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**SAMPLING AND ANALYSES REPORT FOR POSTBURN
SAMPLING AT THE RM-1 UCG SITE, HANNA, WY**

**By
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**By
Western Research Institute
Laramie, Wyoming**

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INTRODUCTION

Between March 3, 1989 and March 9, 1989, Western Research Institute (WRI) completed the first quarterly Rocky Mountain 1 (RM1) groundwater monitoring for the year 1989. This quarterly sample outing represents the second sampling since the completion of the RM1 groundwater restoration in September, 1988.

Background material and the sampling and analytical procedures associated with the sampling task are described in the "Rocky Mountain 1 Postburn Groundwater Monitoring Quality Assurance Plan," prepared by Western Research Institute for the Gas Research Institute and the U.S. Department of Energy.

SAMPLING ACTIVITIES

A summary of the sampling activities performed by WRI at the RM1 site during the March 1989 quarterly sampling period are presented in Table 1. This table shows a list of the wells sampled, sampling date, sampling method, the sample parameter suite, and observations made during sampling.

A total of 23 monitoring wells were sampled during the first quarterly postburn sampling of 1989. This included 16 wells completed in the coal seam, 2 wells completed in the unit A overburden, 2 wells completed in the unit C overburden, 1 well completed in the underburden, 1 well completed in the ELW cavity, and 1 well completed in the CRIP cavity. All wells were sampled for the compliance suite (CS) of parameters. Compliance suite refers to those parameters listed as such in the "Rocky Mountain 1 Postburn Groundwater Monitoring Quality Assurance Plan."

Wells EMW-2 and EMW-8 have very low permeability and historically have not recharged sufficiently to sample with a portable pump. To avoid sampling borehole water, both wells were pumped to the bottom of casing using a Bennett pump at the beginning of the outing and allowed to recharge. These two wells were later sampled with a Teflon bailer on March 9, 1989.

Well EMW-6 has a two inch diameter casing that has become bent or twisted. The Bennett pump system will not reach appropriate sample depth, therefore, a Teflon bailer was also used to sample this well.

All of the other wells have sufficient recharge and were pumped and sampled using the Bennett pump system.

Well purging procedures precede sample collection to ensure that the sample is obtained from the hydrostratigraphic unit and not from the wellbore. Purging data (purge time, temperature, conductivity, pH, Eh, water level, and pump discharge rate) are recorded during the well

purging process. Stabilization of the purging parameters is used to indicate formation water recovery. Well purging data collected for each well are included in Appendix A of this report. Stabilized purging parameter data, water level measurements, field alkalinity titration data, and other data are compiled for each well and are entered on the WRI Groundwater Sampling Record form. These forms correspond to each well sampled at the RM1 site and are also included in Appendix A.

DISCUSSION OF RESULTS AND ANALYSES

The results of sample analyses for compliance suite parameters of all wells sampled during March, 1989 are presented in Table 2.

In general, the wells in the west and southwest areas of the RM1 site, the wells that showed the most significant effect during the UCG burn (TW-2, EMW-11a, TW-18, and TW-17), are continuing to show effects of the burn after the groundwater restoration. Overburden-process conditions communications are also supported by the data collected. There is a trend of higher concentrations of ammonia and sulfate coupled with higher amounts of total dissolved solids in some of the groundwater from coal seam wells.

Total organic carbon (TOC) levels in coal seam wells TW-18 and TW-17 exceeded the highest baseline concentration of 45 mg/L. The value in these wells were 65 mg/L and 51 mg/L, respectively. The value is lower than the value observed during the December 1988 sampling event for well TW-18 and slightly higher for well TW-17.

Total dissolved solids (TDS) levels in coal seam wells TW-2 and TW-18, measured at 2760 mg/L and 3640 mg/L, respectively, were above highest baseline concentrations of 2750 mg/L. These values are lower than the values observed during the previous sample outing.

Well TW-18 had an ammonia level of 9.4 mg/L which was above the highest baseline concentration for coal seam wells of 7.9 mg/L.

Coal seam well TW-5 had a phenolics measurement of .026 mg/L which was above highest baseline concentration. However, this result is believed to be in error. Well EMW-11a and a QA/QC duplicate were sampled immediately after sampling well TW-5 and the duplicate sample showed a high level of phenolics while the EMW-11a sample was below detection limit. It is believed that the duplicate and well TW-5 samples were somehow contaminated by the external environment and not from the UCG water. Also, well TW-5 has never shown phenolics during postburn sampling.

There were several values obtained from cavity wells CPW-2 and VIW-1 that were above the highest baseline concentrations for coal seam wells. These were phenolics: .035 mg/L and .030 mg/L; boron: 1.40 mg/L and 1.02 mg/L; and TDS: 3170 mg/L and 2970 mg/L, respectively. Highest baseline

concentrations for phenolics and boron were below analytical detection limits of .020 mg/L and was 2750 mg/L for TDS.

Coal seam wells that showed an increase in ammonia, sulfate, and TDS were EMW-1, EMW-9, TW-3, TW-15, TW-16, TW-17, and VIW-1. Wells that showed an increase in TOC were EMW-1, EMW-9, TW-5, and TW-17. All other values that increased compared to the December 1988 sampling event were inconsequential or showed no discernible pattern.

Unit A overburden well EMW-2 showed a value above the baseline mean concentration plus two standard deviations for the following parameters: phenols, .057 mg/L (baseline value was below analytical detection level), ammonia, 7.8 mg/L (baseline plus two standard deviations = 3.2 mg/L), and boron, .064 mg/L (baseline plus two standard deviations = .0189 mg/L). Unit A overburden well EMW-8 was above baseline for ammonia, 3.7 mg/L, and boron, .065 mg/L.

For the purpose of making comparisons, values obtained from the December 1988 sample outing and baseline data were used.

QUALITY ASSURANCE AND QUALITY CONTROL

Concentrated stock solutions were supplied by the WRI Quality Assurance/Quality Control (QA/QC) officer, diluted in the field, and submitted as field standard samples. Field standards are designed to check analytical accuracy. Standards of each element or compound to be analyzed were diluted in the field with distilled-deionized water and submitted anonymously as a regular sample set. The sample preparation procedures were supplied by the QA/QC officer.

A field duplicate sample was collected from well EMW-11a which has a history as one of the most contaminated wells at the RM-1 site. The regular and duplicate samples were prepared and preserved in an identical manner. The duplicate sample was submitted anonymously using a predetermined name. Field duplicates are designed to check analytical accuracy and consistency.

Quality assurance and quality control rinsate samples were generated using the sampling pump, local tap water, and Type 1 water. Rinsate sampling is intended to simulate the rinsing which occurs while purging each well before sampling. For this reason, the amount of rinsate water pumped through the sampling system for rinsate sampling represents an average amount of water pumped from each well.

Seventy five gallons of local tap water was pumped through the sampling system. The line was then evacuated using compressed air. Finally, ten gallons of Type 1 water was pumped through the line and sampled.

Type 1 water is high purity deionized, distilled water prepared in

WRI's analytical laboratory using distilled water as a feedstock and processed through a Millipore water purification system. The Millipore system recirculates water through 4 cartridges (1 carbon adsorption, 1 particulate trap, and 2 ion exchanges) and has a conductivity of less than 2 μ mhos/cm. The Type 1 water is thus assumed to be blank, and any levels of the compliance suite parameters detected in the rinsate water are assumed to be the result of cross-contamination from the sample pump and line.

Table 3 shows the results of the QA/QC standard, duplicate, and rinsate samples. Also included in the table are the expected results for each sample as determined by WRI's QA/QC officer. The expected results for the duplicate sample are the results obtained from the regular sample of well EMW-11a.

Western Research Institute's QA/QC officer reviewed the analytical results for the March 1989 RM-1 groundwater sampling test. His report stated that, "in general the results were acceptable and precision and accuracy were within accepted limits." All compliance suite analyses were within acceptable limits.

Table 1. RM1 Sampling Summary for March, 1989

Well Name	Date Sampled	Sample Method	Parameter Suite	Comments
EMW-1	03/07/89	Bennett pump	CS	Strong sulfur odor. Water was clear.
EMW-2	03/09/89	Teflon bailer	CS	Pumped dry and recharged. Water was brown and murky.
EMW-3	03/08/89	Bennett pump	CS	Slight sulfur odor to water. Some gas in line.
EMW-4	03/05/89	Bennett pump	CS	Some sulfur odor. Water was clear.
EMW-6	03/09/89	Teflon bailer	CS	Water was murky when bailed.
EMW-8	03/09/89	Teflon bailer	CS	Pumped dry and recharged. Water was clear and odor free.
EMW-9	03/04/89	Bennett pump	CS	Colorless, odorless water.
EMW-10	03/04/89	Bennett pump	CS	Colorless, odorless water.
EMW-11a	03/08/89	Bennett pump	CS	Water was clear. Some sulfur odor.
TW-2	03/07/89	Bennett pump	CS	Slight sulfur odor. Water was clear.
TW-3	03/07/89	Bennett pump	CS	Slight sulfur odor. Water was clear.
TW-4	03/04/89	Bennett pump	CS	Colorless, odorless water.
TW-5	03/08/89	Bennett pump	CS	Colorless, odorless water.

