

40-6659

w/lt 8/30/88
88-1211

ENVIRONMENTAL SAMPLE DATA

1st Quarter 1988

PETROTOMICS COMPANY
Shirley Basin, WY

1. STACK SAMPLES

No discharge stacks present - Deleted by Amendment No. 21

2. AIR SAMPLES

LOCATIONS: Site 1 - 7800' WW of where yellowcake dryer stack had been located. Rn-222 only -
Amendment No. 21.

Site 2 - Discontinued - Amendment No. 21.

Site 3 - Discontinued - Amendment No. 21.

Site 4 - Discontinued - Amendment No. 21.

Site 5 - 2000' NE of where yellowcake dryer stack had been located.

Site 6 - Discontinued - Amendment No. 21.

DATE COLLECTED: 1st Quarter 1988

LOCATION: Site 1

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)	%TPC
Rn-222	0.80 X 10 ⁻⁹	± 0.08 X 10 ⁻⁹	0.2 X 10 ⁻⁹	26.66

DATE COLLECTED: 1st Quarter 1988

LOCATION: Site 5

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)	%TPC
U-nat	0.48 X 10 ⁻¹⁵		2.0 X 10 ⁻¹⁹	0.01
Th-230	0.48 X 10 ⁻¹⁵	± 0.82 X 10 ⁻¹⁵	2.0 X 10 ⁻¹⁶	0.60
Ra-226	0.30 X 10 ⁻¹⁵	± 0.03 X 10 ⁻¹⁵	4.0 X 10 ⁻¹⁷	0.01
Pb-210	0.32 X 10 ⁻¹⁵	± 0.26 X 10 ⁻¹⁵	1.0 X 10 ⁻¹⁶	0.01
Rn-222	0.30 X 10 ⁻⁹	± 0.04 X 10 ⁻⁹	0.2 X 10 ⁻⁹	10.00

3. LIQUID SAMPLES

DATE COLLECTED: March 29, 1988

LOCATION: Mine Shop Well

TYPE OF SAMPLE: Groundwater - Pumped

<u>RADIOISOTOPE</u>	<u>CONCENTRATION (uCi/ml)</u>	<u>ERROR ESTIMATE (uCi/ml)</u>	<u>LLS (uCi/ml)</u>
U-nat (Dissolved)	1.35×10^{-9}		
U-Nat (Suspended)	14.22×10^{-9}		
Th-230 (Dissolved)	0.00×10^{-9}	$\pm 1.38 \times 10^{-9}$	20.0×10^{-10}
Th-230 (Suspended)	0.00×10^{-9}	$\pm 1.92 \times 10^{-9}$	30.0×10^{-10}
Ra-226 (Dissolved)	0.15×10^{-9}	$\pm 0.11 \times 10^{-9}$	2.0×10^{-10}
Ra-226 (Suspended)	0.68×10^{-9}	$\pm 0.17 \times 10^{-9}$	1.0×10^{-10}
Pb-210 (Dissolved)	1.19×10^{-9}	$\pm 1.32 \times 10^{-9}$	2.0×10^{-9}
Pb-210 (Suspended)	2.97×10^{-9}	$\pm 2.71 \times 10^{-9}$	4.0×10^{-9}
Po-210 (Dissolved)	0.08×10^{-9}	$\pm 0.23 \times 10^{-9}$	0.4×10^{-9}
Po-210 (Suspended)	0.93×10^{-9}	$\pm 0.55 \times 10^{-9}$	8.0×10^{-10}

WESTERN ENVIRONMENTAL SERVICES AND TESTING, INC.
6756 WEST URANIUM ROAD
CASPER, WYOMING 82604
(307)234-5511

Client: Petrotomics Company
Address: P.O. Box 8509, Shirley Basin, Wy. 82615
Attention: Steve Pfaff

Lab #: 88-765.1

Sample Type: 1 Water
Submitted By: Steve Pfaff
Analyzed By: GLH,LL,JPM,SM,CAW

Date Sampled: 03-29-88
Date Submitted: 03-29-88
Date Analyzed: 05-09-88

Subject: Mine Shop Well (W-18103)

PARAMETERS

mg/L *

pH, Units
Total Diss. Solids (TDS)
Chloride (Cl)
Sulfate (SO4)
Arsenic (As)
Selenium (Se)

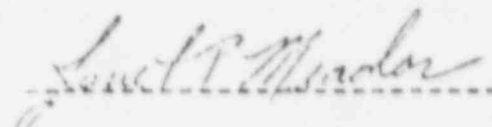
8.40
459
9
190
<0.001
<0.001

DISSOLVED

SUSPENDED

	pCi/L	LLD uCi/ml	pCi/L	LLD uCi/ml
	-----	-----	-----	-----
Uranium (U)	0.002		0.021	
Radium 226	0.15+0.11	2E-10	0.68+0.17	1E-10
Thorium 230	0.00+1.38	2E-9	0.00+1.92	3E-9
Lead 210	1.19+1.32	2E-9	2.97+2.71	4E-9
Polonium 210	0.08+0.23	4E-10	0.93+0.55	8E-10

COMMENTS, * Units are mg/L unless otherwise noted.



