[redacted]

OPERATION AND MAINTENANCE [redacted]

Second Semi-Annual Report

Frontier Chemical - Pendleton Site
Town of Pendleton,
Niagara County, New York

[redacted]

Pendleton Site PRP Group

[redacted]

March 1998

O'BRIEN & GERE
ENGINEERS, INC.

March 31, 1998

Mr. Daniel King, P. E.
Division of Environmental Remediation
New York State Department of Environmental Conversation
270 Michigan Avenue
Buffalo, New York 14203-2999

Subject: Frontier Chemical - Pendleton Site, Pendleton, New York
Order on Consent (#B9-0270-89-05)
Semi-Annual Report on Post Closure Operation, Maintenance, and Monitoring Activities, March 1998

Dear Mr. King:

In accordance with the approved Pendleton O & M Manual for the above referenced site, enclosed are three copies of the first Semi-Annual Report on the Post-Closure Operation, Maintenance, and Monitoring of the Closure Components of the Frontier Chemical-Pendleton Site by the Pendleton PRP Group

If you have any questions regarding the above submittals, please call me at 423-336-4057.

Sincerely,
Pendleton PRP Group

John M. Burns
Chairman - Technical Committee for
Pendleton PRP Group

Distribution:

Mr. Daniel King, P. E. (3 copies)
Division of Environmental Remediation
New York State Department of Environmental Conversation
270 Michigan Avenue
Buffalo, New York 14203-2999

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New York State Department of Health
2 University Place, Room 205
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Division of Hazardous Waste Remediation
New York State Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233

Mr. James Devald (1 copy)
Niagara County Health Department
Environmental Services Division
Main P.O. Box 428
10th and East Falls Street
Niagara Falls, New York 14302-0428

Pendleton PRP Technical Committee

Frontier Chemical - Pendleton Site
March 1998

Second Semi-Annual Report

Frontier Chemical - Pendleton Site
Order on Consent (#B9-0270-89-05)
Pendleton, New York

Prepared by Pendleton PRP Group

March 1998

Frontier Chemical - Pendleton Site
March 1998

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Second Semi-Annual Report
March 1998

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Introduction

This is the second semi-annual report from the Frontier Chemical - Pendleton Site PRP Group (PRP Group) for the Frontier Chemical - Pendleton Site located in Pendleton, New York. This report summarizes the activities performed since September 1997 for Post-Closure Operation, Maintenance, and Monitoring of the Closure Components of the Frontier Chemical-Pendleton Site by the Pendleton PRP Group.

Background

The Frontier Chemical-Pendleton Site is located on Town Line Road in the Town of Pendleton, Niagara County, New York. The total site comprises approximately 22 acres of the 75-acre Frontier Chemical property. Prior to remediation activities, Quarry Lake, a flooded quarry that resulted from the excavation of clay for use in clay brick and tile manufacturing at an on-site facility, occupied 15 acres of the 22-acre site. The remaining 7 acres, identified as the former Process Area, were utilized by Frontier Chemical Waste Process, Inc. (Frontier) when the site was operated as an industrial waste treatment facility from 1958 to 1974. Plating wastes, pickle liquors and other liquid acid wastes from plating and metal finishing industries were treated at the site, with residuals from the waste treatment process being discharged into Quarry Lake. Much of the former Process Area was filled and graded following termination of waste treatment operations.

The site remediation project with remedial designed by O'Brien & Gere and remedial action by Sevenson Environmental Services, Inc. included the following major components:

1. Dewatering Quarry Lake to allow drying and consolidation of sediments
2. Excavation and relocation of sediments from Quarry Lake after dewatering operations to within the limits of the capped area
3. Excavation and relocation of surface soils, fill or debris to within the limits of the capped area
4. Capping of consolidated sediments, previously dredged materials, and surface soils with a low-permeability cap
5. Installation, in conjunction with a cap, of a low-permeability barrier to ground water flow
6. Construction of a ground water collection trench along the eastern shore of Quarry Lake and the southern portion of the capped area
7. Reconstruction of the berm around Quarry Lake and installation of a new outlet structure
8. Construction of a ground water pumping station consisting of a wet well and dry vault
9. Installation of a ground water pre-treatment system within the dry vault
10. Conveyance of collected and pre-treated ground water to the local Publicly Owned Treatment Works (POTW)
11. Creation of new wetlands at the site
12. Construction of a surface water swale adjacent to the cap access road to direct surface water away from the capped area
13. Installation of piezometers inside and outside the capped area and a standpipe within the ground water collection trench
14. Installation of a chain link fence around the capped area and pump station to limit access.

Discussion

Post-closure operation, maintenance, and monitoring of the closure components of the Frontier Chemical-Pendleton Site are the responsibility of the Pendleton PRP Group. Operation, maintenance, and monitoring activities performed by the Pendleton PRP Group during this reporting period includes the following five elements:

1. Routine inspection and maintenance of constructed features, including the capped area, ground water collection and conveyance system, surface water runoff facilities, constructed wetlands, access road, perimeter and containment berms, and outlet weir,

> Regarding routine inspection and maintenance of constructed features, two site inspections were conducted during this reporting period, one on October 28, 1997 and another on February 24, 1998. The completed inspection forms are included in Attachment A-1. Relocated wetlands inside the perimeter berm have not been planted with the species shown in the project specification due to a lack of water in Quarry Lake.
>
> The relocated wetlands inside the Quarry Lake levee have elevations of 574 feet for aquatic bed species (Zone A), 575 feet for non-persistent emergent species (Zone B), and 576 feet for persistent emergence species (Zone C). A water elevation chart is included as Attachment A-2. This water level chart shows the history of the lake elevation starting in April 1996 until it filled around January 8, 1998 with floodwaters from Bull Creek. The PRP Group will plant the specified species after April 1, 1998.

2. Operation and maintenance of the ground water pre-treatment system, as described in the Pre-Treatment System Operations Plan,

> Regarding Operation and maintenance of the ground water pre-treatment system, the monthly submittals to the Niagara Country Sewer District #1 detailing analytical and flow data for this reporting period are included in Attachment B-1. Six months (September 1997 through February 1998) of submittals are included with this report. Also included in Attachment B-2 is a table summarizing Operation, Maintenance, and Monitoring Activities for the site during this report period.

3. Performance of a ground water monitoring program to monitor ground water conditions at the site and to verify the inward hydraulic gradient within the capped area,

> Regarding performance of a ground water monitoring program, the reports for Quarterly Ground Water Measurements for September 1997 and Frontier Chemical - Pendleton Site, Semi-Annual Ground Water Monitoring Report dated March 1998 are included as Attachment C-1.

4. Evaluation of operation, maintenance, and monitoring activities and identification of proposed changes to the O&M Manual or site procedures and policies which would provide a safer and/or more cost-effective operation, and

Regarding evaluation of operation, maintenance, and monitoring activities and identification of proposed changes, a letter detailing the status of the maintenance work completed in August and September is include in Attachment D-1. Field observation reports for these activities are detailed in Attachment D-2.

5. Recordkeeping.

Regarding recordkeeeping activities, Jim Reed maintains at the Site and at Olin's Niagara Falls Plant daily and weekly logs and charts. Glynn Geotechnical (Jesse Grossman) provides assistance to Jim Reed and updates O&M documentation. O'Brien & Gere (Steve Anagnost) provide ground water monitoring. John Burns maintains analytical results and reports to NCSD #1 and NYSDEC at Olin's Charleston Plant. All these records are available for review and inspection upon reasonable notice.

6. Response to NYSDEC Comments from September 1997 Submittal

Comment 1. In addition to the monitoring of the piezometers and the wells, indicate the requirement for monitoring the lake water as required by the approved O&M Plan for determination of the inward gradient.

Response: Quarry Lake water level is included in Attachment C, Table 3 and discussed in section 1.2 of that report

Comment 2. The time period ranging from 0.4 year to 33 years for attainment of ground water equilibrium seems to be out of proportion.

Response: The ranges of time periods for attainment of groundwater equilibrium in the design report were based upon calculations using data collected by Golder and URS.

Comment 2A: How far does water have to travel in the containment to attain the inward gradient?

Response: The maximum distance water will have to travel is the width of the landfill.

Comment 2B: It is our understanding that the ground waters which is present in the overburden has to be evaluated for the inward gradient. What is the hydraulic conductivity of the overburden soil? This should be indicated.

Response: The material under the capped area is composed of sediments, sludge and soils placed under the cap during remedial action. The time required to dewater the capped area is shown in section 1.2 of the report in Attachment C. Appendix B of that report also gives the formula used for the calculation and the values used in the calculation based on measured field values.

Comment 3. The PCB 1254 detected in well 88-12D which is located on the outside of the containment is a matter of concern. Since the level detected is higher than the ground water standard, further evaluation will be warranted after the second round of sampling from the well.

Response: PCB 1254 was not detected during the February 1998 sampling round.

Comment 4. Table 1, include the data for lake water elevations as measured on the specific dates.

Response: See Table 3 in Attachment C.

Comment 5. Figure 1, indicate the ground water level measurements taken from the monitoring wells and the lake water level in the same manner as indicated for the piezometers.

Response: All level measurements are included on Figure 1.

Comment 6. Attachment D - Site Maintenance Work Items, submit the revised drawing G-5 as indicated by the report.

Response: Drawing G-5 is included in Attachment D.

Comment 7. Provide details of the wetland in a sketch showing the areas where the wetland is fully developed and the areas which have yet to be developed.

Response: All wetlands outside the containment berm are fully developed per the project specifications. Wetlands inside the containment berm will be planted after April 1, 1998.

Conclusion

The work performed for the Site from September 1997 to March 1998 was reviewed and found to be in accordance with the approved O&M Manual for the Site. The filling of Quarry Lake during the past winter provides both an opportunity for the Pendleton PRP Group to evaluate the inward gradient at the Site with the lake at its designed water level and for the PRP Group to complete the planting of wetlands inside the lake's containment berm.

ATTACHMENT A

Frontier Chemical - Pendleton Site
March 1998

Attachment A – Site Inspection Reports and Quarry Lake Water Elevations

Site Inspections
- October 28, 1997
- February 23-24, 1998

Quarry Lake Water Elevations

Table 2-1. ier Chemical - Pendleton Site - inspection checklist.

Date Performed: October 28, 1997

Weather: cool + cloudy

Site Name: Frontier - Pendelton

Inspector Name: James Reed

Site Location: Pendelton, N.Y

Inspector Signature: James Reed

Item	Task	Response		Comments
		Yes	No	
Low-Permeability Cover	**Visually inspect surface conditions.**			
	1. Erosion problem?		X	
	2. Lack or thinning of vegetation?		X	
	3. Mowing required?		X	
	4. Drainage problems?		X	
	5. Areas of settlement?		X	
	6. Areas of slope instability?		X	
	7. Areas of damage?		X	
Ground Water Collection and Conveyance System	**Visually inspect manholes and cleanouts.**			
	1. Buildup of solids/precipitates to the extent that the flow of ground water is affected?		X	
	2. Measure water levels in manholes and Quarry Lake. a. MH-1? b. MH-2? c. MH-3? d. Quarry Lake?			
	3. Closed and opened pinch valve?		X	
	4. Leakage, degradation or corrosion of valves, pipes, or appurtenances?		X	
	5. Areas of damage?		X	

Table 2-1. . . :r Chemical - Pendleton Site - Inspection checklist.

Date Performed: October 28, 1997 Weather: Cool & Cloudy

Site Name: Frontier Pendelton Inspector Name: James Reed

Site Location: Pendelton, N.Y. Inspector Signature: James Reed

Item	Task	Response		Comments
		Yes	No	
Ground Water Pre-Treatment System (including Dry Vault and Wet Well)	**Perform inspection in accordance with Pre-Treatment System Operations Plan.**	X		Secure supports on Bag Filter Rack.
Surface Water Runoff Facilities	**Visually inspect ditches and culverts.**			
	1. Accumulation of debris?		X	
	2. Excessive scouring?		X	
	3. Areas of damage?		X	
Perimeter Berm, Containment Berm, and Outlet Weir	**Visually inspect condition.**			
	1. Erosion problems?		X	
	2. Areas of settlement?		X	
	3. Areas of slope instability?		X	
	4. Areas of damage?		X	
Ground Water Monitoring Wells and Piezometers	**Visually inspect condition.**			
	1. Casings secured and locked?	X	XR	
	2. Areas of damage?		X	

Table 2-1. ier Chemical - Pendleton Site - inspection checklist.

Date Performed: October 28, 1997

Weather: Cool & Cloudy

Site Name: Frontier - Pendelton

Inspector Name: James Reed

Site Location: Pendelton, N.Y.

Inspector Signature: James Reed

Item	Task	Response		Comments
		Yes	No	
Access Road	**Visually inspect surface conditions of access roads.**			
	1. Rutting?		X	
	2. Potholes?		X	
	3. Settlement?		X	
	4. Areas of damage?		X	
Physical Site Security	**Visually inspect fences and gates.**			
	1. Signs intact?	X		
	2. Fence breached?		X	
	3. Access gates locked?	X		
	4. Areas of damage?		X	
Notes:	**Note any additional comments.**			
Visited by Two people from N.Y.S.D.E.C., Jesse Grossman (GGC) & John Burns (Abu Barket & Brain Sadowski)				

Table 2-1 ier Chemical - Pendleton Site - inspection checklist.

Date Performed: Feb. 23-24/1998 Weather: Cool (35°F)

Site Name: Pendelton - Frontier Site Inspector Name: James Reed

Site Location: Pendelton, N.Y. Inspector Signature: James Reed

Item	Task	Response		Comments
		Yes	No	
Low-Permeability Cover	**Visually inspect surface conditions.**			
	1. Erosion problem?		✓	
	2. Lack or thinning of vegetation?		✓	
	3. Mowing required?		✓	
	4. Drainage problems?		✓	
	5. Areas of settlement?		✓	Small area to be check 4/98
	6. Areas of slope instability?		✓	
	7. Areas of damage?		✓	
Ground Water Collection and Conveyance System	**Visually inspect manholes and cleanouts.**			
	1. Buildup of solids/precipitates to the extent that the flow of ground water is affected?		✓	No Visable Flow
	2. Measure water levels in manholes and Quarry Lake. a. MH-1? b. MH-2? c. MH-3? d. Quarry Lake?			d) 578.0 Full
	3. Closed and opened pinch valve?			Opened & Closed
	4. Leakage, degradation or corrosion of valves, pipes, or appurtenances?		✓	
	5. Areas of damage?		✓	

Table 2-1. . :er Chemical - Pendleton Site - inspection checklist.

Date Performed: Feb. 23&24/1998 Weather: Cool (35°F)

Site Name: Frontier Inspector Name: James Reed

Site Location: Pendelton, N.Y. Inspector Signature: James Reed

Item	Task	Response		Comments
		Yes	No	
Ground Water Pre-Treatment System (including Dry Vault and Wet Well)	**Perform inspection in accordance with Pre-Treatment System Operations Plan.**		✓	No Problems
Surface Water Runoff Facilities	**Visually inspect ditches and culverts.**			
	1. Accumulation of debris?		✓	
	2. Excessive scouring?		✓	
	3. Areas of damage?		✓	
Perimeter Berm, Containment Berm, and Outlet Weir	**Visually inspect condition.**			
	1. Erosion problems?		✓	
	2. Areas of settlement?		✓	
	3. Areas of slope instability?		✓	
	4. Areas of damage?		✓	
Ground Water Monitoring Wells and Piezometers	**Visually inspect condition.**			
	1. Casings secured and locked?		✓	
	2. Areas of damage?		✓	

Table 2-1. . .er Chemical - Pendleton Site - inspection checklist.

Date Performed: Feb 23+24 / 1998

Weather: cool (35°F)

Site Name: Frontier Site

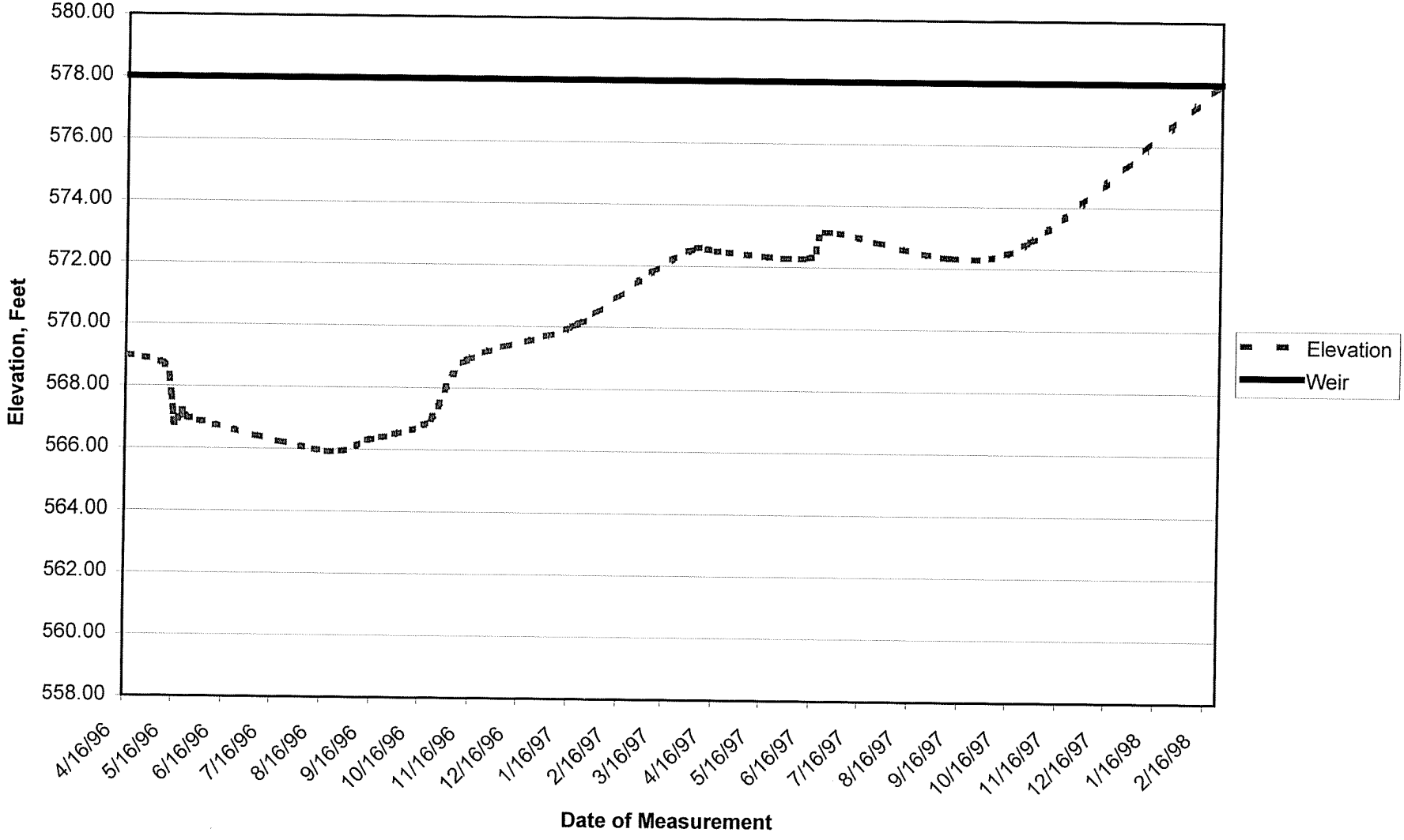
Inspector Name: James Reed

Site Location: Pendelton, N.Y

Inspector Signature: James Reed

Item	Task	Response		Comments
		Yes	No	
Access Road	**Visually inspect surface conditions of access roads.**			
	1. Rutting?		✓	
	2. Potholes?		✓	
	3. Settlement?		✓	
	4. Areas of damage?		✓	
Physical Site Security	**Visually inspect fences and gates.**			
	1. Signs intact?		✓	
	2. Fence breached?		✓	
	3. Access gates locked?		✓	
	4. Areas of damage?		✓	
Notes:	**Note any additional comments.**			

Quarry Lake Water Elevations



ATTACHMENT B

Attachment B – Niagara County Sewer District #1 Submittals and Operation, Maintenance and Monitoring Activities

Niagara County Sewer District 1 Submittals
- February 5, 1998 Sampling
- January 2, 1998 Sampling
- December 4, 1997 Sampling
- November 6, 1997 Sampling
- October 10, 1997 Sampling
- September 5, 1997 Sampling

Operation, Maintenance and Monitoring Activities Summary

FILE COPY

March 6, 1998

Mr. Frank Nerone
Chief Operator
Niagara County Sewer District #1
7346 Liberty Drive
Niagara Falls, NY 14304

Subject: Analytical Sampling Results (2/5/98 Sample)
Groundwater Discharge Through Pre-Treatment System
Pendleton (Frontier Chemical) Site

Dear Mr. Nerone:

Enclosed for your review are analytical results from the February 5, 1998, monthly sampling event for discharge of collected groundwater from the pre-treatment system. Analytical results for this sampling event are compared against the Permit (#96-11) requirements on the attached Analytical Summary and Daily Flow sheets.

A review of the analytical and flow data shows that all permit parameters are significantly below the stated permit requirements.

This data is being provided for your review and concurrence that all permit parameters are well within their limits. If, following review of the enclosed information, you are not in agreement with the above stated conclusion, please contact me at 423-336-4057 as soon as possible so we may discuss any future monitoring requirements.

Sincerely,

John M. Burns
for the Frontier Chemical - Pendleton Site PRP Group

enclosures: as stated
cc: D. Kummer
Pendleton Site Technical Committee

Frontier Chemical - Pendleton Site
Analytical Summary for WS 001
Permit # 96-11
Groundwater Discharge Point: D 002

239,301 Gallons Discharged Prior To 1/2/98
10,357 Gallons Since Last Report
159 Average Daily Flow Based on 34 days Between Samples

Parameters Treatment System Discharge	Permit Limit GPD	Detection Limits	2/5/98 Sample Results GPD
Discharge Rate(1)	662		
624 Analytes	**ug/L**	**ug/L**	**ug/L**
Toluene	10.0	1.0	
1,2-Dichloroethane	10.0	1.0	
4-Methyl-2-Pentanone	10.0	5.0	
Vinyl Chloride	10.0	2.0	
Methylene Chloride	10.0	2.0	
trans-1,2-Dichloroethene	10.0	1.0	
1,1,1-Trichloroethane	10.0	1.0	
Trichloroethene	10.0	1.0	
Benzene	10.0	1.0	
Chloromethane		2.0	
Bromomethane		2.0	
Chloroethane		2.0	
Chloroform		1.0	
Carbon Tetrachloride		1.0	
1,1-Dichloroethene		1.0	
Trichlorofluoromethane		2.0	
1,1-Dichloroethane		1.0	
1,2-Dichloropropane		1.0	
Bromodichloromethane		1.0	
2-Chloroethylvinyl ether		2.0	
cis-1,3-Dichloropropene		1.0	
trans-1,3-Dichloropropene		1.0	
1,1,2-Trichloroethane		1.0	
Tetrachloroethene		1.2	
Dibromochloromethane		1.0	
Chlorobenzene		1.0	
Ethylbenezene		1.0	
Bromoform		1.0	
1,1,2,2-Tetrachloroethane		1.0	
1,3-Dichlorobenzene		1.0	
1,4-Dichlorobezene		1.0	
1,2-Dichlorobenzene		1.0	
Sum of 624 Analytes		100.0	
608 Pesticides	**ug/L**	**ug/L**	**ug/L**
alpha BHC	10.0	0.003	
beta BHC	20.0	0.006	
delta BHC	10.0	0.010	
gamma BHC	10.0	0.003	
Heptachlor	8.0	0.022	
Aldrin	8.0	0.018	
Heptachlor Epoxide	9.0	0.009	
4,4-DDE	20.0	0.005	
Methoxychlor	18.0	0.007	
Metals	**mg/L**	**mg/L**	**mg/L**
Antimony	0.1	0.011	< 0.011
Boron	4.80	0.012	0.459
Chromium	5.33	0.005	0.007
Cyanide(T)	2.0	0.005	< 0.005
Other	**mg/L**	**mg/L**	**mg/L**
Total Phenolics	NA	0.005	< 0.005
TSS	300	4.000	< 4.000

Legend:
(1) Permit limit @ 662 GPD with maximum daily discharged @ 2500 GPD
(a) Detected in blank
NA Not applicable

DAILY FLOW DATA - PENDLETON SITE
"FEBRUARY 1998

DATE	TOTALIZER READING	DAILY FLOW	
2/1/98	248555	310	
2/2/98	248865	264	
2/3/98		264	
2/4/98		264	
2/5/98	249658	110	
2/6/98	249768	164	
2/7/98	249932	107	
2/8/98	250039	166	
2/9/98	250205	108	
2/10/98	250313	162	
2/11/98	250475	213	
2/12/98	250688	391	
2/13/98	251079	193	
2/14/98		193	
2/15/98	251464	111	
2/16/98	251575	255	
2/17/98	251830	419	
2/18/98	252249	553	
2/19/98	252802	385	
2/20/98	253187	222	
2/21/98	253409	110	
2/22/98	253519	161	
2/23/98	253680	167	
2/24/98	253847	162	
2/25/98	254009	193	
2/26/98	254202	54	
2/27/98	254256	163	
2/28/98	254419		
AVERAGE DAILY FLOW IN GALLONS		217	

	= DRY VAULT GROUNDWATER RELIEF		
			gallons
			gallons
			gallons
			gallons
	TOTAL GALLONS	0	

avg =flow between data points divided by days of missing data
avg =(249658-248865)/3 or 264 gallons per day for data between 2/2/98 and 2/5/98

RECEIVED
FEB 2 3 1998
JOHN BURNS

WASTE STREAM TECHNOLOGY, INC.

