BWX Technologies, Inc.
a McDermott company

BWXT of Ohio, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030
(937) 865-4020

01040701 - 0109250001

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June 20, 2000

00-TC-06-20
Mr. Richard B. Provencher, Director
Department of Energy
Miamisburg Environmental Management Project
P.O. Box 66
Miamisburg, OH 45343-0066

ATTENTION: Paul Lucas

SUBJECT: DE-AC24-97OH20044
Transmittal of Groundwater Monitoring Annual Report

Dear Mr. Provencher:

BWXTO is pleased to submit an annual report on the Quarterly Groundwater Monitoring. This is the second of the series of annual reports and covers CY 1999.

This is not an FFA milestone and no formal regulatory review is required. If any comments are received, then BWO will keep them on file and incorporate responses by modifying the next annual report.

If you have any questions regarding this report, please do not hesitate to contact Mark Gilliat at (937) 865-4407.

Sincerely,

John B. Price
Project Manager, Soils Project

/lkl

cc: DCC w/o attachment
DOE/MEMP (2)
M. Gilliat, BWXTO
A. Kleinrath, MEMP w/o attachment
D. Rakel, BWXTO
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ANNUAL GROUNDWATER MONITORING REPORT
CALENDAR YEAR 1999

MOUND PLANT
MIAMISBURG, OHIO

MAY, 2000

DRAFT

Department of Energy
Ohio Field Office

Prepared by the Soils Project of
BWXT OF OHIO

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ABBREVIATIONS AND ACRONYMS

BVA	Buried Valley Aquifer
DOE	Department of Energy
EPA	Environmental Protection Agency
MCL	Maximum Contaminant Level
MEIMS	Mound Environmental Information Management System
MEMP	Mound Environmental Management Project
OU1	Operable Unit 1
PPB	Parts per Billion
PCE	Tetrachloroethene
PRS	Potential Release Site
VOC	Volatile Organic Compound
RI/FS	Remedial Investigation Feasibility Study
SM/PP	Special Metallurgical Plutonium Processing
TCE	Trichloroethene

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1.0 INTRODUCTION

The purpose of this report is to summarize the status of groundwater monitoring activities at the Miamisburg Environmental Management Project (MEMP) in Miamisburg Ohio. The Mound Facility is a Department of Energy owned, contractor-operated facility located on 306 acres within the city limits of Miamisburg. MEMP maintains an extensive network of onsite and offsite groundwater monitoring wells. Currently approximately 60 groundwater wells as well as several groundwater seeps and trenches are routinely monitored for Volatile Organic Compounds (VOCs), select metals and several radiological isotopes.

The objectives of the groundwater monitoring program are to:

- assure site workers that drinking water is safe for consumption,
- assure containment of known groundwater contamination,
- assure local residents and communities that their drinking water has not been adversely impacted by plant activities
- monitor and provide early warning of impacts due to continuing decontamination and decommissioning activities and environmental restoration efforts, and to,
- monitor the progress and effectiveness of ongoing groundwater remediation efforts

This report will focus on historic and current groundwater conditions at Mound through calendar year 1999. The report will summarize results for both VOC and metals concentrations in the current active groundwater monitoring network. Results of extensive radionuclide monitoring can be found in *"Annual Site Environmental Report for Calendar Year 1998,* ***September, 1998****"*.

2.0 HYDROGEOLOGIC SETTING

The hydrogeologic setting at and near the Mound consists of bedrock ridges and valleys in which the valleys are filled with unconsolidated glacial and alluvial deposits. To the west of the plantsite the Great Miami River cuts into a large glacially infilled valley. The glacial deposits are saturated at depth and comprise a portion of an extensive aquifer known as the Buried Valley Aquifer (BVA). The southwest portion of the Mound facility lies directly over the BVA.

The groundwater system at Mound is characterized by two interconnected flow systems; 1) the bedrock flow system and 2) the BVA flow system. Additionally, a small tributary valley separating the main hill from the SM/PP hill trends southwesterly across the plant-site. The tributary valley is a deep, relatively narrow canyon cut into bedrock that was subsequently infilled with glacial sediments. The tributary valley is saturated at depth and discharges into the main BVA on the southwest portion of the plant-site in the vicinity of the large storm water retention basin.

The bedrock flow system is comprised of thick sequences of interbedded shales and limestones that make up the topographic bedrock highs known as the Main Hill and the SM/PP Hill. The bedrock system is not capable of transmitting large quantities of water due to its very low hydraulic conductivity. Groundwater flow in the bedrock system occurs primarily within an upper fracture carapace that extends from the ground surface to a depth of approximately 50 feet. The fracture carapace is characterized by bedrock that contains sufficient interconnected secondary porosity to allow transmission of small quantities of groundwater. Bedrock groundwater typically discharges as either surface seeps or into onlapping deposits of glacial deposits. Additional details concerning the bedrock flow system can be found in " *Operable Unit 9, Hydrogeolgic Investigation: Bedrock Report, U.S. Department of Energy, January, 1994*".

The Buried Valley flow system represents an extensive aquifer that provides drinking water to many communities along its border. The aquifer system has been designated a sole source aquifer by the U.S. Environmental Protection Agency and as such must be protected against water quality degradation. The BVA flow system is characterized by very high hydraulic conductivity glacial outwash deposits and the system is therefore capable of transmitting large quantities of groundwater. Groundwater flow in the vicinity of the Mound plant is to the south. Additional details on the BVA flow system can be found in "*Operable Unit 9, Hydrogeologic Investigation: Buried Valley Aquifer Report, U.S. Department of Energy, September, 1994*".

3.0 GROUNDWATER MONITORING NETWORK

Groundwater monitoring at Mound has been an ongoing activity dating back to early plant production days and continuing on through to the present. The groundwater both on and offsite has historically been monitored to determine potential impacts from operations utilizing various radioisotopes. In the mid-1980s Mound began to analyze the groundwater for potential impacts due to operations that utilized non-radiological constituents such as various halogenated organic solvents, petroleum hydrocarbons and several explosive compounds.

Previous site characterization involved the installation of over 150 monitoring wells. Those wells were sampled quarterly for a period of two years (1993 through 1994) during site Remedial Investigation/Feasibility Studies (RI/FS). The results of those sampling events provided a detailed picture with regards to contaminant concentrations and distribution in groundwater at and around the Mound Facility. The results also allowed Mound to focus monitoring efforts on areas of known contamination and contaminants of concern. The current active groundwater monitoring network is designed to provide information on water quality in the groundwater flow systems at Mound. The network consists of approximately 60 groundwater monitoring wells, 10 groundwater seeps and several monitoring trenches. The network is sampled on a routine basis for select organic compounds, metals and radionuclides.

As previously noted the monitoring network is designed to meet the following overall objectives of then monitoring program:

- assure site workers that drinking water is safe for consumption,
- assure containment of know groundwater contamination,
- assure local residents and communities that their drinking water has not been adversely impacted by plant activities
- monitor and provide early warning of impacts due to continuing decontamination and decommissioning activities and environmental restoration efforts, and to,
- monitor the progress and effectiveness of ongoing groundwater remediation efforts.

Table 1 provides a summary of the wells, sampling parameters and sampling schedule included in the current MEMP groundwater monitoring program. Plates 1 and 2 show the distribution of monitoring wells located outside and inside the facility boundaries .

Additional details of the MEMP groundwater monitoring program can be found in *"Groundwater Monitoring Program and Groundwater Protection Program Management Program Plan, August 1997, Revision 2", and Groundwater Monitoring Plan Review, summary changes, letter from L.R. Bauer (BWX Technologies) to Mr. R. Folker (Director MEMP, DOE). September 30, 1998.*

Table 1 Groundwater Monitoring Plan

Groundwater Monitoring Summary				
		Volatile Organic Compounds	TAL Metals	Well Type
On Site Monitoring Wells				
0063		Q[1]		S/BVA[4]
0111		S[2]	S	M/BVA[5]
0119		S	S	S/BVA
0125		S	S	S/BVA
0305		Q		S/BVA
0308		Q		M/BVA
0312		S		S/BR[6]
0313		Q		S/BVA
0314		S	S	S/BR
0315		S		M/BVA
0317		Q		M/BVA
0345		S	S	S/BVA
0346		S	S	M/BVA
0353		S	S	S/BR
0370		Q		S/BVA
0373		Q		M/BVA
0374		Q		S/BVA
0379		S	S	S/BVA
0382		S	S	S/BR
0395		S	S	M/BVA
0397		Q		S/BVA
0410		Q		S/BVA
0415		Q		S/BVA
0416		Q		S/BVA
0417		Q		S/BVA
0418		Q		S/BVA
0419		Q		S/BVA
0420		Q		M/BVA
0421		Q		S/BVA
0422		Q		S/BVA
0423		Q		M/BVA
0424		Q		S/BVA
0425		Q		M/BVA
P015		Q		S/BVA
P025		Q		S/BVA
P027		Q		S/BVA
P031		Q		S/BVA
P043		Q		M/BVA
P044		Q		M/BVA
P045		Q		M/BVA
P046		Q		M/BVA

TABLE 1 CONTINUED

Groundwater Monitoring Summary				
		Volatile Organic Compounds	TAL Metals	Well Type
OFFSITE MONITORING WELLS				
0123		A[3]	A	M/BVA
0127		A		S/BVA
0128		A	A	M/BVA
0158		A	A	S/BVA
0302		A	A	D/BVA[7]
0303		A	A	D/BVA
0343		A	A	D/BVA
0376		A	A	S/BVA
0377		A	A	S/BVA
0378		A	A	S/BVA
0383		A	A	S/BVA
0386		S		D/BVA
0387		A		D/BVA
0388		A	A	S/BVA
0389		S	A	M/BVA
0392		A	A	M/BVA

1 = quarterly , 2 = semi-annually, 3 = annually, 4 = shallow buried valley aquifer, 5 = medium buried valley aquifer
6 = shallow bedrock, 7 = deep buried valley aquifer

3.1 SPECIAL PROJECTS

There are several special projects at the facility that require or required a considerable groundwater monitoring effort. The projects include: 1) Operable Unit 1 remediation effort, 2) PRS 414 (groundwater south of the OU 1 compliance boundary), 3) PRS 417 (TCE contaminated soils adjacent to Building 19), 4) Evaluation on the effects of sampling technique on metals concentration in groundwater, and 5) PRS 66 (investigation of potential soil and groundwater contamination near a contaminated material disposal area). The current results and future monitoring requirements associated with each of these projects will be discussed individually in the Monitoring Results section of this report.

4.0 GROUNDWATER MONITORING RESULTS

Groundwater monitoring results from Mound's monitoring network are presented in this section. Where appropriate the results will be presented as time-line charts showing the concentration of a particular analyte over time. Results will be presented for Volatile Organic Compounds that have been previously identified as contaminants of concern and for selected metals whose concentrations in groundwater are regulated in accordance with U.S. EPA standards. As previously noted the monitoring results for radionuclides are presented in detail in the Mound Annual Environmental Report for Calendar Year 1998.

4.1 METALS CONCENTRATIONS

Mound routinely analyzes groundwater for the inorganic metals that are listed in the EPA's National Primary and Secondary Drinking Water Regulations. In general results have shown that groundwater concentrations at Mound for a majority of the listed metals are below levels of regulatory concern. However, elevated levels of several metals have occurred consistently throughout the groundwater monitoring history in a number of monitoring wells. Of particular concern are elevated levels of heavy metals such as chromium.

In early 1999, MEMP initiated a field investigation to study the nature of elevated metals levels. In summary, the study results suggest that sampling methodology has a pronounced effect on resulting metals concentrations in groundwater samples. Samples taken under high flow conditions (3-4 gpm) may suspend sediment that has accumulated within the wellbore thus causing the analytical results to be relatively high in metals that sorb to particulates. On the other hand, low flow samples (100 - 200 ml/min) impart a minimal stress to the wellbore and therefore minimize sampling induced turbidity. This allows a more representative groundwater sample to be obtained. Results from the field investigation can be found in "*Metals Investigation Assessment Report, U.S Department of Energy, October, 1999*". As a result of the investigation, Mound has proposed abandoning the traditional sampling methodology (i.e. high flow purge), in favor of micro-purge low flow sampling. Micropurge sampling will result in more representative groundwater samples and should allow for an accurate assessment of metals concentrations in groundwater at Mound. Mound anticipates purchasing the specialized equipment for micro-purge sampling in FY2001 with sampling beginning later that fiscal year.

Plate 1 shows the distribution of the wells in and around the facility. The discussion will be limited to wells that have shown or continue to show concentrations of listed metals above levels of regulatory concern. Complete historical results for metals analyses on the wells listed in Table 1 can be found in the Mound Environmental Information Management System (MEIMS) database.

Well 0125

Well 0125 located just east of Building 34 is screened in the unconsolidated deposits of the Tributary Valley. The well is sampled semi-annually for TAL metals. January sampling indicated no metals levels above EPA guideline values while June sampling showed excedences for chromium and lead. Concentrations in groundwater were 2030 ppb and 43 ppb respectively for chromium and lead. The wells were sampled using the standard high flow three volume purge methodology. The variations may therefore be related to the problem of sampling induced turbidity identified by the *Metals Investigation Assessment Report, DOE, Oct 1999.*

Well 0314

Well 0314 located just north of Building 87 is a composite well screened across unconsolidated deposit/bedrock interface in the Tributary Valley. The well shows concentrations above MCLs for several metals.

Antimony (MCL = 6 ppb) was found at a concentration of 7.6 ppb in September 1993 and 11.1 ppb during December 1997. The latest sampling results (June 1998) show Antimony concentrations below the detection limit of 3.6 ppb.

Arsenic (MCL = 50 ppb) has been found at concentrations significantly above its MCL. Figure 1 shows Arsenic concentrations over time. Of particular interest are the paired sampling results for filtered vs. non-filtered samples. Aresnic is found in a variety of valance states and forms both soluble and insoluble arsenite and arsenate compounds. Several studies have indicated that the mobility of dissolved arsenic in groundwater is limited by its tendency to sorb onto ferric hydroxides (Matisof, et al. 1982). Comparison of the filtered vs. non-filtered samples would suggest that the Arsenic is sorbed onto solids (colloids). Mound has conducted a field study to investigate the effects of sampling induced turbidity on metals concentrations. A relationship between sampling induced turbidity and elevated Chromium concentration was clearly identified during the study. Although the study focused on Chromium, the same effects would be expected for any strongly sorbing species, including arsenic.

Chromium (MCL = 100 ppb) has been found at concentrations above the MCL during several sampling events. As previously noted, Mound has been aware of elevated levels for several metals and recently conducted a study to determine the nature of these elevated levels. As noted above, the study suggests that the elevated levels may be an artifact of sampling methodology and may not accurately reflect the true mobile contaminant load within the aquifer. Mound continues to work with the Ohio and U.S. Environmental Protection Agency to resolve the issues associated with high metals levels in groundwater.

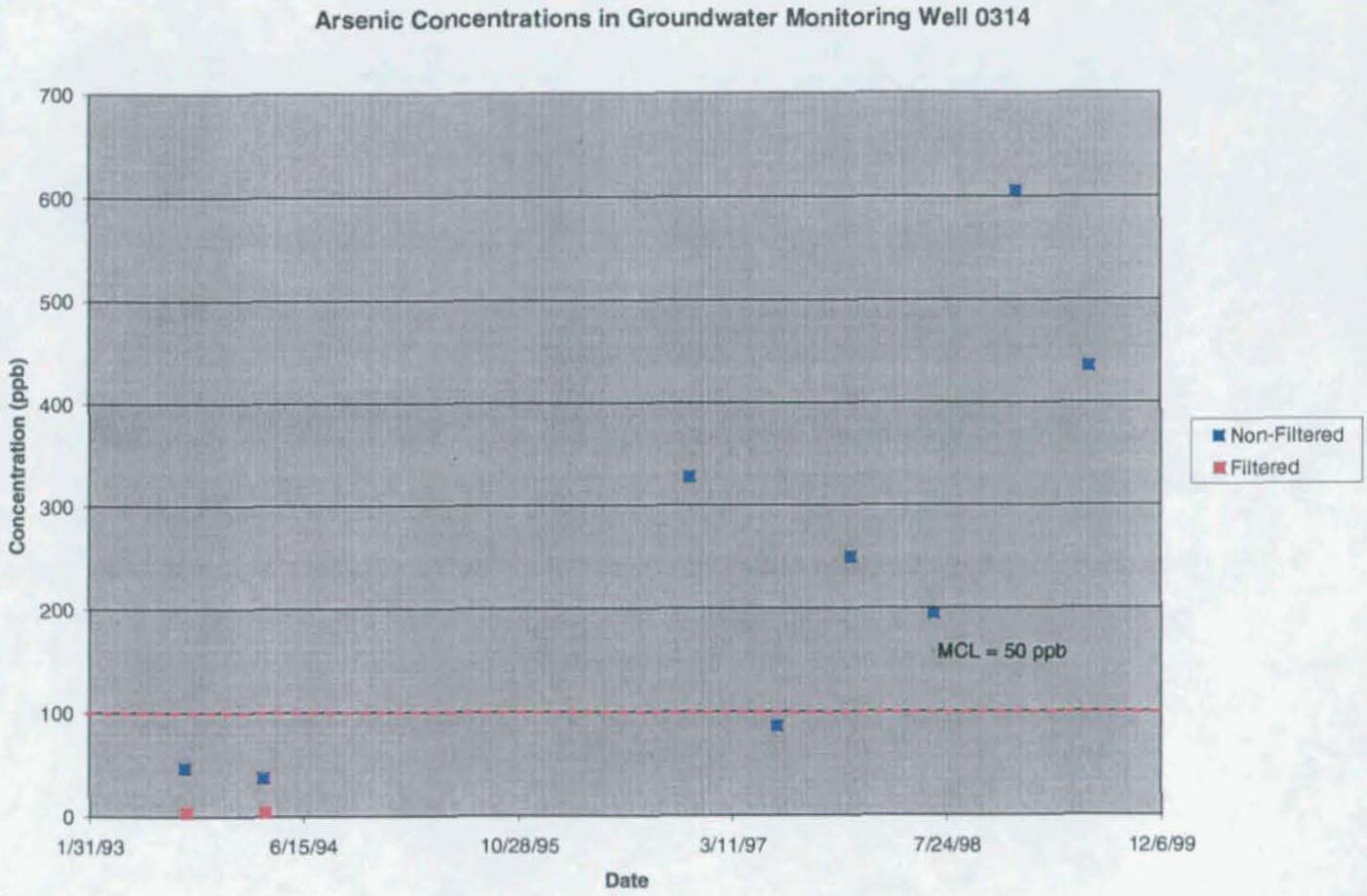

Figure 1 Arsenic Concentrations in Groundwater Monitoring Well 0314

Wells 0376, 0377 and 0378

These three wells located offsite adjacent to the bike path in the restored section of the Miami Erie Canal are all screened in the unconsolidated outwash deposits of the BVA. The wells show elevated levels of chromium and are a part of the study that demonstrated the relationship between elevated chromium concentrations and sampling induced turbidity. As previously noted the issue of elevated chromium concentrations is being addressed by the DOE in cooperation with the Ohio and Federal EPA.

