Public Service Company of New Mexico
Person Generating Station
Groundwater Treatment System

Treatment Effectiveness Report
Fourth Quarter 1998

February 12, 1999

Report Prepared Pursuant to Requirements Contained in:

The Person Generating Station Corrective Action Directive (NMT 360010342)
and
The New Mexico Environment Department Discharge Plan, DP-1006

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Executive Summary

Contour maps for PCE, DCE, and TCA for the fall sampling event are shown in figures 7, 8, and 9, respectively. Figure 7 indicates that a plug or hot spot of higher concentration PCE in the groundwater is moving in an easterly direction towards extraction well PSMW-16. As expected, concentrations of PCE and total chlorinated VOC's at PSMW-16 have increased this quarter.

Operational problems with the PSMW-24 pump caused this extraction well to be off-line during most of October. Consequently, concentrations of total chlorinated VOC's in the combined influent from PSMW-24, 25, and 26 decreased significantly during October.

The GTS has operated satisfactorily for the remainder of the fourth quarter.

I. Introduction

This report is prepared pursuant to requirements contained in the Person Generating Station Corrective Action Directive (NMT360010342) issued by the New Mexico Environment Department (NMED) Hazardous and Radioactive Materials Bureau, and requirements contained in Discharge Plan DP-1006 issued by the NMED Groundwater Protection and Remediation Bureau.

This report contains information on sampling results and operational activities at the Person Generating Station Groundwater Treatment System (GTS). The GTS is designed to extract volatile organic compound contaminated groundwater, treat through an air stripper and granular activated carbon filter, and discharge the treated water to an irrigation pond at the UNM Championship Golf Course.

Figure 1 is a site map of the Person Generating Station vicinity and shows well locations and the location of the pipeline system.

E 382000
E 383000
E 384000
E 385000
E 386000
N 1468000
N 1467000
N 1466000
N 1465000
SOUTH DIVERSION CHANNEL
INTERSTATE 25
RAILROAD TRACK
BROADWAY
SCHWARTZMAN TRUST
TREATED WATER DISCHARGE TO POND
CHAMPIONSHIP GOLF COURSE
UNM PROPERTY
PARKING
UNIVERSITY BLVD.
APPROX. PIPE ALIGNMENTS
1/4 SECTION COR.
PSMW-1
PSMW-2
PSMW-3
PSMW-4
PSMW-5
PSMW-6
PSMW-7
PSMW-8A
PSMW-8B
PSMW-9
PSMW-10
PSMW-11
PSMW-12A
PSMW-12B
PSMW-13A
PSMW-13B
PSMW-14
PSMW-15B
PSMW-16
PSMW-17
PSMW-18
PSMW-19
PSMW-20
PSMW-21
PSMW-22
PSMW-23
PSMW-24
PSMW-25
PSMW-26
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PSMW-28
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PSMW-32
PSMW-35
PSMW-36
PSMW-37
PSPW-1
PSPW-2
PSPW-3
PSPW-4
PSPW-5
PSPW-6
VEW/DW WELL
EW-1
PERSON GENERATING STATION
POWER OPERATIONS BUILDING
CAPITAL LUMBER CO.
APPROXIMATE LOCATION OF VAPOR EXTRACTION SYSTEM
N.M. STATE HIGHWAY DEPT. (R.O.W)
EXISTING CULVERT
ETHICON PROPERTY
PNM
RCRA FACILITY BOUNDARY
BIO BRAVO BLVD.

200 100 0 200 400
SCALE: 1" = 400'

LEGEND
- GROUNDWATER PUMPING WELL
- MONITORING WELL
- PRODUCTION WELL (SEALED)
- ROADS
- PROPERTY LINES

SITE MAP

Public Service Company of New Mexico
Person Generating Station
Albuquerque, New Mexico

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

II. Operational History

The GTS was started on Friday, January 27, 1995, with treated effluent being sent to the UNM Championship Golf Course.

