

PATHFINDER

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Shirley Basin Mine
Shirley Basin, Wyoming 82645
(307) 356-4112*

THIRD QUARTER 1982

Environmental Monitoring Data
With Dose Calculations

IE-25

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40.65 Report Third Quarter-1982

PATHFINDER MINES CORPORATION
 Shirley Basin Mine
 Shirley Basin, Wyoming 82615
 (307) 356-4312

I. STACK SAMPLES

- a. Date Collected: September 17, 1982
 b. Location of Sample Collection: Demister stack located approximately 55 feet above the ground at a rooftop location. Sampling ports (2) are located 3.45 stack diameters downstream of the stack inlet and 1.70 stack diameters upstream of the stack outlet.
 c. Stack Flow Rates:

Radionuclide		ACFM	DSCFM*	m ³ /sec (actual)	m ³ /sec (standard)	Release Rate*** (Ci/Qtr)	Error Estimate (Ci/Qtr)	LLD (uci/ml)
		Concentration (uCi/ml)	Error Estimate (uCi/ml)					
U-nat**	Run 1	9426	6499	4.45	3.06	6.76 x 10 ⁻⁴ (²³⁸ U)	—	1.4 x 10 ⁻¹³
	Run 2	8764	6077	4.13	2.87			
Th-230	Run 1	4.19 x 10 ⁻¹³	± 1.40 x 10 ⁻¹³	1.28 x 10 ⁻⁵	± 4.26 x 10 ⁻⁵	8.53 x 10 ⁻⁶	± 2.84 x 10 ⁻⁶	1.5 x 10 ⁻¹³
	Run 2	3.74 x 10 ⁻¹³	± 1.25 x 10 ⁻¹³					
Ra-226	Run 1	6.99 x 10 ⁻¹⁴	± 1.05 x 10 ⁻¹³	2.13 x 10 ⁻⁶	± 3.20 x 10 ⁻⁶	1.14 x 10 ⁻⁵	± 4.74 x 10 ⁻⁶	1.3 x 10 ⁻¹³
	Run 2	4.99 x 10 ⁻¹³	± 2.08 x 10 ⁻¹³					

* 68°F., 29.92" Hg (20°C., 760 mm Hg).