Well 0379

Well 0379 located just north of the large retention pond near OU1 is screened in the unconsolidated outwash deposits of the BVA. The well has shown the same types of chromium detections (i.e. elevated concentrations for non-filtered samples and very low concentrations for filtered samples) as has been previously discussed. In addition, the well has shown two detections for lead (MCL = 15 ppb) above the MCL. In September 1993 lead concentrations were found to be 16 ppb in one sample and below the detection limit of 2 ppb in a duplicate sample. In June 1997 three samples showed values of 17.2 ppb, 12.3 ppb and below the detection limit of 2 ppb. Subsequent sampling conducted semi-annually has shown lead concentrations considerably below the MCL.

Well 0395

Well 0395 located in the southern portion of the PRS 66 study area. The well is screened in the vadose zone and only periodically contains enough perched water to allow sampling. A sample was obtained during the June 1999 sampling event. The sample showed exceedances for several metals including antimony at 39.5 ppb, and chromium at 11,500 ppb. As a result of field investigations conducted at PRS 66 in the fall of 1999, it is proposed to install several groundwater monitoring wells in the glacial sediments around well 0395. Future groundwater monitoring results should help shed light into the nature of these elevated metals levels.

4.2 VOLATILE ORGANIC COMPOUNDS

Mound routinely analyzes groundwater for the volatile organic compounds (VOCs) that are listed in the EPA's National Primary and Secondary Drinking Water Regulations. Past disposal practices at the plant resulted in VOCs migrating through the subsurface and into the groundwater system. As a result several areas at Mound show elevated levels of VOCs in the groundwater. Mound has an active groundwater remediation system consisting of a hydraulic containment system operating in conjunction with an air sparge/soil vapor extraction system. These systems operate at OU1, an area known to have received large quantities of VOCs for disposal. Additional information on OU1 can be found in *"Operable Unit 1 Remedial Investigation Report, Mound Plant, Miamisburg, Ohio Volumes 1 and 2, March 1994"*.

Plate 1 shows the distribution of the wells in and around the facility. The discussion will be limited to wells which show concentrations of listed VOCs above levels of regulatory concern. Table 2 shows the list of VOCs currently analyzed for during groundwater monitoring. The compounds that continue to be seen above regulatory limits in the groundwater at Mound are limited to trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-Dichloroethene, vinyl chloride and limited hits of carbon tetrachloride. Complete historical results for VOC analyses on the wells can be found in MEIMS. The discussion will be broken into the following three regional areas for convenience: 1) The Tributary Valley, 2) Operable Unit 1, and 3) Other Wells of Interest.

4.2.1 Tributary Valley Wells

Active groundwater monitoring wells screened in the Tributary Valley include 0395, 0111, 0345, 0346, 0119, 0314, and 0125. Monitoring wells 0315, 0386, 0389, 0387, 0392 and 0379 are screened in what is considered a "transition" flow zone where the Tributary Valley flow system enters into the BVA flow system.

VOCs have not been detected above regulatory limits (MCLs) in any of the wells screened within the Tributary Valley, however VOC detections above regulatory limits have occurred in the wells screened in the transition zone. Figures 2 and 3 show time series charts for those wells in the transition zone showing VOC levels above MCLs. An investigation was undertaken in the summer of 1997 to determine potential source areas for the low-level VOC detections seen in several transition zone monitoring wells. In summary, the field investigation identified a small localized area of subsurface VOC soil contamination in the vicinity of Building 19. Potential Release Site 417 was generated as a result of the investigation. PRS 417 has recently been "binned" by the core team as requiring "Further Assessment". Additional bulk soil samples will be collected in an attempt to more accurately characterize the magnitude of soil contamination. Results will be included in a future revision of the PRS 417 package.

In the fall of 1999, Mound initiated an investigation of soils and groundwater associated with PRS 66. PRS 66 lies at the head of the tributary valley. Radioactively contaminated material was disposed there prior to 1970. A large scale investigatory phase included drilling 19 exploratory boreholes to characterize both the hyrostratigraphy and the spatial extent of soil contamination. Based on the results of the exploratory drilling, 10 locations have been selected for monitoring the groundwater system underlying the PRS. No groundwater samples were taken from the PRS 66 area in CY99. It is anticipated that the wells may be installed in the summer of 2000, with

groundwater monitoring activities initiated in the fall of 2000. Results of that sampling will be included in the CY 2001 Groundwater Monitoring Report. For additional information on the PRS 66 project see "*PRS 66 Sampling and Analysis Plan, DOE 1999.*"

Table 2 VOC Target List

Volatile Organic Compounds Analyzed for at Mound
Vinyl Chloride
Trichloroflorometh ane
Freon-113
1,1-Dichloroethene
Methylene Chloride
Trasns-1,2-Dichloroethene
1,1-Dichloroethane
Cis-1,2-Dichloroethene
Trichloromethane
1,1,1-Trichloroethane
Carbon Tetrachloride
1,2-Dichloroethane
Trichloroethene
1,2-Dichloropropane
Bromodichloremethane
2-Chloroethylvinylether
Cis-1,3-Dichloropropene
Trans-1,3-Dichloropropane
Dibromomethane
1-Chlorohexane
Chlorobenzene
1,1,1,2-Tetrachloroethane
Bromoform
1,1,2,2-Tetrachloroethane
1,2,3-Trichkloropropane
Phenyl Bromide
2-Chlorotoluene
4-Chlorotoluene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene
Benzene
Toluene
Ethybenzene
Xylenes (total)
2-Butanone

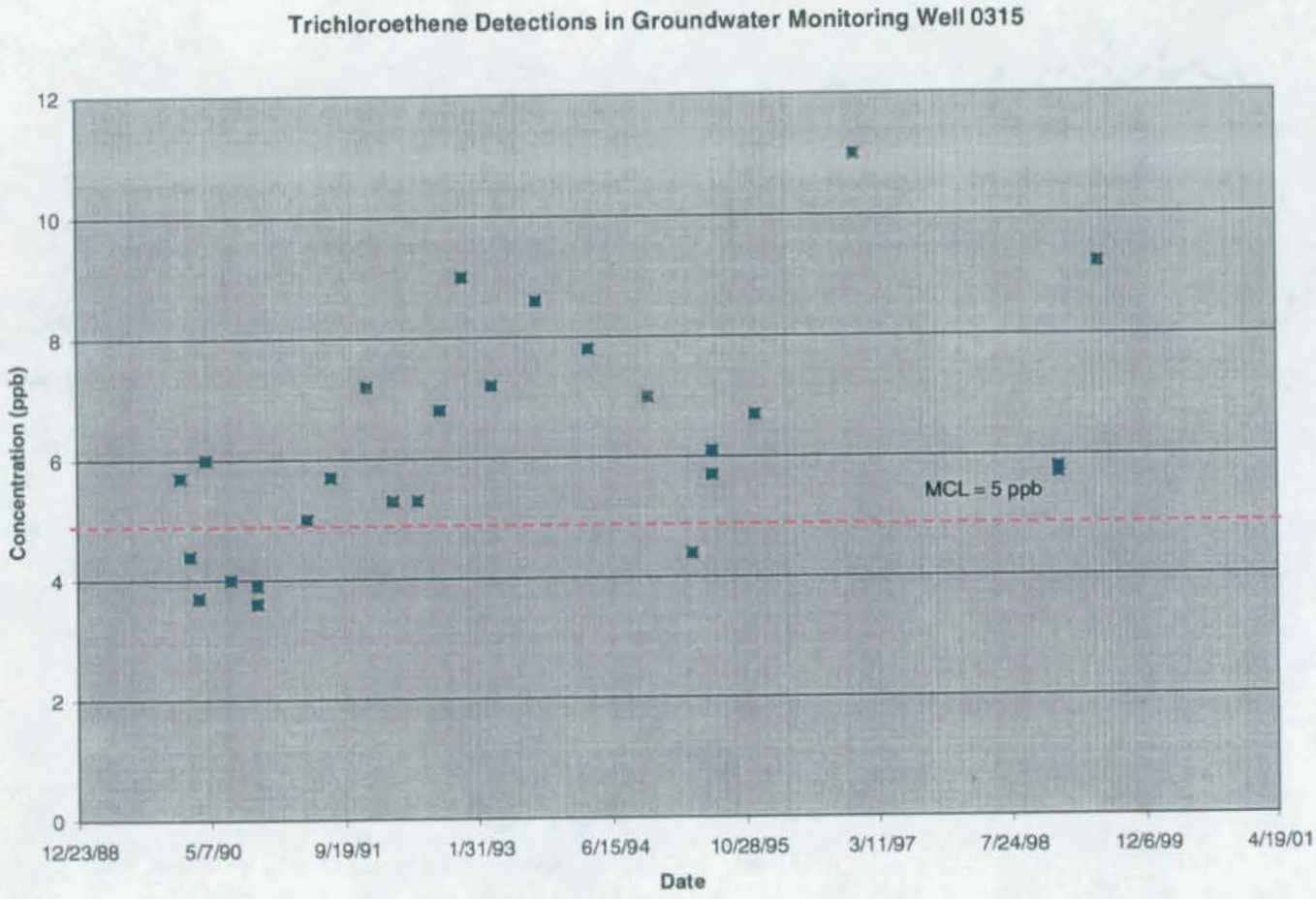

Figure 2
VOC Trichloroethene Concentration in Monitoring Well 0315

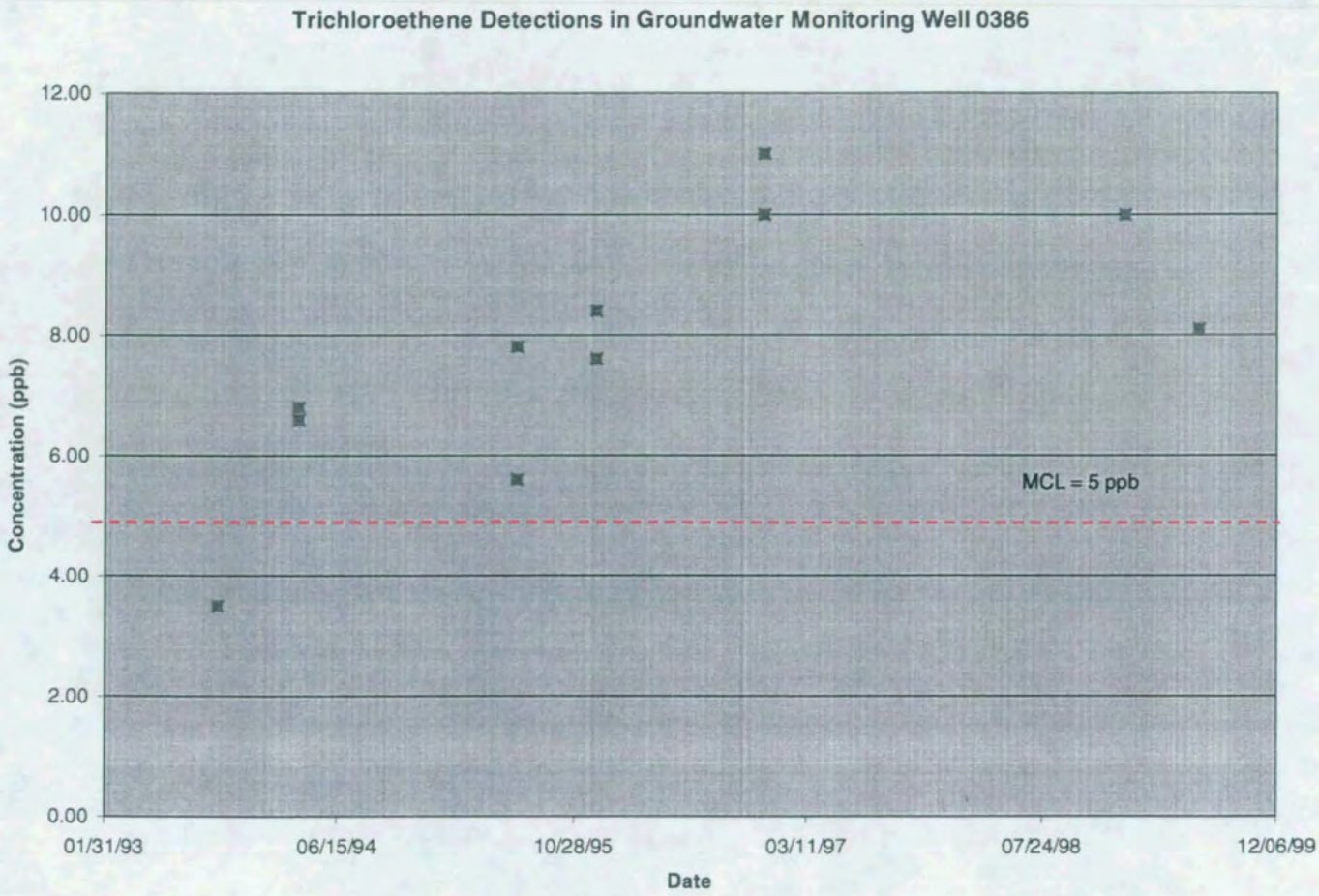

Figure 3
Trichloroethene Concentration in Monitoring Well 0386

4.2.2 Operable Unit 1 Wells

Many monitoring wells within the OU1 area have shown and continue to show elevated levels of VOCs in the groundwater. Historically the highest levels seen have not exceeded hundreds of ppb with recent data showing the highest levels now in the tens of ppb. As noted earlier three remediation systems are currently in operation at OU1 to restore the aquifer system. Time series charts for all OU1 wells currently showing VOC detections above MCLs are shown in Appendix A.

4.2.2.1 OU1 Remedial System Performance

The OU1 pump and treat system began operation in February 1998. Figures 4 and 5 show time series charts for two monitoring wells downgradient of the source zone and within the zone of influence of the pump and treat system. The system configuration is designed to hydraulically isolate the OU1 source zone from the downgradient groundwater system.

The time series charts show the typical mass removal curve characterized by initial rapid declines in contaminant concentrations followed by stabilizing concentrations tailing off asymptotically near MCLs. The shapes of the curves depict two interesting features related to how pump and treat systems affect natural aquifer systems.

The early stages of the curve where contaminant concentrations are declining rapidly presents evidence that the system is: 1) hydraulically isolating the source area from the downgradient groundwater zone as well as, 2) removing contaminant mass from the system via extraction of contaminated groundwater. In essence the groundwater system is being flushed out by removing contaminated groundwater and not allowing additional contaminated groundwater to migrate downgradient away from the source area.

The second portion of the curve where contaminant concentrations stabilize indicates a more interesting phenomena related to the heterogeneous nature of aquifer systems. Natural aquifers consist of a wide variety of material types from coarse sands and gravels to silts and clays. The ability of these materials to transmit water varies greatly, with the coarser materials typically being much more transmissive than the finer grained materials. These variations in the aquifer matrix therefore create variations in groundwater flow within the aquifer with some zones showing relatively high groundwater velocities and other zones being relatively stagnant in terms of groundwater flow. It's these zones of low permeability and therefore low groundwater flow, (e.g. a silty-clay deposit such as glacial till) that are responsible for the portion of the curves exhibiting long term low level contaminant concentration. These low flow zones can essentially become source zones resulting from the long term diffusion controlled movement of contaminant mass into their matrix during the active phase of aquifer contamination (i.e. the time when contaminant mass is being added to the aquifer). As water cannot easily be moved through these zones, it becomes very difficult to flush the contaminant out during active remediation via pump and treat. Contaminant movement out of these zones is identical to the diffusion controlled process that allowed it to initially move into the matrix. Diffusion controlled mass transfer rates are very low and therefore these low permeability zones become persistent long term source zones, continually supplying the surrounding groundwater with low levels of contaminant mass. During this time frame, the system is said to be under "diffusion controlled" conditions.

Typically, if the pump and treat system is shut down during the diffusion controlled phase of remediation, the groundwater system will show a rapid increase in contaminant concentrations in the monitoring wells. This increase is termed "rebound" and is the result of a decrease in the

overall groundwater flux in the vicinity of the monitoring wells thereby allowing the diffusing contaminant mass to build up in concentration around the well.

Rebound tests can be used as an indicator as to the degree to which the aquifer has been remediated. A lack of rebound over an appropriate time frame may indicate that the aquifer has been sufficiently remediated. Mound is currently developing criteria and negotiating with the US and Ohio EPAs for conducting a rebound test at OU1.