During 1995, the GTS encountered periodic minor problems as well as a more serious problem with mineralization of the system components downstream from the air stripper. The GTS was kept off-line for most of the first quarter of 1996 while the mineralization problem was studied. After evaluation of various treatment methods, an acid treatment system was selected as the most feasible solution to the mineralization problem.

Installation of the acid treatment system began in early May 1996. In early April, construction activities were initiated to convert monitor wells PSMW-24, PSMW-25, and PSMW-26 (PSMW-24, 25, and 26) to extraction wells. The GTS resumed regular operation in mid-June 1996.

The Person Generating Station Discharge Plan, DP-1006, was amended and approved by the Groundwater Protection and Remediation Bureau in mid-June 1997. As part of the amended plan, the existing plan requirement for the sulfuric acid treatment system was replaced. Previously, acid addition to the effluent was restricted to 35 mg/l. The new requirement specifies adjustment of the acid treatment system to maintain an effluent pH range of 6.0 to 9.0. A pH probe and chart recorder were installed on the effluent discharge tank for daily monitoring of pH, and effluent samples are collected monthly for total sulfate analysis.

During the fourth quarter, PSMW-24 was off-line for much of October due to operational problems with the pump. For the remainder of the fourth quarter, however, the GTS has operated satisfactorily.

III. Groundwater Treatment Effectiveness

Figures 2, 3, and 4 show graphs of concentration of total chlorinated VOC's as measured at wells PSMW-16, VEW, and EW-1 over the operational period of the GTS. Figure 5 shows a graph of concentration of total chlorinated VOC's in the combined influent from wells PSMW-24, 25, and 26 over the operational period of the GTS. More detailed data for these wells are shown in Tables 1, 2, 3, and 4.

During the first quarter of 1998, total chlorinated VOC's increased slightly at EW-1. Total chlorinated VOC's fluctuated during the first quarter in the combined influent from wells PSMW-24, 25, and 26. During March 1998, PSMW-16 and VEW were redeveloped. Therefore, no samples were collected from these wells in March. Prior to redevelopment activities total chlorinated VOC's had been relatively constant at these wells.

Beginning in January 1998, EPA Method 8021 (Halo) replaced EPA Method 8010. Therefore, all first quarter groundwater samples were analyzed with the 8021 (Halo) method.

During the second quarter of 1998, total chlorinated VOC's increased slightly at the VEW. In April, a decrease in total chlorinated VOC's was noted at PSMW-16 and in the combined influent from PSMW-24, 25, and 26. However, for the remainder of the second quarter, total chlorinated VOC's have fluctuated at these wells. EW-1 showed a decrease in total chlorinated VOC's during the second quarter.

A slight rebound effect was observed at PSMW-16 during the third quarter. This increase and subsequent decrease in total chlorinated VOC's is thought to be due to the GTS being off-line during July and restarted in August. Third quarter analytical data indicated that PSMW-16 had higher concentrations of total chlorinated VOC's than the other extraction wells. Data analysis indicated that a plug or hot spot of higher concentration contaminants in the groundwater was moving towards PSMW-16. Thus, the rebound effect was much more noticeable at this extraction well.

Total chlorinated VOC's fluctuated slightly at the VEW during the third quarter. In the combined influent from PSMW-24, 25, and 26, total chlorinated VOC's dropped. At EW-1, a sharp decrease in total chlorinated VOC's occurred between the August and September sampling events. The cause of this sharp decrease is unknown.

During the fourth quarter, total chlorinated VOC's at EW-1 increased to concentrations that had existed prior to the sharp decrease that occurred in the third quarter. Total chlorinated VOC's at PSMW-16 increased overall, but continued to fluctuate monthly. At the VEW, total chlorinated VOC's fluctuated only slightly. In the combined influent from PSMW-24,25, and 26, total chlorinated VOC's dropped sharply in October, but increased during the last two

months. The sharp decrease is due to PSMW-24 being off line during most of October.

Laboratory reports for this quarter are contained in appendix A.

