STANDARD CHLORINE of Delaware, Inc.
Governor Lea Road
Delaware City, Delaware 19706-0319
PHONE 302-834-4536
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#98115

100407

January 20, 1993

Ms. Anne Hiller
Environmental Scientist
DNREC
715 Grantham Lane
New Castle, DE 19720

Dear Ms. Hiller:

In accordance with Paragraph 6 of the Consent Order between Standard Chlorine of Delaware, Inc. and the Delaware Department of Natural Resources and Environmental Control, we are hereby submitting the Twentieth Quarterly Groundwater Monitoring Report for the period October 1 through December 31, 1992.

Please note that the cover page of the report, containing the signature of the professional geologist, was inadvertently omitted. This will be forwarded immediately upon receipt from Roy F. Weston, Inc. Feel free to contact me should there be any questions.

Sincerely,

Paul Johnston

Paul Johnston
Manager, Environmental

PJ/dm
Enclosure

cc: R. J. Touhey
T. E. Pierson

QUARTERLY MONITORING REPORT
GROUNDWATER RECOVERY SYSTEM OPERATIONS

STANDARD CHLORINE OF DELAWARE, INC.
DELAWARE CITY, DELAWARE

20 January 1993

Prepared By:

ROY F. WESTON, INC.
WESTON WAY
WEST CHESTER, PENNSYLVANIA 19380

AR308021

QUARTERLY MONITORING REPORT
GROUNDWATER RECOVERY SYSTEM OPERATIONS

STANDARD CHLORINE OF DELAWARE, INC.
DELAWARE CITY, DELAWARE

Abraham Thomas, P.G.
Project Director

20 January 1993

Prepared By:

ROY F. WESTON, INC.

AR308022

QUARTERLY MONITORING REPORT
GROUNDWATER RECOVERY SYSTEM OPERATION
STANDARD CHLORINE OF DELAWARE, INC.
DELAWARE CITY, DELAWARE
20 January 1993

This quarterly report has been prepared to document the activities associated with the groundwater recovery program at the Standard Chlorine of Delaware, Inc. (SCD), Delaware City, Delaware facility. This report has been prepared in accordance with the 22 January 1988 Consent Order between the Delaware Department of Natural Resources and Environmental Control (DNREC) and SCD. Included in this report are the results of quarterly groundwater sampling of site monitor and recovery wells, and a summary of the monthly groundwater withdrawal rates and contaminant recovery at the recovery wells. Water level data for the recovery and monitoring wells for this quarter are also presented herein. Additionally, modifications and maintenance activities performed during this period, and an evaluation of the recovery well system performance and recommendations are presented in this report. The documentation presented in this report covers the quarterly period from October through December 1992.

Recovery System Modifications and Maintenance

A review of the system maintenance reports provided by SCD show that for the months of October and November 1992, nearly continuous groundwater withdrawal occurred at recovery wells RW-1, RW-2, RW-3 and RW-4, except for short periods of downtime due to recovery well and plant maintenance activities. Recovery well RW-2 was not pumping for approximately two days during the month of October 1992, due to adjustment and replacement of the flow switch. Recovery well RW-3 was not pumping for approximately 1.5 days during the month of November 1992, due to adjustments made to the flow controller. Recovery well RW-5 was not pumping during the months of October and November 1992 due to well pump failure.

Routine maintenance during the month of December 1992 accounted for approximately 0.5 day of down time at recovery wells RW-1, RW-3 and RW-4. Pump failure occurred at recovery well RW-2 on 7 December 1992 and resulted in approximately 25 days of down time for the month. The well pump at recovery well RW-5 was replaced and the well resumed pumping on 16 December 1992. A treatment system upset caused recovery well RW-5 to be taken off line on 21 December 1992. These events resulted in approximately 26 days of down time at RW-5 in December 1992.