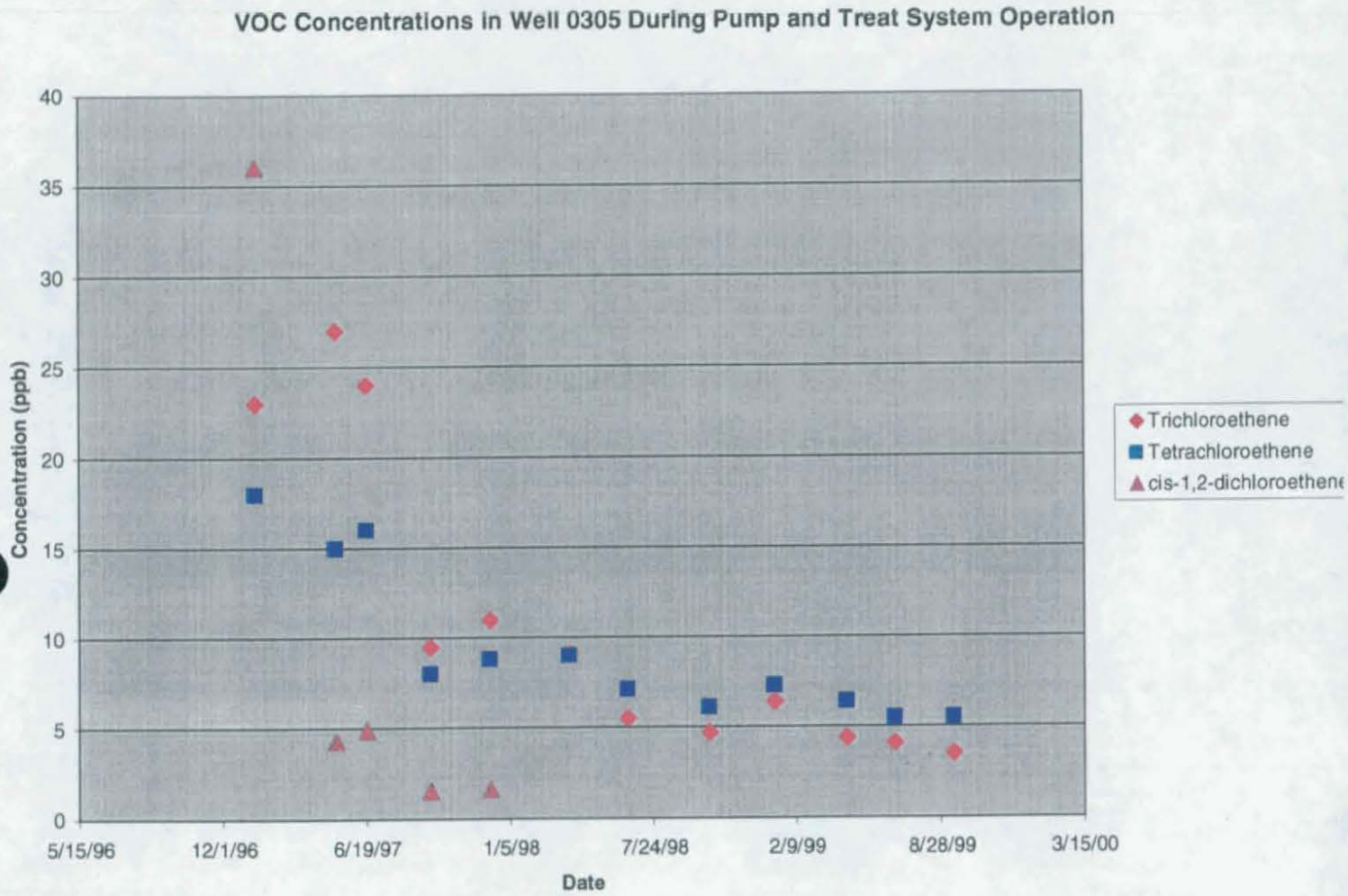

Figure 4 VOC Concentrations in Monitoring Well 0305 During Pump and Treat Operations

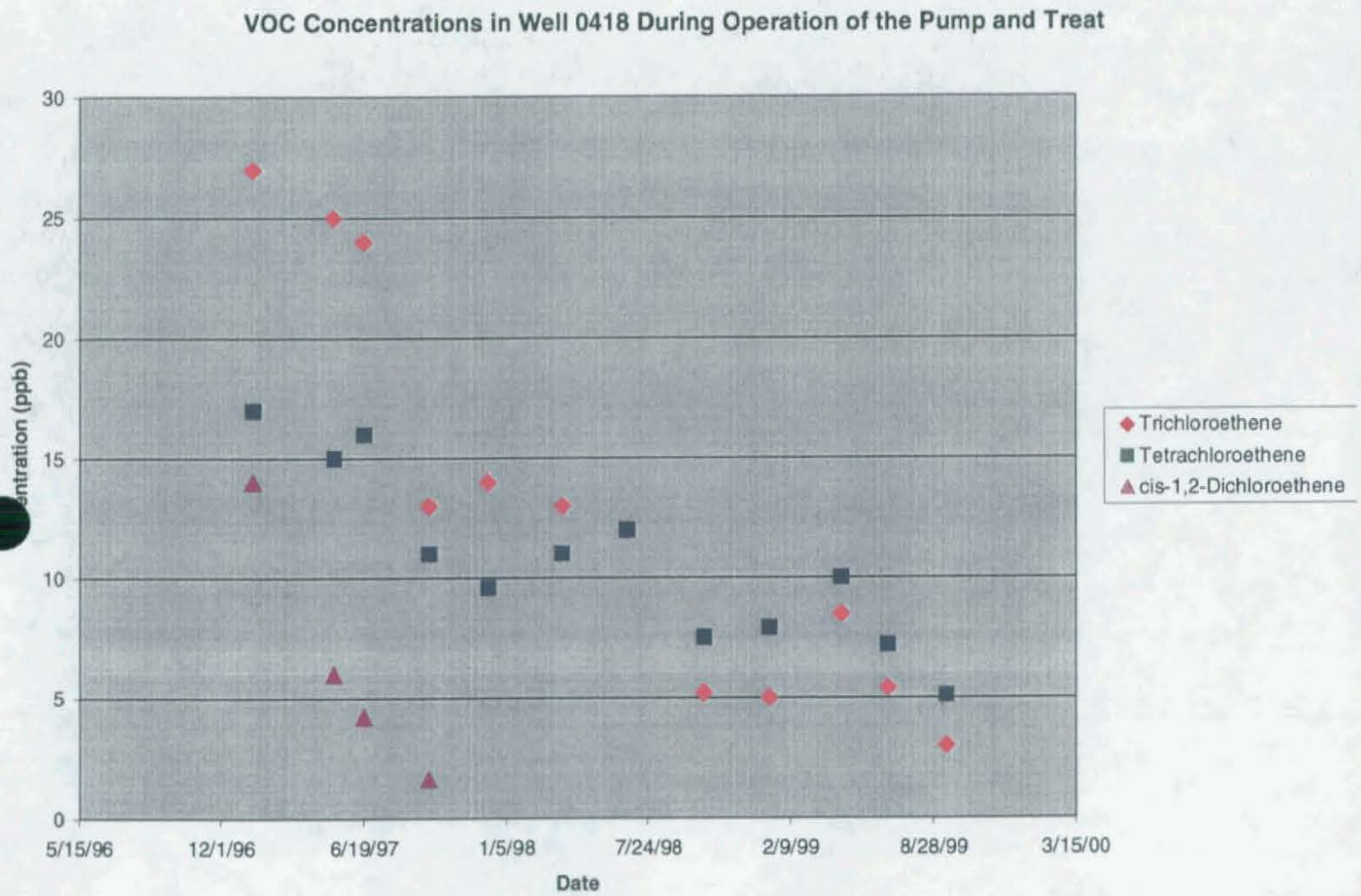

Figure 5 VOC Concentrations in Monitoring Well 0418 During Pump and Treat Operation

Several wells downgradient of the OU1 containment system appear to show a trend of increasing VOC concentration during the last several monitoring events (see time series charts for wells 0410, 0419, P015 and 0418). Figure 6 shows a plot of VOC concentration vs. water level in well 0410. As can be seen there is an inverse relationship between the VOC concentration and the corresponding water level. During periods of relatively high water level the VOC levels are relatively low while during periods of low water levels the VOC levels become elevated. These particular wells are screened along the margin (pinchout) of the aquifer and are subject to widely fluctuating borehole volumes as the water table rises and falls, (water levels may vary in well 0410 from an elevation of 683 to 677 feet above sea level). Withdrawing a groundwater sample from the borehole under low water conditions can therefore act to concentrate the contaminant in a smaller volume of water (the contaminant is not likely to be homogeneously distributed within the aquifer) while withdrawing a sample under high water conditions act to dilute the contaminant. This suggests that the fluctuating VOC levels are more a function of fluctuating water volumes within the wellbore than true increases or decreases in contaminant mass.

4.2.3 Other Wells of Interest

Mound utilizes a series of offsite wells to monitor for potential migration of VOCs away from the Mound plantsite. Plate 1 shows the distribution of those wells. With the exception of monitoring wells 0386 and 0389 (previously discussed in the section 4.2.1) there have been no occurrences of VOCs being detected above MCLs in offsite monitoring wells.

Monitoring wells 0382 and 0353 are two bedrock wells that are sampled to monitor potential migration of VOCs away from the SM-PP bedrock flow system. Neither wells have shown any detections of VOCs above regulatory limits.

Wells 0312 and 0411 have recently been included in the Mound groundwater monitoring program. The wells have shown historically elevated levels of VOCs.

Well 0312 is located on the western plant boundary behind Building 19. Figure 7 shows VOC levels with time in Well 0312. Well 0312 lies within the boundaries of PRS 417 and therefore is currently part of the Further Assessment associated with that PRS.

Well 0411 has show elevated levels of Trichloroethene. Figure 8 shows the concentration of TCE with time in Well 0411. No source areas of TCE contamination have been associated with the elevated levels seen in Well 0411. Well 0411 will continue to be monitored.

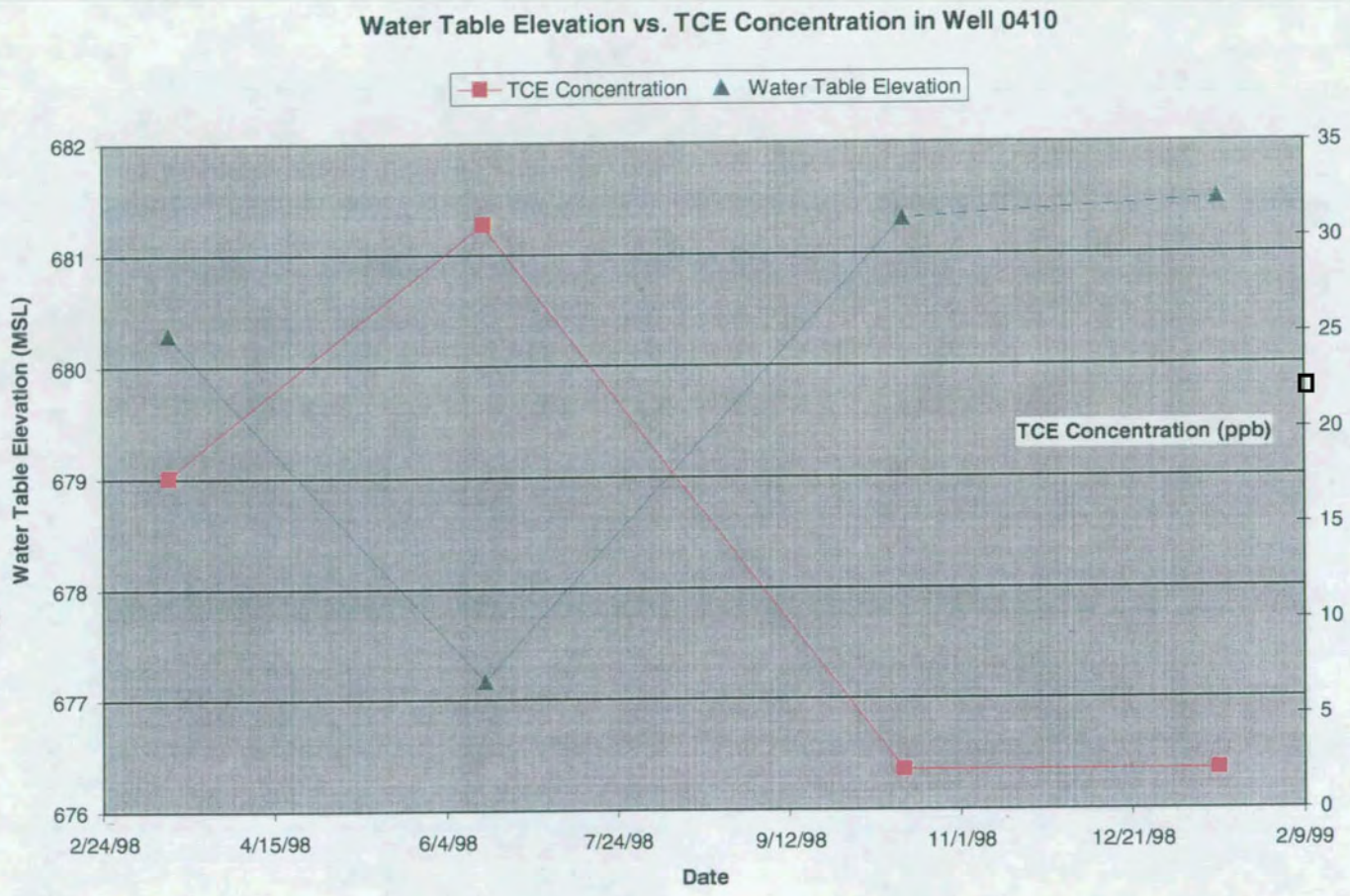

Figure 6
Water Elevation in Monitoring Well 0410 vs. Trichloroethene Concentration

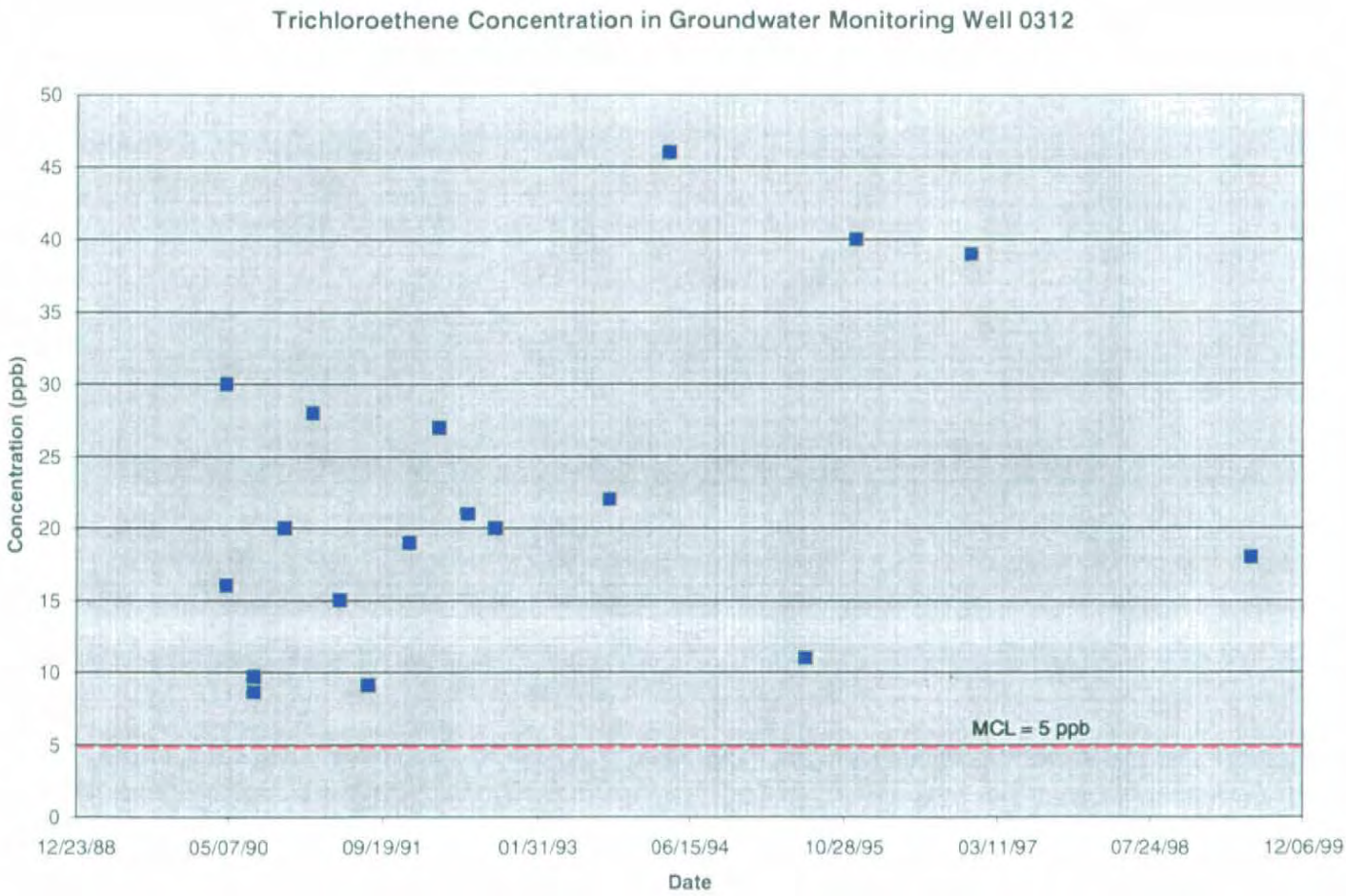

Figure 7
Trichloroethene Concentrations in Monitoring well 0312

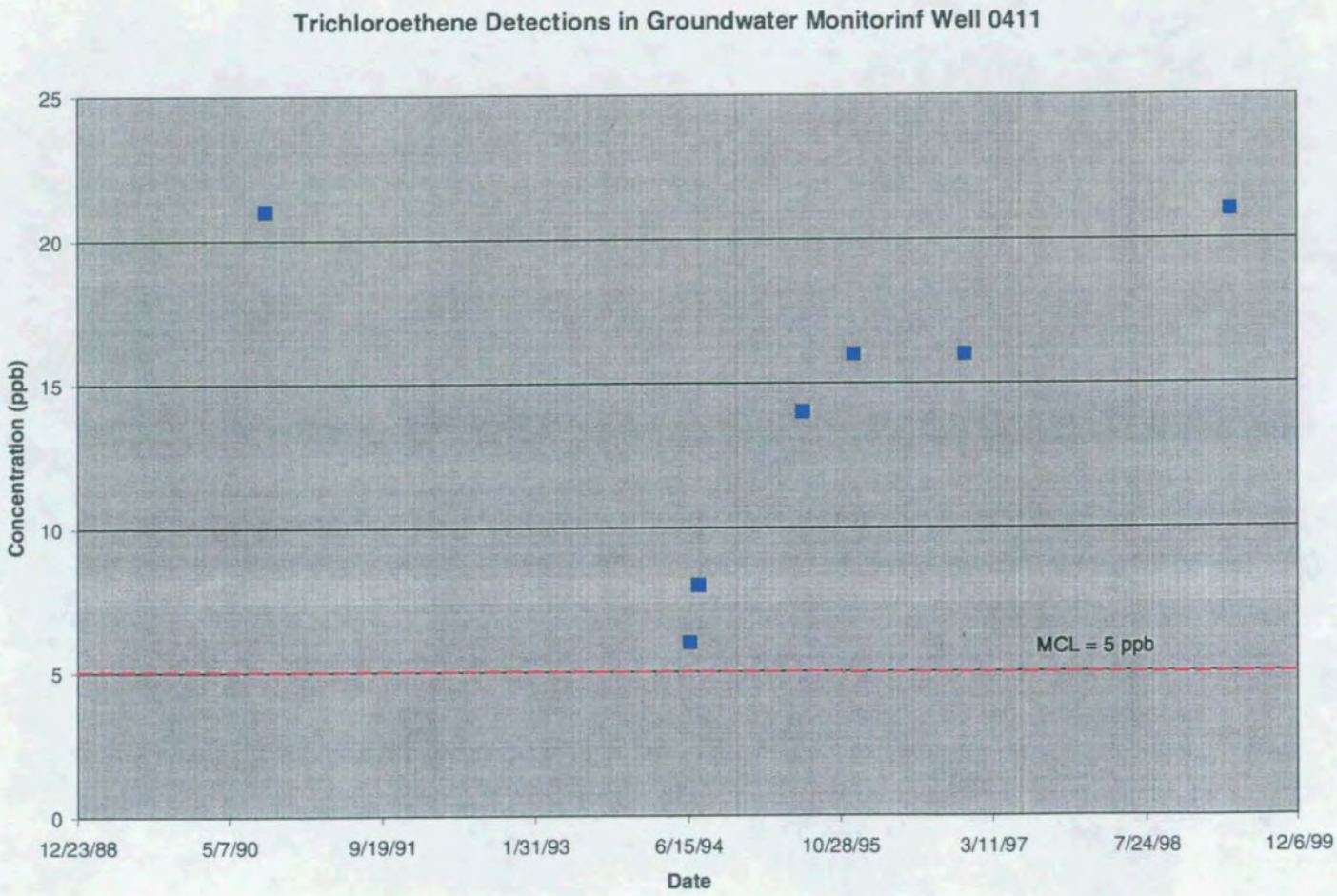

Figure 8
Trichloroethene Concentrations in Monitoring Well 0411

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Matisof, G. 1982. "The nature and source of arsenic in Northeastern Ohio groundwater." Ground Water 20, no. 4: 446-56.

