REPORT

Frontier Chemical - Pendleton Site Semi-Annual Ground Water Monitoring Report

Pendleton Site PRP Group

September 1997

O'BRIEN & GERE
ENGINEERS, INC.

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Semi-Annual Ground Water Monitoring Report

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September 1997

O'BRIEN & GERE ENGINEERS, INC.

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1. Introduction

This document is the first 1997 Semi-Annual Ground Water Monitoring Report for the Frontier Chemical - Pendleton Site located on Town Line Road in the Town of Pendleton, Niagara County, New York. This report is prepared based on the New York State Department of Environmental Conservation (NYSDEC)-approved Operation & Maintenance (O&M) Manual for the Site (O'Brien & Gere Engineers, 1997), which addresses long-term ground water monitoring at the Site. This Semi-Annual Ground Water Monitoring Report presents a discussion of the following:

- Well inspection
- Hydraulic evaluation of the capped area and collection trench
- Evaluation of ground water chemistry in the intermediate and deep ground water zones

These items are described in the following sections.

1.1. Inspection and monitoring well/piezometer re-development

The scope of work associated with this task was detailed in Section 2.6 of the O&M Manual. The piezometer/monitoring well inspection was conducted on June 10, 1997 and included the piezometers (P-1 through P-8), standpipe (SP-1), and ground water monitoring wells (URS-14I, URS-14D, URS-9I, URS-9D, 85-5R, URS-5D, 85-7R, URS-7D, 88-12C, and 88-12D) included in the O&M Manual for the Site. Results of the inspection indicated that each piezometer and monitoring well, with the exception of monitoring wells 88-12C and 88-12D, was in acceptable condition for sampling. Monitoring wells 88-12C and 88-12D were damaged, and the bailer could not be lowered into the upper portion of the well. In addition, the protective casings on upgradient monitoring wells URS-14I and URS-14D were converted from above ground to flush mounts since the property owner (Church) stated that the parking lot may be expanded. The well

repairs and conversions were completed by SJB Drilling, Inc. These monitoring wells were subsequently re-surveyed for elevation by Glynn Geotechnical Engineering.

Although monitoring well/piezometer re-development was not required by the O&M Manual, the ten existing monitoring wells (URS-14I, URS-14D, URS-9I, URS-9D, 85-5R, URS-5D, 85-7R, URS-7D, 88-12C, and 88-12D) and eight existing piezometers (P-1 through P-8) were re-developed since they had not been accessed for a period ranging from one to three years. The development process was completed to increase the hydraulic connection with the aquifer and to remove sediment that may have settled in or around the well screen. The wells were developed using a stainless steel bailer. Purge water generated during well development was contained, passed through a 25-micron bag filter, and discharged to manhole MH-3. The water in manhole MH-3 was conveyed through the pre-treatment system prior to discharge to the Niagara County Sewer District (NCSD) interceptor system at manhole MH-16. Specific details of the inspection and development process are found on the forms contained in Appendix A.

1.2. Hydraulic evaluation of capped area and collection trench

In accordance with the O&M Manual, a complete round of static ground water elevations was collected from the piezometers (P-1 through P-8), standpipe (SP-1), and ground water monitoring wells (URS-14I, URS-14D, URS-9I, URS-9D, 85-5R, URS-5D, 85-7R, URS-7D, 88-12C, and 88-12D). The ground water elevation measurements collected on June 24, 1997 are summarized on Table 1 and illustrated on Figure 1. These measurements are the first collected since remedial construction was substantially completed in August 1996. The ground water elevation data was used to evaluate the following:

- Whether an inward hydraulic gradient exists between the piezometers installed within the capped area (P-2, P-3, P-4, P-6, P-7) as compared to the piezometers installed outside the capped area (P-1, P-5, P-8)
- The ground water flow potential inside the capped area
- Whether the ground water collection trench is effectively controlling ground water migration away from the capped area.

A comparison of the ground water elevations from piezometers installed within the capped area (P-2, P-3, P-4, P-6, P-7) to piezometers installed outside the capped area (P-1, P-5, P-8) indicate that a slight outward hydraulic gradient exists. In summary, ground water elevations are slightly higher inside the capped area as compared to adjacent piezometers located outside the capped area. As presented in the Appendix F of the Final Design Report (O'Brien & Gere Engineers, 1995), it was calculated that approximately 0.4 years (assuming high-permeability soils) to 33 years (assuming low-permeability soils) would be required for hydraulic equilibrium to be reached. Since the amount of water that currently is being discharged to the collection trench is approximately 200 gallons per day (0.13 gpm), which correlates with the calculations for low-permeability soils, it is likely that hydraulic equilibrium will not be achieved in the immediate future.

The ground water elevations in the piezometers installed within the capped area (P-2, P-3, P-4, P-6, P-7) indicate that the overall hydraulic gradient is to the east toward the collection trench. The data also indicates that a slight ground water mound exists inside the capped area, as the elevation at P-3, installed in the center of the capped area, is greater than the other piezometers installed within the capped area. This likely reflects the greater thickness of material under the cap in this area. In summary, the elevation data indicates that ground water inside the capped area is migrating to the east toward the ground water collection trench.

Ground water elevations of piezometers installed within the capped area along the northern (P-7), western (P-4), and southern (P-6) portions of the site are higher than the invert elevations (bottom) of the ground water collection trench. The invert elevations of the collection trench vary from 567.77 ft to 563.37 ft. This information indicates that shallow ground water emanating from beneath the capped area is discharging to the collection trench. In summary, the data indicates that the ground water collection trench is effectively capturing shallow ground water emanating from beneath the capped area.

1.3. Ground water sampling and chemistry

Between June 24 and June 26, 1997, the first round of post-closure ground water samples was collected in accordance with the protocols presented in the O&M Manual. Specifically, ground water samples were obtained from

the ten ground water monitoring wells included in the O&M Manual (URS-14I, URS-14D, URS-9I, URS-9D, 85-5R, URS-5D, 85-7R, URS-7D, 88-12C, and 88-12D). Ground water samples were submitted to O'Brien & Gere Laboratories, Inc. for analysis for the following parameters:

Parameter	Method
VOCs	USEPA Method 8260
SVOCs	USEPA Method 8270
PCBs/Pesticides	USEPA Method 8081
Inorganics	USEPA Series 6010A/7470A
Cyanide	USEPA Method 9010

Specific sampling information is presented on the ground water sampling field logs included as Appendix B. Purge water and waste generated were handled as described in Section 1.1.

The laboratory data was validated by Data Validation Services of North Creek, New York. The validation was performed in accordance with guidance from the most current editions of the United States Environmental Protection Agency (USEPA) Contract Laboratory Procedures (CLP) National Functional Guideline and Organic and Inorganic Data Review, and the USEPA Standard Operating Procedures (SOPs) HW-2 and HW-6. Results of the validation indicated that the samples were processed and analyzed in compliance with protocol requirements, and with adherence to quality criteria. Most analytical results are useable with minor qualification. The only exception to this is the acid extractable components from upgradient monitoring well URS-14D. Since the acid extractable components were not detected at downgradient monitoring wells, this deficiency is likely inconsequential. A copy of the data validation report is included as Appendix C.

Results of the ground water analyses along with a comparison of the results with New York State Class GA Standards are summarized on Table 2. The data base will be updated with data from future sampling events. In addition, it is recommended that the ground water standards be re-evaluated annually to evaluate whether they have changed.

As specified in the O&M Manual, statistical analyses of the ground water chemistry data will be completed. A preliminary exploratory data analysis, using univariate statistics in SAS®, was performed for normality; however, the results were not conclusive. The test for normality is most relevant when used to assess the appropriateness of parametric statistical analyses

such as t-tests; thus, these analyses will be continued as sufficient data is obtained to assess the appropriateness of the t-test analysis. As stated in the O&M Manual, baseline data will be collected during the first two years of monitoring. The June 1997 data represents the results of the initial baseline data collection effort. The t-test analysis will be initiated when an adequate data base exists. The adequacy of the data set will be re-evaluated after each sampling event.

Ground water analytical data was compared with New York State Class GA Standards. The results of this comparison are included in Table 2. Detected constituents exceeding New York State Class GA ground water standards included sodium at nine locations (URS-7D, 85-7R, 88-12C, 88-12D, URS-14D, URS-9I, 88-5R, URS-5D, and URS-14I), iron at two locations (URS-9I and URS-14I), and polychlorinated biphenyl (PCB)-1254 at 88-12D (estimated concentration of 0.19 µg/L). It is likely that the elevated concentrations of sodium and iron are naturally occurring.

2. Conclusions

Based on the data contained in this semi-annual report, the following conclusions are presented:

- Due to the low-permeability of the subsurface soils, an inward hydraulic gradient has not yet been established, and likely will not in the immediate future.