Table 1. RM1 Sampling Summary for March, 1989 continued

Well Name	Date Sampled	Sample Method	Parameter Suite	Comments
TW-11	03/06/89	Bennett pump	CS	Sulfur smell to water. Colorless water. Some gas in line.
TW-12	03/06/89	Bennett pump	CS	Colorless, odorless water.
TW-13	03/05/89	Bennett pump	CS	Gray silt in water. Slight sulfur odor.
TW-14a	03/05/89	Bennett pump	CS	Slight sulfur odor to water. Water has yellow tint. Some gas in line.
TW-15	03/05/89	Bennett pump	CS	Colorless, odorless water. Coal fines in water.
TW-16	03/06/89	Bennett pump	CS	Slight sulfur odor. Colorless water.
TW-17	03/07/89	Bennett pump	CS	Colorless, odorless water.
TW-18	03/07/89	Bennett pump	CS	Sulfur odor to water. Some gas in line.
VIW-1	03/08/89	Bennett pump	CS	Sulfur odor to water. Coal fines in water. Gas in line. Water is extremely clear.
CPW-2	03/08/89	Bennett pump	CS	Slight rubber smell to water. Coal fines in water.

Table 2. Compliance Suite Analyses for Samples Obtained from Coal, Overburden, and Underburden Monitoring Wells and Two Cavity Wells

Well Name	EMW-1	EMW-2	EMW-3	EMW-4	EMW-6	EMW-8	EMW-9	EMW-10	EMW-11a	TW-2	TW-3	TW-4
<u>Parameter</u>												
Phenolic, mg/L	<.02	.057	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
Cyanide, mg/L	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
Ammonia, mg/L	5.2	7.8	2.8	4.1	5.7	3.7	3.3	3.8	4.5	5.0	2.8	2.4
Total Organic Carbon, mg/L	32	<10	20	<10	<10	<10	38	<10	45	45	19	24
Total Dissolved Solids, mg/L	2430	1380	1620	980	1880	1320	2050	540	2720	2760	1590	1460
Sulfide, mg/L	1.9	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulfate, mg/L	750	5	470	160	610	13	920	80	1060	1310	530	410
Boron, mg/L	<.020	.064	<.020	.064	.042	.065	<.020	.030	<.020	<.020	<.020	<.020
Alkalinity (lab) ^a	1184	1280	749	695	855	1120	603	442	990	741	714	742
Alkalinity (field) ^a	1213	*	594.4	722.9	*	*	542.2	381.5	1004	791.2	763.0	743.0
pH (lab)	7.6	9.7	7.3	7.5	10.0	8.9	8.2	7.2	7.4	7.3	8.0	8.2
pH (field)	7.51	*	7.87	7.61	*	*	8.28	7.36	7.90	7.72	8.10	8.55
Eh, mV (field) ^b	20.6	*	17.1	110.0	*	*	151.7	150.0	65.9	17.6	17.0	77.0
Corrected Conductivity												
µmhos/cm (field)	3310	*	2295	1440	*	*	2920	820	3640	3760	2220	2010
Sample Temperature, °C	8.8	*	9.1	6.9	*	*	7.1	2.8	9.8	8.1	9.5	9.0
Sample Discharge Rate, gpm	1.00	Z	.85	.90	Z	Z	1.20	.40	.85	.85	.75	1.20

^a meq CaCO₃

^b Corrected to Standard H⁺ Electrode

Z Bailed Sample, Sample Discharge Rate Not Available

* Value Not Available

Table 2. Compliance Suite Analyses for Samples Obtained from Coal, Overburden, and Underburden Monitoring Wells and Two Cavity Wells continued

Well Name	TW-5	TW-11	TW-12	TW-13	TW-14a	TW-15	TW-16	TW-17	TW-18	VIW-1	CPW-2
Parameter											
Phenolic, mg/L	.026	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	.030	.035
Cyanide, mg/L	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
Ammonia, mg/L	3.5	3.5	3.0	2.5	2.3	2.4	2.5	3.6	9.4	5.2	5.4
Total Organic Carbon, mg/L	37	23	16	18	25	23	24	51	65	<10	<10
Total Dissolved Solids, mg/L	2200	1600	1570	1430	1380	1420	1480	2610	3640	2970	3170
Sulfide, mg/L	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulfate, mg/L	1010	560	570	450	300	380	390	1220	1990	1600	1980
Boron, mg/L	<.020	<.020	<.020	<.020	<.020	<.020	<.020	<.020	<.020	1.02	1.40
Alkalinity (lab) ^a	636	705	646	677	790	772	747	666	586	572	275
Alkalinity (field) ^a	674.7	763.0	670.7	682.7	783.1	823.3	787.1	686.7	614.5	634.5	325.3
pH (lab)	7.3	8.0	8.1	8.2	8.3	8.3	8.3	8.1	7.8	7.2	7.5
pH (field)	8.18	7.84	7.96	8.40	8.50	8.49	8.33	7.86	7.55	7.81	7.70
Eh, mV (field) ^b	99.4	-1.5	98.6	94.6	86.3	39.1	63.8	56.7	22.2	-19.8	-41.0
Corrected Conductivity, μhos/cm (field)	3060	2215	2270	1995	1830	2030	2090	3390	4390	3610	3780
Sample Temperature, °C	9.6	8.2	8.7	7.7	8.0	8.1	9.1	10.0	8.6	20.8	34.7
Sample Discharge Rate, gpm	1.00	.90	.90	.90	.50	.25	1.00	.90	1.00	.90	1.00

^a meq CaCO₃

^b Corrected to Standard H⁺ Electrode

Z Bailed Sample, Sample Discharge Rate Not Available

* Value Not Available

Table 3. Compliance Suite Analyses and Expected Results for Quality Assurance/Quality Control Standard, Control Standard, Duplicate, and Rinsate Samples

<u>QA/QC Sample</u>	<u>Field Standards</u>		<u>Field Duplicate</u>		<u>System Rinsate</u>	
	<u>Actual</u> *	<u>Expected</u> #	<u>Actual</u>	<u>Expected</u> !	<u>Actual</u>	<u>Expected</u>
<u>Parameter</u>						
Phenolics, mg/L	.930	1.000	.035	<.02	<.02	0
Cyanide, mg/L	.730	.800	<.02	<.02	<.02	0
Ammonia, mg/L	2.4	2.5	4.5	4.5	<0.2	0
Total Organic Carbon, mg/L	38	41	44	45	<10	0
Total Dissolved Solids, mg/L	130	109.3	2730	2720	<10	0
Sulfide, mg/L	13 ^a	30.8	<1	<1	<1	0
Sulfate, mg/L	10	10	1110	1060	<5	0
Boron, mg/L	2.55	2.5	<.02	<.02	<.02	0
Alkalinity, meq CaCO ₃ (lab)	65	51.6	993	990	<10	0
pH (lab)	9.5	Z	7.4	7.4	5.6	Z

* Actual results are analytical results from sample.

Expected results were determined by WRI's QA/QC officer.

! Expected duplicate results were obtained from regular sample at well EMW-11a.

a Value may be low due to analytical error.

Z Value not determined.

ACKNOWLEDGEMENT

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DISCLAIMER

Mention of specific brand names or models of equipment is for information only and does not imply endorsement of any particular brand.

APPENDIX A: SAMPLING RECORDS AND PURGING DATA

Project RM-2

Well Name EMW-1

Date 07 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1405</u>	<u>7.9</u>	<u>4330</u>	<u>7.44</u>	<u>-210.5</u>	<u>124.4</u>	<u>0.9</u>
<u>1425</u>	<u>8.4</u>	<u>2395</u>	<u>8.65</u>	<u>-248.7</u>	<u>142.2</u>	<u>1.2</u>
<u>1445</u>	<u>8.5</u>	<u>2485</u>	<u>8.21</u>	<u>-231.5</u>	<u>147.2</u>	<u>1.0</u>
<u>1505</u>	<u>8.7</u>	<u>2740</u>	<u>7.81</u>	<u>-214.3</u>	<u>148.35</u>	<u>1.1</u>
<u>1525</u>	<u>8.6</u>	<u>3320</u>	<u>7.50</u>	<u>-191.5</u>	<u>147.8</u>	<u>1.0</u>
<u>1535</u>	<u>8.8</u>	<u>3310</u>	<u>7.51</u>	<u>-190.5</u>	<u>148.8</u>	<u>1.0</u>

COMMENTS

1405 - Water is clear, slight sulfur odor.

