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ENVIRONMENTAL SAMPLE DATA

3rd Quarter 1990

PETROTOMICS COMPANY
Shirley Basin, WY

9103200412 910228
PDR ADDCK 04006659
PDR

1. STACK SAMPLES

No discharge stacks present - Deleted by Amendment No. 21

2. AIR SAMPLES

LOCATIONS: Site 1 - 7800' WNW 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: 3rd Quarter 1990
 LOCATION: Site 1

<u>RADIONUCLIDE</u>	<u>CONCENTRATION (uCi/ml)</u>	<u>ERROR ESTIMATE (uCi/ml)</u>	<u>LLD (uCi/ml)</u>	<u>ΣMPC</u>
Rn-222	1.40 X 10 ⁻⁹	± 0.13 X 10 ⁻⁹	0.2 X 10 ⁻⁹	46.67

DATE COLLECTED: 3rd Quarter 1990
 LOCATION: Site 5

<u>RADIONUCLIDE</u>	<u>CONCENTRATION (uCi/ml)</u>	<u>ERROR ESTIMATE (uCi/ml)</u>	<u>LLD (uCi/ml)</u>	<u>ΣMPC</u>
U-nat	0.19 X 10 ⁻¹⁵		1.0 X 10 ⁻¹⁶	<0.01
Th-230	<0.10 X 10 ⁻¹⁵	± X 10 ⁻¹⁵	1.0 X 10 ⁻¹⁶	<0.03
Ra-226	0.58 X 10 ⁻¹⁵	± 0.04 X 10 ⁻¹⁵	1.0 X 10 ⁻¹⁶	0.03
Pb-210	8.92 X 10 ⁻¹⁵	± 0.76 X 10 ⁻¹⁵	2.2 X 10 ⁻¹⁶	0.11
Rn-222	1.60 X 10 ⁻⁹	± 0.14 X 10 ⁻⁹	0.2 X 10 ⁻⁹	53.33

3. LIQUID SAMPLES

DATE COLLECTED: September 16, 1990
 LOCATION: Mine Shop Well
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION ($\mu\text{Ci/ml}$)	ERROR ESTIMATE ($\mu\text{Ci/ml}$)	LLD ($\mu\text{Ci/ml}$)
U-nat (Dissolved)	$<0.68 \times 10^{-9}$		
U-nat (Suspended)	2.71×10^{-9}		
Th-230 (Dissolved)	0.00×10^{-9}	$\pm 1.80 \times 10^{-9}$	20.0×10^{-10}
Th-230 (Suspended)	0.22×10^{-9}	$\pm 0.96 \times 10^{-9}$	1.0×10^{-9}
Ra-226 (Dissolved)	0.33×10^{-9}	$\pm 0.13 \times 10^{-9}$	2.0×10^{-10}
Ra-226 (Suspended)	0.46×10^{-9}	$\pm 0.11 \times 10^{-9}$	1.0×10^{-10}
Ra-228 (Dissolved)	11.8×10^{-9}	$\pm 4.10 \times 10^{-9}$	1.0×10^{-9}
Ra-228 (Suspended)	5.50×10^{-9}	$\pm 4.40 \times 10^{-9}$	1.0×10^{-9}
Pb-210 (Dissolved)	0.45×10^{-9}	$\pm 1.01 \times 10^{-9}$	1.0×10^{-9}
Pb-210 (Suspended)	0.25×10^{-9}	$\pm 2.00 \times 10^{-9}$	2.0×10^{-9}
Po-210 (Dissolved)	0.11×10^{-9}	$\pm 0.39 \times 10^{-9}$	1.0×10^{-9}
Po-210 (Suspended)	0.29×10^{-9}	$\pm 0.61 \times 10^{-9}$	2.0×10^{-9}

* Samples not run.



6756 West Uranium Road
Casper, Wyoming 82604
307/234-5511

76 Imperial Drive, Unit I
Evanston, Wyoming 82930
307/789-6420

Client: Petrochemicals Company
Address: P.O. Box 8509 - Shirley Basin, Wyoming 82615
Attention: Steve Pfaff

Lab # : 90-2158-13

Sample Type: Water
Submitted By: Hydro Engineering
Analyzed By: KAH, GLH, FS, JPM

Date Sampled: 9-10-90
Date Submitted: 9-11-90
Date Analyzed: 1-14-91

Identification: Mine Shop Well

WATER ANALYSIS

	mg/l.
pH, Units	9.16
Total Diss. Solids (TDS)	533
Chloride (Cl)	4.9
Sulfate (SO4)	262
Nitrate (NO3 as N)	0.10
Arsenic (As)	0.001
Barium (Ba)	<0.05
Cadmium (Cd)	<0.01
Chromium (Cr)	<0.02
Lead (Pb)	<0.05
Nickel (Ni)	<0.03
Selenium (Se)	0.001

	DISSOLVED		SUSPENDED	
	pCi/l	LLD uCi/ml	pCi/l	LLD uCi/ml
Radium 226	0.33 ± 0.13	2x10E-10	0.46 ± 0.11	1x10E-10
Radium 228	11.8 ± 4.1	1x10E-9	5.5 ± 4.4	1x10E-9
Thorium 230	0 ± 1.8	2x10E-9	0.22 ± .96	1x10E-9
Lead 210	0.45 ± 1.01	1x10E-9	0.25 ± 2.00	2x10E-9
Polonium 210	0.11 ± 0.39	1x10E-9	0.29 ± 0.61	2x10E-9
	mg/l		mg/l	
Uranium (U)	<0.001		0.004	

Scott P. Meador

Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: September 10, 1990
 LOCATION: 1-SC
 TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	12.19 X 10 ⁻⁹		
Th-230	0.79 X 10 ⁻⁹	± 0.48 X 10 ⁻⁹	0.6 X 10 ⁻⁹
Ra-226	1.23 X 10 ⁻⁹	± 0.20 X 10 ⁻⁹	3 X 10 ⁻¹⁰
Ra-228	3.58 X 10 ⁻⁹	± 3.30 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	1.22 X 10 ⁻⁹	± 1.59 X 10 ⁻⁹	2 X 10 ⁻⁹
Po-210	0.18 X 10 ⁻⁹	± 0.44 X 10 ⁻⁹	1 X 10 ⁻⁹