Figure 2
Total VOCs at PSMW-16

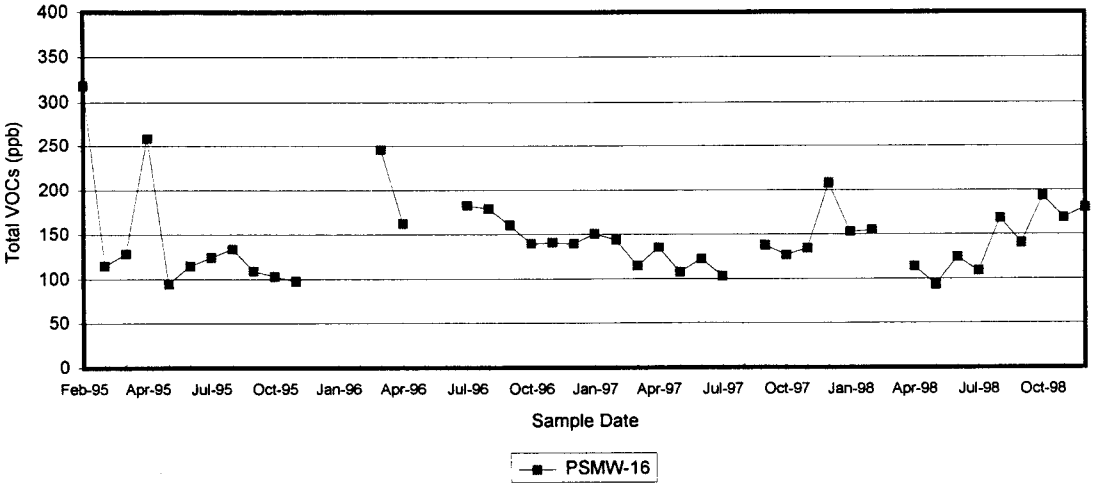

Figure 3
Total VOCs at the VEW

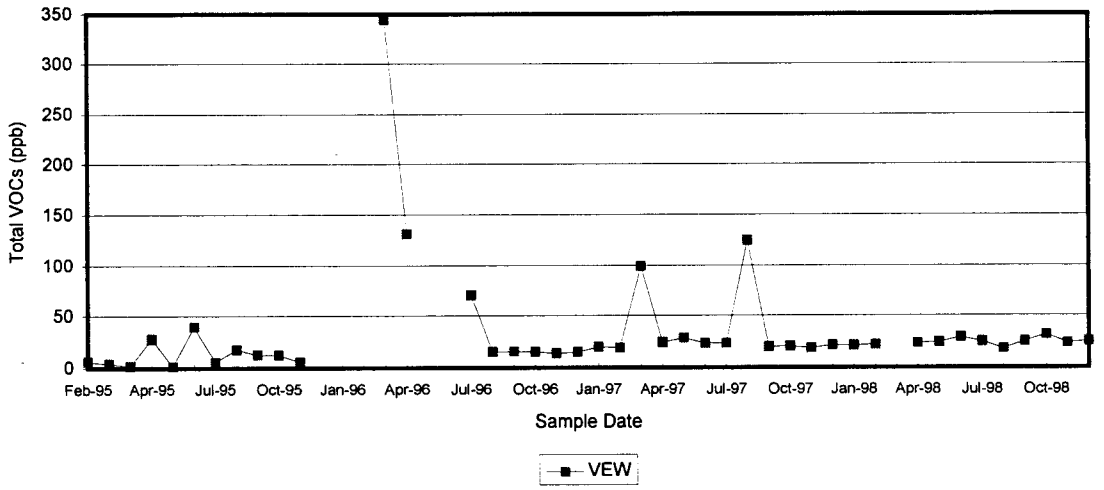

Figure 4
Total VOCs at EW-1

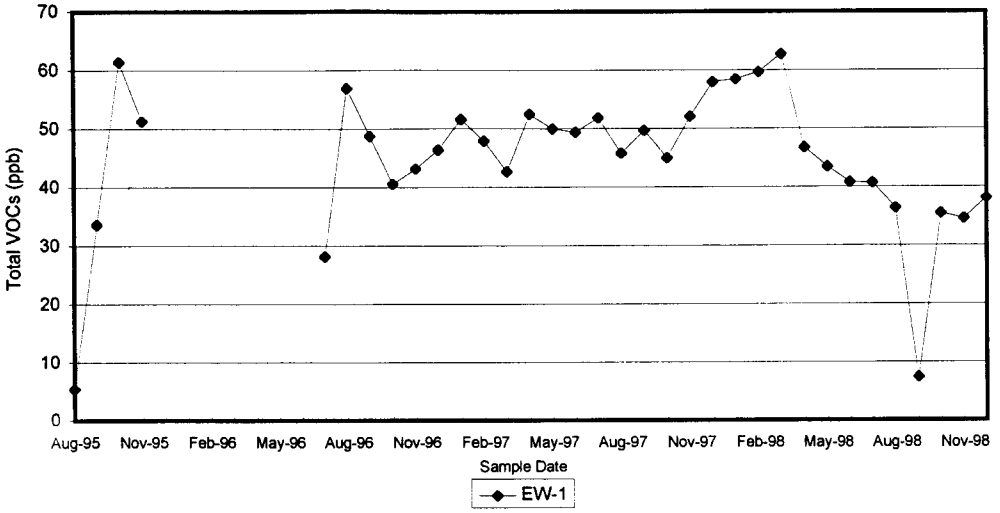

Figure 5
Total VOCs at PSMW-24,25,26

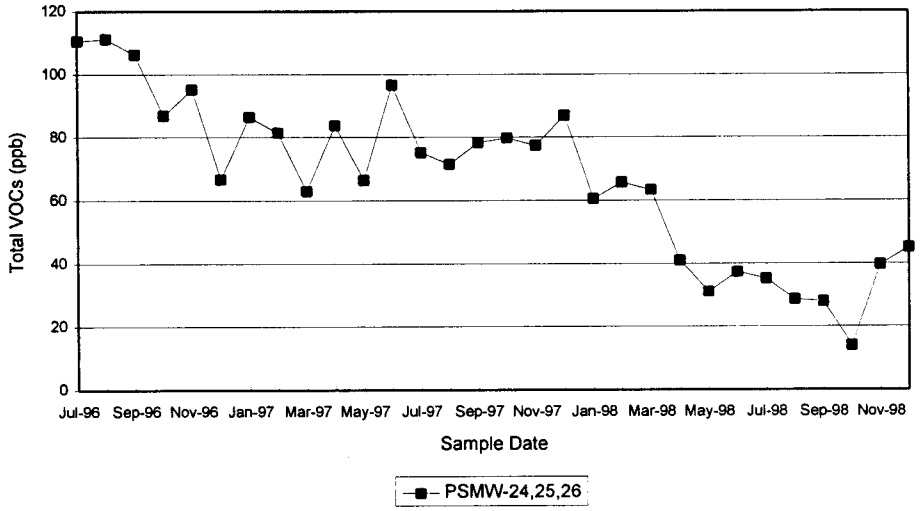

Table 1
Influent Concentrations at PSMW-16

Date	Laboratory Report No.	PCE (ppb)	DCE (ppb)	Total VOC's (ppb)
2/1/95	502304	200	110	31604
2/15/95	502376	69	39	115.0
3/8/95	503317	78	46	128.3
4/10/95	504341	170	81	258.6
5/18/95	505371	62	30	94.6
6/21/95	506396	76	36	114.8
7/12/95	507327	75	41	124.3
8/17/95	508405	83	45	134.0
9/13/95	509339	69	35	109.2
10/11/95	510335	66	32	102.8
11/22/95	511367	58	35	97.5
3/20/96	603347	180	63	245.3
4/17/96	604367	110	46	162.5
7/18/96	607334	120	54	182.9
8/15/96	608331	120	51	179.1
9/18/96	609338	110	43	160.9
10/16/96	610361	97	37	140.0
11/19/96	611331	94	42	141.0
12/17/96	612331	96	39	140.0
1/16/97	701336	99	46	150.7