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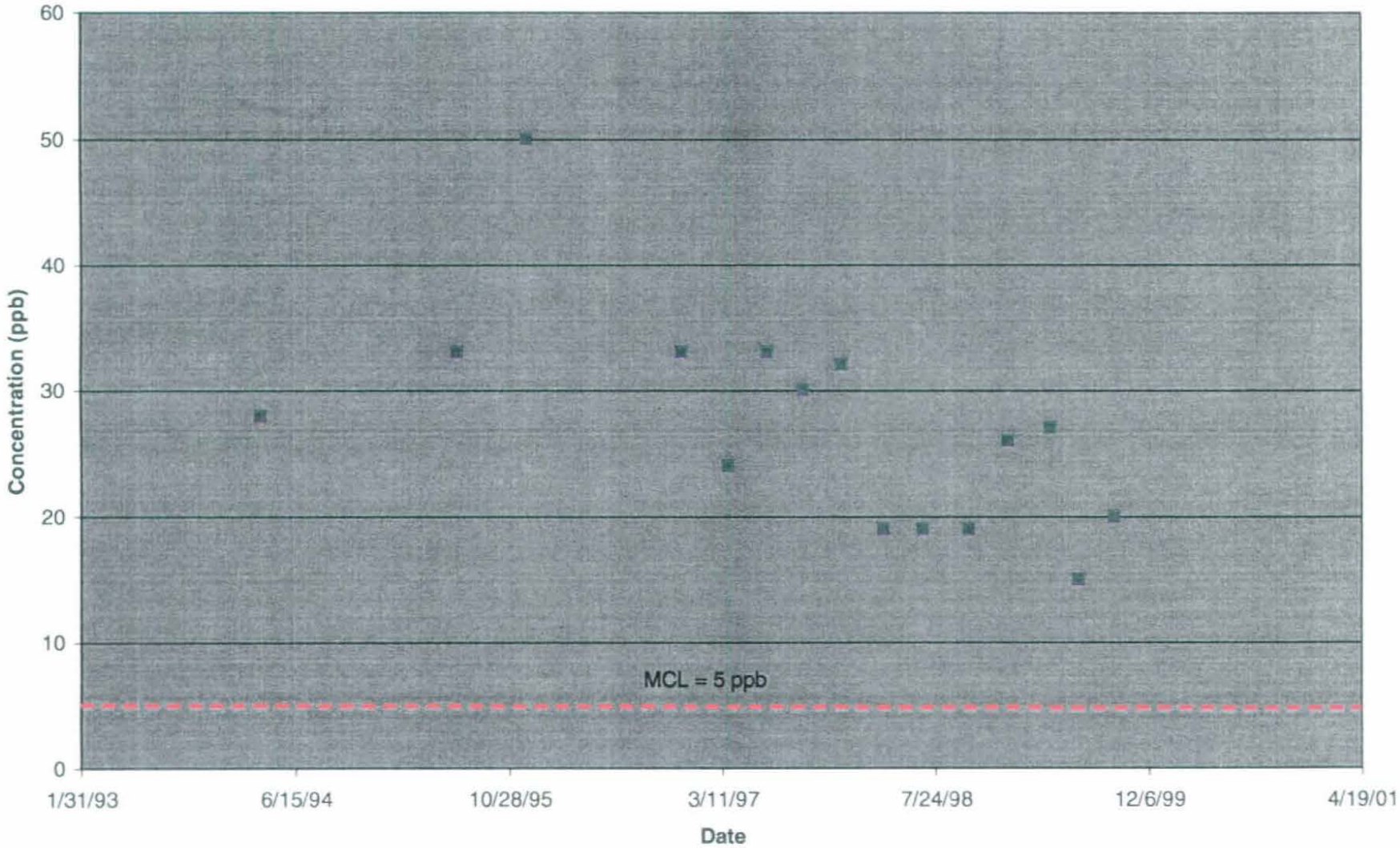
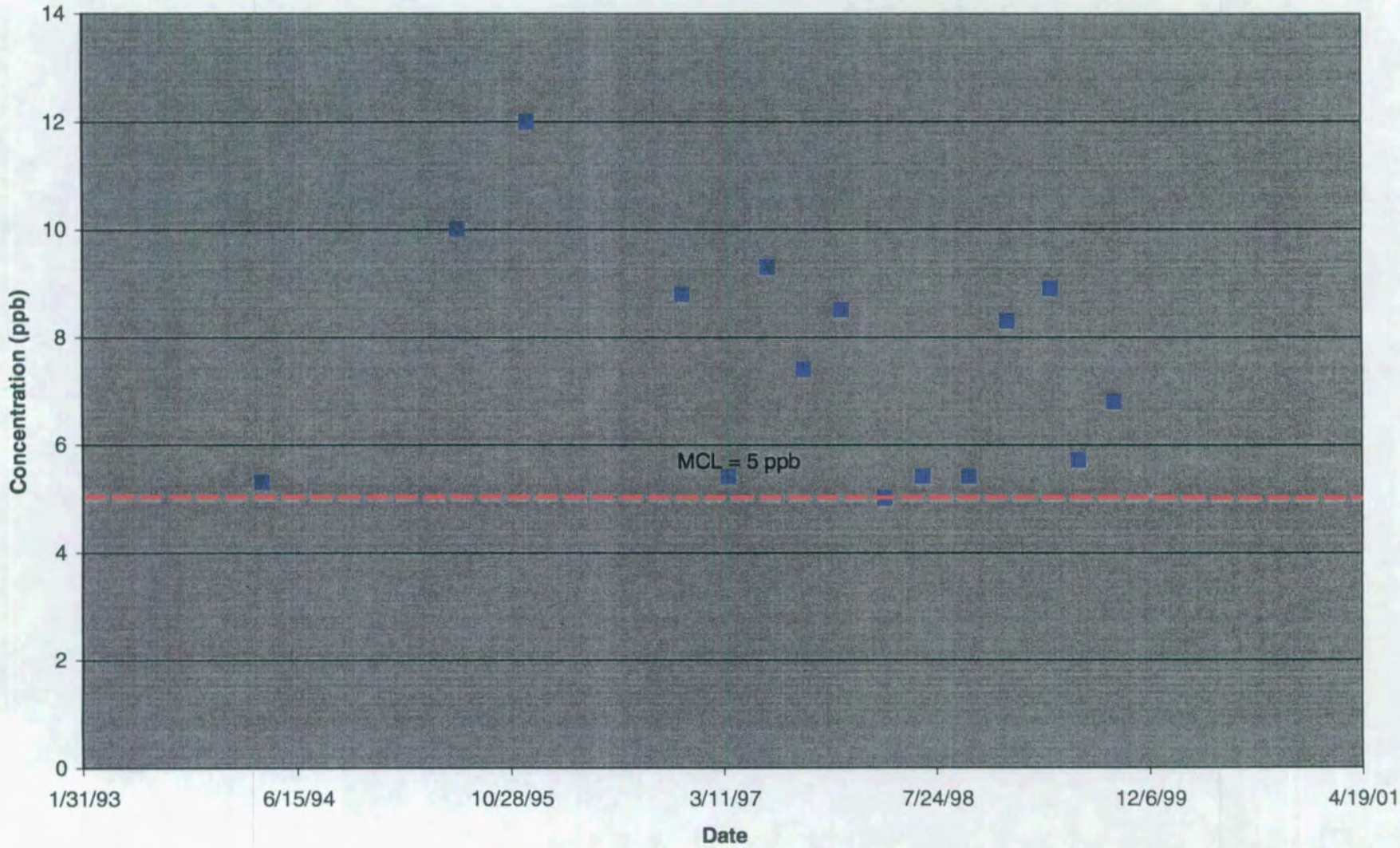
APPENDIX A

VOC CONCENTRATIONS IN MONITORING WELLS AT OU 1

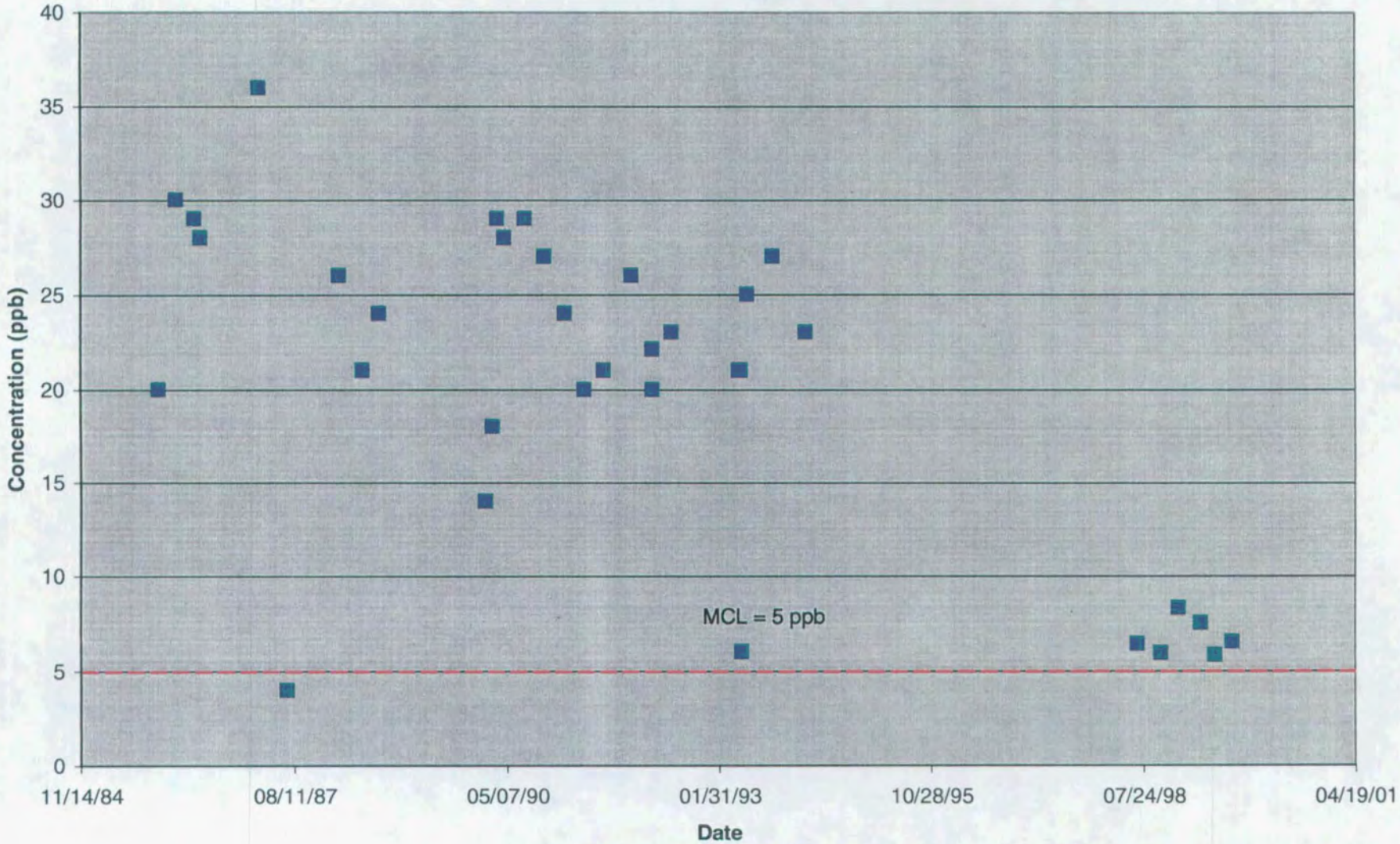
Trichloroethene Detections in Groundwater Monitoring Well P015

