

ARCO Coal Company
Bluewater Mill
Post Office Box 638
Grants, New Mexico 87020
Telephone (505) 876-2211



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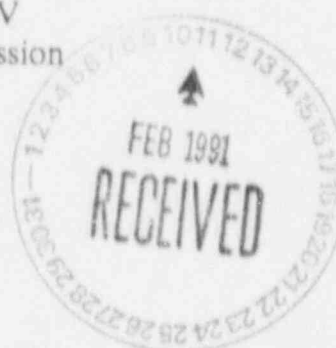
40-8902

February 7, 1991

RETURN ORIGINAL TO PDR, HQ.

Samon Hall, Director
Uranium Recovery Field Office, Region IV
United States Nuclear Regulatory Commission
P.O. Box 25325
Denver, Colorado 80225

RE: License No. SUA-1470
Docket No. 40-8902

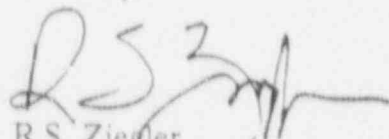


Dear Mr. Hall:

Enclosed are five (5) copies of the Radiological Effluent and Environmental Monitoring Data Report, as required by 10CFR40.65, and Material License No. SUA-1470, Docket No. 40-8902 for ARCO Coal Company, Bluewater Mill, Grants, New Mexico. This report covers the period of July through December 1990. Also included in the report is ground water compliance monitoring data, per License Condition #34.

If you have any questions regarding this report, please contact Natver Patel of my staff.

Sincerely,


R.S. Ziegler
Project Manager

RSZ/lis


Enclosure

pc: PB
NP

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DESIGNATED ORIGINAL

Certified By 

ARCO Coal Company is a Division of AtlanticRichfield Company

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Radiological Effluent and Environmental Data
for Bluewater Mill, Grants, New Mexico

July 01 through December 31, 1990

License No. SUA-1470
Docket No. 40-8902

Submitted by:

ARCO Coal Company
A Division of Atlantic Richfield Company

February 07, 1990

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AIRBORNE RADIONUCLIDE (AIR PARTICULATE) CONCENTRATIONS

Environmental sampling was performed for airborne radionuclides at five (5) permanent environmental air sampling stations at the mill: Nearest Residence #102A, Weather Station #104, North Perimeter #103 (which is used as a background), Berryhill House #106A (also a background), and Southeast Perimeter #107A, as indicated on location map. Stations #106A and #107A were temporarily added by ARCO in February 1990, for additional environmental data. Air was sampled continuously through glass fiber filter paper using a low volume air sampler, at the rate of about eight (8) to nine (9) cubic feet per minute (CFM). Filters were changed weekly. The loaded weekly filters were composited quarterly for each station, and were analyzed for U-Nat, Th-230, Ra-226, and Pb-210 by an outside, contracted laboratory. All radionuclide concentrations were less than 2.25% of the MPC for the unrestricted area (Th-230 at the Weather Station for the second quarter), no significant deviation from previous sampling periods.

The concentration for each radionuclide ranged as follows:

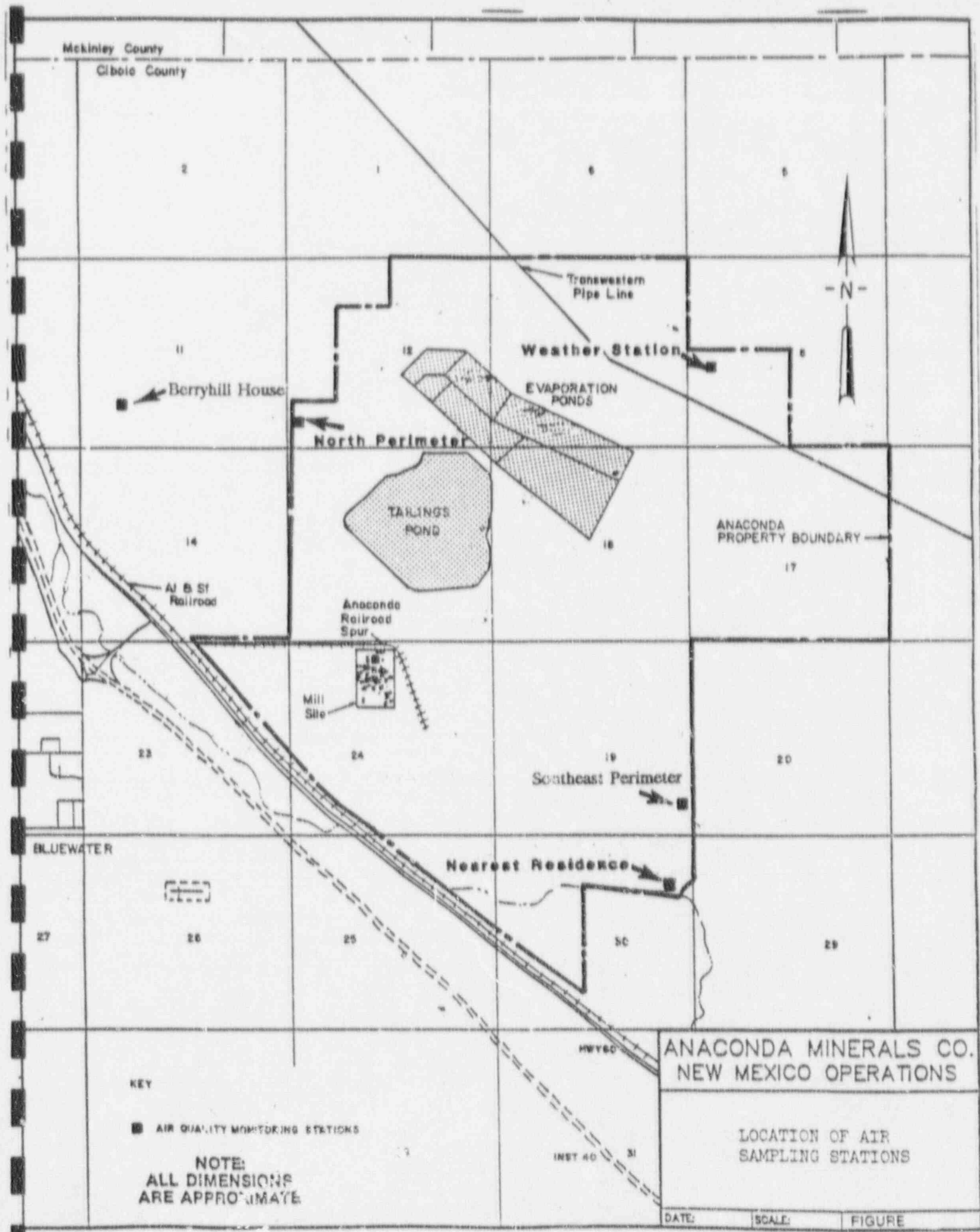
	<u>Reporting Sampling Period</u>	<u>Previous Sampling Period</u>
U-Nat	0.001 to 0.004% of MPC	0.001 to 0.036% of MPC
Th-230	0.038 to 0.225% of MPC	0.001 to 2.25% of MPC
Ra-226	<.001 to 0.011% of MPC	<.001 to 0.005% of MPC
Pb-210	0.475 to 0.650% of MPC	0.100 to 0.450% of MPC

The percentage of MPC for air samples was calculated as follows:

$$\%MPC = \frac{\text{Conc. in Air, uCi/ml}}{\text{MPC, uCi/ml (from Table II, Appendix B, 10CFR20)}} \times 100$$

MPC for unrestricted area in air:

U-Nat	5.0 E-12 uCi/ml
Ra-226	3.0 E-12 uCi/ml
Th-230	8.0 E-14 uCi/ml
Pb-210	4.0 E-12 uCi/ml



ARCO COAL COMPANY
Bluewater Mill

Radiological Analyses of Air Particulate samples

Location: NEAREST RESIDENCE Date sampled: 07-02-90 thru 09-30-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	2.20E-16	1.00E-17	1.00E-16	0.004
Th-230	4.00E-17	2.00E-17	1.00E-16	0.050
Ra-226	8.00E-17	6.00E-17	1.00E-16	0.003
Pb-210	2.20E-14	1.00E-15	1.00E-15	0.550

Location: NORTH PERIMETER Date sampled: 07-02-90 thru 09-30-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	1.60E-16	1.00E-17	1.00E-16	0.003
Th-230	1.80E-16	5.00E-17	1.00E-16	0.225
Ra-226	3.40E-16	1.00E-16	1.00E-16	0.011
Pb-210	2.20E-14	1.00E-15	1.00E-15	0.550

Location: WEATHER STATION Date sampled: 07-02-90 thru 09-30-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	1.70E-16	1.00E-17	1.00E-16	0.003
Th-230	1.50E-16	4.00E-17	1.00E-16	0.188
Ra-226	8.00E-17	9.00E-17	1.00E-16	0.003
Pb-210	2.00E-14	1.00E-15	1.00E-15	0.500

ARCO COAL COMPANY
Bluewater Mill

Radiological Analyses of Air Particulate samples

Location: BERRYHILL HOUSE

Date sampled: 07-02-90 thru 09-30-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	1.80E-16	1.00E-17	1.00E-16	0.004
Th-230	1.30E-16	4.00E-17	1.00E-16	0.162
Ra-226	1.60E-16	6.00E-17	1.00E-16	0.005
Pb-210	2.00E-14	1.00E-15	1.00E-15	0.500

Location: SE PERIMETER

Date sampled: 07-02-90 thru 09-30-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	1.80E-16	1.00E-17	1.00E-16	0.004
Th-230	5.00E-17	3.00E-17	1.00E-16	0.063
Ra-226	1.00E-16	7.00E-17	1.00E-16	0.003
Pb-210	2.60E-14	1.00E-15	1.00E-15	0.650

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

NEAREST RESIDENCE #102A

SAMPLING PERIOD: 07-02-90 through 09-30-90

Filter # =====	DATE SAMPLED From To =====	AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	07-02-90 07-09-90	2.177E+09	0.0350	16.08
2	07-09-90 07-16-90	2.150E+09	0.0241	11.21
3	07-16-90 07-23-90	2.243E+09	0.0405	18.06
4	07-23-90 07-30-90	2.224E+09	0.0471	21.18
5	07-30-90 08-06-90	2.332E+09	0.0509	21.83
6	08-06-90 08-13-90	2.156E+09	0.0449	20.83
7	08-13-90 08-20-90	2.190E+09	0.0263	12.01
8	08-20-90 08-27-90	2.248E+09	0.0380	16.90
9	08-27-90 09-03-90	2.203E+09	0.0585	26.55
10	09-03-90 09-10-90	2.272E+09	0.0362	15.93
11	09-10-90 09-17-90	2.247E+09	0.0570	25.36
12	09-17-90 09-24-90	2.265E+09	0.0273	12.05
13	09-24-90 10-01-90	2.184E+09	0.0343	15.70
TOTAL	07-02-90 09-30-90	2.889E+10	0.5201	18.10

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

NORTH PERIMETER #103

SAMPLING PERIOD: 07-02-90 through 09-30-90

Filter # =====	DATE SAMPLED From To =====		AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	07-02-90	07-09-90	1.836E+09	0.0220	11.98
2	07-09-90	07-16-90	2.133E+09	0.0205	9.61
3	07-16-90	07-23-90*	1.236E+09	0.0154	12.46
4	07-23-90	07-30-90	2.084E+09	0.0418	20.06
5	07-30-90	08-06-90	1.924E+09	0.0296	15.38
6	08-06-90	08-13-90	2.126E+09	0.0350	16.46
7	08-13-90	08-20-90	2.117E+09	0.0215	10.15
8	08-20-90	08-27-90	2.127E+09	0.0242	11.38
9	08-27-90	09-03-90	2.095E+09	0.0452	21.58
10	09-03-90	09-10-90*	1.268E+09	0.0185	14.60
11	09-10-90	09-17-90**	2.092E+09	0.0347	16.59
12	09-17-90	09-24-90***	1.739E+09	0.0157	9.03
13	09-24-90	10-01-90	2.182E+09	0.0218	9.99
TOTAL	07-02-90	09-30-90	2.496E+10	0.3459	13.86