TITLE : Chief Chemist

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 10, 1988
 LOCATION: 1-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIOISOTOPE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LID (uCi/ml)
U-rat	17.60×10^{-9}		
Th-230	1.66×10^{-9}	$\pm 3.00 \times 10^{-9}$	7.5×10^{-10}
Ra-226	0.71×10^{-9}	$\pm 0.17 \times 10^{-9}$	2.0×10^{-10}
Pb-210	2.20×10^{-9}	$\pm 1.39 \times 10^{-9}$	2.0×10^{-9}
Po-210	0.01×10^{-9}	$\pm 0.23 \times 10^{-9}$	0.4×10^{-9}

DATE COLLECTED: January 10, 1988
 LOCATION: 3-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIOISOTOPE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LID (uCi/ml)
U-rat	2376.27×10^{-9}		
Th-230	12.35×10^{-9}	$\pm 3.75 \times 10^{-9}$	30.0×10^{-10}
Ra-226	1.64×10^{-9}	$\pm 0.29 \times 10^{-9}$	2.0×10^{-10}
Pb-210	2.29×10^{-9}	$\pm 1.40 \times 10^{-9}$	2.0×10^{-9}
Po-210	0.34×10^{-9}	$\pm 0.26 \times 10^{-9}$	0.4×10^{-9}

WESTERN ENVIRONMENTAL SERVICES & TESTING, INC.
6756 WEST URANIUM ROAD
CASPER, WYOMING 82604
(307) 234-5511

CLIENT PETROTOMICS COMPANY

ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

1 SC (1/13/88)

LAB #		582-15	582-16	582-23	582-34	582-37
IDENTIFICATION #		18039	18045	18053	18069	18019
T.D.S.	MG/L	-----	-----	-----	-----	2067
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	65.7
SULFATE (SO4)	MG/L	-----	-----	-----	-----	1180
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.053	0.139	0.056	0.073	-----
CADMIUM (CD)	MG/L	0.005	0.006	0.006	0.006	-----
CHROMIUM (CR)	MG/L	(0.005	(0.005	(0.005	(0.005	-----
LEAD (PB)	MG/L	0.030	0.039	0.033	0.039	-----
NICKEL (NI)	MG/L	0.09	0.09	0.07	0.09	-----
SELENIUM (SE)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	0.026	0.028	0.027	0.021	-----
RADIUM 226	PCI/L	0.76	1.02	0.64	0.40	-----
+/-	PCI/L	0.17	0.20	0.14	0.17	-----
LLD	UCI/ML	2E-10	1E-10	1E-10	3E-10	-----
RADIUM 228	PCI/L	4.43	5.51	2.35	0.49	-----
+/-	PCI/L	2.18	1.74	1.59	1.48	-----
LLD	UCI/ML	5E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	0.53	1.54	0.38	4.2	-----
+/-	PCI/L	0.52	0.75	0.53	19.7	-----
LLD	UCI/ML	5E-10	1E-9	5E-10	1E-9	-----

pH
c,wb

4.43
1740

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ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

3 SC (1/14/88)

LAB #		687-1	687-2	687-4	687-6	687-27
IDENTIFICATION #		18052	18059	18066	18072	18042
T.D.S.	MG/L	-----	-----	-----	-----	8530
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	333
SULFATE (SO4)	MG/L	-----	-----	-----	-----	100
ARSENIC (AS)	MG/L	(0.001	(0.001	0.001	(0.001	-----
BARIUM (BA)	MG/L	0.014	0.021	0.010	0.017	-----
CADMIUM (CD)	MG/L	0.054	0.052	0.052	0.053	-----
CHROMIUM (CR)	MG/L	0.011	0.011	0.013	0.013	-----
LEAD (PB)	MG/L	0.079	0.069	0.072	0.071	-----
NICKEL (NI)	MG/L	1.33	1.29	1.35	1.35	-----
SELENIUM (SE)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	3.25	3.90	3.40	3.50	-----
RADIUM 226	PCI/L	2.68	1.88	1.10	1.11	-----
LLD	UCI/ML	3E-10	1E-10	2E-10	2E-10	-----
RADIUM 228	PCI/L	7.77	19.7	15.1	13.4	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	30	9.2	2.9	2.3	-----
LLD	UCI/ML	1E-9	3E-9	3E-9	3E-9	-----

4.03

1260

PH

0000

2. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 10, 1988
 LOCATION: 4-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	123.89 X 10 ⁻⁹		
Th-230	2.61 X 10 ⁻⁹	± 1.93 X 10 ⁻⁹	30.0 X 10 ⁻¹⁰
Ra-226	10.47 X 10 ⁻⁹	± 0.78 X 10 ⁻⁹	3.0 X 10 ⁻¹⁰
Pb-210	4.06 X 10 ⁻⁹	± 1.53 X 10 ⁻⁹	2.0 X 10 ⁻⁹
Po-210	0.80 X 10 ⁻⁹	± 0.30 X 10 ⁻⁹	0.4 X 10 ⁻⁹

DATE COLLECTED: January 10, 1988
 LOCATION: 5-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	9728.49 X 10 ⁻⁹		
Th-230	1879.75 X 10 ⁻⁹	± 62.75 X 10 ⁻⁹	100.0 X 10 ⁻¹⁰
Ra-226	0.55 X 10 ⁻⁹	± 0.16 X 10 ⁻⁹	2.0 X 10 ⁻¹⁰
Pb-210	0.00 X 10 ⁻⁹	± 2.54 X 10 ⁻⁹	4.0 X 10 ⁻⁹
Po-210	0.00 X 10 ⁻⁹	± 0.42 X 10 ⁻⁹	0.8 X 10 ⁻⁹

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CLIENT PETROTOMICS COMPANY

ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

4 SC 11/15/88

LAB #		687-9	687-11	687-13	687-17	687-29
IDENTIFICATION #		18077	18079	18082	18088	18074
T.D.S.	MG/L	-----	-----	-----	-----	5599
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	388
SULFATE (SO4)	MG/L	-----	-----	-----	-----	3000
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	(0.005	0.013	0.039	0.066	-----
CADMIUM (CD)	MG/L	0.021	0.027	0.022	0.023	-----
CHROMIUM (CR)	MG/L	0.013	0.013	0.017	0.005	-----
LEAD (PB)	MG/L	0.049	0.083	0.053	0.050	-----
NICKEL (NI)	MG/L	0.65	0.65	0.66	0.67	-----
SILICON (SE)	MG/L	(0.001	(0.00	10.001	(0.001	-----
URANIUM (U)	MG/L	0.180	0.185	0.190	0.175	-----
RADIUM 226	PCI/L	8.36	12.62	11.8	9.12	-----
LLD	PCI/L	0.67	0.79	0.85	0.8	-----
	UCI/ML	2E-10	3E-10	4E-10	4E-10	-----
RADIUM 228	PCI/L	15.3	22.9	24.5	17.9	-----
LLD	PCI/L	2.57	2.54	2.67	3.16	-----
	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	0.0	4.4	4.6	1.44	-----
LLD	PCI/L	1.8	2.7	2.4	0.8	-----
	UCI/ML	4E-9	4E-9	3E-9	1E-9	-----

pH
cond.
HCO₃

514
5270
107

WESTERN ENVIRONMENTAL SERVICES & TESTING, INC.
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CLIENT PETROATOMICS COMPANY

ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

5 SC (1/14/88)

LAB #		682-20	682-26	682-30	682-33	682-43
IDENTIFICATION #		18046	18057	18063	18067	18041
T.D.S.	MG/L	-----	-----	-----	-----	27765
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	201
SULFATE (SO4)	MG/L	-----	-----	-----	-----	16600
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	(0.005	(0.005	(0.005	(0.005	-----
CADMIUM (CD)	MG/L	0.130	0.132	0.132	0.132	-----
CHROMIUM (CR)	MG/L	1.749	1.502	1.749	1.749	-----
LEAD (PB)	MG/L	0.345	0.339	0.417	0.403	-----
NICKEL (NI)	MG/L	4.09	4.77	4.39	4.84	-----
SELENIUM (SE)	MG/L	0.001	0.001	0.001	(0.001	-----
URANIUM (U)	MG/L	13.500	15.000	15.000	14.000	-----
RADIUM 226	PCI/L	0.60	0.43	0.49	0.63	-----
LLD	PCI/L	0.16	0.13	0.13	0.19	-----
	UCI/ML	2E-10	2E-10	2E-10	2E-10	-----
RADIUM 228	PCI/L	1.52	2.50	0.95	0.09	-----
LLD	PCI/L	1.80	1.76	1.88	1.19	-----
	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	2014	1713	3084	1706	-----
LLD	PCI/L	69	64	63	55	-----
	UCI/ML	1E-8	2E-8	1E-8	1E-8	-----

pH
 8.280

3.06
 15,280

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 10, 1988
 LOCATION: 39-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION ($\mu\text{Ci/ml}$)	ERROR ESTIMATE ($\mu\text{Ci/ml}$)	LJD ($\mu\text{Ci/ml}$)
U-nat	62.28 X 10 ⁻⁹		
Th-230	0.97 X 10 ⁻⁹	$\pm 1.56 \times 10^{-9}$	8 X 10 ⁻¹⁰
Ra-226	2.78 X 10 ⁻⁹	$\pm 0.33 \times 10^{-9}$	2 X 10 ⁻¹⁰
Pb-210	1.99 X 10 ⁻⁹	$\pm 1.38 \times 10^{-9}$	2 X 10 ⁻⁹
Po-210	0.33 X 10 ⁻⁹	$\pm 0.26 \times 10^{-9}$	4 X 10 ⁻⁹

DATE COLLECTED: January 10, 1988
 LOCATION: 40-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION ($\mu\text{Ci/ml}$)	ERROR ESTIMATE ($\mu\text{Ci/ml}$)	LJD ($\mu\text{Ci/ml}$)
U-nat	6.09 X 10 ⁻⁹		
Th-230	1.24 X 10 ⁻⁹	$\pm 0.71 \times 10^{-9}$	6 X 10 ⁻¹⁰
Ra-226	0.65 X 10 ⁻⁹	$\pm 0.19 \times 10^{-9}$	3 X 10 ⁻¹⁰
Pb-210	0.00 X 10 ⁻⁹	$\pm 1.24 \times 10^{-9}$	2 X 10 ⁻⁹
Po-210	0.00 X 10 ⁻⁹	$\pm 0.21 \times 10^{-9}$	4 X 10 ⁻⁹

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CLIENT PETROTOMICS COMPANY

ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

39 SC (1/12/88)

LAB #		682-1	682-5	682-8	682-13	687-26
IDENTIFICATION #		18022	18027	18030	18036	18039
T.D.S.	MG/L	-----	-----	-----	-----	3332
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	59.8
SULFATE (SO4)	MG/L	-----	-----	-----	-----	2040
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.104	0.108	0.073	0.081	-----
CADMIUM (CD)	MG/L	0.015	0.015	0.019	0.019	-----
CHROMIUM (CR)	MG/L	(0.005	(0.005	(0.005	(0.005	-----
LEAD (PB)	MG/L	0.032	0.032	0.048	0.040	-----
NICKEL (NI)	MG/L	0.38	0.38	0.39	0.38	-----
SELENIUM (SE)	MG/L	(0.001	0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	0.074	0.085	0.097	0.110	-----
RADIUM 226	PCI/L	2.98	3.49	2.68	1.98	-----
+/-	PCI/L	0.36	0.36	0.31	0.27	-----
LLD	UCI/ML	1E-10	2E-10	1E-10	2E-10	-----
RADIUM 228	PCI/L	2.31	2.59	2.69	1.47	-----
+/-	PCI/L	2.21	1.56	1.51	1.50	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	0.68	0.92	0.59	1.73	-----
+	PCI/L	0.66	3.5	1.01	1.06	-----
LLD	UCI/ML	6E-10	9E-10	9E-9	9E-10	-----
pH	units					4.94
cond.						2250
temp.						70

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(307) 234-3511

CLIENT PETROTOMICS COMPANY

ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

40 SC (1/13/88)

LAB #		682-3	682-21	682-25	682-31	682-44
IDENTIFICATION #		18024	18050	18056	18065	18043
T.D.S.	MG/L	-----	-----	-----	-----	1464
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	65.7
SULFATE (SO4)	MG/L	-----	-----	-----	-----	650
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.142	0.058	0.045	0.047	-----
CADMIUM (CD)	MG/L	0.005	0.004	0.005	0.004	-----
CHROMIUM (CR)	MG/L	(0.005	(0.005	(0.005	(0.005	-----
LEAD (PB)	MG/L	0.032	0.022	0.029	0.020	-----
NICKEL (NI)	MG/L	0.04	0.04	0.04	0.04	-----
SILICON (SE)	MG/L	0.001	(0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	0.007	0.020	0.004	0.006	-----
RADIUM 226	PCI/L	0.41	0.51	0.67	1.00	-----
+/-	PCI/L	0.19	0.15	0.15	0.22	-----
LLD	UCI/ML	3E-10	3E-10	2E-10	3E-10	-----
RADIUM 228	PCI/L	2.78	3.74	0.00	0.78	-----
+/-	PCI/L	1.86	1.41	1.75	1.54	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	0.44	1.31	0.22	3.0	-----
+/-	PCI/L	0.55	0.69	0.60	1.0	-----
LLD	UCI/ML	5E-10	5E-10	5E-10	8E-10	-----