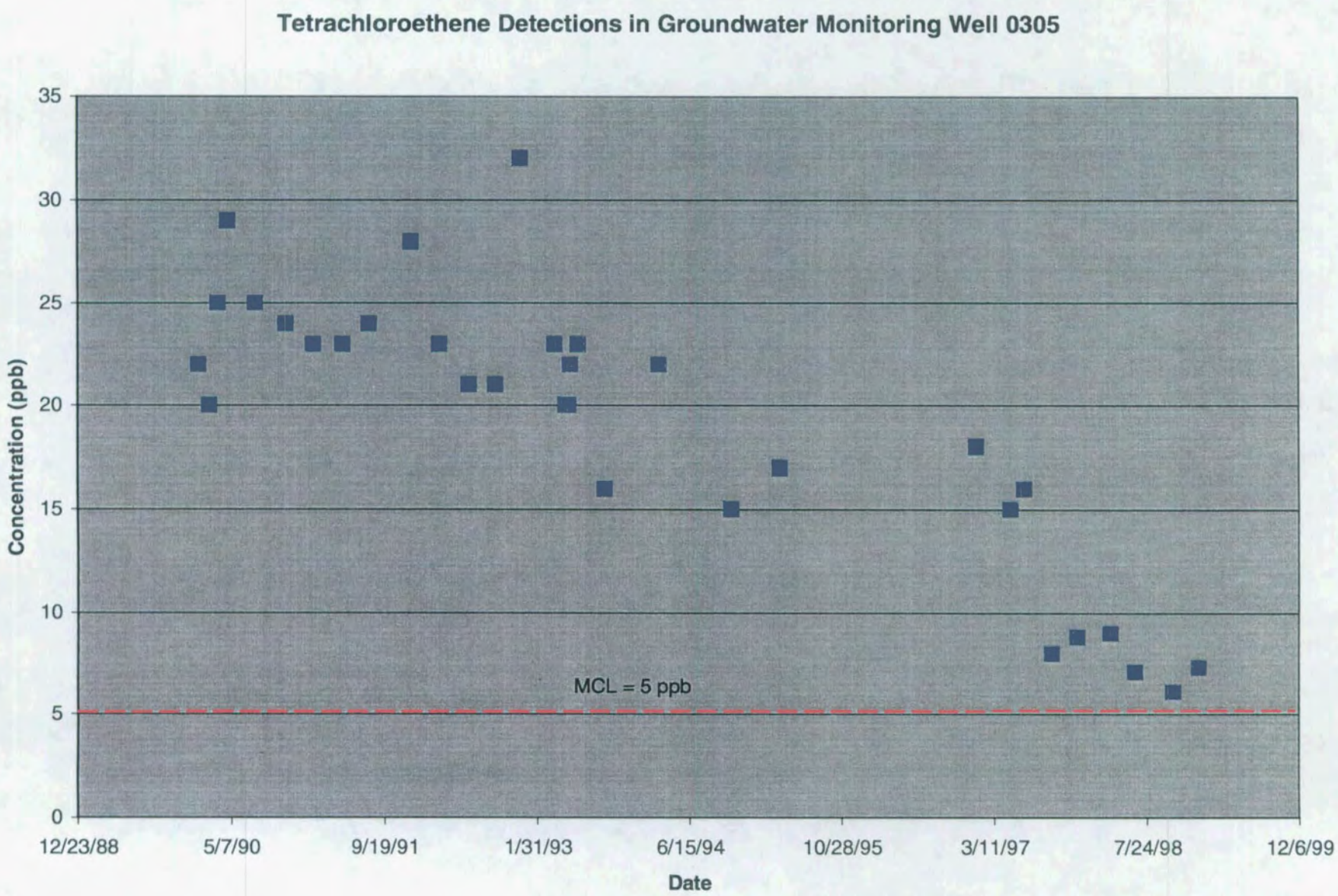


Tetrachloroethene Detections in Groundwater Monitoring Well P015

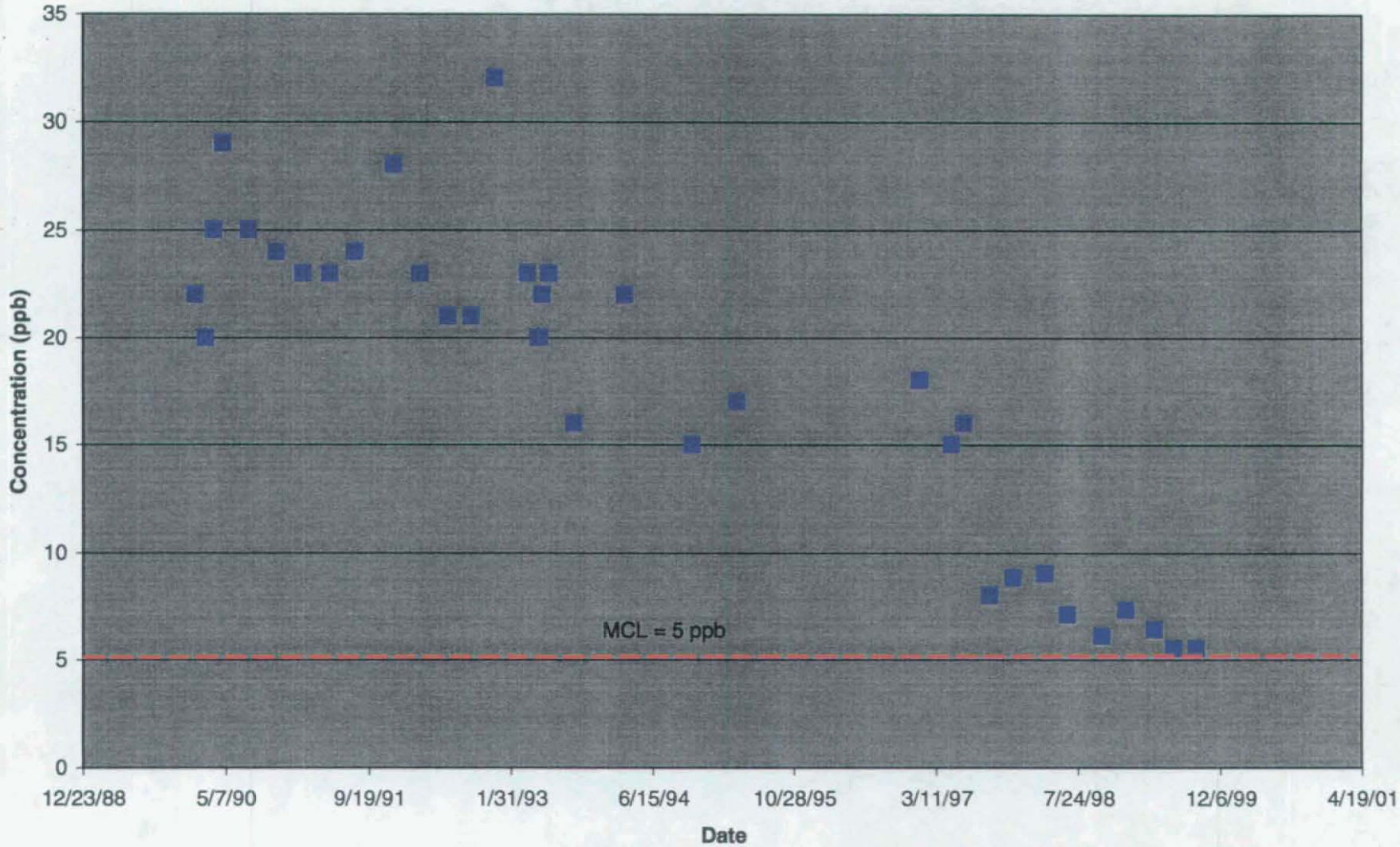


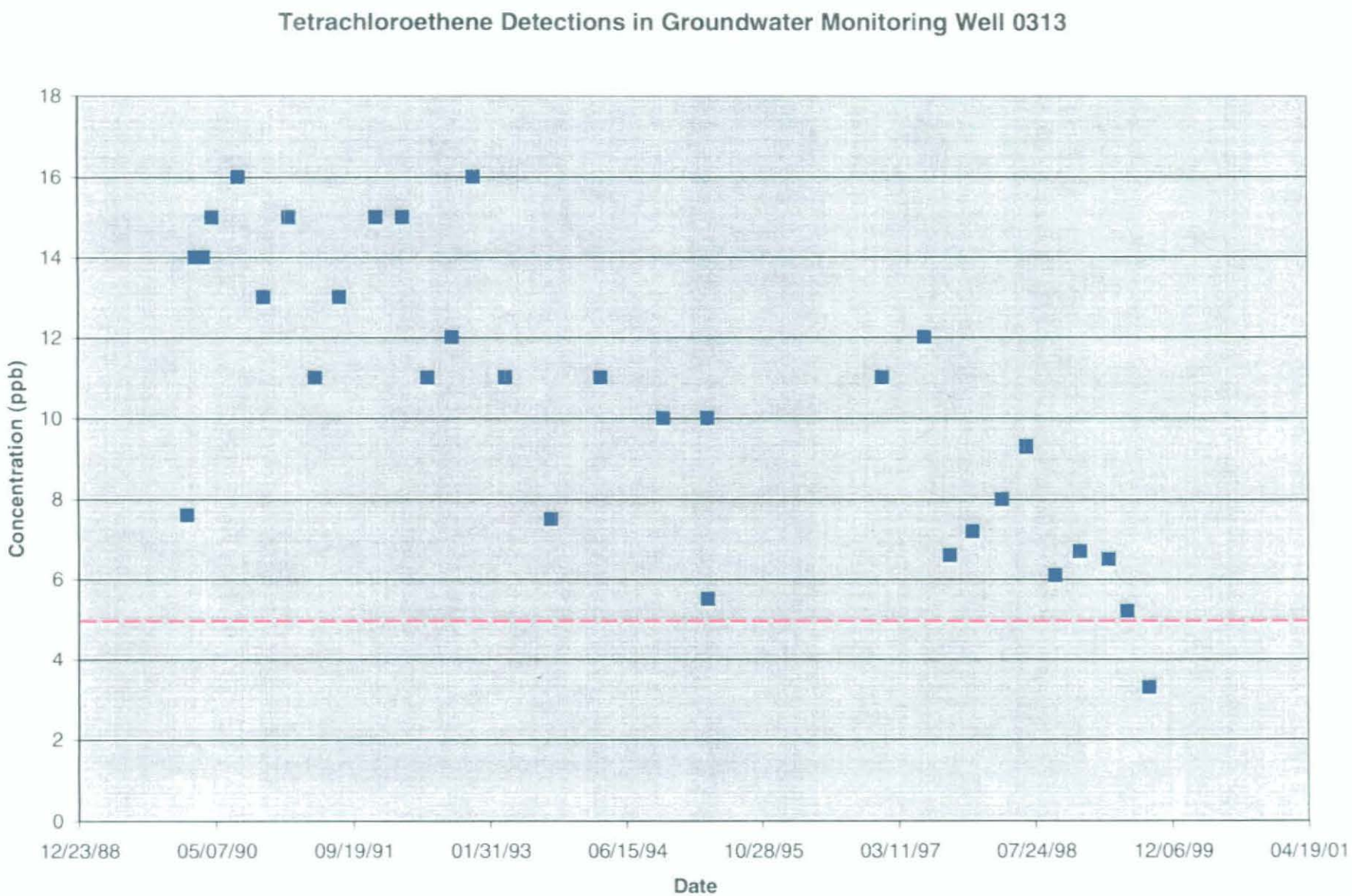
Tetrachloroethene Detections in Groundwater Monitoring Well 0063



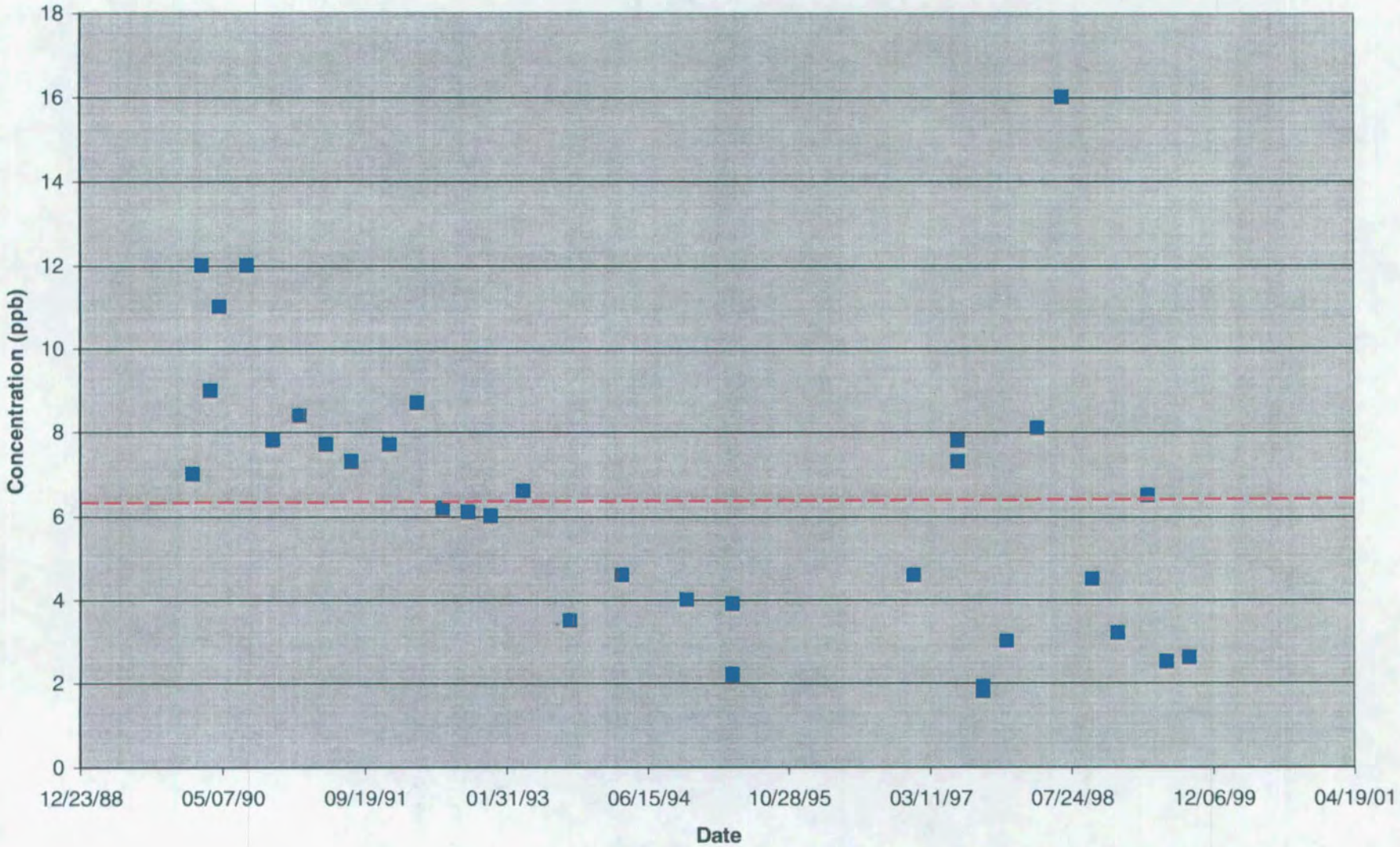

Tetrachloroethene Detections in Groundwater Monitoring Well 0305
Concentration (ppb)
35
30
25
20
15
10
5
0
MCL = 5 ppb
12/23/88
5/7/90
9/19/91
1/31/93
6/15/94
10/28/95
3/11/97
7/24/98
12/6/99
Date

Tetrachloroethene Detections in Groundwater Monitoring Well 0305

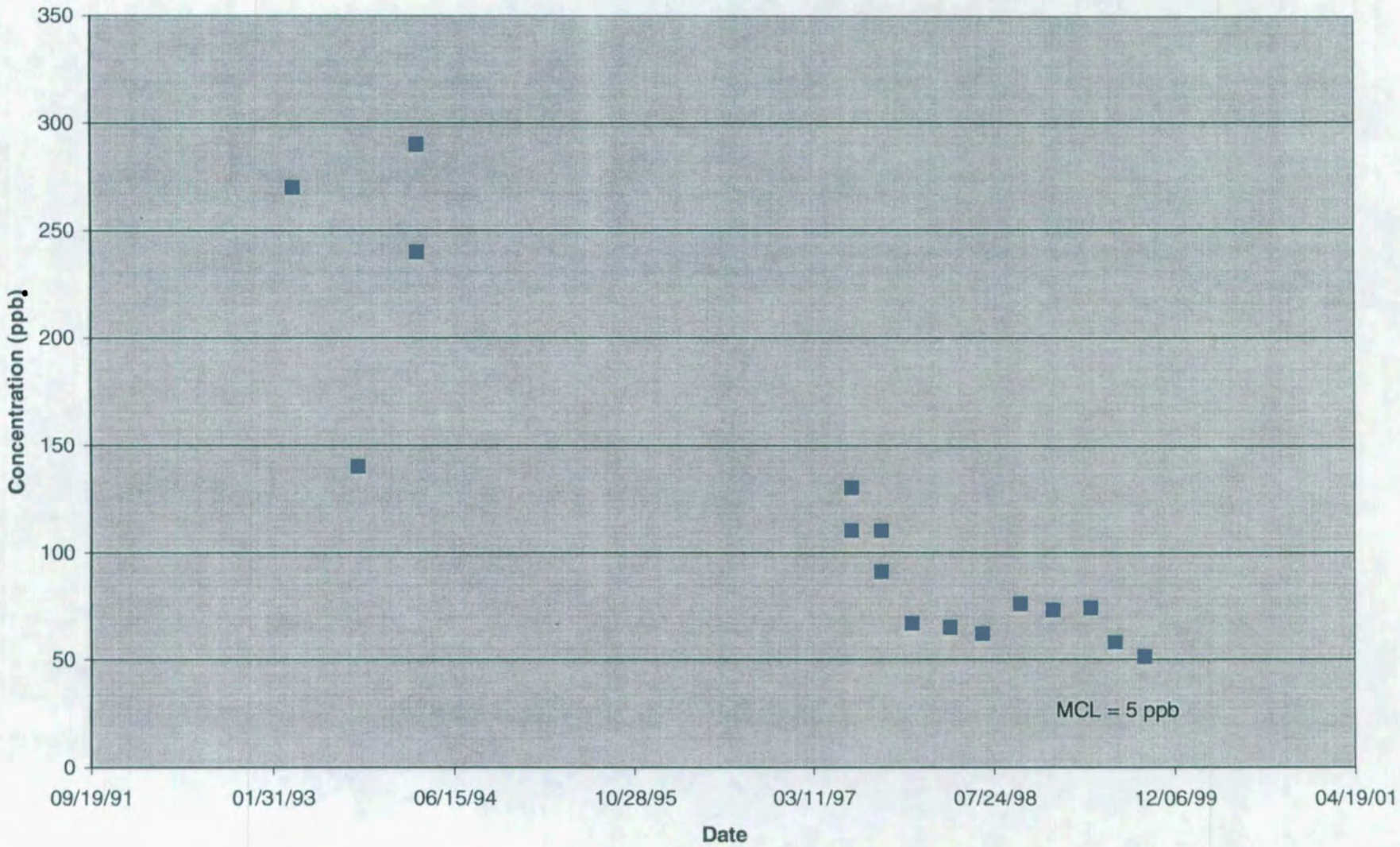



Tetrachloroethene Detections in Groundwater Monitoring Well 0313
Concentration (ppb)
18
16
14
12
10
8
6
4
2
0
12/23/88
05/07/90
09/19/91
01/31/93
06/15/94
10/28/95
03/11/97
07/24/98
12/06/99
04/19/01
Date

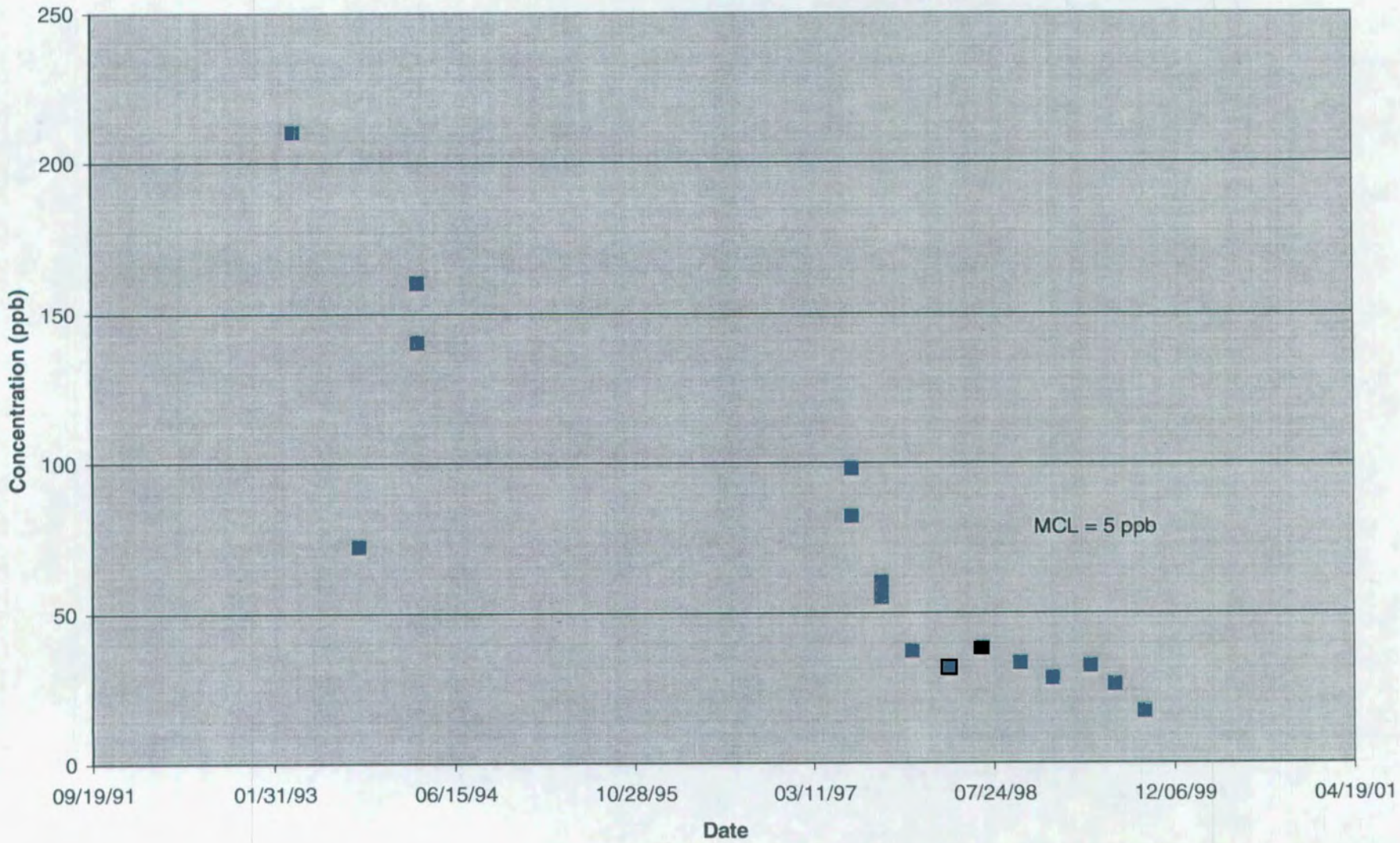
Trichloroethene Detections in Grouindwater Monitoring Well 0313