1445 - Very strong sulfur odor.

Purged 96 gallons.

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name EMW-1
 Date 07 MAR 89 Field Crew Crader, West, Huntington
 Weather Cloudy, Windy Air Temperature 40 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 131.2' Depth of Sampling Device 354'

Field Analyses at Time of Sampling

Temperature 8.8 (°C)
 Corrected Conductivity 3310 (µmhos/cm at 25°C)
 pH 7.51
 Eh -190.5 (Field Electrode)
 Eh 20.58 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.0 (gallons/min)

Alkalinity Titration

Filtered Sample pH 7.59
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 30.2 ml
 Normality of HCl .02008 N
 Total Alkalinity 1212.83 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-93-14-EMW1</u> -C	<u>Total Phenols</u>	<u>A4854</u>
<u>0484-93-14-EMW1</u> -D	TKN, <u>(NH₃)</u> , <u>(TOC)</u> COD, NO ₃ , NO ₂	<u>A4855</u>
<u>0484-93-14-EMW1</u> -E	<u>Sulfide</u>	<u>A4856</u>
<u>0484-93-14-EMW1</u> -F	<u>Cyanide</u>	<u>A4857</u>
<u>0484-93-14-EMW1</u> -G	<u>Sulfate</u> , <u>(HDS)</u> Br, Cl, F, HCO ₃ , CO ₃ , <u>(ALK)</u> <u>(pH)</u>	<u>A4858</u>
<u>0484-93-14-EMW1</u> -H	<u>(Boron)</u> Metals, SCN	<u>A4859</u>
-J	TSS

03 MAR 89 - Pump to Bottom of casing
Date 09 MAR 89 - Bail

Well Name EMW-2

Power Requirements_____

Phase

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

03MAR89 - This well will be pumped to below bottom of casing,
into open interval, and allowed to recharge and then
bailed at end of sampling event
1740 - water has no odor, water is clear
1815 - water is slightly brown and murky

09MAR89 - Bailed at 1100. Did not obtain enough sample to measure parameters on alkalinity. Samples G and H not filtered.

WRI GROUNDWATER SAMPLING RECORD

Project RM-2 Well Name EMW-2
 Date 09 MAR 89 Field Crew Crader, West
 Weather Sunny, Windy Air Temperature 45 (F°)

Measuring Point TOC Sampling Device Bailer
 Depth to Water 299.0' Depth of Sampling Device 301'

Field Analyses at Time of Sampling

Temperature _____ (°C)
 Corrected Conductivity _____ (µmhos/cm at 25°C)
 pH _____
 Eh _____ (Field Electrode)
 Eh _____ (Corrected to Standard Hydrogen Electrode)
 Discharge Rate _____ (gallons/min)
 Alkalinity Titration
 Filtered Sample pH _____
 mls of Sample Tested _____ ml
 mls of HCl Added to Reach pH 4.5 _____ ml
 Normality of HCl _____ N
 Total Alkalinity _____ (mg/L Equiv. CaCO₃)

Not enough water
available to do
field analyses.

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0484-63-14-EMW2 -C	Total Phenols	A4924
0484-63-14-EMW2 -D	TKN, (NH ₃), (TOC), COD, NO ₃ , NO ₂	A4925
0484-63-14-EMW2 -E	Sulfide	A4926
0484-63-14-EMW2 -F	Cyanide	A4927
0484-63-14-EMW2 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK, pH	A4928
0484-63-14-EMW2 -H	Boron, Metals, SCN	A4929
-J	TSS	

Project Rm-2

Well Name EMW-3

Date 08 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>0740</u>	<u>10.7</u>	<u>2220</u>	<u>7.96</u>	<u>-211.9</u>	<u>146.0</u>	<u>1.0</u>
<u>0800</u>	<u>9.0</u>	<u>2080</u>	<u>8.07</u>	<u>-217.6</u>	<u>168.95</u>	<u>0.9</u>
<u>0820</u>	<u>8.9</u>	<u>2070</u>	<u>7.99</u>	<u>-202.9</u>	<u>175.5</u>	<u>.75</u>
<u>0840</u>	<u>8.9</u>	<u>2245</u>	<u>7.92</u>	<u>-196.6</u>	<u>177.50</u>	<u>.75</u>
<u>0900</u>	<u>9.1</u>	<u>2295</u>	<u>7.87</u>	<u>-193.7</u>	<u>177.9</u>	<u>.85</u>

COMMENTS

pH probe - standardized on pH 7 and pH 10.

Eh probe = 255.3 at 12.7°C (standard = Zobell)

Conductivity probe = 1860 at 12.5°C (standard = 2000 μmhos/cm)

0755 - Slight sulfur odor. Some gas in line.

Purged 65 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name EMW-3
 Date 08 MAR 89 Field Crew Crader, West
 Weather Cloudy Air Temperature 35 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 150.15' Depth of Sampling Device 344'

Field Analyses at Time of Sampling

Temperature 9.1 (°C)
 Corrected Conductivity 2295 (µmhos/cm at 25°C)
 pH 7.87
 Eh -193.7 (Field Electrode)
 Eh 17.11 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate .85 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 7.84
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 14.8 ml
 Normality of HCl .02008 N
 Total Alkalinity 594.37 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-97-14-EMW3-C</u>	<u>Total Phenols</u>	<u>A4844</u>
<u>0484-97-14-EMW3-D</u>	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4845</u>
<u>0484-97-14-EMW3-E</u>	<u>Sulfide</u>	<u>A4846</u>
<u>0484-97-14-EMW3-F</u>	<u>Cyanide</u>	<u>A4847</u>
<u>0484-97-14-EMW3-G</u>	<u>Sulfate</u> , <u>TDS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>pH</u>	<u>A4848</u>
<u>0484-97-14-EMW3-H</u>	<u>Boron</u> , Metals, SCN	<u>A4849</u>
-J	TSS	

Project RM-1

Well Name EMW-4

Date 05 MAR 89

Power Requirements —

Phase —

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1025</u>	<u>5.6</u>	<u>1430</u>	<u>n.m.</u>	<u>-85.8</u>	<u>111.6</u>	<u>1.0</u>
<u>1045</u>	<u>6.5</u>	<u>1460</u>	<u>7.53</u>	<u>-131.1</u>	<u>124.8</u>	<u>1.1</u>
<u>1105</u>	<u>6.5</u>	<u>1460</u>	<u>7.58</u>	<u>-135.9</u>	<u>130.7</u>	<u>1.1</u>
<u>1125</u>	<u>6.6</u>	<u>1450</u>	<u>7.64</u>	<u>-129.5</u>	<u>134.3</u>	<u>1.0</u>
<u>1145</u>	<u>6.6</u>	<u>1440</u>	<u>7.61</u>	<u>-111.5</u>	<u>135.4</u>	<u>.90</u>
<u>1205</u>	<u>6.9</u>	<u>1440</u>	<u>7.61</u>	<u>-102.8</u>	<u>135.7</u>	<u>.90</u>
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COMMENTS

1045 - Water is clear and odor free

1145 - Some sulfur odor - water is clear, gas free

Purged 100 gallons

WRI GROUNDWATER SAMPLING RECORD

Project Rm-1 Well Name EMW-4
 Date 05MAR89 Field Crew Croder, West, Huntington
 Weather Clear, Calm, Cold Air Temperature 16 (F°)

Measuring Point TOV Sampling Device Bennett Pump
 Depth to Water 112.6' Depth of Sampling Device 150'

Field Analyses at Time of Sampling

Temperature 6.9 (°C)
 Corrected Conductivity 1440 (µmhos/cm at 25°C)
 pH 7.61
 Eh -102.8 (Field Electrode)
 Eh 109.99 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate .90 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 7.70
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 18.0 ml
 Normality of HCl .02008 N
 Total Alkalinity 722.88 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-75-14-EMW4</u> -C	<u>Total Phenols</u>	<u>A4744</u>
<u>0484-75-14-EMW4</u> -D	TKN <u>(NH₃)</u> <u>(TOC)</u> COD, NO ₃ , NO ₂	<u>A4745</u>
<u>0484-75-14-EMW4</u> -E	<u>Sulfide</u>	<u>A4746</u>
<u>0484-75-14-EMW4</u> -F	<u>Cyanide</u>	<u>A4747</u>
<u>0484-75-14-EMW4</u> -G	<u>Sulfate</u> <u>(TDS)</u> Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> <u>(pH)</u>	<u>A4748</u>
<u>0484-75-14-EMW4</u> -H	<u>Boron</u> Metals, SCN	<u>A4749</u>
-J	TSS

Project Rm-1

Well Name EMW-6

Date 09 MAR 89

Power Requirements

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Water was slightly murky when bailed.