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Recovery System Performance

As shown in Figure 1, the overall influence pumping at the site, and the effectiveness of the recovery system is very limited at the time of the data collection. Consistent with recent quarterly monitoring data, the influence on groundwater levels is most noticeable due to pumping in the areas of RW-3/RW-4 and RW-1. The effectiveness of the recovery system with two wells not pumping is limited to the areas surrounding recovery wells RW-1, RW-3 and RW-4.

The average monthly withdrawal rates for recovery wells RW-1 through RW-5 is presented on Table 1. The number of days that each of the wells were not pumping during each month is also indicated on Table 1. The average monthly withdrawal rates represent the average flow rate for each of the wells for the days during the month that the wells were actually pumping. The flow rates at recovery wells RW-2 through RW-4 for this quarter are similar to the rates reported for the third quarter of 1992. The average withdrawal rate at recovery well RW-1 for this quarter was approximately 14 gpm greater than the average flow rate from the previous quarter. As previously mentioned, RW-5 was inactive for most of the quarter due to well equipment malfunctions and treatment system upset.

A complete round of depth to water measurements from the site monitoring wells and recovery wells was obtained on 30 and 31 December 1992 and are presented in Table 2. Due to pump failure and treatment system upset, recovery wells RW-2 and RW-5 were not pumping on this date. A water table elevation contour map was prepared using water level data obtained on 30 and 31 December, and is presented on Figure 1.

The quarterly groundwater sampling of the monitor and recovery wells at the site was performed on 13 November 1992. Table 3 presents the total benzene species concentrations from groundwater samples obtained from the site recovery wells and monitor wells. The individual benzene species analysis for these recovery and monitor wells are presented in Table 4. The data presented on Table 3 was used to prepare an isoconcentration map (see Figure 2) of the total benzene species from the 13 November 1992 sampling of the site monitor wells and recovery wells. The total benzene species (TBS) concentrations reported for the site monitor and recovery wells are, in general, comparable to the last quarterly monitoring data. The notable exceptions include; RW-2 with TBS concentration of 348.67 mg/L in this quarter compared to a concentration of 281.26 mg/L for last quarter, and TW-6A which showed a TBS concentration decrease from 158.66 mg/L in August 1992 to 2.92 mg/L in November 1992. In addition, free organics were reported in TW-5 for this quarter as compared to a concentration of 160.58

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mg/L for the previous quarterly sampling event.

The summary of groundwater and contaminant recovery for each of the recovery wells RW-1 through RW-5 are presented in Tables 5 through 9, respectively. Each table presents the monthly and cumulative groundwater and contaminant recovery for each well. The total system monthly and cumulative results are presented in Table 10. As shown on Table 10, operation of the site groundwater extraction system through December 1992 has resulted in the recovery of an estimated 47,251 kilograms of contaminants.

Recommendations

- Necessary repairs should be made at RW-2 in order to reactivate this well and an assessment should be made regarding the need for well rehabilitation.

- Necessary repairs should be made at RW-5 in order to reactivate this groundwater recovery well.