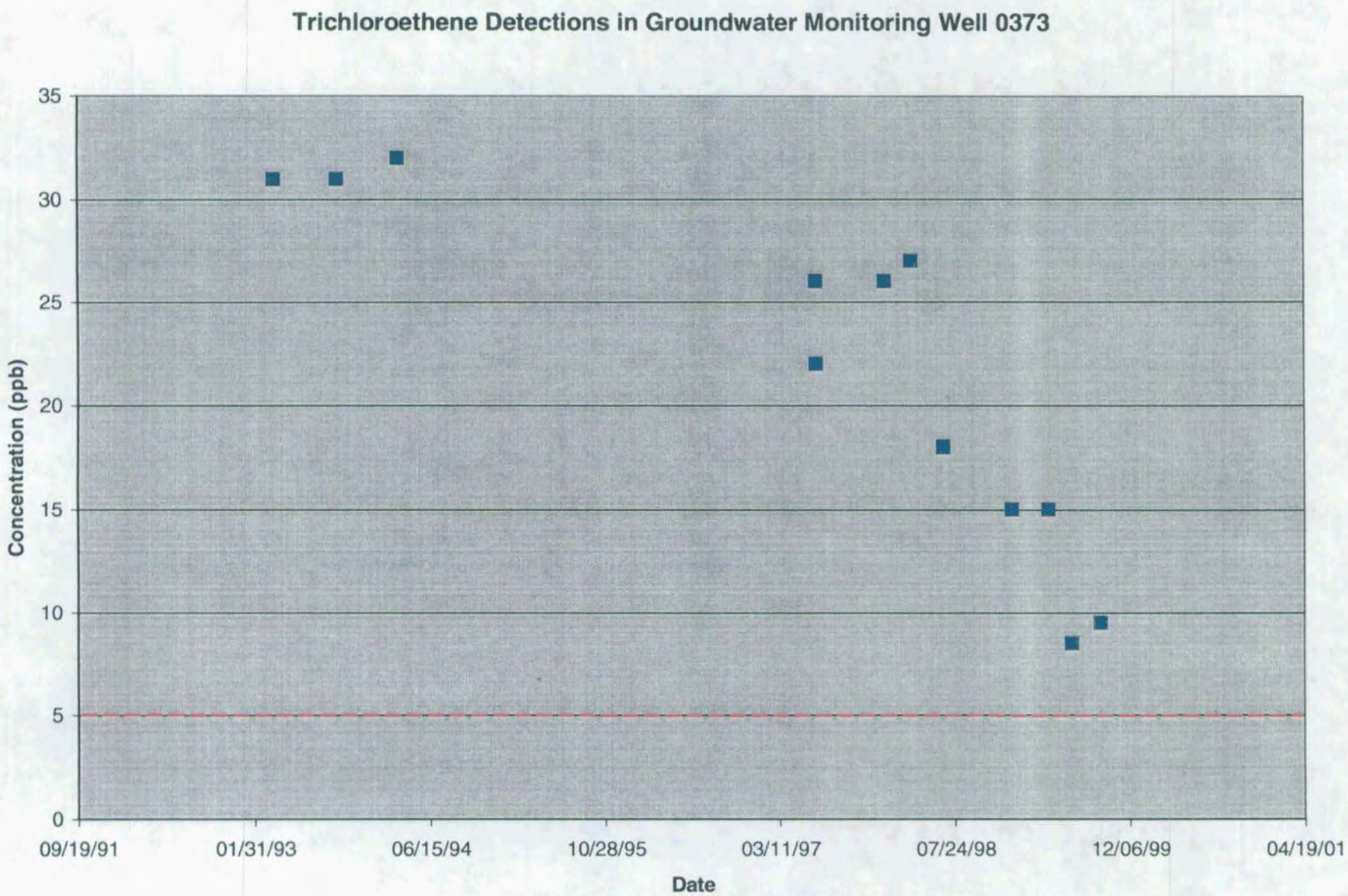


Tetrachloroethene Detections in Groundwater Monitoring Well 0370

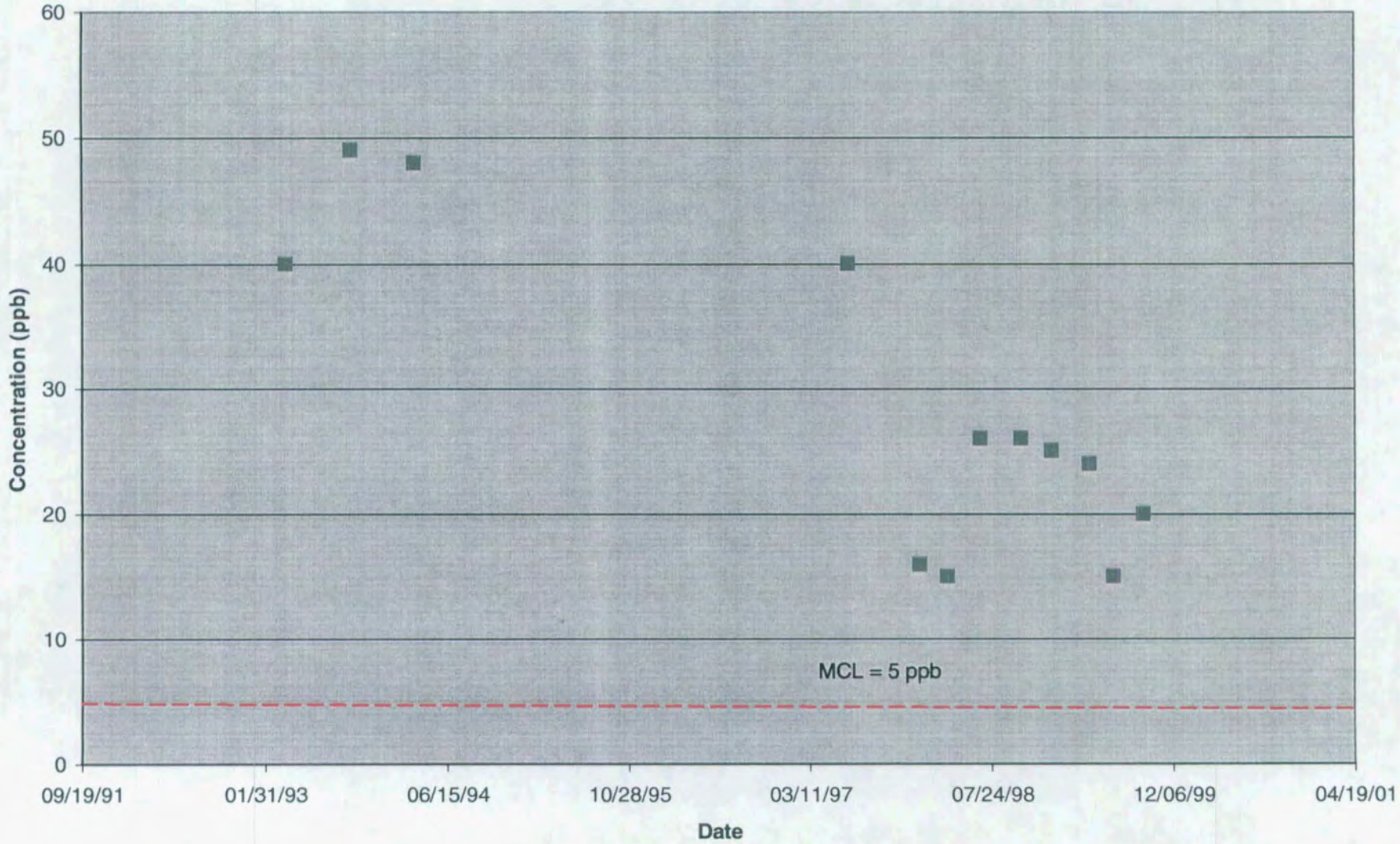


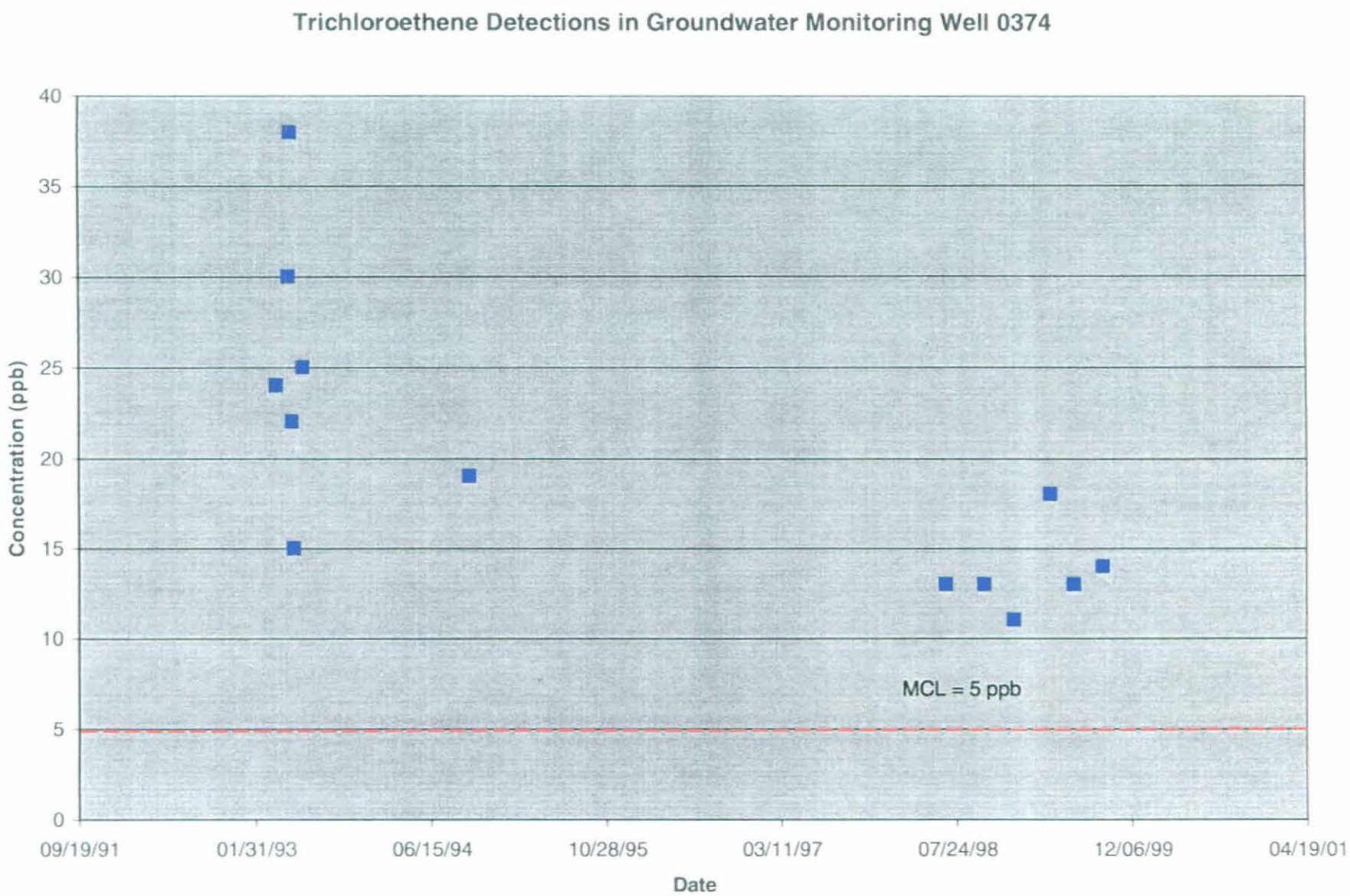
Trichloroethene Detections in Groundwater Monitoring Well 0370



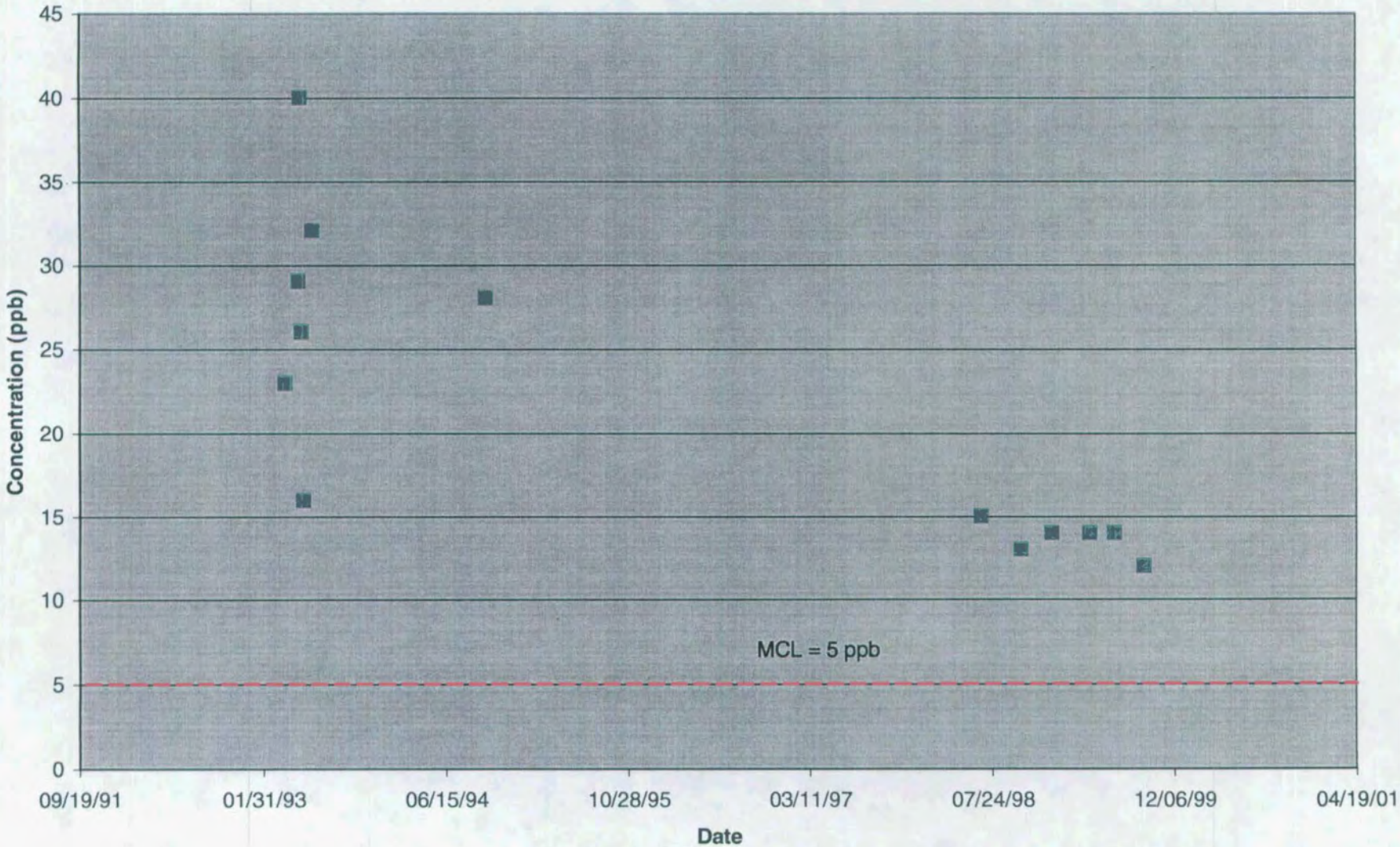

Trichloroethene Detections in Groundwater Monitoring Well 0373
Concentration (ppb)
35
30
25
20
15
10
5
0
09/19/91
01/31/93
06/15/94
10/28/95
03/11/97
07/24/98
12/06/99
04/19/01
Date