2/13/97	702332	100	40	143.7
3/19/97	703344	88	23	114.6
4/17/97	704355	93	38	135.8
5/15/97	705347	71	32	107.6
6/18/97	706353	83	36	122.6
7/23/97	707360	67	34	103.1
9/15/97	709332	100	34	137.9
10/15/97	710358	92	31	127.2
11/19/97	711335	95	34	134.5
12/16/97	712318	140	68	208
1/15/98	801334	110	37	153.1
2/11/98	802336	110	38	155.3
3/11/98	NA	NA	NA	NA
4/8/98	804337	78	30	114.4
5/20/98	805379	67	23	93.4
6/16/98	806353	89	30	124.6
7/1/98	807300	76	29	108.8
8/13/98	808040	120	41	168.5
9/16/98	809042	110	26	140.7
10/7/98	810021	120	68	193.4
11/17/98	811049	100	64	169
12/9/98	812045	110	66	180.7

Table 2
Influent Concentrations at VEW

Date	Laboratory Report No.	PCE (ppb)	DCE (ppb)	Total VOC's (ppb)
2/1/95	502304	5.3	0.8	6.1
2/15/95	502376	4	0.5	4.5
3/8/95	503317	1.5	0.3	1.8
4/10/95	504341	21	5.8	28.1
5/18/95	505371	1.4	<0.2	1.4
6/21/95	506396	25	9.4	39.8
7/12/95	507327	3.5	1.0	5.8
8/17/95	508405	6.4	1.1	17.7
9/13/95	509405	9.7	1.9	12.9