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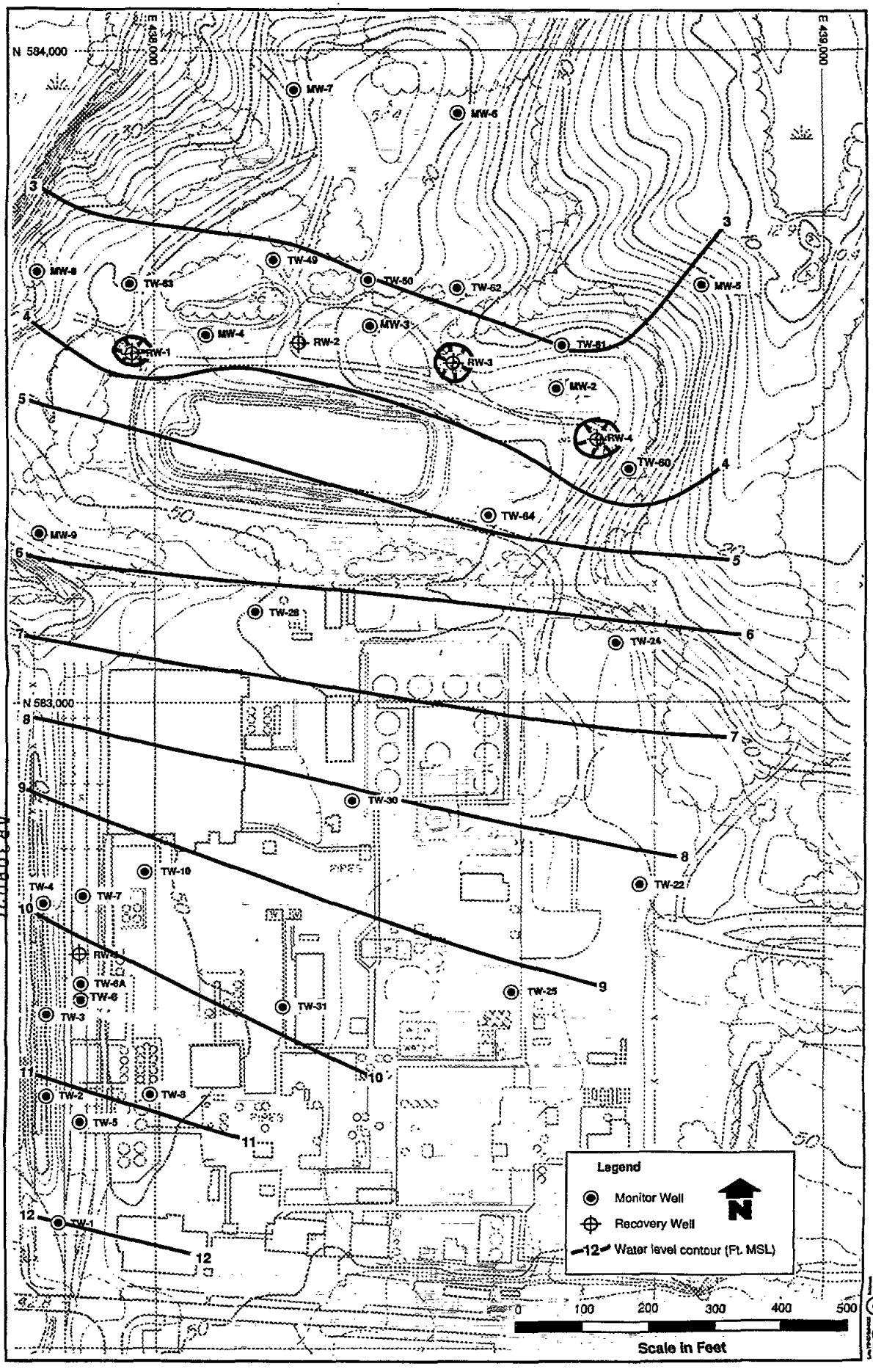