- The elevation data indicates that ground water within the capped area is migrating to the east toward the ground water collection trench.

- The elevation data indicates that the ground water collection trench is effectively capturing shallow ground water emanating from beneath the capped area.

- The June 1997 ground water chemistry is similar to previous sampling events. However, given the limited data available, a statistical comparison cannot be completed at this time.

- Sodium and iron were detected at several monitoring wells at concentrations above New York State Class GA Standards. It is likely that these elements are naturally occurring and are not related to previous site activities. PCB-1254 was detected at a concentration of 0.19 μg/L, which is slightly above New York State Class GA Standard of 0.10 μg/L.

Table 1
Frontier Chemical - Pendleton Site
Elevation Summary Table
June 1997

	Location	Top of Riser Elev. (ft)	Top of Cover Elev. (ft)	Depth (ft below riser)	Screened Elev. (ft)	Ground Water Elev. (ft) 6/24
P-1	East - outside	583.21	583.30	16.4	576.8 - 566.8	579.54
P-2	East - inside	582.90	583.20	15.7	577.2 - 567.2	579.60
P-3	Center	606.33	606.64	39.7	586.6 - 566.6	580.36
P-4	West - inside	583.68	583.85	17.0	576.7 - 566.7	577.15
SP-1	Trench - outside	579.86	580.07	15.0	bop = 564.9	<564.9
P-5	South - outside	583.05	583.55	15.5	577.6 - 567.6	576.87
P-6	South - inside	584.45	584.60	16.2	578.3 - 568.3	578.77
P-7	North - inside	581.84	582.00	16.8	575.0 - 565.0	578.33
P-8	North - outside	582.83	583.00	17.3	575.5 - 565.5	577.76

	Location	Top of Riser Elev. (ft)	Ground Elev. (ft)	Depth (ft below riser)	Screened Elev. (ft)	Hydraulic Conductivity (cm/sec)	Ground Water Elev. (ft) 06/24
URS-4I	South East	581.14	580.8	31.0	550.1 - 555.1	NA	577.15
URS-14D	Upgradient	580.71	580.9	41.5	539.2 - 544.2	1.6E-03	575.50
URS-9I	South Nest	581.68	579.9	46.0	535.6 - 540.6	1.4E-03	575.38
URS-9D	Town Line Road	580.80	579.0	46.5	534.3 - 539.3	9.6E-04	575.36
85-5R	Middle Nest	580.84	578.7	40.0	540.9 - 542.9	9.8E-04	574.70
URS-5D	Town Line Road	580.60	578.0	49.9	530.8 - 535.8	1.6E-04	574.73
85-7R	North Nest	577.90	576.6	27.8	550.2 - 552.2	2.0E-03	575.09
URS-7D	Town Line Road	579.35	576.5	39.9	539.5 - 544.5	3.8E-04	575.15
88-12C	North East	583.12	583.7	31.3	551.8 - 553.8	2.8E-05	576.60
88-12D	Upgradient	582.87	583.3	54.5	528.4 - 533.4	1.1E-05	575.72

Notes: Elevation based on USGS- Datum
------ no measurements

Table 2
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
June 1997

	85-5R					URS-5D				85-7R				
Parameter	7/86	8/90	2/91	10/92	6/97	8/90	2/91	10/92	6/97	7/86	8/90	2/91	10/92	6/97
VOCs (ppb)														
Acetone	NA	R	ND	ND	ND	250	R	ND	ND	NA	ND	R	ND	ND
Benzene	ND	15	ND	ND	ND	ND	ND	1	ND	ND	6	ND	ND	ND
2-Butanone	NA	ND	ND	ND	ND	ND	R	ND	ND	NA	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	71	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	0.14J
Methylene Chloride	ND	ND	ND	ND	ND	ND	R	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	NA	2J	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	ND	2J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	1J	ND	ND	ND	ND	1J	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	0.5J	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs (ppb)														
bis(2-Ethlyhexyl)phthalate	ND	ND	NA	NA	ND	3J	NA	NA	ND	ND	ND	NA	NA	ND
Di-n-Octylphthalate	ND	ND	NA	NA	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND
Phenol	3	ND	NA	NA	ND	ND	ND	NA	ND	4	ND	NA	NA	ND
Metals (ppb)														
Aluminum	1,060	214	37.8B	153	ND	ND	ND	ND	ND	1,200	277	265	249	ND
Antimony	NA	ND	42.4B	ND	ND	ND	31.5B	ND	ND	NA	28.3B	ND	ND	ND
Arsenic	NA	1B	ND	ND	ND	1.3B	1B	ND	ND	NA	1.4B	1.7B	ND	ND
Barium	20	73.5B	23.4B	15	40	224	71.7B	32	20	30	91B	143B	106	100
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND
Calcium	380,000	355,000	378,000	321,000	270,000	378,000	407,000	387,000	440,000	490,000	354,000	298,000	389,000	350,000
Chromium	40	7.5B	ND	ND	ND	3B	ND	ND	ND	20	ND	ND	ND	ND
Cobalt	20	ND	ND	ND	ND	ND	ND	ND	ND	20	ND	ND	ND	ND
Copper	10	ND	ND	11	ND	ND	ND	8	ND	10	ND	ND	8	ND
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	1,020	669	915	419	140	188	143	25	ND	920	586	820	435	190
Lead	150	ND	1.2B	ND	ND	ND	1.3B	12	ND	120	ND	2.6B	ND	ND
Magnesium	179,000	106,000	170,000	139,000	130,000	33,300	2450B	570,000	100,000	131,000	119,000	42,600	124,000	120,000
Manganese	100	40	57.5	42	50	8.8B	3.5B	ND	50	110	40.5	31.5	30	70
Nickel	10	48.1	ND	ND	ND	11.4B	ND	ND	90	ND	7.4B	ND	ND	ND
Potassium	9,500	60,700	6,280	6,400	ND	22,700	16,900	8,500	ND	28,000	5,540	5,770	6,700	5,000
Silver	30	ND	ND	ND	ND	ND	ND	ND	ND	10	ND	ND	ND	ND
Sodium	126,000	132,000	120,000	100,000	93000 J	192000 J	194000 J	114000 J	88000 J	107,000	67,900	38,900	73,100	66000 J
Vanadium	35	4B	ND	ND	ND	3.8B	ND	ND	ND	35	ND	ND	ND	ND
Zinc	75	12.9B	17.6B	ND	ND	19.9B	14.7B	ND	ND	65	ND	21.5	ND	ND
Pesticides (ppb)														
alpha-BHC	0.0001	ND	NA	NA	ND	ND	NA	NA	ND	0.0002	ND	NA	NA	ND
Heptachlor Epoxide	0.0005	ND	NA	NA	ND	ND	NA	NA	ND	0.0007	ND	NA	NA	ND
4,4-DDE	ND	ND	NA	NA	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND
PCBs (ppb)														
PCB-1254	ND	ND	NA	NA	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND

Notes:

1. R = Indicates compound rejected due to blank contamination.
2. J = Indicates result is less than sample quantitation limit but greater than zero.
3. I = Inorganics indicates estimated value.
4. B = Indicates compound is less than quantitation limits but greater than or equal to instrument detection limits.
5. Sample data presented for 6/97 sampling event is for cis-1,2-dichloroethylene.
6. G = Guidance value; S=Standard
7. NA = Not analyzed; ND = Not detected; N = Presumptives present