PH
COND
DRC:

5.9
7930
478

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 10, 1988
 LOCATION: 41-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	166.91 X 10 ⁻⁹		
Th-230	6.99 X 10 ⁻⁹	± 1.57 X 10 ⁻⁹	1.0 X 10 ⁻¹⁰
Ra-226	0.84 X 10 ⁻⁹	± 0.18 X 10 ⁻⁹	1.0 X 10 ⁻¹⁰
Pb-210	4.84 X 10 ⁻⁹	± 2.98 X 10 ⁻⁹	2.0 X 10 ⁻⁹
Po-210	0.45 X 10 ⁻⁹	± 0.28 X 10 ⁻⁹	0.4 X 10 ⁻⁹

DATE COLLECTED: January 10, 1988
 LOCATION: 42-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	3256.37 X 10 ⁻⁹		
Th-230	3300.00 X 10 ⁻⁹	± 32.50 X 10 ⁻⁹	115.0 X 10 ⁻¹⁰
Pa-226	3.23 X 10 ⁻⁹	± 0.33 X 10 ⁻⁹	2.0 X 10 ⁻¹⁰
Pb-210	3.53 X 10 ⁻⁹	± 1.44 X 10 ⁻⁹	2.0 X 10 ⁻⁹
Po-210	0.48 X 10 ⁻⁹	± 0.28 X 10 ⁻⁹	0.4 X 10 ⁻⁹

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CLIENT PETROATOMICS COMPANY

ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

41 SC (1/12/88)

LAB #		662-11	662-19	662-28	662-36	662-42
IDENTIFICATION #		18034	18046	18060	18072	18040
T.D.S.	MG/L	-----	-----	-----	-----	7613
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	63.7
SULFATE (SO4)	MG/L	-----	-----	-----	-----	4650
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.035	0.073	0.046	0.054	-----
CADMIUM (CD)	MG/L	0.007	0.007	0.006	0.007	-----
CHROMIUM (CR)	MG/L	(0.005	(0.005	(0.005	(0.005	-----
LEAD (PB)	MG/L	0.043	0.033	0.037	0.037	-----
NICKEL (NI)	MG/L	0.04	0.04	0.04	0.09	-----
SELENIUM (SE)	MG/L	0.001	(0.001	0.001	(0.001	-----
URANIUM (U)	MG/L	0.215	0.218	0.200	0.235	-----
RADIUM 226	PCI/L	0.79	0.75	1.30	0.50	-----
LLD	UCI/ML	2E-10	1E-10	1E-10	1E-10	-----
RADIUM 228	PCI/L	1.61	2.66	5.00	0.00	-----
LLD	UCI/ML	9E-10	2E-9	2E-9	9E-10	-----
THORIUM 230	PCI/L	9.90	0.17	6.8	11.1	-----
LLD	UCI/ML	2E-9	5E-10	1E-8	2E-9	-----

pH

cond.

temp.

5.76
2310
874

WESTERN ENVIRONMENTAL SERVICES & TESTING, INC.
6756 WEST URANIUM ROAD
CASPER, WYOMING 82604
(307) 234-5511

CLIENT PETROTECHNICS COMPANY

ADDRESS P.O. BOX 6509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

42 SC (1/14/88)

LAB #		682-14	682-27	682-29	682-35	682-40
IDENTIFICATION #		18037	18058	18062	18070	18026
T.P.S.	MG/L	-----	-----	-----	-----	7613
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	83.7
SULFATE (SO4)	MG/L	-----	-----	-----	-----	4650
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.142	0.110	0.108	0.142	-----
CADMIUM (CD)	MG/L	0.049	0.054	0.052	0.052	-----
CHROMIUM (CR)	MG/L	1.010	1.024	0.995	0.995	-----
LEAD (PB)	MG/L	0.101	0.144	0.144	0.125	-----
NICKEL (NI)	MG/L	1.17	1.27	1.27	1.27	-----
SELENIUM (SE)	MG/L	0.001	(0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	4.275	4.750	4.950	5.250	-----
RADIUM 226	PCI/L	2.95	5.56	4.15	2.67	-----
+/-	PCI/L	0.31	0.40	0.33	0.30	-----
LLD	UCI/ML	3E-10	3E-10	2E-10	1E-10	-----
RADIUM 228	PCI/L	31.0	26.9	21.9	19.0	-----
+/-	PCI/L	3.1	3.42	3.37	2.17	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	3951	2728	2976	3541	-----
+/-	PCI/L	39	23	34	34	-----
LLD	UCI/ML	4E-8	1E-9	3E-9	2E-9	-----
pH						2.95
COND						6820

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 10, 1988
 LOCATION: 43-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIOISOTOPE	CONCENTRATION ($\mu\text{Ci/ml}$)	ERROR ESTIMATE ($\mu\text{Ci/ml}$)	LLD ($\mu\text{Ci/ml}$)
U-nat	727.77 X 10 ⁻⁹		
Th-230	3740.00 X 10 ⁻⁹	$\pm 87.75 \times 10^{-9}$	100 X 10 ⁻¹⁰
Ra-226	1.44 X 10 ⁻⁹	$\pm 0.25 \times 10^{-9}$	2 X 10 ⁻¹⁰
Pb-210	3.66 X 10 ⁻⁹	$\pm 2.22 \times 10^{-9}$	3 X 10 ⁻⁹
Po-210	1.19 X 10 ⁻⁹	$\pm 0.48 \times 10^{-9}$	6 X 10 ⁻⁹