302 Grote Street
Buffalo, NY 14207
(716) 876-5290

Analytical Data Report
Report Date : 02/20/98
Group Number : 9801-156

Prepared For :
Mr. John Burns
Olin Corporation
P.O. Box 248
1186 Lower River Road NW
Charleston, TN 37310

Site : Frontier Chemical

Field and Laboratory Information

Client Id	WST Lab #	Matrix	Date Sampled	Date Received	Time
GAC #2	WS39537	Aqueous	02/05/98	02/06/98	0830
Sample Status Upon Receipt : No irregularities.					

Analytical Services

Analytical Parameters	Number of Samples	Turnaround Time
Total Metals	1	Standard
Cyanide	1	Standard
Phenol	1	Standard
Total Suspended Solids	1	Standard

Report Released By : B Schepart
Dr. Brian Schepart, Laboratory Director

ENVIRONMENTAL LABORATORY ACCREDITATION CERTIFICATION NUMBERS
NYSDOH ELAP #11179 NJDEPE #73977 CDHS ELAP #2189

WASTE STREAM TECHNOLOGY

METHODOLOGIES

The specific methodologies employed in obtaining the analytical data reported are indicated on each of the result forms. The method numbers shown refer to the following analytical method references:

Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020, March 1979, Revised 1983, U.S. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.

Federal Register, 40 CFR Part 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. Revised July 1992.

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. Third Edition, Revised December 1996, United States EPA SW-846.

Annual Book of ASTM Standards, Volume II. ASTM, 100 Harbor Drive, West Conshohocken, PA 19428-2959.

Standard Methods for the Examination of Water and Wastewater. (18th Edition). American Public Health Association, 1105 18th Street, NW, Washington, D.C. 20036.

Waste Stream Technology, Inc.
Metals Analysis Result Report

Site: FRONTIER CHEMICAL
Date Sampled: 02/05/98
Date Received: 02/06/98

Group Number: 9801-156
Report Units: mg/L
Matrix: Aqueous

	Lab ID Number Client ID Date Digested	WS39537 GAC #2 02/16/98		
Analyte	**Detection Limit**	**Result**	**Date Analyzed**	**Analysis Method**
Boron by ICP	0.012	0.459	02/19/98	EPA 200.7
Chromium by ICP	0.005	0.007	02/19/98	EPA 200.7
Antimony by ICP	0.011	< 0.011	02/19/98	EPA 200.7

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Cyanide in Water
EPA 335.2

Site: FRONTIER CHEMICAL
Date Sampled: 02/05/98
Date Received: 02/06/98

Group Number: 9801-156
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS39537	GAC #2	02/16/98	0.005	< 0.005

Waste Stream Technology, Inc.
Total Recoverable Phenol
EPA 420.1

Site: FRONTIER CHEMICAL
Date Sampled: 02/05/98
Date Received: 02/06/98

Group Number: 9801-156
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS39537	GAC #2	02/19/98	0.005	< 0.005

Waste Stream Technology, Inc.
Total Suspended Solids
EPA 160.2

Site: FRONTIER CHEMICAL
Date Sampled: 02/05/98
Date Received: 02/06/98

Group Number: 9801-156
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS39537	GAC #2	02/09/98	4.0	< 4.0

WASTESTREAM TECHNOLOGY

302 GROTE STREET
BUFFALO, NY 14207
(716) 876-5290

9801-156

CHAIN OF CUSTODY RECORD

PROJECT NO:

SITE NAME: Frontier Chem-Pendelton

SAMPLERS (SIGNATURE): James Reed

SAMPLE NO.	DATE	TIME	COMP	GRAB	MATRIX	SAMPLE LOCATION	SIZE & NO. OF CONTAINERS	Phenol	Br, Cr, a Sb	CN	T.S.S				PRESERVATIVES	REMARKS
8B05 579	2/5/98		✓		H_2O	GAC #2	Amber 1-1L	✓							H_2SO_4	WS39537
8B05 580	"		✓		"	"	1-1L		✓						HNO_3	
8B05 581	"		✓		"	"	1-1L			✓					NaOH	
8B05 582	"		✓		"	"	1-500ml				✓				Ø	

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
[signature]	2/6/98 8:00 AM	Tony Pcifzk	Tony Pcifzk	2-6-98 09:30	[signature]
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)

SPECIAL INSTRUCTIONS:

TURNAROUND TIME 10 BD

LAB USE: REFRIGERATOR #_____ SHELF #_____ GROUP #_____ DUE DATE _____

FILE COPY

February 8, 1998

Mr. Frank Nerone
Chief Operator
Niagara County Sewer District #1
7346 Liberty Drive
Niagara Falls, NY 14304

Subject: Analytical Sampling Results (1/2/98 Sample)
Groundwater Discharge Through Pre-Treatment System
Pendleton (Frontier Chemical) Site

Dear Mr. Nerone:

Enclosed for your review are analytical results including our semiannual 624 parameters from the January 2, 1998, monthly sampling event for discharge of collected groundwater from the pre-treatment system. Analytical results for this sampling event are compared against the Permit (#96-11) requirements on the attached Analytical Summary and Daily Flow sheets.

A review of the analytical and flow data shows that all permit parameters are significantly below the stated permit requirements.

This data is being provided for your review and concurrence that all permit parameters are well within their limits. If, following review of the enclosed information, you are not in agreement with the above stated conclusion, please contact me at 423-336-4057 as soon as possible so we may discuss any future monitoring requirements.

Sincerely,

John M. Burns
For the Frontier Chemical - Pendleton Site PRP Group

Enclosures: as stated
cc: D. Kummer
Pendleton Site Technical Committee

Frontier Chemical - Pendleton Site
Analytical Summary for WS 001
Permit # 96-11
Groundwater Discharge Point: D 002

233.912 Gallons Discharged Prior To 12/4/97
5.389 Gallons Since Last Report
186 Average Daily Flow Based on 28 days Between Samples

Parameters Treatment System Discharge	Permit Limit GPD	Detection Limits		1/2/98 Sample Results GPD
Discharge Rate(1)	662			
624 Analytes	ug/L	ug/L		ug/L
Toluene	10.0	1.0		
1,2-Dichloroethane	10.0	1.0		
4-Methyl-2-Pentanone	10.0	5.0		
Vinyl Chloride	10.0	2.0		
Methylene Chloride	10.0	2.8		
trans-1,2-Dichloroethene	10.0	1.0		
1,1,1-Trichloroethane	10.0	1.0		
Trichloroethene	10.0	1.0		
Benzene	10.0	1.0		
Chloromethane		2.0		
Bromomethane		2.0		
Chloroethane		2.0		
Chloroform		1.0		
Carbon Tetrachloride		1.0		
1,1-Dichloroethene		1.0		
Trichlorofluoromethane		2.0		
1,1-Dichloroethane		1.0		
1,2-Dichloropropane		1.0		
Bromodichloromethane		1.0		
2-Chloroethylvinyl ether		2.0		
cis-1,3-Dichloropropene		1.0		
trans-1,3-Dichloropropene		1.0		
1,1,2-Trichloroethane		1.0		
Tetrachloroethene		1.2		
Dibromochloromethane		1.0		
Chlorobenzene		1.0		
Ethylbenezene		1.0		
Bromoform		1.0		
1,1,2,2-Tetrachloroethane		1.0		
1,3-Dichlorobenzene		1.0		
1,4-Dichlorobezene		1.0		
1,2-Dichlorobenzene		1.0		
Sum of 624 Analytes		100.0		
608 Pesticides	ug/L	ug/L		ug/L
alpha BHC	10.0	0.003		
beta BHC	20.0	0.006		
delta BHC	10.0	0.010		
gamma BHC	10.0	0.003		
Heptachlor	8.0	0.022		
Aldrin	8.0	0.018		
Heptachlor Epoxide	9.0	0.009		
4,4-DDE	20.0	0.005		
Methoxychlor	18.0	0.007		
Metals	mg/L	mg/L		mg/L
Antimony	0.1	0.009	<	0.009
Boron	4.00	0.200		0.546
Chromium	5.33	0.011	<	0.011
Cyanide(T)	2.0	0.005	<	0.005
Other	mg/L	mg/L		mg/L
Total Phenolics	NA	0.005	<	0.005
TSS	300	4.000	<	4.000

Legend:
(1) Permit limit @ 662 GPD with maximum daily discharged @ 2500 GPD
(a) Detected in blank
NA Not applicable

DAILY FLOW DATA - PENDLETON SITE
JANUARY 1998

DATE	TOTALIZER READING	DAILY FLOW	
1/1/98		226	avg
1/2/98	239301	106	
1/3/98	239407	337	
1/4/98	239744	381	
1/5/98	240125	429	
1/6/98	240554	424	
1/7/98	240978	632	
1/8/98	241610	921	
1/9/98	242531	1160	
1/10/98	243691	459	
1/11/98	244150	450	
1/12/98	244600	327	
1/13/98	244927	223	
1/14/98	245150	222	
1/15/98	245372	171	
1/16/98	245543	237	
1/17/98	245780	110	
1/18/98	245890	219	
1/19/98	246109	109	
1/20/98	246218	163	
1/21/98	246381	166	
1/22/98	246547	166	
1/23/98	246713	221	
1/24/98	246934	268	
1/25/98	247202	168	
1/26/98	247370	164	
1/27/98	247534	162	
1/28/98	247696	169	
1/29/98	247865	222	
1/30/98	248087	179	
1/31/98	248266		
AVERAGE DAILY FLOW IN GALLONS		306	

	= DRY VAULT GROUNDWATER RELIEF		
	1/2/98	353	gallons
	1/9/98	285	gallons
			gallons
			gallons
	TOTAL GALLONS	638	

avg =flow between data points divided by days of missing data
avg =(239301-238622)/3 or 226 gallons per day for data between 12/31/97 and 1/2/98

FILE COPY

WASTE STREAM TECHNOLOGY, INC.

302 Grote Street
Buffalo, NY 14207
(716) 876-5290

Analytical Data Report
Report Date : 01/19/98
Group Number : 9801-001

Prepared For :
Mr. John Burns
Olin Corporation
P.O. Box 248
1186 Lower River Road NW
Charleston, TN 37310

Site : Frontier Chemical

Field and Laboratory Information

Client Id	WST Lab #	Matrix	Date Sampled	Date Received	Time
GAC 2	WS38696	Aqueous	1/2/98	1/5/98	0830
Sample Status Upon Receipt : No irregularities.					

Analytical Services

Analytical Parameters	Number of Samples	Turnaround Time
Total Metals	1	Standard
Cyanide	1	Standard
Phenol	1	Standard
Total Suspended Solids	1	Standard

Report Released By : Daniel W. Vollmer
Daniel Vollmer, Laboratory QA/QC Officer

ENVIRONMENTAL LABORATORY ACCREDITATION CERTIFICATION NUMBERS
NYSDOH ELAP #11179 NJDEPE #73977 CDHS ELAP #2189

WASTE STREAM TECHNOLOGY

METHODOLOGIES

The specific methodologies employed in obtaining the analytical data reported are indicated on each of the result forms. The method numbers shown refer to the following analytical method references:

Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020, March 1979, Revised 1983, U.S. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.

Federal Register, 40 CFR Part 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. Revised July 1992.

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. Third Edition, Revised September 1994, United States EPA SW-846.

Annual Book of ASTM Standards, Volume II. ASTM, 1916 Race Street, Philadelphia, Pennsylvania 19103.

Standard Methods for the Examination of Water and Wastewater. (18th Edition). American Public Health Association, 1105 18th Street, NW, Washington, D.C. 20036.

Waste Stream Technology, Inc.
Total Suspended Solids
EPA 160.2

Site: FRONTIER CHEMICAL
Date Sampled: 01/02/98
Date Received: 01/05/98

Group Number: 9801-001
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS38696	GAC 2	01/05/98	4.0	< 4.0

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Total Recoverable Phenol
EPA 420.1

Site: FRONTIER CHEMICAL
Date Sampled: 01/02/98
Date Received: 01/05/98

Group Number: 9801-001
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS38696	GAC 2	01/05/98	0.005	< 0.005

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Cyanide in Water
EPA 335.2

Site: FRONTIER CHEMICAL
Date Sampled: 01/02/98
Date Received: 01/05/98

Group Number: 9801-001
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS38696	GAC 2	01/14/98	0.005	< 0.005

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Metals Analysis Result Report

Site: FRONTIER CHEMICAL
Date Sampled: 01/02/98
Date Received: 01/05/98

Group Number: 9801-001
Report Units: mg/L
Matrix: Aqueous

	Lab ID Number	WS38696		
	Client ID	GAC 2		
	Date Digested	01/09/98		
Analyte	**Detection Limit**	**Result**	**Date Analyzed**	**Analysis Method**
Antimony by GFAA	0.009	< 0.009	01/13/98	EPA 200.9
Chromium by ICP	0.011	< 0.011	01/13/98	EPA 200.7
Boron by ICP	0.200	0.546	01/13/98	EPA 200.7

WASTE STREAM TECHNOLOGY

WASTE STREAM TECHNOLOGY

302 GROTE STREET
BUFFALO, NY 14207
(716) 876-5290

9801-001

CHAIN OF CUSTODY RECORD

PROJECT NO: E414

SITE NAME: Frontier Chemical (Pendelton)

SAMPLERS (SIGNATURE): James Reed

SAMPLE NO.	DATE	TIME	COMP	GRAB	MATRIX	SAMPLE LOCATION	SIZE & NO. OF CONTAINERS	Phenol	Br, Cr, Sb	CN	T.S.S				PRESERVATIVES	REMARKS
8402 575	11/2 98	1015 Am	✓		H_2O	GAC 2	1-L	✓							H_2SO_4	
8402 576	"	1015 "	✓		"	"	1-L		✓						HNO_3	WS38696
8402 577	"	1015 "	✓		"	"	1-L			✓					NaOH	
8402 578	"	10:15 "	✓		"	"	1-500mL				✓				Ø	

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
[signature]	11/3/98	Tony Pontiller	Tony Pontiller	1 5 98 0830	[signature]
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)

SPECIAL INSTRUCTIONS:

TURNAROUND TIME 10 BD (SP)

LAB REFRIGERATOR # _____ SHELF # _____ GROUP # _____ DUE DATE _____

January 8, 1998

Mr. Frank Nerone
Chief Operator
Niagara County Sewer District #1
7346 Liberty Drive
Niagara Falls, NY 14304

Subject: Analytical Sampling Results (12/4/97 Sample)
Groundwater Discharge Through Pre-Treatment System
Pendleton (Frontier Chemical) Site

Dear Mr. Nerone:

Enclosed for your review are analytical results including our semiannual 624 parameters from the December 4, 1997, monthly sampling event for discharge of collected groundwater from the pre-treatment system. Analytical results for this sampling event are compared against the Permit (#96-11) requirements on the attached Analytical Summary and Daily Flow sheets.

A review of the analytical and flow data shows that all permit parameters are significantly below the stated permit requirements.

This data is being provided for your review and concurrence that all permit parameters are well within their limits. If, following review of the enclosed information, you are not in agreement with the above stated conclusion, please contact me at 423-336-4057 as soon as possible so we may discuss any future monitoring requirements.

Sincerely,

John M. Burns
for the Frontier Chemical - Pendleton Site PRP Group

enclosures: as stated
cc: D. Kummer
Pendleton Site Technical Committee

Frontier Chemical - Pendleton Site
Analytical Summary for WS 001
Permit # 96-11
Groundwater Discharge Point: D 002

228,288 Gallons Discharged Prior To 11/6/97

5,624 Gallons Since Last Report

201 Average Daily Flow Based on 28 days Between Samples

Parameters Treatment System Discharge	Permit Limit GPD	Detection Limits		12/4/97 Sample Results GPD
Discharge Rate(1)	662			
624 Analytes	ug/L	ug/L		ug/L
Toluene	10.0	1.0		
1,2-Dichloroethane	10.0	1.0		
4-Methyl-2-Pentanone	10.0	5.0		
Vinyl Chloride	10.0	2.0		
Methylene Chloride	10.0	2.8		
trans-1,2-Dichloroethene	10.0	1.0		
1,1,1-Trichloroethane	10.0	1.0		
Trichloroethene	10.0	1.0		
Benzene	10.0	1.0		
Chloromethane		2.0		
Bromomethane		2.0		
Chloroethane		2.0		
Chloroform		1.0		
Carbon Tetrachloride		1.0		
1,1-Dichloroethene		1.0		
Trichlorofluoromethane		2.0		
1,1-Dichloroethane		1.0		
1,2-Dichloropropane		1.0		
Bromodichloromethane		1.0		
2-Chloroethylvinyl ether		2.0		
cis-1,3-Dichloropropene		1.0		
trans-1,3-Dichloropropene		1.0		
1,1,2-Trichloroethane		1.0		
Tetrachloroethene		1.2		
Dibromochloromethane		1.0		
Chlorobenzene		1.0		
Ethylbenezene		1.0		
Bromoform		1.0		
1,1,2,2-Tetrachloroethane		1.0		
1,3-Dichlorobenzene		1.0		
1,4-Dichlorobezene		1.0		
1,2-Dichlorobenzene		1.0		
Sum of 624 Analytes		100.0		
608 Pesticides	ug/L	ug/L		ug/L
alpha BHC	10.0	0.003		
beta BHC	20.0	0.006		
delta BHC	10.0	0.010		
gamma BHC	10.0	0.003		
Heptachlor	8.0	0.022		
Aldrin	8.0	0.018		
Heptachlor Epoxide	9.0	0.009		
4,4-DDE	20.0	0.005		
Methoxychlor	18.0	0.007		
Metals	mg/L	mg/L		mg/L
Antimony	0.1	0.009	<	0.009
Boron	4.00	0.200		0.481
Chromium	5.33	0.011	<	0.011
Cyanide(T)	2.0	0.005	<	0.005
Other	mg/L	mg/L		mg/L
Total Phenolics	NA	0.005	<	0.005
TSS	300	4.000	<	4.000

Legend:
(1) Permit limit @ 662 GPD with maximum daily discharged @ 2500 GPD
(a) Detected in blank
NA Not applicable

DAILY FLOW DATA - PENDLETON SITE
DECEMBER 1997

DATE	TOTALIZER READING	DAILY FLOW	
12/1/97	233503	98	
12/2/97	233601	156	avg
12/3/97		156	avg
12/4/97	233912	159	
12/5/97	234071	294	avg
12/6/97		294	avg
12/7/97	234658	105	
12/8/97	234763	105	
12/9/97	234868	105	
12/10/97	234973	108	
12/11/97	235081	160	
12/12/97	235241	142	avg
12/13/97		142	avg
12/14/97		142	avg
12/15/97	235666	210	
12/16/97	235876	266	
12/17/97	236142	157	
12/18/97	236299	104	
12/19/97	236403	336	
12/20/97	236739	105	
12/21/97	236844	106	
12/22/97	236950	104	
12/23/97	237054	105	
12/24/97	237159	373	
12/25/97	237532	209	
12/26/97	237741	570	
12/27/97	238311	104	
12/28/97	238415	104	
12/29/97	238519	103	
12/30/97	238622		
12/31/97			
AVERAGE DAILY FLOW IN GALL		177	

	= DRY VAULT GROUNDWATER RELIEF		
	12/5/97	388	gallons
	12/12/97	147	gallons
	12/19/97	200	gallons
	12/26/97	397	gallons
	TOTAL GALLONS	1,132	

avg =flow between data points divided by days of missing data
avg =(233912-233601)/2 or 156 gallons per day for data between 12/2/97 AND 12/4/97

WASTE STREAM TECHNOLOGY, INC.

302 Grote Street
Buffalo, NY 14207
(716) 876-5290

Analytical Data Report

Report Date : 12/19/97
Group Number : 9701-1300

Prepared For :
Mr. John Burns
Olin Corporation
P.O. Box 248
1186 Lower River Road NW
Charleston, TN 37310

Site : Frontier Chemical

Field and Laboratory Information

Client Id	WST Lab #	Matrix	Date Sampled	Date Received	Time
GAC II	WS38280	Aqueous	12/4/97	12/5/97	0810
Sample Status Upon Receipt : No irregularities.					

Analytical Services

Analytical Parameters	Number of Samples	Turnaround Time
Total Metals	1	Standard
Cyanide	1	Standard
Phenol	1	Standard
Total Suspended Solids	1	Standard

Report Released By : Daniel W. Voll

Daniel Vollmer, Laboratory QA/QC Officer

ENVIRONMENTAL LABORATORY ACCREDITATION CERTIFICATION NUMBERS
NYSDOH ELAP #11179 NJDEPE #73977 CDHS ELAP #2189

WASTE STREAM TECHNOLOGY

METHODOLOGIES

The specific methodologies employed in obtaining the analytical data reported are indicated on each of the result forms. The method numbers shown refer to the following analytical method references:

Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020, March 1979, Revised 1983, U.S. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.

Federal Register, 40 CFR Part 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. Revised July 1992.

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. Third Edition, Revised September 1994, United States EPA SW-846.

Annual Book of ASTM Standards, Volume II. ASTM, 1916 Race Street, Philadelphia, Pennsylvania 19103.

Standard Methods for the Examination of Water and Wastewater. (18th Edition). American Public Health Association, 1105 18th Street, NW, Washington, D.C. 20036.

Waste Stream Technology, Inc.
Metals Analysis Result Report

Site: FRONTIER CHEMICAL
Date Sampled: 12/04/97
Date Received: 12/05/97

Group Number: 9701-1300
Report Units: mg/L
Matrix: Aqueous

	Lab ID Number	WS38280		
	Client ID	GAC II		
	Date Digested	12/12/97		
Analyte	**Detection Limit**	**Result**	**Date Analyzed**	**Analysis Method**
Antimony by GFAA	0.009	< 0.009	12/17/97	EPA 200.9
Chromium by ICP	0.011	< 0.011	12/15/97	EPA 200.7
Boron by ICP	0.200	0.481	12/15/97	EPA 200.7

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Cyanide in Water
EPA 335.2

Site: FRONTIER CHEMICAL
Date Sampled: 12/04/97
Date Received: 12/05/97

Group Number: 9701-1300
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS38280	GAC II	12/17/97	0.005	< 0.005

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Total Recoverable Phenol
EPA 420.1

Site: FRONTIER CHEMICAL
Date Sampled: 12/04/97
Date Received: 12/05/97

Group Number: 9701-1300
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS38280	GAC II	12/12/97	0.005	< 0.005

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Total Suspended Solids
EPA 160.2

Site: FRONTIER CHEMICAL
Date Sampled: 12/04/97
Date Received: 12/05/97

Group Number: 9701-1300
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS38280	GAC II	12/08/97	4.0	< 4.0

WASTE STREAM TECHNOLOGY

WASTE STREAM TECHNOLOGY
302 GROTE STREET
BUFFALO, NY 14207
(716) 876-5290

9701-1300

CHAIN OF CUSTODY RECORD

PROJECT NO:
SITE NAME: Frontier - Pendelton

SAMPLERS (SIGNATURE): James Reed

SAMPLE NO.	DATE	TIME	COMP	GRAB	MATRIX	SAMPLE LOCATION	SIZE & NO. OF CONTAINERS	Phenol	Br, Cr + Sb	CN	T.S.S.			PRESERVATIVES	REMARKS
7L04 570	12/4 97	10 Am	✓		H_2O	GAC II	1-L Glass	✓						H_2SO_4	W338280
7L04 571	"	"	✓		"	"	1-L		✓					HNO_3	
7L04 572	"	"	✓		"	"	1-L			✓				NaOH	
7L04 573	"	"	✓		"	"	500ml				✓			Ø	

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
James Reed	12/5/97 7:35A	Anthony P. Porfilio	[signature]	12/5/97 0810	[signature]
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)

SPECIAL INSTRUCTIONS:

TURNAROUND TIME 10 B.D.