Table 2
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
June 1997

	URS-7D				URS-9I				URS-9D			
Parameter	8/90	2/91	10/92	6/97	8/90	2/91	10/92	6/97	8/90	2/91	10/92	6/97
VOCs (ppb)												
Acetone	120	R	ND	ND	R	R	ND	ND	R	R	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	0.12J	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	2J	ND	ND	ND	6J	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	4J	ND	ND	ND
Carbon Disulfide	0.5J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	1J	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	0.37J
1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	0.66
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	0.7J	ND	ND	ND	0.6J	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	0.29J	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	0.36J
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.26J
SVOCs (ppb)												
bis(2-Ethlyhexyl)phthalate	ND	ND	NA	ND	ND	NA	NA	ND	ND	NA	NA	ND
Di-n-Octylphthalate	ND	ND	NA	ND	ND	NA	NA	ND	ND	NA	NA	ND
Phenol	ND	ND	NA	ND	ND	NA	NA	ND	ND	NA	NA	ND
Metals (ppb)												
Aluminum	167B	52.5B	ND	ND	221	197	110	ND	128	64.2B	ND	ND
Antimony	20.5B	36.3B	ND	ND	ND	ND	ND	ND	ND	28B	ND	ND
Arsenic	ND	ND	ND	ND	1.7B	ND	ND	ND	1.6B	ND	ND	ND
Barium	20.3B	47.2B	29	30	30.1B	22.8B	14	30	110B	38.2B	23	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	277,000	333,000	403,000	360,000	106,000	143,000	123	170,000	56,500	146,000	120,000	200,000
Chromium	ND	ND	ND	ND	8.6B	10.1	ND	ND	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	ND	ND	8	ND	12.7B	ND	ND	ND	5.2B	ND	ND	ND
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.1B	ND	ND
Iron	387	283	63	ND	1,020	1,170	808	460	127	506	252	ND
Lead	ND	ND	ND	ND	ND	1B	ND	ND	ND	ND	ND	ND
Magnesium	96,200	115,000	140,000	120,000	54,500	71,300	63,500	70,000	29,900	70,200	60,000	58,000
Manganese	71.2	140	86	40	67.5	80	75	50	20.1	25.5	9	ND
Nickel	23.5B	ND	ND	ND	7.6B	ND	ND	ND	15.3B	ND	ND	ND
Potassium	5,990	8,550	8,300	5,000	3,910B	4,250B	2,900	ND	9,880	4,170B	3,600	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	82,700	68,900	78,900	66000 J	34,500	54,000	52,400	43000 J	27,400	37,000	42,800	48000 J
Vanadium	4.2B	6.7B	ND	ND	ND	9.6B	ND	ND	10.7B	ND	ND	ND
Zinc	5.6B	12.2B	ND	ND	19.3B	34.6	ND	ND	50.5	16.7B	ND	ND
Pesticides (ppb)												
alpha-BHC	ND	NA	NA	ND	ND	NA	NA	ND	ND	NA	NA	ND
Heptachlor Epoxide	ND	NA	NA	ND	ND	NA	NA	ND	ND	NA	NA	ND
4,4-DDE	ND	NA	NA	ND	ND	NA	NA	ND	ND	NA	NA	ND
PCBs (ppb)												
PCB-1254	ND	NA	NA	ND	ND	NA	NA	ND	ND	NA	NA	ND

Notes:

1. R = Indicates compound rejected due to blank contamination.
2. J = Indicates result is less than sample quantitation limit but greater than zero.
3. I = Inorganics indicates estimated value.
4. B = Indicates compound is less than quantitation limits but greater than or equal to instrument detection limits.
5. Sample data presented for 6/97 sampling event is for cis-1,2-dichloroethylene.
6. G = Guidance value; S=Standard
7. NA = Not analyzed; ND = Not detected; N = Presumptives present

Table 2
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
June 1997

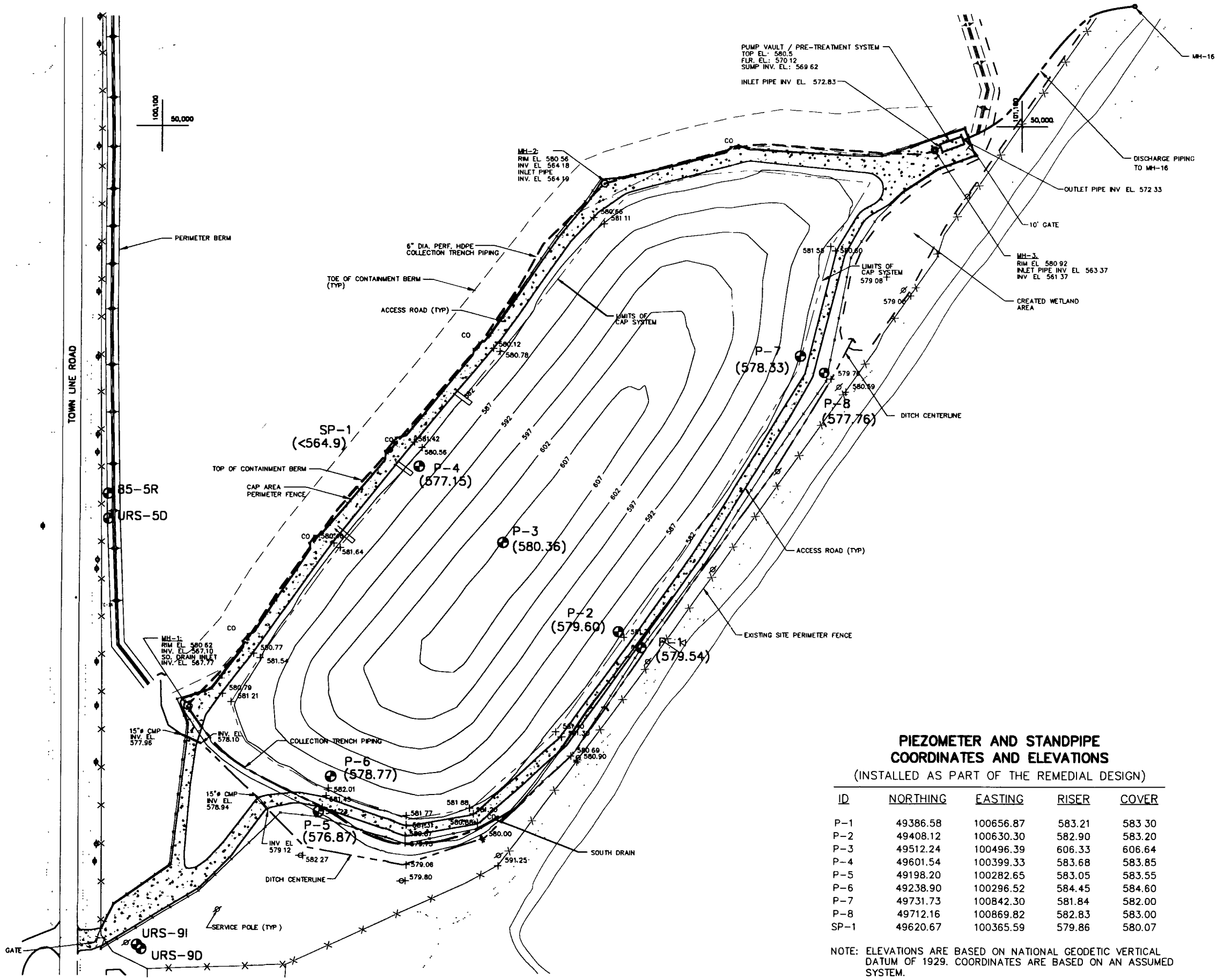
	88-12C				88-12D			URS-14I			URS-14D			Standards
Parameter	8/90	2/91	10/92	6/97	8/90	2/91	6/97	2/91	10/92	6/97	2/91	10/92	6/97	ug/L (ppb)
VOCs (ppb)														
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50(g)
Benzene	ND	ND	ND	ND	1J	0.9J	ND	ND	ND	ND	ND	ND	ND	0.7(s)
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50(g)
Carbon Disulfide	ND	ND	ND	ND	ND	6	ND	ND	ND	ND	ND	ND	ND	---
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7(s)
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50(g)
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5(s)
1,2-Dichloroethene	ND	ND	ND	ND	ND	2J	ND	ND	ND	ND	ND	ND	ND	5(s)
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	R	ND	ND	5(s)
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---
1,1,2,2,-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5(s)
Toluene	ND	ND	ND	ND	R	13	ND	ND	ND	ND	ND	ND	ND	5(s)
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11J	5(s)
Trichloroethene	ND	ND	ND	ND	ND	6	ND	ND	ND	ND	ND	ND	ND	5(s)
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2(s)
SVOCs (ppb)														
bis(2-Ethlyhexyl)phthalate	NA	NA	NA	ND	ND	NA	ND	NA	NA	ND	R	NA	ND	50(s)
Di-n-Octylphthalate	NA	NA	NA	ND	5J	NA	ND	NA	NA	ND	5J	NA	ND	50(g)
Phenol	ND	ND	NA	ND	ND	NA	ND	NA	NA	ND	ND	NA	R	---
Metals (ppb)														
Aluminum	481	187B	453	ND	ND	172B	ND	7,140	1,170	1300	99.8	ND	ND	---
Antimony	19.2B	28B	ND	ND	50.7B	56.1B	ND	ND	ND	ND	32.1B	ND	ND	3(g)
Arsenic	10	12.3B	14	9	ND	1.3BW	ND	7.2B	ND	ND	2B	ND	ND	25(s)
Barium	11.4B	17.3	14	ND	2.9B	7.9B	ND	115B	47	50	25.5B	23	20	1000(s)
Beryllium	ND	ND	ND	ND	ND	ND	ND	1.2B	ND	ND	ND	ND	ND	3(g)
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10(s)
Calcium	62,600	68,500	68,900	73,000	464,000	623,000	490,000	73,900	35,200	28000 J	255,000	292,000	210,000	---
Chromium	21	4.6B	ND	ND	7.6B	27.8E	10	30.9	ND	ND	10.3	7	ND	50(s)
Cobalt	ND	ND	ND	ND	ND	ND	ND	5.8B	ND	ND	ND	ND	ND	---
Copper	4.2B	ND	5	ND	ND	ND	ND	18.5B	8	ND	ND	8	ND	200(s)
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100(s)
Iron	1,530	1,040	1,560	ND	168	250	180	10,400	2,060	1,800	357	193	ND	300(s)
Lead	1.5B	1.2B	ND	ND	ND	1.8BW	ND	7.5	ND	ND	1.1B	ND	ND	25(s)
Magnesium	88,500	103,000	92,500	110,000	109,000	199,000	130,000	32,800	22,300	21,000	75,200	78,000	61,000	35,000(g)
Manganese	45.4	37.8	54	10	33.9	696	90	484	145	70	30.8	27	ND	300(s)
Nickel	14.6B	ND	ND	ND	11.5B	25.5B	ND	30.4B	ND	ND	ND	ND	ND	---
Potassium	2,520B	3,200B	3,000	ND	5,310	12,000E	600	17,100	5,500	ND	4,250B	3,700	ND	---
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50(s)
Sodium	34,600	41,100	41,300	47000 J	66,400	474,000	140000 J	44,700	42,500	58000 J	40,700	38,700	52000 J	20,000(s)
Vanadium	22.1B	10B	ND	ND	51.6	2.4B	ND	16.1B	ND	ND	ND	ND	ND	---
Zinc	10.1B	15.7B	ND	20	7.9B	ND	ND	52.3	ND	10	26.8	ND	ND	300(s)
Pesticides (ppb)														
alpha-BHC	ND	NA	NA	ND	ND	NA	ND	NA	NA	ND	ND	NA	ND	---
Heptachlor Epoxide	ND	NA	NA	ND	ND	NA	ND	NA	NA	ND	ND	NA	ND	---
4,4-DDE	ND	NA	ND	ND	ND	NA	ND	NA	NA	0.032J	ND	NA	ND	---
PCBs (ppb)														
PCB-1254	ND	NA	NA	ND	ND	NA	0.19J N	NA	NA	ND	NA	NA	ND	0.1 (s)