DATE COLLECTED: January 10, 1988
 LOCATION: 44-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIOISOTOPE	CONCENTRATION ($\mu\text{Ci/ml}$)	ERROR ESTIMATE ($\mu\text{Ci/ml}$)	LLD ($\mu\text{Ci/ml}$)
U-nat	3258.40 X 10 ⁻⁹		
Th-230	1562.00 X 10 ⁻⁹	$\pm 55.25 \times 10^{-9}$	100 X 10 ⁻¹⁰
Ra-226	0.36 X 10 ⁻⁹	$\pm 0.14 \times 10^{-9}$	2 X 10 ⁻¹⁰
Pb-210	0.00 X 10 ⁻⁹	$\pm 2.40 \times 10^{-9}$	4 X 10 ⁻⁹
Po-210	0.00 X 10 ⁻⁹	$\pm 0.42 \times 10^{-9}$	8 X 10 ⁻⁹

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ANALYZED BY LAB STAFF DATE 03/30/88

43 SC (1/13/88)

LAB #		682-4	682-7	682-12	682-17	682-39
IDENTIFICATION #		1802	18029	18035	18044	18021
T.D.S.	MG/L	-----	-----	-----	-----	24444
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	244
SULFATE (SO4)	MG/L	-----	-----	-----	-----	13500
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.034	0.025	0.038	0.028	-----
CADMIUM (CD)	MG/L	0.127	0.124	0.124	0.127	-----
CHROMIUM (CR)	MG/L	1.531	1.502	1.575	1.589	-----
LEAD (PB)	MG/L	0.389	0.374	0.331	0.331	-----
NICKEL (NI)	MG/L	3.63	3.63	3.86	3.48	-----
SELENIUM (SE)	MG/L	(0.001	(0.001	(0.001	0.002	-----
URANIUM (U)	MG/L	10.750	10.500	10.750	11.000	-----
RADIUM 226	PCI/L	0.74	2.11	0.92	1.97	-----
+/-	PCI/L	0.23	0.29	0.21	0.28	-----
LLD	UCI/ML	3E-10	2E-10	1E-10	2E-10	-----
RADIUM 228	PCI/L	1.48	2.18	2.29	2.25	-----
+/-	PCI/L	1.70	1.36	1.43	1.41	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	3871	3494	3637	3756	-----
+/-	PCI/L	93	83	99	86	-----
LLD	UCI/ML	3E-8	1E-8	1E-8	1E-8	-----

PA
COND

2.94
14,240

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ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

44 SC (1/13/88)

LAB #		682-2	682-10	682-22	682-32	682-45
IDENTIFICATION #		18023	18032	18051	18066	18047
T.D.S.	MG/L	-----	-----	-----	-----	25235
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	209
SULFATE (SO4)	MG/L	-----	-----	-----	-----	15400
ARSENIC (AS)	MG/L	0.006	0.006	0.007	0.007	-----
BARIUM (BA)	MG/L	0.005	0.006	0.005	0.006	-----
CADMIUM (CD)	MG/L	0.103	0.103	0.106	0.103	-----
CHROMIUM (CR)	MG/L	1.372	1.459	1.517	1.444	-----
LEAD (PB)	MG/L	0.403	0.374	0.345	0.374	-----
NICKEL (NI)	MG/L	3.63	3.48	3.49	3.55	-----
SELENIUM (SE)	MG/L	0.002	0.001	0.001	0.001	-----
URANIUM (U)	MG/L	4.450	5.050	4.900	4.850	-----
RADIUM 226	PCI/L	0.17	0.45	0.29	0.53	-----
+/-	PCI/L	0.13	0.15	0.13	0.15	-----
LLD	UCI/ML	2E-10	1E-10	2E-10	1E-10	-----
RADIUM 228	PCI/L	1.25	0.00	0.30	0.00	-----
+/-	PCI/L	1.93	1.89	1.60	1.63	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	1438	1682	1589	1539	-----
+/-	PCI/L	54	61	60	46	-----
LLD	UCI/ML	1E-8	1E-8	1E-8	2E-8	-----

pH
COND

2.60
17,980

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 10, 1988
 LOCATION: 45-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	378.44 X 10 ⁻⁹		
Th-230	444.00 X 10 ⁻⁹	± 55.50 X 10 ⁻⁹	100.0 X 10 ⁻¹⁰
Ra-226	3.79 X 10 ⁻⁹	± 0.45 X 10 ⁻⁹	3.0 X 10 ⁻¹⁰
Pb-210	0.00 X 10 ⁻⁹	± 1.28 X 10 ⁻⁹	2.0 X 10 ⁻⁹
Po-210	0.00 X 10 ⁻⁹	± 0.22 X 10 ⁻⁹	4.0 X 10 ⁻⁹

DATE COLLECTED: January 10, 1988
 LOCATION: 49-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	33.17 X 10 ⁻⁹		
Th-230	20.25 X 10 ⁻⁹	± 7.00 X 10 ⁻⁹	80.0 X 10 ⁻¹⁰
Ra-226	9.47 X 10 ⁻⁹	± 0.58 X 10 ⁻⁹	3.0 X 10 ⁻¹⁰
Pb-210	4.42 X 10 ⁻⁹	± 1.31 X 10 ⁻⁹	2.0 X 10 ⁻⁹
Po-210	0.32 X 10 ⁻⁹	± 0.26 X 10 ⁻⁹	0.4 X 10 ⁻⁹

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ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