** U-nat Run 1 : Radiochem laboratory loss of sample.

*** Release rate calculation assumes 100% quarterly operation at 92 days per quarter.

II. AIR SAMPLES

MPC: 150 $\mu\text{g}/\text{m}^3$ DEQ Air Quality Standards and Regulations 1982

A. Particulates: High Volume

Station	Data Sampled			Data ($\mu\text{g}/\text{m}^3$) and % MPC					
	July	August	September	July		August		September	
2R	<u>4</u>	<u>3</u>	<u>2</u>	<u>29</u>	<u>19</u>	<u>24</u>	<u>16</u>	<u>16</u>	<u>11</u>
	<u>10</u>	<u>9</u>	<u>8</u>	<u>11</u>	<u>7</u>	<u>28</u>	<u>19</u>	<u>26</u>	<u>17</u>
	<u>16</u>	<u>15</u>	<u>14</u>	<u>56</u>	<u>37</u>	<u>20</u>	<u>13</u>	<u>3</u>	<u>2</u>
	<u>22</u>	<u>21</u>	<u>20</u>	<u>52</u>	<u>35</u>	<u>16</u>	<u>11</u>	<u>15</u>	<u>10</u>
	<u>28</u>	<u>27</u>	<u>26</u>	<u>11</u>	<u>7</u>	<u>21</u>	<u>14</u>	<u>10</u>	<u>7</u>
4R	<u>4</u>	<u>3</u>	<u>2</u>	<u>29</u>	<u>19</u>	<u>210*</u>	<u>140</u>	<u>44</u>	<u>29</u>
	<u>10</u>	<u>9</u>	<u>8</u>	<u>15</u>	<u>10</u>	<u>122*</u>	<u>81</u>	<u>43</u>	<u>29</u>
	<u>16</u>	<u>15</u>	<u>14</u>	<u>78</u>	<u>52</u>	<u>150*</u>	<u>100</u>	<u>12</u>	<u>8</u>
	<u>22</u>	<u>21</u>	<u>20</u>	<u>65</u>	<u>43</u>	<u>22</u>	<u>15</u>	<u>26</u>	<u>17</u>
	<u>28</u>	<u>27</u>	<u>26</u>	<u>13</u>	<u>9</u>	<u>32</u>	<u>21</u>	<u>10</u>	<u>7</u>
7R	<u>4</u>	<u>3</u>	<u>2</u>	<u>34</u>	<u>23</u>	<u>26</u>	<u>17</u>	<u>18</u>	<u>12</u>
	<u>10</u>	<u>9</u>	<u>8</u>	<u>13</u>	<u>9</u>	<u>26</u>	<u>17</u>	<u>22</u>	<u>15</u>
	<u>16</u>	<u>15</u>	<u>14</u>	<u>65</u>	<u>43</u>	<u>38</u>	<u>25</u>	<u>4</u>	<u>3</u>
	<u>22</u>	<u>21</u>	<u>20</u>	<u>51</u>	<u>34</u>	<u>20</u>	<u>13</u>	Filter blew away	-
	<u>28</u>	<u>27</u>	<u>26</u>	<u>14</u>	<u>9</u>	<u>25</u>	<u>17</u>	<u>12</u>	<u>8</u>
10R	<u>4</u>	<u>3</u>	<u>2</u>	<u>49</u>	<u>33</u>	<u>25</u>	<u>17</u>	<u>19</u>	<u>13</u>
	<u>10</u>	<u>9</u>	<u>8</u>	MM	-	<u>28</u>	<u>19</u>	<u>20</u>	<u>13</u>
	<u>16</u>	<u>15</u>	<u>14</u>	MM	-	<u>22</u>	<u>15</u>	<u>4</u>	<u>3</u>
	<u>22</u>	<u>21</u>	<u>20</u>	MM	-	<u>17</u>	<u>11</u>	<u>22</u>	<u>15</u>
	<u>28</u>	<u>27</u>	<u>26</u>	MM	-	<u>22</u>	<u>15</u>	<u>15</u>	<u>10</u>

MM: Machine Malfunction

* : Questionable readings because the machine ran less than half of the 24 hour period.

MPC : Ra-226 2×10^{-12} $\mu\text{Ci/ml}$
 Th-230 8×10^{-14} $\mu\text{Ci/ml}$
 U-nat 5×10^{-12} $\mu\text{Ci/ml}$
 Pb-210 4×10^{-12} $\mu\text{Ci/ml}$

Title 10 CFR Part 20 Appendix B

B. Radiometrics : Low Volume

Station	Radionuclide	Concentration ($\mu\text{Ci} \times 10^{-15}/\text{ml}$)	Error Estimates ($\mu\text{Ci} \times 10^{-15}/\text{ml}$)	% MPC	LLD
2R	Ra-226	0.44	± 0.1	< 0.1	$0.1 \times 10^{-15} \mu\text{Ci/ml}$
	Th-230	0.68	± 0.06	0.8	$0.1 \times 10^{-15} \mu\text{Ci/ml}$
	U-nat	2.8	± 0.2	< 0.1	$0.1 \times 10^{-15} \mu\text{Ci/ml}$
	Pb-210	28	± 2	0.7	$2 \times 10^{-15} \mu\text{Ci/ml}$
7R	Ra-226	0.2	± 0.1	< 0.1	Same as above
	Th-230	0.31	± 0.04	0.4	
	U-nat	0.3	± 0.2	< 0.1	
	Pb-210	23	± 2	0.6	
10R	Ra-226	0.3	± 0.1	< 0.1	Same as above
	Th-230	0.72	± 0.04	0.9	
	U-nat	1.1	± 0.1	< 0.1	
	Pb-210	22	± 2	0.6	
GP-1	Ra-226	0.18	± 0.03	< 0.1	$0.02 \times 10^{-15} \mu\text{Ci/ml}$
	Th-230	0.34	± 0.03	0.4	$0.03 \times 10^{-15} \mu\text{Ci/ml}$
	U-nat	0.74	—	< 0.1	$0.4 \times 10^{-15} \mu\text{Ci/ml}$
	Pb-210	28.4	± 0.01	0.7	$0.3 \times 10^{-15} \mu\text{Ci/ml}$