* Power down 07-20 to 07-23
09-02 to 09-10

** Timer meter hung up, sampler was running

*** Power failure from 10:00 hrs 09-19 to 16:00 hrs 09-20-90

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

WEATHER STATION #104

SAMPLING PERIOD: 07-02-90 through 09-30-90

Filter # =====	DATE SAMPLED From =====	To =====	AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	07-02-90	07-09-90	1.884E+09	0.0220	11.68
2	07-09-90	07-16-90	1.833E+09	0.0194	10.58
3	07-16-90	07-23-90	1.282E+09	0.0173	13.50
4	07-23-90	07-30-90	2.112E+09	0.0441	20.88
5	07-30-90	08-06-90	2.008E+09	0.0312	15.54
6	08-06-90	08-13-90	1.868E+09	0.0357	19.11
7	08-13-90	08-20-90	2.106E+09	0.0209	9.92
8	08-20-90	08-27-90	2.144E+09	0.0227	10.59
9	08-27-90	09-03-90	2.109E+09	0.0438	20.77
10	09-03-90	09-10-90*	1.532E+09	0.0186	12.14
11	09-10-90	09-17-90	2.131E+09	0.0382	17.92
12	09-17-90	09-24-90	2.138E+09	0.0107	5.00
13	09-24-90	10-01-90	2.167E+09	0.0314	14.49
TOTAL	07-02-90	09-30-90	2.531E+10	0.3560	14.06

* Power down 09-02 to 09-10

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

BERRYHILL HOUSE #106A

SAMPLING PERIOD: 07-02-90 through 09-30-90

Filter # =====	DATE SAMPLED From To =====		AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	07-02-90	07-09-90	1.931E+09	0.0279	14.45
2	07-09-90	07-16-90	2.176E+09	0.0209	9.60
3	07-16-90	07-23-90	2.308E+09	0.0420	18.20
4	07-23-90	07-30-90	2.245E+09	0.0421	18.75
5	07-30-90	08-06-90	2.275E+09	0.0740	32.53
6	08-06-90	08-13-90	2.296E+09	0.0474	20.65
7	08-13-90	08-20-90	2.210E+09	0.0249	11.27
8	08-20-90	08-27-90	2.260E+09	0.0413	18.49
9	08-27-90	09-03-90	2.205E+09	0.0650	29.48
10	09-03-90	09-10-90	2.298E+09	0.0406	17.66
11	09-10-90	09-17-90	2.302E+09	0.0506	21.98
12	09-17-90	09-24-90	2.327E+09	0.0211	9.07
13	09-24-90	10-01-90	2.034E+09	0.0284	13.96
=====					
TOTAL	07-02-90	09-30-90	2.887E+10	0.5267	18.25

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

SOUTH EAST PERIMETER #107A

SAMPLING PERIOD: 07-02-90 through 09-30-90

Filter # =====	DATE SAMPLED From =====	To =====	AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	07-02-90	07-09-90	2.055E+09	0.0299	14.55
2	07-09-90	07-16-90	2.074E+09	0.0225	10.85
3	07-16-90	07-23-90	2.094E+09	0.0365	17.43
4	07-23-90	07-30-90	2.024E+09	0.0837	41.36
5	07-30-90	08-06-90	2.115E+09	0.0443	20.95
6	08-06-90	08-13-90	2.113E+09	0.0429	20.30
7	08-13-90	08-20-90*	1.306E+07	0.0011	84.20
8	08-20-90	08-27-90	2.073E+09	0.0298	14.38
9	08-27-90	09-03-90	2.032E+09	0.0565	27.80
10	09-03-90	09-10-90	2.156E+09	0.0306	14.19
11	09-10-90	09-17-90	2.068E+09	0.0523	25.29
12	09-17-90	09-24-90**	9.713E+08	0.0113	11.63
13	09-24-90	10-01-90	2.106E+09	0.0319	15.15
TOTAL	07-02-90	09-30-90	2.389E+10	0.4733	19.81

* Power down, sampler ran for 63 minutes during the week.

** Power failure from 18:00 hrs 09-20 to 11:00 hrs 09-24-90

ARCO COAL COMPANY
Bluewater Mill

Radiological Analyses of Air Particulate samples

Location: NEAREST RESIDENCE Date sampled: 10-01-90 thru 12-31-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	1.90E-16	1.00E-17	1.00E-16	0.004
Th-230	8.00E-17	3.00E-17	1.00E-16	0.100
Ra-226	6.00E-17	3.00E-17	1.00E-16	0.002
Pb-210	2.00E-14	1.00E-15	1.00E-15	0.500

Location: NORTH PERIMETER Date sampled: 10-01-90 thru 12-31-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	1.20E-16	1.00E-17	1.00E-16	0.002
Th-230	3.00E-17	1.00E-17	1.00E-16	0.038
Ra-226	1.00E-17	3.00E-17	1.00E-16	0.000
Pb-210	1.90E-14	1.00E-15	2.00E-15	0.475

Location: WEATHER STATION Date sampled: 10-01-90 thru 12-31-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	1.20E-16	1.00E-17	1.00E-16	0.002
Th-230	6.00E-17	3.00E-17	1.00E-16	0.075
Ra-226	5.00E-17	3.00E-17	1.00E-16	0.002
Pb-210	2.00E-14	1.00E-15	2.00E-15	0.500

ARCO COAL COMPANY
Bluewater Mill

Radiological Analyses of Air Particulate samples

Location: BERRYHILL HOUSE

Date sampled: 10-01-90 thru 12-31-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	7.00E-17	1.00E-17	1.00E-16	0.001
Th-230	3.00E-17	2.00E-17	1.00E-16	0.038
Ra-226	2.00E-17	3.00E-17	1.00E-16	0.001
Pb-210	2.00E-14	1.00E-15	2.00E-15	0.500

Location: SE PERIMETER

Date sampled: 10-01-90 thru 12-31-90

Radionuclide =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
U-nat	1.50E-16	1.00E-17	1.00E-16	0.003
Th-230	6.00E-17	2.00E-17	1.00E-16	0.075
Ra-226	5.00E-17	3.00E-17	1.00E-16	0.002
Pb-210	2.60E-14	2.00E-15	2.00E-15	0.650

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

NEAREST RESIDENCE #102A

SAMPLING PERIOD: 10-01-90 through 12-31-90

Filter # =====	DATE SAMPLED From To =====	AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	10-01-90 10-08-90	2.259E+09	0.0354	15.67
2	10-08-90 10-15-90	2.201E+09	0.0603	27.39
3	10-15-90 10-22-90	2.247E+09	0.0610	27.14
4	10-22-90 10-29-90	2.237E+09	0.0551	24.63
5	10-29-90 11-05-90	2.295E+09	0.0391	17.03
6	11-05-90 11-12-90	2.338E+09	0.0228	9.75
7	11-12-90 11-19-90	2.205E+09	0.0475	21.54
8	11-19-90 11-26-90	2.151E+09	0.0388	18.04
9	11-26-90 12-03-90	2.275E+09	0.0524	23.03
10	12-03-90 12-10-90	2.180E+09	0.0961	44.08
11	12-10-90 12-17-90	1.914E+09	0.0414	21.63
12	12-17-90 12-24-90	2.299E+09	0.0243	10.57
13	12-24-90 12-31-90	2.301E+09	0.0282	12.25
TOTAL	10-01-90 12-31-90	2.890E+10	0.6024	20.84

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

NORTH PERIMETER #103

SAMPLING PERIOD: 10-01-90 through 12-31-90

Filter # =====	DATE SAMPLED From To =====		AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	10-01-90	10-08-90	2.058E+09	0.0220	10.69
2	10-08-90	10-15-90	2.063E+09	0.0306	14.84
3	10-15-90	10-22-90	2.116E+09	0.0371	17.53
4	10-22-90	10-29-90	2.077E+09	0.0415	19.98
5	10-29-90	11-05-90	2.127E+09	0.0241	11.33
6	11-05-90	11-12-90	2.173E+09	0.0174	8.01
7	11-12-90	11-19-90	2.077E+09	0.0307	14.78
8	11-19-90	11-26-90	2.109E+09	0.0257	12.18
9	11-26-90	12-03-90	2.157E+09	0.0333	15.44
10	12-03-90	12-10-90	2.097E+09	0.0419	19.98
11	12-10-90	12-17-90	2.137E+09	0.0114	5.33
12	12-17-90	12-24-90	2.168E+09	0.0148	6.83
13	12-24-90	12-31-90	2.170E+09	0.0185	8.52
TOTAL	10-01-90	12-31-90	2.753E+10	0.3490	12.68

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

WEATHER STATION #104

SAMPLING PERIOD: 10-01-90 through 12-31-90

Filter # =====	DATE SAMPLED From To =====		AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	10-01-90	10-08-90	2.105E+09	0.0214	10.17
2	10-08-90	10-15-90	2.136E+09	0.0760	35.58
3	10-15-90	10-22-90	2.165E+09	0.0348	16.07
4	10-22-90	10-29-90*	1.546E+09	0.0180	11.65
5	10-29-90	11-05-90	2.174E+09	0.0241	11.08
6	11-05-90	11-12-90	2.222E+09	0.0154	6.93
7	11-12-90	11-19-90	2.112E+09	0.0289	13.68
8	11-19-90	11-26-90	2.159E+09	0.0268	12.42
9	11-26-90	12-03-90	2.191E+09	0.0314	14.33
10	12-03-90	12-10-90	2.148E+09	0.0379	17.65
11	12-10-90	12-17-90	2.177E+09	0.0202	9.28
12	12-17-90	12-24-90	2.185E+09	0.0154	7.05
13	12-24-90	12-31-90	2.206E+09	0.0063	2.86
TOTAL	10-01-90	12-31-90	2.753E+10	0.3566	12.96

* Power failure from 10-27 @ 14:20 to 09:45 on 10-29

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

BERRYHILL HOUSE #106A

SAMPLING PERIOD: 10-01-90 through 12-31-90

Filter # =====	DATE SAMPLED From To =====		AIR SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	10-01-90	10-08-90	2.238E+09	0.0337	15.06
2	10-08-90	10-15-90	2.180E+09	0.0760	34.86
3	10-15-90	10-22-90	2.249E+09	0.0499	22.19
4	10-22-90	10-29-90	2.254E+09	0.0592	26.27
5	10-29-90	11-05-90	2.282E+09	0.0326	14.29
6	11-05-90	11-12-90	2.341E+09	0.0249	10.64
7	11-12-90	11-19-90	2.196E+09	0.0472	21.49
8	11-19-90	11-26-90	2.251E+09	0.0348	15.46
9	11-26-90	12-03-90	2.278E+09	0.0468	20.54
10	12-03-90	12-10-90	2.190E+09	0.0607	27.72
11	12-10-90	12-17-90	2.243E+09	0.0349	15.56
12	12-17-90	12-24-90	2.331E+09	0.0232	9.95
13	12-24-90	12-31-90	2.301E+09	0.0303	13.17
TOTAL	10-01-90	12-31-90	2.933E+10	0.5542	18.89