DATE COLLECTED: September 10, 1990
 LOCATION: 3-SC
 TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	500.98 X 10 ⁻⁹		
Th-230	0.27 X 10 ⁻⁹	± 0.68 X 10 ⁻⁹	10 X 10 ⁻¹⁰
Ra-226	1.82 X 10 ⁻⁹	± 0.24 X 10 ⁻⁹	2 X 10 ⁻¹⁰
Ra-228	4.70 X 10 ⁻⁹	± 2.10 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	2.11 X 10 ⁻⁹	± 1.82 X 10 ⁻⁹	2 X 10 ⁻⁹
Po-210	0.16 X 10 ⁻⁹	± 0.45 X 10 ⁻⁹	10 X 10 ⁻⁹



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Client: Petrochemicals Company
Address: P.O.Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2158-2

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed: 01-14-90

1 SC
09-10-90

WATER ANALYSIS

pH, units	4.49
Total Dissolved Solids, mg/l	2038
Chloride (Cl), mg/l	87.0
Sulfate (SO4), mg/l	1060
Nitrate (NO3 as N), mg/l	0.85
Arsenic (As), mg/l	0.003
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	0.08
Selenium (Se), mg/l	0.008
Uranium (U), mg/l	0.019

		LLD uCi/ml
Radium 226, pCi/l	1.23 ± 0.20	3x10E-10
Radium 228, pCi/l	3.58 ± 3.30	1x10E-9
Thorium 230, pCi/l	0.79 ± 0.48	6x10E-10
Lead 210, pCi/l	1.22 ± 1.59	2x10E-9
Polonium 210, pCi/l	0.18 ± 0.44	1x10E-9

Janet P. Macdon
Analyst



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Client: Petrochemicals Company
Address: P.O.Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2158-4

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed: 01-14-91

3 SC
09-10-90

WATER ANALYSIS

pH, units	7.30	
Total Dissolved Solids, mg/l	7148	
Chloride (Cl), mg/l	431	
Sulfate (SO4), mg/l	3380	
Nitrate (NO3 as N), mg/l	7.3	
Arsenic (As), mg/l	0.009	
Barium (Ba), mg/l	<0.05	
Cadmium (Cd), mg/l	0.046	
Chromium (Cr), mg/l	<0.02	
Lead (Pb), mg/l	<0.05	
Nickel (Ni), mg/l	0.72	
Selenium (Se), mg/l	0.002	
Uranium (U), mg/l	0.740	
		L.L.D. uCi/mi
Radium 226, pCi/l	1.82 ± 0.24	2x10-E10
Radium 228, pCi/l	4.70 ± 2.1	1x10E-9
Thorium 230, pCi/l	0.27 ± 0.68	1x10E-9
Lead 210, pCi/l	2.11 ± 1.82	2x10E-9
Polonium 210, pCi/l	0.16 ± 0.45	1x10E-9

Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: September 10, 1990
 LOCATION: 4-SC
 TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION ($\mu\text{Ci}/\text{ml}$)	ERROR ESTIMATE ($\mu\text{Ci}/\text{ml}$)	LLD ($\mu\text{Ci}/\text{ml}$)
U-nat	182.79 X 10 ⁻⁹		
Th-230	0.38 X 10 ⁻⁹	$\pm 0.51 \times 10^{-9}$	8 X 10 ⁻¹⁰
Ra-226	5.30 X 10 ⁻⁹	$\pm 0.45 \times 10^{-9}$	3 X 10 ⁻¹⁰
Ra-228	4.65 X 10 ⁻⁹	$\pm 2.30 \times 10^{-9}$	1 X 10 ⁻⁹
Pb-210	1.77 X 10 ⁻⁹	$\pm 2.11 \times 10^{-9}$	2 X 10 ⁻⁹
Po-210	0.21 X 10 ⁻⁹	$\pm 0.39 \times 10^{-9}$	1 X 10 ⁻⁹

DATE COLLECTED: August 31, 1990
 LOCATION: 5-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	31819.00 X 10 ⁻⁹		
Th-230	2039.00 X 10 ⁻⁹	$\pm 87.00 \times 10^{-9}$	100 X 10 ⁻¹⁰
Ra-226	0.61 X 10 ⁻⁹	$\pm 0.13 \times 10^{-9}$	2 X 10 ⁻¹⁰
Ra-228	10.70 X 10 ⁻⁹	$\pm 2.90 \times 10^{-9}$	1 X 10 ⁻⁹
Pb-210	0.68 X 10 ⁻⁹	$\pm 3.37 \times 10^{-9}$	3 X 10 ⁻⁹
Po-210	0.22 X 10 ⁻⁹	$\pm 0.91 \times 10^{-9}$	2 X 10 ⁻⁹



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Client: Petrochemicals Company
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Attention: Steve Pfaff

Lab #: 90-2158-5

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed: 01-14-91

4 SC
09-10-90

WATER ANALYSIS

pH, units	5.62
Total Dissolved Solids, mg/l	5451
Chloride (Cl), mg/l	481
Sulfate (SO ₄), mg/l	2960
Nitrate (NO ₃ as N), mg/l	25.1
Arsenic (As), mg/l	0.007
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	0.017
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	0.45
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.270

Radium 226, pCi/l	5.30 ± 0.45
Radium 228, pCi/l	4.65 ± 2.3
Thorium 230, pCi/l	0.38 ± 0.51
Lead 210, pCi/l	1.77 ± 2.11
Polonium 210, pCi/l	0.21 ± 0.39