LAB REFRIGERATOR # ____ SHELF # ____ GROUP # ____ DUE DATE ____

December 8, 1997

Mr. Frank Nerone
Chief Operator
Niagara County Sewer District #1
7346 Liberty Drive
Niagara Falls, NY 14304

Subject: Analytical Sampling Results (11/6/97 Sample)
Groundwater Discharge Through Pre-Treatment System
Pendleton (Frontier Chemical) Site

Dear Mr. Nerone:

Enclosed for your review are analytical results including our semiannual 624 parameters from the November 6, 1997, monthly sampling event for discharge of collected groundwater from the pre-treatment system. Analytical results for this sampling event are compared against the Permit (#96-11) requirements on the attached Analytical Summary and Daily Flow sheets.

A review of the analytical and flow data shows that all permit parameters are significantly below the stated permit requirements.

This data is being provided for your review and concurrence that all permit parameters are well within their limits. If, following review of the enclosed information, you are not in agreement with the above stated conclusion, please contact me at 423-336-4057 as soon as possible so we may discuss any future monitoring requirements.

Sincerely,

John M. Burns
for the Frontier Chemical - Pendleton Site PRP Group

enclosures: as stated
cc: D. Kummer
Pendleton Site Technical Committee

DAILY FLOW DATA - PENDLETON SITE
NOVEMBER 1997

DATE	TOTALIZER READING	DAILY FLOW	
11/1/97	227352	103	
11/2/97	227455	167	avg
11/3/97		167	avg
11/4/97		167	avg
11/5/97		167	avg
11/6/97		167	avg
11/7/97	228288	157	
11/8/97	228445	104	
11/9/97	228549	103	
11/10/97	228652	104	
11/11/97	228756	103	
11/12/97	228859	105	
11/13/97	228964	159	
11/14/97	229123	267	
11/15/97	229390	268	
11/16/97	229658	319	
11/17/97	229977	188	avg
11/18/97		188	avg
11/19/97	230353	219	
11/20/97	230572	159	
11/21/97	230731	374	avg
11/22/97		374	avg
11/23/97		374	avg
11/24/97	231854	164	
11/25/97	232018	215	
11/26/97	232233	267	
11/27/97	232500	160	
11/28/97	232660	629	
11/29/97	233289	104	
11/30/97	233393		
AVERAGE DAILY FLOW IN GALLONS		208	

	= DRY VAULT GROUNDWATER RELIEF		
	11/21/97	460	gallons
	11/28/97	477	gallons
	TOTAL GALLONS	937	

avg =flow between data points divided by days of missing data
avg =(228288-227455)/5 or 167 gallons per day for data between 11/7/97 AND 11/12/97

Frontier Chemical - Pendleton Site
Analytical Summary for WS 001
Permit # 96-11
Groundwater Discharge Point: D 002

222,754 Gallons Discharged Prior To 10/2/97
5,534 Gallons Since Last Report
154 Average Daily Flow Based on 36 days Between Samples

Parameters Treatment System Discharge	Permit Limit GPD	Detection Limits	11/6/97 Sample Results GPD
Discharge Rate(1)	662		
624 Analytes	ug/L	ug/L	ug/L
Toluene	10.0	1.0	
1,2-Dichloroethane	10.0	1.0	
4-Methyl-2-Pentanone	10.0	5.0	
Vinyl Chloride	10.0	2.0	
Methylene Chloride	10.0	2.8	
trans-1,2-Dichloroethene	10.0	1.0	
1,1,1-Trichloroethane	10.0	1.0	
Trichloroethene	10.0	1.0	
Benzene	10.0	1.0	
Chloromethane		2.0	
Bromomethane		2.0	
Chloroethane		2.0	
Chloroform		1.0	
Carbon Tetrachloride		1.0	
1,1-Dichloroethene		1.0	
Trichlorofluoromethane		2.0	
1,1-Dichloroethane		1.0	
1,2-Dichloropropane		1.0	
Bromodichloromethane		1.0	
2-Chloroethylvinyl ether		2.0	
cis-1,3-Dichloropropene		1.0	
trans-1,3-Dichloropropene		1.0	
1,1,2-Trichloroethane		1.0	
Tetrachloroethene		1.2	
Dibromochloromethane		1.0	
Chlorobenzene		1.0	
Ethylbenezene		1.0	
Bromoform		1.0	
1,1,2,2-Tetrachloroethane		1.0	
1,3-Dichlorobenzene		1.0	
1,4-Dichlorobezene		1.0	
1,2-Dichlorobenzene		1.0	
Sum of 624 Analytes		100.0	
608 Pesticides	ug/L	ug/L	ug/L
alpha BHC	10.0	0.003	
beta BHC	20.0	0.006	
delta BHC	10.0	0.010	
gamma BHC	10.0	0.003	
Heptachlor	8.0	0.022	
Aldrin	8.0	0.018	
Heptachlor Epoxide	9.0	0.009	
4,4-DDE	20.0	0.005	
Methoxychlor	18.0	0.007	
Metals	mg/L	mg/L	mg/L
Antimony	0.1	0.009	< 0.009
Boron	4.00	0.200	0.653
Chromium	5.33	0.011	< 0.011
Cyanide(T)	2.0	0.005	0.010
Other	mg/L	mg/L	mg/L
Total Phenolics	NA	0.005	< 0.005
TSS	300	4.000	4.800

Legend:
(1) Permit limit @ 662 GPD with maximum daily discharged @ 2500 GPD
(a) Detected in blank
NA Not applicable

WASTE STREAM TECHNOLOGY, INC.
302 Grote Street
Buffalo, NY 14207
(716) 876-5290

Analytical Data Report
Report Date : 11/25/97
Group Number : 9701-1154

Prepared For :
Mr. John Burns
Olin Corporation
P.O. Box 248
1186 Lower River Road NW
Charleston, TN 37310

Site : Frontier Chemical

Field and Laboratory Information

Client Id	WST Lab #	Matrix	Date Sampled	Date Received	Time
GAC II	WS37705	Aqueous	11/6/97	11/11/97	0745
Sample Status Upon Receipt : No irregularities.					

Analytical Services

Analytical Parameters	Number of Samples	Turnaround Time
Total Metals	1	Standard
Cyanide	1	Standard
Phenol	1	Standard
Total Suspended Solids	1	Standard

Report Released By : Daniel W. Voll
Daniel Vollmer, Laboratory QA/QC Officer

ENVIRONMENTAL LABORATORY ACCREDITATION CERTIFICATION NUMBERS
NYSDOH ELAP #11179 NJDEPE #73977 CDHS ELAP #2189

WASTE STREAM TECHNOLOGY

METHODOLOGIES

The specific methodologies employed in obtaining the analytical data reported are indicated on each of the result forms. The method numbers shown refer to the following analytical method references:

Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020, March 1979, Revised 1983, U.S. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.

Federal Register, 40 CFR Part 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. Revised July 1992.

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. Third Edition, Revised September 1994, United States EPA SW-846.

Annual Book of ASTM Standards, Volume II. ASTM, 1916 Race Street, Philadelphia, Pennsylvania 19103.

Standard Methods for the Examination of Water and Wastewater. (18th Edition). American Public Health Association, 1105 18th Street, NW, Washington, D.C. 20036.

Waste Stream Technology, Inc.
Metals Analysis Result Report

Site: FRONTIER CHEMICAL
Date Sampled: 11/06/97
Date Received: 11/11/97

Group Number: 9701-1154
Report Units: mg/L
Matrix: Aqueous

Lab ID Number	WS37705	
Client ID	GAC II	
Date Digested	11/11/97	

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Antimony by GFAA	0.009	< 0.009	11/18/97	EPA 200.9
Chromium by ICP	0.011	< 0.011	11/24/97	EPA 200.7
Boron by ICP	0.200	0.653	11/24/97	EPA 200.7

Waste Stream Technology, Inc.
Cyanide in Water
EPA 335.2

Site: FRONTIER CHEMICAL
Date Sampled: 11/06/97
Date Received: 11/11/97

Group Number: 9701-1154
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS37705	GAC II	11/12/97	0.005	0.010

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Total Recoverable Phenol
EPA 420.1

Site: FRONTIER CHEMICAL
Date Sampled: 11/06/97
Date Received: 11/11/97

Group Number: 9701-1154
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS37705	GAC II	11/18/97	0.005	< 0.005

Waste Stream Technology, Inc.
Total Suspended Solids
EPA 160.2

Site: FRONTIER CHEMICAL
Date Sampled: 11/06/97
Date Received: 11/11/97

Group Number: 9701-1154
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS37705	GAC II	11/12/97	4.0	4.8

WASTE STREAM TECHNOLOGY
302 GROTE STREET
BUFFALO, NY 14207
(716) 876-5290

9701-1154

CHAIN OF CUSTODY RECORD

PROJECT NO: Pendelton - Frontier

SITE NAME:

SAMPLERS (SIGNATURE):

SAMPLE NO.	DATE	TIME	COMP	GRAB	MATRIX	SAMPLE LOCATION	SIZE & NO. OF CONTAINERS	Phenol	Ag Cr + Sb	CN	T.S.S.				PRESERVATIVES	REMARKS
7K06 566	11/6/97	10 am	✓		H_2O	GAC II	1-L Amber	✓							H_2SO_4	WS37705
7K06 567	"	"	✓		"	"	1-L		✓						HNO_3	
7K06 568	"	"	✓		"	"	1-L			✓					NaOH	
7K06 569	"	"	✓		"	"	500ml				✓				Ø	

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
[signature]	11/11/97 7 am	Tony [signature] 11-11-97 0705	Tony [signature]	11/11/97 0745	[signature]
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)

SPECIAL INSTRUCTIONS:

TURNAROUND TIME 10 BD (TP)

USE: REFRIGERATOR # ______ SHELF # ___ ___ GROUP # ______ DUE D ______

November 10,1997

Mr. Frank Nerone
Chief Operator
Niagara County Sewer District #1
7346 Liberty Drive
Niagara Falls, NY 14304

Subject: Analytical Sampling Results (10/10/97 Sample)
Groundwater Discharge Through Pre-Treatment System
Pendleton (Frontier Chemical) Site

Dear Mr. Nerone:

Enclosed for your review are analytical results including our semiannual 624 parameters from the November 10, 1997, monthly sampling event for discharge of collected groundwater from the pre-treatment system. Analytical results for this sampling event are compared against the Permit (#96-11) requirements on the attached Analytical Summary and Daily Flow sheets.

A review of the analytical and flow data shows that all permit parameters are significantly below the stated permit requirements.

This data is being provided for your review and concurrence that all permit parameters are well within their limits. If, following review of the enclosed information, you are not in agreement with the above stated conclusion, please contact me at 423-336-4057 as soon as possible so we may discuss any future monitoring requirements.

Sincerely,

John M. Burns
for the Frontier Chemical - Pendleton Site PRP Group

enclosures: as stated
cc: D. Kummer
Pendleton Site Technical Committee

Frontier Chemical - Pendleton Site
Analytical Summary for WS 001
Permit # 96-11
Groundwater Discharge Point: D 002

218,652 Gallons Discharged Prior To 9/4/97
4,102 Gallons Since Last Report
141 Average Daily Flow Based on 29 days Between Samples

Parameters	Permit Limit	Detection Limits	10/2/97 Sample Results
Treatment System Discharge	GPD		GPD
Discharge Rate(1)	662		
624 Analytes	ug/L	ug/L	ug/L
Toluene	10.0	1.0	1.0
1,2-Dichloroethane	10.0	1.0	1.0
4-Methyl-2-Pentanone	10.0	5.0	5.0
Vinyl Chloride	10.0	2.0	2.0
Methylene Chloride	10.0	2.8	2.8
trans-1,2-Dichloroethene	10.0	1.0	1.0
1,1,1-Trichloroethane	10.0	1.0	1.0
Trichloroethene	10.0	1.0	1.0
Benzene	10.0	1.0	1.0
Chloromethane		2.0	2.0
Bromomethane		2.0	2.0
Chloroethane		2.0	2.0
Chloroform		1.0	1.0
Carbon Tetrachloride		1.0	1.0
1,1-Dichloroethene		1.0	1.0
Trichlorofluoromethane		2.0	2.0
1,1-Dichloroethane		1.0	1.0
1,2-Dichloropropane		1.0	1.0
Bromodichloromethane		1.0	1.0
2-Chloroethylvinyl ether		2.0	2.0
cis-1,3-Dichloropropene		1.0	1.0
trans-1,3-Dichloropropene		1.0	1.0
1,1,2-Trichloroethane		1.0	1.0
Tetrachloroethene		1.2	1.2
Dibromochloromethane		1.0	1.0
Chlorobenzene		1.0	1.0
Ethylbenezene		1.0	1.0
Bromoform		1.0	1.0
1,1,2,2-Tetrachloroethane		1.0	1.0
1,3-Dichlorobenzene		1.0	1.0
1,4-Dichlorobezene		1.0	1.0
1,2-Dichlorobenzene		1.0	1.0
Sum of 624 Analytes		100.0	15.8
608 Pesticides	ug/L	ug/L	ug/L
alpha BHC	10.0	0.003	0.003
beta BHC	20.0	0.006	0.006
delta BHC	10.0	0.010	0.010
gamme BHC	10.0	0.003	0.003
Heptachlor	8.0	0.022	0.022
Aldrin	8.0	0.018	0.018
Heptachlor Epoxide	9.0	0.009	0.009
4,4-DDE	20.0	0.005	0.005
Methoxychlor	18.0	0.007	0.007
Metals	mg/L	mg/L	mg/L
Antimony	0.1	0.009	< 0.009
Boron	4.00	0.200	0.642
Chromium	5.33	0.011	< 0.011
Cyanide(T)	2.0	0.005	< 0.005
Other	mg/L	mg/L	mg/L
Total Phenolics	NA	0.005	< 0.005
TSS	300	4.000	< 4.000

Legend
(1) Permit limit @ 662 GPD with maximum daily discharged @ 2500 GPD
(a) Detected in blank
NA Not applicable

DAILY FLOW DATA - PENDLETON SITE
OCTOBER 1997

DATE	TOTALIZER READING	DAILY FLOW	
9/30/97	222654	50	avg
10/1/97		50	avg
10/2/97	222754	191	
10/3/97	222945	156	
10/4/97	223101	7	
10/5/97	223108	295	
10/6/97	223403	273	
10/7/97		273	
10/8/97	223949	105	
10/9/97	224054	54	
10/10/97	224108	440	
10/11/97	224548	124	
10/12/97	224672	102	
10/13/97	224774	154	
10/14/97	224928	104	
10/15/97	225032	130	avg
10/16/97		130	avg
10/17/97	225291	104	
10/18/97	225395	129	avg
10/19/97		129	avg
10/20/97	225653	104	
10/21/97	225757	104	
10/22/97	225861	104	
10/23/97	225965	149	
10/24/97	226114	112	
10/25/97	226226	105	
10/26/97	226331	130	avg
10/27/97		130	avg
10/28/97	226591	162	
10/29/97	226753	104	
10/30/97	226857	103	
10/31/97	226960		
AVERAGE DAILY FLOW IN GALLONS		142	

	= DRY VAULT GROUNDWATER RELIEF		
	10/3/97	260	gallons
	10/10/97	356	gallons
	TOTAL GALLONS	616	

avg =flow between data points divided by days of missing data
avg =(222754-222654)/2 or 50 gallons per day for data between 9/30/97 AND 10/2/97

WASTE STREAM TECHNOLOGY, INC.
302 Grote Street
Buffalo, NY 14207
(716) 876-5290

Analytical Data Report
Report Date : 10/17/97
Group Number : 9701-991

Prepared For :
Mr. John Burns
Olin Corporation
P.O. Box 248
1186 Lower River Road NW
Charleston, TN 37310

Site : Frontier Chemical - Pendelton

Field and Laboratory Information

Client Id	WST Lab #	Matrix	Date Sampled	Date Received	Time
7J02560-7J02565	WS36793	Aqueous	10/2/97	10/3/97	1030
Sample Status Upon Receipt : No irregularities.					

Analytical Services

Analytical Parameters	Number of Samples	Turnaround Time
624	1	Standard
608	1	Standard
Metals	1	Standard
Cyanide	1	Standard
Phenol	1	Standard
Total Suspended Solids	1	Standard

Report Released By : Daniel W. Vollmer
Daniel Vollmer, Laboratory QA/QC Officer

ENVIRONMENTAL LABORATORY ACCREDITATION CERTIFICATION NUMBERS
NYSDOH ELAP #11179 NJDEPE #73977 CDHS ELAP #2189

WASTE STREAM TECHNOLOGY

METHODOLOGIES

The specific methodologies employed in obtaining the analytical data reported are indicated on each of the result forms. The method numbers shown refer to the following analytical method references:

Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020, March 1979, Revised 1983, U.S. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.

Federal Register, 40 CFR Part 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. Revised July 1992.

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. Third Edition, Revised September 1994, United States EPA SW-846.

Annual Book of ASTM Standards, Volume II. ASTM, 1916 Race Street, Philadelphia, Pennsylvania 19103.

Standard Methods for the Examination of Water and Wastewater. (18th Edition). American Public Health Association, 1105 18th Street, NW, Washington, D.C. 20036.

ORGANIC DATA QUALIFIERS

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicates the presence of a compound that meets identification criteria, but the result is less than the sample quantitation limit but greater than zero.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as the sample.

E - This flag identifies all compounds whose concentrations exceed the calibration range of the GC/MS instrument or that specific analysis.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor.

G - Matrix spike recovery is greater than the expected upper limit of analytical performance.

L - Matrix spike recovery is less than the expected lower limit of analytical performance.

- Indicates that a surrogate recovery was found to be outside the expected limits of analytical performance.

$ - Indicates that the surrogate compound was diluted out because the sample had to be diluted to obtain analytical results and a recovery could not be calculated.

(%) Indicates that the compound is a surrogate and the values reported for these compounds are in percent recovery. The quality control recovery limits (QC Limits) are indicated in the detection limit column.

Waste Stream Technology, Inc.

40 CFR Part 136 Method 624

EPA 624

Site: FRONTIER CHEMICAL - PENDELTON
Date Sampled: 10/02/97
Date Received: 10/03/97

Group Number: 9701-991
Report Units: ug/L
Matrix: Aqueous

Lab ID Number	WS36793
Client ID	7J02560-7J02565
Date Extracted	NA
Date Analyzed	10/07/97

Compound	Detection Limit/ QC Limits (%)	Result	Q
chloromethane	2.0	2.0	U
vinyl chloride	2.0	2.0	U
bromomethane	2.0	2.0	U
chloroethane	2.0	2.0	U
Trichlorofluoromethane	2.0	2.0	U
1,1-dichloroethene	1.0	1.0	U
methylene chloride	2.8	2.8	U
trans-1,2-dichloroethene	1.0	1.0	U
1,1-dichloroethane	1.0	1.0	U
chloroform	1.0	1.0	U
1,1,1-trichloroethane	1.0	1.0	U
carbon tetrachloride	1.0	1.0	U
benzene	1.0	1.0	U
1,2-dichloroethane	1.0	1.0	U
trichloroethene	1.0	1.0	U
1,2-dichloropropane	1.0	1.0	U
bromodichloromethane	1.0	1.0	U
2-chloroethylvinyl ether	2.0	2.0	U
cis-1,3-dichloropropene	1.0	1.0	U
toluene	1.0	1.0	U
trans-1,3-dichloropropene	1.0	1.0	U
1,1,2-trichloroethane	1.0	1.0	U
tetrachloroethene	1.2	1.2	U
dibromochloromethane	1.0	1.0	U
chlorobenzene	1.0	1.0	U
ethylbenzene	1.0	1.0	U
bromoform	1.0	1.0	U
1,1,2,2-tetrachloroethane	1.0	1.0	U
1,3-dichlorobenzene	1.0	1.0	U
1,4-dichlorobenzene	1.0	1.0	U
1,2-dichlorobenzene	1.0	1.0	U
1,2-Dichloroethane-d4 (%)	76-114	104.0	
Toluene-d8 (%)	88-110	110.0	
Bromofluorobenzene (%)	86-115	115.0	

Dilution Factor 1

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.

40 CFR 136 Method 608 Pest-PCBs

EPA 608

Site: FRONTIER CHEMICAL - PENDELTON
Date Sampled: 10/02/97
Date Received: 10/03/97

Group Number: 9701-991
Report Units: ug/L
Matrix: Aqueous

Lab ID Number	WS36793	
Client ID	7J02560-7J02565	
Date Extracted	10/06/97	
Date Analyzed	10/06/97	

Compound	Detection Limit/ QC Limits (%)	Result	Q
alpha-BHC	0.003	0.003	U
beta-BHC	0.006	0.006	U
gamma-BHC	0.003	0.003	U
delta-BHC	0.010	0.010	U
heptachlor	0.022	0.022	U
aldrin	0.018	0.018	U
heptachlor epoxide	0.009	0.009	U
endosulfan I	0.005	0.005	U
dieldrin	0.005	0.005	U
4,4-DDE	0.005	0.005	U
endrin	0.012	0.012	U
endosulfan II	0.006	0.006	U
4,4'-DDD	0.005	0.005	U
endrin aldehyde	0.009	0.009	U
endosulfan sulfate	0.065	0.065	U
4,4'-DDT	0.020	0.020	U
chlordane	0.075	0.075	U
toxaphene	0.338	0.338	U
aroclor 1016	0.294	0.294	U
aroclor 1221	0.251	0.251	U
aroclor 1232	0.414	0.414	U
aroclor 1242	0.196	0.196	U
aroclor 1248	0.100	0.100	U
aroclor 1254	0.057	0.057	U
aroclor 1260	0.065	0.065	U
Tetrachloro-m-xylene (%)	60-150	88.200	
Decachlorobiphenyl (%)	60-150	111.000	

Dilution Factor 1

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Metals Analysis Result Report

Site: FRONTIER CHEMICAL - PENDELTON
Date Sampled: 10/02/97
Date Received: 10/03/97

Group Number: 9701-991
Report Units: mg/L
Matrix: Aqueous

Lab ID Number	WS36793
Client ID	7J02560-7J02565
Date Digested	10/06/97

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Antimony by GFAA	0.009	< 0.009	10/14/97	EPA 200.9
Boron by ICP	0.200	0.642	10/16/97	EPA 200.7
Chromium by ICP	0.011	< 0.011	10/16/97	EPA 200.7

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.