FIGURE 1 WATER LEVEL CONTOUR MAP
30,31 DECEMBER 1992

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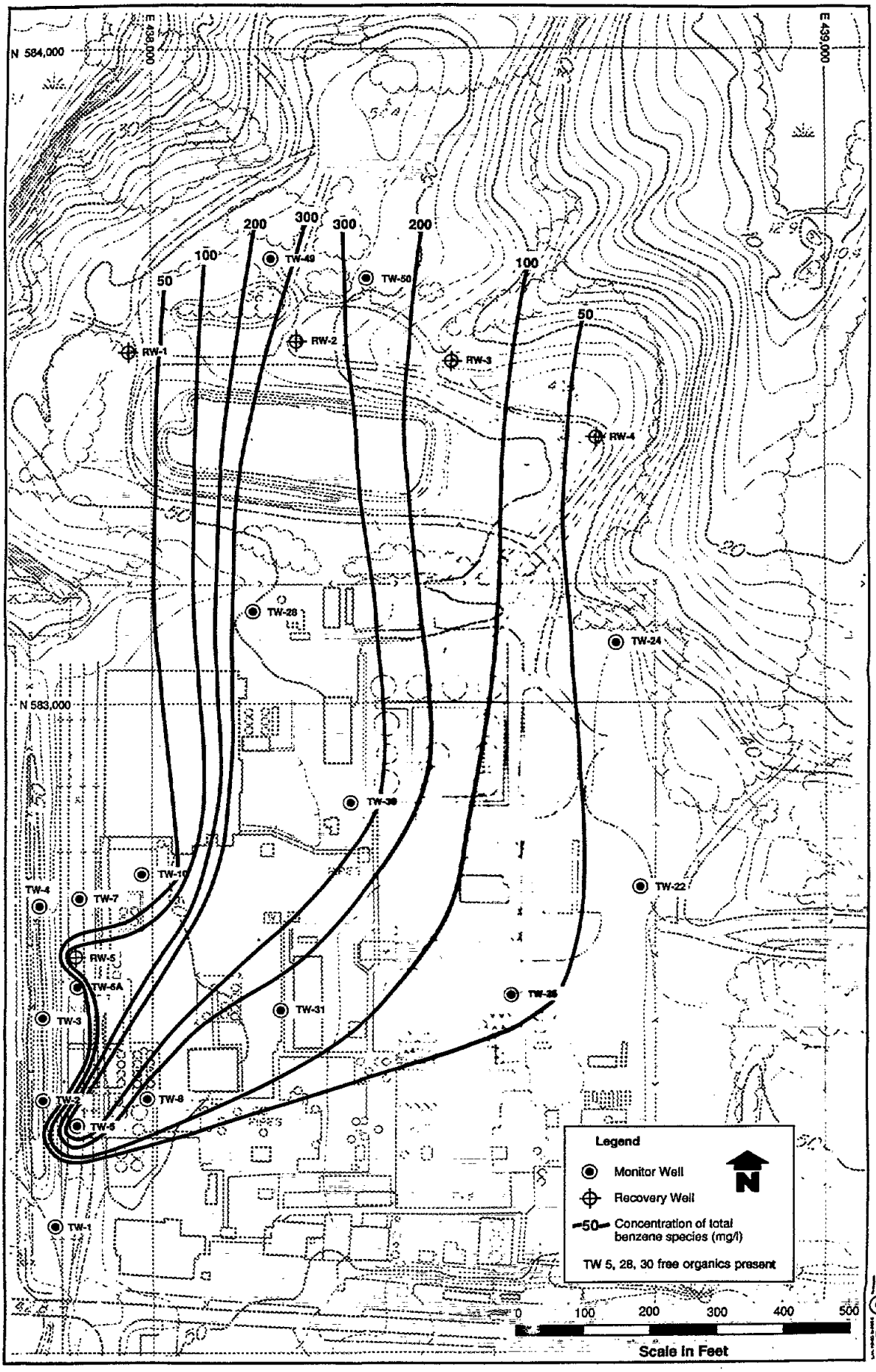

FIGURE 2 ISOCONCENTRATION MAP OF TOTAL BENZENE SPECIES 13 NOVEMBER 1992

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TABLE 1

AVERAGE MONTHLY WITHDRAWAL RATES (GPM)
GROUNDWATER RECOVERY WELL SYSTEM

STANDARD CHLORINE OF DELAWARE, INC.