10/11/95	510335	9.3	1.8	12.5
11/22/95	511367	4.6	1.1	6.0
3/20/96	603347	270	72	344.3
4/17/96	604367	94	24	131.2
7/18/96	607334	47	14	70.6
8/15/96	608331	5.0	2.1	15.2
9/18/96	609338	3.1	2.1	15.8
10/16/96	610361	3.2	2.1	15.3
11/19/96	611331	0.8	1.8	13.6
12/17/96	612331	<0.5	2.0	15.0
1/16/97	701336	0.9	3.2	20.2
2/13/97	702332	1.0	2.4	19.2
3/19/97	703344	68	17	99.5
4/17/97	704355	2.8	3.4	24.4
5/15/97	705347	6.1	5.3	28.5
6/18/97	706353	3.8	4.2	23.5
7/23/97	707360	2.9	4.0	23.6
8/13/97	708339	57	50	124.8
9/15/97	709332	1.7	3.4	19.8
10/15/97	710358	3.2	3.1	20.5
11/19/97	711335	1.3	3.2	18.7
12/16/97	712318	1	4.8	21.7
1/15/98	801334	2.5	3.6	21.3
2/11/98	802336	2.9	3.7	22
3/11/98	NA	NA	NA	NA
4/8/98	804337	6.4	5.0	23.7
5/20/98	805379	8.4	5.4	24.3
6/16/98	806353	11	6.2	29.1
7/1/98	807300	7.6	4.6	25.0
8/13/98	808040	5.6	3.8	18.2
9/16/98	809042	8.9	5.6	25.3
10/7/98	810021	10	9.4	31.7
11/17/98	811049	6.9	5.2	23.7
12/9/98	812045	7.9	5.6	25.4

