24-MONTH ASSESSMENT REPORT GROUNDWATER EXTRACTION, TREATMENT AND DISCHARGE SYSTEM

Marathon Electric Manufacturing Company
Wausau, Wisconsin

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CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

In accordance with a Consent Decree, entered with the court on September 9, 1989, Marathon Electric Manufacturing Company (Marathon) proceeded with an extraction well (EW1) and associated treatment/discharge outlet installation. EW1 and associated treatment/discharge structures were installed at the Marathon facility, under the supervision of Conestoga-Rovers & Associates (CRA) personnel, between June 1, 1990 and September 28, 1990. The extraction well treatment and discharge system commenced operation on November 14, 1990. The facility is located along the west side of the Wisconsin River within the City of Wausau. Regional and Site location maps are shown on Figures 1.1 and 1.2, respectively. The locations of EW1 and existing monitoring wells are shown on Figure 1.3.

The response objectives, as specified in the 1988 Record of Decision (ROD), for the operation of EW1 were:

1. protection from long-term exposure to low levels of TCE from ingestion of drinking water; and
2. protection from future increased levels of contaminants in the West Well Field.

The purpose of installing EW1 at the selected location, as discussed in the 1988 ROD, was to control an identified volatile organic compound (VOC) contaminant plume source in the vicinity of the Marathon property/former City landfill, while capturing a large portion of the west side containment plume. EW1 was intended to remove VOC contaminants in the southern section of the west side contaminant plume (southern plume) while VOC contaminants in the northern section of the west side contaminant plume (northern plume) would continue to be captured by City production well 6 (CW6). The operation of EW1 and CW6 was expected to provide a block to the migration of VOC contaminants to City production wells CW7 and CW9 located northwest of CW6. The operation of EW1 was also expected to provide a block to the migration of VOC contaminants beneath the Wisconsin River to the East Well Field.

Based on modeling results presented in the 1988 ROD, the cone of depression created by the pumping of EW1 (desired cone of depression) would create a groundwater divide between EW1 and CW6 extending from west-northwest to east-southeast in the vicinity of Bos Creek and Randolph Street. The cone of depression would also create a divide between EW1 and CW3 beneath the Wisconsin River, in the vicinity of the island. The desired cone of depression for EW1, based on the modeling results presented in the 1988 ROD, is illustrated on Figure 1.3.

A 6-Month Assessment Report was prepared in accordance with the March 1990 Remedial Action Plan (RAP) and summarized all activities associated with the installation and operation of the groundwater extraction, treatment and discharge system during the first six months of operation, and provided an assessment toward achieving overall objectives of source reduction and control. The 6-Month Assessment Report was initially submitted to the United States Environmental Protection Agency (USEPA) and the Wisconsin Department of Natural Resources

(WDNR) on July 9, 1991. Comments were received on the 6-Month Assessment Report from the USEPA and WDNR on September 27, 1991.

A 12-Month Assessment Report was prepared in accordance with the RAP which included data collected through to the twelfth month of operation of the system (November 1991) and incorporated the USEPA and WDNR comments regarding the 6-Month Assessment Report. The 12-Month Assessment Report was submitted to the USEPA and WDNR on February 28, 1991.

This report provides an assessment of the operation of the groundwater extraction, treatment and discharge system based on monitoring data collected through to the twenty-fourth month of operation of the system (November 1992) in accordance with the annual reporting requirements of the RAP. Section 2.0 summarizes the well operation and monitoring data. Section 3.0 provides an assessment of the groundwater extraction and treatment system based on the monitoring data. Section 4.0 provides a summary of the assessment.

2.0 WELL OPERATION

The groundwater extraction, treatment and discharge system commenced operation on November 14, 1990. Groundwater hydraulic monitoring and sampling have been performed in accordance with the schedule specified in the Groundwater Monitoring Program (GMP) and are discussed in the following subsections.

2.1 HYDRAULIC MONITORING

Hydraulic monitoring commenced on November 13, 1990, prior to system startup. Piezometric elevations of the monitored wells for each sampling event conducted between November 13, 1990 and November 2, 1992 are presented in Table 1.

It is noted that wells IWD, IWM and IWS located on the island were not monitored from November 26, 1990 to April 1, 1991 and on November 4, 1991 and February 17, 1992 because they were inaccessible due to weather conditions.

Additional monitoring wells W56, W56A, MW1A, GM1S, MW1, MW2 and MW3 were included in the water level monitoring network beginning in January 1991 in order to more accurately delineate the extent of the cone of depression created by the pumping of EW1. Monitoring wells MW1, MW2 and MW3 were added to evaluate whether a potential source of groundwater contamination located to the southwest of the Marathon property/former City landfill area was being captured by EW1. Monitoring wells MW1A, GM1S, W56 and W56A were added to better define the cone of depression northeast of EW1 and southwest of CW6.

Evaluation of hydraulic monitoring data collected during the first month of operation of the system indicated that the initial EW1 pumping rate of approximately 1,550 gpm was creating a larger than necessary cone of depression. The progressive expansion of the cone of depression towards the northeast indicated a potential interference with the cone of depression created by CW6, which would result in a stagnation zone being developed where the two cones of depression overlapped. The expansion of the EW1 cone of depression towards the south indicated a potential capture of contaminated groundwater southwest of the Marathon property/former City landfill area.

Based on the August 15, 1990 EW1 pump test data, CRA calculated that the pumping rate of EW1 should range between 415 and 800 gpm in order to minimize interference with the CW6 cone of depression and potential capture of contaminants south of the Marathon property/former City landfill area. The details of this evaluation were provided in the report entitled "Evaluation of the Pumping Rate in Extraction Well No. 1", prepared by CRA and dated January 16, 1991. The pumping rate of EW1 was reduced to approximately 800 gpm on January 31, 1991, with written approval provided by the USEPA.

It is to be noted that after the pumping rate was reduced on January 31, 1991, the hydraulic monitoring events were increased from twice per month (as specified in the GMP) to weekly events until June 27, 1991. After the June 27, 1991 sampling event, the hydraulic monitoring events proceeded according to the quarterly schedule defined in the GMP. An assessment of the hydraulic containment created by EW1 is provided in Section 3.1.

2.2 GROUNDWATER SAMPLING

Groundwater sampling has proceeded according to the GMP. Table 2 summarizes all sampling events for the monitoring wells (C2S, C4D, R2D, R4D, W52, W53A, W53, W54, W55, WSWD, IWD), City production wells (CW3, CW6, CW7, CW9), and extraction well EW1 conducted from November 14, 1990 to November 2, 1992.

It should be noted that monitoring well C2S went dry on November 26, 1990 and the sampling pump was subsequently removed on March 4, 1991. The water level in monitoring well C2S recovered to an elevation of approximately 1,181.5 ft AMSL subsequent to the reduction in the pumping rate of EW1 to 800 gpm and C2S was sampled using a dedicated bottom-loading bailer beginning with the February 17, 1992 quarterly sampling event. The bottom of the C2S well screen has been measured at approximately 1,178.8 ft AMSL, therefore, adequate water is now available within the well such that the dedicated bladder pump, previously removed from the well, could be reinstalled and utilized to collect groundwater samples if the pumping rate of EW1 is maintained at 800 gpm. Should the pumping rate increase as part of the final remedy, the water level in monitoring well C2S would decrease and the well could go dry. Therefore, monitoring well C2S will continue to be sampled using a dedicated bottom-loading stainless steel bailer until the pumping rate of EW1 as part of the final remedy has been finalized and approved by the USEPA.

Well W53A was dry during January 1991 and was therefore not sampled on the January 7, 1991 sampling event. Monitoring well IWD, located on the island, was not sampled between December 4, 1990 and April 1, 1991 and on November 4, 1991 and February 17, 1992 due to weather conditions which made the island inaccessible.

On January 21, 1991, the Force Majeure clause specified in the Consent Decree, Section XII, was invoked due to the closure of Radian Laboratory's commercial laboratory. The extraction well samples scheduled for January 21, 1991 were, therefore, omitted from the schedule and the sampling activities originally scheduled for February 4 and 5, 1991 were delayed until February 12 and 13, 1991 with the approval of the USEPA. S-Cubed, a Division of Maxwell Laboratories Inc., of San Diego, California, a USEPA approved Contract Laboratory Program (CLP), laboratory was retained on February 5, 1991 to perform subsequent analyses.

2.2.1 Analytical Results

Groundwater samples analyzed for TCL VOCs are summarized in Tables 3 to 15. In addition, six groundwater samples were collected from monitoring wells C4D, W52, W53A, W54, and EW1 (influent and effluent) on December 3, 1990 for full TCL and TAL analyses. These six locations were specific sampling points determined by the USEPA and the WDNR to receive the full TCL/TAL analyses one month after the start-up of EW1 and on an annual basis thereafter as specified in the RAP. Tables 16, 17 and 18 summarize the metals, pesticide/PCB and BNA data for the six locations sampled.

Based on the results of the first round of TCL/TAL analyses on December 3, 1990, there was a possible exceedance of copper and zinc in the discharge stream of EW1. The WDNR requested that a sample be collected from the EW1 discharge and analyzed for metals to determine if there was an exceedance of copper and zinc. Effluent samples were collected on January 30, 1991 and February 6, 1991 for copper and zinc analyses, and the analytical data indicated that copper and zinc concentrations in the effluent were far below the water quality limits. At the request of the USEPA and the WDNR the six specific sampling locations (C4D, W52, W53A, W54 and EW1 influent/effluent) were resampled for TAL metals analysis during the March 4, 1991 sampling event. The analytical results for the additional TAL metals analysis conducted on March 4, 1991 and for the third round of TAL metals analysis conducted on February 17, 1992 are summarized in Table 16. Both the second and third rounds of TAL metals analyses confirmed that copper and zinc concentrations in the EW1 effluent were below the maximum allowable effluent limits for copper (36 μg/L) and zinc (220 μg/L).

The pesticide/PCB and BNA data for the December 3, 1990 samples from the six sample locations specified by the USEPA and the WDNR were below CLP detection limits, therefore a recommendation was made in the 6-Month Assessment Report that the annual full TCL/TAL analysis for the six sample locations be reduced to include only TCL VOCs and metals detected in the December 3, 1990 and March 4, 1991 sampling rounds. This recommendation was approved by the USEPA and the WDNR. During the February 17, 1992 quarterly sampling round the six sample locations were sampled for TCL VOCs and the TAL metals list.

QA/QC reviews of the analytical data for all the sampling events were performed by CRA and are included in Appendix A. Data qualifiers have been added to the data summarized in Tables 3 through 18, as appropriate. It should be noted that QA/QC reviews for particular wells found that some secondary dilution and/or reanalysis data reported by the laboratory was frequently unacceptable in relation to the trends indicated by the remaining data. In instances where the dilutions and reanalyses have resulted in data that do not correspond to other data for that specific well, the data have been assumed and qualified as anomalies.

3.0 ASSESSMENT OF GROUNDWATER EXTRACTION AND TREATMENT SYSTEM

3.1 HYDRAULIC CONTAINMENT

Figures 3.1 to 3.20 depict selected shallow well and deep well piezometric contours prior to system startup, before and after the pumping rate was reduced from approximately 1,550 gpm to 800 gpm on January 31, 1991, and for the quarterly hydraulic monitoring events performed between June 27, 1991 and November 2, 1992.

Figures 3.2 and 3.12 present shallow well and deep well piezometric contours, respectively, based on piezometric elevations measured on January 30, 1991 at which time EW1 was still operating at a pumping rate of approximately 1,550 gpm. These figures show that the cone of depression created by pumping EW1 at approximately 1,550 gpm was creating a larger than necessary cone of depression, which could potentially interfere with CW6 and was potentially capturing contaminated groundwater to the southwest of the Site (area of MW1, MW2, MW3). The desired cone of depression for EW1 is discussed in Section 1.0 and is illustrated on Figure 1.3.

Therefore, on January 31, 1991, the pumping rate of EW1 was reduced to approximately 800 gpm. Figures 3.3 to 3.10 present shallow well piezometric contours and Figures 3.13 to 3.20 present deep well piezometric contours based on piezometric elevations measured after the pumping rate of EW1 was reduced to 800 gpm. These figures show that the cone of depression created by pumping well EW1 at approximately 800 gpm receded until approximately June 27, 1991. After June 27, 1991, the cone of depression stabilized and corresponded approximately to the desired cone of depression discussed in Section 1.0 and shown on Figure 1.3.

Both the shallow and deep well piezometric contours shown on Figure 3.3 to 3.10 and 3.13 to 3.20, respectively, exhibit seasonal variations which indicate that the extent of the cone of depression created by EW1 is smallest during the spring and summer months. The seasonal variations in the extent of the cone of depression may be attributed to the high average monthly precipitation which occurs during the months of May through to September, as shown on Figure 3.21 which presents the 1991 and 1992 precipitation data for Antigo, Wisconsin located approximately 25 miles northeast of Wausau. The high levels of precipitation in the spring and summer months recharges the aquifer through infiltration and therefore reduces the extent of the cone of depression created by EW1 during these months.

Hydrographs for the monitoring well nests C4S/C4D, R1S/R1D, R3S/R3D, W52A/W52 and WSWS/WSWD, are shown on Figures 3.22 to 3.26, respectively. The hydrographs support the above discussion that following the reduction in the pumping rate of EW1 to approximately 800 gpm, the water levels in these monitoring wells stabilized after June 27, 1991 and exhibit seasonal fluctuations in piezometric elevations.

3.2 CONTAMINANT EXTRACTION AND TREATMENT

As discussed in Section 1.0, the purpose of installing EW1 at the selected location, was to control an identified VOC contaminant plume source in the vicinity of the Marathon property/former City landfill area, while capturing the southern contaminant plume.

As such, EW1 was installed within an area and was vertically screened at an elevation which exhibited the highest VOC concentrations detected during the RI in the source area. Figures 3.27 and 3.28, reproduced from figures presented in the RI report, present total chlorinated ethane concentration contours in plan and cross-sectional view respectively. Extraction well EW1 has been added to both figures.

Figure 3.29 presents the accumulative amounts of 1,2-dichloroethene and trichloroethene which have been removed from the contaminant plume by the operation of EW-1. Since the groundwater extraction, treatment and discharge system began operation on November 14, 1990, approximately 190 pounds of 1,2-dichloroethene and 2,140 pounds of trichloroethene have been extracted from the contaminant plume up to and including November 2, 1992. These values have been calculated by assuming a constant parameter concentration between sampling events in conjunction with the EW1 influent VOC analytical results (see Table 14) and the corresponding EW1 pumping rate.

Figures 3.30 to 3.46 present concentration versus time plots for the primary contaminants, trichloroethene and 1,2-dichloroethene, for extraction well EW1 (influent and effluent), C4D, WSWD, W53A, W53, W54, IWD, C2S, R4D, W52, R2D and W55 and the City production wells CW3, CW6, CW7 and CW9. It is noted that when a duplicate analysis was performed for a sample, an average concentration of the two samples has been plotted. It is further noted that certain wells exhibit one or more data points which have been labelled as anomalies because they do not correspond with the overall trend indicated by the remainder of the data for that well. These anomalies also occurred during reanalysis or secondary dilution analyses as discussed in Section 2.2.1.

Figure 3.30 indicates a decreasing contaminant concentration trend in the EW1 influent between November 1990 and November 1991. This is attributed to the initial reduction in contaminant concentrations in the southern plume in the vicinity of EW1. Subsequent to November 1991, the trichloroethene concentrations in EW1 have levelled off to approximately 170 µg/L indicating that EW1 is effective in capturing a large portion of the west side plume.

Comparison of Figures 4.30 and 4.31 shows that the EW1 effluent concentrations of the primary contaminants are approximately 30 percent lower than the EW1 influent concentrations of these contaminants. This indicates that the passive VOC stripping rip rap discharge structure has a removal efficiency of approximately 30 percent for the primary contaminants, trichloroethene and 1,2-dichloroethene. The average concentrations of trichloroethene and 1,2-dichloroethene discharged to the Wisconsin River during the first 24 months of system operation were approximately 200 µg/L and 40 µg/L, respectively. These concentrations are well below the maximum water quality effluent limits of 41,000 µg/L for trichloroethene, and 120,000 µg/L for 1,2-dichloroethene as specified in Table 3.1 of the RAP.

The concentration versus time plots for the monitoring wells located southwest of EW1, namely C4D, WSWD, W53A, W53, and W54 (Figures 3.32 to 3.36) show generally decreasing trends in the concentrations of 1,2-dichloroethene and trichloroethene since EW1 began operating. As shown on Figures 3.4 to 3.10 and Figures 3.14 to 3.20, the areal extent of the cone of depression created by EW1 approximately encompasses these monitoring wells and the southern plume. The hydraulic and groundwater quality data show that EW1 is effectively capturing the southern plume source in the vicinity of the Marathon property/former City landfill.

The island monitoring well (IWD) was not sampled regularly due to weather conditions. The concentration versus time plot for IWD presented on Figure 3.37 shows a general increase in the concentration of trichloroethene between November 1990 and August 1991 and a general decrease in concentration of trichloroethene between August 1991 and May 1992. Based on the extent of the deep well piezometric contours shown on Figures 3.12 to 3.20, and the contaminant plume contours shown on Figure 3.27, it is concluded that the initial EW1 pumping rate of approximately 1550 gpm caused a cone of depression which captured a section of the eastern contaminant plume with a concentration of trichloroethene in the order of 1000 ppm. After the pumping rate in EW1 was reduced to approximately 800 gpm on January 31, 1991, the estimated extent of the cone of depression receded to the area of the island, however, the previously captured section of the eastern contaminant plume continued to move northwest towards EW1. The trichloroethene concentrations in IWD increased from November 1990 to August 1991 as the captured section of the eastern contaminant plume moved through IWD towards EW1 and subsequently decreased from August 1991 to May 1992 as the eastern plume section moved past IWN northwest towards EW1. Contaminant concentrations in IWD indicate an increasing trend between May and November 1992, however, it is anticipated that the concentrations will level off and decrease as the southern plume conatminant concertions are reduced in the area of the island by the operation of EW1.

The concentration versus time plot for shallow well C2S presented in Figure 3.38 indicates that the trichloroethene concentrations have stabilized at approximately 50 ug/L between February 1992 and November 1992. The relatively low level of contamination exhibited in C2S is consistent with the low contaminant concentrations found in the shallow groundwater of the west side plume in the area of C2S as shown on Figure 3.28.

The concentration versus time plots for the deep monitoring wells located northeast of EW1, namely R4D, W52, R2D, and W55 (Figures 4.39 to 4.42) generally indicate relatively high concentrations of trichloroethene in these wells. The cause of the high concentrations of trichloroethene in these wells may be seen with reference to Figures 3.27 and 3.28. When the EW1 pumping rate was approximately 1550 gpm, the cone of depression extended northeast of monitoring well R2D, (see Figure 3.12) thereby capturing a section of the northern plume which has contaminant concentrations exceeding 4000 µg/L, as shown on Figure 3.28. When the EW1 pumping rate was reduced to approximately 800 gpm on January 31, 1991, the cone of depression began to recede, however, the previously captured section of the northern contaminant plume continued to move southwest towards EW1. As the captured section of the northern contaminant plume moved southwest, significant increases in trichloroethene concentrations were observed in monitoring wells W55, R2D, W52 and R4D between November 1990 and approximately August 1991.

The trichloroethene concentration in well W55 decreased significatly between November 1991 and May 1992 as shown in Figure 3.42. This decrease in trichloroethene concentration in W55 may be attributed to the northern contaminant plume section, initially captured by EW1, moving past this well location towards EW1. Trichloroethene concentrations in R2D have varied between 2500 and 5200 µg/L during the period of February 1991 to November 1992 as shown on Figure 3.41. The consistently high concentrations of trichloroethene exhibited in R2D indicate that the previously captured portion of the northern plume is continuing to move towards EW1. The trichloroethene concentrations in well W52 have varied between 2100 and 200 µg/L subsequent to August 1991 as shown on Figure 3.40. The variations in trichloroethene concentrations in well W52 are attributed to the capture and movement of the northern plume contaminants through this well location towards EW1. Well R4D has exhibited increasing concentrations of trichloroethene as shown on Figure 3.39. Well R4D is located within an area of high contaminant concentrations in the southern plume as shown on Figures 3.27 and 3.28. High concentrations of trichloroethene in R4D are also caused by the northern plume contaminants which are moving southwest towards EW1 through R4D.

The concentrations of trichloroethene in CW6 have varied between 31 µg/L and 220 µg/L as shown on Figure 3.43. The contaminant concentrations between November 1991 and November 1992 indicate and increasing trend which may be attributed to CW6 capturing sections of the northern plume which have areas of high concentrations south of CW6, as shown on Figures 4.27 and 4.28. If the current pumping rates of EW1 and CW6 are maintained, it is expected that the contaminant concentrations in CW6 will level off and then decrease as the northern plume is captured by CW6.

The concentration versus time plots for CW7 and CW9 (Figures 3.44 and 3.45) indicate that they are not capturing contaminants at detectable levels, therefore, the cones of depression created by EW1 and CW6 are effective in capturing the southern and northern contaminant plumes, preventing them from moving northeast towards CW7 and CW9.

CW3 indicates a slightly decreasing contaminant concentration trend. This is attributed to the fact that EW1 is effectively creating a hydraulic barrier between the southern plume and the east side plume, preventing groundwater and contaminants from flowing under the river towards CW3.

Pursuant to the RAP and as discussed in Section 2.2.1, six sampling locations as specified by EPA and WDNR were subject to full TCL and TAL analyses. Tables 17 and 18 show that there were no pesticides/PCBs or BNAs detected above CLP detection limits in the six locations sampled on December 3, 1990. Table 16 shows that all metals detected in the EW1 effluent were below the water quality effluent limits defined in Table 3.1 of the RAP for all sampling rounds, with the exception of a possible exceedance of copper and zinc for the December 3, 1990 sampling round as discussed in Section 2.3.1.

4.0 SUMMARY

When the EW1 pumping rate of approximately 1,550 gpm was in effect between November 14, 1990 and January 30, 1991, the resulting cone of depression was extensive, causing capture of potentially contaminated groundwater south of the Marathon property/former City landfill area and potential interference with the cone of depression created by City production well CW6.

Subsequent to reducing the pumping rate to approximately 800 gpm on January 31, 1991, the water level monitoring data indicate that the desired cone of depression as presented in the 1988 ROD and as discussed in Section 1.0 is being achieved and has stabilized after June 1991. Seasonal variations in the extent of the EW1 cone of depression may be attributed to high levels of precipitation during the spring and summer months which causes a reduction in the size of the cone of depression during these months.

Based on EW1 influent groundwater sampling data, approximately 190 pounds of 1,2-dichloroethene and 2,140 pounds of trichloroethene have been extracted from the west side VOC contaminant plume between November 14, 1990 and November 8, 1992.

The EW1 treatment/discharge structure has been removing primary contaminants at an efficiency of approximately 30 percent, and the discharge concentrations of the primary contaminants are two and three orders of magnitude below the water quality effluent limits of

41,000 µg/L for trichloroethene and 120,000 µg/L for 1,2-dichloroethene, respectively.

Decreasing contaminant concentrations in CW3 and continued non-detect contaminant concentrations in CW7 and CW9 indicates that the operation of EW1 and CW6 is effective in capturing the west side plume and in preventing the west side plume from moving towards CW3, CW7 and CW9.

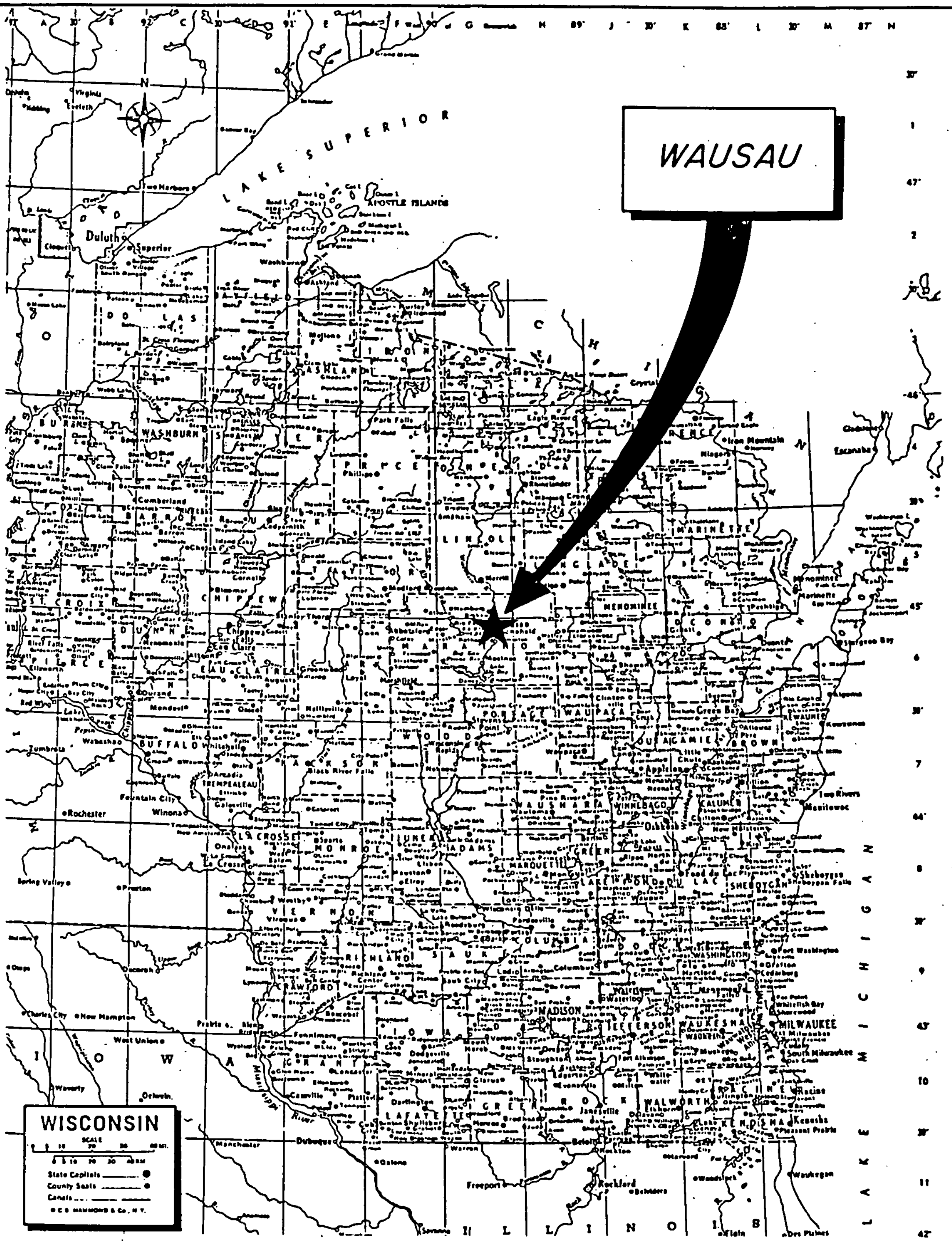

figure 1.1

REGIONAL LOCATION MAP

Marathon Electric Manufacturing Co.

CRA

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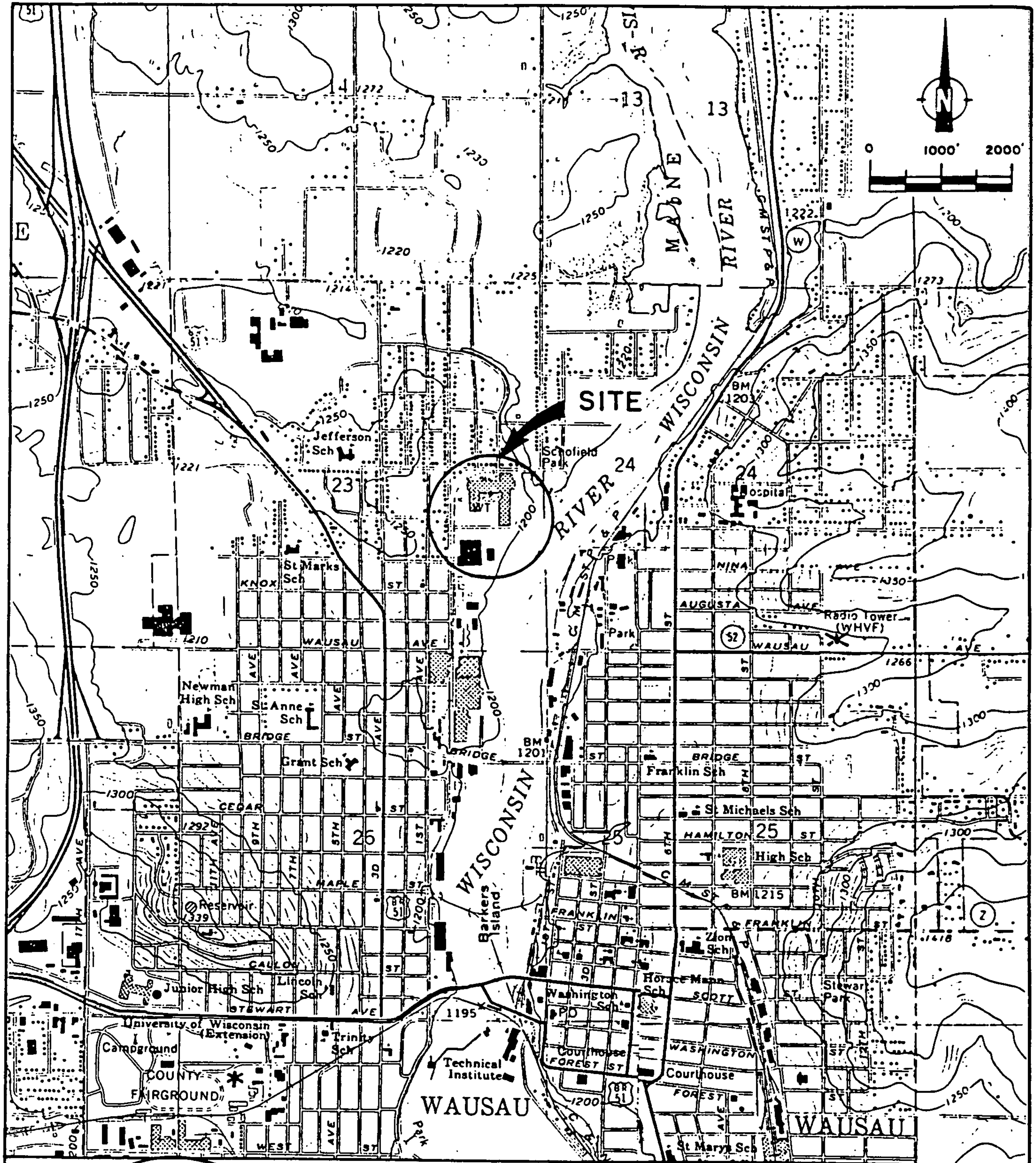
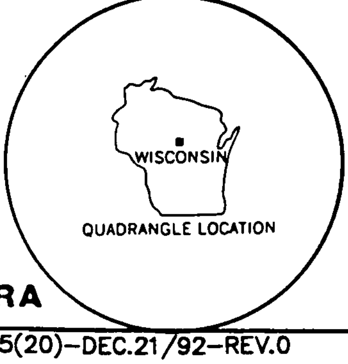


SOURCE : U.S.G.S. WAUSAU WEST QUADRANGLE MAP.



QUADRANGLE LOCATION

CRA

figure 1.2

SITE LOCATION

Marathon Electric Manufacturing Co.

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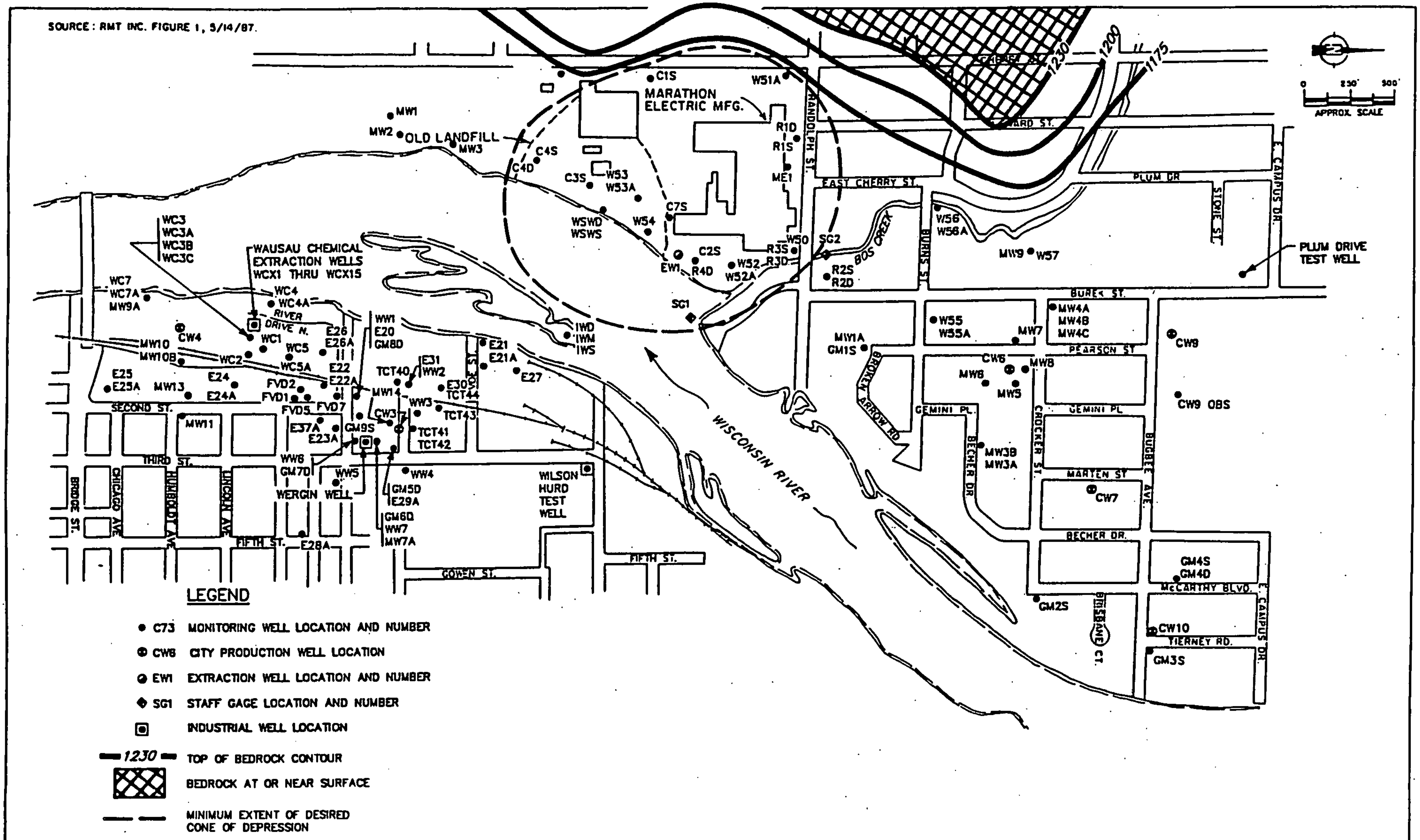


figure 1.3

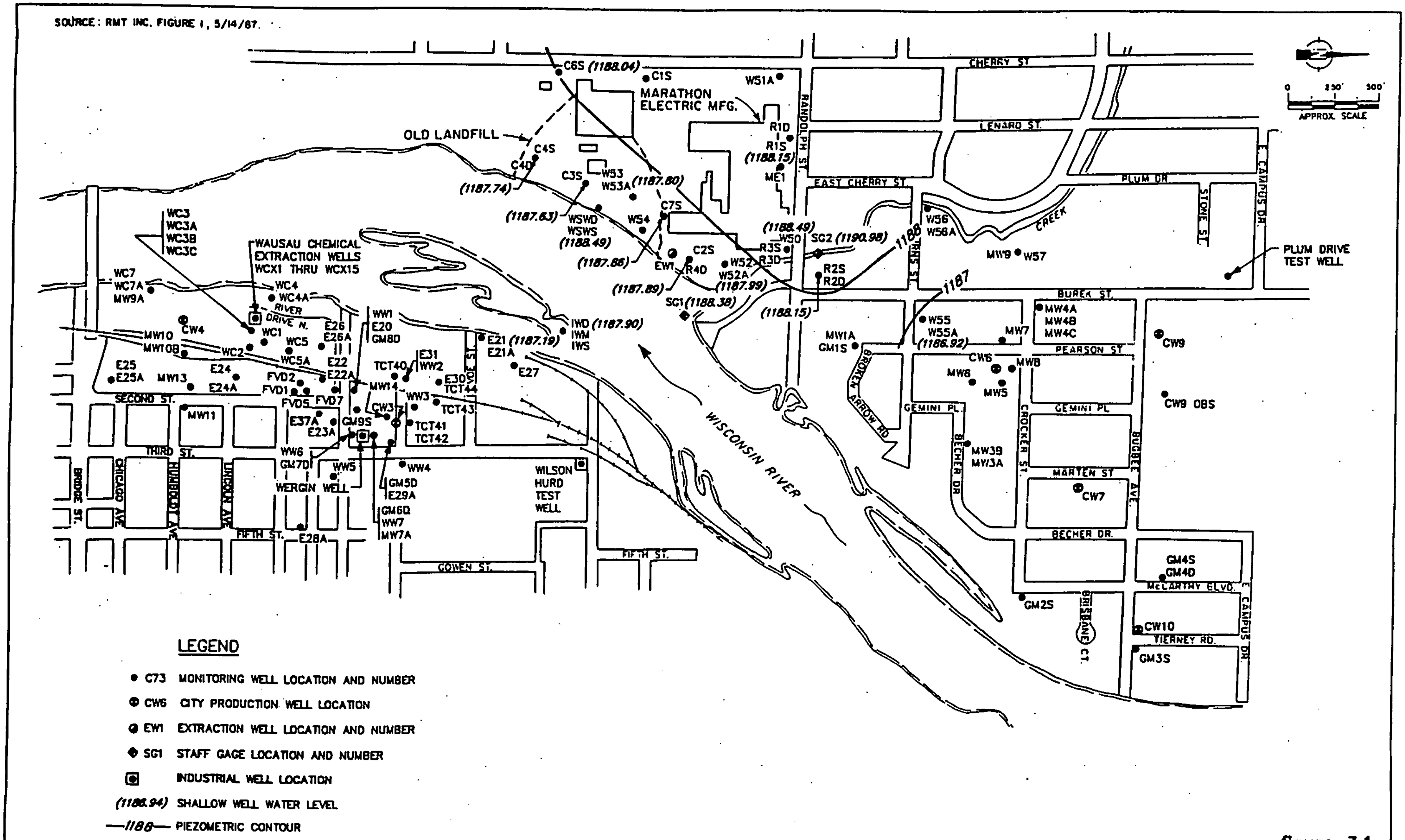
EXTRACTION WELL AND MONITORING WELL LOCATIONS

Marathon Electric Manufacturing Co.

CRA

2115(20)-FEB.10/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.



LEGEND

- ● C73 MONITORING WELL LOCATION AND NUMBER
- ⊕ CW6 CITY PRODUCTION WELL LOCATION
- ◐ EW1 EXTRACTION WELL LOCATION AND NUMBER
- ◆ SG1 STAFF GAGE LOCATION AND NUMBER
- ▣ INDUSTRIAL WELL LOCATION
- (1188.94) SHALLOW WELL WATER LEVEL
- —1188— PIEZOMETRIC CONTOUR

figure 3.1

SHALLOW WELL PIEZOMETRIC CONTOURS (11/13/90)

Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

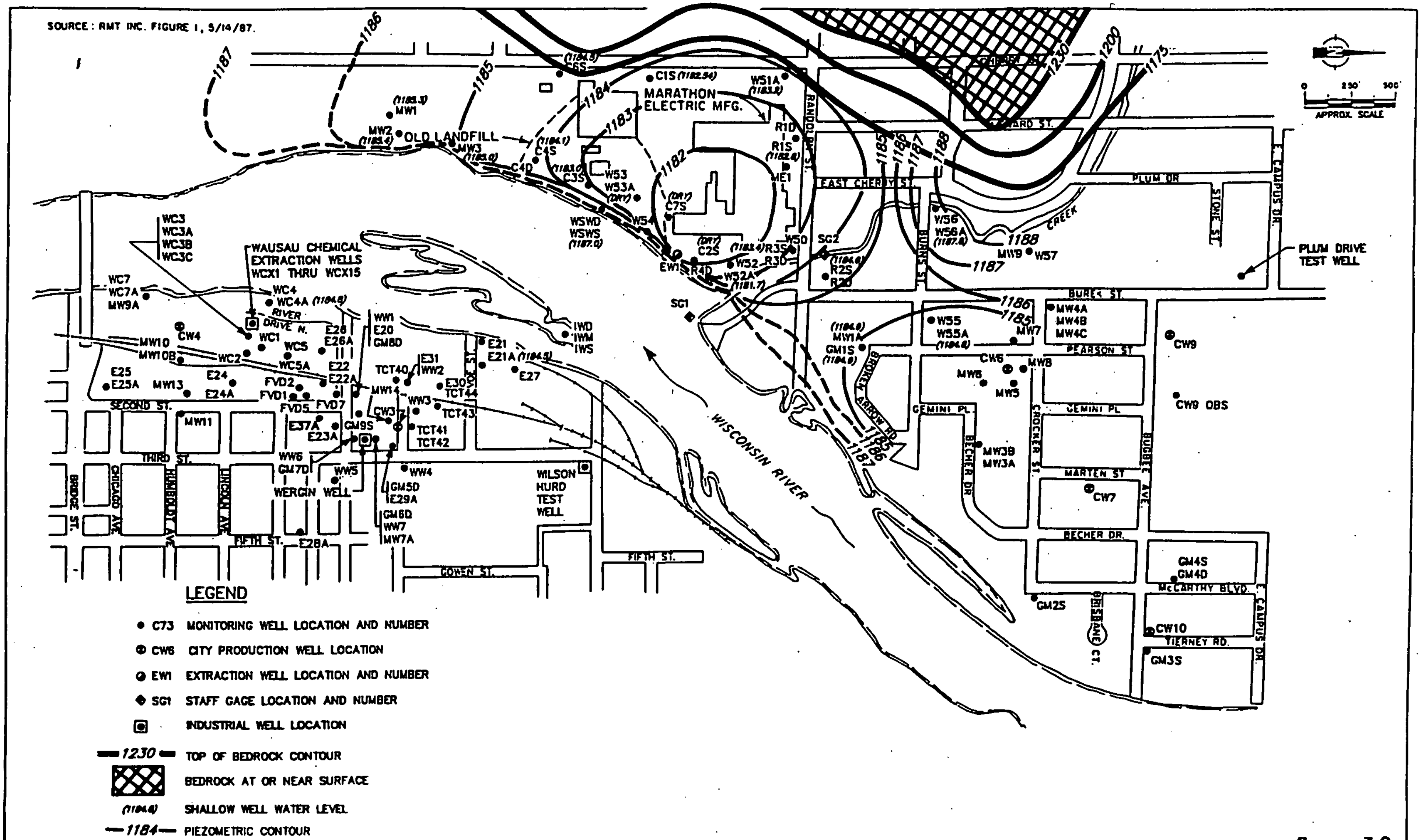


figure 3.2

SHALLOW WELL PIEZOMETRIC CONTOURS (01/30/91)

Marathon Electric Manufacturing Co.

CRA

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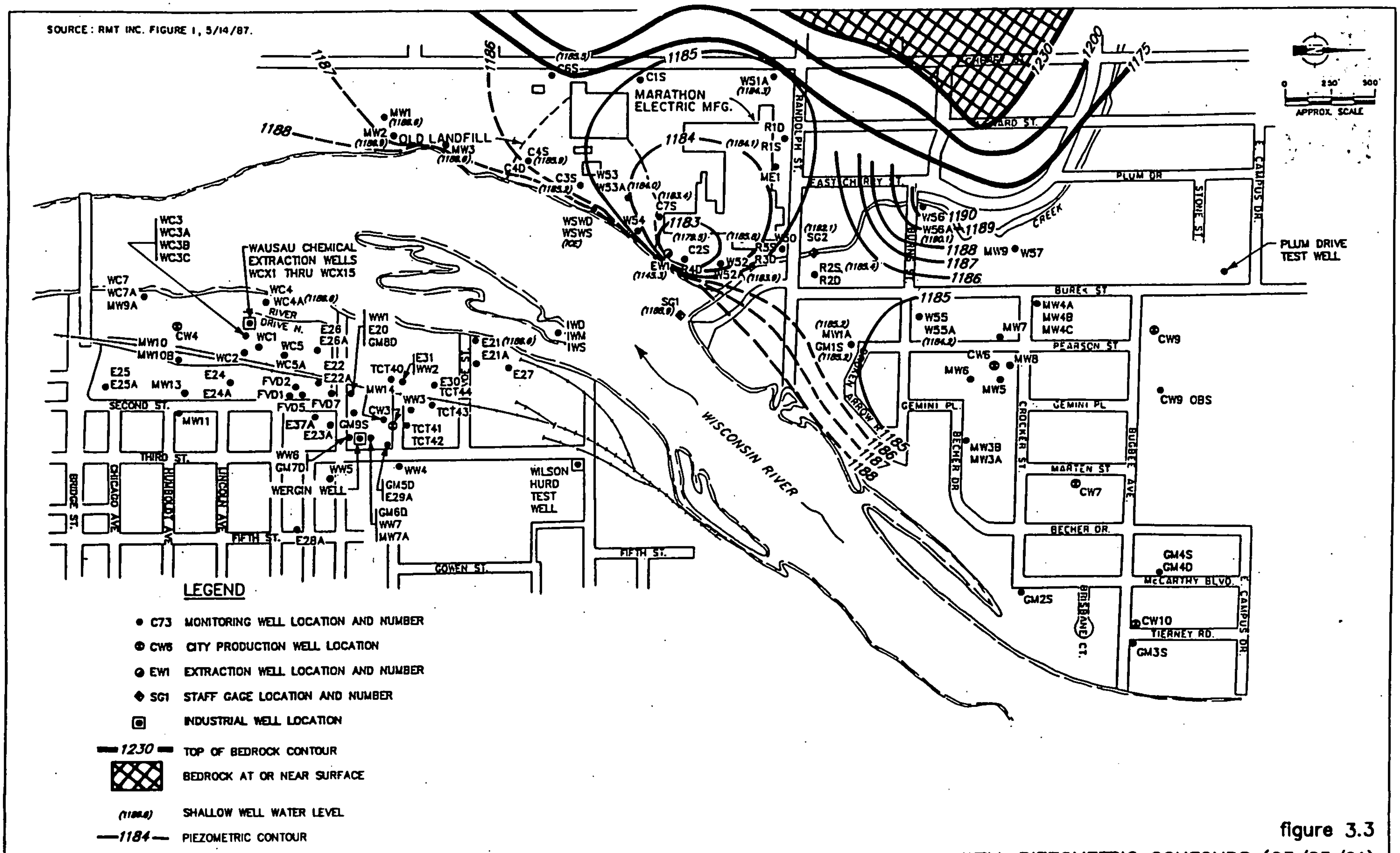

figure 3.3

SHALLOW WELL PIEZOMETRIC CONTOURS (03/25/91)

Marathon Electric Manufacturing Co.

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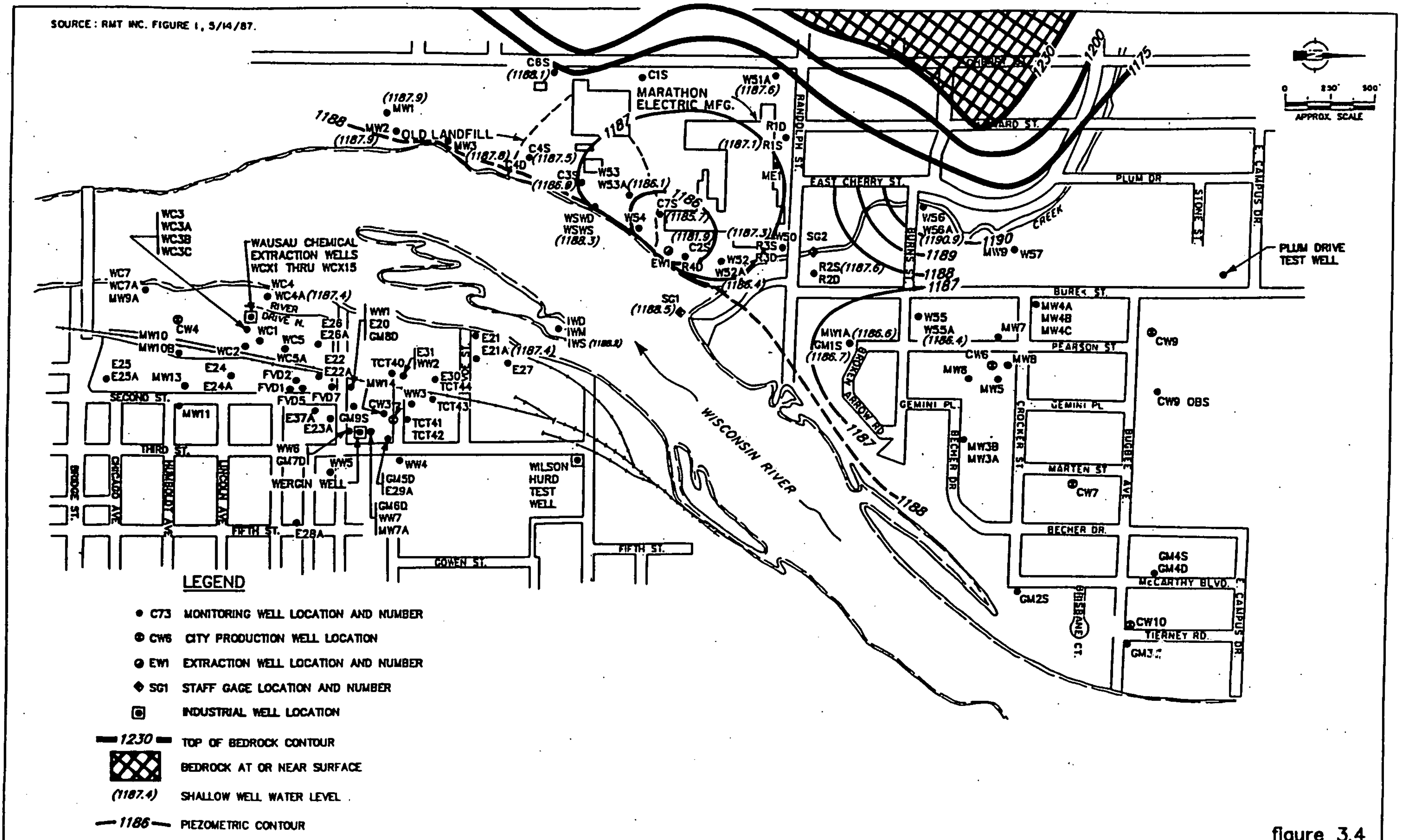

SOURCE: RMT INC. FIGURE 1, 5/14/87.

figure 3.4

SHALLLOW WELL PIEZOMETRIC CONTOURS (06/27/91)

Marathon Electric Manufacturing Co.

CRA

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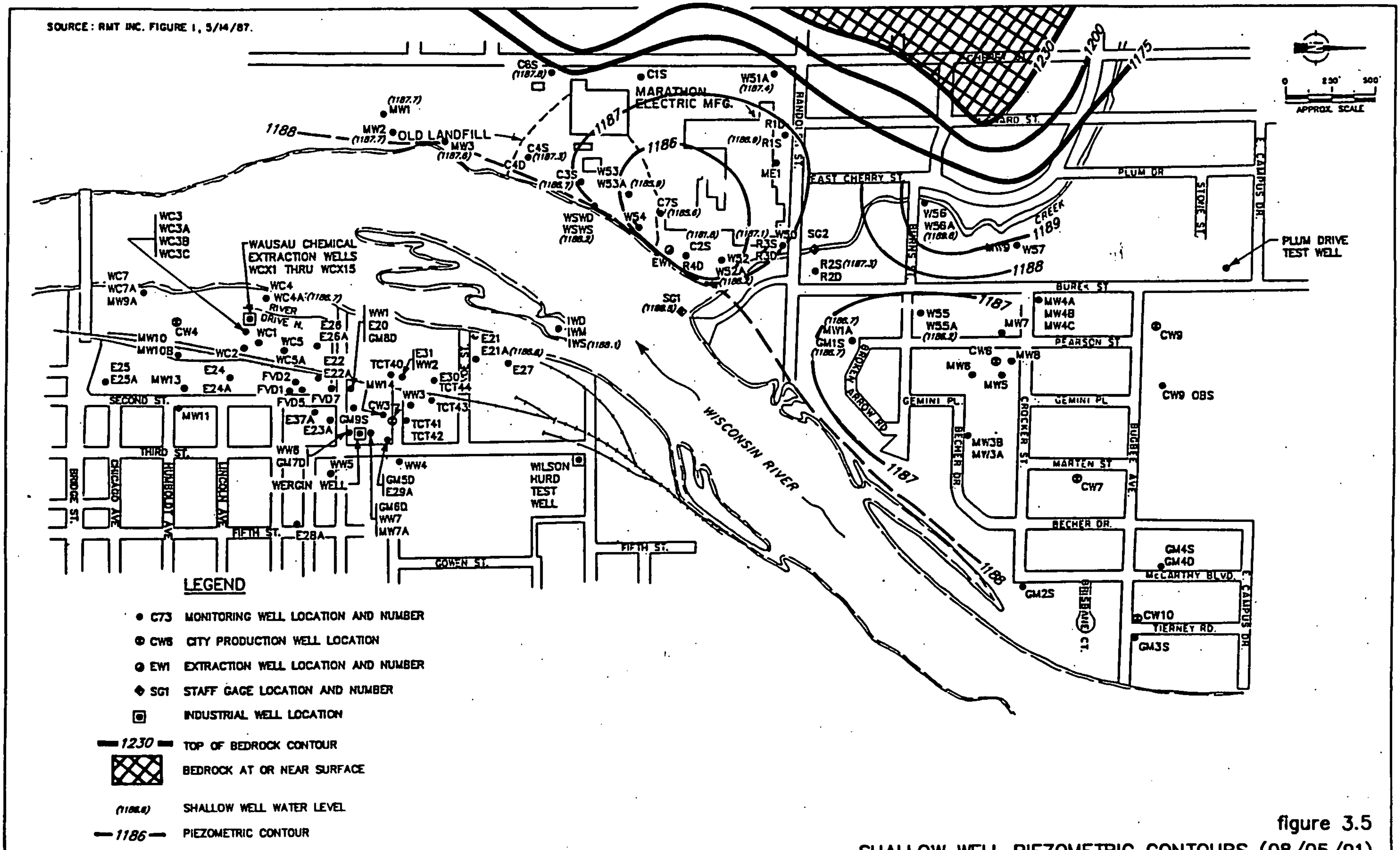

CRA

figure 3.5

SHALLOW WELL PIEZOMETRIC CONTOURS (08/05/91)

Marathon Electric Manufacturing Co.

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

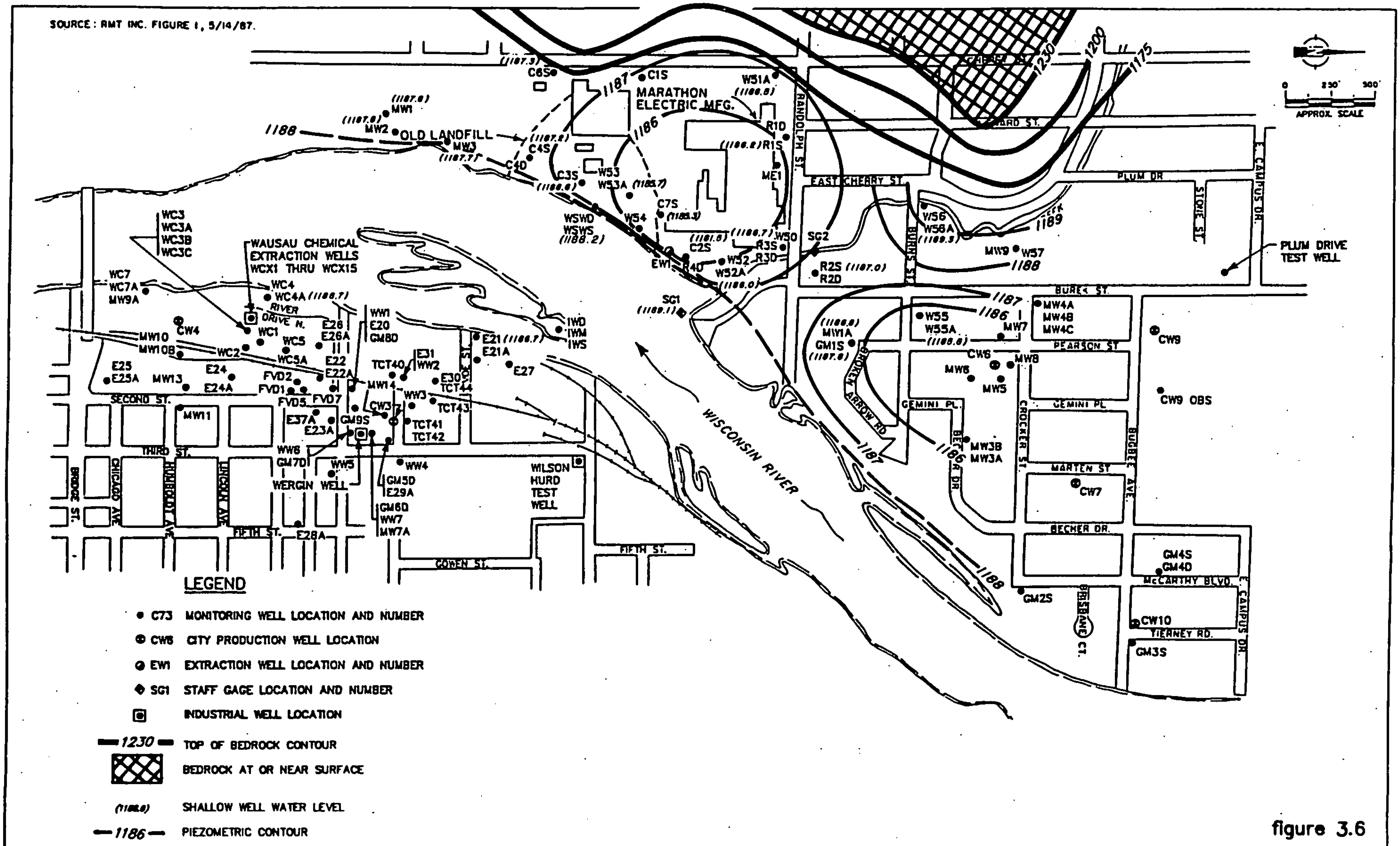

figure 3.6

SHALLOW WELL PIEZOMETRIC CONTOURS (11/04/91)

Marathon Electric Manufacturing Co.

CRA

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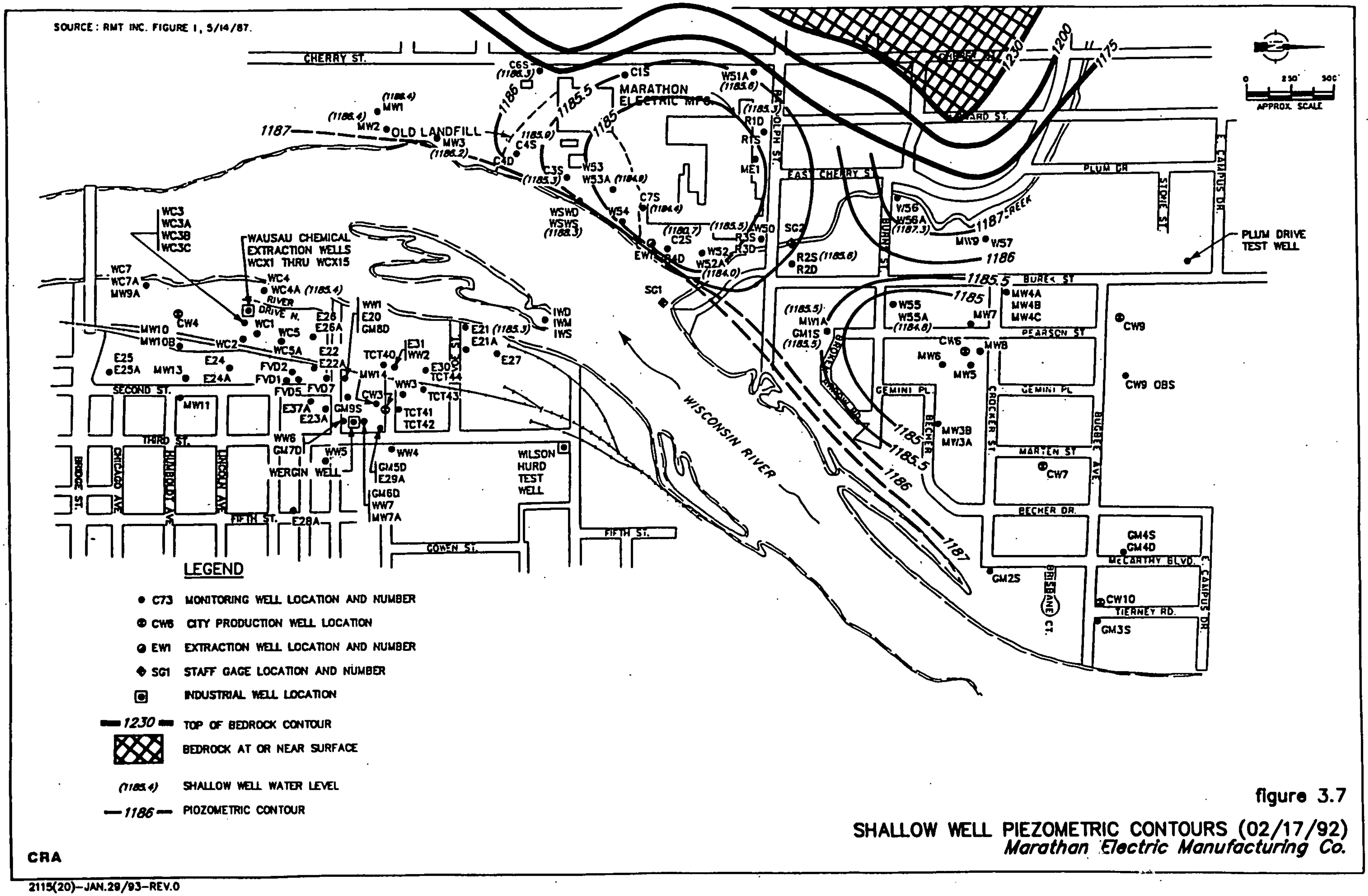
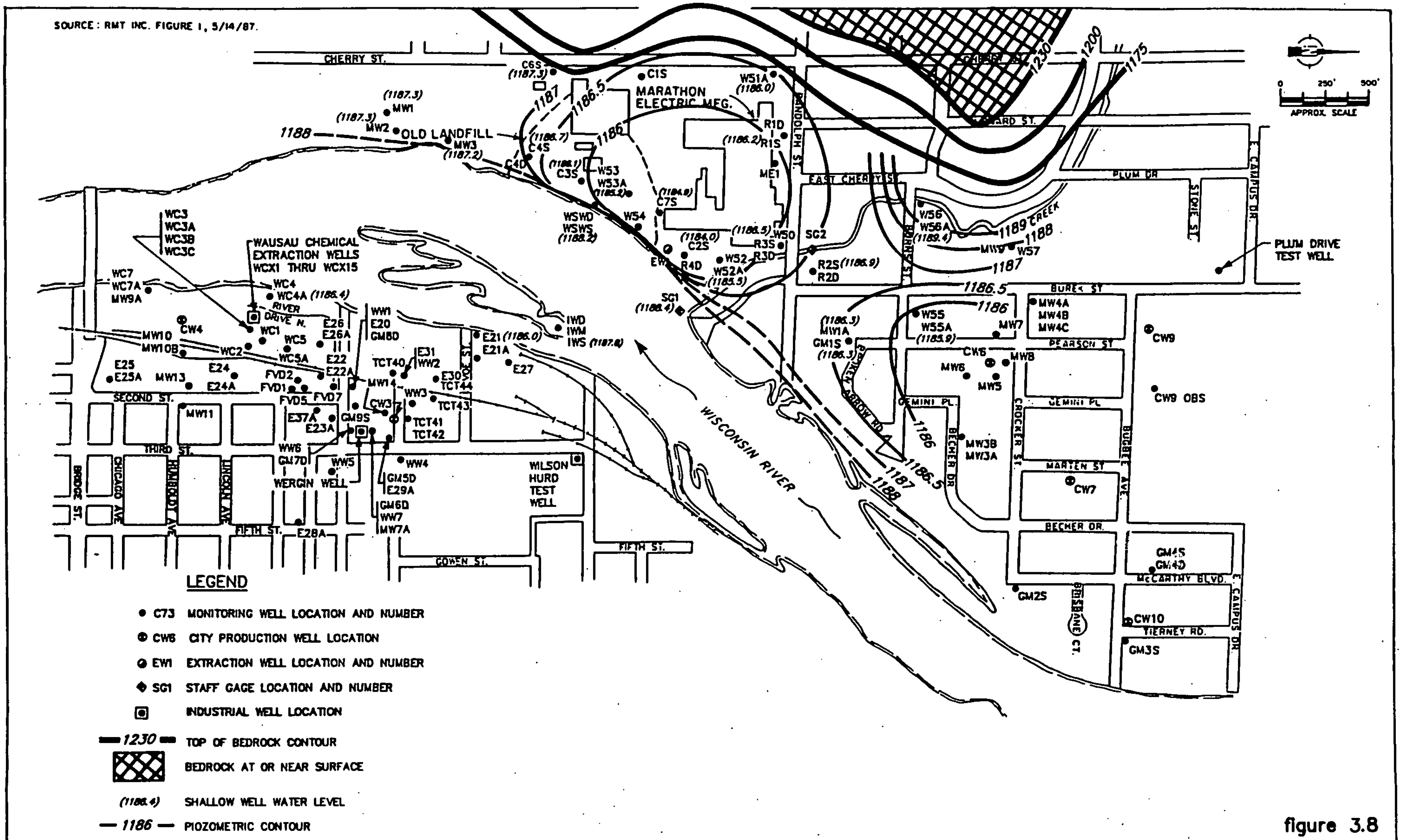


figure 3.7

SHALLOW WELL PIEZOMETRIC CONTOURS (02/17/92)

Marathon Electric Manufacturing Co.