LLD
uCi/ml

3x10E-10
1x10E-9
8x10E-10
2x10E-9
1x10E-9

Loret P Meador
Analyst



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Attention: Steve Pfaff

Lab #: 90-2139-12

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed : 01-15-90

5 SC
08-31-90

WATER ANALYSIS

pH, units	3.09
Total Dissolved Solids, mg/l	25857
Chloride (Cl), mg/l	394
Sulfate (SO4), mg/l	17200
Nitrate (NO3 as N), mg/l	1.47
Arsenic (As), mg/l	<0.001
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	0.048
Chromium (Cr), mg/l	1.55
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	3.1
Selenium (Se), mg/l	0.158
Uranium (U), mg/l	47.0

Radium 226, pCi/l
Radium 228, pCi/l
Thorium 230, pCi/l
Lead 210, pCi/l
Polonium 210, pCi/l

0.61 ± 0.13
10.7 ± 2.9
2039 ± 87.0
0.68 ± 3.37
0.22 ± 0.91

LLD
uCi/ml

2x10E-10
1x10E-9
1x10E-8
3x10E-9
2x10E-9

Steve Pfaff
Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: September 10, 1990
 LOCATION: 33-SC
 TYPE OF SAMPLE: Groundwater - Bailed

<u>RADIONUCLIDE</u>	<u>CONCENTRATION (uCi/ml)</u>	<u>ERROR ESTIMATE (uCi/ml)</u>	<u>LLD (uCi/ml)</u>
U-nat	44.68 X 10 ⁻⁹		
Th-230	0.53 X 10 ⁻⁹	± 0.65 X 10 ⁻⁹	10 X 10 ⁻¹⁰
Ra-226	3.38 X 10 ⁻⁹	± 0.37 X 10 ⁻⁹	1 X 10 ⁻¹⁰
Ra-228	3.46 X 10 ⁻⁹	± 2.00 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	2.64 X 10 ⁻⁹	± 2.10 X 10 ⁻⁹	2 X 10 ⁻⁹
Po-210	0.30 X 10 ⁻⁹	± 0.42 X 10 ⁻⁹	1 X 10 ⁻⁹

DATE COLLECTED: September 10, 1990
 LOCATION: 40-SC
 TYPE OF SAMPLE: Groundwater - Bailed

<u>RADIONUCLIDE</u>	<u>CONCENTRATION (uCi/ml)</u>	<u>ERROR ESTIMATE (uCi/ml)</u>	<u>LLD (uCi/ml)</u>
U-nat	<0.68 X 10 ⁻⁹		
Th-230	0.56 X 10 ⁻⁹	± 0.45 X 10 ⁻⁹	6 X 10 ⁻¹⁰
Ra-226	0.34 X 10 ⁻⁹	± 0.12 X 10 ⁻⁹	1 X 10 ⁻¹⁰
Ra-228	1.88 X 10 ⁻⁹	± 2.10 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	0.29 X 10 ⁻⁹	± 0.51 X 10 ⁻⁹	1 X 10 ⁻⁹
Po-210	0.00 X 10 ⁻⁹	± 0.21 X 10 ⁻⁹	9 X 10 ⁻⁹



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Client: Petrochemical Company
Address: P.O.Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2158-6

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed: 01-14-91

39 SC
09-10-90

WATER ANALYSIS

pH, units	4.80
Total Dissolved Solids, mg/l	3432
Chloride (Cl), mg/l	67
Sulfate (SO4), mg/l	2180
Nitrate (NO3 as N), mg/l	4.7
Arsenic (As), mg/l	0.007
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	0.016
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	0.32
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.066

Radium 226, pCi/l
Radium 228, pCi/l
Thorium 230, pCi/l
Lead 210, pCi/l
Polonium 210, pCi/l

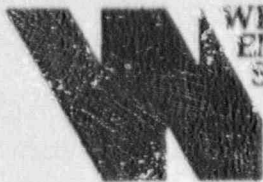
3.58 ± 0.37
3.46 ± 2.0
0.53 ± 0.65
2.64 ± 2.10
0.30 ± 0.42

LLD
uCi/ml

1x10E-10
1x10E-9
1x10E-9
2x10E-9
1x10E-9

Janet P. Meador

Analyst



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Client: Petrochemical Company
Address: P.O. Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2158-7

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed: 01-14-91

40 SC
09-10-90

WATER ANALYSIS

pH, units	6.58	
Total Dissolved Solids, mg/l	2549	
Chloride (Cl), mg/l	156	
Sulfate (SO ₄), mg/l	1300	
Nitrate (NO ₃ as N), mg/l	1.3	
Arsenic (As), mg/l	0.009	
Barium (Ba), mg/l	<0.05	
Cadmium (Cd), mg/l	<0.01	
Chromium (Cr), mg/l	<0.02	
Lead (Pb), mg/l	<0.05	
Nickel (Ni), mg/l	<0.03	
Selenium (Se), mg/l	<0.001	
Uranium (U), mg/l	<0.001	
		LLD uCi/ml
Radium 226, pCi/l	0.34 ± 0.12	1x10E-10
Radium 228, pCi/l	1.88 ± 2.1	1x10E-9
Thorium 230, pCi/l	0.56 ± 0.45	6x10E-10
Lead 210, pCi/l	0.29 ± 0.51	1x10E-9
Polonium 210, pCi/l	0.00 ± 0.21	9x10E-10

Janet P. Meador

Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: September 13, 1990

LOCATION: 41-SC

TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION ($\mu\text{Ci}/\text{ml}$)	ERROR ESTIMATE ($\mu\text{Ci}/\text{ml}$)	LLD ($\mu\text{Ci}/\text{ml}$)
U-nat	280.28×10^{-9}		
Th-230	0.00×10^{-9}	$\pm 0.81 \times 10^{-9}$	20×10^{-10}
Ra-226	0.53×10^{-9}	$\pm 0.18 \times 10^{-9}$	3×10^{-10}
Ra-228	0.88×10^{-9}	$\pm 2.30 \times 10^{-9}$	1×10^{-9}
Pb-210	1.22×10^{-9}	$\pm 1.95 \times 10^{-9}$	2×10^{-9}
Po-210	0.17×10^{-9}	$\pm 0.30 \times 10^{-9}$	1×10^{-9}

