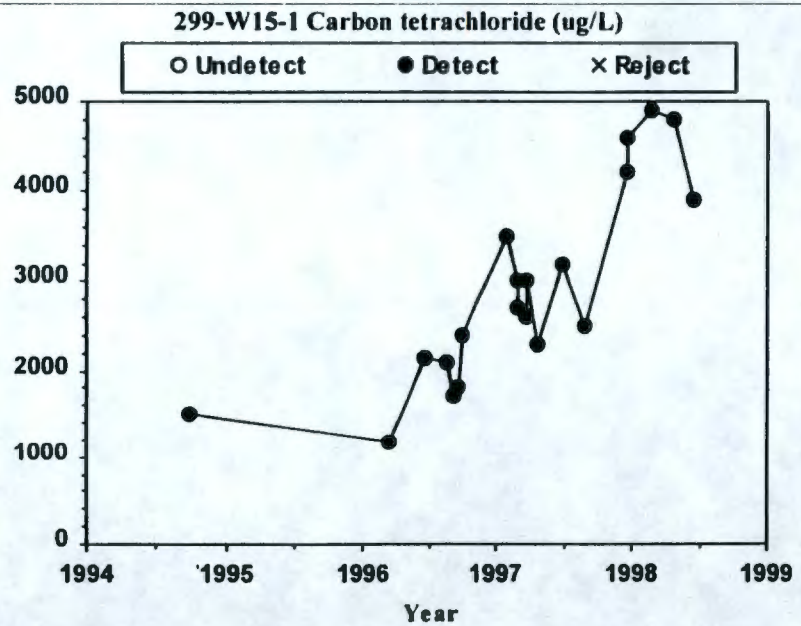
299-W15-1 Carbon tetrachloride (ug/L)
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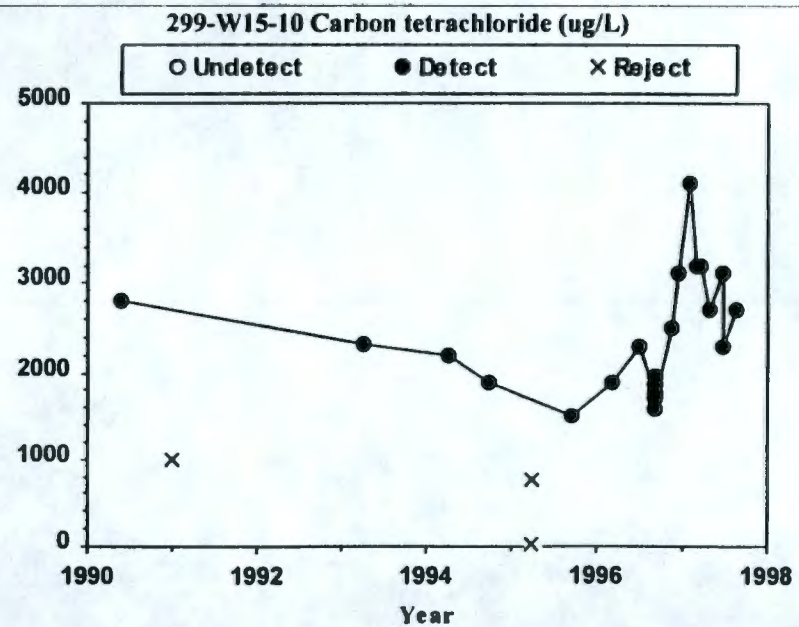
1998
1999
Year


299-W15-10 Carbon tetrachloride (ug/L)
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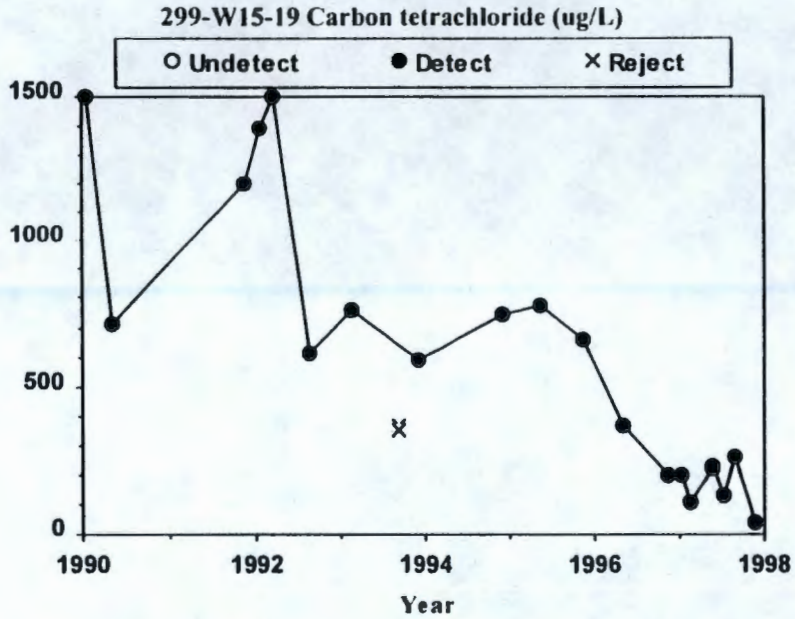
1996
1998
Year


299-W15-19 Carbon tetrachloride (ug/L)
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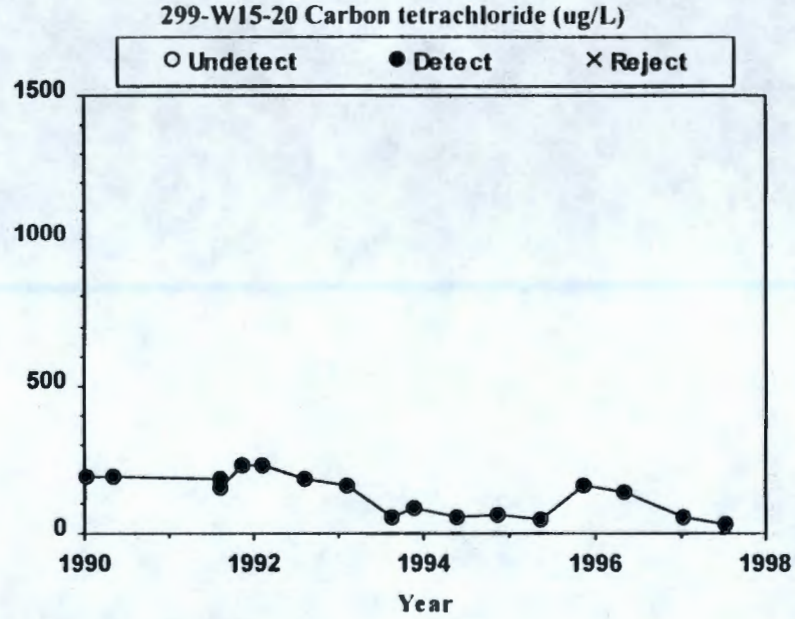
1994
1996
1998
Year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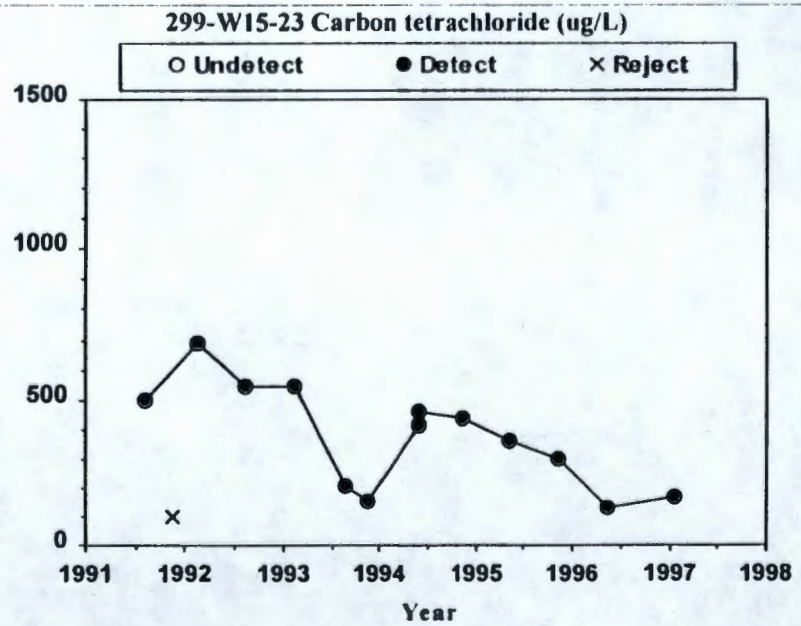
299-W15-23 Carbon tetrachloride (ug/L)
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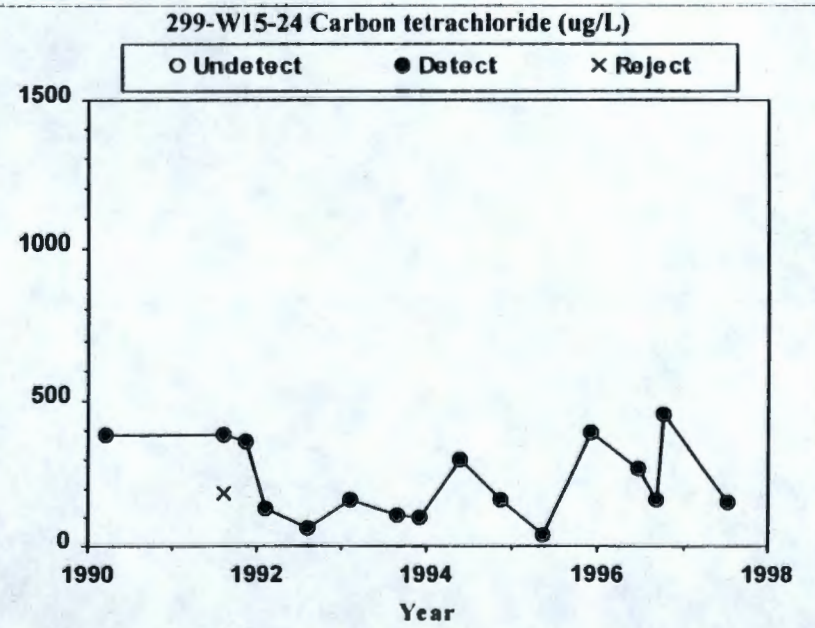
1998
Year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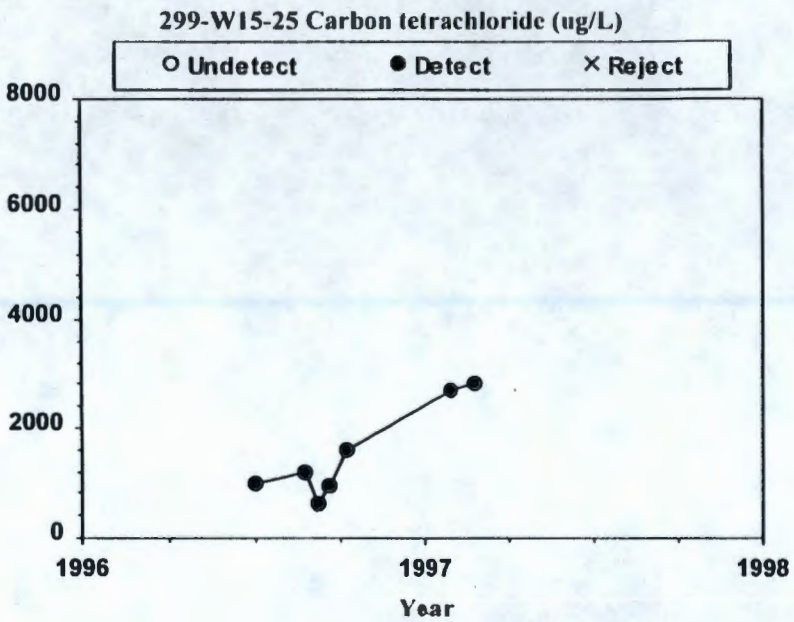
1996
1998
Year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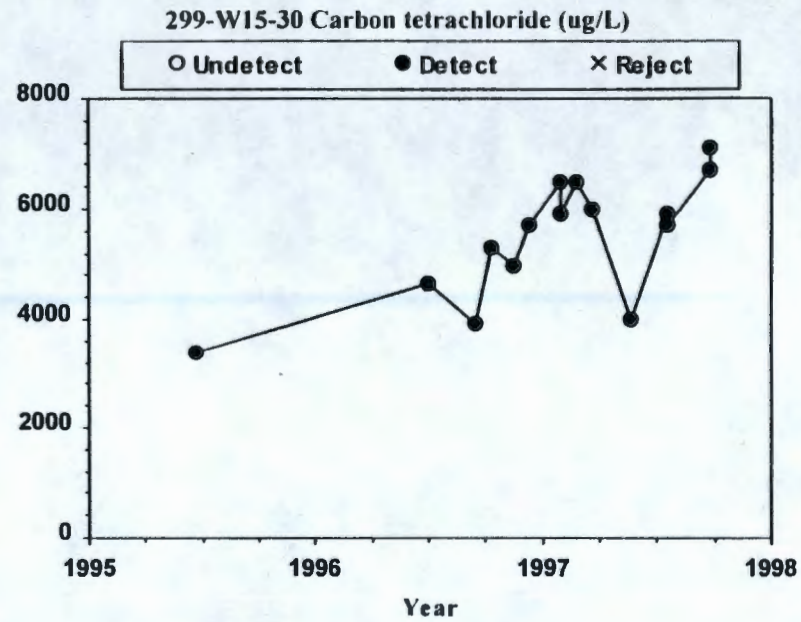
1997
1998
Year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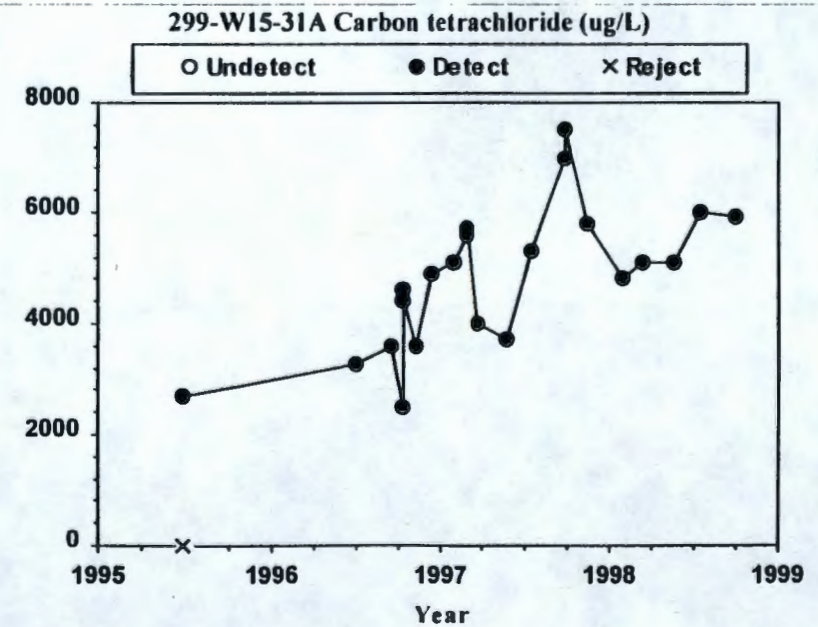
1998
Year


299-W15-31A Carbon tetrachloride (ug/L)
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● Detect
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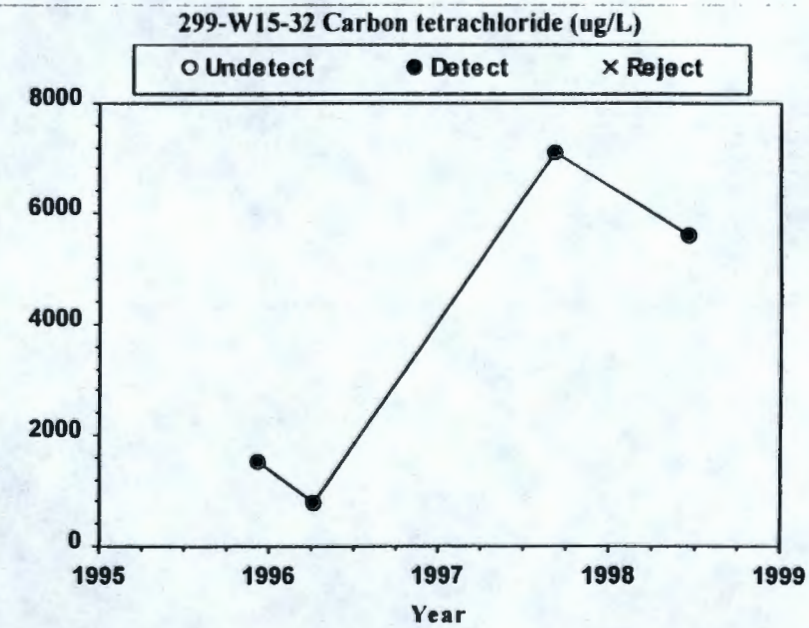
1997
1998
1999
Year


299-W15-32 Carbon tetrachloride (ug/L)
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● Detect
× Reject
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6000
4000
2000
0
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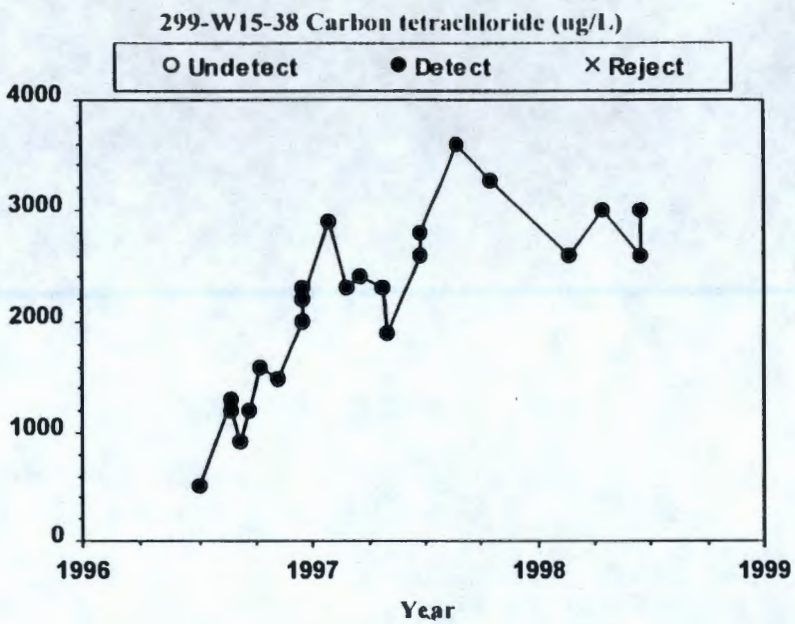
1997
1998
1999
Year


299-W15-38 Carbon tetrachloride (ug/L)
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● Detect
× Reject
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3000
2000
1000
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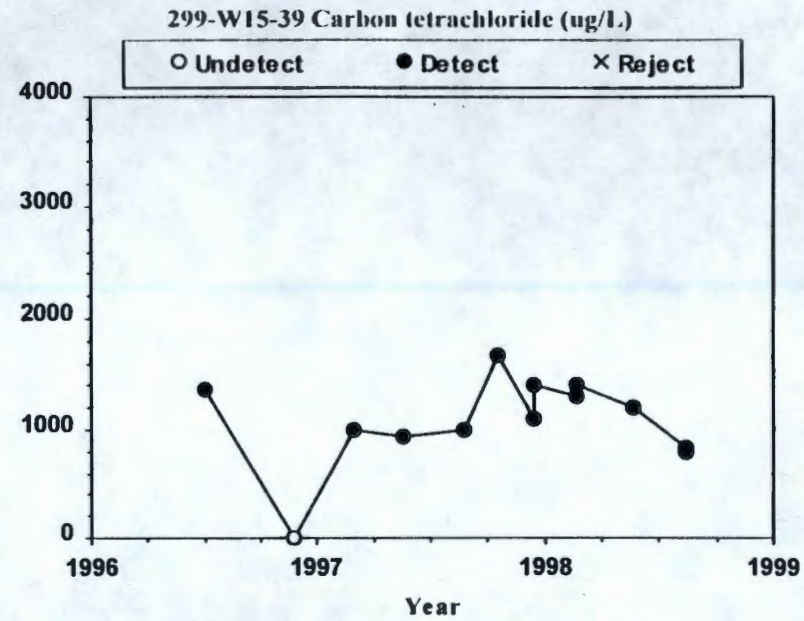
1997
1998
1999
Year