MPC: 3 pCi/l Title 10 CFR Part 20 Appendix B

C. Radon

Station	Date Sampled				Data (pCi/l) and % MPC				IID (pCi/l)				
	July		August		September		July			August		September	
2R	7-1-82	8-2-82	9-1-82	9-1-82	0.90 ± 0.09	30%	0.62 ± 0.08	21%	3.44 ± 0.17	115%	0.2		
	8-2-82	9-1-82	10-4-82										
4R	7-1-82	8-2-82	9-1-82	9-1-82	1.75 ± 0.13	58%	0.22 ± 0.05	7%	1.45 ± 0.12	48%	0.2		
	8-2-82	9-1-82	10-1-82										
7R	7-1-82	8-2-82	9-1-82	9-1-82	0.84 ± 0.09	28%	0.77 ± 0.09	26%	1.99 ± 0.13	66%	0.2		
	8-2-82	9-1-82	10-4-82										
10R	7-1-82	8-2-82	9-1-82	9-1-82	1.07 ± 0.10	36%	0.47 ± 0.07	16%	1.36 ± 0.11	45%	0.2		
	8-2-82	9-1-82	10-4-82										
GP-1	7-1-82	8-2-82	9-1-82	9-1-82	2.70 ± 0.16	90%	0.65 ± 0.08	22%	2.85 ± 0.17	95%	0.2		
	6-2-82	9-1-82	10-1-82										

III. Liquid Samples

A. Surface Water No samples collected in third quarter 1982.

Station	Date Sampled	Parameter	Concentration and Error Estimate	% MPC	LID
SW-1A		U-nat			
		Th ²³⁰			
		Ra ²²⁶			
		Pb ²¹⁰			
		Po ²¹⁰			
		CL ⁻			
		SO ₄ ⁼			
		TSS			
		pH			
		SW-2		U-nat	
Th ²³⁰					
Ra ²²⁶					
Pb ²¹⁰					
Po ²¹⁰					
CL ⁻					
SO ₄ ⁼					
TSS					
pH					

III. Liquid Samples - Continued No samples collected in third quarter 1982

Station	Date Sampled	Parameter	Concentration and Error Estimate	% MPC	LLD
SM-3		U-nat			
		Th ²³⁰			
		Ra ²²⁶			
		Pb ²¹⁰			
		Po ²¹⁰			
		CL ⁻			
		SO ₄ ⁼			
		TSS			
		pH			
		SM-4		U-nat	
Th ²³⁰					
Ra ²²⁶					
Pb ²¹⁰					
Po ²¹⁰					
CL ⁻					
SO ₄ ⁼					
TSS					
pH					

III. Liquid Samples - Continued No samples collected in third quarter 1982

Station	Date Sampled	Parameter	Concentration and Error Estimate	% MPC	LID
SW-5		U-nat			
		Th ²³⁰			
		Ra ²²⁶			
		Pb ²¹⁰			
		Po ²¹⁰			
		CL ⁻			
		SO ₄ ⁼			
		TSS			
		pH			
		SW-6		U-nat	
Th ²³⁰					
Ra ²²⁶					
Pb ²¹⁰					
Po ²¹⁰					
CL ⁻					
SO ₄ ⁼					
TSS					
pH					

III. Liquid Samples - Continued No samples collected in third quarter 1982.

Station	Date Sampled	Parameter	Concentration and Error Estimate	% MPC	LID
SW-7		U-nat			
		Th ²³⁰			
		Ra ²²⁶			
		Pb ²¹⁰			
		Po ²¹⁰			
		CL ⁻			
		SO ₄ ⁼			
		TSS			
		pH			
		SW-8		U-nat	
Th ²³⁰					
Ra ²²⁶					
Pb ²¹⁰					
Po ²¹⁰					
CL ⁻					
SO ₄ ⁼					
TSS					
pH					

MPC: Ra 226 30 pCi/l Cl⁻ 250 mg/l
 Title 10 CFR Part 20 U-nat 30,000 pCi/l SO₄⁼ 250 mg/l
 Appendix B Th 230 2,000 pCi/l TDS 500 mg/l
 Pb 210 100 pCi/l
 Po 210 700 pCi/l