2115(20)–JAN.29/93–REV.0



SOURCE: RMT INC. FIGURE 1, 5/14/87.

figure 3.8

SHALLOW WELL PIEZOMETRIC CONTOURS (05/11/92)
Marathan Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

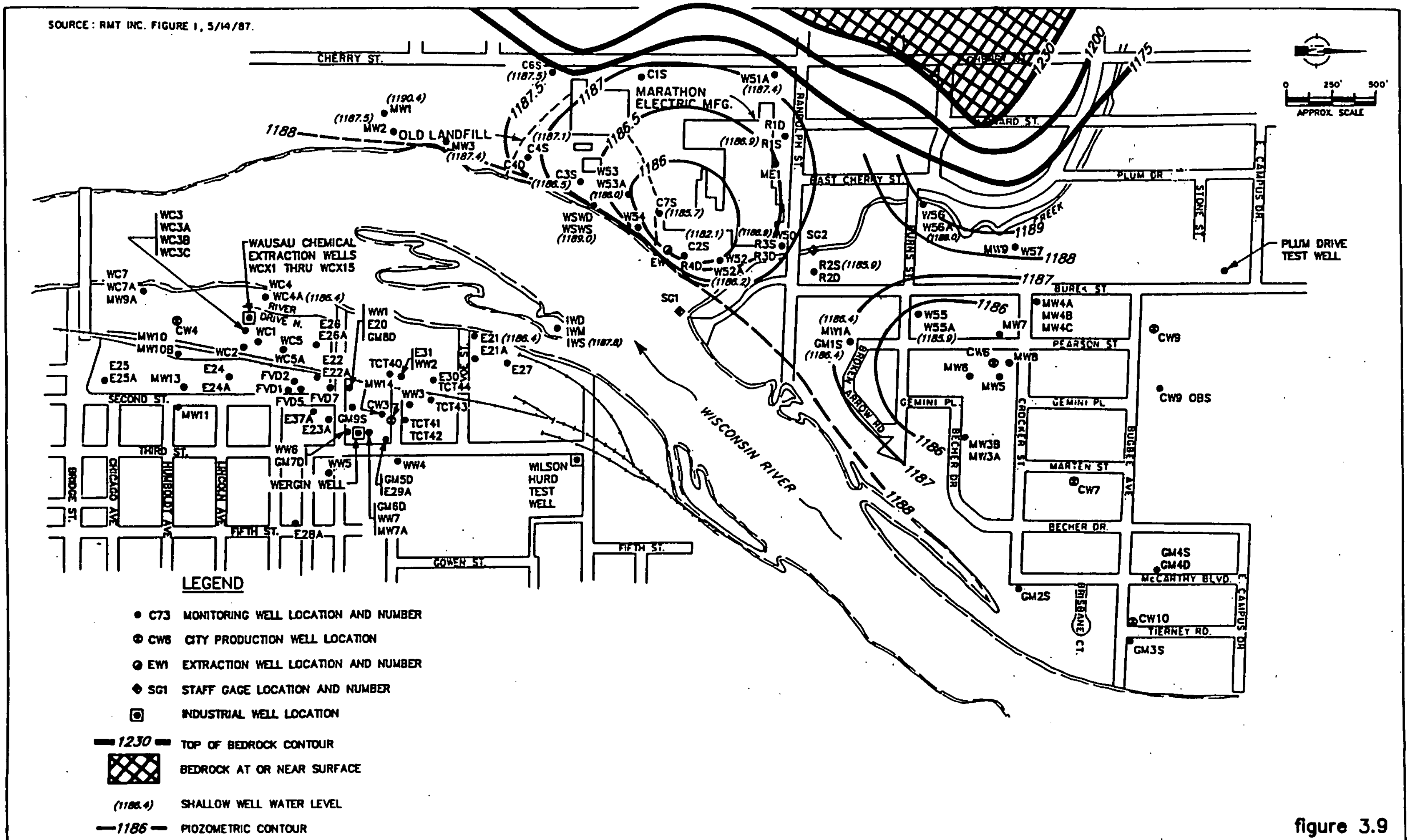


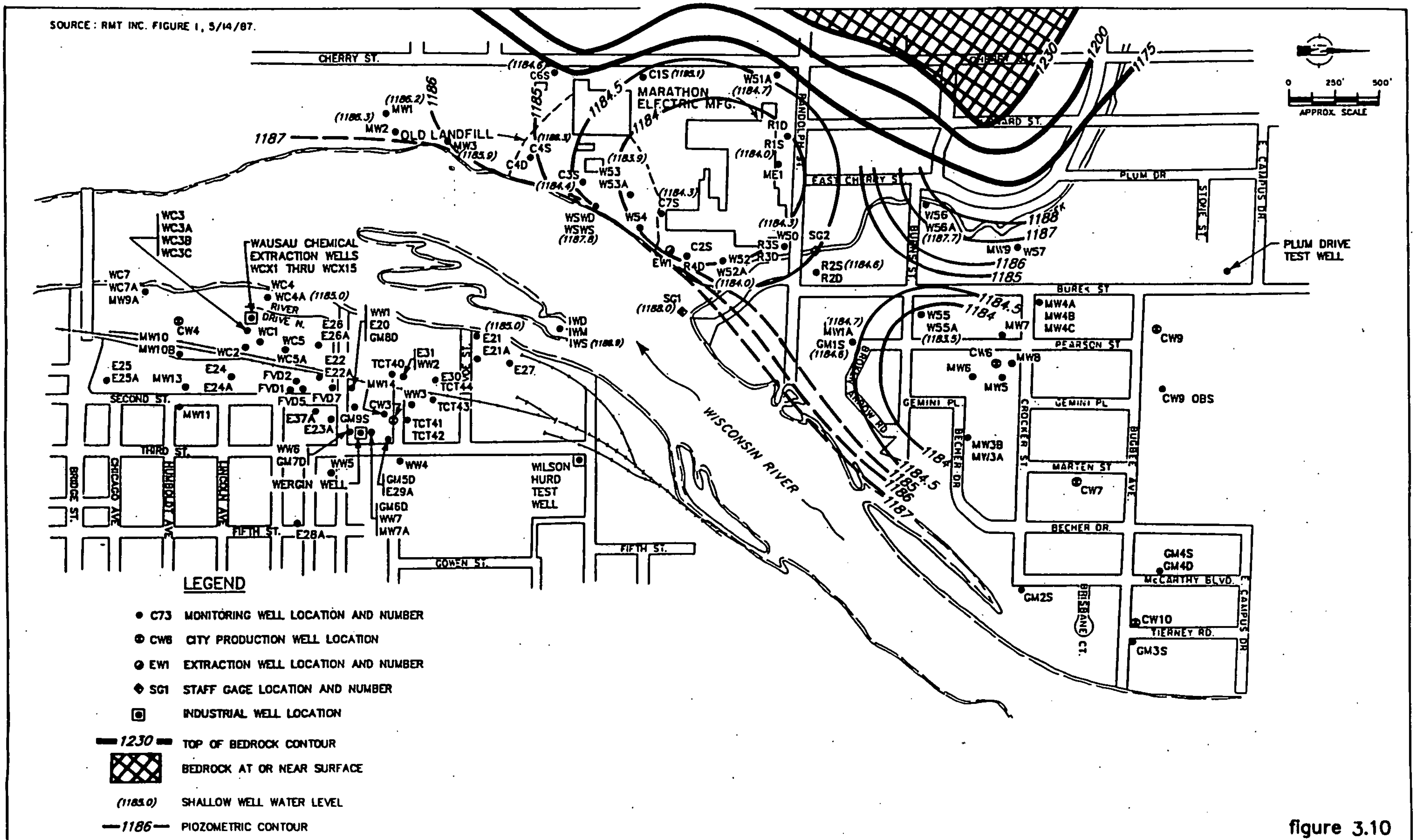
figure 3.9

SHALLOW WELL PIEZOMETRIC CONTOURS (08/03/92)
Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE : RMT INC. FIGURE 1, 5/14/87.



LEGEND

- ● C73 MONITORING WELL LOCATION AND NUMBER
- ⊕ CW6 CITY PRODUCTION WELL LOCATION
- ⊘ EW1 EXTRACTION WELL LOCATION AND NUMBER
- ◆ SG1 STAFF GAGE LOCATION AND NUMBER
- ▣ INDUSTRIAL WELL LOCATION
- ▬1230▬ TOP OF BEDROCK CONTOUR
- ▨ BEDROCK AT OR NEAR SURFACE
- (1185.0) SHALLOW WELL WATER LEVEL
- —1186— PIOZOMETRIC CONTOUR

figure 3.10

SHALLOW WELL PIEZOMETRIC CONTOURS (11/02/92)
Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

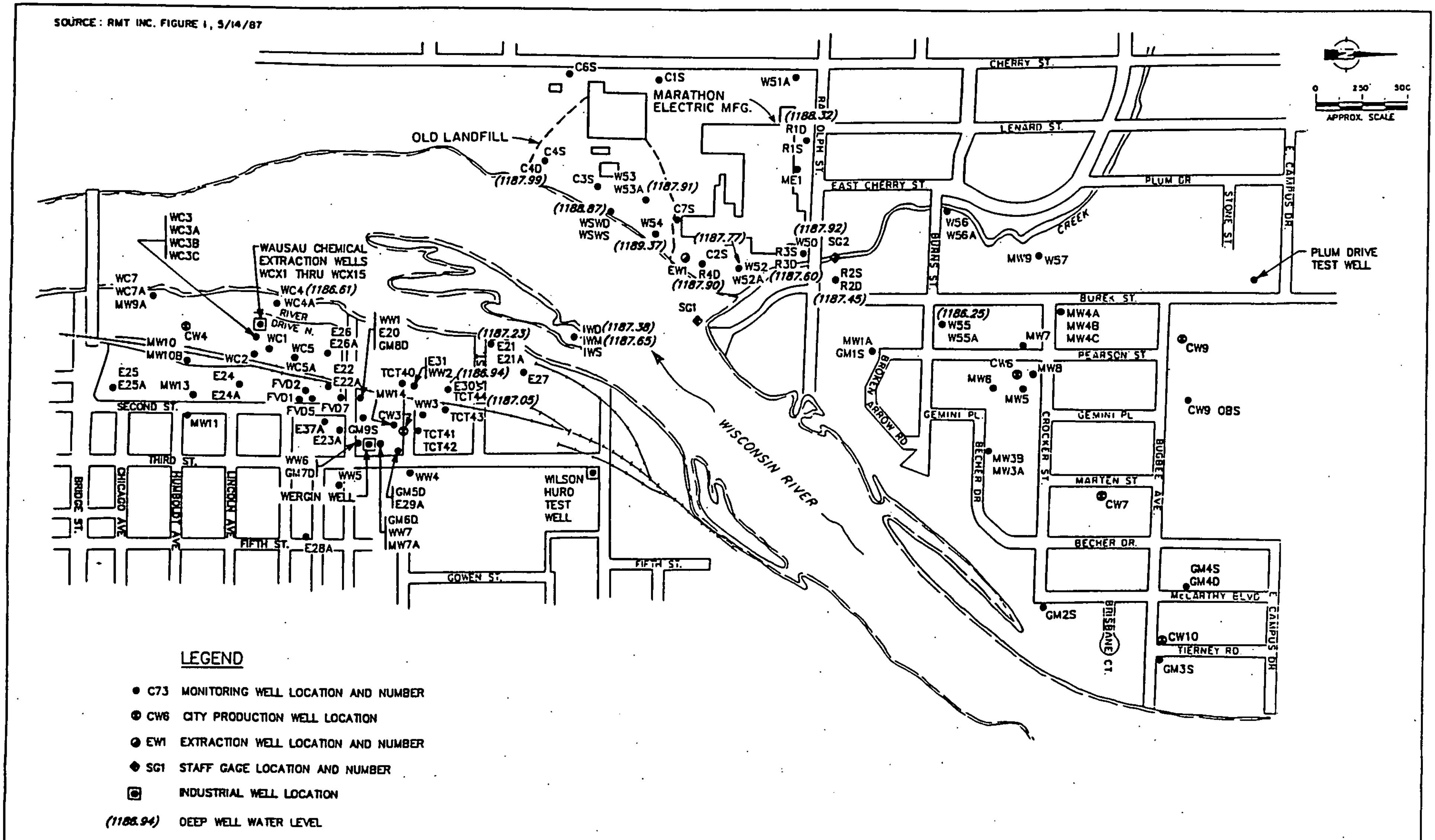


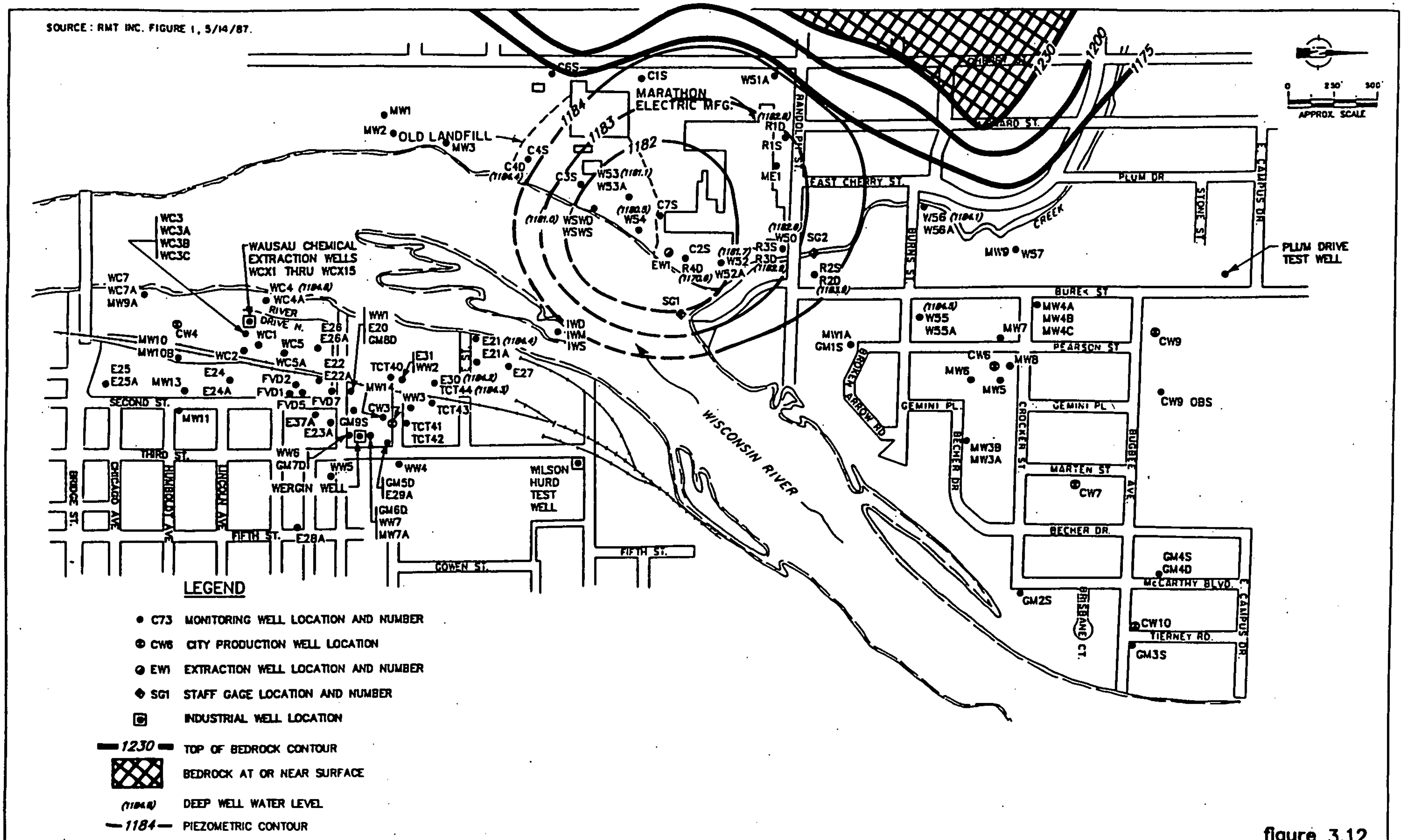
figure 3.11

DEEP WELL PIEZOMETRIC CONTOURS (11/13/90)
Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.



LEGEND

● C73	MONITORING WELL LOCATION AND NUMBER
⊕ CW6	CITY PRODUCTION WELL LOCATION
⊘ EW1	EXTRACTION WELL LOCATION AND NUMBER
◆ SG1	STAFF GAGE LOCATION AND NUMBER
▣	INDUSTRIAL WELL LOCATION
— 1230 —	TOP OF BEDROCK CONTOUR
▨	BEDROCK AT OR NEAR SURFACE
(1184.8)	DEEP WELL WATER LEVEL
— 1184 —	PIEZOMETRIC CONTOUR

figure 3.12

DEEP WELL PIEZOMETRIC CONTOURS (01/30/91)

Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

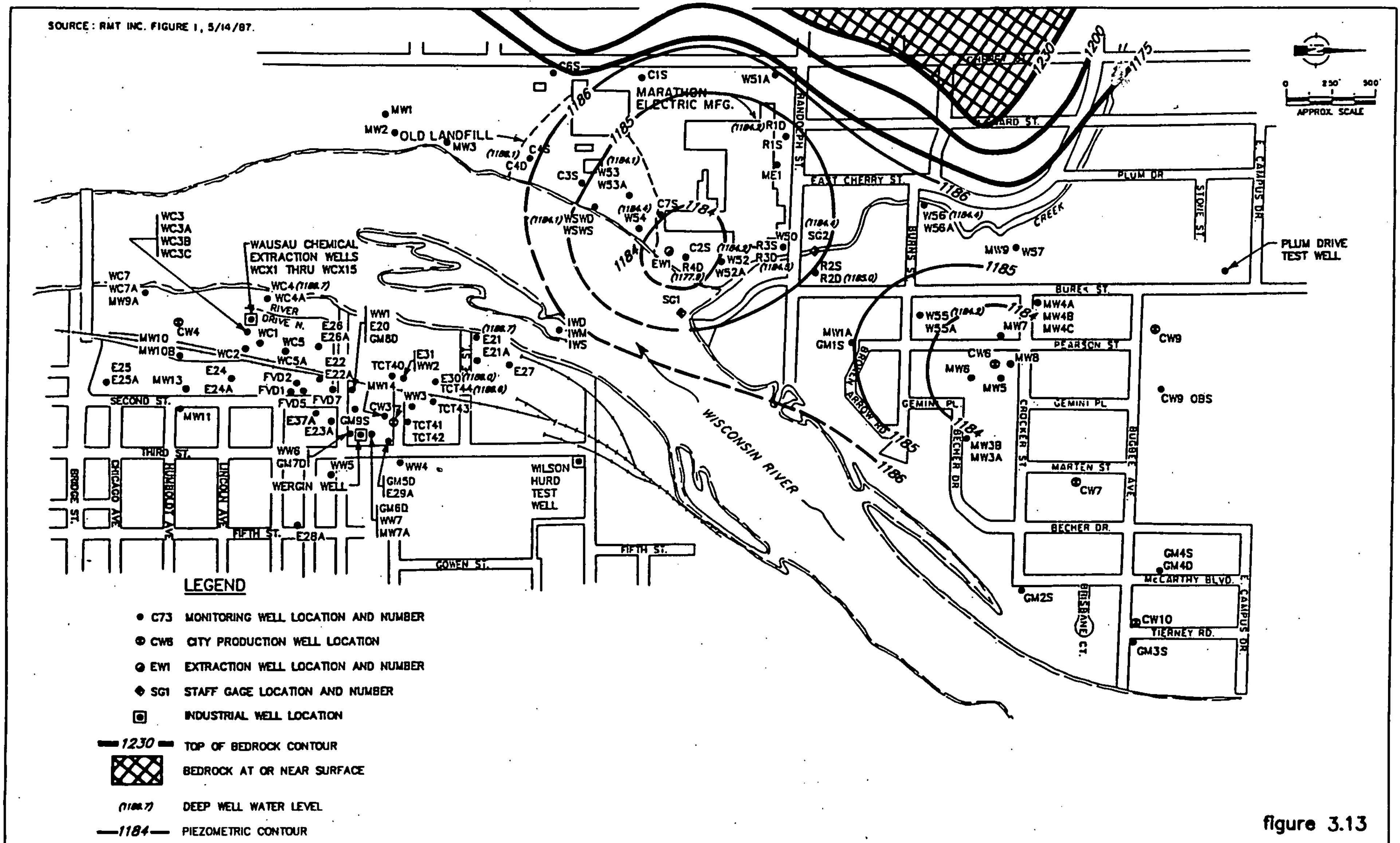
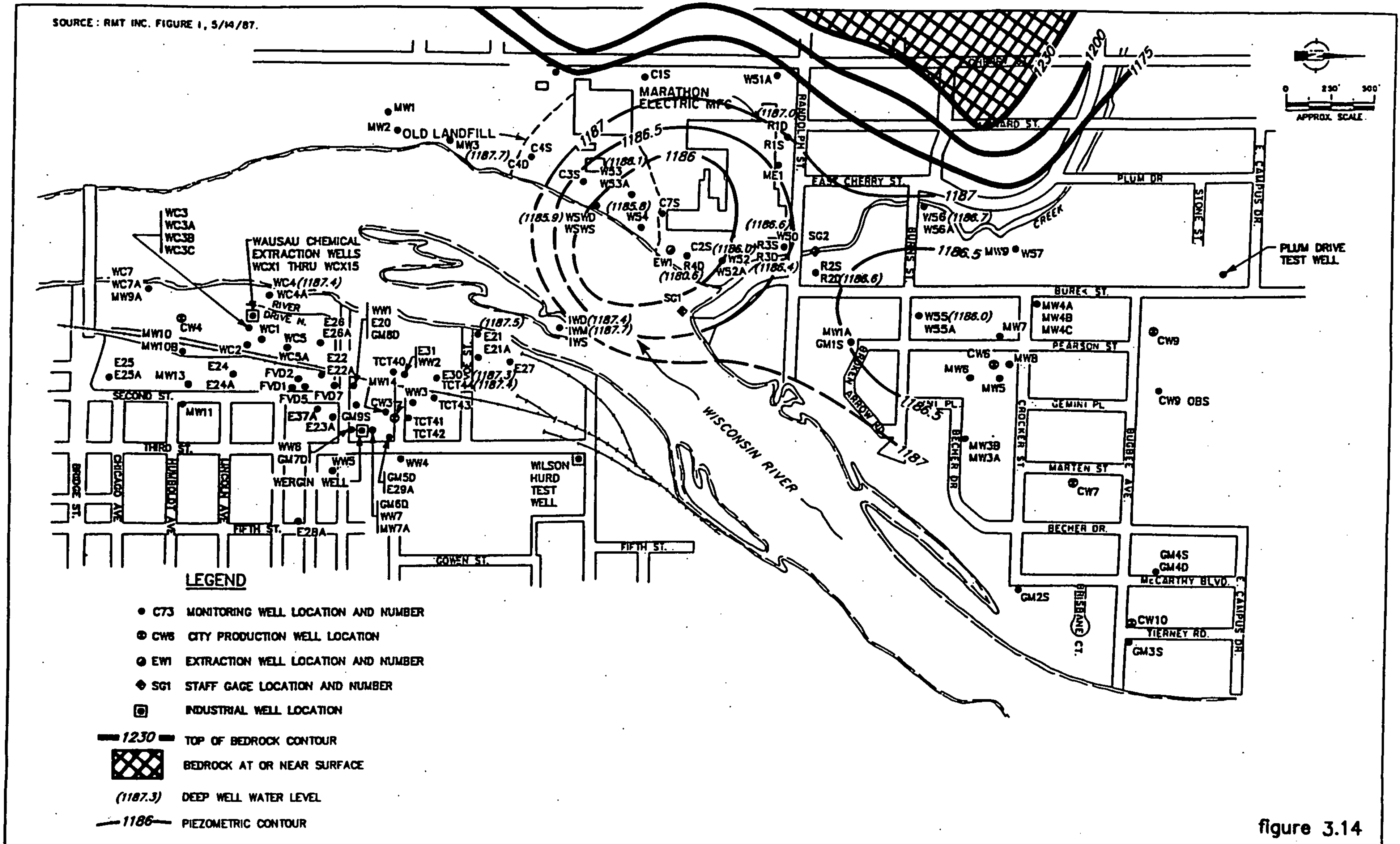


figure 3.13

DEEP WELL PIEZOMETRIC CONTOURS (03/25/91)
Marathon Electric Manufacturing Co.

CRA

2115(20)–JAN.29/93–REV.0



LEGEND

- ● C73 MONITORING WELL LOCATION AND NUMBER
- ⊕ CW6 CITY PRODUCTION WELL LOCATION
- ⊘ EW1 EXTRACTION WELL LOCATION AND NUMBER
- ◆ SG1 STAFF GAGE LOCATION AND NUMBER
- ⊡ INDUSTRIAL WELL LOCATION
- ▬1230▬ TOP OF BEDROCK CONTOUR
- ▩ BEDROCK AT OR NEAR SURFACE
- (1187.3) DEEP WELL WATER LEVEL
- —1186— PIEZOMETRIC CONTOUR

figure 3.14

DEEP WELL PIEZOMETRIC CONTOURS (06/27/91)
Marathon Electric Manufacturing Co.

CRA

2115(20)–JAN.29/93–REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

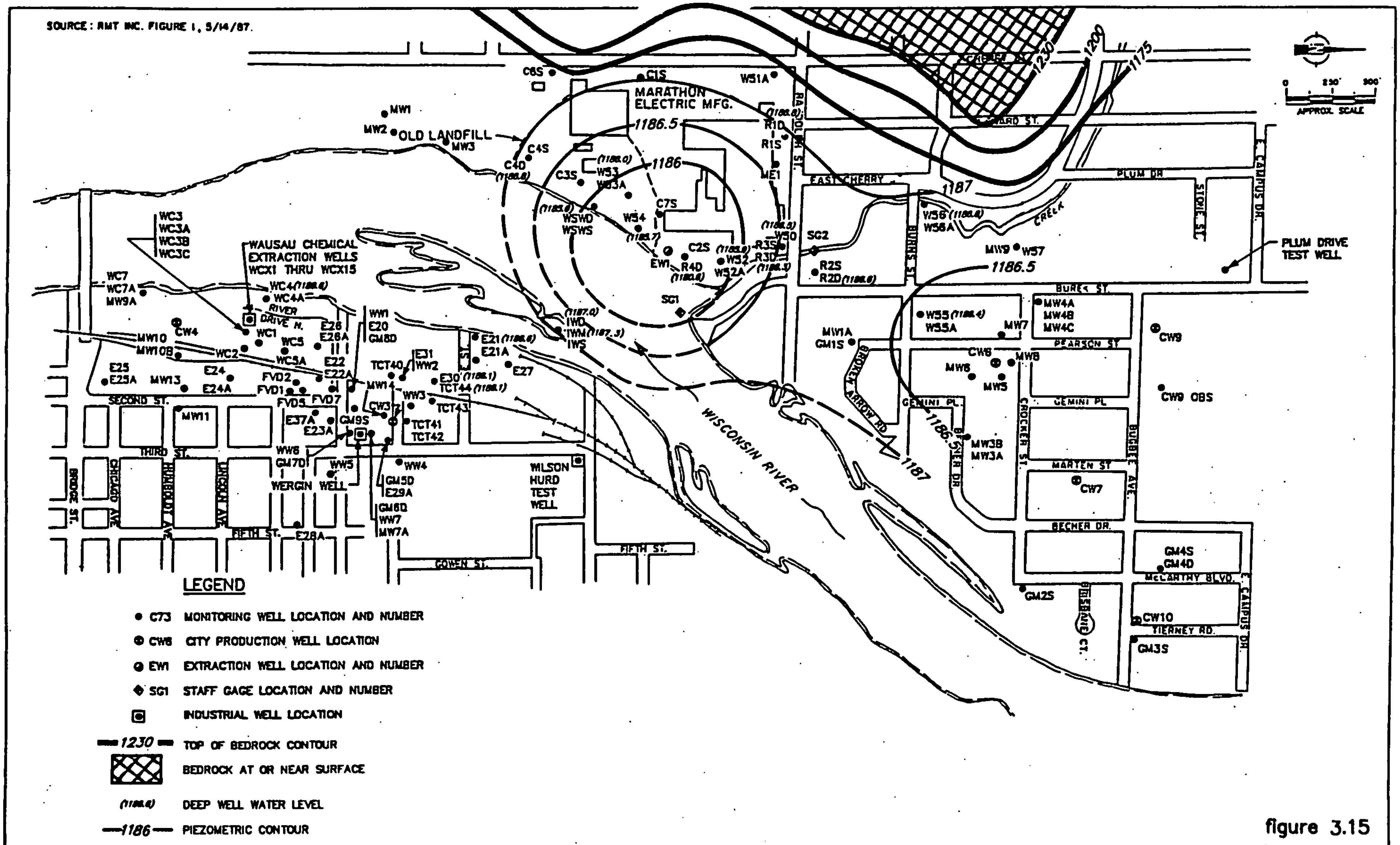


figure 3.15

DEEP WELL PIEZOMETRIC CONTOURS (08/05/91)

Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

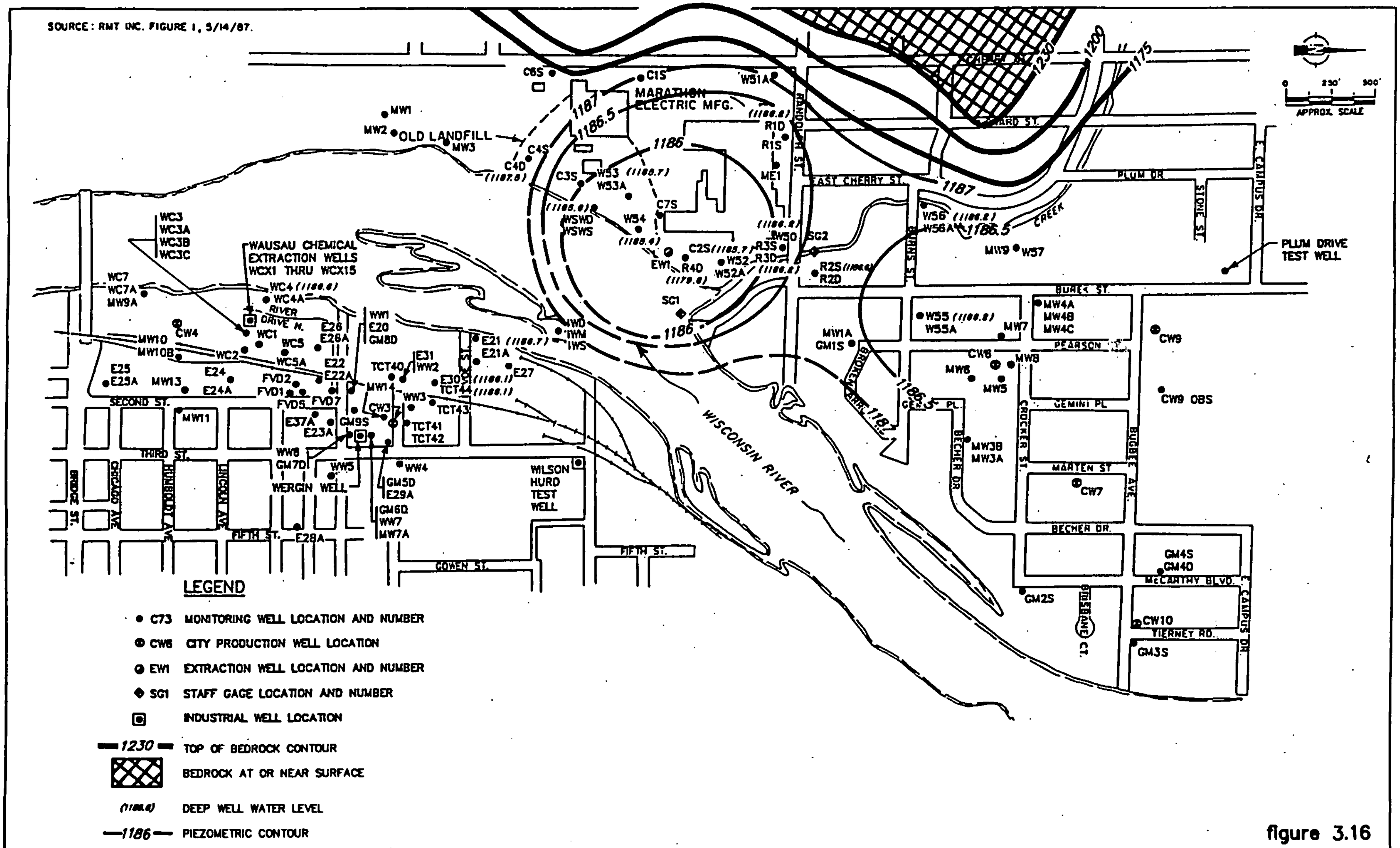


figure 3.16
DEEP WELL PIEZOMETRIC CONTOURS (11/04/91)
Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

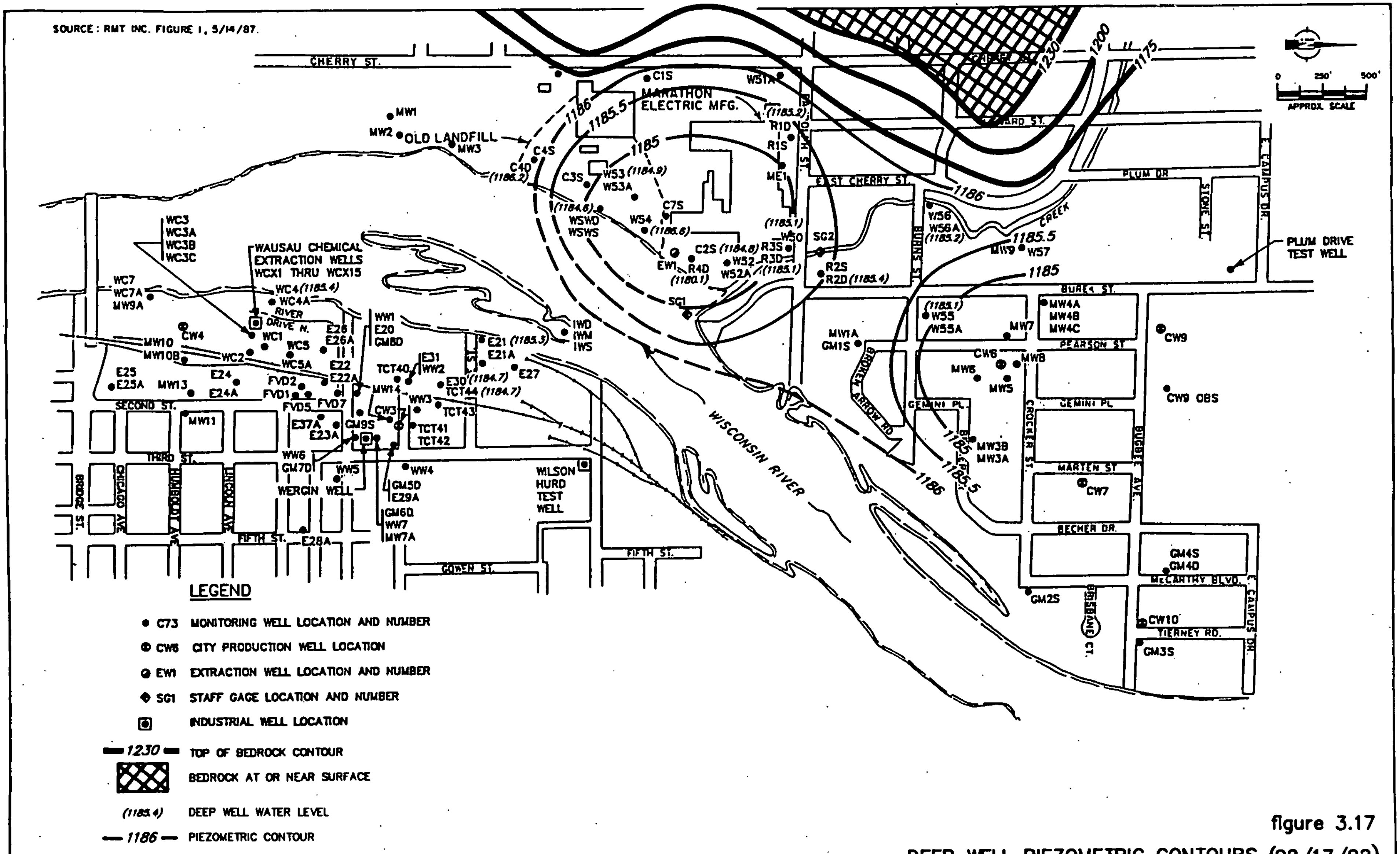


figure 3.17

DEEP WELL PIEZOMETRIC CONTOURS (02/17/92)
Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

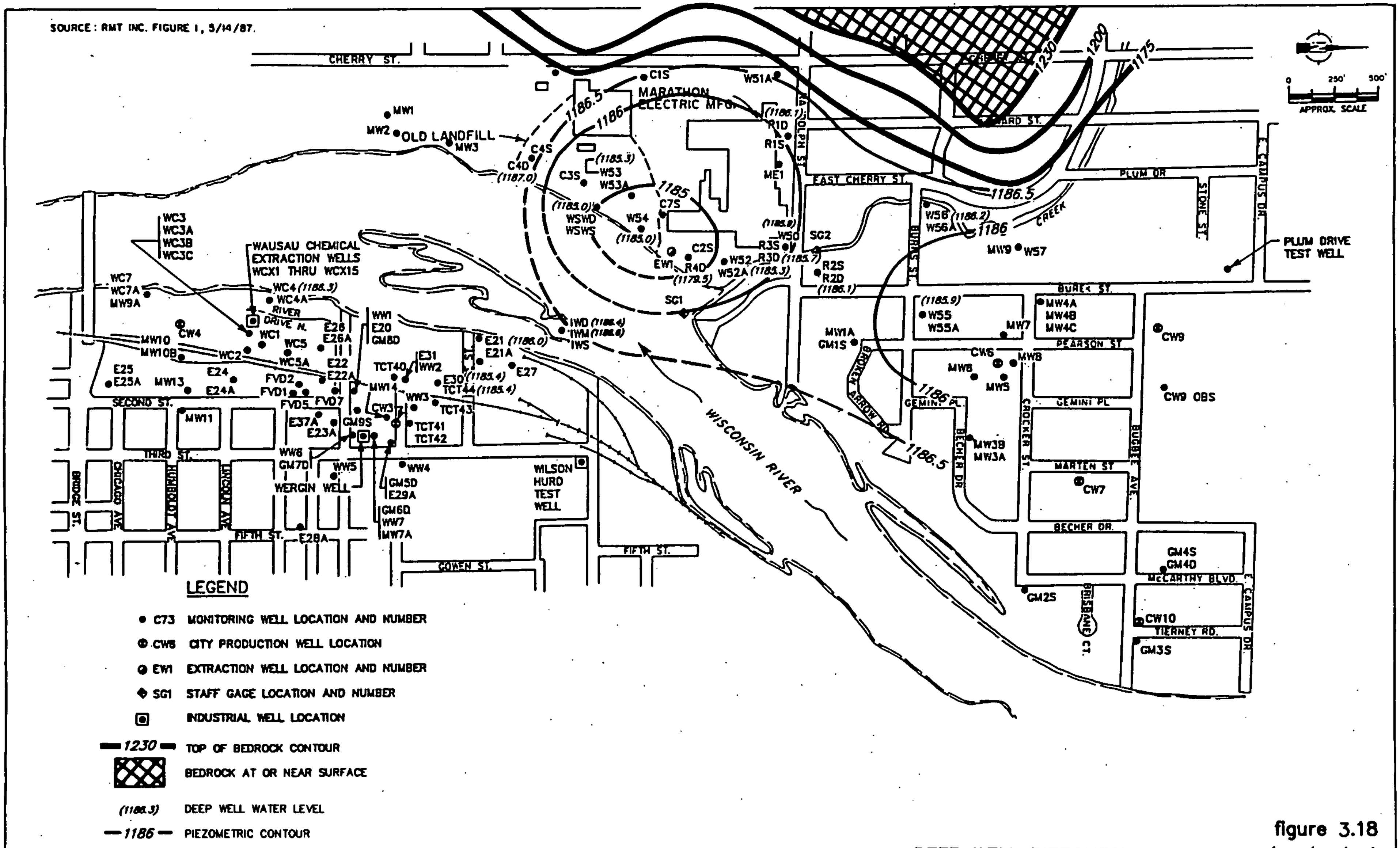


figure 3.18

DEEP WELL PIEZOMETRIC CONTOURS (05/11/92)
Marathan Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

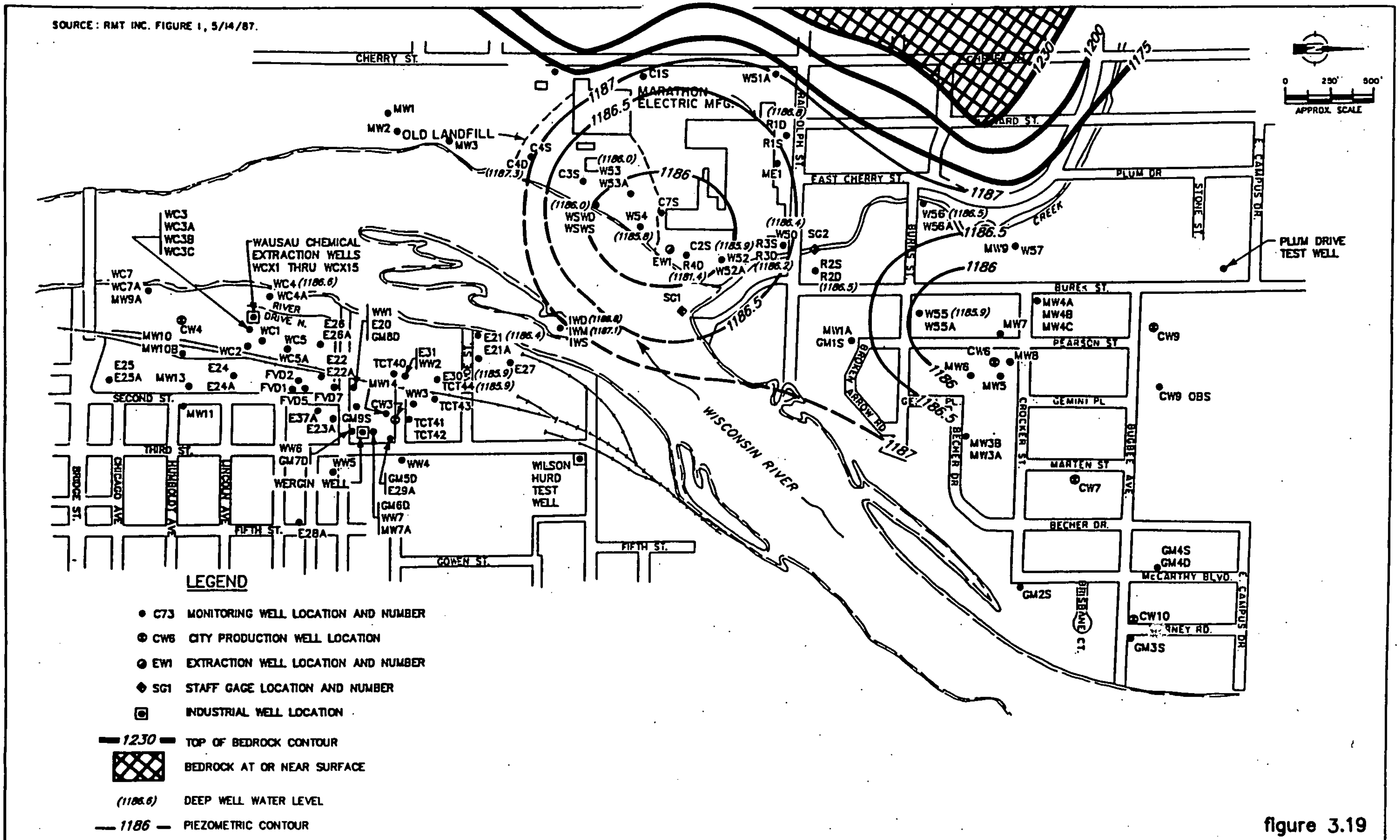


figure 3.19

DEEP WELL PIEZOMETRIC CONTOURS (08/03/92)
Marathan Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: RMT INC. FIGURE 1, 5/14/87.

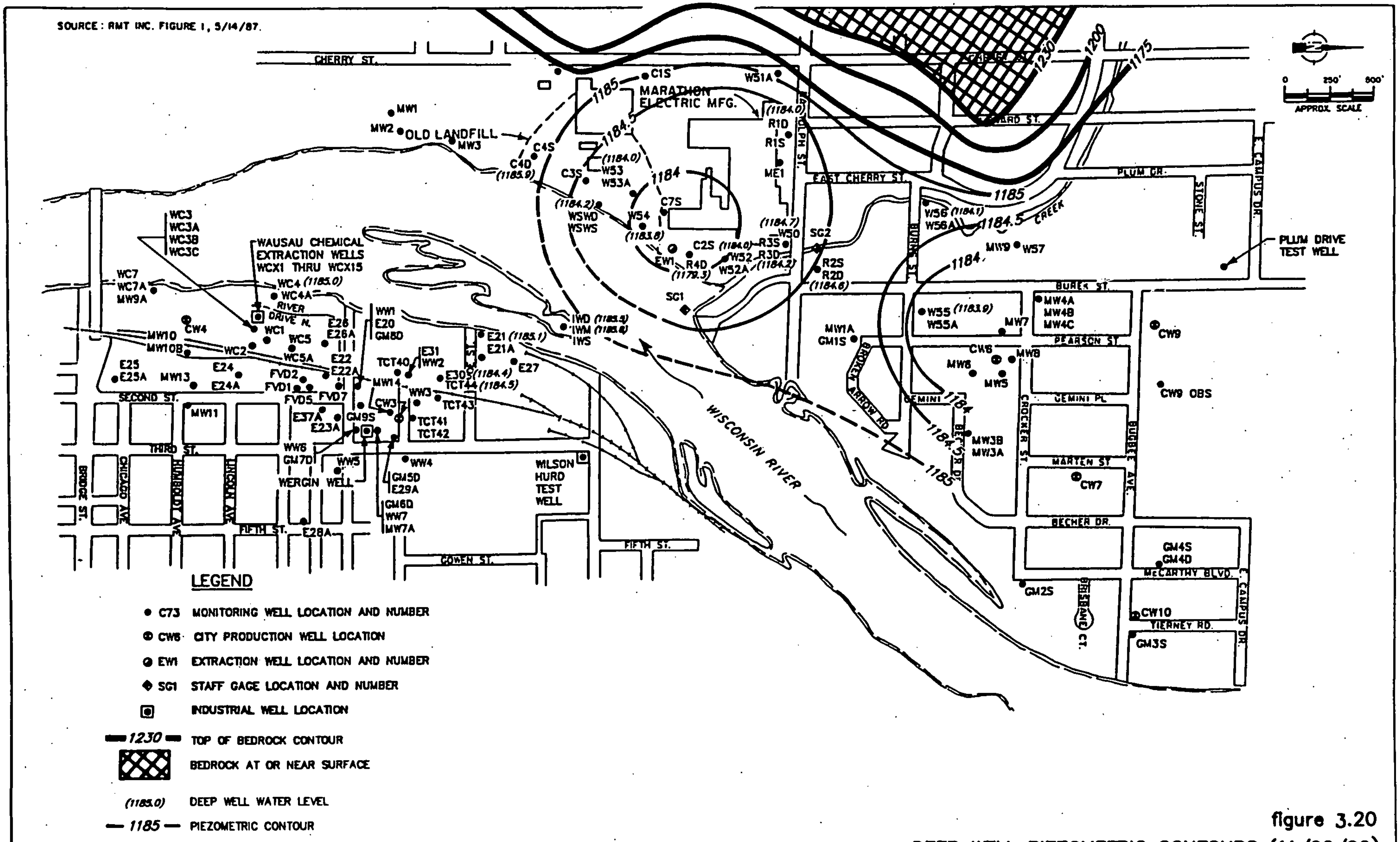


figure 3.20

DEEP WELL PIEZOMETRIC CONTOURS (11/02/92)

Marathan Electric Manufacturing Co.

CRA

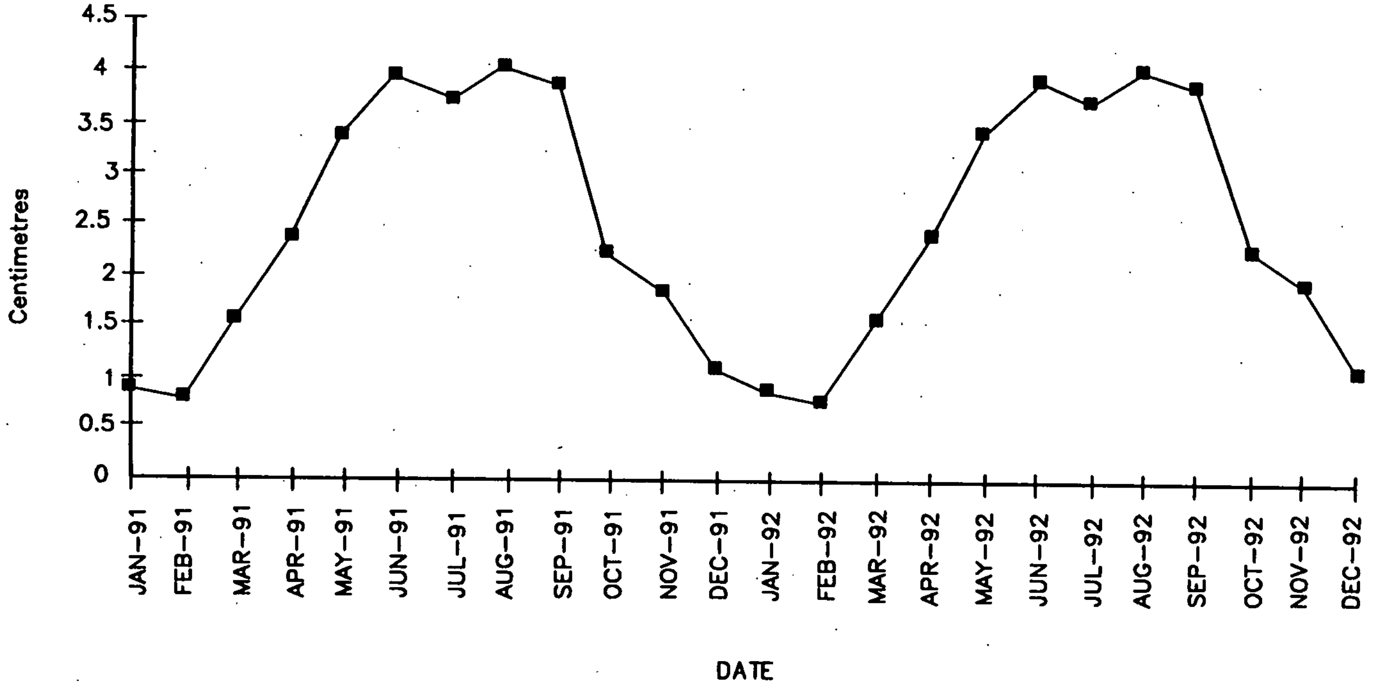
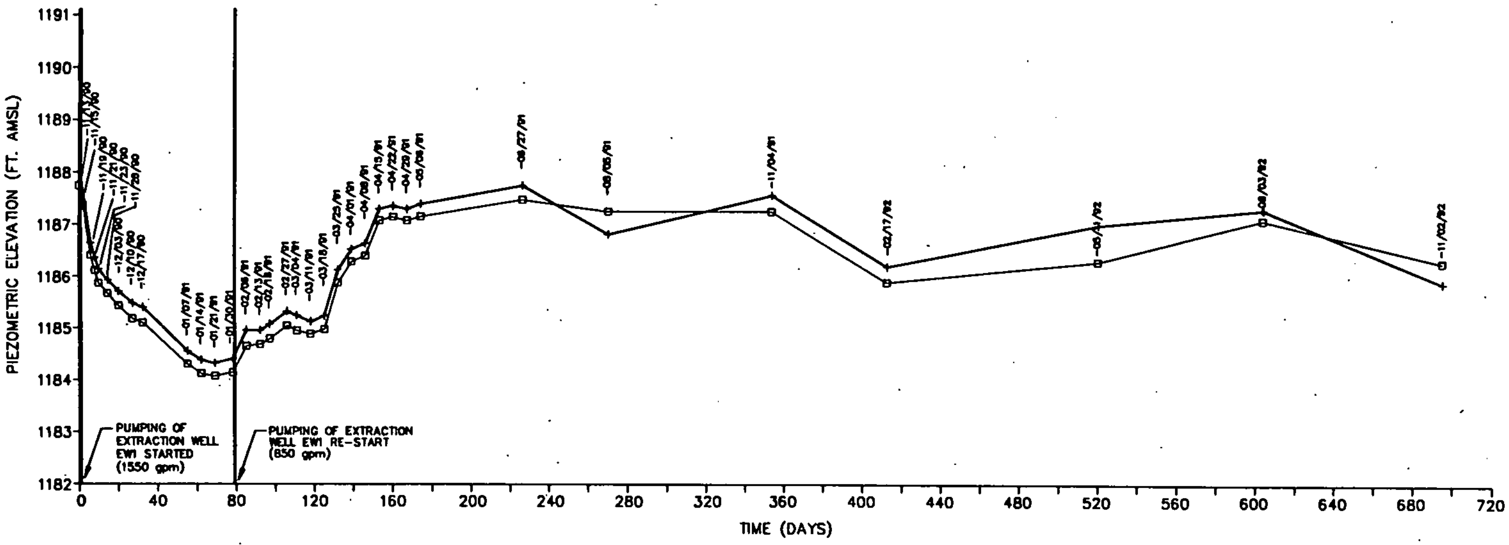


figure 3.21

MONTHLY AVERAGE PRECIPITATION
ANTIGO, WISCONSIN
Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-34)



LEGEND
□ SHALLOW WELL (C4S)
+ DEEP WELL (C4D)

figure 3.22
HYDROGRAPH FOR MONITORING WELL NEST C4S AND C4D
Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-11)

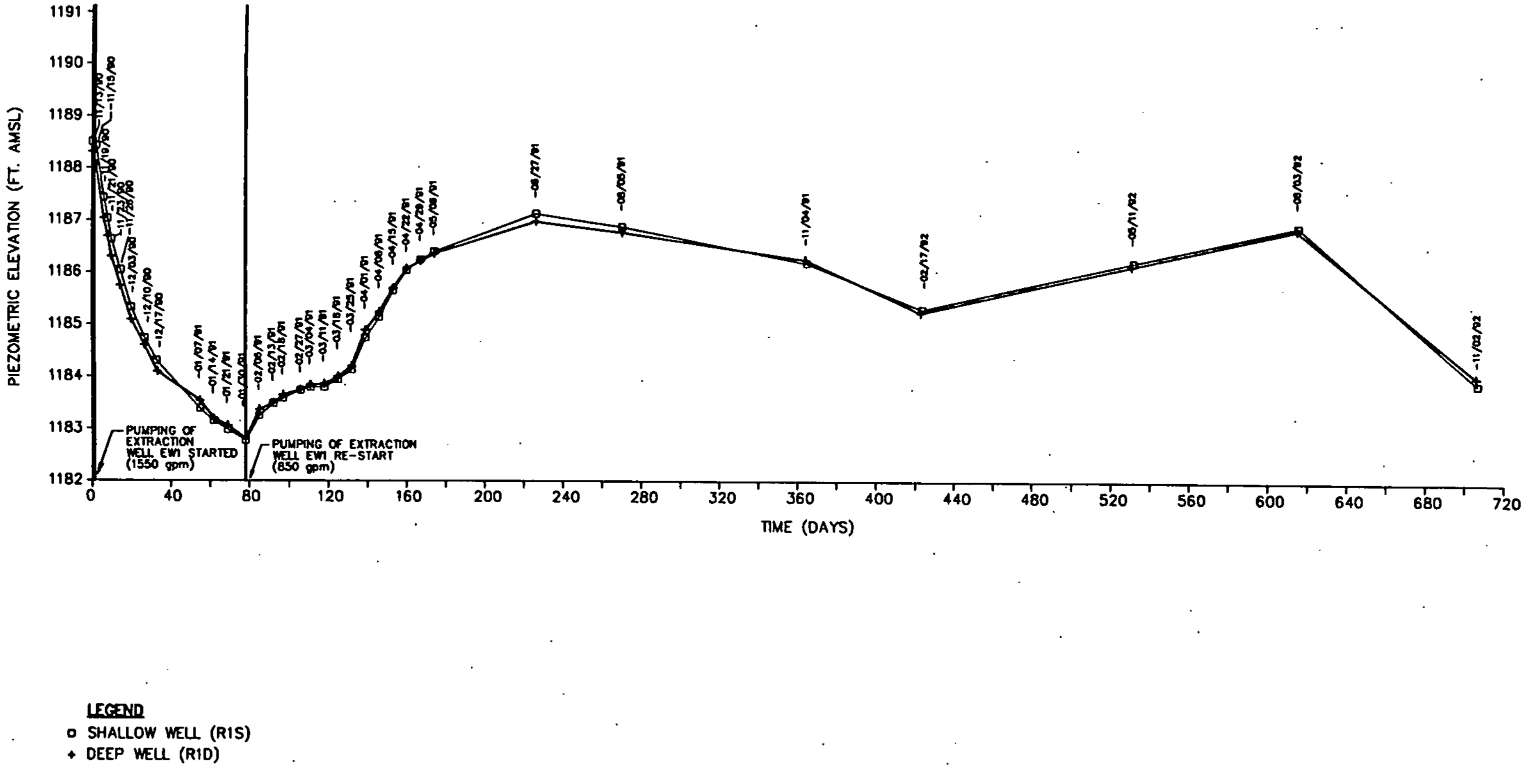


figure 3.23

HYDROGRAPH FOR MONITORING WELL NEST R1S AND R1D
Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-12)

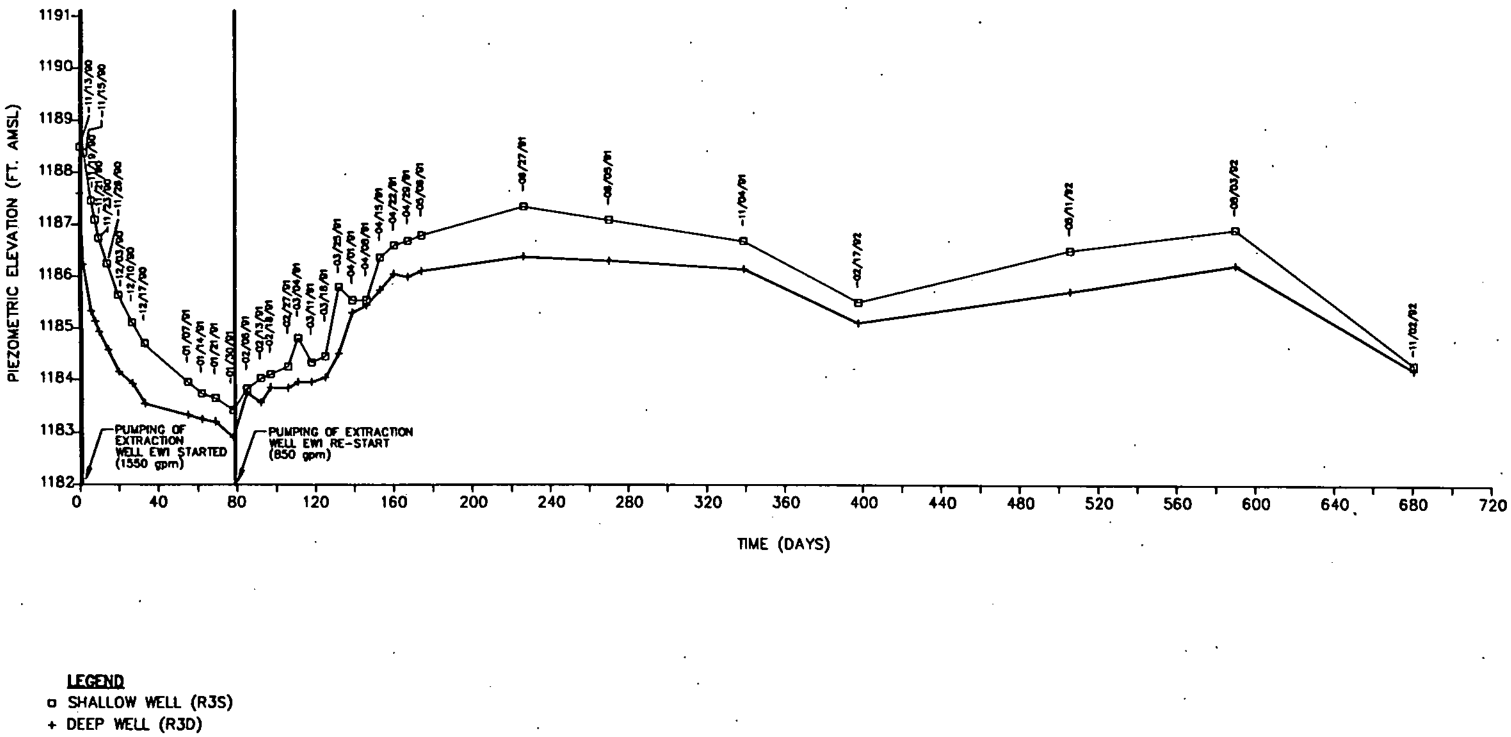


figure 3.24

HYDROGRAPH FOR MONITORING WELL NEST R3S AND R3D

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-13)

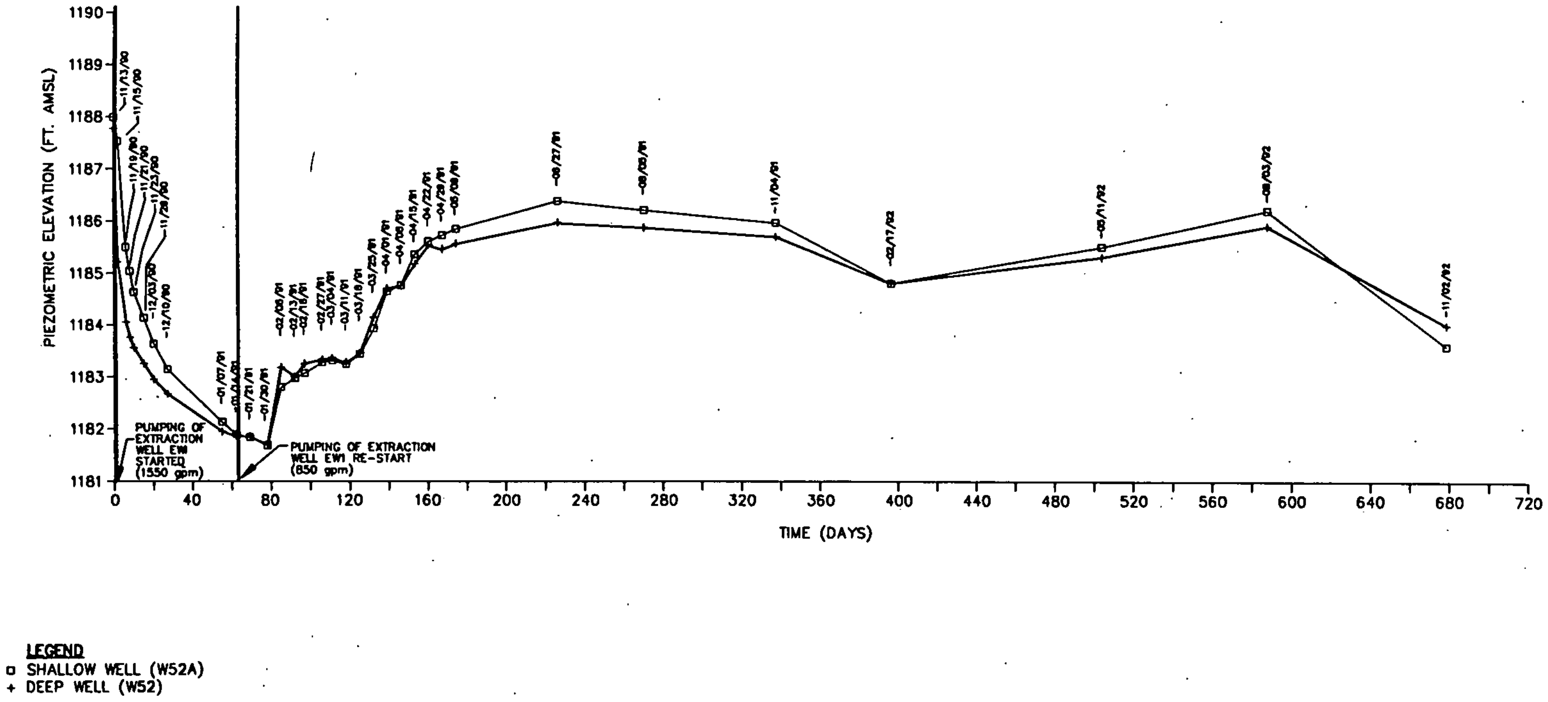


figure 3.25

HYDROGRAPH FOR MONITORING WELL NEST W52 AND W52A

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-14)

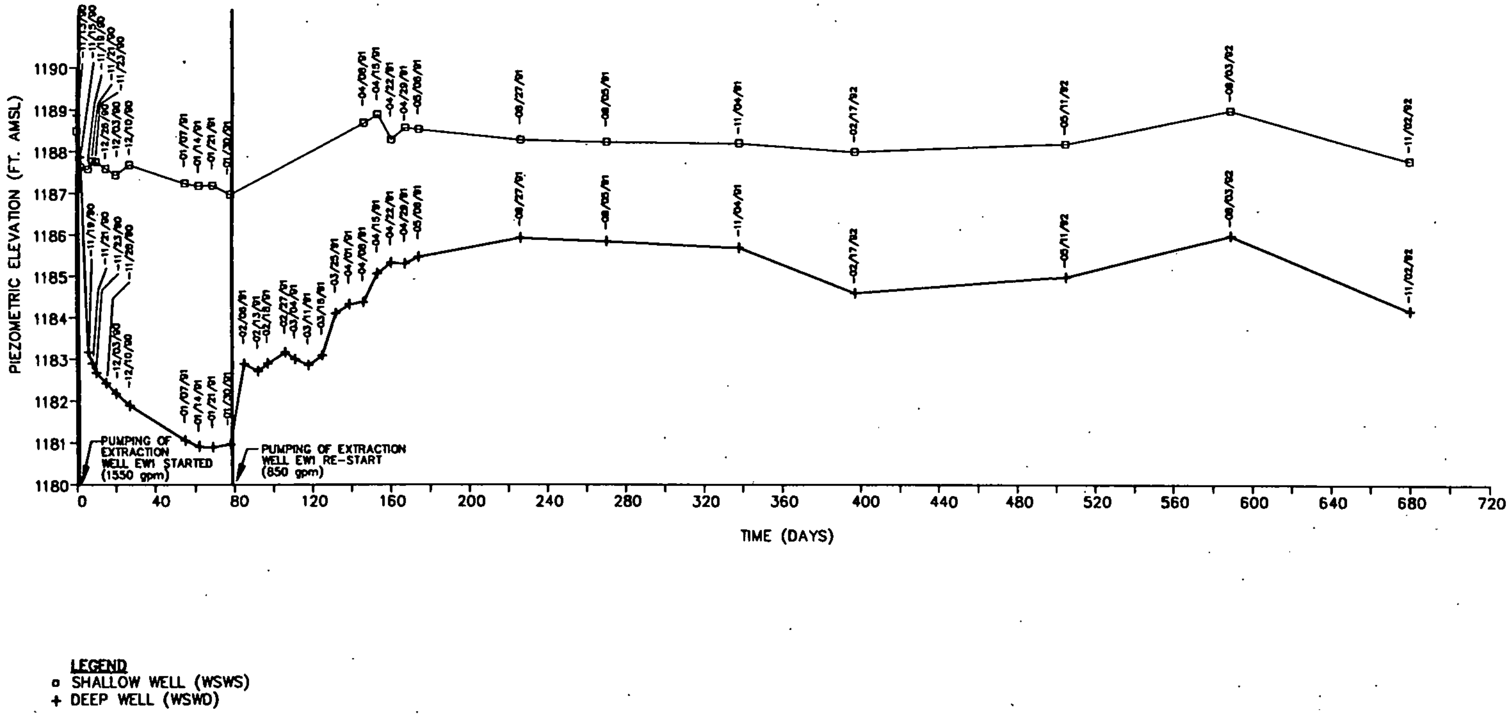


figure 3.26

HYDROGRAPH FOR MONITORING WELL NEST WSWD AND WSWS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-15)

SOURCE: WARZYN ENGINEERING INC. FIGURE 29 (7/24/89)

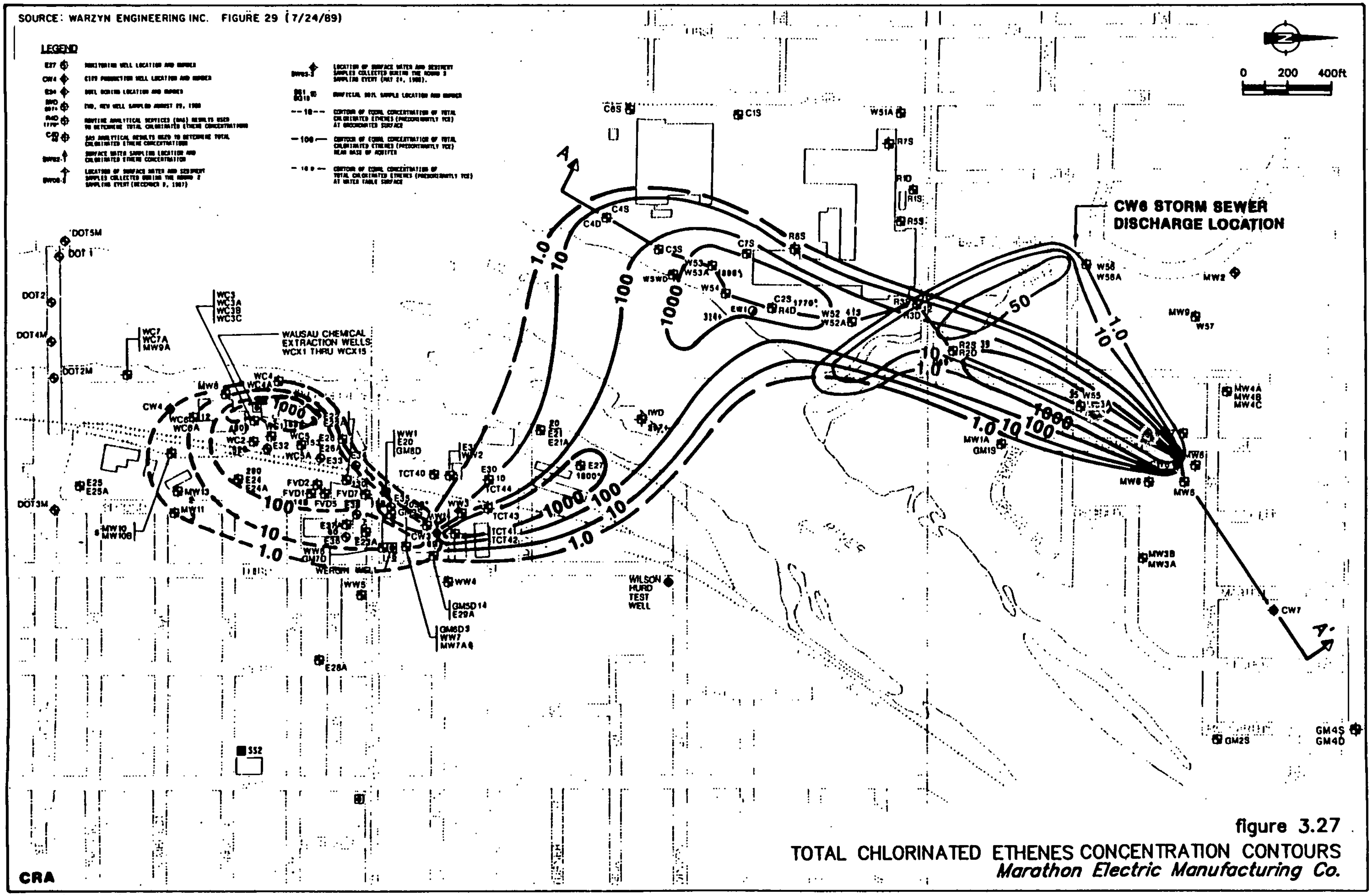


figure 3.27

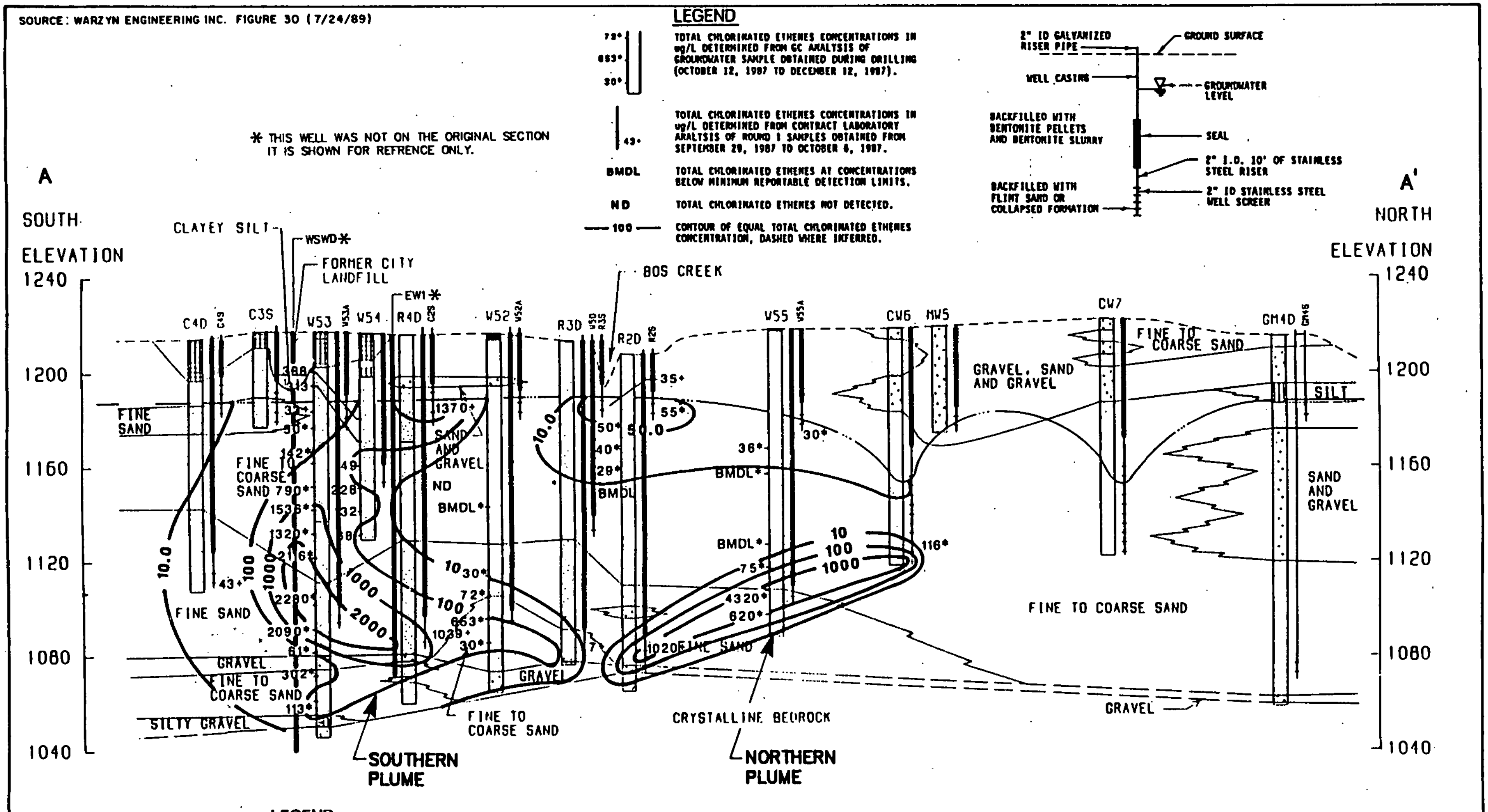
TOTAL CHLORINATED ETHENES CONCENTRATION CONTOURS

Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

SOURCE: WARZYN ENGINEERING INC. FIGURE 30 (7/24/89)



LEGEND

▦ FILL

▨ CLAY

▩ MED. TO COARSE SAND TRACE GRAVEL TRACE SILT

▩ FINE TO MED. SAND LITTLE SILT

▩ SAND AND GRAVEL

☐ WEATHERED ROCK

▥ SILT FINE TO MED. SAND LITTLE GRAVEL

figure 3.28

TOTAL CHLORINATED ETHENES ISOCONCENTRATION, SECTION A – A'

Marathon Electric Manufacturing Co.