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name EMW-6
 Date 09 MAR 89 Field Crew Crader, West
 Weather Sunny, Windy Air Temperature 40 (F°)

Measuring Point TOC Sampling Device Bailer
 Depth to Water 34.0' Depth of Sampling Device 401'

Field Analyses at Time of Sampling

Temperature _____ (°C)
 Corrected Conductivity _____ (µmhos/cm at 25°C)
 pH _____
 Eh _____ (Field Electrode)
 Eh _____ (Corrected to Standard Hydrogen Electrode)
 Discharge Rate _____ (gallons/min)
 Alkalinity Titration
 Filtered Sample pH _____
 mls of Sample Tested _____ ml
 mls of HCl Added to Reach pH 4.5 _____ ml
 Normality of HCl _____ N
 Total Alkalinity _____ (mg/L Equiv. CaCO₃)

*Not enough water
available to do
field analyses*

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0484-107-14-EMW6 -C	Total Phenols	A4944
0484-107-14-EMW6 -D	TKN, (NH ₃) (COD, NO ₃ , NO ₂)	A4945
0484-107-14-EMW6 -E	Sulfide	A4946
0484-107-14-EMW6 -F	Cyanide	A4947
0484-107-14-EMW6 -G	Sulfate, TDS, Br, Cl, F, HCO ₃ , CO ₃ , ALK (PH)	A4948
0484-107-14-EMW6 -H	Boron Metals, SCN	A4949
-J	TSS

Well Name EMW-8

Power Requirements

Phase _____

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

04 MAR 89 - Will pump to open interval, allow recharge, and bail at end of sampling event.
1040 - water is clear and odorless.

09MAR89 - Could not obtain enough sample to measure parameters including alkalinity. Samples G and H not filtered.

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name EMW-8
 Date 09 MAR 89 Field Crew Crader, West
 Weather Sunny, Windy Air Temperature 45 (F°)

Measuring Point TOC Sampling Device Bailer
 Depth to Water 324.45' Depth of Sampling Device 326'

Field Analyses at Time of Sampling

Temperature _____ (°C)
 Corrected Conductivity _____ (µmhos/cm at 25°C)
 pH _____
 Eh _____ (Field Electrode)
 Eh _____ (Corrected to Standard Hydrogen Electrode)
 Discharge Rate _____ (gallons/min)
 Alkalinity Titration
 Filtered Sample pH _____
 mls of Sample Teste _____ ml
 mls of HCl Added to Reach pH 4.5 _____ ml
 Normality of HCl _____ N
 Total Alkalinity _____ (mg/L Equiv. CaCO₃)

*Not enough water
available to do
field analyses.*

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-65-14-EMW8 -C</u>	<u>Total Phenols</u>	<u>A4934</u>
<u>0484-65-14-EMW8 -D</u>	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4935</u>
<u>0484-65-14-EMW8 -E</u>	<u>Sulfide</u>	<u>A4936</u>
<u>0484-65-14-EMW8 -F</u>	<u>Cyanide</u>	<u>A4937</u>
<u>0484-65-14-EMW8 -G</u>	<u>Sulfate</u> , <u>TDS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>pH</u>	<u>A4938</u>
<u>0484-65-14-EMW8 -H</u>	<u>Boron</u> , Metals, SCN	<u>A4939</u>
-J	TSS

Well Name *EMW-9*

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Initial water is clear and odor free. Water quality remained throughout purge.

Purged 108 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name EMW-9
 Date 04 MAR 89 Field Crew Croder, West, Huntington
 Weather Clear, Cold Air Temperature 6 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 109.70' Depth of Sampling Device 364'

Field Analyses at Time of Sampling

Temperature 7.1 (°C)
 Corrected Conductivity 2920 (µmhos/cm at 25°C)
 pH 8.28
 Eh -60.9 (Field Electrode)
 Eh 151.71 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.20 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.34
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 13.5 ml
 Normality of HCl .02008 N
 Total Alkalinity 542.16 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-69-14-EMW9</u> -C	<u>Total Phenols</u>	<u>A4714</u>
<u>0484-69-14-EMW9</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4715</u>
<u>0484-69-14-EMW9</u> -E	<u>Sulfide</u>	<u>A4716</u>
<u>0484-69-14-EMW9</u> -F	<u>Cyanide</u>	<u>A4717</u>
<u>0484-69-14-EMW9</u> -G	<u>Sulfate</u> , TDS, Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>pH</u>	<u>A4718</u>
<u>0484-69-14-EMW9</u> -H	<u>Boron</u> , Metals, SCN	<u>A4719</u>
-J	TSS

WESTERN RESEARCH INSTITUTE

Project RM-1Well Name EMW-10Date 04 MAR 89Power Requirements —Phase —

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
1210	Standardizing Probes - not measured				94.75	n.m.
1220	Line froze - remove line to thaw					
	Had to change Bennett pump because filter broke off					
1305	Resume Pumping					
1310	6.6	850	7.18	+119.0	114.6	1.33
1330	6.0	850	7.50	-23.9	134.0	1.20
1350	4.4	860	7.60	-64.4	144.2	0.4
1410	2.8	850	7.47	-67.5	144.0	0.4
1430	2.8	820	7.36	-66.4	144.2	0.4

COMMENTS

pH probe and meter standardized at pH 7 and pH 10
 Eh probe = 268.2 mV (Zobell) at 4.2°C
 Conductivity = 1880 µmhos/cm at 0.8°C, standard = 2000

1310 - Water is clear and odor free
 1330 - Reduced flow rate
 1350 - Broke suction - reduce flow rate. Some gas bubbles in line.
 Water is clear and odor free. Gas probably due to inter-
 mittent suction breaks.

Purged 48 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name EMW-10
 Date 04 MAR 89 Field Crew Crader, West, Huntington
 Weather Clear, Cold Air Temperature 0 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 95.80' Depth of Sampling Device 147'

Field Analyses at Time of Sampling

Temperature 2.8 (°C)
 Corrected Conductivity 820 (µmhos/cm at 25°C)
 pH 7.36
 Eh -66.4 (Field Electrode)
 Eh 150.0 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 0.4 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 7.52
 mls of Sample Tested 25.0 ml
 mls of HCl Added to Reach pH 4.5 9.5 ml
 Normality of HCl .02008 N
 Total Alkalinity 381.52 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-67-14-EMW10-C</u>	<u>Total Phenols</u>	<u>A4704</u>
<u>0484-67-14-EMW10-D</u>	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4705</u>
<u>0484-67-14-EMW10-E</u>	<u>Sulfide</u>	<u>A4706</u>
<u>0484-67-14-EMW10-F</u>	<u>Cyanide</u>	<u>A4707</u>
<u>0484-67-14-EMW10-G</u>	<u>Sulfate</u> , <u>TDS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALR</u> , <u>PH</u>	<u>A4708</u>
<u>0484-67-14-EMW10-H</u>	<u>Boron</u> , Metals, SCN	<u>A4709</u>
-J	TSS	

Project RM-1

Well Name EMW-1/a

Date 28 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1230</u>	<u>10.1</u>	<u>3490</u>	<u>7.88</u>	<u>-140.2</u>	<u>124.8</u>	<u>1.0</u>
<u>1250</u>	<u>9.3</u>	<u>3985</u>	<u>7.97</u>	<u>-188.3</u>	<u>138.2</u>	<u>1.0</u>
<u>1310</u>	<u>9.3</u>	<u>3810</u>	<u>7.97</u>	<u>-187.7</u>	<u>139.5</u>	<u>1.0</u>
<u>1330</u>	<u>9.5</u>	<u>3680</u>	<u>7.89</u>	<u>-157.5</u>	<u>139.8</u>	<u>0.9</u>
<u>1350</u>	<u>9.8</u>	<u>3640</u>	<u>7.90</u>	<u>-144.3</u>	<u>139.8</u>	<u>.85</u>
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COMMENTS

This well was sampled in duplicate as well TW-32 to
satisfy QA/QC requirements.

1235 - Water is clear and odorless.

1310 - Sulfur odor present.