Month 1992	RW-1	RW-2	RW-3	RW-4	RW-5
October	30.2 PD-1 day	6.1 PD-4 days	25.9 PD-2.5 days	47.6 PD-1.5 days	0.0 PD-31 days
November	45.1 PD-0.5 day	5.2 PD-0.5 day	24.1 PD-2 days	62.7 PD-0.5 day	0.0 PD-31 days
December	43.7 PD-0.5 day	5.4 PD-25 days	24.6 PD-0.5 day	60.0 PD-0.5 day	5.0* PD-26 days

PD - Pump Down (Rounded to nearest 0.5 day)
* - Estimated withdrawal rate

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TABLE 2
GROUNDWATER LEVEL DATA

STANDARD CHLORINE OF DELAWARE, INC.
30, 31 December 1992

Location	Measuring Point Elevation (ft. MSL)	Depth to Water (ft.)	Groundwater Elevation (ft. MSL)
TW-1	44.80	32.80	12.00
TW-2	53.74	42.46	11.28
TW-3	53.46	42.76	10.70
TW-4	52.61	42.70	9.91
TW-5	47.91	36.46	11.45
TW-6A	48.08	37.94	10.14
TW-7	47.27	37.60	9.67
TW-8	51.14	40.26	10.88
TW-10	49.60	40.30	9.30
TW-22	51.23	42.96	8.27
TW-24	48.07	41.78	6.29
TW-25	48.12	38.90	9.22
TW-28	51.39	45.00	6.39
TW-30	50.94	42.90	8.04
TW-31	49.28	39.48	9.80
TW-49	54.45	51.26	3.19
TW-50	52.87	49.78	3.09
TW-60	45.17	41.64	3.53
TW-61	44.23	41.20	3.03
TW-62	47.64	44.74	2.90
TW-63	52.55	49.30	3.25
TW-64	52.21	47.24	4.97
MW-1	49.46	38.92	10.54
MW-2	48.35	45.14	3.21
MW-3	50.23	46.80	3.43
MW-4	55.22	51.58	3.64
MW-5	25.36	22.18	3.18
MW-6	51.43	48.98	2.45
MW-7	48.92	46.44	2.48
MW-8	43.22	39.56	3.66
MW-9	47.45	41.60	5.85
RW-1	53.52	55.12	-1.60
RW-2	51.77	48.20	3.57
RW-3	44.32	54.76	-10.44
RW-4	46.84	50.82	-3.98
RW-5	47.72	37.50	10.22

TABLE 3

QUARTERLY SAMPLING RESULTS
MONITOR AND RECOVERY WELLS

STANDARD CHLORINE OF DELAWARE, INC.
13 November 1992

Location	Total Benzene Species Concentration (mg/L)
TW-1	4.75
TW-2	0.58
TW-3	0.04
TW-4	0.01
TW-5	*
TW-6A	2.92
TW-7	24.23
TW-8	122.78
TW-10	39.05
TW-22	0.09
TW-24	16.65
TW-25	55.56
TW-28	*
TW-30	*
TW-31	183.25
TW-49	219.94
TW-50	243.37
RW-1	29.28
RW-2	348.67
RW-3	148.00
RW-4	22.54
RW-5	109.53

* Free organics in well.

TABLE 4

WATER QUALITY DATA - INDIVIDUAL BENZENE SPECIES
Monitor and Recovery Wells
Standard Chlorine of Delaware, Inc.
13 November 1992