DATE COLLECTED: September 10, 1990

LOCATION: 42-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	3709.97×10^{-9}		
Th-230	1654.00×10^{-9}	$\pm 41.00 \times 10^{-9}$	50×10^{-10}
Ra-226	3.80×10^{-9}	$\pm 0.36 \times 10^{-9}$	3×10^{-10}
Ra-228	18.60×10^{-9}	$\pm 3.50 \times 10^{-9}$	1×10^{-9}
Pb-210	4.33×10^{-9}	$\pm 3.06 \times 10^{-9}$	3×10^{-9}
Po-210	0.39×10^{-9}	$\pm 0.87 \times 10^{-9}$	2×10^{-9}



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Client: Petrochemicals Company
Address: P.O. Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2158-8

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed: 01-14-91

41 SC
09-10-90

WATER ANALYSIS

pH, units	7.31
Total Dissolved Solids, mg/l	2604
Chloride (Cl), mg/l	312
Sulfate (SO ₄), mg/l	960
Nitrate (NO ₃ as N), mg/l	3.3
Arsenic (As), mg/l	0.004
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	<0.03
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.414

		LLD uCi/ml
Radium 226, pCi/l	0.53 ± 0.18	3x10E-10
Radium 228, pCi/l	0.88 ± 2.3	1x10E-9
Thorium 230, pCi/l	0.00 ± .81	2x10E-9
Lead 210, pCi/l	1.22 ± 1.95	2x10E-9
Polonium 210, pCi/l	0.17 ± 0.30	1x10E-9

Janet P. Meador
Analyst



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Client: Petrochemical Company
Address: P.O. Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 96-2158-9

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed: 01-14-91

42 SC
09-10-90

WATER ANALYSIS

pH, units	4.26	
Total Dissolved Solids, mg/l	4933	
Chloride (Cl), mg/l	115	
Sulfate (SO ₄), mg/l	3400	
Nitrate (NO ₃ as N), mg/l	0.56	
Arsenic (As), mg/l	0.004	
Barium (Ba), mg/l	<0.05	
Cadmium (Cd), mg/l	0.022	
Chromium (Cr), mg/l	0.42	
Lead (Pb), mg/l	<0.05	
Nickel (Ni), mg/l	0.63	
Selenium (Se), mg/l	0.001	
Uranium (U), mg/l	5.48	
		LLD
		uCi/ml
Radium 226, pCi/l	3.80 ± 0.36	3x10E-10
Radium 228, pCi/l	18.6 ± 3.5	1x10E-9
Thorium 230, pCi/l	1654 ± 41	5x10E-9
Lead 210, pCi/l	4.33 ± 3.06	3x10E-9
Polonium 210, pCi/l	0.39 ± 0.87	2x10E-9

Janet P. Meador
Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: August 31, 1990

LOCATION: 44-SC

TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	22747.20 X 10 ⁻⁹		
Th-230	3870.00 X 10 ⁻⁹	± 122.00 X 10 ⁻⁹	50 X 10 ⁻¹⁰
Ra-226	0.37 X 10 ⁻⁹	± 0.12 X 10 ⁻⁹	20 X 10 ⁻¹⁰
Ra-228	0.38 X 10 ⁻⁹	± 1.76 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	2.81 X 10 ⁻⁹	± 3.22 X 10 ⁻⁹	3 X 10 ⁻⁹
Po-210	0.05 X 10 ⁻⁹	± 0.89 X 10 ⁻⁹	2 X 10 ⁻⁹

DATE COLLECTED: September 10, 1990

LOCATION: 44-SC

TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	8124.00 X 10 ⁻⁹		
Th-230	1234.00 X 10 ⁻⁹	± 11.00 X 10 ⁻⁹	30 X 10 ⁻¹⁰
Ra-226	0.96 X 10 ⁻⁹	± 0.18 X 10 ⁻⁹	1 X 10 ⁻¹⁰
Ra-228	7.02 X 10 ⁻⁹	± 3.10 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	1.16 X 10 ⁻⁹	± 3.75 X 10 ⁻⁹	4 X 10 ⁻⁹
Po-210	0.12 X 10 ⁻⁹	± 0.95 X 10 ⁻⁹	2 X 10 ⁻⁹

Client: Petrotoomics Company
 Address: P.O.Box 8509, Shirley Basin, WY 82615-8509
 Attention: Steve Pfaff

Lab #: 90-2139-2

Submitted By: Hydro Engineering
 Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
 Date Analyzed: 01-15-90

43 SC
 08-31-90

WATER ANALYSIS

pH, units	2.96
Total Dissolved Solids, mg/l	24519
Chloride (Cl), mg/l	320
Sulfate (SO4), mg/l	16300
Nitrate (NO3 as N), mg/l	0.85
Arsenic (As), mg/l	0.0051
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	0.059
Chromium (Cr), mg/l	1.95
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	3.0
Selenium (Se), mg/l	0.029
Uranium (U), mg/l	33.6

Radium 226, pCi/l	0.37 ± 0.12	2x10E-10
Radium 228, pCi/l	0.38 ± 1.76	1x10E-9
Thorium 230, pCi/l	3870 ± 122	17x10E-9
Lead 210, pCi/l	2.81 ± 3.22	3x10E-9
Polonium 210, pCi/l	0.05 ± 0.89	2x10E-9

LLD
 uCi/ml

Steve Pfaff
 Analyst



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76 Imperial Drive, Unit 1
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307/789-6420

Client: Petrochemical Company

Lab #: 90-2158-10

Address: P.O. Box 8509, Shirley Basin, WY 82158-8509

Attention: Steve Praff

Submitted By: Hydro Engineering

Date Submitted: 09-11-90

Analyzed By: KAH, JPM, GH, FS

Date Analyzed: 01-14-91

44 SC
09-10-90

WATER ANALYSIS

pH, units	3.02
Total Dissolved Solids, mg/l	21723
Chloride (Cl), mg/l	325
Sulfate (SO4), mg/l	14200
Nitrate (NO3 as N), mg/l	0.71
Arsenic (As), mg/l	<0.001
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	0.043
Chromium (Cr), mg/l	1.03
Lead (Pb), mg/l	<0.5
Nickel (Ni), mg/l	2.55
Selenium (Se), mg/l	0.111
Uranium (U), mg/l	12.0