ARCO COAL COMPANY
BLUEWATER MILL

Air Particulate Sample Composite

SOUTH EAST PERIMETER #107A

SAMPLING PERIOD: 10-01-90 through 12-31-90

Filter # =====	DATE SAMPLED From To =====		Air SAMPLED ml =====	PARTICULATE gms =====	DUST CONC. ug/Cub. meter =====
1	10-01-90	10-08-90	1.998E+09	0.0280	14.01
2	10-08-90	10-15-90	2.063E+09	0.0511	24.77
3	10-15-90	10-22-90	1.374E+09	0.0919	66.89
4	10-22-90	10-29-90	2.010E+09	0.0726	36.11
5	10-29-90	11-05-90*	1.178E+09	0.0444	37.68
6	11-05-90	11-12-90	2.112E+09	0.0194	9.18
7	11-12-90	11-19-90	2.011E+09	0.0412	20.49
8	11-19-90	11-26-90	2.043E+09	0.0250	12.23
9	11-26-90	12-03-90	2.089E+09	0.0436	20.87
10	12-03-90	12-10-90	1.999E+09	0.0706	35.32
11	12-10-90	12-17-90	2.107E+09	0.0317	15.05
12	12-17-90	12-24-90	2.107E+09	0.0196	9.30
13	12-24-90	12-31-90	2.099E+09	0.0233	11.10
TOTAL	10-01-90	12-31-90	2.519E+10	0.5624	22.32

* Power failure from 11:02 @ 11:30 to 11:25 on 11-05-90

AMBIENT RADON CONCENTRATION

Radon Gas Monitors (RGM-2s, made by Eberline Instruments) are used for measurement of ambient Rn-222 gas concentrations in the air at five (5) permanent air sampling stations, as indicated on the air sampling station map. The instrument takes continuous measurements and gives daily radon concentrations. The daily radon concentrations are averaged and reported as concentrations for the month and subsequently, for the quarter. The highest measured concentration was found at 50% of the MPC for unrestricted areas at the Nearest Residence (#102A) for the fourth quarter. This compared to 59% of the MPC for the unrestricted area recorded for the prior reporting period at the same station. The North Perimeter, which is used as background, showed concentrations of 18% and 32% of the MPC for the third and fourth quarters. The Berryhill House (#106A), which is also a background station, showed concentrations of 17% and 18% of the MPC for the third and fourth quarters respectively. After subtracting the background concentration (Berryhill House), the nearest residence radon concentrations were 23% of the MPC for the third quarter and 32% of the MPC for the fourth quarter.

ARCO COAL COMPANY
BLUEWATER MILL

AMBIENT RADON CONCENTRATION

Location: NEAREST RESIDENCE #102A

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
July 90	1.09E-09	2.30E-10	2.00E-10	36.33
August 90	1.16E-09	2.30E-10	2.00E-10	38.67
September 90	1.40E-09	2.40E-10	2.00E-10	46.67
AVERAGE	1.22E-09	2.33E-10		40.56

Location: NORTH PERIMETER #103

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
July 90	6.20E-10	2.60E-10	8.00E-11	20.67
August 90	5.60E-10	2.70E-10	8.00E-11	18.67
September 90	4.70E-10	2.70E-10	8.00E-11	15.67
AVERAGE	5.50E-10	2.67E-10		18.33

Location: WEATHER STATION #104

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
July 90	4.50E-10	2.70E-10	1.00E-10	15.00
August 90	5.90E-10	2.70E-10	1.00E-10	19.67
September 90	6.40E-10	2.70E-10	1.00E-10	21.33
AVERAGE	5.60E-10	2.70E-10		18.67

ARCO COAL COMPANY
BLUEWATER MILL

AMBIENT RADON CONCENTRATION

Location: BERRYHILL HOUSE #106A

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
July 90	4.60E-10	1.90E-10	8.00E-11	15.33
August 90	5.20E-10	2.00E-10	8.00E-11	17.33
September 90	5.20E-10	2.00E-10	8.00E-11	17.33
AVERAGE	5.20E-10	2.00E-10		17.33

Location: SOUTH EAST PERIMETER #107A

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
July 90	7.60E-10	2.90E-10	1.30E-10	25.33
August 90	8.90E-10	2.90E-10	1.30E-10	29.67
September 90	1.17E-09	2.90E-10	1.30E-10	39.00
AVERAGE	1.03E-09	2.90E-10		34.33

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: July 90

STATION: Nearest Residence#102A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
182	1	1.70	0.25
183	2 *		
184	3 *		
185	4 *		
186	5	1.07	0.23
187	6	0.37	0.21
188	7	0.94	0.23
189	8	1.30	0.24
190	9	0.58	0.21
191	10	0.58	0.21
192	11	0.76	0.22
193	12	0.48	0.21
194	13	0.79	0.22
195	14	0.84	0.22
196	15	0.97	0.23
197	16	1.33	0.24
198	17	1.60	0.25
199	18	1.82	0.26
200	19	1.46	0.24
201	20	1.02	0.23
202	21	1.42	0.24
203	22	1.00	0.23
204	23	0.90	0.22
205	24	1.16	0.23
206	25	1.30	0.24
207	26	1.21	0.24
208	27	1.49	0.25
209	28	0.99	0.23
210	29	0.85	0.22
211	30	1.31	0.24
212	31	1.26	0.24
		=====	=====
		Mean= 1.09	Mean= 0.23
		Sd= 0.36	
		Var= 0.13	

RGM# 133
C.F. 2.00 pCi/l
Bkg. 1.13 pCi/l
LLD 0.20 pCi/l

* Quarterly background check

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: August 90

STATION: Nearest Residence#102A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
213	1	1.25	0.24
214	2	1.72	0.25
215	3	2.02	0.26
216	4	1.22	0.24
217	5	0.72	0.22
218	6	0.37	0.21
219	7	1.11	0.23
220	8	1.88	0.26
221	9	1.00	0.23
222	10	1.77	0.25
223	11	1.71	0.25
224	12	1.76	0.25
225	13	0.83	0.22
226	14	0.49	0.21
227	15	0.50	0.21
228	16	0.40	0.21
229	17	1.11	0.23
230	18	0.85	0.22
231	19	1.41	0.24
232	20	0.99	0.23
233	21	0.22	0.20
234	22	0.33	0.20
235	23	0.72	0.22
236	24	0.87	0.22
237	25	1.39	0.24
238	26	1.70	0.25
239	27	1.48	0.24
240	28	1.13	0.23
241	29	1.69	0.25
242	30	1.59	0.25
243	31	1.83	0.26
		=====	=====
		Mean= 1.16	Mean= 0.23
		Sd= 0.52	
		Var= 0.27	

RGM# 133
C.F. 2.00 pCi/l
Bkg. 1.13 pCi/l
LLD 0.20 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: September 90 STATION: Nearest Residence#102A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
244	1	1.76	0.25
245	2	1.84	0.26
246	3	2.00	0.26
247	4	0.90	0.22
248	5	1.22	0.24
249	6	1.93	0.26
250	7	1.31	0.24
251	8	0.73	0.22
252	9	2.28	0.27
253	10	2.00	0.26
254	11	2.26	0.27
255	12	2.54	0.28
256	13	2.15	0.27
257	14	2.00	0.26
258	15	1.36	0.24
259	16	1.08	0.23
260	17	2.12	0.26
261	18	1.56	0.25
262	19	0.82	0.22
263	20	1.06	0.23
264	21	0.67	0.22
265	22	0.92	0.23
266	23	0.90	0.23
267	24	0.32	0.20
268	25	1.40	0.24
269	26	1.57	0.25
270	27	1.42	0.24
271	28	0.71	0.22
272	29	0.58	0.21
273	30	0.58	0.21

=====
Mean= 1.40
Sd= 0.60
Var= 0.36

=====
Mean= 0.24

RGM# 133
C.F. 2.00 pCi/l
Bkg. 1.13 pCi/l
LLD 0.20 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: July 90

STATION: North Perimeter #103

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
182	1 *		
183	2 *		
184	3	0.65	0.26
185	4	0.67	0.26
186	5	0.78	0.26
187	6	0.66	0.26
188	7	0.59	0.26
189	8	0.95	0.27
190	9	0.20	0.24
191	10	0.53	0.25
192	11	0.53	0.25
193	12	0.46	0.25
194	13	0.58	0.26
195	14	0.58	0.26
196	15	0.72	0.26
197	16	0.82	0.26
198	17	0.60	0.26
199	18	0.72	0.26
200	19	0.75	0.26
201	20 **		
202	21 **		
203	22 **		
204	23	0.34	0.25
205	24	0.76	0.26
206	25	0.55	0.26
207	26	0.39	0.25
208	27	0.42	0.25
209	28	0.64	0.26
210	29	0.72	0.26
211	30	0.86	0.26
212	31	0.77	0.26
		=====	=====
		Mean= 0.62	Mean= 0.26
		Sd= 0.17	
		Var= 0.03	

RGM# 102
C.F. 2.01 pCi/l
Bkg. 1.77 pCi/l
LLD 0.08 pCi/l

* Quarterly background check
** Power failure at the station

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: August 90 STATION: North Perimeter #103

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
213	1	0.50	0.27
214	2	0.72	0.28
215	3	0.71	0.28
216	4	0.79	0.28
217	5	0.83	0.28
218	6	0.64	0.27
219	7	0.53	0.27
220	8	0.50	0.27
221	9	0.42	0.27
222	10	0.62	0.27
223	11	0.48	0.27
224	12	0.55	0.27
225	13	0.64	0.27
226	14	0.34	0.27
227	15	0.32	0.27
228	16	0.76	0.28
229	17	0.39	0.27
230	18	0.58	0.27
231	19	0.68	0.28
232	20	0.65	0.28
233	21	0.78	0.28
234	22	0.16	0.26
235	23	0.50	0.27
236	24	0.52	0.27
237	25	0.63	0.27
238	26	0.65	0.28
239	27	0.38	0.27
240	28	0.14	0.26
241	29	0.60	0.27
242	30	0.66	0.28
243	31	0.79	0.28

=====
Mean= 0.56
Sd= 0.17
Var= 0.03

=====
Mean= 0.27

RGM# 102
C.F. 2.01 pCi/l
Bkg. 2.05 pCi/l
LLD 0.08 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: September 90 STATION: North Perimeter #103

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
244	1	0.56	0.27
245	2	0.57	0.27
246	3	0.71	0.28
247	4	0.55	0.27
248	5	0.76	0.28
249	6	0.36	0.27
250	7	0.59	0.27
251	8 *		0.26
252	9 *		0.26
253	10 *		0.26
254	11	0.31	0.26
255	12	0.71	0.28
256	13	0.72	0.28
257	14	0.80	0.28
258	15	0.63	0.27
259	16	0.54	0.27
260	17	0.60	0.27
261	18	0.46	0.27
262	19	0.26	0.26
263	20	0.15	0.26
264	21	0.27	0.26
265	22 **		0.26
266	23	-0.08	0.25
267	24	0.12	0.26
268	25	0.28	0.26
269	26	0.37	0.27
270	27	0.59	0.27
271	28	0.46	0.27
272	29	0.53	0.27
273	30	0.51	0.27

=====

Mean=	0.47
Sd=	0.21
Var=	0.05

=====

Mean= 0.27

RGM# 102
C.F. 2.01 pCi/l
Bkg. 2.05 pCi/l
LLD 0.08 pCi/l

* Power failure
** Rain storm during weekend
Day 265 @148 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: July 90