299-W15-39 Carbon tetrachloride (ug/L)
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● Detect
× Reject
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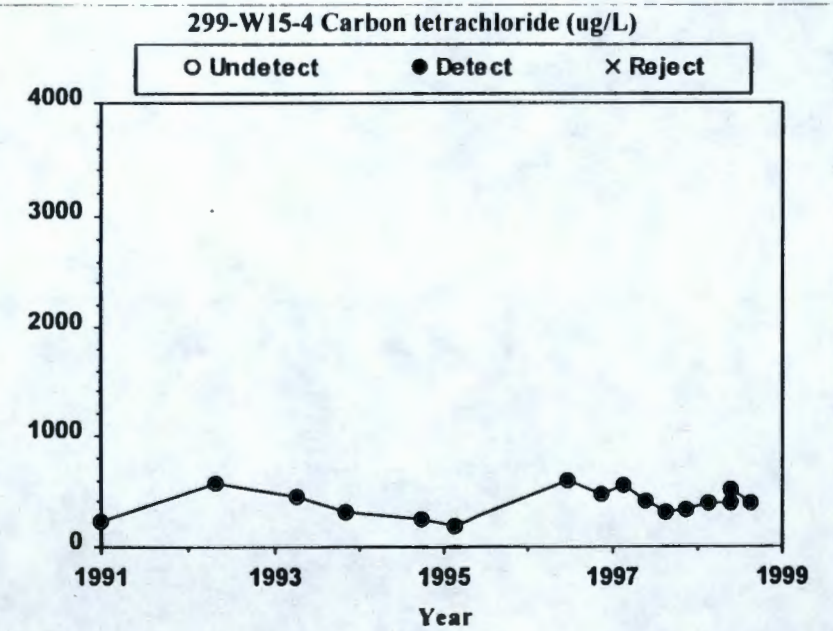
1997
1998
1999
Year


299-W15-4 Carbon tetrachloride (ug/L)
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● Detect
× Reject
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3000
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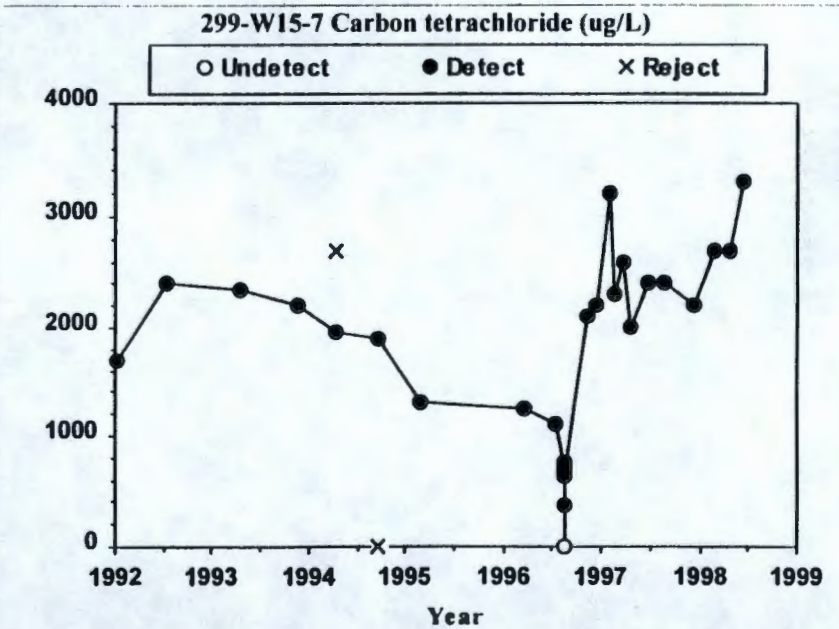
1995
1997
1999
Year


299-W15-7 Carbon tetrachloride (ug/L)
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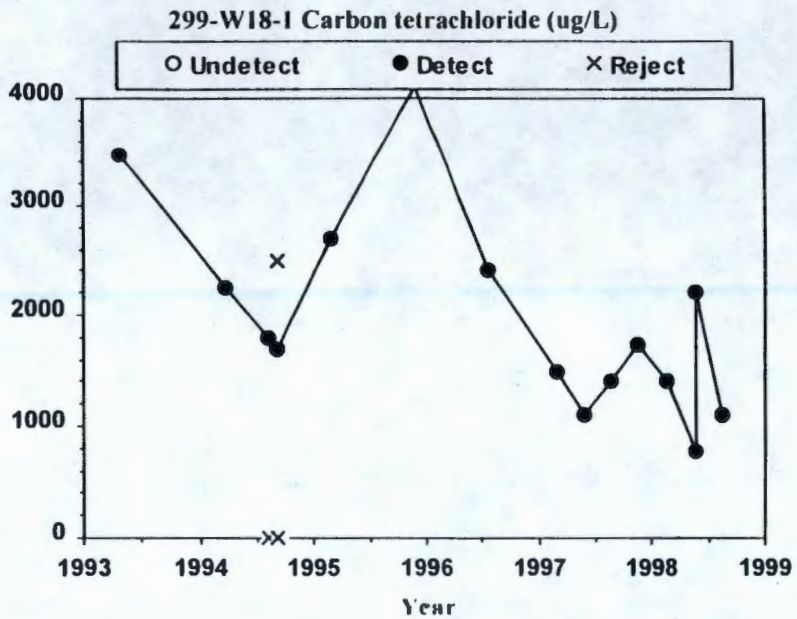
1997
1998
1999
Year


299-W18-1 Carbon tetrachloride (ug/L)
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● Detect
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3000
2000
1000
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1993
1994
1995
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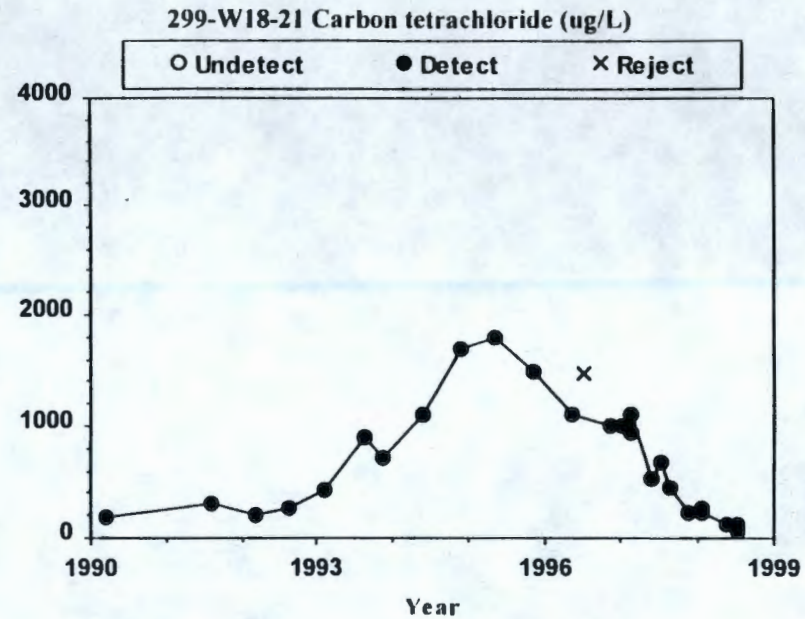
1997
1998
1999
Year


299-W18-21 Carbon tetrachloride (ug/L)
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● Detect
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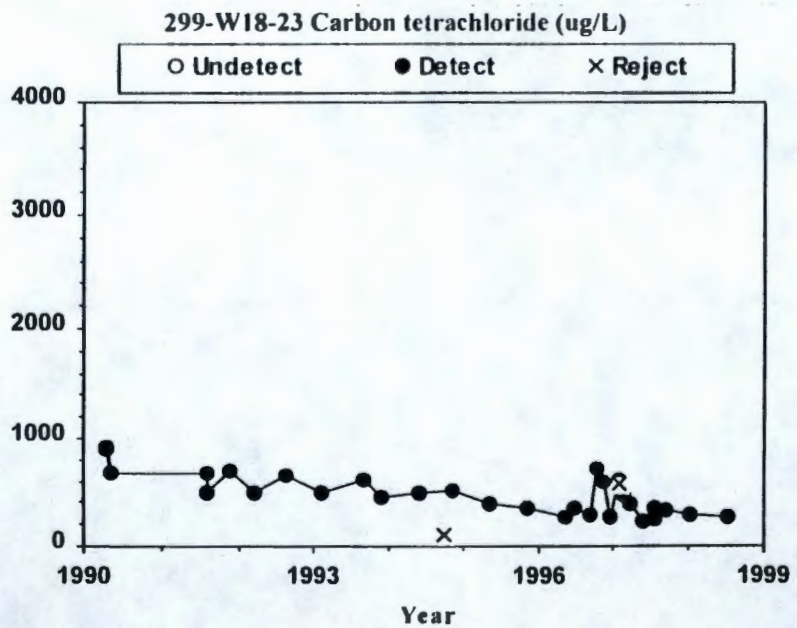
1993
1996
1999
Year


299-W18-23 Carbon tetrachloride (ug/L)
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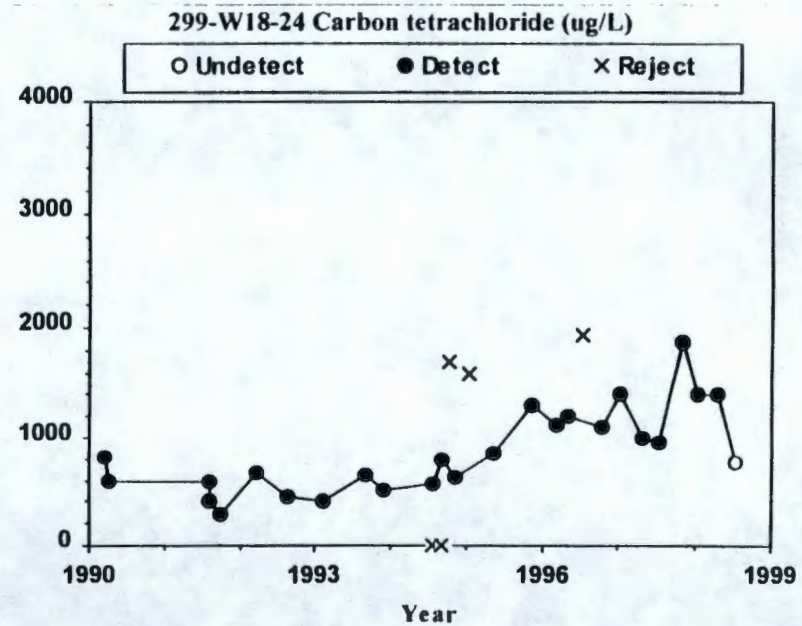
● Detect
× Reject
4000
3000
2000
1000
0
1990
1993
1996
1999
Year


299-W18-24 Carbon tetrachloride (ug/L)
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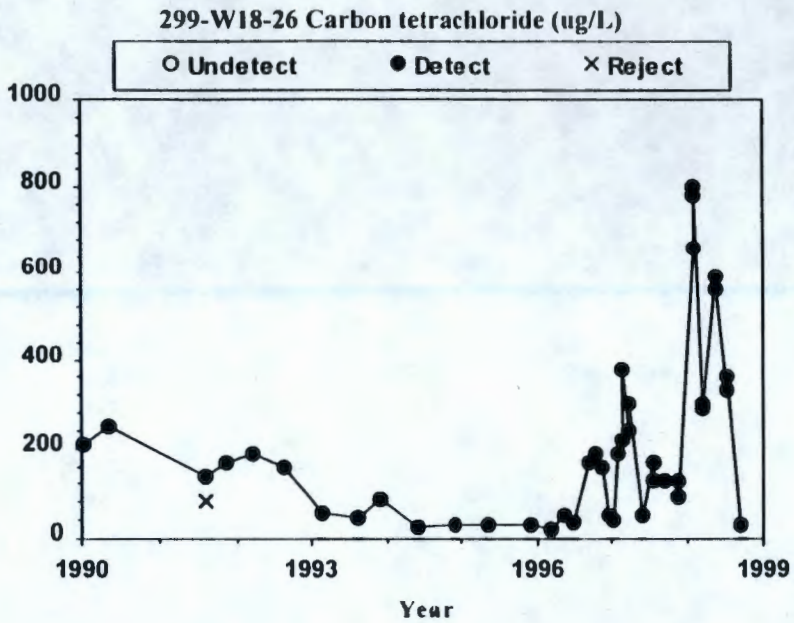
● Detect
× Reject
4000
3000
2000
1000
0
1990
1993
1996
1999
Year


299-W18-26 Carbon tetrachloride (ug/L)
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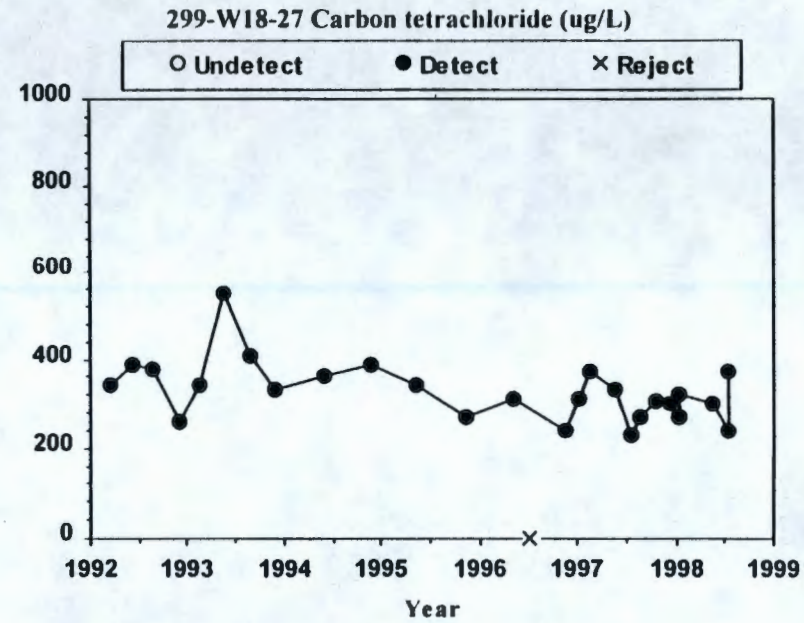
● Detect
× Reject
1000
800
600
400
200
0
1990
1993
1996
1999
Year


299-W18-27 Carbon tetrachloride (ug/L)
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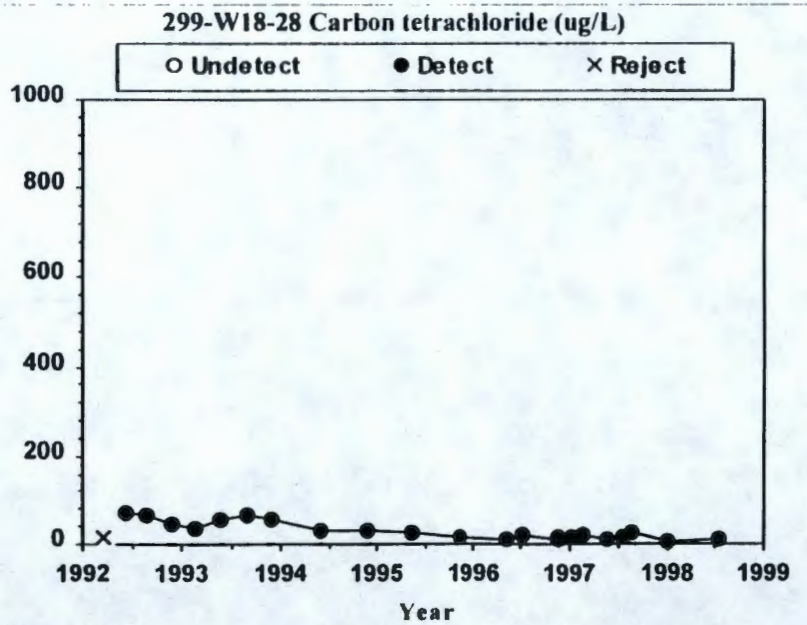
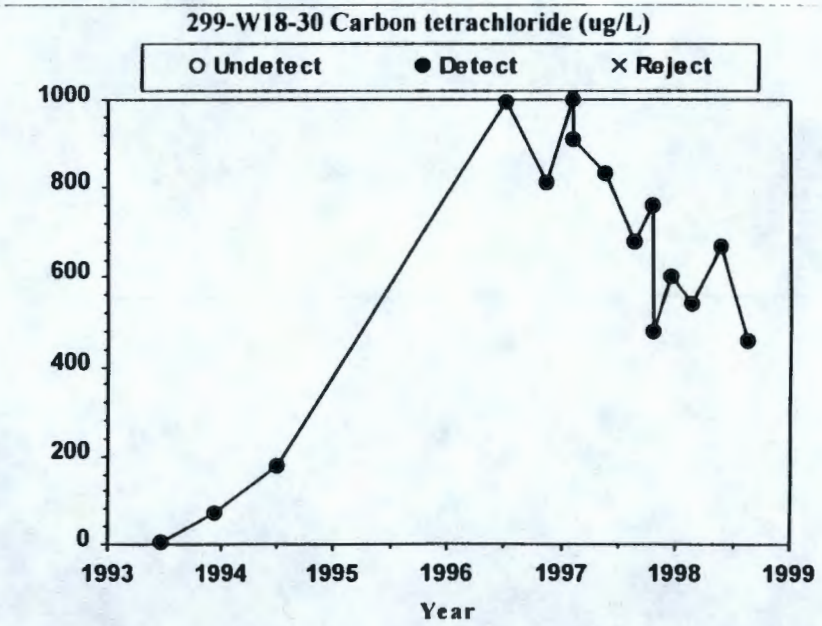
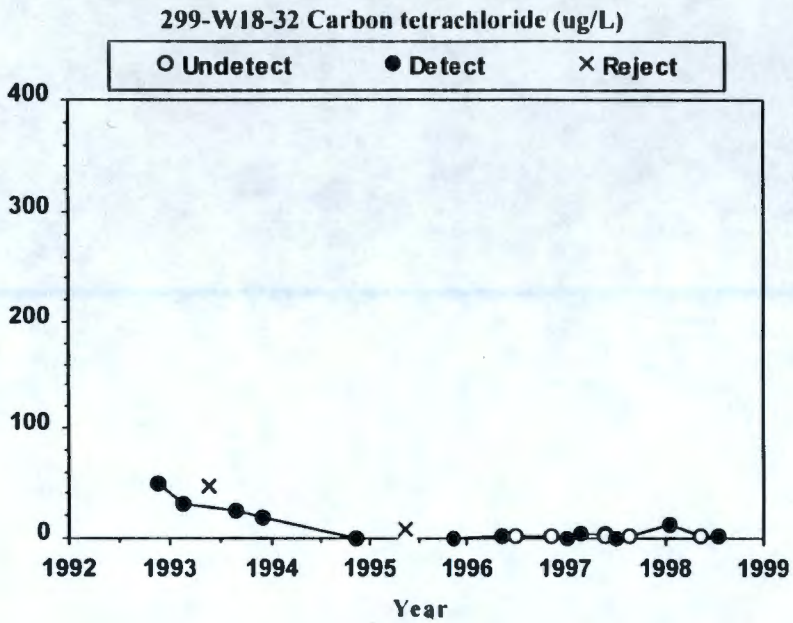
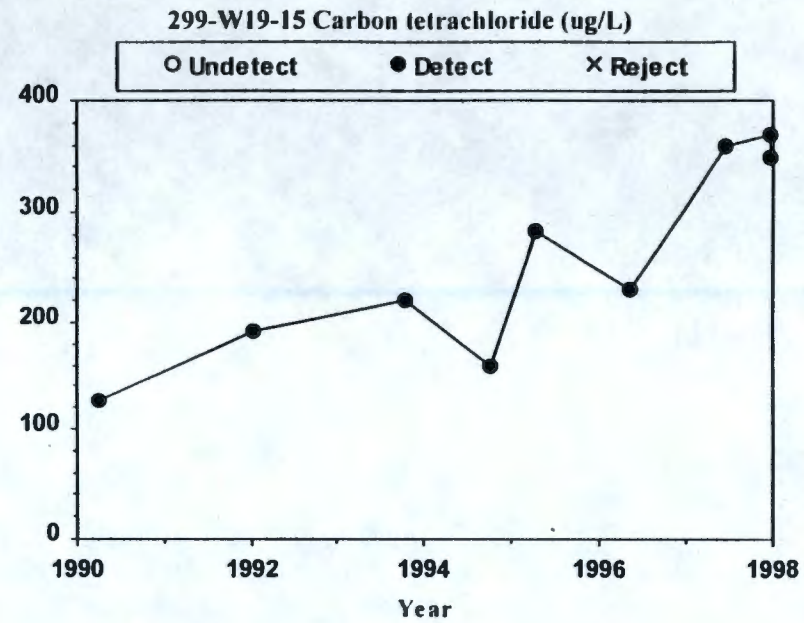
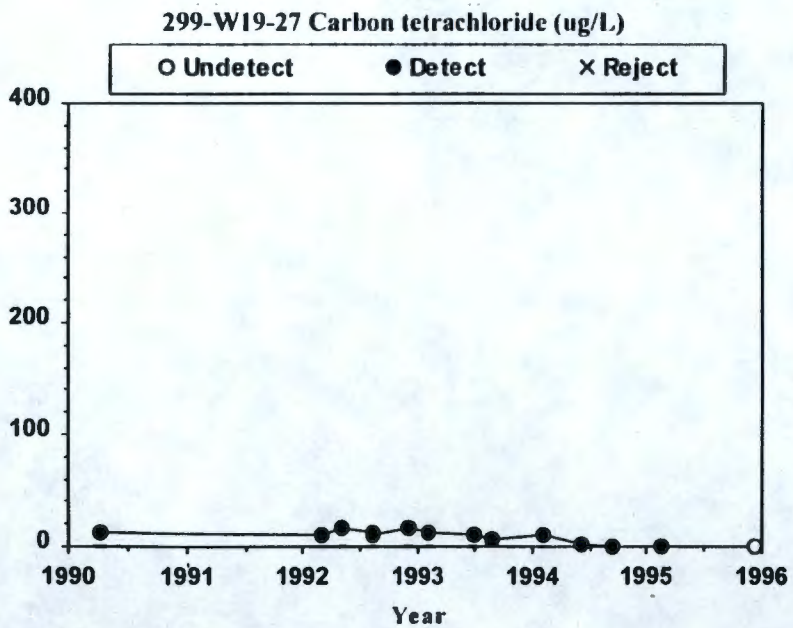
200
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