Metals Method Blank Analysis Result Report

Site: FRONTIER CHEMICAL - PENDELTON
Date Sampled: NA
Date Received: NA

Group Number: 9701-991
Report Units: PPM

Lab ID Number	MB100697-HP1
Client ID	NA
Date Digested	10/06/97

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Sb Method Blank	0.009	< 0.009	10/14/97	EPA 200.9
B Method Blank	0.200	< 0.200	10/16/97	EPA 200.7
Cr Method Blank	0.011	< 0.011	10/16/97	EPA 200.7

MB denotes Method Blank
NA denotes Not Applicable

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Cyanide in Water
EPA 335.2

Site: FRONTIER CHEMICAL - PENDELTON
Date Sampled: 10/02/97
Date Received: 10/03/97

Group Number: 9701-991
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS36793	7J02560-7J02565	10/07/97	0.005	< 0.005

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Total Recoverable Phenol
EPA 420.1

Site: FRONTIER CHEMICAL - PENDELTON
Date Sampled: 10/02/97
Date Received: 10/03/97

Group Number: 9701-991
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS36793	7J02560-7J02565	10/13/97	0.005	< 0.005

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Total Suspended Solids
EPA 160.2

Site: FRONTIER CHEMICAL - PENDELTON
Date Sampled: 10/02/97
Date Received: 10/03/97

Group Number: 9701-991
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS36793	7J02560-7J02565	10/06/97	4.0	< 4.0

WASTE STREAM TECHNOLOGY
302 GROTE STREET
BUFFALO, NY 14207
(716) 876-5290

9701 - 9911

CHAIN OF CUSTODY RECORD

PROJECT NO: E 414

SITE NAME: Frontier Pendelton

SAMPLERS (SIGNATURE): James Reed

SAMPLE NO.	DATE	TIME	COMP	GRAB	MATRIX	SAMPLE LOCATION	SIZE & NO. OF CONTAINERS	Phenol	BC Gr x 5d	CN	T.S.S.	Pest 608	VOA 624		PRESERVATIVES	REMARKS
1	10/3/97		✓		H_2O	7J02560	1-L	✓							H_2SO_4	WS36793
2	↓		✓		↓	7J02561	1-L		✓						HNO_3	
3	↓		✓		↓	7J02562	1-L			✓					NaOH	
4	↓		✓		↓	7J02563	1-500ml				✓				Ø	
5	↓		✓		↓	7J02564	1-L Amber					✓			Ø	
6	↓			✓	↓	7J02565	2-40ml						✓		HCL	

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
C. E. Dixon	10/3/97 10:00 AM	C. Fankey	C. Fankey	10/3/97 12:30	[signature]
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)

SPECIAL INSTRUCTIONS:

TURNAROUND TIME 10 BD (GP)

LAL REFRIGERATOR # ______ SHELF # ______ GROUP # ______ DUE DATE ______

October 9. 1997

Mr. Frank Nerone
Chief Operator
Niagara County Sewer District #1
7346 Liberty Drive
Niagara Falls, NY 14304

Subject: Analytical Sampling Results (9/4/97 Sample)
Groundwater Discharge Through Pre-Treatment System
Pendleton (Frontier Chemical) Site

Dear Mr. Nerone:

Enclosed for your review are analytical results from the September 4, 1997, monthly sampling event for discharge of collected groundwater from the pre-treatment system. Analytical results for this sampling event are compared against the Permit (#96-11) requirements on the attached Analytical Summary and Daily Flow sheets.

A review of the analytical and flow data shows that all permit parameters are significantly below the stated permit requirements.

This data is being provided for your review and concurrence that all permit parameters are well within their limits. If, following review of the enclosed information, you are not in agreement with the above stated conclusion, please contact me at 423-336-4057 as soon as possible so we may discuss any future monitoring requirements.

Sincerely,

John M. Burns

John M. Burns
for the Frontier Chemical - Pendleton Site PRP Group

enclosures: as stated
cc: D. Kummer
Pendleton Site Technical Committee

Frontier Chemical - Pendleton Site
Analytical Summary for WS 001
Permit # 96-11
Groundwater Discharge Point: D 002

213 819 Gallons Discharged Prior To 8/7/97
4 833 Gallons Since Last Report
167 Average Daily Flow Based on 29 days Between Samples

Parameters Treatment System Discharge	Permit Limit GPD	Detection Limits		9/4/97 Sample Results GPD
Discharge Rate(1)	662			
624 Analytes	ug/L	ug/L		ug/L
Toluene	10.0	1.0		
1,2-Dichloroethane	10.0	1.0		
4-Methyl-2-Pentanone	10.0	5.0		
Vinyl Chloride	10.0	2.0		
Methylene Chloride	10.0	2.8		
trans-1,2-Dichloroethene	10.0	1.0		
1,1,1-Trichloroethane	10.0	1.0		
Trichloroethene	10.0	1.0		
Benzene	10.0	1.0		
Chloromethane		2.0		
Bromomethane		2.0		
Chloroethane		2.0		
Chloroform		1.0		
Carbon Tetrachloride		1.0		
1,1-Dichloroethene		1.0		
Trichlorofluoromethane		2.0		
1,1-Dichloroethane		1.0		
1,2-Dichloropropane		1.0		
Bromodichloromethane		1.0		
2-Chloroethylvinyl ether		2.0		
cis-1,3-Dichloropropene		1.0		
trans-1,3-Dichloropropene		1.0		
1,1,2-Trichloroethane		1.0		
Tetrachloroethene		1.2		
Dibromochloromethane		1.0		
Chlorobenzene		1.0		
Ethylbenezene		1.0		
Bromoform		1.0		
1,1,2,2-Tetrachloroethane		1.0		
1,3-Dichlorobenzene		1.0		
1,4-Dichlorobezene		1.0		
1,2-Dichlorobenzene		1.0		
Sum of 624 Analytes		100.0		
608 Pesticides	ug/L	ug/L		ug/L
alpha BHC	10.0	0.003		
beta BHC	20.0	0.006		
delta BHC	10.0	0.009		
gamma BHC	10.0	0.003		
Heptachlor	8.0	0.020		
Aldrin	8.0	0.017		
Heptachlor Epoxide	9.0	0.008		
4,4-DDE	20.0	0.005		
Methoxychlor	18.0	0.003		
Metals	mg/L	mg/L		mg/L
Antimony	0.1	0.009	<	0.009
Boron	4.00	0.200		0.740
Chromium	5.33	0.011	<	0.011
Cyanide(T)	2.0	0.005		0.015
Other	mg/L	mg/L		mg/L
Total Phenolics	NA	0.005	<	0.005
TSS	300	4.000	<	4.000

Legend:
(1) Permit limit @ 662 GPD with maximum daily discharged @ 2500 GPD
(a) Detected in blank
NA Not applicable

DAILY FLOW DATA - PENDLETON SITE
SEPTEMBER 1997

DATE	TOTALIZER READING	DAILY FLOW	
9/1/97		54	avg
9/2/97	218337	51	
9/3/97	218388	264	
9/4/97	218652	103	
9/5/97	218755	154	
9/6/97	218909	102	
9/7/97	219011	257	
9/8/97	219268	154	
9/9/97	219422	51	avg
9/10/97		51	avg
9/11/97	219524	154	
9/12/97	219678	353	
9/13/97	220031	155	
9/14/97	220186	103	
9/15/97	220289	102	
9/16/97	220391	155	
9/17/97	220546	102	
9/18/97	220648	103	
9/19/97	220751	154	
9/20/97	220905	157	
9/21/97	221062	258	
9/22/97	221320	104	
9/23/97	221424	104	
9/24/97	221528	95	avg
9/25/97		95	avg
9/26/97	221718	416	
9/27/97	222134	103	
9/28/97	222237	153	
9/29/97	222390	264	
9/30/97	222654		
AVERAGE DAILY FLOW IN GALLONS		151	

	= DRY VAULT GROUNDWATER RELIEF		
	9/12/97	243	gallons
	9/26/97	339	gallons
	TOTAL GALLONS	582	

avg =flow between data points divided by days of missing data
avg =(219524-219422)/2 or 51 gallons per day for data between 9/9/97 AND 9/11/97

WASTE STREAM TECHNOLOGY, INC.

302 Grote Street
Buffalo, NY 14207
(716) 876-5290

Analytical Data Report

Report Date : 09/19/97
Group Number : 9701-841

Prepared For :
Mr. John Burns
Olin Corporation
P.O. Box 248
1186 Lower River Road NW
Charleston, TN 37310

Site : Frontier Chemical

Field and Laboratory Information

Client Id	WST Lab #	Matrix	Date Sampled	Date Received	Time
GAC II	WS36182	Aqueous	9/4/97	9/5/97	0830
Sample Status Upon Receipt : No irregularities.					

Analytical Services

Analytical Parameters	Number of Samples	Turnaround Time
Cyanide	1	Standard
Phenol	1	Standard
Total Metals	1	Standard
Total Suspended Solids	1	Standard

Report Released By : Daniel W. Vollmer

Daniel Vollmer, Laboratory QA/QC Officer

ENVIRONMENTAL LABORATORY ACCREDITATION CERTIFICATION NUMBERS
NYSDOH ELAP #11179 NJDEPE #73977 CDHS ELAP #2189

WASTE STREAM TECHNOLOGY

METHODOLOGIES

The specific methodologies employed in obtaining the analytical data reported are indicated on each of the result forms. The method numbers shown refer to the following analytical method references:

Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020, March 1979, Revised 1983, U.S. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.

Federal Register, 40 CFR Part 136: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. Revised July 1992.

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. Third Edition, Revised September 1994, United States EPA SW-846.

Annual Book of ASTM Standards, Volume II. ASTM, 1916 Race Street, Philadelphia, Pennsylvania 19103.

Standard Methods for the Examination of Water and Wastewater. (18th Edition). American Public Health Association, 1105 18th Street, NW, Washington, D.C. 20036.

Waste Stream Technology, Inc.
Cyanide in Water
EPA 335.2

Site: FRONTIER CHEMICAL
Date Sampled: 09/04/97
Date Received: 09/05/97

Group Number: 9701-841
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS36182	GAC II	09/10/97	0.005	0.015

Waste Stream Technology, Inc.
Total Recoverable Phenol
EPA 420.1

Site: FRONTIER CHEMICAL
Date Sampled: 09/04/97
Date Received: 09/05/97

Group Number: 9701-841
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS36182	GAC II	09/09/97	0.005	< 0.005

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Metals Analysis Result Report

Site: FRONTIER CHEMICAL
Date Sampled: 09/04/97
)ate Received: 09/05/97

Group Number: 9701-841
Report Units: mg/L
Matrix: Aqueous

Lab ID Number	WS36182	
Client ID	GAC II	
Date Digested	09/09/97	

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Antimony by GFAA	0.009	< 0.009	09/09/97	EPA 200.9
Boron by ICP	0.200	0.740	09/19/97	EPA 200.7
Chromium by ICP	0.011	< 0.011	09/19/97	EPA 200.7

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.

Metals Method Blank Analysis Result Report

Site: FRONTIER CHEMICAL
Date Sampled: NA
ate Received: NA

Group Number: 9701-841
Report Units: PPM

Lab ID Number	MB090997-HP1
Client ID	NA
Date Digested	09/09/97

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Sb Method Blank	0.009	< 0.009	09/09/97	EPA 200.9
B Method Blank	0.200	< 0.200	09/19/97	EPA 200.7
Cr Method Blank	0.011	< 0.011	09/19/97	EPA 200.7

MB denotes Method Blank
NA denotes Not Applicable

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
Total Suspended Solids
EPA 160.2

Site: FRONTIER CHEMICAL
Date Sampled: 09/04/97
Date Received: 09/05/97

Group Number: 9701-841
Report Units: mg/L
Matrix: Aqueous

WST Lab ID	Client ID	Analysis Date	Detection Limit	Result
WS36182	GAC II	09/10/97	4.0	< 4.0

WASTE STREAM TECHNOLOGY

WASTE STREAM TECHNOLOGY

302 GROTE STREET
BUFFALO, NY 14207
(716) 876-5290

9701 - 841

CHAIN OF CUSTODY RECORD

PROJECT NO:

SITE NAME: Frontier

SAMPLERS (SIGNATURE): James Reed

SAMPLE NO.	DATE	TIME	COMP	GRAB	MATRIX	SAMPLE LOCATION	SIZE & NO. OF CONTAINERS	Phenol	Br, Cr, + Sb	CN	T.S.S.			PRESERVATIVES	REMARKS
7I 04556	9/4/97	10A	✓		H_2O	GAC II	1-L	✓						H_2SO_4	WS360182
7I 04557	9/4/97	10A	✓		H_2O	"	1-L		✓					HNO_3	
7I 04558	9/4/97	10A	✓		H_2O	"	1-L			✓				NaOH	
7I 04559	9/4/97	10A	✓		H_2O	"	1-500ml				✓			Ø	

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
[signature]	9/5/97 7:55	Tony [signature]	Tony [signature]	9/5/97 8:30	[signature]
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)

SPECIAL INSTRUCTIONS:

TURNAROUND TIME ______

LAB REFRIGERATOR # ______ SHELF # ______ GROUP # ______ DUE DATE ______

Operation, Maintenance, and Monitoring Activities
Frontier Chemical - Pendleton Site
March 1998

Date	Event	Response
September 4, 1997	NCSD Monthly Sampling	Completed
September 5, 1997	Front Gate Damaged	Repaired by Fox Fence
September 9, 1997	Maintenance Work Items	Completed work items
September 16, 1997	Autodialer problems continue	Order replacement board
September 30, 1997	Piezometer Well Levels Measurements	Completed by O'Brien & Gere
October 2, 1997	NCSD Monthly Sampling	Completed
October 6, 1997	High Pressure on pump discharge	Changed filter bags
October 28, 1997	Site Inspection	NYSDEC
October 31, 1997	Bracing for filter required by inspection	Installed
November 3, 1997	Telephone out of service	Cut cable off site
November 6, 1997	NCSD Monthly Sampling	Completed
November 7, 1997	Autodialer problems	Completed
December 2, 1997	NCSD Monthly Sampling	Completed
December 31, 1997	Pressure gage not working	Replaced
January 2, 1998	NCSD Monthly Sampling	Completed
January 8, 1998	Quarry Lake Level	Lake filling from back flow of Bull Creek
January 16, 1998	Broken Nipple on Filters	Replaced
January 22, 1998	Chart Recorder & Exhaust Fan	Changed chart recorder from 7 to 14 day recording cycle; removed broken exhaust fan
January 26, 1998	Level transmitter & GFI	Calibrated level transmitter; replace faulty GFI.
February 5, 1998	NCSD Monthly Sampling	Completed
February 19, 1998	Exhaust Fan	Installed new exhaust fan
February 23, 1998	Groundwater Sampling and Piezometer measurements & Site Inspection	Started sampling
February 24, 1998	Site Inspection by NYSDEC	Completed
February 26, 1998	Groundwater Sampling and Piezometer measurements	Completed by O'Brien and Gere

ATTACHMENT C

Frontier Chemical - Pendleton Site
March 1998

Attachment C – Frontier Chemical – Pendleton Site; Quarterly Ground Water Elevation and Semi-Annual Ground Water Analysis; March 1998

Frontier Chemical-Pendleton Site; Quarterly Ground Water Measurements, September 1997

Frontier Chemical – Pendleton Site; Semi-Annual Ground Water; March 1998

O'BRIEN & GERE
ENGINEERS, INC.

November 3, 1997

Mr. John M. Burns
Technical Committee Chair
P.O. Box 248
1186 Lower River Road
Charleston, Tennessee 37310

Re: Frontier Chemical - Pendleton Site

File: 5829.003 #2

Dear Mr. Burns:

This letter presents the results of the second quarter (September 1997) piezometer/monitoring well inspection and ground water elevation monitoring completed at 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 second quarter report presents a discussion of the following:

- Piezometer/monitoring well inspection
- Hydraulic evaluation of the capped area and collection trench

These items are described in the following sections.

Piezometer/monitoring well inspection

The piezometer/monitoring well inspection was conducted on September 30, 1997 and included 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 inspection forms are included in Attachment A. During the inspection, the following deficiencies were noted:

Piezometers

- Piezometers P-4 and P-7 are installed with flush-mounted protective covers. The top of the 2-inch PVC risers should be lowered by approximately 3 inches so that there is enough clearance to install the locking expansion plugs beneath the flush-mounted covers.
- As previously noted, piezometer P-6 is currently angled 20 to 30 degrees from vertical.

Monitoring wells

- The concrete pads of monitoring wells URS-9I and URS-9D have deteriorated. New concrete pads should be installed.

- Monitoring wells URS-14I and URS-14D should have fill material installed around the concrete pads.

Hydraulic evaluation of the capped area and collection trench

In accordance with the O&M Manual, a complete round of static ground water elevations was collected from 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 were collected on September 30, 1997. The ground water elevations measured in the piezometers and standpipe are summarized on Table 1 and illustrated on Figure 1. The ground water elevations measured in the monitoring wells are summarized on Table 2. These measurements are the second 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) indicates that a slight outward hydraulic gradient exists in the southern, eastern, and western portions of the capped area. A slight inward hydraulic gradient exists in the northeast portion of the capped area, as the ground water elevation at P-8 (installed outside the capped area) is slightly higher than the ground water elevation at P-7 (installed within the capped area). As stated in the semi-annual ground water monitoring report, due to the low permeability of the native 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 west 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 west 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.

The next quarterly sampling event has tentatively been scheduled for early December. During this event ground water elevations will be measured in the piezometers, standpipe, and ground water monitoring wells. Ground water samples will also be collected from the ten monitoring wells specified in the O&M Manual. A representative of O'Brien & Gere will notify the NYSDEC and PRP Group at least one week prior to sampling.

If you have any questions, please do not hesitate to contact me at your convenience.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

Stephen W. Anagnost, P.E.
Managing Engineer

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Tables

Table 1

Frontier Chemical - Pendleton Site

Piezometer Elevation Summary Table

Piezometer	Location	Top of Riser Elev. (ft)	Top of Cover Elev. (ft)	Depth (ft below riser)	Screened Elev. (ft)	Ground water elevation (ft) 6/24/97	Ground water elevation (ft) 9/30/97
P-1	(O) East portion of	583.21	583.30	16.4	576.8 - 566.8	579.54	577.09
P-2	(I) capped area	582.90	583.20	15.7	577.2 - 567.2	579.60	579.24
P-3	(I) Center of capped area	606.33	606.64	39.7	586.6 - 566.6	580.36	580.38
P-4	(I) Adjacent to	583.68	583.85	17.0	576.7 - 566.7	577.15	577.43
SP-1	(T) Quarry Lake	579.86	580.07	15.0	bop = 564.9	<564.9	<564.9
P-5	(O) Southern portion	583.05	583.55	15.5	577.6 - 567.6	576.87	577.25
P-6	(I) of capped area	584.45	584.60	16.2	578.3 - 568.3	578.77	579.17
P-7	(I) Northern portion	581.84	582.00	16.8	575.0 - 565.0	578.33	578.62
P-8	(O) of capped area	582.83	583.00	17.3	575.5 - 565.5	577.76	578.87

Notes:

1. Elevation based on USGS Datum.
2. bop = bottom of pipe.
3. O = piezometer located outside of capped area.
4. I = piezometer located inside capped area.
5. T = standpipe located within the ground water collection trench.

Table 2

Frontier Chemical - Pendleton Site

Monitoring Well Elevation Summary Table

Monitoring Well	Location	Top of Riser Elev. (ft)	Ground Elev. (ft)	Depth (ft below riser)	Screened Elev. (ft)	Ground water elevation (ft)	
						6/24/97	9/30/97
URS-14I	Upgradient well nest	581.14	580.84	31.0	550.1 - 555.1	577.15	578.77
URS-14D	in church parking lot	580.71	580.85	41.5	539.2 - 544.2	575.50	574.28
URS-9I	Southern well nest	581.68	579.90	46.0	535.6 - 540.6	575.38	574.22
URS-9D	along Town Line Road	580.80	579.00	46.5	534.3 - 539.3	575.36	574.21
85-5R	Middle well nest	580.84	578.70	40.0	540.9 - 542.9	574.70	573.97
URS-5D	along Town Line Road	580.60	578.00	49.9	530.8 - 535.8	574.73	574.02
85-7R	North well nest	577.90	576.60	27.8	550.2 - 552.2	575.09	574.21
URS-7D	along Town Line Road	579.35	576.50	39.9	539.5 - 544.5	575.15	574.35
88-12C	Well nest outside northeast	583.12	583.70	31.3	551.8 - 553.8	576.60	574.03
88-12D	portion of capped area	582.87	583.28	54.5	528.4 - 533.4	575.72	574.54

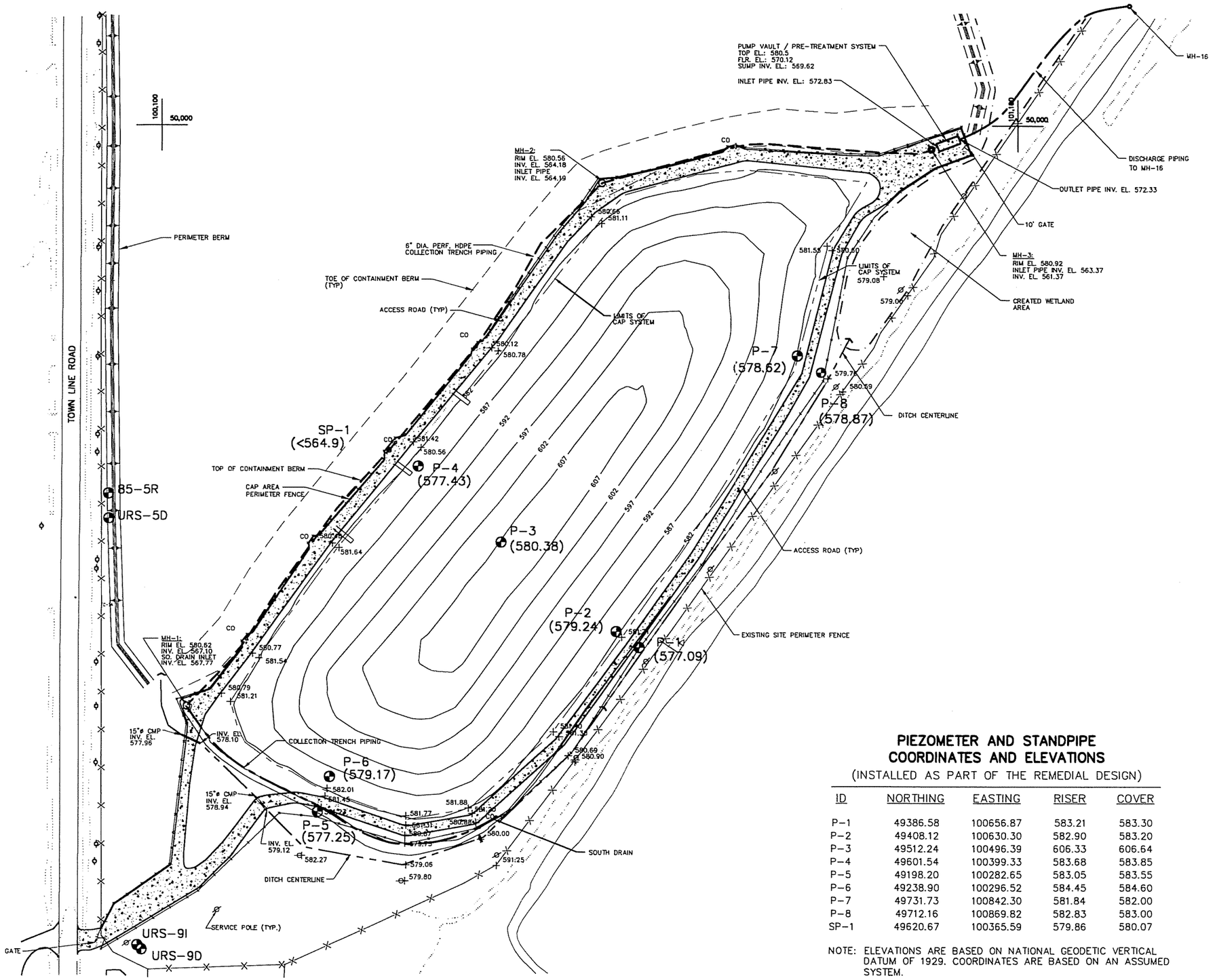
Notes:

1. Elevation based on USGS Datum.
2. NA = not available.

Figures

MWH I:\DIV71\PROJECTS\5829001\DWG\71\056.DWG SF:120 11/4/97

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 (SEPTEMBER 30, 1997)

0 120 240

SCALE IN FEET

FILE NO. 5829.001-056

O'BRIEN & GERE ENGINEERS INC.