STATION: Weather Station #104

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
182	1 *		
183	2 *		
184	3	0.13	0.26
185	4	0.41	0.27
186	5	0.56	0.27
187	6	0.37	0.27
188	7	0.22	0.26
189	8	0.62	0.28
190	9 **		
191	10	0.37	0.27
192	11	0.23	0.26
193	12	0.15	0.26
194	13	0.26	0.27
195	14	0.32	0.27
196	15	0.49	0.27
197	16	0.75	0.28
198	17	0.41	0.27
199	18	0.50	0.27
200	19	0.53	0.27
201	20	0.32	0.27
202	21 **		
203	22 **		
204	23	0.95	0.28
205	24	0.58	0.27
206	25	0.48	0.27
207	26	0.34	0.27
208	27	0.46	0.27
209	28	0.50	0.27
210	29	0.53	0.27
211	30	0.53	0.27
212	31	0.60	0.27
		=====	=====
		Mean= 0.45	Mean= 0.27
		Sd= 0.18	
		Var= 0.03	

RGM# 101
C.F. 2.10 pCi/l
Bkg. 2.18 pCi/l
LLD 0.10 pCi/l

* Quarterly background check
** Power failure at the station

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: August 90

STATION: Weather Station #104

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
213	1	0.41	0.27
214	2	0.54	0.27
215	3	0.56	0.27
216	4	0.65	0.28
217	5	0.34	0.27
218	6	0.32	0.27
219	7	0.42	0.27
220	8	0.86	0.28
221	9	0.44	0.27
222	10	0.81	0.28
223	11	0.67	0.28
224	12	0.70	0.28
225	13	0.50	0.27
226	14	0.25	0.27
227	15	0.46	0.27
228	16	0.24	0.26
229	17	0.47	0.27
230	18	0.65	0.28
231	19	0.73	0.28
232	20	0.90	0.28
233	21	0.55	0.27
234	22	0.83	0.28
235	23	0.52	0.27
236	24	0.52	0.27
237	25	0.83	0.28
238	26	0.85	0.28
239	27	0.55	0.27
240	28	0.27	0.27
241	29	0.83	0.28
242	30	0.84	0.28
243	31	0.83	0.28
		=====	=====
		Mean= 0.59	Mean= 0.27
		Sd= 0.20	
		Var= 0.04	

RGM# 101
C.F. 2.10 pCi/l
Bkg. 2.18 pCi/l
LLD 0.10 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: September 90 STATION: Weather Station #104

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
244	1	0.84	0.28
245	2	0.95	0.28
246	3	0.77	0.28
247	4	0.60	0.28
248	5	0.44	0.27
249	6	0.64	0.28
250	7	0.75	0.28
251	8 *		0.26
252	9 *		0.26
253	10	0.36	0.27
254	11	0.81	0.28
255	12	1.18	0.29
256	13	1.12	0.29
257	14	1.20	0.29
258	15	0.69	0.28
259	16	0.71	0.28
260	17	0.89	0.28
261	18	0.61	0.28
262	19	0.30	0.27
263	20	0.73	0.28
264	21	0.29	0.27
265	22	0.43	0.27
266	23	-0.05	0.26
267	24	1.34	0.29
268	25	0.49	0.27
269	26	0.59	0.27
270	27	0.68	0.28
271	28	0.30	0.27
272	29	0.23	0.26
273	30	0.15	0.26

=====

Mean=	0.64
Sd=	0.33
Var=	0.11

=====

Mean= 0.27

RGM# 101
C.F. 2.10 pCi/l
Bkg. 2.18 pCi/l
LLD 0.10 pCi/l

* Power failure

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: July 90

STATION: Berryhill House #106A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
182	1	0.40	0.19
183	2 *		
184	3 *		
185	4 *		0.17
186	5	0.72	0.20
187	6	0.33	0.19
188	7	0.73	0.21
189	8	0.54	0.20
190	9	0.35	0.19
191	10	0.39	0.19
192	11	0.34	0.19
193	12	0.30	0.19
194	13	0.37	0.19
195	14	0.36	0.19
196	15	0.50	0.20
197	16	0.86	0.21
198	17	0.55	0.20
199	18	0.62	0.20
200	19	0.63	0.20
201	20	0.47	0.19
202	21	0.51	0.20
203	22	0.29	0.19
204	23	0.35	0.19
205	24	0.45	0.19
206	25	0.37	0.19
207	26	0.28	0.19
208	27	0.41	0.19
209	28	0.37	0.19
210	29	0.31	0.19
211	30	0.47	0.19
212	31	0.57	0.20
		=====	=====
		Mean= 0.46	Mean= 0.19
		Sd= 0.15	
		Var= 0.02	

RGM# 134
C.F. 1.90 pCi/l
Bkg. 0.89 pCi/l
LLD 0.08 pCi/l

* Quarterly background check

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: August 90

STATION: Berryhill House #106A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
213	1	0.44	0.19
214	2	0.58	0.20
215	3	0.61	0.20
216	4	0.46	0.19
217	5	0.41	0.19
218	6	0.33	0.19
219	7	0.52	0.20
220	8	0.56	0.20
221	9	0.46	0.19
222	10	0.57	0.20
223	11	0.47	0.19
224	12	0.61	0.20
225	13	0.39	0.19
226	14	0.36	0.19
227	15	0.38	0.19
228	16	0.38	0.19
229	17	0.77	0.21
230	18	0.69	0.20
231	19	0.75	0.21
232	20	0.58	0.20
233	21	0.23	0.18
234	22	0.37	0.19
235	23	0.56	0.20
236	24	0.61	0.20
237	25	0.66	0.20
238	26	0.66	0.20
239	27	0.52	0.20
240	28	0.27	0.19
241	29	0.56	0.20
242	30	0.59	0.20
243	31	0.68	0.20
		=====	=====
		Mean= 0.52	Mean= 0.20
		Sd= 0.14	
		Var= 0.02	

RGM# 134
C.F. 1.90 pCi/l
Bkg. 0.89 pCi/l
LLD 0.08 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: September 90 STATION: Berryhill House #106A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
244	1	0.63	0.20
245	2	0.63	0.20
246	3	0.62	0.20
247	4	0.43	0.19
248	5	0.54	0.20
249	6	0.53	0.20
250	7	0.53	0.20
251	8	0.35	0.19
252	9	0.69	0.20
253	10	0.65	0.20
254	11	0.68	0.20
255	12	0.72	0.21
256	13	0.75	0.21
257	14	0.77	0.21
258	15	0.59	0.20
259	16	0.56	0.20
260	17	0.74	0.21
261	18	0.59	0.20
262	19	0.34	0.19
263	20	0.59	0.20
264	21	0.39	0.19
265	22	0.34	0.19
266	23	0.15	0.18
267	24	0.24	0.18
268	25	0.46	0.19
269	26	0.45	0.19
270	27	0.51	0.20
271	28	0.43	0.19
272	29	0.46	0.19
273	30	0.37	0.19

=====

Mean=	0.52
Sd=	0.15
Var=	0.02

=====

Mean=	0.20
-------	------

RGM#	134
C.F.	1.90 pCi/l
Bkg.	0.89 pCi/l
LLD	0.08 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: July 90

STATION: SE Perimeter

#107A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
182	1 *		
183	2 *		
184	3	0.47	0.28
185	4	0.68	0.28
186	5	0.80	0.29
187	6	0.52	0.28
188	7	0.34	0.27
189	8	0.84	0.29
190	9	0.98	0.29
191	10	0.45	0.28
192	11	0.61	0.28
193	12	0.56	0.28
194	13	0.56	0.28
195	14	0.65	0.28
196	15	0.85	0.29
197	16	0.85	0.29
198	17	0.99	0.29
199	18	1.34	0.30
200	19	0.94	0.29
201	20	0.80	0.29
202	21	0.91	0.29
203	22	0.68	0.28
204	23	0.67	0.28
205	24	0.89	0.29
206	25	0.86	0.29
207	26	0.77	0.29
208	27	0.97	0.29
209	28	0.63	0.28
210	29	0.59	0.28
211	30	0.83	0.29
212	31	0.96	0.29

=====
Mean= 0.76
Sd= 0.21
Var= 0.04

=====
Mean= 0.29

RGM# 128
C.F. 2.10 pCi/l
Bkg. 1.44 pCi/l
LLD 0.13 pCi/l

* Quarterly background check

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: August 90

STATION: SE Perimeter

#107A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
213	1	0.79	0.29
214	2	1.15	0.30
215	3	1.27	0.30
216	4	0.67	0.28
217	5	0.58	0.28
218	6	0.39	0.28
219	7	0.83	0.29
220	8	1.49	0.30
221	9	0.70	0.28
222	10	1.36	0.30
223	11	0.33	0.27
224	12	1.35	0.30
225	13	0.60	0.28
226	14 *		
227	15 *		
228	16 *		
229	17 *		
230	18 *		
231	19 *		
232	20	0.47	0.28
233	21	0.33	0.27
234	22	0.40	0.28
235	23	0.77	0.29
236	24	0.73	0.28
237	25	1.32	0.30
238	26	1.37	0.30
239	27	0.97	0.29
240	28	0.75	0.29
241	29	1.25	0.30
242	30	1.22	0.30
243	31	1.23	0.30
		=====	=====
	Mean=	0.89	Mean= 0.29
	Sd=	0.37	
	Var=	0.14	

RGM# 128
C.F. 2.10 pCi/l
Bkg. 2.29 pCi/l
LLD 0.13 pCi/l

* Power failure

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: September 90 STATION: SE Perimeter #107A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
244	1	1.28	0.30
245	2	1.42	0.30
246	3	1.73	0.31
247	4	0.68	0.28
248	5	0.73	0.28
249	6	1.17	0.30
250	7	1.00	0.29
251	8	0.57	0.28
252	9	1.57	0.31
253	10	1.34	0.30
254	11	1.57	0.31
255	12	1.58	0.31
256	13	1.55	0.31
257	14	1.78	
258	15	1.07	
259	16	0.83	
260	17	1.35	
261	18	1.07	
262	19	0.57	
263	20 *		0.26
264	21 *		0.26
265	22 *		0.26
266	23 *		0.26
267	24	0.45	0.28
268	25	1.10	0.29
269	26	1.45	0.30
270	27	1.33	0.30
271	28	0.87	0.29
272	29 *		0.26
273	30 *		0.26

=====

Mean= 1.17
Sd= 0.38
Var= 0.15

=====

Mean= 0.29

RGM# 128
C.F. 2.10 pCi/l
Bkg. 2.29 pCi/l
LLD 0.13 pCi/l

* Power failure

ARCO COAL COMPANY
BLUEWATER MILL

AMBIENT RADON CONCENTRATION

Location: NEAREST RESIDENCE #102A

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
October 90	1.79E-09	2.50E-10	2.00E-10	59.67
November 90	1.50E-09	2.40E-10	2.00E-10	50.00
December 90	1.24E-09	2.30E-10	2.00E-10	41.33
AVERAGE	1.51E-09	2.40E-10		50.33

Location: NORTH PERIMETER #103

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
October 90	8.90E-10	2.80E-10	8.00E-11	29.67
November 90	1.04E-09	2.6 E-10	8.00E-11	34.67
December 90	9.20E-10	2.70E-10	1.00E-10	30.67
AVERAGE	9.50E-10	2.70E-10		31.67

Location: WEATHER STATION #104

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
October 90	1.03E-09	2.90E-10	1.00E-10	34.33
November 90	9.40E-10	2.80E-10	1.00E-10	31.33
December 90	9.20E-10	2.80E-10	1.00E-10	30.67
AVERAGE	9.63E-10	2.83E-10		32.11

ARCO COAL COMPANY
BLUEWATER MILL

AMBIENT RADON CONCENTRATION

Location: BERRYHILL HOUSE #106A

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
October 90	6.10E-10	2.00E-10	8.00E-11	20.33
November 90	5.40E-10	2.00E-10	8.00E-11	18.00
December 90	5.40E-10	2.20E-10	8.00E-11	18.00
AVERAGE	5.40E-10	2.10E-10		18.00