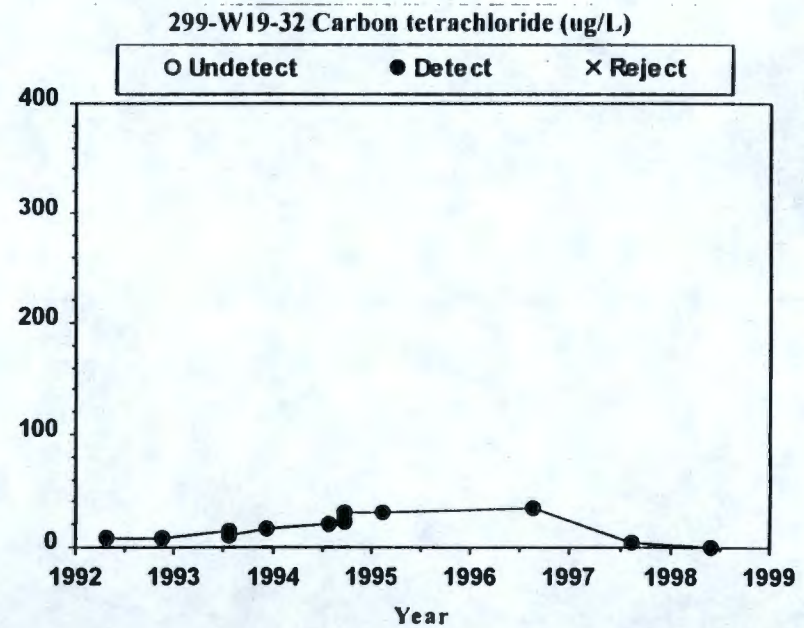

299-W18-28 Carbon tetrachloride (ug/L)
O Undetect
● Detect
× Reject
1000
800
600
400
200
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

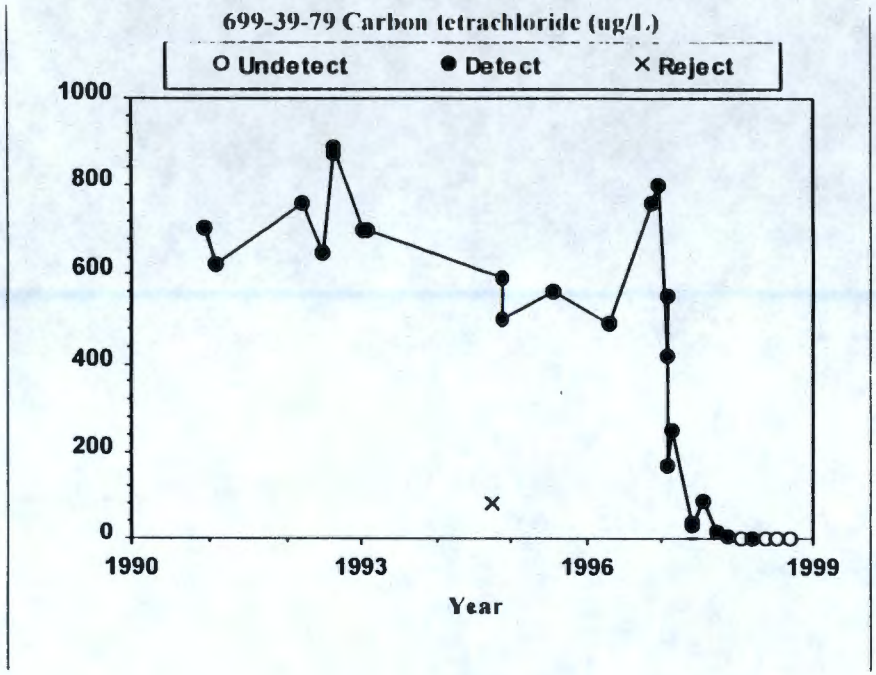

299-W18-30 Carbon tetrachloride (ug/L)
O Undetect
● Detect
× Reject
1000
800
600
400
200
0
1993
1994
1995
1996
1997
1998
1999
Year

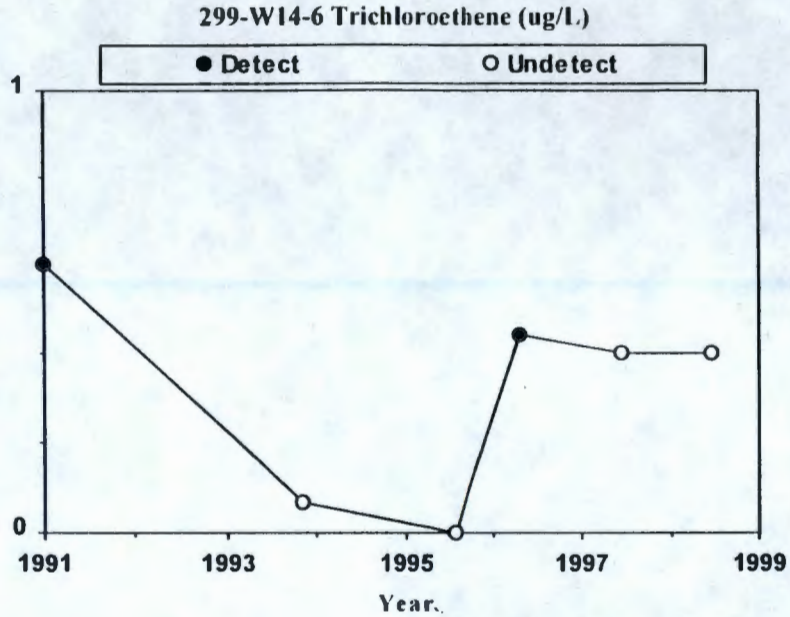

299-W18-32 Carbon tetrachloride (ug/L)
Undetect
Detect
Reject
400
300
200
100
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

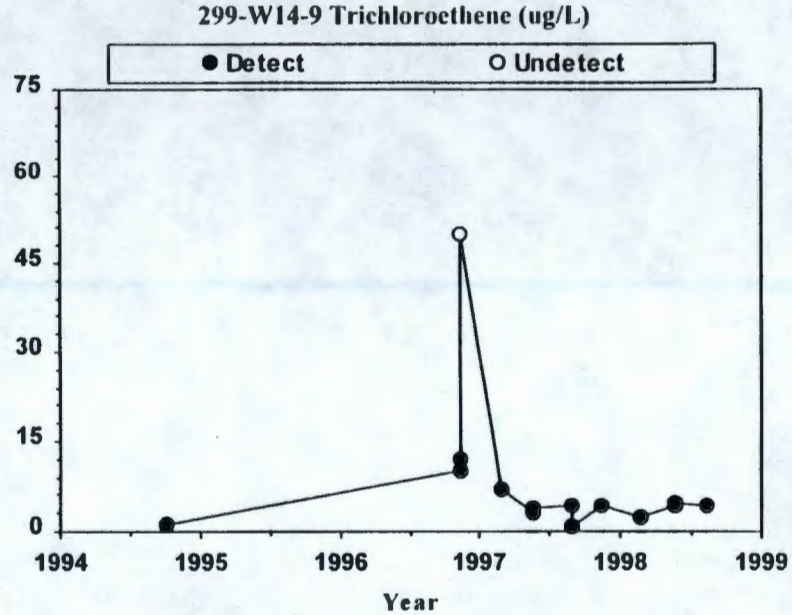

299-W19-15 Carbon tetrachloride (ug/L)
Undetect
Detect
Reject
400
300
200
100
0
1990
1992
1994
1996
1998
Year

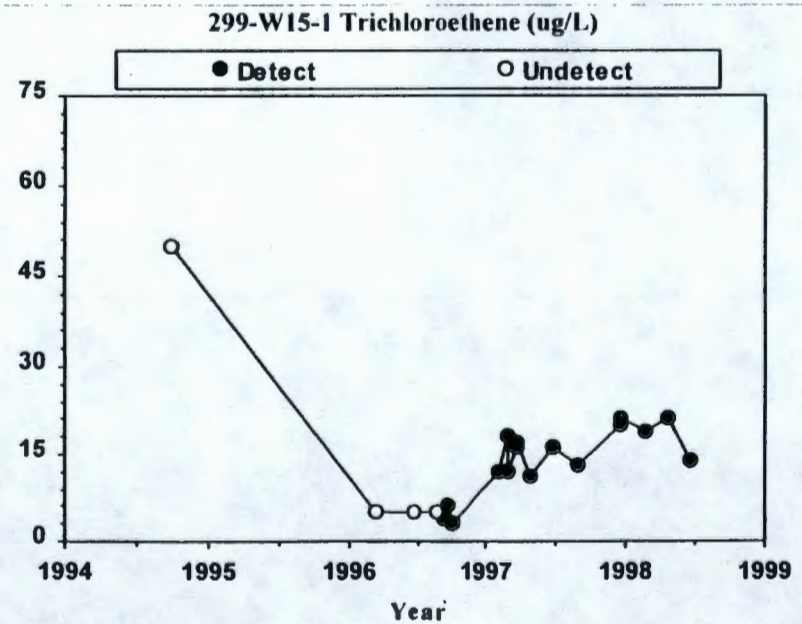

299-W19-27 Carbon tetrachloride (ug/L)
Undetect
Detect
Reject
400
300
200
100
0
1990
1991
1992
1993
1994
1995
1996
Year

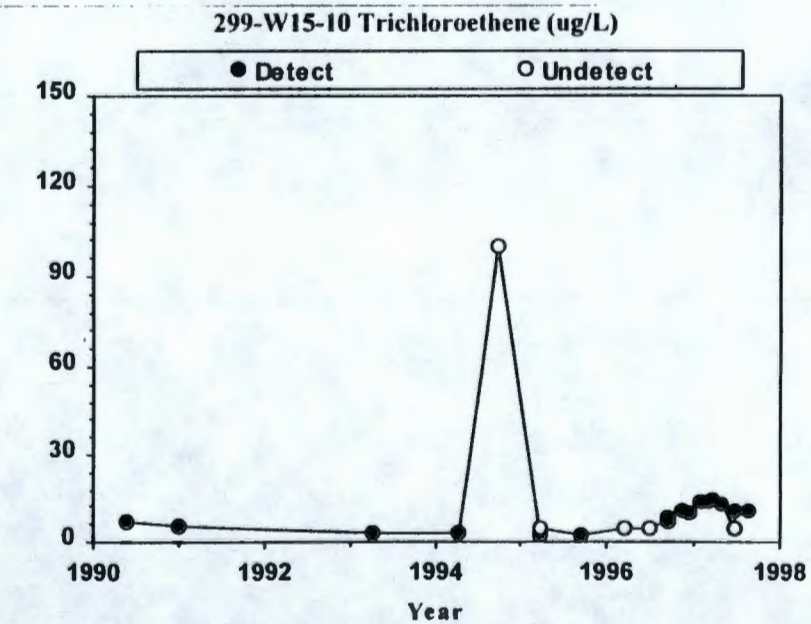

299-W19-32 Carbon tetrachloride (ug/L)
Undetect
Detect
Reject
400
300
200
100
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

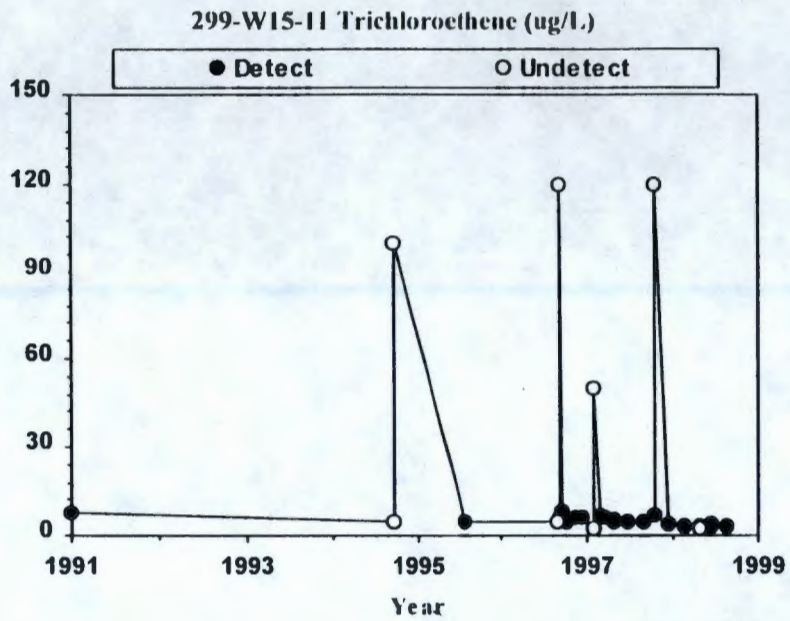

699-39-79 Carbon tetrachloride (ug/L)
O Undetect
● Detect
× Reject
1000
800
600
400
200
0
1990
1993
1996
1999
Year

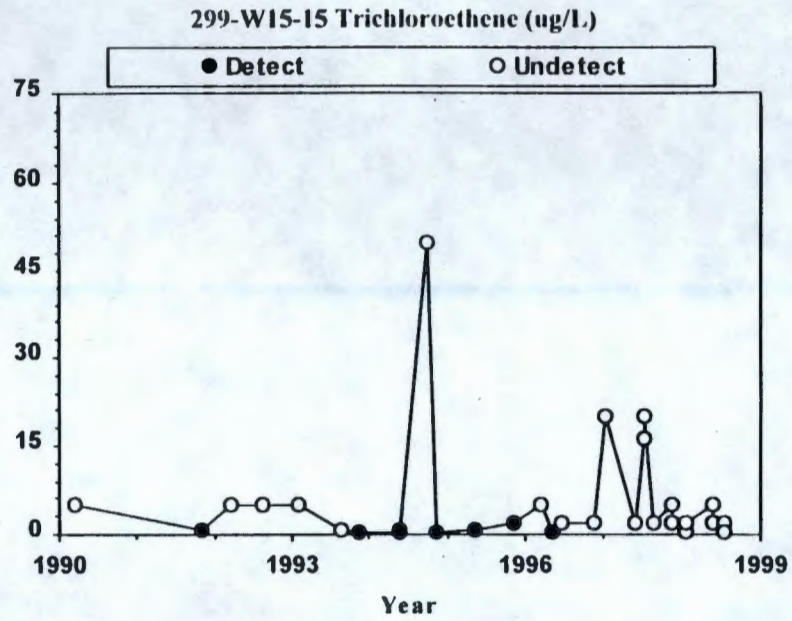

299-W14-6 Trichloroethene (ug/L)
Detect
Undetect
1
0
1991
1993
1995
1997
1999
Year

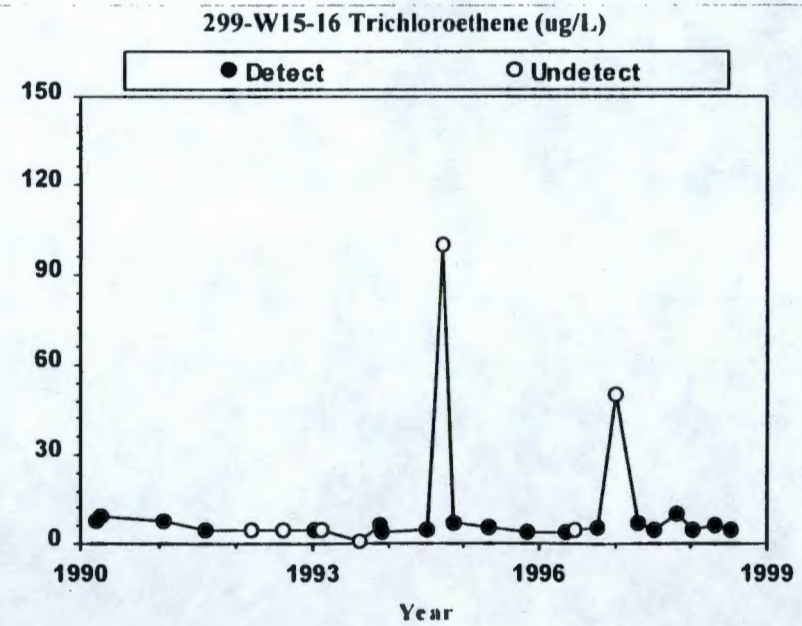

299-W14-9 Trichloroethene (ug/L)
Detect
Undetect
75
60
45
30
15
0
1994
1995
1996
1997
1998
1999
Year

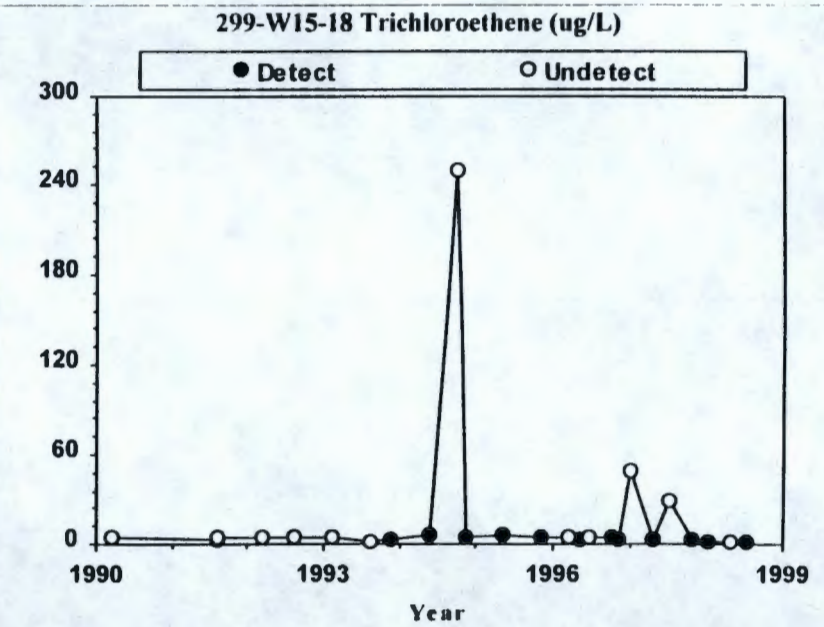

299-W15-1 Trichloroethene (ug/L)
Detect
Undetect
75
60
45
30
15
0
1994
1995
1996
1997
1998
1999
Year

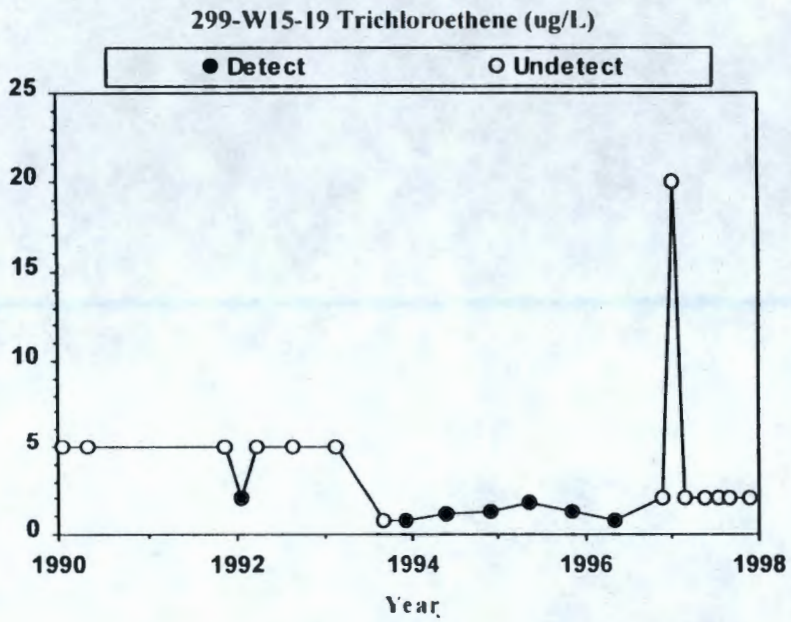

299-W15-10 Trichloroethene (ug/L)
Detect
Undetect
150
120
90
60
30
0
1990
1992
1994
1996
1998
Year