Purged 75 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name EMW-11a
 Date 08MAR89 Field Crew Crader, West, WDEG Group
 Weather Cloudy, Calm Air Temperature 43 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 129.0' Depth of Sampling Device 349'

Field Analyses at Time of Sampling

Temperature 9.8 (°C)
 Corrected Conductivity 3640 (µmhos/cm at 25°C)
 pH 7.90
 Eh -144.3 (Field Electrode)
 Eh 65.88 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate .85 (gallons/min)

Alkalinity Titration

Filtered Sample pH 7.87
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 25.0 ml
 Normality of HCl .02008 N
 Total Alkalinity 1004.0 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-101-14-EMW11a</u> -C	<u>Total Phenols</u>	<u>A4884</u>
<u>0484-101-14-EMW11a</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4885</u>
<u>0484-101-14-EMW11a</u> -E	<u>Sulfide</u>	<u>A4886</u>
<u>0484-101-14-EMW11a</u> -F	<u>Cyanide</u>	<u>A4887</u>
<u>0484-101-14-EMW11a</u> -G	<u>Sulfate</u> , <u>TDS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>pH</u>	<u>A4888</u>
<u>0484-101-14-EMW11a</u> -H	<u>Boron</u> , Metals, SCN	<u>A4889</u>
-J	TSS	

Project Rm-1

Well Name TW-2

Date 07 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1625</u>	<u>7.8</u>	<u>3400</u>	<u>7.31</u>	<u>-201.6</u>	<u>137.6</u>	<u>1.10</u>
<u>1645</u>	<u>8.1</u>	<u>4170</u>	<u>8.57</u>	<u>-233.6</u>	<u>160.7</u>	<u>1.10</u>
<u>1705</u>	<u>8.2</u>	<u>4110</u>	<u>8.27</u>	<u>-219.4</u>	<u>165.2</u>	<u>1.0</u>
<u>1725</u>	<u>8.3</u>	<u>3850</u>	<u>7.81</u>	<u>-191.3</u>	<u>168.5</u>	<u>1.0</u>
<u>1745</u>	<u>8.1</u>	<u>3760</u>	<u>7.74</u>	<u>-194.5</u>	<u>170.1</u>	<u>1.0</u>
<u>1755</u>	<u>8.1</u>	<u>3760</u>	<u>7.72</u>	<u>-194.1</u>	<u>168.8</u>	<u>.85</u>
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COMMENTS

1645- Slight sulfur odor. Water is clear.

Purged 90 gallons.

WRI GROUNDWATER SAMPLING RECORD

Project Rm-2 Well Name TW-2
 Date 07 MAR 89 Field Crew Crader, West
 Weather Cloudy, Windy Air Temperature 35 (F°)

Measuring Point TOV Sampling Device Bennett Pump
 Depth to Water 140.2' Depth of Sampling Device 349'

Field Analyses at Time of Sampling

Temperature 8.1 (°C)
 Corrected Conductivity 3760 (µmhos/cm at 25°C)
 pH 7.72
 Eh -194.1 (Field Electrode)
 Eh 17.61 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate .85 (gallons/min)

Alkalinity Titration

Filtered Sample pH 8.3
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 19.7 ml
 Normality of HCl .02008 N
 Total Alkalinity 791.15 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-95-14-TW2</u> -C	<u>Total Phenols</u>	<u>A4864</u>
<u>0484-95-14-TW2</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> COD, NO ₃ , NO ₂	<u>A4865</u>
<u>0484-95-14-TW2</u> -E	<u>Sulfide</u>	<u>A4866</u>
<u>0484-95-14-TW2</u> -F	<u>Cyanide</u>	<u>A4867</u>
<u>0484-95-14-TW2</u> -G	<u>Sulfate</u> , <u>TDS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> <u>PH</u>	<u>A4868</u>
<u>0484-95-14-TW2</u> -H	<u>Baron</u> Metals, SCN	<u>A4869</u>
-J	TSS	

Project RM-1

Well Name TW-3

Date 07 MAR 89

Power Requirements —

Phase —

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
0745	not measured - standardizing probes				138.4	1.2
0755	13.5	2170	8.61	-209.5	150.8	0.9
0815	13.1	2210	8.45	-196.0	160.1	1.0
0835	11.4	2220	8.23	-192.6	165.5	0.9
0855	10.7	2230	8.17	-195.3	167.5	1.0
0915	10.7	2220	8.14	-197.5	169.0	.85
0925	9.5	2220	8.10	-193.5	167.1	.75
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COMMENTS

pH probe - standardized on pH 7 and pH 10
 Eh probe = 256.3 at 10.8°C (standard = Zobell)
 Conductivity = 1880 at 10.6°C (standard = 2000)

0755 - water is clear. Very slight sulfur odor.

Purged 101 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-3
 Date 07 MAR 89 Field Crew Crader, West, Huntington
 Weather Partly Cloudy, Slight breeze Air Temperature 25 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 142.5' Depth of Sampling Device 346'

Field Analyses at Time of Sampling

Temperature 9.5 (°C)
 Corrected Conductivity 2220 (μmhos/cm at 25°C)
 pH 8.10
 Eh -193.5 (Field Electrode)
 Eh 16.95 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate .75 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.14
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 19.0 ml
 Normality of HCl .02008 N
 Total Alkalinity 763.04 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-87-14-TW3</u> -C	<u>Total Phenols</u>	<u>A4814</u>
<u>0484-87-14-TW3</u> -D	TKN <u>(NH₃)</u> <u>(TOC)</u> COD, NO ₃ , NO ₂	<u>A4815</u>
<u>0484-87-14-TW3</u> -E	<u>Sulfide</u>	<u>A4816</u>
<u>0484-87-14-TW3</u> -F	<u>Cyanide</u>	<u>A4817</u>
<u>0484-87-14-TW3</u> -G	<u>Sulfate</u> TDS Br, Cl, F, HCO ₃ , CO ₃ <u>ALK</u> <u>PH</u>	<u>A4818</u>
<u>0484-87-14-TW3</u> -H	<u>Boron</u> Metals, SCN	<u>A4819</u>
-J	TSS

Well Name TW-4

Date 04 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

[illegible]

COMMENTS

Water was clear and odor free throughout purging

Purged 96 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-4
 Date 04 MAR 89 Field Crew Crader, West, Huntington
 Weather Clear, Cold Air Temperature 7 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 112.8' Depth of Sampling Device 372'

Field Analyses at Time of Sampling

Temperature 9.0 (°C)
 Corrected Conductivity 2010 (µmhos/cm at 25°C)
 pH 8.55
 Eh -139.9 (Field Electrode)
 Eh 77.0 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.20 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.51
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 18.5 ml
 Normality of HCl 0.02008 N
 Total Alkalinity 742.96 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-71-14-TW4</u> -C	<u>Total Phenols</u>	<u>A4724</u>
<u>0484-71-14-TW4</u> -D	TKN, <u>(NH₄)</u> , <u>(NO₃)</u> , COD, NO ₃ , NO ₂	<u>A4725</u>
<u>0484-71-14-TW4</u> -E	<u>Sulfide</u>	<u>A4726</u>
<u>0484-71-14-TW4</u> -F	<u>Cyanide</u>	<u>A4727</u>
<u>0484-71-14-TW4</u> -G	<u>Sulfate</u> , <u>(TDS)</u> Br, Cl, F, HCO ₃ , CO ₃ , <u>(ALK)</u> , <u>(AN)</u>	<u>A4728</u>
<u>0484-71-14-TW4</u> -H	<u>Boron</u> Metals, SCN	<u>A4729</u>
-J	TSS	

Project RM-1

Well Name TW-5

Date 08 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1000</u>	<u>9.2</u>	<u>2700</u>	<u>8.04</u>	<u>-155.5</u>	<u>109.6</u>	<u>1.1</u>
<u>1020</u>	<u>9.0</u>	<u>3030</u>	<u>8.35</u>	<u>-187.6</u>	<u>132.65</u>	<u>1.0</u>
<u>1040</u>	<u>9.0</u>	<u>3030</u>	<u>8.34</u>	<u>-183.4</u>	<u>138.4</u>	<u>1.0</u>
<u>1100</u>	<u>9.3</u>	<u>3050</u>	<u>8.21</u>	<u>-150.2</u>	<u>141.2</u>	<u>1.0</u>
<u>1120</u>	<u>9.4</u>	<u>3040</u>	<u>8.18</u>	<u>-127.2</u>	<u>142.55</u>	<u>1.0</u>
<u>1140</u>	<u>9.6</u>	<u>3060</u>	<u>8.18</u>	<u>-111.0</u>	<u>142.7</u>	<u>1.0</u>

COMMENTS

1005- water is clear and odor free

Purged 100 gallons.

