Stearns & Wheler, LLC
ENVIRONMENTAL ENGINEERS & SCIENTISTS

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January 10, 2001

Mr. Bruce H. Mero, REM
Air Force Research Laboratories
Rome Research Site
150 Electronics Parkway
Rome, NY 13441-4516

Re: Semiannual Monitoring Analytical Summary Report
Verona Research Facility
S&W No. 90060.0

Dear Mr. Mero:

This letter report provides a comprehensive summary of the groundwater analytical results for samples collected from the Verona Research Facility from October 1996 to September 2000 (see Figure 1 for site location map). Stearns & Wheler has compiled and reviewed the groundwater analytical data from eight sampling events that occurred during that period. Groundwater sampling was implemented based on the detection of volatile organic compounds, as reported in a February 1997 Preliminary Site Assessment (PSA) report completed by Stearns & Wheler. Groundwater samples were collected from Well MW-001and MW-1231C at Building 1231, and Wells MW-002 and MW-004 at Building 1253 (see Figures 2 and 3 for monitoring well locations). In addition, one sample was collected from Brandy Brook during each sampling event. Analytical results were presented in summary reports prepared by Stearns & Wheler following each of the sampling events. Consistent with those summary reports, this comprehensive summary focuses on four contaminants of concern: tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2 dichloroethene (DCE), and chlorobenzene (CB).

RESULTS

A summary of the eight rounds of analytical data is presented in Table 1. Instances when water samples could not be obtained due to dry conditions are indicated with "NS." Figure 4 presents the results for the contaminants of concern.

Brandy Brook

The sampling point for the Brandy Brook sampling location is located approximately 200 feet south (down gradient) of Building 1231. No VOCs were detected in Brandy Brook during the sampling period.

BUILDING 1231

MW-001

Samples could not be collected in 1999 (well was dry) and September of 2000 (well not found). However, other data indicate that concentrations of VOCs have decreased below NYSDEC groundwater standards since the October 1996 sampling event, and no VOCs were present above detection limits in February 2000.

MW-1231C

Concentrations of PCE and TCE are highly variable through the sample period. However, concentrations of DCE have steadily decreased below NYSDEC groundwater standards since October 1997 from 14 ppb to 3 ppb in September 2000. CB has not been present above detection limits since April of 1998.

BUILDING 1253

MW-002

Contaminants of concern have remained below NYSDEC standards during the period. Otherwise, concentrations of 1,1,1 trichloroethane (TCA) have decreased below detection limits. Although, 1,1-dichloroethane (DCA) was recently detected at 8 ppb, it has decreased from 16 ppb compared to the March 1999 sampling event.

MW-004

As seen in Figure 2, concentrations of contaminants of concern have generally declined. An exception occurs during the September 1999 sampling event, when anomalous high concentrations of TCE and DCE were detected. These anomalous levels are likely related to dry conditions during this period and the resultant low water table.

DISCUSSION OF RESULTS

Factors impacting migration, degradation, and potential remediation of chlorinated compounds at this site include the water table gradient, local groundwater discharge points, the nature of the overburden, and the geochemical state of the groundwater.

As reported in the February 1997 PSA report, Brandy Brook is the local groundwater discharge point for the site and the greatest distance over which migration could occur. The data indicates that contaminated groundwater has not significantly impacted the brook during this period.

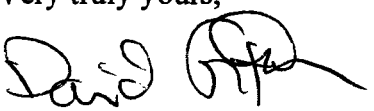
The variability in the PCE and TCE data reported from MW-1231C and MW-004 tends to obscure chemical evidence of attenuation. It appears that variation may be caused in part by water table fluctuations. For example, in September of 1999 high levels of VOCs in the wells is likely the result of dry conditions and low water table levels. Despite this variability, there is chemical evidence of natural degradation of contaminants of concern. For example, chlorinated compounds are not as easily degraded under aerobic (oxygen rich) conditions as compared to anaerobic (low oxygen) conditions. Figure 5 shows a graphical representation of the ratio of TCE/DCE plotted versus dissolved oxygen. If compounds are being attenuated at the site, one would expect that as dissolved oxygen decreases the ratio of TCE/DCE would decrease also, reflecting the degradation of TCE into DCE. This is observed in Figure 5.