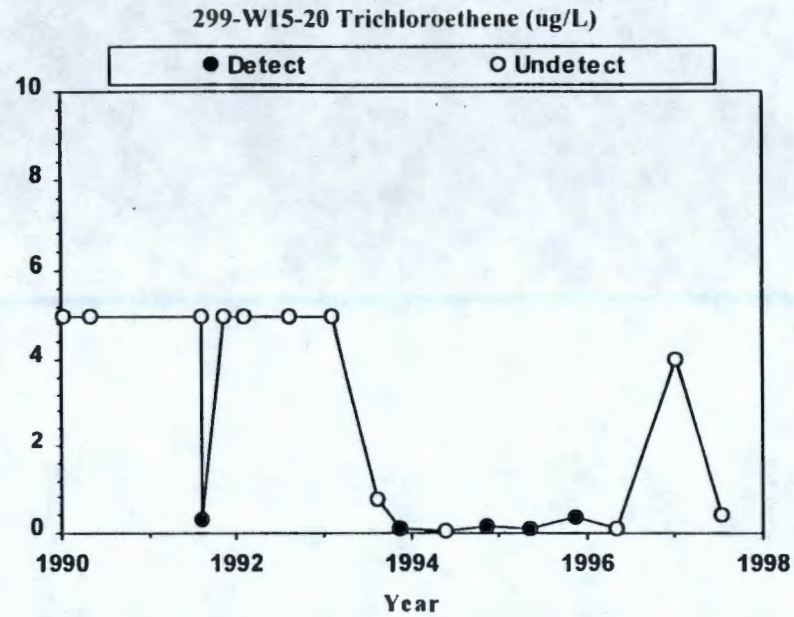

299-W15-11 Trichloroethene (ug/L)
Detect
Undetect
150
120
90
60
30
0
1991
1993
1995
1997
1999
Year

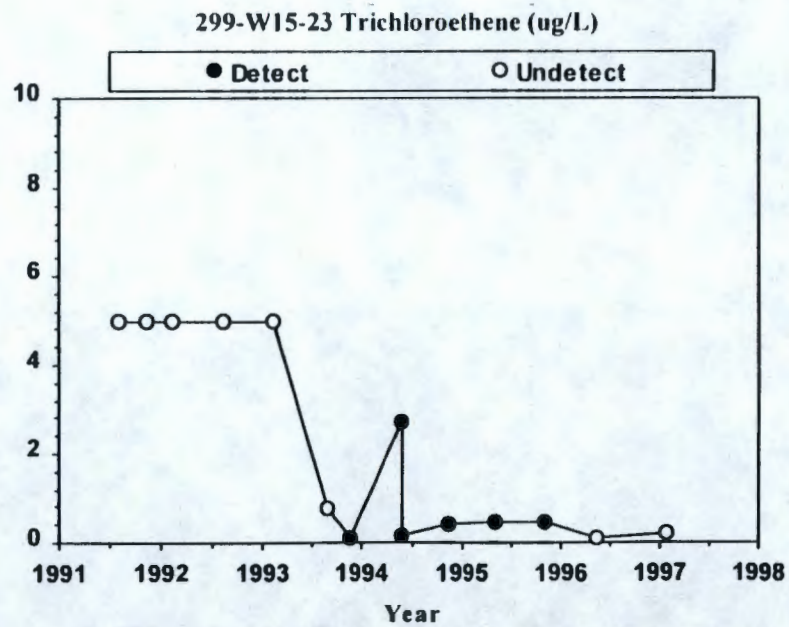

299-W15-15 Trichloroethene (ug/L)
Detect
Undetect
75
60
45
30
15
0
1990
1993
1996
1999
Year

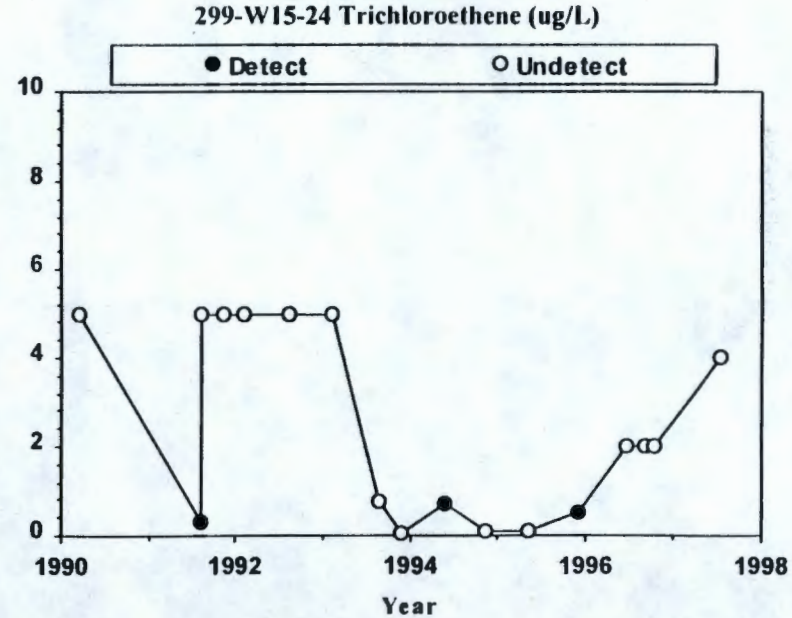

299-W15-16 Trichloroethene (ug/L)
Detect
Undetect
150
120
90
60
30
0
1990
1993
1996
1999
Year

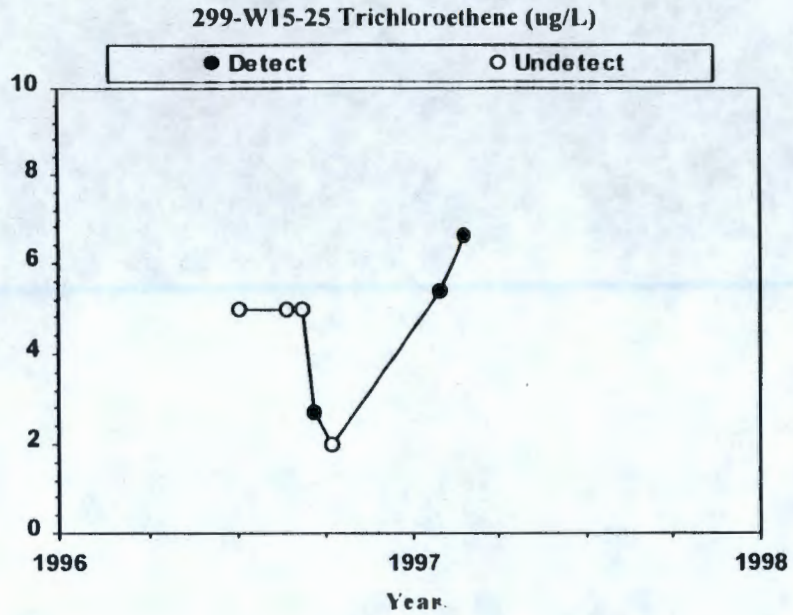

299-W15-18 Trichloroethene (ug/L)
Detect
Undetect
300
240
180
120
60
0
1990
1993
1996
1999
Year

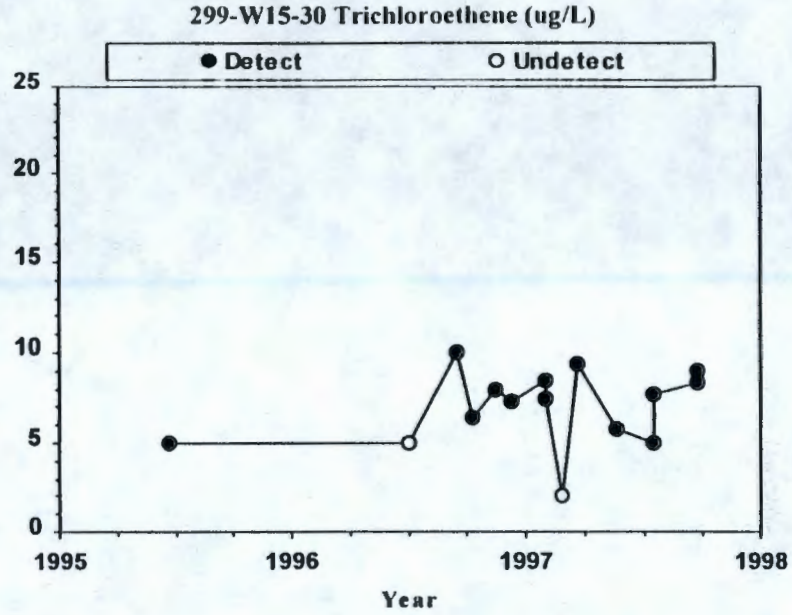

299-W15-19 Trichloroethene (ug/L)
Detect
Undetect
25
20
15
10
5
0
1990
1992
1994
1996
1998
Year

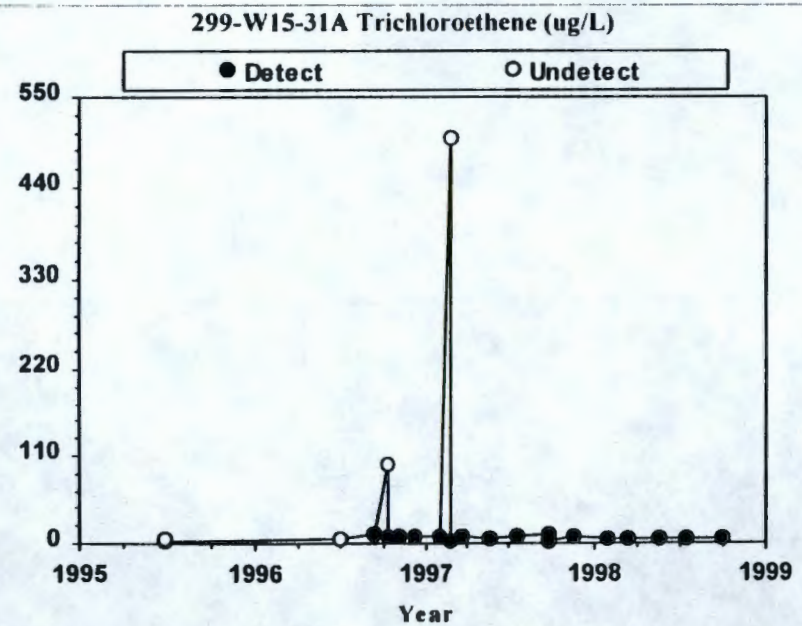

299-W15-20 Trichloroethene (ug/L)
Detect
Undetect
10
8
6
4
2
0
1990
1992
1994
1996
1998
Year

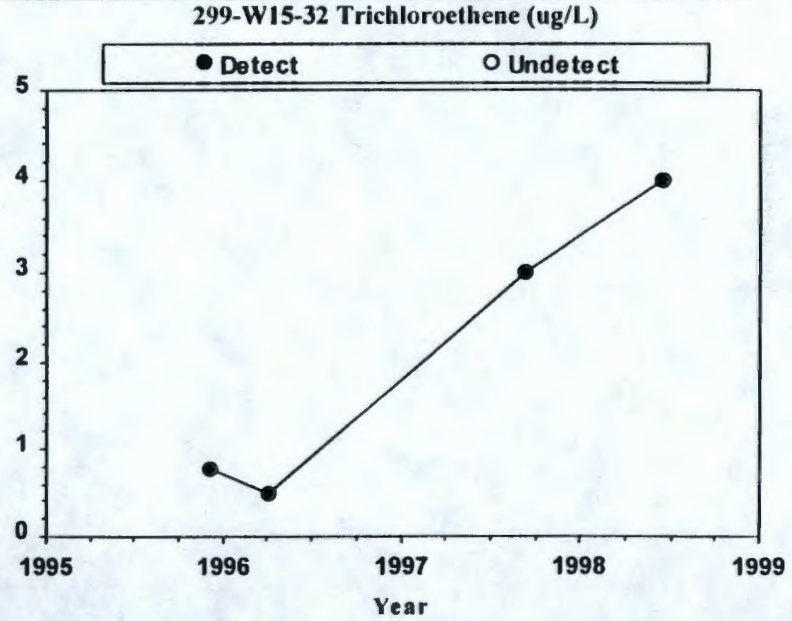

299-W15-23 Trichloroethene (ug/L)
Detect
Undetect
10
8
6
4
2
0
1991
1992
1993
1994
1995
1996
1997
1998
Year

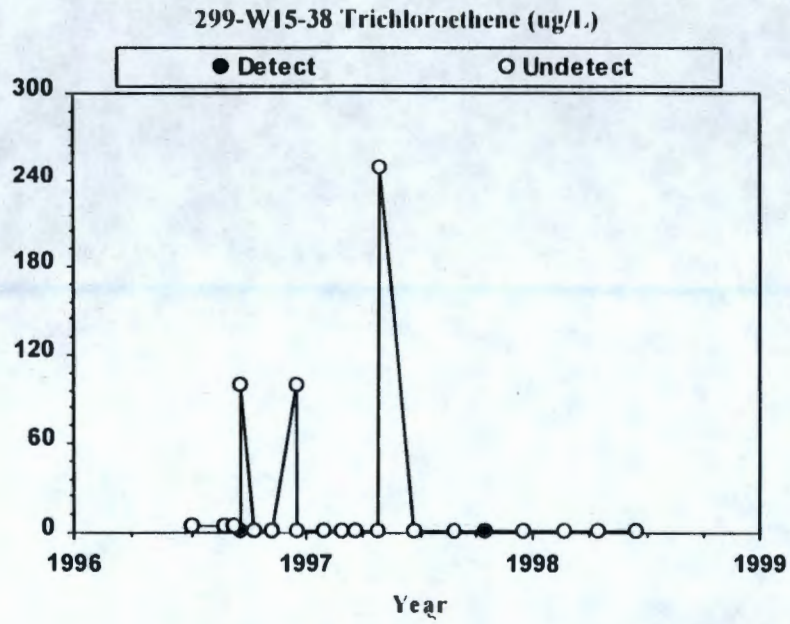

299-W15-24 Trichloroethene (ug/L)
Detect
Undetect
10
8
6
4
2
0
1990
1992
1994
1996
1998
Year

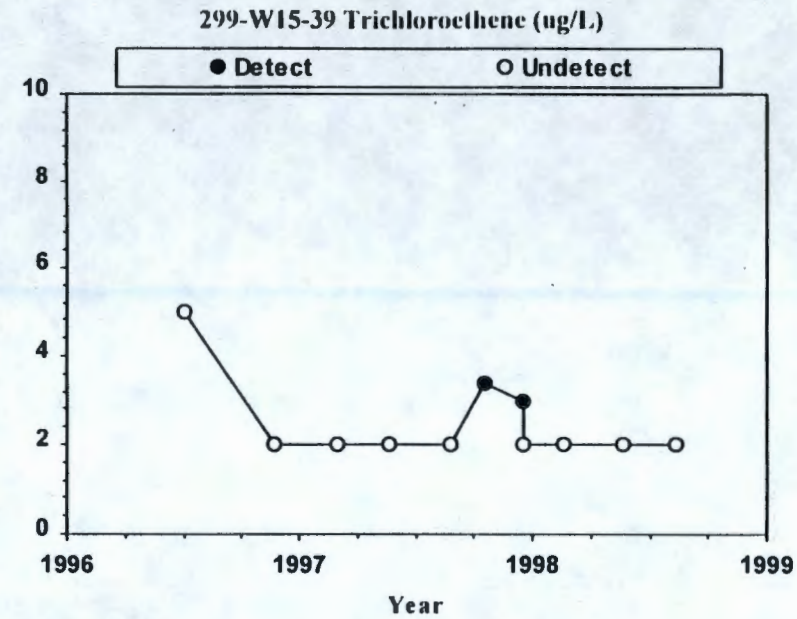

299-W15-25 Trichloroethene (ug/L)
Detect
Undetect
10
8
6
4
2
0
1996
1997
1998
Year

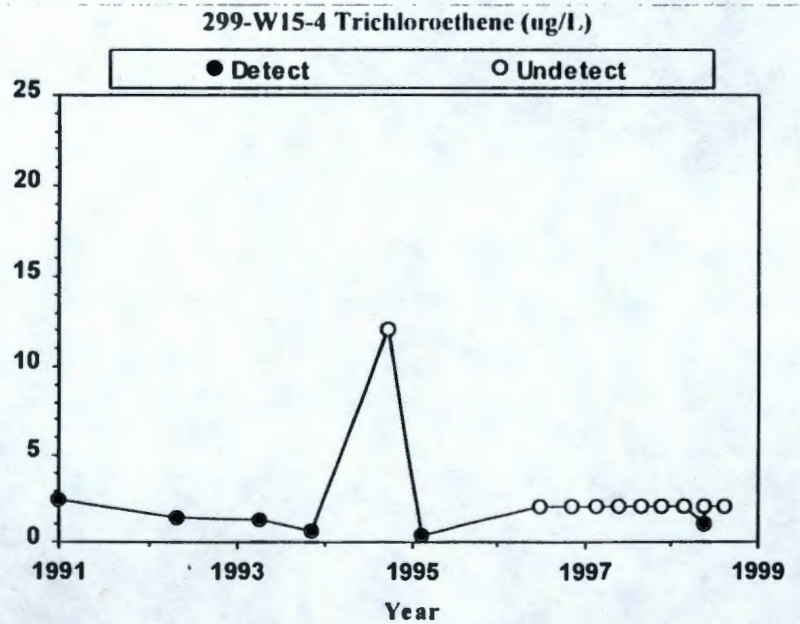

299-W15-30 Trichloroethene (ug/L)
Detect
Undetect
25
20
15
10
5
0
1995
1996
1997
1998
Year

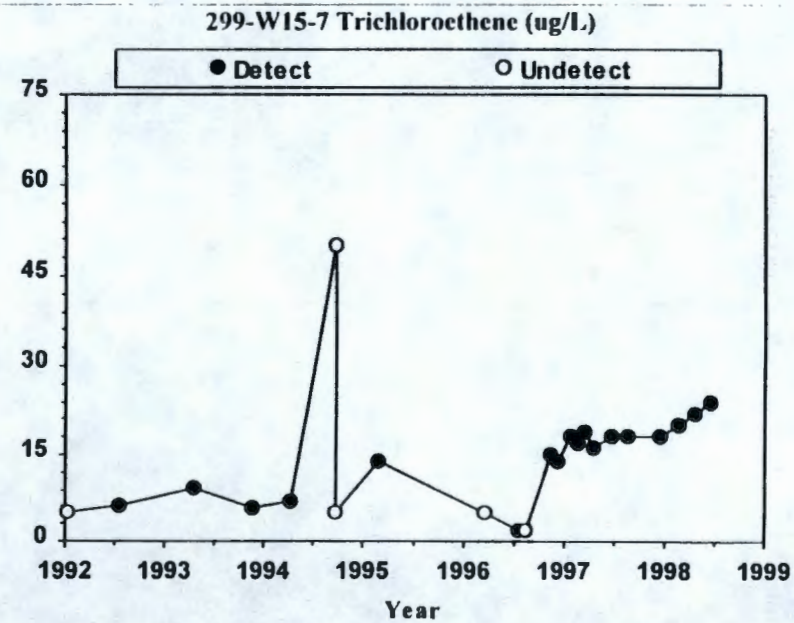

299-W15-31A Trichloroethene (ug/L)
Detect
Undetect
550
440
330
220
110
0
1995
1996
1997
1998
1999
Year

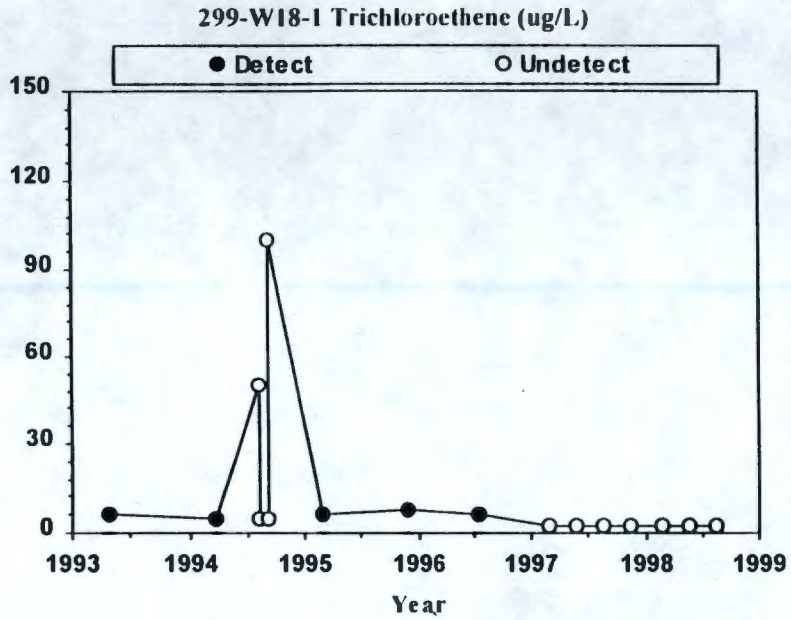

299-W15-32 Trichloroethene (ug/L)
Detect
Undetect
5
4
3
2
1
0
1995
1996
1997
1998
1999
Year