CRA

2115(20)-JAN.29/93-REV.0

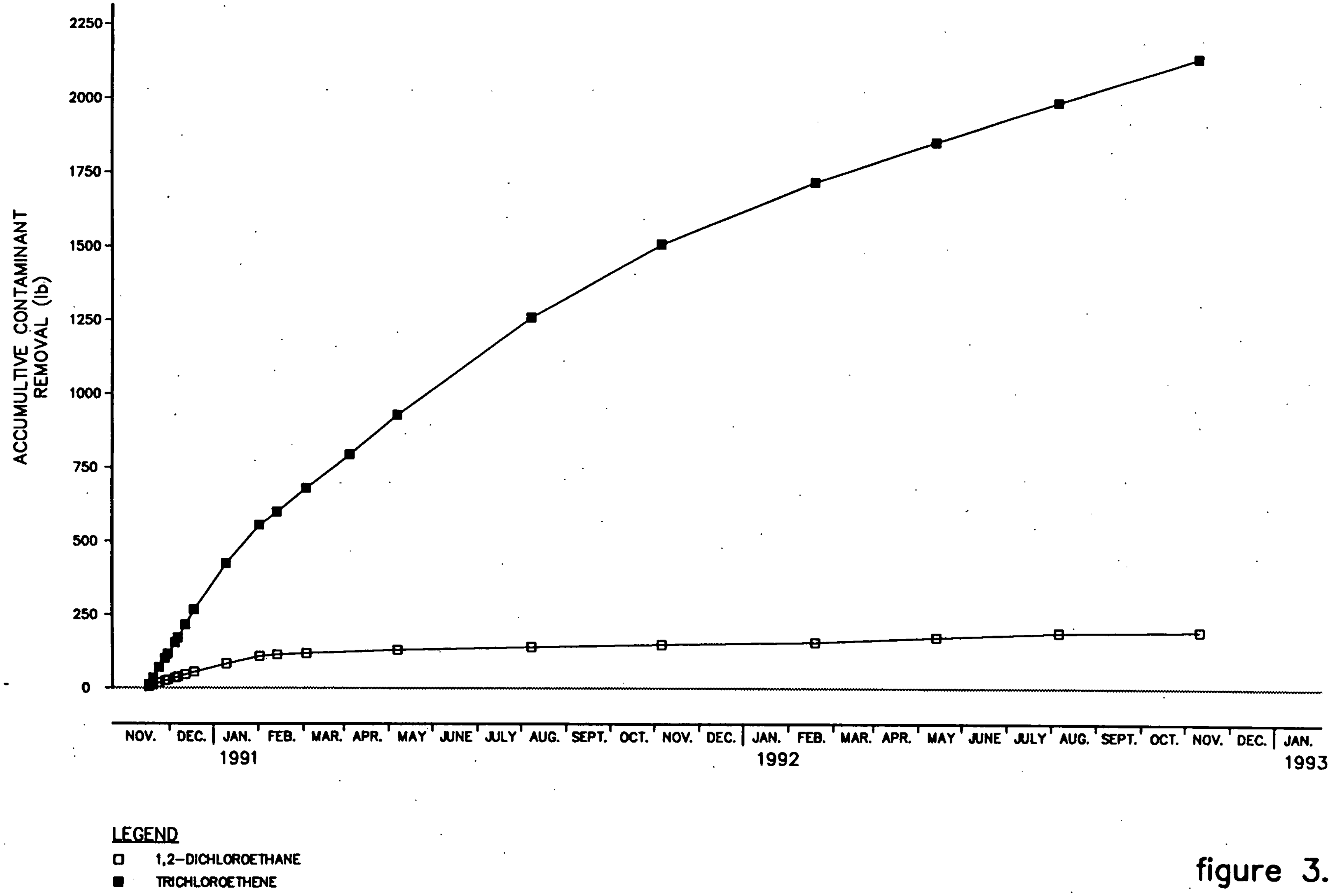


figure 3.29

EXTRACTION WELL (INFLUENT)
TCE AND 1,2-DCE ACCUMULATIVE REMOVAL VS. TIME
Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-33)

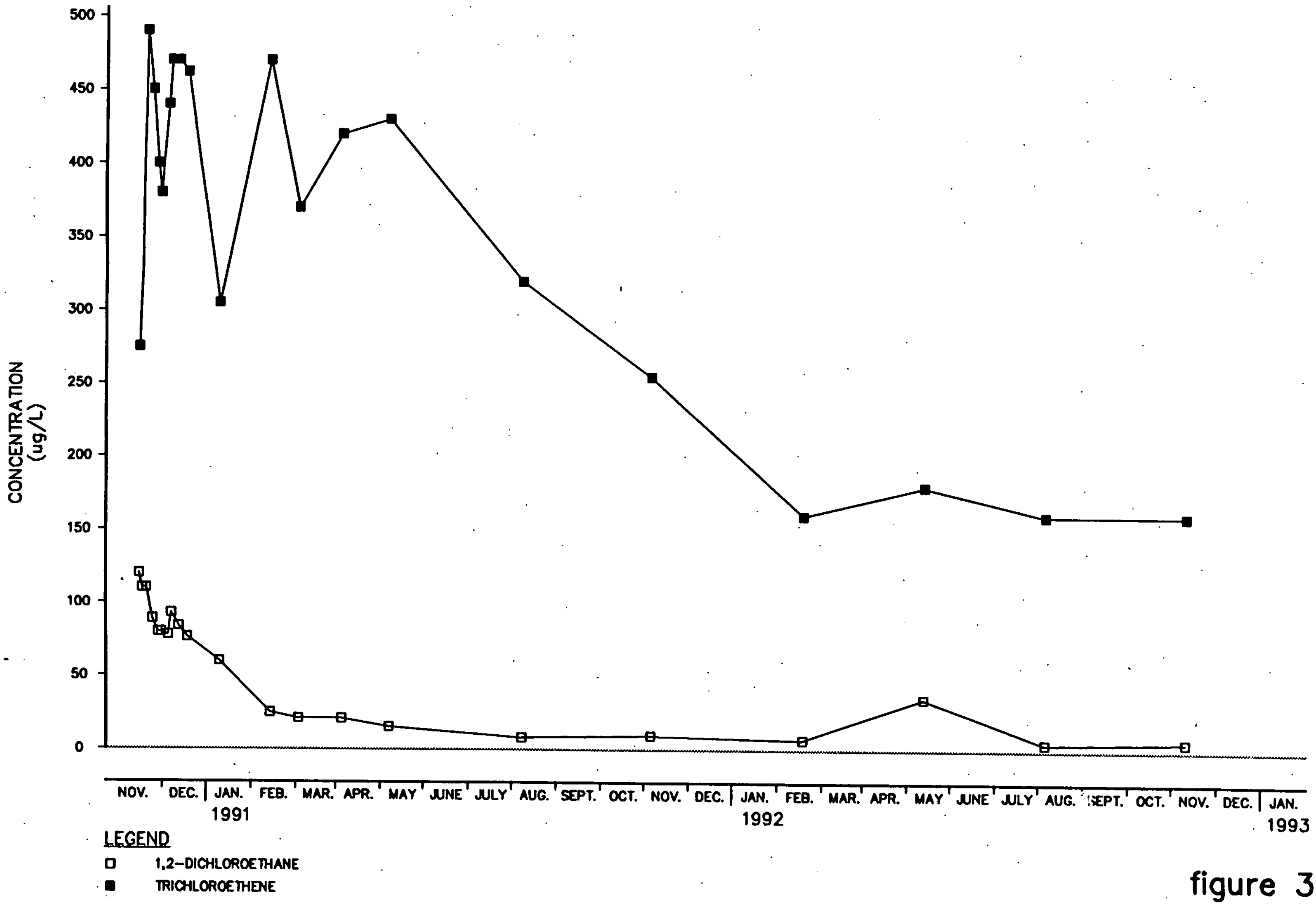


figure 3.30

EW1 INFLUENT PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-16)

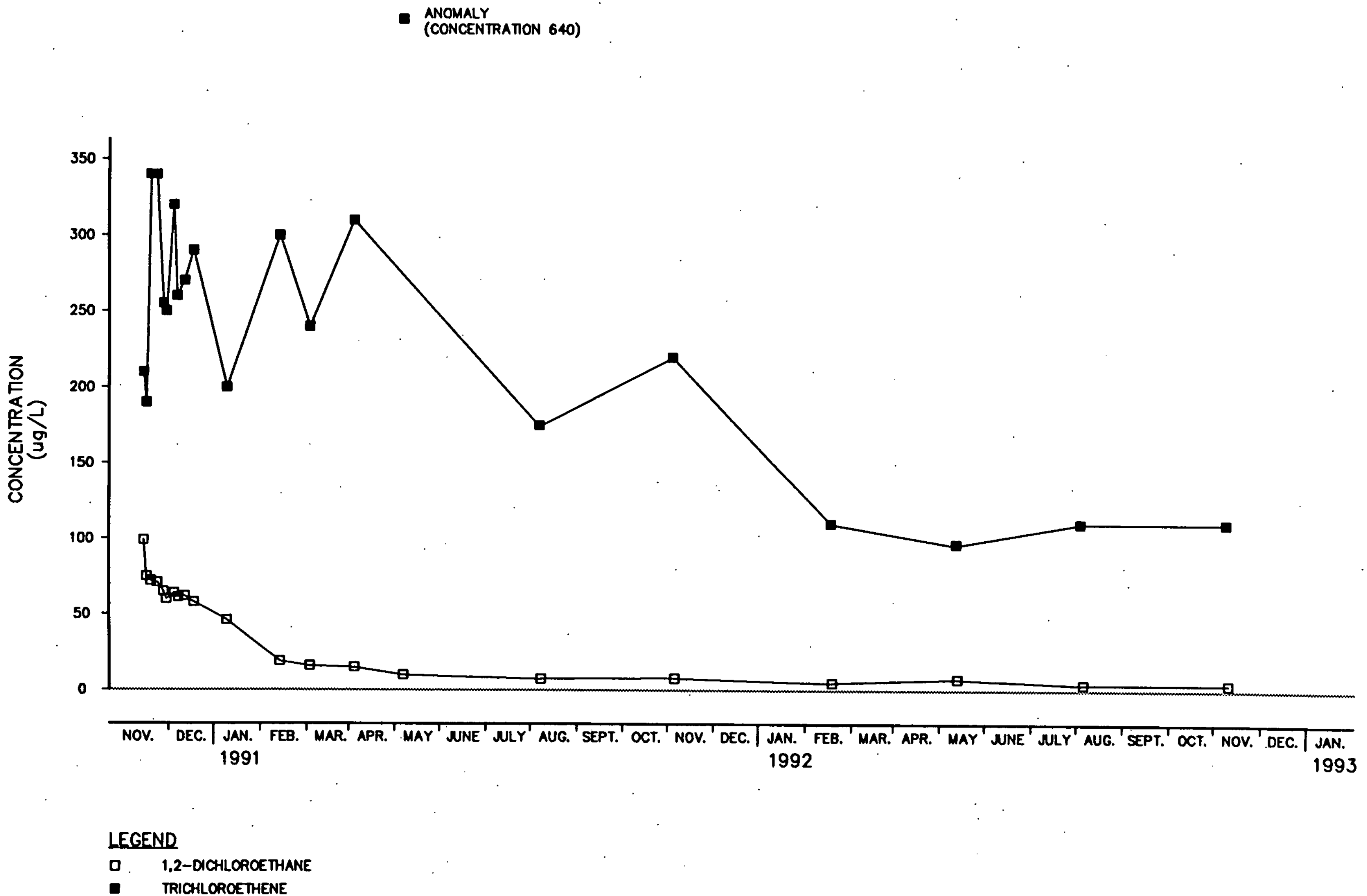


figure 3.31

EW1 EFFLUENT PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-17)

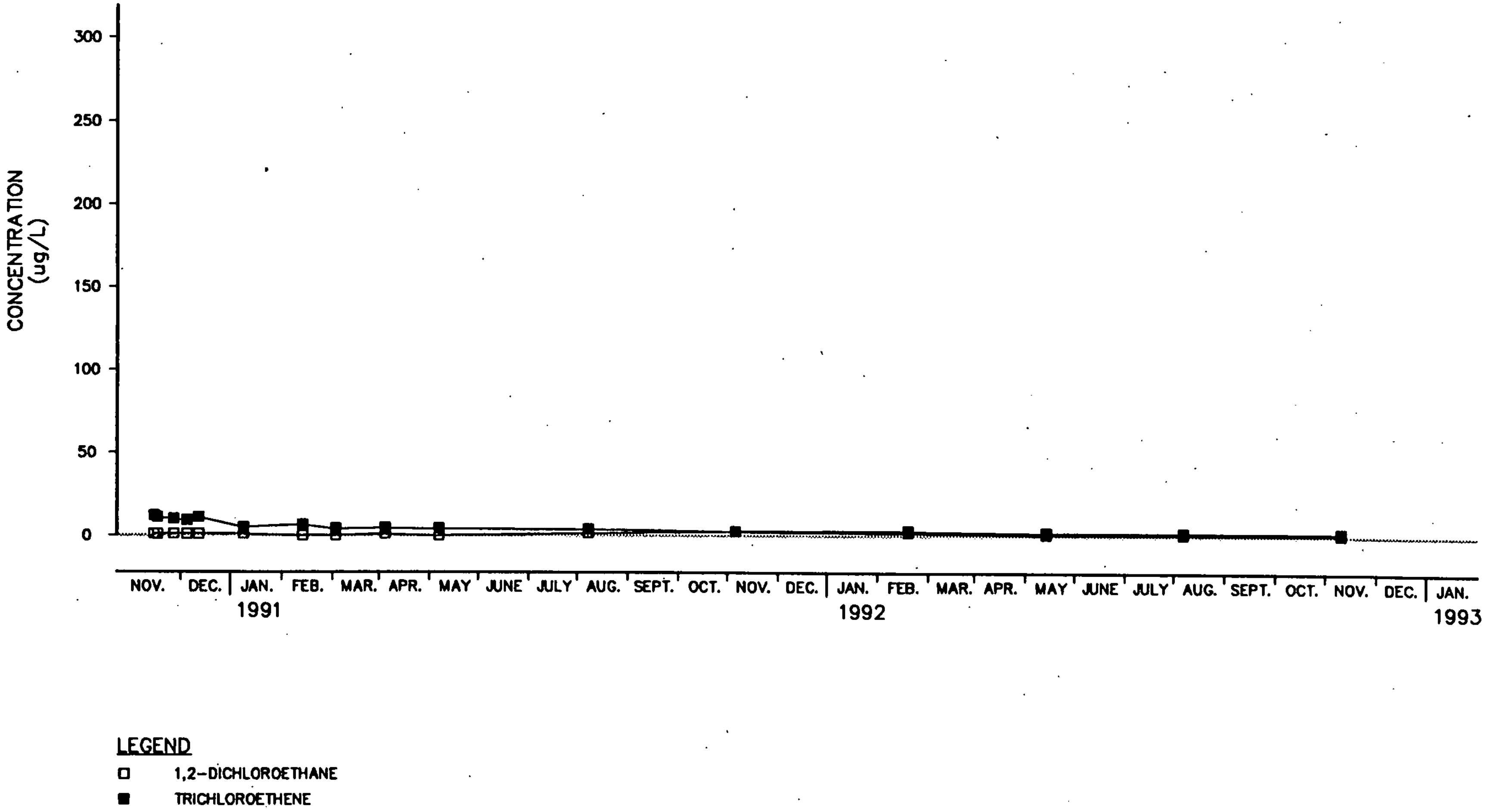


figure 3.32

C4D PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

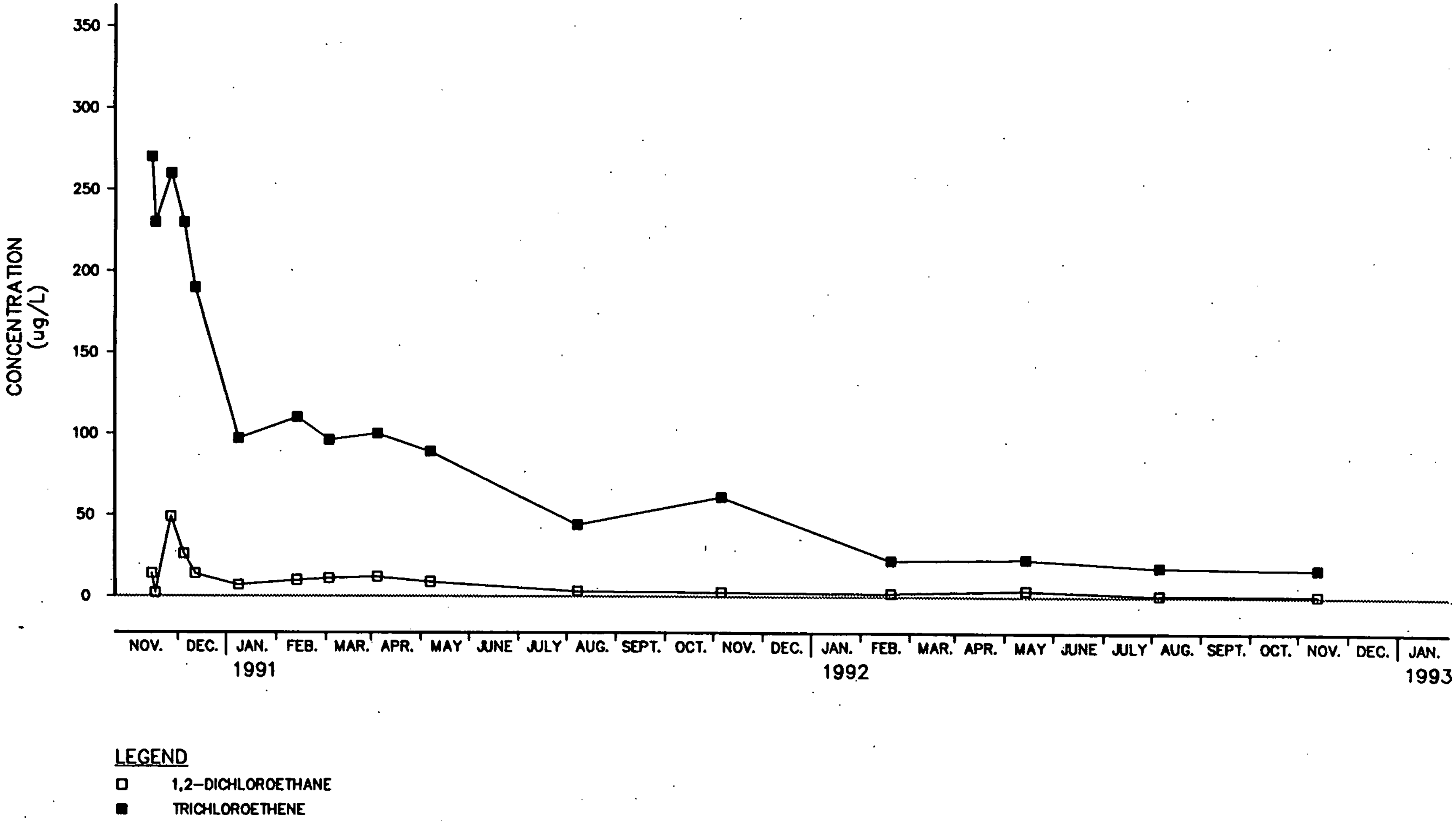


figure 3.33

WSWD PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-19)

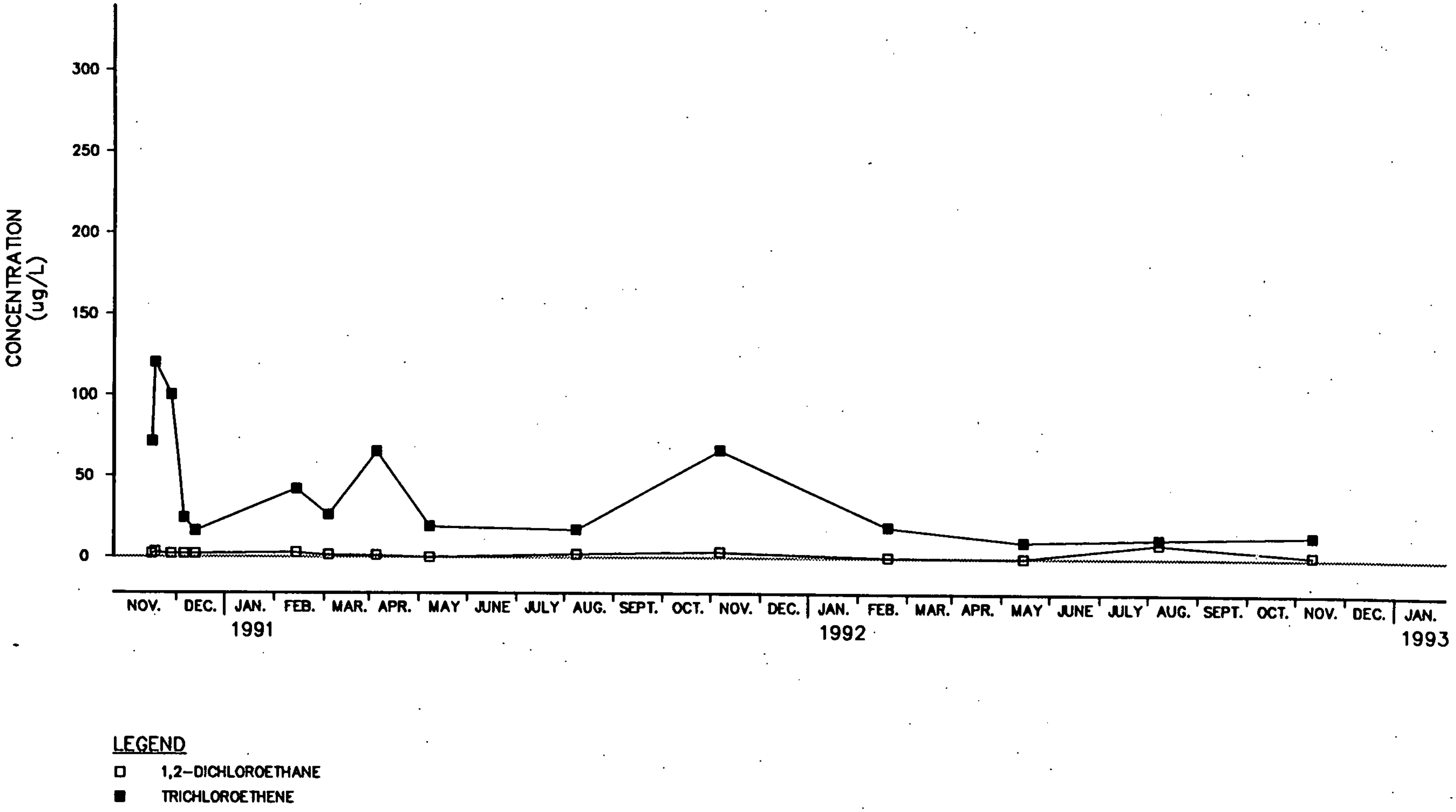


figure 3.34
W53A PARAMETER CONCENTRATIONS
Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-20)

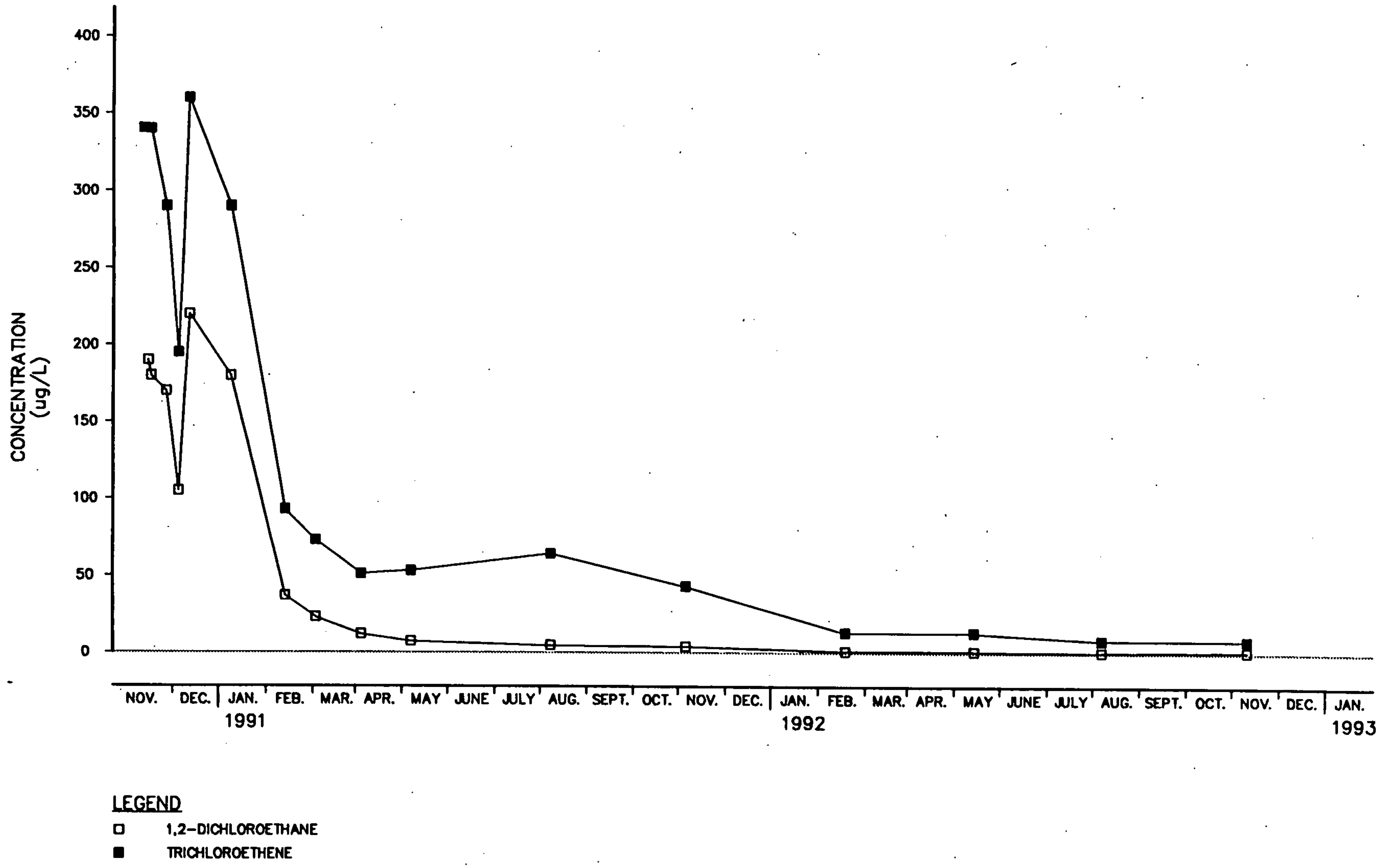


figure 3.35

W53 PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-21)

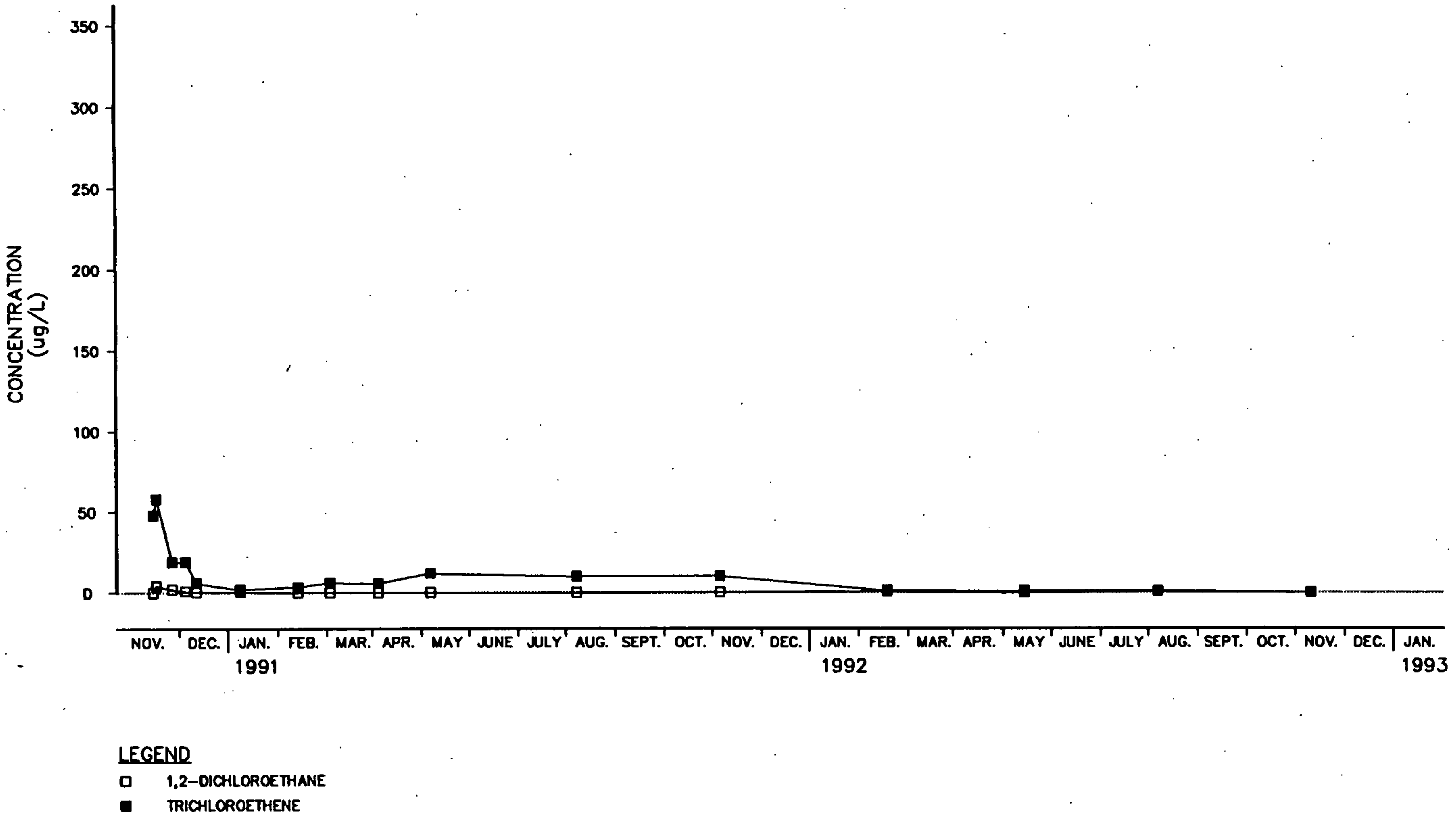


figure 3.36
W54 PARAMETER CONCENTRATIONS
Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-22)

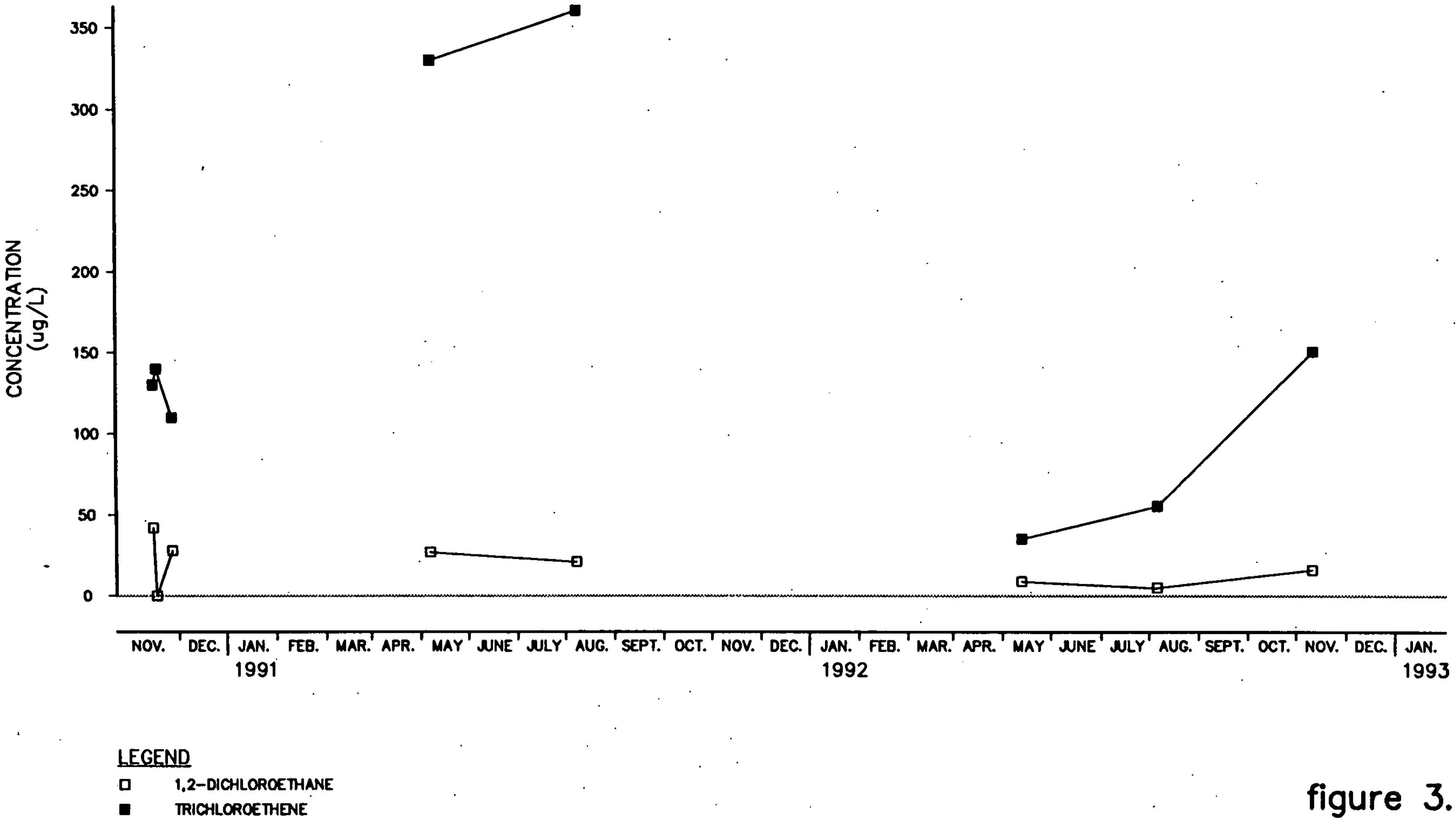


figure 3.37

IWD PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

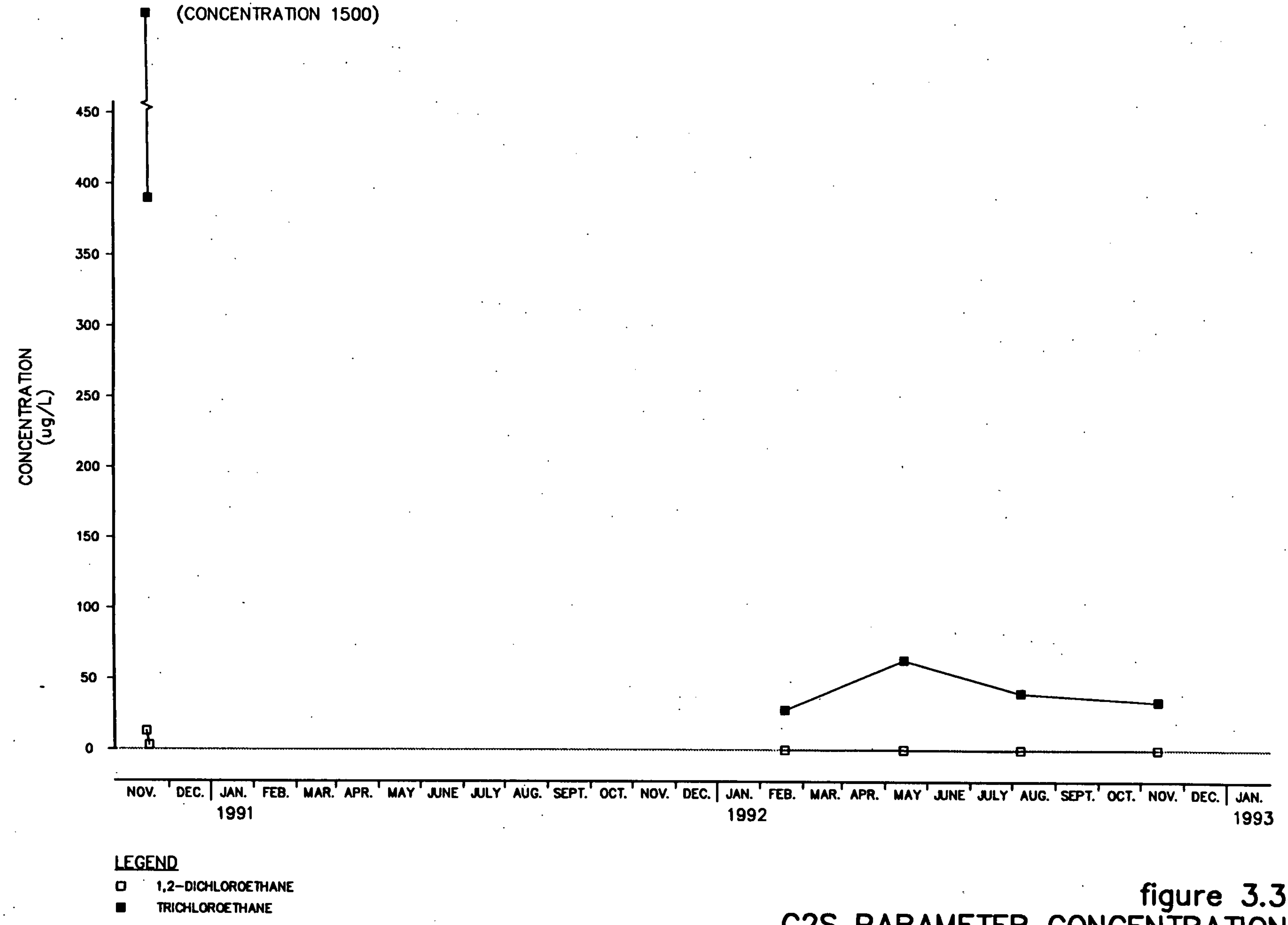


figure 3.38

C2S PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-24)

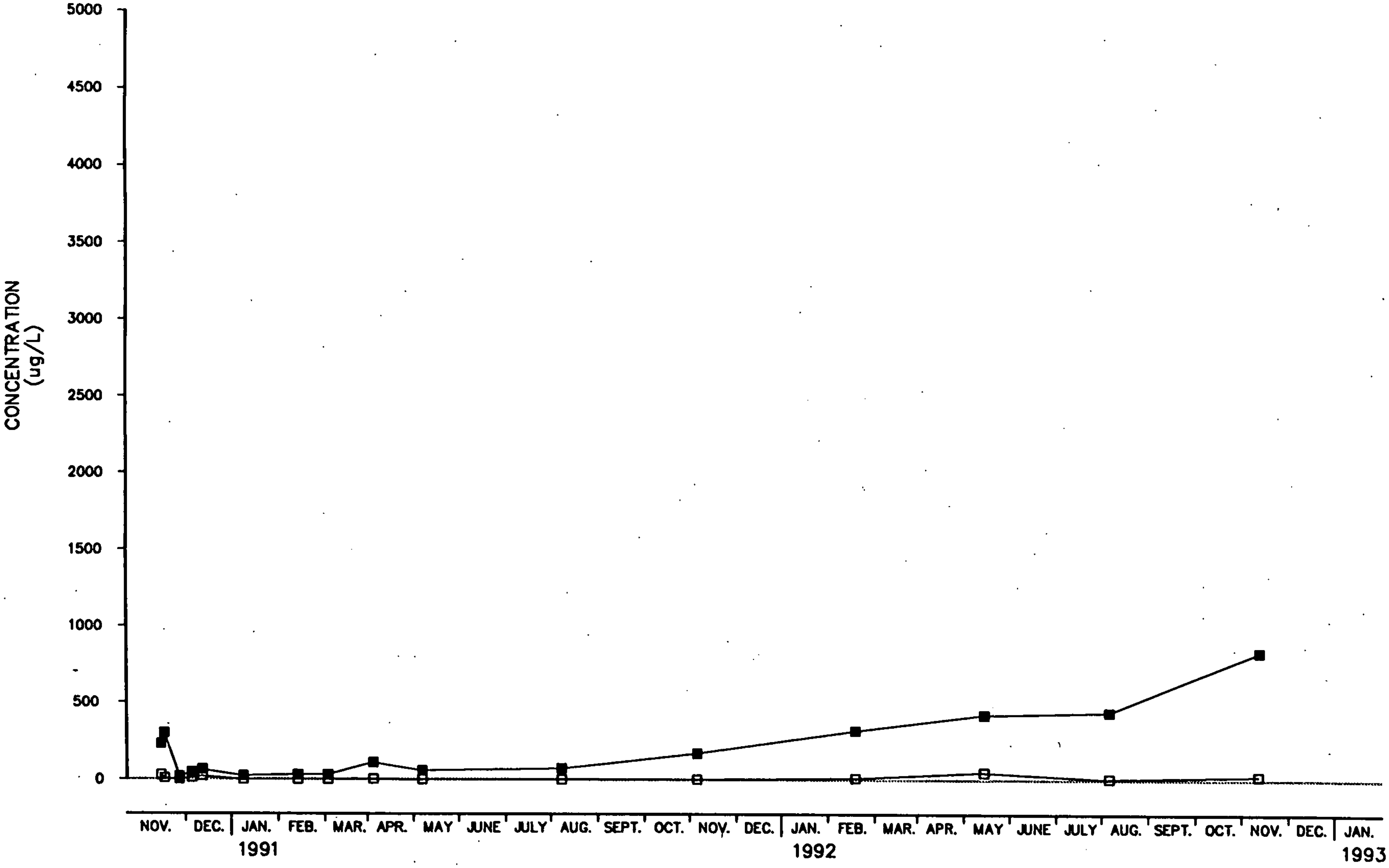


figure 3.39

R4D PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-25)

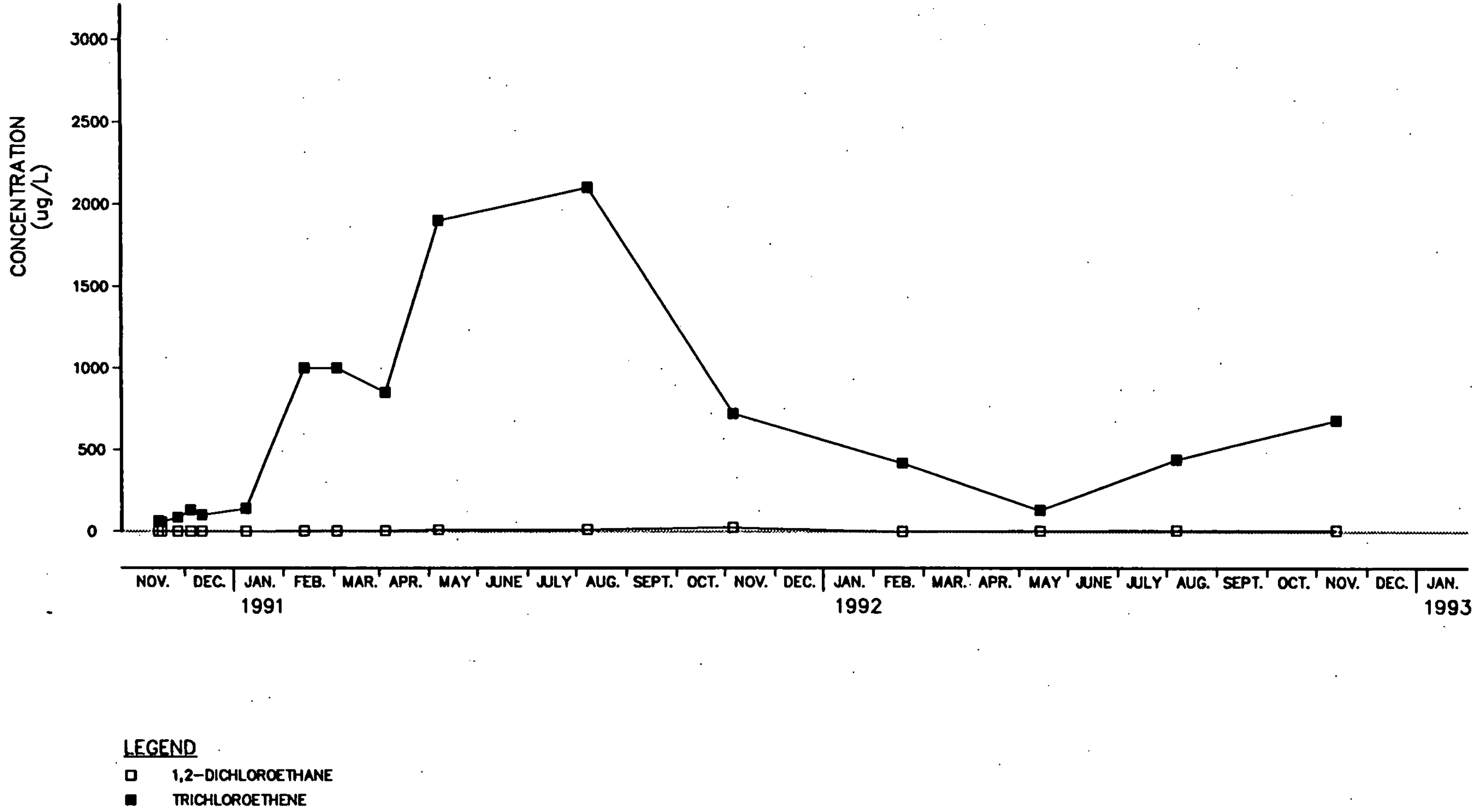


figure 3.40
W52 PARAMETER CONCENTRATIONS
Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-26)

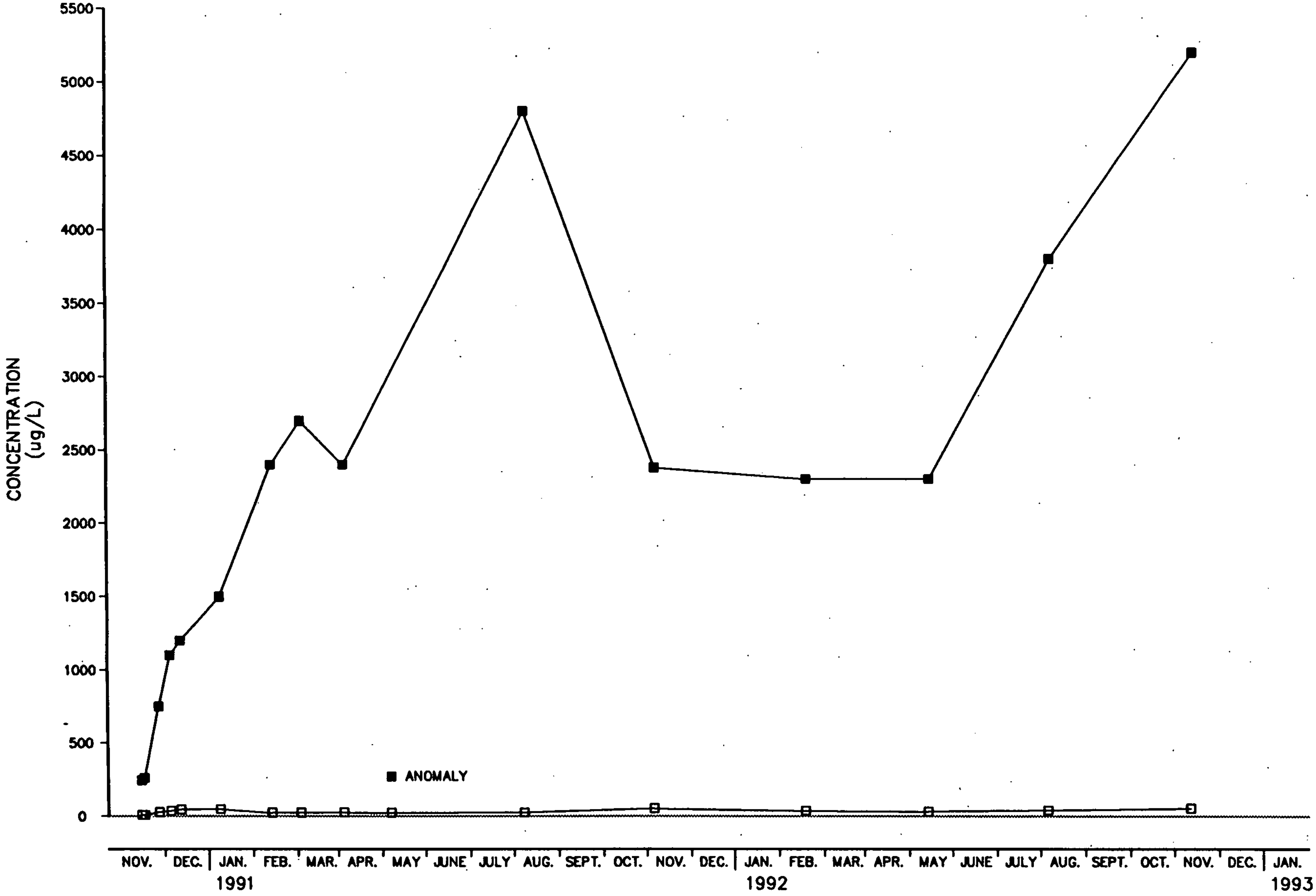


figure 3.41

R2D PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

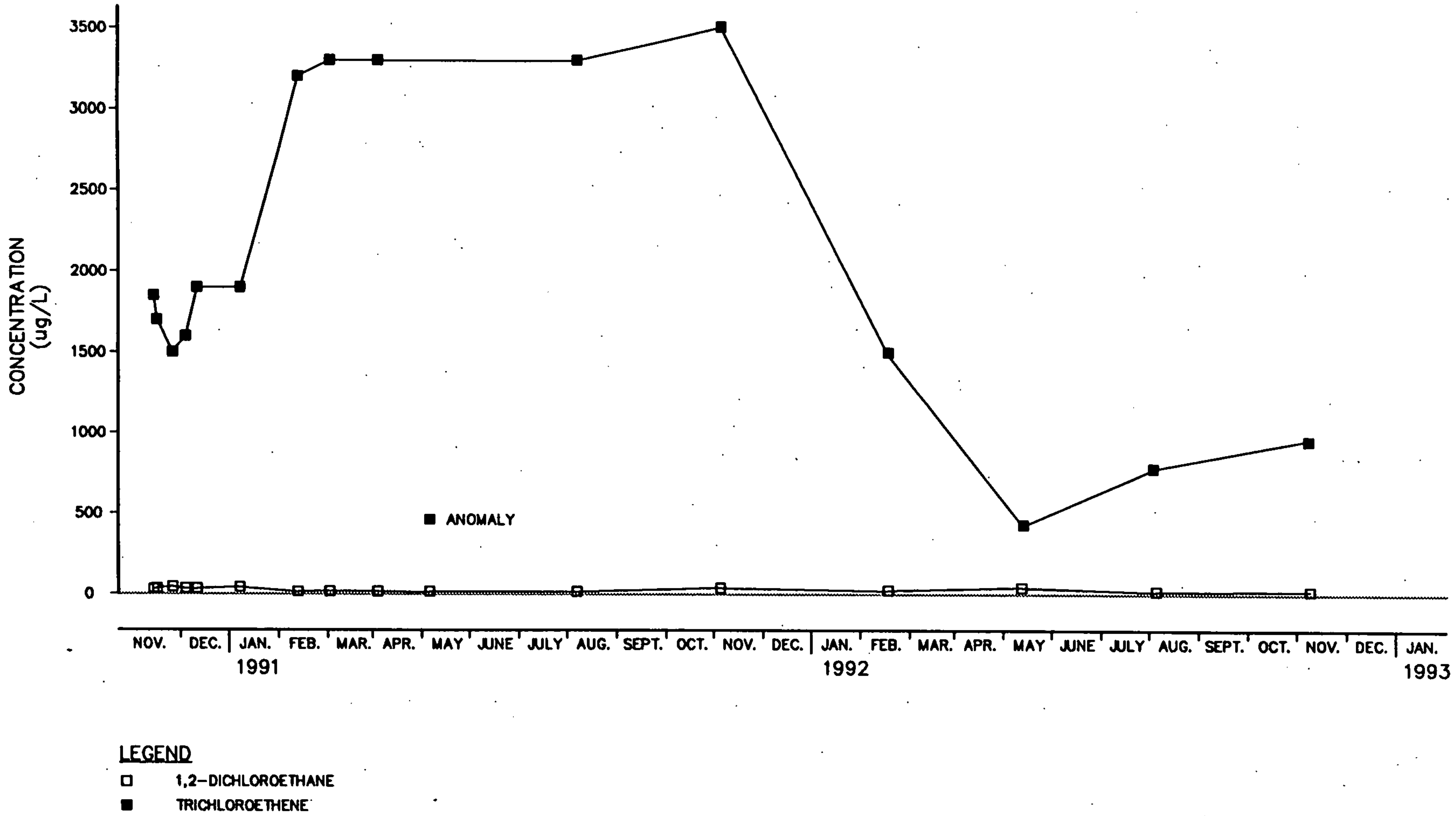


figure 3.42

W55 PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-28)

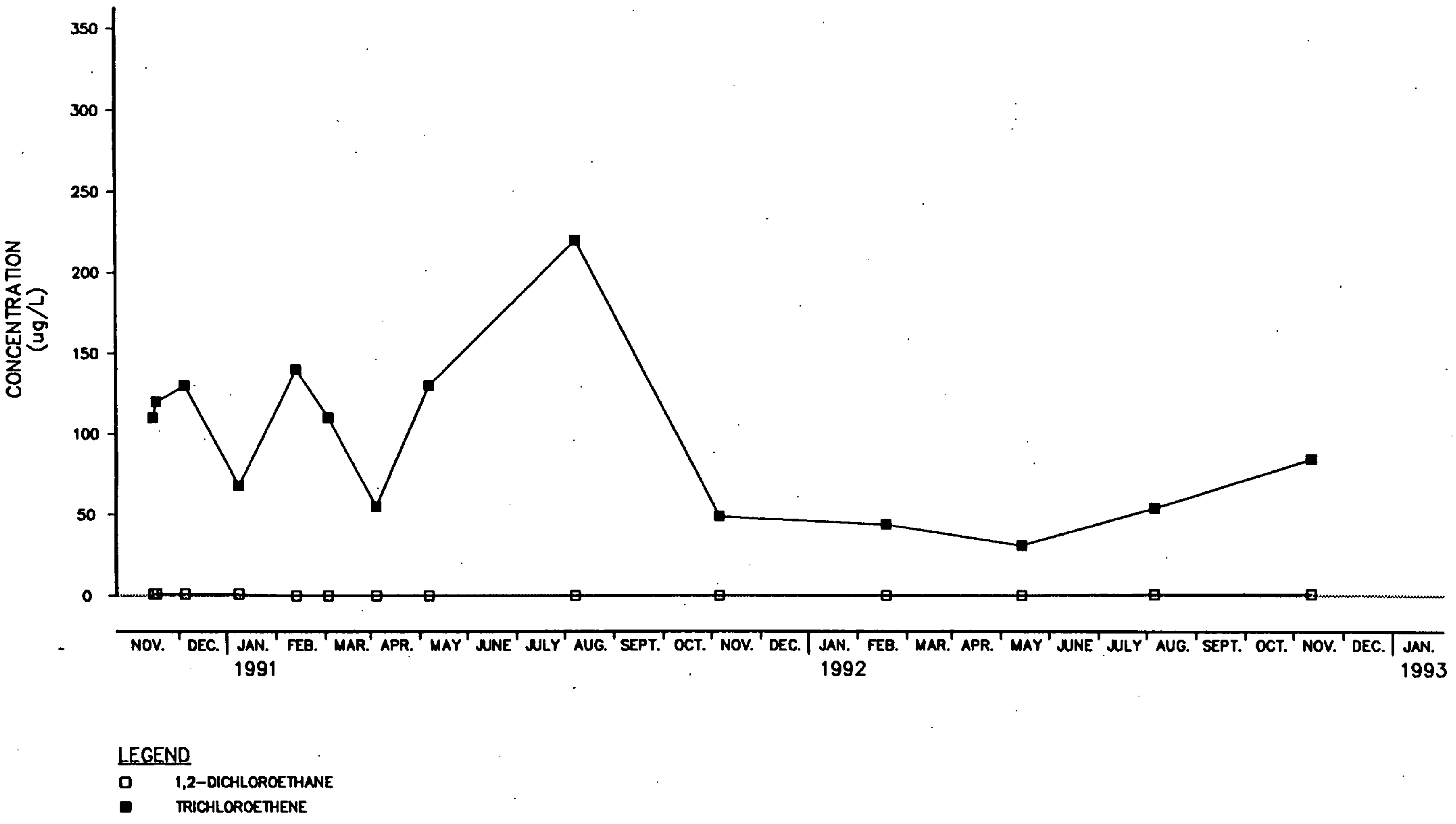


figure 3.43

CW6 PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-29)