Table 3
Influent Concentrations at EW-1

Date	Laboratory Report No.	PCE (ppb)	DCE(ppb)	Total VOC's (ppb)
8/17/95	508405	3.5	0.9	5.4
9/13/95	509339	25	6.1	33.6
10/11/95	510335	49	8.8	61.4
11/22/95	511367	38	9.5	51.3
7/18/96	607334	20	5.7	28.2
8/15/96	608331	45	8.4	57.0
9/18/96	609338	37	7.8	48.8
10/16/96	610361	29	7.3	40.6
11/19/96	611331	32	7.0	43.2
12/17/96	612331	33	7.7	46.4
1/16/97	701336	36	9.2	51.6
2/13/97	702332	32	7.7	47.9
3/19/97	703344	29	5.7	42.7
4/17/97	704355	31	8.4	52.5
5/15/97	705347	27	9.7	50
6/18/97	706353	23	8.6	49.4
7/23/97	707360	25	9.5	51.9
8/13/97	708339	20	6.8	45.8
9/15/97	709332	21	8.5	49.7
10/15/97	710358	18	6.5	45
11/19/97	711335	20	9.7	52.1
12/16/97	712318	21	12	58
1/15/98	801334	20	11	58.5
2/11/98	802336	21	11	59.7
3/11/98	803324	20	16	62.7
4/8/98	804337	16	9.7	46.8
5/20/98	805379	16	9	43.5
6/16/98	806353	13	7.9	40.8
7/1/98	807300	12	7.7	40.7
8/13/98	808040	8.5	7	36.4
9/16/98	809042	3.2	2.7	7.4
10/7/98	810021	9.5	7.7	35.5
11/17/98	811049	10	7.5	34.6
12/9/98	812045	12	8.4	38.1

Table 4
Combined Influent Concentrations at PSMW-24, 25, and 26

Date	Laboratory Report No.	PCE (ppb)	DCE(ppb)	Total VOC's (ppb)
7/18/96	607334	49	55	110.6
8/15/96	608331	47	50	111.3
9/18/96	609338	58	44	106.3
10/16/96	610361	41	40	86.8
11/19/96	611331	46	44	95.2
12/17/96	612331	33	30	66.7
1/16/97	701336	41	41	86.5
2/13/97	702332	41	37	81.5
3/19/97	703344	37	23	63.0
4/17/97	704355	42	37	83.8
5/15/97	705347	33	30	66.4
6/18/97	706353	39	55	96.6
7/23/97	707360	37	36	75.2
8/13/97	708339	39	30	71.5
9/15/97	709332	42	34	78.4
10/15/97	710358	48	29	79.8
11/19/97	711335	41	34	77.5
12/16/97	712318	40	47	87
1/15/98	801334	33	25	60.6
2/11/98	802336	36	27	65.7
3/11/98	803324	30	31	63.4
4/8/98	804337	21	18	41
5/20/98	805379	18	12	31.1
6/16/98	806353	21	15	37.3
7/1/98	807300	18	16	35.2
8/13/98	808040	14	13	28.6
9/16/98	809042	6.5	4.4	27.9
10/7/98	810021	5	7.3	13.9
11/17/98	811049	22	17	39.7
12/9/98	812045	25	19	45

IV. Operational Activities

Operational problems with the pump caused PSMW-24 to remain off-line for most of October. The pump has been repaired and PSMW-24 has operated satisfactorily for the remainder of the quarter.

V. Influent and Effluent Flow Volumes

Flow totalizing meters are present on each influent well line and on the effluent flow line. Table 5 below details flow volumes from each influent well and the effluent line. Differences between total influent and total effluent may be attributed to water loss (evaporation) out the stack in the air stripper system and to differences, inaccuracies, and operational problems with the flow meters.