Well	pH	C6H6	MONO	PARA	META	ORTHO	135	124	123	NB	1245	1234	MCNB	2,4-DCNB	PENTA	HEXA	TOTAL
TW-1	6.00	<0.10	3.88	0.72	<0.20	<0.20	<0.010	0.15	<0.010	<0.015	<0.010	<0.010	<0.020	<0.015	<0.010	<0.010	4.75
TW-2	6.60	0.01	0.47	0.02	<0.010	0.07	<0.010	0.01	<0.010	<0.015	<0.010	<0.010	<0.020	<0.015	<0.010	<0.010	0.58
TW-3	6.59	<0.005	0.01	0.01	<0.010	0.01	<0.010	0.01	<0.010	<0.015	<0.010	<0.010	<0.020	<0.015	<0.010	<0.010	0.04
TW-4	6.67	<0.005	0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.015	<0.010	<0.010	<0.020	<0.015	<0.010	<0.010	0.01
TW-5	4.50	FREE ORGANICS															
TW-6A	6.60	<0.05	0.92	0.40	<0.10	1.10	<0.010	0.38	0.06	<0.015	0.02	0.04	<0.020	<0.015	<0.010	<0.010	2.92
TW-7	6.60	<0.10	0.59	15.61	1.39	3.24	0.03	2.39	0.71	<0.015	0.03	0.21	<0.020	<0.015	0.03	<0.010	24.23
TW-8	5.80	14.64	61.80	4.79	<2.00	41.17	<0.010	0.38	<0.010	<0.015	<0.010	<0.010	<0.020	<0.015	<0.010	<0.010	122.78
TW-10	7.70	<0.25	3.72	32.37	<0.50	2.46	<0.010	0.24	0.20	<0.015	0.01	0.05	<0.020	<0.015	<0.010	<0.010	39.05
TW-22	8.25	<0.005	0.04	0.02	<0.010	0.01	<0.010	0.02	<0.010	<0.015	<0.010	<0.010	<0.020	<0.015	<0.010	<0.010	0.09
TW-24	5.90	<0.10	0.19	0.78	<0.20	15.31	<0.010	0.23	0.05	<0.015	0.01	0.06	<0.020	<0.015	0.02	<0.010	16.65
TW-25	7.50	0.54	2.08	9.06	<1.00	39.64	<0.010	3.79	0.18	<0.015	0.05	0.20	<0.020	<0.015	0.02	<0.010	55.56
TW-28	4.28	FREE ORGANICS															
TW-30	5.95	FREE ORGANICS															
TW-31	6.60	53.90	75.27	23.87	<2.00	24.48	<0.010	5.38	0.24	<0.015	0.07	0.04	<0.020	<0.015	<0.010	<0.010	183.25
TW-49	5.90	43.97	75.13	19.85	<2.00	23.40	<0.050	46.22	8.54	<0.015	1.89	0.94	<0.020	<0.015	<0.010	<0.010	219.94
TW-50	4.20	104.91	88.18	25.30	<2.00	19.04	<0.010	4.43	1.08	0.32	0.06	0.05	<0.020	<0.015	<0.010	<0.010	243.37
RW-1	6.70	4.31	5.38	8.75	<0.50	4.00	0.01	5.09	1.50	<0.015	0.05	0.17	<0.020	<0.015	0.02	<0.010	29.28
RW-2	4.18	56.16	97.76	44.84	3.22	37.12	<0.12	74.68	13.21	0.67	10.52	8.74	0.41	<0.04	1.31	0.03	348.67
RW-3	3.50	10.13	71.01	11.63	2.46	44.28	<0.010	2.48	0.43	3.94	0.08	0.05	1.51	<0.07	<0.010	<0.010	148.00
RW-4	5.90	1.21	2.88	4.42	<2.00	12.46	<0.010	0.92	0.34	0.16	0.02	0.06	0.07	<0.015	<0.010	<0.010	22.54
RW-5	6.30	<1.00	45.06	24.28	<2.00	32.26	<0.02	6.22	1.09	<0.015	0.19	0.39	<0.020	<0.015	0.04	<0.010	109.53

Legend

ORTHO - Orthodichlorobenzene
MONO - Monochlorobenzene
PARA - Paradichlorobenzene
135 - 135 Trichlorobenzene
MCNB - Metachloronitrobenzene
NB - Nitrobenzene
1234 - 1234 Tetrachlorobenzene
PENTA - Pentachlorobenzene
C6H6 - Benzene
META - Metachlorobenzene
124 - 124 Trichlorobenzene
2,4-DCNB - 2,4-Dichloronitrobenzene
123 - 123 Trichlorobenzene
1245 - 1245 Tetrachlorobenzene
HEXA - Hexachlorobenzene