Notes:

1. R = Indicates compound rejected due to blank contamination.
2. J = Indicates result is less than sample quantitation limit but greater than zero.
3. I = Inorganics indicates estimated value.
4. B = Indicates compound is less than quantitation limits but greater than or equal to instrument detection limits.
5. Sample data presented for 6/97 sampling event is for cis-1,2-dichloroethylene.
6. G = Guidance value; S=Standard
7. NA = Not analyzed; ND = Not detected; N = Presumptives present

MWH I:\DIV71\PROJECTS\5829001\DWG\71\055.DWG SF:120 9/25/97

FIGURE 1



LEGEND

P-1	PIEZOMETER
(579.54)	GROUND WATER ELEVATION (FT
	WETLAND AREA
x	SIX FOOT HIGH CHAIN LINK FENCE
580	GRADE ELEVATION CONTOUR
CO	GROUND WATER COLLECTION TRENCH & CLEAN OUT
SP-1	STANDPIPE
	APPROXIMATE TOE OF BERM
+581.77	SPOT ELEVATION

PIEZOMETER AND STANDPIPE COORDINATES AND ELEVATIONS

(INSTALLED AS PART OF THE REMEDIAL DESIGN)

ID	NORTHING	EASTING	RISER	COVER
P-1	49386.58	100656.87	583.21	583.30
P-2	49408.12	100630.30	582.90	583.20
P-3	49512.24	100496.39	606.33	606.64
P-4	49601.54	100399.33	583.68	583.85
P-5	49198.20	100282.65	583.05	583.55
P-6	49238.90	100296.52	584.45	584.60
P-7	49731.73	100842.30	581.84	582.00
P-8	49712.16	100869.82	582.83	583.00
SP-1	49620.67	100365.59	579.86	580.07

NOTE: ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929. COORDINATES ARE BASED ON AN ASSUMED SYSTEM.

FRONTIER CHEMICAL PENDLETON SITE TOWN OF PENDLETON, NIAGARA COUNTY, NY

HYDRAULIC POTENTIAL MAP (JUNE 24, 1997)

0 120 240

SCALE IN FEET

FILE NO. 5829.001-055

O'BRIEN & GERE ENGINEERS INC.

Appendix A

Well inspection/re-development forms/survey data

O'Brien & Gere Engineers, Inc.

Standard Ground Water Sampling Log

Date: 6/10/97

Site Name: FRONTIER CHEMICAL

Location: PENDLETON, NY

Project No.: 5829.003.

Personnel: J. MOORE / T. PRAWEL

Weather: SUNNY 75°F

Well #: 85-5R

Evacuation Method: S.S. BAILER

Well Information:

Depth of Well *	37.97	ft.
Depth to Water *	6.41	ft.
Length of Water Column	31.56	ft.
Volume of Water in Well	5.14	gal.(s)
3X Volume of Water in Well	15.42	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 6.0 & 10.0 gal.(s)

Did well go dry? YES X

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings	
4.0 Standard	4.00
7.0 Standard	7.00
10.0 Standard	9.99

Conductivity Standard Readings	
84 S Standard	86
1413 S Standard	—

Water parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial 1.5	initial 53.1	initial 7.32	initial 1003
6.0	53.6	7.36	1340
10.0	53.4	8.22	1686

Water Sample:

Physical Appearance at Start	
Color	COLORLESS
Odor	NONE
Turbidity (> 100 NTU)	NO
Sheen/Free Product	NONE

Physical Appearance at End	
Color	LIGHT TAN
Odor	NONE
Turbidity (> 100 NTU)	YES
Sheen/Free Product	NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes: Dry @ 10 gal 812 (38 MIN) 850 BEGAN PURGING 38 MIN - 4 gallons recovery / TOTAL DEPTH AFTER PURGING = 38.03

JAM:ers/div76/admin/4_notes/stad9log

55-13.57 TD

April 25. 1997

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 6/10/97
Site Name FRONTIER CHEMICAL
Location PENDLETON, NY
Project No. 5829.003
Personnel J. MOORE / T. PRAWER

Weather SUNNY 75° F
Well # URS-5D
Evacuation Method S.S. BAILER

Well Information:

Depth of Well *	49.85	ft.
Depth to Water *	6.05	ft.
Length of Water Column	43.80	ft.
Volume of Water in Well	7.14	gal.(s)
3X Volume of Water in Well	21.42	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: DRY 0825 11.0 14.0 gal.(s)
Did well go dry? YES YES

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	4.00	84 S Standard	86
7.0 Standard	7.00	1413 S Standard	
10.0 Standard	9.99		

Water parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial 1.0	initial 53.2	initial 7.30	initial 1280
7.0	53.4	8.04	1341
11.0	54.3	8.33	2100
14.0	54.5	8.05	1986

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	COLORLESS	Color	MILKY GREEN
Odor	NONE	Odor	NONE
Turbidity (> 100 NTU)	NO	Turbidity (> 100 NTU)	YES
Sheen/Free Product	NONE	Sheen/Free Product	NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes:
0825 - 0845 20 min = 3 gal recovery / TOTAL DEPTH AFTER PURGING = 49.89

O'Brien & Gere Engineers, Inc. **Standard Ground Water Sampling Log**

Date 6/10/97
Site Name FRONTIER CHEMICAL
Location PENDLETON, NY
Project No. 5829.003
Personnel J. MOORE / T. FRANCE

Weather SUNNY, 80° F
Well # URS-14I
Evacuation Method S. STEEL BAILER

Well Information:

Depth of Well *	33.16	ft.
Depth to Water *	3.75	ft.
Length of Water Column	29.41	ft.
Volume of Water in Well	4.79	gal.(s)
3X Volume of Water in Well	14.37	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 10.5 gal.(s)
Did well go dry? YES

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	86
7.0 Standard		1413 S Standard	
10.0 Standard			

Water parameters:

	Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial	0	65.1		674
	5.5	53.1		483
	10.5	53.4		477

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	COLORLESS	Color	BROWN
Odor	NONE	Odor	NONE
Turbidity (> 100 NTU)	NO	Turbidity (> 100 NTU)	YES
Sheen/Free Product	NONE	Sheen/Free Product	NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes: 1345 END PURGING 1ST 10.5 gallons
33.16 (TD) SHALLOW MONITOR WELL - CAPPED IN 2" STAINLESS STEEL RISER
NONE AT SURFACE

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 6/10/97
Site Name FRONTIER CHEMICAL
Location PENDLETON, NY
Project No. 5829.003.
Personnel T. MOORE / T. PRAWER

Weather SUNNY 80°F
Well # URS-14D
Evacuation Method S.S. BAILER

Well Information:

Depth of Well *	43.79	ft.
Depth to Water *	7.55	ft.
Length of Water Column	36.24	ft.
Volume of Water in Well	5.91	gal.(s)
3X Volume of Water in Well	17.73	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling ___ gal.(s)
Did well go dry? ___

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	86
7.0 Standard		1413 S Standard	
10.0 Standard			

Water parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial Init	initial 55.6	initial —	initial 795
7	53.2	—	1173
14	52.7	—	1274
20	53.1	—	1316

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	COLORLESS	Color	DARK GREY
Odor	SULFUR	Odor	SULFUR
Turbidity (> 100 NTU)	NO	Turbidity (> 100 NTU)	YES
Sheen/Free Product	NONE	Sheen/Free Product	NONE.