45 SC (1/14/88)

LAB #		687-2	687-4	687-5	687-7	687-28
IDENTIFICATION #		18055	18061	18064	18071	18049
T.D.S.	MG/L	-----	-----	-----	-----	32311
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	278
SULFATE (SO4)	MG/L	-----	-----	-----	-----	20400
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.010	0.010	(0.005	0.006	-----
CADMIUM (CD)	MG/L	0.023	0.023	0.062	0.023	-----
CHROMIUM (CR)	MG/L	0.647	0.647	0.633	0.633	-----
LEAD (PB)	MG/L	0.130	0.133	0.432	0.131	-----
NICKEL (NI)	MG/L	5.38	5.45	5.38	5.45	-----
SELENIUM (SE)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	0.580	0.525	0.570	0.560	-----
RADIUM 226	PCI/L	4.42	4.32	2.80	3.63	-----
+/-	PCI/L	0.42	0.42	0.44	0.51	-----
LLD	UCI/ML	2E-10	2E-10	3E-10	3E-10	-----
RADIUM 228	PCI/L	32.4	56.7	73.4	65.3	-----
+/-	PCI/L	3.14	4.7	4.3	4.9	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	395	550	403	429	-----
+/-	PCI/L	32	109	49	32	-----
LLD	UCI/ML	1E-8	1E-8	3E-8	1E-8	-----

pH
COND.

3.80
13,930

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ANALYZED BY LAB STAFF DATE 03/30/88

49 SC (1/15/88)

LAB #		687-19	687-20	687-22	687-23	687-32
IDENTIFICATION #		18090	18091	18093	18095	18086
T.D.S.	MG/L	-----	-----	-----	-----	13478
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	234
SULFATE (SO4)	MG/L	-----	-----	-----	-----	8000
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.010	0.006	0.010	(0.005	-----
CADMIUM (CD)	MG/L	0.028	0.028	0.028	0.028	-----
CHROMIUM (CR)	MG/L	0.008	0.008	0.008	0.005	-----
LEAD (PB)	MG/L	0.230	0.245	0.245	0.245	-----
NICKEL (NI)	MG/L	2.02	2.02	2.02	2.02	-----
SELENIUM (SE)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	0.047	0.048	0.047	0.051	-----
RADIUM 226	PCI/L	12.6	6.66	8.85	9.78	-----
LLD	PCI/L	0.62	0.45	0.49	0.78	-----
	UCI/ML	2E-10	2E-10	3E-10	3E-10	-----
RADIUM 228	PCI/L	15.6	23.0	22.6	24.8	-----
LLD	PCI/L	2.59	3.11	2.57	3.11	-----
	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	33	10	18	20	-----
LLD	PCI/L	9	6	7	7	-----
	UCI/ML	1E-8	6E-9	3E-9	6E-9	-----

pH
COND

4.10
10,170

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 10, 1988
 LOCATION: 51-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	5.42 X 10 ⁻⁹		
Th-230	0.29 X 10 ⁻⁹	± 15.66 X 10 ⁻⁹	300.0 X 10 ⁻¹⁰
Ra-226	37.55 X 10 ⁻⁹	± 1.14 X 10 ⁻⁹	3.0 X 10 ⁻¹⁰
Pb-210	0.00 X 10 ⁻⁹	± 3.34 X 10 ⁻⁹	6.0 X 10 ⁻⁹
Po-210	0.00 X 10 ⁻⁹	± 0.57 X 10 ⁻⁹	1.0 X 10 ⁻⁹

DATE COLLECTED: January 10, 1988
 LOCATION: 52-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	15.57 X 10 ⁻⁹		
Th-230	4.03 X 10 ⁻⁹	± 1.13 X 10 ⁻⁹	12.6 X 10 ⁻¹⁰
Ra-226	13.30 X 10 ⁻⁹	± 0.64 X 10 ⁻⁹	4.0 X 10 ⁻¹⁰
Pb-210	2.14 X 10 ⁻⁹	± 1.38 X 10 ⁻⁹	2.0 X 10 ⁻⁹
Po-210	0.15 X 10 ⁻⁹	± 0.21 X 10 ⁻⁹	0.4 X 10 ⁻⁹

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ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

51 SC (1/14/88)

LAB #		682-6	682-9	682-15	682-24	682-38
IDENTIFICATION #		18028	18031	18038	18054	18020
T.D.S.	MG/L	-----	-----	-----	-----	30401
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	289
SULFATE (SO4)	MG/L	-----	-----	-----	-----	16660
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.006	(0.005	(0.005	0.010	-----
CADMIUM (CD)	MG/L	0.027	0.022	0.022	0.022	-----
CHROMIUM (CR)	MG/L	0.014	0.008	0.008	0.010	-----
LEAD (PB)	MG/L	0.131	0.133	0.117	0.115	-----
NICKEL (NI)	MG/L	4.92	5.00	5.07	4.92	-----
SELENIUM (SE)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	0.009	0.005	0.011	0.004	-----
RADIUM 226	PCI/L	44.2	45.0	39.3	22.7	-----
LLD	PCI/L	1.26	1.38	1.15	0.78	-----
	UCI/ML	3E-10	2E-10	3E-10	2E-10	-----
RADIUM 228	PCI/L	60.4	74.8	51.5	53.1	-----
LLD	PCI/L	4.02	4.6	5.3	5.37	-----
	UCI/ML	9E-10	9E-10	9E-10	2E-9	-----
THORIUM 230	PCI/L	1.18	0.00	0.00	0.00	-----
LLD	PCI/L	15.6	15.4	16.11	15.50	-----
	UCI/ML	2E-8	3E-8	3E-8	3E-8	-----

pH
COND

387
16,050

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ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