WRI GROUNDWATER SAMPLING RECORD

Project RM-2 Well Name TW-5
 Date 08 MAR 89 Field Crew Crader, West
 Weather Cloudy Air Temperature 40 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 116.45' Depth of Sampling Device 359'

Field Analyses at Time of Sampling

Temperature 9.6 (°C)
 Corrected Conductivity 3060 (µmhos/cm at 25°C)
 pH 8.18
 Eh -111.0 (Field Electrode)
 Eh 99.36 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.0 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.19
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 16.8 ml
 Normality of HCl .02008 N
 Total Alkalinity 674.69 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-99-14-TWS</u> -C	<u>Total Phenols</u>	<u>A4874</u>
<u>0484-99-14-TWS</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> COD, NO ₃ , NO ₂	<u>A4875</u>
<u>0484-99-14-TWS</u> -E	<u>Sulfide</u>	<u>A4876</u>
<u>0484-99-14-TWS</u> -F	<u>Cyanide</u>	<u>A4877</u>
<u>0484-99-14-TWS</u> -G	<u>Sulfate</u> TDS, Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> <u>PH</u>	<u>A4878</u>
<u>0484-99-14-TWS</u> -H	<u>Boron</u> Metals, SCN	<u>A4879</u>
-J	TSS

WESTERN RESEARCH INSTITUTE

Project RM-1

Well Name TW-11

Date 06 MAR 89

Power Requirements —

Phase —

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1620</u>	<u>6.0</u>	<u>2240</u>	<u>7.94</u>	<u>-157.5</u>	<u>144.4</u>	<u>1.1</u>
<u>1640</u>	<u>7.7</u>	<u>2160</u>	<u>8.14</u>	<u>-226.3</u>	<u>165.4</u>	<u>0.9</u>
<u>1700</u>	<u>7.8</u>	<u>2150</u>	<u>8.08</u>	<u>-232.5</u>	<u>171.1</u>	<u>0.9</u>
<u>1720</u>	<u>7.7</u>	<u>2240</u>	<u>7.93</u>	<u>-219.8</u>	<u>173.8</u>	<u>1.0</u>
<u>1740</u>	<u>8.2</u>	<u>2230</u>	<u>7.86</u>	<u>-214.1</u>	<u>174.7</u>	<u>0.9</u>
<u>1750</u>	<u>8.2</u>	<u>2215</u>	<u>7.84</u>	<u>-213.1</u>	<u>174.9</u>	<u>0.9</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

COMMENTS

1620 - water clear and odorless

1625 - very strong sulfur odor

1640 - some gas bubbles in line, odor persists

Purged 83 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-11
 Date 06 MAR 89 Field Crew Crader, West, Huntington
 Weather Cloudy, Windy Air Temperature 28 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 150.8' Depth of Sampling Device 334'

Field Analyses at Time of Sampling

Temperature 8.2 (°C)
 Corrected Conductivity 2215 (µmhos/cm at 25°C)
 pH 7.84
 Eh -213.1 (Field Electrode)
 Eh -1.48 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 0.9 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 7.92
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 19.0 ml
 Normality of HCl .02008 N
 Total Alkalinity 763.04 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-85-14-TW11</u> -C	<u>Total Phenols</u>	<u>A4804</u>
<u>0484-85-14-TW11</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4805</u>
<u>0484-85-14-TW11</u> -E	<u>Sulfide</u>	<u>A4806</u>
<u>0484-85-14-TW11</u> -F	<u>Cyanide</u>	<u>A4807</u>
<u>0484-85-14-TW11</u> -G	<u>Sulfate</u> , <u>TDS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>PH</u>	<u>A4808</u>
<u>0484-85-14-TW11</u> -H	<u>Boron</u> , Metals, SCN	<u>A4809</u>
-J	TSS

WESTERN RESEARCH INSTITUTE

Project RM-1

Well Name TW-12

Date 06 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1400</u>	<u>11.4</u>	<u>2060</u>	<u>7.83</u>	<u>-68.6</u>	<u>144.3</u>	<u>1.0</u>
<u>1420</u>	<u>8.6</u>	<u>2120</u>	<u>7.93</u>	<u>-138.7</u>	<u>160.9</u>	<u>1.</u>
<u>1440</u>	<u>8.5</u>	<u>2240</u>	<u>7.93</u>	<u>-130.4</u>	<u>163.7</u>	<u>.90</u>
<u>1500</u>	<u>8.7</u>	<u>2270</u>	<u>7.91</u>	<u>-123.2</u>	<u>165.4</u>	<u>.90</u>
<u>1520</u>	<u>8.7</u>	<u>2270</u>	<u>7.96</u>	<u>-112.6</u>	<u>166.4</u>	<u>.90</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

COMMENTS

1410 - very slight sulfur odor. Water is clear

1445 - slight sulfur odor. Water is clear.

- Plastic discharge path is emitting constant sulfur odor.
This may also contribute to sulfur odor in other wells.

1450 - Water was odorless when in glass container.

Purged 74 gallons

WRI GROUNDWATER SAMPLING RECORD

Project Rm-1 Well Name TW-12
 Date 06 MAR 89 Field Crew Crader, West, Huntington
 Weather Cloudy, Windy Air Temperature 36 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 149.75' Depth of Sampling Device 347'

Field Analyses at Time of Sampling

Temperature 8.7 (°C)
 Corrected Conductivity 2270 (μmhos/cm at 25°C)
 pH 7.96
 Eh -112.6 (Field Electrode)
 Eh 98.57 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 0.9 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.05
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 16.7 ml
 Normality of HCl .02008 N
 Total Alkalinity 670.67 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-83-14-TW12</u> -C	<u>Total Phenols</u>	<u>A4794</u>
<u>0484-83-14-TW12</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4795</u>
<u>0484-83-14-TW12</u> -E	<u>Sulfide</u>	<u>A4796</u>
<u>0484-83-14-TW12</u> -F	<u>Cyanide</u>	<u>A4797</u>
<u>0484-83-14-TW12</u> -G	<u>Sulfate</u> , <u>TDS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>pH</u>	<u>A4798</u>
<u>0484-83-14-TW12</u> -H	<u>Boron</u> , Metals, SCN	<u>A4799</u>
-J	TSS	

Project RM-1

Well Name TW-13

Date 05MAR89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1250</u>	<u>7.4</u>	<u>1930</u>	<u>8.56</u>	<u>-159.3</u>	<u>114.9</u>	<u>1.2</u>
<u>1310</u>	<u>8.1</u>	<u>2055</u>	<u>8.94</u>	<u>-190.9</u>	<u>138.5</u>	<u>1.0</u>
<u>1330</u>	<u>8.1</u>	<u>2050</u>	<u>9.0</u>	<u>-192.2</u>	<u>146.8</u>	<u>1.1</u>
<u>1350</u>	<u>6.9</u>	<u>2015</u>	<u>8.57</u>	<u>-161.8</u>	<u>151.7</u>	<u>1.1</u>
<u>1410</u>	<u>7.5</u>	<u>2005</u>	<u>8.39</u>	<u>-142.7</u>	<u>154.4</u>	<u>1.1</u>
<u>1430</u>	<u>7.7</u>	<u>1995</u>	<u>8.40</u>	<u>-117.5</u>	<u>153.2</u>	<u>.90</u>
—	—	—	—	—	—	—
—	—	—	—	—	—	—
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—	—	—	—	—	—	—
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—	—	—	—	—	—	—

COMMENTS

1300 - Water is clear. Slight sulfur odor. Also, an odor that is
not distinguishable

1350 - Gray murky water appears.

1410 - Reduced flow rate.

all samples but "D" will be filtered.

Purged 104 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-13
 Date 05 MAR 89 Field Crew Crader, West, Huntington
 Weather Clear, Calm Air Temperature 20 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 122.2' Depth of Sampling Device 340'

Field Analyses at Time of Sampling

Temperature 7.7 (°C)
 Corrected Conductivity 1995 (µmhos/cm at 25°C)
 pH 8.40
 Eh -117.5 (Field Electrode)
 Eh 94.57 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 0.9 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.40
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 17.0 ml
 Normality of HCl .02008 N
 Total Alkalinity 682.72 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-77-14-TW13</u> -C	<u>Total Phenols</u>	<u>A4754</u>
<u>0484-77-14-TW13</u> -D	TKN, <u>(NH₃)</u> , <u>(TOC)</u> COD, NO ₃ , NO ₂	<u>A4755</u>
<u>0484-77-14-TW13</u> -E	<u>Sulfide</u>	<u>A4756</u>
<u>0484-77-14-TW13</u> -F	<u>Cyanide</u>	<u>A4757</u>
<u>0484-77-14-TW13</u> -G	<u>Sulfate</u> , <u>(TDS)</u> Br, Cl, F, HCO ₃ , CO ₃ , <u>(ALK)</u> <u>(pH)</u>	<u>A4758</u>
<u>0484-77-14-TW13</u> -H	<u>Boron</u> Metals, SCN	<u>A4759</u>
-J	TSS	

Project RM-1

Well Name TW-14a

Date 05 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
0750	<i>Standardizing Probes - not measured</i>				<u>98.5</u>	<u>1.20</u>
0800	<u>8.4</u>	<u>1870</u>	<u>8.38</u>	<u>-197.8</u>	<u>119.1</u>	<u>1.20</u>
0820	<u>8.6</u>	<u>1250</u>	<u>8.58</u>	<u>-186.1</u>	<u>142.3</u>	<u>1.10</u>
0840	<u>8.8</u>	<u>1810</u>	<u>8.55</u>	<u>-176.1</u>	<u>160.5</u>	<u>1.10</u>
0900	<u>8.4</u>	<u>1830</u>	<u>8.55</u>	<u>-169.1</u>	<u>174.0</u>	<u>1.10</u>
0920	<u>8.7</u>	<u>1760</u>	<u>8.47</u>	<u>-158.1</u>	<u>182.5</u>	<u>.90</u>
0940	<u>8.0</u>	<u>1830</u>	<u>8.50</u>	<u>-125.5</u>	<u>181.5</u>	<u>.50</u>

COMMENTS

pH probe and meter standardized on pH 7 and pH 10

Eh probe = 262.0 mV at 9°C (Zobell = standard)

Conductivity = 1390 μmhos/cm at 6.8°C (2000 = standard)

0820 - Water is clear to slight yellow tint. Has sulfur odor.