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes: TD - 43.80

JAM:ers/div76/admin/4_notes/stad9log

O'Brien & Gere Engineers, Inc.

Standard Ground Water Sampling Log

Date 6/ /97
Site Name FRONTIER CHEMICAL
Location PENDLETON, NY
Project No. 5829.003
Personnel J. MOORE / T. PERRY

Weather SUNNY 80°F
Well # BB-12C
Evacuation Method S.S. BAILER

Well Information:

Depth of Well *	31.12	ft.
Depth to Water *	6.40	ft.
Length of Water Column	24.72	ft.
Volume of Water in Well	4.03	gal.(s)
3X Volume of Water in Well	12.09	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling ___ gal.(s)
Did well go dry? ___

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings
- 4.0 Standard ___
- 7.0 Standard ___
- 10.0 Standard ___

Conductivity Standard Readings
- 84 S Standard ___
- 1413 S Standard ___

Water parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial	initial	initial	initial

Water Sample:

Physical Appearance at Start

Color	
Odor	
Turbidity (> 100 NTU)	
Sheen/Free Product	

Physical Appearance at End

Color	
Odor	
Turbidity (> 100 NTU)	
Sheen/Free Product	

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes:
PID 0 ppm wellhead TO BE REPAIRED

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 6/97
Site Name FRONTIER CHEMICAL
Location PENDLETON, NY
Project No. 5822.003
Personnel J. MOORE / T. PRAWEL

Weather
Well # 88-12D
Evacuation Method S.S. BAILER

Well Information:

Depth of Well * ____ ft.
Depth to Water * ____ ft.
Length of Water Column ____ ft.
Volume of Water in Well ____ gal.(s)
3X Volume of Water in Well ____ gal.(s)

Water Volume /ft. for:
____ 2" Diameter Well = 0.163 X LWC
____ 4" Diameter Well = 0.653 X LWC
____ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling ____ gal.(s)
Did well go dry? ____

* Measurements taken from [ ] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings
4.0 Standard ____
7.0 Standard ____
10.0 Standard ____

Conductivity Standard Readings
84 S Standard ____
1413 S Standard ____

Water parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial	initial	initial	initial

Water Sample:

Physical Appearance at Start

Color ____
Odor ____
Turbidity (> 100 NTU) ____
Sheen/Free Product ____

Physical Appearance at End

Color ____
Odor ____
Turbidity (> 100 NTU) ____
Sheen/Free Product ____

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes:
Well Damaged - STAINLESS STEEL TO BE REPAIRED.

'Brien & Gere Engineers, Inc.

Standard Ground Water Sampling Log

Date: 6/18/97
te Name: Frontier Chem. - Pendelton
ocation: Pendelton
Project No.: 5829 or 3
ersonnel: T. Prawel

Weather: Lt. Rain 65° ± F
Well #: 88-12C
Evacuation Method: Hand Bail w/ SS. Bailer

Well Information:

epth of Well *	31.28	ft.
Depth to Water *	6.64	ft.
Length of Water Column	24.64	ft.
olume of Water in Well	4.02	gal.(s)
3X Volume of Water in Well	12.06	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed ~~before sampling~~: 15 gal.(s)
Did well go dry? No

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

nstrument Calibration:

pH Buffer Readings	
4.0 Standard	4.0
7.0 Standard	7.0
10.0 Standard	10.0

Conductivity Standard Readings	
84 S Standard	
1413 S Standard	1413

By B Jennings OBG # 106-3

ater parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial —	initial 54.5	initial 7.13	initial 6.89.0
4	53.3	16.52	15.98.0
8	54.0	16.51	16.53.0
12	53.3	16.50	6.45
15	53.6	16.48	6.39

(pH readings 16.52–16.48 marked: Broke)

Water Sample:

Physical Appearance at Start	
Color	Black
Odor	None
Turbidity (> 100 NTU)	> 100
Sheen/Free Product	None

Physical Appearance at End	
Color	Lt Brown
Odor	None
Turbidity (> 100 NTU)	> 100
Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes:
PID - Ø ppm @ well head Total D 31.35 ±

April 25, '

JAM:ersidiv7Sections4_notes/stdlog

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date: 6/18/97
Site Name: Frontier Chemical
Location: Pendelton
Project No. 5829.003
Personnel: T. Prazwel

Weather: Lt Rain 65°F ±
Well #: 88-12D
Evacuation Method: Hand Bail w/ SS Bailer

Well Information:

Depth of Well *: 54.52 ft.
Depth to Water *: 7.62 ft.
Length of Water Column: 46.90 ft.
Volume of Water in Well: 7.54 gal.(s)
3X Volume of Water in Well: 22.62 gal.(s)

Water Volume /ft. for:
X 2" Diameter Well = 0.163 X LWC
4" Diameter Well = 0.653 X LWC
6" Diameter Well = 1.469 X LWC

Volume removed ~~before sampling~~ TP: 20 gal.(s)
Did well go dry? Yes 2X

(Other, Specify)

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ]

Instrument Calibration:

pH Buffer Readings
4.0 Standard: 4.0
7.0 Standard: 7.0
10.0 Standard: 10.0

Conductivity Standard Readings
84 S Standard:
1413 S Standard: 1413

By B. Jennings OBG # 106-3

Water parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial 1/2	initial 54.0	initial 16.50	initial 11800.0
7	54.3	16.48	48500.0
15	54.9	16.44	46220.0
20	54.8	16.45	41690.0

Broke

Water Sample:

Physical Appearance at Start
Color: Black (Dark) insects
Odor: Sulphur like
Turbidity (> 100 NTU): > 100
Sheen/Free Product: None

Physical Appearance at End
Color: Lt Black
Odor: Sulpher
Turbidity (> 100 NTU): > 100
Sheen/Free Product: None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes:
PID - Ø PPM @ Well head Dry @ 10 gal 1400 1430 start 1515 Dry @ 20 gal stop

JAM/c:\...\notes\stdGWlog

Frontier Chemical - Pendleton Site
Piezometer/Well Inspection Check List

Well #	Casing Secured and Locked	Areas of Damage	Comments
P-1	Yes	none	none
2	Yes		
3	Yes		
4	Yes		
5	Yes		Casing bent ~ 30°
6	Yes		
7	Yes		
9	Yes		
14I	Yes	none	none
14D	Yes		
9I	Yes	none	none
9D	Yes		
5R	Yes	none	none
5D	Yes		
7R	Yes	none	none
7D	Yes		
12C	Yes	none.	
12D	Yes		

Appendix B

Ground water sampling logs

O'Brien & Gere Engineers, Inc. — Standard Ground Water Sampling Log

Date 6/25/97
Site Name Pendleton
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather ~85°F Overcast
Well # 5R
Evacuation Method Bailer S-S.

Well Information:

Depth of Well *	37.97	ft.
Depth to Water *	6.06	ft.
Length of Water Column	31.91	ft.
Volume of Water in Well	5.2	gal.(s)
3X Volume of Water in Well	15.6	gal.(s)

Water Volume /ft. for:
- [X] 2" Diameter Well = 0.163 X LWC
- [ ] 4" Diameter Well = 0.653 X LWC
- [ ] 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 15 gal.(s)
Did well go dry? 2X

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	-	84 S Standard	-
7.0 Standard	-	1413 S Standard	1420
10.0 Standard	-		

Water parameters:

Gallons Removed	Temperature Readings	pH Readings (PH paper)	Conductivity Readings uS/cm
initial	initial	initial	initial
3	54	7	1372
6	54.1	7	1290
12	54.9	7	1290

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Lt Gray	Color	Clear
Odor	Sulphur	Odor	Sulphur
Turbidity (> 100 NTU)	>100	Turbidity (> 100 NTU)	>100
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-Liter	Clear Glass	1	NO	-	
1-Liter	Clear Glass	1	No	$Na_2S_2O_3$	
1-Liter	Plastic	1	Yes	HNO_3	
Notes: Quart.	Plastic	1	Yes	Na_2SO_4	

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 6/25/97
Site Name Pendleton
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather ~85°F overcast.
Well # 5D 2:50
Evacuation Method Bailer S-S.