Attachment A

Piezometer/monitoring well inspection forms

CALIBRATION DATA SHEET **O'BRIEN & GERE ENGINEERS, INC.**

Equipment Name	PID HNu		
Model Number	PI 101		
Serial Number	101150		
☐ New	Serviced	☒ As Found ☐ As Left	☐ In Tolerance ☐ Out of Tolerance

Routine Calibration Due Date: When used

Standards Used: Isobutylene 100 ppm

Manufactured/Bottled by EIRTECH

Date Shipped 4/18/96

Ref. # 88-45991

☒ **Environmental Conditions are Suitable for Calibration**

TEMPERATURE = 59° ±

ATMOSHPHERIC PRESSURE = 60% Bar. Pressure

Comments: Init Read. Atmospleric - 3.11 / 98 ppm

3.06 / 100 ppm

Final Readings - 101 ppm Isobutylene

This equipment has been calibrated using standards whose accuracies are traceable to the National Institute of Standards & Technology (NIST) within the limits of the Institutes's calibration service.

Calibration Performed By: T. Prawel

Date: 9/30/97

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton NY

Well Identification : P-1

Personnel : TPP

Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	2-inch	4-inch

Depth to Ground Water : 6.12

Well Depth: 16.42

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no	
.. Well covers and locks in good condition and secure ?	yes	no	
3. Is the well stand pipe vertically aligned and secure ?	yes	no	
4. Is the concrete pad and surface seal in good condition ?	yes	no	N/A - Stone
5. Are soils surrounding the well pad eroded ?	yes	no	
6. Is the well casing in good condition ?	yes	no	
7. Is the measuring point on casing well marked ?	yes	no	cut in pvc
8. Is there standing water in the annular space ?	yes	no	@ ground level
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	

COMMENTS: PID - 5.6 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton NY.

Well Identification : P-2

Personnel : TPP

Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing — Above Ground — **Flush Mounted** (circled)

Well Construction — **PVC** (circled) — Stainless Steel

Well Diameter — **2-inch** (circled) — 4-inch

Depth to Ground Water : 3.66

Well Depth: 15.74

WELL INTEGRITY

1. Well identification clearly marked ?	**yes** (circled)	no	
. Well covers and locks in good condition and secure ?	**yes** (circled)	no	
3. Is the well stand pipe vertically aligned and secure ?	**yes** (circled)	no	N/A
4. Is the concrete pad and surface seal in good condition ?	**yes** (circled)	no	
5. Are soils surrounding the well pad eroded ?	yes	**no** (circled)	
6. Is the well casing in good condition ?	**yes** (circled)	no	
7. Is the measuring point on casing well marked ?	**yes** (circled)	no	cut in PVC
8. Is there standing water in the annular space ?	TP² ~~yes~~	**no** (circled)	~~Dry~~ Dry
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A

COMMENTS: PID 3.8 ppm

Well cover good, No Key for Lock

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton, NY

Well Identification : P-3

Personnel : TPP

Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch

Depth to Ground Water : 25.95

Well Depth: 39.73

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	Cut in pvc
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A Flush

COMMENTS: PID - 6 ppm

Well cover good, No key for Lock

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton NY Well Identification : P-4

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	6.25	
Well Depth:	17.04	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	Cut in PVC
8. Is there standing water in the annular space ?	(yes)	no	2"±
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A - Flush

COMMENTS: P.I.D - 3 ppm PVC Riser to high to install protective Cap and lock

Well cover good, No key for lock

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton, N.Y. Well Identification : PS

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	5.80	
Well Depth:	15.57	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	yes	no	N/A - stone
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	cut in pvc
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no	

COMMENTS: PID - 0.6 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton N.Y. Well Identification : P-6

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	5.28	
Well Depth:	16.23	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	yes	(no)	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	cut in pvc
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A - Flush Mount

COMMENTS: PID - 28 ppm

Diff. getting total Depth due to slope of PVC (approx 20° Lean)

Well cover good, No Key for Lock

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton NY. Well Identification : P-7

Personnel : T.P.P. Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	3.22	
Well Depth:	16.74	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
.. Well covers and locks in good condition and secure ?	yes	(no)	
3. Is the well stand pipe vertically aligned and secure ?	yes	no	N/A
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	cut in pvc
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A

COMMENTS: PID - 0 ppm

Flush Mount Well cap, pvc stand to high for protective cap and Lock installation, will need to be cut down and Resurveyed and lock installed

TP2

Well cover good, No key for Lock

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton NY Well Identification : P-8

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch

Depth to Ground Water : 3.96

Well Depth: 17.21

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	yes	no	U/A - Stone
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	cut in PVC
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no	

COMMENTS:

PID - 0.4 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton, NY Well Identification : SP-1

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	2-inch	TP² ~~4-inch~~ 6"
Depth to Ground Water :	Dry	
Well Depth:	15.02 ft	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no Red Paint
. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	TP² ~~yes~~	(no)
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no Red Paint
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	yes	no N/A Flush

COMMENTS: PID - Ø ppm 4" pipe leaning approx 5°-10° away from lake

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton NY

Well Identification : 14 I (middle)

Personnel : TPP

Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	2.37	
Well Depth:	31.10	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	Red Paint
Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	(yes)	(no)	needs fill
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	Red Paint
8. Is there standing water in the annular space ?	(yes)	no	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A - Flush

COMMENTS: PID - 1.5 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton, NY Well Identification : 14D (North)

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	6.43	
Well Depth:	41.60	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	Red Paint
Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	(yes)	(no)	needs fill
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	Red Paint
8. Is there standing water in the annular space ?	(yes)	no	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	N/A - Flush

COMMENTS: PID - 1.5ppm

746
659

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton NY Well Identification : 9-I (North)

Personnel : TPP Date : 9/3/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	7.46	
Well Depth:	46.45	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	Red Paint
Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	yes	(no)	None Present
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	Cut PVC Cap
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	Not noted

COMMENTS: PID - 0 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton, NY Well Identification : 9-D (South)

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch

Depth to Ground Water : 6.59

Well Depth: 50.90

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	Red Paint
Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	yes	no	None noted
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	cut in PVC
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	none noted

COMMENTS: PID - 0 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton, NY Well Identification : 5 S - R

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	6.87	
Well Depth:	38.00'	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	Red Paint
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	Red Paint
8. Is there standing water in the annular space ?	(yes)	no	
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no	

COMMENTS: PID - 0 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton, NY

Well Identification : ~~5~~ 5-D

Personnel : TPP

Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	Stainless Steel
Well Diameter	2-inch	4-inch

Depth to Ground Water : 6.58

Well Depth: 49.85

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	Red Paint
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	Red Paint
8. Is there standing water in the annular space ?	(yes)	no	
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no	

COMMENTS: PID - 0 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton NY Well Identification : 7-R

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	3.69	
Well Depth:	27.72	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no Red Paint
. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no Cut in PVC
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS: PID - 0 ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendleton, NY Well Identification : 7-D

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	5.00	
Well Depth:	39.83	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	Red Paint
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	(yes)	(no)	standing water
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	Cut in PVC cap
8. Is there standing water in the annular space ?	yes	(no)	none noted
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no	

COMMENTS: PID - Ø ppm

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton N.Y. Well Identification : 12-C

Personnel : TPP Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	Above Ground	Flush Mounted
Well Construction	~~PVC~~ TP	Stainless Steel
Well Diameter	2-inch	4-inch
Depth to Ground Water :	9.09	
Well Depth:	31.30	

WELL INTEGRITY

1. Well identification clearly marked ?	yes	no	Red Paint Pen
2. Well covers and locks in good condition and secure ?	yes	no	
3. Is the well stand pipe vertically aligned and secure ?	yes	no	
4. Is the concrete pad and surface seal in good condition ?	yes	no	N/A - Stone
5. Are soils surrounding the well pad eroded ?	yes	no	
6. Is the well casing in good condition ?	yes	no	
7. Is the measuring point on casing well marked ?	yes	no	Red Paint
8. Is there standing water in the annular space ?	yes	no	
9. Is the stand pipe vented at the base to allow drainage ?	yes	no	

COMMENTS: PID - 0.2 ppm

I know 2'x2' concrete pad @ Base of Steel protective Case Burried in stone

MONITORING WELL INTEGRITY CHECKLIST

Site Name: Frontier Chemical Pendelton N.Y.

Well Identification : 12-D

Personnel : T.P.P.

Date : 9/30/97

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	~~PVC~~ TP	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	8.33	
Well Depth:	53.41	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	Red Paint Pen
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	yes	no	N/A stone
5. Are soils surrounding the well pad eroded ?	TP ~~yes~~	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	paint (Red)
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no	

COMMENTS: PID - 0.2 ppm

2'x2' Concrete Base Burried in stone

REPORT

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

Pendleton Site PRP Group

March 1998

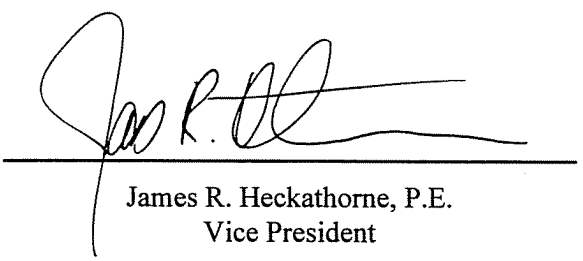
O'BRIEN & GERE
ENGINEERS, INC.

5829.003

REPORT

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

Pendleton Site PRP Group



James R. Heckathorne, P.E.
Vice President

March 1998

O'BRIEN & GERE ENGINEERS, INC.

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1. Introduction

This document is the second 1997/1998 Semi-Annual Ground Water Monitoring Report for the Frontier Chemical - Pendleton Site (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, 1997a), which addresses long-term ground water monitoring at the Site. This Semi-Annual Ground Water Monitoring Report presents a discussion of the following:

- Piezometer/monitoring 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. Piezometer/monitoring well inspection

The piezometer/monitoring well inspection was conducted on February 23, 1998, and included the piezometers (P-1 through P-8), standpipe (SP-1), and ground water monitoring wells (85-5R, URS-5D, 85-7R, URS-7D, URS-9I, URS-9D, 88-12C, 88-12D, URS-14I, and URS-14D) identified as the Site monitoring network in the O&M Manual for the Site.

Results of the inspection indicated that each piezometer and monitoring well was in an acceptable condition for sampling. However, the February 1998 inspection noted similar maintenance issues as those identified in the November 1997 Piezometer/Monitoring Well Inspection and Ground Water Elevation Monitoring Letter Report (O'Brien & Gere Engineers, 1997b):

- Piezometers P-4 and P-7 are installed with flush-mounted protective covers. The tops of the 2-inch PVC risers should be lowered by approximately 3 inches so that there is enough clearance to install the locking expansion plugs beneath the flush-mounted covers.

- As previously noted, piezometer P-6 is currently angled 20 to 30 degrees from vertical.

- The concrete pads of monitoring wells URS-9I and URS-9D have deteriorated. New concrete pads should be installed.

- Monitoring wells URS-14I and URS-14D should have fill material installed around the concrete pads.

It should be noted that these issues are aesthetic in nature and at this time are not affecting the integrity of the piezometers or monitoring wells. February 1998 inspection forms are included 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 (85-5R, URS-5D, 85-7R, URS-7D, URS-9I, URS-9D, 88-12C, 88-12D, URS-14I, and URS-14D). The ground water elevation measurements were collected on February 23, 1998. The surface water elevation of Quarry Lake was also measured on February 23, 1998, by Glynn Geotechnical Engineering, Inc. The ground water elevations measured in the piezometers and standpipe, and in the monitoring wells, are summarized on Tables 1 and 2, respectively. Quarry Lake surface water elevations are summarized on Table 3. As shown on Table 3, Quarry Lake has filled to the design elevation of 578.0 ft. The water level measurements collected on February 23, 1998 are illustrated on Figure 1. These measurements are the third collected since remedial construction was substantially completed in August 1996. The water elevation data was used to evaluate the following:

- Whether an inward hydraulic gradient exists at the site by comparing water level measurements within the capped area (P-2, P-3, P-4, P-6, and P-7) to those measured outside the capped area (P-1, P-5, P-8, SP-1, and Quarry Lake)

- 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.

The data indicates that ground water elevations from the piezometers installed within the capped area (P-2, P-4, P-6, and P-7) are lower than ground water elevations of the piezometers installed outside the capped area (P-1, P-5, and P-8), with the exception of piezometer P-3, installed in the center of the capped area. The data from piezometer P-3 indicates that a slight ground water mound exists in the center of the capped area, since the elevation at P-3 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 addition, the ground water elevation from the standpipe (SP-1) in the ground water collection trench is less than the surface water elevation of Quarry Lake. This data indicates that an inward hydraulic gradient has been established around the capped area. The ground water elevations in the piezometers installed within the capped area (P-2, P-3, P-4, P-6, and P-7) indicate that the overall hydraulic gradient is to the west 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 ground water collection trench vary from 568.80 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.

As discussed in the September 1997 Semi-Annual Ground Water Monitoring Report (O'Brien & Gere Engineers, 1997c) and presented in Appendix F of the Final Remedial 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 dewatering the capped area.

The data collected in February 1998 indicate that an inward hydraulic gradient exists between the containment area and the surrounding area.

The range in time to dewater the capped area presented in the Final Remedial Design Report was directly related to the range in horizontal hydraulic conductivities of subsurface soils previously calculated by Golder Associates and URS Consultants (URS, 1991). The time period of 0.4 years was calculated using a hydraulic conductivity of 1.3×10^{-3} cm/sec, whereas the time period of 33 years was calculated using a hydraulic conductivity of 1.5×10^{-5} cm/sec.

The average daily flow rate to the 1517 ft length ground water collection trench in 1997 and early 1998 was calculated to be 170 gallons/day (0.12 gpm). This flow rate is indicative of materials having a low permeability. Using the equation utilized in the Final Remedial Design Report (O'Brien & Gere Engineers, 1995) for calculating the yield to the collection trench, the hydraulic conductivity adjacent to the ground water collection trench was calculated to be 3.3×10^{-6} cm/sec. Using the flow rate to the collection trench and the amount of ground water beneath the capped area, it is estimated that approximately 110 years will be required to dewater the containment area. However, the amount of water present within the capped area has no effect on the effectiveness of the containment, since an inward hydraulic has been established adjacent to the capped area. Hydraulic evaluation calculations are included in Appendix B.

1.3. Ground water sampling and chemistry

Between February 23 and 25, 1998, the second round of post-closure ground water samples was collected in accordance with the protocols presented in the O&M Manual. Ground water samples were obtained from the ten ground water monitoring wells identified for sampling in the O&M Manual (85-5R, URS-5D, 85-7R, URS-7D, URS-9I, URS-9D, 88-12C, 88-12D, URS-14I, and URS-14D).

Due to high turbidity levels found in ground water samples collected during the September 1997 sampling event, a low-flow ground water sampling method was used during the February 1998 sampling event to reduce the turbidity levels in the ground water samples. The low-flow ground water sampling method consisted of an in-line flow meter capsule, dedicated Waterra tubing, Redi-flow Grundfos Pump which was decontaminated between each monitoring well, a water level probe, and a generator. During low-flow sampling, pH, specific conductance, temperature, oxidation-reduction potential (redox), dissolved oxygen (DO), and turbidity

were monitored at 3 to 5 minute intervals. Once the parameters equilibrated, samples were collected. If a monitoring well could not sustain a minimal flow rate of 50ml/min over a 2 hour period, samples were collected after 2 hours. This was the case for monitoring well URS-14I.

Following sample collection, 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

Ground water sampling logs and chain of custody forms are included in Appendix C.

Purge water generated during sampling 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.

The laboratory analytical data is currently being validated by Data Validation Services of North Creek, New York. The validation is being 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. Data validation has been completed for the VOCs and SVOCs analytical results for all wells, and for the PCBs/pesticides analytical results for wells 85-5R, URS-5D, 88-12C, 88-12D, and URS-14I. Validated analytical results for these samples are summarized on Table 4. Results of the data validation completed to date indicate that the samples validated were processed and analyzed in compliance with protocol requirements, and with adherence to quality criteria.

Following data validation of the metals analytical results for all wells and the PCBs/pesticides analytical results for wells URS-9I, URS-9D, 85-7R, URS-7D, and URS-14D, Table 4 will be revised, if required, and reissued

along with a copy of the validation report. Preliminary analytical results for the metals for all wells and the PCBs/pesticides for wells URS-9I, URS-9D, 85-7R, URS-7D, and URS-14D, are included in Table 4.

Results of the ground water analyses, along with a comparison of the results with New York State Class GA Standards, are summarized on Table 4. The New York State Class GA Standards presented on Table 4 have been revised to reflect revisions to the New York State water quality standards (NYSDEC, 1998). The data base will be updated with data from future sampling events, and ground water standards will be reviewed annually to evaluate whether standards have been revised.

As specified in the O&M Manual, statistical analyses of the ground water chemistry data have been completed. A preliminary exploratory data analysis, using univariate statistics in SAS®, was performed for normality; however, the results were not meaningful. 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 February 1998 data represents the results of the second baseline data collection effort. The t-test analysis will be initiated when an adequate database 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 (NYSDEC, 1998). The results of this comparison are included in Table 4. Detected constituents exceeding New York State Class GA ground water standards included: chromium at one location (URS-14I); iron at six locations (85-5R, 85-7R, URS-9I, 88-12C, 88-12D, and URS-14I); sodium at ten locations (85-5R, 85-5D, 85-7R, URS-7D, URS-9I, URS-9D, 88-12C, 88-12D, URS-14I, and URS-14D); nickel at one location (URS-14I); and benzene at one location (URS-9D). It should be noted that these constituents were detected above New York State Class GA ground water standards in the background wells URS-14I (chromium, iron, sodium. nickel, and benzene) and URS-14D (sodium). It is likely that the elevated concentrations of iron and sodium are naturally occurring. This section will be revised, if required, based on the results of the data validation.

2. Conclusions

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

- An inward hydraulic gradient has been established around the capped area.
- The elevation data indicates that ground water within the capped area is migrating to the west 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 February 1998 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.

Although concerns were raised by the NYSDEC regarding the detection of PCBs in monitoring well 88-12D during the September 1997 sampling event in a letter dated November 17, 1997 to the Group, it is believed that the PCB detection was attributable to the turbidity of the sample. This was confirmed during the February 1998 low-flow sampling event. Low-flow sampling was successful in reducing the turbidity of the samples, as shown on the attached ground water sampling logs, included in Appendix C. PCBs were not detected during the February 1998 sampling event in any of the wells sampled.

In addition, based on a review of existing ground water monitoring data, PCBs have not previously been detected in ground water monitoring wells on the site. PCBs have been detected at low levels in site soils and sediment. The levels of PCBs detected in monitoring well 88-12D during

the September 1997 sampling event were very low, at 0.19 parts per billion (ppb). Based on data validation of the analytical data, the concentration of PCBs in the sample was qualified as an estimated value. In addition, due to poor individual congener correlation, results of the data validation qualified the PCB concentration as tentative ("N" qualifier).

Based on the evaluation of the ground water analytical data, it is recommended that sampling for TCL SVOCs and PCBs/pesticides be discontinued at the Site, as discussed in the NYSDEC-approved O&M Manual. Sampling will be continued semi-annually for TCL VOCs and TAL metals during the second through fifth years of monitoring.

References

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URS Consultants, Inc., 1991. *Remedial Investigation at the Frontier Chemical - Pendleton Site*, Draft Final Report, June 1991.

Table 1

Frontier Chemical - Pendleton Site

Piezometer Ground Water Elevation Summary Table

Piezometer		Location	Top of Riser Elev. (ft)	Top of Cover Elev. (ft)	Depth (ft below riser)	Screened Elev. (ft)	Ground water elevation (ft)		
							6/24/97	9/30/97	2/23/98
P-1	(O)	East portion of	583.21	583.30	16.4	576.8 - 566.8	579.54	577.09	579.25
P-2	(I)	capped area	582.90	583.20	15.7	577.2 - 567.2	579.60	579.24	578.20
P-3	(I)	Center of capped area	606.33	606.64	39.7	586.6 - 566.6	580.36	580.38	580.06
P-4	(I)	Adjacent to	583.68	583.85	17.0	576.7 - 566.7	577.15	577.43	576.70
SP-1	(T)	Quarry Lake	579.86	580.07	15.0	bop = 564.9	<564.9	<564.9	<564.9
P-5	(O)	Southern portion	583.05	583.55	15.5	577.6 - 567.6	576.87	577.25	578.57
P-6	(I)	of capped area	584.45	584.60	16.2	578.3 - 568.3	578.77	579.17	578.14
P-7	(I)	Northern portion	581.84	582.00	16.8	575.0 - 565.0	578.33	578.62	576.45
P-8	(O)	of capped area	582.83	583.00	17.3	575.5 - 565.5	577.76	578.87	578.75

Notes:

1. Elevation based on USGS Datum.
2. bop = bottom of pipe.
3. O = piezometer located outside of capped area.
4. I = piezometer located inside capped area.
5. T = standpipe located within the ground water collection trench.

Table 2
Frontier Chemical - Pendleton Site
Monitoring Well Ground Water Elevation Summary Table

Monitoring Well	Location	Top of Riser Elev. (ft)	Ground Elev. (ft)	Depth (ft below riser)	Screened Elev. (ft)	Ground water elevation (ft)		
						6/24/97	9/30/97	2/23/98
URS-14I	Upgradient well nest	581.14	580.84	31.0	550.1 - 555.1	577.15	578.77	580.24
URS-14D	in church parking lot	580.71	580.85	41.5	539.2 - 544.2	575.50	574.28	575.87
URS-9I	Southern well nest	581.68	579.90	46.0	535.6 - 540.6	575.38	574.22	575.69
URS-9D	along Town Line Road	580.80	579.00	46.5	534.3 - 539.3	575.36	574.21	575.68
85-5R	Middle well nest	580.84	578.70	40.0	540.9 - 542.9	574.70	573.97	575.39
URS-5D	along Town Line Road	580.60	578.00	49.9	530.8 - 535.8	574.73	574.02	575.42
85-7R	North well nest	577.90	576.60	27.8	550.2 - 552.2	575.09	574.21	575.53
URS-7D	along Town Line Road	579.35	576.50	39.9	539.5 - 544.5	575.15	574.35	575.60
88-12C	Well nest outside northeast	583.12	583.70	31.3	551.8 - 553.8	576.60	574.03	576.53
88-12D	portion of capped area	582.87	583.28	54.5	528.4 - 533.4	575.72	574.54	576.17

Notes:

1. Elevation based on USGS Datum.
2. NA = not available.

Table 3

Frontier Chemical - Pendleton Site

Quarry Lake Surface Water Elevation Summary Table

Date	Quarry Lake Surface Water Elevation (ft)
9/8/97	572.3
2/23/98	578.0

Notes:

1. Elevation based on USGS Datum.

Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 1998

	85-5R						URS-5D				
Parameter	7/86	8/90	2/91	10/92	6/97	2/98	8/90	2/91	10/92	6/97	2/98
VOCs (ppb)											
Acetone	NA	R	ND	ND	ND	ND	250	R	ND	ND	ND
Benzene	ND	15	ND	ND	ND	0.34 J	ND	ND	1	ND	0.25 J
2-Butanone	NA	ND	ND	ND	ND	ND	ND	R	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	NA	NA	NA	ND	0.28 J	NA	NA	NA	ND	0.31 J
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	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
1,2-Dichloroethene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	0.24 J	ND	ND	ND	ND	0.32 J
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	R	ND	ND	ND
4-Methyl-2-Pentanone	NA	2J	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	ND	2J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	0.14 J	ND	1J	ND	ND	0.19 J
Total Xylenes	NA	ND	ND	ND	ND	0.96	ND	0.5J	ND	ND	1.5
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs (ppb)											
bis(2-Ethlyhexyl)phthalate	ND	ND	NA	NA	ND	ND	3J	NA	NA	ND	ND
Di-n-Octylphthalate	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
Phenol	3	ND	NA	NA	ND	ND	ND	ND	NA	ND	ND
Metals (ppb)											
Aluminum	1,060	214	37.8B	153	ND	300	ND	ND	ND	ND	ND
Antimony	NA	ND	42.4B	ND	ND	ND	ND	31.5B	ND	ND	ND
Arsenic	NA	1B	ND	ND	ND	ND	1.3B	1B	ND	ND	ND
Barium	20	73.5B	23.4B	15	40	80	224	71.7B	32	20	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	380,000	355,000	378,000	321,000	270,000	220,000	378,000	407,000	387,000	440,000	300,000
Chromium	40	7.5B	ND	ND	ND	30	3B	ND	ND	ND	ND
Cobalt	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	61
Copper	10	ND	ND	11	ND	ND	ND	ND	8	ND	ND
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	1,020	669	915	419	140	2,300	188	143	25	ND	120
Lead	150	ND	1.2B	ND	ND	ND	ND	1.3B	12	ND	ND
Magnesium	179,000	106,000	170,000	139,000	130,000	85,000	33,300	2450B	570,000	100,000	24,000
Manganese	100	40	57.5	42	50	260	8.8B	3.5B	ND	50	10
Nickel	10	48.1	ND	ND	ND	ND	11.4B	ND	ND	90	ND
Potassium	9,500	60,700	6,280	6,400	ND	ND	22,700	16,900	8,500	ND	ND
Silver	30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	126,000	132,000	120,000	100,000	93,000 J	58,000	192,000	194,000	114,000	88,000	93,000
Thallium	NA	ND	ND	ND	ND	8	ND	ND	ND	ND	ND
Vanadium	35	4B	ND	ND	ND	ND	3.8B	ND	ND	ND	ND
Zinc	75	12.9B	17.6B	ND	ND	ND	19.9B	14.7B	ND	ND	10
Pesticides (ppb)											
alpha-BHC	0.0001	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
Heptachlor Epoxide	0.0005	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
4,4-DDE	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
PCBs (ppb)											
PCB-1254	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND	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 and 2/98 sampling events is for cis-1,2-dichloroethylene.
6. NA = Not analyzed; ND = Not detected; N = Presumptives present
7. Shaded data for 2/98 sampling event indicates data validation is pending.

Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 1998

	85-7R						URS-7D				
Parameter	7/86	8/90	2/91	10/92	6/97	2/98	8/90	2/91	10/92	6/97	2/98
VOCs (ppb)											
Acetone	NA	ND	R	ND	ND	ND	120	R	ND	ND	ND
Benzene	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	0.11 J
2-Butanone	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	71	ND	ND	ND	ND	ND	0.5J	ND	ND	ND	ND
Chlorobenzene	ND	NA	NA	NA	ND	ND	NA	NA	NA	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	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
1,2-Dichloroethene	NA	ND	ND	ND	0.14J	0.19 J	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	NA	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
Toluene	ND	ND	1J	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.37 J
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs (ppb)											
bis(2-Ethlyhexyl)phthalate	ND	ND	NA	NA	ND	ND	ND	ND	NA	ND	ND
Di-n-Octylphthalate	ND	ND	NA	NA	ND	ND	ND	ND	NA	ND	ND
Phenol	4	ND	NA	NA	ND	ND	ND	ND	NA	ND	ND
Metals (ppb)											
Aluminum	1,200	277	265	249	ND	ND	167B	52.5B	ND	ND	ND
Antimony	NA	28.3B	ND	ND	ND	ND	20.5B	36.3B	ND	ND	ND
Arsenic	NA	1.4B	1.7B	ND	ND	ND	ND	ND	ND	ND	ND
Barium	30	91B	143B	106	100	80	20.3B	47.2B	29	30	40
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	490,000	354,000	298,000	389,000	350,000	350,000	277,000	333,000	403,000	360,000	300,000
Chromium	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	10	ND	ND	8	ND	ND	ND	ND	8	ND	ND
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	920	586	820	435	190	310	387	283	63	ND	70
Lead	120	ND	2.6B	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium	131,000	119,000	42,600	124,000	120,000	120,000	96,200	115,000	140,000	120,000	89,000
Manganese	110	40.5	31.5	30	70	80	71.2	140	86	40	30
Nickel	ND	7.4B	ND	ND	ND	ND	23.5B	ND	ND	ND	ND
Potassium	28,000	5,540	5,770	6,700	5,000	5,000	5,990	8,550	8,300	5,000	ND
Silver	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	107,000	67,900	38,900	73,100	66,000 J	67,000	82,700	68,900	78,900	66,000 J	54,000
Thallium	NA	ND	ND	ND	ND	6	ND	ND	ND	ND	ND
Vanadium	35	ND	ND	ND	ND	ND	4.2B	6.7B	ND	ND	ND
Zinc	65	ND	21.5	ND	ND	ND	5.6B	12.2B	ND	ND	ND
Pesticides (ppb)											
alpha-BHC	0.0002	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
Heptachlor Epoxide	0.0007	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
4,4-DDE	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
PCBs (ppb)											
PCB-1254	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND	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 and 2/98 sampling events is for cis-1,2-dichloroethylene.
6. NA = Not analyzed; ND = Not detected; N = Presumptives present
7. Shaded data for 2/98 sampling event indicates data validation is pending.

Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 1998

	URS-9I					URS-9D				
Parameter	8/90	2/91	10/92	6/97	2/98	8/90	2/91	10/92	6/97	2/98
VOCs (ppb)										
Acetone	R	R	ND	ND	ND	R	R	ND	ND	ND
Benzene	ND	ND	ND	0.12J	0.29 J	ND	ND	ND	ND	1.9
2-Butanone	ND	2J	ND	ND	ND	ND	6J	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	4J	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	NA	NA	NA	ND	0.20 J	NA	NA	NA	ND	0.79
Chloroform	ND	ND	ND	ND	ND	8	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	1J	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	0.7	0.37J	0.34 J
1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	1	0.66	0.59
Ethylbenzene	ND	ND	ND	ND	0.14 J	ND	ND	ND	ND	0.44 J
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	2	ND	ND
4-Methyl-2-Pentanone	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
Toluene	0.7J	ND	ND	ND	0.11 J	0.6J	ND	ND	ND	0.51
Total Xylenes	ND	ND	ND	0.29J	0.54	ND	ND	ND	ND	1.8
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	0.6	0.36J	0.24 J
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	0.26J	0.44 J
SVOCs (ppb)										
bis(2-Ethlyhexyl)phthalate	R	NA	NA	ND	ND	ND	NA	NA	ND	ND
Di-n-Octylphthalate	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
Phenol	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
Metals (ppb)										
Aluminum	221	197	110	ND	ND	128	64.2B	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND	28B	ND	ND	ND
Arsenic	1.7B	ND	ND	ND	ND	1.6B	ND	ND	ND	ND
Barium	30.1B	22.8B	14	30	ND	110B	38.2B	23	ND	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	106,000	143,000	123	170,000	150,000	56,500	146,000	120,000	200,000	190,000
Chromium	8.6B	10.1	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	12.7B	ND	ND	ND	ND	5.2B	ND	ND	ND	ND
Cyanide	ND	ND	ND	ND	ND	ND	11.1B	ND	ND	ND
Iron	1,020	1,170	808	460	440	127	506	252	ND	70
Lead	ND	1B	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium	54,500	71,300	63,500	70,000	69,000	29,900	70,200	60,000	58,000	73,000
Manganese	67.5	80	75	50	30	20.1	25.5	9	ND	ND
Nickel	7.6B	ND	ND	ND	ND	15.3B	ND	ND	ND	ND
Potassium	3,910B	4,250B	2,900	ND	ND	9,880	4,170B	3,600	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	34,500	54,000	52,400	43,000 J	45,000	27,400	37,000	42,800	48,000 J	52,000
Thallium	ND	ND	ND	ND	11	ND	ND	ND	ND	14
Vanadium	ND	9.6B	ND	ND	ND	10.7B	ND	ND	ND	ND
Zinc	19.3B	34.6	ND	ND	ND	50.5	16.7B	ND	ND	ND
Pesticides (ppb)										
alpha-BHC	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
Heptachlor Epoxide	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
4,4-DDE	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND
PCBs (ppb)										
PCB-1254	ND	NA	NA	ND	ND	ND	NA	NA	ND	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 and 2/98 sampling events is for cis-1,2-dichloroethylene.
6. NA = Not analyzed; ND = Not detected; N = Presumptives present
7. Shaded data for 2/98 sampling event indicates data validation is pending.

Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 1998

	88-12C					88-12D			
Parameter	8/90	2/91	10/92	6/97	2/98	8/90	2/91	6/97	2/98
VOCs (ppb)									
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	1J	0.9J	ND	0.13 J
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	6	ND	ND
Chlorobenzene	NA	NA	NA	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	2J	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	0.11 J
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	R	13	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	0.48 J
Trichloroethene	ND	ND	ND	ND	ND	ND	6	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs (ppb)									
bis(2-Ethlyhexyl)phthalate	NA	NA	NA	ND	ND	ND	NA	ND	4.3 J
Di-n-Octylphthalate	NA	NA	NA	ND	ND	5J	NA	ND	ND
Phenol	ND	ND	NA	ND	ND	ND	NA	ND	ND
Metals (ppb)									
Aluminum	481	187B	453	ND	900	ND	172B	ND	ND
Antimony	19.2B	28B	ND	ND	ND	50.7B	56.1B	ND	ND
Arsenic	10	12.3B	14	9	7	ND	1.3BW	ND	ND
Barium	11.4B	17.3	14	ND	ND	2.9B	7.9B	ND	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	62,600	68,500	68,900	73,000	70,000	464,000	623,000E	490,000	480,000
Chromium	21	4.6B	ND	ND	10	7.6B	27.8E	10	30
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	4.2B	ND	5	ND	ND	ND	ND	ND	ND
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	1,530	1,040	1,560	ND	2,200	168	250	180	480
Lead	1.5B	1.2B	ND	ND	ND	ND	1.8BW	ND	ND
Magnesium	88,500	103,000	92,500	110,000	98,000	109,000	199,000E	130,000	110,000
Manganese	45.4	37.8	54	10	70	33.9	696	90	60
Nickel	14.6B	ND	ND	ND	ND	11.5B	25.5B	ND	ND
Potassium	2,520B	3,200B	3,000	ND	ND	5,310	12,000E	600	6,000
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	34,600	41,100	41,300	47,000 J	43,000	66,400	474,000	140,000 J	100,000
Thallium	ND	ND	ND	ND	13	ND	ND	ND	ND
Vanadium	22.1B	10B	ND	ND	ND	51.6	2.4B	ND	ND
Zinc	10.1B	15.7B	ND	20	20	7.9B	ND	ND	10
Pesticides (ppb)									
alpha-BHC	ND	NA	NA	ND	ND	ND	NA	ND	ND
Heptachlor Epoxide	ND	NA	NA	ND	ND	ND	NA	ND	ND
4,4-DDE	ND	NA	ND	ND	ND	ND	NA	ND	ND
PCBs (ppb)									
PCB-1254	ND	NA	NA	ND	ND	ND	NA	0.19J N	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 and 2/98 sampling events is for cis-1,2-dichloroethylene.
6. NA = Not analyzed; ND = Not detected; N = Presumptives present
7. Shaded data for 2/98 sampling event indicates data validation is pending.

Table 4
Frontier Chemical-Pendleton Site
Summary of Ground Water Analytical Data
February 1998

	URS-14I				URS-14D				Standard
Parameter	2/91	10/92	6/97	2/98	2/91	10/92	6/97	2/98	ug/L (ppb)
VOCs (ppb)									
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	---
Benzene	ND	ND	ND	1	ND	ND	ND	ND	1
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	---
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	---
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	---
Chlorobenzene	NA	NA	ND	0.81	NA	NA	ND	ND	5
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	7
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	---
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	5
1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	5
Ethylbenzene	ND	ND	ND	0.13 J	ND	ND	ND	ND	5
Methylene Chloride	ND	ND	ND	ND	R	ND	ND	ND	5
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	---
1,1,2,2,-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	5
Toluene	ND	ND	ND	0.15 J	ND	ND	ND	ND	5
Total Xylenes	ND	ND	ND	ND	ND	ND	0.11J	0.21 J	5
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	5
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	2
SVOCs (ppb)									
bis(2-Ethlyhexyl)phthalate	NA	NA	ND	ND	R	NA	ND	ND	5
Di-n-Octylphthalate	NA	NA	ND	ND	5J	NA	ND	ND	---
Phenol	NA	NA	ND	ND	ND	NA	R	ND	1
Metals (ppb)									
Aluminum	7,140	1,170	1300	400	99.8	ND	ND	ND	---
Antimony	ND	ND	ND	ND	32.1B	ND	ND	ND	3
Arsenic	7.2B	ND	ND	ND	2B	ND	ND	ND	25
Barium	115B	47	50	40	25.5B	23	20	ND	1000
Beryllium	1.2B	ND	ND	ND	ND	ND	ND	ND	---
Cadmium	ND	ND	ND	1	ND	ND	ND	ND	5
Calcium	73,900	35,200	28,000 J	21,000	255,000	292,000	210,000	250,000	---
Chromium	30.9	ND	ND	160	10.3	7	ND	ND	50
Cobalt	5.8B	ND	ND	ND	ND	ND	ND	ND	---
Copper	18.5B	8	ND	10	ND	8	ND	ND	200
Cyanide	ND	ND	ND	ND	ND	ND	ND	10	200
Iron	10,400	2,060	1,800	2,300	357	193	ND	ND	300
Lead	7.5	ND	ND	ND	1.1B	ND	ND	ND	25
Magnesium	32,800	22,300	21,000	17,000	75,200	78,000	61,000	66,000	---
Manganese	484	145	70	60	30.8	27	ND	ND	300
Nickel	30.4B	ND	ND	170	ND	ND	ND	ND	100
Potassium	17,100	5,500	ND	25,000	4,250B	3,700	ND	ND	---
Silver	ND	ND	ND	ND	ND	ND	ND	ND	50
Sodium	44,700	42,500	58,000 J	48,000	40,700	38,700	52,000 J	49,000	20,000
Thallium	ND	ND	ND	6	ND	ND	ND	ND	---
Vanadium	16.1B	ND	ND	ND	ND	ND	ND	ND	---
Zinc	52.3	ND	10	30	26.8	ND	ND	10	---
Pesticides (ppb)									
alpha-BHC	NA	NA	ND	ND	ND	NA	ND	ND	---
Heptachlor Epoxide	NA	NA	ND	ND	ND	NA	ND	ND	0.03
4,4-DDE	NA	NA	0.032J	ND	ND	NA	ND	ND	0.2
PCBs (ppb)									
PCB-1254	NA	NA	ND	ND	NA	NA	ND	ND	0.09

Notes:

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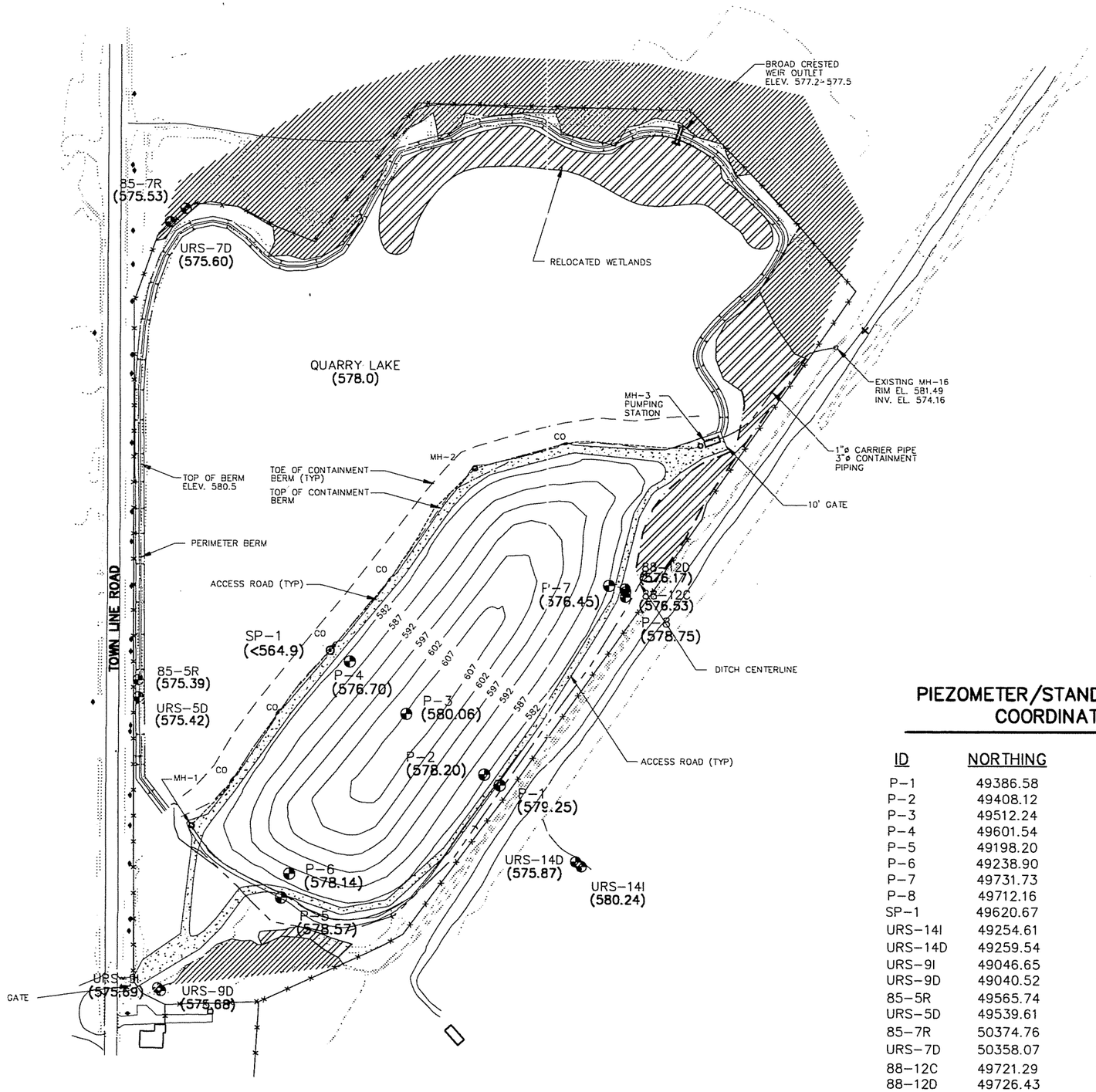
6. NA = Not analyzed; ND = Not detected; N = Presumptives present
7. Shaded data for 2/98 sampling event indicates data validation is pending.

FIGURES

FIGURE 1



LEGEND

- P-1 — PIEZOMETER
- (580.24) — WATER ELEVATION
- WETLAND AREA
- 6' HIGH CHAIN LINK FENCE
- 580 — GRADE ELEVATION CONTOUR
- CO — GROUND WATER COLLECTION TRENCH & CLEAN OUT
- STANDPIPE
- UTILITY POLE

PIEZOMETER/STANDPIPE AND MONITORING WELL COORDINATES AND ELEVATIONS

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
URS-14I	49254.61	100794.43	581.14	580.84
URS-14D	49259.54	100789.09	580.71	580.85
URS-9I	49046.65	100075.10	581.68	579.90
URS-9D	49040.52	100076.81	580.80	579.00
85-5R	49565.74	100036.14	580.84	578.70
URS-5D	49539.61	100035.69	580.60	578.00
85-7R	50374.76	100115.55	577.90	576.60
URS-7D	50358.07	100095.40	579.35	576.50
88-12C	49721.29	100870.45	583.12	583.70
88-12D	49726.43	100869.13	582.87	583.28

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

HYDRAULIC POTENTIAL MAP (FEBRUARY 23, 1998)

0 200 400
SCALE IN FEET

FILE NO. 5829.003-001

O'BRIEN & GERE ENGINEERS INC.

APPENDICES

Appendix A

Piezometer/monitoring well inspection forms

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : P-1

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	3.96	
Well Depth:	—	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : P-2

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	4.70	
Well Depth:	—	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	~~no~~ N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : P-3

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	26.27	
Well Depth:	—	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	~~no~~ N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : P-4

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	6.98	
Well Depth:	—	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	(yes)	no
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	~~no~~ N/A

REMOVED PRIOR TO WATER LEVEL READING.

COMMENTS: PVC RISER TO HIGH TO INSERT PLUG (CAP) 2" & LOCK INSIDE BOLTED FLUSHMOUNT COVER.

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : P-5

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	4.48	
Well Depth:	—	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : P-6

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	6.31	
Well Depth:	—	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	yes	(no)	SEE COMMENTS BELOW.
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	~~no~~	N/A

COMMENTS: - STAND PIPE AT SURFACE IS BENT FROM VERTICAL ~ 20-25°.

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : P-7

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	5.39	
Well Depth:	—	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	~~no~~ N/A

COMMENTS:

PVC RISER TO HIGH TO INSERT PLUG (CAP) 2" & LOCK INSIDE FLUSHMONT COVER.

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : P-8

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	4.08	
Well Depth:	—	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : SP-1

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)	
Well Construction	(PVC)	Stainless Steel	
Well Diameter	2-inch	4-inch	(6-inch)
Depth to Ground Water :	DRY		
Well Depth:	—		

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	~~no~~ N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : 85-5R

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	5.45	
Well Depth:	38.06	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

te Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : URS-5D

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	5.18	
Well Depth:	49.92	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

ıte Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : 85-7R

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	(PVC)	Stainless Steel
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	2.37	
Well Depth:	27.77	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

.te Name: Well Identification : UKS - 7D

Personnel : Date :

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	3.75	
Well Depth:	39.89	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : URS-9I

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	5.99	
Well Depth:	46.49	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	yes	(no)	NOW - PRESENT
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	
8. Is there standing water in the annular space ?	yes	(no)	
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no	

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

.te Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : URS-9D

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	5.12	
Well Depth:	57.01	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	yes	(no) NON-PROJECT
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

.te Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : 88-12C

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	6.59	
Well Depth:	31.37	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

NOTE: CONCRETE PAD UNDER (GRAVEL).

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : 88-12D

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	(Above Ground)	Flush Mounted
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	6.70	
Well Depth:	53.50	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no
2. Well covers and locks in good condition and secure ?	(yes)	no
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no
4. Is the concrete pad and surface seal in good condition ?	(yes)	no
5. Are soils surrounding the well pad eroded ?	yes	(no)
6. Is the well casing in good condition ?	(yes)	no
7. Is the measuring point on casing well marked ?	(yes)	no
8. Is there standing water in the annular space ?	yes	(no)
9. Is the stand pipe vented at the base to allow drainage ?	(yes)	no

COMMENTS:

NOTE: CONCRETE PAD UNDER (GRAVEL).

MONITORING WELL INTEGRITY CHECKLIST

ite Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : URS-14I

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	0.90	
Well Depth:	31.15	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	
8. Is there standing water in the annular space ?	(yes)	no	REMOVED PRIOR TO COLLECTING WATER LEVEL READINGS
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	no	N/A

COMMENTS:

MONITORING WELL INTEGRITY CHECKLIST

Site Name: FRONTIER CHEMICAL PENDLETON SITE Well Identification : URS-14D

Personnel : JAM Date : FEBRUARY 23, 1998

WELL SPECIFICATIONS

Protective Casing	Above Ground	(Flush Mounted)
Well Construction	PVC	(Stainless Steel)
Well Diameter	(2-inch)	4-inch
Depth to Ground Water :	4.84	
Well Depth:	41.67	

WELL INTEGRITY

1. Well identification clearly marked ?	(yes)	no	
2. Well covers and locks in good condition and secure ?	(yes)	no	
3. Is the well stand pipe vertically aligned and secure ?	(yes)	no	
4. Is the concrete pad and surface seal in good condition ?	(yes)	no	
5. Are soils surrounding the well pad eroded ?	yes	(no)	
6. Is the well casing in good condition ?	(yes)	no	
7. Is the measuring point on casing well marked ?	(yes)	no	
8. Is there standing water in the annular space ?	(yes)	no	REMOVED PRIOR TO WATER LEVEL READING.
9. Is the stand pipe vented at the base to allow drainage ?	~~yes~~	~~no~~	N/A

COMMENTS:

Appendix B

Hydraulic evaluation calculations

PROJECT:	PAGE:	BY:	DATE:	JOB NUMBER:
Pendleton - Flow Calculation.	1	PGB	3/18/04	5829.003 -

Flow to Trench:
Source: Construction Dewatering

$$Q = \frac{K(h) \cdot (H^2 - h^2) \cdot X}{2880 \cdot L} \quad \text{solving for } K(h)$$

$$K(h) = \frac{2880 \cdot L \cdot Q}{(H^2 - h^2) \cdot X}$$

where

$K(h)$ = Horizontal Hydraulic Conductivity (gpd/ft²)

Q = Yield (gpm) = 0.12 gpm (170 gpd - average Flow in trench)

H = Static Head = 13 ft - average depth of trench.

h = Head at trench while pumping = (1 ft)

X = Length of Trench = (1517 ft)

L = Length Perpendicular to trench that contributes flow = 50 ft (assumed - Zone of influence based on fine grained nature of soils).

$$K(h) = \frac{2880 \cdot 50 \text{ ft} \cdot 0.12 \text{ gpm}}{(13^2 - 1^2) \cdot 1517 \text{ ft}} = 0.07 \text{ gpd/ft}^2$$

$$0.07 \text{ gpd/ft}^2 \cdot 4.716 \times 10^{-5} = 3.3 \times 10^{-6} \text{ cm/sec}$$

O'BRIEN & GERE COMPANIES

CT:	PAGE:	BY:	DATE:	JOB NUMBER:
Pendleton - Time Calculation	2	PGB	3/18/98	5829.003

Containment Area = $980' \times 360' = 352{,}800\ ft^2$.