RECOMENDATIONS

The concentration of compounds detected at the site during the eight sampling events has shown either a decreasing trend or significant variation. There is chemical evidence to support that some degree of natural attenuation is occurring, and site impacts have not been observed in the brook. Given the sites rural setting, limited migration potential, and lack of impact to its groundwater discharge point (Brandy Brook) exposure pathways to contaminants are incomplete. Therefore, Stearns & Wheler recommends that actions at the site be limited to continued monitoring, with a focus on Wells MW-001, MW-1231C (Building 1231), and MW-002 (Building 1253). It is suggested that the above three wells and Brandy Brook undergo continued monitoring, semi-annually for two years. Following two more years of sampling, data can be reevaluated to assess whether there is continued improvement.

If you have any questions regarding the results of this sampling event, please do not hesitate to contact us.

Very truly yours,



David R. Frostclapp
Engineer

DRF/jlb

Enclosures

cc: Don Sorbello, S&W Redevelopment (w/ enc.)

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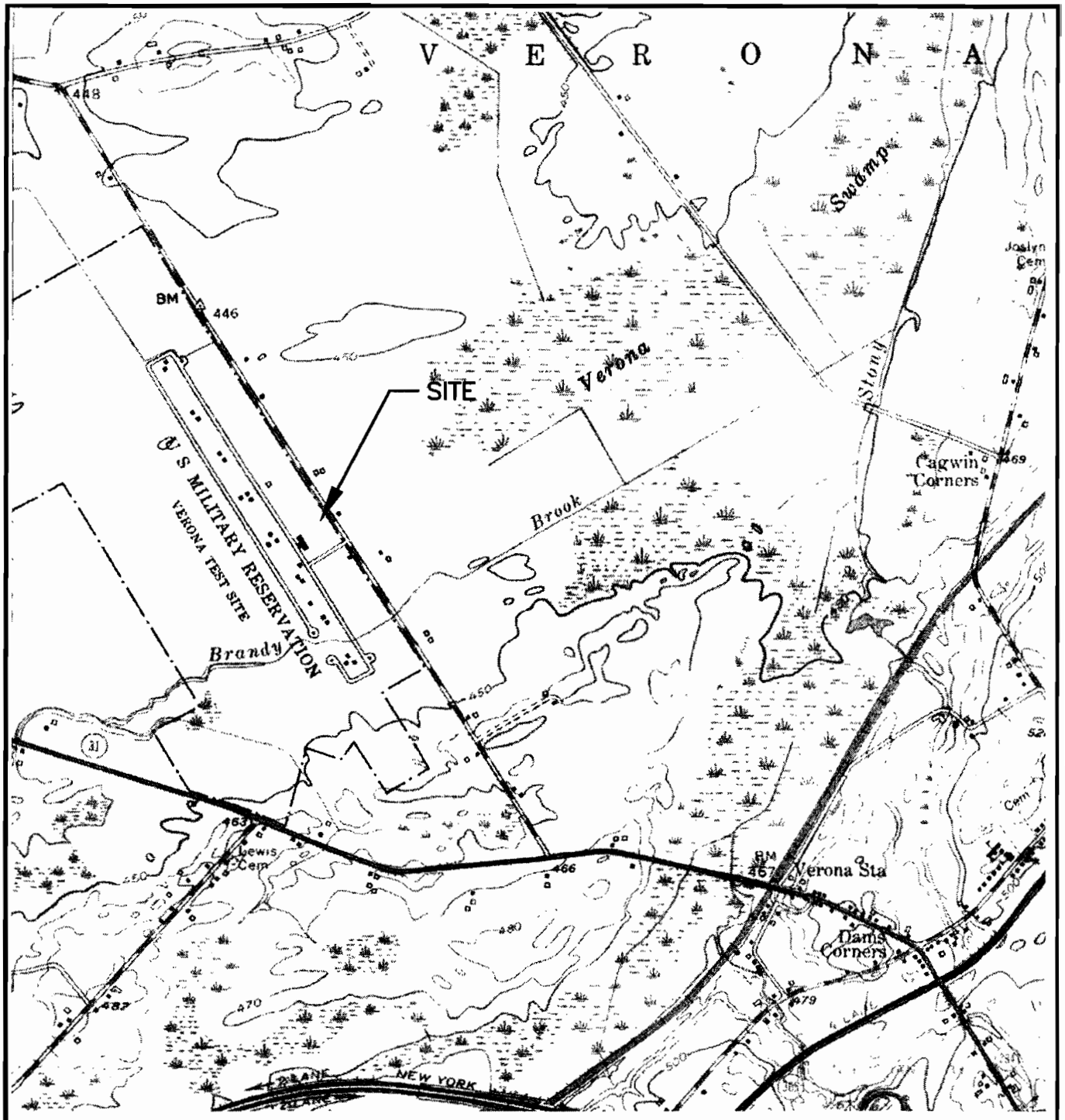
FIGURES



SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

-N-

QUADRANGLE LOCATION

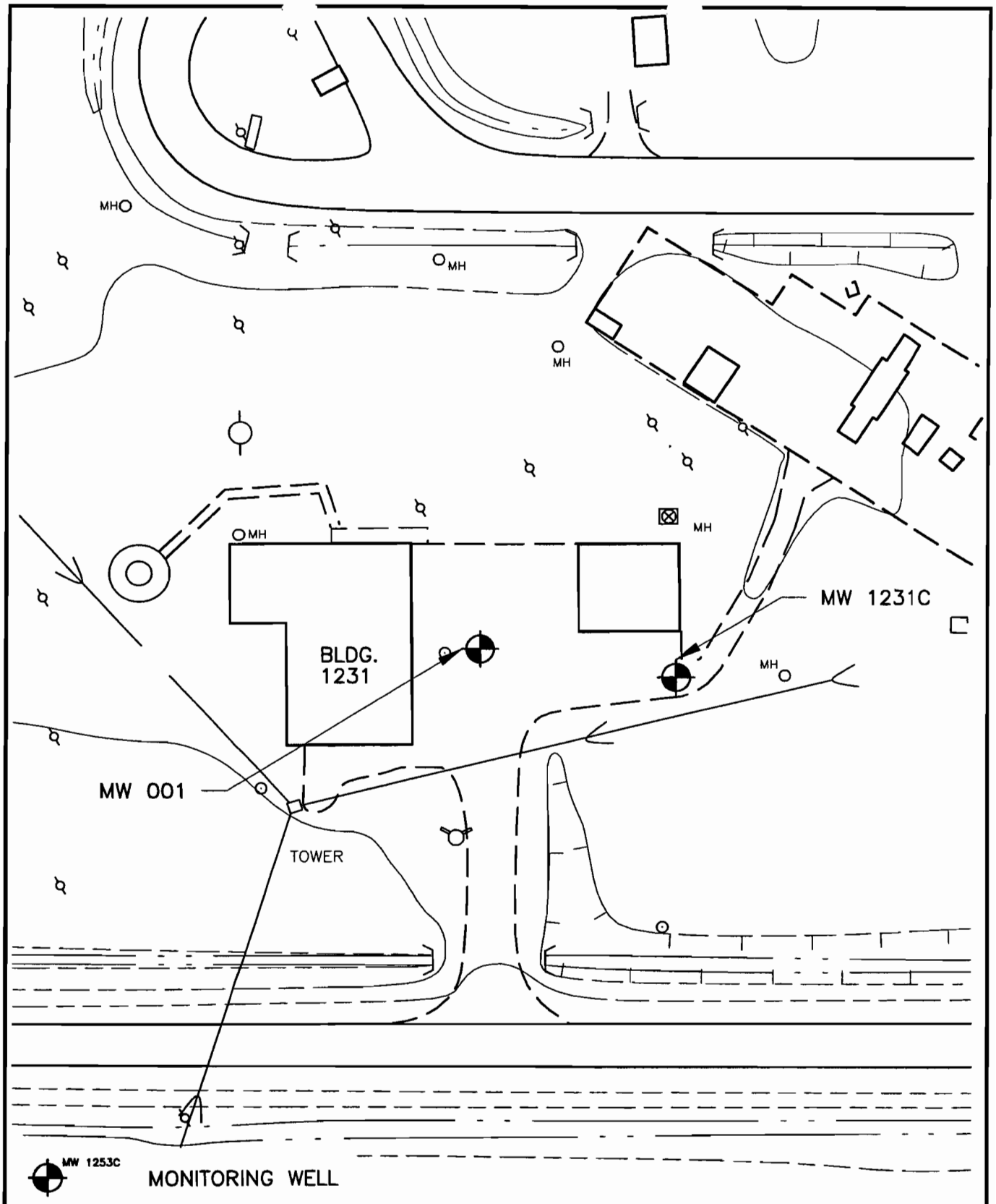
Stearns & Wheler, LLC
ENVIRONMENTAL ENGINEERS & SCIENTISTS
CAZENOVIA, NEW YORK