Well Information:

Depth of Well *	49.85	ft.
Depth to Water *	5.86	ft.
Length of Water Column	43.99	ft.
Volume of Water in Well	7.17	gal.(s)
3X Volume of Water in Well	21.51	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 14 gal.(s)
Did well go dry? Yes

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard		1413 S Standard	
10.0 Standard			

Water parameters:

Paper pH strips.

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial 1/2	initial 59	initial 6	initial 1320
7	56.2	~6.5	2830
10	54.6	~6.5	2920
13	54.1	~6.5	2830

Water Sample:

Physical Appearance at Start

Color	Clear
Odor	None
Turbidity (> 100 NTU)	<100
Sheen/Free Product	None.

Physical Appearance at End

Color	Light-Grey/Brown
Odor	None
Turbidity (> 100 NTU)	> 100 NTU
Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-Liter	Clear Glass	1	NO	—	
1-Liter	Clear Glass	1	NO	$Na_2S_2O_3$	
1-Liter	Plastic	1	Yes	HNO_3	
Notes: Quart.	Plastic	1	Yes	Na_2SO_4	

Filtered

O'Brien & Gere Engineers, Inc. — Standard Ground Water Sampling Log

Date 6/25/97
Site Name Pendleton
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather ~ 85°F overcast
Well # 7D
Evacuation Method Bailer S-S.

Well Information:

Depth of Well *	39.87	ft.
Depth to Water *	4.24	ft.
Length of Water Column	35.63	ft.
Volume of Water in Well	5.8	gal.(s)
3X Volume of Water in Well	17.4	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 20 gal.(s)
Did well go dry? no - bailed down.

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	-	84 S Standard	
7.0 Standard	-	1413 S Standard	
10.0 Standard	-		

Water parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
		pH paper.	
initial	initial	initial	initial 1950
5	53.8	6.5	1930
10	53.8	6.5	2550
15	5.38	6.5	2560
20	5.43	6.5	2520

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Clear	Color	Light Gray
Odor	Slight Sulfur	Odor	Sulphur
Turbidity (> 100 NTU)	< 100 NTU	Turbidity (> 100 NTU)	> 100 NTU
Sheen/Free Product	none	Sheen/Free Product	none.

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-liter	Clear Glass	1	NO	—	
1-liter	Clear Glass	1	No	$Na_2S_2O_3$	
1-liter	Plastic	1	Yes	HNO_3	
Notes: Quart.	Plastic	1	Yes	Na_2SO_4	

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 6/25/97
Site Name Pendleton
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather 85°F overcast
Well # 7R
Evacuation Method Bailer S-S.

Well Information:

Depth of Well *	27.75	ft.
Depth to Water *	2.84	ft.
Length of Water Column	24.91	ft.
Volume of Water in Well	4.0	gal.(s)
3X Volume of Water in Well	12.2	gal.(s)

Water Volume /ft. for:
- K 2" Diameter Well = 0.163 X LWC
- 4" Diameter Well = 0.653 X LWC
- 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 12 gal.(s)
Did well go dry? No

* Measurements taken from: [K] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	—	84 S Standard	—
7.0 Standard	—	1413 S Standard	—
10.0 Standard	—		

Water parameters:

Gallons Removed	Temperature Readings	pH Readings (pH paper)	Conductivity Readings uS/cm
initial 3	initial 46.4	initial 6.5	initial 2760
6	53.6	6.5	2230
12	54.1	6.5	2030

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Dk Gray/Red	Color	Gray-Red
Odor	Slight	Odor	Sulfur
Turbidity (> 100 NTU)	>100	Turbidity (> 100 NTU)	>100
Sheen/Free Product	None	Sheen/Free Product	none

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-Liter	Clear Glass	1	NO	—	
1-Liter	Clear Glass	1	No	$Na_2S_2O_3$	
1-Liter	Plastic	1	Yes	HNO_3	
Notes: Quart.	Plastic	1	Yes	Na_2SO_4	

O'Brien & Gere Engineers, Inc. — Standard Ground Water Sampling Log

Date 6/25/97
Site Name Pendleton
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather @ 75 overcast
Well # 9I
Evacuation Method Bailer S-S.

Well Information:

Depth of Well *	~~46.50~~ 46.04	ft.
Depth to Water *	6.19	ft.
Length of Water Column	39.85	ft.
Volume of Water in Well	6.5	gal.(s)
3X Volume of Water in Well	19.5	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 20 gal.(s)
Did well go dry? NO

* Measurements taken from: [*] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	—	84 S Standard	
7.0 Standard	—	1413 S Standard	1415
10.0 Standard	—		

Water parameters:

	Gallons Removed	Temperature Readings	pH Readings (pH paper)	Conductivity Readings uS/cm
initial	3	53.4	6	1470
	10	53.0	6	1350
	15	52.9	6	1340
		~~52.8~~	~~6~~	~~1328~~
	20	52.9	6	1330

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Clear	Color	Brownish - Red
Odor	None	Odor	Slight Sulfur
Turbidity (> 100 NTU)	< 100	Turbidity (> 100 NTU)	< 100 NTU
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-Liter	Clear Glass	1	NO	—	
1-Liter	Clear Glass	1	NO	$Na_2S_2O_3$	
1-Liter	Plastic	1	Yes	HNO_3	
Quart.	Plastic	1	Yes	Na_2SO_4	

Notes: MS and MSD collected

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 6/25/97
Site Name Pendleton
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather ~75°F
Well # 9D
Evacuation Method Bailer S-S.

Well Information:

Depth of Well *	46.50	ft.
Depth to Water *	5.42	ft.
Length of Water Column	41.08	ft.
Volume of Water in Well	6.67	gal.(s)
3X Volume of Water in Well	20.10	gal.(s)

Water Volume /ft. for:
- [X] 2" Diameter Well = 0.163 X LWC
- [ ] 4" Diameter Well = 0.653 X LWC
- [ ] 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 20 gal.(s)
Did well go dry? No

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	–	84 S Standard	–
7.0 Standard	–	1413 S Standard	
10.0 Standard	–		

Water parameters:

pH paper

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial 1/2	initial 53.6	initial 6	initial 1460
6	54.0	6	1460
10	53.8	6	1428
15	52.5	6	1466
20	51.8	6	1422

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Clear	Color	Clear
Odor	Sulphur	Odor	Sulphur
Turbidity (> 100 NTU)	<100	Turbidity (> 100 NTU)	<100
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-liter	Clear Glass	1	NO	–	
1-liter	Clear Glass	1	No	$Na_2S_2O_3$	
1-liter	Plastic	1	Yes	HNO_3	
Notes: Quart.	Plastic	1	Yes	Na_2SO_4	

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 6/25/97
Site Name Pendleton
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather ~70 overcast
Well # 12D
Evacuation Method Bailer S-S.

Well Information:

Depth of Well *	54.52	ft.
Depth to Water *	7.13	ft.
Length of Water Column	47.39	ft.
Volume of Water in Well	7.7	gal.(s)
3X Volume of Water in Well	23.2	gal.(s)

Water Volume /ft. for:
- K 2" Diameter Well = 0.163 X LWC
- ____ 4" Diameter Well = 0.653 X LWC
- ____ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 15 gal.(s)
Did well go dry? Yes

* Measurements taken from [K] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	—	84 S Standard	
7.0 Standard	—	1413 S Standard	1425
10.0 Standard	—		

Water parameters:

Paper

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial 4	initial 56.8	initial 7.0	initial 749
8	53.8	7.0	730
	53.8	7.0	730

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Clear	Color	Slightly Black
Odor	Sulfur	Odor	Sulfur
Turbidity (> 100 NTU)	>100 NTU	Turbidity (> 100 NTU)	<100
Sheen/Free Product	none	Sheen/Free Product	None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-liter	Clear Glass	1	NO	—	
1-liter	Clear Glass	1	NO	$Na_2S_2O_3$	
1-liter	Plastic	1	Yes	HNO_3	
Notes: Quart.	Plastic	1	Yes	Na_2SO_4	

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date: 6/25/97
Site Name: Pendleton
Location: Pendleton, NY
Project No.: 5829.003
Personnel: PGB / TPP

Weather: ~70 overcast.
Well #: 12C
Evacuation Method: Bailer S-S.