		L.L.D. uCi/ml
Radium 226, pCi/l	0.96 ± 0.18	1x10E-10
Radium 228, pCi/l	7.02 ± 3.1	1x10E-9
Thorium 230, pCi/l	1234 ± 11.0	3x10E-9
Lead 210, pCi/l	1.16 ± 3.75	4x10E-9
Polonium 210, pCi/l	0.12 ± 0.95	2x10E-9

Janet P. Meador
Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: September 10, 1990
 LOCATION: 15-SC
 TYPE OF SAMPLE: Groundwater - Bailed

<u>RADIONUCLIDE</u>	<u>CONCENTRATION (uCi/ml)</u>	<u>ERROR ESTIMATE (uCi/ml)</u>	<u>LLD (uCi/ml)</u>
U-nat	1272.76 X 10 ⁻⁹		
Th-230	699.00 X 10 ⁻⁹	+57.00 X 10 ⁻⁹	300 X 10 ⁻¹⁰
Ra-226	3.34 X 10 ⁻⁹	+ 0.34 X 10 ⁻⁹	3 X 10 ⁻¹⁰
Ra-228	31.00 X 10 ⁻⁹	+ 4.60 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	1.79 X 10 ⁻⁹	+ 3.80 X 10 ⁻⁹	4 X 10 ⁻⁹
Po-210	0.07 X 10 ⁻⁹	+ 0.99 X 10 ⁻⁹	2 X 10 ⁻⁹

DATE COLLECTED: August 31, 1990
 LOCATION: 49-SC
 TYPE OF SAMPLE: Groundwater - Pumped

<u>RADIONUCLIDE</u>	<u>CONCENTRATION (uCi/ml)</u>	<u>ERROR ESTIMATE (uCi/ml)</u>	<u>LLD (uCi/ml)</u>
U-nat	73.79 X 10 ⁻⁹		
Th-230	15.80 X 10 ⁻⁹	+24.80 X 10 ⁻⁹	380 X 10 ⁻¹⁰
Ra-226	3.00 X 10 ⁻⁹	+ 0.29 X 10 ⁻⁹	1 X 10 ⁻¹⁰
Ra-228	3.20 X 10 ⁻⁹	+ 2.10 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	2.01 X 10 ⁻⁹	+ 1.98 X 10 ⁻⁹	2 X 10 ⁻⁹
Po-210	0.29 X 10 ⁻⁹	+ 0.65 X 10 ⁻⁹	2 X 10 ⁻⁹



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Client: Petrochemicals Company
Address: P.O.Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2158-11

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed: 01-14-91

45 SC
09-10-90

WATER ANALYSIS

pH, units	3.51
Total Dissolved Solids, mg/l	26258
Chloride (Cl), mg/l	353
Sulfate (SO ₄), mg/l	17200
Nitrate (NO ₃ as N), mg/l	0.37
Arsenic (As), mg/l	0.011
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	0.65
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	4.1
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	1.88

		L.L.D. uCi/ml
Radium 226, pCi/l	3.34 ± 0.34	3x10E-10
Radium 228, pCi/l	31.0 ± 4.6	1x10E-9
Thorium 230, pCi/l	699 ± 57	3x10E-8
Lead 210, pCi/l	1.79 ± 3.80	4x10E-9
Polonium 210, pCi/l	0.07 ± 0.99	2x10E-9

Janet P. Meador

Analyst



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Client: Petrochemicals Company
Address: P.O.Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2139-3

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed: 01-15-90

49 SC
08-31-90

WATER ANALYSIS

pH, units	3.35
Total Dissolved Solids, mg/l	8371
Chloride (Cl), mg/l	417
Sulfate (SO4), mg/l	4100
Nitrate (NO3 as N), mg/l	1.62
Arsenic (As), mg/l	<0.001
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	0.03
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	3.1
Selenium (Se), mg/l	0.002
Uranium (U), mg/l	0.109

Radium 226, pCi/l	3.00 ± 0.29	LLD uCi/ml
Radium 228, pCi/l	3.20 ± 2.1	1x10E-10
Thorium 230, pCi/l	15.8 ± 24.8	1x10E-9
Lead 210, pCi/l	2.01 ± 1.98	38x10E-9
Polonium 210, pCi/l	0.29 ± 0.65	2x10E-9

Steve Pfaff
Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: August 31, 1990
 LOCATION: 51-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	97.49 X 10 ⁻⁹		
Th-230	3.84 X 10 ⁻⁹	±10.40 X 10 ⁻⁹	110 X 10 ⁻¹⁰
Ra-226	45.80 X 10 ⁻⁹	± 1.00 X 10 ⁻⁹	1 X 10 ⁻¹⁰
Ra-228	90.50 X 10 ⁻⁹	± 4.90 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	1.51 X 10 ⁻⁹	± 3.22 X 10 ⁻⁹	3 X 10 ⁻⁹
Po-210	0.49 X 10 ⁻⁹	± 0.98 X 10 ⁻⁹	2 X 10 ⁻⁹

DATE COLLECTED: August 31, 1990
 LOCATION: 52-SC
 TYPE OF SAMPLE: Groundwater - Dry

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	X 10 ⁻⁹		
Th-230	X 10 ⁻⁹	± X 10 ⁻⁹	X 10 ⁻¹⁰
Ra-226	X 10 ⁻⁹	± X 10 ⁻⁹	X 10 ⁻¹⁰
Ra-228	X 10 ⁻⁹	± X 10 ⁻⁹	X 10 ⁻⁹
Pb-210	X 10 ⁻⁹	± X 10 ⁻⁹	X 10 ⁻⁹
Po-210	X 10 ⁻⁹	± X 10 ⁻⁹	X 10 ⁻⁹