} State of Wyoming Class I
 water standards (drinking water)

B. Groundwater:

Station	Date Sampled	Analysis	Concentration and Error Estimate	% MPC	LID
RPI 20A	8-20-82	Ra ²²⁶	0.4 ± 0.1 pCi/l	1.3	0.14
		U-nat	490 ± 20 pCi/l	1.6	2
		Th ²³⁰	0.3 ± 0.2 pCi/l	< 1	0.14
		Pb ²¹⁰	0 ± 1 pCi/l	0	0.7
		Po ²¹⁰	0 ± 0.2 pCi/l	0	0.14
		CL ⁻	1020 mg/l	408	0.5
		SO ₄ ⁼	675 mg/l	270	1
		TDS	3382 mg/l	676	10
		pH	7.0 s.u.	N.A.	N.A.
		Water Level	7024.5	N.A.	N.A.
RPI 21B	8-12-82	Ra ²²⁶	0.4 ± 0.1 pCi/l	1.3	0.14
		U-nat	400 ± 20 pCi/l	1.3	2
		Th ²³⁰	0 ± 0.2 pCi/l	0	0.14
		Pb ²¹⁰	2 ± 1 pCi/l	2	0.7
		Po ²¹⁰	0 ± 0.2 pCi/l	0	0.14
		CL ⁻	166 mg/l	66	0.5
		SO ₄ ⁼	195 mg/l	78	1
		TDS	904 mg/l	181	10
		pH	7.5 s.u.	N.A.	N.A.
		Water Level	7025.9	N.A.	N.A.

MPC: Ra 226 30 pCi/l
 U-nat 30,000 pCi/l
 Th 230 2,000 pCi/l
 Pb 210 100 pCi/l
 Po 210 700 pCi/l

State of Wyoming Class I
 water standards (drinking water)

Cl⁻ 250 mg/l
 SO₄²⁻ 250 mg/l
 TDS 500 mg/l

Station	Date Sampled	Analysis	Concentration and Error Estimate	% MPC	LID
NPI 42A	8-19-82	Ra ²²⁶	0.7 ± 0.1	2.3	0.14
		U-nat	480 ± 20	1.6	2
		Th ²³⁰	2.9 ± 0.3	< 1	0.14
		Pb ²¹⁰	5 ± 1	5	0.7
		Po ²¹⁰	0.5 ± 0.2	< 1	0.14
		Cl ⁻	600	240	0.5
		SO ₄ ²⁻	582	233	1
		TDS	2492	498	10
		pH	7.7	N.A.	N.A.
		Water Level	7052.2	N.A.	N.A.
		MC-7	8-12-82	Ra ²²⁶	0.5 ± 0.1
U-nat	16 ± 2			< 1	2
Th ²³⁰	0.5 ± 0.2			< 1	0.14
Pb ²¹⁰	0 ± 1			0	0.7
Po ²¹⁰	0 ± 0.2			0	0.14
Cl ⁻	610			244	0.5
SO ₄ ²⁻	149			60	1
TDS	1768			354	10
pH	7.5			N.A.	N.A.
Water Level	7037.6			N.A.	N.A.

MPC: Ra 226 30 pCi/l
 U-nat 30,000 pCi/l
 Th 230 2,000 pCi/l
 Pb 210 100 pCi/l
 Po 210 700 pCi/l

Cl⁻ 250 mg/l
 SO₄⁼ 250 mg/l
 TDS 500 mg/l

} State of Wyoming Class I
 Water standards (drinking water)

