

BIG ROCK POINT NUCLEAR POWER PLANT

ENVIRONMENTAL MONITORING REPORT

JANUARY - DECEMBER 1979

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This report provides information relating to environmental monitoring at the Big Rock Point Plant during the period of January through December 1979 as required by Technical Specification 6.9.3.b.

## II. ENVIRONMENTAL MONITORING

### A. Sampling Summary

For each medium sampled, Table II-A1 contains the number of sampling locations, total number of samples collected and the number of locations at which levels were found to be significantly above local concurrent background. A listing of the highest, lowest and annual average concentration for the sampling point with the highest average concentration is presented in Table II-A2.

### B. Environmental Dose Estimates

Levels of radioactive materials in environmental media do not indicate the likelihood of public intake in excess of 1% of those that could result from continuous annual exposure to the concentration values listed in Appendix B, Table II, Part 20.

### C. Variation of Environmental Concentrations With Time

Statistical analyses of the data for significance at  $P < 0.05$  show that there has been no detectable increase in radioactivity levels of environmental media that can be attributed to plant effluents, with the exception of lake water and aquatic biota samples collected in the shallow waters immediately adjacent and to the east of the discharge.

### D. Discussion and Interpretation of Results

1. Air Samples: No significant increase above concurrent background was observed at the air particulate sampling locations.

No iodine-131 activity on the charcoal cartridges was observed above the minimum detectable level. This is consistent with expected results based on actual plant effluents and site meteorology.

2. Lake Water: Monthly composite samples of the plant intake and discharge indicate a statistically significant difference at  $p < 0.05$ . Gross Beta concentrations ranged from  $<1$  to  $63$  pCi/l and tritium concentrations ranged from  $<300$  to  $830$  pCi/l. A comparison of calculated discharge concentrations based on effluent analyses and net measured discharge concentrations is presented in Table II-A3.

The Charlevoix drinking water sample does not indicate the presence of other than natural background radioactivity.

3. Well Water: Well water samples do not indicate the presence of other than natural background radioactivity.

4. Milk: Strontium-90 and Cesium-137 were the only radionuclides detectable in milk samples collected during the period. Concentrations of these two isotopes are consistent with or lower than the previous year.
5. Aquatic Biota: Samples of periphyton, algae, crayfish, and fish are collected semiannually, when available. Periphyton (June, 1979) and crayfish (June and September, 1979) samples collected near the discharge appear to contain higher concentrations of certain radionuclides (Cs-137 and Co-60) than samples collected at the remote locations. Cs-137 and Co-60 have consistently been present in liquid effluents from the plant (Cs-137 is also attributable to fallout). Therefore, the concentration of these two isotopes in biota would be expected to be higher in the immediate vicinity of the discharge.

Table II-A4 presents the crayfish sampling results for June and September 1979 and the periphyton sampling results for June 1979. These results are consistent with past aquatic biota samples and do not seem to indicate a change when compared to prior years.

This localized increase has also been observed and reported by the Great Lakes Radioecology Group at Argonne National Laboratory. It should be noted, however, that current levels are consistent with levels observed over the last six or seven years.

6. Gamma Dose: Both thermoluminescent dosimeters and film are used to monitor the levels of gamma radiation in the vicinity of the site. There were no significant differences in levels observed at the various sampling locations.

TABLE II-A1

BIG ROCK POINT NUCLEAR POWER PLANT  
RADIOLOGICAL ENVIRONMENTAL MONITORING  
SAMPLING AND ANALYSIS SUMMARY  
JANUARY 1, 1979 TO DECEMBER 31, 1979