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Client: Petrotoomics Company
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Attention: Steve Pfaff

Lab #: 90-2139-4

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed : 01-15-90

51 SC
08-30-90

WATER ANALYSIS

pH, units	3.51
Total Dissolved Solids, mg/l	28174
Chloride (Cl), mg/l	359
Sulfate (SO4), mg/l	18800
Nitrate (NO3 as N), mg/l	0.73
Arsenic (As), mg/l	<0.001
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	0.06
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	3.74
Selenium (Se), mg/l	0.001
Uranium (U), mg/l	0.144

Radium 226, pCi/l	45.8 ± 1.0
Radium 228, pCi/l	90.5 ± 4.9
Thorium 230, pCi/l	3.84 ± 10.4
Lead 210, pCi/l	1.51 ± 3.22
Polonium 210, pCi/l	0.49 ± 0.98

LLD
uCi/ml

1x10E-10
1x10E-9
11x10E-9
3x10E-9
2x10E-9

Janet P. Madon

Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: September 10, 1990
 LOCATION: 53-SC
 TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	249.14 X 10 ⁻⁹		
Th-230	0.00 X 10 ⁻⁹	± 1.90 X 10 ⁻⁹	20 X 10 ⁻¹⁰
Ra-226	3.83 X 10 ⁻⁹	± 0.37 X 10 ⁻⁹	3 X 10 ⁻¹⁰
Ra-228	6.10 X 10 ⁻⁹	± 3.50 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	1.23 X 10 ⁻⁹	± 2.06 X 10 ⁻⁹	2 X 10 ⁻⁹
Po-210	0.31 X 10 ⁻⁹	± 0.34 X 10 ⁻⁹	1 X 10 ⁻⁹

DATE COLLECTED: August 31, 1990
 LOCATION: 54-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	3.38 X 10 ⁻⁹		
Th-230	0.00 X 10 ⁻⁹	± 9.90 X 10 ⁻⁹	110 X 10 ⁻¹⁰
Ra-226	10.10 X 10 ⁻⁹	± 0.50 X 10 ⁻⁹	2 X 10 ⁻¹⁰
Ra-228	118.00 X 10 ⁻⁹	± 3.00 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	0.99 X 10 ⁻⁹	± 1.52 X 10 ⁻⁹	2 X 10 ⁻⁹
Po-210	0.39 X 10 ⁻⁹	± 0.52 X 10 ⁻⁹	2 X 10 ⁻⁹



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307/789-6420

Client: Petrochemicals Company
Address: P.O.Box 8509, Shirley Basin, WY 82615-850.
Attention: Steve Pfaff

ib #: 90-2158-12

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 09-11-90
Date Analyzed : 01-14-91

53 SC
09-10-90

WATER ANALYSIS

pH, units	4.97
Total Dissolved Solids, mg/l	4727
Chloride (Cl), mg/l	74
Sulfate (SO ₄), mg/l	3060
Nitrate (NO ₃ as N), mg/l	14.7
Arsenic (As), mg/l	0.003
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	0.32
Selenium (Se), mg/l	0.013
Uranium (U), mg/l	0.368

		LLD uCi/ml
Radium 226, pCi/l	3.89 ± 0.37	3x10E-10
Radium 228, pCi/l	6.10 ± 3.5	1x10E-9
Thorium 230, pCi/l	0.00 ± 1.9	2x10E-9
Lead 210, pCi/l	1.23 ± 2.06	2x10E-9
Polonium 210, pCi/l	0.31 ± 0.34	1x10E-9

Janet P. Quada
Analyst



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Client: Petrochemicals Company
Address: P.O. Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2139-5

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed: 01-15-90

54 SC
08-30-90

WATER ANALYSIS

pH, units	3.92
Total Dissolved Solids, mg/l	17775
Chloride (Cl), mg/l	407
Sulfate (SO4), mg/l	11000
Nitrate (NO3 as N), mg/l	0.54
Arsenic (As), mg/l	<0.001
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	0.09
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	2.07
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.005

		L.L.D uCi/ml
Radium 226, pCi/l	10.1 ± 0.5	2x10E-10
Radium 228, pCi/l	118 ± 3.0	1x10E-9
Thorium 230, pCi/l	0.00 ± 9.9	11x10E-9
Lead 210, pCi/l	0.99 ± 1.52	2x10E-9
Polonium 210, pCi/l	0.39 ± 0.52	2x10E-9

Janet P. Madon
Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: August 31, 1990
 LOCATION: 55-SC
 TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	31.14 X 10 ⁻⁹		
Th-230	25.00 X 10 ⁻⁹	± 9.10 X 10 ⁻⁹	100 X 10 ⁻¹⁰
Ra-226	7.61 X 10 ⁻⁹	± 0.41 X 10 ⁻⁹	2 X 10 ⁻¹⁰
Ra-228	79.80 X 10 ⁻⁹	± 2.60 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	1.78 X 10 ⁻⁹	± 2.27 X 10 ⁻⁹	2 X 10 ⁻⁹
Po-210	0.21 X 10 ⁻⁹	± 0.56 X 10 ⁻⁹	2 X 10 ⁻⁹

DATE COLLECTED: August 31, 1990
 LOCATION: 56-SC
 TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	16.25 X 10 ⁻⁹		
Th-230	0.29 X 10 ⁻⁹	± 1.40 X 10 ⁻⁹	30 X 10 ⁻¹⁰
Ra-226	4.97 X 10 ⁻⁹	± 0.31 X 10 ⁻⁹	3 X 10 ⁻¹⁰
Ra-228	26.90 X 10 ⁻⁹	± 2.00 X 10 ⁻⁹	3 X 10 ⁻⁹
Pb-210	2.26 X 10 ⁻⁹	± 2.85 X 10 ⁻⁹	3 X 10 ⁻⁹
Po-210	6.22 X 10 ⁻⁹	± 0.59 X 10 ⁻⁹	2 X 10 ⁻⁹