*0900 - Yellow tint and sulfur odor very slight. Some gas in line.
Lowered flow rate.*

0920 - Reduce flow rate again.

Purged 106 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-14a
 Date 05 MAR 89 Field Crew Croder, West, Huntington
 Weather Clear, Calm Air Temperature 15 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 104.30' Depth of Sampling Device 383'

Field Analyses at Time of Sampling

Temperature 8.0 (°C)
 Corrected Conductivity 1830 (µmhos/cm at 25°C)
 pH 8.50
 Eh -125.5 (Field Electrode)
 Eh 86.30 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate .50 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.44
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 19.5 ml
 Normality of HCl .02008 N
 Total Alkalinity 783.12 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-73-14-TW14a</u> -C	<u>Total Phenols</u>	<u>A4734</u>
<u>0484-73-14-TW14a</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> COD, NO ₃ , NO ₂	<u>A4735</u>
<u>0484-73-14-TW14a</u> -E	<u>Sulfide</u>	<u>A4736</u>
<u>0484-73-14-TW14a</u> -F	<u>Cyanide</u>	<u>A4737</u>
<u>0484-73-14-TW14a</u> -G	<u>Sulfate</u> , <u>TDS</u> Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>PM</u>	<u>A4738</u>
<u>0484-73-14-TW14a</u> -H	<u>Boron</u> Metals, SCN	<u>A4739</u>
-J	TSS

WESTERN RESEARCH INSTITUTE

Project RM-1

Well Name TW-15

Date 05 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1545</u>	<u>8.0</u>	<u>n.m.</u>	<u>8.52</u>	<u>-139.2</u>	<u>107.5</u>	<u>1.1</u>
<u>1605</u>	<u>8.4</u>	<u>2050</u>	<u>8.51</u>	<u>-174.8</u>	<u>137.2</u>	<u>1.0</u>
<u>1625</u>	<u>8.4</u>	<u>2050</u>	<u>8.56</u>	<u>-182.1</u>	<u>157.6</u>	<u>1.0</u>
<u>1645</u>	<u>8.4</u>	<u>2050</u>	<u>8.57</u>	<u>-182.5</u>	<u>173.6</u>	<u>1.0</u>
<u>1705</u>	<u>8.5</u>	<u>2050</u>	<u>8.56</u>	<u>-179.8</u>	<u>189.9</u>	<u>1.0</u>
<u>1725</u>	<u>8.5</u>	<u>2040</u>	<u>8.53</u>	<u>-175.5</u>	<u>192.7</u>	<u>.70</u>
<u>1745</u>	<u>8.1</u>	<u>2040</u>	<u>8.52</u>	<u>-173.5</u>	<u>194.8</u>	<u>.25</u>
<u>1755</u>	<u>8.1</u>	<u>2030</u>	<u>8.49</u>	<u>-172.6</u>	<u>194.5</u>	<u>.25</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
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COMMENTS

1555 - water is clear and odorless

1705 - lowered flow rate

1725 - lowered flow rate again

1745 - coal fines in discharge bath

Purged 104 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-15
 Date 05 MAR 89 Field Crew Crader, West, Huntington
 Weather Clear, Calm Air Temperature 15 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 116.65' Depth of Sampling Device 400'

Field Analyses at Time of Sampling

Temperature 8.1 (°C)
 Corrected Conductivity 2030 (µmhos/cm at 25°C)
 pH 8.49
 Eh -172.6 (Field Electrode)
 Eh 39.11 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate .25 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.51
 mls of Sample Tested 25.0 ml
 mls of HCl Added to Reach pH 4.5 20.5 ml
 Normality of HCl .02008 N
 Total Alkalinity 823.28 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-79-14-TW15</u> -C	<u>Total Phenols</u>	<u>A4774</u>
<u>0484-79-14-TW15</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4775</u>
<u>0484-79-14-TW15</u> -E	<u>Sulfide</u>	<u>A4776</u>
<u>0484-79-14-TW15</u> -F	<u>Cyanide</u>	<u>A4777</u>
<u>0484-79-14-TW15</u> -G	<u>Sulfate</u> , <u>DS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>pH</u>	<u>A4778</u>
<u>0484-79-14-TW15</u> -H	<u>Barium</u> , Metals, SCN	<u>A4779</u>
-J	TSS

WESTERN RESEARCH INSTITUTE

Project RM-2

Well Name TW-16

Date 06 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
0750	Standardizing Probes - not measured				132.2	1.1
0800	7.5	2007	8.40	-150.2	146.8	1.1
0820	8.0	2008	8.38	-155.5	151.9	1.0
0840	7.7	2008	8.34	-154.4	153.7	1.1
0900	9.0	2009	8.35	-146.7	154.5	1.0
0910	9.1	2090	8.33	-147.0	154.9	1.0
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COMMENTS

pH probe and meter standardized on pH 7 and pH 10.

Eh probe = 259.4 mV at 6.0°C (standard = Zobell)

Conductivity = 1860 μmhos/cm at 7.2°C (standard = 2000)

0800 - Water is clear and odor free

0820 - Slight sulfur odor.

Purged 104 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-16
 Date 06 MAR 89 Field Crew Crader, West, Huntington
 Weather Cloudy, Windy Air Temperature 23 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 136.6' Depth of Sampling Device 395'

Field Analyses at Time of Sampling

Temperature 9.1 (°C)
 Corrected Conductivity 2090 (μmhos/cm at 25°C)
 pH 8.33
 Eh -147.0 (Field Electrode)
 Eh 63.81 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.0 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 8.38
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 19.6 ml
 Normality of HCl .02008 N
 Total Alkalinity 787.14 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-81-14-TW16</u> -C	<u>Total Phenols</u>	<u>A4764</u>
<u>0484-81-14-TW16</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4765</u>
<u>0484-81-14-TW16</u> -E	<u>Sulfide</u>	<u>A4766</u>
<u>0484-81-14-TW16</u> -F	<u>Cyanide</u>	<u>A4767</u>
<u>0484-81-14-TW16</u> -G	<u>Sulfate</u> , TDS, Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> <u>PM</u>	<u>A4768</u>
<u>0484-81-14-TW16</u> -H	<u>Boron</u> , Metals, SCN	<u>A4769</u>
-J	TSS

WESTERN RESEARCH INSTITUTE

Project RM-1

Well Name TW-17

Date 07 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1000</u>	<u>9.5</u>	<u>2850</u>	<u>8.01</u>	<u>-168.5</u>	<u>115.1</u>	<u>0.9</u>
<u>1020</u>	<u>9.7</u>	<u>3450</u>	<u>8.15</u>	<u>-182.3</u>	<u>127.4</u>	<u>0.9</u>
<u>1040</u>	<u>9.8</u>	<u>3450</u>	<u>7.89</u>	<u>-152.4</u>	<u>129.0</u>	<u>1.0</u>
<u>1100</u>	<u>9.9</u>	<u>3420</u>	<u>7.85</u>	<u>-155.3</u>	<u>130.3</u>	<u>0.9</u>
<u>1120</u>	<u>10.0</u>	<u>3390</u>	<u>7.86</u>	<u>-153.3</u>	<u>131.1</u>	<u>0.9</u>
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COMMENTS

1005 - water is clear and odorless

Purged 74 gallons

WRI GROUNDWATER SAMPLING RECORD

Project RM-1 Well Name TW-17
 Date 07 MAR 89 Field Crew Crader, West, Huntington
 Weather Cloudy Air Temperature 35 (F°)

Measuring Point TOL Sampling Device Bennett Pump
 Depth to Water 120.75' Depth of Sampling Device 329'

Field Analyses at Time of Sampling

Temperature 10.0 (°C)
 Corrected Conductivity 3390 (µmhos/cm at 25°C)
 pH 7.86
 Eh -153.3 (Field Electrode)
 Eh 56.7 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 0.9 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 7.92
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 17.1 ml
 Normality of HCl 0.02008 N
 Total Alkalinity 686.74 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-89-14-TW17</u> -C	<u>Total Phenols</u>	<u>A4824</u>
<u>0484-89-14-TW17</u> -D	TKN <u>(NH₃)</u> <u>TOC</u> COD, NO ₃ , NO ₂	<u>A4825</u>
<u>0484-89-14-TW17</u> -E	<u>Sulfide</u>	<u>A4826</u>
<u>0484-89-14-TW17</u> -F	<u>Cyanide</u>	<u>A4827</u>
<u>0484-89-14-TW17</u> -G	<u>Sulfate</u> <u>TDS</u> Br, Cl, F, HCO ₃ , CO ₃ , <u>(ALK)</u> <u>(pH)</u>	<u>A4828</u>
<u>0484-89-14-TW17</u> -H	<u>Boron</u> Metals, SCN	<u>A4829</u>
-J	TSS