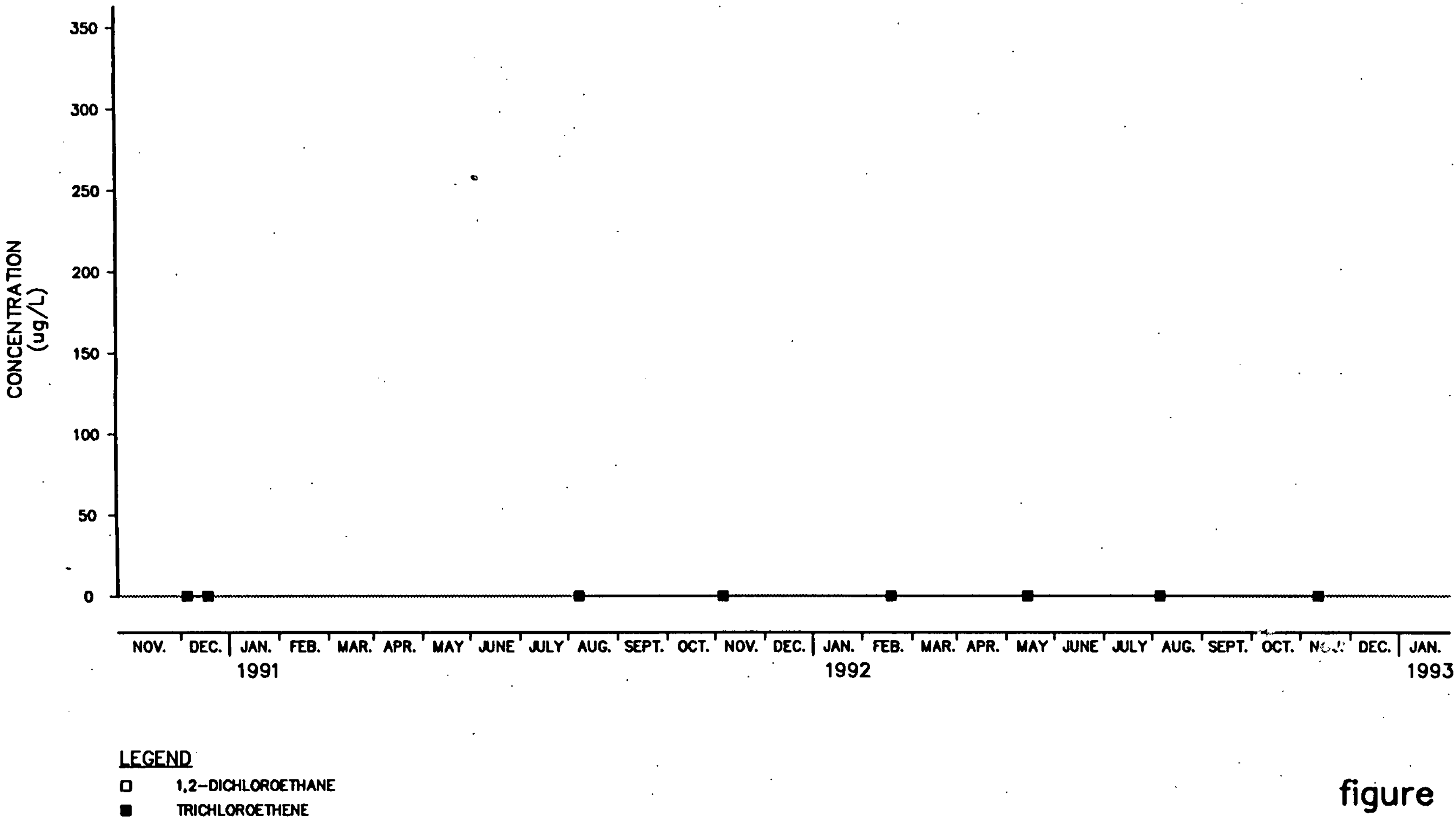


figure 3.44

CW7 PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-30)

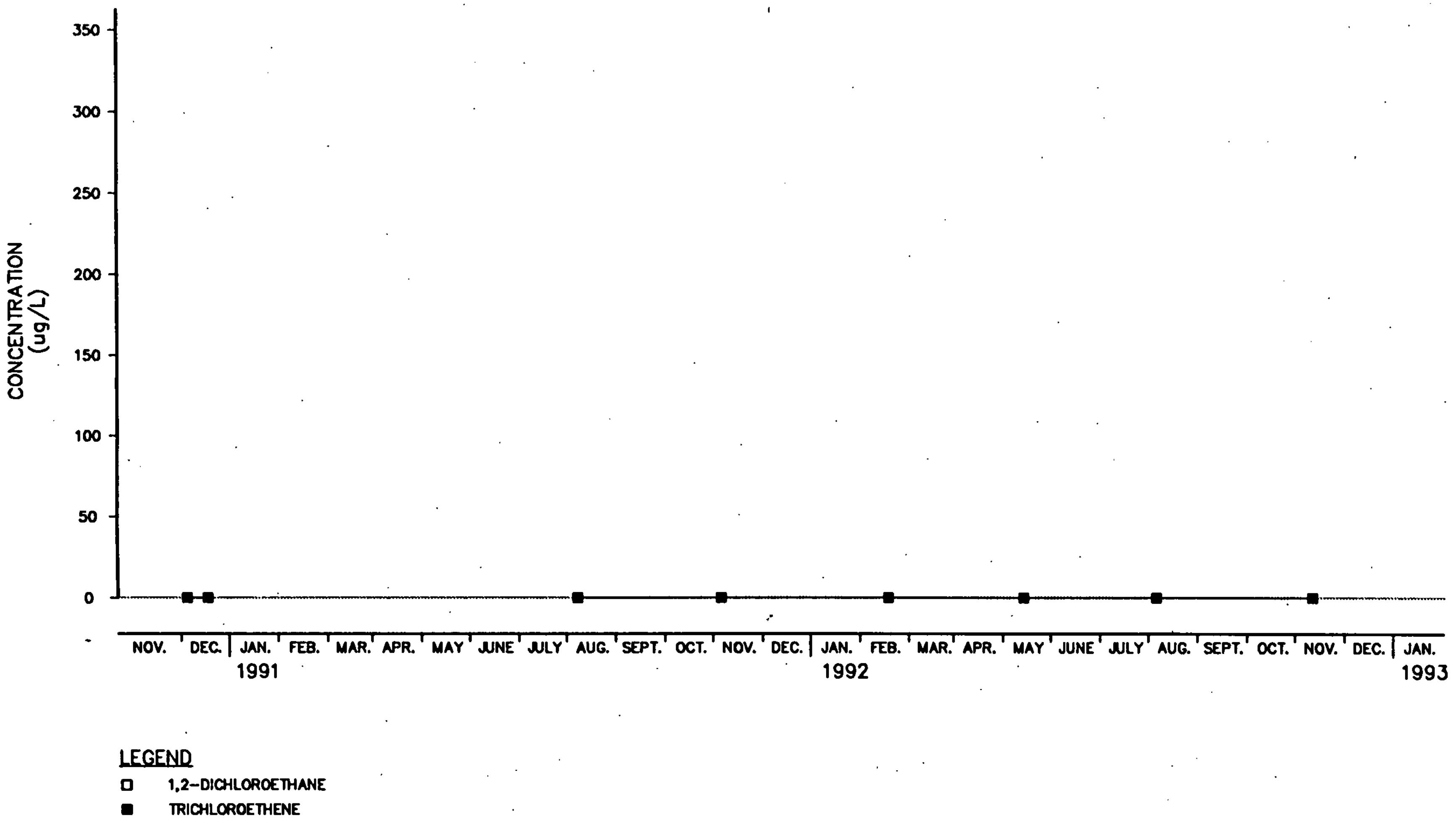


figure 3.45
CW9 PARAMETER CONCENTRAIONS
Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-31)

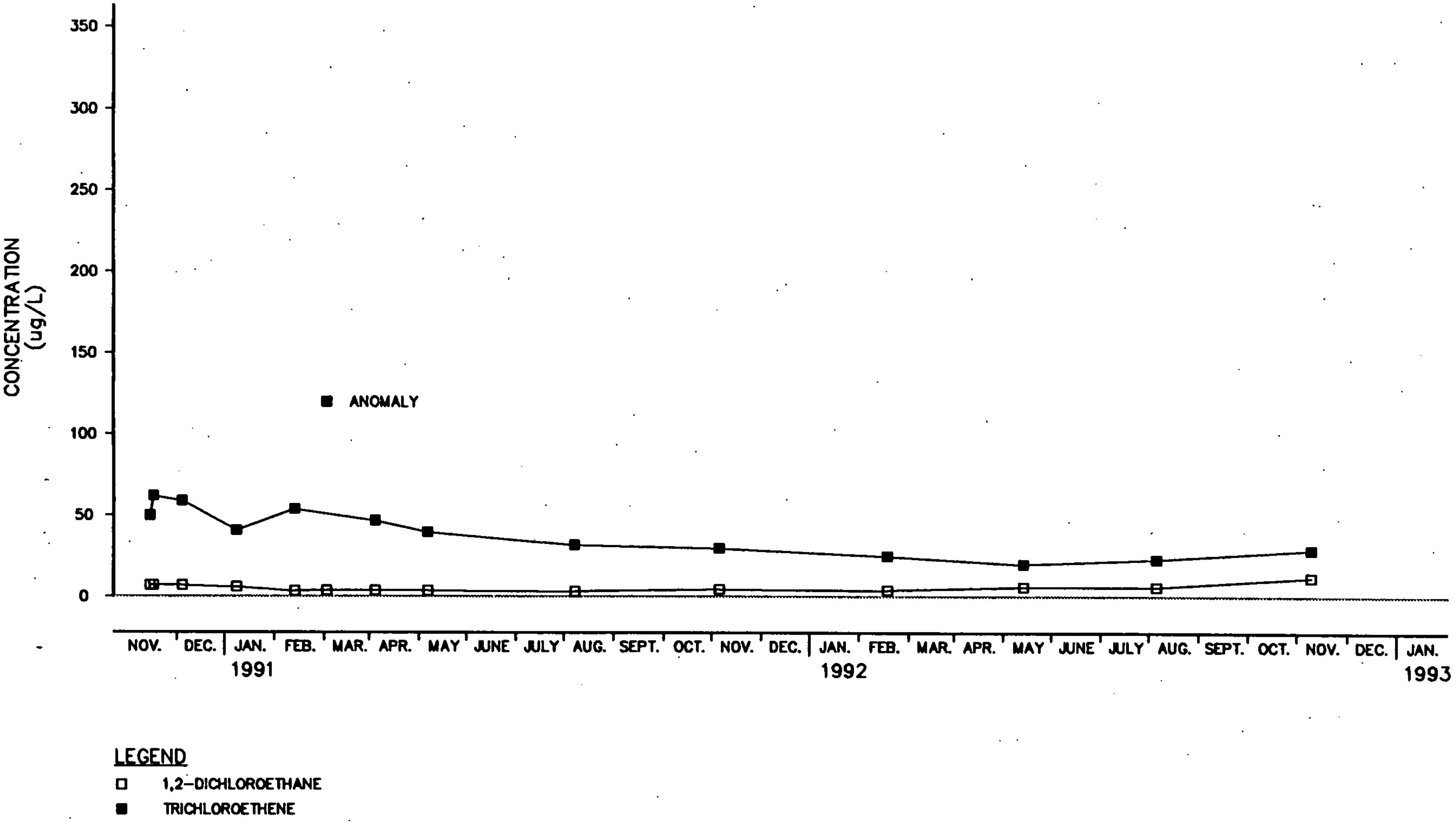


figure 3.46

CW3 PARAMETER CONCENTRATIONS

Marathon Electric Manufacturing Co.

CRA

2115 (20) FEB 10/93 REV.0 (G-32)

TABLE 1

PIEZOMETRIC ELEVATIONS
GROUNDWATER MONITORING PROGRAM
MARATHON ELECTRIC COMPANY
WAUSAU, WISCONSIN

Monitoring Well No.	*Top of Casing Elevation (ft. AMSL)*	*Piezometric Elevations (ft. AMSL)*							
		11/13/90	*11/15/90*	*11/19/90*	*11/21/90*	*11/23/90*	*11/26/90*	*12/03/90*	*12/10/90*
C1S	1,223.69	1,195.08	1,194.99	1,194.69	1,194.66	1,194.46	–	1,194.34	1,193.94
C2S (1)	1,216.23	1,187.89	1,181.09	Dry	Dry	Dry	Dry	Dry	Dry
C3S	1,220.24	1,187.63	1,186.84	1,185.51	1,185.21	1,184.95	–	1,184.43	1,184.14
C4S	1,216.84	1,187.74	1,187.37	1,186.40	1,186.11	1,185.87	–	1,185.43	1,185.18
C4D	1,216.50	1,187.99	1,187.62	1,186.64	1,186.36	1,186.14	1,185.99	1,185.71	1,185.48
C6S	1,221.69	1,188.04	1,188.04	1,187.66	1,187.40	1,187.10	–	1,186.17	1,185.91
C7S (2)	1,221.00	1,187.86	1,185.89	1,183.67	1,183.24	1,182.90	–	1,182.07	1,181.72
R1S	1,222.13	1,188.51	1,188.43	1,187.43	1,187.03	1,186.63	–	1,185.33	1,184.74
R1D	1,222.39	1,188.32	1,188.06	1,187.03	1,186.69	1,186.30	–	1,185.09	1,184.60
R2S	1,209.88	1,188.15	1,187.84	1,187.12	1,186.94	1,186.79	–	1,186.08	1,185.58
R2D	1,209.66	1,187.43	1,187.35	1,185.85	1,185.72	1,185.61	1,185.69	1,184.87	1,184.81
R3S	1,215.29	1,188.49	1,188.38	1,187.46	1,187.09	1,186.74	–	1,185.64	1,185.11
R3D	1,215.53	1,187.60	1,186.23	1,185.33	1,185.13	1,184.93	–	1,184.16	1,183.93
R4D	1,219.07	1,187.90	1,175.19	1,173.47	1,173.03	1,172.81	1,172.43	1,172.12	1,171.75
E21	1,197.61	1,187.23	1,186.95	1,185.45	1,185.23	1,185.08	–	1,185.89	1,184.92
E21A	1,197.95	1,187.19	1,186.55	1,185.39	1,185.15	1,185.03	–	1,185.85	1,184.87
E30	1,204.58	1,186.94	1,186.86	1,184.60	1,184.33	1,184.19	–	1,185.83	1,184.13
TCT44	1,204.57	1,187.05	1,186.97	1,184.75	1,184.47	1,184.29	–	1,185.92	1,184.27
W50	1,215.67	1,187.92	1,187.20	1,186.00	1,185.69	1,185.41	–	1,184.48	1,184.11
W51A	1,224.50	Blockage	1,188.93	1,188.48	1,188.20	1,187.87	–	1,186.40	1,185.76
W52A	1,219.08	1,187.99	1,187.53	1,185.50	1,185.04	1,184.63	–	1,183.63	1,183.14
W52	1,219.25	1,187.77	1,185.22	1,184.05	1,183.76	1,183.56	1,183.32	1,182.95	1,182.67
W53A (3)	1,217.12	1,187.80	1,186.05	1,183.95	1,183.55	1,183.27	1,182.92	1,181.60	1,182.29
W53	1,216.91	1,187.91	1,185.98	1,184.01	1,183.63	1,183.33	1,183.01	1,182.73	1,182.33
W54	1,216.44	1,189.37	1,185.31	1,183.17	1,182.80	1,182.54	1,182.24	1,181.92	1,181.61
W55A	1,217.40	1,186.92	1,186.48	1,186.43	1,186.48	1,186.45	–	1,185.63	1,185.39
W55	1,217.29	1,186.24	1,185.64	1,186.29	1,186.29	1,186.29	1183.30*	1,184.88	1,185.43
W56	–	–	–	–	–	–	–	–	–
W56A	–	–	–	–	–	–	–	–	–
IWD	1,192.08	1,187.38	1,186.78	1,185.62	1,185.48	1,185.35	–	–	–
IWM	1,192.91	1,187.65	1,187.05	1,185.91	1,185.77	1,185.65	–	–	–
IWS	1,193.17	1,187.90	1,187.52	1,187.00	1,187.01	1,186.92	–	–	–
WSWD	1,193.25	1,188.87	1,187.87	1,183.17	1,182.89	1,182.67	–	1,182.17	1,181.89
WSWS	1,193.24	1,188.49	1,187.63	1,187.58	1,187.78	1,187.75	–	1,187.44	1,187.68
WC4	1,196.86	1,186.61	1,186.61	1,185.76	1,185.58	1,185.46	–	1,185.91	1,185.39
WC4A	1,196.69	–	1,186.59	1,185.76	1,185.58	1,185.46	–	1,185.89	1,185.39
MW1A	–	–	–	–	–	–	–	–	–
GM1S	–	–	–	–	–	–	–	–	–
MW1	–	–	–	–	–	–	–	–	–
MW2	–	–	–	–	–	–	–	–	–
MW3	–	–	–	–	–	–	–	–	–
EW1	–	–	–	–	–	–	–	–	–
Staff Gages									
SG1	1,189.37	1,188.36	1,187.88	1,187.75	1,187.96	1,187.89	–	1,187.83	1,188.35
SG2	1,193.94	1,191.58	1,191.88	1,191.57	1,191.61	1,191.52	–	1,191.54	1,191.73

Notes:

*	Measured on 11/27/90.
(1)	Bottom of well measured at approximately 1,178.8 ft. AMSL.
(2)	Bottom of well measured at approximately 1,181.3 ft. AMSL.
(3)	Bottom of well measured at approximately 1,181.7 ft. AMSL.

TABLE 1

PIEZOMETRIC ELEVATIONS
GROUNDWATER MONITORING PROGRAM
MARATHON ELECTRIC COMPANY
WAUSAU, WISCONSIN

Monitoring Well No.	*Top of Casing Elevation (ft. AMSL)*	*Piezometric Elevations (ft. AMSL)*							
		12/17/90	*01/07/91*	*01/14/91*	*01/21/91*	*01/30/91*	*02/06/91*	*02/13/91*	*02/18/91*
C1S	1,223.69	1,193.62	1,193.13	1,193.13	1,192.74	1,192.54	1,192.51	1,191.95	1,191.68
C2S (1)	1,216.23	Dry	Dry	Dry	Dry	Dry	1,178.33	1,178.18	1,178.38
C3S	1,220.24	1,184.10	1,183.24	1,183.06	1,183.02	1,183.06	1,183.95	1,183.96	1,184.05
C4S	1,216.84	1,185.14	1,184.30	1,184.12	1,184.07	1,184.14	1,184.66	1,184.69	1,184.80
C4D	1,216.50	1,185.40	1,184.55	1,184.38	1,184.32	1,184.40	1,184.97	1,184.96	1,185.08
C6S	1,221.69	1,185.65	1,184.86	1,184.29	1,184.53	1,184.47	1,184.71	1,184.86	1,184.94
C7S (2)	1,221.00	1,181.50	Dry	Dry	Dry	Dry	1,182.25	1,182.28	1,182.41
R1S	1,222.13	1,184.29	1,183.39	1,183.15	1,182.98	1,182.77	1,183.25	1,183.48	1,183.58
R1D	1,222.39	1,184.12	1,183.54	1,183.19	1,183.06	1,182.80	1,183.37	1,183.49	1,183.65
R2S	1,209.88	1,185.27	1,185.03	1,184.94	1,184.90	1,184.57	1,184.78	1,184.64	1,184.77
R2D	1,209.66	1,184.32	1,184.39	1,184.34	1,184.30	1,183.90	1,184.40	1,184.15	1,184.50
R3S	1,215.29	1,184.70	1,183.96	1,183.74	1,183.65	1,183.42	1,183.83	1,184.03	1,184.11
R3D	1,215.53	1,183.58	1,183.33	1,183.25	1,183.20	1,182.90	1,183.75	1,183.57	1,183.86
R4D	1,219.07	1,171.60	1,170.87	1,170.54	1,170.45	1,170.58	1,176.77	1,176.18	1,176.51
E21	1,197.61	1,185.83	1,183.99	1,183.85	1,184.19	1,184.42	1,185.01	1,184.22	1,184.49
E21A	1,197.95	1,185.79	1,183.93	1,183.80	1,183.77	1,184.45	1,184.95	1,184.15	1,184.44
E30	1,204.58	1,185.83	1,183.09	1,182.95	1,182.92	1,184.24	1,184.74	1,183.29	1,183.83
TCT44	1,204.57	1,185.92	1,183.20	1,183.06	1,183.03	1,184.31	1,184.82	1,183.39	1,183.83
W50	1,215.67	1,183.71	1,183.27	1,183.13	1,183.07	1,182.79	1,183.53	1,183.53	1,183.72
W51A	1,224.50	1,185.16	1,183.98	1,183.65	1,183.45	1,183.20	1,183.52	1,183.77	1,183.87
W52A	1,219.08	1,182.79	1,182.13	1,181.90	1,181.84	1,181.69	1,182.80	1,182.98	1,183.07
W52	1,219.25	1,182.41	1,181.95	1,181.87	1,181.85	1,181.69	1,183.18	1,183.00	1,183.25
W53A (3)	1,217.12	1,182.17	Dry	Dry	Dry	Dry	1,182.81	1,182.78	1,182.91
W53	1,216.91	1,182.21	1,181.39	1,181.19	1,181.16	1,181.07	1,182.41	1,182.86	1,182.91
W54	1,216.44	1,181.49	1,180.65	1,180.51	1,180.47	1,180.49	1,183.54	1,183.46	1,182.59
W55A	1,217.40	1,184.75	1,185.58	1,185.62	1,185.62	1,184.84	1,184.59	1,183.97	1,184.39
W55	1,217.29	1,184.21	1,185.57	1,185.64	1,185.66	1,184.46	1,184.25	1,183.89	1,184.69
W56	1,200.17	–	1,184.97	1,184.91	1,184.86	1,184.12	1,184.16	1,183.87	1,184.40
W56A	1,200.95	–	1,188.19	1,188.07	1,188.00	1,187.77	1,187.73	1,187.67	1,187.58
IWD	1,192.08	–	--	–	–	–	–	--	–
IWM	1,192.91	–	--	–	–	–	–	--	–
IWS	1,193.17	–	--	–	–	–	–	--	–
WSWD	1,193.25	1,181.86	1,181.05	1,180.91	1,180.89	1,180.96	1,182.88	1,182.71	1,182.90
WSWS	1,193.24	1,187.49	1,187.24	1,187.18	1,187.19	1,186.97	ice	ice	ice
WC4	1,196.86	1,185.93	1,184.53	1,184.40	1,184.36	1,184.77	1,185.00	1,184.56	1,184.76
WC4A	1,196.69	1,185.93	1,184.52	1,184.39	1,184.37	1,184.76	1,185.01	1,184.57	1,184.75
MW1A	1,215.79	–	1,185.51	1,185.54	1,185.54	1,184.86	1,184.84	1,184.52	1,184.99
GM1S	1,216.07	–	1,185.53	1,185.55	1,185.57	1,184.94	1,184.91	1,184.57	1,184.99
MW1	1,221.86	–	--	1,185.22	1,185.18	1,185.32	1,185.57	1,185.46	1,185.56
MW2	1,220.25	–	--	1,185.25	1,185.22	1,185.37	1,185.60	1,185.46	1,185.58
MW3	1,218.75	–	--	1,184.98	1,184.91	1,185.03	1,185.33	1,185.26	1,185.37
EW1	1,218.30	–	--	1,130.80	1,130.80	1,130.80	1,130.80	1,145.53	1,146.30
Staff Gages									
SG1	1,189.37	1,187.81	1,187.72	1,187.72	1,187.68	1,187.66	1,187.93	1,187.70	ice
SG2	1,193.94	1,191.54	1,191.38	1,191.40	1,191.38	1,191.24	1,191.42	1,191.41	1,191.29

Notes:

(1) Bottom of well measured at approximately 1,178.8 ft. AMSL.
(2) Bottom of well measured at approximately 1,181.3 ft. AMSL.
(3) Bottom of well measured at approximately 1,181.7 ft. AMSL.

TABLE 1

PIEZOMETRIC ELEVATIONS
GROUNDWATER MONITORING PROGRAM
MARATHON ELECTRIC COMPANY
WAUSAU, WISCONSIN

Monitoring Well No.	*Top of Casing Elevation (ft. AMSL)*	*Piezometric Elevations (ft. AMSL)*								
		02/27/91	*03/04/91*	*03/11/91*	*03/18/91*	*03/25/91*	*04/01/91*	*04/08/91*	*04/15/91*	*04/22/91*
C1S	1,223.69	1,191.61	1,191.60	1,191.59	1,191.70	1,198.36	1,197.55	1,196.83	1,197.45	1,197.39
C2S (1)	1,216.23	1,178.62	1,178.53	1,178.38	1,178.71	1,179.48	1,179.90	1,179.97	1,180.60	1,181.13
C3S	1,220.24	1,184.29	1,184.22	1,184.14	1,184.25	1,185.20	1,185.56	1,185.70	1,186.34	1,186.48
C4S	1,216.84	1,185.05	1,184.96	1,184.89	1,184.98	1,185.88	1,186.29	1,186.40	1,187.08	1,187.15
C4D	1,216.50	1,185.33	1,185.25	1,185.13	1,185.24	1,186.13	1,186.53	1,186.64	1,187.30	1,187.36
C6S	1,221.69	1,185.11	1,185.16	1,185.15	1,185.25	1,185.45	1,183.24	1,186.49	1,187.01	1,187.39
C7S (2)	1,221.00	1,182.65	1,182.60	1,182.51	1,182.74	1,183.36	1,183.90	1,184.01	1,184.64	1,185.00
R1S	1,222.13	1,183.74	1,183.80	1,183.80	1,183.95	1,184.13	1,184.74	1,185.14	1,185.65	1,186.03
R1D	1,222.39	1,183.75	1,183.84	1,183.86	1,184.00	1,184.20	1,184.89	1,185.24	1,185.69	1,186.07
R2S	1,209.88	1,184.82	1,184.86	1,184.93	1,184.99	1,185.40	1,177.67	1,187.00	1,187.51	1,187.53
R2D	1,209.66	1,184.42	1,184.58	1,184.61	1,184.64	1,185.01	1,185.93	1,186.07	1,186.07	1,186.54
R3S	1,215.29	1,184.26	1,184.81	1,184.34	1,184.46	1,185.80	1,185.54	1,185.84	1,186.37	1,186.60
R3D	1,215.53	1,183.85	1,183.96	1,183.96	1,184.05	1,184.52	1,185.30	1,185.44	1,185.74	1,186.05
R4D	1,219.07	1,176.81	1,176.52	1,176.03	1,176.89	1,177.89	1,177.92	1,178.11	1,178.35	1,179.71
E21	1,197.61	1,185.41	1,184.72	1,184.60	1,184.67	1,186.65	1,185.95	1,185.76	1,187.37	1,187.43
E21A	1,197.95	1,185.37	1,184.65	1,184.54	1,184.60	1,186.63	1,185.91	1,185.71	1,187.36	1,187.41
E30	1,204.58	1,185.23	1,184.12	1,183.75	1,183.83	1,185.98	1,185.08	1,184.89	1,187.20	1,187.40
TCT44	1,204.57	1,185.33	1,184.13	1,183.87	1,183.96	1,186.58	1,185.20	1,184.90	1,187.29	1,187.50
W50	1,215.67	1,183.80	1,183.88	1,183.88	1,183.99	1,184.35	1,185.19	1,185.41	1,185.83	1,186.13
W51A	1,224.50	1,183.95	1,184.08	1,184.10	1,184.19	1,184.30	1,184.58	1,184.93	1,185.34	1,185.76
W52A	1,219.08	1,183.28	1,183.31	1,183.24	1,183.43	1,183.93	1,184.64	1,184.76	1,185.36	1,185.60
W52	1,219.25	1,183.33	1,183.36	1,183.27	1,183.45	1,184.15	1,184.70	1,184.76	1,185.17	1,183.53
W53A (3)	1,217.12	1,183.16	1,183.08	1,182.98	1,183.20	1,184.00	1,184.38	1,184.52	1,185.16	1,185.44
W53	1,216.91	1,183.18	1,182.99	1,185.00	1,182.96	1,184.05	1,184.44	1,184.57	1,185.22	1,185.49
W54	1,216.44	1,182.84	1,183.20	1,182.64	1,182.83	1,184.44	1,184.99	1,184.19	1,184.82	1,185.16
W55A	1,217.40	1,184.14	1,184.42	1,184.55	1,184.56	1,184.22	1,185.71	1,186.37	1,186.38	1,186.81
W55	1,217.29	1,183.81	1,184.77	1,184.95	1,184.74	1,184.21	1,186.31	1,186.49	1,185.67	1,186.63
W56	1,200.17	1,184.03	1,184.52	1,184.61	1,184.63	1,184.44	1,185.80	1,186.37	1,186.07	1,186.65
W56A	1,200.95	1,187.57	1,187.96	1,187.89	1,188.03	1,190.09	1,190.63	1,192.35	1,191.30	1,190.58
IWD	1,192.08	–	--	–	–	–	–	1,186.23	1,187.33	1,187.31
IWM	1,192.91	–	--	–	–	–	–	1,186.51	1,187.59	1,187.55
IWS	1,193.17	–	--	–	–	–	–	1,188.09	1,188.67	1,188.23
WSWD	1,193.25	1,183.17	1,183.00	1,182.86	1,183.09	1,184.11	1,184.33	1,184.38	1,185.07	1,185.33
WSWS	1,193.24	ice	ice	ice	ice	ice	ice	1,188.69	1,188.90	1,188.29
WC4	1,196.86	1,185.41	1,185.04	1,185.04	1,185.08	1,186.72	1,186.21	1,186.11	1,187.18	1,187.28
WC4A	1,196.69	1,185.40	1,185.05	1,185.05	1,185.11	1,186.55	1,186.34	1,186.43	1,187.33	1,187.39
MW1A	1,215.79	1,184.64	1,185.07	1,185.13	1,185.06	1,185.19	1,186.49	1,186.63	1,186.50	1,186.83
GM1S	1,216.07	1,184.71	1,185.06	1,185.12	1,185.08	1,185.22	1,186.50	1,186.65	1,186.61	1,186.91
MW1	1,221.86	1,185.85	1,185.71	1,185.68	1,185.68	1,186.82	1,187.08	1,187.19	1,187.87	1,187.82
MW2	1,220.25	1,185.90	1,185.75	1,185.69	1,185.71	1,186.87	1,187.10	1,187.27	1,187.95	1,185.83
MW3	1,218.75	1,185.65	1,185.53	1,185.49	1,185.53	1,186.59	1,186.89	1,187.03	1,187.73	1,187.67
EW1	1,218.30	1,146.30	1,144.30	1,143.30	1,145.30	1,145.30	1,145.30	1,146.30	1,145.30	1,152.30
Staff Gages										
SG1	1,189.37	ice	ice	ice	1,187.67	1,188.91	1,188.75	1,188.68	1,189.02	1,188.44
SG2	1,193.94	1,191.27	1,191.56	1,191.60	1,191.76	1,192.05	1,192.05	1,192.04	1,191.95	1,191.74

Notes:

(1) Bottom of well measured at approximately 1,178.8 ft. AMSL.
(2) Bottom of well measured at approximately 1,181.3 ft. AMSL.
(3) Bottom of well measured at approximately 1,181.7 ft. AMSL.

TABLE 1

PIEZOMETRIC ELEVATIONS
GROUNDWATER MONITORING PROGRAM
MARATHON ELECTRIC COMPANY
WAUSAU, WISCONSIN

Monitoring Well No.	*Top of Casing Elevation (ft. AMSL)*	*Piezometric Elevations (ft. AMSL)*								
		04/29/91	*05/06/91*	*06/27/91*	*08/05/91*	*11/04/91*	*02/17/92*	*05/11/92*	*08/03/92*	*11/02/92*
C1S	1,223.69	1,197.25	1,196.99	1,196.92	1,195.87	1,194.71	1,193.13	1,196.95	1,195.10	1,195.14
C2S (1)	1,216.23	1,181.13	1,181.23	1,181.87	1,181.77	1,181.45	1,180.72	1,181.04	1,182.09	–
C3S	1,220.24	1,186.42	1,186.52	1,186.90	1,186.70	1,186.64	1,185.30	1,186.05	1,186.52	1,184.44
C4S	1,216.84	1,187.08	1,187.16	1,187.48	1,187.26	1,187.24	1,185.87	1,186.73	1,187.07	1,186.26
C4D	1,216.50	1,187.30	1,187.40	1,187.75	1,186.82	1,187.52	1,186.16	1,187.00	1,187.32	1,185.86
C6S	1,221.69	1,187.52	1,187.69	1,188.11	1,187.81	1,187.31	1,186.25	1,187.30	1,187.45	1,184.59
C7S (2)	1,221.00	1,185.05	1,185.17	1,185.71	1,185.56	1,185.26	1,184.35	1,184.89	1,185.73	1,183.35
R1S	1,222.13	1,186.24	1,186.40	1,187.13	1,186.88	1,186.21	1,185.26	1,186.22	1,186.87	1,183.91
R1D	1,222.39	1,186.22	1,186.36	1,186.98	1,186.77	1,186.22	1,185.24	1,186.14	1,186.77	1,183.96
R2S	1,209.88	1,187.38	1,187.34	1,187.64	1,187.29	1,187.02	1,185.63	1,186.86	1,185.91	1,184.48
R2D	1,209.66	1,186.42	1,186.50	1,186.63	1,186.63	1,186.61	1,185.42	1,186.11	1,186.46	1,184.62
R3S	1,215.29	1,186.68	1,186.79	1,187.35	1,187.09	1,186.72	1,185.52	1,186.52	1,186.93	1,184.33
R3D	1,215.53	1,185.99	1,186.10	1,186.38	1,186.30	1,186.18	1,185.07	1,185.74	1,186.20	1,184.20
R4D	1,219.07	1,179.77	1,179.77	1,180.60	1,180.61	1,179.83	1,180.06	1,179.45	1,181.43	1,179.29
E21	1,197.61	1,186.36	1,186.41	1,187.48	1,186.63	1,186.74	1,185.33	1,186.03	1,186.41	1,185.08
E21A	1,197.95	1,186.33	1,186.56	1,187.45	1,186.59	1,186.69	1,185.27	1,185.99	1,186.34	1,185.01
E30	1,204.58	1,185.43	1,186.04	1,187.35	1,186.08	1,186.14	1,184.72	1,185.40	1,185.85	1,184.42
TCT44	1,204.57	1,185.37	1,186.03	1,187.42	1,186.09	1,186.14	1,184.73	1,185.42	1,185.85	1,184.46
W50	1,215.67	1,186.11	1,186.22	1,186.65	1,186.49	1,186.17	1,185.09	1,185.90	1,186.39	1,184.71
W51A	1,224.50	1,186.10	1,186.36	1,187.55	1,187.44	1,186.48	1,185.60	1,185.95	1,187.36	1,184.70
W52A	1,219.08	1,185.72	1,185.84	1,186.38	1,186.21	1,185.95	1,184.83	1,185.54	1,186.22	1,183.58
W52	1,219.25	1,185.45	1,185.55	1,185.96	1,185.87	1,185.70	1,184.75	1,185.25	1,185.91	1,184.03
W53A (3)	1,217.12	1,185.45	1,185.58	1,186.07	1,185.86	1,185.67	1,184.67	1,185.22	1,185.96	1,183.87
W53	1,216.91	1,185.49	1,185.61	1,186.11	1,185.95	1,185.74	1,184.91	1,185.31	1,186.04	1,184.01
W54	1,216.44	1,185.16	1,185.28	1,185.85	1,185.72	1,185.44	1,186.58	1,184.95	1,185.80	1,183.81
W55A	1,217.40	1,186.38	1,186.30	1,186.43	1,186.23	1,185.82	1,184.78	1,185.86	1,185.88	1,183.53
W55	1,217.29	1,186.41	1,186.34	1,185.92	1,186.39	1,186.23	1,185.13	1,185.94	1,186.12	1,183.94
W56	1,200.17	1,186.59	1,186.60	1,186.71	1,186.77	1,186.23	1,185.22	1,186.22	1,186.51	1,184.08
W56A	1,200.95	1,190.47	1,190.21	1,190.87	1,189.82	1,189.30	1,187.28	1,189.40	1,189.04	1,187.70
IWD	1,192.08	1,188.28	1,186.90	1,187.45	1,187.03	–	–	1,186.36	1,186.76	1,185.51
IWM	1,192.91	1,186.99	1,188.21	1,187.73	1,187.32	–	–	1,186.61	1,187.05	1,185.81
IWS	1,193.17	1,188.31	1,188.33	1,188.15	1,188.09	–	–	1,187.76	1,187.80	1,186.85
WSWD	1,193.25	1,185.31	1,185.47	1,185.93	1,185.85	1,185.63	1,184.64	1,185.02	1,185.95	1,184.15
WSWS	1,193.24	1,185.58	1,188.54	1,188.29	1,188.24	1,188.16	1,187.99	1,188.19	1,188.95	1,187.78
WC4	1,196.86	1,186.68	1,186.78	1,187.42	1,189.63	1,186.62	1,185.47	1,186.31	1,186.61	1,185.04
WC4A	1,196.69	1,186.87	1,186.91	1,187.44	1,186.67	1,186.73	1,185.44	1,186.36	1,186.49	1,185.03
MW1A	1,215.79	1,186.63	1,186.71	1,186.63	1,186.72	1,186.79	1,185.50	1,186.29	1,186.43	1,184.69
GM1S	1,216.07	1,186.65	1,186.73	1,186.73	1,186.74	1,187.80	1,185.49	1,186.32	1,186.44	1,184.64
MW1	1,221.86	1,187.66	1,187.74	1,187.92	1,187.67	1,187.77	1,186.35	1,187.29	1,190.44	1,186.22
MW2	1,220.25	1,186.69	1,187.78	1,187.95	1,187.70	1,187.80	1,186.38	1,187.34	1,187.50	1,186.31
MW3	1,218.75	1,187.56	1,187.64	1,187.82	1,187.58	1,187.67	1,186.23	1,187.16	1,187.35	1,185.90
EW1	1,218.30	1,152.30	1,153.30	1,153.30	1,153.30	1,152.30	1,153.30	1,153.30	1,153.30	1,153.30
Staff Gages										
SG1	1,189.37	1188.72	1,188.81	1,188.45	1,188.50	1,189.12	–	1,188.43	1,188.30	1,188.02
SG2	1,193.94	1192.08	1,191.83	1,191.58	1,191.45	1,191.63	1,191.37	1,191.74	1,191.41	1,192.17

Notes:

(1) Bottom of well measured at approximately 1,178.8 ft. AMSL.
(2) Bottom of well measured at approximately 1,181.3 ft. AMSL.
(3) Bottom of well measured at approximately 1,181.7 ft. AMSL.

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (µmhos)*	*Temp. °C*	*Appearance*
C2S	11/14/90	W-111490-JM-008	VOCs	5	6.00	360	12.3	Clear, No Odor
	11/15/90	W-111590-RRR-023	VOCs	3	6.07	440	12.8	Clear, No Odor
	11/26/90	dry						
	12/03/90	dry						
	12/10/90	dry						
	01/07/91	dry						
	02/12/91	dry						
	03/04/91	pump pulled						
	02/17/92	W-02179-RR-217	VOCs	3	6.62	830	12.2	–
	05/12/92	W-051192-RR-238	VOCs	3	5.99	650	11.8	–
	08/04/92	W-080492-RR-268	VOCs	4	5.49	420	11.7	–
	11/03/92	W-110392-RR-258	VOCs	6	6.36	430	11.6	–
C4D	11/14/90	W-111490-JM-005	VOCs	6	5.92	380	10.6	–
	11/16/90	W-111690-RRR-033	VOCs	6	6.20	380	11.1	Clear
	11/26/90	W-112690-JM-050	VOCs	6	6.73	398	9.7	–
	12/03/90	W-120390-MB-042	VOCs, BNAs Pest/PCB, Metals	6	6.12	390	10.1	Clear, No Odor
	12/10/90	W-121090-RR-054	VOCs	6	6.10	400	10.7	–
	01/07/91	W-010791-RR-068(MS/MSD)	VOCs	6	5.81	420	10.0	–
	01/07/91	W-010791-RR-069 (Dup)	VOCs	–	--	–	–	–
	02/12/91	W-021291-RR-085	VOCs	6	5.80	490	10.4	–
	03/04/91	W-030491-RR-102 (MS/MSD)	VOCs, Metals	6	6.47	470	10.2	–
	03/04/91	W-030491-RR-107 (Dup)	VOC, Metals	–	--	–	–	–
	04/01/91	W-040191-RR-122	VOCs	6	6.15	530	11.2	–
	05/06/91	W-050691-RR-139	VOCs	6	5.67	570	10.4	–
	08/05/91	W-080591-RR-164(MS/MSD)	VOCs	6	6.33	550	11.4	–
	08/06/91	W-080691-RR-177 (Dup)	VOCs	–	--	–	–	–
	11/04/91	W-110491-RR-184	VOCs	6	6.32	710	10.4	–
	02/18/92	W-021892-RR-212	VOCs, Metals	6	6.18	717	9.9	–
	05/12/92	W-051292-RR-231	VOCs	6	6.40	730	10.5	–
	05/12/92	W-051292-RR-232 (Dup)	VOCs	–	--	–	–	–
	08/04/92	W-080492-RR-261	VOCs	–	6.67	650	10.1	–
	11/03/92	W-110392-RR-251	VOCs	6	6.53	610	9.6	–

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (μmhos)*	*Temp. °C*	*Appearance*
R2D	11/14/90	W-111490-RRR-015	VOCs	6	6.79	270	10.7	Slightly Cloudy, No Odor
	11/14/90	W-111490-RRR-016 (Dup)	VOCs	–	--	–	–	–
	11/15/90	W-111590-JM-027	VOCs	6	6.88	280	11.7	Clear, No Odor
	11/26/90	W-112690-JM-044	VOCs	6	7.15	300	9.3	Clear, No Odor
	12/04/90	W-120490-MB-044	VOCs	6	6.30	300	9.5	Clear, No Odor
	12/11/90	W-121190-RR-058	VOCs	6	6.85	320	9.9	–
	01/08/91	W-010891-RR-075	VOCs	6	6.88	310	9.6	–
	02/13/91	W-021391-RR-097	VOCs	6	5.81	310	9.5	–
	03/05/91	W-030591-RR-110	VOCs	6	6.24	310	9.9	–
	04/02/91	W-040291-RR-130 (MS/MSD)	VOCs	6	8.11	310	9.7	–
	04/02/91	W-040291-RR-131 (Dup)	VOCs	–	--	–	–	–
	05/07/91	W-050791-RR147	VOCs	6	6.46	290	9.8	–
	08/06/91	W-080691-RR-172	VOCs	6	6.42	280	10.1	–
	11/05/91	W-110591-RR-193(MS/MSD)	VOCs	6	6.00	320	10.2	–
	11/05/91	W-110591-RR-194 (Dup)	VOCs	–	--	–	–	–
	02/18/92	W-021892-RR-211	VOCs	6	6	400	9	–
	05/11/92	W-051192-RR-225	VOCs	6	9.42	380	10	–
	08/03/92	W-080392-RR-255	VOCs	6	6.39	340	10.1	–
	11/02/92	W-110292-RR-245	VOCs	6	7.20	340	10.2	–
R4D	11/14/90	W-111490-RRR-007	VOCs	6	5.99	450	11.4	Clear, No Odor
	11/15/90	W-111590-RRR-024	VOCs	6	6.06	500	12.3	Clear, No Odor
	11/26/90	W-112690-JM-041	VOCs	6	6.50	450	10.8	–
	12/04/90	W-120490-MB-046	VOCs	6	6.35	375	10.9	Clear, No Odor
	12/11/90	W-121190-RR-059	VOCs	6	6.18	400	11.5	–
	01/07/91	W-010791-RR-073	VOCs	6	6.34	370	9.5	–
	02/12/91	W-021291-RR-90 (MS/MSD)	VOCs	6	5.45	290	11.6	–
	02/12/91	W-021291-RR-91 (Dup)	VOCs	–	--	–	–	–
	03/04/91	W-030491-RR-106	VOCs	6	6.30	280	11.4	–
	04/01/91	W-040291-RR-123	VOCs	6	6.20	380	11.2	–
	05/06/91	W-050691-RR140 (MS/MSD)	VOCs	6	6.10	300	11.8	–
	05/06/91	W-050691-RR-151 (Dup)	VOCs	–	--	–	–	–
	08/05/91	W-080591-RR-165	VOCs	6	6.05	320	12.4	–
	11/04/91	W-110491-RR-185	VOCs	6	5.89	310	11.3	–
	02/18/92	W-021892-RR-214 (MS/MSD)	VOCs	6	6.02	330	11.0	–
	02/18/92	W-021892-RR-215 (Dup)	VOCs	–	--	–	–	–
	05/12/92	W-051292-RR-236	VOCs	6	6.22	360	11.5	–
	08/04/92	W-080392-RR-265 (MS/MSD)	VOCs	6	5.66	280	12.4	–
	11/03/92	W-110392-RR-256	VOCs	6	6.40	330	11.0	–

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (µmhos)*	*Temp. °C*	*Appearance*
W52	11/14/90	W-111490-CH-009	VOCs	6	6.92	283	11.1	Clear, No Odor
	11/15/90	W-111590-JM-025	VOCs	6	7.17	292	11.6	Clear, No Odor
	11/15/90	W-11590-JM-026 (Dup)	VOC	–	--	–	–	–
	11/26/90	W-112690-JM-042	VOCs	6	7.42	310	9.3	Cloudy
	12/04/90	W-120490-MB-045	VOCs, BNAs, Pest/PCB, Metals	6	6.95	283	10.4	Clear, No Odor
	12/11/90	W-121190-RR-060	VOCs	6	7.39	320	10.6	–
	01/07/91	W-010791-RR-074	VOCs	6	6.79	340	9.8	–
	02/12/91	W-021291-RR-089	VOCs	6	6.88	370	10.3	–
	03/04/91	W-030491-RR-105	VOCs, Metals	6	7.15	370	10.2	–
	04/01/91	W-040191-RR-124	VOCs	6	7.29	410	10.3	–
	05/06/91	W-050691-RR-141	VOCs	6	7.14	380	9.9	–
	08/05/91	W-080591-RR-166	VOCs	6	7.02	500	10.2	–
	11/04/91	W-110491-RR-186	VOCs	6	6.97	340	9.1	–
	02/18/92	W-021892-RR-213	VOCs, Metals	6	8.12	327	7.6	–
	05/12/92	W-051292-RR-237	VOCs	6	7.06	410	9.8	–
	08/04/92	W-080492-RR-266	VOCs	6	6.42	340	10.6	–
	08/04/92	W-080492-RR-267 (Dup)	VOCs	–	--	–	–	–
	11/03/92	W-110392-RR-257	VOCs	6	7.76	390	9.5	–
W53A	11/14/90	W-111490-CH-004	VOCs	6	6.29	780	11.3	Clear, No Odor
	11/15/90	W-111590-RRR-020	VOCs	6	6.26	786	11.8	Clear, No Odor
	11/26/90	W-112690-JM-037	VOCs	5	6.40	1190	11.2	Clear, No Odor
	11/26/90	W-112690-JM-038 (Dup)	VOCs	–	--	–	–	–
	12/03/90	W-120390-MB-039	VOCs, BNAs, Pest/PCB, Metals	5	6.00	1180	11.0	Clear, No Odor
	12/10/90	W-121090-RR-056	VOCs	5	6.73	1140	11.5	–
	01/07/91	dry						
	02/12/91	W-021291-RR-087	VOCs	5	7.42	350	10.6	–
	03/04/91	W-030491-RR-104	VOCs, Metals	5	7.20	290	10.4	–
	04/02/91	W-040291-RR-132	VOCs	5	8.13	220	11.5	–
	05/07/91	W-050791-RR-150	VOCs	5	6.85	190	10.8	–
	08/06/91	W-080691-RR-175	VOCs	5	6.78	180	9.3	–
	11/05/91	W-110591-RR-197	VOCs	5	6.46	680	7.9	–
	02/17/92	W-021792-RR-206	VOCs, Metals	4	6.88	293	10.3	–
	05/12/92	W-051192-RR-234	VOCs	4	6.48	280	14.2	–
	08/04/92	W-080492-RR-263	VOCs	5	6.20	480	12.9	–
	11/03/92	W-110392-RR-253	VOCs	4	7.03	560	12.0	–

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (µmhos)*	*Temp. °C*	*Appearance*
W53	11/13/90	W-111390-RRR-002	VOCs	7.5	6.90	385	9.9	Clear, No Odor
	11/15/90	W-111590-RRR-021	VOCs	6	7.35	380	10.9	Clear, No Odor
	11/15/90	W-111590-RRR-022 (Dup)	VOCs	–	--	–	–	–
	11/26/90	W-112690-JM-039	VOCs	6	8.62	460	9.5	–
	12/03/90	W-120390-MB-040	VOCs	6	6.75	590	9.3	Clear, No Odor
	12/03/90	W-120390-MB-041 (Dup)	VOCs	–	--	–	–	–
	12/10/90	W-121090-RR-057 (MS/MSD)	VOCs	6	6.94	540	9.8	–
	01/07/91	W-010791-RR-071	VOCs	6	7.51	520	7.8	–
	02/12/91	W-021291-RR-086	VOCs	6	7.24	100	10.1	–
	03/04/91	W-030491-RR-103	VOCs	6	7.50	730	9.7	–
	04/02/91	W-040291-RR-133	VOCs	6	8.95	860	10.1	–
	05/07/91	W-050791-RR-149	VOCs	6	6.78	720	10.2	–
	08/06/91	W-080691-RR-174	VOCs	6	6.71	705	9.9	–
	11/05/91	W-110591-RR-196	VOCs	6	7.88	580	6.5	–
	02/17/92	W-021792-RR-205	VOCs	6	7.42	403	8.9	–
	05/12/92	W-051292-RR-233	VOCs	6	7.25	280	10.9	–
	08/04/92	W-080492-RR-262	VOCs	6	6.80	180	10.6	–
	11/03/92	W-110392-RR-252	VOCs	6	7.76	250	9.8	–
W54	11/13/90	W-111390-MB-001	VOCs	20	--	–	–	Clear, No Odor
	11/15/90	W-111590-JM-019	VOCs	16	7.10	680	11.8	Clear, No Odor
	11/26/90	W-112690-JM-036	VOCs	17	7.48	480	10.2	Slightly gray
	12/03/90	W-120390-MB-038	VOCs, BNAs, Pest/PCBs, Metals	17	7.60	560	9.2	–
	12/10/90	W-120990-RR-053	VOCs	15	7.46	350	10.4	–
	12/10/90	W-120990-RR-055 (Dup)	VOCs	–	--	–	–	–
	01/07/91	W-010791-RR-072	VOCs	15	6.67	250	10.2	–
	02/12/91	W-021291-RR-088	VOCs	15	9.83	370	10.2	–
	03/05/91	W-030591-RR-111	VOCs, Metals	15	7.19	180	8.5	–
	04/02/91	W-040291-RR-134	VOCs	15	9.56	250	5.1	–
	05/07/91	W-050791-RR_148	VOCs	15	6.93	170	3.4	–
	08/06/91	W-080691-RR-173	VOCs	16	6.88	170	10.9	–
	11/05/91	W-110591-RR-195	VOCs	16	6.74	190	12.2	–
	02/17/92	W-021792-RR-207	VOCs, Metals	16	7.12	730	12.1	–
	05/12/92	W-051192-RR-237	VOCs	15.5	7.24	310	8.2	–
	08/04/92	W-080492-RR-264	VOCs	16	6.38	190	9.0	–
	11/03/92	W-110392-RR-255 (Dup)	VOCs	–	--	–	–	–
	11/03/92	W-110392-RR-254 (MS/MSD)	VOCs	15	7.12	150	9.5	–

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (µmhos)*	*Temp. ℃*	*Appearance*
W55	11/14/90	W-111490-018 (MS/MSD)	VOCs	6	6.80	320	9.8	Cloudy Gray, No Odor
	11/14/90	W-111490-RRR-017 (Dup)	VOCs	--	--	--	--	--
	11/16/90	W-111690-RRR-032	VOCs	6	7.52	310	9.6	Clear, No Odor
	11/27/90	W-112790-JM-049	VOCs	6	6.64	310	9.3	Gray, Cloudy
	12/04/90	W-120490-MB-043 (MS/MSD)	VOCs	6	6.88	280	8.6	Gray, cloudy, No Odor
	12/11/90	W-121190-RR-061	VOCs	6	7.60	330	9.4	--
	01/08/91	W-010891-RR-076	VOCs	6	6.99	310	9.2	--
	02/13/91	W-021391-RR-092	VOCs	6	6.93	400	9.0	--
	03/05/91	W-030591-RR-108	VOCs	6	7.10	370	8.9	--
	04/02/91	W-040291-RR-129	VOCs	6	8.32	380	9.3	--
	05/07/91	W-050791-RR-146	VOCs	6	7.08	380	9.4	--
	08/06/91	W-080691-RR-171	VOCs	6	6.98	370	10.2	--
	11/05/91	W-110591-RR-192	VOCs	6	7.01	440	9.4	--
	02/17/92	W-021792-RR-204	VOCs	6	7.38	383	9.0	--
	05/11/92	W-051192-RR-224	VOCs	6	12.70	400	10.4	--
	08/03/92	W-080392-RR-254	VOCs	6	7.25	360	10.0	--
	11/02/92	W-110292-RR-244	VOCs	6	7.66	380	9.8	--
WSWD	11/14/90	W-111490-RRR-013	VOCs	6	6.70	290	9.5	Cloudy (Rusty), No Odor
	11/16/90	W-111690-MB-028	VOCs	6	6.72	280	9.8	Light Orange Color, No Odor
	11/27/90	W-112790-JM-045	VOCs	6	6.57	510	9.2	Clear
	12/04/90	W-120490-MB-047	VOCs	6	6.37	430	8.6	Slight off color, No Odor
	12/11/90	W-121190-RR-062	VOCs	6	6.75	430	8.6	--
	01/08/91	W-010891-RR-077	VOCs	6	6.27	470	8.1	--
	02/13/91	W-021391-RR-093	VOCs	6	5.74	540	6.0	--
	03/05/91	W-030591-RR-109	VOCs	6	5.92	550	4.9	--
	04/01/91	W-040191-RR-125	VOCs	6	6.85	570	4.6	--
	05/06/91	W-050691-RR-142	VOCs	6	6.67	540	6.6	--
	08/05/91	W-080591-RR-167	VOCs	6	6.31	550	11.6	--
	11/04/91	W-110491-RR-187	VOCs	6	5.92	420	10.0	--
	02/18/92	W-021892-RR-216	VOCs	6	6.22	417	7.0	--
	05/11/92	W-051192-RR-226	VOCs	6	6.34	440	7.3	--
	08/03/92	W-080392-RR-256	VOCs	6	6.14	390	12.0	--
	11/02/92	W-110292-RR-246	VOCs	6	6.84	370	10.1	--

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (µmhos)*	*Temp. °C*	*Appearance*
IWD	11/14/90	W-111490-RRR-014	VOCs	6	6.62	448	10.1	Cloudy (Rusty), No Odor
	11/16/90	W-111690-MB-029	VOCs	6	6.48	470	9.8	Clear, No Odor
	11/27/90	W-112790-JM-046	VOCs	6	6.59	360	9.3	Clear
	12/04/90	Not sampled						
	12/11/90	Not sampled						
	01/07/91	Not sampled						
	02/13/91	Not sampled						
	03/04/91	Not sampled						
	04/02/91	Not sampled						
	05/07/91	W-050791-RR-152	VOCs	6	6.81	240	8.4	–
	08/06/91	W-080691-RR-176	VOCs	6	7.61	380	9.2	–
	11/04/91	Not sampled						
	02/18/92	Not sampled						
	05/11/92	W-051192-RR-227	VOCs	6	8.64	150	8.8	–
	08/03/92	W-080392-RR-257	VOCs	6	6.45	190	9.6	–
	11/02/92	W-110292-RR-247	VOCs	6	8. 66	150	8.1	–
CW3	11/14/90	W-111490-MB-003	VOCs	NA	--	–	–	–
	11/16/90	W-111690-MB-030	VOCs	NA	--	–	–	–
	12/03/90	W-120390-MB-036	VOCs	NA	--	–	–	–
	01/07/91	W-010791-RR-066	VOCs	NA	--	–	–	–
	02/12/91	W-021291-RR-081	VOCs	NA	--	–	–	–
	03/04/91	W-030491-RR-100	VOCs	NA	--	–	–	–
	04/01/91	W-040191-RR-120	VOCs	NA	--	–	–	–
	05/06/91	W-050191-RR-135	VOCs	NA	--	–	–	–
	08/05/91	W-080591-RR-160	VOCs	NA	--	–	–	–
	11/04/91	W-110491-RR-180	VOCs	NA	--	–	–	–
	02/17/92	W-021792-RR-200	VOCs	NA	--	–	–	–
	05/12/92	W-051192-RR-220	VOCs	NA	--	–	–	–
	08/03/92	W-080392-RR-250	VOCs	NA	--	–	–	–
	11/02/92	W-110292-RR-240	VOCs	NA	--	–	–	–

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (μmhos)*	*Temp. °C*	*Appearance*
CW6	11/14/90	W-111490-MB-006	VOCs	NA	--	–	–	–
	11/16/90	W-111690-MB-031	VOCs	NA	--	–	–	–
	12/03/90	W-120390-MB-037	VOCs	NA	--	–	–	–
	01/07/91	W-010791-RR-067	VOCs	NA	--	–	–	–
	02/12/91	W-021291-RR-082	VOCs	NA	--	–	–	–
	03/04/91	W-030491-RR-101	VOCs	NA	--	–	–	–
	04/01/91	W-040191-RR-121	VOCs	NA	--	–	–	–
	05/06/91	W-050691-RR-136	VOCs	NA	--	–	–	–
	08/05/91	W-080591-RR-161	VOCs	NA	--	–	–	–
	11/04/91	W-110491-RR-181	VOCs	NA	--	–	–	–
	02/17/92	W-021792-RR-201	VOCs	NA	--	–	–	–
	05/12/92	W-051192-RR-221	VOCs	NA	--	–	–	–
	08/03/92	W-080392-RR-251	VOCs	NA	--	–	–	–
	11/02/92	W-110292-RR-241	VOCs	NA	--	–	–	–
CW7	02/12/91	W-021291-RR-083	VOCs	NA	--	–	–	–
	05/06/91	W-050691-RR-137	VOCs	NA	--	–	–	–
	08/05/91	W-080591-RR-162	VOCs	NA	--	–	–	–
	11/04/91	W-110491-RR-182	VOCs	NA	--	–	–	–
	02/17/92	W-021792-RR-202	VOCs	NA	--	–	–	–
	05/12/92	W-051192-RR-222	VOCs	NA	--	–	–	–
	08/03/92	W-080392-RR-252	VOCs	NA	--	–	–	–
	11/02/92	W-110292-RR-242	VOCs	NA	--	–	–	–
CW9	02/12/91	W-021291-RR-084	VOCs	NA	--	–	–	–
	05/06/91	W-050691-RR-138	VOCs					
	08/05/91	W-080591-RR-163	VOCs	NA	--	–	–	–
	11/04/91	W-110491-RR-183	VOCs	NA	--	–	–	–
	02/17/92	W-021792-RR-203	VOCs	NA	--	–	–	–
	05/12/92	W-051192-RR-223	VOCs	NA	--	–	–	–
	08/03/92	W-080392-RR-253	VOCs	NA	--	–	–	–
	11/02/92	W-110292-RR-243	VOCs	NA	--	–	–	–

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (µmhos)*	*Temp. °C*	*Appearance*
EW1 (Influent)	11/14/90	W-111490-RRR-010	VOCs	NA	5.99	390	11.3	Clear, No Odor
	11/14/90	W-111490-RRR-011 (Dup)	VOCs	NA				
	11/16/90	W-111690-RRR-034	VOCs	NA	--	–	–	–
	11/19/90	PW-112790-JM-001	VOCs	NA	--	–	–	–
	11/23/90	PW-112390-RRR-003	VOCs	NA	--	–	–	–
	11/27/90	PW-112790-JM-005 (MS/MSD)	VOCs	NA	--	–	–	–
	11/29/90	PW-112990-RRR-009	VOCs	NA	5.95	710	11.8	Clear, No Odor
	11/29/90	PW-112990-RRR-010 (Dup)	VOCs	NA	--	–	–	–
	12/04/90	W-120490-MB-048	VOCs, BNAs,	NA	--	–	–	–
	12/04/90	W-120490-MB-050 (Dup)	Pest/PCBs, Metals					
	12/06/90	PW-120690-MH-011	VOCs	NA	6.75	545	11.9	Clear, No Odor
	12/06/90	PW-120690-MH-012 (Dup)	VOCs	NA	--	–	–	–
	12/11/90	W-121190-RR-063	VOCs	NA	--	–	–	–
	12/17/90	PW-121790-JM-014 (MS/MSD)	VOCs	NA	--	–	–	–
	12/17/90	PW-121790-JM-015 (Dup)	VOCs	NA	--	–	–	–
	01/08/91	W-010891-RR-078	VOCs	NA	--	–	–	–
	01/08/91	W-010891-RR-079 (Dup)	VOCs	NA	--	–	–	–
	02/13/91	W-021391-RR-094	VOCs	NA	--	–	–	–
	03/05/91	W-030591-RR-112	VOCs, Metals	NA	--	–	–	–
	03/05/91	W-030591-RR-113 (Dup)	VOCs, Metals	NA	--	–	–	–
	04/01/91	W-040191-RR-126	VOCs	NA	--	–	–	–
	05/06/91	W-050691RR-143	VOCs	NA	--	–	–	–
	05/06/91	W-050691RR-144 (Dup)	VOCs	NA	--	–	–	–
	08/05/91	W-080591-RR-168	VOCs	NA	--	–	–	–
	11/04/91	W-110491-189	VOCs	NA	--	–	–	–
	11/04/91	W-110491-190 (Dup)	VOCs	NA	--	–	–	–
	02/17/92	W-021792-RR-208 (MS/MSD)	VOCs, Metals	NA	--	–	–	–
	05/11/92	W-051192-RR-228	VOCs	NA	--	–	–	–
	08/03/92	W-080392-RR-258	VOCs	NA	--	–	–	–
	08/03/92	W-080392-RR-259 (Dup)	VOCs	NA	--	–	–	–
	11/02/92	W-110292-RR-248	VOCs	NA	--	–	–	–

TABLE 2

SAMPLE KEY/FIELD DATA
MARATHON ELECTRIC MANUFACTURING CORP.

Sample Source	*Date Stamped*	*Sample Number*	*Analyses*	*Purge Volume (gal.)*	*pH*	*Conductivity (µmhos)*	*Temp. °C*	*Appearance*
EW1 (Effluent)	11/14/90	W-111490-RRR-012	VOCs	NA	6.31	390	11.1	Clear, No Odor
	11/16/90	PW-111690-RRR-035	VOCs	NA	--	–	–	Clear, No Odor
	11/19/90	PW-111990-RRR-002	VOCs	NA	--	–	–	Clear
	11/23/90	PW-112390-RRR-004	VOCs	NA	--	–	–	–
	11/27/90	PW112790-JM-006	VOCs	NA	--	–	–	–
	11/27/90	PW112790-JM-007 (Dup)	VOCs	NA	--	–	–	–
	11/29/90	PW-112990-RRR-008	VOCs	NA	6.35	370	10.9	–
	12/04/90	W-120490-MB-049	VOCs, BNAs, Pest/PCBs, Metals	NA	6.56	350	10.9	–
	12/06/90	PW-120690-MN-013	VOCs	NA	6.89	380	10.1	Clear, No Odor
	12/11/90	W-121190-RR-064	VOCs	NA	6.77	370	10.9	–
	12/11/90	W-1211190-RR-065 (Dup)	VOCs	NA	--	–	–	–
	12/17/90	PW-121790-JM-016	VOCs	NA	6.96	620	10.9	–
	01/08/91	W-010891-RR-080	VOCs	NA	--	–	–	–
	02/13/91	W-021391-RR-095	VOCs	NA	6.20	290	9.3	–
	02/13/91	W-021391-RR-096 (Dup)	VOCs	NA	--	–	–	–
	03/05/91	W-030591-RR-114	VOCs	NA	7.27	290	10.4	–
	03/05/91	W-030591-RR-115	Metals	NA	7.27	290	10.4	–
	04/01/91	W-040191-RR-127	VOCs	NA	6.86	300	9.8	–
	04/01/91	W-040191-RR-128 (Dup)	VOCs	NA	--	–	–	–
	05/06/91	W-050691-RR-145	VOCs	NA	7.92	270	9.3	–
	08/05/91	W-080591-RR-169	VOCs	NA	--	–	–	–
	08/05/91	W-080591-RR-170 (Dup)	VOCs	NA	--	–	–	–
	11/04/91	W-110491-RR-191	VOCs	NA	6.34	260	10.2	–
	02/17/92	W-021792-RR-209	VOCs, Metals	NA	6.92	260	10.1	–
	02/17/92	W-021792-RR-210 (Dup)	VOCs, Metals	NA	--	–	–	–
	05/11/92	W-051192-RR-229	VOCs	NA	7.49	280	10.6	–
	05/11/92	W-051192-RR-230 (Dup)	VOCs	NA	--	–	–	–
	08/03/92	W-080392-RR-260	VOCs	NA	6.54	420	10.0	–
	11/02/92	W-110292-RR-249	VOCs	NA	6.58	430	9.9	–
	11/02/92	W-110292-RR-250 (Dup)	VOCs	NA	--	–	–	–

Note: NA = Not Applicable

TABLE 3

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL C2S

Parameter (µg/L)	*C2S*						
VOCs	*11/14/90*	*11/15/90*	*02/17/92*	*02/17/92 Diluted*	*05/12/92*	*08/04/92*	*11/02/92*
Chloromethane		ND20	ND2	ND4	ND2	ND2	2
Bromomethane	ND80	ND20	ND2	ND4	ND2	ND2	ND2
Vinyl Chloride	ND80	ND20	ND2	ND4	ND2	ND2	ND2
Chloroethane	ND80	ND20	ND2	ND4	ND2	ND2	ND2
Methylene Chloride	ND80	13U	ND1	3D	ND1	ND1	ND1
Acetone	44U	ND20J	ND2	ND4	ND2J	ND2J	ND2UJ
Carbon Disulfide	ND80J	ND10	ND1	ND2	ND1	ND1J	ND1
1,1-Dichloroethene	ND40	ND10	ND1	ND2	ND1	ND1J	ND1
1,1-Dichloroethane	ND40	ND10	ND1	ND2	ND1	ND1	ND1
1,2-Dichloroethene (total)	ND40	3J	ND1	ND2	0.6J	0.2J	ND1
Chloroform	13J	ND10	ND1	ND2	ND1	ND1	ND1
1,2-Dichloroethane	ND40	ND10	ND1	ND2	ND1	ND1	ND1
2-Butanone	ND40	ND20J	ND2	ND4	ND2J	ND2	ND2
1,1,1-Trichloroethane	ND80J	ND10	ND1	ND2	ND1	ND1	ND1
Carbon Tetrachloride	ND40	ND10	ND1J	ND2J	ND1	ND1	ND1
Vinyl Acetate	ND40	ND20	ND2	ND4	ND2J	ND2	ND2
Bromodichloromethane	ND80	ND10	ND1	ND2	ND1J	ND1	ND1
1,2-Dichloropropane	ND40	ND10	ND1	ND2	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND40	ND10	ND1	ND2	ND1	ND1	ND1
Trichloroethene	1500	390J	62J	28D	63	40	34
Dibromochloromethane	ND40	ND10	ND1	ND2	ND1J	ND1	ND1
1,1,2-Trichloroethane	ND40	ND10	ND1	ND2	ND1	ND1	ND1
Benzene	ND40	ND10	ND1	ND2	ND1	ND1	ND1
Trans-1,3-Dichloropropene	ND40	ND10	ND1	ND2	ND1	ND1	ND1UJ
Bromoform	ND40	ND10	ND1	ND2	ND1J	ND1	ND1UJ
4-Methyl-2-Pentanone	ND40	ND20J	ND2	ND4	ND2	ND2	ND2
2-Hexanone	ND80	ND20J	ND2	ND4	ND2	ND2	ND2
Tetrachloroethene	ND80	ND10	ND1	ND2	ND1	ND1	ND1
1,1,2,2-Tetrachloroethane	ND40	ND10	ND1	ND2	ND1	ND1	ND1
Toluene	ND40	ND10	ND1	ND2	ND1	ND1	ND1
Chlorobenzene	ND40	ND10	ND1	ND2	ND1	ND1	ND1
Ethylbenzene	ND40	ND10	ND1	ND2	ND1	ND1	ND1
Styrene	ND40	ND10	ND1	ND2	ND1	ND1	ND1
Total Xylenes	ND40	ND10	ND1	ND2	ND1	ND1	ND1

<u>Notes:</u>

NDx = not detected at quantitation limit x.