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Client: Petrochemicals Company
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Attention: Steve Pfaff

Lab #: 90-2139-6

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed: 01-15-90

55 SC
08-31-90

WATER ANALYSIS

pH, units	3.43
Total Dissolved Solids, mg/l	21028
Chloride (Cl), mg/l	383
Sulfate (SO ₄), mg/l	13200
Nitrate (NO ₃ as N), mg/l	0.73
Arsenic (As), mg/l	<0.001
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	0.16
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	2.30
Selenium (Se), mg/l	0.001
Uranium (U), mg/l	0.046

Radium 226, pCi/l	7.61 ± 0.42	LLD uCi/ml
Radium 228, pCi/l	79.8 ± 2.6	2x10E-10
Thorium 230, pCi/l	25.0 ± 9.8	1x10E-9
Lead 210, pCi/l	1.78 ± 2.27	1x10E-8
Polonium 210, pCi/l	0.21 ± 0.56	2x10E-9

7.61 ± 0.42
79.8 ± 2.6
25.0 ± 9.8
1.78 ± 2.27
0.21 ± 0.56

LLD
uCi/ml
2x10E-10
1x10E-9
1x10E-8
2x10E-9
2x10E-9

Janet P. Meador
Analyst



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Attention: Steve Pfaff

Lab #: 90-2139-7

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed: 01-15-90

56 SC
08-31-90

WATER ANALYSIS

pH, units	3.12
Total Dissolved Solids, mg/l	11458
Chloride (Cl), mg/l	286
Sulfate (SO ₄), mg/l	7000
Nitrate (NO ₃ as N), mg/l	1.34
Arsenic (As), mg/l	0.002
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	1.73
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.024

Radium 226, pCi/l	4.97 ± 0.34	3x10E-10
Radium 228, pCi/l	26.9 ± 2.0	1x10E-9
Thorium 230, pCi/l	0.29 ± 1.4	3x10E-9
Lead 210, pCi/l	2.26 ± 2.85	3x10E-9
Polonium 210, pCi/l	0.22 ± 0.59	2x10E-9

LLD
uCi/ml

LLD
uCi/ml

Sanet P. Prado
Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: August 31, 1990
 LOCATION: 57-SC
 TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	10.83 X 10 ⁻⁹		
Th-230	0.00 X 10 ⁻⁹	± 1.30 X 10 ⁻⁹	30 X 10 ⁻¹⁰
Ra-226	1.60 X 10 ⁻⁹	± 0.21 X 10 ⁻⁹	2 X 10 ⁻¹⁰
Ra-228	50.60 X 10 ⁻⁹	± 13.30 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	3.02 X 10 ⁻⁹	± 2.55 X 10 ⁻⁹	3 X 10 ⁻⁹
Po-210	0.27 X 10 ⁻⁹	± 0.59 X 10 ⁻⁹	2 X 10 ⁻⁹

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: August 31, 1990
 LOCATION: 58-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	9.48 X 10 ⁻⁹		
Th-230	13.70 X 10 ⁻⁹	± 8.70 X 10 ⁻⁹	100 X 10 ⁻¹⁰
Ra-226	12.30 X 10 ⁻⁹	± 0.50 X 10 ⁻⁹	1 X 10 ⁻¹⁰
Ra-228	226.00 X 10 ⁻⁹	± 5.00 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	3.02 X 10 ⁻⁹	± 2.91 X 10 ⁻⁹	3 X 10 ⁻⁹
Po-210	0.75 X 10 ⁻⁹	± 0.79 X 10 ⁻⁹	3 X 10 ⁻⁹



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307/789-6420

Client: Petrochemicals Company
Address: P.O.Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2139-8

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed: 01-15-90

57 SC
08-31-90

WATER ANALYSIS

pH, units	3.21
Total Dissolved Solids, mg/l	9957
Chloride (Cl), mg/l	326
Sulfate (SO4), mg/l	5900
Nitrate (NO3 as N), mg/l	3.32
Arsenic (As), mg/l	0.0031
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	1.53
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.016

Radium 226, pCi/l	1.60 ± 0.21
Radium 228, pCi/l	50.6 ± 13.3
Thorium 230, pCi/l	0.00 ± 1.3
Lead 210, pCi/l	3.02 ± 2.55
Polonium 210, pCi/l	0.27 ± 0.59

LLD
uCi/ml

2x10E-10
1x10E-9
3x10E-9
3x10E-9
2x10E-9

Steve Pfaff
Analyst



**WESTERN
ENVIRONMENTAL
SERVICES AND
TESTING INC.**

6756 West Uranium Road
Casper, Wyoming 82604
307/234-5511

76 Imperial Drive, Unit 1
Evanston, Wyoming 82930
307/789-6420

Client: Petrotoomics Company
Address: P.O.Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2139-9

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed : 01-15-90

58 SC
08-30-90

WATER ANALYSIS

pH, units	3.35
Total Dissolved Solids, mg/l	27536
Chloride (Cl), mg/l	423
Sulfate (SO4), mg/l	18200
Nitrate (NO3 as N), mg/l	0.56
Arsenic (As), mg/l	0.002
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	0.43
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	3.60
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.014

Radium 226, pCi/l
Radium 228, pCi/l
Thorium 230, pCi/l
Lead 210, pCi/l
Polonium 210, pCi/l

12.3 ± 0.5
226 ± 5.0
13.7 ± 8.7
3.02 ± 2.91
0.75 ± 0.79

LLD
uCi/ml

1x10E-10
1x10E-9
1x10E-8
3x10E-9
2x10E-9

Janet P. Meador

Analyst

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3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: August 31, 1990
 LOCATION: 59-SC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	4.06 X 10 ⁻⁹		
Th-230	3.06 X 10 ⁻⁹	± 4.38 X 10 ⁻⁹	80 X 10 ⁻¹⁰
Ra-226	5.29 X 10 ⁻⁹	± 0.35 X 10 ⁻⁹	3 X 10 ⁻¹⁰
Ra-228	95.30 X 10 ⁻⁹	± 3.30 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	2.63 X 10 ⁻⁹	± 2.98 X 10 ⁻⁹	3 X 10 ⁻⁹
Po-210	0.65 X 10 ⁻⁹	± 0.79 X 10 ⁻⁹	2 X 10 ⁻⁹