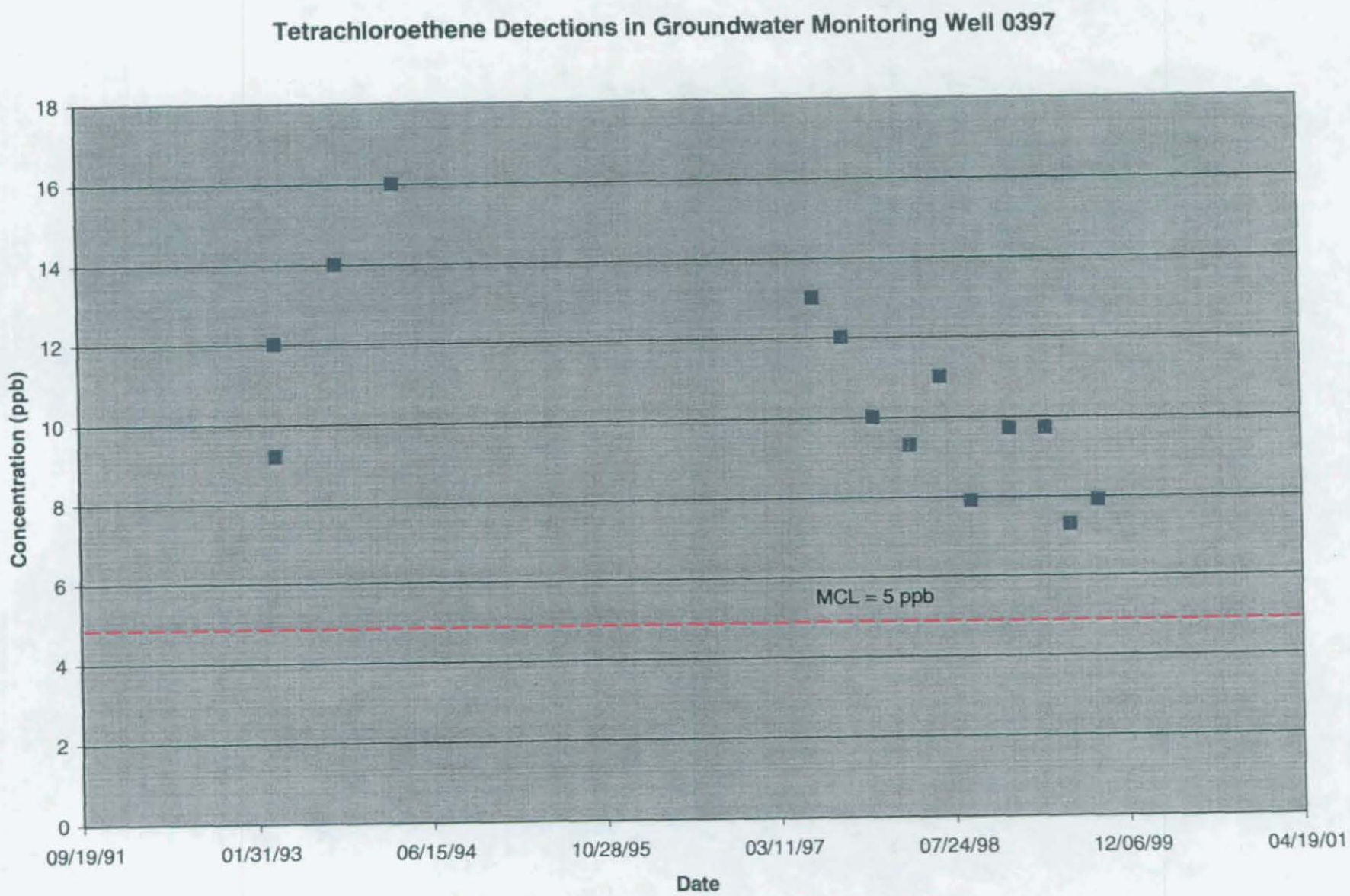
Tetrachloroethene Detections in Groundwater Monitoring Well 0373



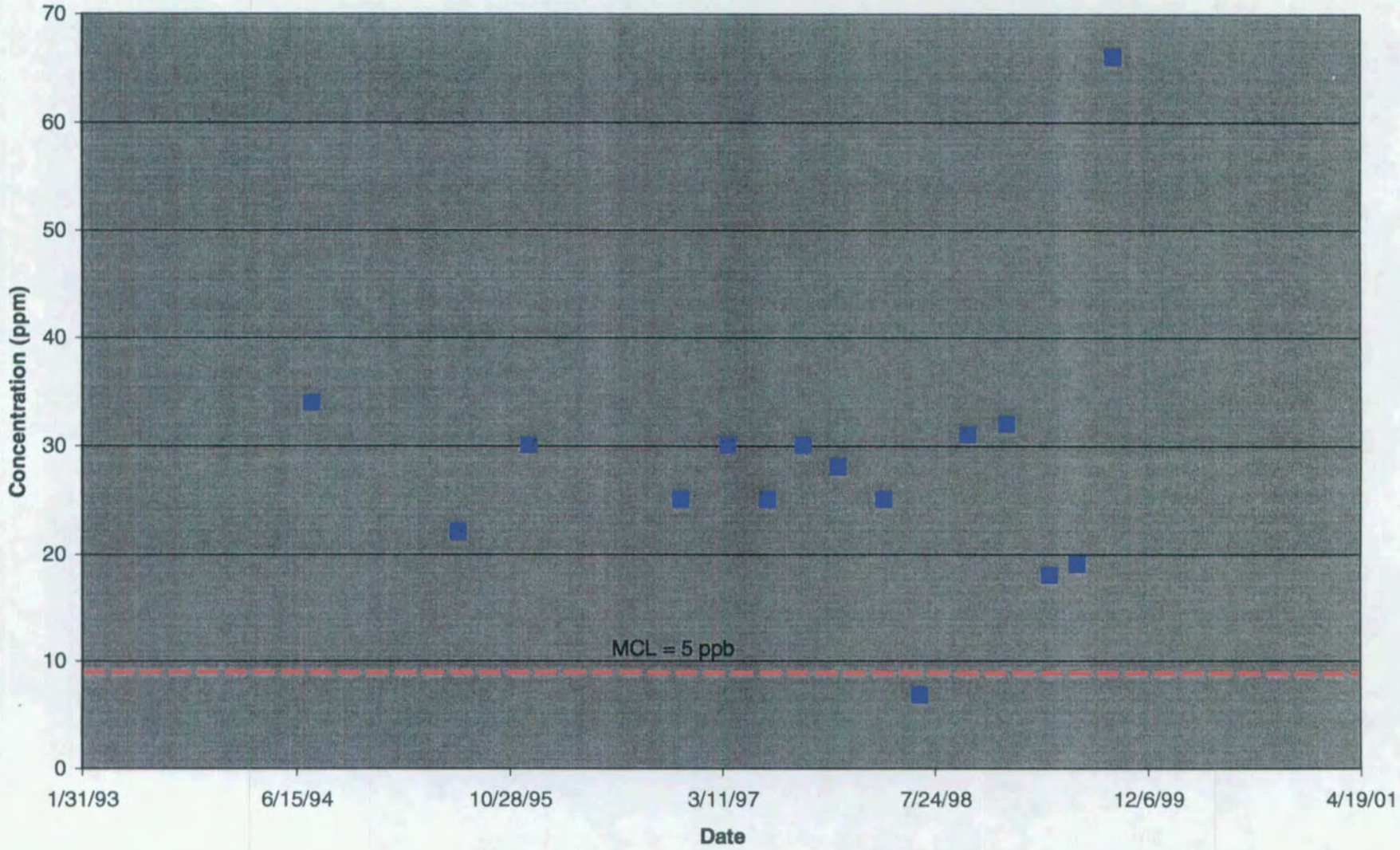

Trichloroethene Detections in Groundwater Monitoring Well 0374
Concentration (ppb)
40
35
30
25
20
15
10
5
0
MCL = 5 ppb
09/19/91
01/31/93
06/15/94
10/28/95
03/11/97
07/24/98
12/06/99
04/19/01
Date

Tetrachloroethene Detection in Groundwater Monitoring Well 0374

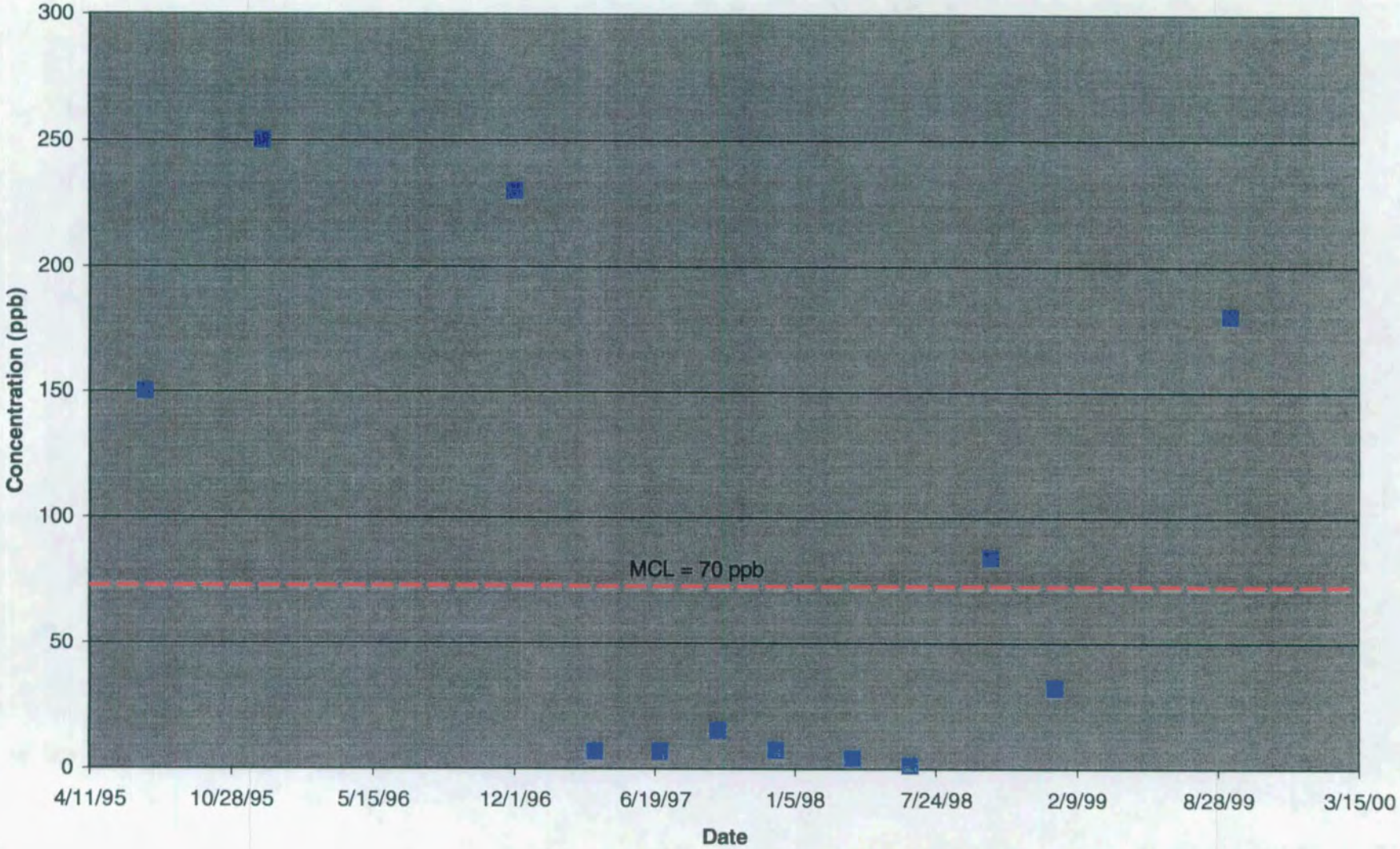


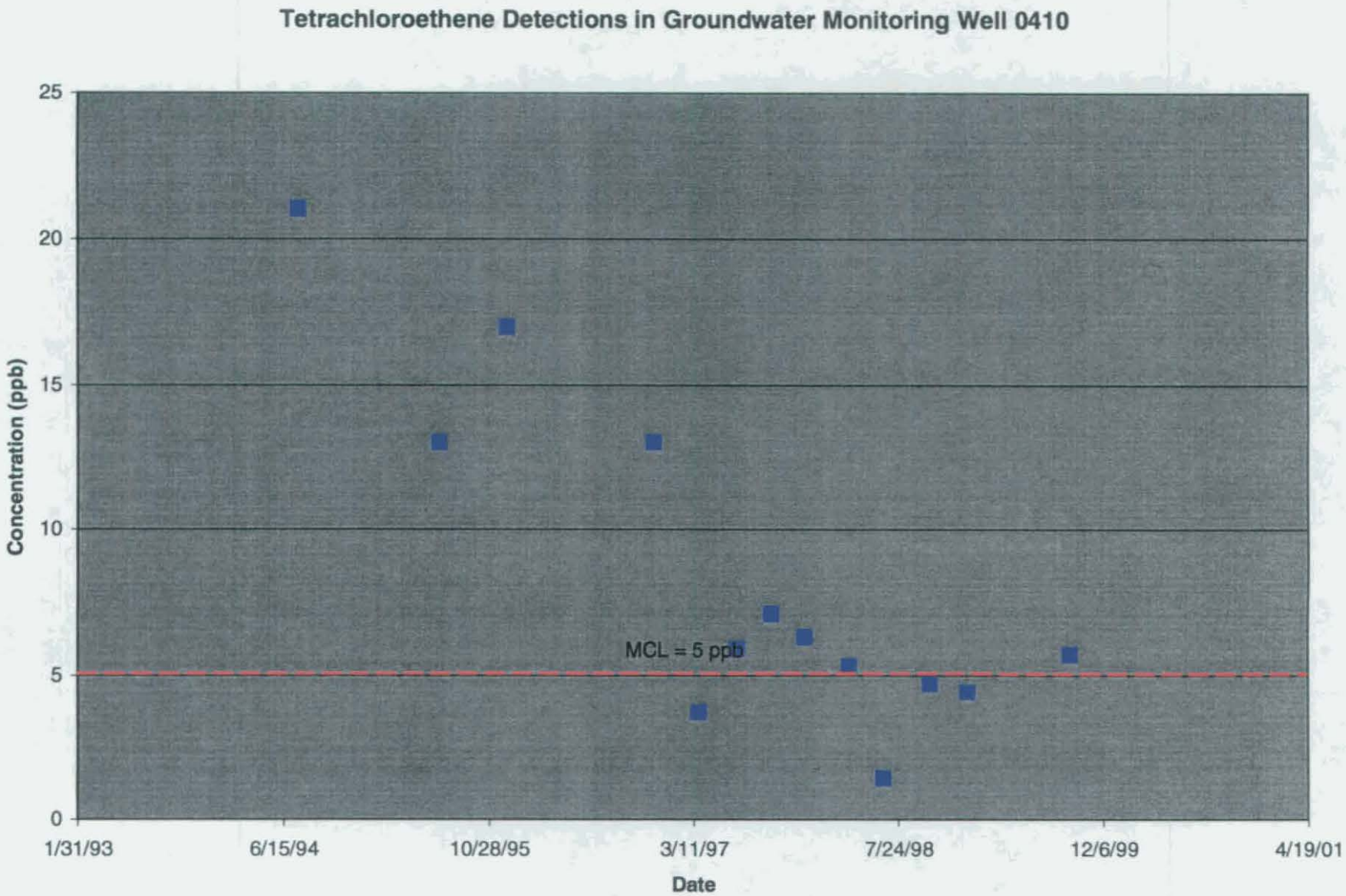

Tetrachloroethene Detections in Groundwater Monitoring Well 0397
Concentration (ppb)
18
16
14
12
10
8
6
4
2
0
MCL = 5 ppb
09/19/91
01/31/93
06/15/94
10/28/95
03/11/97
07/24/98
12/06/99
04/19/01
Date