Location: SOUTH EAST PERIMETER #107A

DATE SAMPLED =====	Concentration uCi/ml =====	Error estimate uCi/ml =====	LLD uCi/ml =====	% of MPC =====
October 90	1.46E-09	3.00E-10	1.30E-10	48.67
November 90	1.17E-09	3.00E-10	1.30E-10	39.00
December 90	1.04E-09	2.90E-10	1.30E-10	34.67
AVERAGE	1.11E-09	2.95E-10		36.83

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: October 90 STATION: Nearest Residence#102A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
274	1 *		
275	2 *		
276	3 *		
277	4	1.36	0.24
278	5	1.72	0.25
279	6	2.16	0.27
280	7	1.13	0.23
281	8	1.08	0.23
282	9	1.47	0.24
283	10	2.21	0.27
284	11	2.48	0.28
285	12	1.95	0.26
286	13	2.33	0.27
287	14	1.72	0.25
288	15	2.59	0.28
289	16	2.53	0.28
290	17	1.16	0.23
291	18	2.09	0.26
292	19	1.87	0.26
293	20	0.58	0.21
294	21	1.45	0.24
295	22	1.75	0.25
296	23	1.87	0.26
297	24	1.87	0.26
298	25	2.15	0.27
299	26	2.29	0.27
300	27	1.72	0.25
301	28	1.32	0.24
302	29 **		
303	30 **		
304	31 **		

=====

Mean=	1.79
Sd=	0.50
Var=	0.25

=====

Mean=	0.25
-------	------

RGM# 133
C.F. 2.00 pCi/l
Bkg. 1.08 pCi/l
LLD 0.20 pCi/l

* Background check
** Printer jammed

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: November 90 STATION: Nearest Residence#102A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
305	1 *		
306	2	0.61	0.21
307	3	0.52	0.21
308	4	0.95	0.22
309	5	1.85	0.25
310	6	0.96	0.22
311	7	0.51	0.21
312	8	0.56	0.21
313	9	0.84	0.22
314	10	1.21	0.23
315	11	1.91	0.26
316	12	2.06	0.26
317	13	2.56	0.27
318	14	2.60	0.28
319	15	2.11	0.26
320	16	1.40	0.24
321	17	1.23	0.23
322	18	2.56	0.27
323	19	2.34	0.27
324	20	0.82	0.22
325	21	1.07	0.23
326	22	1.86	0.25
327	23	1.48	0.24
328	24	2.05	0.26
329	25	1.81	0.25
330	26	0.85	0.22
331	27	0.84	0.22
332	28	1.52	0.24
333	29	1.46	0.24
334	30	3.07	0.29

=====

Mean= 1.50
Sd= 0.71
Var= 0.50

=====

Mean= 0.24

RGM# 133
C.F. 2.00 pCi/l
Bkg. 1.08 pCi/l
LLD 0.20 pCi/l

* Printer malfunction

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: December 90 STATION: Nearest Residence#102A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
335	1	2.46	0.27
336	2	1.98	0.26
337	3 *		
338	4	1.02	0.23
339	5	2.59	0.28
340	6	1.55	0.24
341	7	1.76	0.25
342	8	2.59	0.28
343	9	2.46	0.27
344	10	2.55	0.27
345	11	2.58	0.28
346	12	1.91	0.26
347	13	0.88	0.22
348	14	0.81	0.22
349	15	1.82	0.25
350	16 **		
351	17	0.53	0.21
352	18	0.59	0.21
353	19	0.76	0.22
354	20	0.21	0.19
355	21	0.20	0.19
356	22	0.38	0.20
357	23	0.82	0.22
358	24	0.75	0.22
359	25	0.84	0.22
360	26	0.95	0.22
361	27	1.00	0.22
362	28	0.88	0.22
363	29	0.23	0.20
364	30	0.19	0.19
365	31	0.55	0.21
		=====	=====
		Mean= 1.24	Mean= 0.23
		Sd= 0.82	
		Var= 0.68	

RGM# 133
C.F. 2.00 pCi/l
Bkg. 1.08 pCi/l
LLD 0.20 pCi/l

* Printer malfunction
** Power failure

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: October 90 STATION: North Perimeter #103

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
274	1 *		
275	2 *		
276	3 *		
277	4	0.89	0.28
278	5	0.96	0.28
279	6	1.07	0.29
280	7	0.76	0.28
281	8	0.57	0.27
282	9 **		
283	10 **		
284	11 **		
285	12 **		
286	13 **		
287	14 **		
288	15	0.63	0.27
289	16	1.08	0.29
290	17	0.61	0.27
291	18	0.98	0.28
292	19	1.03	0.29
293	20	0.42	0.27
294	21	0.77	0.28
295	22	0.91	0.28
296	23	0.86	0.28
297	24	0.88	0.28
298	25	0.94	0.28
299	26	0.91	0.28
300	27	0.96	0.28
301	28	0.89	0.28
302	29	1.16	0.29
303	30	1.12	0.29
304	31	1.22	0.29
		=====	=====
		Mean= 0.89	Mean= 0.28
		Sd= 0.20	
		Var= 0.04	

RGM# 127
C.F. 1.98 pCi/l
Bkg. 1.59 pCi/l
LLD 0.10 pCi/l

* Background Check
** Microprocessor shorted due to lightening

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: November 90 STATION: North Perimeter #103

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
305	1	0.99	0.26
306	2	0.77	0.25
307	3	0.75	0.25
308	4	0.75	0.25
309	5	1.39	0.27
310	6	0.95	0.26
311	7	0.86	0.26
312	8	0.61	0.25
313	9	0.75	0.25
314	10	0.80	0.25
315	11	1.08	0.26
316	12	1.30	0.27
317	13	1.29	0.27
318	14	1.36	0.27
319	15	1.15	0.26
320	16	1.01	0.26
321	17	0.92	0.26
322	18	1.44	0.27
323	19	1.68	0.28
324	20	0.87	0.26
325	21	0.86	0.26
326	22	0.97	0.26
327	23	0.93	0.26
328	24	1.26	0.27
329	25	1.34	0.27
330	26	0.97	0.26
331	27	0.75	0.25
332	28	0.98	0.26
333	29	1.16	0.26
334	30	1.40	0.27

=====
Mean= 1.04
Sd= 0.26
Var= 0.07

=====
Mean= 0.26

RGM# 127
C.F. 1.98 pCi/l
Bkg. 1.59 pCi/l
LLD 0.10 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: December 90 STATION: North Perimeter #103

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
335	1	1.52	0.28
336	2	1.20	0.27
337	3	0.88	0.26
338	4	1.44	0.27
339	5	1.35	0.27
340	6	0.99	0.26
341	7	1.14	0.26
342	8	1.36	0.27
343	9	1.10	0.26
344	10	1.23	0.27
345	11	1.55	0.28
346	12	1.32	0.27
347	13	0.87	0.26
348	14	0.73	0.25
349	15	1.38	0.27
350	16	1.05	0.26
351	17 *		
352	18 *		
353	19 *		
354	20 *		
355	21 **	0.31	0.26
356	22	0.34	0.26
357	23	0.51	0.27
358	24	0.69	0.27
359	25	0.73	0.28
360	26	0.75	0.28
361	27	0.71	0.28
362	28	0.61	0.27
363	29	0.20	0.26
364	30	0.27	0.26
365	31	0.51	0.27
		=====	=====
		Mean= 0.92	Mean= 0.27
		Sd= 0.40	
		Var= 0.16	

RGM# 127 & 129
C.F. 1.98 pCi/l
Bkg. 1.59 pCi/l
LLD 0.10 pCi/l

* RGM brought in for calibration
** Calibrated RGM #129 installed

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: October 90 STATION: Weather Station #104

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
274	1 *		
275	2 *		
276	3 *		
277	4	0.87	0.28
278	5	0.91	0.28
279	6	1.12	0.29
280	7	0.66	0.28
281	8	0.43	0.27
282	9	0.42	0.27
283	10	0.85	0.28
284	11	1.58	0.30
285	12	0.97	0.29
286	13	1.53	0.30
287	14	0.85	0.28
288	15	1.22	0.29
289	16	1.50	0.30
290	17	0.79	0.28
291	18	1.15	0.29
292	19	0.96	0.28
293	20	0.36	0.27
294	21	0.69	0.28
295	22 **		
296	23 **		
297	24 **		
298	25	1.04	0.29
299	26	1.19	0.29
300	27	0.99	0.29
301	28	1.07	0.29
302	29	1.68	0.30
303	30	1.27	0.29
304	31	1.54	0.30
		=====	=====
		Mean= 1.03	Mean= 0.29
		Sd= 0.36	
		Var= 0.13	

RGM# 101
C.F. 2.10 pCi/l
bkg. 2.00 pCi/l
LLD 0.10 pCi/l

* Background check
** Printer jammed

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: November 90 STATION: Weather Station #104

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
305	1	0.86	0.28
306	2	0.59	0.27
307	3	0.37	0.27
308	4	0.47	0.27
309	5	1.21	0.29
310	6	0.79	0.28
311	7	0.48	0.27
312	8	0.31	0.27
313	9	0.48	0.27
314	10	0.58	0.27
315	11	1.03	0.29
316	12	1.53	0.30
317	13	1.45	0.30
318	14	1.61	0.30
319	15	1.33	0.29
320	16	0.96	0.28
321	17	0.75	0.28
322	18	1.68	0.30
323	19	1.67	0.30
324	20	0.58	0.27
325	21	0.56	0.27
326	22	0.82	0.28
327	23	0.67	0.28
328	24	1.17	0.29
329	25	1.36	0.30
330	26 *		
331	27 *		
332	28	0.54	0.27
333	29	0.89	0.28
334	30	1.51	0.30

=====

Mean= 0.94
Sd= 0.43
Var= 0.18

=====

Mean= 0.28

RGM# 101
C.F. 2.10 pCi/l
Bkg. 2.00 pCi/l
LLD 0.10 pCi/l

* Printer malfunction

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: December 90 STATION: Weather Station #104

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
335	1	1.45	0.30
336	2	0.76	0.28
337	3	0.47	0.27
338	4	1.12	0.29
339	5	1.48	0.30
340	6	0.54	0.27
341	7	0.79	0.28
342	8	1.27	0.29
343	9	1.00	0.29
344	10	1.52	0.30
345	11	1.75	0.31
346	12	1.20	0.29
347	13	0.80	0.28
348	14	0.60	0.28
349	15	1.27	0.29
350	16	0.87	0.28
351	17 *		
352	18 *		
353	19 *		
354	20 *		
355	21 *		
356	22 *		
357	23 *		
358	24 *		
359	25 *		
360	26 *		
361	27 **	0.94	0.27
362	28	0.62	0.26
363	29	0.13	0.24
364	30	0.19	0.24
365	31	0.56	0.25
		=====	=====
		Mean= 0.92	Mean= 0.28
		Sd= 0.43	
		Var= 0.19	

RGM# 101 & 127
C.F. 2.10 pCi/l
Bkg. 2.00 pCi/l
LLD 0.10 pCi/l

* RGM brought in for calibration
** Calibrated RGM #127 installed

APCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RCM-2 Continuous Monitors)