All concentrat[illegible]g/L

SCD DE6\WATER Q4 TBL

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Table 5

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-1

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gal. x1000)	Average Monthly Concentrations Total Benzene Species (mg/l)	Total Benzene Species Monthly Total Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1991						
October	28.0	1127590	28,064	21.41 **	91.4	6,334.9
November	27.5	1150252	29,214	21.41 **	93.2	6,428.1
December	25.2	1088439	30,302	21.41 **	88.2	6,516.3
1992						
January	24.3	1085891	31,388	33.16 **	136.3	6,652.6
February	23.6	987191	32,375	33.16 **	123.9	6,776.6
March	22.6	1009847	33,385	33.16 **	126.8	6,903.3
April	24.6	851688	34,237	32.66 **	105.3	7,008.6
May	24.0	1004025	35,241	32.66 **	124.1	7,132.7
June	25.0	1044383	36,285	32.66 **	129.1	7,261.9
July	27.7	558130	36,844	40.00 **	84.5	7,346.4
August	22.7	996150	37,840	40.00 **	150.8	7,497.2
September	29.2	1239940	39,080	40.00 **	187.7	7,684.9
October	30.2	1262110	40,342	29.28 **	139.9	7,824.8
November	45.1	1916810	42,259	29.28 **	212.4	8,037.3
December	43.7	1917150	44,176	29.28 **	212.5	8,249.8

** Starting with fourth quarter 1991, only single quarterly sample collected.

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Table 6

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-2

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gal. x1000)	Average Monthly (**) Concentrations Total Benzene Species (mg/l)	Total Benzene Species Monthly Total Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1991						
October	8.7	50080	6,816	350 *(**)	66.3	6,944.7
November	0.0	0	6,816	350 *(**)	0.0	6,944.7
December	9.1	314972	7,131	350 *(**)	417.3	7,362.0
1992						
January	7.3	261606	7,393	155.47 (**)	154.0	7,516.0
February	6.0	234370	7,627	155.47 (**)	137.9	7,653.9
March	6.3	280594	7,908	155.47 (**)	165.1	7,819.0
April	6.6	276751	8,185	350.00 *(**)	366.7	8,185.7
May	5.4	240328	8,425	350.00 *(**)	318.4	8,504.1
June	6.1	256334	8,681	350.00 *(**)	339.9	8,844.0
July	6.8	137100	8,819	281.26 (**)	146.0	8,989.9
August	5.3	232210	9,051	281.26 (**)	247.2	9,237.1
September	6.0	254030	9,305	281.26 (**)	270.5	9,507.6
October	6.1	229770	9,535	348.67 (**)	303.3	9,810.9
November	5.2	219690	9,754	348.67 (**)	290.0	10,100.8
December	5.4	46520	9,801	348.67 (**)	61.4	10,162.2

* value estimated
(**) Starting with fourth quarter 1991, only single quarterly sample collected.

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Table 7

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-3

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gal. x1000)	Average Monthly Concentrations Total Benzene Species (mg/l)	Total Benzene Species Monthly Total Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1991						
October	23.0	298470	19,441	97.19 *	109.8	9,709.3
November	0	0	19,441	97.19 *	0.0	9,709.3
December	21.2	366050	19,807	97.19 *	134.7	9,844.0
1992						
January	29.0	1251948	21,059	86.89 *	411.8	10,255.8
February	23.2	867651	21,926	86.89 *	285.4	10,541.2
March	18.2	682692	22,609	86.89 *	224.5	10,765.7
April	19.2	745785	23,355	113.03 *	319.1	11,084.8
May	20.5	736455	24,091	113.03 *	315.1	11,399.9
June	32.5	749463	24,841	113.03 *	320.7	11,720.5
July	22.6	454830	25,295	199.35 *	343.2	12,063.8
August	24.7	1083990	26,379	199.35 *	818.0	12,881.8
September	23.2	667430	27,047	199.35 *	503.6	13,385.4
October	25.9	1023750	28,071	148.00 *	573.5	13,958.9
November	24.1	971370	29,042	148.00 *	544.2	14,503.1
December	24.6	1078690	30,121	148.00 *	604.3	15,107.4

* Starting with fourth quarter 1991, only single quarterly sample collected.