DATE COLLECTED: August 31, 1990
 LOCATION: 60-SC
 TYPE OF SAMPLE: Groundwater - Bailed

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	832.71 X 10 ⁻⁹		
Th-230	2.60 X 10 ⁻⁹	± 7.78 X 10 ⁻⁹	100 X 10 ⁻¹⁰
Ra-226	7.70 X 10 ⁻⁹	± 0.42 X 10 ⁻⁹	1 X 10 ⁻¹⁰
Ra-228	31.30 X 10 ⁻⁹	± 4.30 X 10 ⁻⁹	1 X 10 ⁻⁹
Pb-210	3.00 X 10 ⁻⁹	± 2.46 X 10 ⁻⁹	3 X 10 ⁻⁹
Po-210	0.68 X 10 ⁻⁹	± 0.52 X 10 ⁻⁹	1 X 10 ⁻⁹



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Client: Petrochemicals Company
Address: P.O. Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2139-10

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed: 01-15-90

59 SC
08-30-90

WATER ANALYSIS

pH, units	3.38
Total Dissolved Solids, mg/l	23920
Chloride (Cl), mg/l	370
Sulfate (SO ₄), mg/l	15600
Nitrate (NO ₃ as N), mg/l	0.71
Arsenic (As), mg/l	<0.001
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	0.22
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	3.0
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.006

		LLD uCi/ml
Radium 226, pCi/l	5.29 ± 0.35	3x10E-10
Radium 228, pCi/l	95.3 ± 3.3	1x10E-9
Thorium 230, pCi/l	3.06 ± 4.38	8x10E-9
Lead 210, pCi/l	2.63 ± 2.98	3x10E-9
Polonium 210, pCi/l	0.65 ± 0.79	2x10E-9

Janet P. Madon
Analyst

Client: Petrochemicals Company
Address: P.O. Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2139-11

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed: 01-15-90

60 SC
08-30-90

WATER ANALYSIS

pH, units	3.28
Total Dissolved Solids, mg/l	4361
Chloride (Cl), mg/l	78
Sulfate (SO ₄), mg/l	2980
Nitrate (NO ₃ as N), mg/l	0.37
Arsenic (As), mg/l	0.002
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	0.37
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	1.23

Radium 226, pCi/l	7.70 ± 0.42	LLD uCi/ml
Radium 228, pCi/l	31.3 ± 4.3	1x10E-10
Thorium 230, pCi/l	2.60 ± 7.78	1x10E-9
Lead 210, pCi/l	3.00 ± 2.46	1x10E-8
Polonium 210, pCi/l	0.68 ± 0.52	3x10E-9
		1x10E-9

Sanet P. Meador
Analyst

3. LIQUID SAMPLES (CONTINUED)

DATE COLLECTED: August 31, 1990
 LOCATION: 5-DC
 TYPE OF SAMPLE: Groundwater - Pumped

RADIONUCLIDE	CONCENTRATION (uCi/ml)	ERROR ESTIMATE (uCi/ml)	LLD (uCi/ml)
U-nat	387.92 X 10 ⁻³		
Th-230	0.00 X 10 ⁻³	±10.00 X 10 ⁻³	140 X 10 ⁻¹⁰
Ra-226	8.02 X 10 ⁻³	± 0.50 X 10 ⁻³	3 X 10 ⁻¹⁰
Ra-228	41.20 X 10 ⁻³	± 3.40 X 10 ⁻³	1 X 10 ⁻³
Pb-210	3.28 X 10 ⁻³	± 3.12 X 10 ⁻³	3 X 10 ⁻³
Po-210	0.38 X 10 ⁻³	± 0.69 X 10 ⁻³	2 X 10 ⁻³



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Client: Petrochemicals Company
Address: P.O. Box 8509, Shirley Basin, WY 82615-8509
Attention: Steve Pfaff

Lab #: 90-2139-1

Submitted By: Hydro Engineering
Analyzed By: KAH, JPM, GH, FS

Date Submitted: 08-31-90
Date Analyzed: 01-15-90

5 DC
8-30-90

WATER ANALYSIS

pH, units	3.15
Total Dissolved Solids, mg/l	15530
Chloride (Cl), mg/l	300
Sulfate (SO4), mg/l	9000
Nitrate (NO3 as N), mg/l	0.25
Arsenic (As), mg/l	0.003
Barium (Ba), mg/l	<0.05
Cadmium (Cd), mg/l	<0.01
Chromium (Cr), mg/l	<0.02
Lead (Pb), mg/l	<0.05
Nickel (Ni), mg/l	2.0
Selenium (Se), mg/l	<0.001
Uranium (U), mg/l	0.573

Radium 226, pCi/l
Radium 228, pCi/l
Thorium 230, pCi/l
Lead 210, pCi/l
Polonium 210, pCi/l

8.02 ± 0.50
41.2 ± 3.4
0.00 ± 10.0
3.28 ± 3.12
0.38 ± 0.69

LLD
uCi/ml

3x10E-10
1x10E-9
14x10E-9
3x10E-9
2x10E-9

Janet P. Meador
Analyst

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: 3rd Quarter 1990

<u>LOCATION</u>	<u>EXPOSURE RATE</u> <u>(mr/qr)</u>	<u>ERROR ESTIMATE</u> <u>(mr/qr)</u>
Site 1	44.6	±10.1
Site 5	69.0	±11.3

LOCATIONS: Site 1 - 7800' WNW of where yellowcake dryer stack had been located.
Site 2 - Discontinued.
Site 3 - Discontinued.
Site 4 - Discontinued.
Site 5 - 1800' NE of where yellowcake dryer stack had been located.
Site 6 - Discontinued.