Saturated thickness = 13 ft. average flow in trench = 170 gpd.

Specific Yield = 20%

Volume of water to be drained

$$352{,}800\ ft^2 \cdot 13\ ft \cdot 0.20 \cdot 7.48 \frac{gallons}{ft^3} = 6.86 \times 10^6\ gallons$$

$$\frac{6.86 \times 10^6\ gallons}{170\ gallons/day} = 40{,}360\ days = 110\ years.$$

Appendix C

Ground water sampling logs

O'Brien & Gere Engineers, Inc.

Low Flow Ground Water Sampling Log

Date	FEB 24, 1998	Personnel	JAM, TP	Weather	SNOW 32°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	85-5R
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5529.

Well information:

Depth of Well *	38.06	ft.
Depth to Water *	5.45	ft.
Length of Water Column	32.61	ft.

* Measurements taken from

- [X] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

1 of 2

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
0	4.49 5.18			~~215~~	~~026~~			
815 3	6.80	9.3	8.01	213	028	6.17	56.2	150
818 6	6.77	8.2	8.02	313	-010	5.47	33.0	150
821 9	6.75	~~7.7~~	8.02	300	-037	4.56	52.3	150
824 12	6.75	7.6	8.02	294	-078	3.82	65.9	150
827 15	6.74	7.7	8.01	197	-100	3.34	54.0	150
830 18	6.74	7.8	7.99	230	-111	2.96	50.4	150
833 21	6.75	7.9	7.96	248	-115	2.69	108.0	150
836 24	6.75	8.0	7.92	221	-128	2.26	59.9	150
839 27	6.76	8.2	7.90	226	-129	2.14	57.1	150
842 30	6.77	8.3	7.88	223	-132	1.94	45.2	150
845 33	6.77	8.4	7.83	197	-136	1.76	41.8	150
848 36	6.75	8.5	7.81	197	-139	1.66	38.2	150
851 39	6.76	8.6	7.74	188	-141	1.49	33.5	150
854 42	6.77	8.7	7.70	192	-141	1.43	36.4	150
858 45	6.77	8.8	7.65	189	-144	1.33	26.1	150
900 48	6.78	8.8	7.60	207	-146	1.25	21.2	150
903 51	6.77	9.0	7.56	205	-147	1.17	18.9	150
906 54	6.76	9.1	7.50	217	-154	1.05	15.6	150
909 57	6.77	9.3	7.46	214	-157	1.02	13.6	150

Water sample:

Time collected: 0955

Total volume of purged water removed: 4.05 gallons

Physical appearance at start
- Color: Lt Tan
- Odor: None
- Sheen/Free Product: None

Physical appearance at sampling
- Color: COLORLESS
- Odor: NONE
- Sheen/Free Product: NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes: PID = 0.00 ppm

O'Brien & Gere Engineers, Inc.

Low Flow Ground Water Sampling Log

Date	FEB 24, 1998	Personnel	JAM, TP	Weather	SNOW 32°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	85-5R
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.03.

Well information:

Depth of Well * ~~_____~~ ft.
Depth to Water * ~~_____~~ ft.
Length of Water Column ~~_____~~ ft.

* Measurements taken from
- [x] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

2 of 2

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

	Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
912	60	6.76	9.3	7.42	2.20	-161	0.95	12.6	150
915	63	6.76	9.5	7.39	228	-164	0.91	10.5	150
918	66	6.75	9.5	7.36	229	-167	0.88	10.6	150
921	69	6.75	9.6	7.33	232	-171	0.85	8.38	150
924	72	6.75	9.6	7.31	236	-176	0.81	8.19	150
927	75	6.76	9.7	7.29	235	-178	0.77	8.84	150
930	78	6.76	9.7	7.28	2.35	-182	0.76	7.69	150
933	81	6.74	9.7	7.26	235	-185	0.71	7.66	150
936	84	6.74	9.7	7.25	235	-189	0.67	6.52	150
939	87	6.74	9.8	7.24	236	-190	0.66	6.69	150
942	90	6.74	9.8	7.23	241	-194	0.61	5.76	150
945	93	6.74	9.8	7.21	239	-198	0.61	6.53	150
948	96	6.74	9.7	7.22	239	-200	0.60	6.03	150
951	99	6.74	9.7	7.21	239	-201	0.60	6.60	150
954	102	6.74	9.4	7.21	239	-200	0.60	5.91	150
957	SAMPLED AT 0955								
1000									

Water sample:

Time collected: 0955

Total volume of purged water removed: 4.05 gallons.

Physical appearance at start
Color LIGHT TAN
Odor NONE
Sheen/Free Product NONE

Physical appearance at sampling
Color COLORLESS
Odor NONE
Sheen/Free Product NO

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ml	GLASS	3	NO	1:1 HCl	<2
LITER LITER	GLASS GLASS	2 1		$Na_2O_2O_3$ NONE	~~>12~~
LITER	POLY	1		HNO_3	<2
500ml	POLY	1	↓	NaOH	>12

Notes:

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

Date	FEB 24, 1998	Personnel	JAM, TP	Weather	SNOW 32°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	MW5-5D
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.

Well information:

Depth of Well *	49.92	ft.
Depth to Water *	5.18	ft.
Length of Water Column	44.74	ft.

* Measurements taken from

X	Top of Well Casing
	Top of Protective Casing
	(Other, Specify)

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

	Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
	0 min's	4.45							150
1030	3	7.66	8.4	9.31	1675	-115	6.35	9.45	150
1033	6	8.00	8.3	9.38	1629	-106	5.49	7.08	75
1036	9	8.06	8.1	9.43	1577	-096	5.22	6.88	50
1039	12	8.08	8.0	9.46	1560	-089	5.06	6.92	50
1042	15	8.09	7.7	9.49	1566	-085	4.90	6.82	50
1045	18	8.10	7.4	9.50	1563	-080	4.90	6.84	50
1048	21	8.10	7.1	9.52	1572	-075	5.00	7.15	50
1051	24	8.12	6.8	9.59	1579	-071	4.94	6.78	50
10	27	8.13	6.5	9.61	1589	-067	4.86	6.93	50
10	30	8.13	6.3	9.62	1604	-065	4.83	5.98	50
1100	33	8.15	6.9	9.63	1621	-061	4.92	5.42	50
1103	36	8.15	5.7	9.64	1630	-059	4.95	5.58	50
1106	39	8.15	5.7	9.64	1631	-059	4.98	5.57	50
1109	42	8.15	5.7	9.63	1632	-059	4.98	5.61	50
1112	45	8.15	5.7	9.63	1632	-059	4.97	5.56	50

Water sample:

Time collected: 1130

Total volume of purged water removed: 0.6 gallons.

Physical appearance at start
Color: Clear
Odor: None
Sheen/Free Product: None

Physical appearance at sampling
Color: CLEAR
Odor: SLIGHT SULFIDE
Sheen/Free Product: NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ml	GLASS	3	NO	1:1 HCl	<2
1/2 LITER	GLASS GLASS	2		$Na_2S_2O_3$ NONE	>12
~~PINT~~ 1/2 LITER	POLY	1		HNO_3	<2
500ML	POLY	1		NaOH	>12

Notes: EB #2 COLLECTED AT 1145 PID = 0.0ppm

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

Date	FEB 24, 1998	Personnel	JAM, TP	Weather	RAIN/SNOW 35°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	85-7R
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829

Well information:

Depth of Well *	27.77	ft.
Depth to Water *	2.37	ft.
Length of Water Column	25.40	ft.

* Measurements taken from

- [X] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
0	2.62							
1430 3	2.91	9.1	~~8.14~~ ~~11.37~~	1637	-152	7.15	—	600
33 6	2.94	9.6	8.18	1633	-207	4.11	19.90	600
36 9	2.98	10.0	8.21	1630	-236	2.07	11.00	600
39 12	3.00	10.2	8.11	1685	-240	1.19	8.40	600
42 15	3.03	10.3	7.89	1656	-241	0.92	10.2	5.75
45 18	3.04	10.4	7.70	1681	-246	0.77	6.55	575
48 21	3.04	10.4	7.60	1690	-255	0.66	4.51	575
51 24	3.04	10.4	7.49	~~1656~~ 1922	-263	0.54	3.21	575
54 27	3.04	10.6	7.46	1684	-270	0.44	1.97	575
30	3.04	10.6	7.40	1689	-274	0.41	1.20	575
1500 33	3.04	10.6	7.35	1691	-274	0.40	1.37	575
36	3.04	10.6	7.34	1692	-276	0.39	0.90	575
39	3.04	10.7	7.34	1692	-276	0.39	0.69	575
42	3.04	10.7	7.34	1693	-277	0.38	0.60	575
45	3.04	10.7	7.34	1692	-277	0.39	0.58	575
48	3.04	10.7	7.35	1693	-276	0.38	6.58	575

Water sample:

Time collected: 1530

Total volume of purged water removed: 7.3 gallons

Physical appearance at start
Color COLORLESS
Odor NONE (SLIGHT SULFIDE ODORS)
Sheen/Free Product NONE

Physical appearance at sampling
Color COLORLESS
Odor SLIGHT SULFIDE
Sheen/Free Product NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ML	GLASS	6	NO	1:1 HCl	<2
LITER/LITER	GLASS/GLASS	4/2		$Na_2S_2O_3$/NONE	>12/NONE
LITER	POLY	2		HNO_3	<2
500ML	POLY	2		NaOH	>12

Notes: BLIND DUPLICATES COLLECTED AT 85-7R PID = 0.00 ppm

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

Date	FEB 24, 1998	Personnel	JAM, TP	Weather	RAIN/SNW 35°
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	URS-7D
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5929.

Well information:

Depth of Well *	39.89	ft.
Depth to Water *	3.75	ft.
Length of Water Column	36.14	ft.

* Measurements taken from

- [X] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
0	3.55	0						
1232 3	6.11	8.9	7.43	1529	-284	2.55	13.9	300
35 6	6.21	8.4	7.40	1364	-288	1.25	13.7	300
38 9	6.21	7.9	7.45	1486	-289	0.71	11.9	300
41 12	6.21	7.8	7.46	1467	-306	0.50	11.6	300
44 15	6.23	7.7	7.50	1500	-307	0.34	9.09	300
47 18	6.24	7.8	7.52	1533	-310	0.27	7.33	300
50 21	6.25	7.9	7.53	1569	-311	0.22	6.50	300
53 24	6.25	8.0	7.54	1592	-31	0.20	5.29	300
27	6.26	8.1	7.53	1612	-311	0.18	4.63	300
30	6.26	8.4	7.52	1625	-310	0.16	4.52	300
1302 33	6.26	8.5	7.51	1641	-310	0.15	3.70	300
05 36	6.26	8.5	7.49	1673	-308	0.14	3.04	300
08 39	6.27	8.6	7.45	1708	-309	0.14	2.70	300
11 42	6.27	8.7	7.43	1740	-308	0.13	2.33	300
14 45	6.27	8.7	7.41	1772	-308	0.15	1.88	300
17 48	6.27	8.8	7.39	1801	-310	0.14	1.92	300
20 51	6.27	8.8	7.39	1806	-309	0.14	1.83	300
23 54	6.27	8.8	7.39	1809	-310	0.14	1.79	300
26 57								

Water sample:

Time collected: 1330

Total volume of purged water removed: 4.28 gal

Physical appearance at start
Color COLORLESS
Odor NONE / (SULFUR SLIGHT) DURING.
Sheen/Free Product NO

Physical appearance at sampling
Color COLORLESS
Odor SULFUR (SLIGHT)
Sheen/Free Product NONE.

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ML	GLASS	9	NO	1:1 HCL	<2
1LTR 1LTR	GLASS GLASS	6 3		$Na_2S_2O_3$ NONE	>12
1LTR	POLY	3		HNO_3	<2
500ML	POLY	3		NaOH	>12

Notes: MS/MSD COLLECTED. PID = 0.0 ppm

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

Date	FEB 23, 1998	Personnel	JAM, TP	Weather	OVERCAST 46°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	URS-9I
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.

Well information:

Depth of Well *	46.49	ft.
Depth to Water *	5.99	ft.
Length of Water Column	40.50	ft.

* Measurements taken from

X	Top of Well Casing
	Top of Protective Casing
	(Other, Specify)

Sh. 1 of 2

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

	Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
	0	5.99							
1449	3	6.60	9.4	7.88	1248	-148	7.59	52.1	500
1452	6	6.43	9.5	7.83	1257	-140	1.55	47.2	500
1455	9	6.44	9.8	7.78	1257	-139	0.99	51.0	500
1458	12	6.46	10.1	7.75	1251	-139	0.76	50.1	500
1501	15	6.46	10.1	7.74	1253	-139	0.65	57.5	500
1504	18	6.44	10.1	7.72	1232	-175	0.63	61.9	500
1507	21	6.36	10.0	7.60	1215	-206	0.60	56.2	390
1510	24	6.36	9.8	7.50	1215	-219	0.47	43.0	390
1513	27	6.36	9.9	7.43	1218	-227	0.41	36.9	390
1516	30	6.36	10.1	7.38	1212	-232	0.38	31.0	390
1519	33	6.37	10.0	7.36	1216	-237	0.36	25.1	400
1522	36	6.37	10.1	7.34	1219	-241	0.34	21.9	400
1525	39	6.37	10.1	7.32	1218	-242	0.33	18.4	400
1528	42	6.37	10.2	7.31	1216	-245	0.32	16.8	400
1531	45	6.37	10.2	7.29	1223	-248	0.30	17.8	400
1534	48	6.37	10.2	7.27	1226	-250	0.30	13.6	400
1537	51	6.37	10.2	7.26	1227	-252	0.29	12.7	400
1540	54	6.37	10.3	7.26	1233	-254	0.29	13.2	400
1543	57	6.37	10.2	7.26	1233	-255	0.29	11.0	400

Water sample:

Time collected: 1630

Total volume of purged water removed: 89 gal

Physical appearance at start
Color: Milky white
Odor: No
Sheen/Free Product: No

Physical appearance at sampling
Color: COLORLESS
Odor: SULFUR (SLIGHT)
Sheen/Free Product: NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes: 18 min Reduced Flow to 300 ml/min due to Turb > PID = 0.00

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

Date	FEB 23, 1998	Personnel	JAM, TP	Weather	OVERCAST 40°
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	UES-9I
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.003

Well information:

Depth of Well * ____ ft.
Depth to Water * ____ ft.
Length of Water Column ____ ft.

* Measurements taken from
- [x] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

Sh. 2 of 2

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

	Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
1546	60	6.37	10.2	7.26	1238	-258	0.29	10.10	400
1549	63	6.37	10.3	7.25	1242	-260	0.28	9.65	400
1552	66	6.37	10.3	7.25	1243	-262	0.27	8.37	400
1555	69	6.37	10.3	7.25	1247	-282	0.27	7.91	400
1558	72	6.37	10.3	7.25	1248	-285	0.27	7.37	400
1601	75	6.37	10.3	7.24	1248	-273	0.27	7.25	400
1604	78	6.37	10.3	7.24	1257	-270	0.26	6.68	400
1607	81	6.37	10.4	7.24	1257	-270	0.26	6.57	400
1610	84	6.37	10.3	7.24	1257	-270	0.25	6.30	400
1612	87								
161	90								
1619									

Water sample:

Time collected: 1630

Total volume of purged water removed: 8.5 gallons

Physical appearance at start
Color MILKY WHITE
Odor NONE
Sheen/Free Product NONE

Physical appearance at sampling
Color COLORLESS
Odor SULFIDE (SLIGHT)
Sheen/Free Product NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ML	GLASS	3	NO	1:1 HCL	<2
LITER LITER	GLASS GLASS	2 1	NO NO	$Na_2S_2O_3$ NONE	>12
LITER ~~LITER~~	POLY ~~POLY~~	1 ~~1~~	NO ~~NO~~	HNO3 ~~HNO3~~	<2
500ML	POLY	1	NO	NAOH	>12

Notes: — 1700 EQUIPMENT BLANK #1 COLLECTED

O'Brien & Gere Engineers, Inc.

Low Flow Ground Water Sampling Log

Date	FEB 23, 1998	Personnel	JAN, TP	Weather	SUNNY 40°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	URS - 9D
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829. •

Well information:

Depth of Well *	51.01	ft.
Depth to Water *	5.12	ft.
Length of Water Column	45.89	ft.

* Measurements taken from

- [X] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

sh. # 1 of 2

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
0 min	5.07							
1201 3	5.43	9.6	7.05	226	008	4.49	33.9	160 ml/m
1204 6	5.40	9.7	7.26	210	-010	4.21	38.2	160
1207 9	5.44	9.7	7.43	213	-038	3.87	26.2	160
1210 12	5.42	9.8	7.53	225	-014	3.51	23.2	160
1213 15	5.42	10.1	7.69	227	-101	3.26	25.8	160
1216 18	5.44	9.8	7.75	227	-125	3.06	17.0	160
1219 21	5.44	9.4	7.80	242	-140	2.86	14.5	160
1222 24	5.44	9.2	7.81	236	-152	2.68	13.5	160
1225 27	5.44	9.0	7.83	249	-159	2.51	15.4	160
1228 30	5.44	9.0	7.83	236	-166	2.33	13.5	160
1231 33	5.45	9.0	7.84	242	-169	2.20	13.5	160
1234 36	5.44	9.1	7.82	231	-174	2.05	12.4	160
1237 39	5.44	9.1	7.82	221	-177	1.95	11.2	160
1240 42	5.44	9.1	7.80	221	-182	1.80	8.92	160
1243 45	5.44	9.1	7.79	210	-185	1.65	13.1	160
1246 48	5.44	9.2	7.76	212	-187	1.60	9.40	160
1249 51	5.44	9.2	7.75	215	-189	1.53	8.75	160
1252 54	5.44	9.2	7.74	212	-191	1.43	7.26	160
1255 57	5.44	9.2	7.73	203	-194	1.40	8.92	160

Water sample:

Time collected: 1400

Total volume of purged water removed: 5.10 gallons

Physical appearance at start
Color: clear
Odor: None
Sheen/Free Product: None

Physical appearance at sampling
Color: CLEAR
Odor: NONE/SLIGHT
Sheen/Free Product: NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes: PID - 0 ppm

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

Date	FEB 23, 1998	Personnel	JAM, TP	Weather	OVERCAST 35°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	UBS-9D
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5929

Well information:

Depth of Well * _____ ft.
Depth to Water * _____ ft.
Length of Water Column _____ ft.

* Measurements taken from
- [x] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

Sh. 2 of 2

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
1258 60	5.44	9.2	7.71	219	-197	1.32	7.33	160
1301 63	5.44	9.2	7.70	198	-198	1.24	6.59	160
1304 66	5.44	9.2	7.68	197	-201	1.20	7.40	160
1307 69	5.44	9.2	7.66	196	-203	1.14	6.55	160
1310 72	5.44	9.2	7.65	195	-206	1.07	7.41	160
1313 75	5.44	9.3	7.63	188	-208	1.03	5.36	160
1316 78	5.44	9.3	7.62	185	-210	0.98	6.23	160
1319 81	5.44	9.3	7.60	192	-213	0.93	5.32	160
1322 84	5.44	9.4	7.63	186	-215	0.86	4.80	160
1325 87	5.44	9.4	7.58	179	-216	0.85	5.16	160
1328 90	5.44	9.5	7.55	178	-219	0.81	5.54	160
1331 93	5.44	9.5	7.55	175	-220	0.78	6.35	160
1334 96	5.44	9.6	7.55	168	-223	0.74	6.09	160
1337 99	5.44	9.6	7.53	168	-225	0.72	4.08	160
1340 102	5.44	9.5	7.52	173	-226	0.70	4.72	160
1343 105	5.44	9.5	7.50	175	-228	0.66	3.47	160
1346 108	5.44	9.4	7.50	163	-229	0.64	3.63	160
1349 111	5.44	9.4	7.50	170	-230	0.61	3.09	160
1352 114	5.44	9.3	7.50	168	-231	0.59	3.28	160
1355 117	5.44	9.3	7.51	167	-233	0.57	4.04	160
1358 120	5.44	9.3	7.50	166	-235	0.55	3.74	160

Water sample:

Time collected: 1402

Total volume of purged water removed: 5.1 gallons.

Physical appearance at start
Color CLEAR
Odor NONE
Sheen/Free Product NONE

Physical appearance at sampling
Color CLEAR
Odor NONE / SLT FINE
Sheen/Free Product NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ML	GLASS	3	NO	HCl	<2
1 LITER	GLASS	2	NO	$Na_2S_2O_3$	>2
1 LITER	[redacted]	1	NO	NONE	<2
[redacted]	[redacted]	1	NO	[redacted]	>2
500 ML	[redacted]	1	NO	NONE	>2

Notes:

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

Date	FEB 25, 1998	Personnel	JAM, TP	Weather	SUNNY 35°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	88-12C
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.003

Well information:

Depth of Well *	31.39	ft.
Depth to Water *	6.59	ft.
Length of Water Column	24.79	ft.

* Measurements taken from

- [X] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

	Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
	0	6.35							
1254	~~1254~~ 3	7.13	9.6	8.13	1176	-113	5.12	307	300
1257	~~1257~~ 6	7.16	9.7	7.96	1182	-106	4.43	144	320
1300	~~1300~~ 9	7.22	10.0	7.84	1192	-107	3.95	60.1	320
03	12	7.25	10.2	7.79	1192	-106	3.69	60.7	*190
06	15	7.18	10.4	7.70	1183	-101	3.42	31.8	190
09	18	7.18	10.3	7.65	1180	-099	3.50	20.6	190
12	21	7.20	9.9	7.61	1191	-96	3.49	17.6	190
15	24	7.19	10.0	7.58	1189	-096	3.40	14.6	200
18	27	7.20	10.1	7.58	1194	-097	3.35	13.6	200
2	30	7.22	10.2	7.57	1189	-096	3.19	12.9	200
24	33	7.25	10.4	7.56	1192	-099	3.08	13.4	200
27	36	7.25	10.4	7.56	1191	-099	3.00	11.6	200
30	39	~~7.25~~ 7.27	10.5	7.56	1191	-101	2.74	10.9	200
33	42	7.28	10.6	7.55	1184	-102	2.62	9.87	200
36	45	7.28	10.5	7.53	*795	-104	2.43	10.9	200
39	48	7.28	10.6	7.52	790	-105	2.35	10.7	200
42	51	7.26	10.6	7.52	809	-103	2.34	8.90	200
45	55	7.27	10.4	7.53	810	-105	2.31	8.93	200
48	58	7.27	10.5	7.52	809	-105	2.32	9.01	200

Water sample:

Time collected: 1358

Total volume of purged water removed: 3.05 gal

Physical appearance at start
Color: Lt Tan
Odor: None
Sheen/Free Product: None

Physical appearance at sampling
Color: Clear
Odor: None
Sheen/Free Product: None

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ml	3 / GLASS	3	NO	1:1 HCl	<2
LITER/LITER	2 / 1 GLASS/GLASS	2/1		$Na_2S_2O_3$ / NONE	>12 / NONE
LITER	1 / POLY	1	✓	HNO_3	<2
500ml	1 / POLY	1		NaOH	>12

Notes: * Reset Flow Rate

PID = 0.0ppm

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

Date	FEB 25, 1998	Personnel	JAM, TP	Weather	SUNNY 35°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	88-12D
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.003

Well information:

Depth of Well *	53.50	ft.
Depth to Water *	6.70	ft.
Length of Water Column	46.80	ft.