Well Information:

Depth of Well *	31.28	ft.
Depth to Water *	6.45	ft.
Length of Water Column	24.83	ft.
Volume of Water in Well	4.04	gal.(s)
3X Volume of Water in Well	12	gal.(s)

Water Volume /ft. for:
- [X] 2" Diameter Well = 0.163 X LWC
- [ ] 4" Diameter Well = 0.653 X LWC
- [ ] 6" Diameter Well = 1.469 X LWC

Volume removed before sampling: 15 gal.(s)
Did well go dry? No

* Measurements taken from: [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard		1413 S Standard	1423
10.0 Standard			

Water parameters:

pH paper.

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial 2	initial 54.2	initial 7	initial 1282
10	53.8	7	1285
15	54.1	7	1288

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Clear	Color	light Brown-Red.
Odor	Sulfur None	Odor	Sulfur None
Turbidity (> 100 NTU)	< 100 NTU	Turbidity (> 100 NTU)	7100
Sheen/Free Product	None	Sheen/Free Product	none.

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-Liter	Clear Glass	1	NO	—	
1-Liter	Clear Glass	1	No	$Na_2S_2O_3$	
1-Liter	Plastic	1	Yes	HNO_3	
Quart.	Plastic	1	Yes	Na_2SO_4	

Notes: Field Duplicate collected, ~~xxx~~ Bottles were labelled PS-GW-12E

O'Brien & Gere Engineers, Inc. — **Standard Ground Water Sampling Log**

Date 6/24/97
Site Name Pendleton / Frontier Chemical
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather ~85°F Humid
Well # MBS-14D
Evacuation Method Bailer.

Well Information:

Depth of Well *	41.52	ft.
Depth to Water *	5.21	ft.
Length of Water Column	36.31	ft.
Volume of Water in Well	5.92	gal.(s)
3X Volume of Water in Well	17.8	gal.(s)

Water Volume /ft. for:
- X 2" Diameter Well = 0.163 X LWC
- ___ 4" Diameter Well = 0.653 X LWC
- ___ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling 18 gal.(s)
Did well go dry? No

* Measurements taken from [X] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	—	84 S Standard	
7.0 Standard	—	1413 S Standard	1415
10.0 Standard	—		

Water parameters:

Gallons Removed	Temperature Readings	pH Readings (meter not working, pH strips)	Conductivity Readings uS/cm
initial 1/2	initial 57.3	initial 7	initial 1553
5	54.2	7	18.18
10			
15	54.0	7	1852
18	54.1	7	1843

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Dk Gray	Color	Lt Gray
Odor	Sulpher	Odor	Sulfur
Turbidity (> 100 NTU)	> 100	Turbidity (> 100 NTU)	> 100
Sheen/Free Product	None	Sheen/Free Product	None

Samples collected:

Container Size	Container Type (Tin)	# Collected	Field Filtered	Preservative	Container pH
VOA	1545 Glass	3	NO	HCL	
1 Lt	1550 Glass	1	No	None	
1 Lt	1548 Glass	1	~~YES~~ No	NAZS203	
	1605 Plastic	1	yes	Sod. Hydrox.	
Notes: 1 Lt	1610 plastic	1	yes	Nitric	

O'Brien & Gere Engineers, Inc. — Standard Ground Water Sampling Log

Date 6/24/97 - 6/26/97
Site Name Pendleton
Location Pendleton, NY
Project No. 5829.003
Personnel PGB / TPP

Weather ~85°F Humid.
Well # MRS-14S
Evacuation Method Bailer S-S.

Well Information:

Depth of Well *	31.00	ft.
Depth to Water *	3.99	ft.
Length of Water Column	27.01	ft.
Volume of Water in Well	4.40	gal.(s)
3X Volume of Water in Well	13.20	gal.(s)

Water Volume /ft. for:
- K 2" Diameter Well = 0.163 X LWC
- ____ 4" Diameter Well = 0.653 X LWC
- ____ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling ~10 gal.(s)
Did well go dry? 3X

* Measurements taken from [K] Well Casing [ ] Protective Casing [ ] (Other, Specify)

Instrument Calibration: Probe broke use pH paper

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard	-	84 S Standard	
7.0 Standard	-	1413 S Standard	
10.0 Standard	-		

Water parameters:

Gallons Removed	Temperature Readings	pH Readings	Conductivity Readings uS/cm
initial	initial	initial	initial
4	56.9	6.5	439
8	57.1	7.0	620

Water Sample:

Physical Appearance at Start		Physical Appearance at End	
Color	Clear	Color	light brown / Red
Odor	None	Odor	None
Turbidity (> 100 NTU)	7100 NTU	Turbidity (> 100 NTU)	7100 NTU
Sheen/Free Product	None	Sheen/Free Product	None.

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ml	Glass Vial	#3	No	HCL	
1-liter	Clear Glass	1	NO	—	
1-liter	Clear Glass	1	NO	$Na_2S_2O_3$	
1-liter	Plastic	1	Yes	HNO_3	
Quart.	Plastic	1	Yes	Na_2SO_4	

Notes:
Dry @ 10 gallons 1502 6/24 Dry 6/25/97 0730.
Dry @ .5 1550 6/24 Sample 6/26/97.

O'BRIEN & GERE
LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

SURVEY: Pendleton PRP Group — SAMPLED BY: Peter Bogardus / Tim Prevard

LOCATION: Pendleton, N.Y — ORGANIZATION: O'Brien & Gere Engineers.

STATION NUMBER	SAMPLE LOCATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	COMP. OR GRAB	NO. OF CONTAINERS	ANALYSIS REQUIRED
	URS-14D	6/21/17		GW	Grab	7	6010A, 7470A, 9010A 8260A, 8270B, 8081,
	[redacted] P.6.B	P.6.B		P.6.B			
	URS PS-GW-12C		845			6	
	PS-GW-12D		930			6	
	PS-GW-12E		—			6	
	PS-GW-9I		1115			7	
	PS-GW-9IMS		1115			7	
	PS-GW-9IMSD		1115			7	
	PS-GW-9D		1100			7	
	PS-GW-FB		1200	Distilled		6	6010A, 7470A 8260A, 8270B, 8081
	PS-GW-7R		1430	GW		7	6010A 7470A 8260A, 8270B, 8081
	PS-GW-7D		1500			7	

Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Relinquished By: Peter G. Bogardus	DATE 6/26/17	TIME 8:20	Received by Laboratory: Mark F. Jackson	DATE 6/27/17	TIME 08:20

COMMENTS:

METHOD OF SHIPMENT:

Drop-off

CHAIN OF CUSTODY RECORD

O'BRIEN & GERE
LABORATORIES, INC.

SURVEY: Pendleton PRP Group

LOCATION: Pendleton, NY

SAMPLED BY: Peter Bozgudus / Tim Prowal

ORGANIZATION: O'Brien & Gere Engineers, Inc.

STATION NUMBER	SAMPLE LOCATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	COMP OR GRAB	NO OF CONTAINERS	ANALYSIS REQUIRED
	PS-GW-5R	6/25/97	3:00	GW	Grab	7	6010A, 7470A, 9010A 8260A, 8270B, 8081,
	PS-GW-5D	6/25/97	2:50			7	↓
	QC-Trip Blank	—	—	W	—	1	~~802~~ 8260A

Relinquished By	DATE	TIME	Received By	DATE	TIME
Relinquished By	DATE	TIME	Received By	DATE	TIME
Relinquished By: Peter G. Bozgudus	6/26/97	8:20	Received by Laboratory: Marla F. Jackson	6/26/97	08:20

COMMENTS:

METHOD OF SHIPMENT:

Drop-Off

O'BRIEN & GERE LABORATORIES, INC. an O'Brien & Gere Company
5000 Brittonfield Parkway / P.O. Box 4942 / Syracuse, NY 13221 / (315) 437-0200 FAX (315) 463-7554

Appendix C

Data validation report

Data Validation Services

Cobble Creek Road P. O. Box 208
North Creek, N. Y. 12853
Phone 518-251-4429

September 22, 1997

Jennifer Smith
O'Brien & Gere Engineers
5000 Brittonfield Parkway
P. O. Box 4873
Syracuse, NY 13221

RE: Validation of Frontier Chemical Site Data Packages
OBG Labs Report of 7/28/97

Dear Ms. Smith:

Review has been completed for the data packages generated by OBG Laboratories, pertaining to samples collected at the Frontier Chemical Site. Eleven aqueous samples were analysed for TCL/TAL parameters. Matrix spikes/duplicates, and field and trip blanks were also processed. Methodologies utilized are those of the USEPA SW846.