U = the analyte was detected but was attributed to laboratory contamination.

J = the associated numerical value is an estimated quantity.

D = secondary dilution was performed to obtain result.

R = data was rejected, analyte may or may not be present.

TABLE 4

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL C4D

Parameter (µg/L)	*C4D*											
VOCs	*11/14/90*	*11/16/90*	*11/26/90*	*12/03/90*	*12/10/90*	*01/07/91*	*01/07/91*	*02/12/91*	*03/04/91*	*03/04/91*	*04/03/91*	*05/06/91*
							Dup		*MS/MSD*			
Chloromethane	ND2	ND2J	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2
Bromomethane	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2
Vinyl Chloride	ND2	ND2	ND2	ND2	ND2	ND2	ND2	2.2	ND2	1.3J	3.8	3.3
Chloroethane	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2
Methylene Chloride	0.4U	0.5U	ND1	0.5U	0.6U	0.2U	0.3U	ND1	ND1	ND1	ND1	ND1
Acetone	ND2J	ND2J	ND2J	ND2J	ND2J	ND2J	ND2	6.9UJ	ND2J	ND2J	3J	ND2
Carbon Disulfide	ND1	ND1	ND1	ND1	0.3J	ND1	ND1	ND1	ND1	ND1	ND1	ND1
1,1-Dichloroethene	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
1,1-Dichloroethane	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
1,2-Dichloroethene (total)	1	0.9J	1	0.9J	0.95	1	1	ND1	ND1	ND1	1	ND1
Chloroform	0.9J	0.9J	0.9J	0.6J	0.5J	0.2J	0.3J	ND1	ND1	ND1	ND1	ND1
1,2-Dichloroethane	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
2-Butanone	ND2	ND2	ND2	ND2J	ND2J	ND2J	ND2	ND2R	ND2J	ND2J	ND2	ND2R
1,1,1-Trichloroethane	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Carbon Tetrachloride	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Vinyl Acetate	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2R
Bromodichloromethane	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
1,2-Dichloropropane	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Trichloroethene	12J	11	10	9	11	5J	5J	6.5	3.4 J	4.1 J	4.6J	4.3
Dibromochloromethane	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
1,1,2-Trichloroethane	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Benzene	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Trans-1,3-Dichloropropene	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Bromoform	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
4-Methyl-2-Pentanone	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2	ND2	ND2
2-Hexanone	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2	ND2	ND2
Tetrachloroethene	ND1	ND1	ND1	ND1	ND1	3	3	7.5	7.2	7.2	12	8.7
1,1,2,2-Tetrachloroethane	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Toluene	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Chlorobenzene	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Ethylbenzene	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Styrene	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1
Total Xylenes	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1

Notes:

NDx = not detected at quantitation limit x.

U = the analyte was detected but was attributed to laboratory contamination.

J = the associated numerical value is an estimated quantity.

D = secondary dilution was performed to obtain result.

R = data was rejected, analyte may or may not be present.

TABLE 4

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL C4D

Parameter (µg/L)	*C4D*							
VOCs	*08/05/91*	*08/05/91*	*11/04/91*	*02/18/92*	*05/12/92*	*05/12/92*	*08/04/92*	*11/02/92*
		Duplicate				*Duplicate*		
Chloromethane	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2
Bromomethane	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2
Vinyl Chloride	2.9	3.6	1.8J	ND2	ND2	ND2	ND2	ND2
Chloroethane	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2
Methylene Chloride	ND1	ND1	1.2J	0.6J	ND1	ND1	ND1	ND1
Acetone	ND2J	ND2J	ND2J	ND1	ND2J	ND2	ND2J	ND2UJ
Carbon Disulfide	ND1	ND1	ND1J	ND1	ND1	ND1	ND1J	ND1
1,1-Dichloroethene	ND1	ND1	ND1J	ND1	ND1	ND1	ND1J	ND1
1,1-Dichloroethane	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
1,2-Dichloroethene (total)	1.4	1.6	2.5J	2	1	1	1	1
Chloroform	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
1,2-Dichloroethane	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
2-Butanone	ND2J	ND2J	ND2J	ND2	ND2	ND2	ND2	ND2UJ
1,1,1-Trichloroethane	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
Carbon Tetrachloride	ND1	ND1	ND1J	ND1J	ND1	ND1	ND1	ND1
Vinyl Acetate	ND2	ND2	ND2J	ND2	ND2J	ND2	ND2	ND2
Bromodichloromethane	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
1,2-Dichloropropane	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
Trichloroethene	3.9	3.8J	2.7J	3	2J	2	2	2
Dibromochloromethane	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
1,1,2-Trichloroethane	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
Benzene	ND1	ND1J	ND1J	ND1	ND1	ND1	ND1	ND1
Trans-1,3-Dichloropropene	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
Bromoform	ND1	ND1	ND1J	ND1	ND1R	ND1	ND1	ND1
4-Methyl-2-Pentanone	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2
2-Hexanone	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2
Tetrachloroethene	10	12	8.9J	9	6	7	8	8
1,1,2,2-Tetrachloroethane	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
Toluene	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
Chlorobenzene	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
Ethylbenzene	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1
Styrene	ND1	ND1	ND1J	ND1	ND1R	ND1R	ND1	ND1
Total Xylenes	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 5

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL R2D

Parameter (μg/L)	*R2D*											
VOCs	*11/14/90*	*11/14/90 Dup*	*11/15/90*	*11/26/90*	*12/04/90*	*12/11/90*	*12/11/90 Reanalysis*	*01/08/91*	*02/12/91*	*02/12/91 Diluted*	*03/04/91*	*03/04/91 Diluted*
Chloromethane	ND20	ND20	ND20	ND40	ND80	ND50	ND80	ND98J	ND2	ND100	ND2	ND200J
Bromomethane	ND20	ND20	ND20	ND40	ND80	ND50	ND80	ND98	ND2	ND100	ND2	ND200
Vinyl Chloride	ND20	ND20	ND20	ND40	ND80	ND50	ND80	ND98	ND2	ND100	ND2	ND200
Chloroethane	ND20	ND20	ND20	ND40	ND80	ND50	ND80	ND98	ND2	ND100	ND2	ND200
Methylene Chloride	ND10	ND10	13U	19U	100U	7U	25U	50U	ND1	53DU	ND1	190D
Acetone	ND20J	ND20J	ND20J	ND40J	ND80J	ND50J	ND80J	ND98J	ND2J	ND100J	ND2J	ND200J
Carbon Disulfide	ND10	ND10	ND10	ND20J	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
1,1-Dichloroethene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
1,1-Dichloroethane	ND10	ND10	ND10	ND20	ND40	ND25	ND40J	ND49	ND1	ND50	ND1	ND100
1,2-Dichloroethene (total)	8J	8J	8J	27	35J	44	43D	48J	24	ND50	24	ND100
Chloroform	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
1,2-Dichloroethane	ND10	ND10	ND10	ND20	ND40	ND25J	ND40J	ND49	ND1	ND50	ND1	ND100
2-Butanone	ND20J	ND20J	ND20J	ND40	ND80J	ND50J	ND80J	ND98	ND2R	ND100R	ND2R	ND200J
1,1,1-Trichloroethane	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Carbon Tetrachloride	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Vinyl Acetate	ND20	ND20	ND20	ND40J	ND80	ND50J	ND80J	ND98	ND2	ND100	ND2	ND200
Bromodichloromethane	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
1,2-Dichloropropane	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
cis-1,3-Dichloropropene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Trichloroethene	240	250	260	750	1100	1200	1200	1500J	650	2400D	650	2700D
Dibromochloromethane	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
1,1,2-Trichloroethane	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Benzene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Trans-1,3-Dichloropropene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Bromoform	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100J
4-Methyl-2-Pentanone	ND20	ND20	ND20J	ND40	ND80	ND50J	ND80J	ND98	ND2	ND100	ND2	ND200
2-Hexanone	ND20	ND20	ND20J	ND40J	ND40	ND50J	ND80J	ND98	ND2	ND100	ND2J	ND200
Tetrachloroethene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
1,1,2,2-Tetrachloroethane	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Toluene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Chlorobenzene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Ethylbenzene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Styrene	ND10	ND10	ND10	ND20	ND40	ND25	ND40	ND49	ND1	ND50	ND1	ND100
Total Xylenes	ND10	ND10	ND10	ND20	ND40	ND25J	ND40J	ND49	ND1	ND50	ND1	ND100

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 5

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL R2D

Parameter (µg/L)	R2D											
VOCs	*04/03/91*	*04/03/91 Diluted*	*04/03/91 Dup*	*04/03/91 Dup-Diluted*	*05/07/91*	*05/07/91 Diluted*	*08/06/91*	*08/06/91 Diluted*	*11/05/91*	*11/05/91 Diluted*	*11/05/91 Dup*	*11/05/91 Dup/Diluted*
Chloromethane	ND2	ND100	ND2	ND100	ND2J	ND100	ND2	ND200	ND2J	ND200J	ND2J	ND400J
Bromomethane	ND2	ND100	ND2	ND100	ND2	ND100	ND2	ND200	ND2J	ND200J	ND2J	ND400J
Vinyl Chloride	ND2	ND100	ND2	ND100	ND2	ND100	ND2	ND200	ND2J	ND200J	ND2J	ND400J
Chloroethane	ND2	ND100	ND2	ND100	ND2	ND100	ND2	ND200	ND2J	ND200J	ND2J	ND400J
Methylene Chloride	ND1	83D	ND1	ND50	ND1	ND50	ND1	160D	ND1J	250DUJ	ND1J	100DJ
Acetone	ND2J	290UJ	ND2J	ND100J	ND2	ND100J	ND2J	340DJ	ND2J	ND200J	ND2J	ND400J
Carbon Disulfide	ND1U	ND50	ND1U	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	9600DJ
1,1-Dichloroethene	ND1	ND50	ND1	ND50	1.2	ND50	1.1	ND100	ND1J	ND100J	ND1J	ND200J
1,1-Dichloroethane	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
1,2-Dichloroethene (total)	25	ND50	27	ND50	24	ND50	25	ND100	57J	ND100J	49J	ND200J
Chloroform	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
1,2-Dichloroethane	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
2-Butanone	ND2	ND100	ND2	ND100	ND2R	ND100R	ND2J	ND200J	ND2J	ND200J	ND2J	170DJ
1,1,1-Trichloroethane	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Carbon Tetrachloride	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Vinyl Acetate	ND2J	ND100	ND2	ND100	ND2R	ND100	ND2	ND200	ND2J	ND200J	ND2J	ND400J
Bromodichloromethane	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
1,2-Dichloropropane	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
cis-1,3-Dichloropropene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Trichloroethene	690J	2700D	780J	2100D	880R	270JA	860J	4800D	1300J	3800DJ	550J	960DJ
Dibromochloromethane	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
1,1,2-Trichloroethane	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Benzene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Trans-1,3-Dichloropropene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Bromoform	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
4-Methyl-2-Pentanone	ND2J	ND100	ND2	ND100	ND2	ND100	ND2	ND200	ND2J	ND200J	ND2J	ND400J
Chlorobenzene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Ethylbenzene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Styrene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Total Xylenes	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Chlorobenzene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Ethylbenzene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Styrene	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J
Total Xylenes	ND1	ND50	ND1	ND50	ND1	ND50	ND1	ND100	ND1J	ND100J	ND1J	ND200J

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.
A = assumed anomaly

TABLE 5

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL R2D

Parameter (µg/L)	R2D								
VOCs	*02/18/92*	*02/18/92 Reanalysis*	*02/18/92 Diluted*	*05/11/92*	*05/11/92 Diluted*	*08/03/92*	*08/03/92 Diluted*	*11/02/92*	*11/02/92 Diluted*
Chloromethane	ND2J	ND2J	ND100J	ND2	ND50	ND2J	ND250J	1J	ND200
Bromomethane	ND2J	ND2J	ND100J	ND2	ND50	ND2	ND250	ND2	ND200
Vinyl Chloride	ND2J	ND2J	ND100J	ND2	ND50	ND2	ND250	ND2	ND200
Chloroethane	ND2J	ND2J	ND100J	ND2	ND50	ND2	ND250	ND2	ND200
Methylene Chloride	ND1J	ND1J	ND50J	1U	33U	ND1	79DJ	ND1	100U
Acetone	ND2J	ND2J	ND100J	3U	180U	ND2J	ND250	ND2UJ	ND200UJ
Carbon Disulfide	ND1J	ND1J	ND50J	ND1	ND25	ND1J	ND120	ND1	ND100
1,1-Dichloroethene	ND1J	ND1J	ND50J	1J	ND25	1J	ND120	2	ND100
1,1-Dichloroethane	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
1,2-Dichloroethene (total)	39J	37J	ND50J	32	39D	40	26DJ	53	ND100
Chloroform	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
1,2-Dichloroethane	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
2-Butanone	ND2J	ND2J	ND100J	ND2	ND50	ND2	ND250	ND2	ND200
1,1,1-Trichloroethane	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
Carbon Tetrachloride	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
Vinyl Acetate	ND2J	ND2J	ND100J	ND2	ND50	ND2	ND250	ND2	ND200
Bromodichloromethane	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
1,2-Dichloropropane	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
cis-1,3-Dichloropropene	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
Trichloroethene	1300J	1300J	2300DJ	190J	2300D	240J	3800D	480J	5200D
Dibromochloromethane	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
1,1,2-Trichloroethane	ND1J	ND1J	ND50J	ND1	ND25	3	ND120	3	ND100
Benzene	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
Trans-1,3-Dichloropropene	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1UJ	ND100UJ
Bromoform	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1UJ	ND100UJ
4-Methyl-2-Pentanone	ND2J	ND2J	ND100J	ND2	ND50	ND2	ND250	ND2	ND200
2-Hexanone	ND2J	ND2J	ND100J	ND2	ND50	ND2	ND250	ND2	ND200
Tetrachloroethene	ND1J	ND1J	ND50J	0.9J	ND25	1	ND120	1	ND100
1,1,2,2-Tetrachloroethane	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
Toluene	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
Chlorobenzene	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
Ethylbenzene	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100
Styrene	ND1J	ND1J	ND50J	ND1R	ND25R	ND1	ND120	ND1	ND100
Total Xylenes	ND1J	ND1J	ND50J	ND1	ND25	ND1	ND120	ND1	ND100

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
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D = secondary dilution was performed to obtain result.
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TABLE 6

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL R4D

Parameter (µg/L)	*R4D*																	
VOCs	*11/14/90*	*11/15/90*	*11/26/90*	*12/04/90*	*12/11/90*	*01/07/91*	*02/12/91*	*02/12/91*	*03/04/91*	*04/03/91*	*04/03/91*	*05/06/91*	*05/06/91*	*05/06/91*	*08/05/91*	*08/05/91*	*11/04/91*	*11/04/91*
								Dup			*Diluted*		*Dup*	*Dup-Diluted*		*Diluted*		*Diluted*
Chloromethane	ND14	ND20	ND2J	ND4	ND5	4	ND2	ND2	ND2	ND2	ND10	ND2J	ND2J	ND4	ND2	ND4	ND2J	ND20J
Bromomethane	ND14	ND20	ND2	ND4	ND5	ND2	ND2	ND2	ND2	ND2	ND10	ND2	ND2	ND4	ND2	ND4	ND2J	ND20J
Vinyl Chloride	ND14	ND20	ND2	ND4	ND5	ND2	ND2	ND2	ND2	ND2	ND10	ND2	ND2	ND4	ND2	ND4	ND2J	ND20J
Chloroethane	ND14	ND20	ND2	ND4	ND5	ND2	ND2	ND2	ND2	ND2	ND10	ND2	ND2	ND4	ND2	ND4	ND2J	ND20J
Methylene Chloride	8U	13U	ND1	4U	0.9U	0.2U	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	2.3D	3.3J	19DUJ
Acetone	ND14J	ND20J	ND2J	ND4J	ND5J	ND2	ND2J	ND2J	ND2J	ND2J	ND10J	ND2	ND2	ND4J	ND2J	ND4J	ND2J	ND20J
Carbon Disulfide	ND7	ND10	ND1J	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	1.6J	ND10J
1,1-Dichloroethene	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
1,1-Dichloroethane	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
1,2-Dichloroethene (total)	27	8J	0.9J	11	21	1	ND1	ND1	ND1	2.8	ND5	ND1	ND1	ND2	ND1	ND2	2.7J	ND10J
Chloroform	ND7	ND10	1	0.8J	0.9J	1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
1,2-Dichloroethane	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
2-Butanone	ND14J	ND20J	ND2	ND4J	ND5J	ND2	ND2R	ND2R	ND2J	ND2	ND10	ND2R	ND2R	ND4R	ND2J	ND4J	ND2J	ND20J
1,1,1-Trichloroethane	ND7	ND10	ND1	ND2	ND3	0.2J	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Carbon Tetrachloride	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Vinyl Acetate	ND14	ND20	ND2	ND4	ND5	ND2	ND2	ND2	ND2	ND2	ND10J	ND2R	ND2R	ND4R	ND2	ND4	ND2J	ND20J
Bromodichloromethane	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
1,2-Dichloropropane	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
cis-1,3-Dichloropropene	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Trichloroethene	230	300	17	45	64	23J	28J	32	31	80J	110D	58	74J	58D	74J	71D	220J	170DJ
Dibromochloromethane	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
1,1,2-Trichloroethane	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Benzene	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Trans-1,3-Dichloropropene	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Bromoform	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
4-Methyl-2-Pentanone	ND14	ND20J	ND2	ND4	ND5J	ND2	ND2	ND2	ND2	ND2	ND10J	ND2	ND2	ND4	ND2	ND4	ND2J	ND20J
2-Hexanone	ND14	ND20J	ND2	ND4	ND5J	ND2	ND2	ND2	ND2J	ND2	ND10	ND2	ND2	ND4	ND2	ND4	ND2J	ND20J
Tetrachloroethene	3J	2J	ND1	ND2	0.5J	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
1,1,2,2-Tetrachloroethane	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Toluene	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Chlorobenzene	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Ethylbenzene	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Styrene	ND7	ND10	ND1	ND2	ND3	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J
Total Xylenes	ND7	ND10	ND1	ND2	ND3J	ND1	ND1	ND1	ND1	ND1	ND5	ND1	ND1	ND2	ND1	ND2	ND1J	ND10J

<u>Notes:</u>

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 6

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL R4D

Parameter (μg/L)	*R4D*										
VOCs	*02/18/2*	*02/18/92 Diluted*	*02/18/92 Dup*	*02/18/92 Dup-Reanalysis*	*02/18/92 Dup-Diluted*	*05/12/92*	*05/12/92 Diluted*	*08/04/92*	*08/04/92 Diluted*	*11/02/92*	*11/02/92 Diluted*
Chloromethane	ND2	ND20	ND2	ND2	ND20	ND2	ND8	ND2	ND50J	ND2	ND40
Bromomethane	ND2	ND20	ND2	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND40
Vinyl Chloride	ND2	ND20	ND2	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND40
Chloroethane	ND2	ND20	ND2	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND40
Methylene Chloride	ND1	9JD	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	15JDB
Acetone	ND2	ND20	ND2	ND2	ND20	ND2J	ND8	ND2J	ND50	ND2UJ	ND40UJ
Carbon Disulfide	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1J	ND25	ND1	ND20
1,1-Dichloroethene	ND1	ND10	ND1	ND1	ND10	0.8J	ND4	ND1J	ND25	ND1	ND20
1,1-Dichloroethane	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
1,2-Dichloroethene (total)	11J	ND10	11J	10J	8DJ	50J	30DJ	9	8DJ	26	18JD
Chloroform	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
1,2-Dichloroethane	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
2-Butanone	ND2	ND20	ND2	ND2	ND20	ND2J	ND8	ND2	ND50	ND2	ND40
1,1,1-Trichloroethane	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Carbon Tetrachloride	ND1J	ND10J	ND1J	ND1J	ND10J	ND1	ND4	ND1	ND25	ND1	ND20
Vinyl Acetate	ND2	ND20	ND2	ND2	ND20	ND2J	ND8	ND2	ND50	ND2	ND40
Bromodichloromethane	ND1	ND10	ND1	ND1	ND10	ND1J	ND4	ND1	ND25	ND1	ND20
1,2-Dichloropropane	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
cis-1,3-Dichloropropene	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Trichloroethene	410J	330DJ	420J	380J	300DJ	140J	420D	110J	440D	350J	830D
Dibromochloromethane	ND1	ND10	ND1	ND1	ND10	ND1J	ND4	ND1	ND25	ND1	ND20
1,1,2-Trichloroethane	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Benzene	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Trans-1,3-Dichloropropene	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Bromoform	ND1	ND10	ND1	ND1	ND10	ND1J	ND4	ND1	ND25	ND1	ND20
4-Methyl-2-Pentanone	ND2	ND20	ND2	ND2	ND20	ND2	ND8	ND2	ND50	ND2UJ	ND40
2-Hexanone	ND2	ND20	ND2	ND2	ND20	ND2	ND8	ND2	ND50	ND2UJ	ND40
Tetrachloroethene	ND1	ND10	ND1	ND1	ND10	0.9J	ND4	ND1	ND25	0.5J	ND20
1,1,2,2-Tetrachloroethane	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Toluene	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Chlorobenzene	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Ethylbenzene	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20
Styrene	ND1	ND10	ND1	ND1	ND10	ND1	ND4R	ND1	ND25	ND1	ND20
Total Xylenes	ND1	ND10	ND1	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND20

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 7

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL W52

Parameter (µg/L)	*W52*																
VOCs	*11/14/90*	*11/15/90*	*11/15/90*	*11/26/90*	*12/04/90*	*12/11/90*	*01/07/91*	*02/12/91*	*02/12/91*	*03/04/91*	*03/04/91*	*04/03/91*	*04/03/91*	*05/06/91*	*05/06/91*	*08/05/91*	*08/05/91*
			Dup						*Diluted*		*Diluted*		*Diluted*		*Diluted*		*Diluted*
Chloromethane	ND4	ND4	ND4	ND6	ND10	ND8	ND12J	ND2	ND40	ND2	ND40	ND2	ND40	ND2	ND100	ND2	ND100
Bromomethane	ND4	ND4	ND4	ND6	ND10	ND8	ND12	ND2	ND40	ND2	ND40	ND2	ND40	ND2	ND100	ND2	ND100
Vinyl Chloride	ND4	ND4	ND4	ND6	ND10	ND8	ND12	ND2	ND40	ND2	ND40	ND2	ND40	ND2	ND100	ND2	ND100
Chloroethane	ND4	ND4	ND4	ND6	ND10	ND8	ND12	ND2	ND40	ND2	ND40	ND2	ND40	ND2	ND100	ND2	ND100
Methylene Chloride	1U	1U	1U	4U	7U	8U	7U	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	84D
Acetone	ND4J	ND4J	ND4J	ND6J	ND10J	ND8J	ND12J	ND2J	ND40J	ND2J	ND40J	3.7J	ND40J	ND2	ND100J	ND2J	ND100J
Carbon Disulfide	ND2	ND2	ND2	ND3J	ND5	ND4	ND6	ND1	ND20	1.9	ND20	ND1	ND20	ND1	ND50	ND1	ND50
1,1-Dichloroethene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
1,1-Dichloroethane	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
1,2-Dichloroethene (total)	ND2	ND2	ND2	ND3	ND5	ND4	ND6	2	ND20	2.5	ND20	4.5	ND20	9.4	ND50	9.8	ND50
Chloroform	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
1,2-Dichloroethane	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
2-Butanone	ND4J	ND4J	ND4J	ND6	ND10J	ND8J	ND12	ND2R	ND40R	ND2R	ND40J	ND2	ND40	ND2R	ND100R	ND2J	ND100J
1,1,1-Trichloroethane	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Carbon Tetrachloride	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Vinyl Acetate	ND4	ND4	ND4	ND6J	ND10	ND8	ND12	ND2	ND40	ND2	ND40	ND2	ND40J	ND2R	ND100	ND2	ND100
Bromodichloromethane	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
1,2-Dichloropropane	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
cis-1,3-Dichloropropene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Trichloroethene	64	56	55	84	130	100	140J	500	1000D	480	1000D	490J	850D	750J	1900D	620J	2100D
Dibromochloromethane	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
1,1,2-Trichloroethane	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Benzene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Trans-1,3-Dichloropropene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Bromoform	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
4-Methyl-2-Pentanone	ND4	ND4	ND4	ND6	ND10	ND8	ND12	ND2	ND40	ND2	ND40	ND2	ND40J	ND2	ND100	ND2	ND100
2-Hexanone	ND4J	ND4	ND4	ND6J	ND10	ND8	ND12	ND2	ND40	ND2J	ND40	ND2	ND40	ND2	ND100	ND2	ND100
Tetrachloroethene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
1,1,2,2-Tetrachloroethane	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Toluene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Chlorobenzene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Ethylbenzene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	290D
Styrene	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50
Total Xylenes	ND2	ND2	ND2	ND3	ND5	ND4	ND6	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND50

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 7

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL W52

Parameter (µg/L)	*W52*											
VOCs	*11/04/91*	*11/04/91 Diluted*	*02/18/92*	*02/18/92 Diluted*	*05/12/92*	*05/12/92 Diluted*	*08/04/92*	*08/04/92 Diluted*	*08/04/92 Duplicate*	*08/04/92 Dup-Diluted*	*11/02/92*	*11/02/92 Diluted*
Chloromethane	ND2J	ND200J	ND2	ND20	ND2	ND8	ND2	ND50J	ND2	ND50J	ND2	ND40
Bromomethane	ND2J	ND200J	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND50	ND2	ND40
Vinyl Chloride	ND2J	ND200J	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND50	ND2	ND40
Chloroethane	ND2J	ND200J	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND50	ND2	ND40
Methylene Chloride	ND1J	ND100J	ND1	ND10	1U	4U	ND1	ND25	ND1	ND25	ND1	20U
Acetone	ND2J	ND200J	ND2	ND20	3U	21U	ND2J	ND50	ND2J	ND50UJ	ND2UJ	ND40
Carbon Disulfide	ND1J	220DJ	51	ND10	ND1	ND4	ND1J	ND25	1J	ND25	ND1	ND20
1,1-Dichloroethene	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1J	ND25	ND1J	ND25	ND1	ND20
1,1-Dichloroethane	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
1,2-Dichloroethene (total)	23J	ND100J	ND1	ND10	4	4D	7	ND25	7	ND25	7	ND20
Chloroform	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
1,2-Dichloroethane	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
2-Butanone	ND2J	ND200J	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND50	ND2	ND40
1,1,1-Trichloroethane	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Carbon Tetrachloride	ND1J	ND100J	ND1J	ND10J	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Vinyl Acetate	ND2J	ND200J	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND50	ND2	ND40
Bromodichloromethane	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
1,2-Dichloropropane	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
cis-1,3-Dichloropropene	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Trichloroethene	610J	720DJ	470J	420D	110J	130D	300J	440D	140J	440D	450E	680D
Dibromochloromethane	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
1,1,2-Trichloroethane	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Benzene	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Trans-1,3-Dichloropropene	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1UJ	ND20
Bromoform	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1UJ	ND20
4-Methyl-2-Pentanone	ND2J	ND200J	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND50	ND2	ND40
2-Hexanone	ND2J	ND200J	ND2	ND20	ND2	ND8	ND2	ND50	ND2	ND50	ND2	ND40
Tetrachloroethene	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
1,1,2,2-Tetrachloroethane	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Toluene	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Chlorobenzene	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Ethylbenzene	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20
Styrene	ND1J	ND100J	ND1	ND10	ND1R	ND4R	ND1	ND25	ND1	ND25	ND1	ND20
Total Xylenes	ND1J	ND100J	ND1	ND10	ND1	ND4	ND1	ND25	ND1	ND25	ND1	ND20

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 8

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELLS W53A AND W53

Parameter (µg/L)	*W53A*																
VOCs	*11/14/90*	*11/15/90*	*11/26/90*	*11/26/90 Dup*	*12/03/90*	*12/10/90*	*02/12/91*	*02/12/91 Diluted*	*03/04/91*	*04/02/91*	*05/07/91*	*08/06/91*	*11/05/91*	*02/17/92*	*05/12/92*	*08/04/92*	*11/08/92*
Chloromethane	ND6	ND8	ND6	ND10J	ND2	ND2	ND2	ND4	ND2	ND2	ND2J	ND2	ND2J	ND2	ND2	ND2	2J
Bromomethane	ND6	ND8	ND6	ND10	ND2	ND2	ND2	ND4	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Vinyl Chloride	ND6	ND8	ND6	ND10	ND2	ND2	ND2	ND4	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Chloroethane	ND6	ND8	ND6	ND10	ND2	ND2	ND2	ND4	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Methylene Chloride	1U	2U	ND3	3U	0.5U	0.4U	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	1U	ND1	ND1
Acetone	ND6J	ND8J	ND6J	ND5J	ND2J	ND2J	ND2J	3.6J	ND2J	1.5J	ND2	ND2J	ND2J	ND2	4U	ND2J	ND2UJ
Carbon Disulfide	ND3	ND4	ND3J	ND5J	ND1	3	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1J	ND1
1,1-Dichloroethene	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1J	ND1
1,1-Dichloroethane	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,2-Dichloroethene (total)	2J	3J	2J	ND5	2	2	2.8	ND2	1.5	1.2	ND1	1.9	3.4J	0.5J	ND1	9	2
Chloroform	ND3	ND4	ND3	ND5	ND1	ND1	3.5	2.2D	1.3	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,2-Dichloroethane	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
2-Butanone	ND6J	ND8J	ND6	ND10	ND2J	ND2J	ND2R	ND4R	ND2R	ND2	ND2R	ND2J	ND2J	ND2	ND2	ND2	ND2
1,1,1-Trichloroethane	0.8J	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Carbon Tetrachloride	ND3	ND4	ND3	ND5	ND1	ND1	ND1	2.5D	1.7	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Vinyl Acetate	ND6	ND8	ND6J	ND10	ND2	ND2	ND2	ND4	ND2	ND2J	ND2R	ND2	ND2J	ND2	ND2	ND2	ND2UJ
Bromodichloromethane	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,2-Dichloropropane	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Trichloroethene	71	120	100	100	24	16	72J	42D	26	65	19	17	66J	19	10	12	14
Dibromochloromethane	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,1,2-Trichloroethane	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Benzene	ND3	ND4	ND3	ND5	0.2J	0.3J	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	0.6J
Trans-1,3-Dichloropropene	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Bromoform	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
4-Methyl-2-Pentanone	ND6	ND8	ND6	ND10	ND2	ND2J	ND2	ND4	ND2	ND2J	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
2-Hexanone	ND6J	ND8	ND6J	ND10	ND2	ND2J	ND2	ND4	ND2J	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Tetrachloroethene	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,1,2,2-Tetrachloroethane	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Toluene	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Chlorobenzene	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Ethylbenzene	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Styrene	ND3	ND4	ND3	ND5	ND1	ND1	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1R	ND1	ND1
Total Xylenes	ND3	ND4	ND3	ND5	ND1	ND1J	ND1	ND2	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 8

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELLS W53A AND W53

Parameter (µg/L)	*W53*														
VOCs	*11/13/90*	*11/15/90*	*11/15/90*	*11/26/90*	*12/03/90*	*12/03/90*	*12/10/90*	*01/07/91*	*02/12/91*	*02/12/91*	*03/04/91*	*03/04/91*	*04/03/91*	*05/07/91*	*08/06/91*
			Dup			*Dup*				*Diluted*		*Diluted*			
Chloromethane	ND26	ND20	ND20	ND20J	ND14	ND14	ND25	ND20	ND2	ND10	ND2	ND10	ND2	ND2J	ND2
Bromomethane	ND26	ND20	ND20	ND20	ND14	ND14	ND25	ND20	ND2	ND10	ND2	ND10	ND2	ND2	ND2
Vinyl Chloride	ND26	ND20	ND20	ND20	ND14	ND14	ND25	ND20	ND2	ND10	ND2	ND10	ND2	ND2	ND2
Chloroethane	ND26	ND20	ND20	ND20	ND14	ND14	ND25	ND20	ND2	ND10	ND2	ND10	ND2	ND2	ND2
Methylene Chloride	22U	35U	27U	47U	24U	21U	8U	25U	51U	48U	16U	18U	8.4J	4.7U	1.3
Acetone	ND26J	ND20J	ND20J	ND20J	ND14J	ND14J	ND25J	ND20J	12UJ	ND10J	ND2J	ND10J	1.9J	ND2	5.3
Carbon Disulfide	ND13	ND10	ND10	ND10J	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
1,1-Dichloroethene	ND13	ND10	ND10	ND10	ND7	ND7	ND13J	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
1,1-Dichloroethane	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
1,2-Dichloroethene (total)	190	190	170	170	110	100	220	180	37	28	23	23	12	7.4	4.7
Chloroform	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	7.6	6.4
1,2-Dichloroethane	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
2-Butanone	ND26J	ND20J	ND20J	ND20	ND14J	ND14J	ND25J	ND20	ND2R	ND10R	ND2R	ND10J	ND2	ND2R	ND2
1,1,1-Trichloroethane	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Carbon Tetrachloride	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	7	4.4
Vinyl Acetate	ND26	ND20	ND20	ND20	ND14	ND14	ND25	ND20	ND2	ND10	ND2	ND10	ND2J	ND2R	ND2
Bromodichloromethane	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
1,2-Dichloropropane	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Trichloroethene	340	360	320	290	200	190	360J	290J	110J	93	73	73	51	53	64
Dibromochloromethane	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
1,1,2-Trichloroethane	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Benzene	ND13	ND10	ND10	ND10	ND7	ND7	ND13J	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Trans-1,3-Dichloropropene	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Bromoform	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND2
4-Methyl-2-Pentanone	ND26J	ND20J	ND20	ND20	ND14	ND14	ND25J	ND20	ND2	ND10	ND2	ND10	ND2J	ND2	ND2
2-Hexanone	ND26J	ND20J	ND20	ND20	ND14	ND14	ND25J	ND20	ND2	ND10	ND2J	ND10	ND2	ND2	ND1
Tetrachloroethene	ND13	ND10	ND10	3J	1J	ND7	3J	2J	ND1	ND5	ND1	ND5	ND1	ND1	ND1
1,1,2,2-Tetrachloroethane	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Toluene	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Chlorobenzene	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Ethylbenzene	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Styrene	ND13	ND10	ND10	ND10	ND7	ND7	ND13	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1
Total Xylenes	ND13	ND10	ND10	ND10	ND7	ND7	ND13J	ND10	ND1	ND5	ND1	ND5	ND1	ND1	ND1

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 8

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELLS W53A AND W53

Parameter (µg/L)	*W53*					
VOCs	*11/05/91*	*11/05/91 Diluted*	*02/17/92*	*05/12/92*	*08/04/92*	*11/02/92*
Chloromethane	ND2J	ND20J	ND2	ND2	ND2	ND2
Bromomethane	ND2J	ND20J	ND2	ND2	ND2	ND2
Vinyl Chloride	ND2J	ND20J	ND2	ND2	ND2	ND2
Chloroethane	ND2J	ND20J	ND2	ND2	ND2	ND2
Methylene Chloride	ND1J	18DUJ	ND1	ND1	ND1	ND1
Acetone	ND2J	ND20J	ND2	ND2J	ND2J	ND2UJ
Carbon Disulfide	ND1J	ND10J	ND1	ND1	ND1J	ND1
1,1-Dichloroethene	ND1J	ND10J	ND1	ND1	ND1J	ND1
1,1-Dichloroethane	ND1J	ND10J	ND1	ND1	ND1	ND1
1,2-Dichloroethene (total)	4.1J	ND10J	1	1	0.7J	1J
Chloroform	11J	13DJ	9	ND1	ND1	ND1
1,2-Dichloroethane	ND1J	ND10J	ND1	ND1	ND1	ND1
2-Butanone	ND2J	ND20J	ND2	ND2J	ND2	ND2UJ
1,1,1-Trichloroethane	ND1J	ND10J	ND1	ND1	ND1	ND1
Carbon Tetrachloride	13J	ND10J	6	ND1	ND1	ND1
Vinyl Acetate	ND2J	ND20J	ND2	ND2J	ND2	ND2
Bromodichloromethane	ND1J	ND10J	ND1	ND1J	ND1	ND1
1,2-Dichloropropane	ND1J	ND10J	ND1	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND1J	ND10J	ND1	ND1	ND1	ND1
Trichloroethene	220JR	43DJ	13	13	8	8
Dibromochloromethane	ND1J	ND10J	ND1	ND1J	ND1	ND1
1,1,2-Trichloroethane	ND1J	ND10J	ND1	ND1	ND1	ND1
Benzene	ND1J	ND10J	ND1	ND1	ND1	ND1
Trans-1,3-Dichloropropene	ND1J	ND10J	ND1	ND1	ND1	ND1
Bromoform	ND1J	ND10J	ND1	ND1J	ND1	ND1
4-Methyl-2-Pentanone	ND2J	ND20J	ND2	ND2	ND2	ND2
2-Hexanone	ND2J	ND20J	ND2	ND2	ND2	ND2
Tetrachloroethene	ND1J	ND10J	ND1	ND1	ND1	ND1
1,1,2,2-Tetrachloroethane	ND1J	ND10J	ND1	ND1	ND1	ND1
Toluene	ND1J	ND10J	ND1	ND1	ND1	ND1
Chlorobenzene	ND1J	ND10J	ND1	ND1	ND1	ND1
Ethylbenzene	ND1J	ND10J	ND1	0.5J	ND1	ND1
Styrene	ND1J	ND10J	ND1	ND1	ND1	ND1
Total Xylenes	ND1J	ND10J	ND1	ND1	ND1	ND1

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 9

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL W54

Parameter (µg/L)	*W54*													
VOCs	*11/13/90*	*11/15/90*	*11/26/90*	*12/03/90*	*12/10/90*	*12/10/90*	*01/07/91*	*02/12/91*	*03/04/91*	*04/03/91*	*05/07/91*	*08/06/91*	*11/05/91*	*11/05/91*
						Duplicate								*Diluted*
Chloromethane	ND4	ND4	ND2J	0.5J	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND2	ND2J	ND20J
Bromomethane	ND4	ND4	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND20J
Vinyl Chloride	ND4	ND4	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND20J
Chloroethane	ND4	ND4	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND20J
Methylene Chloride	ND1U	2U	ND1	0.8U	0.3U	0.4U	.2U	ND1	ND1	ND1	ND1	ND1	ND1J	21DUJ
Acetone	ND4J	ND4J	ND2J	2UJ	ND2J	ND2J	ND2	ND2J	ND2J	ND2J	ND2	ND2J	ND2J	ND20J
Carbon Disulfide	ND2	ND2	ND1J	ND1	0.3J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
1,1-Dichloroethene	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
1,1-Dichloroethane	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
1,2-Dichloroethene (total)	ND4	4	2	0.9J	0.4J	0.4J	.5J	ND1	ND1	ND1	ND1	ND1	43JR	ND10J
Chloroform	ND2	ND2	ND1	ND1	ND1	ND1	ND1	30	1.2	ND1	ND1	ND1	ND1J	ND10J
1,2-Dichloroethane	ND2J	ND2J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
2-Butanone	ND4	ND4	ND2	ND2J	ND2J	ND2J	ND2	ND2R	ND2J	ND2	ND2R	ND2	ND2J	ND20J
1,1,1-Trichloroethane	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Carbon Tetrachloride	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Vinyl Acetate	ND4	ND4	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND2R	ND2J	ND2J	ND20J
Bromodichloromethane	ND2	ND2	ND1	ND1	ND1	ND1	ND1	3.4	ND1	ND1	ND1	ND1	ND1J	ND10J
1,2-Dichloropropane	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
cis-1,3-Dichloropropene	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Trichloroethene	48	58	19	19	6	6	2J	3.3	6.1 J	5.7J	12	10	350JR	10DJ
Dibromochloromethane	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
1,1,2-Trichloroethane	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Benzene	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Trans-1,3-Dichloropropene	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Bromoform	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
4-Methyl-2-Pentanone	ND4	ND4J	ND2	ND2	ND2J	ND2J	ND2	ND2	ND2	ND2J	ND2	ND2	ND2J	ND20J
2-Hexanone	ND4J	ND4J	ND2	ND2	ND2J	ND2J	ND2	ND2	ND2J	ND2	ND2	ND2	ND2J	ND20J
Tetrachloroethene	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	1.2J	ND10J
1,1,2,2-Tetrachloroethane	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Toluene	ND2	ND2	ND1	0.3J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Chlorobenzene	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Ethylbenzene	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Styrene	ND2	ND2	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J
Total Xylenes	ND2	ND2	ND1	ND1	ND1J	ND2J	ND2	ND1	ND1	ND1	ND1	ND1	ND1J	ND10J

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 9

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL W54

Parameter (µg/L) *VOCs*	*W54* *02/17/92*	 *02/17/92* *Reanalysis*	 *05/12/92*	 *08/04/92*	 *11/02/92*	 *11/02/92* *Duplicate*
Chloromethane	ND2J	ND2	ND2	ND2	2J	1J
Bromomethane	ND2J	ND2	ND2	ND2	ND2	ND2
Vinyl Chloride	ND2J	ND2	ND2	ND2	ND2	ND2
Chloroethane	ND2J	ND2	ND2	ND2	ND2	ND2
Methylene Chloride	ND1J	ND1	1U	ND1	ND1	ND1
Acetone	ND2J	ND2	3U	ND2J	ND2UJ	ND2UJ
Carbon Disulfide	ND1J	ND1	ND1	ND1J	ND1	ND1
1,1-Dichloroethene	ND1J	ND1	ND1	ND1J	ND1	ND1
1,1-Dichloroethane	ND1J	ND1	ND1	ND1	ND1	ND1
1,2-Dichloroethene (total)	ND1J	ND1	ND1	0.6J	ND1	ND1
Chloroform	2J	1J	ND1	ND1	ND1	ND1
1,2-Dichloroethane	ND1J	ND1	ND1	ND1	ND1	ND1
2-Butanone	ND2J	ND2	ND2	ND2	ND2UJ	ND2UJ
1,1,1-Trichloroethane	ND1J	ND1	ND1	ND1	ND1	ND1
Carbon Tetrachloride	ND1J	ND1J	ND1	ND1	ND1	ND1
Vinyl Acetate	ND2J	ND2	ND2	ND2	ND2	ND2
Bromodichloromethane	ND1J	ND1	ND1	ND1	ND1	ND1
1,2-Dichloropropane	ND1J	ND1	ND1	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND1J	ND1	ND1	ND1	ND1	ND1
Trichloroethene	0.8J	0.9J	1	0.8J	ND1	ND1
Dibromochloromethane	ND1J	ND1	ND1	ND1	ND1	ND1
1,1,2-Trichloroethane	ND1J	ND1	ND1	ND1	ND1	ND1
Benzene	ND1J	ND1	ND1	ND1	ND1	ND1
Trans-1,3-Dichloropropene	ND1J	ND1	ND1	ND1	ND1	ND1
Bromoform	ND1J	ND1	ND1	ND1	ND1	ND1
4-Methyl-2-Pentanone	ND2J	ND2	ND2	ND2	ND2	ND2
2-Hexanone	ND2J	ND2	ND2	ND2	ND2	ND2
Tetrachloroethene	ND1J	ND1	ND1	ND1	ND1	ND1
1,1,2,2-Tetrachloroethane	ND1J	ND1	ND1	ND1	ND1	ND1
Toluene	ND1J	ND1	ND1	ND1	ND1	ND1
Chlorobenzene	ND1J	ND1	ND1	ND1	ND1	ND1
Ethylbenzene	ND1J	ND1	ND1	ND1	ND1	ND1
Styrene	ND1J	ND1	ND1	ND1	ND1	ND1
Total Xylenes	ND1J	ND1	ND1	ND1	ND1	ND1

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 10

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL W55

Parameter (µg/L)	*W55*															
VOCs	*11/14/90*	*11/14/90 Dup*	*11/16/90*	*11/27/90*	*12/04/90*	*12/11/90*	*01/08/91*	*02/12/91*	*02/12/91 Diluted*	*03/04/91*	*03/04/91 Diluted*	*04/03/91*	*04/03/91 Diluted*	*05/07/91*	*05/07/91 Diluted*	*08/06/91*
Chloromethane	ND100	ND100	ND100J	ND80	ND100	ND100	ND120J	ND2	ND100	ND2	ND200J	ND2	ND100	ND2J	ND100	ND2
Bromomethane	ND100	ND100	ND100	ND80	ND100	ND100	ND120	ND2	ND100	ND2	ND200	ND2	ND100	ND2	ND100	ND2
Vinyl Chloride	ND100	ND100	ND100	ND80	ND100	ND100	ND120	ND2	ND100	ND2	ND200	ND2	ND100	ND2	ND100	ND2
Chloroethane	ND100	ND100	ND100	ND80	ND100	ND100	ND120	ND2	ND100	ND2	ND200	ND2	ND100	ND2	ND100	ND2
Methylene Chloride	ND50	ND50	74U	34U	29U	85U	56U	ND1	51U	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Acetone	ND100J	ND100J	ND100J	ND80J	ND100J	ND100J	ND120J	ND2J	ND100J	ND2J	ND200J	ND2J	64UJ	ND2	ND100J	ND2J
Carbon Disulfide	ND50	ND50	ND50	ND40J	ND50	ND50	ND59	ND1	ND50	ND1	ND100	1.5	ND50	ND1	ND50	8
1,1-Dichloroethene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	1.1	ND50	1.3	ND50	1
1,1-Dichloroethane	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
1,2-Dichloroethene (total)	28J	27J	33J	42	33J	32J	41J	13	ND50	15	ND100	15	ND50	14	ND50	14
Chloroform	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
1,2-Dichloroethane	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
2-Butanone	ND100J	ND100J	ND100	ND80	ND100J	ND100J	ND120	ND2R	ND100R	ND2R	ND200J	ND2	ND100	ND2R	ND100R	ND2J
1,1,1-Trichloroethane	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Carbon Tetrachloride	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Vinyl Acetate	ND100	ND100	ND100	ND80J	ND100	ND100	ND120	ND2	ND100	ND2	ND200	ND2J	ND100	ND2R	ND100	ND2
Bromodichloromethane	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
1,2-Dichloropropane	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
cis-1,3-Dichloropropene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Trichloroethene	1900	1800	1700	1500	1600J	1900	1900J	710	3200	720	3300	860J	3300D	830R	230DJA	780J
Dibromochloromethane	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
1,1,2-Trichloroethane	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Benzene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Trans-1,3-Dichloropropene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Bromoform	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100J	ND1	ND50	ND1	ND50	ND1
4-Methyl-2-Pentanone	ND100	ND100	ND100	ND80J	ND100	ND100	ND120	ND2	ND100	ND2	ND200	ND2J	ND100	ND2	ND100	ND2
2-Hexanone	ND100	ND100	ND100	ND80	ND100	ND100	ND120	ND2	ND100	ND2J	ND200	ND2	ND100	ND2	ND100	ND2
Tetrachloroethene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
1,1,2,2-Tetrachloroethane	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Toluene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Chlorobenzene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Ethylbenzene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Styrene	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1
Total Xylenes	ND50	ND50	ND50	ND40	ND50	ND50	ND59	ND1	ND50	ND1	ND100	ND1	ND50	ND1	ND50	ND1

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.
A = assumed anomaly

TABLE 10

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL W55

Parameter (µg/L) *VOCs*	*W55* *08/06/91* *Diluted*	*11/05/91*	*11/05/91* *Diluted*	*02/17/92*	*02/17/92* *Diluted*	*05/11/92*	*05/11/92* *Diluted*	*08/03/92*	*08/03/92* *Diluted*	*11/02/92*	*11/02/92* *Diluted*
Chloromethane	ND100	ND2J	ND200J	ND2	ND50	ND2J	ND8	ND2J	ND50	ND2	ND40
Bromomethane	ND100	ND2J	ND200J	ND2	ND50	ND2J	ND8	ND2	ND50	ND2	ND40
Vinyl Chloride	ND100	ND2J	ND200J	ND2	ND50	ND2J	ND8	ND2	ND50	ND2	ND40
Chloroethane	ND100	ND2J	ND200J	ND2	ND50	ND2J	ND8	ND2	ND50	ND2	ND40
Methylene Chloride	310D	ND1J	190DUJ	ND1	ND25	ND1J	4U	ND1	ND25	ND1	24U
Acetone	460UJ	ND2J	ND200J	ND2	ND50	ND2J	11U	ND2J	ND50	ND2UJ	ND40UJ
Carbon Disulfide	ND50	ND1J	ND100J	ND1	ND25	4J	ND4	ND1J	ND25	2	ND20
1,1-Dichloroethene	ND50	1.1J	ND100J	0.7J	ND25	0.8J	ND4	0.8J	ND25	0.8J	ND20
1,1-Dichloroethane	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
1,2-Dichloroethene (total)	ND50	37J	ND100J	22	ND25	40J	16DJ	16	17DJ	18	18JD
Chloroform	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
1,2-Dichloroethane	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
2-Butanone	ND100J	ND2J	ND200J	ND2	ND50	ND2J	ND8	ND2	ND50	ND2	ND40
1,1,1-Trichloroethane	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
Carbon Tetrachloride	ND50	ND1J	ND100J	ND1	ND25J	ND1J	ND4	ND1	ND25	ND1	ND20
Vinyl Acetate	ND100	ND2J	ND200J	ND2	ND50	ND2J	ND8	ND2	ND50	ND2UJ	ND40
Bromodichloromethane	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
1,2-Dichloropropane	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
cis-1,3-Dichloropropene	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
Trichloroethene	3300D	1600J	3500DJ	740J	1500D	130J	430D	170J	780D	530J	950D
Dibromochloromethane	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
1,1,2-Trichloroethane	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	1	ND20
Benzene	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
Trans-1,3-Dichloropropene	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20UJ
Bromoform	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20UJ
4-Methyl-2-Pentanone	ND100	ND2J	ND200J	ND2	ND50	ND2J	ND8	ND2	ND50	ND2	ND40
2-Hexanone	ND100	ND2J	ND200J	ND2	ND50	ND2J	ND8	ND2	ND50	ND2	ND40
Tetrachloroethene	ND50	2J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
1,1,2,2-Tetrachloroethane	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
Toluene	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
Chlorobenzene	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
Ethylbenzene	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20
Styrene	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4R	ND1	ND25R	ND1	ND20
Total Xylenes	ND50	ND1J	ND100J	ND1	ND25	ND1J	ND4	ND1	ND25	ND1	ND20

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.
A = assumed anomaly

TABLE 11

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL WSWD

Parameter (µg/L)	*WSWD*															
VOCs	*11/14/90*	*11/16/90*	*11/27/90*	*12/04/90*	*12/11/90*	*01/08/91*	*02/12/91*	*02/12/91 Diluted*	*03/04/91*	*03/04/91 Diluted*	*04/03/91*	*04/03/91 Diluted*	*05/06/91*	*05/06/91 Diluted*	*08/05/91*	*11/04/91*
Chloromethane	ND20	ND20	ND20	ND20	ND12	ND6J	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND2J
Bromomethane	ND20	ND20	ND20	ND20	ND12	ND6	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND2J
Vinyl Chloride	ND20	ND20	ND20	ND20	ND12	ND6	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND2J
Chloroethane	ND20	ND20	ND20	ND20	ND12	ND6	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND2J
Methylene Chloride	11U	5U	7U	25U	5U	2U	ND1	5U	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Acetone	ND20J	ND20J	ND20J	ND20J	ND12J	ND6J	1.6J	ND10J	ND2J	ND10J	ND2J	ND10J	ND2	ND10J	ND2J	ND2J
Carbon Disulfide	ND10	ND10	ND10J	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
1,1-Dichloroethene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
1,1-Dichloroethane	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
1,2-Dichloroethene (total)	14	2	49	26	14	7	9.8	9.2D	11	10D	12	9.9D	8.9	9.5D	3.3	2.8J
Chloroform	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
1,2-Dichloroethane	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
2-Butanone	ND20J	ND20J	ND20	ND20J	ND12J	ND6	ND2R	ND10R	ND2R	ND10J	ND2	ND10	ND2R	ND10R	ND2J	ND2J
1,1,1-Trichloroethane	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Carbon Tetrachloride	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Vinyl Acetate	ND20	ND20	ND20J	ND20	ND12	ND6	ND2	ND10	ND2	ND10	ND2J	ND10	ND2R	ND10	ND2	ND2J
Bromodichloromethane	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
1,2-Dichloropropane	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
cis-1,3-Dichloropropene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Trichloroethene	270	230	260	230	190	97J	100	110D	96	86D	100J	100D	80J	89D	44	61J
Dibromochloromethane	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
1,1,2-Trichloroethane	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Benzene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Trans-1,3-Dichloropropene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Bromoform	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
4-Methyl-2-Pentanone	ND20	ND20	ND20J	ND20	ND12	ND6	ND2	ND10	ND2	ND10	ND2J	ND10	ND2	ND10	ND2	ND2J
2-Hexanone	ND20	ND20	ND20	ND20	ND12	ND6	ND2	ND10	ND2J	ND10	ND2	ND10	ND2	ND10	ND2	ND2J
Tetrachloroethene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
1,1,2,2-Tetrachloroethane	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Toluene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Chlorobenzene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Ethylbenzene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Styrene	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J
Total Xylenes	ND10	ND10	ND10	ND10	ND6	ND3	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND1J

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 11

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL WSWD

Parameter (µg/L)	*WSWD*			
VOCs	*02/18/92*	*05/11/92*	*08/03/92*	*11/02/92*
Chloromethane	ND2	ND2	ND2J	ND2
Bromomethane	ND2	ND2	ND2	ND2
Vinyl Chloride	ND2	ND2	ND2	ND2
Chloroethane	ND2	ND2	ND2	ND2
Methylene Chloride	ND1	ND1	ND1	ND1
Acetone	ND2	ND2J	ND2	ND2UJ
Carbon Disulfide	ND1	ND1	ND1	ND1
1,1-Dichloroethene	ND1	ND1	ND1	ND1
1,1-Dichloroethane	ND1	ND1	ND1	ND1
1,2-Dichloroethene (total)	2	4	1	1
Chloroform	ND1	ND1	ND1	1
1,2-Dichloroethane	ND1	ND1	ND1	ND1
2-Butanone	ND2	ND2	ND2	ND2
1,1,1-Trichloroethane	ND1	ND1	ND1	ND1
Carbon Tetrachloride	ND1	ND1	ND1	ND1
Vinyl Acetate	ND2	ND2J	ND2	ND2
Bromodichloromethane	ND1	ND1	ND1	ND1
1,2-Dichloropropane	ND1	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND1	ND1	ND1	ND1
Trichloroethene	22	23	18	17
Dibromochloromethane	ND1	ND1	ND1	ND1
1,1,2-Trichloroethane	ND1	ND1	ND1	ND1
Benzene	ND1	ND1	ND1	ND1
Trans-1,3-Dichloropropene	ND1	ND1	ND1	ND1UJ
Bromoform	ND1	ND1J	ND1	ND1UJ
4-Methyl-2-Pentanone	ND2	ND2	ND2	ND2
2-Hexanone	ND2	ND2	ND2	ND2
Tetrachloroethene	ND1	ND1	ND1	ND1
1,1,2,2-Tetrachloroethane	ND1	ND1	ND1	ND1
Toluene	ND1	ND1	ND1	ND1
Chlorobenzene	ND1	ND1	ND1	ND1
Ethylbenzene	ND1	ND1	ND1	ND1
Styrene	ND1	ND1	ND1	ND1
Total Xylenes	ND1	ND1	ND1	ND1

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 12

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL IWD

Parameter (µg/L)	*IWD*										
VOCs	*11/14/90*	*11/16/90*	*11/27/90*	*05/07/91*	*05/07/91 Diluted*	*08/06/91*	*08/06/91 Diluted*	*05/11/92*	*08/03/92*	*11/02/92*	*11/02/92 Diluted*
Chloromethane	ND10	ND10J	ND10	ND2	ND40	ND2	ND40	ND2	ND2J	0.8J	ND10
Bromomethane	ND10	ND10	ND10	ND2	ND40	ND2	ND40	ND2	ND2	ND2	ND10
Vinyl Chloride	ND10	ND10	ND10	ND2	ND40	ND2	ND40	ND2	ND2	ND2	ND10
Chloroethane	ND10	ND10	ND10	ND2	ND40	ND2	ND40	ND2	ND2	ND2	ND10
Methylene Chloride	ND5	2U	4U	ND1	ND20	ND1	ND20	ND1	ND1	ND1	5U
Acetone	ND10J	ND10J	ND10J	ND2J	ND40J	ND2J	ND40J	ND2J	ND2J	ND2UJ	ND10UJ
Carbon Disulfide	ND5	ND5	ND5J	ND1	ND20	ND1	ND20	ND1	ND1J	ND1	ND5
1,1-Dichloroethene	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1J	ND1	ND5
1,1-Dichloroethane	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
1,2-Dichloroethene (total)	42	ND5	28	27	23D	21	ND20	9	5	16	14D
Chloroform	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
1,2-Dichloroethane	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
2-Butanone	ND10J	ND10	ND10	ND2R	ND40R	ND2J	ND40J	ND2	ND2	ND2	ND10
1,1,1-Trichloroethane	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Carbon Tetrachloride	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Vinyl Acetate	ND10	ND10	ND10J	ND2	ND40	ND2	ND40	ND2J	ND2	ND2UJ	ND10
Bromodichloromethane	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
1,2-Dichloropropane	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
cis-1,3-Dichloropropene	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Trichloroethene	130	140	110	290J	330D	280J	360D	35	55	150E	120D
Dibromochloromethane	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
1,1,2-Trichloroethane	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Benzene	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Trans-1,3-Dichloropropene	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5UJ
Bromoform	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1J	ND1	ND1	ND5UJ
4-Methyl-2-Pentanone	ND10	ND10	ND10	ND2	ND40	ND2	ND40	ND2	ND2	ND2	ND10
2-Hexanone	ND10	ND10	ND10J	ND2	ND40	ND2	ND40	ND2	ND2	ND2	ND10
Tetrachloroethene	ND5	ND5	ND5	2.5	ND20	1.7	ND20	ND1	ND1	0.7J	ND5
1,1,2,2-Tetrachloroethane	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Toluene	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Chlorobenzene	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Ethylbenzene	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Styrene	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5
Total Xylenes	ND5	ND5	ND5	ND1	ND20	ND1	ND20	ND1	ND1	ND1	ND5

<u>Notes:</u>

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 13

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELLS CW3, CW6, CW7 AND CW9

Parameter (μg/L; VOCs	*CW3*														
	11/14/90	*11/16/90*	*12/03/90*	*01/07/91*	*02/12/91*	*03/04/91*	*03/04/91 Diluted*	*04/03/91*	*05/06/91*	*08/05/91*	*11/04/91*	*02/17/92*	*05/12/92*	*08/03/92*	*11/02/92*
Chloromethane	ND4	ND6J	ND4	ND3J	ND2	ND2	ND10	ND2	ND2	ND2	ND2J	ND2	ND2	ND2J	ND2
Bromomethane	ND4	ND6	ND4	ND3	ND2	ND2	ND10	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Vinyl Chloride	ND4	ND6	ND4	ND3	ND2	ND2	ND10	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Chloroethane	ND4	ND6	ND4	ND3	ND2	ND2	ND10	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Methylene Chloride	1U	2U	1U	.7U	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Acetone	ND4J	2J	ND4J	ND3J	31J	ND2J	ND10J	ND2J	32	28J	ND2J	ND2	ND2J	ND2J	ND2
Carbon Disulfide	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1J	ND1
1,1-Dichloroethene	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1J	ND1
1,1-Dichloroethane	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,2-Dichloroethene (total)	7	7	7	6	3.5	3.8	ND5	3.8	3.7	3.1	4.6J	4	6	6	12
Chloroform	0.3J	ND3	0.5J	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,2-Dichloroethane	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
2-Butanone	ND4J	ND6	ND4J	ND3	ND2R	ND2R	ND10J	6.5	ND2R	5.4J	ND2J	ND2	ND2J	ND2	ND2
1,1,1-Trichloroethane	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Carbon Tetrachloride	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Vinyl Acetate	ND4	ND6	ND4	ND3	ND2	ND2	ND10	ND2	ND2R	ND2	ND2J	ND2	ND2J	ND2	ND2
Bromodichloromethane	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1J	ND1	ND1
1,2-Dichloropropane	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Trichloroethene	50	62	59	41J	54	47	120A	47	40	32	30J	25	20	23	29
Dibromochloromethane	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1J	ND1	ND1
1,1,2-Trichloroethane	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Benzene	2	ND3	4	5	8.8	7.4	ND5	7.7	7.4	8.2	5J	7	7	6	8
Trans-1,3-Dichloropropene	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Bromoform	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1J	ND1	ND1
4-Methyl-2-Pentanone	ND4	ND6	ND4	ND3	ND2	ND2	ND10	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
2-Hexanone	ND4J	ND6	ND4	ND3	ND2	ND2J	ND10	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Tetrachloroethene	4	6	8	8	12	13	ND5	13	11	12	11J	11	10	10	16
1,1,2,2-Tetrachloroethane	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Toluene	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Chlorobenzene	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Ethylbenzene	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Styrene	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Total Xylenes	ND2	ND3	ND2	ND2	ND1	ND1	ND5	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1

Notes:

NDx = not detected at quantitation limit x.

U = the analyte was detected but was attributed to laboratory contamination.

J = the associated numerical value is an estimated quantity.

D = secondary dilution was performed to obtain result.

R = data was rejected, analyte may or may not be present.