MONTH: October 90 STATION: Berryhill House #106A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
274	1 *		
275	2 *		
276	3 *		
277	4	0.44	0.19
278	5	0.67	0.20
279	6	0.82	0.21
280	7	0.43	0.19
281	8	0.40	0.19
282	9	0.37	0.19
283	10	0.59	0.20
284	11	0.85	0.21
285	12	0.62	0.20
286	13	0.78	0.21
287	14	0.59	0.20
288	15	0.78	0.21
289	16	0.74	0.21
290	17	0.41	0.19
291	18	0.63	0.20
292	19	0.65	0.20
293	20	0.22	0.18
294	21	0.39	0.19
295	22	0.60	0.20
296	23	0.60	0.20
297	24	0.57	0.20
298	25	0.65	0.20
299	26	0.67	0.20
300	27	0.60	0.20
301	28	0.51	0.20
302	29	0.84	0.21
303	30	0.79	0.21
304	31	0.77	0.21
		=====	=====
		Mean= 0.61	Mean= 0.20
		Sd= 0.16	
		Var= 0.03	

RGM# 134
C.F. 1.90 pCi/l
Bkg. 0.94 pCi/l
LLD 0.08 pCi/l

* Background check

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: November 90 STATION: Berryhill House #106A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
305	1	0.55	0.20
306	2	0.50	0.20
307	3	0.31	0.19
308	4	0.34	0.19
309	5	1.04	0.22
310	6	0.44	0.20
311	7	0.23	0.19
312	8	0.20	0.19
313	9	0.33	0.19
314	10	0.40	0.20
315	11	0.61	0.20
316	12	0.66	0.21
317	13	0.72	0.21
318	14	0.73	0.21
319	15	0.74	0.21
320	16	0.60	0.20
321	17	0.51	0.20
322	18	0.84	0.21
323	19	0.94	0.22
324	20	0.38	0.19
325	21	0.32	0.19
326	22	0.52	0.20
327	23	0.53	0.20
328	24	0.71	0.21
329	25	0.70	0.21
330	26	0.47	0.20
331	27	0.24	0.19
332	28	0.40	0.20
333	29	0.58	0.20
334	30	0.79	0.21

=====

Mean= 0.54
Sd= 0.21
Var= 0.04

=====

Mean= 0.20

RGM# 134
C.F. 1.90 pCi/l
Bkg. 0.94 pCi/l
LLD 0.08 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: December 90 STATION: Berryhill House #106A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
335	1	0.80	0.21
336	2	0.50	0.20
337	3	0.44	0.20
338	4	0.71	0.21
339	5	0.80	0.21
340	6	0.48	0.20
341	7	0.65	0.21
342	8	0.72	0.21
343	9	0.75	0.21
344	10	0.78	0.21
345	11	0.78	0.21
346	12	0.70	0.21
347	13	0.33	0.19
348	14	0.25	0.19
349	15	0.62	0.21
350	16 *		
351	17	1.68	0.24
352	18	0.30	0.19
353	19	0.38	0.19
354	20 **	-0.00	0.23
355	21	0.65	0.26
356	22	0.11	0.24
357	23	0.29	0.24
358	24	0.44	0.25
359	25	0.55	0.25
360	26	0.52	0.25
361	27	0.62	0.26
362	28	0.41	0.25
363	29	0.64	0.26
364	30	0.06	0.24
365	31	0.29	0.24
		=====	=====
		Mean= 0.54	Mean= 0.22
		Sd= 0.31	
		Var= 0.09	

RGM# 134 and 125
C.F. 1.90 pCi/l
Bkg. 0.94 pCi/l
LLD 0.08 pCi/l

* Power failure
** Calibrated RGM #125 installed

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: October 90 STATION: SE Perimeter #107A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
274	1 *		
275	2 *		
276	3 *		
277	4 **		
278	5 **		
279	6 **		
280	7 **		
281	8	1.76	0.31
282	9	0.72	0.28
283	10	1.31	0.30
284	11	1.85	0.31
285	12	1.35	0.30
286	13	1.86	0.31
287	14	1.19	0.30
288	15	1.73	0.31
289	16	1.93	0.32
290	17	0.69	0.28
291	18	1.46	0.30
292	19	1.48	0.30
293	20 **		
294	21 **		
295	22	0.98	0.29
296	23	1.18	0.30
297	24	1.18	0.30
298	25	1.51	0.30
299	26	1.80	0.31
300	27	1.40	0.30
301	28	0.97	0.29
302	29	2.18	0.32
303	30	1.80	0.31
304	31	1.83	0.31
		=====	=====
		Mean= 1.46	Mean= 0.30
		Sd= 0.40	
		Var= 0.16	

RGM# 128
C.F. 2.10 pCi/l
Bkg. 2.34 pCi/l
LLD 0.13 pCi/l

* Background check
** Power failure

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: November 90 STATION: SE Perimeter #107A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estir red Error pCi/l, 1.96 sigma =====
305	1	0.83	0.29
306	2	0.52	0.28
307	3	0.34	0.28
308	4	0.62	0.28
309	5	1.51	0.31
310	6	0.87	0.29
311	7	0.41	0.28
312	8	0.31	0.28
313	9	0.60	0.28
314	10	0.88	0.29
315	11	1.65	0.31
316	12	1.81	0.31
317	13	2.11	0.32
318	14	2.35	0.33
319	15	1.85	0.32
320	16	1.14	0.30
321	17	0.98	0.29
322	18	1.86	0.32
323	19	2.11	0.32
324	20	0.69	0.29
325	21	0.69	0.29
326	22	1.32	0.30
327	23	1.05	0.30
328	24	1.48	0.31
329	25	1.54	0.31
330	26	0.73	0.29
331	27	0.49	0.28
332	28	0.98	0.29
333	29	1.09	0.30
334	30	2.32	0.33

=====
Mean= 1.17
Sd= 0.61
Var= 0.37

=====
Mean= 0.30

RGM# 128
C.F. 2.10 pCi/l
Bkg. 2.34 pCi/l
LLD 0.13 pCi/l

ARCO COAL COMPANY
BLUEWATER MILL

Radon Monitoring Program
(RGM-2 Continuous Monitors)

MONTH: December 90 STATION: SE Perimeter #107A

Day of Year =====	Day of Month =====	24 Hour Avg. Rn-222, pCi/l =====	Estimated Error pCi/l, 1.96 sigma =====
335	1	2.02	0.32
336	2	1.25	0.30
337	3	0.68	0.29
338	4	1.71	0.31
339	5	1.97	0.32
340	6	1.05	0.30
341	7	1.27	0.30
342	8	2.09	0.32
343	9	1.79	0.31
344	10	2.09	0.32
345	11	1.88	0.32
346	12	1.49	0.31
347	13	0.58	0.28
348	14	0.50	0.28
349	15	1.29	0.30
350	16	0.75	0.29
351	17	0.36	0.28
352	18	0.60	0.28
353	19	0.74	0.29
354	20	0.23	0.27
355	21	1.42	0.30
356	22	0.20	0.27
357	23	0.56	0.28
358	24	0.67	0.29
359	25	1.18	0.30
360	26	1.10	0.30
361	27	1.27	0.30
362	28	0.56	0.28
363	29	0.21	0.27
364	30	0.16	0.27
365	31	0.56	0.28
		=====	=====
		Mean= 1.04	Mean= 0.29
		Sd= 0.61	
		Var= 0.37	

RGM# 128
C.F. 2.10 pCi/l
Bkg. 2.34 pCi/l
LLD 0.13 pCi/l

DIRECT GAMMA RADIATION

Environmental TLD's (Thermo Luminescent Dosimeters) are utilized at each permanent air sampling station to monitor direct gamma radiation. TLD's are exchanged and analyzed on a quarterly basis.

Data indicated that the maximum direct radiation exposure rate occurred at the Nearest Residence at 38.2 mrem/qtr for the third quarter, with 33.0 mrem/qtr as control. For the fourth quarter, the maximum exposure rate occurred at the Southeast Perimeter and was 30.4 mrem/qtr, with a control of 30.6 mrem/qtr.

ARCO COAL COMPANY
BLUEWATER MILL

Direct Gamma Radiation Measurements

Measurement Period: July 01 through September 30, 1990

LOCATION =====	Exposure Rate mrem/quarter =====	Estimated Error mrem/quarter, 2 sigma =====
Control	33.0	15.2
Nearest Residence (#102A)	36.2	4.1
North Perimeter (#103)	29.8	4.1
Weather Station (#104)	43.8	6.1
Berryhill House (106A)	24.4	12.9
S.E. Perimeter (107A)	23.6	13.9

Measurement Period: October 01 through December 31, 1990

LOCATION =====	Exposure Rate mrem/quarter =====	Estimated Error mrem/quarter, 2 sigma =====
Control	30.6	6.9
Nearest Residence (#102A)	29.0	14.9
North Perimeter (#103)	24.8	1.7
Weather Station (#104)	29.2	4.6
Berryhill House (106A)	24.6	8.1
S.E. Perimeter (107A)	30.4	9.4

TMA

Thermo Analytical Inc.

TMA/BarOne

5435 Jefferson Street NE

Albuquerque, NM 87109

(505) 345-9031

TLD ENVIRONMENTAL MONITOR REPORT

DATE ISSUED 07/01/90 DATE ANNEALED 06/15/90 CUSTOMER NO. 0772 DOSIMETRY SERVICES
 DATE RETURNED 07/04/90 DATE READ 10/17/90 PAGE 1 OF 1 DATE 11/19/90

BADGE NUMBER	IDENTIFICATION	DOSIMETER READINGS (mrem)					AVERAGE	2 σ	MREM/WEEK ** FREQUENCY
		FIRST	SECOND	THIRD	FOURTH	FIFTH			
1000	CONTROL	43	35	31	34	22	33.0	15.2	1.85
1001	RESIDENCE #1024	40	35	40	38	33	36.2	4.1	2.14
1002	N PERIMETER #103	28	29	32	32	28	29.8	4.1	1.67
1003	WEATHER STA #104	40	48	45	42	44	43.8	6.1	2.40
1004	BERRY HILL HOUSE	30	16	28	29	19	24.4	12.9	1.37
1005	SE PERIM #107A	17	16	32	28	25	23.6	13.9	1.52

* - DOSIMETER DAMAGED

FREQUENCY CODES

** - BASED ON ELAPSED TIME
 FROM DATE ANNEALED TO
 DATE READ

M - MONTHLY
 Q - QUARTERLY
 S - SEMI ANNUAL
 A - ANNUAL
 I - IRREGULAR

CUSTOMER
 ATTENTION
 ADDRESS
 CITY

CHEM NUCLEAR SYSTEMS
 BARBARA
 P.O. BOX 2972
 MILIN

TLD ENVIRONMENTAL MONITOR REPORT

DATE ISSUED 01/01/90 DATE ANNEALED 09/11/90 CUSTOMER NO. 0112
DATE RETURNED 11/09/91 DATE READ 11/17/91 PAGE 1 OF 1

BIOMETRY SERVICES
DATE 01/23/91

BAUGE NUMBER	IDENTIFICATION	DOSIMETER READINGS (mrem)					AVERAGE	2 σ	MREM/WEEK **	FREQUENCY
		FIRST	SECOND	THIRD	FOURTH	FIFTH				
1000	CONTROL	36	32	29	28	28	30.6	6.9	1.74	Q
1001	RESIDENCE #102A	41	21	30	27	26	29.0	14.9	1.65	Q
1002	N PERIMETER #103	24	25	26	24	25	24.8	1.7	1.41	Q
1003	WEATHER STA #104	26	28	32	28	27	28.2	4.6	1.60	Q
1004	BERRYHILL HOUSE	24	25	31	20	23	24.6	8.1	1.60	Q
1005	SE PERIM #107A	25	36	32	26	33	30.4	9.4	1.73	Q

FREQUENCY CODES

M - MONTHLY
Q - QUARTERLY
S - SEMI ANNUAL
A - ANNUAL
I - IRREGULAR

* - DOSIMETER DAMAGED

** - BASED ON ELAPSED TIME
FROM DATE ANNEALED TO
DATE READ

CUSTOMER

ATTENTION
ADDRESS
CITY

ARCO COAL COMPANY

STAN FITCH
HIGHWAY 60
GRANTS

NM 87020

SOIL AND VEGETATION ANALYSES

Soil and vegetation sampling was performed at each permanent air sampling station during the second half of 1990.