DATE:1/01 JOB No.:90060

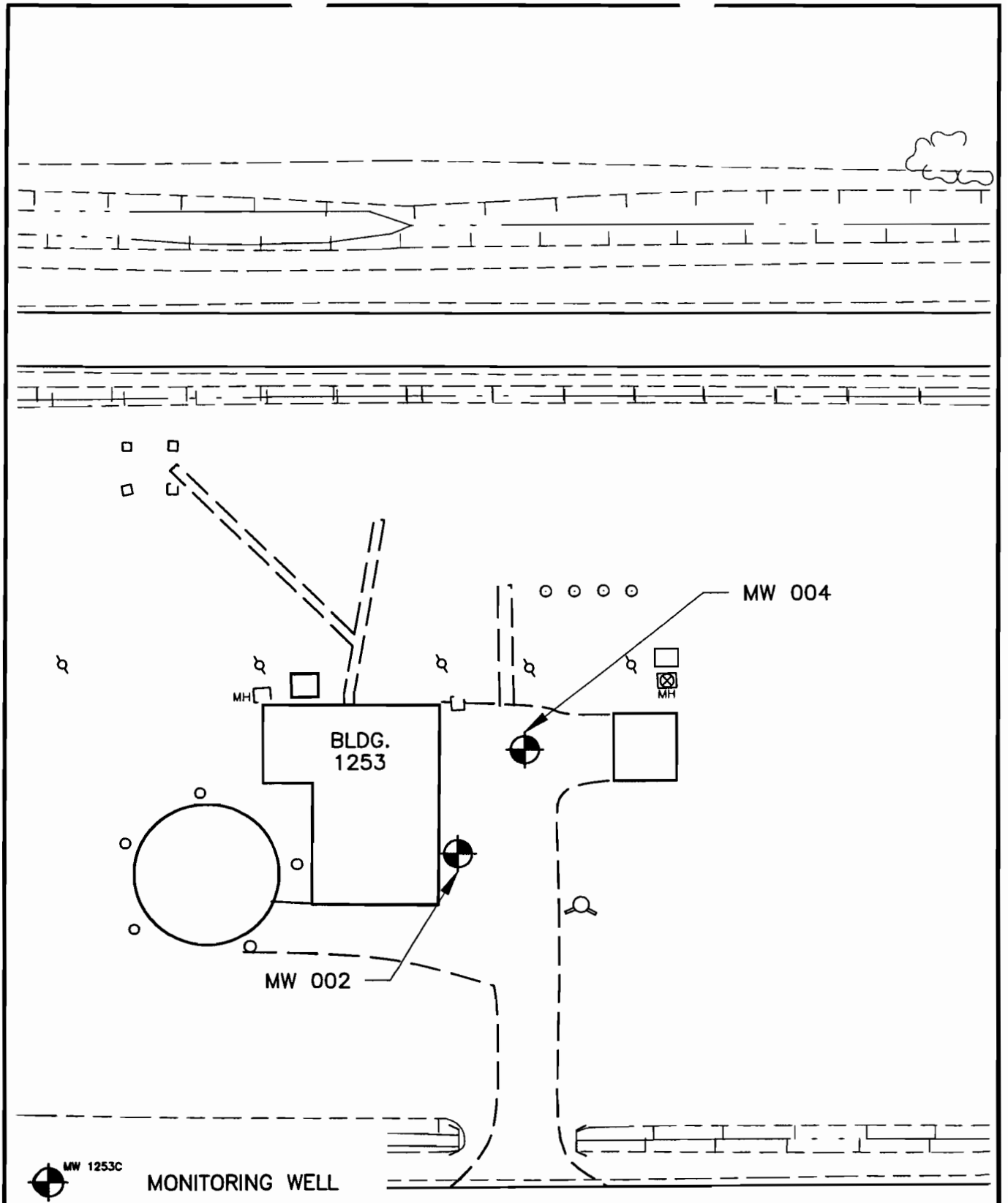
VERONA RESEARCH FACILITY
TOWN OF VERONA, NEW YORK

FIGURE 1
SITE LOCATION MAP

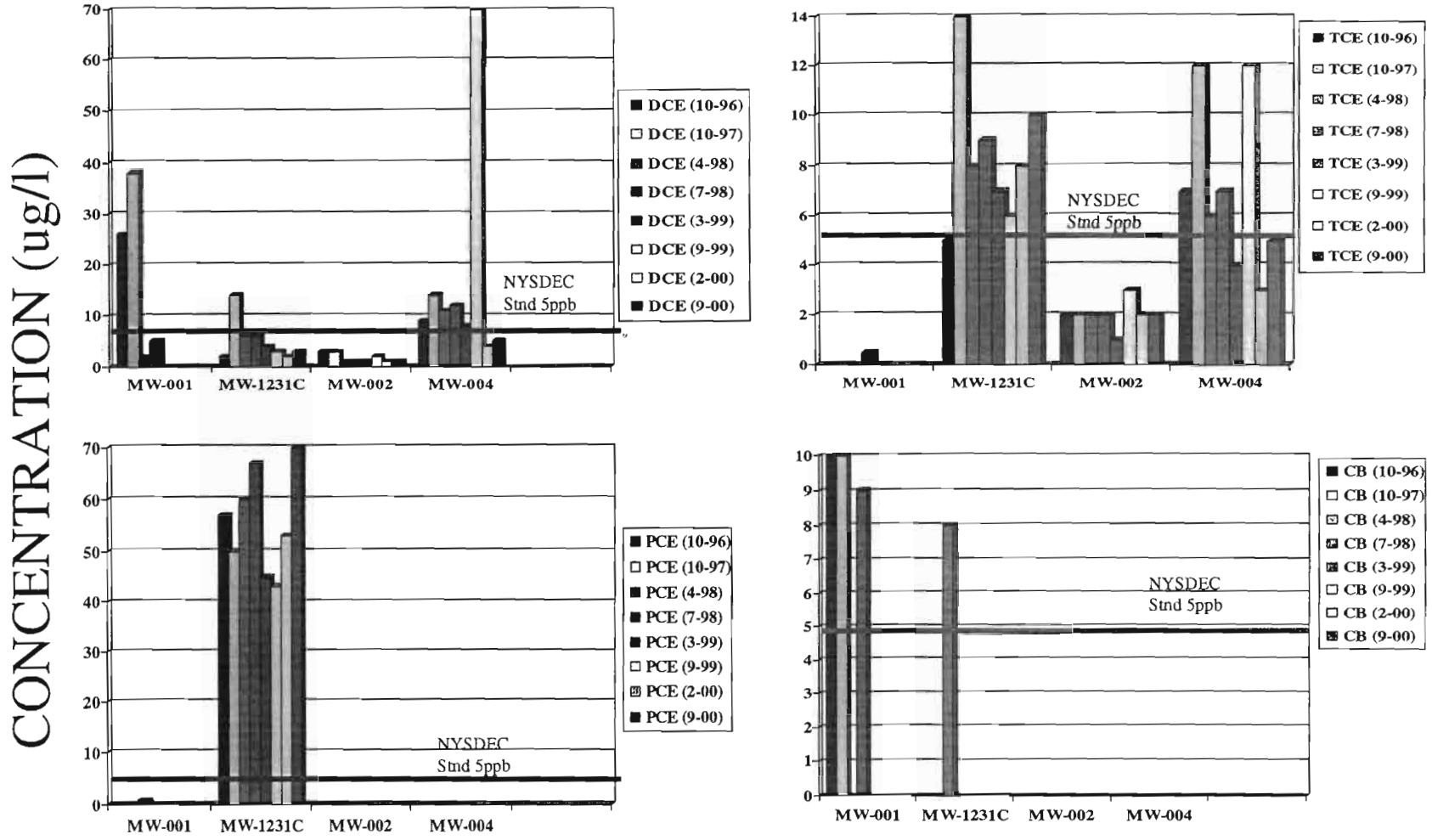
VERONA.TIF
01/01 CAZ CMS
\\FS2\DATA1\CADUSE\90060\FIGURE\90060F01.DWG



Stearns & Wheler, LLC ENVIRONMENTAL ENGINEERS & SCIENTISTS CAZENOVIA, NEW YORK	DRAWN BY: DRF DATE: 01/01 JOB NO.: 9006010	VERONA TEST ANNEX BUILDING 1231 MONITORING WELL LOCATIONS FIGURE 2 SITE PLAN



Stearns & Wheler, LLC ENVIRONMENTAL ENGINEERS & SCIENTISTS CAZENOVIA, NEW YORK	DRAWN BY: DRF DATE: 1/01 JOB NO.: 9006010	VERONA TEST ANNEX BUILDING 1253 MONITORING WELL LOCATIONS FIGURE 3 SITE PLAN