A = assumed anomaly

TABLE 13

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELLS CW3, CW6, CW7 AND CW9

Parameter (μg/L)	*CW6*																				
VOCs	*11/14/90*	*11/16/90*	*12/03/90*	*01/07/91*	*02/12/91*	*02/12/91 Diluted*	*03/04/91*	*04/03/91*	*05/06/91*	*05/06/91 Diluted*	*08/05/91*	*08/05/91 Diluted*	*11/04/91*	*02/17/92*	*02/17/92 Diluted*	*05/12/92*	*05/12/92 Diluted*	*08/03/92*	*08/03/92 Diluted*	*11/02/92*	*11/02/92 Diluted*
Chloromethane	ND10	ND8J	ND10	ND4	ND2	ND10	ND2	ND2	ND2	ND10	ND2	ND20	ND2J	ND2	ND4	ND2	ND4	ND2J	ND4J	1J	1JD
Bromomethane	ND10	ND8	ND10	ND4	ND2	ND10	ND2	ND2	ND2	ND10	ND2	ND20	ND2J	ND2	ND4	ND2	ND4	ND2	ND4	ND2	ND4
Vinyl Chloride	ND10	ND8	ND10	ND4	ND2	ND10	ND2	ND2	ND2	ND10	ND2	ND20	ND2J	ND2	ND4	ND2	ND4	ND2	ND4	ND2	ND4
Chloroethane	ND10	ND8	ND10	ND4	ND2	ND10	ND2	ND2	ND2	ND10	ND2	ND20	ND2J	ND2	ND4	ND2	ND4	ND2	ND4	ND2	ND4
Methylene Chloride	2U	3U	2U	1U	ND1	ND5	ND1	ND1	ND1	ND5	ND1	10D	ND1J	ND1	2JD	1U	6U	ND1	1DJ	ND1	2U
Acetone	ND10J	ND8J	ND10J	ND4J	ND2J	ND10J	ND2J	ND2J	ND2	ND10J	ND2J	56UJ	ND2J	ND2	ND4	3U	8U	ND2J	ND4	ND2UJ	ND4UJ
Carbon Disulfide	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1J	ND2	ND1	ND2
1,1-Dichloroethene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1J	ND2	ND1	ND2
1,1-Dichloroethane	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
1,2-Dichloroethene (total)	1J	1J	1J	1J	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	0.8J	0.6DJ	0.9J	ND2
Chloroform	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
1,2-Dichloroethane	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
2-Butanone	ND10J	ND8J	ND10J	ND4	ND2R	ND10R	ND2R	ND2	ND2R	ND10R	ND2J	ND20J	ND2J	ND2	ND4	ND2	ND4	ND2	ND4	ND2	ND4
1,1,1-Trichloroethane	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1J	12DJ	ND1	ND2	ND1	ND2
Carbon Tetrachloride	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1J	ND2J	ND1	ND2	ND1	ND2	ND1	ND2
Vinyl Acetate	ND10	ND8	ND10	ND4	ND2	ND10	ND2	ND2	ND2R	ND10R	ND2	ND20	ND2J	ND2	ND4	ND2	ND4	ND2	ND4	ND2	ND4
Bromodichloromethane	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
1,2-Dichloropropane	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
cis-1,3-Dichloropropene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
Trichloroethene	110	120	130	68J	150	140	110	55	110J	130D	100J	220D	49J	73J	44D	74J	31DJ	74J	54D	95J	84D
Dibromochloromethane	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
1,1,2-Trichloroethane	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
Benzene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
Trans-1,3-Dichloropropene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1UJ	ND2UJ
Bromoform	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1UJ	ND2UJ
4-Methyl-2-Pentanone	ND10	ND8	ND10	ND4	ND2	ND10	ND2	ND2	ND2	ND10	ND2	ND20	ND2J	ND2	ND4	ND2	ND4	ND2	ND4	ND2	ND4
2-Hexanone	ND10J	ND8	ND10	ND4	ND2	ND10	ND2J	ND2	ND2	ND10	ND2	ND20	ND2J	ND2	ND4	ND2	ND4	ND2	ND4	ND2	ND4
Tetrachloroethene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
1,1,2,2-Tetrachloroethane	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
Toluene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	8DJ	ND1	ND2	ND1	ND2
Chlorobenzene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
Ethylbenzene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1	ND2	ND1	ND2	ND1	ND2
Styrene	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND5	ND1	ND10	ND1J	ND1	ND2	ND1R	ND2R	ND1	ND2	ND1	ND2
Total Xylenes	ND5	ND4	ND5	ND2	ND1	ND5	ND1	ND1	ND1	ND1	ND1	ND10	ND1J	ND1	ND2	ND1	2U	ND1	ND2	ND1	ND2

Notes:
NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 13

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELLS CW3, CW6, CW7 AND CW9

Parameter (µg/L)	*CW7*									*CW9*							
VOCs	*02/12/91*	*05/06/91*	*08/05/91*	*11/04/91*	*02/17/92*	*05/12/92*	*05/12/92*	*08/03/92*	*11/02/92*	*02/12/91*	*05/06/91*	*08/05/91*	*11/04/91*	*02/17/92*	*05/12/92*	*08/03/92*	*11/02/92*
Chloromethane	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2J	ND2
Bromomethane	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Vinyl Chloride	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Chloroethane	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Methylene Chloride	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	1.1U	ND1	ND1	ND1J	2	ND1	ND1	ND1
Acetone	5.7UJ	ND2	ND2J	ND2J	ND2	ND2	4BJ	ND2J	ND2UJ	6.1UJ	ND2	ND2J	ND2J	ND2	ND2J	ND2J	ND2UJ
Carbon Disulfide	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1J	ND1
1,1-Dichloroethene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1J	ND1
1,1-Dichloroethane	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,2-Dichloroethene (total)	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Chloroform	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,2-Dichloroethane	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
2-Butanone	ND2R	ND2R	ND2J	ND2J	ND2	ND2	ND2	ND2	ND2UJ	ND2R	ND2R	ND2J	ND2J	ND2	ND2	ND2	ND2UJ
1,1,1-Trichloroethane	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Carbon Tetrachloride	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1J	ND1	ND1	ND1
Vinyl Acetate	ND2	ND2R	ND2	ND2J	ND2	ND2	ND2J	ND2	ND2	ND2	ND2R	ND2	ND2J	ND2	ND2J	ND2	ND2
Bromodichloromethane	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,2-Dichloropropane	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
cis-1,3-Dichloropropene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Trichloroethene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Dibromochloromethane	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,1,2-Trichloroethane	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Benzene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Trans-1,3-Dichloropropene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Bromoform	ND1	ND1	ND1	ND1J	ND1	ND1	ND1R	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1J	ND1	ND1
4-Methyl-2-Pentanone	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
2-Hexanone	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2	ND2J	ND2	ND2	ND2	ND2
Tetrachloroethene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
1,1,2,2-Tetrachloroethane	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Toluene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Chlorobenzene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Ethylbenzene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Styrene	ND1	ND1	ND1	ND1J	ND1	ND1	ND1R	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1
Total Xylenes	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1	ND1J	ND1	ND1	ND1	ND1

<u>Notes:</u>
NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 14

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL EW1 (INFLUENT)

Parameter (µg/L)	*EW1 (Influent)*										
VOCs	*11/14/90*	*11/14/90* *Dup.*	*11/16/90*	*11/19/90*	*11/23/90*	*11/27/90*	*11/29/90*	*11/29/90* *Dup*	*12/04/90*	*12/04/90* *Dup*	*12/06/90*
Chloromethane	ND20	ND20	ND20	ND30J	ND30J	ND32	ND20	ND20	ND30	ND32	ND30J
Bromomethane	ND20	ND20	ND20	ND30	ND30	ND32	ND20	ND20	ND30	ND32	ND30
Vinyl Chloride	ND20	ND20	ND20	ND30	ND30	ND32	ND20	ND20	ND30	ND32	ND30
Chloroethane	ND20	ND20	ND20	ND30	ND30	ND32	ND20	ND20	ND30	ND32	ND30
Methylene Chloride	9U	ND10	8U	ND15	ND15	ND16	ND10	ND10	36U	36U	20U
Acetone	ND20J	ND20J	ND20J	ND30J	ND30J	ND32J	ND20J	ND20J	ND30J	ND32J	ND30J
Carbon Disulfide	ND10	ND10	ND10	ND15	ND15J	ND16	ND10	ND10	ND15	ND16	ND15
1,1-Dichloroethene	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
1,1-Dichloroethane	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
1,2-Dichloroethene (total)	130	110	110	110	89	80	80	80	75	78	93
Chloroform	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
1,2-Dichloroethane	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
2-Butanone	ND20J	ND20J	ND20J	ND30	ND30	ND32R	ND20R	ND20R	ND30J	ND32J	ND30J
1,1,1-Trichloroethane	ND10	ND10	ND10	ND15	7J	11J	10	11	8J	9J	9J
Carbon Tetrachloride	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Vinyl Acetate	ND20	ND20	ND20	ND30J	ND30J	ND32	ND20	ND20	ND30	ND32	ND30
Bromodichloromethane	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
1,2-Dichloropropane	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
cis-1,3-Dichloropropene	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Trichloroethene	290	260	330	490	450	400	380J	380J	440J	440J	470J
Dibromochloromethane	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
1,1,2-Trichloroethane	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Benzene	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Trans-1,3-Dichloropropene	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Bromoform	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
4-Methyl-2-Pentanone	ND20	ND20J	ND20	ND30	ND30	ND32	ND20J	ND20J	ND30	ND32	ND30
2-Hexanone	ND20	ND20J	ND20	ND30	ND30	ND32	ND20J	ND20J	ND30	ND32	ND30
Tetrachloroethene	2J	2J	5J	4J	3J	ND16J	2J	2J	ND15	ND16	ND15
1,1,2,2-Tetrachloroethane	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Toluene	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Chlorobenzene	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Ethylbenzene	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Styrene	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15
Total Xylenes	ND10	ND10	ND10	ND15	ND15	ND16	ND10	ND10	ND15	ND16	ND15

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 14

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL EW1 (INFLUENT)

Parameter (µg/L)	*EW1 (Influent)*										
VOCs	*12/06/90*	*12/11/90*	*12/17/90*	*12/17/90*	*12/17/90*	*12/17/90*	*01/08/91*	*01/08/91*	*02/12/91*	*02/12/91*	*03/04/91*
	Dup			*Reanalysis*	*Dup*	*Dup-Reanalysis*		*Dup*		*Diluted*	
Chloromethane	ND30J	ND28	ND20	ND40J	ND20	ND40J	ND20	ND20	3.2	ND20	ND2
Bromomethane	ND30	ND28	ND20	ND40J	ND20	ND40J	ND20	ND20	ND2	ND20	ND2
Vinyl Chloride	ND30	ND28	ND20	ND40J	ND20	ND40	ND20	ND20	ND2	ND20	ND2
Chloroethane	ND30	ND28	ND20	ND40J	ND20	ND40	ND20	ND20	ND2	ND20	ND2
Methylene Chloride	16U	14U	3U	4U	3U	ND20	9U	8U	ND1	ND10	ND1
Acetone	ND30J	ND28J	ND20J	ND40J	ND20J	ND40J	ND20J	ND20J	ND2J	ND20J	ND2J
Carbon Disulfide	ND15	ND14	ND10	ND20J	ND10	ND20J	ND10	ND10	ND1	ND10	ND1
1,1-Dichloroethene	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
1,1-Dichloroethane	ND15	ND14	ND10J	ND20	ND10J	ND20	ND10	ND10	ND1	ND10	ND1
1,2-Dichloroethene (total)	89	84	76	75D	83	72D	60	60	25	25D	22
Chloroform	ND15	ND14	ND10	ND20	ND10	ND10	ND20	ND10	ND1	ND10	ND1
1,2-Dichloroethane	ND15	ND14	ND10J	ND20	ND10J	ND10	ND20	ND10	ND1	ND10	ND1
2-Butanone	ND30J	28J	ND20J	ND40J	ND20J	ND20J	ND40	ND20	ND2R	ND20R	ND2R
1,1,1-Trichloroethane	9J	6	4J	ND20	5J	ND20	ND20	ND10	ND1	ND10	ND1
Carbon Tetrachloride	ND15	ND14	ND10	ND20	ND10	ND20	ND20	ND10	ND1	ND10	ND1
Vinyl Acetate	ND30	ND28	ND20J	ND40	ND20J	ND20	ND40	ND20	ND2	ND20	ND2
Bromodichloromethane	ND15	ND14	ND10	ND20	ND10	ND40	ND20	ND10	ND1	ND10	ND1
1,2-Dichloropropane	ND15	ND14	ND10	ND20	ND10	ND40	ND20	ND10	ND1	ND10	ND1
cis-1,3-Dichloropropene	ND15	ND14	ND10	ND20	ND10	ND40	ND20	ND10	ND1	ND10	ND1
Trichloroethene	460	470	440	500DJ	450	460D	320J	290J	310	470D	290
Dibromochloromethane	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
1,1,2-Trichloroethane	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
Benzene	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
Trans-1,3-Dichloropropene	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
Bromoform	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
4-Methyl-2-Pentanone	ND30	ND28	ND20J	ND40	ND20J	ND40	ND20	ND20	ND2	ND20	ND2
2-Hexanone	ND30	ND28	ND20J	ND40	ND20J	ND40	ND20	ND20	ND2	ND20	ND2J
Tetrachloroethene	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	1.3
1,1,2,2-Tetrachloroethane	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
Toluene	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
Chlorobenzene	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
Ethylbenzene	ND15	ND14	ND10	8DJ	ND10	ND20	ND10	ND10	ND1	ND10	ND1
Styrene	ND15	ND14	ND10	ND20	ND10	ND20	ND10	ND10	ND1	ND10	ND1
Total Xylenes	ND15	ND14	ND10J	46J	ND10J	ND20J	ND10	ND10	ND1	ND10	ND1

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 14

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL EW1 (INFLUENT)

Parameter (µg/L)	*EW1 (Influent)*												
VOCs	*03/04/91 Diluted*	*03/04/91 Dup*	*03/04/91 Dup-Diluted*	*04/03/91*	*04/03/91 Diluted*	*05/06/91*	*05/06/91 Diluted*	*05/06/91 Dup*	*05/06/91 Dup-Diluted*	*08/05/91*	*08/05/91 Diluted*	*11/04/91*	*11/04/91 Diluted*
Chloromethane	ND20	ND2	ND40	ND2	ND40	ND2	ND40	ND2J	ND100	ND2	ND20	ND2J	ND20J
Bromomethane	ND20	ND2	ND40	ND2	ND40	ND2	ND40	ND2	ND100	ND2	ND20	ND2J	ND20J
Vinyl Chloride	ND20	ND2	ND40	ND2	ND40	ND2	ND40	ND2	ND100	ND2	ND20	ND2J	ND20J
Chloroethane	ND20	ND2	ND40	ND2	ND40	ND2	ND40	ND2	ND100	ND2	ND20	ND2J	ND20J
Methylene Chloride	ND20	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	10D	ND1J	17DUJ
Acetone	ND20J	ND2J	ND40J	ND2J	ND40J	ND2	ND40J	ND2	ND100J	ND2J	66J	ND2J	ND20J
Carbon Disulfide	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
1,1-Dichloroethene	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
1,1-Dichloroethane	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
1,2-Dichloroethene (total)	22D	24	20D	21	ND20	16	ND20	15	ND50	8.3	ND10	9.5J	ND10J
Chloroform	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
1,2-Dichloroethane	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
2-Butanone	ND20J	ND2R	ND40J	ND2	ND40	ND2R	ND40R	ND2R	ND100R	ND2J	ND20J	ND2J	ND20J
1,1,1-Trichloroethane	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Carbon Tetrachloride	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Vinyl Acetate	ND20	ND2	ND40	ND2	ND40	ND2R	ND40R	ND2R	ND100	ND2	ND20	ND2J	ND20J
Bromodichloromethane	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
1,2-Dichloropropane	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
cis-1,3-Dichloropropene	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Trichloroethene	370D	300	370D	340J	420D	290J	430D	270R	29DA	240J	320D	290J	210DJ
Dibromochloromethane	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
1,1,2-Trichloroethane	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Benzene	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Trans-1,3-Dichloropropene	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Bromoform	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
4-Methyl-2-Pentanone	ND20	ND2	ND40	ND2	ND40J	ND2	ND40	ND2	ND100	ND2	ND20	ND2J	ND20J
2-Hexanone	ND20	ND2J	ND40	ND2	ND40	ND2	ND40	ND2	ND100	ND2	ND20	ND2J	ND20J
Tetrachloroethene	ND10	ND1	ND20	1.2	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
1,1,2,2-Tetrachloroethane	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Toluene	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Chlorobenzene	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Ethylbenzene	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Styrene	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J
Total Xylenes	ND10	ND1	ND20	ND1	ND20	ND1	ND20	ND1	ND50	ND1	ND10	ND1J	ND10J

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.
A = assumed anomaly.

TABLE 14

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL EW1 (INFLUENT)

Parameter (µg/L)	*EW1 (Influent)*											
VOCs	*11/04/91*	*11/04/91*	*02/17/92*	*02/17/92*	*05/11/92*	*05/11/92*	*08/03/92*	*08/03/92*	*08/03/92*	*08/03/92*	*11/02/92*	*11/02/92*
	Dup	*Dup-Diluted*		*Diluted*		*Diluted*		*Diluted*	*Duplicate*	*Dup-Diluted*		*Diluted*
Chloromethane	ND2J	ND20J	ND2	ND10	ND2	ND10	ND2	ND10J	ND2	ND10J	0.9J	ND10
Bromomethane	ND2J	ND20J	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10
Vinyl Chloride	ND2J	ND20J	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10
Chloroethane	ND2J	ND20J	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10
Methylene Chloride	ND1J	17DU	ND1	ND5	ND1	5U	ND1	ND5	ND1	ND5	ND1	5U
Acetone	ND2J	ND20J	ND2	ND10	ND2J	15U	ND2J	ND10J	ND2J	ND10J	ND2UJ	ND10UJ
Carbon Disulfide	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1J	ND5J	ND1J	ND5J	ND1	ND5
1,1-Dichloroethene	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1J	ND5J	ND1J	ND5J	ND1	ND5
1,1-Dichloroethane	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
1,2-Dichloroethene (total)	9.9J	ND10J	7	5JD	10	60	4	4D	5	4D	5	6D
Chloroform	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
1,2-Dichloroethane	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
2-Butanone	ND2J	ND20J	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2UJ	ND10
1,1,1-Trichloroethane	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Carbon Tetrachloride	ND1J	ND10J	ND1J	ND5J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Vinyl Acetate	ND2J	ND20J	ND2	ND10	ND2J	ND10	ND2	ND10	ND2	ND10	ND2	ND10
Bromodichloromethane	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
1,2-Dichloropropane	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
cis-1,3-Dichloropropene	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Trichloroethene	340J	300DJ	240J	160D	210J	180D	150J	150D	160J	160D	160J	150D
Dibromochloromethane	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
1,1,2-Trichloroethane	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Benzene	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Trans-1,3-Dichloropropene	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5UJ
Bromoform	ND1J	ND10J	ND1	ND5	ND1J	ND5	ND1	ND5	ND1	ND5	ND1	ND5UJ
4-Methyl-2-Pentanone	ND2J	ND20J	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10
2-Hexanone	ND2J	ND20J	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10	ND2	ND10
Tetrachloroethene	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
1,1,2,2-Tetrachloroethane	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Toluene	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Chlorobenzene	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Ethylbenzene	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5
Styrene	ND1J	ND10J	ND1	ND5	ND1	ND5R	ND1	ND5	ND1	ND5	ND1	ND5
Total Xylenes	ND1J	ND10J	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5	ND1	ND5

<u>Notes:</u>

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 15

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL EW1 (EFFLUENT)

Parameter (µg/L)	*EW1 (Effluent)*												
VOCs	*11/14/90*	*11/16/90*	*11/19/90*	*11/23/90*	*11/27/90*	*11/27/90 Dup*	*11/29/90*	*12/04/90*	*12/06/90*	*12/11/90*	*12/11 90 Dup*	*12/17/90*	*12/17/90 Reanalysis*
Chloromethane	ND20	ND10J	ND30J	ND30J	ND20	ND20	ND20	ND20	ND20J	ND20	ND20	ND20	ND20J
Bromomethane	ND20	ND10	ND30	ND30	ND20	ND20	ND20	ND20	ND20	ND20	ND20	ND20	ND20J
Vinyl Chloride	ND20	ND10	ND30	ND30	ND20	ND20	ND20	ND20	ND20	ND20	ND20	ND20	ND20
Chloroethane	ND20	ND10	ND30	ND30	ND20	ND20	ND20	ND20	ND20	ND20	ND20	ND20	ND20
Methylene Chloride	10U	4U	ND15	ND15	4U	4U	ND10	24U	13U	4U	4U	3U	ND10
Acetone	ND20J	ND10J	ND30J	ND30J	ND20J	ND20J	ND20J	ND20J	ND20J	ND20J	ND20J	ND20J	ND20J
Carbon Disulfide	ND10	ND5	ND15	ND15J	ND10	ND10	ND10	ND10	ND10	4J	ND10	5J	ND10J
1,1-Dichloroethene	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
1,1-Dichloroethane	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	3J	ND10	ND10	ND10J	ND10
1,2-Dichloroethene (total)	99	75	72	71	60	65	60	64	62	62	49	58	50
Chloroform	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
1,2-Dichloroethane	ND10J	ND5	ND15	ND15	ND10R	ND10R	ND10R	ND10	ND10	ND10	ND10	ND10J	ND10J
2-Butanone	ND20	ND10	ND30	ND30	ND20	ND20	ND20	ND20J	ND20J	ND20J	ND20J	ND20J	ND20J
1,1,1-Trichloroethane	ND10	ND5	ND15	ND15	5J	6J	6J	6J	5J	3J	3J	3J	3J
Carbon Tetrachloride	ND10	ND5	ND15J	ND15J	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Vinyl Acetate	ND20	ND10	ND30	ND30	ND20	ND20	ND20	ND20	ND20	ND20	ND20	ND20J	ND20J
Bromodichloromethane	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
1,2-Dichloropropane	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
cis-1,3-Dichloropropene	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Trichloroethene	210	190	340	340J	250	260	250J	320	260	300	240	290	290
Dibromochloromethane	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
1,1,2-Trichloroethane	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Benzene	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Trans-1,3-Dichloropropene	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Bromoform	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
4-Methyl-2-Pentanone	ND20	ND10	ND30	ND30	ND20	ND20	ND20J	ND20	ND20	ND20	ND20	ND20J	ND20J
2-Hexanone	ND20	ND10	ND30	ND30	ND20	ND20	ND20J	ND20	ND20	ND20	ND20	ND20J	ND20J
Tetrachloroethene	ND10	3J	ND15	ND15	ND10J	ND10J	ND10	ND10	ND10	ND10	ND10	ND10	ND10
1,1,2,2-Tetrachloroethane	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Toluene	ND10J	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Chlorobenzene	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Ethylbenzene	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Styrene	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10
Total Xylenes	ND10	ND5	ND15	ND15	ND10	ND10	ND10	ND10	ND10	ND10	ND10	ND10J	ND10J

<u>Notes:</u>

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.

TABLE 15

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL EW1 (EFFLUENT)

Parameter (µg/L) VOCs	*EW1 (Effluent)*												
	01/08/90	*02/12/91*	*02/12/91 Diluted*	*02/12/91 Dup*	*02/12/91 Dup-Diluted*	*03/04/91*	*03/04/91 Diluted*	*04/03/91*	*04/03/91 Diluted*	*04/03/91 Duplicate*	*04/03/91 Dup-Diluted*	*05/06/91*	*05/06/91 Diluted*
Chloromethane	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2J	ND20
Bromomethane	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20
Vinyl Chloride	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20
Chloroethane	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20
Methylene Chloride	8U	ND1	ND10	ND1	18U	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Acetone	ND20J	ND2J	ND20J	ND2J	78J	ND2J	ND20J	4J	ND20J	ND1J	163UJ	ND2	ND20J
Carbon Disulfide	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
1,1-Dichloroethene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
1,1-Dichloroethane	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
1,2-Dichloroethene (total)	46	17J	18D	18J	19D	15J	16D	15	12D	15	14D	9.9	75DA
Chloroform	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
1,2-Dichloroethane	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
2-Butanone	ND20	ND2R	ND20R	ND2R	ND20R	ND2R	ND20J	ND2	ND20	ND2	ND20	ND2R	ND20R
1,1,1-Trichloroethane	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Carbon Tetrachloride	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Vinyl Acetate	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20J	ND2J	ND20J	ND2R	ND20R
Bromodichloromethane	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
1,2-Dichloropropane	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
cis-1,3-Dichloropropene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Trichloroethene	200J	250J	300D	230J	300D	220J	240D	250J	270D	280J	350D	200J	640DA
Dibromochloromethane	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
1,1,2-Trichloroethane	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Benzene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Trans-1,3-Dichloropropene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Bromoform	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
4-Methyl-2-Pentanone	ND20	ND2	ND20	ND2	ND20	ND2	ND20	ND2	ND20J	ND2J	ND20	ND2	ND20
2-Hexanone	ND20	ND2	ND20	ND2	ND20	ND2J	ND20J	ND2	ND20	ND2	ND20	ND2	ND20
Tetrachloroethene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
1,1,2,2-Tetrachloroethane	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Toluene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Chlorobenzene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Ethylbenzene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Styrene	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10
Total Xylenes	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10	ND1	ND10

<u>Notes:</u>

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.
A = assumed anomaly.

TABLE 15

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL EW1 (EFFLUENT)

Parameter (µg/L)	*EW1 (Effluent)*										
VOCs	*08/05/91*	*08/05/91 Re-Analysis*	*08/05/91 Diluted*	*08/05/91 Dup.*	*08/05/91 Dup-Diluted*	*11/04/91*	*11/04/91 Diluted*	*02/17/92*	*02/17/92 Diluted*	*02/17/92 Dup*	*02/17/92 Dup-Diluted*
Chloromethane	ND2J	ND2J	ND40	ND2	ND10	ND2J	ND20J	ND2	ND10	ND2	ND10
Bromomethane	ND2J	ND2J	ND40	ND2	ND10	ND2J	ND20J	ND2	ND10	ND2	ND10
Vinyl Chloride	ND2J	ND2J	ND40	ND2	ND10	ND2J	ND20J	ND2	ND10	ND2	ND10
Chloroethane	ND2J	ND2J	ND40	ND2	ND10	ND2J	ND20J	ND2	ND10	ND2	ND10
Methylene Chloride	ND1J	2J	ND20	ND1	ND5	ND1J	24DUJ	ND1	ND5	ND1	ND5
Acetone	ND2J	ND2J	ND40	ND2J	21UJ	ND2J	ND20J	ND2	ND10	ND2	ND10
Carbon Disulfide	ND1J	1.9J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
1,1-Dichloroethene	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
1,1-Dichloroethane	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
1,2-Dichloroethene (total)	11J	24JA	ND20	5.7	5.6D	7.9J	ND10J	5	3JD	5	ND5
Chloroform	ND1J	1.5J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
1,2-Dichloroethane	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
2-Butanone	ND2J	ND2J	ND40	ND2J	ND10J	ND2J	ND20J	ND2	ND10	ND2	ND10
1,1,1-Trichloroethane	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Carbon Tetrachloride	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1J	ND5J	ND1J	ND5J
Vinyl Acetate	ND2J	ND2J	ND40	ND2	ND10	ND2J	ND20J	ND2	ND10	ND2	ND10
Bromodichloromethane	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
1,2-Dichloropropane	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
cis-1,3-Dichloropropene	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Trichloroethene	330J	590JA	160D	160J	190D	210J	220DJ	140J	120D	130J	100D
Dibromochloromethane	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
1,1,2-Trichloroethane	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Benzene	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Trans-1,3-Dichloropropene	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Bromoform	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
4-Methyl-2-Pentanone	ND2J	ND2J	ND40	ND2	ND10	ND2J	ND20J	ND2	ND10	ND2	ND10
2-Hexanone	ND2J	ND2J	ND40	ND2	ND10	ND2J	ND20J	ND2	ND10	ND2	ND10
Tetrachloroethene	ND1J	1.1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
1,1,2,2-Tetrachloroethane	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Toluene	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Chlorobenzene	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Ethylbenzene	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Styrene	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5
Total Xylenes	ND1J	ND1J	ND20	ND1	ND5	ND1J	ND10J	ND1	ND5	ND1	ND5

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
R = data was rejected, analyte may or may not be present.
A = assumed anomaly.

TABLE 15

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS (VOCs)
WELL EW1 (EFFLUENT)

Parameter (µg/L) VOCs	*EW1 (Effluent)*									
	05/11/92	*05/11/92 Diluted*	*05/11/92 Duplicate*	*05/11/92 Dup-Diluted*	*08/03/92*	*08/03/92 Diluted*	*11/02/92*	*11/02/92 Duplicate*	*11/02/92 Diluted*	*11/02/92 Dup-Diluted*
Chloromethane	ND2	ND8	ND2	ND8	ND2	ND10J	0.9J	ND2	ND4	1JD
Bromomethane	ND2	ND8	ND2	ND8	ND2	ND10	ND2	ND2	ND4	ND4
Vinyl Chloride	ND2	ND8	ND2	ND8	ND2	ND10	ND2	ND2	ND4	ND4
Chloroethane	ND2	ND8	ND2	ND8	ND2	ND10	ND2	ND2	ND4	ND4
Methylene Chloride	ND1	ND4	ND1	4U	ND1	3DJ	ND1	ND1	2U	2U
Acetone	ND2J	11U	ND2J	9U	ND2J	ND10J	ND2UJ	ND2UJ	ND4UJ	ND4UJ
Carbon Disulfide	ND1	ND4	ND1	ND4	ND1J	ND5J	ND1	ND1	ND2	ND2
1,1-Dichloroethene	ND1	ND4	ND1	ND4	ND1J	ND5J	ND1	ND1	ND2	ND2
1,1-Dichloroethane	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
1,2-Dichloroethene (total)	8	4DJ	7	3JD	4	3DJ	3	3	3D	4D
Chloroform	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
1,2-Dichloroethane	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
2-Butanone	4	ND8	ND2	ND8	ND2	ND10	ND2UJ	ND2UJ	ND4	ND4
1,1,1-Trichloroethane	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Carbon Tetrachloride	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Vinyl Acetate	ND2J	ND8	ND2J	ND8	ND2	ND10	ND2	ND2	ND4	ND4
Bromodichloromethane	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
1,2-Dichloropropane	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
cis-1,3-Dichloropropene	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Trichloroethene	170J	110DJ	130J	83DJ	120J	110D	100E	110E	77D	110D
Dibromochloromethane	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
1,1,2-Trichloroethane	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Benzene	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Trans-1,3-Dichloropropene	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2UJ	ND2UJ
Bromoform	ND1J	ND4	ND1J	ND4	ND1	ND5	ND1	ND1	ND2UJ	ND2UJ
4-Methyl-2-Pentanone	ND2	ND8	ND2	ND8	ND2	ND10	ND2	ND2	ND4	ND4
2-Hexanone	ND2	ND8	ND2	ND8	ND2	ND10	ND2	ND2	ND4	ND4
Tetrachloroethene	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
1,1,2,2-Tetrachloroethane	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Toluene	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Chlorobenzene	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Ethylbenzene	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2
Styrene	ND1	ND4R	ND1	ND4R	ND1	ND5	ND1	ND1	ND2	ND2
Total Xylenes	ND1	ND4	ND1	ND4	ND1	ND5	ND1	ND1	ND2	ND2

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
D = secondary dilution was performed to obtain result.
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A = assumed anomaly.

TABLE 16

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
METALS

Parameter (µg/L)	*C4D*			*W52*			*W53A*			*W54*		
Metals	*12/03/90*	*03/04/91*	*02/18/92*	*12/04/90*	*03/04/91*	*02/18/92*	*12/03/90*	*03/04/91*	*02/17/92*	*12/03/90*	*03/04/91*	*02/17/92*
Aluminum	188U	ND72	1030	771J	ND72	ND81	ND38.5	264	120U	750	300	659
Antimony	28.2J	ND56	ND58	170J	ND56	ND58	41.9J	ND56	ND58	27.3J	ND56	ND58
Arsenic	ND3	ND1	ND3J	ND3J	ND1	ND3J	ND3	ND1	ND3J	ND3	ND1	ND3J
Barium	54.9J	13U	185U	641J	63U	ND35	114J	59U	62U	131J	ND32	53U
Beryllium	ND0.3	ND2	ND2	16.4J	ND2	ND2	ND0.3	ND2	ND2	ND0.3	ND2	ND2
Cadmium	3.8J	ND3	ND3	20.2J	5	15	ND1.7	ND3	ND3	ND1.7	8	ND3
Calcium	43000J	50200	60100	30400J	37700	28900	106000J	29700	17800	61100J	27700	33100
Chromium	ND1.7	ND7	ND7	61.6J	ND7	ND7	ND1.7	27	ND7	2.6J	ND7	7U
Cobalt	6.5J	ND15	ND10	157J	ND15	ND10	ND1.7	ND15	ND10	2.8J	ND15	ND10
Copper	178J	25	ND18	270J	19J	ND18	15.3UJ	51	ND18	27.4UJ	35	29
Iron	173	ND70	ND62	1380J	992	651	52U	3280	285	641	634	2320
Lead	ND1J	ND1	ND2J	34.7J	21.6	48.8J	ND1J	46.7	3.1J	3.6J	13.6	17.9J
Magnesium	11600	15400	24300	14500J	13700	10300	27900	10500	10100	24400	2570J	3980U
Manganese	431J	2430	6270	3480J	4220	3740	3.1J	39	16	226J	157	1160
Mercury	ND0.1	ND0.2UJ	ND0.2J	ND0.1	ND0.2UJ	ND0.2J	ND0.1	ND0.2UJ	ND0.2J	ND0.1	ND0.2UJ	ND0.2J
Nickel	18.8J	ND32	ND32	163J	ND32	ND32	ND10.7	ND32	ND32	ND10.7	ND32	ND32
Potassium	1430J	8340	18600	1430J	1390	ND1300	5910	9380	18500	11700	4080J	3890U
Selenium	ND3	9.8	ND4J	ND3J	2J	ND4J	ND3	3J	ND4J	4.4J	ND1	ND4J
Silver	ND8.4	ND11	ND10	18.5J	ND11	ND10	ND8.4	ND11	ND10	ND8.4	ND11	ND10
Sodium	12800J	21200	23300	15300J	12800	10800	61700J	12300	7640	16300J	9460	113000
Thallium	ND2	ND3R	ND3J	ND2	3.4R	ND3J	ND2	ND3R	ND3J	ND2	ND3R	ND3J
Vandium	ND2	ND19	ND20	149J	ND19	ND20	ND2	ND19	ND20	ND2	ND19	ND20
Zinc	158J	56U	167	16100J	16800	51500	356J	2490	453	1240J	1340	1860
Cyanide	ND10J	--	--	ND10J	--	--	ND10J	--	--	ND10J	--	--

Notes:

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
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R = data was rejected, analyte may or may not be present

TABLE 16

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
METALS

Parameter (µg/L)	*EW1 (Influent)*				*EW1 (Effluent)*			
Metals	***12/04/90***	***12/04/90 (Dup)***	***03/04/91***	***02/17/92***	***12/04/90***	***03/04/91***	***02/17/92***	***02/17/92 (Dup)***
Aluminum	ND38.5	ND38.5	ND72	114U	66.3U	ND72	115U	128U
Antimony	19.1J	13J	ND56	ND58	18.5J	ND56	ND58	ND58
Arsenic	ND3	ND3	ND1	ND3J	ND3	ND1	ND3J	ND3J
Barium	59.4J	35.1J	46U	35U	57.6J	44U	35U	36U
Beryllium	ND0.3	ND0.3	ND2	ND2	ND0.3	ND2	ND2	ND2
Cadmium	ND1.7	ND1.7	ND3	ND3	3.1J	ND3	ND3	ND3
Calcium	32400J	18700J	27400	21000	30600J	26600	20900	20700
Chromium	ND1.7	ND1.7	ND7	ND7	ND1.7	ND7	ND7	ND7
Cobalt	4.2J	2.7J	ND15	ND10	7.2J	ND15	ND10	ND10
Copper	54.4J	63.6J	24J	42	176J	21J	ND18	ND18
Iron	1290	1050	1450	1820	1100	1330	1240	1260
Lead	38.9J	ND1J	2J	6.7J	ND1J	ND1	ND2J	ND2J
Magnesium	10700J	6150J	7750	5550	10200	7430J	5540	5610
Manganese	373J	219J	471	290	357J	455	291	291
Mercury	ND0.1	0.11J	ND0.2UJ	ND0.4J	ND0.1	ND0.2UJ	ND0.2J	0.46J
Nickel	ND10.7	ND10.7	ND32	ND32	14.5J	ND32	ND32	ND32
Potassium	ND970	2190J	1390	1810U	2170J	ND1390	ND1300	1830U
Selenium	ND3	ND3	ND1	ND4J	ND3	ND1	ND4J	ND4J
Silver	ND8.4	ND8.4	ND11	ND10	ND8.4	ND11	ND10	ND10
Sodium	21300J	12000J	15900	11600	19800J	15900	12400	12300
Thallium	ND2	ND2	ND3R	ND3J	ND2	ND3R	ND3J	ND3J
Vandium	ND2	ND2	ND19	ND20	ND2	ND19	ND20	ND20
Zinc	90.8J	90.6J	119U	223	56.3J	55U	56	58
Cyanide	ND10J	ND10J	–	–	ND10J	–	–	–

<u>Notes:</u>

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
R = data was rejected, analyte may or may not be present

TABLE 17

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
PESTICIDES AND PCBs

Parameter (µg/L)	*C4D*	*W52*	*W53A*	*W54*	*EW1 (Influent)*		*EW1 (Effluent)*
Pesticides	*12/03/90*	*12/04/90*	*12/03/90*	*12/03/90*	*12/04/90*	*12/04/90 (Dup)*	*12/04/90*
alpha-BHC	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
beta-BHC	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
delta-BHC	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
gamma-BHC	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
Heptachlor	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
Aldrin	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
Heptachlor epoxide	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
Endosulfan I	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
Dieldrin	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025	ND0.025
4,4'-DDE	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05
Endrin	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05
Endosolfan II	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05
4,4'-DDD	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05
Endosulfan Sulfate	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05
4,4'-DDT	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05
Methoxychlor	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25
Endrin ketone	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05	ND0.05
alpha-Chlordane	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25
gamma-chlordane	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25
Toxaphene	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
PCBs							
Aroclor-1016	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25
Aroclor-1221	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25
Aroclor-1232	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25
Aroclor-1242	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25
Aroclor-1248	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25	ND0.25
Aroclor-1254	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
Aroclor-1260	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50

Notes:

NDx = not detected at quantitation limit x.

TABLE 18

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
BNAs

Parameter (µg/L)	*C4D*		*W52*		*W53A*	*W54*	*EW1 (Influent)*			*EW1 (Effluent)*
BNAs	*12/03/90*	*12/03/90*	*12/04/90*	*12/04/90*	*12/03/90*	*12/03/90*	*12/04/90*	*12/04/90*	*12/04/90*	*12/04/90*
		Reanalysis		*Reanalysis*				*Reanalysis*	*Dup*	
3-Nitroaniline	ND50	ND50J	ND50	ND50J	ND50	ND50	ND50	ND50J	ND50	ND50
Acenaphthene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
2,4-Dinitrophenol	ND50	ND50J	ND50R	ND50R	ND50	ND50	ND50R	ND50J	ND50	ND50
4-Nitrophenol	ND50J	ND50J	ND50R	ND50R	ND50J	ND50J	ND50R	ND50J	ND50J	ND50J
Dibenzofuran	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
2,4-Dinitrotoluene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Diethylphthalate	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
4-Chlorophenyl-phenylether	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Fluorene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
4-Nitroaniline	ND50	ND50J	ND50	ND50J	ND50	ND50	ND50	ND50J	ND50	ND50
4,6-Dinitro-2-Methylphenol	ND50	ND50J	ND50R	ND50R	ND50	ND50	ND50R	ND50J	ND50	ND50
N-Nitrosodiphenylamine (1)	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
4-Bromophenyl-phenylether	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Hexachlorobenzene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Pentachlorophenol	ND50	ND50J	ND50R	ND50R	ND50	ND50	ND50R	ND50J	ND50	ND50
Phenanthrene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Anthracene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Di-n-Butylphthalate	ND10	ND10J	0.3J	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Fluoranthene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Pyrene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Butylbenzylphalate	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
3,3'-Dichlorobenzidine	ND20	ND20J	ND20	ND20J	ND20	ND20	ND20	ND20J	ND20	ND20
Benzo(a)Anthracene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Chrysene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Bis(2-ethylhexyl)phthalate	4J	1UJ	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Di-n-Octyl Phthalate	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Benzo(b)Fluoranthene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Benzo(k)Fluoranthene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Benzo(a)Pyrene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Indeno(1,2,3-cd)Pyrene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Dibenz(a,h) Anthracene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Benzo(g,h,i)Perylene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10

<u>Notes:</u>

NDx = not detected at quantitation limit x.
U = the analyte was detected but was attributed to laboratory contamination.
J = the associated numerical value is an estimated quantity.
R = data was rejected, analyte may or may not be present.

TABLE 18

GROUNDWATER SAMPLE ANALYTICAL DATA SUMMARY
BNAs

Parameter (µg/L)	*C4D*		*W52*		*W53A*	*W54*	*EW1 (Influent)*			*EW1 (Effluent)*
BNAs	*12/03/90*	*12/03/90 Reanalysis*	*12/04/90*	*12/04/90 Reanalysis*	*12/03/90*	*12/03/90*	*12/04/90*	*12/04/90 Reanalysis*	*12/04/90 Dup*	*12/04/90*
Phenol	ND10	ND10J	ND10R	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
bis(2-Chloroethyl)Ether	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
2-Chlorophenol	ND10	ND10J	ND10R	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
1,3-Dichlorobenzene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
1,4-Dichlorobenzene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Benzyl Alcohol	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
1,2-Dichlorobenzene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
2-Methylphenol	ND10	ND10J	ND10	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
bis(2-Chloroisopropyl) Ether	ND10J	ND10R	ND10	ND10J	ND10J	ND10J	ND10J	ND10J	ND10J	ND10J
4-Methylphenol	ND10	ND10J	ND10R	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
N-Nitroso-Di-n-Propylamine	ND10	ND10J	ND10J	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Hexachloroethane	ND10	ND10J	ND10R	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Nitrobenzene	ND10	ND10R	ND10	ND10R	ND10	ND10	ND10	ND10R	ND10	ND10
Isophorone	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
2-Nitrophenol	ND10	ND10J	ND10R	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
2,4-Dimethylphenol	ND10	ND10J	ND10R	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
Benzoic Acid	ND50R	ND50J	ND50R	ND50R	ND50R	ND50R	ND50R	ND50J	ND50R	ND50R
bis(2-Chloroethoxy)Methane	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
2,4-Dichlorophenol	ND10	ND10J	ND10R	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
1,2,4-Trichlorobenzene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Naphthalene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
4-Chloroaniline	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Hexachlorobutadiene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
4-Chloro-3-Methylphenol	ND10	ND10J	ND10R	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
2-Methylnaapthalene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Hexachlorocyclopentadiene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
2,4,6-Trichlorophenol	ND10	ND10J	ND10R	ND10R	ND10	ND10	ND10R	ND10J	ND10	ND10
2,4,5-Trichlorophenol	ND50	ND50J	ND50R	ND50R	ND50	ND50	ND50R	ND50J	ND50	ND50
2-Chloronaphthalene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10J	ND10J	ND10	ND10
2-Nitroaniline	ND50	ND50J	ND50	ND50J	ND50	ND50	ND50	ND50J	ND50	ND50
Dimethyl Phthalate	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10
Acenaphthylene	ND10J	ND10J	ND10J	ND10J	ND10J	ND10J	ND10J	ND10J	ND10J	ND10J
2,6-Dinitrotoluene	ND10	ND10J	ND10	ND10J	ND10	ND10	ND10	ND10J	ND10	ND10

<u>Notes:</u>

NDx = not detected at quantitation limit x.
J = the associated numerical value is an estimated quantity.
R = data was rejected, analyte may or may not be present.

APPENDIX A

DATA QUALITY ASSESSMENT AND VALIDATION FOR GROUNDWATER SAMPLES

MEMORANDUM

TO: Ed Roberts
REFERENCE NO. 2115

FROM: David Dempsey
DATE: February 26, 1991

RE: Data Quality Assessment and Validation for Sixty-Three Groundwater Samples Collected during the November 1990 Sampling Events at the Wausau, Wisconsin, Site

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The following details a data quality assessment and validation for 63 groundwater samples collected November 13 through November 29, 1990, at the Wausau, Wisconsin, site. All samples were analyzed for target compound list volatile organic compounds (TCL VOC) by the Radian Corporation-Sacramento.[1] Quality assurance criteria are defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

The holding time period for VOC samples is defined in the QAPP and requires samples to be analyzed within 14 days from sample collection. Examining the analysis dates showed samples were analyzed within the allotted time frame.

Instrument Performance

Prior to analyzing samples, the gas chromatograph/mass spectrometer (GC/MS) performance was checked using 4-bromofluorobenzene. Relative peak intensities for selected ions were within limits specified in the QAPP. Therefore, the GC/MS was in proper working condition prior to sample analysis.

Initial Calibration Data

The initial calibration data were used to judge analyte response versus concentration. For system performance check compounds, the minimum response factor allowed is 0.300 (0.150 for bromoform).[3] All remaining analytes are required to have response factors greater than 0.050. Percent relative standard deviations for all analytes are required to be less than 30. Table 1 lists the outlying initial calibration data.

The 1,1,2,2-tetrachloroethane mean response factor on November 29 was below the limit of 0.300 (1,1,2,2-tetrachloroethane is a system performance check compound). Discussion with Radian technical advisor Marilyn Melton revealed 1,1,2,2-tetrachloroethane does not usually meet the 0.300 limit when using a 25 m*l* purge volume. I was told David Payne (USEPA) has reviewed previous Radian data and found this violation to have no impact on the data. A copy of a letter confirming this is presented as Attachment A.

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[1] The analytical method was the Contract Laboratory Program-Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988.

[3] This criterion is from the low level detection VOC CLP-SOW 1990 and has been extrapolated to these data as the CLP-SOW 1988 does not specify calibration criteria using a 25 m*l* purge volume.

Typographical errors were found for the butanone initial calibration data from November 23, 1990 and November 29, 1990. The mean response factors for butanone were reported to be 0.082 and 0.039, respectively; however, recalculating gives mean response factors of 0.103 and 0.065, respectively.

Only the acetone data from all samples were qualified as estimated (J or UJ). Thus, the GC/MS were properly calibrated prior to sample analysis.

Continuing Calibration Data

Continuing calibration data were used to assess analyte response versus concentration on a daily basis. For system performance check compounds, daily response factors are required to be greater than 0.300 (0.150 for bromoform). All remaining analytes are required to have daily response factors greater than 0.05. Percent differences between mean response factors and daily response factors for all analytes must be less than 25. Table 2 lists the outlying continuing calibration data.

Again, 1,1,2,2-tetrachloroethane had response factors below 0.300 and no action upon the data was necessary. Analytes with response factors below 0.05 had data qualified as estimated (J) if detected and unusable (R) if not detected. Analytes with percent differences greater than 25 had data from associated samples qualified as estimated (J or UJ).

Method Blank Samples

Extent of lab contamination of samples was measured using method blank samples. Table 3 summarizes the analytes detected in method blank samples. Note that only methylene chloride was detected often and had data qualified from associated samples as non-detect (U).

As a low level detection method was used, the lab stated acetone and methylene chloride in the range of 10 $\mu g/l$ or less should be considered a lab artifact even if the associated method blank sample is clean. This criterion is applied to the actual result; therefore, dilutions were not taken into consideration. Table 4 lists the methylene chloride data, which were qualified as non-detect (U). Sample W-111690-MB-030 acetone datum was also qualified as non-detect (U).

Surrogate Compounds Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was judged using surrogate recoveries. Control limits are set in the QAPP. All percent recoveries were within these limits.

The d_8-toluene recoveries were calculated using 1,4-difluorobenzene as the internal standard, rather than d_5-chlorobenzene. As d_8-toluene elutes nearly midway between these two internal standards, either may be used to calculate d_8-toluene recoveries. Thus, the method was in control during each sample analysis.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

Matrix efficacy with respect to analytical data was checked using MS/MSD analyses. Samples W-111490-MB-005, W-111490-RRR-012, W-111490-RRR-018, W-111590-RRR-023, PW-112390-RRR-004, PW-111990-RRR-002 and W-112990-RRR-008 underwent MS/MSD analyses.

The trichloroethene MS/MSD recoveries from sample W-111590-RRR-023 were 0 and -40; therefore, this datum was qualified as estimated (J). Sample PW-112390-RRR-004 had trichloroethene data qualified as estimated (J) as the MS/MSD recoveries were 66 and 54.

Samples W-111490-MB-005 and W-111490-RRR-012 had typographical errors in the MS/MSD data. The benzene MSD recovery from sample W-111490-RRR-012 was recalculated to be 72 and the relative percent difference for toluene was 30, not 40. The toluene datum was qualified as estimated (J), while no action was taken on the benzene datum. For sample W-111490-MB-005, all reported MS/MSD recoveries were miscalculated. Table 5 lists the correct recoveries. Trichloroethene datum from this sample was qualified as estimated (UJ).

Overall, no significant matrix effects were observed.

Internal Standard Summaries

Overall instrument performance was monitored using internal standard peak area and retention times. Peak areas are required to match within +100 percent and -50 percent the daily calibration sample internal standard peak areas. Retention time must match within 0.5 minutes. Examining the data showed both criteria were met. Therefore, the GC/MSs were in proper working order during each analysis.

Trip Blank Samples

Trip blank samples were used to monitor the extent of cross contamination of samples during shipment to Radian. Two such sample were sent from Radian, TB11/14 and TB11/16. Both sample contained methylene chloride; however, both results were qualified as non-detect (U).

No trip blank samples were sent with samples from November 19, 23, 26, 27 and 29.

Rinsate Samples

Rinsate samples were originally part of the field quality assurance plan. However, a switch to dedicated bailer made rinsate sampling unnecessary.

Prior to inserting bailers into wells, a rinsate sample should have been taken to insure the bailers were clean. This was not done. As the data have been consistent over the first month of sampling, the bailers apparently have had no effect upon the data.

Field Duplicate Samples

Overall precision for these sampling events was measured using field duplicate samples. A total of seven sets of field duplicate samples was collected. Table 6 lists the field duplicate sample sets. Note that not every sampling event, namely, November 19 and 23, contains a field duplicate sample as is required in the QAPP. No action upon the data was necessary despite this.

Agreement between field duplicate samples was acceptable; thereby indicating the overall sampling program was precise.

Overall Assessment

Overall the data were found to be accurate and precise. Exceptions have been discussed and documented in the above sections. These qualified data may be used for qualitative assessment purposes, except where the data have been rejected.

cc: Bruce Clegg

TABLE 1

OUTLYING INITIAL CALIBRATION DATA ASSOCIATED WITH THE NOVEMBER 1990 SAMPLING EVENTS AT THE WAUSAU, WISCONSIN SITE

Date	Analyte	RRF[1]	%RSD[2]	Qualifier[3]
11/23/90	Butanone[4]	0.082	16.0	NR
	Acetone	0.505	43.9	J/UJ
11/29/90	Butanone[4]	0.039	16.0	NR
	Acetone	0.244	40.0	J/UJ
	1,1,2,2-tetrachloroethane	0.260	8.1	NR

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[1] RRF = Mean Relative Response Factor
[2] %RSD = Percent Relative Standard Deviation
[3] Analyte reslts was qualified as:
J = The associated value is an estimated quantity, for detected analytes.
UJ = The analyte was checked for, but not detected. The associated value is an estimate.
NR = No additional qualifiers were required.
[4] RRF values were miscalculated. For 11/23/90, RRF = 0.103 and for 11/29/90 RRF = 0.065.

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA ASSOCIATED WITH NOVEMBER 1990 SAMPLING EVENTS AT THE WAUSAU, WISCONSIN, SITE

Date/Time	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
11/25, 09:13	Acetone Butanone 2-hexanone	0.727 0.073 0.187	44.0 29.1 31.8	NR J/UJ J/UJ	W-111490-CH-009; W-111390-MB-001; W-111490-MB-003; W-111490-CH-004; W-111490-CH-006
11/26, 08:41	Butanone	0.069	33	J/UJ	W-111490-RRR-007; W-111490-JM-008; W-111490-RRR-010; W-111490-RRR-012 through W-111490-RRR-018
11/27, 07:52	Acetone Butanone 4-methyl-2-pentanone 2-hexanone	0.306 0.061 0.147 0.163	39.4 40.8 33.8 40.5	NR J/UJ J/UJ J/UJ	W-111390-RRR-002; W-111490-RRR-011; W-111490-RRR-012 MS/MSD; W-111490-RRR-018 MS/MSD; W-111590-JM-019; W-111590-RRR-021; W-111590-RRR-023; W-111590-RRR-024; W-111590-RRR-027
11/29, 08:38	Butanone	0.131	27.2	J/UJ	W-111590-RRR-020; W-111590-RRR-022; W-111590-RRR-025; W-111590-RRR-026; W-111590-RRR-023 MS/MSD; W-111690-RRR-028; W-111690-RRR-034
11/30, 08:51	Chloromethane	1.886	27.6	J/UJ	W-111690-MB-029; W-111690-MB-030; W-111690-MB-031; W-111690-MB-032; W-111690-MB-033; W-111690-MB-035
11/30, 09:22	Chloromethane Vinyl Acetate Bromoform 1,1,2,2-tetrachloroethane	1.953 0.058 0.144 0.233	26.9 83.5 6.5 13.1	J/UJ J/UJ NR NR	PW-111990-RRR-01; PW-111990-RRR-02; Starsample 11/19; Starsample 11/23

TABLE 2 (CONT'D)

OUTLYING CONTINUING CALIBRATION DATA ASSOCIATED WITH NOVEMBER 1990 SAMPLING EVENTS AT THE WAUSAU, WISCONSIN, SITE

Date/Time	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
12/3, 10:59	1,1,2,2-tetrachloroethane	0.287	7.1	NR	PW-112390-RRR-003;
	Chloromethane	1.108	28	J/UJ	PW-112390-RRR-004
	Carbon Disulfide	4.707	34	J/UJ	
	Vinyl Acetate	0.058	83.5	J/UJ	
	2-hexanone	0.177	25.3	NR	
12/4, 11:52	Chloromethane	1.087	29.4	J/UJ	W-112690-JM-036;
	Carbon Disulfide	4.881	31.5	J/UJ	W-112690-JM-038;
					W-112690-JM-039;
					W-112690-JM-041
12/5, 11:43	1,1,2,2-tetrachloroethane	0.224	16.4	NR	W-112690-JM-037;
	Acetone	0.134	45.1	NR	W-112690-JM-042;
	Carbon Disulfide	5.255	26.3	J/UJ	W-112690-JM-044;
	Vinyl Acetate	0.186	17.2	J/UJ	W-112790-JM-045;
	2-hexanone	0.125	47.3	J/UJ	W-112790-JM-046;
					W-112790-JM-049
12/6, 08:31	Acetone	0.157	35.7	NR	W-112790-JM-005;
	Butanone	0.049	24.6	J/R	W-112790-JM-005 MS/MSD;
	4-methyl-2-pentanone	0.091	25.4	NR	W-112790-JM-006;
	Tetrachloroethene	0.520	31.7	J/UJ	W-112790-JM-007;
					Starsample 11/27
12/7, 10:27	Butanone	0.016	75.4	J/R	W-112990-008;
	1,1,2,2-tetrachloroethane	0.239	10.8	NR	W-112990-009;
	Acetone	0.152	37.7	NR	W-112990-010;
	Trichloroethene	0.548	28.9	J/UJ	Starsample 11/29
	4-methyl-2-pentanone	0.091	25.4	J/UJ	
	2-hexanone	0.111	53.2	J/UJ	
	d_4-1,2-dichloroethane[4]	0.727	30.2	J/UJ	

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[1] RRF = Daily Relative Response Factor

[2] %D = Percent Difference

[3] Analyte data from associated samples were qualified as:

J = The associated value is an estimated quantity, for detected analytes.
UJ = The analyte was checked for, but not detected. The associated value is an estimate.
R = The data are unusable, for non-detected analytes.
NR = No additional qualifiers were necessary.

[4] Surrogate Compound

TABLE 3

ANALYTES DETECTED IN METHOD BLANK SAMPLES ASSOCIATED WITH THE NOVEMBER 1990 SAMPLING EVENTS AT THE WAUSAU, WISCONSIN, SITE

Blank ID	Analyte	Concentration (µg/*l*)	Associated Samples[1]
VBLK3-11/26	Methylene Chloride	0.6 J[2]	TB11/14; W-111490-RRR-007; W-111490-JM-008; W-111490-RRR-010; W-111490-RRR-012; W-111490-RRR-013
VBLK2-11/29	Methylene Chloride	0.5 J	W-111590-RRR-020; W-111590-RRR-022; W-111590-RRR-025; W-111590-RRR-026; W-111690-RRR-028; W-111690-MB-034;
VBLK3-11/29	Methylene Chloride	0.9 J	TB11/18; W-111690-MB-029; W-111690-MB-030; W-111690-MB-031; W-111690-MB-032; W-111690-MB-033; W-111690-MB-035
VBLK1-11/30	Styrene	0.4 J	
	Xylenes	0.2 J	
VBLK1-12/4	Methylene Chloride	0.8 J	W-112690-JM-038; W-112690-JM-039
VBLK3-12/7	Styrene	0.2 J	
VBLK4-12/11	Methylene Chloride	0.6 J	
	2-hexanone	1 J	
	Acetone	2 J	

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[1] Analyte data from associated samples were qualified as non-detect (U).

[2] The associated value is an estimate.

TABLE 4

ADDITIONAL METHYLENE CHLORIDE DATA QUALIFIED AS NON-DETECT NOVEMBER 1990 SAMPLING EVENTS AT THE WAUSAU, WISCONSIN, SITE

Sample ID[1]
W-111490-JM-005
W-111490-CH-004
W-111390-RRR-002
W-111490-MB-006
W-111490-MB-003
W-111590-RRR-023
W-111590-JM-027
W-111590-RRR-024
W-111590-RRR-021
W-111590-JM-019
W-112690-JM-044
W-112690-JM-042
W-112790-JM-049
W-112790-JM-045
W-112790-JM-046
W-112790-JM-006
W-112790-JM-007

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[1] Methylene chloride data for these samples were qualified as non-detect (U).

TABLE 5

CORRECTED MS/MSD RECOVERIES FOR SAMPLE W-111490-MB-005 COLLECTED DURING THE NOVEMBER 1990 SAMPLING EVENTS AT THE WAUSAU, WISCONSIN, SITE

Analyte	Percent Recoveries		Limits[1]	Qualifier[2]
	MS	MSD		
1,1-dichloroethene	162	144	61-145	NR
Trichloroethene	182	125	71-120	J
Benzene	129	130	76-127	NR
Toluene	129	125	76-125	NR
Chlorobenzene	124	121	75-130	NR

---

[1] Limits are specified in the QAPP.

[2] Analyte datum for sample W-111490-MB-005 was qualified as:

J - The associated value is an estimated quantity.

NR - No additional qualifiers were required.

TABLE 6

LIST OF FIELD DUPLICATE SAMPLE SETS COLLECTED DURING THE NOVEMBER 1990 SAMPLING EVENTS AT THE WAUSAU, WISCONSIN, SITE

Sample IDs
W-111490-RRR-015/W-111490-RRR-016
W-111490-RRR-017/W-111490-RRR-018
W-111590-JM-025/W-111590-JM-026
W-112690-JM-037/W-112690-JM-038
W-111590-RRR-021/W-111590-RRR-022
W-111490-RRR-010/W-111490-RRR-011
W-112990-RRR-009/W-112990-RRR-010
W-112790-JM-006/W-112790-JM-007

ATTACHMENT A

RADIAN
CORPORATION

8501 Mo-Pac Blvd.
P.O. Box 201088
Austin, TX 78720-1088
(512)454-4797

19 February 1991

Rec CRA

FEB 25 91

Mr. David Dempsey
Conestoga-Rovers & Associates
382 West County Road D
St. Paul, MN 55112

Dear Dave:

You had raised a question about the Rf value of 1,1,2,2-tetrachloroethane in some 8240 work the Sacramento laboratory did for CRA. CLP requires that the Rf for this compound be 0.3 or greater for a 5 mL purge. CRA asked us to run a 25 mL purge, which is less efficient than a 5 mL purge. While all other analytes met the required criteria, this compound did not.

To obtain this Rf with a 25 mL purge, conditions were required which caused other analytes to perform badly. When these results were discussed with David Paine from EPA Region V, he sanctioned the use of the lower Rf for tetrachloroethane.

If you should have any further questions regarding this matter, please feel free to call me.

Sincerely,

Marilyn

Marilyn A. Melton, Ph.D.

mam/dg

cc: Robert Richardson
Wanda Brown

MEMORANDUM

TO: [redacted]

REFERENCE NO. 2115

FROM: David Dempsey

DATE: March 3, 1991

RE: Data Quality Assessment and Validation for Thirty Eight Groundwater Samples Collected during the December 1990 Sampling Events at the Wausau, Wisconsin, Site

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The following details a data quality assessment and validation for 38 groundwater samples collected December 3 through December 17, 1990, at the Wausau, Wisconsin, site. All samples were analyzed for target compound list volatile organic compounds (TCL VOC), while six samples were also analyzed for TCL base-neutral/acid extractable organic compounds (BN/A), TCL pesticides/polychlorinated biphenyls (PEST/PCB), target analyte list (TAL) metals and cyanide. All analyses were performed by the Radian Corporation-Sacramento.[1] Quality assurance/quality control criteria are defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Periods

Holding time periods are defined in the QAPP and are summarized below:

VOC - 14 days from sample collection to completion of analysis

BN/A - 7 days from sample collection to extraction
- 40 days from extraction to completion of analysis

PEST/PCB - 7 days from sample collection to extraction
- 40 days from extraction to completion of analysis

metals - 6 months from sample collection to completion of analysis, except for mercury
- 28 days from sample collection to completion of mercury analysis

cyanide - 14 days from sample collection to completion of analysis

Samples W-120390-MB-042, W-120490-MB-045 and W-120490-MB-048 were reanalyzed for BN/A. These samples were re-extracted 55 and 54 days, respectively, from dates of sample collection; therefore, the reanalyses data were qualified as estimated (UJ).

All remaining analyses were completed within the prescribed holding time periods.

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[1] The analytical methods were the Contract Laboratory Program-Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance/quality control criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988 and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses", July 1, 1988.

Instrument Performance

Prior to VOC and BN/A analyses, the gas chromatograph/mass spectrometer (GC/MS) performance was checked using 4-bromofluorobenzene and decafluorotriphenylphosphine, respectively. Selected ion peak relative intensities were within limits specified in the QAPP. Therefore, the GC/MSs were in proper working condition prior to sample analysis.

Prior to PEST/PCB analyses, the gas chromatograph performance was checked using 4,4'-DDT retention times, endrin/4,4'-DDT breakdown percentages and dibutylchlorendate retention times. All criteria were met for both qualitative and quantitative columns.

Initial Calibration Data

The initial calibration data were used to judge analyte response versus concentration. For system performance check compounds, the minimum response factor allowed is 0.300 (0.100 for bromoform[3]) and 0.050 for VOC and BN/A analyses, respectively. All remaining analytes are required to have response factors greater than 0.050. Percent relative standard deviations (%RSD) for all analytes are required to be less than 30. Table 1 lists the outlying initial calibration data. Acetone and butanone data for all samples were qualified as estimated (J or UJ) as a result. Other analyte data were qualified as estimated (J or UJ) or unusable (R) for samples listed in Table 1.

The initial calibration curve for PEST/PCB analyses consists of three standards. The %RSD for aldrin, endrin, dibutylchlorendate and 4,4'-DDT are required to be less than ten. Calibration data for qualitative and quantitative columns met this criterion. Therefore, the gas chromatograph was properly calibrated prior to sample analyses.

Initial calibration curves for metals consisted of a minimum of two points. Metals analyzed by atomic absorption and cyanide required curves with minimum of four points. Five points were used in determining the mercury calibration curve. Linear regression calculations were performed and the correlation factors were greater than 0.995. Thus, these methods were properly calibrated.

Continuing Calibration Data

Continuing calibration data were used to assess analyte response versus concentration on a daily basis. For system performance check compounds, daily response factors are required to be greater than 0.300 (0.100 for bromoform) and 0.050 for VOC and BN/A analyses, respectively. All remaining analytes are required to have daily response factors greater than 0.050. Percent differences between mean response factors and daily response factors for all analytes must be less than 25. Table 2 lists the outlying continuing calibration data. These data were qualified as estimated (J or UJ).

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[3] This criterion is from the low level detection VOC CLP-SOW 1990 (draft). As the VOC CLP-SOW 1988 does not allow for a 25 *ml* sample purge volume, the criterion has been extrapolated to these data.

Calibration factors for PEST/PCB analyses were required to be within 15 percent for the quantitative column and 20 percent for the qualitative column with respect to initial calibration factors. As both criteria were met, the gas chromatograph was properly calibrated throughout the PEST/PCB analyses.

Calibration standards were analyzed to check the metals and cyanide calibrations. Due to the sample case, no calibration standard analyses were required.

Method Blank Samples

Extent of lab contamination of samples was measured using method blank samples. Table 3 summarizes the analytes detected in method blank samples. Analyte data listed in Table 3 were attributed to lab contamination and were qualified as non-detect (U) for associated samples.

As a low level detection method was used, the lab stated acetone and methylene chloride in the range of 10 μg/*l* or less should be considered a lab artifact even if the associated method blank sample is clean. This criterion is applied to the actual result; therefore, dilutions are <u>not</u> taken into consideration. Table 4 lists the methylene chloride data below 10 μg/*l* and were qualified as non-detect (U).

ICP Interference Check Samples

The ICP method is shown to be free of interelemental interferences using a check sample. Percent recoveries were within required limits. Thus, no significant interelemental interferences are suspected.

Laboratory Control Sample

Accuracy of metals and cyanide methods was demonstrated using control samples. Percent recoveries were within specified limits. Thus, these methods were accurate at time of samples analyses.

Surrogate Compounds Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC, BN/A and PEST/PCB analyses was judged using surrogate recoveries. Control limits are set in the QAPP. Table 5 lists outlying surrogate recoveries for VOC and BN/A analyses. No action upon the VOC data was necessary, as the surrogate compound d_4-1,2-dichloroethane data were qualified as estimated based upon calibration data.

The d_8-toluene recoveries were calculated using 1,4-difluorobenzene as the internal standard, rather than d_5-chlorobenzene. As d_8-toluene elutes nearly midway between these two internal standards, either may be used to calculate d_8-toluene recoveries.

The acid fraction data of samples listed in Table 5 were qualified as estimated (J) or unusable (R) as the outlying surrogate recoveries were below ten. The base-neutral fraction data were not qualified based upon the surrogate recoveries.

All dibutylchlorendate recoveries were in required limits. Thus, the PEST/PCB method was in control for all analyses.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

Matrix efficacy with respect to analytical data was checked using MS/MSD analyses. Samples W-120490-MB-045, PW-121790-JM-014DL[4], W-120690-MH-011, W-121090-RR-057, W-120490-MB-043 and W-120390-MB-042RE[5] underwent MS/MSD analyses. Table 6 lists the outlying MS/MSD recoveries.

The metals matrix spike analyses were performed upon sample W-120490-MB-045. The majority of metals had recoveries below the control window. As a result, these data were qualified as estimated (J or UJ). As the spikes added were less than one-fourth the amount of manganese or zinc detected, no qualifier was required for the manganese or zinc data although these recoveries were out of control limits. Due to the excessive amounts of calcium and magnesium detected in this sample no matrix spike recoveries could be calculated. Therefore, these results were qualified as estimated (J).

Samples PW-121790-JM-014DL, W-120690-MH-011, W-120390-MB-043 and W-121090-RR-057 underwent MS/MSD analyses for VOC. Although trichloroethene and toluene recoveries from sample PW-121790-JM-014DL were out of specified limits, no action upon the data was taken. However, the trichloroethene data from samples W-120690-MH-011 and W-120390-MB-043 were qualified as estimated (J), while 1,1-dichloroethene, trichloroethene and benzene data from sample W-121090-RR-057 were qualified as estimated (J or UJ).

The BN/A MS/MSD recoveries from sample W-120390-MB-042RE were qualified as estimated (J) as this sample was analyzed out of the holding time period. Therefore, these recoveries could not be used to quantitate matrix effects. However, reviewing the data showed no major matrix effects.

No MS/MSD analyses were performed upon PEST/PCB analytes. Also, no matrix spike data for cyanide were reported.

Duplicate Analyses

Precision for metals and cyanide methods was measured using duplicate analyses upon sample W-120390-MB-042. Table 7 summarizes the duplicate analyses results. All zinc data were qualified as estimated (J or UJ) based upon low analytical precision. Precisions for remaining analytes, excluding cyanide, were acceptable.

No duplicate analysis for cyanide was reported. Coupled with a lack of matrix spike data, all cyanide results were qualified as estimated (UJ).

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[4] The suffix 'DL' denotes sample was reanalyzed after being diluted.
[5] The suffix 'RE' denotes sample was reanalyzed.

ICP Dilution Recoveries

Matrix effects with respect to ICP data were also checked for using a five-fold dilution of sample W-120390-MB-045. Agreement between five times the five-fold dilution data and undiluted data showed no significant matrix effects.

Method of Standard Addition

Lead results for samples W-120390-MB-038 and W-120390-MD-045 were obtained using method of standard addition. As the correlation coefficients are greater than 0.995, these data are acceptable.

Internal Standard Summaries

Overall instrument performance for VOC and BN/A analyses was monitored using internal standard peak area and retention times. Peak areas from each sample are required to match within +100 percent and -50 percent the daily calibration sample internal standard peak areas. Retention time must match within 0.5 minutes. Examining the data showed both criteria were met. Therefore, the GC/MSs were in proper working order during each analysis.

Trip Blank Samples

Trip blank samples were used to monitor the extent of cross contamination of samples during shipment to Radian. Five trip blank samples were sent from Radian. Each sample contained methylene chloride; however, these results were qualified as non-detect (U). Trichloroethene, 4-methyl-2-pentanone and 1,2-dichloroethane were also detected within selected trip blank samples. However, these concentrations were not comparable to the investigative samples.

Chloromethane was detected at 1 µg/*l* in trip blank sample TB12/4. The chloromethane datum from sample W-120390-MB-038 was qualified as estimated (J) as this concentration was within five time the amount detected in TB12/4.

Rinsate Samples

Rinsate samples were originally part of the field quality assurance plan. However, a switch to dedicated bailer made rinsate samples unnecessary.

Field Duplicate Samples

Overall precision for these sampling events was measured using field duplicate samples. A total of five sets of field duplicate samples was collected. Table 8 lists the field duplicate sample sets.

Field duplicate samples W-121790-JM-014 and W-121790-JM-015 were reanalyzed for VOC due to necessary dilutions. Comparing the reanalyses showed acceptable precision, as did the majority of field duplicate samples.

Samples W-120490-MB-048 and W-120490-MB-050 were analyzed for VOC, BN/A, PEST/PCB, metals and cyanide. Table 9 summarizes detected analyte concentrations for these samples. The overall precision was acceptable.

Overall Assessment

Based on the data packages, the majority of data are acceptable for quantitative assessment purposes. Qualified data are suitable for qualitative assessments, except where the data have been rejected.

TABLE 1

OUTLYING INITIAL CALIBRATION DATA ASSOCIATED WITH SAMPLES COLLECTED DURING THE DECEMBER 1990 EVENTS

Analyte	Date	Analyte	RRF[1]	%RSD[2]	Qualifier[3]	Associated Samples
VOC	11/23/90	Acetone	0.505	43.9	J/UJ	All Samples
		Butanone	0.082	58.8	J/UJ	
BN/A	12/10/90	Benzoic Acid	0.040	29.8	J/R	W-120390-MB-038; W-120390-MB-039; W-120390-MB-042; W-120490-MB-045; W-120490-MB-048; W-120490-MB-049; W-120490-MB-050;
	2/12/92	Nitrobenzene	0.026	63.4	J/R	W-120390-MB-042RE; W-120490-MB-045RE; W-120490-MB-048RE
		2-chloronaphthalene	1.433	37.0	UJ	
		Indeno(1,2,3-cd)pyrene	0.534	36.9	J/UJ	
		Benzo(g,h,i)perylene	0.587	33.0	J/UJ	

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[1] RRF = Mean Relative Response Factor

[2] %RSD = Percent Relative Standard Deviation

[3] Associated samples had analyte data qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

R - The data are unusable.