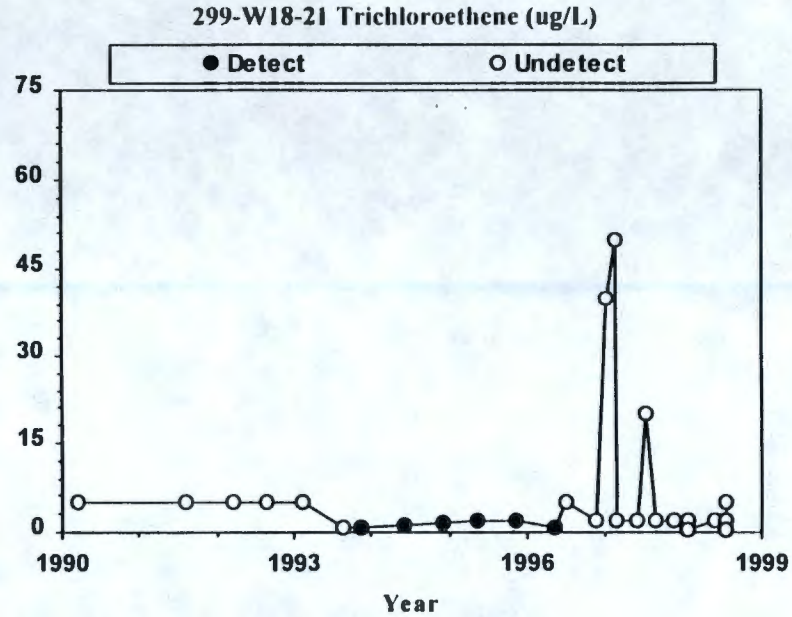

299-W15-38 Trichloroethene (ug/L)
● Detect
O Undetect
300
240
180
120
60
0
1996
1997
1998
1999
Year

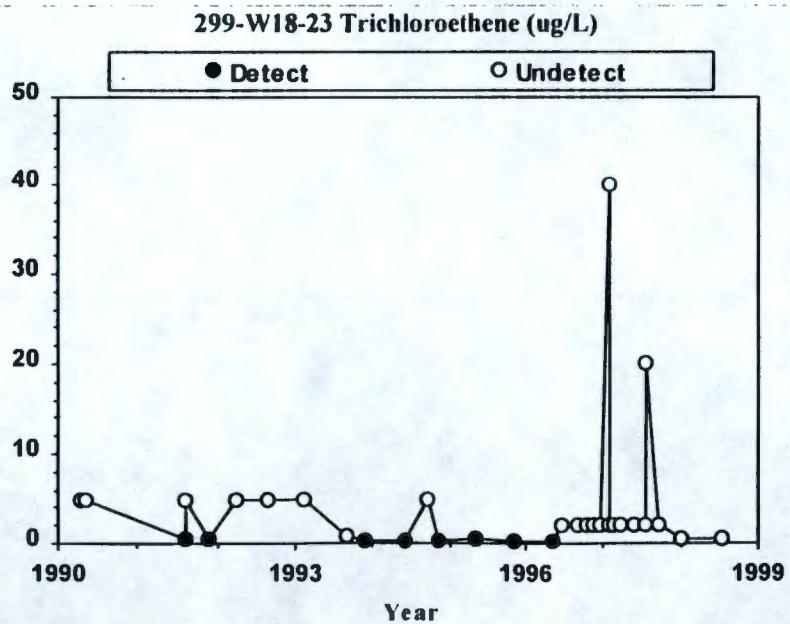

299-W15-39 Trichloroethene (ug/L)
● Detect
O Undetect
10
8
6
4
2
0
1996
1997
1998
1999
Year

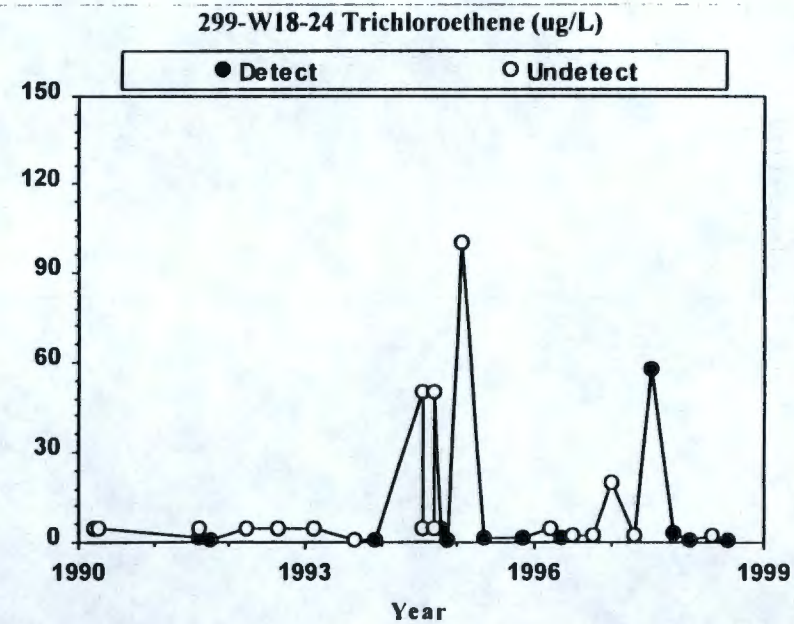

299-W15-4 Trichloroethene (ug/L)
● Detect
O Undetect
25
20
15
10
5
0
1991
1993
1995
1997
1999
Year

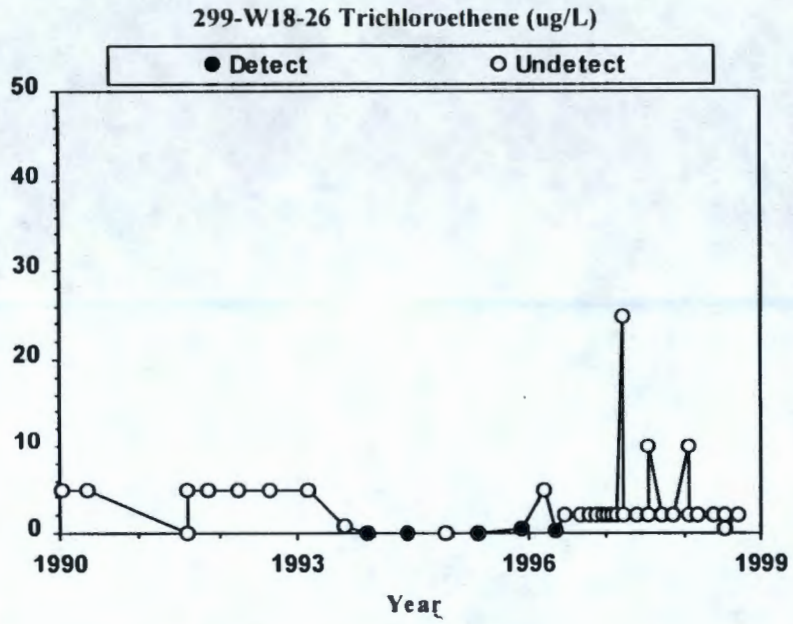

299-W15-7 Trichloroethene (ug/L)
● Detect
O Undetect
75
60
45
30
15
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

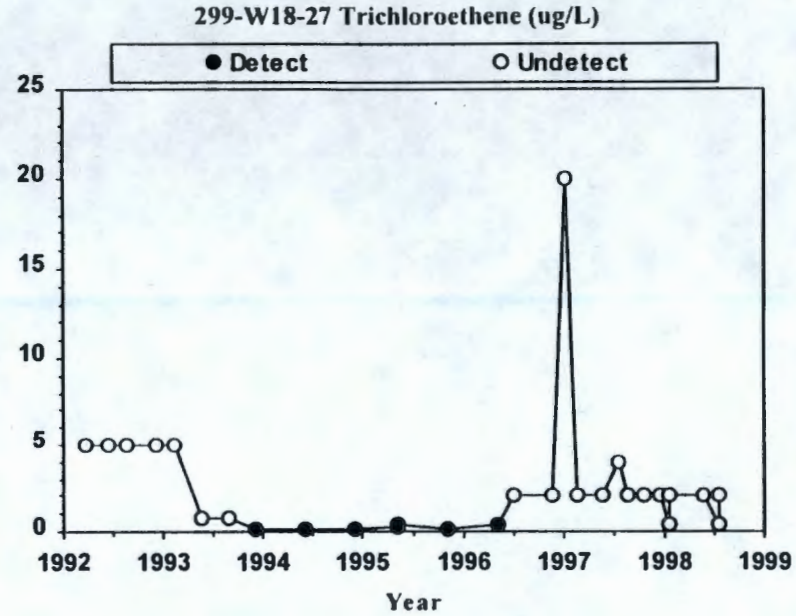

299-W18-1 Trichloroethene (ug/L)
Detect
Undetect
150
120
90
60
30
0
1993
1994
1995
1996
1997
1998
1999
Year

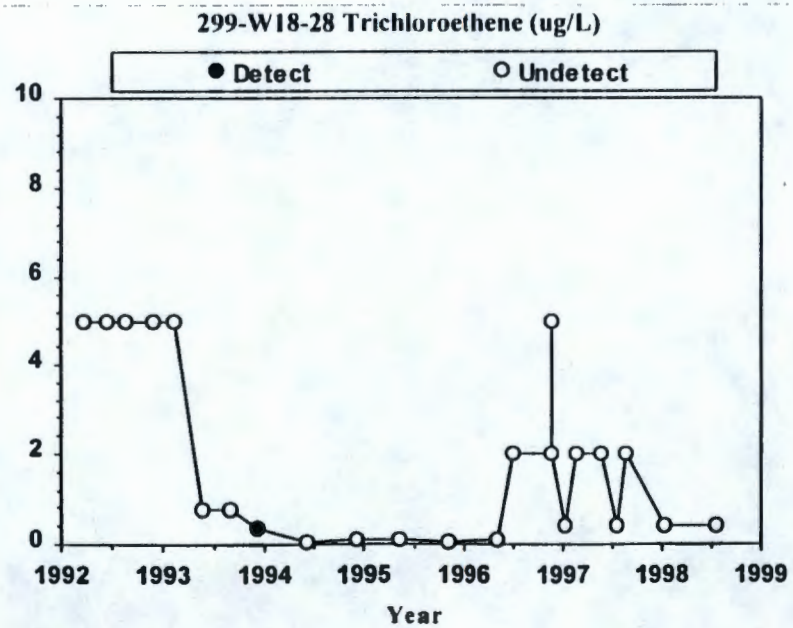

299-W18-21 Trichloroethene (ug/L)
Detect
Undetect
75
60
45
30
15
0
1990
1993
1996
1999
Year

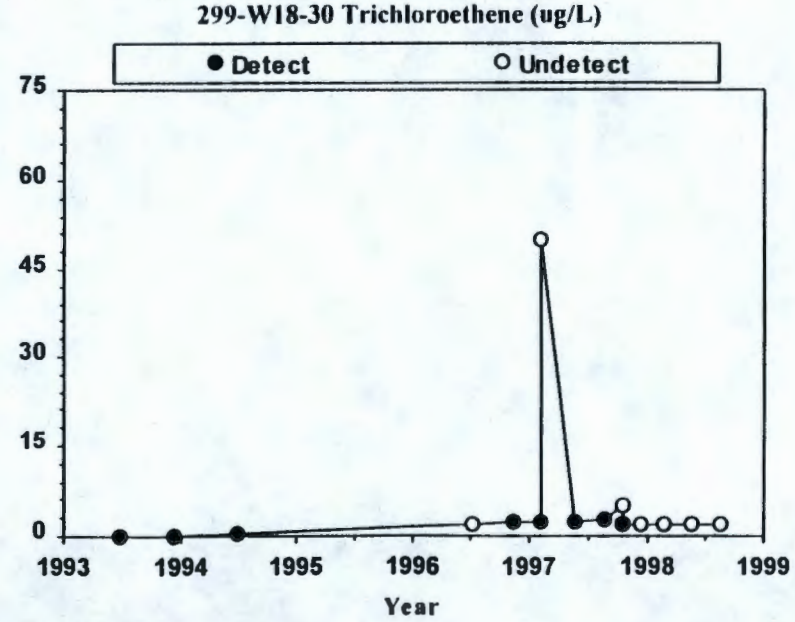

299-W18-23 Trichloroethene (ug/L)
Detect
Undetect
50
40
30
20
10
0
1990
1993
1996
1999
Year

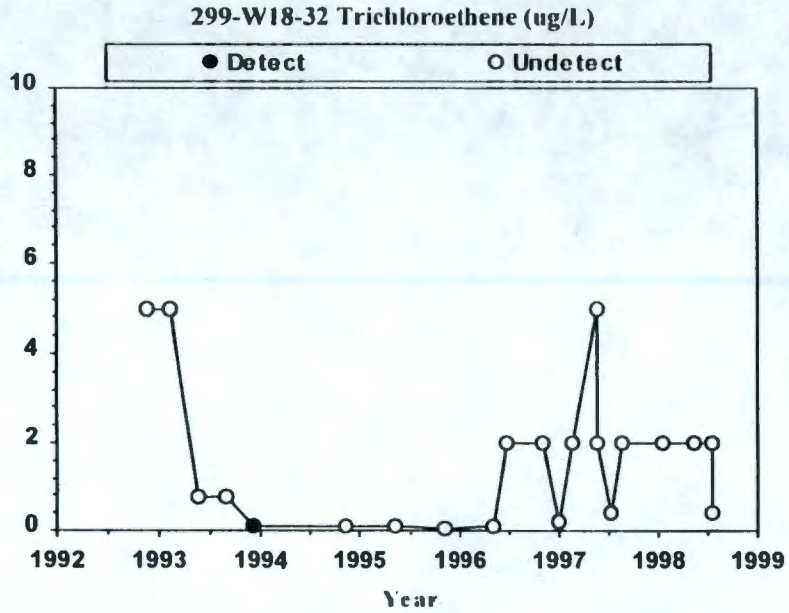

299-W18-24 Trichloroethene (ug/L)
Detect
Undetect
150
120
90
60
30
0
1990
1993
1996
1999
Year

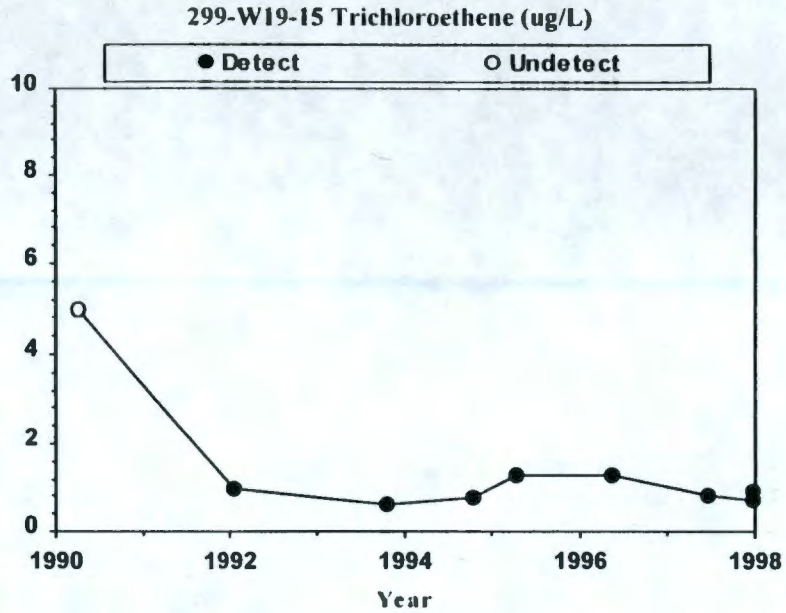

299-W18-26 Trichloroethene (ug/L)
● Detect
O Undetect
50
40
30
20
10
0
1990
1993
1996
1999
Year

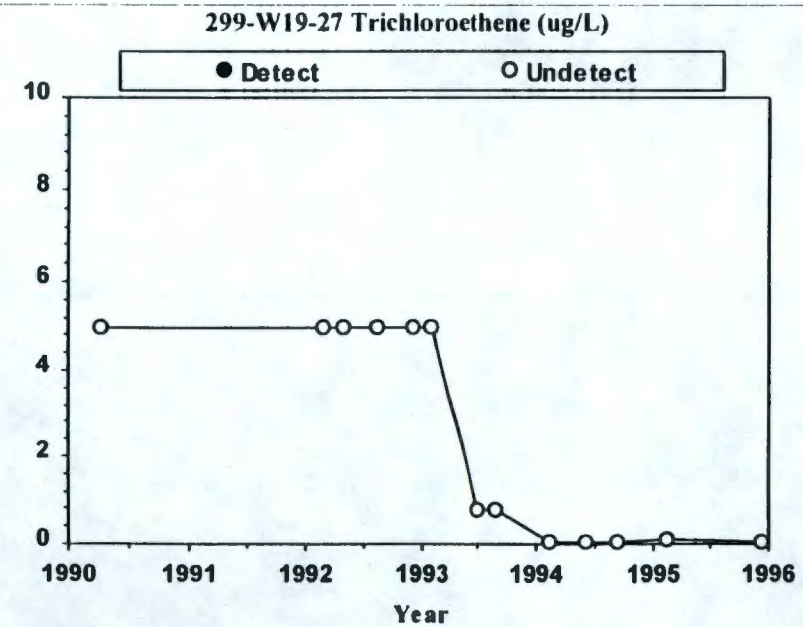

299-W18-27 Trichloroethene (ug/L)
● Detect
O Undetect
25
20
15
10
5
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

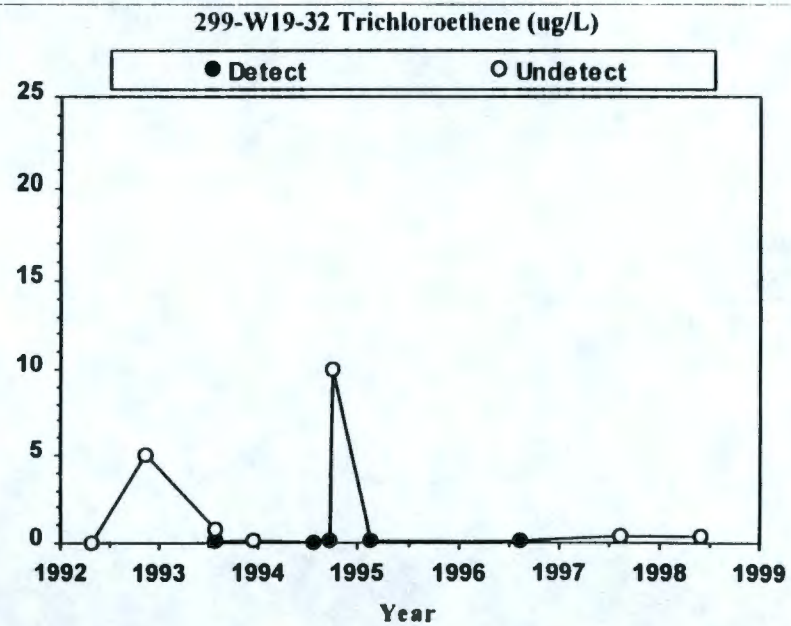

299-W18-28 Trichloroethene (ug/L)
● Detect
O Undetect
10
8
6
4
2
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

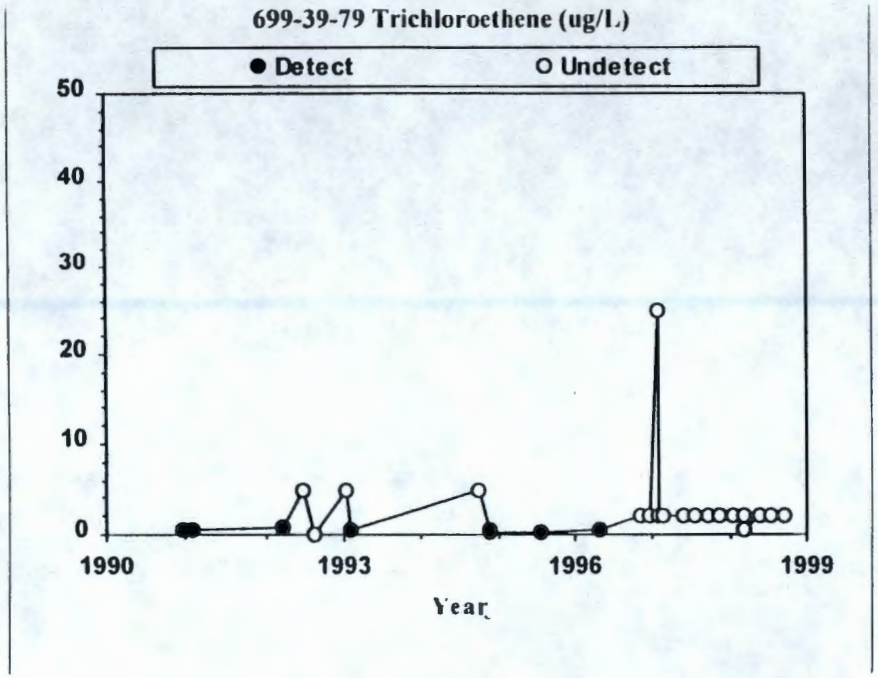

299-W18-30 Trichloroethene (ug/L)
● Detect
O Undetect
75
60
45
30
15
0
1993
1994
1995
1996
1997
1998
1999
Year