WESTERN RESEARCH INSTITUTE

Project RM-1

Well Name TW-18

Date 27MAR 89

Power Requirements —

Phase —

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, µmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1200</u>	<u>9.4</u>	<u>4100</u>	<u>7.62</u>	<u>-132.5</u>	<u>136.7</u>	<u>1.1</u>
<u>1220</u>	<u>8.5</u>	<u>4485</u>	<u>7.60</u>	<u>-195.4</u>	<u>150.0</u>	<u>1.0</u>
<u>1240</u>	<u>8.5</u>	<u>4425</u>	<u>7.59</u>	<u>-197.8</u>	<u>152.2</u>	<u>1.0</u>
<u>1300</u>	<u>8.6</u>	<u>4420</u>	<u>7.58</u>	<u>-193.1</u>	<u>153.2</u>	<u>1.1</u>
<u>1320</u>	<u>8.6</u>	<u>4390</u>	<u>7.55</u>	<u>-189.1</u>	<u>154.0</u>	<u>1.0</u>
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COMMENTS

1205 - Sulfur odor present. Gas in line.

1240 - Odor persists. No gas.

Purged 82 gallons

WRI GROUNDWATER SAMPLING RECORD

Project Rm-2 Well Name TW-18
 Date 07 MAR 89 Field Crew Crader, West, Huntington
 Weather Cloudy Air Temperature 40 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 139.9' Depth of Sampling Device 294'

Field Analyses at Time of Sampling

Temperature 8.6 (°C)
 Corrected Conductivity 4390 (µmhos/cm at 25°C)
 pH 7.55
 Eh -189.1 (Field Electrode)
 Eh 22.16 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.0 (gallons/min)
 Alkalinity Titration
 Filtered Sample pH 7.65
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 15.3 ml
 Normality of HCl 0.02008 N
 Total Alkalinity 614.45 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-91-14-TW18</u> -C	<u>Total Phenols</u>	<u>A4834</u>
<u>0484-91-14-TW18</u> -D	TKN, <u>NH₄</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4835</u>
<u>0484-91-14-TW18</u> -E	<u>Sulfide</u>	<u>A4836</u>
<u>0484-91-14-TW18</u> -F	<u>Cyanide</u>	<u>A4837</u>
<u>0484-91-14-TW18</u> -G	<u>Sulfate</u> (TDS), Br, Cl, F, HCO ₃ , CO ₃ , <u>ALR</u> , <u>pH</u>	<u>A4838</u>
<u>0484-91-14-TW18</u> -H	<u>Boron</u> , Metals, SCN	<u>A4839</u>
-J	TSS	

Project RM-2

Well Name CPW-2

Date 08MAR89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1700</u>	<u>27.8</u>	<u>3370</u>	<u>8.51</u>	<u>-234.1</u>	<u>137.2</u>	<u>0.6</u>
<u>1720</u>	<u>34.8</u>	<u>3470</u>	<u>8.39</u>	<u>-284.2</u>	<u>137.85</u>	<u>1.1</u>
<u>1740</u>	<u>35.3</u>	<u>3420</u>	<u>8.00</u>	<u>-262.3</u>	<u>138.35</u>	<u>1.1</u>
<u>1800</u>	<u>34.9</u>	<u>3660</u>	<u>7.78</u>	<u>-239.4</u>	<u>138.65</u>	<u>1.0</u>
<u>1820</u>	<u>34.7</u>	<u>3780</u>	<u>7.70</u>	<u>-228.8</u>	<u>138.8</u>	<u>1.0</u>
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COMMENTS

1700 - Water is cloudy grey with slight smell of rubber
1710 - Coal fines in discharge bath.

Purged 84 gallons.

WRI GROUNDWATER SAMPLING RECORD

Project Rm-1 Well Name CPW-2
 Date 08 MAR 89 Field Crew Crader, West
 Weather Cloudy, Breezy Air Temperature 45 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 137.35' Depth of Sampling Device 335'

Field Analyses at Time of Sampling

Temperature 34.7 (°C)
 Corrected Conductivity 3780 (µmhos/cm at 25°C)
 pH 7.70
 Eh -228.8 (Field Electrode)
 Eh -41.03 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate 1.0 (gallons/min)

Alkalinity Titration

Filtered Sample pH 7.77
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 8.1 ml
 Normality of HCl .02008 N
 Total Alkalinity 325.30 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
0484-105-14-CPW 2 -C	Total Phenols	A4914
0484-105-14-CPW 2 -D	TKN, (NH ₃), (TOC) COD, NO ₃ , NO ₂	A4915
0484-105-14-CPW 2 -E	Sulfide	A4916
0484-105-14-CPW 2 -F	Cyanide	A4917
0484-105-14-CPW 2 -G	Sulfate, (DS) Br, Cl, F, HCO ₃ , CO ₃ , (ALK) (PH)	A4918
0484-105-14-CPW 2 -H	(Boron) Metals, SCN	A4919
-J	TSS

WESTERN RESEARCH INSTITUTE

Project RM-1

Well Name VIEW-1

Date 08 MAR 89

Power Requirements

Phase

FIELD MEASUREMENTS DURING WELL PURGING

Time	Temp., °C	Corrected Conductivity, μmhos/cm	pH	Eh, mV	Water Level, (feet below top of casing)	Pump Rate, gpm
<u>1455</u>	<u>16.4</u>	<u>3420</u>	<u>7.75</u>	<u>-206.7</u>	<u>115.4</u>	<u>.85</u>
<u>1515</u>	<u>21.3</u>	<u>3550</u>	<u>7.99</u>	<u>-226.1</u>	<u>116.5</u>	<u>.90</u>
<u>1535</u>	<u>21.0</u>	<u>3560</u>	<u>7.84</u>	<u>-228.4</u>	<u>116.7</u>	<u>1.0</u>
<u>1555</u>	<u>20.9</u>	<u>3355</u>	<u>7.95</u>	<u>-224.0</u>	<u>117.2</u>	<u>.90</u>
<u>1615</u>	<u>20.8</u>	<u>3610</u>	<u>7.81</u>	<u>-220.1</u>	<u>117.45</u>	<u>.90</u>
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COMMENTS

1500 - Sulfur odor, alot of gas in line.

1535 - Water is extremely clear

1615 - Coal fines in discharge bath.

Purged 74 gallons.

WRI GROUNDWATER SAMPLING RECORD

Project Rm-1 Well Name VIW-1
 Date 08 MAR 89 Field Crew Crader, West
 Weather Sunny, breezy Air Temperature 50 (F°)

Measuring Point TOC Sampling Device Bennett Pump
 Depth to Water 115.6' Depth of Sampling Device 365'

Field Analyses at Time of Sampling

Temperature 20.8 (°C)
 Corrected Conductivity 3610 (µmhos/cm at 25°C)
 pH 7.81
 Eh -220.1 (Field Electrode)
 Eh -19.82 (Corrected to Standard Hydrogen Electrode)
 Discharge Rate .90 (gallons/min)

Alkalinity Titration

Filtered Sample pH 7.85
 mls of Sample Tested 25 ml
 mls of HCl Added to Reach pH 4.5 15.8 ml
 Normality of HCl .02008 N
 Total Alkalinity 634.53 (mg/L Equiv. CaCO₃)

Analytical Submissions	Analysis Requested	Tag Numbers
-A	VOA	
-B	BNA	
<u>0484-103-14-VIW1</u> -C	<u>Total Phenols</u>	<u>A4904</u>
<u>0484-103-14-VIW1</u> -D	TKN, <u>NH₃</u> , <u>TOC</u> , COD, NO ₃ , NO ₂	<u>A4905</u>
<u>0484-103-14-VIW1</u> -E	<u>Sulfide</u>	<u>A4906</u>
<u>0484-103-14-VIW1</u> -F	<u>Cyanide</u>	<u>A4907</u>
<u>0484-103-14-VIW1</u> -G	<u>Sulfate</u> , <u>TDS</u> , Br, Cl, F, HCO ₃ , CO ₃ , <u>ALK</u> , <u>pH</u>	<u>A4908</u>
<u>0484-103-14-VIW1</u> -H	<u>Boron</u> , Metals, SCN	<u>A4909</u>
-J	TSS	

DATE

FILMED

9/9/94

END