A nine (9) point soil composite sample was collected, using a small garden shovel, at about a six inch (6") depth from a 100 square meter area for each station. The sample was analyzed for Ra-226, U-Nat, Th-230, and Pb-210 by an outside, contracted laboratory. The highest concentration in soil for U-Nat was 1.5 pCi/gm at the Nearest Residence Station, 2.1 pCi/gm for Ra-226 at the Southeast Perimeter, 1.9 pCi/gm of Pb-210 at the North Perimeter, and 12.0 pCi/gm for Th-230 at the Weather Station. There were no significant deviations from the previous sampling results.

All results for vegetation are reported in uCi per kg of wet vegetation (as it was collected in the field). The highest concentrations of radionuclide in vegetation were $5.4 \text{ E-}5$ uCi/kg for U-Nat, $9.5 \text{ E-}5$ uCi/kg for Ra-226, and $1.3 \text{ E-}4$ uCi/kg for Th-230 at the Weather Station. The highest concentration of Pb-210 in vegetation was found at the North Perimeter Station at $5.9 \text{ E-}4$ uCi/kg.

ARCO COAL COMPANY
BLUEWATER MILL

SOIL AND VEGETATION SAMPLING
September 25, 1990

Soil Sampling Procedure

A nine point composite soil sample was collected over a 100 square meter area surrounding each of the monitoring stations. Soil was collected from the surface to four inches in depth. Soils were field textured and estimated for grain size. The composite soil samples were dried, crushed to two millimeters in diameter particle size or less (-10 mesh), and then blended prior to being split. The soil samples were split three times with a Jones splitter to obtain a representative aliquot for the laboratory performing the analysis. The aliquots sent to the laboratory equaled one sixth of the total composite sample collected. The remaining portion of the sample was temporarily stored.

Vegetation Sampling Procedure

Vegetation samples were collected over approximately a 1000 square meter area around each station. The percent abundance of each type of foliage was visibly estimated for the monitoring stations. The different types of foliage (shrubs, grasses, and forbs) for each station were bagged separately. The foliage types were then blended in proportions by weight equal to their percent abundance at each station. This procedure was utilized to obtain a representative aliquot for each station. The blended aliquot was bagged and sent for laboratory analysis.

Sample Data by Station

North Perimeter (#103):

Soil - The soil texture was estimated to be course to medium grained. The sample aliquot sent for analysis weighed 384 grams.

Vegetation - The vegetation at this station was predominantly made up of grasses, shrubs, and forbs.

Shrubs - approximately 40% of the vegetative cover
(aliquot portion weighed 400 grams)

- * Winterfat
- * 4 Wingsalt bush

Grass - approximately 40% of the vegetative cover
(aliquot portion weighed 400 grams)

- * Bluegrass
- * Galleta

- * Indian Rice Grass
- * Sanddropseed
- Forbs - approximately 20% of the vegetative cover
(aliquot portion weighed 200 grams)
 - * Rubber Rabbit Brush
 - * Russian Thistle

Weather Station (#104):

Soil - The soil texture was estimated to be medium grained. The sample aliquot sent for analysis weighed 473 grams.

Vegetation - The vegetation at this station was predominantly made up of grasses, shrubs, and forbs.

- Shrubs - approximately 10% of the vegetative cover
(aliquot portion weighed 100 grams)
 - * 4 - Wingsalt bush
- Grass - approximately 40% of the vegetative cover
(aliquot portion weighed 400 grams)
 - * Alkali Sacaton
 - * Galleta
 - * Bottle Brush Squirreltail
- Forbs - approximately 50% of the vegetative cover
(aliquot portion weighed 500 grams)
 - * Kochia
 - * Broom Snake Weed

Nearest Residence (#102-A):

Soil - The soil texture was estimated to be medium grained. The sample aliquot sent for analysis weighed 458 grams.

Vegetation - The vegetation at this station was predominantly made up of shrubs and forbs.

- Shrubs - approximately 5% of the vegetative cover
(aliquot portion weighed 40 grams)
 - * Winterfat
 - * 4 - Wingsalt bush
- Forbs - approximately 95% of the vegetative cover
(aliquot portion weighed 800 grams)
 - * Kochia
 - * Bind Weed
 - * Sneezeweed (yellow flower)

Berryhill (#106-A):

Soil - The soil texture was estimated to be course to medium grained. The sample aliquot sent for analysis weighed 411 grams.

Vegetation - The vegetation at this station was predominantly made up of grasses, shrubs, and forbs.

Shrubs - approximately 5% of the vegetative cover
(aliquot portion weighed 30 grams)

- * Winterfat
- * 4 - Wingsalt bush

Grass - approximately 70% of the vegetative cover
(aliquot portion weighed 550 grams)

- * Bluegrass

Forbs - approximately 25% of the vegetative cover
(aliquot portion weighed 200 grams)

- * Rubber Rabbit Brush
- * Russian Thistle
- * Broom Snake Weed

Southeast Perimeter (#107-A):

Soil - The soil texture was estimated to be medium grained. The sample aliquot sent for analysis weighed 511 grams.

Vegetation - The vegetation at this station was predominantly made up of grasses, shrubs, and forbs.

Shrubs - approximately 10% of the vegetative cover
(aliquot portion weighed 100 grams)

- * Winterfat
- * 4 - Wingsalt bush

Grass - approximately 40% of the vegetative cover
(aliquot portion weighed 400 grams)

- * Bluegrass
- * Galleta
- * Indian Rice Grass
- * Bottle Brush Squirreltail

Forbs - approximately 50% of the vegetative cover
(aliquot portion weighed 500 grams)

- * Rubber Rabbit Brush
- * Russian Thistle
- * Kochia
- * Broom Snake Weed

NP 90 SOILVEG.SAM

ARCO COAL COMPANY
Bluewater Mill

Radiological Analyses of Soil Samples
(Nine Point Soil Composite)

Location: NEAREST RESIDENCE

Date sampled: 09-25-90

Radionuclide =====	Concentration uCi/gm =====	Error estimate uCi/gm =====	LLD uCi/gm =====
U-nat	1.50E-06	1.00E-07	2.00E-07
Ra-226	1.60E-06	3.00E-07	1.00E-07
Pb-210	1.50E-06	2.00E-07	2.00E-07
Th-230	1.50E-06	4.00E-01	1.00E-07

Location: NORTH PERIMETER

Date Sampled: 09-25-90

Radionuclide =====	Concentration uCi/gm =====	Error estimate uCi/gm =====	LLD uCi/gm =====
U-nat	1.10E-06	1.00E-07	2.00E-07
Ra-226	1.30E-06	3.00E-07	2.00E-07
Pb-210	1.40E-06	2.00E-07	2.00E-07
Th-230	1.40E-06	4.00E-07	1.00E-07

Location: WEATHER STATION

Date Sampled: 09-25-90

Radionuclide =====	Concentration uCi/gm =====	Error estimate uCi/gm =====	LLD uCi/gm =====
U-nat	6.00E-07	1.00E-07	2.00E-07
Ra-226	1.40E-06	3.00E-07	1.00E-07
Pb-210	1.80E-06	2.00E-07	2.00E-07
Th-230	1.20E-05	1.00E-06	1.00E-07

ARCO COAL COMPANY
Bluewater Mill

Radiological Analyses of Soil Samples
(Nine Point Soil Composite)

Location: BERRYHILL HOUSE

Date sampled: 09-25-90

Radionuclide =====	Concentration uCi/gm =====	Error estimate uCi/gm =====	LLD uCi/gm =====
U-nat	9.00E-07	1.00E-07	2.00E-07
Ra-226	7.00E-07	2.00E-07	2.00E-07
Pb-210	1.10E-06	2.00E-07	2.00E-07
Th-230	1.10E-06	3.00E-07	1.00E-07

Location: S.E. PERIMETER

Date Sampled: 09-25-90

Radionuclide =====	Concentration uCi/gm =====	Error estimate uCi/gm =====	LLD uCi/gm =====
U-nat	1.10E-06	1.00E-07	2.00E-07
Ra-226	2.10E-06	3.00E-07	1.00E-07
Pb-210	1.70E-06	2.00E-07	2.00E-07
Th-230	2.10E-06	5.00E-07	2.00E-07

ARCO COAL COMPANY
Bluewater Mill

Radiological Analyses of Vegetation Samples

Location: Nearest Residence Date sampled: 09-25-90
Vegetation Comp (forbs 95% and shrubs 5%)

Radionuclide =====	Concentration uCi/Kg =====	Error estimate uCi/Kg =====	LLD uCi/Kg =====
U-nat	2.80E-05	3.00E-06	3.00E-08
Ra-226	2.40E-05	4.00E-06	4.00E-07
Pb-210	3.00E-04	1.00E-05	3.00E-06
Th-230	1.20E-05	4.00E-06	2.00E-06

Location: North Perimeter Date Sampled: 09-25-90
Vegetation Comp (forbs 20%, grasses 40% and shrubs 40%)

Radionuclide =====	Concentration uCi/Kg =====	Error estimate uCi/Kg =====	LLD uCi/Kg =====
U-nat	2.80E-05	4.00E-06	2.00E-07
Ra-226	7.20E-05	4.00E-06	4.00E-07
Pb-210	5.90E-04	1.00E-05	3.00E-06
Th-230	6.80E-05	4.00E-06	1.00E-06

Location: Weather Station Date Sampled: 09-25-90
Veg Comp. (forbs 50%; shrubs 10%; grasses 40%)

Radionuclide =====	Concentration uCi/Kg =====	Error estimate uCi/Kg =====	LLD uCi/Kg =====
U-nat	5.40E-05	8.00E-06	2.00E-07
Ra-226	9.50E-05	4.00E-06	3.00E-07
Pb-210	4.10E-04	1.00E-05	3.00E-06
Th-230	1.30E-04	1.00E-05	1.00E-06

ARCO COAL COMPANY
Bluewater Mill

Radiological Analyses of Vegetation Samples

Location: Beryhill House Date sampled: 09-25-90
Vegetation Comp (forbs 25%, shrubs 5% and Ggrass 70%)