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA ASSOCIATED WITH SAMPLES COLLECTED DURING THE DECEMBER 1990 EVENTS

Analysis	Time/Date	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
VOC	12-7;10:36	Butanone	0.129	25.2	NR	
	12-10;10:51	Acetone	0.890	76.2	NR	
		Butanone	0.129	25.2	NR	
	12-11;10:57	Chloromethane	1.88	27.9	J/UJ	W-120690-MH-011; W-120690-MH-011 MS/MSD; W-120690-MH-012; W-120690-MH-013; TB12/6; W-120390-MB-043 MS/MSD
	12-19;10:31	Acetone	0.362	28.3	NR	W-121090-RR-053; W-121090-RR-054; W-121090-RR-055; W-121090-RR-056; W-121090-RR-057; W-121090-RR-059
		4-methyl-2-pentanone	0.155	30.2	J/UJ	
		2-hexanone	0.194	29.2	J/UJ	
		Xylenes	0.701	27.5	J/UJ	
	12/21;11:47	Bromoform	0.110	61	NR	W-121790-JM-014; W-121790-JM-015; W-121790-JM-016; W-121090-JM-058; W-121090-RR-057 MS; TB12/17; W-121090-RR-058DL
		1,2-dichloroethane	1.500	28.7	J/UJ	
		Vinyl Acetate	2.074	36.6	J/UJ	
		4-methyl-2-pentanone	0.143	35.6	J/UJ	
		2-hexanone	0.200	27.0	J/UJ	
		Xylenes	0.713	26.3	J/UJ	
		d_4-1,2-dichloroethane[4]	0.508	31.9	J/UJ	
	12-26;12:37	Chloromethane	3.287	26.1	J/UJ	W-121790-JM-014 DL; W-121790-JM-015 DL; W-121790-JM-016 RE; W-121790-JM-014 MS/MSD; W-121090-RR-057 MSD; TB12/17RE
		Bromomethane	4.632	27.5	J/UJ	
		Acetone	1.910	99.9	NR	
		Carbon Disulfide	8.583	32.7	J/UJ	
		Butanone	0.163	58.3	NR	
		Xylenes	0.715	26.1	J/UJ	

TABLE 2 (CONT'D)

OUTLYING CONTINUING CALIBRATION DATA
ASSOCIATED WITH SAMPLES COLLECTED
DURING THE DECEMBER 1990 EVENTS

Analysis	Time/Date	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
BN/A	12-19;09:51	Benzoic Acid	0.024	31.4	NR	W-120390-MB-038; W-120390-MB-039; W-120390-MB-042; W-120490-MB-045; W-120490-MB-049; W-120490-MB-050
		Acenaphthylene	0.820	37.3	UJ	
		4-nitrophenol	0.103	42.5	UJ	
	12-26;11:22	Benzoic Acid	0.023	34.3	NR	W-120490-MB-048
		2-chloronaphthalene	2.203	42.5	UJ	
		Acenaphthylene	0.797	39.1	UJ	
		4-nitrophenol	0.093	48.0	UJ	

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[1] RRF = Daily Response Factors

[2] %D = Percent Difference

[3] Associated samples had analyte data qualified as:

J - The associated value is an estimated quantity, for detection analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

R - The data are unusable.

NR - No additional qualifiers were required.

[4] Surrogate Compound

TABLE 3

ANALYTES DETECTED IN METHOD BLANK SAMPLE

Blank ID	Analyte	Concentration (µg/*l*)	Associated Samples[1]
VBLK12/11	Methylene Chloride	0.6 J[2]	W-120690-MH-011; W-120690-MH-012; W-120690-MH-013; TB12/6
	Acetone	2	
	2-hexanone	1 J	
VBLK12/07	Methylene Chloride	1	W-120390-MB-038; W-120390-MB-039; W-120390-MB-042; W-120490-MB-045; W-120490-MB-047; W-120490-MB-049; TB12/4
	Acetone	2	W-120390-MB-038
	2-hexanone	0.9 J	
VBLK12/10	Methylene Chloride	0.5 J	W-120390-MB-036; W-120390-MB-037; W-120390-MB-040; W-120390-MB-041; W-120490-MB-043; W-120490-MB-044; W-120490-MB-046; W-120490-MB-048; W-120490-MB-050;
	Acetone	1 J	
	2-hexanone	1 J	
VBLK12/19	Methylene Chloride	0.5 J	W-121090-RR-053; W-121090-RR-054; W-121090-RR-055; W-121090-RR-056; W-121090-RR-057; W-121090-RR-059
	2-hexanone	0.6 J	
VBLK12/20	Methylene Chloride	0.3 J	W-121090-RR-060; W-121190-RR-061; W-121190-RR-062; W-121190-RR-063; W-121190-RR-064; W-121190RR-065; TB12/11

TABLE 3 (CONT'D)

ANALYTES DETECTED IN METHOD BLANK SAMPLE

Blank ID	Analyte	Concentration (μg/*l*)	Associated Samples[1]
VBLK12/21	Acetone	2	
VBLK12/26	2-hexanone	0.5 J	
SBLK2/13	Di-*n*-butylphthalate	0.4 J	
	Bis(2-ethylhexyl)phthalate	0.9 J	W-120390-MB-042RE
Metals	Aluminum	44.2 J	W-120390-MB-042; W-120490-MB-049
	Beryllium	0.6 J	
	Calcium	40.9 J	
	Copper	5.9 J	W-120390-MB-038; W-120390-MB-039
	Iron	18 J	W-120390-MB-039
	Magnesium	42 J	
	Zinc	3 J	

---

[1] Associated samples had analyte result qualified as non-detect.

[2] The associated value is an estimate.

TABLE 4

ADDITIONAL METHYLENE CHLORIDE DATA QUALIFIED AS NON-DETECT

Sample ID
W-121790-MH-014
W-121790-MH-014DL
W-121790-MH-015
W-121790-MH-016
W-121090-RR-058
W-121090-RR-058DL

TABLE 5

OUTLYING SURROGATE COMPOUND PERCENT RECOVERIES

Sample ID	Analysis	Compound	%R[1]	Limits[2]	Qualifier[3]
W-121790-JM-014	VOC	d_4-1,2-dichloroethane	128	76-114	NR
W-121790-JM-014MSD	VOC	4-bromofluorobenzene	116	86-115	NR
W-121790-JM-015	VOC	d_4-1,2-dichloroethane	134	76-114	NR
W-121790-JM-016	VOC	d_4-1,2-dichloroethane	127	76-114	NR
TB12/17	VOC	d_4-1,2-dichloroethane	134	76-114	NR
W-120490-MB-045	BN/A[4]	d_5-phenol	7	10-94	J/R
		2-fluorophenol	0	21-100	
		2,4,6-tribromophenol	1	10-123	
W-120490-MB-045RE	BN/A[4]	2-fluorophenol	1	21-100	J/R
		2,4,6-tribromophenol	2	10-123	
W-120490-MB-048	BN/A[4]	2-fluorophenol	3	21-100	J/R
W-121090-RR-057MS	VOC	d_4-1,2-dichloroethane	123	76-114	NR
W-121090-RR-058	VOC	d_4-1,2-dichloroethane	124	76-114	NR
W-121090-RR-058DL	VOC	d_4-1,2-dichloroethane	122	76-114	NR

---

[1] %R = Percent Recovery

[2] Limits were specified in the QAPP.

[3] Sample data were qualified as:

J - The associated value is an estimated quantity, for detected analytes.

R - The data are usable.

NR - No qualifiers were required.

[4] Only the acid fraction was qualified.

TABLE 6

OUTLYING MS/MSD RECOVERIES

Sample ID	Analysis	Analyte	Percent Recovery MS	Percent Recovery MSD	Limits[1]	Qualifier[2]
W-120690-MH-011	VOC	Trichloroethene	68	66	71-120	J
W-121790-014DL	VOC	Trichloroethene	68	78	71-120	NR
		Toluene	74	77	76-125	NR
W-120390-MB-043	VOC	Trichloroethene	84	98	71-120	J
W-120490-MB-045	Metals	Aluminum	54.8	-	75-125	J
		Antimony	58.1	-	75-125	J
		Barium	55.1	-	75-125	J
		Beryllium	62.2	-	75-125	J
		Cadmium	61.2	-	75-125	J
		Calcium	NC[3]	-	75-125	J
		Chromium	57.2	-	75-125	J
		Cobalt	56.6	-	75-125	J
		Copper	6.8	-	75-125	J
		Iron	46.2	-	75-125	J
		Lead	64	-	75-125	J
		Magnesium	NC	-	75-125	J
		Manganese	22.2	-	75-125	J
		Nickel	56.7	-	75-125	J
		Potassium	NC	-	75-125	J
		Selenium	66.0	-	75-125	J
		Silver	46.2	-	75-125	J
		Sodium	NC	-	75-125	J
		Vanadium	56.2	-	75-125	J
		Zinc	120	-	75-125	J
W-121090-RR-057	VOC	1,1-dichloroethene	116	91	61-145	J
		Trichloroethene	100	150	71-120	J
		Benzene	91	78	76-127	J
		Chlorobenzene	73	77	75-130	NR

---

[1] Limits were specified in the QAPP.

[2] Sample result for analytes were qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No qualifiers were required.

[3] Recovery was not calculated.

TABLE 7

SUMMARY OF LABORATORY DUPLICATE ANALYSES

Sample ID	Analysis	Analyte	Concentration (µg/l) Initial	Concentration (µg/l) Duplicate	RPD[1]	Qualifier[2]
W-120390-MB-042	Metals	Antimony	28.2 J[3]	2.10 J	-	NR
		Cadmium	3.8 J	2.4 J	-	NR
		Cobalt	6.5 J	5.2 J	-	NR
		Copper	178.5 J	70.5 J	-	NR
		Nickel	18.8 J	13.8 J	-	NR
		Potassium	1,432 J	1,991 J	-	NR
		Sodium	12,770	12,860	0.7	NR
		Zinc	157.9	107.9	38	J
	Cyanide		Not Reported		-	UJ

---

[1] RPD = relative percent difference

[2] Analyte data for all samples were qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was looked for, but not detected. The associated value is an estimate.

NR - No qualifiers were required.

[3] The associated value is an estimate.

TABLE 8

LIST OF FIELD DUPLICATE SAMPLE SETS

Sample IDs
W-120390-MB-040/W-120390-MB-041
W-121090-RR-053/W-121090-RR-055
W-120490-MB-048/W-120490-MB-050
W-121790-JM-014/W-121790-JM-015
W-121190-RR-064/W-121190-JM-065

TABLE 9

COMPARING FIELD DUPLICATE SAMPLE DATA FROM W-120490-MB-048 AND W-120490-MB-050

Analysis	Analyte	Concentration (μg/*l*) W-120490-MB-048	Concentration (μg/*l*) W-120490-MB-050	RPD[1]
VOC	Methylene Chloride	36 U[2]	36 U	-
	1,2-dichloroethane	75	78	3.9
	1,1,1-trichloroethane	8 J[3]	9 J	-
	Trichloroethene	440	440	0
Metals	Antimony	19.1 J	13 J	-
	Barium	59.4 J	35.1 J	-
	Calcium	32,400 J	18,700 J	-
	Cobalt	4.2 J	2.7 J	-
	Copper	54.4	63.6 J	-
	Iron	1,290	1,050	20
	Lead	38.9 J	ND (<1) UJ[4]	-
	Manganese	373 J	219 J	-
	Magnesium	10,700 J	6,150 J	-
	Mercury	ND (<0.1)	0.11 J	-
	Sodium	21,300 J	1,200 J	-
	Zinc	90.8 J	90.6 J	-

---

[1] RPD = Relative Percent Difference

[2] The associated result is qualified as non-detect.

[3] The associated value is an estimate.

[4] The quantitation limit is an estimate.

MEMORANDUM

TO: [redacted] REFERENCE NO. 2115

FROM: David Dempsey DATE: March 26, 1991

RE: Data Quality Assessment and Validation for Fifteen Groundwater Samples Collected during the January 1991 Sampling Event at the Wausau, Wisconsin, Site

---

The following details a data quality assessment and validation for 15 groundwater samples collected January 7 and 8, 1991, at the Wausau, Wisconsin, site. All samples were analyzed for target compound list volatile organic compounds (TCL VOC) by the Radian Corporation-Sacramento.[1] Quality assurance criteria are defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

The holding time period for VOC samples is defined in the QAPP and requires samples to be analyzed within 14 days from sample collection. Examining the analysis dates showed samples were analyzed within the allotted time frame.

Instrument Performance

Prior to analyzing samples, the gas chromatograph/mass spectrometer (GC/MS) performance was checked using 4-bromofluorobenzene. Relative peak intensities for selected ions were within limits specified in the QAPP. Therefore, the GC/MS was in proper working condition prior to sample analysis.

Initial Calibration Data

The initial calibration data were used to judge analyte response versus concentration. For system performance check compounds, the minimum response factor allowed is 0.300 (0.100 for bromoform[3]). All remaining analytes are required to have response factors greater than 0.050. Percent relative standard deviations for all analytes are required to be less than 30. Table 1 lists the outlying initial calibration data.

The 1,1,2,2-tetrachloroethane mean response factor below the limit of 0.300 (1,1,2,2-tetrachloroethane is a system performance check compound). As reported in the November 1990 data validation memo, this violation has no impact on the data.

The %RSD value for acetone was less than one percent above 30. Thus, the acetone data were not qualified based upon the initial calibration data.

---

[1] The analytical method was the Contract Laboratory Program-Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988.

[3] This criterion is from the low level detection VOC CLP-SOW 1990 (draft) and has been extrapolated to these data as the CLP-SOW 1988 does not specify calibration criteria using a 25 m*l* purge volume.

Continuing Calibration Data

Continuing calibration data were used to assess analyte response versus concentration on a daily basis. For system performance check compounds, daily response factors are required to be greater than 0.300 (0.100 for bromoform). All remaining analytes are required to have daily response factors greater than 0.050. Percent differences between mean response factors and daily response factors for all analytes must be less than 25. Table 2 lists the outlying continuing calibration data.

On January 16 and 21, the 1,1,2,2-tetrachloroethane had response factors below 0.300 and no action upon the data was necessary. Acetone data for all samples were qualified as estimated (J or UJ) as the percent differences between the initial mean and daily calibration factors were greater than 25. Chloromethane data for samples analyzed on January 21 were also qualified as estimated (J or UJ) for this reason.

Method Blank Samples

Extent of lab contamination upon samples was measured using method blank samples. Table 3 summarizes the analytes detected in method blank samples. Note that only methylene chloride was detected and methylene chloride data from associated samples were qualified as non-detect (U).

As a low level detection method was used, the lab stated acetone and methylene chloride in the range of 10 $\mu g/l$ or less should be considered a lab artifact even if the associated method blank sample is clean. This criterion is applied to the actual result; therefore, dilutions are <u>not</u> taken into consideration. Therefore, samples W-010791-RR-068, W-010791-RR-072 and W-010791-RR-073 methylene chloride data were also qualified as non-detect (U).

Surrogate Compounds Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was judged using surrogate recoveries. Control limits are set in the QAPP. All percent recoveries were within these limits. Thus, the method was in control during each sample analysis.

The d_8-toluene recoveries were calculated using 1,4-difluorobenzene as the internal standard, rather than d_5-chlorobenzene. As d_8-toluene elutes nearly midway between these two internal standards, either may be used to calculate d_8-toluene recoveries.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

Matrix efficacy with respect to analytical data was checked using MS/MSD analyses. Sample W-010791-RR-068 underwent MS/MSD analyses.

The trichloroethene MS/MSD recoveries from this sample were 85 and 67, which results in an relative percent difference greater than 14. Therefore, these data were qualified as estimated (J), due to the poor precision. All remaining MS/MSD recoveries showed no significant matrix effects.

Internal Standard Summaries

Overall instrument performance was monitored using internal standard peak areas and retention times. Peak areas from each sample are required to match within +100 percent and -50 percent the daily calibration sample internal standard peak areas. Retention time must match within 0.5 minutes. Examining the data showed both criteria were met. Therefore, the GC/MS was in proper working order during each analysis.

Trip Blank Sample

A trip blank sample was used to monitor the extent of cross contamination of samples during shipment to Radian. Table 4 lists the analytes detected in this sample. The methylene chloride result was qualified as non-detect (U) based upon method blank sample data, and no samples contained 1,2-dichloroethane. The trichloroethene result from sample W-010891-RR-072 was qualified as estimated (J) as this value was within five times the amount in the trip blank sample. Overall, no significant cross contamination had occurred.

Rinsate Samples

Rinsate samples were originally part of the field quality assurance plan. However, a switch to dedicated bailer made rinsate samples unnecessary.

Field Duplicate Samples

Overall precision for these sampling events was measured using field duplicate samples. Two sets of field duplicate samples were collected, namely, W-010791-RR-068 and W-010791-RR-069, W-010891-RR-078 and W-010891-RR-079. Agreement between field duplicate samples was acceptable; indicating the overall sampling program was precise.

Overall Assessment

Overall the data were found to be accurate and precise. Exceptions have been discussed and documented in the above sections. These qualified data may be used for qualitative assessment purposes.

TABLE 1

OUTLYING VOC INITIAL CALIBRATION DATA

Date	Analyte	RRF[1]	% RSD[2]
1/15/91	1,1,2,2-tetrachloroethane	0.293	6.6
	Acetone	0.450	30.2

---

[1] RRF = mean relative response factor.
[2] % RSD = percent relative standard deviation.

TABLE 2

OUTLYING VOC CONTINUING CALIBRATION DATA

Date/Time	Analyte	RRF[1]	% D[2]	Qualifier[3]	Associated Samples
1/16/91; 10:33	1,1,2,2-tetrachloroethane	0.262	10.6	J/UJ	W-010791-RR-067
	Acetone	0.964	99.9	J/UJ	W-010791-RR-067
					W-010791-RR-068 MSD
					W-010791-RR-071
					W-010891-RR-078
					W-010891-RR-079
					W-010891-RR-080
					TB 1/4
1/21/91; 09:02	1,1,2,2-tetrachloroethane	0.285	2.7	NR	W-010791-RR-066
	Chloromethane	0.897	29.6	J/UJ	W-010791-RR-068 MSD
	Acetone	0.646	43.6	J/UJ	W-010791-RR-074
	Vinyl Acetate	2.365	25.3	NR	W-010891-RR-075
					W-010891-RR-076
					W-010891-RR-077

---

[1] RRF = daily relative response factor.

[2] % D = Percent difference.

[3] Analyte data for associated samples were qualified as:

J - associated value is an estimated quantity.

UJ - the analyte was checked for, but not detected. The associated value is an estimate.

NR - no qualifiers were required.

TABLE 3

METHYLENE CHLORIDE CONCENTRATIONS IN METHOD BLANK SAMPLES

Blank ID	Concentration (µg/*l*)	Associated Samples[1]
VBLK 1/16	0.3 J[2]	W-010791-RR-067; W-010791-RR-071; W-010891-RR-078; W010891-RR-079; W-010891-RR-080; TB 1/7
VBLK 1/21	0.3 J	W-010791-RR-066; W-0101791-RR-074; W-010891-RR-075; W-010891-RR-076; W-010891-RR-077

---

[1] Assocated samples had methylene chloride data qualified as non-detect (U).
[2] The associated value is an estimate.

TABLE 4

ANALYTES DETECTED IN SAMPLE TB1/7

Analyte	Concentration (µg/*l*)	Associated Samples[1]
Methylene Chloride	0.8 U[2]	
1,2-dichloroethane	0.2 J[3]	
Trichloroethene	0.3 J	W-010791-RR-072

---

[1] Associated samples had analyte data qualified as estimated (J).
[2] The analyte datum was qualified as non-detect.
[3] The associated value is an estimate.

MEMORANDUM

TO: [redacted]

FROM: David Dempsey

REFERENCE NO. 2115

DATE: April 5, 1991

RE: Data Quality Assessment and Validation for Seventeen Groundwater Samples Collected during the February 1991 Sampling Events at the Wausau, Wisconsin, Site

The following details a data quality assessment and validation for 17 groundwater samples collected February 12 and 13, 1991, at the Wausau, Wisconsin, site. All samples were analyzed for target compound list volatile organic compounds (TCL VOC) by S-Cubed.[1] Quality assurance/quality control criteria are defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

The holding time period for VOC samples is defined in the QAPP and requires samples to be analyzed within 14 days from sample collection. Examining the analysis dates showed samples were analyzed within the allotted time frame.

Instrument Performance

Prior to analyzing samples, the gas chromatograph/mass spectrometer (GC/MS) performance was checked using 4-bromofluorobenzene. Relative peak intensities for selected ions were within limits specified in the QAPP. Therefore, the GC/MS was in proper working condition prior to sample analysis.

Initial Calibration Data

The initial calibration data were used to judge analyte response versus concentration. For system performance check compounds, the minimum response factor allowed is 0.300 (0.100 for bromoform).[3] All remaining analytes are required to have response factors greater than 0.050. Percent relative standard deviations for all analytes are required to be less than 30. Table 1 lists the outlying initial calibration data.

Bromoform and 1,1,2,2-tetrachloroethane mean response factors were below these limits. However, discussing the matter with S-Cubed revealed bromoform and 1,1,2,2-tetrachloroethane do not usually meet these limits when using a 25 *ml* purge volume and a packed column. Thus, these violations have no impact on the data. A copy of a letter confirming this is presented as Attachment A.

Butanone data for all samples were qualified as estimated (J) or unusable (R) as the mean relative response factor was 0.045. Acetone data for all samples were qualified as estimated (J or UJ) as the percent relative standard deviation was 32.5.

---

[1] The analytical method was the Contract Laboratory Program-Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance/quality control criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988.

[3] These criteria are from the low level detection VOC CLP-SOW 1990 (draft) and have been extrapolated to these data as the CLP-SOW 1988 does not specify calibration criteria using a 25 *ml* purge volume.

Continuing Calibration Data

Continuing calibration data were used to assess analyte response versus concentration on a daily basis. For system performance check compounds, daily response factors are required to be greater than 0.300 (0.100 for bromoform). All remaining analytes are required to have daily response factors greater than 0.05. Percent differences between mean response factors and daily response factors for all analytes must be less than 25. Table 2 lists the outlying continuing calibration data.

Again, bromoform and 1,1,2,2-tetrachloroethane had response factors below these limits and no action upon the data was necessary. Butanone was the only other analyte to fail continuing calibration criteria; however, as these data were qualified based upon the initial calibration data, no additional action was necessary.

Method Blank Samples

Extent of lab contamination of samples was measured using method blank samples. Table 3 summarizes the analytes detected in method blank samples. Note that only methylene chloride was detected often and had data qualified from associated samples as non-detect (U).

Surrogate Compounds Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was judged using surrogate recoveries. Control limits are set in the QAPP. All percent recoveries were within these limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

Matrix efficacy with respect to analytical data was checked using MS/MSD analyses. Sample W-021291-RR-090 underwent MS/MSD analyses. The relative percent difference for trichloroethene MS/MSD recoveries was reported to be 9. Recalculating yields a value of 24, which is correct. As a result, the trichloroethene datum for this sample was qualified as estimated (J). Thus, no significant matrix effects were observed.

Internal Standard Summaries

Overall instrument performance was monitored using internal standard peak area and retention times. Peak areas are required to match within +100 percent and -50 percent the daily calibration sample internal standard peak areas. Retention time must match within 0.5 minutes. Examining the data showed both criteria were met. Therefore, the GC/MS was in proper working order during each analysis.

Trip Blank Samples

A trip blank sample was used to monitor the extent of cross contamination of samples during shipment to S-Cubed. This sample contained methylene chloride; however, this datum was qualified as non-detect (U). Thus, no significant cross contamination was observed.

Rinsate Samples

Rinsate samples were originally part of the field quality assurance plan. However, a switch to dedicated bailers made rinsate samples unnecessary.

Field Duplicate Samples

Overall precision for this sampling event was measured using field duplicate samples. Two sets of field duplicate samples were collected, namely, W-021291-RR-090 and W-021291-RR-091, W-021391-RR-095 and W-021391-RR-096. The latter set was reanalyzed as dilutions to bring all analyte peaks on scale were required. Agreement between the field duplicate samples showed this event was precise.

Overall Assessment

Overall the data were found to be accurate and precise. Exceptions have been discussed and documented in the above sections. These qualified data may be used for qualitative assessment purposes, except where the data have been rejected.

TABLE 1

OUTLYING INITIAL CALIBRATION DATA

Analyte	RRF[1]	%RSD[2]	Qualifier[3]
Bromoform	0.094	11.7	NR
1,1,2,2-tetrachloroethane	0.273	9.8	NR
Acetone	0.227	32.5	J/UJ
Butanone	0.045	15.7	J/R

---

[1] RRF = Mean Relative Response Factor
[2] %RSD = Percent Relative Standard Deviation
[3] All samples had analyte data qualified as:
J - The associated value is an estimated quantity, for detected analytes.
UJ - The analyte was checked for, but not detected. The associated value is an estimate.
R - The datum is unusable, for non-detected results.

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA

Date/Time	Analyte	RRF[1]	%D[2]	Qualifier[3]
2/19; 10:47	Bromoform	0.093	1.5	NR
	1,1,2,2-tetrachloroethane	0.288	5.5	NR
	Butanone	0.049	8.6	NR
2/20; 08:18	Bromoform	0.087	7.8	NR
	1,1,2,2-tetrachloroethane	0.249	8.9	NR

---

[1] RRF = Daily Relative Response Factor

[2] %D = Percent Difference

[3] No data were qualified based upon continuing calibrations.

TABLE 3

ANALYTES DETECTED WITH METHOD BLANK SAMPLES

Method Blank	Analyte	Concentration (µg/*l*)	Associated Samples[1]
VBLK11	Methylene Chloride	3.3	W-021291-RR-084; W-021291-RR-086;
	Acetone	8.4	W-021291-RR-081; W-021291-RR-083; W-021291-RR-084; W-021291-RR-085; W-021291-RR-086
VBLK12	Methylene Chloride	2.2	W-021291-RR-086DL[2]
VBLK13	Methylene Chloride	3.1	W-021391-RR-092DL; W-021391-RR-093DL; W-021391-RR-096DL; W-021391-RR-097DL; TB02/12-13

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[1] Associates samples had analyte datum qualified as non-detect (U).

[2] Sample was diluted and re-analyzed.

ATTACHMENT A

S-CUBED
A Division of Maxwell Laboratories, Inc.

Rec'd CRA
APR 0 5 91

April 4, 1991

David Dempsey
Conestoga-Rovers and Associates
382 W. County Road D
St. Paul, MN 55112

Dear Mr. Dempsey:

This letter is to confirm our recent discussion concerning the mean relative response factors for bromoform and 1,1,2,2-tetrachloroethane. EPA 2/88 SOW VOA procedures call for minimum RRFs for these compounds of 0.25 and 0.30, respectively. When modifying the method by introducing a 25-mL purge in place of a 5-mL purge, the achievable RRFs for these compounds are reduced. 1,1,2,2-Tetrachloroethane RRFs are generally in the range of 0.20 and 0.30. Bromoform is affected more significantly especially when a packed column is used. The RRFs generally achieved under these circumstances range from 0.08 to 0.15. Detection limit studies performed by S-Cubed under these analytical conditions for bromoform have demonstrated a detection limit of 0.2 µg/L. This indicates that the lower response does not affect the quality of the data produced.

We are currently one of two laboratories that are performing low detection VOA analysis for Region V's residential well program and using the draft CLP 25-mL procedure. This procedure utilizes a capillary column for the GC separation. By utilizing a capillary column instead of a packed column (as we currently do for the MEM project). Bromoform RRFs are generally in the 0.15 to 0.22 range and pass the criteria. 1,1,2,2-Tetrachloroethane is still reduced and does not meet the criteria and we take exception to this requirement. Some versions of the method do allow two compounds to be out.

If I can provide more information concerning this issue, please let me know.

Sincerely,

John DeWald
Manager, Commerical Analysis

P.O. Box 1620, La Jolla, California 92038-1620 3398 Carmel Mountain Road, San Diego, California 92121-1095
Tel: (619) 453-0060 TWX: 910-337-1253 FAX: (619) 755-0474

MEMORANDUM

TO: [redacted]

REFERENCE NO. 2115

FROM: David Dempsey

DATE: April 18, 1991

RE: Data Quality Assessment and Validation for Sixteen Groundwater Samples Collected during the March 1991 Sampling Event at the Wausau, Wisconsin Site

---

The following details a data quality assessment and validation for 16 groundwater samples collected March 4 and 5, 1991, at the Wausau, Wisconsin, site. All samples were analyzed for target compound list volatile organic compounds (TCL VOC) by S-Cubed.[1] Seven samples were also analyzed for target analyte list metals by S-Cubed. Quality assurance/quality control criteria are defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

The holding time period for VOC samples is defined in the QAPP. VOC samples must be analyzed within 14 days from sample collection. Metals samples must be analyzed within 6 months (28 days-mercury) from sample collection. Examining the analysis dates showed samples were analyzed within allotted time frames.

Instrument Performance

Prior to analyzing samples, the gas chromatograph/mass spectrometer (GC/MS) performance was checked using 4-bromofluorobenzene. Selected ion relative peak intensities were within limits specified in the QAPP. Therefore, the GC/MS was in proper working condition prior to sample analysis.

Initial Calibration Data

The initial calibration data were used to judge analyte response versus concentration. For system performance check compounds, the minimum response factor allowed is 0.300 (0.100 for bromoform[3]). All remaining analytes are required to have response factors greater than 0.050. Percent relative standard deviations for all analytes are required to be less than 30. Bromoform and 1,1,2,2-tetrachloroethane mean response factors were below these limits However, discussing the matter with S-Cubed revealed bromoform and 1,1,2,2-tetrachloroethane do not usually meet these limits when using a 25 m*l* purge volume and a packed column. As reported in the data validation memo for the February 1991 event, these violations have no impact on the data.

---

[1] The analytical method was the Contract Laboratory Program-Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance/quality control criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988 and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses", July 1, 1988.

[3] This criterion is from the low level detection VOC CLP-SOW 1990 (draft) and has been extrapolated to these data as the CLP-SOW 1988 does not specify calibration criteria using a 25 m*l* purge volume.

Calibration curves for metals consisted at least of two points. Atomic absorption method calibration curves had four points, while the mercury calibration curve had five points. Calibration coefficients for all curves were greater than 0.995. Thus, the instruments used for metals analyses were properly calibrated.

Continuing Calibration Data

Continuing calibration data were used to assess analyte response versus concentration on a daily basis. For system performance check compounds, daily response factors are required to be greater than 0.300 (0.100 for bromoform). All remaining analytes are required to have daily response factors greater than 0.05. Percent differences between mean response factors and daily response factors for all analytes must be less than 25. Table 1 lists the outlying VOC continuing calibration data.

Again, bromoform and 1,1,2,2-tetrachloroethane had response factors below these limits and no action upon the data was necessary. Acetone, butanone and 2-hexanone also failed continuing calibration criteria. Therefore, these analyte data were qualified as directed in Table 1 as estimated (J or UJ) or unusable (R).

Calibration standards were analyzed to verify the metals calibration curves. Thallium, selenium and arsenic had standards with recoveries below the control limits. However, as these recoveries were less than one percent below the limits, no action upon the data was necessary. Thus, the instruments used for metals analyses were properly calibrated.

Method Blank Samples

Extent of lab contamination of samples was measured using method blank samples. Table 2 summarizes the analytes detected in method blank samples. Note that only methylene chloride was detected in both VOC method blank samples and had data qualified from associated samples as non-detect (U). Copper, iron, lead and zinc were all detected in the metals method blank sample and had data qualified as non-detect (U).

Initially, nickel was reported in the method blank sample at -129 µg/*l*. S-Cubed reported instrument problems and recalculated nickel concentrations for all samples. Thus, no extensive lab contamination was observed.

Laboratory Control Samples

Accuracy for metals methods was measured using control samples. Percent recoveries are required to between 80 and 120. However, lead and arsenic percent recoveries were 136 and 144 percent, respectively. Therefore, all detected data for each analyte were qualified as estimated (J). Accuracy for remaining metals was acceptable.

ICP Interference Check Sample

The ICP method was shown to be free of interelemental interferences via a check sample. As the percent recoveries were within specified limits, no interelemental interferences were observed.

Surrogate Compounds Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was judged using surrogate recoveries. Control limits are set in the QAPP. All percent recoveries were within these limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

Matrix efficacy with respect to analytical data was checked using MS/MSD analyses. Sample W-030491-RR-102 underwent VOC MS/MSD analyses. The relative percent difference for trichloroethene MS/MSD recoveries was reported to be 10. Recalculating gives a value of 11, which is correct. Thus, no significant matrix effects were observed for VOC analyses.

Samples W-030491-RR-104, W-030591-RR-112 and W-030591-RR-115 underwent metals MS/MSD analyses. Table 3 lists the outlying recoveries. As a result, thallium data for all samples were qualified as estimated (J) or unusable (R), mercury data for all samples were qualified as estimated (J or UJ), and silver data for all samples were qualified as estimated (J) for detected results only. No severe matrix effects were observed for the remaining metals.

Laboratory Duplicate Analyses

Precision for metals analyses was measured using duplicate analyses of samples W-030591-RR-112 and W-030591-RR-115. Thallium duplicate analyses for sample W-030591-RR-112 showed poor precision; however, as thallium datum for this sample was already qualified as unusable (R), no additional action was taken. Duplicate analyses for sample W-030591-RR-115 showed an acceptable degree of precision. Therefore, these methods were precise when investigative samples were analyzed.

Internal Standard Summaries

Overall instrument performance was monitored using internal standard peak area and retention times. Peak areas are required to match within +100 percent and -50 percent the daily calibration sample internal standard peak areas. Retention time must match within 0.5 minutes. Examining the data showed both criteria were met. Therefore, the GC/MS were in proper working order during each analysis.

Trip Blank Samples

A trip blank sample was used to monitor the extent of cross contamination of samples during shipment to S-Cubed. This sample contained trichloroethene at 1.2 µg/*l*. Trichloroethene data from samples W-030491-RR-102, W-030491-RR-107 and W-030591-RR-111 were qualified as estimated as these data were within five times the amount detected in the trip blank sample. Overall, no significant cross contamination was observed.

Rinsate Samples

Rinsate samples were originally part of the field quality assurance plan. However, a switch to dedicated bailers made rinsate samples unnecessary.

Field Duplicate Samples

Overall precision for these sampling events was measured using field duplicate samples. Two sets of field duplicate samples were collected, namely, W-030491-RR-102 and W-030491-RR-103, W-030591-RR-112 and W-030591-RR-113. Both sets were analyzed for VOC only. Based on these data, the overall event was precise for VOC.

No field duplicate samples for metals were collected.

Overall Assessment

Overall the data were found to be accurate and precise. Exceptions have been discussed and documented in the above sections. These qualified data may be used for qualitative assessment purposes, except where the data have been rejected.

TABLE 1

OUTLYING VOC CONTINUING CALIBRATION DATA ASSOCIATED WITH THE WAUSAU, WISCONSIN SITE

Date/Time	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
3/11, 10:48	Butanone	0.043	14.1	J/R	W-030491-RR-100
	Bromoform	0.110	10	NR	W-030491-RR-101
	1,1,2,2-tetrachloroethane	0.263	3.6	NR	W-030491-RR-103
	Acetone	0.118	45.7	J/UJ	W-030491-RR-104
	2-hexane	0.095	31.7	J/UJ	W-030491-RR-105
					W-030491-RR-106
					W-030591-RR-108
					W-030591-RR-109
					W-030591-RR-110
					W-030591-RR-111
					W-030591-RR-112
					W-030591-RR-113
					W-030591-RR-114
					TB 3/91

TABLE 1 (CONT'D)

OUTLYING VOC CONTINUING CALIBRATION DATA ASSOCIATED WITH THE WAUSAU, WISCONSIN SITE

Date/Time	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
3/12, 8:40	Acetone	0.319	46.8	J/UJ	W-030491-RR-102
	Butone	0.072	42.2	J/UJ	W-030491-RR-107
	Bromoform	0.107	1.9	NR	W-030491-RR-101DL
	1,1,2,2-tetrachloroethane	0.265	3.0	NR	W-030491-RR-103DL
					W-030491-RR-105DL
					W-030591-RR-109DL
					W-030591-RR-112DL
					W-030591-RR-113DL
					W-030591-RR-114DL
3/13; 9:40	Chloromethane	1.277	34.9	J/UJ	W-030591-RR-108DL
	Acetone	0.300	37.8	J/UJ	W-030591-RR-110DL
	Butanone	0.068	35.4	J/UJ	
	Bromoform	0.080	26.3	J/UJ	
	1,1,2,2-tetrachloroethane	0.238	12.9	NR	

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[1] RRF = Daily Relative Response Factor

[2] %D = Percent Difference

[3] Analyte datum for associated samples was qualified as:

J = The associated value is an estimated quantity, for detected analytes.
UJ = The analyte was checked for, but not detected. The associated value is an estimate.
R = The datum is rejected, for non-detected analytes.
NR = No additional qualifiers were required.

TABLE 2

ANALYTES DETECTED IN METHOD BLANK SAMPLES ASSOCIATED WITH THE WAUSAU, WISCONSIN, SITE

Blank ID	Analyte	Concentration (µg/*l*)	Associated Samples[1]
VBLK11	Methylene Chloride	1.5	W-030491-RR-103
	Acetone	5.8	
VBLK12	Methylene Chloride	2.2	W-030491-RR-103DL
Metals	Copper	22 *J*[2]	W-030491-RR-102; W-030491-RR-104; W-030491-RR-105; W-030591-RR-111; W-030591-RR-112; W-030591-RR-114; W-030591-RR-115
	Iron	71 *J*	W-030491-RR-105
	Lead	1.5 *J*	W-030491-RR-102; W-030591-RR-112; W-030591-RR-114; W-030591-RR-115
	Zinc	59	W-030591-RR-102; W-030591-RR-114; W-030591-RR-115

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[1] Analyte data from associated samples were qualified as non-detect (U).

[2] The associated value is an estimate.

TABLE 3

OUTLYING METALS/MATRIX SPIKE RECOVERIES FOR SAMPLES COLLECTED AT THE WAUSAU, WISCONSIN, SITE

Blank ID	Analyte	Percent Recovery	Limits[1]	Qualifier[2]
W-030491-RR-105	Mercury	61.4	75-125	J/UJ
W-030591-RR-112	Thallium	18	75-125	J/R
W-030591-RR-115	Silver	144	75-125	J/NR

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[1] Limits are specified in the QAPP.

[2] Analyte data for all samples are qualified as:
J - the associated value is an estimated quantity for detected analytes.
UJ - the analyte was checked for, but not detected. The associated value is an estimate.
R - The datum is rejected, for non-detected analytes.
NR - No additional qualifiers are necessary.

MEMORANDUM

TO: [redacted]

REFERENCE NO. 2115

FROM: David Dempsey

DATE: April 30, 1991

RE: Addendum to the March 1991 Data Validation and Assessment Memo for the March 1991 Sampling event at the Wausau, Wisconsin Site

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S-Cubed reported lead data for seven groundwater samples collected during the March 1991 sampling event at the Wausau, Wisconsin site. The lead control sample percent recovery was out of control limits. Therefore, S-Cubed reanalyzed these samples. The following details a data quality assessment and validation for these reanalyses.

Holding Time Period

Holding time period for lead analysis is six months from sample collection to completion of analysis. Examining the analysis dates showed the lead holding time period was met.

Continuing Calibration

The initial calibration curve consisted of one blank and four standards. The correlation coefficient was greater than 0.995; therefore, the initial calibration was acceptable.

Calibration standards were analyzed prior to sample analyses. The percent recoveries were within ten percent of the standard's concentration. Therefore, the instrument was properly calibrated.

Continuing Calibrations

Calibration standards were used to verify the instrument calibration during sample analyses. As the percent recoveries were within ten percent of the standard's concentration, the instrument calibration was verified for all sample analyses.

Method Blank Samples

Lab contamination was measured using a method blank sample. This sample was free of lead; therefore, no lab contamination was observed.

Lab Control Sample

Overall accuracy for this method was measured using a check sample. As the percent recovery was within ten percent of the sample concentration, the method was accurate.

Matrix Spike Analyses

Matrix effects were checked for using a matrix spike analysis upon sample W-030491-RR-102. As the percent recovery was within limits, no significant matrix effects were observed.

Lab Duplicate Analysis

Analytical precision was measured using duplicate analysis of sample W-030491-RR-102. As both analyses were in agreement, the precision was acceptable.

Field Quality Assurance Samples

No field quality assurance samples were analyzed for lead.

Overall Assessment

The data are accurate and precise. Therefore, the data may be used for quantitative assessment of lead concentrations.

MEMORANDUM

TO: [redacted]

REFERENCE NO. 2115

FROM: David Dempsey

DATE: May 9, 1991

RE: Data Quality Assessment and Validation for Fifteen Groundwater Samples Collected during the April 1991 Sampling Event at the Wausau, Wisconsin Site

The following details a data quality assessment and validation for 15 groundwater samples collected on April 1, 1991, at the Wausau, Wisconsin site. All samples were analyzed for target compound list volatile organic compounds (TCL VOC) by S-Cubed.[1] Quality assurance/quality control criteria are defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

The holding time period for VOC samples is defined in the QAPP. All VOC samples must be analyzed within 14 days from sample collection. Examining the analysis dates showed samples were analyzed within the allotted time frame.

Instrument Performance

Prior to analyzing samples, the gas chromatograph/mass spectrometer (GC/MS) performance was checked using 4-bromofluorobenzene. Selected ion relative peak intensities were within limits specified in the QAPP. Therefore, the GC/MS was in proper working condition prior to sample analysis.

Initial Calibration Data

The initial calibration data were used to judge analyte response versus concentration. For system performance check compounds, the minimum response factor allowed is 0.300 (0.100 for bromoform[3]). All remaining analytes are required to have response factors greater than 0.050. Percent relative standard deviations for all analytes are required to be less than 30. Bromoform and 1,1,2,2-tetrachloroethane mean response factors were below these limits However, discussing the matter with S-Cubed revealed bromoform and 1,1,2,2-tetrachloroethane do not usually meet these limits when using a 25 m*l* purge volume and a packed column. As reported in the data validation memo for the February 1991 event, these violations have no impact on the data.

Acetone failed the percent relative percent difference criteria for both initial calibration curves. Therefore all acetone data are qualified as estimated (J or UJ).

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[1] The analytical method was the Contract Laboratory Program-Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance/quality control criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988.

[3] This criterion is from the low level detection VOC CLP-SOW 1990 (draft) and has been extrapolated to these data as the CLP-SOW 1988 does not specify calibration criteria using a 25 m*l* purge volume.

Continuing Calibration Data

Continuing calibration data were used to assess analyte response versus concentration on a daily basis. For system performance check compounds, daily response factors are required to be greater than 0.300 (0.100 for bromoform). All remaining analytes are required to have daily response factors greater than 0.05. Percent differences between mean response factors and daily response factors for all analytes must be less than 25. Table 1 lists the outlying VOC continuing calibration data.

Again, bromoform and 1,1,2,2-tetrachloroethane had response factors below these limits and no action upon the data was necessary. On April 10, vinyl acetate and 4-methyl-2-pentanone also failed continuing calibration criteria. Therefore, these analyte data from samples listed in Table 1 are qualified as estimated (J or UJ).

Method Blank Samples

Extent of lab contamination of samples was measured using method blank samples. Methylene chloride was detected in the method blank sample from April 10. As a result, methylene chloride data from samples W-040191-RR-133 and TB4/2 are qualified as non detect (U). As no other action upon the data based upon method blank sample data was necessary, no significant lab contamination was observed.

However, methylene chloride and acetone were detected in diluted analyses for several samples, which are listed in Table 2. These analytes were not detected in initial analyses; therefore, the water used to dilute these samples is the most likely source. These data are believed to be lab artifacts, even though the associated method blank samples are VOC free. Therefore, these data are qualified as non detect (U).

Surrogate Compounds Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was judged using surrogate recoveries and control limits are set in the QAPP. All percent recoveries were within these limits, indicating the method was in control for all analyses.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

Matrix efficacy with respect to analytical data was checked using MS/MSD analyses. Sample W-040191-RR-130 underwent VOC MS/MSD analyses. The reported percent difference recoveries were miscalculated due to rounding errors. Table 3 presents the corrected MS/MSD recoveries, which indicate that there are no significant matrix effects upon the data.

Internal Standard Summaries

Overall instrument performance was monitored using internal standard peak area and retention times. Peak areas are required to match within +100 percent and -50 percent the daily calibration sample internal standard peak areas. Retention time must match within 0.5 minutes. Examining the data showed both criteria were met. Therefore, the GC/MS was in proper working order during each analysis.

Trip Blank Samples

A trip blank sample was used to monitor the extent of cross contamination of samples during shipment to S-Cubed. This sample contained methylene chloride, acetone and trichloroethene. Concentrations are given in Table 4. Samples listed in Table 4 have the analyte datum qualified as estimated (J) as the sample concentration is less than five times the amount detected in the trip blank sample.

Rinsate Samples

Rinsate samples were originally part of the field quality assurance plan. However, a switch to dedicated bailers made rinsate samples unnecessary.

Field Duplicate Samples

Overall precision for these sampling events was measured using field duplicate samples. Two sets of field duplicate samples were collected, namely, W-040191-RR-127 and W-040191-RR-128, W-040191-RR-130 and W-040191-RR-131. Based on these data, the overall event was precise.

Overall Assessment

Overall the data were found to be accurate and precise. Exceptions have been discussed and documented in the above sections. These qualified data may be used for qualitative assessment purposes.

TABLE 1

OUTLYING VOC CONTINUING CALIBRATION DATA ASSOCIATED WITH THE WAUSAU, WISCONSIN SITE

Date/Time	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples[4]
4/10; 8:08	Vinyl Acetate	0.073	31.2	J/UJ	W-040191-RR-128
	4-methyl-2-pentanone	0.17	28.2	J/UJ	W-040191-RR-129
	Bromoform	0.095	23.7	NR	W-040191-RR-130
	1,1,2,2-tetrachloroethane	0.281	20.7	NR	W-040191-RR-132
					W-040191-RR-133
					W-040191-RR-134
					W-040191-RR-123DL
					W-040191-RR-124DL
					W-040191-RR-125DL
					W-040191-RR-126DL
					W-040191-RR-127DL
					TB 4/2
4/12; 8:26	Bromoform	0.083	1.3	NR	W-040191-RR-130DL
	1,1,2,2-tetrachloroethane	0.239	13.9	NR	

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[1] RRF = Daily relative response factor

[2] %D = Percent difference

[3] Analyte datum for associated samples is qualified as:

J	-	The associated value is an estimated quantity.
UJ	-	The analyte was checked for, but not detected. The associated value is an estimate.
NR	-	No additional qualifers are necessary.

[4] Sufix 'DL' represents a diluted analysis.

TABLE 2

SUMMARY OF DILUTED ANALYSES WITH DETECTABLE AMOUNTS OF ACETONE AND/OR METHYLENE CHLORIDE WAUSAU, WISCONSIN

Sample ID	Qualified[1]
W-040191-RR-128DL	Acetone
W-040191-RR-129DL	Acetone
W-040191-RR-130DL	Methylene Chloride Acetone

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[1] Analyte datum from the sample is qualified as non-detect (U).

TABLE 3

CORRECTED MS/MSD RECOVERIES
WAUSAU, WISCONSIN

Sample ID	Analyte	*Percent Recovery*		Limits[1]
		MS	MSD	
W-040191-RR-130	1,1-dichloroethene	131	135	61-145 (14)
	Trichloroethene	68	75	71-120 (14)
	Benzene	124	127	76-127 (11)
	Toluene	110	107	76-125 (13)
	Chlororbenzene	113	111	75-130 (13)

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[1] Limits are specified in the QAPP.

TABLE 4

ANALYTES DETECTED IN THE TRIP BLANK SAMPLE
WAUSAU, WISCONSIN

Analyte	Concentration (mg/l)	Associated Samples[1]
Methylene Chloride	2.7 U[2]	
Acetone	19	W-040191-RR-122 W-040191-RR-124 W-040191-RR-127 W-040191-RR-132 W-040191-RR-137
Trichloroethene	1.2	W-040191-RR-122 W-040191-RR-134

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[1] Analyte datum is qualified as estimated (J).

[2] Analyte datum is qualified as non-detect, based upon method blank samples data.

MEMORANDUM

TO: [redacted]

REFERENCE NO. 2115

FROM: David Dempsey

DATE: June 8, 1991

RE: Data Quality Assessment and Validation for Eighteen Groundwater Samples Collected during the May 1991 Sampling Event at the Wausau, Wisconsin Site

The following details a data quality assessment and validation for 18 groundwater samples collected on May 6 and 7, 1991, at the Wausau, Wisconsin site. All samples were analyzed for target compound list volatile organic compounds (TCL VOC) by S-Cubed.[1] Quality assurance/quality control criteria are defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

The holding time period for VOC samples is defined in the QAPP. All VOC samples must be analyzed within 14 days from sample collection. Examining the analysis dates showed samples were analyzed within the allotted time frame.

Instrument Performance

Prior to analyzing samples, the gas chromatograph/mass spectrometer (GC/MS) performance was checked using 4-bromofluorobenzene. Selected ion relative peak intensities are within limits specified in the QAPP. Therefore, the GC/MS was in proper working condition prior to sample analysis.

Initial Calibration Data

The initial calibration data were used to judge analyte response versus concentration. For system performance check compounds, the minimum response factor allowed is 0.300 (0.100 for bromoform[3]). All remaining analytes are required to have response factors greater than 0.050. The 1,1,2,2-tetrachloroethane mean response factors were below this limit However, discussing the matter with S-Cubed revealed 1,1,2,2-tetrachloroethane does not usually meet this limit when using a 25 m*l* purge volume and a packed column. As reported in the data validation memo for the February 1991 sampling event, these violations have no impact on the data. Percent relative standard deviations for all analytes are required to be less than 30.

On May 16, butanone and vinyl acetate failed the minimum response factor criterion. Butanone also failed this criterion on May 20. Therefore, all butanone data and vinyl chloride data from samples analyzed before May 20 are qualified as estimated (J) or

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[1] The analytical method was the Contract Laboratory Program-Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance/quality control criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988.

[3] This criterion is from the low level detection VOC CLP-SOW 1990 (draft) and has been extrapolated to these data as the CLP-SOW 1988 does not specify calibration criteria using a 25 m*l* purge volume.

unusable (R). On May 20, acetone failed the percent difference criterion for both initial calibration curves. Therefore, acetone data from samples analyzed on May 20 are qualified as estimated (J or UJ). These violations are summarized in Table 1.

Continuing Calibration Data

Continuing calibration data were used to assess analyte response versus concentration on a daily basis. For system performance check compounds, daily response factors are required to be greater than 0.300 (0.100 for bromoform). All remaining analytes are required to have daily response factors greater than 0.050. Percent differences between mean response factors and daily response factors for all analytes must be less than 25. Table 2 lists the outlying VOC continuing calibration data.

Again, 1,1,2,2-tetrachloroethane had response factors below the required limit and no action upon the data was necessary. Butanone and vinyl acetate violated the continuing calibration criteria on each day samples were analyzed (excluding vinyl acetate on May 20.) However, as these data have been qualified based upon the initial calibration data, no additional action upon is necessary.

Method Blank Samples

Extent of lab contamination of samples was measured using method blank samples. Methylene chloride was detected in the method blank samples from May 17 and May 20. As a result, methylene chloride data from sample W-050791-RR-149 is qualified as non detect (U). As no other action upon the data based upon method blank sample data was necessary, no significant lab contamination was observed.

Surrogate Compounds Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was judged using surrogate recoveries and control limits are set in the QAPP. All percent recoveries were within these limits, indicating the method was in control for all analyses.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

Matrix efficacy with respect to analytical data was checked using MS/MSD analyses. Sample W-050691-RR-140 underwent VOC MS/MSD analyses. The reported percent difference values were miscalculated due to rounding errors. Table 3 presents the corrected percent difference values, which indicate the analytical precision is acceptable. No matrix effects upon the data were observed.

Internal Standard Summaries

Overall instrument performance was monitored using internal standard peak area and retention times. Peak areas are required to match within +100 percent and -50 percent the daily calibration sample internal standard peak areas. Retention time must match within 0.5 minutes. Examining the data showed all samples met these criteria. Therefore, the GC/MS was in proper working order during each analysis.

Trip Blank Samples

A trip blank sample was used to monitor the extent of cross contamination of samples during shipment to S-Cubed. This sample contained chloromethane and butanone. As samples did not contain either analytes within five times the amount detected in the trip blank sample, no cross contamination was observed.

Rinsate Samples

Rinsate samples were originally part of the field quality assurance plan. However, a switch to dedicated bailers made rinsate samples unnecessary.

Field Duplicate Samples

Overall precision for these sampling events was measured using field duplicate samples. Two sets of field duplicate samples were collected, namely, W-050691-RR-140 and W-050691-RR-151, W-050791-RR-143 and W-050791-RR-144. Based on these data, the overall event was precise.

Overall Assessment

Overall the data were found to be accurate and precise. Exceptions have been discussed and documented in the above sections. These qualified data may be used for qualitative assessment purposes, except where the data have been rejected.

TABLE 1

OUTLYING INITIAL CALIBRATION DATA

Date	Analyte	RRF[1]	%RSD[2]	Qualifier[3]	Associated Samples[4]
5/16	Butanone	0.034	31.7	J/R	W-050691-RR-135
	Vinyl Acetate	0.032	11.1	J/R	W-050691-RR-136
	1,1,2,2-tetrachloroethane	0.272	6.2	NR	W-050691-RR-136 DL
					W-050691-RR-137
					W-050691-RR-138
					W-050691-RR-139
					W-050691-RR-140
					W-050791-RR-141
					W-050791-RR-142
					W-050791-RR-142 DL
					W-050791-RR-143
					W-050791-RR-143 DL
					W-050791-RR-144
					W-050791-RR-145
					W-050791-RR-145 DL
					W-050791-RR-146
					W-050791-RR-147
					W-050791-RR-148
					W-050791-RR-149
					W-050791-RR-150
					W-050691-RR-151
					W-050691-RR-151 DL
					Trip Blank
5/20	Acetone	0.170	31.6	J/UJ	W-050791-RR-141 DL
	Butanone	0.046	47.1	J/R	W-050791-RR-144 DL
	1,1,2,2-tetrachloroethane	0.155	3.2	NR	W-050791-RR-146 DL
					W-050791-RR-147 DL
					W-050791-RR-152
					W-050791-RR-152 DL

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[1] RRF = Relative Response Factor

[2] %RSD = Percent Relative Standard Deviation

[3] Analyte result is qualified as:

J - The associated value is an estimated quantity for detected analytes.
UJ - The analyte was checked for, but not detected. The associated value is an estimate.
R - The datum is rejected, for non-detected analytes.
NR - No additional qualifiers are necessary.

[4] Suffix 'DL' means samples was diluted and reanalyzed.

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA

Date/Time	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples[4]
5/17; 08:11	Chloromethane	1.468	27.4	J/UJ	W-050791-RR-144
	Butanone	0.037	6.8	NR	W-050791-RR-145
	Vinyl Acetate	0.021	34.9	NR	W-050791-RR-146
	1,1,2,2-tetrachloroethane	0.205	24.7	NR	W-050791-RR-147
					W-050791-RR-148
					W-050791-RR-149
					W-050791-RR-150
					W-050691-RR-151
					W-050691-RR-140
5/18; 0:44	Acetone	0.159	51.3	J/UJ	Trip Blank
	Butanone	0.043	24.5	NR	W-050691-RR-136 DL
	Vinyl Acetate	0.019	40.8	NR	W-050791-RR-142 DL
	2-hexanone	0.101	39.8	J/UJ	W-050791-RR-143 DL
	1,1,2,2-tetrachloroethane	0.211	22.4	NR	W-050791-RR-145 DL
					W-050691-RR-151 DL
5/20; 16:51	Butanone	0.040	14.2	NR	W-050791-RR-141 DL
	1,1,2,2-tetrachloroethane	0.169	8.9	NR	W-050791-RR-144 DL
					W-050791-RR-146 DL
					W-050791-RR-147 DL
					W-050791-RR-152 DL

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[1] RRF = Relative Response Factor

[2] %D = Percent Difference

[3] Analyte result is qualified as:

J	- The associated value is an estimated quantity, for detected analytes.
UJ	- The analyte was checked for, but not detected. The associated value is an estimate.
NR	- No additional qualifiers are necessary.

[4] Suffix 'DL' means sample was diluted and reanalyzed.

TABLE 3

CORRECTED PERCENT DIFFERENCE VALUES FROM MS/MSD ANALYSES UPON SAMPLE W-050691-RR-140

	Percent Difference	
Analyte	Reported	Corrected
1,1-dichloroethene	1	0.1
Trichloroethene	0	0.1
Benzene	1	0.8
Toluene	3	3.2
Chlorobenzene	2	2.0

MEMORANDUM

TO: Ed Roberts REFERENCE NO. 2115

FROM: Ruth M. Lewis DATE: February 24, 1992

RE: Data Quality Assessment and Validation for Eighteen Groundwater Samples Collected during the August 1991 Sampling Event at the Wausau, Wisconsin, Site

The following details a data quality assessment and validation for 18 groundwater samples collected on August 5 and 6, 1991, from the Wausau, Wisconsin, site. The samples were analyzed for target compound list volatile organic compounds (TCL VOC). All analyses were performed by Maxwell/S-Cubed Division in Sorrento Valley, California.[1] The quality assurance criteria were defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

The holding time for the analysis is 14 days from sample collection to completion of analysis. All analyses were completed within the specified holding time period.

Instrument Performance

To ensure that the data for the analyses would be interpreted correctly, each instrument was tuned using bromofluorobenzene (BFB). Analysis of the data reported for the GC/MS instrument tunes indicated criteria were met for all VOC analyses.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Criteria for VOC analytes required a mean relative response factor (RRF) greater than 0.300 (0.100 for bromoform)[3] for system performance check compounds (SPCC). The remaining analytes were required to have response factors greater than 0.050. Percent relative standard deviations for all analytes were required to be less than 30. Bromoform and 1,1,2,2-tetrachloroethane mean response factors were below these limits. However, discussing the matter with S-

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[1] Analytical method derived from Contract Laboratory Program Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1988.

[3] This criterion was taken from the low level detection VOC CLP SOW 1990 (draft) and was extrapolated to these data since the CLP SOW 1988 does not specify calibration criteria using a 25 ml purge volume.

Cubed revealed bromoform and 1,1,2,2-tetrachloroethane do not usually meet these limits when using a 25 ml purge volume and a packed GC column. As reported in the data validation memorandum for the February 1991 event, these violations have no impact on the data.

Table 1 lists the analytes that failed mean relative response factor and relative percent difference criteria for the initial calibration curve. Associated sample data should be qualified as estimated (J or UJ) or unusable (R).

Continuing Calibration

To ensure that each instrument was capable of producing quantitative results over the specified analysis period, routine checks upon the instrument calibration were performed. For SPCC, daily response factors were required to be greater than 0.300 (0.100 for bromoform). All remaining analytes were required to have daily response factors greater than 0.05. Percent difference between mean response factors and daily response factors for all analytes must be less than 25.

Again, bromoform and 1,1,2,2-tetrachloroethane had response factors below these limits, but no action upon the data was necessary. A number of analytes failed the mean RRF and percent difference criteria. As a result, associated sample data should be qualified as estimated (see Table 2).

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. One method blank was reported to contain methylene chloride (1 µg/*l*). Since associated sample results were non-detect for methylene chloride, no qualification of data was deemed necessary.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. One VOC surrogate recovery was outside the control limits. The sample that should be qualified as estimated (J) for positive results and the detection limit estimated for negative results is listed in Table 3. The remainder of the surrogate data were within the control limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

To assess the long term accuracy and precision of the analytical method on various matrices, MS/MSD percent recoveries and relative percent difference (RPD) of the recoveries were determined. Sample W-080591RR-164 underwent VOC MS/MSD analyses. RPD data listed in Table 4 were outside the control limits. As the data indicate a lack of precision, benzene and trichloroethane results for sample W080591RR-164 should be qualified as estimated (J/UJ).

Internal Standard Summaries

Overall instrument performance was monitored using internal standard peak area and retention time data. Peak areas were required to fall within +100 percent and -50 percent of the daily calibration sample internal standard peak areas. Sample retention times must fall within a 0.5 minute window from the calibration sample retention times. Table 5 lists the outlying internal standard data. Associated sample results should be qualified as estimated (J or UJ). It should be noted that sample W-080591RR-169RE was previously qualified based on surrogate recovery criteria and no further qualification of the data was deemed necessary.

Field QA/QC

The field QA/QC for this sampling event included one trip blank and two sets of field duplicate samples.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank was submitted to the laboratory for VOC analysis. The trip blank yielded a positive concentration of methylene chloride (2.3 µg/*l*). The majority of method blanks and project samples were reported to be free of methylene chloride. One method blank yielded a positive concentration of methylene chloride (1 µg/*l*). Several project samples not associated with this method blank were reported to contain low positive concentrations of methylene chloride. Since none of the investigative samples contained high concentrations of methylene chloride, cross contamination during shipment was unlikely. Positive sample results for methylene chloride were likely due to laboratory error. As a result, none of the investigative sample data should be qualified based on trip blank results.

Overall precision for the sampling event was monitored using two field duplicate sample sets. Sample summaries appear on Tables 6A through 6C. The overall level of precision was found to be acceptable.

Diluted Sample Results

A number of investigative samples were diluted and reanalyzed to obtain results within calibration range. Several dilution runs yielded data that was not comparable to the associated undiluted run. In most instances, this was considered acceptable since the original undiluted sample was reported to contain analyte concentrations so far above the calibration range that instrument response was completely non-linear. As expected, the diluted run yielded much higher analyte concentrations.

In several instances, compounds were detected in the diluted run but not in the non-diluted run. The case narrative for the data package acknowledged this and noted that there was no evidence of carryover or apparent cross-contamination from samples. The narrative discussed the possibility that samples were not homogeneous as second VOC vials were used for diluted sample analysis.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision with the specific qualifications noted herein.

cc: Steve Day

TABLE 1

OUTLYING INITIAL CALIBRATION DATA ASSOCIATED WITH SAMPLES COLLECTED DURING THE AUGUST 1991 SAMPLING EVENT

Date	Analysis	Analyte	RRF[1]	%RSD[2]	Qualifier[3]	Associated Samples
7/17/91	VOC	Acetone	0.122	31.5	J/UJ	All Project Samples
		2-Butanone	0.042	32.2	J/R	
		Bromoform	0.111	5.9	NR	
		1,1,2,2-Tetrachloroethane	0.196	5.3	NR	

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[1] RRF = Mean Relative Response Factor

[2] %RSD = Percent Relative Standard Deviation

[3] Sample data should be qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No qualification of the data was deemed necessary.

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA ASSOCIATED WITH SAMPLES COLLECTED DURING THE AUGUST 1991 SAMPLING EVENT

Date/ Time	Analysis	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
08/08/91 07:41	VOC	Acetone	0.195	60.2	NR	VBW2525-1 W-080591RR-160 W-080591RR-161 W-080591RR-162 W-080591RR-164 W-080591RR-165 W-080591RR-166 W-080591RR-167 W-080591RR-168 W-080591RR-169 W-080591RR-170 W-080691RR-171 W-080691RR-172 W-080691RR-173
		2-Butanone	0.045	6.8	NR	
		Bromoform	0.094	15.5	NR	
		2-Hexanone	0.082	47.7	J/UJ	
		1,1,2,2-Tetrachloroethane	0.186	5.2	NR	
08/09/91 07:45	VOC	2-Butanone	0.039	7.4	NR	VBW2525-2 Trip Blank W-080691RR-174 W-080691RR-175 W-080691RR-176 W-080591RR-168DL W-080591RR-170DL W-080691RR-171DL W-080591RR-163 W-080591RR-161DL W-080591RR-165DL
		Bromoform	0.089	20.5	NR	
		2-Hexanone	0.072	29.6	J/UJ	
		1,1,2,2-Tetrachloroethane	0.182	7.4	NR	
08/12/91 09:43	VOC	Acetone	0.208	71.1	NR	VBW2525-3 W-080691RR-177 W-080591RR-169RE W-080691RR-176DL W-080591RR-166DL W-080691RR-172DL W-080591RR-169DL
		Bromoform	0.092	17.5	NR	
		2-Hexanone	0.082	47.7	J/UJ	
		1,1,2,2-Tetrachloroethane	0.199	1.3	NR	
		2-Butanone	0.041	2.5	NR	
08/13/91 07:51	VOC	Methylene Chloride	2.200	34.9	J/UJ	VBW2525-4 W-080591RR-164MS LCS2525 W-080591RR-164MSD
		Acetone	0.204	68.1		
		2-Butanone	0.045	6.3	NR	
		Bromoform	0.087	21.7	NR	
		2-Hexanone	0.073	32.1	J/UJ	
		1,1,2,2-Tetrachloroethane	0.185	5.4	NR	

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[1] RRF = Mean Relative Response Factor

[2] %D = Percent Difference

[3] Sample data should be qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No additional qualification of the data was deemed necessary.

TABLE 3

OUTLYING SURROGATE RECOVERY FROM SAMPLE COLLECTED DURING THE AUGUST 1991 SAMPLING EVENT

Sample ID	Analysis	Compound	%R[1]	Limits[2]	Qualifier[3]
W-080591RR-169RE[4]	VOC	Toluene-d_8	85	88-110	J/UJ

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[1] %R = Percent Recovery
[2] Limits = Control limits established in associated QAPP.
[3] Sample data should be qualified as:
J - The associated value is an estimated quantity, for detected analytes.
UJ - The analyte was checked for, but not detected.
NR - No qualification of the data was deemed necessary.
[4] Suffix "RE" denotes re-analyzed sample.

TABLE 4

OUTLYING MS/MSD PERCENT RECOVERIES FOR SAMPLES COLLECTED DURING THE AUGUST 1991 SAMPLING EVENT

Sample ID	Analysis	Parameter	MS%R	MSD%R	Limits[1]	RPD[2]	Limits[3]	Qualifier[4]
W-080591RR-164	VOC	Trichloroethene	91	109	71-120	18	14	J/UJ
		Benzene	93	117	76-127	23	11	J/UJ
		Chlorobenzene	103	119	75-130	14	13	NR

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[1] %R Limits = Percent recovery control limits established in associated QAPP.

[2] RPD = Relative Percent Difference

[3] RPD Limits = Relative Percent Difference Limits

[4] Sample data should be qualified as:

NR - No additional qualification of the data was deemed necessary.

TABLE 5

SUMMARY OF VIOLATIONS OF INTERNAL STANDARD AREAS FOR SAMPLES COLLECTED DURING THE AUGUST 1991 SAMPLING EVENT

Sample ID	Analysis	Internal Standard	Area	Rt[1]	Qualifier[2]
W-080591RR-169	VOC	Bromochloromethane	20491	8.07	J/UJ
		1,4-Difluorobenzene	155480	18.30	
		Chlorobenzene-d5	109926	23.07	
W-080591RR-169RE	VOC	Bromochloromethane	10728	8.03	NR
		1,4-Difluorobenzene	87699	18.3	
		Chlorobenzene-d5	64634	23.11	

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[1] Rt = Retention Time

[2] Sample data should be qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No additional qualification of the data was deemed necessary.