Table 5
Influent and Effluent Flow Volumes

Source	Meter Number	Start Reading	End Reading	Volume (Gallons)
Flow Volumes for October 1998:				
Influent (VEW)	Badger Meter No. 94976130	3,581,387	3,625,665	44,278
Influent (PSMW-16)	Hayes Meter No. 29408700	5,487,476	5,650,464	162,988
Influent (EW-1)	Hayes Meter No. 29408732	4,404,091	4,545,427	141,336
Influent (PSMW-24)	Fisher Porter Meter No. 960307112	4,166,430	4,172,480	6,050
Influent (PSMW-25)	Fisher Porter Meter No. 960307112	1,192,340	1,263,150	70,810
Influent (PSMW-26)	Fisher Porter Meter No. 960307112	2,100,980	2,153,100	52,120
Monitor Well Sample Purge	NA	NA	NA	1,232
Effluent (to Golf Course)	Fisher Porter Meter No. 960307112	15,540,925	16,008,107	467,182
Flow Volumes for November 1998:				
Influent (VEW)	Badger Meter No. 94976130	3,625,665	3,646,566	20,901
Influent (PSMW-16)	Hayes Meter No. 29408700	5,650,464	5,762,880	112,416
Influent (EW-1)	Hayes Meter No. 29408732	4,545,427	4,670,142	124,715
Influent (PSMW-24)	Fisher Porter Meter No. 960307112	4,172,480	4,331,930	159,450
Influent (PSMW-25)	Fisher Porter Meter No. 960307112	1,263,150	1,329,230	66,080
Influent (PSMW-26)	Fisher Porter Meter No. 960307112	2,153,100	2,204,290	51,190
Effluent (to Golf Course)	Fisher Porter Meter No. 960307112	16,008,107	16,533,226	525,119
Flow Volumes for December 1998:				
Influent (VEW)	Badger Meter No. 94976130	3,646,566	3,692,171	45,605
Influent (PSMW-16)	Hayes Meter No. 29408700	5,762,880	5,861,260	98,380
Influent (EW-1)	Hayes Meter No. 29408732	4,670,142	4,809,755	139,613
Influent (PSMW-24)	Fisher Porter Meter No. 960307112	4,331,930	4,507,070	175,140
Influent (PSMW-25)	Fisher Porter Meter No. 960307112	1,329,230	1,405,030	75,800
Influent (PSMW-26)	Fisher Porter Meter No. 960307112	2,204,290	2,266,510	62,220
Effluent (to Golf Course)	Fisher Porter Meter No.960307112	16,533,226	17,119,325	586,099
Quarterly Total for Influent (VEW+PSMW-16+EW-1+PSMW-24+PSMW-25+PSMW-26)				1,610,324
Quarterly Total for Effluent:				1,578,400
Annual Totals				
Annual Cumulative Influent Total for 1998:				6,673,306
Annual Cumulative Effluent Total for 1998:				6,588,079

VI. Laboratory Analysis

A. Influent and Effluent Sampling for Chlorinated VOC's (8021 Analysis)

During the fourth quarter, influent and effluent sampling was conducted pursuant to the routine schedule outlined in DP-1006, i.e., once each month. Chlorinated VOC analysis of GTS influent and effluent (after GAC units) is shown graphically in figure 6. More detailed data are shown in table 6 below. Laboratory analytical data reports are contained in appendix A. All influent and effluent sampling results indicate that the GTS has consistently removed chlorinated VOC contaminants in the 50 to 200 ppb range to levels below laboratory detection limits in the effluent sent to the golf course. Laboratory analysis of the water at a point after the air stripper and before the granular activated carbon treatment also show that at these influent concentrations and a flow rate of approximately 20 to 25 gpm, the air stripper alone is capable of treating the groundwater to concentrations consistently below or near laboratory detection limits for chlorinated VOC's.