<u>MEDIUM</u>	<u>DESCRIPTION</u>	<u>TYPE OF ANALYSIS</u>	<u>FREQUENCY</u>	<u># OF SAMPLING LOCATIONS</u>	<u># OF SAMPLES COLLECTED</u>	<u>NUMBER OF LOCATIONS SIGNIFICANTLY ABOVE CONCURRENT BACKGROUND</u>
Air	Continuous @ approx 1 cfm	Gross Beta, I-131	Weekly	7	364	None
Lake Water	Composite	Gross Beta, H-3	Monthly	3	36	One (Plant Discharge)
Well Water	Grab	Gross Beta	Monthly	1	12	None
Milk	Grab	I-131, Sr-89/90, Gamma Isotopic (Cs-137)	Monthly	4	47	None
Gamma Dose	Continuous	TLD	Monthly	12	144	None
			Quarterly	12	48	None
		Film	Monthly	12	144	None
Aquatic Biota	Grab	Gross Beta, Sr-89/90, Gamma Isotopic	Semi-annually	5	40	One (Plant Discharge)

TABLE II-A2

BIG ROCK POINT NUCLEAR POWER PLANT  
HIGH, LOW AND AVERAGE CONCENTRATION  
FOR THE HIGHEST AVERAGE SAMPLING LOCATION  
JANUARY 1, 1979 TO DECEMBER 31, 1979

<u>MEDIA</u>	<u>TYPE OF ANALYSIS</u>	<u>UNITS</u>	<u>LOCATION</u>	<u>HIGH</u>	<u>LOW</u>	<u>AVERAGE</u> <sup>(h)</sup>
Air	Gross Beta I-131 <sup>(a)</sup>	$\rho\text{Ci}/\text{m}^3$	CH (4.5 miles SW)	0.08	0.01	0.04
		$\rho\text{Ci}/\text{m}^3$	All	----	----	<MDL
Lake Water	Gross Beta <sup>(b)</sup> H-3 <sup>(c)</sup>	$\rho\text{Ci}/\ell$	Discharge	63	<MDL	18
		$\rho\text{Ci}/\ell$	Discharge	830	<MDL	471
Well Water	Gross Beta <sup>(b)</sup>	$\rho\text{Ci}/\ell$	Site	3	<MDL	2
Milk	I-131 <sup>(d)</sup> Cs-137 <sup>(b)</sup> Sr-89 <sup>(e)</sup> Sr-90	$\rho\text{Ci}/\ell$	All	----	----	<MDL
		$\rho\text{Ci}/\ell$	TD (4 miles SSE)	20	<MDL	7.5
		$\rho\text{Ci}/\ell$	All	----	----	<MDL
		$\rho\text{Ci}/\ell$	LK (3.5 mi E)	12	4	8.4
Gamma Dose <sup>(g)</sup>	TLD (monthly) TLD (quarterly) Film (monthly)	mR/mo	C (0.8 mi SW)	19.9	3.0	6.4
		mR/qtr	E (0.9 mi SSE)	17.2	8.4	13.3
		mR/mo	TR (50 mi SSW)	6	0	1
Biota <sup>(f)</sup>	All Identified $\gamma$	$\rho\text{Ci}/\text{g}$ (wet)	Discharge	64	0.1	32
		$\rho\text{Ci}/\text{g}$ (wet)	1/4 Mile N	4.1	4	4.1
		$\rho\text{Ci}/\text{g}$ (wet)	1/4 Mile N	2.6	2	2.3
		$\rho\text{Ci}/\text{g}$ (wet)	Discharge	6.9	4.8	5.8
		$\rho\text{Ci}/\text{g}$ (wet)				

## NOTES:

- a. Minimum Detectable Level (MDL) =  $0.02 \rho\text{Ci}/\text{m}^3$ .  
 b. MDL =  $1.0 \rho\text{Ci}/\ell$   
 c. MDL =  $100 \rho\text{Ci}/\ell$   
 d. MDL =  $0.5 \rho\text{Ci}/\ell$   
 e. MDL =  $5 \rho\text{Ci}/\ell$

- f. Two sample per location.  
 g. Includes background and transportation dose.  
 h. Based upon detectable measurements only.  
 i. MDLs are calculated as defined in HASL-300  
 (Rev 8/73), Pages D-08-01, 02 and 03.