Station	Date Sampled	Analysis	Concentration and Error Estimate	% MPC	LLD
MC-14	8-12-82	Ra ²²⁶	0 ± 0.1	0	0.14
		U-nat	67 ± 3	< 1	2
		Th ²³⁰	0.4 ± 0.2	< 1	0.14
		Pb ²¹⁰	24 ± 1	24	0.7
		Po ²¹⁰	1.0 ± 0.2	< 1	0.14
		CL ⁻	8	3	0.5
		SO ₄ ⁼	24	10	1
		TDS	354	71	10
		pH	7.7	N.A.	N.A.
		Water Level	7060.8	N.A.	N.A.
WW 20	8-12-82	Ra ²²⁶	0.2 ± 0.1	< 1	0.14
		U-nat	6 ± 2	< 1	2
		Th ²³⁰	0.3 ± 0.2	< 1	0.14
		Pb ²¹⁰	0 ± 1	0	0.7
		Po ²¹⁰	2.0 ± 0.2	< 1	0.14
		CL ⁻	10	4	0.5
		SO ₄ ⁼	222	89	1
		TDS	541	108	10
		pH	8.2	N.A.	N.A.
		Water Level	N. A. (drinking water well - sealed)	N. A.	N. A.

MPC: Ra 226 30 pCi/l
 U-nat 30,000 pCi/l
 Th 230 2,000 pCi/l
 Pb 210 100 pCi/l
 Po 210 700 pCi/l

Cl⁻ 250 mg/l
 SO₄⁼ 250 mg/l
 TDS 500 mg/l

State of Wyoming Class I
 water standards (drinking water)

Station	Date Sampled	Analysis	Concentration and Error Estimate	% MPC	LLD
WW 22	8-12-82	Ra ²²⁶	0.6 ± 0.1	2	0.14
		U-nat	61 ± 3	<1	2
		Th ²³⁰	0.6 ± 0.2	<1	0.14
		Pb ²¹⁰	2 ± 1	2	0.7
		Po ²¹⁰	0 ± 0.2	0	0.14
		CL ⁻	14	6	0.5
		SO ₄ ⁼	21	8	1
		TDS	192	38	10
		pH	7.7	N.A.	N.A.
	Water Level	6936.9	N.A.	N.A.	

IV. Vegetation Samples

Station	Date Sampled	Radionuclide	Concentration (μCi/kg)	Error Estimate (μCi/kg)	LID (μCi/kg)
2R	3 rd week in August 1982	Ra ²²⁶	1.7×10^{-5}	2.0×10^{-6}	5×10^{-8}
		Pb ²¹⁰	2.7×10^{-3}	1.0×10^{-4}	1×10^{-6}
7R	3 rd week in August 1982	Ra ²²⁶	2.0×10^{-5}	2.0×10^{-6}	5×10^{-8}
		Pb ²¹⁰	2.1×10^{-3}	1.0×10^{-4}	1×10^{-6}
10R	3 rd week in August 1982	Ra ²²⁶	5.3×10^{-4}	3.0×10^{-5}	5×10^{-8}
		Pb ²¹⁰	3.1×10^{-3}	1.0×10^{-4}	1×10^{-6}
GP-1	3 rd week in August 1982	Ra ²²⁶	1.22×10^{-4}	6.0×10^{-6}	5×10^{-8}
		Pb ²¹⁰	3.1×10^{-3}	2.0×10^{-4}	1×10^{-6}

V. Soil Samples

Station	Date Sampled	Radionuclide	Concentration ($\mu\text{Ci/g}$)	Error Estimate ($\mu\text{Ci/g}$)	LID ($\mu\text{Ci/g}$)
2R	3 rd week in August 1982	U-nat	1.08×10^{-5}	5×10^{-7}	2×10^{-7}
		Th ²³⁰	3.1×10^{-6}	2×10^{-7}	7×10^{-8}
		Ra ²²⁶	2.5×10^{-6}	1×10^{-7}	3×10^{-8}
		Pb ²¹⁰	4.4×10^{-6}	2×10^{-7}	2×10^{-7}
7R	3 rd Week in August 1982	U-nat	3.7×10^{-6}	2×10^{-7}	2×10^{-7}
		Th ²³⁰	1.8×10^{-6}	2×10^{-7}	7×10^{-8}
		Ra ²²⁶	1.1×10^{-6}	1×10^{-7}	3×10^{-8}
		Pb ²¹⁰	2.4×10^{-6}	1×10^{-7}	2×10^{-7}
10R	3 rd week in August 1982	U-nat	6.8×10^{-6}	3×10^{-7}	2×10^{-7}
		Th ²³⁰	2.9×10^{-6}	2×10^{-7}	7×10^{-8}
		Ra ²²⁶	2.0×10^{-6}	1×10^{-7}	3×10^{-8}
		Pb ²¹⁰	4.0×10^{-6}	2×10^{-7}	2×10^{-7}
GP-1	3 rd week in August 1982	U-nat	1.9×10^{-6}	2×10^{-7}	2×10^{-7}
		Th ²³⁰	1.5×10^{-6}	2×10^{-7}	7×10^{-8}
		Ra ²²⁶	9.0×10^{-7}	1×10^{-7}	3×10^{-8}
		Pb ²¹⁰	1.1×10^{-6}	2×10^{-7}	2×10^{-7}