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Table B

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-4

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gal. x1000)	Average Monthly Concentrations Total Benzene Species (mg/l)	Total Benzene Species Monthly Total Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1991						
October	50.7	2042790	39,348	22.95 *	177.5	5,497.2
November	50.5	2108735	41,457	22.95 *	183.2	5,680.4
December	48.8	2036525	43,494	22.95 *	176.9	5,857.3
1992						
January	43.4	1937195	45,431	18.58 *	136.2	5,993.5
February	46.1	1923653	47,354	18.58 *	135.3	6,128.8
March	43.4	1937566	49,292	18.58 *	136.3	6,265.1
April	47.9	1242437	50,534	24.80 *	116.6	6,381.7
May	35.1	505414	51,040	24.80 *	47.4	6,429.2
June	54.5	2277614	53,318	24.80 *	213.8	6,643.0
July	60.4	1218510	54,536	19.15 *	88.3	6,731.3
August	48.9	2148430	56,684	19.15 *	155.7	6,887.1
September	48.3	2049920	58,734	19.15 *	148.6	7,035.7
October	47.6	1951850	60,686	22.54 *	166.5	7,202.2
November	62.7	2662050	63,348	22.54 *	227.1	7,429.3
December	60.0	2633610	65,982	22.54 *	224.7	7,654.0

* Starting with fourth quarter 1991, only single quarterly sample collected.

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Table 9

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-5

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gal. x1000)	Average Monthly Concentrations Total Benzene Species (mg/l)	Total Benzene Species Monthly Total Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1991						
October	7.2	289980	8,534	156.42 **	171.7	5,695.6
November	7.2 *	310693	8,845	156.42 **	184.0	5,879.5
December	7.2 *	300336	9,145	156.42 **	177.8	6,057.4
1992						
January	5 *	223200	9,368	81.08 **	68.5	6,125.9
February	5 *	208800	9,577	81.08 **	64.1	6,189.9
March	5 *	115200	9,692	81.08 **	35.4	6,225.3
April	5 *	201600	9,894	178.10 **	135.9	6,361.2
May	5 *	208800	10,103	178.10 **	140.8	6,502.0
June	5 *	208800	10,311	178.10 **	140.8	6,642.7
July	0.7	2125	10,313	30.8 **	1.7	6,644.4
August	0.0	0	10,313	30.8 **	0.0	6,644.4
September	0.0	0	10,313	30.8 **	0.0	6,644.4
October	0.0	0	10,313	109.53 **	0.0	6,644.4
November	0.0	0	10,313	109.53 **	0.0	6,644.4
December	5 *	36000	10,349	109.53 **	14.9	6,659.4

* Average monthly pumping rate estimated. Actual flow rate could not be determined due to totalizer malfunctioning.

** Starting with fourth quarter 1991, only single quarterly sample collected.

AR308036

Table 10

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Wells RW-1, -2, -3, -4 and -5

Month	Total Monthly Pumpage(gal x1000)	Total Cumulative Pumpage(gal x1000)	Total Benzene Species Monthly Total Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1991				
October	3,809	101,075	616.7	33936.8
November	3,570	104,645	460.4	34397.2
December	4,106	108,751	994.9	35392.1
1992				
January	4,760	113,511	906.8	35962.0
February	4,222	117,733	746.6	36708.6
March	4,026	121,759	688.1	37396.7
April	3,318	125,077	1043.6	38440.3
May	2,695	127,772	945.8	39386.1
June	4,537	132,309	1144.2	40530.3
July	2,371	134,680	663.7	41194.0
August	4,461	139,140	1371.8	42565.8
September	4,211	143,352	1110.4	43676.3
October	4,467	147,819	1183.2	44859.5
November	5,770	153,589	1273.7	46133.2
December	5,712	159,301	1117.8	47251.0

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