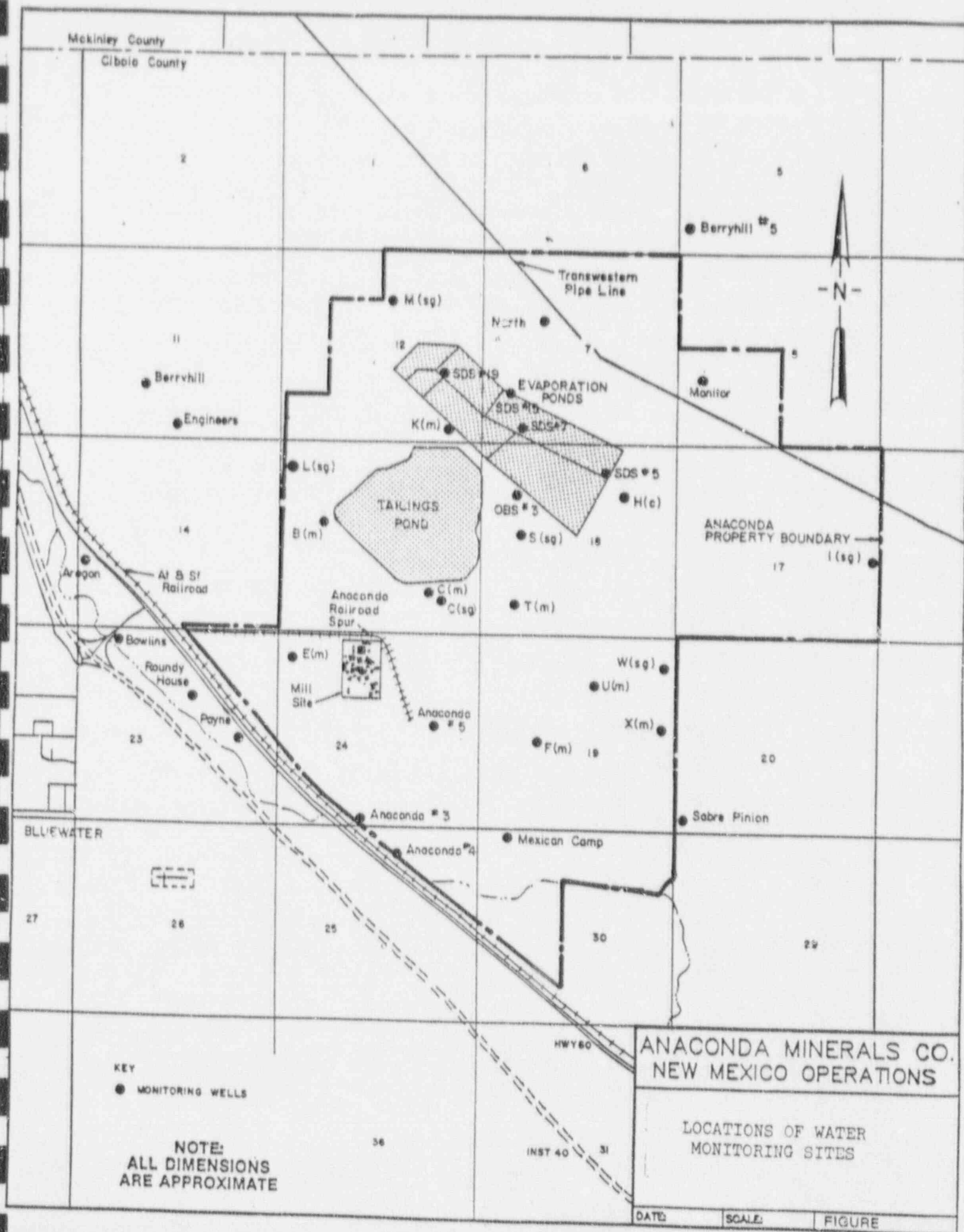
Radionuclide =====	Concentration uCi/Kg =====	Error estimate uCi/Kg =====	LLD uCi/Kg =====
U-nat	2.60E-05	4.00E-06	3.00E-07
Ra-226	3.10E-05	6.00E-06	6.00E-07
Pb-210	4.10E-04	2.00E-05	1.00E-05
Th-230	2.60E-05	4.00E-06	1.00E-06

Location: S.E. Perimeter Date Sampled: 09-25-90
Vegetation Comp (forbs 50%, grasses 40% and shrubs 10%)

Radionuclide =====	Concentration uCi/Kg =====	Error estimate uCi/Kg =====	LLD uCi/Kg =====
U-nat	3.50E-05	5.00E-06	2.00E-07
Ra-226	5.40E-05	5.00E-06	3.00E-07
Pb-210	4.60E-04	1.00E-05	5.00E-06
Th-230	3.20E-05	4.00E-06	1.00E-06

GROUND WATER COMPLIANCE MONITORING

Ground water compliance monitoring was continued during the second half of 1990. One (1) background well and two (2) Point of Compliance (POC) wells are monitored in both the San Andres and Alluvial aquifers. The Alluvial aquifer is monitored for U-Natural, selenium, and molybdenum; while U-Nat and selenium are monitored in the San Andres aquifer.



WELL CONSTRUCTION SUMMARY

Well	Aquifer, a	Elevation, b	Diameter (Inches)	Total Depth (Feet)	Open Interval (Feet)	Lithology (d)					
						Qal	Qb	QToa	TRc	Psg	Psy
L(SG)	S	6602.60	8	610	412-610c	--	0-110	110-122	122-412	412-TD	--
OBS#3	S	6612.60	5	355	10-355	--	--	--	0-50	50-317	317-TD
S(SG)	S	6621.14	8	337	159-280	--	--	--	--	--	--
E(M)	A	6613.08	4	100	67-90	--	0-73	73-82	82-TD	--	--
F(M)	A	6600.31	6	136	94-115	--	0-95	95-112	112-TD	--	--
T(M)	A	6609.40	6	142	128-133	--	0-128	128-133	133-TD	--	--

Notes:

a Aquifer

A = Alluvial/Basalt aquifer

S = San Andres/Glorieta aquifer

b Elevation of measuring point (usually top of casing)

c Open hole completions; all other completions are slotted casing

d Lithology

Qal = recent alluvium

QToa = Old Alluvium

Qb = basalt

TRc = Chinle Formation

Psg = San Andres-Glorieta aquifer

Psy = Yeso Formation

ARCO COAL COMPANY
BLUEWATER MILL

Ground Water Monitoring Results

Well Description: E(M), Alluvial Aquifer

Sample Date =====	pH =====	Water level Elevation feet =====	U-nat mg/l =====	Selenium mg/l =====	Molybdenum mg/l =====
06/14/88	7.72	6540.80	0.013	< 0.005	< 0.005
09/07/88	7.73	6541.93	0.017	< 0.005	< 0.005
12/06/88	7.04	6541.25	0.019	< 0.005	< 0.005
03/07/89	7.49	6540.25	0.022	< 0.005	< 0.005
06/15/89	7.14	6439.72	0.027	< 0.005	< 0.005
09/20/89	7.27	6539.67	0.017	< 0.005	< 0.005
12/18/89	7.21	6539.13	0.030	< 0.005	< 0.005
03/12/90	7.16	6538.98	0.029	< 0.005	< 0.005
04/09/90	7.18	6538.88	0.025	< 0.005	< 0.005
07/12/90	7.25	6539.58	0.027	< 0.005	< 0.005
09/17/90	6.90	6538.43	0.022	< 0.005	< 0.005
10/03/90	7.22	6538.38	0.030	< 0.005	< 0.005
12/18/90	7.22	6538.18	0.031	< 0.005	< 0.005

ARCO COAL COMPANY
BLUEWATER MILL

Ground Water Monitoring Results

Well Description: F(M), Alluvial Aquifer

Sample =====		Water level Elevation =====	U-nat =====	Selenium =====	Molybdenum =====
06/14/88	7.54	6495.00	0.006	< 0.005	< 0.005
09/07/88	7.80	6494.71	0.007	< 0.005	< 0.005
12/06/88	7.46	6494.77	0.007	< 0.005	< 0.005
03/07/89	7.53	6494.65	0.007	< 0.005	< 0.005
06/15/89	7.10	6494.38	0.006	< 0.005	< 0.005
09/20/89	7.29	6494.38	0.005	< 0.005	< 0.005
12/18/89	7.25	6494.10	0.006	< 0.005	< 0.005
03/12/90	7.10	6493.63	0.007	< 0.005	< 0.005
05/23/90	7.27	6493.36	0.008	< 0.005	< 0.005
07/11/90					
09/17/90	7.20	6492.68	0.003	< 0.005	< 0.005
10/02/90	7.12	6492.71	0.007	< 0.005	< 0.005
12/18/90	7.00	6492.19	0.013	< 0.005	< 0.005

ARCO COAL COMPANY
BLUEWATER MILL

Ground Water Monitoring Results

Well Description: T(M), Alluvial Aquifer

Sample Date =====	pH =====	Water level Elevation feet =====	U-nat mg/l =====	Selenium mg/l =====	Molybdenum mg/l =====
06/14/88	7.16	6493.85	0.18	0.013	0.027
09/07/88	7.46	6494.80	0.17	0.008	0.019
12/06/88	7.24	6494.92	0.19	0.008	0.027
03/07/89	7.19	6494.42	0.16	0.007	0.033
06/15/89	7.00	6493.72	0.16	0.003	0.034
09/20/89	7.07	6493.59	0.15	0.007	0.032
12/18/89	7.10	6486.83	0.15	< 0.005	0.045
03/14/90	7.01	6492.32	0.13	0.005	0.025
05/24/90	7.01	6491.58	0.11	0.012	0.034
07/11/90	7.08	6490.75	0.13	0.005	0.032
09/18/90	7.05	6489.95	0.18	0.005	0.028
10/01/90	7.02	6490.02	0.14	0.005	0.033
12/18/90	6.96	6487.40	0.15	< 0.005	0.034

ARCO Coal Company
BLUEWATER MILL

Ground Water Monitoring Results

Well Description: L(SG), San Andres Aquifer

Sample Date =====	pH =====	Water level Elevation feet =====	U-nat mg/l =====	Selenium mg/l =====
06/14/88	6.97	6499.30	0.003	< 0.005
09/08/88	6.96	6500.81	0.005	< 0.005
12/08/88	6.96	6499.42	0.004	< 0.005
03/07/89	7.20	6497.61	0.004	< 0.005
06/15/89	6.88	6497.99	0.003	< 0.005
09/20/89	6.77	6496.21	0.002	< 0.005
11/18/89	6.60	6494.35	0.003	< 0.005
1/13/90	6.62	6493.20	0.003	< 0.005
2/10/90	6.73	6492.66	0.002	< 0.005
3/11/90	6.78	6488.98	0.003	< 0.005
4/2/90	6.75	6487.30	0.003	< 0.005
5/2/90	6.67	6487.87	0.002	< 0.005
6/18/90	6.79	6487.16	0.002	< 0.005

ARCO Coal Company
BLUEWATER MILL

Ground Water Monitoring Results

Well Description: S(SG), San Andres Aquifer

Sample Date =====	pH =====	Water level Elevation feet =====	U-nat mg/l =====	Selenium mg/l =====
06/14/88	6.95	6481.89	1.7	0.012
09/08/88	6.91	6482.32	1.4	0.010
12/08/88	6.84	6483.10	1.7	0.012
03/07/89	6.79	6482.19	1.5	0.007
06/15/89	6.80	6481.34	1.6	0.011
09/21/89	6.82	6480.08	1.2	0.009
12/18/89	6.65	6478.95	1.6	0.007
03/14/90	6.66	6478.89	1.6	0.009
05/24/90	6.65	6477.84	1.3	0.005
07/11/90	6.72	6476.48	1.6	0.006
09/17/90	6.79	6475.25	1.2	0.007
10/01/90	6.66	6474.99	1.3	0.005
12/18/90	6.60	6475.14	1.8	< 0.005

ARCO Coal Company
BLUEWATER MILL

Ground Water Monitoring Results

Well Description: O Bs#3, San Andres Aquifer

Sample Date =====	pH =====	Water level Elevation feet =====	U-nat mg/l =====	Selenium mg/l =====
06/14/88	7.11	6481.50	0.51	< 0.008
09/08/88	6.95	6482.81	0.42	0.010
12/08/88	6.94	6482.61	0.92	0.010
03/07/89	6.88	6482.61	1.00	0.011
06/15/89	6.67	6481.40	0.94	0.011
09/21/89	6.64	6479.53	1.24	0.020
12/19/89	6.44	6397.24	1.77	0.010
03/14/90	6.54	6478.33	1.64	0.014
05/24/90	6.66	6477.37	1.23	0.008
07/12/90	6.67	6476.69	1.62	0.008
09/18/90	6.77	6474.70	1.26	0.011
10/02/90	6.66	6474.52	1.77	0.010
12/18/90	6.60	6474.30	1.43	< 0.005