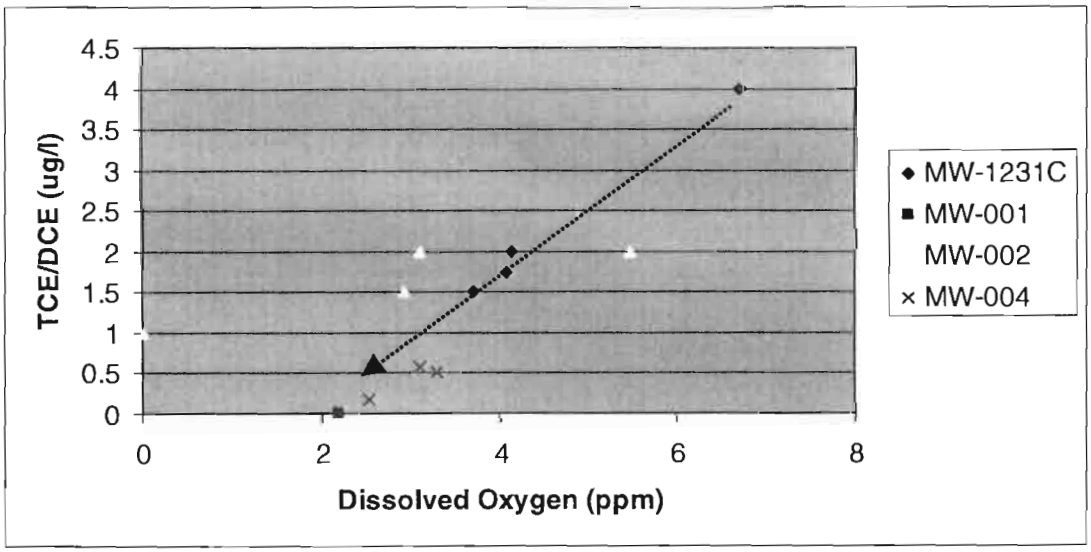


Stearns & Wheler, LLC
ENVIRONMENTAL ENGINEERS & SCIENTISTS
Cazenovia, NY
Date: 1/01 JOB No. 90060.10

Verona Research Facility
Town of Verona, New York

FIGURE 4
HISTORICAL TRENDS

TCE/DCE VS. DISSOLVED OXYGEN



Lower levels of dissolved oxygen in groundwater provides favorable conditions for anaerobic degradation of chlorinated organic compounds. The figure above indicates that a decline in oxygen levels causes TCE to degrade to DCE as evidenced by the decrease in the TCE/DCE ratio.

Stearns & Wheler, LLC ENVIRONMENTAL ENGINEERS & SCIENTISTS CAZENOVIA, NEW YORK JOB No: 90060.10	Verona Research Facility Verona, NY **FIGURE 5** **Verona Groundwater Sampling Summary Report**

TABLES

Table 1
Historical Groundwater Analytical Results
Volatile Organic Compounds
Verona Research Facility
Verona, NY
Jan-01

	BUILDING 1231																GW
	MW-001								MW-1231C								
Compound (ug/l)	Oct-96	Oct-97	Apr-98	Jul-98	Mar-99	Sep-99	Feb-00	Sep-00	Oct-96	Oct-97	Apr-98	Jul-98	Mar-99	Sep-99	Feb-00	Sep-00	Std.
Chloromethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	50
Bromomethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
Vinyl Chloride	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	2
Chloroethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	2 J	5
Methylene Chloride	U	UJ	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	5 J	5
Acetone	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	50G
Carbon Disulfide	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	50
Vinyl Acetate	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	NOINE
1,1-Dichloroethene	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
1,1-Dichloroethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
cis-1,2-Dichloroethene	26	38 J	2 J	5 J	NS	NS	U	NS	2	14	6 J	6 J	4 J	3 J	2 J	3	5
trans-1,2-Dichloroethene	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
Chloroform	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	7
1,2-Dichloroethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	0.6
2-Butanone	U	U	U	U	NS	NS	U	NS	U	U	U	U	0.8 J	U	U	U	5
1,1,1-Trichloroethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
Carbon Tetrachloride	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
Bromodichloromethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	50G
1,2-Dichloropropane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	1
cis-1,3-Dichloropropene	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	0.4
Trichloroethene	5 J	8 J	U	0.5 J	NS	NS	U	NS	5	14	8 J	9 J	7	6	8	10	5
Dibromochloromethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	50G
1,1,2-Trichloroethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	1
Benzene	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	1
trans-1,3-Dichloropropene	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	0.4
Bromoform	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	50
4-Methyl-2-Pentanone	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	50G
2-Hexanone	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	50G
Tetrachloroethene	U	U	0.7 J	U	NS	NS	U	NS	57	50	60	67	45	43	53	70	5
Toluene	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
1,1,2,2-Tetrachloroethane	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
Chlorobenzene	290	930 J	U	9 J	NS	NS	U	NS	U	U	8 J	U	U	U	U	U	5
Ethylbenzene	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
Styrene	U	U	U	U	NS	NS	U	NS	U	U	U	U	U	U	U	U	5
Xylene (total)	U	U	U	0.7 J	NS	NS		NS	U	U	U	U	U	U	U	U	5
Total VOCs	321	976	2.7	14.5	-	-	0	-	64	78	82	82	56.8	52	63	90	
Depth to Groundwater (ft.)		6.25	2.48	3.24	DRY	DRY	1.34	NA	NA	9.8	6.01	6.89	4.89	12.89	4.84	NA	