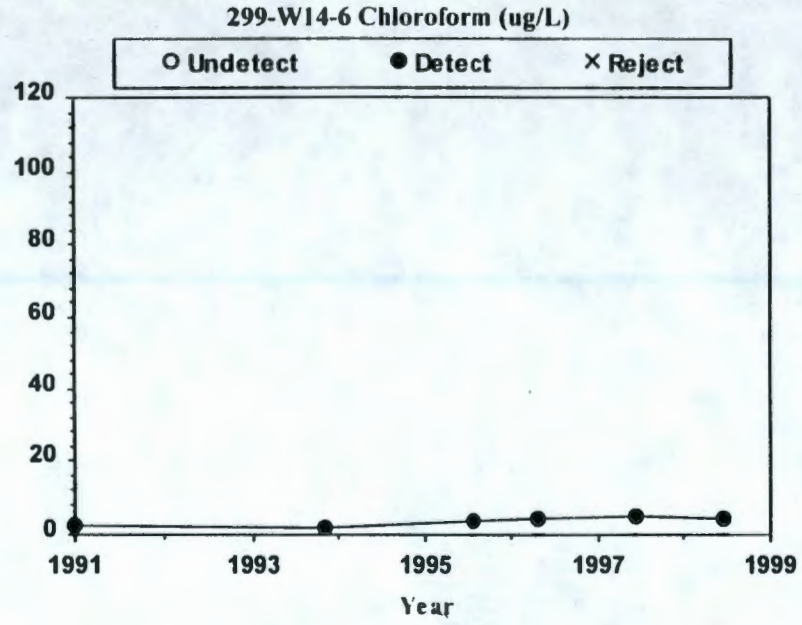

299-W18-32 Trichloroethene (ug/L)
Detect
Undetect
10
8
6
4
2
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

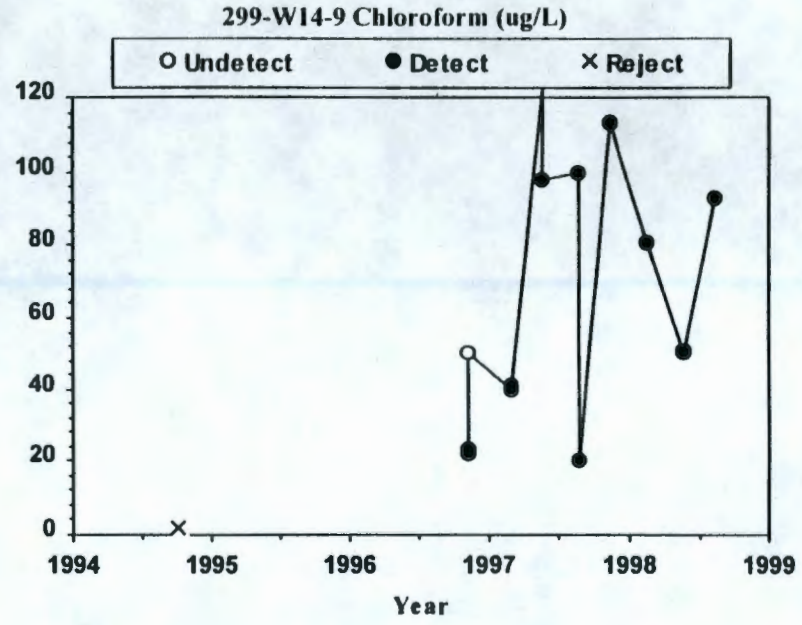

299-W19-15 Trichloroethene (ug/L)
Detect
Undetect
10
8
6
4
2
0
1990
1992
1994
1996
1998
Year

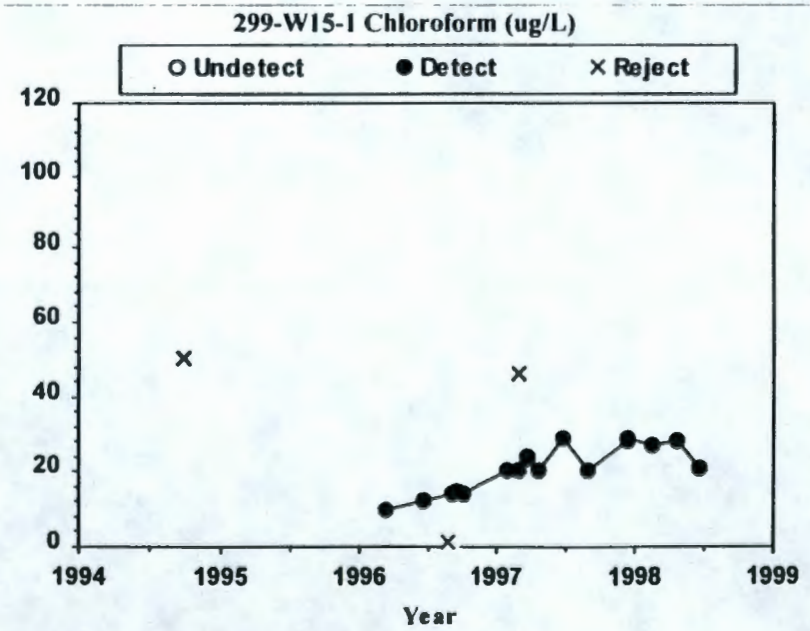

299-W19-27 Trichloroethene (ug/L)
Detect
Undetect
10
8
6
4
2
0
1990
1991
1992
1993
1994
1995
1996
Year

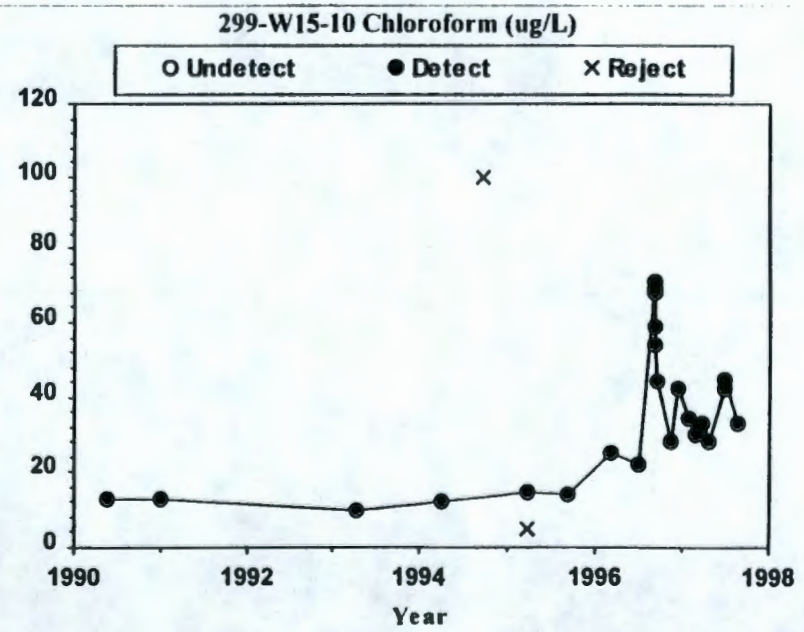

299-W19-32 Trichloroethene (ug/L)
Detect
Undetect
25
20
15
10
5
0
1992
1993
1994
1995
1996
1997
1998
1999
Year

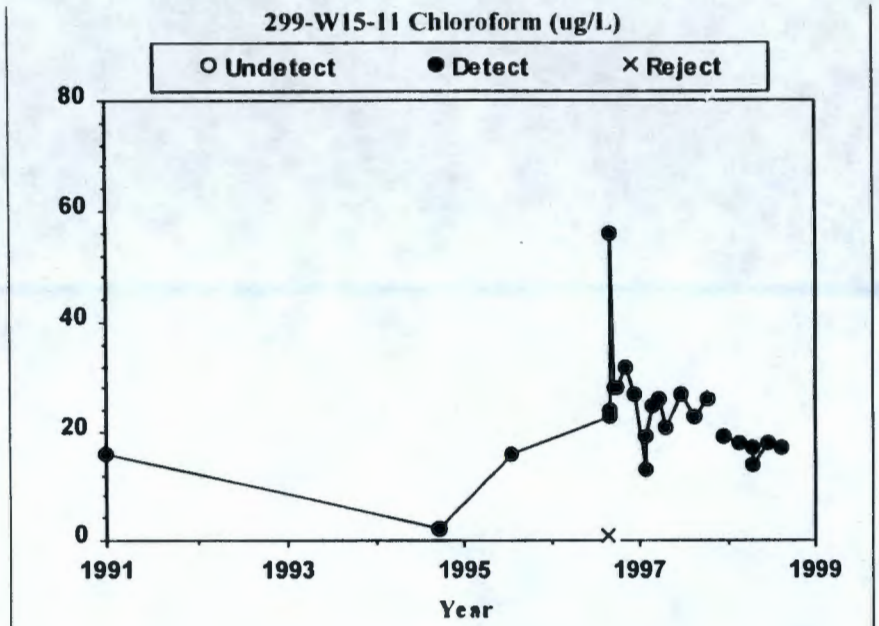

699-39-79 Trichloroethene (ug/L)
Detect
Undetect
50
40
30
20
10
0
1990
1993
1996
1999
Year

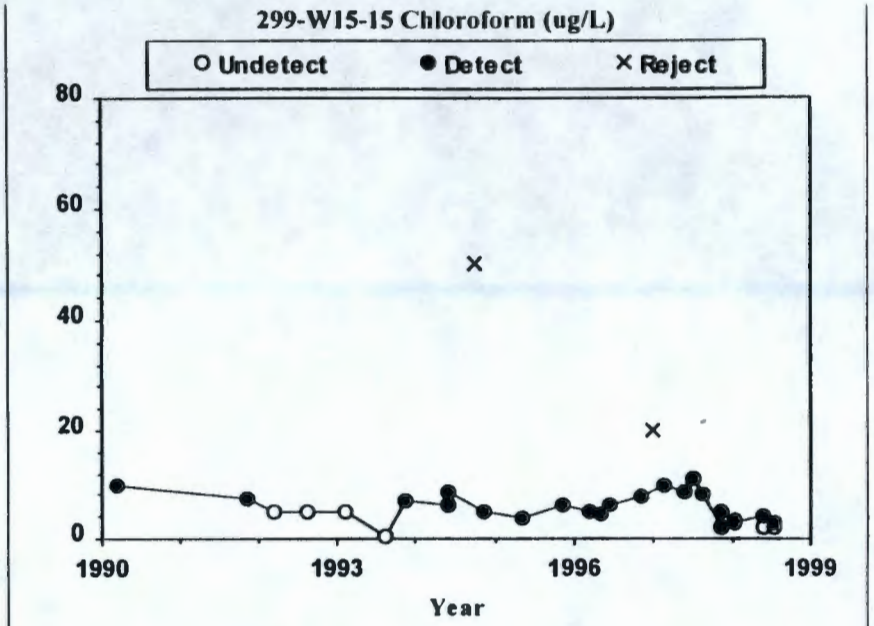

299-W14-6 Chloroform (ug/L)
O Undetect
● Detect
× Reject
120
100
80
60
40
20
0
1991
1993
1995
1997
1999
Year

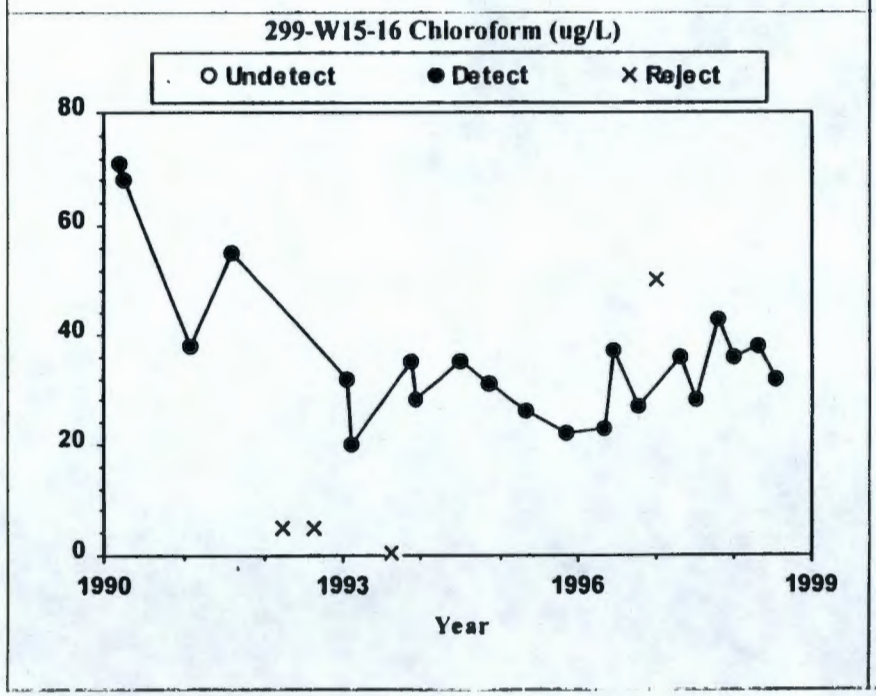

299-W14-9 Chloroform (ug/L)
O Undetect
● Detect
× Reject
120
100
80
60
40
20
0
1994
1995
1996
1997
1998
1999
Year

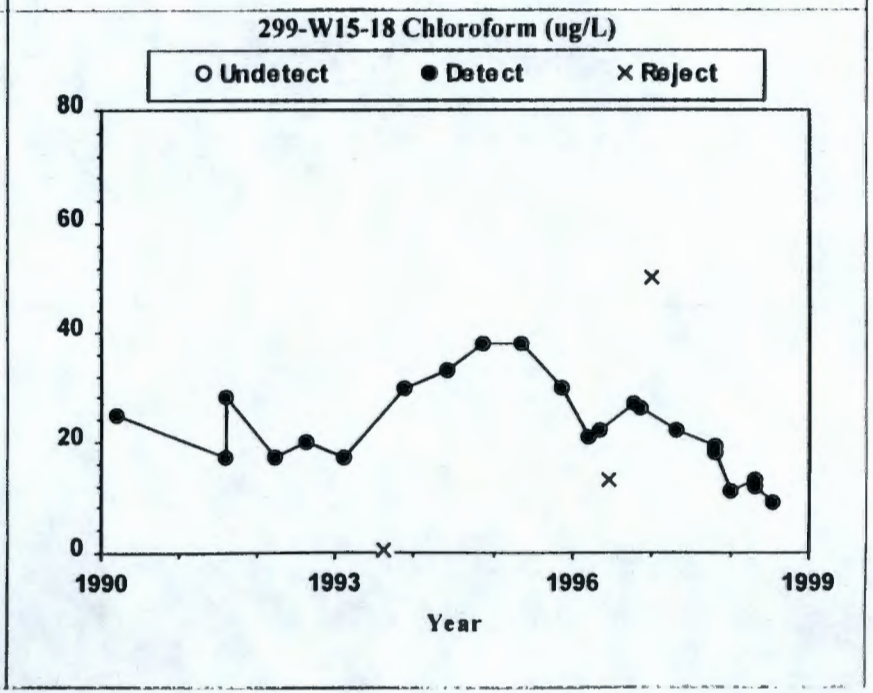

299-W15-1 Chloroform (ug/L)
O Undetect
● Detect
× Reject
120
100
80
60
40
20
0
1994
1995
1996
1997
1998
1999
Year

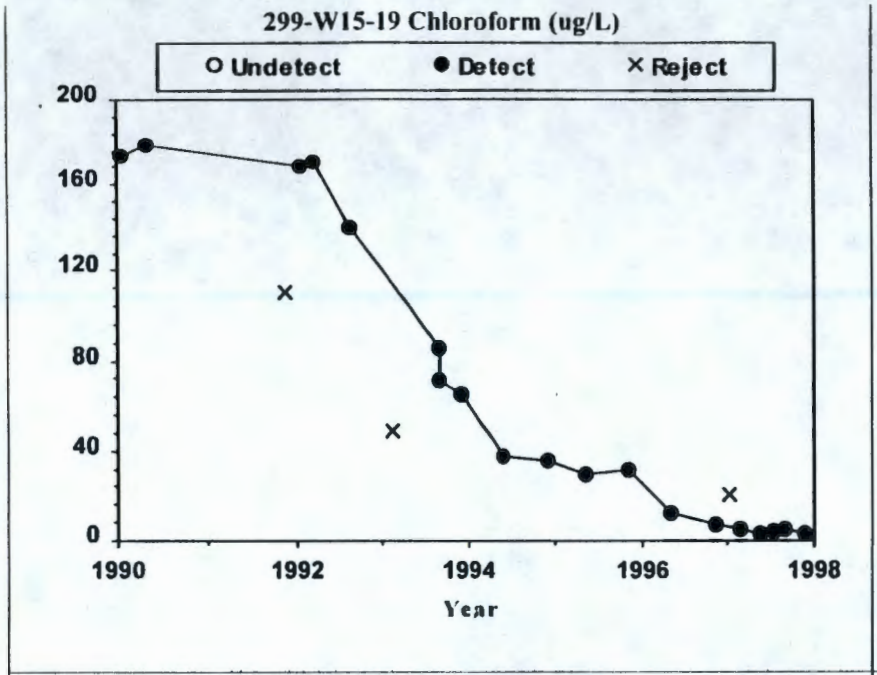

299-W15-10 Chloroform (ug/L)
O Undetect
● Detect
× Reject
120
100
80
60
40
20
0
1990
1992
1994
1996
1998
Year

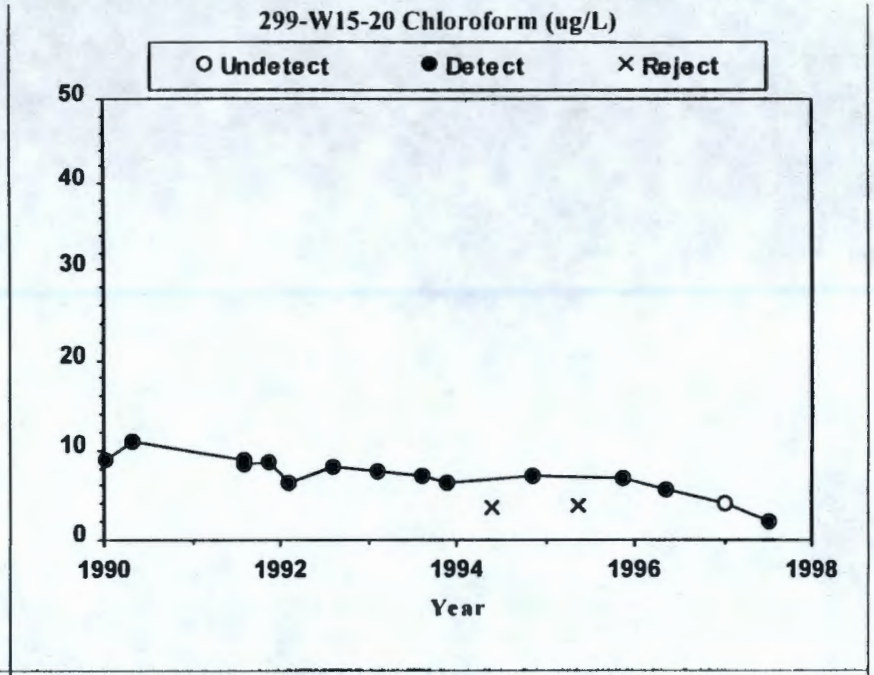

299-W15-11 Chloroform (ug/L)
O Undetect
● Detect
× Reject
80
60
40
20
0
1991
1993
1995
1997
1999
Year