VI. Direct Radiation Measurements

Station	Sampling Period	Exposure Rate (mR/qtr)	Error Estimate (mR/qtr)
2R	3 rd quarter 1982 *	35.2	± 5.4
4R	3 rd quarter 1982 *	36.9	± 8.5
7R	3 rd quarter 1982 *	39.6	± 6.8
10R	3 rd quarter 1982 *	34.6	± 7.2
GP-1	3 rd quarter 1982 *	41.9	± 25.4
		Getty results: 44.3 ± 22.0	

* See explanation on following page.

Direct Radiation Measurements

Direct radiation measurements for the third quarter of 1982 are based upon average August and September data. The instrumentation that was used in July (AeroVironment) resulted in values that were approximately twice those obtained by another system at one of the locations (Eberline Getty-Petrotonics).

As a result of this, instrumentation was obtained in August so that a side by side test could be conducted with three monitoring systems. This proved that the July results were indeed too high and as such are not included in the direct radiation measurements. Please refer to the table listed below for the data obtained.

<u>Method</u>		
Aero Vironment (one TLD chip)	July	28.42
	August	27.36
	September	26.64
		<u>82.42 mrem/qtr</u>
Eberline (five TLD chips) Getty-Petrotonics	First Quarter 1982	38.9 ± 9.9
	Second Quarter 1982	47.3 ± 13.8
	Third Quarter 1982	44.3 ± 22.0
Eberline (five TLD chips) Pathfinder	July	-
	August	12.98 ± 4.46
	September	14.6 ± 23.3
		<u>41.6 mrem/qtr</u>

Section VII

Dose Calculations

Dose calculations are computed for the nearest residence (Heward's ranch, Station 7R, 3.5 miles east of the mill) and a background station (GP-1, 1.5 miles west-northwest of the Getty-Petrotoomics mill and 3.5 miles southwest of Pathfinder's mill). All calculations are based on actual data collected at each site. The appropriate conversion factors were obtained from the U.S. NRC Regulatory Guide 3.51.

The following information was used in calculating the dose:

1. The Hewards have no dairy cattle and purchase all of their milk.
2. All of their vegetables are purchased.
3. One-hundred percent of their beef is raised locally.
4. The Heward's drinking water comes from a deep well.
5. The surface water which the cattle drink is so low in radionuclides that it can be ignored as a source of contaminant.

Three exposure pathways were evaluated: inhalation, ingestion and direct external. Inhalation of airborne radioactive material was calculated based on third quarter low volume radionuclide data collected at each site. Ingestion calculations were based on radionuclide analysis of vegetation samples taken at each location. Transfer coefficients and consumption quantities were then used to calculate the subsequent dose to man. External dose was obtained from third quarter TLD information located at each site.

Tables VIIA and VIIB detail the dose data for inhalation at sites 7R and GP-1, respectively. Table VIIC shows the activity of the vegetation samples and exposure rates from direct radiation. Table VIID gives the ingestion dose at sites 7R and GP-1. Table VIIE summarizes all of the previous mentioned tables by tabulating the total dose for each exposure pathway.

Table VIIE shows that the dose for each parameter is higher at the background station (GP-1) than at the nearest residence (7R). This shows that 7R is in the same order of magnitude as the background station and that the mine has little, if any, impact on the nearest residence.