NS: Not Sampled (1999 well was dry; September 2000 well was not located.
* Treated as UOC
G: NYSDEC guidance value.
ND: No Detectable amounts allowed.
All values in this table are based upon NYSDEC TOGS (October 1993) Revised June 1998.
Shaded areas indicate exceedances of standards
U - not present above detectio limits
J - reported value is an estimate
NA - information not available

Table 1 (cont'd)
Historical Groundwater Analytical Results
Volatile Organic Compounds
Verona Research Facility
Verona, NY
Jan-01

	BUILDING 1253																GW
	MW-002								MW-004								
Compound (ug/l)	Oct-96	Oct-97	Apr-98	Jul-98	Mar-99	Sep-99	Feb-00	Sep-00	Oct-96	Oct-97	Apr-98	Jul-98	Mar-99	Sep-99	Feb-00	Sep-00	Std.
Chloromethane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	50
Bromomethane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Vinyl Chloride		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	2
Chloroethane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Methylene Chloride	1 J	U	0.7 J	U	U	U	U	U	U	U	U	U	U	0.7 J	U	0.4 J	5
Acetone		U	16 B	U	U	U	U	U	U	U	U	U	U	2 JB	U	4 J	50G
Carbon Disulfide		U	0.5 J	U	U	U	U	U	U	U	U	U	U	U	U	U	50
Vinyl Acetate		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NOINE
1,1-Dichloroethene		18	30	26	U	U	U	U	U	U	U	U	U	U	U	U	5
1,1-Dichloroethane	9 J	3 J	2 J	2 J	16	14 J	8	8	U	26	U	U	U	U	U	U	5
cis-1,2-Dichloroethene	3 J	3 J	1 J	1 J	1 J	2 J	1 J	1 J	9 J	7	11	12	8	71	4 J	5	5
trans-1,2-Dichloroethene	2 J	1 J	U	U	U	2 J	0.8 J	0.5 J	1 J	U	2 J	2 J	2 J	15	0.7 J	1 J	5
Chloroform		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	7
1,2-Dichloroethane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	0.6
2-Butanone		U	100	29	U	U	U	U	U	U	U	U	0.8 J	U	U	U	5
1,1,1-Trichloroethane		22	80	U	2 J	1 J	U	U	U	U	U	U	U	U	U	U	5
Carbon Tetrachloride		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Bromodichloromethane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	50G
1,2-Dichloropropane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	1
cis-1,3-Dichloropropene		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	0.4
Trichloroethene	2 J	2 J	2 J	2 J	1 J	3 J	2 J	2 J	7 J	12	6 J	7 J	4 J	12	3 J	5	5
Dibromochloromethane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	50G
1,1,2-Trichloroethane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	1
Benzene		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	1
trans-1,3-Dichloropropene		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	0.4
Bromoform		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	50
4-Methyl-2-Pentanone		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	50G
2-Hexanone		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	50G
Tetrachloroethene		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Toluene		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
1,1,2,2-Tetrachloroethane		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Chlorobenzene		J	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Ethylbenzene		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Styrene		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Xylene (total)		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	5
Total VOCs	16	49	215.5	60	20	22	11.8	11.5	17	45	19	21	14.8	98	7.7	11	
Depth to Groundwater (ft.)	4.74	5.52	2.43	2.99	1.55	8.9	1.51	NA	2.88	5.64	2.64	3.56	NA	8.83	1.28	NA	