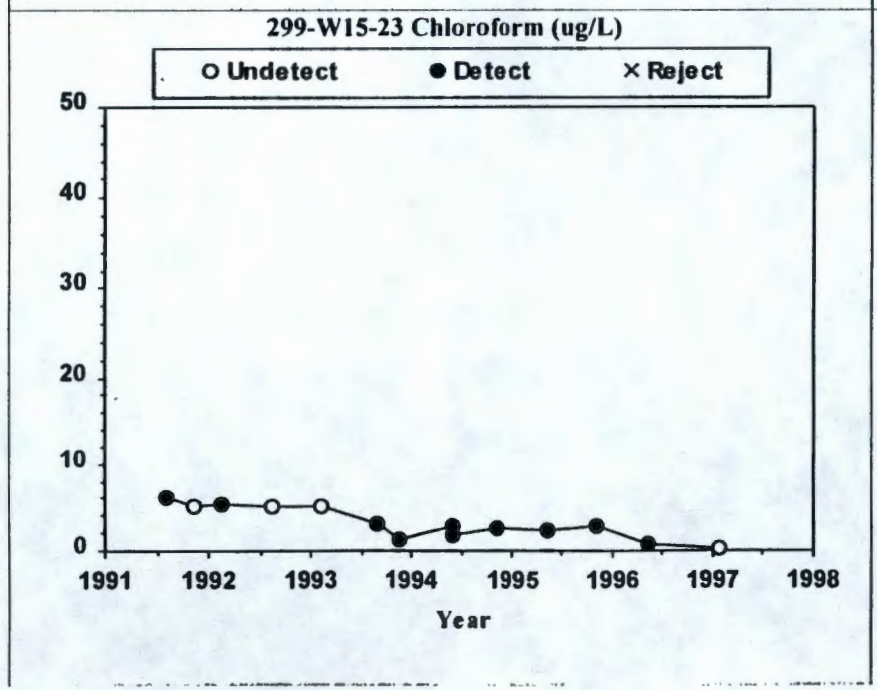

299-W15-15 Chloroform (ug/L)
O Undetect
● Detect
× Reject
80
60
40
20
0
1990
1993
1996
1999
Year

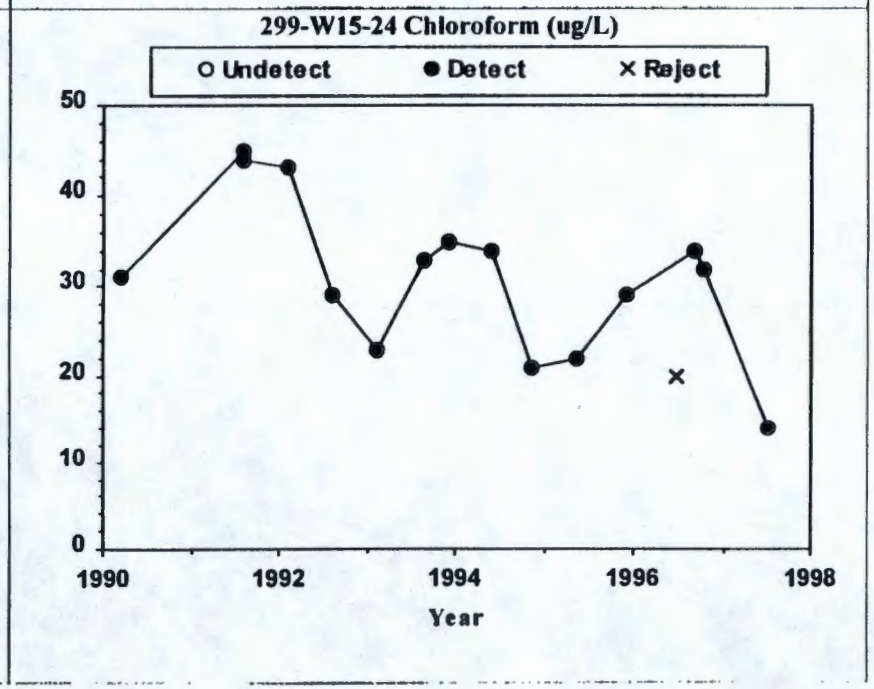

299-W15-16 Chloroform (ug/L)
O Undetect
● Detect
× Reject
80
60
40
20
0
1990
1993
1996
1999
Year

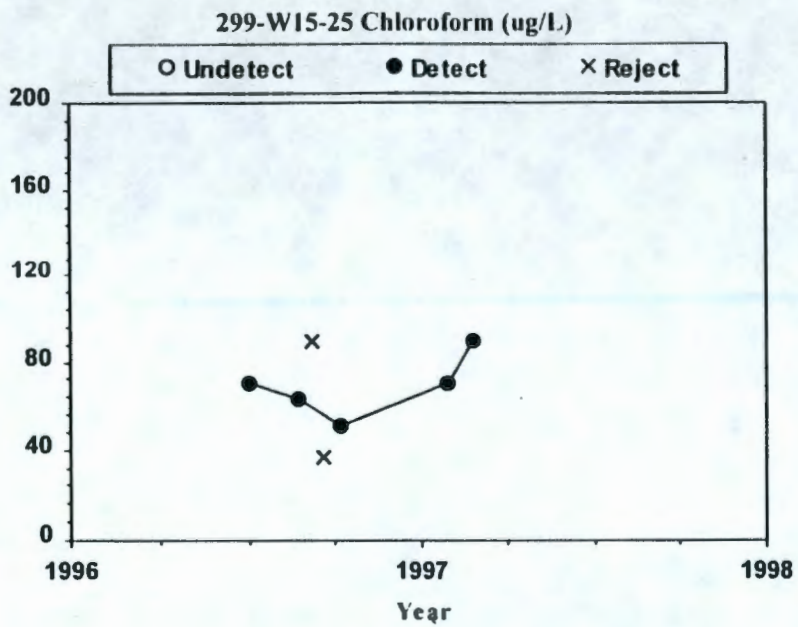

299-W15-18 Chloroform (ug/L)
O Undetect
● Detect
× Reject
80
60
40
20
0
1990
1993
1996
1999
Year

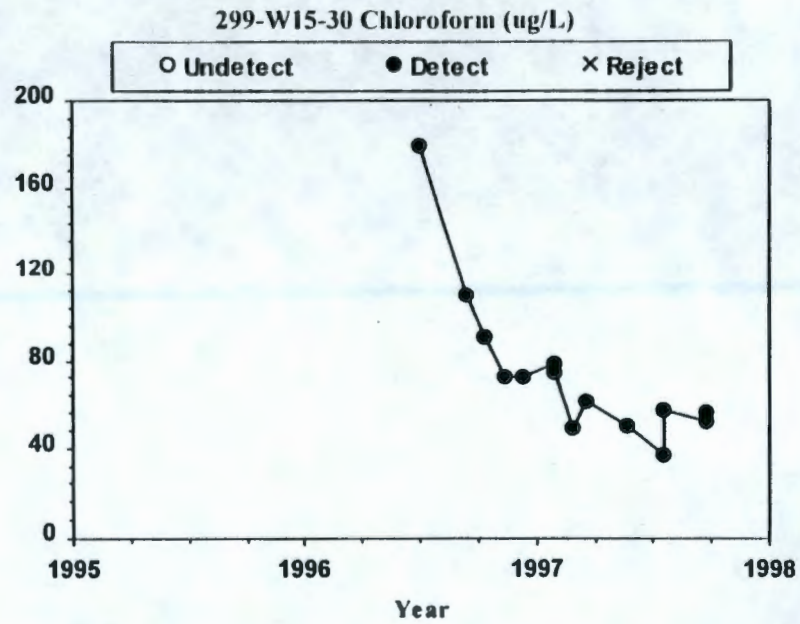

299-W15-19 Chloroform (ug/L)
O Undetect
● Detect
× Reject
200
160
120
80
40
0
1990
1992
1994
1996
1998
Year

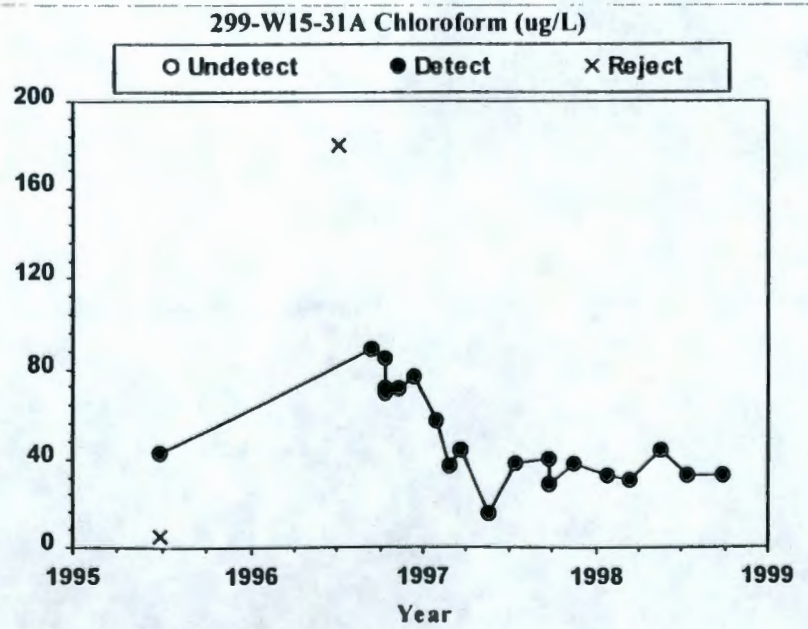

299-W15-20 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
10
0
1990
1992
1994
1996
1998
Year

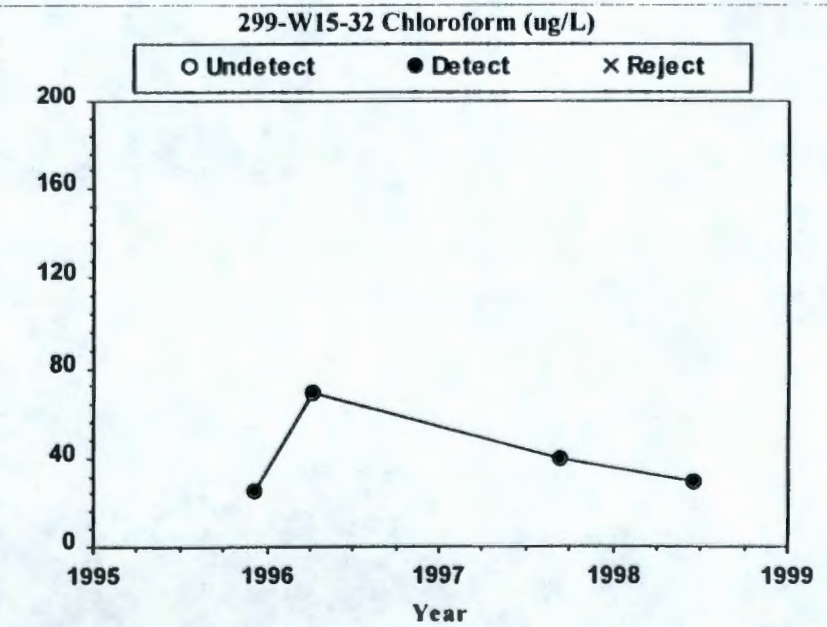

299-W15-23 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
10
0
1991
1992
1993
1994
1995
1996
1997
1998
Year

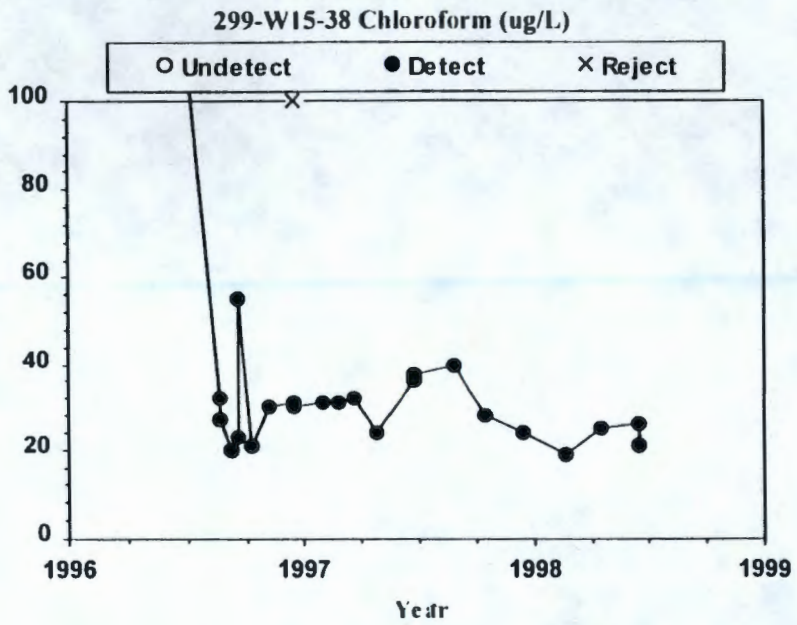

299-W15-24 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
10
0
1990
1992
1994
1996
1998
Year

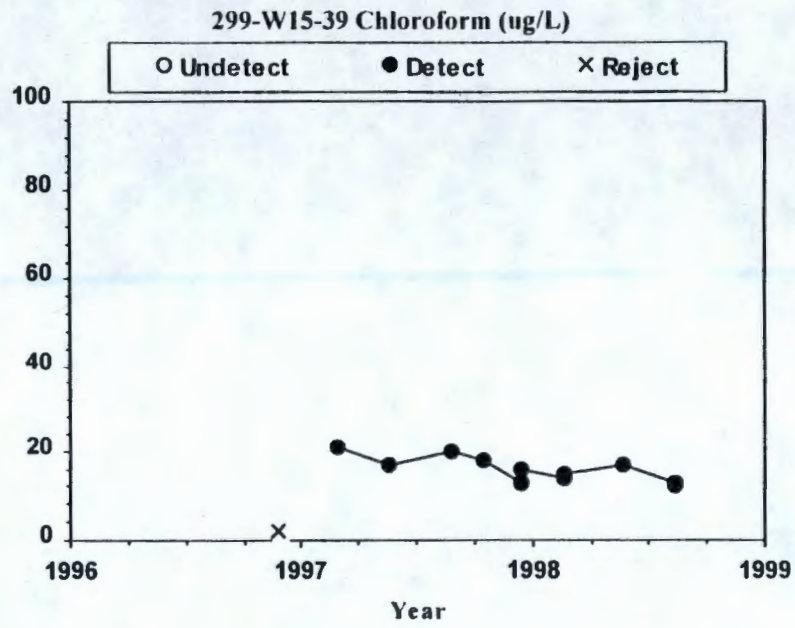

299-W15-25 Chloroform (ug/L)
O Undetect
● Detect
× Reject
200
160
120
80
40
0
1996
1997
1998
Year

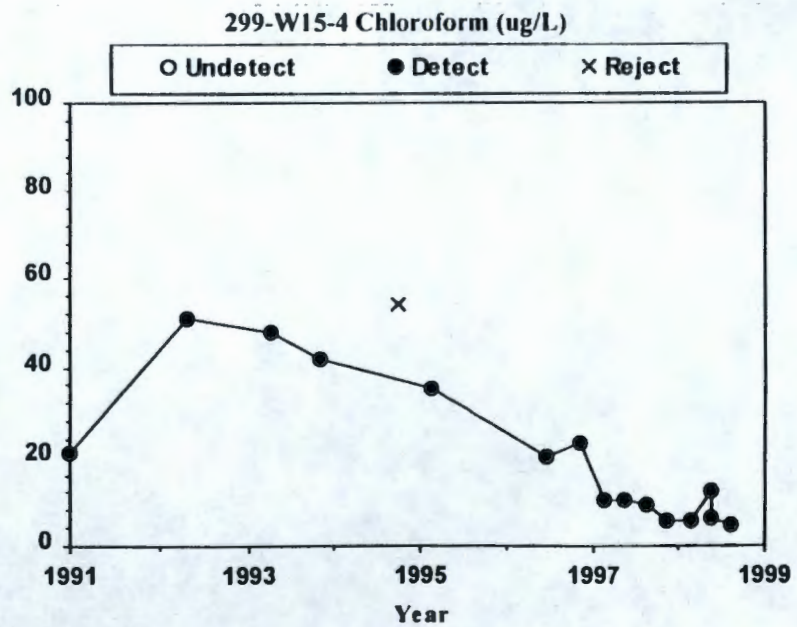

299-W15-30 Chloroform (ug/L)
O Undetect
● Detect
× Reject
200
160
120
80
40
0
1995
1996
1997
1998
Year

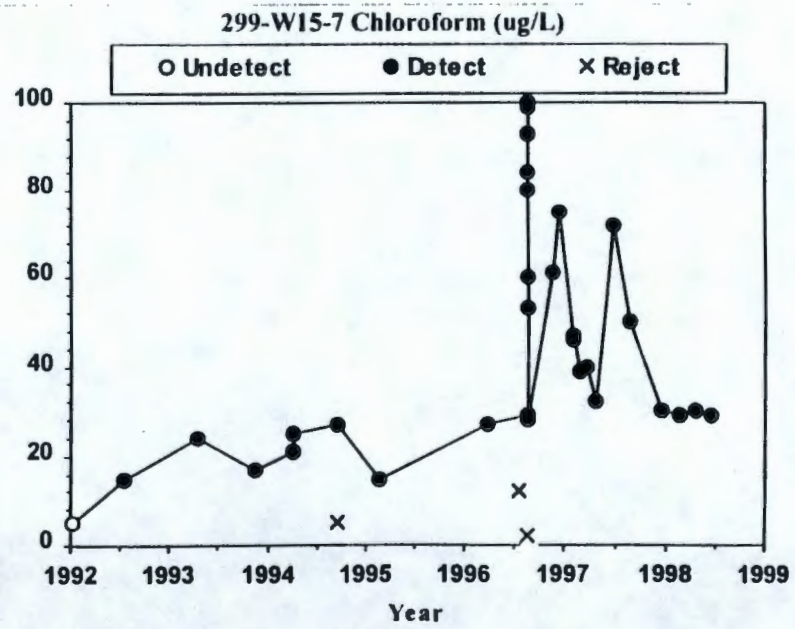

299-W15-31A Chloroform (ug/L)
O Undetect
● Detect
× Reject
200
160
120
80
40
0
1995
1996
1997
1998
1999
Year


299-W15-32 Chloroform (ug/L)
O Undetect
● Detect
× Reject
200
160
120
80
40
0
1995
1996
1997
1998
1999
Year


299-W15-38 Chloroform (ug/L)
O Undetect
● Detect
× Reject
100
80
60
40
20
0
1996
1997
1998
1999
Year


299-W15-39 Chloroform (ug/L)
O Undetect
● Detect
× Reject
100
80
60
40
20
0
1996
1997
1998
1999
Year


299-W15-4 Chloroform (ug/L)
O Undetect
● Detect
× Reject
100
80
60
40
20
0
1991
1993
1995
1997
1999
Year