Figure 6
Total VOCs GTS Influent vs. Effluent

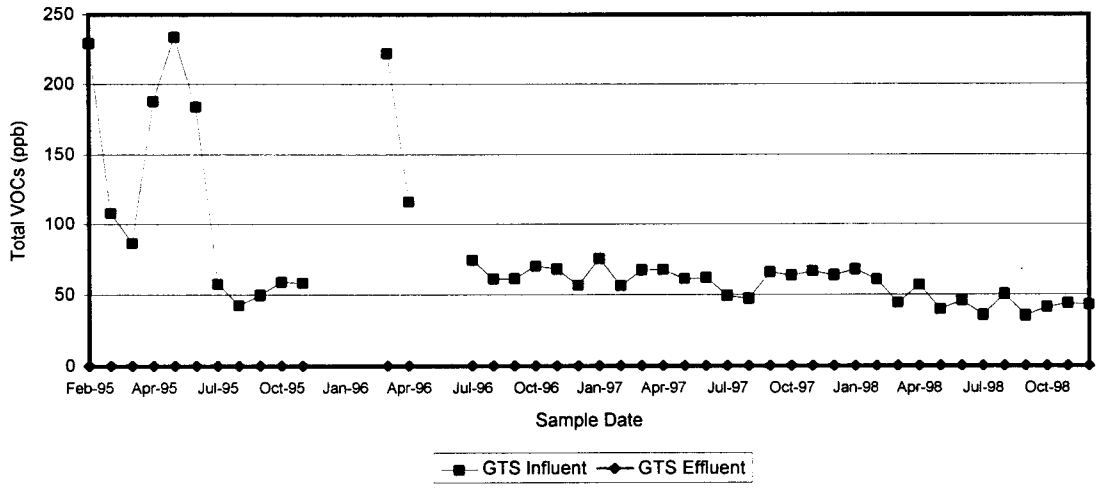

Table 6
Influent and Effluent VOC Concentrations

Sampling Date: 10/7/98	Lab Report Number: 810021		
VOC Compound	Influent (ppb)	Effluent After Air Stripper (ppb)	Effluent After GAC Unit (ppb)
1,1-Dichloroethene	11	< 0.2	< 0.2
Tetrachloroethene	27	0.5	< 0.5
1,1,1-Trichloroethane	3.3	< 1.0	< 1.0
TOTAL VOC'S	41.3	0.5	BDL

Sampling Date: 11/17/98	Lab Report Number: 811049		
VOC Compound	Influent (ppb)	Effluent After Air Stripper (ppb)	Effluent After GAC Unit (ppb)
Chloroform	0.8	< 0.5	< 0.5
1,1-Dichloroethane	2.0	< 0.3	< 0.3
1,1-Dichloroethene	14	< 0.2	< 0.2
Tetrachloroethene	25	< 0.5	< 0.5
1,1,1-Trichloroethane	2.2	< 1.0	< 1.0
TOTAL VOC'S	44.0	BDL	BDL

Sampling Date: 12/9/98	Lab Report Number: 812045		
VOC Compound	Influent (ppb)	Effluent After Air Stripper (ppb)	Effluent After GAC Unit (ppb)
Chloroform	0.6	< 0.5	< 0.5
1,1-Dichloroethane	1.7	< 0.3	< 0.3
1,1-Dichloroethene	14	< 0.2	< 0.2
Tetrachloroethene	25	0.6	< 0.5
1,1,1-Trichloroethane	1.8	< 1.0	< 1.0
TOTAL VOC'S	43.1	0.6	BDL

B. Effluent Sulfate Analysis and pH Monitoring

The June 1997 amendment to DP-1006 requires monthly sulfate analysis and daily pH monitoring of the GTS effluent. Table 7 presents the results of the fourth quarter sulfate analysis using EPA Method 375.4. The monthly minimum, maximum, and average pH readings for this quarter are shown in table 8. The 12/98 minimum reading of 5.6 is due to recalibration of the pH probes.

Table 7
GTS Effluent Sulfate Concentrations

Date	Lab Report Number	Sulfate (Mg/l)
10/7/98	810021	470
11/17/98	811049	520
12/9/98	812045	490

Table 8
Monthly pH Readings

Date	Minimum pH	Maximum pH	Average pH
10/98	6.9	7.3	7.0
11/98	7.2	7.4	7.3
12/98	5.6	7.5	7.3

C. Golf Course Pond Sampling

DP-1006 requires monthly sampling of the east and west ponds for 8021 (Halo) analysis during each month of operation. During the fourth quarter, the ponds were sampled three times pursuant to this requirement. No EPA Method 8021 (Halo) parameters were detected in the samples. Copies of the laboratory reports are contained in appendix A.

VII. Groundwater Sampling

Under the RCRA permit, a network of groundwater monitoring wells are sampled on a twice per year schedule (normally in the spring and fall). Once sampling is complete and analytical results have been received, contour maps showing the distribution of the contaminants in the groundwater are prepared. Contour maps for PCE, DCE, and TCA for the fall sampling event are shown in Figures 7, 8, and 9, respectively.