Table VIIA. Inhalation Dose (mrem/yr) at Site 7R

Radio-nuclide	Whole Body	Bone	Kidney	Liver	Lung
^{226}Ra	$6.18 \times 10^{-3} \pm 3.09 \times 10^{-3}$	$6.18 \times 10^{-2} \pm 3.09 \times 10^{-3}$	$2.18 \times 10^{-4} \pm 1.09 \times 10^{-4}$	(1)	1.32 ± 0.65
^{230}Th	$5.15 \times 10^{-2} \pm 6.64 \times 10^{-3}$	$1.84 \pm 2.38 \times 10^{-2}$	$0.52 \pm 6.68 \times 10^{-3}$	$0.11 \pm 1.37 \times 10^{-2}$	$9.98 \times 10^{-2} \pm 1.28 \times 10^{-2}$
^{238}U	$1.29 \times 10^{-3} \pm 8.64 \times 10^{-4}$	$2.37 \times 10^{-2} \pm 1.58 \times 10^{-2}$	$4.98 \times 10^{-3} \pm 3.32 \times 10^{-3}$	0	$4.74 \times 10^{-2} \pm 3.16 \times 10^{-2}$
^{210}Pb	$0.10 \pm 8.72 \times 10^{-3}$	3.10 ± 0.27	2.59 ± 0.23	0.79 ± 0.07	17.75 ± 0.15
Total Dose	0.16 ± 0.02	5.02 ± 0.31	3.12 ± 0.24	0.90 ± 0.08	19.22 ± 0.84

(1) Less than 10^{-4}

Table VIIB. Inhalation Dose (mrem/yr) at Site GP-1

Radio-nuclide	Whole Body	Bone	Kidney	Liver	Lung
^{226}Ra	$5.56 \times 10^{-3} \pm 9.27 \times 10^{-4}$	$5.64 \times 10^{-2} \pm 9.27 \times 10^{-3}$	$1.96 \times 10^{-4} \pm (1)$	(1)	1.19 ± 0.19
^{230}Th	$5.64 \times 10^{-2} \pm 4.98 \times 10^{-3}$	2.02 ± 0.17	$0.57 \pm 5 \times 10^{-2}$	$0.12 \pm 1.02 \times 10^{-2}$	$0.11 \pm 9.66 \times 10^{-2}$
^{238}U	$3.19 \times 10^{-3} \pm 1.29 \times 10^{-4}$	$5.86 \times 10^{-2} \pm 2.37 \times 10^{-3}$	$1.23 \times 10^{-2} \pm 4.98 \times 10^{-4}$	0	$0.12 \pm 4.74 \times 10^{-3}$
^{210}Pb	$0.12 \pm (1)$	$3.78 \pm 1.35 \times 10^{-3}$	$3.16 \pm 1.13 \times 10^{-3}$	$0.97 \pm 3.45 \times 10^{-4}$	$21.6 \pm 7.72 \times 10^{-3}$
Total Dose	0.18 ± 0.006	5.92 ± 0.18	3.74 ± 0.05	1.09 ± 0.01	23.02 ± 0.3

(1) Less than 10^{-4}

Table VIIC. Activity of Vegetation
Samples and Exposure Rates from Direct
Radiation at Sites 7R and GP-1

<u>Location</u>	<u>Vegetation Samples (pCi/kg)</u>	
	<u>^{226}Ra</u>	<u>^{210}Pb</u>
7R	20 ± 2	2100 ± 100
GP-1	122 ± 6	3100 ± 200

<u>Direct Radiation (mrem/yr)</u>	
<u>Location</u>	
7R	158.4
GP-1	167.6

Table VIID. Ingestion Dose at Sites 7R and GP-1 (micro/yr)

<u>Radionuclide</u>	<u>Site 7R</u>			
	<u>Whole Body</u>	<u>Bone</u>	<u>Liver</u>	<u>Kidney</u>
^{226}Ra	0.18 ± 0.02	0.18 ± 0.02	(1)	$0.006 \pm (1)$
^{210}Pb	3.17 ± 0.15	89.31 ± 4.25	25.5 ± 1.21	71.79 ± 3.41
Total	3.35 ± 0.17	89.49 ± 4.27	25.5 ± 1.21	71.79 ± 3.41
	<u>Site GP-1</u>			
^{226}Ra	1.12 ± 0.05	1.12 ± 0.05	$0.001 \pm (1)$	$0.004 \pm (1)$
^{210}Pb	4.68 ± 0.3	131.7 ± 8.5	37.6 ± 2.4	105.9 ± 6.8
Total	5.80 ± 0.35	132.82 ± 8.55	37.6 ± 2.4	105.9 ± 6.8