NS: Not Sampled (1999 well was dry; September 2000 well was not located.
* Treated as UOC
G: NYSDEC guidance value.
ND: No Detectable amounts allowed.
All values in this table are based upon NYSDEC TOGS (October 1993) Revised June 1998
Shaded areas indicate exceedances of standards
U - not present above detectio limits

FIELD PARAMETERS

Historical Field Parameters
Building 1231
Verona Research Facility
Verona, NY

MW-001

Sampling Event	DTW (ft)	Time	Purge Rate (L/min)	Temp. (C)	Cond. (ms/cm)	pH	Eh (mV)	Turbidity (NTU)	DO (ppm)	Salinity %
Oct-96	2.83									
Oct-97	6.25									
Apr-98	2.48									
Jul-98	3.24	9:30	BAILED	20	0.720	7.50	-80	690	2.20	0.00
Mar-99	-	-	-	-	-	-	-	-	-	-
Sep-99	-	-	-	-	-	-	-	-	-	-
Feb-00	1.34	11:40	BAILED	7.4	0.391	7.21	180	287	18.04	0.01
Sep-00	-	-	-	-	-	-	-	-	-	-

* Mar-99 - Well was damaged and frozen, unable to thaw.

* Sep-99 - Well was damaged and dry.

* Sep-00 - Well destroyed, possibly dug up during excavation. Large area appears disturbed, possibly from excavation and refill.

MW-1231C

Sampling Event	DTW (ft)	Time	Purge Rate (L/min)	Temp. (C)	Cond. (ms/cm)	pH	Eh (mV)	Turbidity (NTU)	DO (ppm)	Salinity %
Oct-96	3.68									
Oct-97	9.80									
Apr-98	6.01									
Jul-98	6.89	9:30	BAILED	15.0	0.730	7.60	175	728	3.70	0.00
Mar-99	4.89	10:00	BAILED	5.0	0.769	6.42	195	OR	4.06	0.03
Sep-99	12.89	-	BAILED	14.1	0.721	6.51	125	282	4.12	0.03
Feb-00	4.84	12:50	BAILED	7.7	0.726	6.96	205	OR	6.71	0.03
Sep-00	-	-	-	-	-	-	-	-	-	-

* Sep-00 - Field equipment not functioning properly. Unable to obtain field parameters.

OR - Over Range (>999 NTU).

Historical Field Parameters
Building 1253
Verona Research Facility
Verona, NY

MW-002

Sampling Event	DTW (ft)	Time	Purge Rate (L/min)	Temp. (C)	Cond. (ms/cm)	pH	Eh (mV)	Turbidity (NTU)	DO (ppm)	Salinity %
Oct-96	1.58									
Oct-97	5.52									
Apr-98	2.43									
Jul-98	2.99	8:00	BAILED	19	0.860	7.40	80	328	3.10	0.00
Mar-99	1.55	9:30	BAILED	4.3	0.664	6.75	-	986	3.23	0.02
Sep-99	8.90	10:15	BAILED	17.8	-	6.54	195	OR	2.93	0.03
Feb-00	1.51	10:40	BAILED	7.1	0.749	7.08	145	OR	5.48	0.03
Sep-00	-	-	-	-	-	-	-	-	-	-

* Sep-00 - Field equipment not functioning properly. Unable to obtain field parameters.
OR - Over Range (>999 NTU).

MW-004

Sampling Event	DTW (ft)	Time	Purge Rate (L/min)	Temp. (C)	Cond. (ms/cm)	pH	Eh (mV)	Turbidity (NTU)	DO (ppm)	Salinity %
Oct-96	1.31									
Oct-97	5.64									
Apr-98	2.64									
Jul-98	3.56	8:30	BAILED	20.0	1.200	7.40	240	68	3.10	0.00
Mar-99	-	9:15	BAILED	3.9	0.902	7.29	195	OR	3.30	0.03
Sep-99	8.83	10:30	BAILED	18.0	1.010	6.54	210	311	2.53	0.04
Feb-00	1.28	11:00	BAILED	6.3	0.980	6.90	170	117	19.44	0.04
Sep-00	-	-	-	-	-	-	-	-	-	-

* Sep-00 - Field equipment not functioning properly. Unable to obtain field parameters.
OR - Over Range (>999 NTU).