299-W15-7 Chloroform (ug/L)
O Undetect
● Detect
× Reject
100
80
60
40
20
0
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1993
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1995
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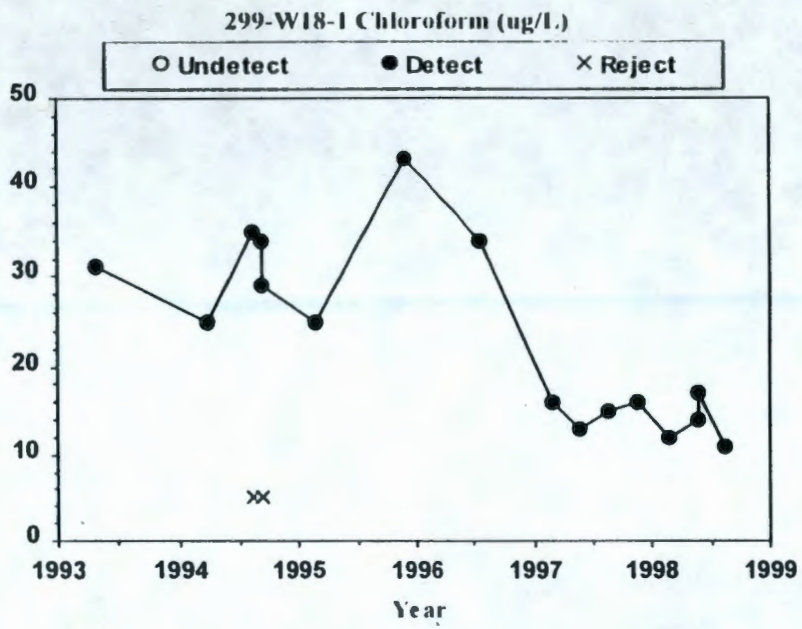
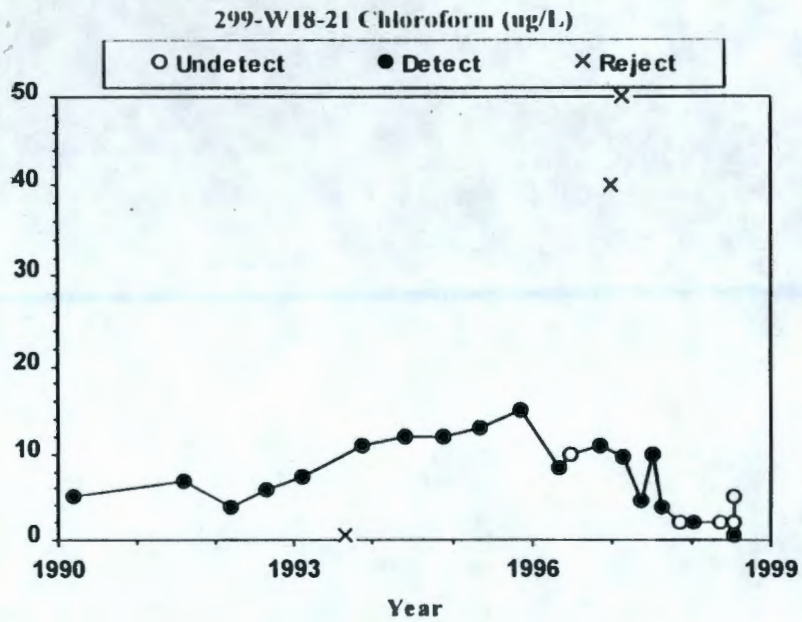
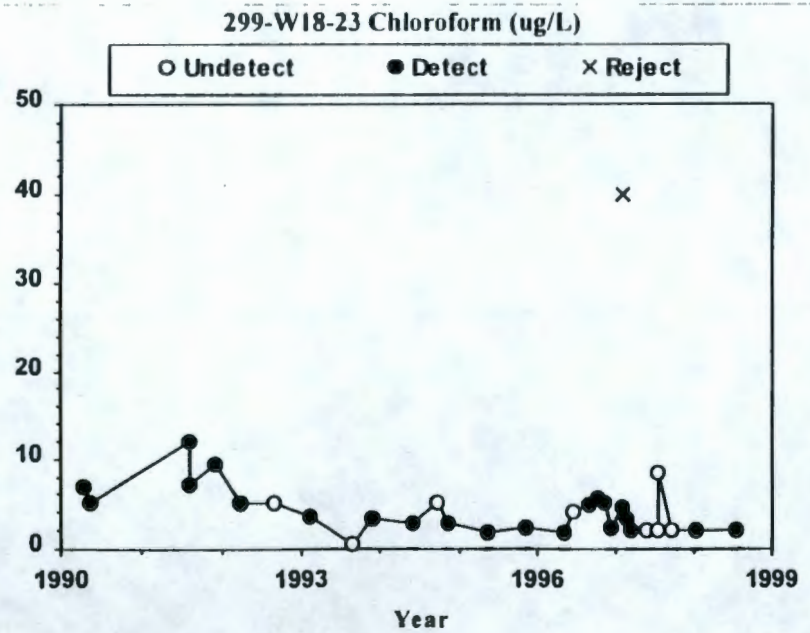
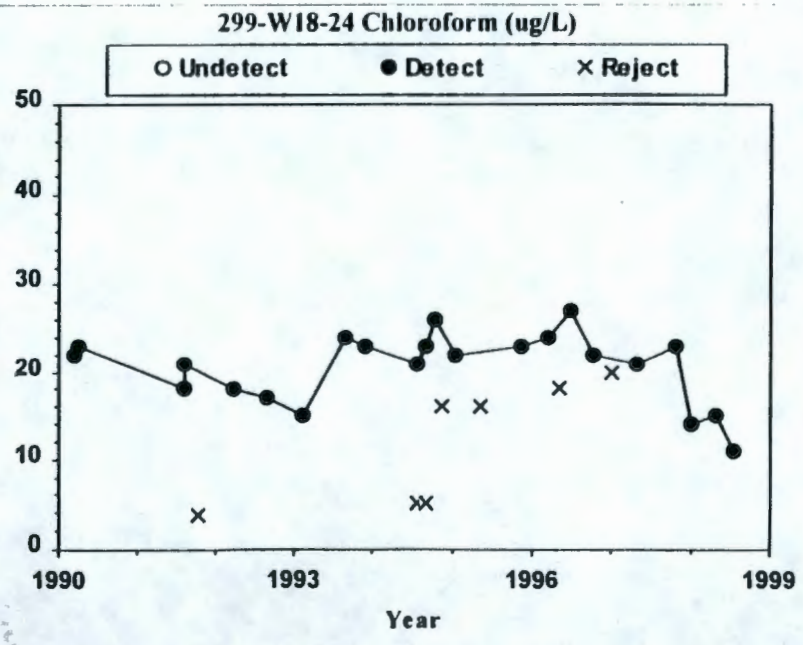
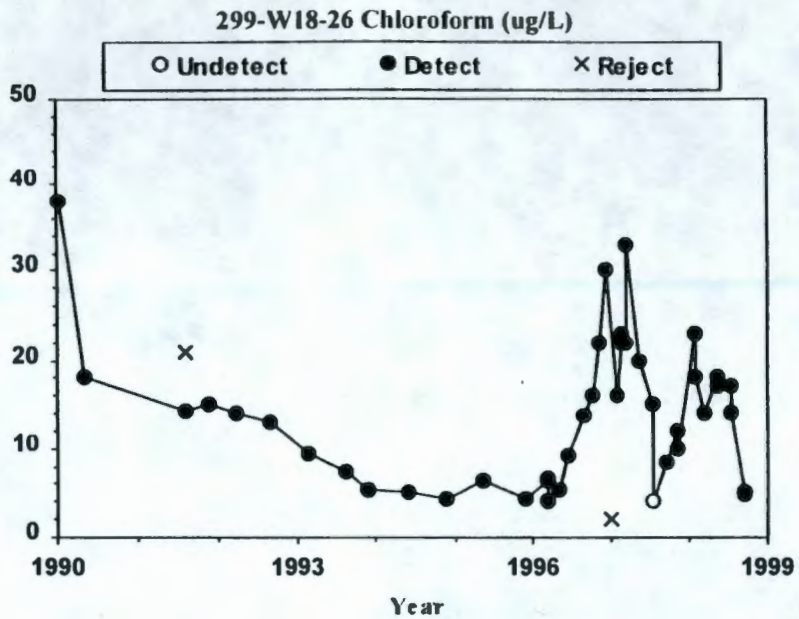
1997
1998
1999
Year

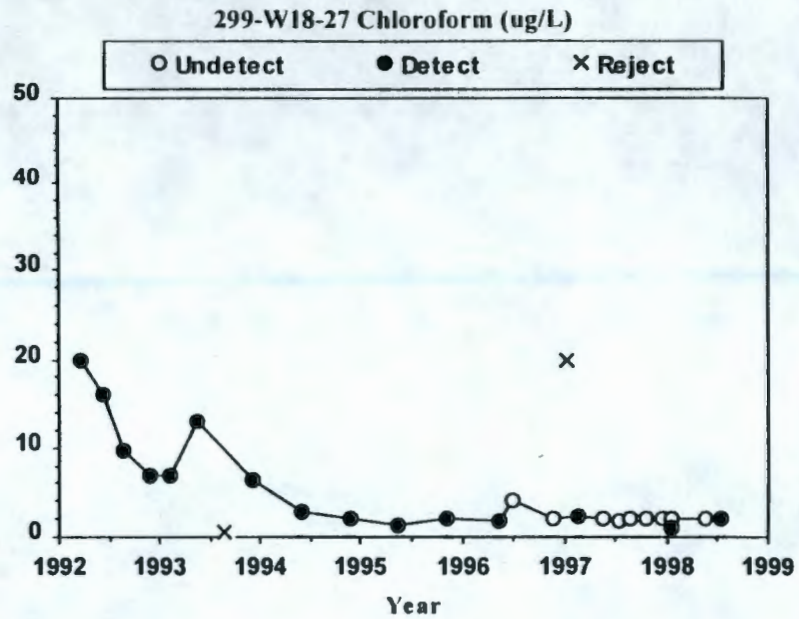

299-W18-1 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
10
0
1993
1994
1995
1996
1997
1998
1999
Year


299-W18-21 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
10
0
1990
1993
1996
1999
Year


299-W18-23 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
10
0
1990
1993
1996
1999
Year


299-W18-24 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
10
0
1990
1993
1996
1999
Year


299-W18-26 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
10
0
1990
1993
1996
1999
Year


299-W18-27 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
40
30
20
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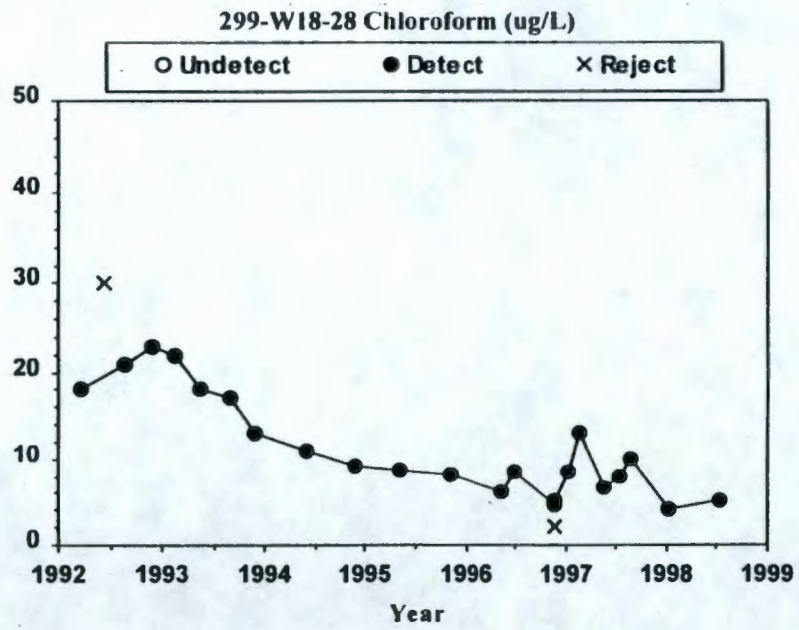
0
1992
1993
1994
1995
1996
1997
1998
1999
Year


299-W18-28 Chloroform (ug/L)
O Undetect
● Detect
× Reject
50
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30
20
10
0
1992
1993
1994
1995
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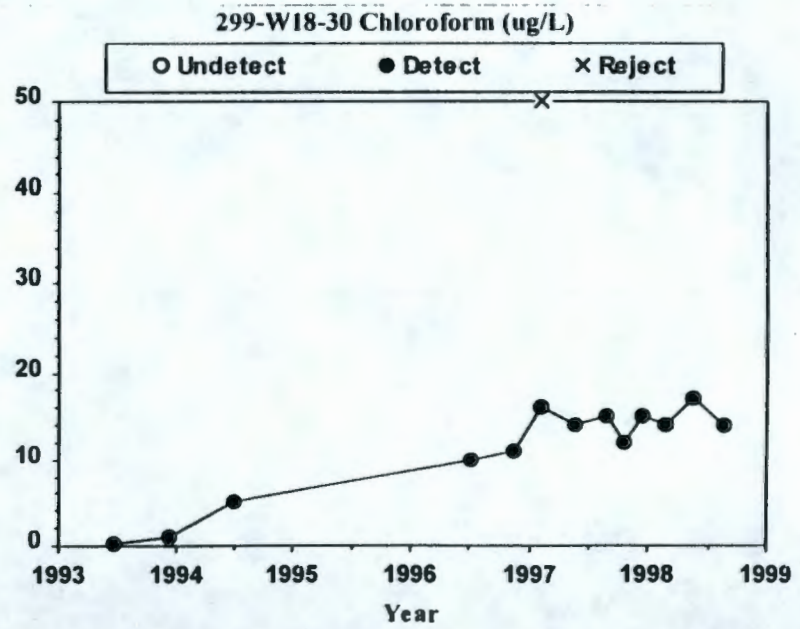
1997
1998
1999
Year


299-W18-30 Chloroform (ug/L)
O Undetect
● Detect
× Reject
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40
30
20
10
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1993
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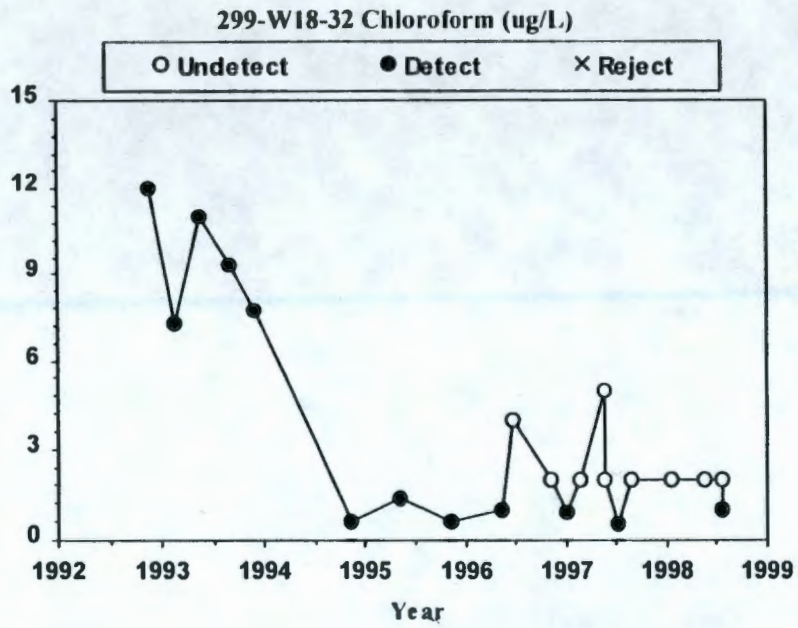
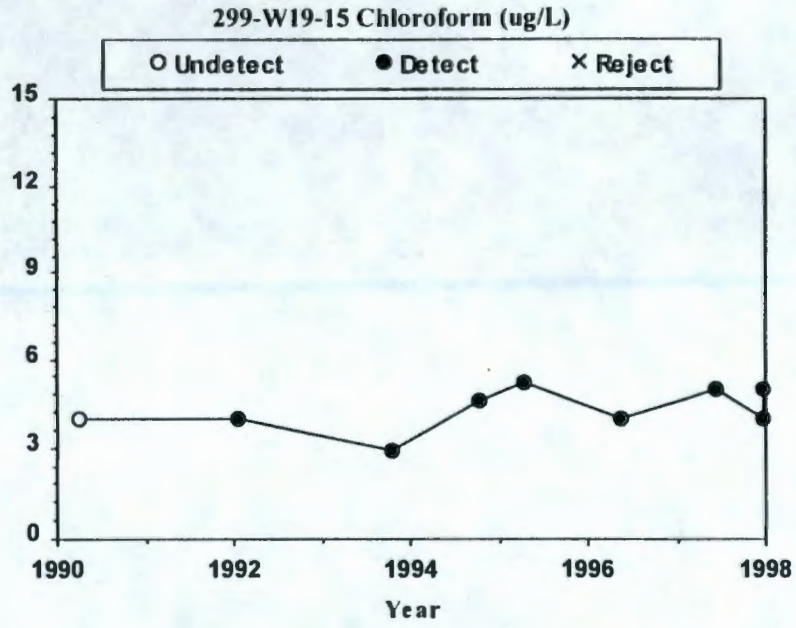
1997
1998
1999
Year


299-W18-32 Chloroform (ug/L)
O Undetect
● Detect
× Reject
15
12
9
6
3
0
1992
1993
1994
1995
1996
1997
1998
1999
Year


299-W19-15 Chloroform (ug/L)
O Undetect
● Detect
× Reject
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12
9
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3
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1990
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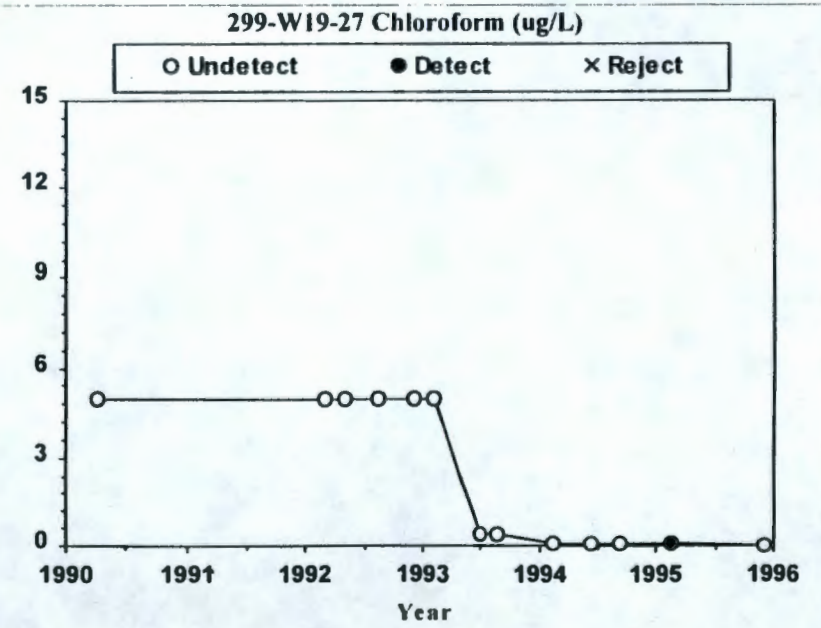
1994
1996
1998
Year


299-W19-27 Chloroform (ug/L)
O Undetect
● Detect
× Reject
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12
9
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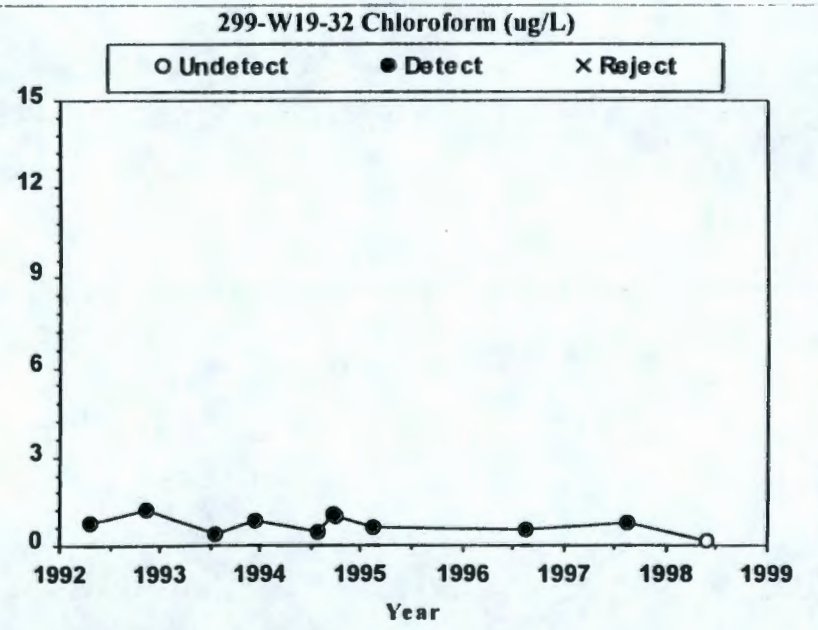
Year


299-W19-32 Chloroform (ug/L)
O Undetect
● Detect
× Reject
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3
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1994
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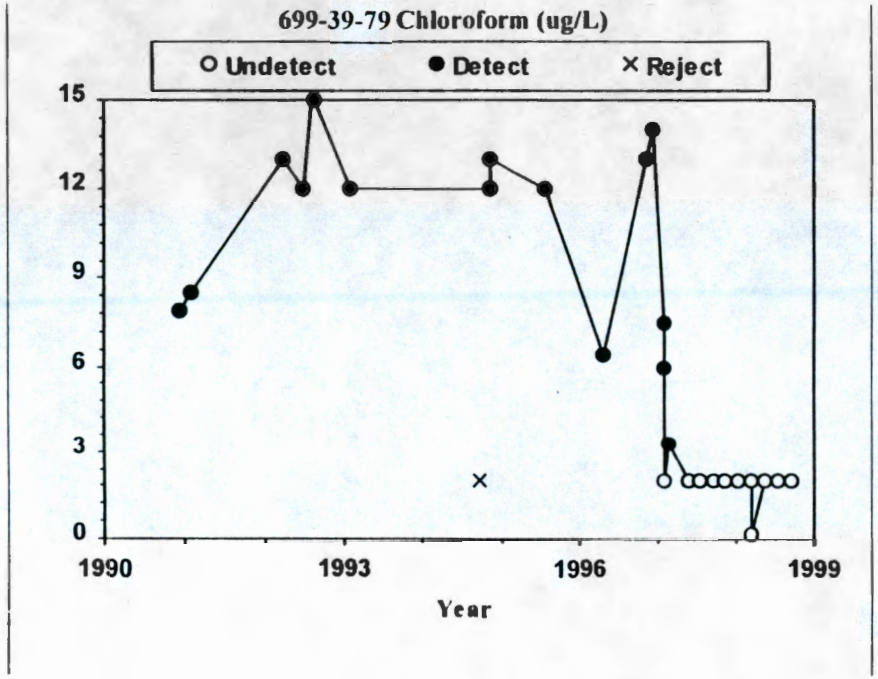
1998
1999
Year

065171


699-39-79 Chloroform (ug/L)
Undetect
Detect
Reject
15
12
9
6
3
0
1990
1993
1996
1999
Year

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