(1) Value below 10^{-4}

Table VIII. Total Dose at Sites 7R and GP-1 (mrem/yr)

<u>Site 7R</u>					
	<u>Whole Body</u>	<u>Bone</u>	<u>Kidney</u>	<u>Liver</u>	<u>Lung</u>
Inhalation	0.16±0.01	5.02±0.31	3.12±0.24	0.90±0.08	19.21±0.84
Ingestion	3.35±0.17	89.49±4.27	-	25.50±1.21	71.79±3.41
External	<u>158.4±27.2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
Total	161.9±27.4	94.5±4.6	3.1±0.2	26.4±1.3	91.0±4.2

<u>Site GP-1</u>					
Inhalation	0.18±0.006	5.91±0.18	3.74±0.05	1.09±0.01	23.02±0.29
Ingestion	5.80±0.35	132.82±8.55	-	37.6±2.4	105.9±6.8
External	<u>167.6±101.6</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
Total	173.6±102	138.7±8.7	3.74±0.05	38.7±2.4	128.9±7.1

VIII. T-Well Water Elevations

Date	T-1	T-2	T-3	T-4		Comments
9-22-81	No water	No Water	7062.6	7057.9		Collar Elevation
10-25-81	No water	No Water	7062.6	7058.0		T-1 7096.4
11-29-81	No water	No water	7062.6	7058.0		T-2 7079.8
12-29-81	No water	No Water	7062.6	7058.0		T-3 7098.3
1-15-82	Buried by snow + ice	No Water	Buried by snow + ice	Buried by snow + ice		T-4 7088.9
2-5-82	Buried by snow + ice	No Water	Buried by snow + ice	Buried by snow + ice		
2-19-82	Buried by snow + ice	No Water	Buried by snow + ice	Buried by snow + ice		
3-5-82	No water	No Water	Plugged with dirt	Buried by snow + ice		T-3 plugged because casing was perforated above ground level
4-16-82	Plugged with dirt	No Water	Plugged with dirt	Buried by snow + ice		T-1 + T-3 plugged because casing was perforated above ground level
5-21-82	No water	No water	No Water	No Water		
6-3-82	No water	No Water	No water	7059.0		
6-11-82	No water	No Water	No water	7059.0		
7-23-82	No Water	No Water	7063.9	7058.6		
8-20-82	No Water	No Water	No Water	7058.4		
9-24-82	No water	No water	No Water	7058.4		
10-22-82	No Water	No Water	No water	7058.5		
11-12-82	No water	No water	No water	7058.8		

IX. Pit Wall Water Seepage Monitoring

Third Quarter 1982

Monitoring of pit wall seepage was done only in pit 3.09 during the third quarter of 1982. Data which was obtained is as follows:

Coordinates: N107,556.48
E 90,649.88

Elevation of Seep: 7035 crest
6989 seep
45.1 feet from crest

3.09 Seep 7/2/82

TDS 542 mg/l
Cl⁻ 124 mg/l
SO₄ 196 mg/l


X. Bioassay Report

The following report is submitted in accordance with Amendment No. 10, License Condition 19.

During the quarter beginning July 1, 1982 and ending September 30, 1982, the action level of 15 $\mu\text{g}/\text{l}$ uranium for urinalysis was reached in one instance.

On July 13, 1982, one individual (a mill operator) had results of 15 $\mu\text{g}/\text{l}$. His preceding sample (June 28) has results of 4 $\mu\text{g}/\text{l}$. There were no additional samples taken because the individual terminated employment on July 14, 1982. No other operators had results approaching 15 $\mu\text{g}/\text{l}$ and this individual had not performed any tasks requiring a RWP prior to the sample date. The cause of the results are unknown, and no action was taken due to the employee's termination.

No in vivo measurements were performed during the quarter.


Marvin C. Nolte
Radiation Safety Officer