Data validation was performed with guidance from the most current editions of the USEPA CLP National Functional Guidelines for Organic and Inorganic Data Review and the USEPA SOPs HW-2 and HW-6. The following items were reviewed:

* Data Completeness
* Custody Documentation
* Holding Times
* Surrogate and Internal Standard Recoveries
* Matrix Spike Recoveries/Duplicate Correlations
* Preparation/Calibration Blanks
* Control Spike/Laboratory Control Samples
* Instrumental Tunes
* Calibration Standards
* Instrument IDLs
* Method Compliance
* Sample Result Verification

Those items showing deficiencies are discussed in the following sections of this report. All others were found to be acceptable as outlined in the above-mentioned validation procedures, and as applicable for the methodology. Unless noted specifically in the following text, reported results are substantiated by the raw data, and generated in compliance with protocol requirements.

In summary, sample processing was primarily conducted with compliance to protocol requirements and with adherance to quality criteria, and most reported results are usable with minor qualification. Exceptions include the acid extractable components of URS-14D, which have no usable data. Certain edits to, and qualification of, reported results are indicated. These issues are discussed in the following analytical sections.

The laboratory summary data package, with recommended qualifiers applied in red ink to the sample result forms is attached to this narrative, and should be reviewed in conjunction with this text.

Data Completeness

The laboratory data packages were not directly in compliance with the required NYSDEC ASP Category B deliverables, but the information needed for validation of the data was present. The laboratory NYSDEC Sample Preparation and Analysis Summary Forms were not provided.

Chain-of-Custody

The cyanide fractions of PS-GW-7D and PS-GW-7R, and the trip blank associated with sample URS-14I, were not entered onto the field chain-of-custody forms. They were collected, submitted, and processed.

Volatile Analyses

Methylene chloride was detected in certain of the method and trip blanks at concentrations similar to those of the samples. The sample reported methylene chloride results should therefore be edited to reflect nondetection at the CRDL (i.e. "<0.5").

Carbon disulfide and toluene were detected in the field blank at levels of 0.47 ug/L and 0.18 ug/L, respectively. Due to possible contamination contribution, the reported results for those analytes in all project samples should be edited to reflect nondetection at the CRDL (i.e. "<0.5 "), or at the originally reported value (i.e. add "<"), whichever is greater.

Matrix spikes of PS-GW-9I involved evaluation of recoveries of all target analytes. Certain compounds produced elevated recoveries, but the samples do not contain these components, and results are therefore not affected. Duplicate correlation, and spiked blank recoveries were acceptable.

It should be noted that the "solvent" identification in the reported volatile Tentatively Identified Compounds (TICs) refers to carbon dioxide gas. This response is rejected as a sample constituent.

Semivolatile Analyses

The acid surrogates failed to recover in the extract of URS-14D. Although the laboratory reinjected the sample, they did not perform the required reextraction. Therefore no usable data are available for the phenolic analytes in this sample, and the reported results for them should be rejected ("R" qualifier). Without reextraction it cannot be determined whether the extraction failure is procedural or matrix related. There was a large intereferent response in the sample (which behaves chromatographically like elemental sulfur); this response should have been identified by the laboratory and reported as a TIC for the sample.

Due to copresence in the associated blank, bis(2-ethylhexyl)phthalate detections in the samples are suspect as contamination. Reported results for this analyte should be edited to nondetection at the CRDL (i.e. "<10"). This compound should have been flagged as "B" by the laboratory.

The matrix spikes of PS-GW-9I produced generally acceptable recoveries and duplicate correlations, but one of the matrix spikes produced lack of recovery of 4 compounds. They recovered acceptably in the other spike. The failure of these compounds to recover is not apparent in the data (surrogate recoveries were acceptable, etc.). Due to the potential for these compounds to fail the extraction from the sample, results for 4-chloroaniline, 3,3-dimethylbenzidine, 3-nitroaniline, and 4-nitroaniline in PS-GW-9I should be rejected ("R" qualifier).

The following analytes produced outlying responses in the daily standards which warrent qualification of associated sample results as estimated. Outliers include depressed responses exceeding 25%D:

Standard	Analyte	%D	Affected Samples
07-07-97 @ 10:32	2,2'-oxybis(1-chloropropane)	32	PS-GW-9I, URS-14I, PS-GW-FB
	4-Nitrophenol	26	PS-GW-7D,PS-GW-5R, PS-GW-5D

The reported Method Detection Limits (MDLs) should be procedure specific (i.e. aqueous extraction versus soil extraction). However, the same extract numbers were used to generate the soil MDLs as the aqueous MDLs. This should be corrected by the laboratory, reporting only those which apply to a given method. Instrument Detection Limits are the statistics which are not extraction procedure related.

Pesticide/PCB Analyses

Please see the case narrative discussion regarding the failure of endrin aldehyde to recover in the sample extracts which underwent TBA cleanup. As discussed, for each sample, the split extracts which were not cleaned were also processed for endrin aldehyde specifically, and reported from that analysis. Upon validation, the raw data were reviewed for capability to detect the endrin aldehyde above the interferent response. The following sample endrin aldehyde results are to be rejected ("R") due to matrix interference: URS-14D, PS-GW-12D, PS-GW-9I, PS-GW-9D,

Sample surrogate recoveries were acceptable with the exception of the recoveries of DCB in several of the samples and the matrix spikes. It is observed that, although the matrix spikes showed low DCB recoveries similar to those of most samples, the recoveries of the pesticide spiked analytes were not correspondingly low. Therefore, the low DCB recoveries are not seen as representative of the pesticide analyte recoveries, and no qualification is made for those cases. Those samples exhibiting DCB recoveries below 30% will be recommended for qualification of Aroclor and toxaphene analyte results as estimated ("J") because they have not been evaluated accordingly. Those samples for which all Aroclor and toxaphene results should be considered estimated are the following: PS-GW-12C, PS-GW-12E, and PS-GW-9I

Due to poor individual congener correlation, the Aroclor 1254 result for PS-GW-12D should be considered tentative ("N" qualifier).

Accuracy and precision values for PS-GW-9I, which were provided for all single-response analytes, were acceptable (surrogate DCB recovery was only 20%).

Standard responses were noncompliant in many cases (particularly as regards BHC isomer results). However, the responses were elevated, and because samples did no contain those constituents, reported results are unaffected.

Additionally, two of the five Aroclor 1221 initial calibration standards were processed on different dates than the other three. This does not indicate good system performance for that analyte.

The reported Method Detection Limits (MDLs) should be procedure specific (i.e. aqueous extraction versus soil extraction). However, the same extract numbers were used to generate the soil MDLs as the aqueous MDLs. This should be corrected by the laboratory, reporting only those which apply to a given method. Instrument Detection Limits are the statistics which are not extraction procedure related.

Metals/CN Analyses

The recovery for potassium in the Laboratory Control Sample (LCS) associated with URS14I potassium failed. It was reanalysed with compliant recovery, but the sample was not reprocessed with it. Therefore the potassium result for URS14I should be considered estimated, possibly biased low.

As indicated by the detection of calcium in the field blank, the calcium result for URS-14I should be considered estimated ("J") due to possible contamination contribution.

Accuracy and precision evaluations for PS-GW-9I were acceptable, with the exception of cyanide. The initial cyanide recovery was 56%. The laboratory redistilled and reanalysed a spike, and achieved good recovery. However, the samples were not redistilled, and are associated with a low recovery spike. Therefore the sample cyanide results should be considered estimated.

The preparation blank for the 6/26/97 digestion was reanalysed three times; the reason is not indicated in the data package. It is inappropriate to re-process a control sample in order to bring results into range.

The serial dilution determinations for PS-GW-9I produced acceptable correlations, with the exception of sodium (13%D); sodium results in the sample should be considered estimated ("J").

Please do not hesitate to contact me if questions or comments arise during your review of this report.

Very truly yours,

Judy Harry

COMPLIANCE CHART

Project: OBG Engineers Frontier Chemical-Pendleton Site

SDG Nos. OBG Labs report of 7/23/97

Protocol: SW846

Rec. Date	Sample ID	Matrix	VOA	BNA	PCB/Pest	Metals/CN	Noncompliancy
06-26-97	URS-14D	Soil	OK	NO	OK	OK	1
06-26-97	PS-GW-12C	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-12D	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-12E	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-9I	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-9D	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-7R	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-7D	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-5R	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-5D	Soil	OK	OK	OK	OK	
06-26-97	PS-GW-FB	Soil	OK	OK	OK	OK	
06-26-97	QC TRPBLK	Soil	OK	OK	OK	OK	
06-27-97	URS 14I	Soil	OK	OK	OK	OK	
06-27-97	QC TRPBLK	Soil	OK	OK	OK	OK	

1. BNA surrogate failure, and no reextraction performed.

Volume 1 of 8 of the validated analytical data is separately bound.