* Measurements taken from

- [X] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Time	Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
	0	5.88	1·						
1416	3	9.81	10.0	7.52	2960	~~3.19~~ -012	3.19	7.53	150 50
1419	6	10.10	10.1	7.25	2910	-008	2.75	5.99	50
22	9	10.14	10.3	7.42	2880	-005	2.59	5.89	50
25	12	10.14	10.3	7.40	2870	-007	2.52	5.50	50
28	15	10.15	10.3	7.38	2870	-006	2.35	5.65	50
31	18	10.15	10.2	7.37	2860	-006	2.29	5.91	50
34	21	10.15	10.2	7.36	2840	-006	2.04	5.85	50
37	24	10.16	10.2	7.36	2850	-007	1.76	5.97	50
40	27	10.16	9.9	7.36	2850	-007	1.56	5.87	50
4	30	10.16	9.9	7.35	2850	-007	1.37	5.48	50
46	33	10.16	9.8	7.18	2870	-006	1.29	5.87	50
49	36	10.16	9.6	7.18	2870	-006	1.21	5.89	50
52	39	10.16	9.6	7.18	2870	-006	1.21	5.78	50
55	42								
58	45								
150	48								
04	51								
07	54								
10	57								

Water sample:

Time collected: 1500

Total volume of purged water removed: 0.52 gallons

Physical appearance at start
Color: COLORLESS
Odor: NONE
Sheen/Free Product: NONE

Physical appearance at sampling
Color: COLORLESS
Odor: NONE/SLIGHT SULFUR
Sheen/Free Product: NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ML	GLASS	3	NO	1:1 HCl	<2
LITER/LITER	GLASS/GLASS	2/1		$Na_2S_2O_3$/NONE	>12/NONE
LITER	POLY	1		HNO_3	<2
500ML	POLY	1	↓	~~NaOH~~ NaOH	>12

Notes: EB #4 COLLECTED AT 1600

PID = 0.00 ppm

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

Date	FEB 25, 1998	Personnel	JAM, TP	Weather	SUNNY 30°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	MWS-14I
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.003

Well information:

Depth of Well *	31.15	ft.
Depth to Water *	0.90	ft.
Length of Water Column	30.25	ft.

* Measurements taken from

- [X] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

1 of 2

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
0	~~4.88~~ 1.36	9.0	8.80	587	-256	5.55	69.4	~~150~~ 75
5	4.59	9.8	8.93	540	-238	3.87	73.5	75
10	5.10	8.6	8.97	5.49	-220	3.49	74.5	88 (440)
15	5.65	8.1	893	567	-210	3.41	53.7	80 (400)
20	6.02	8.3	8.96	563	-200	3.42	45.5	56 (280)
25	6.64	8.4	8.96	563	-191	3.45	26.5	100 (500)
30	7.35	8.2	8.95	582	-182	3.86	26.0	100 (500)
35	8.01	9.0	8.96	567	-175	3.25	41.5	120 (600)
40	8.37	9.1	8.96	566	-158	3.27	38.5	80 (400)
45	8.80	9.2	8.97	548	-144	2.98	32.0	70 (350)
50	9.06	9.0	8.95	553	-138	3.12	29.0	70 (350)
55	9.66	8.9	8.97	556	-130	3.03	32.0	95 (475)
60	9.94	9.3	8.97	542	-126	2.98	20.5	70 (350)
65	10.45	8.9	8.97	557	-115	3.00	12.3	80 (400)
70	11.02	9.1	8.98	556	-108	3.02	10.6	100 (500)
75	11.44	9.2	8.97	557	-103	2.96	11.1	72 (360)
80	11.78	9.3	8.97	546	-097	2.89	11.6	72 (360)
85	12.23	9.2	8.97	555	-094	2.85	12.4	50 (250)
90	12.61	9.1	8.96	560	-090	2.86	11.0	45 (475)
95	12.91	9.4	8.97	543	-087	2.79	20.2	40

Water sample:

Time collected: 1200

Total volume of purged water removed: 2.4 gallons

Physical appearance at start
Color: CLEAR
Odor: NONE
Sheen/Free Product: NONE

Physical appearance at sampling
Color: CLEAR / VERY LIGHT MILKY WHITE
Odor: NONE / SLIGHT
Sheen/Free Product: NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40 ML	GLASS	3	NO	HCl	<2
1 LITER / 1 LITER	GLASS / GLASS	2 / 1		$Na_2S_2O_3$ / NONE	>12 / NONE
1 LITER	POLY	1		HNO_3	<2
500 ML	POLY	1	↓	NaOH	>12

Notes: Flow Rate has to be adjusted to compensate for increased head. Rate is averaged over 5 min intervals

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

Date	FEB 25, 1998	Personnel	JAM, TP	Weather	SUNNY 30°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	URS-14I
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.003

Well information:

Depth of Well * _____ ft.
Depth to Water * _____ ft.
Length of Water Column _____ ft.

* Measurements taken from
- [x] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

2 of 2

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).	
35 100	1340	9.5	8.99	5.62	-088	2.93	43.8	100	600
105	1383	9.6	8.97	560	-083	2.85	45.3	90	(450
45 110	1438	9.9	8.97	385	-077	2.98	40.8	100	(500
115	1471	10.3	8.97	549	-072	283	43.2	50	(250
55 120	1545	10.6	8.97	572	-084	2.99	44.9	50	(250

Water sample:

Time collected: 1200

Total volume of purged water removed: 2.4 gal

Physical appearance at start
Color CLEAR
Odor NONE
Sheen/Free Product NONE

Physical appearance at sampling
Color CLEAR / VERY LIGHT MILKY WHITE
Odor SULFUR SLIGHT
Sheen/Free Product NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ML	GLASS	3	NO	1:1 HCl	<2
1 LITER / 1 LITER	GLASS / GLASS	2 / 1		$Na_2S_2O_3$ / NONE	>12 / NONE
1 LITER	POLY	1	↓	HNO_3	<2
500ML	POLY	1		NaOH	>12

Notes: @100 Pump impellers wouldn't increase, Increased Flow Rate PID = 0.0 ppm

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

Date	FEB 25, 1998	Personnel	JAM, TP	Weather	SUNNY 30°F
Site Name	FRONTIER CHEMICAL	Evacuation Method	REDI-FLOW 2	Well #	URS-14D
Site Location	PENDLETON SITE	Sampling Method	REDI-FLOW 2	Project #	5829.003.

Well information:

Depth of Well *	41.67	ft.
Depth to Water *	4.84	ft.
Length of Water Column	36.83	ft.

* Measurements taken from
- [x] Top of Well Casing
- [ ] Top of Protective Casing
- [ ] (Other, Specify)

Water parameters: Lower submersible pump slowly through stagnant water column
Position pump in center of screened interval & maximum pumping rate of 0.5 liters/minute
Collect readings at every three minute intervals

Elapsed Time	Depth To Water	Temperature	pH	Conductivity	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).
Ø min	4.88							
8:28 3	5.12	5.8	9.75	1085	-230	6.02	19.5	350
31 6	5.12	5.8	8.65	1255	-261	3.98	18.1	350
34 9	5.14	9.1	8.03	1329	-284	2.27	12.6	350
37 12	5.14	9.3	7.79	1372	-297	1.71	7.03	350
40 15	5.14	9.5	7.67	1390	-302	1.27	5.45	350
43 18	5.15	9.5	7.59	1436	-305	1.07	6.05	350
46 21	5.15	9.6	7.49	1488	-306	0.94	7.64	350
49 24	5.16	9.7	7.44	1543	-308	0.90	7.26	350
52 27	5.16	9.7	7.37	1626	-311	0.81	4.41	350
55 30	5.16	9.8	7.30	1665	-313	0.74	2.87	350
58 33	5.16	9.8	7.28	1696	-314	0.69	2.16	350
01 36	5.17	9.8	7.23	1700	-316	0.65	1.31	350
04 39	5.17	9.8	7.20	1728	-320	0.60	1.11	350
07 42	5.17	9.8	7.16	1740	-321	0.56	0.81	350
10 45	5.17	9.8	7.14	1740	-321	0.52	1.01	350
13 48	5.17	9.8	7.11	1741	-320	0.51	1.00	350
16 51	5.17	9.8	7.11	1742	-320	0.51	0.63	350
19 54	5.17	9.9	7.10	1741	-320	0.52	0.93	350
22 57								

Water sample:
Time collected: 930

Total volume of purged water removed: 5 gallons

Physical appearance at start
Color: Clear
Odor: Sulfur
Sheen/Free Product: None

Physical appearance at sampling
Color: CLEAR
Odor: SULFUR.
Sheen/Free Product: NONE

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH
40ML	GLASS	3	NO	1:1 HCl	<2
LITER/LITER	GLASS/GLASS	2/1		Na_2SO_3/NONE	>12/NONE
LITER	POLY	1		HNO_3	<2
500ML	POLY	1		NaOH	>12

Notes: BW #3 COLLECTED AT 0800 — PID = 0.0 ppm

O'Br) & Gere Laboratories, Inc.

500(ttonfield Parkway
East Syracuse, New York 13057
(315) 437-0200

Chain o ustody

Client: Frontier Chemical

Project: Pendleton Site

Sampled by: James A. Moore

Client Contact: Tom Burns/Glenn Smith (OBG) Phone #

Sample Description

Sample Location	Date Collected	Time Collected	Sample Matrix	Comp. or Grab	No. of Containers	#	VOC (8260)	Semi-volatiles (8270)	PCBs/Pest	Total Metals	Cyanide			Comments
URS-9D	2/23/98	1400	Water	Grab	8	3	2	1	1	1				
URS-9T	2/23/98	1630	Water	Grab	8	3	2	1	1	1				
Equipment Blank #1	2/23/98	1700	Water	Grab	8	3	2	1	1	1				
85-5R	2/24/98	0955	Water	Grab	8	3	2	1	1	1				
URS-5D	2/24/98	1130	Water	Grab	8	3	2	1	1	1				
Equipment Blank #2	2/24/98	1145	Water	Grab	8	3	2	1	1	1				
URS-7D	2/24/98	1330	Water	Grab	8	3	2	1	1	1				
URS-7D (MS)	2/24/98	1330	Water	Grab	8	3	2	1	1	1				
URS-7D (MSD)	2/24/98	1330	Water	Grab	8	3	2	1	1	1				
85-7R	2/24/98	1530	Water	Grab	8	3	2	1	1	1				
Blind Duplicate	2/24/98	—	Water	Grab	8	3	2	1	1	1				
Trip Blank (Lab)	2/ /98		Water	Grab	3	3								

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by: [signature]	Date: 2/24/98	Time: 1900	Received by Lab:	Date:	Time:
Shipment Method: Federal Express			Airbill Number: 55 1739 0115		

Turnaround Time Required:
Routine____________
Rush (Specify)____________

Comments: 3 - Coolers (Total)

Cooler Temperature:____________

Original-Laboratory Copy-Client

O'Br[illegible] & Gere Laboratories, Inc.

500[illegible] ttonfield Parkway
East Syracuse, New York 13057
(315) 437-0200

Chain o[illegible] ustody

Client: FRONTIER CHEMICAL
Project: PENDLETON SITE
Sampled by: JAMES A. MOORE
Client Contact: JOHN BURNS. Phone #

Sample Description

Sample Location	Date Collected	Time Collected	Sample Matrix	Comp. or Grab	No. of Containers	VOA's (624)	Semivolatiles (625)	BNA's/PEST	TCL metals	Cyanide			Comments
EQUIPMENT BLANK #3 (083)	2/25/98	0820	WATER	GRAB	8	3	2	1	1	1			
URS-14D	2/25/98	0930	WATER	GRAB	8	3	2	1	1	1			
URS-14I	2/25/98	1200	WATER	GRAB	8	3	2	1	1	1			
88-12S	2/25/98	1350	WATER	GRAB	8	3	2	1	1	1			
88-12D	2/25/98	1500	WATER	GRAB	8	3	2	1	1	1			
EQUIPMENT BLANK #4 (084)	2/25/98	1600	WATER	GRAB	8	3	2	1	1	1			
TRIP BLANKS (LAB)	2/98	—	WATER	GRAB	3	3							

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date: 2/26/98	Time: 1515	Received by Lab: Mandy C. Jordan	Date: 2/27/98	Time: 15:15
Shipment Method: HAND DELIVERED.			Airbill Number:		

Turnaround Time Required:
Routine_____
Rush (Specify)_____

Comments:

Cooler Temperature: 1

Original-Laboratory Copy-Client

ATTACHMENT D

Frontier Chemical - Pendleton Site
March 1998

Attachment D – Site Maintenance Work Items and Field Observation Reports

GLYNN GEOTECHNICAL ENGINEERING
GEOTECHNICAL AND CIVIL ENGINEERING SERVICES

FIELD OBSERVATION REPORT

PROJECT NO.: 94 - 1014 REPORT NO.: 97-18 DATE: 28-Oct-97 PAGE: 1 OF 1

PROJECT: Pendleton (Frontier Chemical) Site Remediation DAY: Tuesday

SUBJECT: On Site Supervisor's Report PROJECT TIME: 1:30 pm - 3:00 pm

CLIENT: Pendleton Site PRP Group SITE TIME: 1:30 pm - 3:00 pm

WEATHER: Cool, Breezy, Partly Cloudy (45° F) PHOTOS: YES NO X

- Meet representatives from the PPRP and NYSDEC on site to discuss ongoing Operations and Maintenance and observe site conditions.
- Brian Sechowski (NYSDEC) observes the pre-treatment system and discusses present discharge / leachate generation rates, filter change-out schedules, system components, etc. B. Sechowski comments that the bag filter rack should be anchored to prevent rocking.
- Note that the pre-treatment vault is presently dry and Jim Reed (Olin) reports that the hydrostatic relief has not been opened recently (past three weeks) to drain groundwater exterior to the vault.
- Observe the cap area noting that the grass cover is in good condition.
- Note that the lakeside slope remediated in early September, '97 is partially vegetated and no recurring erosion is noted.
- Record the present lake elevation by level survey. The lake water elevation is 572.88'.
- Receive diskette copies of O'Brien & Gere record as-built drawings from John Burns. GGE to revise drawings to include as-built details relative to the additional work items completed in Aug - Sept. '97.
- R.L. Stone has completed repairs to the instrumentation transmitter at the pre-treatment vault (ref. FOR 97-13, 4-Sep-97) and the system is working properly. GGE requested by John Burns to research documentation / correspondence regarding past repairs to the system.
- GGE requested to develop method for visually determining lake level (e.g. calibrated marker, other).
- Leave site at approx. 3:00 pm.

PERSONNEL ON SITE / CONTACTED:
John Burns, Jim Reed - Olin
Abul Barkat, Brian Sechowski

DISTRIBUTION:
John Burns - Olin
Jim Reed - Olin

Man-hours: 1.5

REPORTED BY: Jesse E. Grossman, Project Manager

REVIEWED BY: Mark W. Glynn, P.E. 11.7.97

DOCFILE:941014c9717

6503 Campbell Blvd., Lockport, New York 14094 (716) 625-6933 / fax (716) 625-6983

GLYNN GEOTECHNICAL ENGINEERING
GEOTECHNICAL AND CIVIL ENGINEERING SERVICES

FIELD OBSERVATION REPORT

PROJECT NO.: 94-1014-O REPORT NO.: 98-01 DATE: 23-Feb-98 PAGE: 1 OF 1

PROJECT: Pendleton (Frontier Chemical) Site Remediation DAY: Monday

SUBJECT: On Site Supervisor's Report PROJECT TIME: 1:00 pm - 3:00 pm

CLIENT: Pendleton Site PRP Group SITE TIME: 1:00 pm - 3:00 pm

WEATHER: Cool, Overcast (35° F) PHOTOS: YES X NO

- Meet Jim Reed (PPRP) on site for semi-annual inspection. O'Brien & Gere team is also on site for quarterly groundwater sample collection event.
- With Jim Reed, record Quarry Lake water surface elevation via level survey. Lake elevation is recorded at 578.0' and is at the design overflow elevation. Note overflow weir and note that lake surface is at the same elevation as standing water in the wetlands north of the perimeter berm.
- Observe the pre-treatment vault and note that the relief drain in the sump is plugged (i.e. no water flow when the drain is opened). Minimal seepage is noted at the vault walls.
- Observe the cap area. Cap vegetation is generally in good condition, however a settled area is noted on lake side cap slope and there is evidence of mole or mice tunnels in the cover soil.
- With Jim Reed, operate the pinch valve at manhole #3. The valve is fully closed and flow into the manhole is stopped. The valve is then returned to the fully open position.
- With Jim Reed, remove the covers from manhole #1 and manhole #2 to inspect the manhole inverts. Both manholes are empty. No flow is noted at the manhole #1 invert. Very low flow is noted through the manhole #2 invert. Also, a small amount of sediment is noted in the manhole #2 invert.
- Jim Reed notes that PPRP and NYSDEC representatives will be on site tomorrow for semi-annual inspection. GGE will be notified to meet at site if required.
- Leave site at approx. 3:00 pm.

PERSONNEL ON SITE / CONTACTED:
Jim Reed - PPRP
Tim - O'B&G

DISTRIBUTION:
John Burns - PPRP
Jim Reed - PPRP

Man-hours: 2.0

REPORTED BY: Jesse E. Grossman, Project Manager

REVIEWED BY: Mark W. Glynn, P.E.

DOCFILE:94r014s98f

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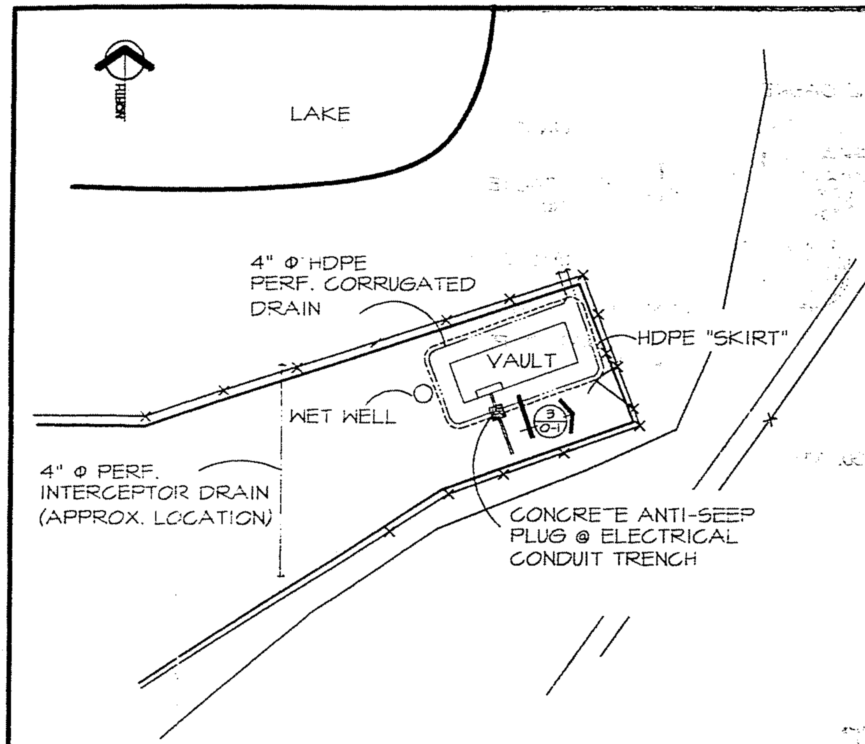
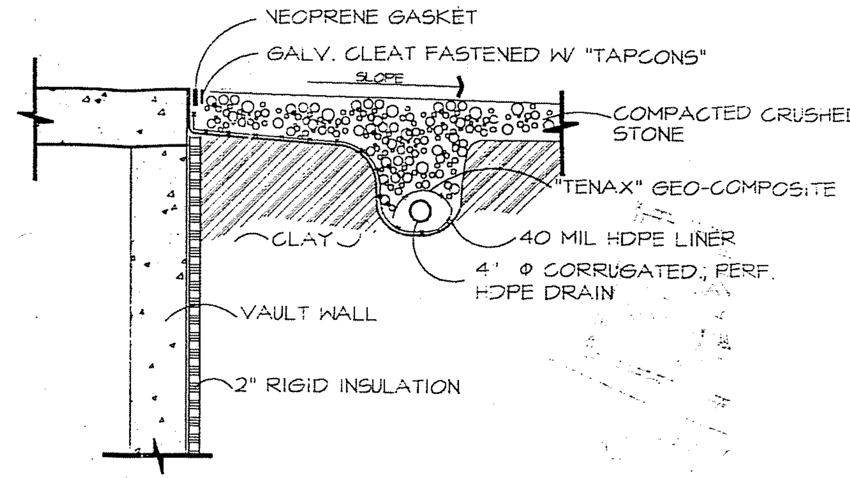
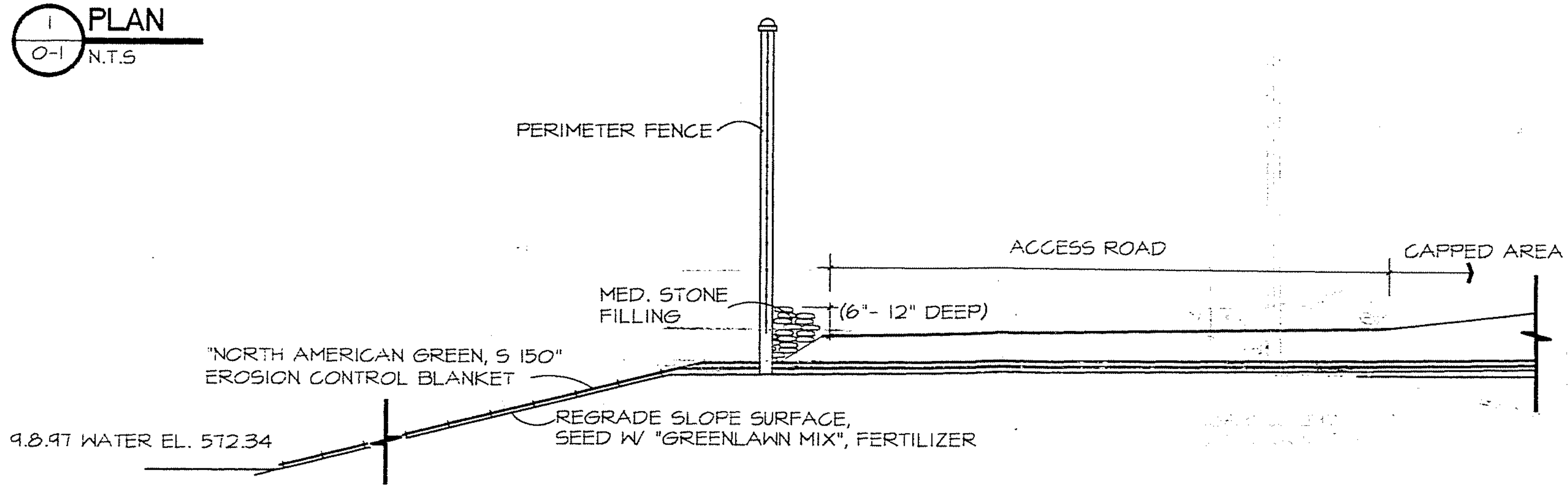


1 / O-1 PLAN
N.T.S



3 / O-1 VAULT "RAIN SKIRT"
N.T.S.



2 / O-1 LAKESIDE SLOPE, EROSION CONTROL
N.T.S.

J:\94-1014 (Pendleton Site)\94-1014-0 (Operations Maint)\O-1 Thu Nov 13 13:57:09 1997

WARNING, IT IS A VIOLATION OF NEW YORK STATE EDUCATION LAW FOR ANY PERSON TO ALTER THIS DRAWING UNLESS THEY COMPLY WITH SECTION 7209.3 OF THE LAW.

GGE
GLYNN GEOTECHNICAL ENGINEERING
LOCKPORT, NEW YORK • (716) 625-6933

STATE OF NEW YORK — MARK W. GLYNN — LICENSED PROFESSIONAL ENGINEER

GGE PROJ #: 94-1014-0
DATE: 11-13-97
DRN: MFS
CHK: JEG

CLIENT: PENDLETON PRP GROUP
PROJECT: FRONTIER CHEMICAL- PENDLETON SITE
TITLE: POST-CONSTRUCTION WORK DETAILS
DWG: O-1