52 EC (1/15/88)

LAB #		687-10	687-15	687-16	687-18	687-30
IDENTIFICATION #		18078	18084	18087	18089	18075
T.D.S.	MG/L	-----	-----	-----	-----	1381
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	25.9
SULFATE (SO4)	MG/L	-----	-----	-----	-----	800
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.025	0.025	0.010	(0.005	-----
CADMIUM (CD)	MG/L	0.005	0.005	0.003	0.005	-----
CHROMIUM (CR)	MG/L	0.011	(0.005	(0.005	(0.005	-----
LEAD (PB)	MG/L	0.033	0.032	0.019	0.027	-----
NICKEL (NI)	MG/L	0.04	0.04	0.04	0.04	-----
SELENIUM (SE)	MG/L	0.002	0.002	0.002	0.003	-----
URANIUM (U)	MG/L	0.023	0.024	0.021	0.025	-----
RADIUM 226	PCI/L	9.04	16.8	14.9	12.4	-----
+/-	PCI/L	0.67	1.0	1.1	0.79	-----
LLD	UCI/ML	3E-10	5E-10	4E-10	2E-10	-----
RADIUM 226	PCI/L	5.73	5.10	6.18	8.56	-----
+/-	PCI/L	2.23	2.07	2.31	1.91	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	0.00	5.8	4.7	5.6	-----
+/-	PCI/L	0.04	1.2	1.3	1.6	-----
LLD	UCI/ML	9E-10	1E-9	1E-9	2E-9	-----

pH
COND
HCO₃

657
1740
937

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 10, 1988

LOCATION: 53-SC

TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION ($\mu\text{Ci}/\text{ml}$)	ERROR ESTIMATE ($\mu\text{Ci}/\text{ml}$)	LLD ($\mu\text{Ci}/\text{ml}$)
U-nat	39.27×10^{-9}		
Th-230	0.00×10^{-9}	$\pm 0.71 \times 10^{-9}$	7.0×10^{-10}
Ra-226	3.67×10^{-9}	$\pm 0.44 \times 10^{-9}$	3.0×10^{-10}
Pb-210	2.45×10^{-9}	$\pm 2.13 \times 10^{-9}$	3.0×10^{-9}
Po-210	0.15×10^{-9}	$\pm 0.32 \times 10^{-9}$	0.5×10^{-9}

DATE COLLECTED: January 10, 1988

LOCATION: 54-SC

TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION ($\mu\text{Ci}/\text{ml}$)	ERROR ESTIMATE ($\mu\text{Ci}/\text{ml}$)	LLD ($\mu\text{Ci}/\text{ml}$)
U-nat	14.22×10^{-9}		
Th-230	18.08×10^{-9}	$\pm 6.00 \times 10^{-9}$	65.0×10^{-10}
Ra-226	12.29×10^{-9}	$\pm 0.83 \times 10^{-9}$	2.0×10^{-10}
Pb-210	0.90×10^{-9}	$\pm 2.10 \times 10^{-9}$	3.0×10^{-9}
Po-210	0.22×10^{-9}	$\pm 0.39 \times 10^{-9}$	0.6×10^{-9}

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ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

53 SC

LAB #		687-25	772-1	772-2	687-26
IDENTIFICATION #		1/15/88 18097	3/28/88 18094	3/28/88 18094A	18097
T.D.S.	MG/L	-----	-----	-----	4703
CHLORIDE (CL)	MG/L	-----	-----	-----	47.8
SULFATE (SO4)	MG/L	-----	-----	-----	3100
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.021	(0.005	(0.005	-----
CADMIUM (CD)	MG/L	0.016	0.007	0.007	-----
CHROMIUM (CR)	MG/L	(0.005	(0.005	(0.005	-----
LEAD (PB)	MG/L	0.063	0.062	0.065	-----
NICKEL (NI)	MG/L	0.64	0.21	0.15	-----
SELENIUM (SE)	MG/L	(0.001	(0.001	(0.001	-----
URANIUM (U)	MG/L	0.070	0.051	.052	-----
RADIUM 226	PCI/L	3.67	3.13	5.39	-----
+/-	PCI/L	0.44	0.31	0.42	-----
LLD	UCI/ML	3E-10	1E-10	2E-10	-----
RADIUM 228	PCI/L	8.43	4.58	4.79	-----
+/-	PCI/L	1.92	2.07	2.08	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	0.00			-----
+/-	PCI/L	0.71			-----
LLD	UCI/ML	7E-10			-----

PP
COND.
NO₂

5.1
4110
195

WESTERN ENVIRONMENTAL SERVICES & TESTING, INC.
6756 WEST URANIUM ROAD
CASPER, WYOMING 82604
(307) 234-5511

CLIENT PETROTOMICS COMPANY

ADDRESS P.O. BOX 8509 SHIRLEY BASIN, WY 82615 DATE RECEIVED 01/18/88

ANALYZED BY LAB STAFF DATE 03/30/88

54 SC (1/15/88)

LAB #		687-12	687-14	687-21	687-24	687-31
IDENTIFICATION #		18080	18083	18092	18096	18076
T.D.S.	MG/L	-----	-----	-----	-----	2996
CHLORIDE (CL)	MG/L	-----	-----	-----	-----	53.6
SULFATE (SO4)	MG/L	-----	-----	-----	-----	2080
ARSENIC (AS)	MG/L	(0.001	(0.001	(0.001	(0.001	-----
BARIUM (BA)	MG/L	0.067	0.108	0.078	0.061	-----
CADMIUM (CD)	MG/L	0.015	0.005	0.006	0.007	-----
CHROMIUM (CR)	MG/L	0.017	(0.005	(0.005	(0.005	-----
LEAD (PB)	MG/L	0.078	0.033	0.040	0.045	-----
NICKEL (NI)	MG/L	1.14	0.35	0.35	0.38	-----
SELENIUM (SE)	MG/L	(0.001	0.002	0.002	0.002	-----
URANIUM (U)	MG/L	0.045	0.016	0.014	0.014	-----
RADIUM 226	PCI/L	8.99	16.7	10.46	13.0	-----
+/-	PCI/L	0.77	1.0	0.54	1.0	-----
LLD	UCI/ML	2E-10	2E-10	2E-10	2E-10	-----
RADIUM 228	PCI/L	33.5	33.5	16.2	24.8	-----
+/-	PCI/L	3.76	2.97	2.32	3.47	-----
LLD	UCI/ML	9E-10	9E-10	9E-10	9E-10	-----
THORIUM 230	PCI/L	42	4.3	10	16	-----
+/-	PCI/L	12	2.6	2.5	7	-----
LLD	UCI/ML	1E-8	4E-9	3E-9	9E-9	-----

pH
COND

470
3310

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: January 15, 1988
 LOCATION: 5-DC
 TYPE OF SAMPLE: Groundwater - Pumped