TABLE II-A3  
BIG ROCK POINT NUCLEAR POWER PLANT  
Comparison of Measured and Effluent Concentrations

<u>Sampling Period</u>	<u>GROSS BETA CONCENTRATION (pCi/l)</u>			
	<u>Measured</u>			<u>Calculated Average *</u>
	<u>Discharge</u>	<u>Intake</u>	<u>Net</u>	<u>Discharge</u>
January	17	6	11	11
February	14	5	9	25
March	19	8	11	22
April	63	7	56	19
May	18	3	15	8
June	18	4	14	38
July	<1	<1	--	6
August	5	2	3	17
September	7	4	3	14
October	24	19	5	11
November	7	2	5	10
December	7	5	2	3

	<u>TRITIUM CONCENTRATION (pCi/l)</u>			
January	800	500	300	192
February	300	270	30	133
March	320	210	110	215
April	720	300	420	151
May	410	210	200	221
June	270	100	170	<1
July	450	360	90	14
August	350	390	---	121
September	<300	240	<60	<1
October	420	290	130	<1
November	830	380	450	<1
December	310	600	---	<1

NOTE:

\*Calculated from total quantities released (B&γ) determined by release tank samples divided by total dilution flow during the interval.

TABLE II A4

BIG ROCK POINT  
RADIOACTIVITY IN CRAYFISH SAMPLES  
(Semiannual Collections)

Collection Date	Collection Site	$\mu\text{Ci/g (wet)}$							
		Gross $\beta$	Sr-89	Sr-90	Cs-134	Cs-137	Mn-54	Co-60	Other $\gamma$
06/19/79	1/4 Mile S	2+1	<.025	.51+.05	<.08	.22+.06	<.08	.14+.07	<0.1
06/19/79	1/4 Mile N	2+1	<.025	.54+.05	<.08	.58+.11	.17+.06	.28+.11	<0.1
06/19/79	9 Mile Point	2+1	<.04(a)	.38+.06	<.08	.17+.07	<.08	<.05	<0.1
06/19/79	Mt McSuba	2+1	<.025	.25+.03	<.08	.15+.06	<.08	<.05	<0.1
06/19/79	Discharge	2+1	<.025	.41+.04	.37+.06	3.2+.0.3	.94+.11	2.0+.0.2	<0.1
09/29/79	1/4 Mile S	3+1	<.025	.783+.054	<.08	.55+.10	<.08	<.05	<0.1
09/28/79	1/4 Mile N	2+1	<.025	.41+.04	<.08	.77+.11	<.08	.13+.06	<0.1
09/28/79	9 Mile Point	3+1	<.025	.66+.07	<.08	.08	<.08	<.05	<0.1
09/28/79	Mt McSuba	3+1	<.025	.33+.03	<.08	.07+.02	<.08	<.05	<0.1
09/28/79	Discharge	8+1	<.025	.451+.009	.28+.06	3.0+.0.3	.17+.05	.87+.16	<0.1

(a) Lower sensitivity due to low chemical yield.

BIG ROCK POINT  
RADIOACTIVITY IN PERIPHYTON SAMPLES

06/20/79	1/4 Mile S	2+1	<.025	.024+.011	<.08	1.2 +0.1	.12+.04	.45+.11	<0.1(a)
06/20/79	1/4 Mile N	4+1	<.025	.03+.02	<.08	1.2 +0.1	.25+.06	.15+.10	<0.1
06/20/79	9 Mile Point	7+1	<.025	.059+.015	<.08	.39+.07	<.08	<.05	<0.1
06/21/79	Mt McSuba	7+1	<.025	.140+.030	<.08	.27+.06	<.08	<.05	<0.1
06/20/79	Discharge	1+1	<.028(b)	.150+.040	2.8+.0.3	30+3	14+1	17+2	<0.1

(a) Ce-144 = 1.5+0.3

(b) Lower sensitivity due to low chemical yield.