TABLE 6A

SUMMARY OF FIELD DUPLICATE SAMPLE DATA FOR SAMPLES W-080591RR-169RE AND W-080591RR-170

		(Concentration (µg/l)				
Analysis	Parameter	W-080591RR-169RE	Qualifier[1]	W-080591RR-170	Qualifier	RPD[2]
VOC	Methylene Chloride	2 J	NR	ND (<1)	UJ	--
	Carbon Disulfide	1.9 J	NR	ND (<1)	UJ	--
	1,2-Dichloroethene	24 J	NR	5.7	J	--
	Chloroform	1.5 J	NR	ND (<1)	UJ	--
	Trichloroethene	590 J	NR	160 J	NR	--
	Tetrachloroethene	1.1 J	NR	ND (<1)	UJ	--

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[1] Sample data should be qualified as:
J - The associated value is an estimated quantity for detected analytes.
UJ - The analyte was check for, but not detected. The associated value is an estimate.
NR - No additional qualification of the data was deemed necessary.

[2] Relative Percent Difference

TABLE 6B

SUMMARY OF FIELD DUPLICATE SAMPLE DATA FOR SAMPLES W-080591RR-169DL AND W-080591RR-170DL

Analysis	Parameter	(Concentration (µg/*l*)) W-080591RR-169DL	Qualifier[1]	W-080591RR-170DL	Qualifier	RPD[2]
VOC	Acetone	ND (<40) UJ	NR	21 J	NR	--
	Trichloroethene	160	NR	190	NR	17
	1,2-Dichloroethene	ND (<20)	UJ	5.6	NR	--

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[1] Sample data should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

UJ - The analyte was check for, but not detected. The associated value is an estimate.

NR - No additional qualification of the data was deemed necessary.

[2] Relative Percent Difference

TABLE 6C

SUMMARY OF FIELD DUPLICATE SAMPLE DATA FOR SAMPLES W-080519RR-164 AND W-080591RR-177

		Concentration (µg/*l*)			
Analysis	Parameter	W-080591RR-164	W-080591RR-177	RPD[1]	Qualifier[2]
	Vinyl Chloride	2.9	3.6	21	NR
	1,2-Dichloroethene	1.4	1.6	13	NR
	Trichloroethene	3.9 J	3.8	--	NR
	Tetrachloroethene	10	12	18	NR

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[1] Relative Percent Difference

[2] Sample data should be qualified as:
NR - No qualification of the data was deemed necessary.
J - The associated value is an estimated quantity for detected analytes.

MEMORANDUM

TO: Ed Roberts
REFERENCE NO. 2115

FROM: Ruth M. Lewis
DATE: January 24, 1992

RE: Data Quality Assessment and Validation for Eighteen Groundwater Samples Collected during the November 1991 Sampling Event at the Wausau, Wisconsin, Site

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The following details a data quality assessment and validation for 18 groundwater samples collected on November 4 and 5, 1991, from the Wausau, Wisconsin, site. The samples were analyzed for target compound list volatile organic compounds (TCL VOC). All analyses were performed by Maxwell/S-Cubed Division in Sorrento Valley, California.[1] The quality assurance criteria were defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

The holding time for the analysis is 14 days from sample collection to completion of analysis.

Samples W-110491RR-186DL[3] and W-110591RR-194DL were analyzed 26 and 25 days, respectively, from the date of sample collection to completion of analysis; therefore, the data for these samples should be qualified as estimated (Table 1).

All remaining analyses were completed within the specified holding time period.

Instrument Performance

To ensure that the data for the analyses would be interpreted correctly, each instrument was tuned using bromofluorobenzene (BFB). Analysis of the data reported for the GC/MS instrument tunes indicated criteria were met for all VOC analyses.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Criteria for VOC analytes required a mean relative response factor (RRF) greater than 0.300 (0.100 for bromoform)[4] for system performance check compounds (SPCC). The remaining analytes were required to have response factors greater than 0.050. Percent relative standard deviations for all analytes were required to be less than 30. Bromoform and 1,1,2,2-tetrachloroethane mean response factors were below these limits. However, discussing the matter with S-

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[1] Analytical method derived from Contract Laboratory Program Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1988.

[3] Suffix "DL" denotes a diluted sample.

[4] This criterion was taken from the low level detection VOC CLP SOW 1990 (draft) and was extrapolated to these data since the CLP SOW 1988 does not specify calibration criteria using a 25 ml purge volume.

Cubed revealed bromoform and 1,1,2,2-tetrachloroethane do not usually meet these limits when using a 25 ml purge volume and a packed GC column. As reported in the data validation memorandum for the February 1991 event, these violations have no impact on the data.

Table 2 lists the analytes that failed the relative percent difference criteria for the initial calibration curves. Associated sample data should be qualified as estimated (J or UJ).

Continuing Calibration

To ensure that each instrument was capable of producing quantitative results over the specified analysis period, routine checks upon the instrument calibration were performed. For SPCC, daily response factors were required to be greater than 0.300 (0.100 for bromoform). All remaining analytes were required to have daily response factors greater than 0.05. Percent difference between mean response factors and daily response factors for all analytes must be less than 25.

Again, bromoform and 1,1,2,2-tetrachloroethane had response factors below these limits, but no action upon the data was necessary. A number of analytes failed the percent difference criteria. As a result, associated sample data should be qualified as estimated (see Table 3).

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. One method blank associated with diluted samples was reported to contain acetone (2.0 μg/*l*) and methylene chloride (2.6 μg/*l*). As a result, data for these analytes from several samples should be qualified as non-detect (U). A summary of these samples appears in Table 4.

Although reported acetone and methylene chloride data for the samples were much greater than the amount found in the method blank sample, the investigative samples were diluted to bring analyte peaks into calibration range. Dividing the reported value by the dilution factor yields the amount of analyte detected in the sample aliquot. Based on the amount of analyte detected in the sample aliquot relative to the amount in the method blank, acetone and methylene chloride data for the samples should be qualified as non-detect (U) as shown in Table 4.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. A number of VOC surrogate recoveries were outside the control limits. The samples that should be qualified as estimated (J) for positive results and the detection limit estimated for negative results are listed in Table 5. It should be noted that many of these samples were previously qualified for selected analytes and no additional qualifiers were necessary (NR). The remainder of the surrogate data were within the control limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

To assess the long term accuracy and precision of the analytical method on various matrices, MS/MSD percent recoveries and relative percent difference (RPD) of the recoveries were determined. Sample W-110591RR-193 underwent VOC MS/MSD analyses. Percent recoveries and RPD data listed in Table 6 were outside the control limits. However, since the matrix spike samples had been previously qualified, no further action was taken upon the data.

Internal Standard Summaries

Overall instrument performance was monitored using internal standard peak area and retention time data. Peak areas were required to fall within +100 percent and -50 percent of the daily calibration sample internal standard peak areas. Sample retention times must fall within a 0.5 minute window from the calibration sample retention times. Table 7 lists the outlying internal standard data. All of the sample data had been previously qualified so no further qualification of data was necessary.

Field QA/QC

The field QA/QC for this sampling event included one trip blank and two sets of field duplicate samples.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank was submitted to the laboratory for VOC analysis. The trip blank yielded a positive concentration of methylene chloride (2.4 µg/l). The associated method blank was reported to be free of all target analytes, including methylene chloride. Investigative samples that had been diluted out with reagent water and the associated reagent (method) blank were reported to contain methylene chloride. The investigative sample results for methylene chloride were qualified as non-detect (U) with the associated value being the quantitation limit. As a result, none of the investigative sample data should be qualified based on trip blank results.

Overall precision for the sampling event was monitored using two field duplicate sample sets. Sample summaries appear on Tables 8A through 8D. The overall level of precision was found to be acceptable despite the fact that all results were previously qualified as estimated. Sample W-110591RR-194DL yielded positive results for carbon disulfide and 2-butanone. The compounds were not detected in the undiluted sample or duplicate sample. For this reason, positive results for these analytes from this well should be qualified as unusable (R).

Diluted Sample Results

A number of investigative samples were diluted and reanalyzed to obtain results within calibration range. Several dilution runs yielded data that was not comparable to the associated undiluted run. In some instances, this was considered acceptable since the original undiluted sample was reported to contain analyte concentrations so far above the calibration range that instrument response was completely non-linear. As expected, the diluted run yielded much higher analyte concentrations.

Samples from two wells yielded non-comparable data in that much lower results were reported for diluted samples (see Table 9). The history of results from past sampling events for the two wells suggest the diluted results to be more accurate. Positive results from the undiluted samples which were out of calibration range should be qualified as unusable (R). Diluted sample results should be qualified as estimated. However, diluted sample results were previously qualified and no additional qualifiers were necessary.

Overall Assessment

Violation of several quality assurance criteria resulted in qualification of the majority of the data as detailed in the text and tables. Therefore, the VOC data should be used for qualitative assessment purposes only.

cc: Steve Day

TABLE 1

HOLDING TIME VIOLATIONS FOR SAMPLES COLLECTED DURING THE NOVEMBER 1991 SAMPLING EVENT

Sample ID	Date Collected	Analysis	Days to Analysis	Limit	Qualifier[1]
W-110491RR-186DL	11/04/91	VOC	26	14	J/UJ
W-110591RR-194DL[2]	11/05/91	VOC	25	14	J/UJ

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[1] Sample data should be qualified as:
J - The associated value is an estimated quantity for detected analytes.
UJ - The analyte was checked for, but not detected. The associated value is an estimate.

[2] Methylene chloride was detected in the associated method blank; the sample result should be qualified as non-detect (U) with the associated value being the quantitation limit.

TABLE 2

OUTLYING INITIAL CALIBRATION DATA ASSOCIATED WITH SAMPLES COLLECTED DURING THE NOVEMBER 1991 SAMPLING EVENT

Date	Analysis	Analyte	RRF[1]	%RSD[2]	Qualifier[3]	Associated Samples
11/13/91	VOC	1,2-dichloroethane	2.119	30.64	NR	-
		Vinyl Acetate	0.062	43.01	J/UJ	Trip Blank W-110491RR-180 W-110491RR-181 W-110491RR-182 W-110491RR-183 W-110491RR-184 VBW2678-1
11/14/91	VOC	Acetone	0.669	77.98	J/UJ[4]	VBW2678-2
		Vinyl Acetate	0.068	38.37	J/UJ	W-110491RR-185 W-110491RR-186 W-110491RR-187 W-110491RR-189 W-110491RR-190 W-110491RR-191 W-110591RR-192 W-110591RR-193 W-110591RR-194 W-110591RR-195 W-110591RR-196 W-110591RR-197 LCS2678 VBW2678-3 W-110491RR-185DL W-110491RR-189DL W-110491RR-190DL W-110491RR-191DL W-110591RR-192DL W-110591RR-193DL W-110591RR-195DL W-110591RR-196DL W-110591RR-193DLMS W-110591RR-193DLMSD

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[1] RRF = Mean Relative Response Factor

[2] %RSD = Percent Relative Standard Deviation

[3] Sample data should be qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No qualification of the data was deemed necessary.

[4] Acetone was detected in the associated method blank for sample W-110591RR-193DLMSD; the sample result should be qualified as non-detect (U) with the associated value being the quantitation limit. See method blank section.

TABLE 3

OUTLYING CONTINUING CALIBRATION DATA ASSOCIATED WITH SAMPLES COLLECTED DURING THE NOVEMBER 1991 SAMPLING EVENT

Date/ Time	Analysis	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
11/13/91	VOC	1,1,1-trichloroethane	0.426	38.3	J/UJ	VBW2678-1
18:49		Vinyl Acetate	0.062	27.4	NR	Trip Blank
						W-110491RR-180
						W-110491RR-181
						W-110491RR-182
						W-110491RR-183
						W-110491RR-184
11/15/91	VOC	Chloromethane	4.922	25.4	NR	VBW2678-2
09:06		Acetone	0.669	57.0	NR	W-110491RR-185
		2-butanone	0.522	37.7	J/UJ	W-110491RR-186
		cis-1,3-dichloropropene	0.296	25.7	NR	W-110491RR-187
		Bromoform	0.072	31.9	J/UJ	W-110491RR-189
		2-hexanone	0.091	57.1	J/UJ	W-110491RR-190
		1,1,2,2-tetrachloroethane	0.097	32.0	J/UJ	W-110491RR-191
						W-110591RR-192
						W-110591RR-193
						W-110591RR-194
						W-110591RR-195
						W-110591RR-196
						W-110591RR-197
						LCS2678
						VBW2678-3
						W-110491RR-185DL
						W-110491RR-189DL
						W-110491RR-190DL
						W-110591RR-192DL
						W-110591RR-193DL
						W-110591RR-195DL
						W-110591RR-196DL
						W-110591RR-193DLMS
						W-110591RR-193DLMSD

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[1] RRF = Mean Relative Response Factor

[2] %D = Percent Difference

[3] Sample data should be qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No qualification of the data was deemed necessary.

TABLE 4

SUMMARY OF ANALYTES DETECTED IN METHOD BLANK SAMPLES ASSOCIATED WITH THE NOVEMBER 1991 SAMPLING EVENT

Blank ID	Analysis	Analyte	Concentration (µg/l)	Associated Samples[1]
VBW2678-3	VOC	Acetone	2.0	W-110591RR-193DLMSD
		Methylene Chloride	2.6	W-110491RR-185DL W-110491RR-187DL W-110491RR-189DL W-110491RR-190DL W-110491RR-191DL W-110591RR-192DL W-110591RR-193DL W-110591RR-194DL W-110591RR-195DL W-110591RR-196DL W-110591RR-193DLMS W-110591RR-193DLMSD

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[1] Sample results should be qualified as non-detect (U) with the associated value being the quantitation limit.

TABLE 5

OUTLYING SURROGATE RECOVERIES FROM SAMPLES COLLECTED DURING THE NOVEMBER 1991 SAMPLING EVENT

Sample ID	Analysis	Compound	%R[1]	Limits[2]	Qualifier[3]
W-110491RR-180	VOC	Bromofluorobenzene	85	86-115	NR
W-110491RR-181	VOC	Bromofluorobenzene	83	86-115	J/UJ
W-110491RR-182	VOC	Bromofluorobenzene	81	86-115	J/UJ
W-110491RR-183	VOC	Bromofluorobenzene	84	86-115	J/UJ
W-110491RR-183	VOC	1,2-dichloroethane-d$_4$	65	76-114	J/UJ
W-110491RR-184	VOC	Bromofluorobenzene	81	86-115	J/UJ
W-110491RR-184	VOC	1,2-dichloroethane-d$_4$	67	76-114	J/UJ
W-110491RR-185	VOC	1,2-dichloroethane-d$_4$	59	76-114	J/UJ
W-110491RR-185DL	VOC	Bromofluorobenzene	85	86-115	NR
W-110491RR-186	VOC	Toluene-d$_8$	73	88-110	J/UJ
W-110491RR-186	VOC	Bromofluorobenzene	85	86-115	J/UJ
W-110491RR-186	VOC	1,2-dichloroethane-d$_4$	55	76-114	J/UJ
W-110491RR-187	VOC	1,2-dichloroethane-d$_4$	42	76-114	J/UJ
W-110491RR-187RE[4]	VOC	1,2-dichloroethane-d$_4$	71	76-114	J/UJ
W-110491RR-189	VOC	Bromofluorobenzene	80	86-115	J/UJ
W-110491RR-189	VOC	1,2-dichloroethane-d$_4$	45	76-114	J/UJ
W-110491RR-189DL	VOC	Bromofluorobenzene	81	86-115	J/UJ
W-110491RR-189DL	VOC	1,2-dichloroethane-d$_4$	66	76-114	J/UJ
W-110491RR-190	VOC	Bromofluorobenzene	77	86-115	J/UJ
W-110491RR-190	VOC	1,2-dichloroethane-d$_4$	43	76-114	J/UJ
W-110491RR-190DL	VOC	Bromofluorobenzene	84	86-115	J/UJ
W-110491RR-190DL	VOC	1,2-dichloroethane-d$_4$	69	76-114	J/UJ
W-110491RR-191	VOC	Bromofluorobenzene	80	86-115	J/UJ
W-110491RR-191	VOC	1,2-dichloroethane-d$_4$	40	76-114	J/UJ
W-110491RR-191DL	VOC	1,2-dichloroethane-d$_4$	63	76-114	J/UJ
W-110491RR-191DL	VOC	Bromofluorobenzene	84	86-115	J/UJ
W-110591RR-192	VOC	Toluene-d$_8$	24	88-110	J/UJ
W-110591RR-192	VOC	1,2-dichloroethane-d$_4$	38	76-114	J/UJ
W-110591RR-192DL	VOC	1,2-dichloroethane-d$_4$	64	76-114	J/UJ
W-110591RR-193	VOC	Toluene-d$_8$	25	88-110	J/UJ
W-110591RR-193	VOC	1,2-dichloroethane-d$_4$	26	76-114	J/UJ
W-110591RR-193DL	VOC	1,2-dichloroethane-d$_4$	64	76-114	J/UJ
W-110591RR-193DLMS	VOC	Bromofluorobenzene	82	86-115	J/UJ
W-110591RR-193DLMSD	VOC	1,2-dichloroethane-d$_4$	71	76-114	J/UJ
W-110591RR-194	VOC	Toluene-d$_8$	20	88-110	J/UJ
W-110591RR-194	VOC	Bromofluorobenzene	85	86-115	J/UJ
W-110591RR-194	VOC	1,2-dichloroethane-d$_4$	15	76-114	J/UJ
W-110591RR-195	VOC	Toluene-d$_8$	22	88-110	J/UJ
W-110591RR-195	VOC	1,2-dichloroethane-d$_4$	19	76-114	J/UJ
W-110591RR-195DL	VOC	Bromofluorobenzene	83	86-115	J/UJ
W-110591RR-195DL	VOC	1,2-dichloroethane-d$_4$	65	76-114	J/UJ
W-110591RR-196	VOC	Toluene-d$_8$	64	88-110	J/UJ
W-110591RR-196	VOC	Bromofluorobenzene	76	86-115	J/UJ
W-110591RR-196	VOC	1,2-dichloroethane-d$_4$	14	76-114	J/UJ
W-110591RR-196DL	VOC	Bromofluorobenzene	84	86-115	J/UJ
W-110591RR-196DL	VOC	1,2-dichloroethane-d$_4$	74	76-114	J/UJ
W-110591RR-197	VOC	Toluene-d$_8$	82	88-110	J/UJ
W-110591RR-197	VOC	Bromofluorobenzene	80	86-115	J/UJ
W-110591RR-197	VOC	1,2-dichloroethane-d$_4$	20	76-114	J/UJ
Trip Blank	VOC	Bromofluorobenzene	85	86-115	NR
VBW2678-2	VOC	1,2-dichloroethane-d$_4$	67	76-114	J/UJ
VBW2678-3	VOC	Bromofluorobenzene	83	86-115	J/UJ
VBW2678-3	VOC	1,2-dichloroethane-d$_4$	74	76-114	J/UJ
LCS2678	VOC	Bromofluorobenzene	75	86-115	J/UJ
LCS2678	VOC	1,2-dichloroethane-d$_4$	38	76-114	J/UJ

---

[1] %R = Percent Recovery

[2] Limits = Control limits established in associated QAPP.

[3] Sample data should be qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected.

NR - No qualification of the data was deemed necessary.

[4] Suffix "RE" denotes re-analyzed sample.

TABLE 6

OUTLYING MS/MSD PERCENT RECOVERIES FOR SAMPLES COLLECTED DURING THE NOVEMBER 1991 SAMPLING EVENT

Sample ID	Analysis	Parameter	MS%R	MSD%R	Limits[1]	RPD[2]	Limits[3]	Qualifier[4]
W-110591RR-193	VOC	Trichloroethene	0	0	71-120	-	14	NR
		Benzene	110	130	76-127	17	11	NR
		Toluene	99	120	76-125	19	13	NR
		Chlorobenzene	110	130	75-130	17	13	NR

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[1] %R Limits = Percent recovery control limits established in associated QAPP.

[2] RPD = Relative Percent Difference

[3] RPD Limits = Relative Percent Difference Limits

[4] Sample data should be qualified as:

NR - No additional qualification of the data was deemed necessary.

TABLE 7

SUMMARY OF VIOLATIONS OF INTERNAL STANDARD AREAS FOR SAMPLES COLLECTED DURING THE NOVEMBER 1991 SAMPLING EVENT

Sample ID	Analysis	Internal Standard	Area	Rt[1]	Qualifier[2]
W-110491RR-186	VOC	Chlorobenzene-d5	9713018	57.23	NR
W-110491RR-187	VOC	1,4-difluorobenzene	14438018	34.82	NR
		Chlorobenzene-d5	10784019	57.28	
W-110491RR-190	VOC	Chlorobenzene-d5	11458020	57.23	NR
W-110491RR-191	VOC	1,4-difluorobenzene	16697018	34.88	NR
		Chlorobenzene-d5	10537020	57.28	
W-110591RR-192	VOC	1,4-difluorobenzene	13253016	34.82	NR
		Chlorobenzene-d5	3296012	57.28	
W-110591RR-193	VOC	1,4-difluorobenzene	17289018	34.82	NR
		Chlorobenzene-d5	2514011	57.28	
W-110591RR-194	VOC	1,4-difluorobenzene	11110015	34.77	NR
		Chlorobenzene-d5	1538010	57.17	
W-110591RR-195	VOC	1,4-difluorobenzene	15297015	34.77	NR
		Chlorobenzene-d5	1891010	57.23	
W-110591RR-196	VOC	1,4-difluorobenzene	7828015	34.77	NR
		Chlorobenzene-d5	7253016	57.23	
W-110591RR-197	VOC	1,4-difluorobenzene	14891018	34.77	NR
W-110491RR-191DL	VOC	1,4-difluorobenzene	21087000	34.77	NR
		Chlorobenzene-d5	14657026	57.28	
W-110591RR-192DL	VOC	Chlorobenzene-d5	12323000	57.23	NR
W-110591RR-193DL	VOC	1,4-difluorobenzene	15905000	34.71	NR
		Chlorobenzene-d5	12184000	57.23	
W-110591RR-193DLMSD	VOC	1,4-difluorobenzene	20450000	34.77	NR

---

[1] Rt = Retention Time

[2] Sample data should be qualified as:

NR - No additional qualification of the data was deemed necessary.

TABLE 8A

SUMMARY OF FIELD DUPLICATE SAMPLE DATA FOR SAMPLES W-110491RR-189 AND W-110491RR-190

		(Concentration (µg/*l*)		
Analysis	Parameter	W-110491RR-189	W-110491RR-190	RPD[1]
VOC	1,2-dichloroethene	9.5 J	9.9 J	--
	Trichloroethene	290 J	340 J	--

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[1] Relative Percent Difference

TABLE 8B

SUMMARY OF FIELD DUPLICATE SAMPLE DATA FOR SAMPLES W-110491RR-189DL AND W-110491RR-190DL

		(Concentration (µg/l)		
Analysis	Parameter	W-110491RR-189DL	W-110491RR-190DL	RPD[1]
VOC	Methylene Chloride	17 U	17 U	--
	Trichloroethene	210 J	300 J	--

---

[1] Relative Percent Difference

TABLE 8C

SUMMARY OF FIELD DUPLICATE SAMPLE DATA FOR SAMPLES W-110591RR-193 AND W-110591RR-194

Analysis	Parameter	(Concentration (µg/l)) W-110591RR-193	(Concentration (µg/l)) W-110591RR-194	RPD[1]
VOC	1,2-dichloroethene	57 J	49 J	--
	Trichloroethene	1300 J	550 J	--
	Tetrachloroethene	1.4 J	1.8 J	--

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[1] Relative Percent Difference

TABLE 8D

SUMMARY OF FIELD DUPLICATE
SAMPLE DATA FOR SAMPLES
W-110591RR-193DL AND W-110491RR-194DL

		(Concentration (µg/l)				
Analysis	Parameter	W-110591RR-193DL	Qualifier[1]	W-110591RR-194DL	Qualifier	RPD[2]
VOC	Methylene Chloride	250 U	NR	100 U	NR	--
	Trichloroethene	3800 J	NR	960 J	NR	--
	2-butanone	ND (<200) UJ	NR	170 J	R	--
	Carbon Disulfide	ND (<100) UJ	NR	9600 J	R	--

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[1] Sample data should be qualified as:
NR - No additional qualification of the data was deemed necessary.
R - The data was unusable.

[2] Relative Percent Difference

TABLE 9

COMPARISON OF UNDILUTED/DILUTED SAMPLE RESULTS FOR SAMPLES W-110591RR-195 AND W-110591RR-196

		Concentration (µg/*l*)			
Analysis	**Analyte**	**W-110591RR-195**	**Qualifier[1]**	**W-110591RR-195DL**	**Qualifier**
VOC	1,2-dichloroethene	43 J	R	ND (<10) UJ	NR
	Trichloroethene	350 J	R	10 J	NR
	Tetrachloroethene	1.2 J	NR	ND (<10) UJ	NR
	Methylene Chloride	ND (<2) UJ	NR	21 U	NR

Analysis	Analyte	W-110591RR-196	Qualifier	W-110591RR-196DL	Qualifier
VOC	1,2-dichloroethene	4.1 J	NR	ND (<10) UJ	NR
	Chloroform	11 J	NR	13 J	NR
	Carbon Tetrachloride	13 J	NR	ND (<10) UJ	NR
	Trichloroethene	220 J	R	43 J	NR
	Methylene Chloride	ND (<2) UJ	NR	18 U	NR

---

[1] Sample data should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

UJ - The anayte was check for, but not detected. The associated value is an estimate.

R - The data was unusable.

U - Sample results should be qualified as non-detect with the associated value being the quantitation limit.

NR - No additional qualifiers were required.

MEMORANDUM

TO: Ed Roberts　　REFERENCE NO. 2115

FROM: Ruth M. Lewis　　DATE: February 26, 1992

RE: Amendments to Data Quality Assessment Memorandums for Groundwater Samples Collected during Several Sampling Events at the Wausau, Wisconsin, Site

The following details amendments to data quality assessment memos for groundwater samples collected during the February, May and August 1991 sampling events at the Wausau, Wisconsin, site. The samples were analyzed for Target Compounds List Volatile Organic Compounds (TCL VOC). All analyses were performed by Maxwell/S-Cubed Division in Sorrento Valley, California.[1] The quality assurance criteria were defined in the associated quality assurance project plan.[2]

Several investigative samples from February, May and August sampling events were diluted and reanalyzed to obtain results within calibration range. Several dilution runs yielded data that was not comparable to the associated undiluted run. In some instances, this was considered acceptable since the original undiluted sample was reported to contain analyte concentrations so far above the calibration range that instrument response was completely non-linear. As expected, the diluted run yield much higher analyte concentrations.

Samples from a number of wells yielded non-comparable data in that much lower results were reported for diluted samples. This is indicative of analytical difficulties experienced at the laboratory. There is no quality control criteria for diluted/undiluted sample results for data validation purposes. As a result, qualification is based on the judgement of the data validation chemist. After further review, non-comparable sample data should be qualified as detailed in Table 1.

The remaining data from the sampling events was found to be acceptable with the specific qualifications noted in previous memos.

---

[1] Analytical method derived from Contract Laboratory Program Statement of Work, February 1988, revised September 1988 and April 1989.

[2] Application of quality assurance criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1988.

TABLE 1

COMPARISON OF UNDILUTED/ DILUTED SAMPLE RESULTS

Sampling Event	Sample ID	VOC Analyte	Concentration (µg/*l*)	Previous Qualifier[1]	Current Qualifier
02/12/91	W53A	Trichloroethene	72	NR	J
02/12/91	W53A DL	Trichloroethene	42	NR	J
05/06/91	R2D	Trichloroethene	880	J	R
05/06/91	R2D DL	Trichloroethene	270	J	NR
05/06/91	W55	Trichloroethene	830	J	R
05/06/91	W55 DL	Trichloroethene	230	J	NR
05/06/91	EW1 Inf.	Trichloroethene	270	J	R
05/06/91	EW1 Inf. DL	Trichloroethene	29	NR	J
08/05/91	EW1 Eff.	Trichloroethene	330	J	R
08/05/91	EW1 Eff. DL	Trichloroethene	160	NR	J

---

[1] Sample data should be qualified as:
J - The associated value is an estimated quantity for detected analytes.
R - The data are unusable.
NR - No qualification of the data was deemed necessary.

Note: Current qualifiers account for results from undiluted/diluted sample runs.

Waterloo File Copy

MEMORANDUM

TO: Ed Roberts

REFERENCE NO. 2115

FROM: Ruth M. Lewis

DATE: May 7, 1992

RE: Data Quality Assessment and Validation for 18 Groundwater Samples Collected during the February 1992 Sampling Event at the Marathon Electric Manufacturing Site

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The following details a data quality assessment and validation for 18 groundwater samples collected on February 17 and 18, 1992, from the Marathon Electric Manufacturing site in Wausau, Wisconsin. The samples were analyzed for target compound list volatile organic compounds (TCL VOC) and target analyte list metals (TAL metals). All analyses were performed by Maxwell/S-Cubed Division in Sorrento Valley, California.[1] The quality assurance criteria were defined in the associated quality assurance project plan (QAPP).[2]

Holding Time Period

Holding time periods are summarized below:

TCL VOC - 14 days from sample collection to completion of analysis

TAL Metals (except mercury) - 6 months from sample collection to completion of analysis

Mercury - 28 days from sample collection to completion of analysis

On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by S-Cubed, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by the laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from target analytes, indicating no significant laboratory contamination occurred.

---

[1] Analytical methods were derived from Contract Laboratory Program Statement of Work, March 1990.

[2] Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", December 1990, and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", July 1988.

GC/MS Tuning Performance

To ensure that the data for VOC analyses would be interpreted correctly, each instrument was tuned using bromofluorobenzene (BFB). Analysis of the data reported for the GC/MS instrument tunes indicated criteria were met for all VOC analyses.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Criteria for VOC analytes required a mean relative response factor (RRF) greater than or equal to 0.050. Percent relative standard deviations for all analytes were required to be less than or equal to 30.

Initial calibration criteria for TAL metals required successful analysis of the correct number of blanks and standards. All correlation coefficients for atomic absorption analysis were to be at or above the limit of 0.995. Initial calibration verification (ICV) results were required to be within control limits specified in CLP SOW, March 1990.

Table 1 lists the metals parameters that failed correlation coefficient criteria. Associated sample data should be qualified as estimated (J) for positive parameter results and the quantitation limit estimated (UJ) for negative parameter results. The remaining initial calibration results for VOC and metals analyses were within acceptance criteria.

Continuing Calibration

To ensure that each instrument was capable of producing quantitative results over the specified analysis period, routine checks upon the instrument calibration were performed. For VOC analyses, daily response factors were required to be greater than or equal to 0.050. Percent difference between mean RRF and daily RRF for all analyses must be less than or equal to 25.

Continuing calibration criteria for TAL metals required successful analysis of the correct number of instrument blanks and standards. Continuing calibration verification (CCV) results were required to be within control limits specified in CLP SOW, March 1990.

The majority of continuing calibration results for VOC and metals analyses were within acceptance criteria. Table 2 lists the analytes that failed calibration criteria. Associated sample data should be qualified as estimated (J) for positive parameter results and the detection limit estimated (UJ) for negative parameter results. The continuing calibration verification (89.7%R) result for antimony was just outside the control limits (90 to 110%). Considering the fact that the result was less than one percent from the acceptable range, no qualification of data was required on this basis.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. A number of surrogate recoveries were outside the control limits. The samples that should be qualified as estimated (J) for positive results and the detection limit estimated (UJ) for negative results are listed in Table 3. The remainder of the surrogate data were within the control limits.

Internal Standard Summaries

Overall instrument performance for VOC analyses was monitored using internal standard peak area and retention time data. Peak areas were required to fall within +100 percent and -50 percent of the daily calibration sample internal standard peak areas. Sample retention times must fall within a 0.5 minute window from the calibration sample retention times. All internal standard results were within acceptance criteria.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results - VOC Analyses

To assess the long term accuracy and precision of the analytical method on various matrices, MS/MSD percent recoveries and relative percent difference (RPD) of the recoveries were determined. Percent recoveries listed in Table 4 were outside the control limits. The trichloroethene matrix spike recovery for W-021792RR-208 was reported to be above the upper control limit. The spike concentration for the parameter was significantly below the sample concentration and, thus, could not be distinguished from the sample's analytical signal. Therefore, no qualification of VOC data was required on this basis. The remaining percent recovery and RPD data were within control limits.

Matrix Spike/Laboratory Duplicate (MS/DUP) Results - Metals Analyses

To assess the long term accuracy and precision of the analytical method on various matrices, MS percent recoveries and relative percent differences of duplicate results were determined. Table 5 lists the outlying percent recovery data. The high spike recovery indicates poor laboratory accuracy for the spiked sample and all associated samples. Results for the spiked sample and associated samples should be qualified as estimated (J) for positive parameter results. The remaining percent recovery and RPD data were within control limits.

Laboratory Control Samples (LCS)

Overall performance of VOC and metals analyses was monitored by means of LCS. As all percent recoveries fell within control limits reported by S-Cubed, the analytical protocols were shown to be able to generate acceptable quantitative data.

ICP Interference Check Sample (ICS)

Measurement of inter-elemental interferences for TAL metals analytes analyzed by ICP was checked for by means of an ICP ICS. As all percent recoveries fell within specified control limits, no significant inter-elemental interferences were observed.

ICP Serial Dilution Results

Matrix interferences were monitored by means of ICP serial dilution analyses. As the parameters demonstrated adequate precision, the ICP analytical protocols were shown to be able to generate acceptable quantitative data.

Field QA/QC

The field QA/QC for this sampling event included one trip blank and two sets of field duplicate samples.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank was submitted to the laboratory for VOC analysis. The trip blank yielded a positive concentration of methylene chloride (2.0 µg/l). The associated method blank was reported to be free of methylene chloride. Several project samples were reported to contain low positive concentrations of methylene chloride. Since none of the investigative samples contained high concentrations of methylene chloride, cross contamination during shipment was unlikely. Positive sample results for methylene chloride were likely due to laboratory error. As a result, none of the investigative sample data should be qualified based on trip blank results.

Overall precision for the sampling event was monitored using two field duplicate sample sets (see Tables 6A and 6B). The overall level of precision was found to be acceptable despite the fact that many results were previously qualified as estimated. A number of the field duplicate sets yielded a positive result in one sample and a negative result in the other sample. In all cases, the positive result was reported to be near the detection limit. Considering the potential for variability in measurement of field and laboratory precision, particularly near the detection limit, the associated field duplicate data should remain unqualified. Relative percent difference (RPD) values were calculated for unqualified positive parameter results. The RPD values ranged from zero to 18 and were considered acceptable.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, and may be used with the qualifications noted.

RL/kk
Enc.
cc: Steve Day
Bob Martin

TABLE 1

OUTLYING CORRELATION COEFFICIENT RESULTS
METALS ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
FEBRUARY 1992 SAMPLING EVENT

Parameter	Correlation Coefficient	Qualifier[1]	Associated Samples
Arsenic	0.94607	J/UJ	W-021792RR-206
Selenium	0.98668	J/UJ	W-021792RR-207
Thallium	0.98497	J/UJ	W-021792RR-208
Lead	0.98572	J/UJ	W-021792RR-209
			W-021792RR-210
			W-021892RR-212
			W-021892RR-213

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[1] Sample data should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA
MARATHON ELECTRIC MANUFACTURING SITE
FEBRUARY 1992 SAMPLING EVENT

Date/ Time	Analysis	Analyte	RRF[1]	%D[2]	Qualifier[3]	Associated Samples
2/24	VOC	Acetone	0.216	30.5	NR	VBW2820-1
13:03						LSCW2820
						W-021792RR-204
						VBW2820-2
						W-021792RR-200
						W-021792RR-202
2/27	VOC	Chloromethane	1.562	30.9	NR	VBW2820-4
13:05		Carbon Tetrachloride	0.554	36.3	J/UJ	W-021792RR-207RE
						W-021792RR-201DL
						W-021792RR-209DL
						W-021792RR-210DL
						W-021892RR-211DL
						W-021892RR-212
						W-021792RR-208
						W-021792RR-217
						W-021892RR-214
						W-021892RR-215
						W-021892RR-213
						VBW2820-5
						W-021792RR-203
						W-021792RR-217DL
						W-021792RR-208DL
						W-021892RR-214DL
						W-021892RR-215DL
						W-021892RR-213DL
						W-021792RR-204DL
						W-021792RR-201
						W-021792RR-209
						W-021792RR-210
						W-021892RR-215RE
						W-021892RR-211RE
2/28	VOC	1,2-Dichloroethane-d_4	1.796	32.3	J/UJ	VBW2820-6
13:58						W-021792RR-208MS
						W-021792RR-208MSD

---

[1] RRF = Mean Relative Response Factor

[2] %D = Percent Difference

[3] Sample data should be qualified as:

J - The associated value is an estimated quantity, for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No qualification of the data was deemed necessary.

TABLE 3

OUTLYING SURROGATE RECOVERIES
MARATHON ELECTRIC MANUFACTURING SITE
FEBRUARY 1992 SAMPLING EVENT

Sample ID	Analysis	Compound	%R[1]	Limits	Qualifier[2]
W-021892-RR-211	VOC	Bromofluorobenzene	82	86-115	J/UJ
W-021892-RR-211	VOC	1,2-Dichloroethane-d_4	131	76-114	NR
W-021892-RR-211DL	VOC	Bromofluorobenzene	84	86-115	J/UJ
W-021892-RR-211RE	VOC	Bromofluorobenzene	73	86-115	J/UJ
W-021892-RR-215	VOC	1,2-dichloroethane-d_4	116	76-114	J/NR
W-021892-RR-215RE	VOC	1,2-dichloroethane-d_4	118	76-114	J/NR
W-021892-RR-207	VOC	Bromofluorobenzene	84	86-115	J/UJ
W-021892-RR-207RE	VOC	Toluene-d_8	114	88-110	J/NR

---

[1] %R = Percent Recovery

[2] Sample data should be qualified as:

J - The associated value is an estimated quantity, for detected analytes.
UJ - The analyte was checked for, but not detected.
NR - No qualification of the data was deemed necessary.

TABLE 4

OUTLYING MS/MSD PERCENT RECOVERIES - VOC ANALYSES MARATHON ELECTRIC MANUFACTURING SITE FEBRUARY 1992 SAMPLING EVENT

Sample ID	Analysis	Parameter	MS%R	MSD%R	%R Limits[1]	RPD[2]	RPD Limits[3]	Qualifier[4]
W-021792RR-208	VOC	Trichloroethene	494	392	71-120	4	14	NR

---

[1] %R Limits = Percent recovery control limits established in associated QAPP.

[2] RPD = Relative Percent Difference

[3] RPD Limits = Relative Percent Difference Limits

[4] Sample data should be qualified as:

NR - No qualification of the data was deemed necessary.

TABLE 5

OUTLYING MATRIX SPIKE RECOVERIES
METALS ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
FEBRUARY 1992 SAMPLING EVENT

Spiked Sample	Analysis	Parameter	Instrument[1]	MS %R	%R Limits	Qualifier[2]	Associated Samples
W-021792RR-208	Metals	Mercury	CV	182.3	75-125	J/NR	W-021792RR-206 W-021792RR-207 W-021792RR-208 W-021792RR-209 W-021792RR-210 W-021892RR-212 W-021892RR-213
	Metals	Selenium	F	142.3	75-125	J/NR	

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[1] Instrument - Instrument utilized for metals analysis (F = Furnace AA, CV = Cold Vapor AA)

[2] Sample data should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

NR - No qualification of the data was deemed necessary for non-detect analytes.

TABLE 6A

SUMMARY OF FIELD DUPLICATE DATA FOR SAMPLES W-021792RR-209 AND W-021792RR-210 MARATHON ELECTRIC MANUFACTURING SITE FEBRUARY 1992 SAMPLING EVENT

Analysis	Parameter	W-021792RR-209 (Concentration (µg/*l*))	Qualifier[1]	W-021792RR-210 (Concentration (µg/*l*))	Qualifier	RPD[2]
VOC	1,2-Dichloroethene	5	NR	5	NR	0
	Trichloroethene	140 J	NR	130 J	NR	--
Metals	Aluminum	115	NR	128	NR	11
	Barium	35.0	NR	36.0	NR	3.0
	Calcium	20,900	NR	20,700	NR	0.96
	Iron	1,240	NR	1,260	NR	1.6
	Magnesium	5,540	NR	5,610	NR	1.3
	Manganese	291	NR	291	NR	0
	Sodium	12,400	NR	12,300	NR	0.81
	Zinc	56.0	NR	58.0	NR	3.5
	Mercury	ND (<0.20)	NR	0.46	NR	NC[3]
	Potassium	ND (<1300)	NR	1830	NR	NC

Analysis	Parameter	W-021792RR-209DL (Concentration (µg/*l*))	Qualifier	W-021792RR-210DL (Concentration (µg/*l*))	Qualifier	RPD
VOC	1,2-Dichloroethene	3 J	NR	ND (<5)	NR	NC
	Trichloroethene	120	NR	100	NR	18

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[1] Sample data should be qualified as:
NR - No additional qualification of the data was deemed necessary.

[2] Relative Percent Difference

[3] NC - Non-calculable

TABLE 6B

SUMMARY OF FIELD DUPLICATE DATA FOR SAMPLES W-021892RR-214 AND W-021892RR-215 MARATHON ELECTRIC MANUFACTURING SITE FEBRUARY 1992 SAMPLING EVENT

		(Concentration (µg/l)				
Analysis	Parameter	W-021892RR-214	Qualifier[1]	W-021892RR-215	Qualifier	RPD[2]
VOC	1,2-Dichloroethene	11	NR	10	NR	9.5
	Trichloroethene	410 J	NR	380 J	NR	--

		(Concentration (µg/l)				
Analysis	Parameter	W-021892RR-214DL	Qualifier	W-021892RR-215DL	Qualifier	RPD
VOC	Methylene Chloride	9 J	NR	ND (<10)	NR	NC[3]
	1,2-Dichloroethene	10	NR	8 J	NR	--
	Trichloroethene	330	NR	300	NR	9.5

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[1] Sample data should be qualified as:
NR - No additional qualification of the data was deemed necessary.

[2] Relative Percent Difference

[3] NC = Non-calculable

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MEMORANDUM

TO: Ed Roberts
REFERENCE NO. 2115

FROM: Ruth M. Lewis
DATE: October 2, 1992
Revised from 9/17/92

RE: Data Quality Assessment and Validation for Eighteen Groundwater Samples Collected during the May 1992 Sampling Event at the Wausau, Wisconsin, Site

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The following details a data quality assessment and validation for 18 groundwater samples collected on May 11 and 12, 1992, from the Wausau, Wisconsin site. The samples were analyzed for target compound list volatile organic compounds (TCL VOC). All analyses were performed by Maxwell/S-Cubed Division in Sorrento Valley, California[1]. The quality assurance criteria were defined in the associated quality assurance project plan (QAPP)[2].

Holding Time Period

The holding time for the analysis is 14 days from sample collection to completion of analysis. All analyses were completed within the specified holding time period.

Instrument Performance

To ensure that the data for the analyses would be interpreted correctly, each instrument was tuned using bromofluorobenzene (BFB). Analyses of the data reported for the GC/MS instrument tunes indicated criteria were met for all VOC analyses.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Criteria for VOC analytes required a mean relative response factor (RRF) greater than or equal to 0.050. Percent relative standard deviations for all analytes were required to be less than or equal to 30. Table 2 lists the analytes that failed initial calibration criteria. Associated sample

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[1] Analytical method derived from Contract Laboratory Program Statement of Work, March 1990.

[2] Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", December 1990 (draft) and June 1991 (revision).

data should be qualified as estimated (J) for positive parameter results and the quantitation limit estimated (UJ) for negative parameter results. The remaining initial calibration results for VOC analyses were within acceptance criteria.

Continuing Calibration

To ensure that each instrument was capable of producing quantitative results over the specified analyses period, routine checks upon the instrument calibration were performed. All analytes were required to have daily response factors greater than or equal to 0.050. Percent difference between mean response factors and daily response factors for all analytes must be less than or equal to 25. Table 3 lists the analytes that failed continuing calibration criteria. Associated sample data should be qualified as estimated (J) for positive parameter results and the quantitation limit estimated (UJ) or unusable (R) for negative parameter results. The remaining continuing calibration results for VOC analyses were within acceptance criteria.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. Several surrogate recoveries were outside the control limits. The samples that should be qualified as estimated (J) for positive results and the quantitation limit estimated (UJ) for negative results are listed in Table 4. The remainder of the surrogate data were within the control limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

To assess the long term accuracy and precision of the analytical method on various matrices, MS/MSD percent recoveries and relative percent difference (RPD) of the recoveries were determined. Sample W051292RR-231 underwent VOC MS/MSD analyses. Percent recoveries and RPD data listed in Table 5 were outside the control limits. As a result, trichloroethene data from W051292-231 should be qualified as estimated (J).

Method Blank Samples

Contamination of the samples contributed by the laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. Method blank samples listed in Table 6 yielded detectable concentrations of target analytes. As a result, associated sample data should be qualified as non-detect (U). The remaining method blank samples were reported to be free from target analytes, indicating no significant laboratory contamination occurred.

Internal Standard Summaries

Overall instrument performance for VOC analyses was monitored using internal standard peak area and retention time data. Peak areas were required to fall within +100 percent and -50 percent of the daily calibration sample internal standard peak area. Sample retention times must fall within a 0.5 minute window from the calibration sample retention times. All internal standard results were within acceptance criteria.

Field QA/QC

The field QA/QC for this sampling event included one trip blank and two sets of field duplicate samples.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank was submitted to the laboratory for VOC analysis. The trip blank was reported to be free of target analytes.

Overall precision for the sampling event was monitored using two field duplicate sample sets: W051192-229/W051192-230, W051292RR-231/W0512RR-232. The RPD data was found to be acceptable, indicating an adequate level of precision was achieved.

Diluted Sample Results

A number of investigative samples were diluted and reanalyzed to obtain results within calibration range. Several dilution runs yielded data that was not comparable to the associated undiluted run. In most instances, this was considered acceptable since the original undiluted sample was reported to contain analyte concentrations so far above the calibration range that instrument response was completely non-linear. As expected, the diluted run yielded much higher analyte concentrations. Table 7 lists non-comparable diluted sample results.

Several well samples noted in Table 7 yielded non-comparable data in that much lower results were reported for diluted samples. Positive results from the undiluted samples which were out of calibration range were previously qualified as estimated (J). Diluted sample results should also be qualified as estimated (J) for positive parameter results.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the specific qualifications noted.

Enc.
cc: Steve Day
RL/jm

TABLE 1

SUMMARY OF SAMPLE IDENTIFICATION NUMBERS
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

W051192RR-220
W051192RR-221
W051192RR-222
W051192RR-223
W051192RR-224
W051192RR-225
W051192RR-226
W051192RR-227
W051192RR-228
W051192RR-229
W051192RR-230
W051292RR-231
W051292RR-232
W051292RR-233
W051292RR-234
W051292RR-235
W051292RR-236
W051292RR-237
W051292RR-238
TRIP BLANK

TABLE 2

OUTLYING INITIAL CALIBRATION DATA
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

INST*	Date	Parameter	RRF**	%RSD***	Qualifier****	Associated Samples
HP4	5/18	Carbon Disulfide	2.865	30.5	NR	W051192RR-223
		Vinyl Acetate	0.174	32.2	J/UJ	W051192RR-224
		Bromoform	0.134	33.0	J/UJ	W051192RR-226
						W051192RR-227
						W051192RR-228
						W051192RR-229
						W051192RR-230
						VBW2948-1
						LCS2948
						VBW2948-2
VG1	5/22	Styrene	0.022*****	5.33	J/R	W051192RR-222
						W051292RR-231
						W051192RR-221
						W051192RR-225
						W051292RR-231MS
						W051292RR-231MSD
						W051292RR-232
						W051292RR-234
						W051292RR-235
						W051292RR-237
						W051192RR-221DL
						W051192RR-224DL

TABLE 2

OUTLYING INITIAL CALIBRATION DATA
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

INST*	Date	Parameter	RRF**	%RSD***	Qualifier****	Associated Samples
VG1	5/22	Styrene	0.022*****	5.33	J/R	W051192RR-228DL W051192RR-229DL W051192RR-230DL W051292RR-236DL W051292RR-237DL W051192RR-225DL VBLK01 VBLK02 VBLK03

TABLE 2

OUTLYING INITIAL CALIBRATION DATA
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

INST*	Date	Parameter	RRF**	%RSD***	Qualifier****	Associated Samples
HP4	5/22	2-Butanone	0.11	40.6	J/UJ	Trip Blank W051192RR-220 W051292RR-233 W051292RR-236 W051292RR-238 VBW2948-3

*INST - Instrument
**RRF - Mean Relative Response Factor
***%RSD - Percent Relative Standard Deviation
**** Sample data should be qualified as:
J - The associated value is an estimated quantity for detected analytes.
UJ - The analyte was checked for, but not detected. The associated value is an estimate
R - The data are unusable.
NR - No qualification of the data was deemed necessary.

*****Relative response factor value was reported to be less than the minimum value (0.05) for this compound.

TABLE 3

OUTLYING CONTINUING CALIBRATION DATA
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
HP4	5/19;1119	Vinyl Acetate	26.3	NR	VBW2948-1
					LCS2948
HP4	5/20;1223	Acetone	101.1	J/UJ	VBW2948-2
		Bromoform	30.3	J/UJ	W051192RR-223
		1,2-Dichloroethane-d4	28.2	J/UJ	W051192RR-224
					W051192RR-226
					W051192RR-227
					W051192RR-228
					W051192RR-229
					W051192RR-230
VG1	5/23;1200	Acetone	27.4	J/UJ	VBLK01
		Vinyl Acetate	37.4	J/UJ	W051192RR-222
		Styrene	4.5 (0.023)****	NR	W051292RR-231
		Bromoform	23.5 (0.039)****	J/R	
HP4	5/23;1451	Acetone	45.7	J/UJ	VBW2948-3
		2-Butanone	25.2	NR	Trip Blank
		Vinyl Acetate	61.9	J/UJ	W051192RR-220
		Bromodichloromethane	29.4	J/UJ	W051292RR-233
		Dibromochloromethane	34.1	J/UJ	W051292RR-236
		Bromoform	56.0	J/UJ	W051292RR-238

TABLE 3

OUTLYING CONTINUING CALIBRATION DATA
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
VG1	5/25;0721	Styrene	4.5 (0.023)****	J/R	VBLK02 W051192RR-221 W051192RR-225 W051292RR-231MS W051292RR-231MS W051292RR-232 W051292RR-234 W051292RR-235 W051292RR-237 W051192RR-221DL W051192RR-224DL W051192RR-228DL W051192RR-229DL

TABLE 3

OUTLYING CONTINUING CALIBRATION DATA
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
VG1	5/25;1926	Bromoform	17.6 (0.042)****	J/UJ	VBLK03
		Styrene	27.3 (0.028)****	J/R	W051192RR-230DL
					W051292RR-236DL
					W051292RR-237DL
					W051192RR-225DL

* INST-Instrument

** %D-Percent Difference

*** Sample result should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No qualification of the data was deemed necessary.

R - The data are unusable.

**** Relative response factor value in parentheses was reported to be less than the minimum value (0.05) for this compound.

TABLE 4

OUTLYING SURROGATE RECOVERIES
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

Compound	Sample ID	%R	%R Limits	Qualifier*
Bromofluorobenzene	W051192RR-224	76	86-115	J/UJ
1,4-Dichloroethane-d4	W051192RR-228DL	115	76-114	NR
1,4-Dichloroethane-d4	VBLK03	132	76-114	J/NR

* Sample result should be qualified as:
J - The associated value is an estimated quantity for detected analytes.
UJ - The analyte was checked for, but not detected.
The associated value is an estimate.
NR - No qualification of the data was deemed necessary.

TABLE 5

OUTLYING MATRIX SPIKE PERCENT RECOVERIES
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

Parameter	Sample ID	MS %R	MSD %R	%R limits	RPD*	RPD Limits	Qualifier**
Trichloroethene	W051292RR-231	130	96	70-120	27	0-14	J

* RPD-Relative Percent Difference

** Sample result should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

TABLE 7

NON-COMPARABLE SAMPLE DILUTION RESULTS
MARATHON ELECTRIC MANUFACTURING SITE
MAY 1992 SAMPLING EVENT

Sample ID	Parameter	Undil Result (ug/L)	Dil Result (ug/L)	RPD*	Qualifier**
W051192RR-221	1,1,1-Trichloroethane	<1	12	NC	J/UJ
	Trichloroethene	74***	31	-	J
	Toluene	<1	8	NC	J/UJ

Sample ID	Parameter	Undil Result (ug/L)	Dil Result (ug/L)	RPD	Qualifier
W051192RR-224	Trichloroethene	130***	430	-	NR
	1,2-Dichloroethene	40	16	86	J

Sample ID	Parameter	Undil Result (ug/L)	Dil Result (ug/L)	RPD	Qualifier
W051192RR-229	Trichloroethene	170***	110	-	J
	1,2-Dichloroethene	8	4****	-	NR

Sample ID	Parameter	Undil Result (ug/L)	Dil Result (ug/L)	RPD	Qualifier
W051192RR-230	Trichloroethene	130***	83	-	J
	1,2-Dichloroethene	7	3****	-	NR

Sample ID	Parameter	Undil Result (ug/L)	Dil Result (ug/L)	RPD	Qualifier
W051292RR-236	Trichloroethene	140***	420	-	NR
	1,2-Dichloroethene	50	30	-	J

* RPD - Relative Percent Difference

** Sample result should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No qualification of the data was deemed necessary.

***Sample result previously qualified as estimated (J) as it was reported to be outside of the calibration range.

****Sample result previously qualified as estimated (J) as it was reported to be below the quantitation limit.

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MEMORANDUM

TO: Ed Roberts REFERENCE NO. 2115

FROM: Ruth M. Lewis RML DATE: September 28, 1992

RE: Data Quality Assessment and Validation for Eighteen Groundwater Samples Collected during the August 1992 Sampling Event at the Marathon Electric Manufacturing Site

The following details a data quality assessment and validation for 18 groundwater samples collected on August 3 and 4, 1992, from the Marathon Electric Manufacturing Site in Wausau, Wisconsin. The samples were analyzed for target compound list volatile organic compounds (TCL VOC). All analyses were performed by Maxwell/S-Cubed Division in Sorrento Valley, California[1]. The quality assurance criteria were defined in the associated quality assurance project plan (QAPP)[2].

Holding Time Period

The holding time for the analysis is 14 days from sample collection to completion of analysis. All analyses were completed within the specified holding time period.

Instrument Performance

To ensure that the data for the analyses would be interpreted correctly, each instrument was tuned using bromofluorobenzene (BFB). Analyses of the data reported for the GC/MS instrument tunes indicated criteria were met for all VOC analyses.

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Criteria for VOC analytes required a mean relative response factor (RRF) greater than or equal to 0.050. Percent relative standard deviations for all analytes were required to be less than or equal to 30. The initial calibration results for VOC analyses were within acceptance criteria.

---

[1] Analytical method derived from Contract Laboratory Program Statement of Work, March 1990.

[2] Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", December 1990 (draft) and June 1991 (revision).

Continuing Calibration

To ensure that each instrument was capable of producing quantitative results over the specified analyses period, routine checks upon the instrument calibration were performed. All analytes were required to have daily response factors greater than or equal to 0.050. Percent difference between mean response factors and daily response factors for all analytes must be less than or equal to 25. Table 2 lists the analytes that failed continuing calibration criteria. Associated sample data should be qualified as estimated (J) for positive parameter results and the quantitation limit estimated (UJ) for negative parameter results. The remaining continuing calibration results for VOC analyses were within acceptance criteria.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. The surrogate data were within the control limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

To assess the long term accuracy and precision of the analytical method on various matrices, MS/MSD percent recoveries and relative percent difference (RPD) of the recoveries were determined. Sample W080492RR-265 underwent VOC MS/MSD analyses. Percent recoveries and RPD data listed in Table 3 were outside the control limits. As a result, trichloroethen e data from W080492RR-265 should be qualified as estimated (J).

Method Blank Samples

Contamination of the samples contributed by the laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from target analytes, indicating no significant laboratory contamination occurred.

Internal Standard Summaries

Overall instrument performance for VOC analyses was monitored using internal standard peak area and retention time data. Peak areas were required to fall within +100 percent and -50 percent of the daily calibration sample internal standard peak area. Sample retention times must fall within a 0.5 minute window from the calibration sample retention times. All internal standard results were within acceptance criteria.

Field QA/QC

The field QA/QC for this sampling event included one trip blank and two sets of field duplicate samples.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank was submitted to the laboratory for VOC analysis. The trip blank sample yielded a positive concentration for carbon disulfide (2 ug/L). The associated method blank sample was reported to be free of carbon disulfide. One investigative sample (W080492RR-267) yielded a positive concentration for carbon disulfide (1 ug/L). The positive parameter results for carbon disulfide in the trip blank and W080492RR-267 were likely due to poor laboratory procedures. As a result, carbon disulfide data for W080492RR-267 should be qualified as non-detect (U).

Overall precision for the sampling event was monitored using two field duplicate sample sets: W080392RR-258/W080392RR-259 and W080492RR-266/W080492RR-267. The RPD data was found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the specific qualifications noted.

Enc.
cc: Steve Day
RL/jm

TABLE 1

SUMMARY OF SAMPLE IDENTIFICATION NUMBERS
MARATHON ELECTRIC MANUFACTURING SITE
AUGUST 1992 SAMPLING EVENT

W080392RR-250
W080392RR-251
W080392RR-252
W080392RR-253
W080392RR-254
W080392RR-255
W080392RR-256
W080392RR-257
W080392RR-258
W080392RR-259
W080392RR-260
W080492RR-261
W080492RR-262
W080492RR-263
W080492RR-264
W080492RR-265
W080492RR-266
W080492RR-267
W080492RR-268
TRIP BLANK

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA - VOC ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
AUGUST 1992 SAMPLING EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
HP4	8/07;1408	Acetone	31.4	J/UJ	Trip Blank
		Carbon Disulfide	29.8	J/UJ	VBW 3191-1
		1,1-Dichloroethene	28.9	J/UJ	LCS 3191
		2-Butanone	25.1	NR	W080392RR-258
					W080392RR-259
					W080392RR-260
					W080492RR-261
					W080492RR-262
					W080492RR-263
					W080492RR-264
					W080492RR-265
					W080492RR-265MS
					W080492RR-267
					W080492RR-268
					VBW 3191-2
					W080392RR-250
					W080392RR-251
					W080392RR-252
					W080392RR-253
					W080392RR-254
					W080392RR-255

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA - VOC ANALYSIS MARATHON ELECTRIC MANUFACTURING SITE AUGUST 1992 SAMPLING EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
HP4 (Cont'd)					W080392RR-257 W080492RR-265MSD W080492RR-266 W080392RR-258DL W080392RR-259DL W080392RR-260DL
HP4	8/08;2231	Chloromethane	28.3	J/UJ	VBW-3191-3 W080392RR-251DL W080392RR-256 VBW 3191-2 W080392RR-250 W080392RR-251 W080392RR-252 W080392RR-253 W080392RR-254 W080392RR-255 W080392RR-257 W080492RR-265MSD W080492RR-266 W080392RR-258DL W080392RR-259DL W080392RR-260DL

TABLE 2

OUTLYING CONTINUING CALIBRATION DATA - VOC ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
AUGUST 1992 SAMPLING EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
HP4	8/09;1508	Chloromethane	31.2	J/UJ	VBW 3191-4 W080392RR-254DL W080492RR-265DL W080492RR-266DL W080492RR-267DL W080392RR-255DL VBW-3191-3 W080392RR-251DL W080392RR-256

* INST-Instrument
** %D-Percent Difference
*** Sample result should be qualified as:
J - The associated value is an estimated quantity for detected analytes.
UJ - The analyte was checked for, but not detected. The associated value is an estimate.
NR - No qualification of the data was deemed necessary.

TABLE 3

OUTLYING MATRIX SPIKE PERCENT RECOVERIES - VOC ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
AUGUST 1992 SAMPLING EVENT

Parameter	Sample ID	MS %R	MSD %R	%R limits	RPD*	RPD Limits	Qualifier**
Trichloroethene	W080492RR-265	1460	1750	70-120	11	0-14	J

* RPD-Relative Percent Difference

** Sample result should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

Waterloo File Copy

MEMORANDUM

TO: Ed Roberts REFERENCE NO. 2115

FROM: Ruth M. Lewis DATE: December 14, 1992

RE: Data Quality Assessment and Validation for Nineteen Groundwater Samples Collected during the November 1992 Sampling Event at the Marathon Electric Manufacturing Site

The following details a data quality assessment and validation for 19 groundwater samples collected on November 2 and 3, 1992, from the Marathon Electric Manufacturing Site in Wausau, Wisconsin. The samples were analyzed for target compound list volatile organic compounds (TCL VOC). All analyses were performed by Maxwell/S-Cubed Division in Sorrento Valley, California[1]. The quality assurance criteria were defined in the associated quality assurance project plan (QAPP)[2].

Holding Time Period

The holding time for the analysis is 14 days from sample collection to completion of analysis. All analyses were completed within the specified holding time period.

Instrument Performance

To ensure that the data for the analyses would be interpreted correctly, each instrument was tuned using bromofluorobenzene (BFB). Analyses of the data reported for the GC/MS instrument tunes indicated criteria were met for all VOC analyses.

Method Blank Samples

Contamination of the samples contributed by the laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The five associated method blank samples yielded positive concentrations for methylene chloride. As a result, associated sample data presented in Table 2 should be qualified as non-detect (U).

---

[1] Analytical method derived from Contract Laboratory Program Statement of Work, March 1990.

[2] Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", December 1990 (draft) and June 1991 (revision).

Initial Calibration

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Criteria for VOC analytes required a mean relative response factor (RRF) greater than or equal to 0.050. Percent relative standard deviations for all analytes were required to be less than or equal to 30. The initial calibration results for VOC analyses were within acceptance criteria.

Continuing Calibration

To ensure that each instrument was capable of producing quantitative results over the specified analyses period, routine checks upon the instrument calibration were performed. All analytes were required to have daily response factors greater than or equal to 0.050. Percent difference between mean response factors and daily response factors for all analytes must be less than or equal to 25. Table 3 lists the analytes that failed continuing calibration criteria. Associated sample data should be qualified as estimated (J) for positive parameter results and the quantitation limit estimated (UJ) for negative parameter results. The remaining continuing calibration results for VOC analyses were within acceptance criteria.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. The surrogate data were within the control limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries

To assess the long term accuracy and precision of the analytical method on various matrices, MS/MSD percent recoveries and relative percent difference (RPD) of the recoveries were determined. Sample W110392RR-254 underwent VOC MS/MSD analyses. The percent recovery and RPD data were within the control limits, indicating an adequate level of accuracy and precision was achieved.

Internal Standard Summaries

Overall instrument performance for VOC analyses was monitored using internal standard peak area and retention time data. Peak areas were required to fall within +100 percent and -50 percent of the daily calibration sample internal standard peak area. Sample retention times must fall within a 0.5 minute window from the calibration sample retention times. All internal standard results were within acceptance criteria.

Field QA/QC

The field QA/QC for this sampling event included two sets of field duplicate samples.

Overall precision for the sampling event was monitored using two field duplicate sample sets: W110292RR-249/W110292RR-250 and W110392RR-254/W110392RR-255. The RPD data from both sets was found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the specific qualifications noted.

Enc.
cc: Steve Day
RL/jm

TABLE 1

SUMMARY OF SAMPLE IDENTIFICATION NUMBERS
MARATHON ELECTRIC MANUFACTURING SITE
NOVEMBER 1992 SAMPLING EVENT

W110292RR-240
W110292RR-241
W110292RR-242
W110292RR-243
W110292RR-244
W110292RR-245
W110292RR-246
W110292RR-247
W110292RR-248
W110292RR-249
W110292RR-250
W110392RR-251
W110392RR-252
W110392RR-253
W110392RR-254
W110392RR-255
W110392RR-256
W110392RR-257
W110392RR-258

TABLE 2

SUMMARY OF ANALYTES DETECTED IN METHOD BLANKS
MARATHON ELECTRIC MANUFACTURING SITE
NOVEMBER 1992 SAMPLING EVENT

Blank ID	Analysis	Parameter	Concentration (ug/L)	Associated Samples*
VBW3406-3	VOC	Methylene Chloride	0.5	244dl 248dl 249dl 250dl
VBW3406-4	VOC	Methylene Chloride	0.7	241dl 247dl 245dl
VBW3406-5	VOC	Methylene Chloride	0.8	257dl

* Positive sample results reported at a concentration less than 5x the method blank concentration should be qualified as non-detect (U) with the associated value being the quantitation limit.

TABLE 3

OUTLYING CONTINUING CALIBRATION DATA - VOC ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
NOVEMBER 1992 EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
HP4	11/7;2144	Acetone	27.4	J/UJ	W110292RR-240
		2-Butanone	31.8	J/UJ	W110292RR-242
					W110292RR-243
					W110292RR-244
					W110292RR-248
					W110292RR-249
					W110292RR-250
					W110392RR-251
					W110392RR-252
					W110392RR-253
					W110392RR-254
					W110392RR-255
					W110292RR-247

TABLE 3

OUTLYING CONTINUING CALIBRATION DATA - VOC ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
NOVEMBER 1992 EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
HP4	11/8;1930	Acetone	53.5	J/UJ	W110392RR-254MS
					W110392RR-254MSD
					W110292RR-244DL
					W110292RR-248DL
					W110292RR-249DL
					W110292RR-250DL
					W110392RR-256
					W110292RR-241
					W110292RR-245
					W110292RR-248
					W110292RR-249
					W110292RR-250
					W110392RR-251
					W110392RR-252
					W110392RR-253
					W110392RR-254
					W110392RR-255
					W110292RR-247

TABLE 3

OUTLYING CONTINUING CALIBRATION DATA - VOC ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
NOVEMBER 1992 EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
HP4	11/9;1944	trans-1,3-Dichloropropene	28.3	J/UJ	W110392RR-254MS
		Bromoform	29.9	J/UJ	W110392RR-254MSD
					W110292RR-244DL
					W110292RR-248DL
					W110292RR-249DL
					W110292RR-250DL
					W110392RR-256
					W110292RR-241
					W110292RR-245
					W110292RR-241DL
					W110292RR-247DL
					W110292RR-245DL
					W110392RR-258
					W110392RR-257
					W110292RR-246

TABLE 3

OUTLYING CONTINUING CALIBRATION DATA - VOC ANALYSIS
MARATHON ELECTRIC MANUFACTURING SITE
NOVEMBER 1992 EVENT

INST*	Date;Time	Parameter	%D**	Qualifier***	Associated Samples
HP4	11/10;1833	Acetone	27.1	J/UJ	W110392RR-257DL W110392RR-256DL W110292RR-241DL W110292RR-247DL W110292RR-245DL W110392RR-258 W110392RR-257 W110292RR-246

NOTES:

* INST-Instrument

** %D-Percent Difference

*** Sample result should be qualified as:

J - The associated value is an estimated quantity for detected analytes.

UJ - The analyte was checked for, but not detected. The associated value is an estimate.

NR - No qualification of the data was deemed necessary.