<u>RADIONUCLIDE</u>	<u>CONCENTRATION</u> <u>(uCi/ml)</u>	<u>ERROR ESTIMATE</u> <u>(uCi/ml)</u>	<u>LLD</u> <u>(uCi/ml)</u>
U-nat	0.09 X 10 ⁻⁹		
Th-230	0.00 X 10 ⁻⁹	± 3.45 X 10 ⁻⁹	40 X 10 ⁻¹⁰
Ra-226	5.66 X 10 ⁻⁹	± 0.44 X 10 ⁻⁹	2 X 10 ⁻¹⁰
Pb-210	6.27 X 10 ⁻⁹	± 4.40 X 10 ⁻⁹	7 X 10 ⁻⁹
Po-210	0.31 X 10 ⁻⁹	± 0.76 X 10 ⁻⁹	1 X 10 ⁻⁹

WESTERN ENVIRONMENTAL SERVICES AND TESTING, INC.
6756 WEST URANIUM ROAD
CASPER, WYOMING 82404
(307)234-5511

Date : 04-05-88 Job # :
Client : Petrochemicals Company
Address : P.O. Box 8509
City : Shirley Basin
State : WY Zip : 82615

Lab No. : 86-693.1

Date Sampled : 1/15/88
Submitted By : Hydro Engineering
Attention : Steve Pfaff
Date Analyzed : 05-05-88

Date Submitted : 1/18/88

Analyst : LL, SM, JM, GLH, CW

Subject : 5DC (W18081, W18085)

WATER ANALYSIS
=====

Conductivity @25C, UMHO/CM	: Not Requested	
pH, units	: 3.25	
Total Dissolved Solids, mg/l	: 18653	
Sulfate, mg/l as SO4	: 10900	
Chloride, mg/l as Cl	: 244	
Arsenic, mg/l as As	: <0.001	
Selenium, mg/l as Se	: <0.001	
Uranium, mg/l as U	: 0.009	LLD
Radium 226, pCi/l	: 5.66±0.44	=====
Thorium 230, pCi/l	: 0.00±3.45	: 2E-10
Lead 210, pCi/l	: 6.27±4.40	: 4E-9
Polonium 210, pCi/l	: 0.31±0.76	: 7E-9
		: 1E-9

Comments :

By : *Richard J. Leaper*
Title : Lab Manager

4. VEGETATION, FOOD, AND FISH SAMPLES

Deleted by Amendment No. 21

5. SOIL AND SEDIMENT SAMPLES

Deleted by Amendment No. 21

6. DIRECT RADIATION MEASUREMENTS

DATE: 1st Quarter 1988

<u>LOCATION</u>	<u>EXPOSURE RATE</u> <u>(mr/qr)</u>	<u>ERROR ESTIMATE</u> <u>(mr/qr)</u>
Site 1	42.8	± 8.9
Site 5	66.0	± 9.1

LOCATIONS: Site 1 - 7800' WNW of where yellowcake dryer stack had been located.
Site 2 - Discontinued.
Site 3 - Discontinued.
Site 4 - Discontinued.
Site 5 - 2000' NE of where yellowcake dryer stack had been located.
Site 6 - Discontinued.

LLD CALCULATIONS

$$LLD = \frac{4.66 \sqrt{C_b \cdot T}}{(2.22)(E)(R)(V)(T)} \quad \text{in pCi/units used (V)}$$

WHERE:

C_b = BACKGROUND COUNT RATE

T = COUNT TIME (SAME FOR SAMPLE AND BACKGROUND)

E = DETECTOR EFFICIENCY (CPM/DPM)

R = FRACTIONAL RECOVERY

V = SAMPLE SIZE LITERS OF AIR OR WATER
 GRAMS OF SOIL
 KILCGRAMS OF VEGETATION

2.22 = DPM/pCi

Since the LLD is a function of sample volume, counting efficiency, radiochemical yield, etc., it may vary for different sampling and analysis procedures. The following are some of the normal values used.

Ra^{226}

C_b = 0.05 to 0.30 counts per minute

T = 60 minutes

E = about 0.9

R = about 0.9 frequently less in soil and vegetation

V = 1 liter of water

= 20 grams of soil

= air volume taken is usually 1/4 of volume sampled

= vegetation weight is usually 1/2 of sample provided

Th²³⁰

C_s = 0.04 to 0.20 cpm

T = 200 minutes, may be less for "hot" samples like tailings pond

E&R = combined recovery and efficiency from Th²³⁰ tracer varies greatly from 0.02 to 0.20

V = 1 liter of water, or less if high in iron. Iron interferes and volumes as low as 25 or 50 ml. may be used.
= 1.0 grams soil
= air volume taken is usually 1/4 of volume sampled (about 7 x 10⁶ L)

Pb²¹⁰

C_s = 1 to 2 cpm

T = 100 to 200 minutes

E = 0.25 to 0.33

R = usually 0.75 to 0.90 but may be less for vegetation and waters high in TDS

V = 1 liter of water, again samples high in iron will be less to lessen its interference.
= air volume taken is usually 1/4 of sample (about 7 x 10⁶ L)
= vegetation weight is usually 1/2 of sample provided.

Po²¹⁰

C_s = about 0.2 cpm

T = 100 to 200 minutes

E = 0.15 to 0.20

R = 0.5 to 0.8

V = 1 liter of water, iron causes interference so smaller volumes of samples high in iron are used, down to about 200 ml.

%MPC CALCULATION

The %MPC is calculated using the values obtained from 10 CFR 20 appendix B for unrestricted limits in air.

The calculation is as follows:

$$\%MPC = \frac{\text{sample concentration}}{\text{unrestricted limit}}$$

unrestricted limits for air from 10 CFR 20 Appendix B

U nat	5000×10^{-15}
Th ²³⁰	80×10^{-15}
Ra ²²⁶	3000×10^{-15}
Pb ²¹⁰	4000×10^{-15}
Rn ²²²	3×10^{-9}