Trichloroethene Detections in Groundwater Monitoring Well 0410

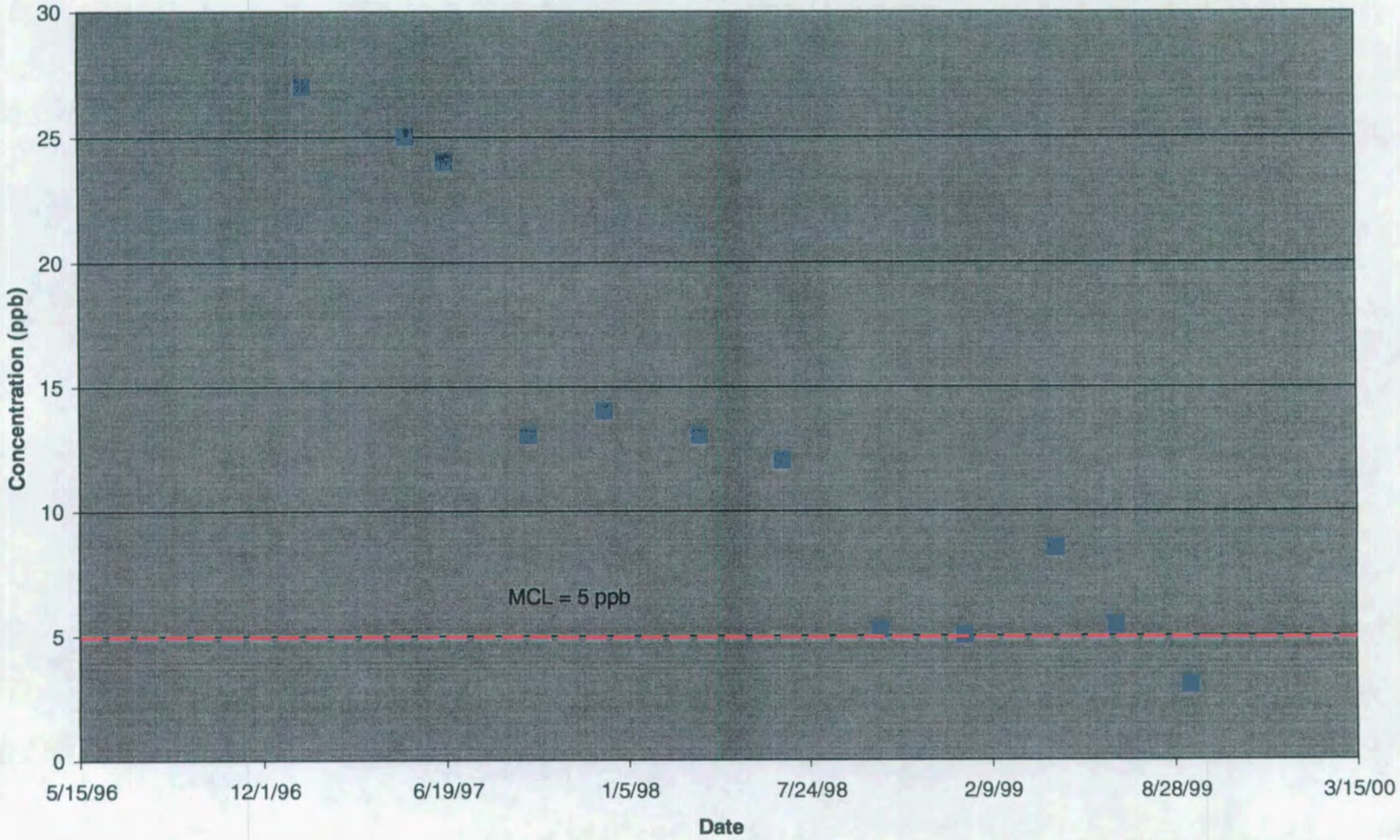


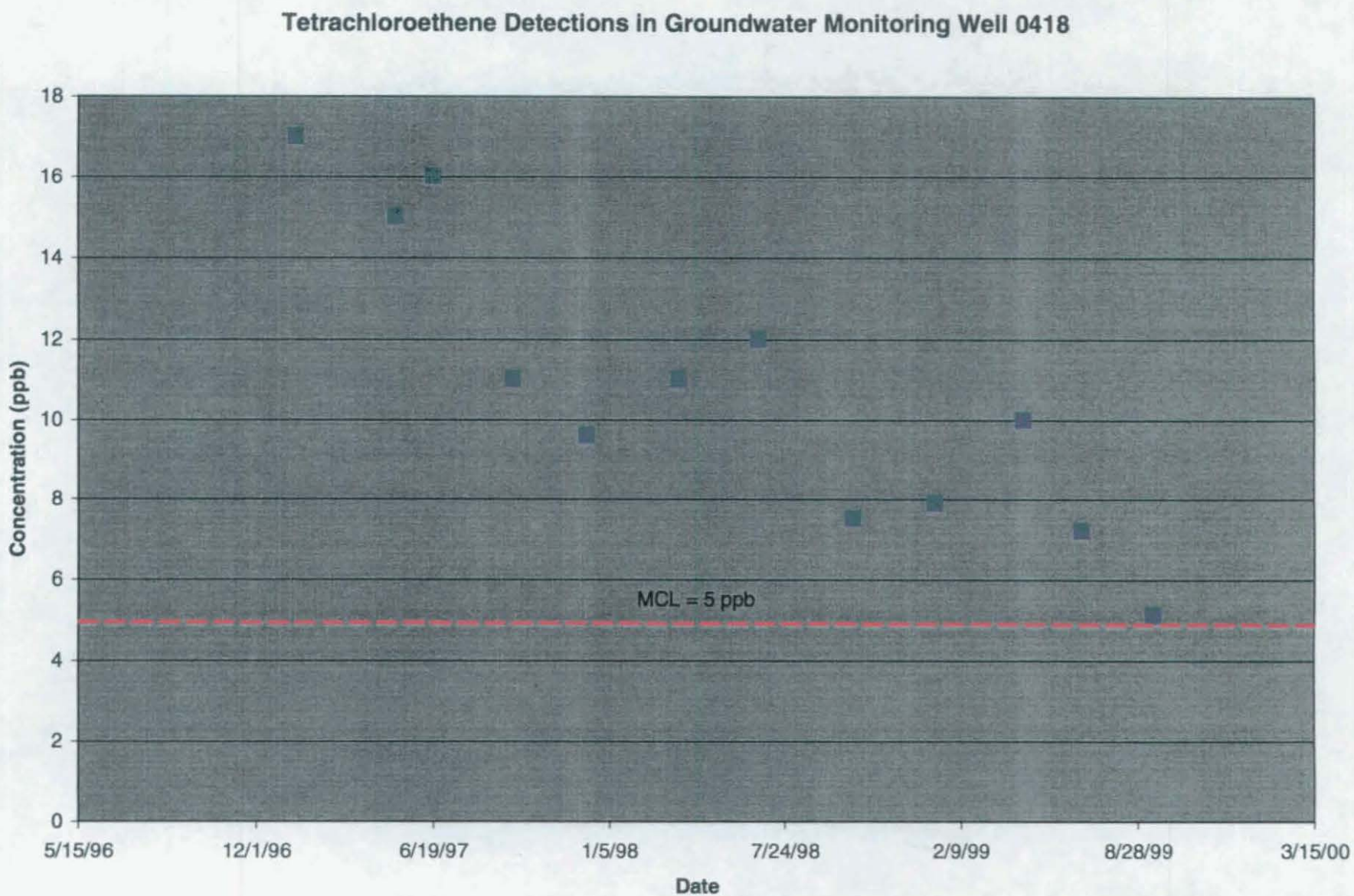
1,2-cis-dichloroethene Detections in Groundwater Monitoring Well 0410



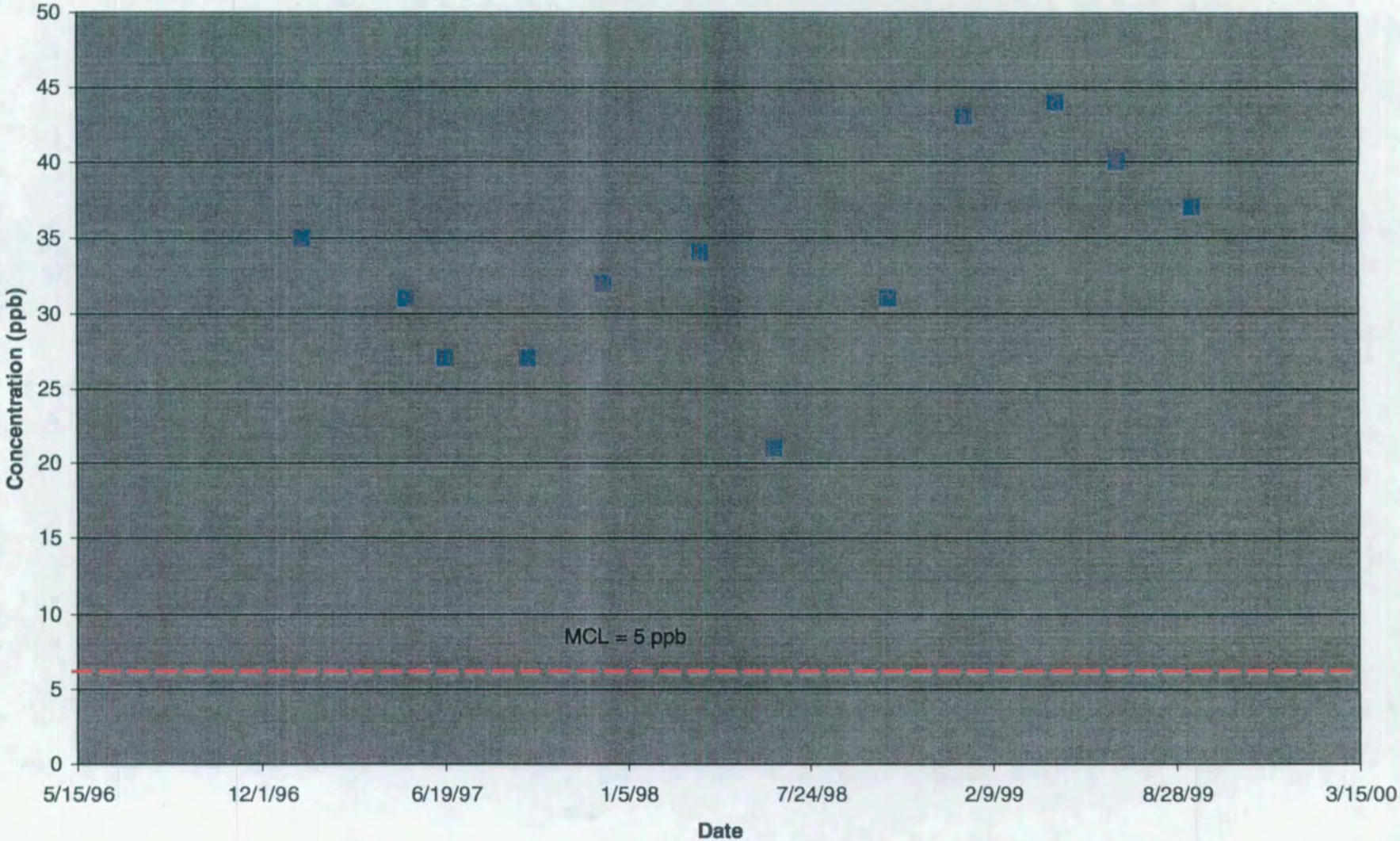

Tetrachloroethene Detections in Groundwater Monitoring Well 0410
Concentration (ppb)
25
20
15
10
5
0
MCL = 5 ppb
1/31/93
6/15/94
10/28/95
3/11/97
7/24/98
12/6/99
4/19/01
Date

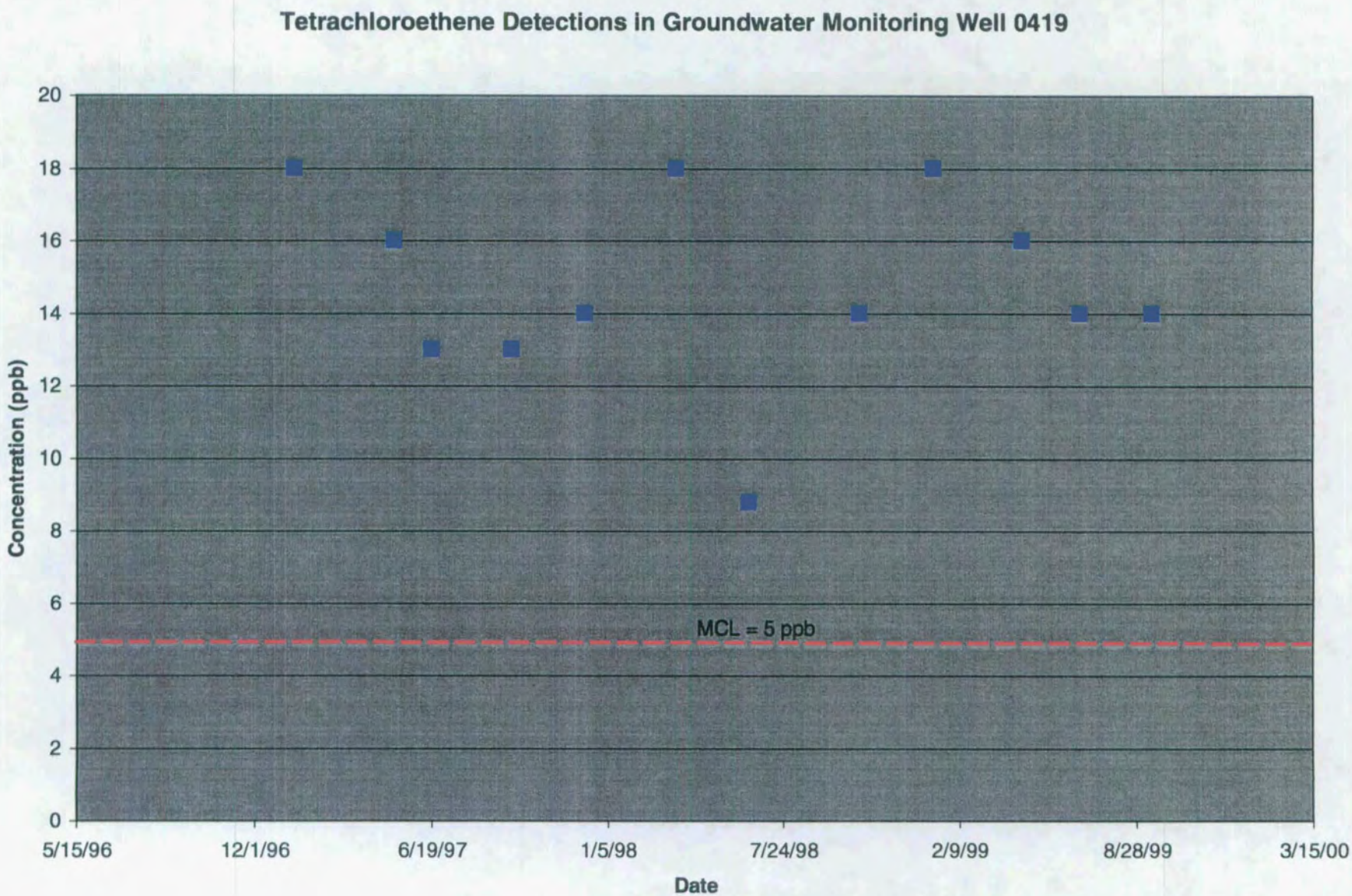
Trichloroethene Detections in Groundwater Monitoring Well 0418



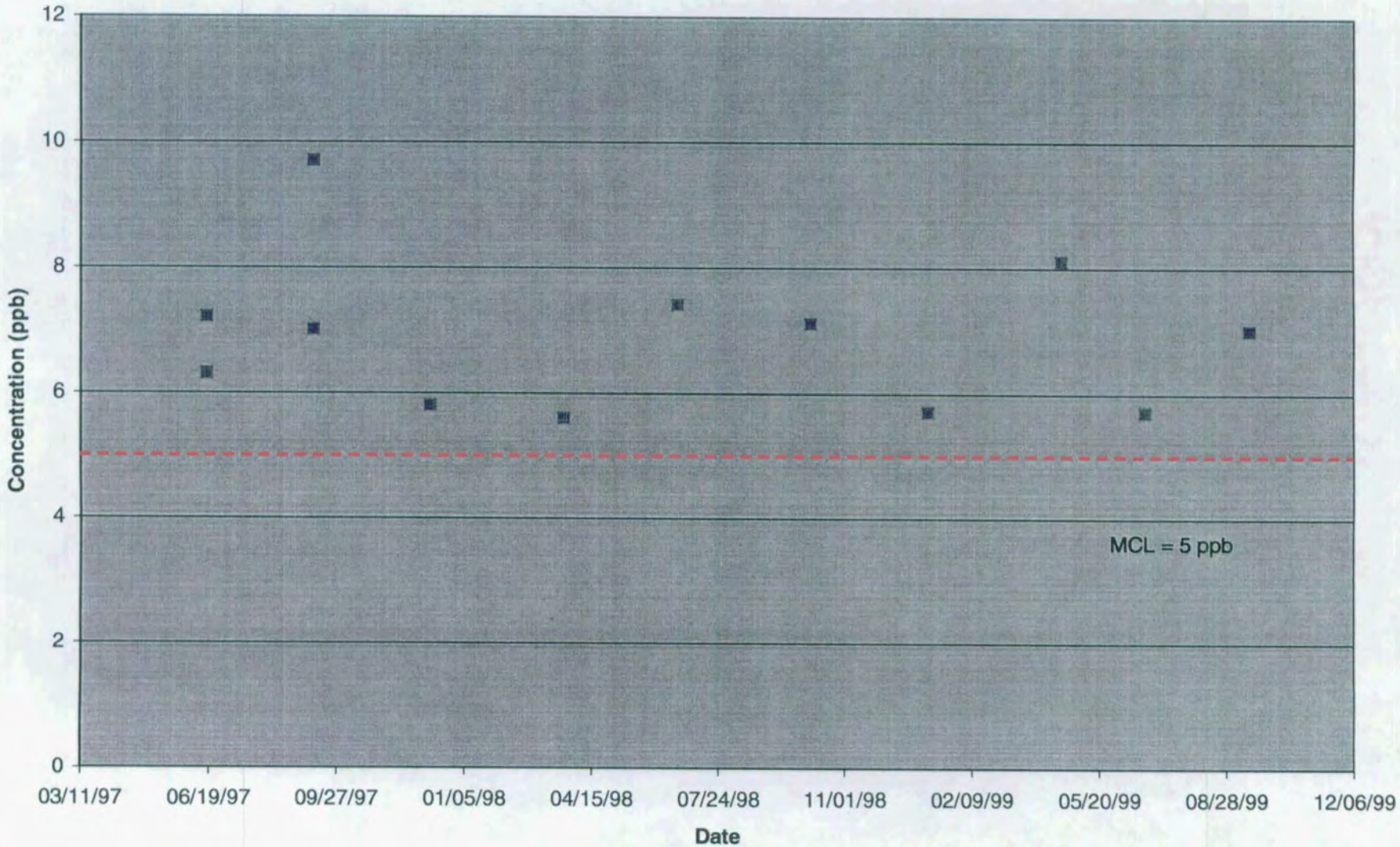

Tetrachloroethene Detections in Groundwater Monitoring Well 0418
Concentration (ppb)
18
16
14
12
10
8
6
4
2
0
MCL = 5 ppb
5/15/96
12/1/96
6/19/97
1/5/98
7/24/98
2/9/99
8/28/99
3/15/00
Date

Trichloroethene Detections in Groundwater Monitoring Well 0419




Tetrachloroethene Detections in Groundwater Monitoring Well 0419
Concentration (ppb)
20
18
16
14
12
10
8
6
4
2
0
MCL = 5 ppb
5/15/96
12/1/96
6/19/97
1/5/98
7/24/98
2/9/99
8/28/99
3/15/00
Date

Tetrachloroethene Detections in Groundwater Monitoring Well 0420



Legend

- Structures
- Paved roadway
- Unpaved roadway
- Railroad
- Water course
- Fence
- Retaining wall
- Mound Plant boundary
- Contour line
- 0370 Monitoring well
- P015 Piezometer

0 100 200 400 600 800 1000
Scale in Feet

1. The electronic base map data file was obtained from Woolpert Consultants, Inc., Dayton, Ohio. The data were photogrammetrically compiled from aerial photography dated 04/04/94.

Coordinate Datum is based on the Ohio State Plane Coordinate System, South Zone . Horizontal Ground Control is based on NAD 1983. Vertical Ground Control is based on NAVD 1988.

1981 magnetic north declination at center of plant. Magnetic north is 3 degrees west of true north. Declination between state plane (grid) north is 1. 13 degrees west of true north.

TN
GN
MN

MOUND
Environmental Restoration Geographic Information System

ISS	DATE	REVISION	BY	CHKR	ENG	M
	04/27/00		SSP			

DRAWING NUMBER allmon.dgn

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ISSUE
SHEET 1 2 3 4 5 6
ISSUE
PART CLASSIFICATION

( ) TITLE CLASSIFICATION
Active Groundwater Monitoring at Mound

DRAWING CLASSIFICATION: UNCLASSIFIED
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PRMG:
CAGEC:
SCALE: Graph
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ORIGIN: