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DUKE POWER

April 24, 1992

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: McGuire Nuclear Station
Docket Nos. 50-369 and 50-370
Annual Radiological Environmental Operating Report
Reference TS 6.9.1.6

Gentlemen:

Pursuant to Technical Specification 6.9.1.6 for McGuire Nuclear Station, attached is the subject report for 1992 including Appendix E.

For questions concerning this report, please contact Kathleen Mullen at (704) 875-4302.

Very truly yours,

T. C. McMeekin, Vice President
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Attachments -Report
-Appendix E

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DUKE POWER COMPANY

McGuire Nuclear Station
Units 1 and 2

Annual
Radiological
Environmental
Operating Report
1991

**ANNUAL RADIOLOGICAL
ENVIRONMENTAL OPERATING REPORT**

for

DUKE POWER COMPANY
McGuire Nuclear Station
Units 1 and 2

January 1 - December 31

1991

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1.0 EXECUTIVE SUMMARY

This Annual Radiological Environmental Operating Report describes the McGuire Nuclear Station Radiological Environmental Program and the results of the program for the calendar year 1991.

Included in the report are identification of sampling locations, descriptions of environmental sampling and analysis procedures, comparisons of present environmental radioactivity levels and preoperational environmental data, analysis of trends in the environmental radioactivity levels since the beginning of station operation, comparisons of doses calculated from environmental measurements and doses calculated from effluent data, a summary of the results of the 1991 program, discussion of the results, and discussion of the quality assurance activities associated with the program. Deviations from program requirements are also included.

Sampling activities were conducted as prescribed by Selected Licensee Commitments. Required analyses were performed and detection capabilities met Selected Licensee Commitments Manual requirements. Supplemental samples also were taken in addition to the required sampling locations.

Concentrations observed in the environment in 1991 for station related radionuclides were within the ranges of concentrations observed in the past. All positive indications of radioactivity due to plant operations were less than the reporting levels specified by the Nuclear Regulatory Commission (NRC) and given in Selected Licensee Commitments. The environmental doses also were well below specified limits.

Statistical analysis of data indicates that there are no radionuclides demonstrating high to moderate increasing trends. All possible increasing trends showed moderate to no probability. It can be concluded that the contribution of McGuire to the radioactivity in the environment is slight.

2.0 INTRODUCTION

2.1 SITE DESCRIPTION AND SAMPLE LOCATIONS

McGuire Nuclear Station is located geographically near the center of the highly industrialized region of the Carolinas. The land is predominantly rural non-farm with a small amount of land being used to support beef cattle and farming. Recreation in the area is confined mostly to the lake and shores of Lake Norman and Mountain Island reservoir. The McGuire site is in northwestern Mecklenburg County, North Carolina, 17 miles north-northwest of Charlotte, North Carolina. The site is bounded to the west by the Catawba River channel and to the north by the 32,510 acre Lake Norman. Lake Norman is impounded by Duke Power Company's Cowans Ford Dam Hydroelectric Station, which is located immediately west of the site and on the Catawba River channel. The tailwater of Cowans Ford Dam is the upper limit of Mountain Island Reservoir. Mountain Island Dam is located 15 miles downstream from the site. Lookout Shoals Hydroelectric Station is at the upper reaches of Lake Norman. Marshall Coal Station is located on the western shore of Lake Norman, approximately 16 miles upstream from the site (reference 6.2 and 6.3). The sites exclusion radius is 2500 feet.

Tables 2.1-A and 2.1-B define the sampling and TLD locations for the McGuire Radiological Monitoring Program. Figures 1 and 2 illustrate these locations as compared to McGuire Nuclear Station.

2.2 SCOPE AND REQUIREMENTS OF ENVIRONMENTAL MONITORING PROGRAM

An environmental monitoring program has been in effect at McGuire Nuclear Station since 1977, four years prior to the Unit No. 1 startup in 1981. The preoperational program provided data on the existing environmental radioactivity levels for the site and vicinity which may be used to determine whether increases in environmental levels are attributable to the station. The operational program provides surveillance and backup support of detailed effluent monitoring which is necessary to evaluate the significance, if any, of the contributions to the existing environmental radioactivity levels that result from station operation.

This monitoring program is based on NRC guidance as reflected in Selected Licensee Commitments Manual Section 16.11-13 with regard to sample media, sampling locations, sampling frequency, and analytical sensitivity requirements. Tables 2.2-A and 2.2-B show the maximum values for LLD and the reporting levels, respectively, from Selected Licensee Commitments. Table 2.2-C shows the analysis schedule for each medium and the type of analysis required. Indicator and control locations were established for comparison purposes to distinguish radioactivity of station origin from natural or other "man-made" environmental radioactivity. The environmental monitoring program also verifies projected and anticipated radionuclide concentrations in the environment and related exposures from releases of radionuclides from McGuire Nuclear Station. This program provides surveillance of all appropriate critical exposure pathways to man and satisfies vital interests of the company, public, and state and federal agencies concerned with the environment.

TABLE 2.1-A

McGuire Radiological Monitoring Program Sampling Locations

Code:

W-Weekly

BW-BiWeekly

M-Monthly

C-Control

SM-Semi-monthly

Q-Quarterly

SA-Semi-annually

Sampling	Location Description	Air Radioiodine and Particulates	Surface Water	Drinking Water	Shoreline Sediment	Food Products	Fish	M&S	Broadleaf Vegetation
120	Site Boundary (0.4 mi NNE)	W							M
121	Site Boundary (0.5 mi NE)	W							
125	Site Boundary (0.4 mi SW)	W							M
129	Discharge Canal Bridge (0.4 mi ENE)		BW						
129	Discharge Canal Entrance to Lake Norman (0.6 mi ENE)				SA		SA		
130	Hwy 73 Bridge Downstream (0.6 mi SW)				SA				
131	Cowans Form Dam (0.7 mi W)		BW						
132	Charlotte Municipal Water Supply (11.2 mi SSE)			BW					
133	Cornelius (6.2 mi NE)	W							
134C	East Lincoln Jr. High School (8.7 mi WNW)	W							M
135C	Plant Marshall Intake Canal (12.0 mi N)		BW						
136C	Mooresville Municipal Water Supply (12.5 mi NNE)			BW					
137C	Pinnacle Access Area (12.0 mi N)				SA		SA		
138	Henry Cook Dairy (2.75 mi ESE)							SM	
139	William Cook Dairy (2.6 mi E)							SM	
140	Kidd Dairy-Cows (2.8 mi SSE)							SM	
141C	Lynch Dairy-Cows (14.8 mi WNW)							SM	
142	Davidson Municipal Water Supply (7.5 mi NE)			BW					
158	4-5 mile radius (5.0 mi NNE)								M
184	5 mile radius Gardens (2.5 mi ENE)					M(a)			
185	5 mile radius Gardens (4.9 mi N) - Special Interest					M(a)			
188	5 mile radius Gardens (2.8 mi N) - Special Interest					M(a)			

(a) during harvest season

Table 2.1-B

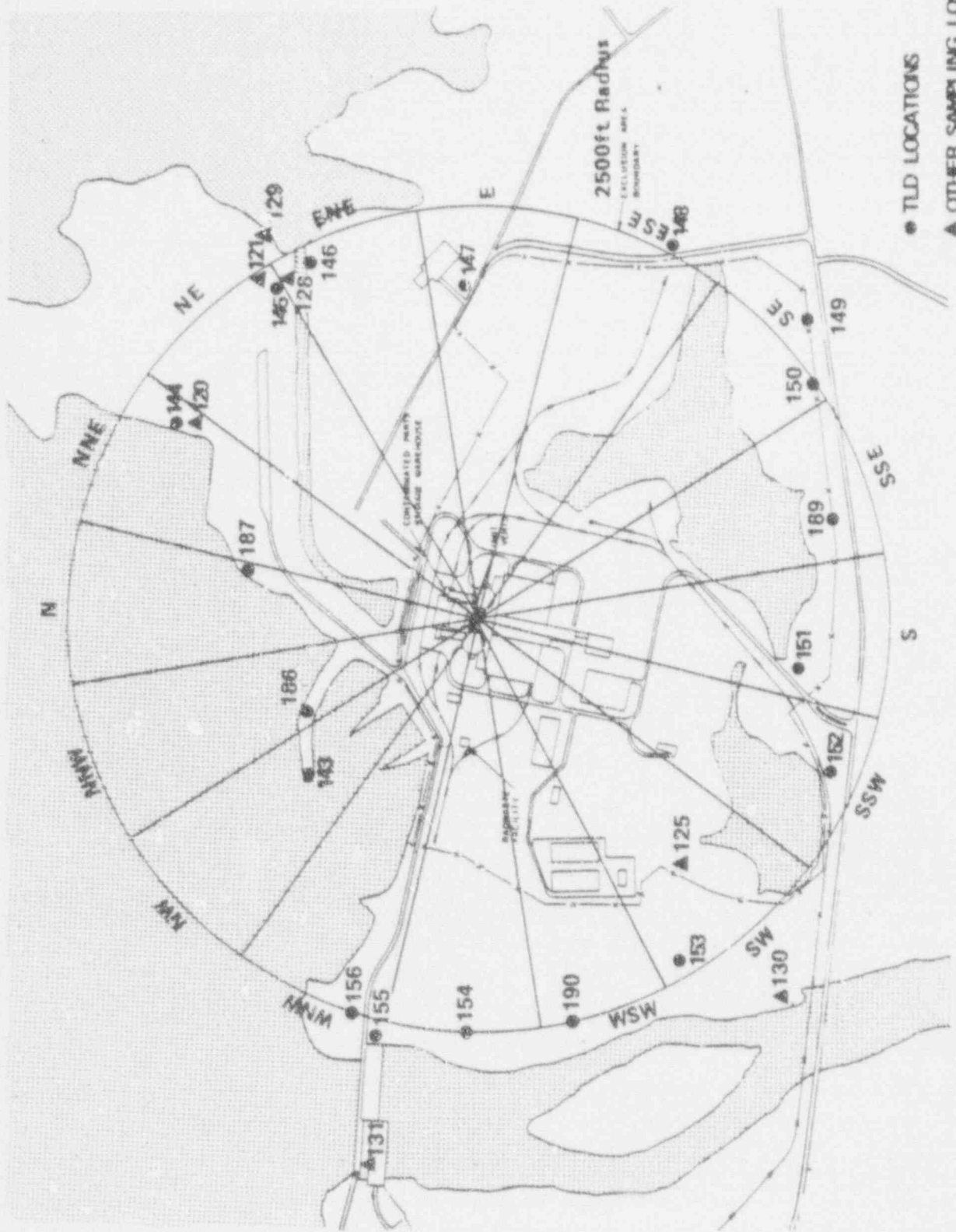
**MCGUIRE RADIOLOGICAL MONITORING PROGRAM SAMPLING LOCATIONS
(TLD LOCATIONS)**

SAMPLING LOCATION DESCRIPTION*			SAMPLING LOCATION DESCRIPTION*		
143	SITE BOUNDARY	(0.3 MILES NW)	164	4-5 MILE RADIUS	(4.5 MILES SSE)
144	SITE BOUNDARY	(0.4 MILES NNE)	165	4-5 MILE RADIUS	(5.0 MILES S)
145	SITE BOUNDARY	(0.5 MILES NE)	166	4-5 MILE RADIUS	(5.2 MILES SSW)
146	SITE BOUNDARY	(0.5 MILES ENE)	167	4-5 MILE RADIUS	(4.9 MILES SW)
147	SITE BOUNDARY	(0.4 MILES E)	168	4-5 MILE RADIUS	(4.7 MILES WSW)
148	SITE BOUNDARY	(0.5 MILES ESE)	169	4-5 MILE RADIUS	(4.4 MILES W)
149	SITE BOUNDARY	(0.6 MILES SE)	170	4-5 MILE RADIUS	(4.5 MILES WNW)
150	SITE BOUNDARY	(0.5 MILES SE)	171	4-5 MILE RADIUS	(4.5 MILES NW)
151	SITE BOUNDARY	(0.4 MILES S)	172	4-5 MILE RADIUS	(5.2 MILES NNW)
152	SITE BOUNDARY	(0.5 MILES SSW)	173	SPECIAL INTEREST	(8.5 MILES NNW)
153	SITE BOUNDARY	(0.5 MILES SW)	174	SPECIAL INTEREST	(8.7 MILES WNW)
154	SITE BOUNDARY	(0.5 MILES W)	175	CONTROL	(12.7 MILES WNW)
155	SITE BOUNDARY	(0.5 MILES WNW)	176	SPECIAL INTEREST	(11.0 MILES SW)
156	SITE BOUNDARY	(0.5 MILES WNW)	177	SPECIAL INTEREST	(8.6 MILES S)
189**	SITE BOUNDARY	(0.4 MILES SSE)	178	SPECIAL INTEREST	(9.2 MILES SE)
190**	SITE BOUNDARY	(0.5 MILES WSW)	179	SPECIAL INTEREST	(10.4 MILES ESE)
157	4-5 MILE RADIUS	(4.8 MILES N)	180	SPECIAL INTEREST	(11.5 MILES NNE)
158	4-5 MILE RADIUS	(4.4 MILES NNE)	181	SPECIAL INTEREST	(6.7 MILES NE)
159	4-5 MILE RADIUS	(5.0 MILES NE)	182	SPECIAL INTEREST	(6.0 MILES NE)
160	4-5 MILE RADIUS	(4.9 MILES ENE)	183	SPECIAL INTEREST	(5.5 MILES S)
161	4-5 MILE RADIUS	(4.7 MILES E)	186	SPECIAL INTEREST	(0.2 MILES NNW)
162	4-5 MILE RADIUS	(4.6 MILES ESE)	187	SPECIAL INTEREST	(0.3 MILES N)
163	4-5 MILE RADIUS	(5.0 MILES SE)			

* All TLD samples are collected quarterly.

** These TLD's were added 12/91 as a result of GPS data (See Appendix A)

FIGURE 1



● TLD LOCATIONS
▲ OTHER SAMPLING LOCATIONS

Revision 33
1/1/92

135 A PLANT MARSHALL

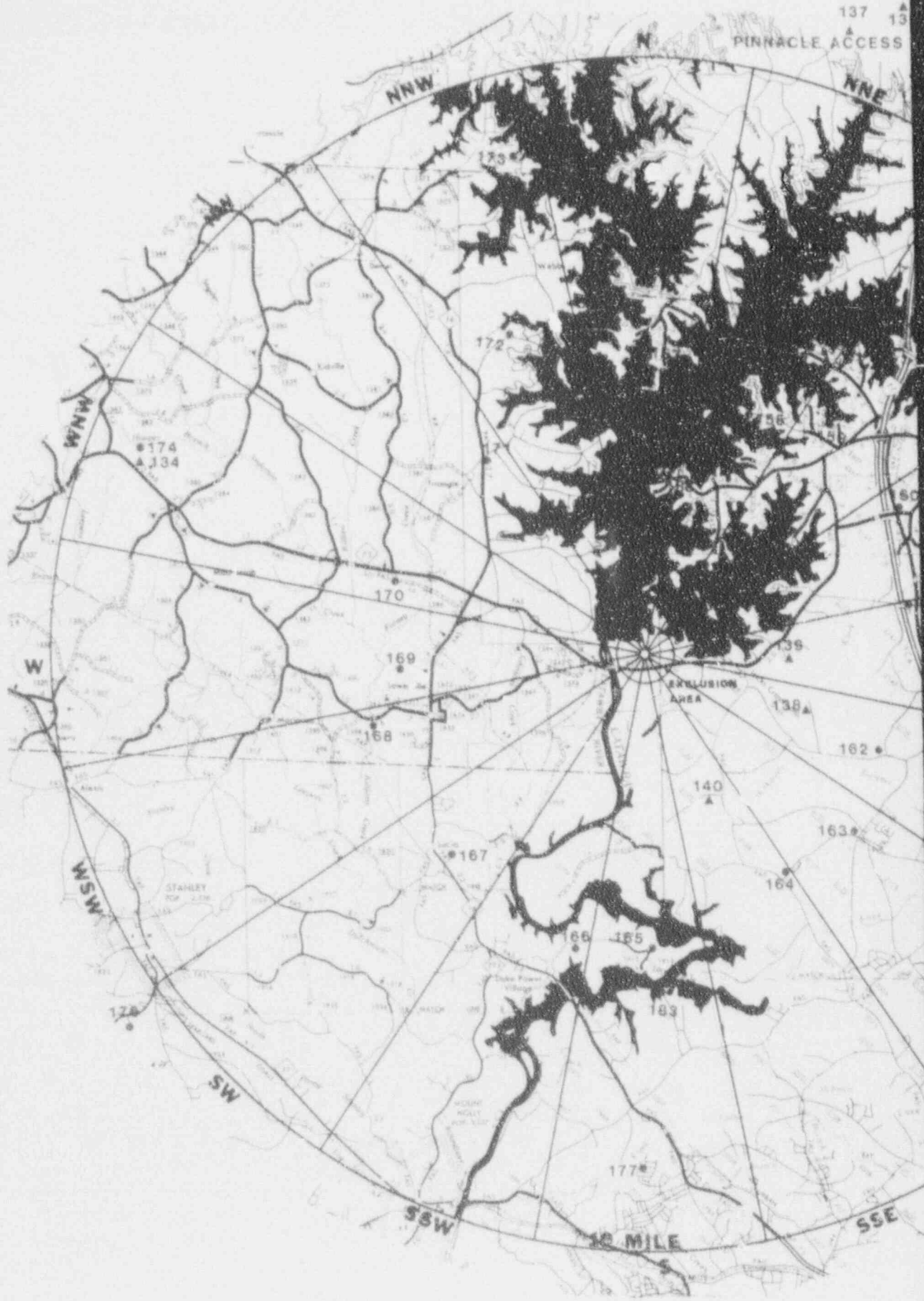
137 A 13

PINNACLE ACCESS

141

175

2-6



132 A

MOORESVILLE WATER
TREATMENT PLANT

• 180



- TLD LOCATIONS
- ▲ ALL OTHER SAMPLING LOCATIONS

Figure 2

LEGEND

- ROADWAY UNIMPROVED ROAD
- ROADWAY GRAVEL AND GRAVEL ROAD
- ROADWAY SOIL, GRAVEL OR STONE SURFACE ROAD
- ROADWAY HARD SURFACE ROAD
- ROADWAY 1 LANE UNIMPROVED HIGHWAY
- ROADWAY DIVIDED HIGHWAY
- ROADWAY HIGHWAY WITH FRONTAGE ROADS
- ROADWAY FULL CONTROL ACCESS
- ROADWAY FEDERAL AID INTERSTATE ROAD
- ROADWAY FEDERAL AID PRIMARY ROAD
- ROADWAY FEDERAL AID SECONDARY ROAD
- ROADWAY FEDERAL AID USHWY
- ROADWAY HIGHWAY SYSTEM ROAD
- ROADWAY PROJECTED LOCATION
- ROADWAY INTERSECTION DISTANCE
- ROADWAY TRAFFIC SIGNAL
- ROADWAY HIGHWAY INTERCHANGE
- ROADWAY DETAILED HIGHWAY INTERCHANGE
- ROADWAY INTERSTATE HIGHWAY
- ROADWAY U.S. NUMBERED HIGHWAY
- ROADWAY N.C. NUMBERED HIGHWAY
- ROADWAY SECONDARY ROAD NUMBER
- ROADWAY UNDERGROUND CABLE
- ROADWAY RAILROAD ANY NUMBER OF TRACKS USED BY SINGLE OPERATING COMPANY
- ROADWAY RAILROAD ANY NUMBER OF TRACKS USED BY MORE THAN ONE OPERATING COMPANY OR SAME OR ADJACENT SECTIONS OF RAIL
- ROADWAY RAILROAD SWITCH
- ROADWAY GRADE CROSSING
- ROADWAY UNDERPASS
- ROADWAY OVERPASS
- ROADWAY TUNNEL
- ROADWAY AIRPORT OR MARINE CORPS FIELD
- ROADWAY COPIER OF MUNICIPAL AIRPORT
- ROADWAY AIRCRAFT FIELD
- ROADWAY HANGAR OR FIELD "E" IN STRIP
- ROADWAY DOCK, PIER OR LANDING
- ROADWAY POND OR SOIL POND
- ROADWAY LIGHT RAILROAD
- ROADWAY LIGHTHOUSE
- ROADWAY COAST GUARD STATION
- ROADWAY CANAL
- ROADWAY NARROW STREAM
- ROADWAY WIDE STREAM
- ROADWAY DAM WITH LOCK
- ROADWAY DAM
- ROADWAY RESERVOIR, POND OR LAKE
- ROADWAY NEIGHBORHOOD NAME NUMBERS INDICATE ELEVATION
- ROADWAY ROAD THROUGH HOUSING TRAIL
- ROADWAY HIGHWAY BRIDGE OVER 20 FT.
- ROADWAY GRADE GRADE ON BRIDGE
- ROADWAY HIGHWAY TUNNEL
- ROADWAY FORD
- ROADWAY STEEP SLOPE
- ROADWAY COUNTY LINE
- ROADWAY CITY LIMITS
- ROADWAY RESERVATION OR PARK BOUNDARY
- ROADWAY UNIMPROVED AREA
- ROADWAY UNIMPROVED AREA, POPULATION ETC.
- ROADWAY COUNTY SEAT
- ROADWAY OTHER TOWNS AND VILLAGES
- ROADWAY TRANSFER STATION
- ROADWAY INCORPORATED CITY OR VILLAGE (UNINCORPORATED)
- ROADWAY SCHOOL
- ROADWAY CHURCH
- ROADWAY CHURCH WITH CENTER
- ROADWAY CEMETERY
- ROADWAY HOSPITAL
- ROADWAY CORRECTIONAL OR PENAL INSTITUTION
- ROADWAY HIGHWAY GARAGE OR WAREHOUSE YARD
- ROADWAY HIGHWAY DIV. OR DIST. OFFICE
- ROADWAY WEIGHT STATION
- ROADWAY PATROL STATION
- ROADWAY ARMY AREA
- ROADWAY HIGHWAY - SMALL HISTORICAL SITE

SI
APERTURE
CARD

Also Available On
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SCALE OF MILES



MCGUIRE NUCLEAR STATION

Figure 2
Map of REMI
Sampling Locations

Table 2.2-A

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD)

ANALYSIS	WATER (pCi/l)	AIRBORN PARTICULATE OR GAS (pCi/m ³)	FISH (pCi/kg,wet)	MILK (pCi/l)	BROAD LEAF VEGETATION (pCi/kg,wet)	SEDIMENT (pCi/kg, dry)
Gross beta	4	N.A.	N.A.	N.A.	N.A.	N.A.
H-3	2000*	N.A.	N.A.	N.A.	N.A.	N.A.
Mn-54	15	N.A.	130	N.A.	N.A.	N.A.
Fe-59	30	N.A.	260	N.A.	N.A.	N.A.
Co-58, 60	15	N.A.	130	N.A.	N.A.	N.A.
Zn-65	30	N.A.	260	N.A.	N.A.	N.A.
Zr-95	15	N.A.	N.A.	N.A.	N.A.	N.A.
Nb-95	15	N.A.	N.A.	N.A.	N.A.	N.A.
I-131	1	7×10^{-2}	N.A.	1	60	N.A.
Cs-134	15	5×10^{-2}	130	15	60	150
Cs-137	18	6×10^{-2}	150	18	80	180
Ba-140	15	N.A.	N.A.	15	N.A.	N.A.
La-140	15	N.A.	N.A.	15	N.A.	N.A.

* If no drinking water pathway exists, a value of 3000 pCi/l may be used.

Table 2.2-B

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

REPORTING LEVELS

ANALYSIS	WATER (pCi/l)	AIRBORN PARTICULATE OR GAS (pCi/m ³)	FISH (pCi/kg,wet)	MILK (pCi/l)	BROAD LEAF VEGETATION (pCi/kg,wet)
H-3	2 X 10 ⁴ (1)	N.A.	N.A.	N.A.	N.A.
Mn-54	1 x 10 ³	N.A.	3 x 10 ⁴	N.A.	N.A.
Fe-59	4 x 10 ²	N.A.	1 x 10 ⁴	N.A.	N.A.
Co-58	1 x 10 ³	N.A.	3 x 10 ⁴	N.A.	N.A.
Co-60	3 x 10 ²	N.A.	1 x 10 ⁴	N.A.	N.A.
Zn-65	3 x 10 ²	N.A.	2 x 10 ⁴	N.A.	N.A.
Zr-Nb-95	4 x 10 ²	N.A.	N.A.	N.A.	N.A.
I-131	2	1	N.A.	3	1 x 10 ²
Cs-134	30	10	1 x 10 ³	60	1 x 10 ³
Cs-137	50	20	2 x 10 ³	70	2 x 10 ³
Ba-La-140	2 x 10 ²	N.A.	N.A.	3 x 10 ²	N.A.

(1) For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 3 x 10⁴ pCi/l may be used.

Table 2.2--C

McGuire Radiological Monitoring Program Analysis

Sample Medium	Analyses Schedule	Analyses				
		Gamma Isotopic	Tritium	Low Level I-131	Gross Beta	TLD
Radioiodine & Particulates	Weekly	X				
		X			X	
Direct Radiation	Quarterly					X
Surface Water	Biweekly			X		
	Monthly Composite	X				
	Quarterly Composite		X			
Drinking Water	Biweekly			X		
	Monthly Composite	X				
	Quarterly Composite		X		X	
Shoreline Sediment	Semiannually	X				
Milk	Semimonthly	X		X		
Fish	Semiannually	X				
Broadleaf Vegetation	Semiannually	X				
Food Products	Monthly (during harvest season)	X				

2.3 STATISTICAL AND CALCULATIONAL METHODOLOGY

2.3.1 ESTIMATION OF THE MEAN VALUE

There was one (1) basic statistical calculation performed on the raw data resulting from the environmental sample analysis program. The calculation involved the determination of the mean value for the indicator and the control samples for each sample medium. The mean is a widely used statistic. This value was used in the reduction of the data generated by the sampling and analysis of the various media in the Environmental Monitoring Program. The following equation was used to estimate the mean:

$$\bar{x} = \frac{\sum_{i=1}^N x_i}{N}$$

Where:

\bar{x} = estimate of the mean,

i = individual sample,

N = total number of samples with a net activity (or concentration)

x_i = net activity (or concentration) for sample i .

NOTE: "Net activity (or concentration)" is the activity (or concentration) determined to be present in the sample. No "Minimum Detectable Activity", "Lower Limit of Detection", "Less Than Level", or negative activities or concentrations are included in the calculation of the mean.

2.3.2 LOWER LEVEL OF DETECTION AND MINIMUM DETECTABLE ACTIVITY

The Lower Level of Detection (LLD) and Minimum Detectable Activity (MDA) are used throughout the Environmental Monitoring Program, both in the Selected Licensee Commitments and in the implementation of the specifications.

The LLD, as defined in the Selected Licensee Commitments Manual is the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is an a priori lower limit of detection. The actual LLD is dependent upon the standard deviation of the background counting rate, the counting efficiency, the sample size (mass or volume), the radiochemical yield, and the radioactive decay of the sample between sample collection and counting. The "required" LLD's for each sample medium and selected radionuclides are given in the Technical Specifications.

The MDA may be thought of as an "actual" LLD for a particular sample measurement remembering that the MDA is calculated using a sample

background instead of a system background. In gamma spectroscopy analyses, the sample background may be elevated above the system background due to the continuum produced by higher energy gammas from other radionuclides (either man-made or naturally produced). The continuum increases the smallest concentration of a particular radionuclide that could be positively identified in the sample. Therefore, to insure that the "required" LLD is not exceeded for any radionuclide in a sample medium, the MDA is calculated based on the actual background in the area of the identifying gamma energy and is compared to the "required" LLD. If the MDA exceeds the "required" LLD, the sample is counted for a longer time period so that the standard deviation of the sample background is minimized. If the "required" LLD exceeds the MDA, then the analysis of the sample meets the requirements for the detection capability for environmental sample analysis.

For "gross" counters (such as alpha/beta proportional counters and liquid scintillation counters), the MDA is calculated using a batch background count. This MDA is then compared to the "required" LLD. If the MDA exceeds the "required" LLD, the sample is counted for a longer time period so that the standard deviation of the batch background is minimized. If the "required" LLD exceeds the MDA, then the analysis of the sample meets the requirements for the detection capability for environmental sample analysis.

2.3.3 TREND IDENTIFICATION

One of the purposes of an environmental monitoring program is to determine if there is a buildup of radionuclides in the environment due to the operation of the nuclear station. This is traditionally done by looking at historical data (including preoperational data) and determining if a trend exists. Trends, if they exist, may be either positive or negative. Since nuclear reactor operations do not normally remove radioactivity from the surrounding environment, a negative trend in a particular radionuclide's concentration in an environmental medium does not indicate that reactor operations are removing radioactivity from the environment but that reactor operations are not adding that radionuclide to the environment in quantities exceeding the preoperational level and that the normal removal processes (radioactive decay, deposition, resuspension, etc.) are influencing the concentration.

In some cases, visual inspection of tabular or graphical presentations of data may be sufficient to determine if a trend exists. In other cases, it may not be so obvious. Therefore, it is desirable to obtain a single numerical value from the data which will permit a meaningful interpretation of the relationship existing between the variations in the data. If it is assumed that a linear relationship exists between the time after startup of the reactor and the amount of radionuclides in a particular environmental medium, the least squares regression method may be used to define the linear relationship. To determine if the data actually correlate to the straight line assumption, the theoretical variance is compared to the actual variance. The numerical value that summarizes this comparison is known as the correlation coefficient. This correlation coefficient, symbolized by "r", is a determination of how closely the data fit a straight line and may be calculated from the equation on the next page:

$$r = \frac{N\sum XY - \sum X \sum Y}{[(N\sum X^2 - (\sum X)^2)(N\sum Y^2 - (\sum Y)^2)]^{1/2}}$$

Where:

- r = correlation coefficient for the data set of X and Y,
 X = the year or point in time,
 Y = the radionuclide concentration associated with X,
 N = number of observations.

The range of values as calculated by the correlation coefficient lies between positive on (+1) and negative on (-1). The absolute value of the correlation coefficient represents the probability of a trend. Zero (0) represents no indication of either a positive or negative trend. A positive (+) correlation coefficient indicates an increasing trend, and conversely, a negative (-) correlation coefficient indicates a decreasing trend. The ranges of a correlation coefficient may be summarized as following:

- 1 > |r| > 0.7 High to moderate probability of a trend.
 0.7 > |r| > 0.3 Moderate to poor probability of a trend.
 0.3 > |r| > 0 Poor to no probability of trend.

Identifying a trend by using the correlation coefficient is only useful for the time periods where the discharge from the nuclear plant is relatively stable and no other sources of radioactivity are present. Substantial increases or decreases in the amount of a particular radionuclide's release from the nuclear plant will greatly affect the resulting environmental levels; therefore, a knowledge of the release of a radionuclide from the nuclear plant is necessary to completely interpret the trends, or lack of trends, determined from the environmental data. Other factors that may affect environmental levels of radionuclides include prevailing weather conditions (periods of drought or heavier than normal precipitation), construction in or around either the nuclear plant or the sampling location, addition or deletion of other sources of radioactive materials (such as the Chernobyl accident), etc.. Some of these factors may be obvious while others are sometimes unknown to the plant personnel.

The recent change in the method of calculating the mean (using only net positive results) will also affect the apparent trends.

Because of the above considerations, how trends are identified will depend not only on the least squares regression method, but will include some judgement by plant personnel on the factors affecting environmental levels.

2.3.4 TEST STATISTIC

In some cases, we would not expect to observe a buildup of radionuclides in the environment, but instead would expect to see a measurable increase in levels over a short duration. This is the case for direct radiation measurements, where the radiation level is measured over a finite period and is dependent upon whether plant discharges were occurring at that time or not. In this case, the correlation coefficient is not a sufficient indicator of whether effluents are having an impact on the environment, since there is no bioaccumulation. Another test is needed to give us a meaningful interpretation of the data. If we assume that the naturally occurring radiation levels around the plant are normally distributed and that the effluents are not affecting the environment outside of this normal distribution, then we can compare the values of two sets of measurements taken at different times around the plant. One measurement can be taken when we are certain no effect is occurring and one when an effect may be occurring, to determine if they are statistically different from one another.

The statistic that compares the means from two sets of measurements to determine if there is a statistically significant difference is called the test statistic, or t-statistic, and is calculated as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{s_p \sqrt{1/n_1 + 1/n_2}}$$

Where:

\bar{X}_1 = the mean value of the first set of measurements

\bar{X}_2 = the mean value of the second set of measurements

s_p = the average standard deviation of the two sets of measurements

$$= \sqrt{s_p^2}$$

Where:

$$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$$

n_1 = the number of measurements in the first set

n_2 = the number of measurements in the second set

The calculated value of the test statistic is then compared to expected values of the test statistic tabulated based on the number of measurements taken and the degree of confidence required for the results. For our purposes, the expected value of the test statistic will always be chosen to give a 95% confidence level that a positive result is truly positive with only a 5% probability that a positive result is truly negative. This confidence level is chosen since it is consistent with the standard confidence levels specified for similar measurements.

Due to the existence of naturally occurring differences in background radiation levels over time (as a result of solar cycles and other meteorological phenomena) and systematic errors due to instrument variability, ratios of measurements can be used to calculate the t-statistic instead of individual measurements. By using ratios, the errors associated with the measurement process then cancel each other out and allow us to more accurately compare results from one year to the next. Specifically, in the case of TLD measurements, the inner ring of TLD results is ratioed with the outer ring of TLD measurements in a given year and the ratio for one year is compared to the ratio for another year.

As with other environmental samples, outside factors may affect the results observed and the resulting trends identified. Therefore, the significance of trends will be based in part on judgment of plant personnel familiar with the factors affecting environmental levels, as well as the statistical results.

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM MONITORING PROGRAM - DISCUSSION, INTERPRETATION AND TRENDING OF RESULTS

The radionuclides with Selected Licensee Commitments reporting levels in the environmental media samples have been historically trended over a twelve-year period from 1979 - 1991. Analyses from 1977 - 1978 have been excluded since these results were much higher than the other preoperational years due to outside influence such as weapons testing. Including these results would have produced correlation coefficients and averages that were not representative. The highest annual mean concentration of each Selected Licensee Commitments radionuclide from the indicator and control locations for each media type was used for the estimation of the mean value and correlation coefficient. The preoperational analyses from 1981 were combined with the operational analyses from the latter part of 1981 and averaged to give one concentration for each radionuclide for that year. However, when preoperational comparisons were necessary, only the preoperational report was used.

Thirteen annual means were used to determine trends and often the average concentrations reported were negative. All negative values (concentrations) were replaced with a zero to properly represent environmental conditions. Figures 3 through 6 provide a graphical presentation of the annual mean concentrations for drinking water, shoreline sediment, fish, and TLD data. Some of these figures show both indicators and controls for significant radionuclides, while others show only indicators for clarity purposes. These media were chosen for graphical representation for special interest purposes or because they consistently show detectable activity for a few radionuclides. In addition, the percentages of Selected Licensee Commitments reporting levels were calculated for each reportable radionuclide in each media type.

Only the radionuclides with Selected Licensee Commitments reporting levels were historically trended and compared with the eleven-year average and control levels. It is important to note that while historical trends are helpful in determining radioactivity buildup, environmental radionuclide levels could be affected without exhibiting increasing or decreasing trends.

No Selected Licensee Commitments reporting levels were exceeded in 1991 due to plant effluents.

Sample analysis reports (SAR'S) are included in Appendix E. On many of these reports naturally occurring radionuclides (NOR) are listed. In most cases the listed NOR's are Potassium-40 (K-40) and Beryllium-7 (Be-7).

3.1 AIRBORNE RADIOIODINES AND PARTICULATES

3.1.1 RADIOIODINES

In 1991, 261 radioiodine samples were analyzed, 209 at four indicator locations and 52 at the control location.

The I-131, Cs-134, and Cs-137 concentrations did not significantly differ from the twelve-year average, preoperational data, or control location levels for the twelve-year period. The historical trends based on highest annual mean for indicator and control locations for I-131, Cs-134, and Cs-137 showed poor to no probability of increasing or decreasing trends as illustrated in Table 3.1.1-A. Cs-137 activity which was present on the cartridge but not on the particular filter, was determined to be inherent in the charcoal and was not included for trending purposes (see page 5-1)

Table 3.1.1-B shows the percentages of environmental concentrations to the Selected Licensee Commitments reporting levels for the indicators at the locations with the highest annual mean for 1991.

Table 3.1.1-B

Radionuclide	Concentration (pCi/m ³)	Reporting Level(pCi/m ³)	Percentage
I-131	0.00E0	1.00E0	0.00%
Cs-134	0.00E0	1.00E1	0.00%
Cs-137	0.00E0	2.00E1	0.00%

**Table 3.1.1-A Concentration of Radionuclides in
Airborne Radioiodines**

YEAR	Concentration (pCi/n. ³)					
	I-131		Cs-134		Cs-137	
	Indicator	Control	Indicator	Control	Indicator	Control
1979 *	3.28E-3	1.04E-3	1.19E-3	-7.64E-4	4.40E-3	1.47E-3
1980 *	2.04E-3	1.10E-3	-5.89E-5	-2.45E-4	6.70E-3	4.53E-3
1981 *	4.17E-3	6.27E-4	1.15E-3	2.99E-4	6.16E-3	5.32E-3
1982 *	1.42E-3	2.48E-3	4.85E-4	2.27E-3	3.82E-3	2.29E-3
1983 *	1.99E-3	2.01E-4	6.80E-4	4.98E-4	2.93E-3	3.21E-3
1984	3.17E-3	-1.15E-3	1.54E-3	3.05E-4	4.67E-3	3.39E-3
1985	3.15E-3	1.04E-3	2.43E-3	9.24E-4	4.49E-3	3.56E-3
1986	1.27E-2	6.10E-3	1.18E-3	1.09E-3	3.32E-3	2.99E-3
1987	1.07E-2	6.60E-3	1.08E-2	8.04E-3	1.49E-2	6.41E-3
1988	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1989	2.18E-2	0.00E0	0.00E0	0.00E0	1.02E-2	3.52E-2
1990	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
12 YEAR AVERAGE	5.37E-3	1.77E-3	1.62E-3	1.12E-3	5.13E-3	5.70E-3
1991	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
CORRELATION COEFFICIENT	0.21	0.01	0.05	0.08	-0.17	0.20

* Radioiodines and Particulates analyzed together.

NOTE: All negative values were replaced with "zero's" for calculational purposes.

3.1. PARTICULATES

In 1991, 261 particulate samples were analyzed, 209 at the four indicator locations and 52 at the control location.

The I-131, Cs-134, and Cs-137 concentrations did not significantly differ from the twelve-year average, preoperational data, and control location levels. The historical trends for the indicator and control locations with the highest annual mean for I-131, Cs-134, and Cs-137 showed moderate to no probabilities of increasing or decreasing trends as illustrated in Table 3.1.2-A.

Table 3.1.2-B shows the percentages of environmental concentrations to the Selected Licensee Commitments reporting levels for the indicator locations with the highest annual mean for 1991. No activity was detected and therefore no reporting levels were approached.

Table 3.1.2-B

Radionuclide	Concentration (pCi/m ³)	Reporting Level(pCi/m ³)	Percentage
I-131	0.00E0	1.00E0	0.00%
Cs-134	0.00E0	1.00E1	0.00%
Cs-137	0.00E0	2.00E1	0.00%

Table 3.1.2-A Concentration of Radionuclides in Airborne Particulates

YEAR	Concentration (pCi/m ³)					
	I-131		Cs-134		Cs-137	
	Indicator	Control	Indicator	Control	Indicator	Control
1979 *	3.28E-3	1.04E-3	1.19E-3	-7.64E-4	4.40E-3	1.47E-3
1980 *	2.04E-3	1.10E-3	-5.89E-5	-2.45E-4	6.70E-3	4.53E-3
1981 *	4.17E-3	6.27E-4	1.15E-3	2.99E-4	6.16E-3	5.32E-3
1982 *	1.42E-3	2.48E-3	4.35E-4	2.27E-3	3.82E-3	2.29E-3
1983 *	1.99E-3	2.01E-4	6.80E-4	4.98E-4	2.93E-3	3.21E-3
1984	2.72E-3	2.08E-3	9.90E-4	8.83E-4	1.74E-3	8.29E-4
1985	1.57E-3	2.05E-3	1.38E-3	1.05E-3	1.86E-3	1.32E-3
1986	4.42E-3	3.36E-3	2.76E-3	8.90E-4	4.98E-3	3.03E-3
1987	9.73E-3	0.00E0	7.25E-3	0.00E0	1.07E-2	7.91E-3
1988	0.00E0	9.15E-3	0.00E0	0.00E0	0.90E0	0.00E0
1989	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1990	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
12 YEAR AVERAGE	2.61E-3	1.84E-3	1.32E-3	4.91E-4	3.57E-3	2.49E-3
1991	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
CORRELATION COEFFICIENT	-0.27	0.06	0.02	-0.28	-0.53	-0.42

* Radiiodines and Particulates analyzed together.

NOTE: All negative values were replaced with "zero's" for calculational purposes.

3.2 DRINKING WATER

In 1991, 39 drinking water samples were analyzed for I-131/LL, 26 at the two indicator locations and 13 at the control location. Tritium (H-3) analyses were performed on 12 composite samples, eight at indicator locations and four at the control location. Thirty-nine samples were analyzed for all the other radionuclides with Selected Licensee Commitments reporting levels, 26 at indicator locations, and 13 at the control location. Analyses showed zero ranges for all indicator locations except for tritium, which means no other detectable activity was measured. All radionuclides did not significantly differ from the twelve-year average. All radionuclides, except tritium, did not significantly differ from preoperational data.

A moderate to poor probability of an increasing trend was indicated for the indicator locations for H-3. However, the 1991 H-3 concentration only resulted in 2.61% of the Selected Licensee Commitments reporting level. The correlation coefficients indicated a high to moderate probability of a decreasing trend for Co-60 indicator, Zr-95 indicator, Ba/La-140 indicator, and I-131 (indicator and control) locations. All other radionuclide indicators and controls exhibited moderate to no probabilities of increasing or decreasing trends. Table 3.2-A and Figure 3 illustrate these trends.

FIGURE 3

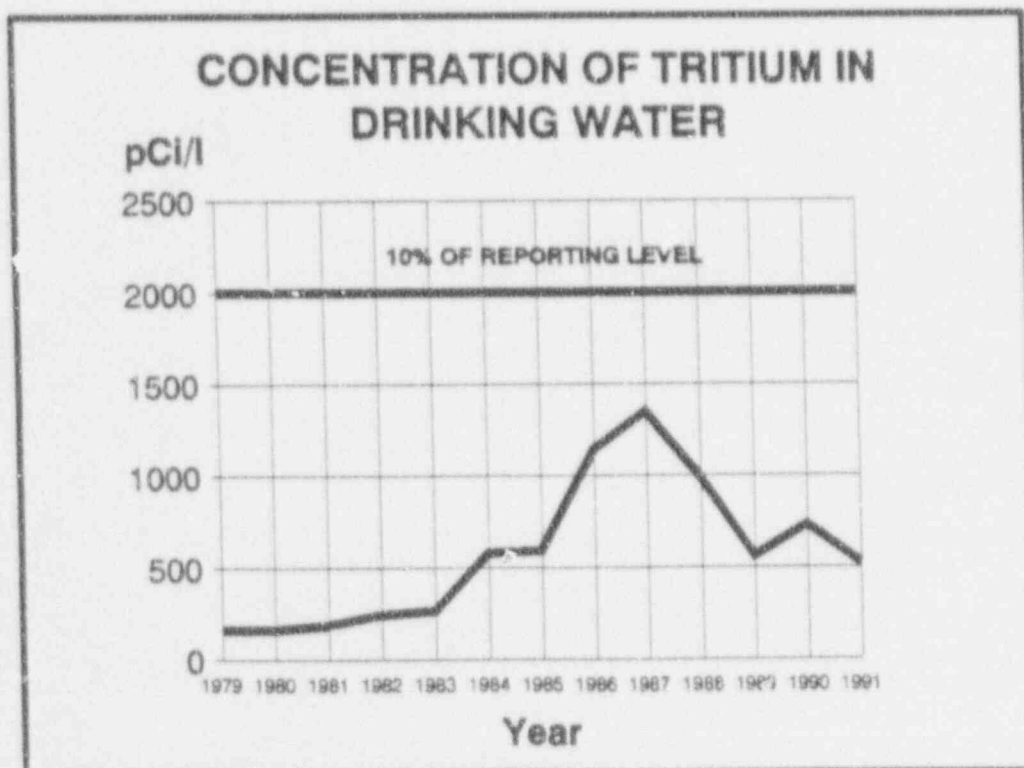


Table 3.2-B shows the percentages of environmental concentrations to the Selected Licensee Commitments reporting levels for the indicators at the locations with the highest annual mean for 1991.

Table 3.2-B

Radionuclide	Concentration (pCi/l)	Reporting Level (pCi/l)	Percentage
H-3	5.22E2	2.00E4	2.61%
Mn-54	0.00E0	1.00E3	0.00%
Fe-59	0.00E0	4.00E2	0.00%
Co-58	0.00E0	1.00E3	0.00%
Co-60	0.00E0	3.00E2	0.00%
Zn-65	0.00E0	3.00E2	0.00%
Nb-95	0.00E0	4.00E2	0.00%
Zr-95	0.00E0	4.00E2	0.00%
I-131/LL	0.00E0	2.00E0	0.00%
Cs-134	0.00E0	3.00E1	0.00%
Cs-137	0.00E0	5.00E1	0.00%
Ba/La-140	0.00E0	2.00E2	0.00%

Table 3.2-A Concentration of Radionuclides in Drinking Water

(Page 1 of 3)

Year	Concentration (pCi/liter)							
	H-3		Mn-54		Fe-59		Co-58	
	Indicator	Control	Indicator	Control	Indicator	Control	Indicator	Control
1979	1.65E2	1.50E2	1.46E0	4.27E-1	1.29E0	5.96E-1	1.14E0	2.01E0
1980	1.63E2	2.05E2	6.20E-1	-4.29E-1	1.77E0	5.20E-1	5.62E-1	-3.72E-1
1981	1.88E2	1.78E2	1.40E-1	-1.96E0	4.58E0	1.13E0	9.36E-1	4.33E-1
1982	2.43E2	1.45E2	8.63E-1	7.05E-2	3.50E0	-7.39E-1	7.71E-1	6.26E-1
1983	2.65E2	1.45E2	4.18E-1	-3.06E-2	1.44E0	7.93E-1	6.78E-1	-2.60E-1
1984	5.77E2	2.45E2	1.05E0	1.42E-1	2.15E0	1.60E-1	8.89E-1	-2.57E-1
1985	5.93E2	4.00E2	7.14E-2	9.49E-2	7.73E-1	-4.73E-1	3.39E-1	6.16E-1
1986	1.14E3	4.37E2	9.76E-1	-4.59E-2	2.16E0	-4.92E-1	3.82E-1	1.04E-2
1987	1.35E3	7.75E2	4.80E0	0.00E0	6.60E0	0.00E0	4.20E0	0.00E0
1988	9.92E2	7.11E2	0.00E0	2.50E0	0.00E0	0.00E0	0.00E0	0.00E0
1989	5.62E2	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1990	7.32E2	6.11E2	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
12 Yr. Avg.	5.81E2	3.34E2	8.67E-1	2.70E-1	2.02E0	2.67E-1	8.25E-1	3.08E-1
1991	5.22E2	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
Corr. Coef	0.63	0.30	-0.10	0.14	-0.37	-0.69	-0.18	-0.58

NOTE: All negative values were replaced with "zero's" for calculational purposes.

Concentration of Radionuclides in Drinking Water

(Page 2 of 3)

Year	Concentration (pCi/liter)							
	Co-60		Zn-65		Nb-95		Zr-95	
	Indicator	Control	Indicator	Control	Indicator	Control	Indicator	Control
1979	2.30E0	2.01E0	1.10E-1	2.56E-1	2.52E0*	-3.74E-2*	2.52E0*	-3.74E-2*
1980	2.26E0	1.80E0	1.18E0	-7.44E-1	1.71E0*	6.52E-1*	1.71E0*	6.52E-1*
1981	1.43E0	1.34E-1	1.76E0	1.29E0	2.30E0	1.47E0	2.42E0	1.81E0
1982	8.25E-1	5.98E-1	1.16E-1	9.43E-1	1.35E0	1.42E0	2.49E0	2.02E0
1983	1.26E0	1.22E0	-6.05E-2	-2.48E0	-3.99E-1	2.32E-1	1.82E0	1.05E0
1984	7.22E-1	-2.81E-1	5.03E-1	1.29E-1	7.47E-1	1.91E-1	2.70E0	-1.06E0
1985	8.44E-1	7.09E-1	-3.43E-1	-7.20E-2	9.32E-1	4.63E-1	1.09E0	5.70E-1
1986	2.33E-1	-3.46E-1	2.44E-1	7.25E-2	9.87E-1	1.06E0	5.17E-1	-4.43E-1
1987	0.00E0	0.00E0	0.00E0	0.00E0	5.30E0	0.00E0	0.00E0	7.10E0
1988	0.00E0	4.50E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1989	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1990	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
12 Yr. Avg.	8.23E-1	9.14E-1	3.26E-1	2.24E-1	1.32E0	4.57E-1	1.27E0	1.09E0
1991	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
Corr. Coef	-0.92	-.20	-0.55	-0.49	-0.37	-0.50	-0.88	-0.05

* Nb-95 and Zr-95 analyzed as Nb/Zr-95

NOTE: All negative values were replaced with "zero's" for calculational purposes.

Table 3.2-A Concentration of Radionuclides in Drinking Water

(Page 3 of 3)

Year	Concentration (pCi/liter)							
	I-131		Cs-134		Cs-137		Ba/La-140	
	Indicator	Control	Indicator	Control	Indicator	Control	Indicator	Control
1979	4.95E0	6.97E-1	-1.09E0	-4.12E-1	2.55E0	2.86E-1	1.62E0	1.54E-2
1980	7.39E-1	8.96E-1	-3.54E-1	-6.24E-1	9.53E-1	1.73E0	8.53E-2	2.06E-1
1981	1.83E0	1.05E0	1.46E0	4.77E-1	1.13E0	1.16E0	1.09E0	-8.20E-1
1982	2.45E0	7.79E-2	5.38E-1	2.64E0	1.08E0	3.50E0	8.28E-1	-6.73E-1
1983	4.34E-1	-5.57E-1	6.29E-1	1.54E0	8.91E-1	5.31E-1	4.26E-1	1.13E0
1984	9.46E-2*	-8.65E-2*	6.16E-1	-2.01E-1	2.80E0	6.07E-1	1.16E0	-7.66E-1
1985	-1.84E-1*	-1.27E-1*	1.00E0	5.55E-1	1.43E0	-1.79E-1	5.15E-1	7.75E-1
1986	3.07E-2*	5.63E-2*	8.18E-1	-1.45E-2	2.58E-1	2.83E-1	7.53E-1	-1.11E-1
1987	4.10E-1	0.00E0	0.00E0	5.90E0	4.20E0	2.80E0	0.00E0	4.00E0
1988	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1989	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1990	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
12 Yr. Avg.	8.77E-1	2.31E-1	4.22E-1	9.26E-1	1.27E0	9.08E-1	5.40E-1	5.11E-1
1991	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
Corr. Coef	-0.71	-0.72	-0.37	-0.01	-0.39	-0.39	-0.71	0.09

* I-131/LL analysis data used.

NOTE: All negative values were replaced with "zero's" for calculational purposes.

3.3 SURFACE WATER

In 1991, 39 surface water samples were analyzed for I-131/LL, 26 at the two indicator locations and 13 at the control location. Analyses for H-3 were performed on 12 samples, eight at indicator locations and four at the control location. Thirty-nine samples were analyzed for all other radionuclides with Selected Licensee Commitments reporting levels, 26 at indicator locations and 13 at the control location. All Selected Licensee Commitments radionuclides except H-3 showed zero ranges indicating that no other detectable activity was measured. All radionuclides, except H-3, were not significantly different from preoperational data and the control location levels. All radionuclides did not differ significantly from the twelve-year average.

There is a moderate to poor probability of an increasing trend for H-3 indicator. There is a high to moderate probability of a decreasing trend for Co-58 (indicator), Co-60 (control) and I-131 (indicator). The 1991 concentration of H-3 resulted in 3.77% of the Selected Licensee Commitments reporting levels. All other radionuclide indicators and controls exhibited moderate to no probability of increasing or decreasing trends. Table 3.3-A illustrates these trends.

Table 3.3-B shows the percentages of environmental concentrations to the Selected Licensee Commitments reporting levels for the indicators at the location with the highest annual mean for 1991.

Table 3.3-B

Radionuclide	Concentration (pCi/l)	Reporting Level (pCi/l)	Percentage
H-3	7.53E2	2.00E4	3.77%
Mn-54	0.00E0	1.00E3	0.00%
Fe-59	0.00E0	4.00E2	0.00%
Co-58	0.00E0	1.00E3	0.00%
Co-60	0.00E0	3.00E2	0.00%
Zn-65	0.00E0	3.00E2	0.00%
Nb-95	0.00E0	4.00E2	0.00%
-95	0.00E0	4.00E2	0.00%
I-131/LL	0.00E0	2.00E0	0.00%
Cs-134	0.00E0	3.00E1	0.00%
Cs-137	0.00E0	5.00E1	0.00%
Ba/La-140	0.00E0	2.00E2	0.00%

Table 3.3-A Concentration of Radionuclides in Surface Water

(Page 1 of 3)

Year	Concentration (pCi/liter)							
	H-3		Mn-54		Fe-59		Co-58	
	Indicator	Control	Indicator	Control	Indicator	Control	Indicator	Control
1979	1.85E2	1.66E2	8.95E-1	6.35E-1	1.69E0	2.55E0	1.47E0	1.90E-1
1980	2.13E2	1.93E2	2.17E0	5.81E-1	5.21E-1	9.48E-1	1.17E0	-5.16E-2
1981	1.75E2	1.70E2	4.95E-2	-1.10E0	1.79E0	3.40E0	9.74E-1	-1.35E-1
1982	3.30E2	1.23E2	1.02E0	-1.22E-1	1.97E0	-3.99E-2	1.63E-1	5.10E-1
1983	5.75E2	3.67E2	-2.30E-1	9.74E-1	1.76E0	-7.08E-1	6.14E-1	5.08E-2
1984	4.10E2	2.65E2	-7.55E-2	-4.19E-1	-4.88E-1	9.15E-1	3.30E-1	4.24E-1
1985	7.33E2	*	1.01E0	-4.75E-1	3.91E-1	1.04E0	7.61E-1	1.65E-1
1986	2.33E3	6.13E2	5.13E-1	3.97E-1	-1.67E-1	4.36E-2	-2.95E-3	3.31E-1
1987	9.20E2	7.70E2	0.00E0	0.00E0	1.10E1	0.00E0	0.00E0	0.00E0
1988	9.40E2	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1989	8.22E2	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1990	6.77E2	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
12 Yr. Avg.	6.93E2	2.22E2	4.71E-1	2.16E-1	1.59E0	7.41E-1	4.57E-1	1.39E-1
1991	7.53E2	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
Corr. Coef	0.49	-0.16	-0.61	-0.53	-0.06	-0.67	-0.85	-0.34

* No sample analyzed.

NOTE: All negative values were replaced with "zero's" for calculational purposes.

Table 3.3-A Concentration of Radionuclides in Surface Water

(Page 2 of 3)

Year	Concentration (pCi/liter)							
	Co-60		Zn-65		Nb-95		Zr-95	
	Indicator	Control	Indicator	Control	Indicator	Control	Indicator	Control
1979	2.45E0	2.60E0	8.62E-1	-5.33E-1	-2.53E-1*	5.77E-1*	-2.53E-1*	5.77E-1*
1980	1.36E0	1.12E0	7.70E-1	1.80E0	1.00E0*	-2.54E-1*	1.00E0*	-2.54E-1*
1981	2.47E-1	1.54E0	-6.29E-1	6.93E-1	-2.92E-1	3.50E-2	1.98E0	9.04E-1
1982	1.14E0	6.02E-1	6.28E-1	-3.93E-1	2.16E0	8.89E-1	2.23E0	8.92E-1
1983	1.66E0	2.01E0	-1.20E0	4.71E-1	3.22E-1	1.15E0	3.27E-2	1.41E0
1984	1.47E0	3.38E-1	-9.79E-2	5.91E-1	8.59E-1	2.66E-2	1.67E0	-1.45E-1
1985	3.86E-1	9.97E-1	1.22E0	-2.43E-2	6.10E-1	4.17E-1	1.16E0	1.74E0
1986	-1.36E-1	2.24E-2	-1.24E0	-1.65E0	1.05E0	1.19E0	1.33E0	-3.91E-1
1987	5.20E0	0.00E0	0.00E0	0.00E0	4.50E0	0.00E0	1.20E1	0.00E0
1988	0.00E0	0.00E0	2.70E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1989	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1990	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
12 Yr. Avg.	1.16E0	7.69E-1	5.15E-1	2.96E-1	8.75E-1	3.57E-1	1.78E0	4.60E-1
1991	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
Corr. Coef	-0.29	-0.81	-0.08	-0.54	-0.05	-0.34	0.03	-0.43

* Nb-95 and Zr-95 analyzed as Nb/Zr-95

NOTE: All negative values were replaced with "zero's" for calculational purposes.

Table 3.3-A Concentration of Radionuclides in Surface Water

(Page 3 of 3)

Year	Concentration (pCi/liter)							
	I-131		Cs-134		Cs-137		Ba/La-140	
	Indicator	Control	Indicator	Control	Indicator	Control	Indicator	Control
1979	2.66E0	-8.27E-1	-3.62E-1	-1.00E-1	2.63E0	-2.21E-1	2.26E-1	-4.25E-1
1980	1.13E0	1.20E0	-2.60E-1	-9.98E-1	1.97E0	1.27E0	9.70E-1	-3.20E-1
1981	2.32E0	-6.85E-1	2.10E-2	1.88E-1	1.05E0	2.44E0	6.98E-1	8.66E-1
1982	-3.11E-1	-9.19E-1	-5.68E-1	8.34E-1	1.23E-1	1.65E0	4.30E-1	-4.11E-1
1983	1.89E0	2.88E0	7.87E-1	2.50E-1	8.43E-1	2.39E-1	1.38E0	2.89E-1
1984	3.02E-2*	1.58E-1*	7.36E-1	1.70E0	9.46E-1	3.30E-2	-2.84E-1	-6.81E-3
1985	-8.69E-2*	-7.90E-2*	1.72E0	1.25E0	1.23E0	3.26E-1	3.79E-1	4.53E-1
1986	8.94E-2*	2.13E-2*	7.54E-1	1.13E-1	5.61E-1	1.97E-1	8.72E-1	8.29E-1
1987	0.00E0	0.00E0	4.40E0	0.00E0	4.70E0	0.00E0	0.00E0	0.00E0
1988	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1989	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
1990	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
12 Yr. Avg.	6.77E-1	3.55E-1	7.02E-1	3.61E-1	1.17E0	5.14E-1	4.13E-1	2.03E-1
1991	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
Corr. Coef	-0.73	-0.31	0.12	-0.20	-0.36	-0.58	-0.56	-0.21

* I-131/LL analysis data used.

NOTE: All negative values were replaced with "zero's" for calculational purposes.

3.4 MILK

In 1991, 108 milk samples were analyzed, 81 at the three indicator locations and 27 at the control location.

All Selected Licensee Commitments radionuclides showed a zero range indicating no detectable activity was measured in 1991. The I-131/LL, Cs-134, Cs-137, and Ba/La-140 concentrations did not significantly differ from the twelve-year average, preoperational data, and control levels.

A high to moderate probability of a decreasing trend was indicated for Cs-137 indicator. All other radionuclide indicators and controls exhibited moderate to no probability of increasing or decreasing trends. These trends are illustrated in Table 3.4-A.

Table 3.4-B shows the percentages of environmental concentrations to the Selected Licensee Commitments reporting levels for the indicators at the location with the highest annual mean for 1991.

Table 3.4-B

Radionuclide	Concentration (pCi/l)	Reporting Level(pCi/l)	Percentage
I-131/LL	0.00E0	3.00E0	0.00%
Cs-134	0.00E0	6.00E1	0.00%
Cs-137	0.00E0	7.00E1	0.00%
Ba/La-140	0.00E0	3.00E2	0.00%

Table 3.4-A Concentration of Radionuclides in Milk

Year	Concentration (pCi/liter)							
	I-131		Cs-134		Cs-137		Ba/La-140	
	Indicator	Control	Indicator	Control	Indicator	Control	Indicator	Control
1979	6.87E-3	-6.13E-2	-7.05E-1	7.63E-1	2.48E1	6.04E0	0.00E0	-6.15E-1
1980	1.06E0	3.22E-2	-7.94E-2	-6.12E-1	1.72E1	4.13E0	1.29E0	1.33E-1
1981	-3.70E-3	-6.54E-2	1.37E0	-2.88E-1	2.04E1	4.15E0	3.77E-1	-7.95E-2
1982	-3.22E-2	-8.49E-2	9.44E-1	-4.38E-2	1.21E1	5.20E0	2.31E-1	-4.11E-1
1983	1.23E-2	-4.57E-2	1.26E0	1.55E0	2.02E1	2.82E0	4.44E-1	2.35E-1
1984	1.78E-2	-4.30E-2	1.08E0	1.80E0	1.48E1	2.56E0	4.79E-1	1.43E-1
1985	2.00E-2	-5.80E-2	9.32E-1	1.99E-1	1.42E1	2.72E0	5.78E-1	5.97E-1
1986	8.30E-1	7.55E-1	2.36E0	9.38E-1	3.74E0	3.45E0	2.95E-1	1.08E-1
1987	4.80E-1	0.00E0	5.10E0	3.60E0	5.20E0	8.60E0	0.00E0	4.40E0
1988	0.00E0	0.00E0	0.00E0	0.00E0	3.40E0	2.90E0	0.00E0	0.00E0
1989	0.00E0	0.00E0	0.00E0	0.00E0	6.00E0	5.60E0	0.00E0	0.00E0
1990	0.00E0	0.00E0	0.00E0	0.00E0	5.30E0	2.60E0	0.00E0	0.00E0
12 Yr. Avg.	2.02E-1	6.56E-2	1.09E0	7.38E-1	1.23E1	4.23E0	3.08E-1	4.68E-1
1991	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
Corr. Coef	-0.21	0.06	0.01	-0.03	-0.90	-0.33	-0.56	0.14

NOTE: All negative values were replaced with "zero's" for calculational purposes.

3.5 BROADLEAF VEGETATION

In 1991, 48 broadleaf vegetation samples were analyzed, 36 at the three indicator locations and 12 at the control location. The 1986 data is higher than the other years due to the Chernobyl accident.

All Selected Licensee Commitments radionuclides except Cs-137 showed zero ranges indicating that no detectable activity was measured. Only one of 36 samples taken indicated Cs-137 activity.

The correlation coefficients for the location with the highest annual mean indicated a moderate to poor probability of an increasing trend for Cs-137 indicator and control. However, this concentration resulted in only 1.65% of the Selected Licensee Commitments reporting level. Since there were anomalous results in 1984 for Cs-134 and Cs-137, new concentrations for these radionuclides were calculated using the location with the highest annual mean excluding these anomalies. The remaining radionuclide indicators and controls exhibited poor to no probabilities of increasing or decreasing trends. These trends are illustrated in Table 3.5-A.

Table 3.5-B shows the percentage of environmental concentrations to the Selected Licensee Commitments reporting levels for the indicators at the locations with the highest annual mean for 1991.

Table 3.5-B

Radionuclide	Concentration (pCi/kg)	Reporting Level(pCi/kg)	Percentage
I-131	0.00E0	1.00E2	0.00%
Cs-134	0.00E0	1.00E3	0.00%
Cs-137	3.30E1	2.00E3	1.65%

Table 3.5-A Concentration of Radionuclides in Broadleaf
Vegetation

YEAR	Concentration (pCi/kg-wet)					
	I-131		Cs-134		Cs-137	
	Indicator	Control	Indicator	Control	Indicator	Control
1979	-5.82E0	7.30E-1	-1.00E1	-1.06E1	2.19E1	1.93E1
1980	1.91E1	6.15E0	-2.59E0	-1.25E1	2.30E1	1.92E1
1981	-1.87E0	3.16E0	1.24E1	5.96E0	3.04E1	2.02E1
1982	1.41E1	6.59E0	1.50E1	-6.31E-1	2.46E1	1.22E1
1983	1.13E1	7.19E0	4.13E0	1.24E0	9.07E0	7.85E0
1984	6.06E0	5.99E0	8.46E0	2.80E0	1.02E1	1.05E1
1985	5.67E0	7.98E-1	9.77E0	1.66E1	8.05E0	2.37E-2
1986	2.85E1	1.76E1	2.53E1	2.07E1	4.03E1	1.27E1
1987	0.00E0	1.10E1	1.70E1	2.50E1	2.20E1	1.70E1
1988	0.00E0	0.00E0	0.00E0	0.00E0	3.90E1	3.40E1
1989	0.00E0	0.00E0	0.00E0	0.00E0	9.60E1	0.00E0
1990	0.00E0	0.00E0	0.00E0	0.00E0	4.00E1	0.00E0
12 YEAR AVERAGE	7.06E0	4.93E0	7.67E0	6.03E0	3.04E1	1.27E1
1991	0.00E0	0.00E0	0.00E0	0.00E0	3.30E1	0.00E0
CORRELATION COEFFICIENT	-0.32	-0.19	-0.13	0.10	0.48	-0.43

NOTE: All negative values were replaced with "zero's" for calculational purposes.

3.6 SHORELINE SEDIMENT

In 1991, six shoreline sediment samples were analyzed, four from two indicator locations and two at the control location.

The correlation coefficient for the location with the highest annual mean indicated a moderate to poor probability of an increasing trend for Cs-137 indicator. However, the Cs-137 concentration only corresponds to a small percentage of the Selected Licensee Commitments reporting level as shown in Table 3.6-B. Cs-134 indicator and control and Cs-137 control exhibited poor to no probability of an increasing or decreasing trend. These trends are illustrated in Table 3.6-A and Figure 4.

Table 3.6-B

Radionuclide	Concentration (pCi/kg)	Reporting Level(pCi/kg)	Percentage
Cs-134	0.00E0	3.00E3	0.00%
Cs-137	1.03E2	3.00E3	3.43%

FIGURE 4

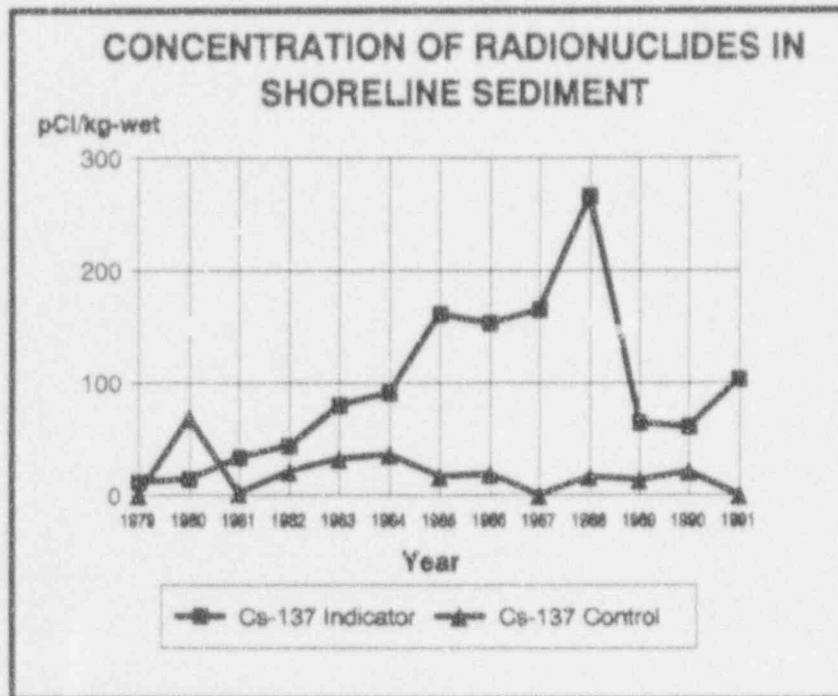


Table 3.6-A Concentration of Radionuclides in Shoreline Sediment

Year	Concentration (pCi/kg-dry)			
	Cs-134		Cs-137	
	Indicator	Control	Indicator	Control
1979	0.00E0	1.20E1	1.20E1	-1.77E1
1980	-3.53E0	-1.85E1	1.44E1	6.88E1
1981	3.97E1	6.08E0	3.36E1	1.65E0
1982	7.67E1	4.61E1	4.40E1	2.13E1
1983	7.65E1	2.78E1	8.02E1	3.28E1
1984	3.34E1	1.32E1	9.13E1	3.65E1
1985	2.02E1	1.03E1	1.61E2	1.70E1
1986	6.35E1	3.67E1	1.53E2	1.95E1
1987	4.20E1	2.40E1	1.65E2	0.00E0
1988	9.10E0	0.00E0	2.66E2	1.70E1
1989	5.30E1	0.00E0	6.50E1	1.40E1
1990	0.00E0	0.00E0	6.10E1	2.10E1
12 Year Average	3.45E1	1.47E1	9.55E1	2.08E1
1991	0.00E0	0.00E0	1.03E2	0.00E0
Correlation Coefficient	-0.14	-0.30	0.53	-0.32

NOTE: All negative values were replaced with "zero's" for calculational purposes.

3.7 FISH

In 1991, 12 fish samples were analyzed, six at the indicator locations and six at the control location. All Selected Licensee Commitments radionuclides except Mn-54, Co-58, Co-60, Cs-134, and Cs-137 showed zero ranges indicating no detectable activity was measured. The radionuclides named above were not significantly different from the twelve-year average, preoperational data, and control location levels. In addition, these concentrations only correspond to small percentages of the Selected Licensee Commitments reporting levels as shown in Table 3.7-B. The correlation coefficients for the location with the highest annual mean indicated a moderate to poor probability of an increasing trend for the indicator concentrations of Mn-54, Co-58, Co-60, Cs-134, and Cs-137 and a high to moderate probability of a decreasing trend for the control concentration of Fe-59. All other radionuclide indicators and controls exhibited moderate to no probability of increasing or decreasing trends. These trends are illustrated in Table 3.7-A and Figure 5.

Table 3.7-B

Radionuclide	Concentration (pCi/kg)	Reporting Level (pCi/kg)	Percentage
Mn-54	6.20E0	3.00E4	0.02%
Fe-59	0.00E0	1.00E4	0.00%
Co-58	1.40E1	3.00E4	0.05%
Co-60	6.50E1	1.00E4	0.65%
Zn-65	0.00E0	2.00E4	0.00%
Cs-134	5.90E0	1.00E3	0.59%
Cs-137	2.60E1	2.00E3	1.30%

Table 3.7-A Concentration of Radionuclides in Fish

(Page 1 of 2)

Year	Concentration (pCi/kg-wet)							
	Mn-54		Fe-59		Co-58		Co-60	
	Indicator	Control	Indicator	Control	Indicator	Control	Indicator	Control
1979	*	0.00E-2	*	3.71E1	*	-2.78E-1	*	9.86E0
1980	-1.97E1	1.14E1	-1.95E1	4.74E1	8.36E0	8.60E1	-2.25E1	1.14E1
1981	-2.71E0	2.74E0	3.70E0	2.97E1	-2.98E0	4.25E0	-2.65E0	-2.36E0
1982	-3.83E0	1.28E1	0.00E0	8.47E1	8.16E0	2.65E0	-4.34E-1	2.95E0
1983	-2.60E0	-1.84E0	-8.68E0	8.28E0	2.60E1	-5.31E0	1.11E1	2.42E0
1984	3.61E0	3.97E0	-1.23E1	2.21E1	1.45E2	4.15E0	2.82E1	2.83E0
1985	2.53E-1	-1.75E0	4.25E0	4.49E0	7.19E0	1.32E1	1.72E1	1.55E1
1986	1.03E0	-1.91E0	-1.21E0	3.77E0	3.17E1	-1.79E0	2.96E1	5.13E0
1987	0.00E0	0.00E0	0.00E0	0.00E0	2.71E2	0.00E0	1.25E2	0.00E0
1988	1.20E1	0.00E0	0.00E0	0.00E0	7.70E1	0.00E0	0.00E0	0.00E0
1989	9.00E1	5.40E0	0.00E0	0.00E0	4.05E2	0.00E0	2.99E2	0.00E0
1990	0.00E0	0.00E0	0.00E0	0.00E0	5.60E1	0.00E0	4.10E1	0.00E0
12 Yr. Avg.	9.72E0	3.02E0	7.23E-1	1.98E1	9.41E1	2.74E0	5.01E1	4.17E0
1991	6.20E0	0.00E0	0.00E0	0.00E0	1.40E1	0.00E0	6.50E1	0.00E0
Corr. Coef	0.37	-0.42	-0.21	-0.72	0.44	-0.37	0.52	-0.53

* No sample analyzed.

NOTE: All negative values were replaced with "zero's" for calculational purposes.

Table 3.7-A Concentration of Radionuclides in Fish

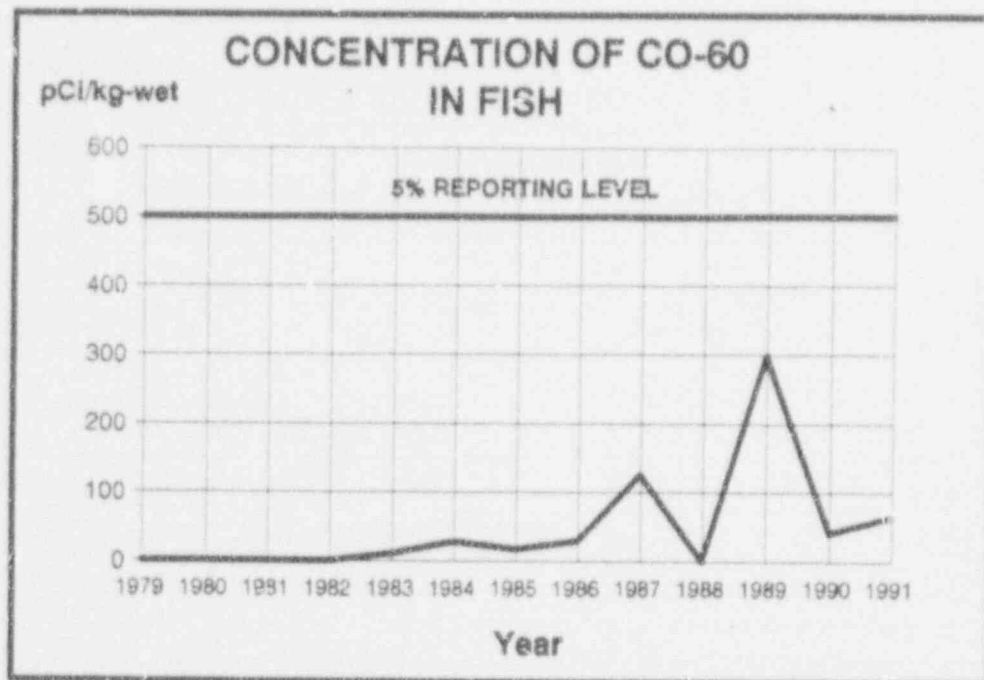
(Page 2 of 2)

YEAR	Concentration (pCi/kg-wet)					
	Zn-65		Cs-134		Cs-137	
	Indicator	Control	Indicator	Control	Indicator	Control
1979	*	1.73E0	*	-4.17E0	*	2.20E1
1980	-3.22E1	-2.26E1	-2.70E1	-2.30E0	-4.13E0	8.07E0
1981	-5.52E0	1.16E0	-1.99E0	9.09E0	1.80E1	2.77E1
1982	-1.39E1	-9.27E0	-8.22E-1	3.57E-1	2.69E1	9.52E0
1983	-1.07E0	4.86E0	-1.32E0	-2.57E0	6.03E1	2.08E1
1984	-2.87E0	-3.26E0	3.11E1	-7.09E-1	4.38E1	8.18E0
1985	-2.55E0	3.17E0	-1.56E0	5.22E0	1.86E1	1.48E1
1986	-8.09E0	-1.40E1	1.67E1	1.56E0	3.49E1	8.64E0
1987	0.00E0	0.00E0	2.60E1	0.00E0	5.10E1	2.90E1
1988	0.00E0	0.00E0	2.70E1	0.00E0	3.60E1	2.30E1
1989	0.00E0	0.00E0	1.10E1	0.00E0	3.53E1	1.50E1
1990	0.00E0	0.00E0	0.00E0	0.00E0	3.30E1	1.60E1
12 Year Average	4.20E-1	9.10E-1	1.02E1	1.35E0	3.25E1	1.74E1
1991	0.00E0	0.00E0	5.90E0	0.00E0	2.60E1	0.00E0
CORRELATION COEFFICIENT	-0.31	-0.34	0.35	-0.28	0.47	-0.16

* No sample analyzed.

NOTE: All negative values were replaced with "zero's" for calculational purposes.

FIGURE 5



3.8 DIRECT GAMMA RADIATION

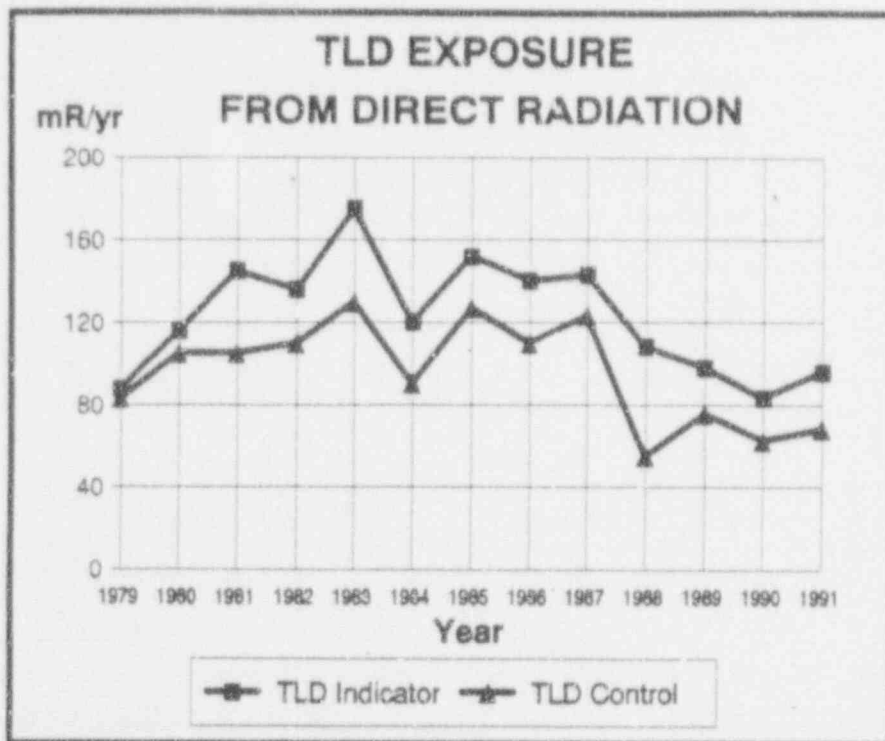
In 1991, 170 TLD's were analyzed, 166 at indicator locations and four at the control location. The 1991 exposure rate at the indicator location with the highest annual mean did not significantly differ from the preoperational data or twelve-year average. Table 3.8-A and Figure 6 illustrate this summary.

Table 3.8-A TLD Exposure from Direct Radiation

YEAR	Exposure (mrem/yr)	
	Indicator	Control
1979	8.76E1	8.32E1
1980	1.16E2	1.05E2
1981	1.45E2	1.05E2
1982	1.36E2	1.10E2
1983	1.75E2	1.30E2
1984	1.20E2	9.02E1
1985	1.52E2	1.27E2
1986	1.40E2	1.10E2
1987	1.43E2	1.23E2
1988	1.08E2	5.48E1
1989	9.77E1	7.55E1
1990	8.30E1	6.23E1
12 Year Average	1.24E2	9.67E1
1991	9.60E1	6.80E1

NOTE: The expected background for North Carolina is 120 mrem per year from FSAR 11.6.1.

FIGURE 6



The test statistic, or t-test, was used to compare the TLD measurements during preoperation to those taken during 1991. In this case, ratios of results from the 1-2 mile radius and the 4-5 mile radius were compared from one year to the next. Since the inner ring of TLD's are most likely to be affected by plant operations, the hypothesis was used that a significant change in the ratio from one year to another would be indicative of an environmental effect or some other phenomena requiring investigation. A statistically significant change in the ratio was determined by comparing the calculated t-value to the expected values of the test statistic based on the number of measurements and the desired accuracy of the results.

The value of the t-statistic was calculated by comparing preoperational results to 1991. As shown in Table 3.8-B, the t-value was -0.502. This compared well to the expected value of ± 2.056 , based on 26 degrees of freedom at the 95% confidence level ($\alpha = 0.025$, $n = 26$). Therefore, it can be concluded that the dose rates around McGuire during 1991 did not differ significantly from those measured during preoperation.

**Table 3.8-B
Comparison of Inner Ring/Outer Ring TLD Results**

	1991 (mr/hr)	Preop (mr/hr)
Inner Ring	51.42	79.14
Outer Ring	55.91	88.16
Ratio	0.94	0.91
Variance	0.03	0.02
t-value	-0.502	
t-table	-2.056	

3.9 FOOD PRODUCTS

In 1991, 17 food products (crops) samples were analyzed, all at the indicator location. No control site was available for food products in 1991. All Selected Licensee Commitments radionuclides exhibited a zero range indicating no measurable activity present.

The I-131, Cs-137, and Cs-134 concentrations did not significantly differ from the twelve-year average and preoperational data. All of the radionuclides exhibited moderate to no probability of a decreasing trend. No control sites were available for 1984 through 1991; therefore, a representative correlation coefficient could not be calculated for the control data. Table 3.9-A illustrates this summary.

Table 3.9-B shows the percentages of environmental concentrations to the Selected Licensee Commitments reporting levels for the indicators at the location with the highest annual mean for 1991. No activity was detected and therefore no reporting levels were approached.

Table 3.9-B

Radionuclide	Concentration (pCi/kg)	Reporting level (pCi/kg)	Percentage
I-131	0.00E0	1.00E2	0.00%
Cs-134	0.00E0	1.00E3	0.00%
Cs-137	0.00E0	2.00E3	0.00%

Table 3.9-A Concentration of Radionuclides in Food Products

YEAR	Concentration (pCi/kg-wet)					
	I-131		Cs-134		Cs-137	
	Indicator	Control	Indicator	Control	Indicator	Control
1979*	-5.82E0	7.30E-1	-1.00E1	-1.06E1	2.19E1	1.93E1
1980*	1.91E1	6.15E0	-2.59E0	-1.25E1	2.30E1	1.92E1
1981*	-1.87E0	3.16E0	1.24E1	5.96E0	3.04E1	2.02E1
1982*	1.41E1	6.59E0	1.50E1	-6.31E-1	2.46E1	1.22E1
1983*	1.13E1	7.19E0	4.13E0	1.24E0	9.07E0	7.85E0
1984	-5.08E-1	**	4.49E-1	**	8.45E0	**
1985	1.02E-1	**	-2.48E0	**	7.99E0	**
1986	1.52E1	**	1.74E0	**	2.15E1	**
1987	0.00E0	**	0.00E0	**	2.90E1	**
1988	0.00E0	**	0.00E0	**	0.00E0	**
1989	0.00E0	**	0.00E0	**	0.00E0	**
1990	0.00E0	**	0.00E0	**	0.00E0	**
12 YEAR AVERAGE	4.98E0	4.76E0	2.81E0	1.44E0	1.47E1	1.58E1
1991	0.00E0	**	0.00E0	**	0.00E0	**
CORRELATION COEFFICIENT	-0.42	---	-0.43	---	-0.70	---

* Broadleaf vegetation samples used for food products media.

** No control site available.

--- Insufficient data to calculate a representative correlation coefficient.

NOTE: All negative values were replaced with "zero's" for calculational purposes.

3.10 LAND USE CENSUS

The land use census was completed June 24, 1991 and the results are shown in Table 3.10. The 1991 census revealed two new irrigated gardens at 2.8 miles N and 2.6 miles NNE. Due to size and number of crop classes, the Austin garden (2.8 miles N) was added to the sampling program as location 188. The census also revealed a location where sampling is required (goat milk at 2.6 miles East), but was not added to the program since the milk is not used for human consumption.

Table 3.10 Land Use Census Results

Page 1 of 2

<u>SECTOR</u>		<u>DISTANCE</u>
N	Nearest Residence	2.7 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	2.8 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
NNE	Nearest Residence	1.5 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	2.6 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
NE	Nearest Residence	2.0 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	2.2 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
ENE	Nearest Residence	0.7 miles
	Nearest Meat Animal	4.0 miles
	Nearest Garden	2.4 miles
	Nearest Cow	3.6 miles
	Nearest Goat	None in 5 miles
E	Nearest Residence	0.5 miles
	Nearest Meat Animal	4.0 miles
	Nearest Garden	0.75 miles
	Nearest Cow	2.6 miles
	Nearest Goat	2.6 miles
ESE	Nearest Residence	0.5 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	0.8 miles
	Nearest Cow	2.8 miles
	Nearest Goat	None in 5 miles
SE	Nearest Residence	0.8 miles
	Nearest Meat Animal	3.5 miles
	Nearest Garden	3.4 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
SSE	Nearest Residence	0.9 miles
	Nearest Meat Animal	2.7 miles
	Nearest Garden	1.8 miles
	Nearest Cow	2.8 miles
	Nearest Goat	None in 5 miles
S	Nearest Residence	1.3 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	1.2 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles

Table 3.10 Land Use Census Results

Page 2 of 2

<u>SECTOR</u>		<u>DISTANCE</u>
SSW	Nearest Residence	3.3 miles
	Nearest Meat Animal	3.5 miles
	Nearest Garden	3.5 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
SW	Nearest Residence	1.8 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	4.0 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
WSW	Nearest Residence	1.0 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	1.25 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
W	Nearest Residence	0.9 miles
	Nearest Meat Animal	0.25 miles
	Nearest Garden	1.2 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
WNW	Nearest Residence	1.1 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	1.75 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
NW	Nearest Residence	1.5 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	1.8 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles
NNW	Nearest Residence	1.75 miles
	Nearest Meat Animal	None in 5 miles
	Nearest Garden	3.1 miles
	Nearest Cow	None in 5 miles
	Nearest Goat	None in 5 miles

4.0 EVALUATION OF DOSE FROM ENVIRONMENTAL MEASUREMENTS VERSUS ESTIMATED DOSE FROM RELEASES

4.1 DOSE FROM ENVIRONMENTAL MEASUREMENTS

Doses were estimated for measured concentrations of radionuclides in direct pathways to man using NRC Regulatory Guide 1.109 methodology. The highest annual mean values for each sample type and radionuclide were used after the background concentrations, as measured at the control location, had been subtracted; the maximum exposed individual's doses are summarized below:

Organ	Critical Age	Critical Pathway	Maximum Dose (mrem/yr)
Skin	Teen	Shoreline Sediment	2.88E-3
Bone	Child	Broadleaf Vegetation	2.81E-1
Liver	Child	Broadleaf Vegetation	2.71E-1
T. Body	Adult	Broadleaf Vegetation	1.51E-1
Thyroid	Child	Drinking Water	5.40E-2
Kidney	Child	Broadleaf Vegetation	8.83E-2
Lung	Child	Drinking Water	5.40E-2
GI-LLI	Adult	Fish	6.42E-2

4.2 ESTIMATED DOSE FROM RELEASES

Doses were estimated for release concentrations of radionuclides in direct pathways to man using NRC Regulatory Guide 1.109 methodology. The doses were calculated using GASPAR and LADTAP computer programs. The maximum exposed individual's doses are summarized below:

LIQUID RELEASES

Organ	Critical Age	Critical Pathway	Maximum Dose (mrem/yr)
Skin	Teen	Shoreline Sediment	1.15E-2
Bone	Child	Fish	1.11E-1
Liver	Teen	Fish	1.74E-1
T. Body	Adult	Fish	1.33E-1
Thyroid	Infant	Drinking Water	6.04E-2
Kidney	Child	Fish	7.61E-2
Lung	Child	Drinking Water	4.99E-2
GI-LLI	Adult	Fish	2.07E-1

GASEOUS RELEASES

Organ	Critical Age	Critical Pathway	Maximum Dose (mrem/yr)
Thyroid	Child	Inhalation	1.45E-1

4.3 COMPARISON OF DOSES

The environmental doses compared well with doses calculated from effluent releases. The differences in the doses calculated from environmental samples and the doses calculated from releases can be attributed to the conservatism used in computing the highest annual mean. For the broadleaf vegetation pathway, only one of twelve samples indicated detectable activity. The highest annual mean was calculated using only detectable activity without averaging samples less than LLD.

The doses, as calculated using the environmental sample results, are well below the limits as specified in Selected Licensee Commitments Manual Section 16.11-12.

4.4 PATHWAY DOSE CALCULATIONS

Dose calculations for each age and pathway can be found on the following pages.

**Dose from Air Particulate Inhalation Pathway for 1991 Data
Maximum Exposed Adult**

Usage (intake rate) = 8000 (m³/yr)

Highest Annual Mean Concentration

Radionuclide	Adult Inhalation dose factor (mrem per pCi ingested)							Location	Air (pCi/m ³)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.95E-06	7.87E-07	NO DATA	1.23E-06	1.74E-04	9.67E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.98E-07	2.59E-07	NO DATA	NO DATA	1.18E-04	1.33E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.47E-06	3.47E-06	1.32E-06	NO DATA	NO DATA	1.27E-04	2.35E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	1.44E-08	1.85E-08	NO DATA	NO DATA	7.48E-04	3.56E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.05E-06	1.29E-05	5.28E-06	NO DATA	8.62E-06	1.08E-04	6.88E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	1.78E-06	9.77E-07	5.26E-07	NO DATA	9.67E-07	6.31E-05	1.30E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.34E-05	4.30E-06	2.91E-06	NO DATA	6.77E-06	2.21E-04	1.88E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	3.15E-06	4.47E-06	2.58E-06	1.49E-03	7.66E-06	NO DATA	7.85E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	4.68E-05	1.06E-04	9.10E-05	NO DATA	3.59E-05	1.22E-05	1.30E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	5.95E-05	7.78E-05	5.35E-05	NO DATA	2.78E-05	9.40E-06	1.05E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	4.88E-06	6.13E-09	3.20E-07	NO DATA	2.09E-08	1.59E-04	2.73E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL DOSE EQUIVALENT(mrem/yr)=									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

**Dose from Air Radioiodines Inhalation Pathway for 1991 Data
Maximum Exposed Adult**

Usage (intake rate) = 8000.00 (m3/yr)

Highest Annual Mean Concentration

Adult

Radionuclide	Inhalation dose factor (mrem per pCi ingested)							Location	Air (pCi/m3)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.95E-06	7.87E-07	NO DATA	1.23E-06	1.74E-04	9.57E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.00E+00	0.00E+00
Cs-56	NO DATA	1.06E-07	2.50E-07	NO DATA	NO DATA	1.10E-04	1.33E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.47E-06	3.47E-06	1.32E-06	NO DATA	NO DATA	1.27E-04	2.35E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	1.44E-06	1.85E-06	NO DATA	NO DATA	7.40E-04	3.50E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.05E-06	1.29E-05	5.28E-06	NO DATA	8.82E-06	1.08E-04	6.66E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	1.70E-06	3.77E-07	5.20E-07	NO DATA	9.67E-07	8.31E-05	1.30E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.34E-05	4.30E-06	2.91E-06	NO DATA	6.77E-06	2.21E-04	1.88E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	3.15E-06	4.47E-06	2.50E-06	1.49E-03	7.06E-06	NO DATA	7.85E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	4.06E-05	1.06E-04	9.10E-05	NO DATA	3.50E-05	1.22E-05	1.30E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	5.95E-05	7.70E-05	5.35E-05	NO DATA	2.78E-05	9.40E-06	1.05E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	4.88E-06	6.13E-09	3.20E-07	NO DATA	2.09E-09	1.59E-04	2.73E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL DOSE EQUIVALENT(mrem/yr)=									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

4-7

Dose from Milk Pathway for 1991 Data Maximum Exposed Adult

Usage (intake rate) = 310 L/yr

Adult Highest Annual Mean Concentration

Radionuclide	Ingestion Dose Factor (mrem per pCi Ingested)										Indicator Location	Milk (pCi/L)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Thyroid	Kidney	Lung			GI-LLI	Bone	Liver	T. Body	Thyroid	Kidney	Lung
Mn-54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	7.45E-07	1.87E-06	NO DATA	NO DATA	NO DATA	1.51E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	4.34E-06	1.02E-05	3.81E-06	NO DATA	NO DATA	2.85E-06	3.40E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.07E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-06	1.54E-05	6.90E-06	NO DATA	1.03E-05	NO DATA	9.70E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	6.22E-06	3.46E-06	1.85E-06	NO DATA	3.42E-06	NO DATA	2.10E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	3.04E-06	9.75E-06	6.00E-06	NO DATA	1.53E-06	NO DATA	3.06E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.16E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	NO DATA	1.57E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	9.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	7.87E-05	1.08E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.03E-05	2.55E-06	1.33E-06	NO DATA	9.87E-09	1.46E-08	9.25E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Total Dose Equivalent (mrem/yr) = 0.00E+00

**Dose from Drinking Water Pathway for 1991 Data
Maximum Exposed Adult**

Usage (Intake rate) = 730 (l/yr)

Highest Annual Mean Concentration

Radionuclide	Adult Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Water (pCi/l)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-06	1.54E-05	6.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	6.22E-09	3.46E-09	1.88E-09	NO DATA	3.42E-09	NO DATA	2.10E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	3.04E-08	9.75E-09	6.80E-09	NO DATA	1.53E-08	NO DATA	3.08E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.18E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	NO DATA	1.57E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.03E-05	2.55E-06	1.33E-06	NO DATA	8.87E-09	1.46E-08	4.18E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	142	522	0.00E+00	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02
TOTAL DOSE EQUIVALENT(mrem/yr)=										0.00E+00	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02

9-7

Dose from Food Products (Crops) Pathway for 1991 Data Maximum Exposed Adult

Usage (intake rate) = 520 kg/yr

Highest Annual Mean Concentration

Radionuclide	Adult Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Food (pCi/kg)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.38E-08	NO DATA	1.40E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	7.45E-07	1.07E-06	NO DATA	NO DATA	NO DATA	1.51E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	4.34E-08	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-06	1.54E-05	8.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	6.22E-09	3.46E-09	1.86E-09	NO DATA	3.42E-09	NO DATA	2.10E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	3.04E-08	9.75E-09	6.80E-09	NO DATA	1.53E-08	NO DATA	3.09E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.18E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	NO DATA	1.57E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.56E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.03E-05	2.55E-08	1.33E-06	NO DATA	8.17E-09	1.46E-08	4.18E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL DOSE EQUIVALENT(mrem/yr)=										0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4-7

Dose from Broadleaf Vegetation Pathway for 1991 Data Maximum Exposed Adult

Usage (intake rate) = 64 kg/yr

Highest Annual Mean Concentration

Radionuclide	Adult Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Food (pCi/kg)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.57E-08	8.72E-07	NO DATA	1.36E-08	NO DATA	1.40E-05	158	9.5	0.00E+00	2.78E-03	5.30E-04	0.00E+00	8.27E-04	0.00E+00	8.51E-03
Co-58	NO DATA	7.45E-07	1.87E-08	NO DATA	NO DATA	NO DATA	1.51E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-56	4.34E-08	1.02E-05	3.91E-08	NO DATA	NO DATA	2.85E-08	3.40E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-08	4.72E-08	NO DATA	NO DATA	NO DATA	4.02E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-08	1.54E-05	8.98E-08	NO DATA	1.03E-05	NO DATA	9.70E-08	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	8.22E-09	3.48E-09	1.88E-09	NO DATA	3.42E-05	NO DATA	2.10E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	3.04E-08	9.75E-09	8.80E-09	NO DATA	1.53E-08	NO DATA	3.99E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.18E-08	5.95E-08	3.41E-08	1.95E-02	1.02E-05	NO DATA	1.57E-08	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	8.22E-05	1.48E-04	1.21E-04	NO DATA	4.78E-05	1.59E-05	2.59E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-08	125	33	1.78E-01	2.30E-01	1.51E-01	0.00E+00	7.81E-02	2.80E-02	4.48E-03
BaLa-140	2.03E-05	2.55E-08	1.33E-08	NO DATA	8.87E-09	1.46E-08	4.18E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr)										1.88E-01	2.33E-01	1.51E-01	0.00E+00	7.90E-02	2.80E-02	1.30E-02

*Dose from Fish Pathway for 1991 Data
Maximum Exposed Adult*

Usage (intake rate) = 21 kg/yr

Highest Annual Mean Concentration

Radionuclide	Adult Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Fish (pCi/kg)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.57E-08	8.72E-07	NO DATA	1.38E-08	NO DATA	1.40E-05	129	6.2	0.00E+00	5.95E-04	1.14E-04	0.00E+00	1.77E-04	6.90E+00	1.82E-03
Cr-58	NO DATA	7.45E-07	1.87E-08	NO DATA	NO DATA	NO DATA	1.51E-05	129	14	0.00E+00	2.19E-04	4.91E-04	0.00E+00	0.00E+00	0.00E+00	4.44E-02
Fe-58	4.34E-08	1.02E-05	3.91E-08	NO DATA	NO DATA	2.85E-08	3.40E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-80	NO DATA	2.14E-08	4.72E-08	NO DATA	NO DATA	NO DATA	4.02E-05	129	65	0.00E+00	2.92E-03	6.44E-03	0.00E+00	0.00E+00	0.00E+00	5.49E-02
Zn-85	4.81E-08	1.54E-05	6.98E-08	NO DATA	1.03E-05	NO DATA	9.79E-06	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-85	6.22E-09	3.48E-09	1.88E-09	NO DATA	3.42E-09	NO DATA	2.10E-05	129	3.5	4.57E-07	2.54E-07	1.37E-07	0.00E+00	2.51E-07	0.00E+00	1.54E-03
Zr-95	3.04E-08	9.75E-09	6.80E-09	NO DATA	1.53E-08	NO DATA	3.09E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.18E-08	5.85E-08	3.41E-08	1.95E-03	1.02E-05	NO DATA	1.57E-08	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06	129	5.9	7.71E-03	1.83E-02	1.50E-02	0.00E+00	5.93E-03	1.97E-03	3.21E-04
Ce-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	129	28	4.35E-02	5.95E-02	3.90E-02	0.00E+00	2.02E-02	6.72E-03	1.15E-03
BaLa-140	2.03E-05	2.55E-08	1.33E-08	NO DATA	8.87E-09	1.48E-08	4.18E-05	ALL	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL DOSE EQUIVALENT(mrem/yr)=										5.12E-02	8.16E-02	6.10E-02	0.00E+00	2.83E-02	8.89E-03	8.42E-02

6-4

*Dose from Shoreline Sediment Pathway for 1991 Data
Maximum Exposed Adult*

Shoreline Recreation 12 hr/yr
 Shore Width Factor = 0.3 (lake shore - location 129)
 Shore Width Factor = 0.2 (river shoreline - location 130)

Radionuclide	External Dose Factor for Standing on Contaminated Ground (mrem/hr per pCi/m ²)		Indicator Location	Highest Annual Mean Concentration Dose (mrem/yr)		
	T. Body	Skin		Sediment (pCi/kg)		
	T. Body	Skin		T. Body	Skin	
Mn-54	5.80E-09	6.80E-09	129	28.0	2.34E-05	2.74E-05
Co-58	7.00E-09	8.20E-09	129	53.0	5.34E-05	6.26E-05
Fe-59	8.00E-09	9.40E-09	ALL	0.0	0.00E+00	0.00E+00
Co-60	1.70E-08	2.00E-08	129	131.0	3.21E-04	3.77E-04
Zn-65	4.00E-09	4.80E-09	ALL	0.0	0.00E+00	0.00E+00
Nb-95	5.10E-09	6.00E-09	ALL	0.0	0.00E+00	0.00E+00
Zr-95	5.00E-09	5.80E-09	ALL	0.0	0.00E+00	0.00E+00
I-131	2.80E-09	3.40E-09	ALL	0.0	0.00E+00	0.00E+00
Cs-134	1.20E-08	1.40E-08	ALL	0.0	0.00E+00	0.00E+00
Cs-137	4.20E-09	4.90E-09	130	103.0	4.15E-05	4.85E-05
BaLa-140	2.10E-09	2.40E-09	ALL	0.0	0.00E+00	0.00E+00

Total Dose (mrem/yr) = 4.39E-04 5.16E-04

*Dose from Air Particulate Inhalation Pathway for 1991 Data
Maximum Exposed Teen*

Usage (intake rate) = 8000 (m³/yr)

Highest Annual Mean Concentration

Radionuclide	TEEN Inhalation dose factor (mrem per pCi ingested)							Indicator Location	Air (pCi/m ³)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	6.39E-08	1.05E-08	NO DATA	1.59E-08	2.48E-04	8.35E-08	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	2.58E-07	3.47E-07	NO DATA	NO DATA	1.88E-04	1.19E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.09E-08	4.82E-08	1.79E-08	NO DATA	NO DATA	1.91E-04	2.23E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	1.89E-08	2.48E-08	NO DATA	NO DATA	1.09E-03	3.24E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.82E-08	1.67E-05	7.80E-08	NO DATA	1.08E-05	1.55E-04	5.83E-08	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	2.32E-08	1.26E-08	7.08E-07	NO DATA	1.25E-08	9.36E-05	1.21E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.82E-05	5.73E-08	3.94E-08	NO DATA	8.42E-08	3.38E-04	1.86E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.43E-08	6.14E-08	3.30E-08	1.83E-03	1.05E-05	NO DATA	8.11E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	6.28E-05	1.41E-04	6.88E-05	NO DATA	4.89E-05	1.83E-05	1.22E-08	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ca-137	8.38E-05	1.06E-04	3.89E-05	NO DATA	3.80E-05	1.51E-05	1.06E-08	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	6.84E-08	8.38E-09	4.40E-07	NO DATA	2.85E-09	2.54E-04	2.88E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr)=									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

TT-7

*Dose from Air Radioiodines Inhalation Pathway for 1991 Data
Maximum Exposed Teen*

Usage (intake rate) = 8000 (m³/yr)

Highest Annual Mean Concentration

Radionuclide	TEEN							Location	Air (pCi/m ³)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Inhalation dose factor (mrem per pCi ingested)		Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
				Thyroid	Kidney											
Mn-54	NO DATA	6.39E-06	1.05E-06	NO DATA	1.59E-06	2.48E-04	8.35E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	2.59E-07	3.47E-07	NO DATA	NO DATA	1.88E-04	1.19E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.09E-06	4.82E-08	1.79E-08	NO DATA	NO DATA	1.91E-04	2.23E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-80	NO DATA	1.89E-06	2.48E-06	NO DATA	NO DATA	1.09E-03	3.24E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.82E-06	1.87E-05	7.80E-06	NO DATA	1.08E-05	1.55E-04	5.83E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	2.32E-06	1.29E-06	7.08E-07	NO DATA	1.25E-06	9.39E-05	1.21E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.82E-05	5.73E-06	3.94E-06	NO DATA	8.42E-06	3.38E-04	1.89E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.43E-06	6.14E-06	3.20E-06	1.83E-03	1.05E-05	NO DATA	8.11E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ca-134	6.28E-05	1.41E-04	8.88E-05	NO DATA	4.89E-05	1.83E-05	1.22E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ca-137	8.38E-05	1.08E-04	3.89E-05	NO DATA	3.80E-05	1.51E-05	1.08E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	6.84E-06	8.38E-09	4.40E-07	NO DATA	2.85E-09	2.54E-04	2.86E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr)=									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

4-12

*Dose from Milk Pathway for 1991 Data
Maximum Exposed Teen*

Usage (intake rate) = 400 L/yr

Teen *Highest Annual Mean Concentration*

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Milk (pCi/L)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.06E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	5.76E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	9.47E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-65	8.22E-09	4.58E-09	2.51E-09	NO DATA	4.42E-09	NO DATA	1.95E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	4.12E-08	1.30E-08	8.94E-09	NO DATA	1.01E-08	NO DATA	3.00E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	5.85E-06	8.19E-06	4.40E-06	2.39E-03	1.41E-05	NO DATA	1.82E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	6.26E-05	2.39E-05	2.45E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.84E-05	3.48E-06	1.83E-06	NO DATA	1.18E-06	2.34E-06	4.38E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr)=									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

*Dose from Drinking Water Pathway for 1991 Data
Maximum Exposed Teen*

Usage (Intake rate) = 510 U/yr

Teen *Highest Annual Mean Concentration*

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Drinking Water (pCi/L)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.66E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	5.76E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	8.22E-09	4.56E-09	2.51E-09	NO DATA	4.42E-09	NO DATA	1.95E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	4.12E-08	1.30E-08	8.94E-09	NO DATA	1.01E-08	NO DATA	3.05E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	5.85E-06	8.19E-06	4.40E-06	2.39E-03	1.41E-05	NO DATA	1.82E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	6.26E-05	2.39E-05	2.45E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.97E-05	1.97E-05	2.12E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.84E-05	3.48E-08	1.83E-06	NO DATA	1.18E-08	2.34E-08	4.38E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	1.08E-07	1.08E-07	1.08E-07	1.08E-07	1.08E-07	1.08E-07	142	522	0.00E+00	2.82E-02	2.82E-02	2.82E-02	2.82E-02	2.82E-02	2.82E-02
Total Dose Equivalent (mrem/yr)=										0.00E+00	2.82E-02	2.82E-02	2.82E-02	2.82E-02	2.82E-02	2.82E-02

71-7

Dose from Food Products Pathway (Crops) for 1991 Data Maximum Exposed Teen

Usage (intake rate) = 630 (kg/yr)

Teen Highest Annual Mean Concentration

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)										Indicator Location	Food F-CI(w/kg)	Dose (mrem/yr)				
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Lung	Bone	Liver			T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.79E-06	NO DATA	1.21E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Co-58	NO DATA	9.72E-07	2.24E-08	NO DATA	NO DATA	NO DATA	1.34E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Co-60	NO DATA	2.81E-06	8.33E-06	NO DATA	NO DATA	NO DATA	3.89E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Zn-65	5.79E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Nb-95	8.27E-09	4.59E-08	2.51E-08	NO DATA	4.42E-09	NO DATA	1.95E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Ti-95	4.12E-08	1.30E-08	8.94E-09	NO DATA	1.01E-08	NO DATA	3.00E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
I-131	5.85E-06	8.19E-06	4.40E-06	2.39E-03	1.41E-05	NO DATA	1.82E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Cs-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	8.26E-05	2.39E-05	2.45E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Cs-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
BaLa-140	2.84E-05	3.48E-06	1.83E-06	NO DATA	1.18E-08	2.34E-08	4.38E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

Total Dose Equivalent (mrem/yr) = 0.00E+00

*Dose from Broadleaf Vegetation Pathway for 1991 Data
Maximum Exposed Teen*

Usage (intake rate) = 42 (kg/yr)

Teen *Highest Annual Mean Concentration*

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Food (kg/yr)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LI
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05	158	9.5	0.00E+00	2.35E-03	4.87E-04	0.00E+00	7.02E-04	0.00E+00	4.83E-03
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.86E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	5.76E-06	2.00E-05	6.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-65	8.22E-09	4.58E-09	2.51E-09	NO DATA	4.42E-09	NO DATA	1.95E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	4.12E-08	1.30E-08	8.94E-09	NO DATA	1.01E-08	NO DATA	3.00E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	.5E-06	8.19E-06	4.40E-06	2.39E-03	1.41E-05	NO DATA	1.82E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	8.26E-05	2.39E-05	2.45E-06	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ca-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06	125	33.0	1.55E-01	2.07E-01	7.19E-02	0.00E+00	7.93E-02	2.73E-02	2.94E-03
BaLa-140	2.84E-05	3.48E-06	1.83E-06	NO DATA	1.11E-06	2.34E-06	4.38E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr)=										1.55E-01	2.09E-01	7.24E-02	0.00E+00	7.10E-02	2.73E-02	7.77E-03

91-4

Usage (intake rate) = 18 (kg/yr)

Dose from Fish Pathway for 1991 Data Maximum Exposed Teen

TEEN Highest Annual Mean Concentration

Radionuclide	Ingestion Dose Factor) (mrem per pCi ingested)							Indicator Location	Fish (kg/yr)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	5.90E-08	1.17E-08	NO DATA	1.78E-08	NO DATA	1.21E-05	129	8.2	0.00E+00	5.85E-04	1.18E-04	0.00E+00	1.75E-04	0.00E+00	1.20E-03
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	129	14.0	0.00E+00	2.18E-04	5.02E-04	0.00E+00	0.00E+00	0.00E+00	3.00E-03
Fe-59	5.87E-08	1.37E-05	5.29E-05	NO DATA	NO DATA	4.32E-08	3.24E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-08	6.33E-08	NO DATA	NO DATA	NO DATA	3.69E-05	129	85.0	0.00E+00	2.92E-03	8.58E-03	0.00E+00	0.00E+00	0.00E+00	3.61E-02
Zn-65	5.78E-08	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-08	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	8.22E-09	1.0E-09	2.51E-09	NO DATA	4.42E-09	NO DATA	1.95E-05	129	3.5	4.80E-07	2.55E-07	1.41E-07	0.00E+00	2.48E-07	0.00E+00	1.09E-03
Zr-95	4.12E-08	1.30E-08	8.94E-09	NO DATA	1.01E-08	NO DATA	3.00E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	5.85E-08	8.19E-08	4.40E-08	2.39E-03	1.41E-05	NO DATA	1.82E-08	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	8.26E-05	2.39E-05	2.45E-08	129	5.9	7.90E-03	1.86E-02	8.63E-03	0.00E+00	5.91E-03	2.26E-03	2.31E-04
Cs-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-08	129	28.0	4.86E-02	8.20E-02	2.18E-02	0.00E+00	2.11E-02	8.20E-03	8.82E-04
BaLa-140	2.34E-05	3.48E-08	1.83E-08	NO DATA	1.18E-08	2.34E-08	4.38E-05	ALL	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr)=										5.45E-02	8.43E-02	3.74E-02	0.00E+00	2.72E-02	1.05E-02	4.45E-02

4-17

**Dose from Shoreline Sediment Pathway for 1991 Data
Maximum Exposed Teen**

Shoreline Recreation 67 hr/yr
 Shore Width Factor = 0.3 (lake shore - location 129)
 Shore Width Factor = 0.2 (river shoreline - location 130)

External Dose Factor
 for Standing on
 Contaminated Ground

Highest Annual Mean Concentration

Radionuclide	(mrem/hr per pCi/m ²)		Indicator Location	Dose (mrem/yr)		
	T. Body	Skin		Sediment (pCi/kg)	T. Body	Skin
Mn-54	5.80E-09	6.80E-09	129	28.0	1.31E-04	1.53E-04
Co-58	7.00E-09	8.20E-09	129	53.0	2.98E-04	3.49E-04
Fe-59	8.00E-09	9.40E-09	ALL	0.0	0.00E+00	0.00E+00
Co-60	1.70E-08	2.00E-08	129	131.0	1.79E-03	2.11E-03
Zn-65	4.00E-09	4.80E-09	ALL	0.0	0.00E+00	0.00E+00
Nb-95	5.10E-09	6.00E-09	ALL	0.0	0.00E+00	0.00E+00
Zr-95	5.00E-09	5.80E-09	ALL	0.0	0.00E+00	0.00E+00
I-131	2.80E-09	3.40E-09	ALL	0.0	0.00E+00	0.00E+00
Cs-134	1.20E-08	1.40E-08	ALL	0.0	0.00E+00	0.00E+00
Cs-137	4.20E-09	4.90E-09	130	103.0	2.32E-04	2.71E-04
BaLa-140	2.10E-09	2.40E-09	ALL	0.0	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr)=				2.45E-03	2.88E-03	

**Dose from Inhalation Air Particulate Pathway for 1991 Data
Maximum Exposed Child**

Breathing rate = 3700 (m³/yr)

Highest Annual Mean Concentration

Radionuclide	CHILD Inhalation Dose Factor (mrem per pCi inhaled)							Indicator Location	Air (pCi/m ³)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.18E-05	2.57E-06	NO DATA	2.71E-06	4.28E-04	8.19E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	4.79E-07	8.55E-07	NO DATA	NO DATA	2.99E-04	9.29E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	5.59E-06	9.04E-06	4.51E-06	NO DATA	NO DATA	3.43E-04	1.91E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	3.55E-06	6.12E-06	NO DATA	NO DATA	1.91E-03	2.60E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.15E-05	3.08E-05	1.90E-05	NO DATA	1.93E-05	2.69E-04	4.41E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	6.35E-06	2.48E-06	1.77E-06	NO DATA	2.33E-06	1.86E-04	1.00E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tr-95	5.13E-05	1.13E-05	1.00E-05	NO DATA	1.81E-05	6.03E-04	1.85E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.30E-05	1.30E-05	7.37E-06	4.39E-03	2.13E-05	NO DATA	7.89E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	1.78E-04	2.74E-04	8.07E-05	NO DATA	8.93E-05	3.27E-05	1.04E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	2.45E-04	2.23E-04	3.47E-05	NO DATA	7.63E-05	2.81E-05	9.78E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.00E-05	1.75E-06	1.17E-06	NO DATA	5.71E-06	4.71E-04	2.75E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr) =									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

61-7

*Dose from Inhalation Air Radioiodines Pathway for 1991 Data
Maximum Exposed Child*

Breathing rate = 3700 m³/yr

Highest Annual Mean Concentration

Radionuclide	CHILD							Indicator Location	Air (pCi/m ³)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Inhalation Dose Factor (mrem per pCi inhaled)		Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.18E-05	2.57E-06	NO DATA	2.71E-08	4.28E-04	8.19E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	4.79E-07	8.55E-07	NO DATA	NO DATA	2.99E-04	9.29E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	5.59E-06	9.04E-06	4.51E-06	NO DATA	NO DATA	3.43E-04	1.91E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	3.55E-06	8.12E-06	NO DATA	NO DATA	1.91E-03	2.80E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.15E-05	3.08E-05	1.80E-05	NO DATA	1.93E-05	2.89E-04	4.41E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	6.35E-05	2.48E-06	1.77E-06	NO DATA	2.33E-08	1.66E-04	1.00E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	5.13E-05	1.13E-05	1.00E-05	NO DATA	1.81E-05	8.03E-04	1.85E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.30E-05	1.30E-05	7.37E-06	4.39E-03	2.13E-05	NO DATA	7.88E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	1.78E-04	2.74E-04	9.07E-05	NO DATA	8.93E-05	3.27E-05	1.04E-06	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	2.45E-04	2.23E-04	3.47E-05	NO DATA	7.83E-05	2.81E-05	9.78E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.00E-05	1.75E-08	1.17E-08	NO DATA	5.71E-09	4.71E-04	2.75E-03	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent(mrem/yr)=									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

4-20

*Dose from Milk Pathway for 1991 Data
Maximum Exposed Child*

Usage (intake rate) = 330.00 (l/yr)

CHILD

Highest Annual Mean Concentration

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Milk (pCi/l)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-08	NO DATA	3.00E-08	NO DATA	8.98E-08	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.80E-06	5.51E-08	NO DATA	NO DATA	NO DATA	1.05E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.85E-05	2.67E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.78E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	5.29E-08	1.56E-05	NO DATA	NO DATA	NO DATA	2.93E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.37E-05	3.65E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-08	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	2.25E-08	8.76E-09	6.26E-09	NO DATA	8.23E-09	NO DATA	1.62E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.16E-07	2.55E-08	2.27E-08	NO DATA	3.85E-08	NO DATA	2.86E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.72E-05	1.73E-05	9.83E-08	5.72E-03	2.84E-05	NO DATA	1.54E-08	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-08	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	3.27E-04	3.13E-04	4.82E-05	NO DATA	1.02E-04	3.67E-05	1.96E-08	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	8.31E-05	7.28E-08	4.85E-08	NO DATA	2.37E-08	4.34E-08	4.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose (mrem/yr) =									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

**Dose from Drinking Water Pathway for 1991 Data
Maximum Exposed Child**

Usage (intake rate) = 510 (l/yr)

CHILD **Highest Annual Mean Concentration**

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)								Indicator Location	Water (pCi/l)	Dose (mrem/yr)					
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Bone			Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-05	NO DATA	3.00E-08	NO DATA	8.98E-08	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.80E-08	5.51E-01	NO DATA	NO DATA	NO DATA	1.05E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.85E-05	2.87E-05	1.33E-05	NO DATA	NO DATA	7.74E-08	2.78E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.09E+00
Co-60	NO DATA	5.29E-08	1.58E-05	NO DATA	NO DATA	NO DATA	2.93E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.37E-05	3.85E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	8.41E-08	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	2.25E-08	8.78E-09	8.26E-09	NO DATA	8.23E-09	NO DATA	1.82E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.16E-07	2.55E-06	2.27E-08	NO DATA	3.85E-08	NO DATA	2.88E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.72E-05	1.73E-05	9.83E-06	5.72E-03	2.84E-05	NO DATA	1.54E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.18E-04	4.27E-05	2.07E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ca-137	3.27E-04	3.13E-04	4.82E-05	NO DATA	1.02E-04	3.87E-05	1.88E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	8.31E-05	7.28E-08	4.85E-08	NO DATA	2.37E-08	4.34E-08	4.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	142	522	0.00E+00	5.40E-02	5.40E-02	5.40E-02	5.40E-02	5.40E-02	5.40E-02
Total Dose Equivalent(mrem/yr) =										0.00E+00	5.40E-02	5.40E-02	5.40E-02	5.40E-02	5.40E-02	5.40E-02

*Dose from Food Pathway (Crops) for 1991 Data
Maximum Exposed Child*

Usage (Intake rate) = 520 kg/yr

CHILD

Highest Annual Mean Concentration

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Food (pCi/kg)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-06	NO DATA	8.98E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.80E-06	5.51E-06	NO DATA	NO DATA	NO DATA	1.05E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.85E-05	2.87E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.78E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	5.29E-06	1.58E-05	NO DATA	NO DATA	NO DATA	2.93E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.37E-05	3.65E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	2.25E-08	8.76E-09	6.26E-09	NO DATA	8.23E-09	NO DATA	1.82E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.18E-07	2.55E-08	2.27E-08	NO DATA	3.65E-08	NO DATA	2.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.72E-05	1.73E-05	9.83E-06	5.72E-03	2.84E-05	NO DATA	1.54E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	3.27E-04	3.13E-04	4.82E-05	NO DATA	1.02E-04	3.87E-05	1.98E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	8.31E-05	7.28E-06	4.85E-06	NO DATA	2.37E-08	4.34E-03	4.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent(mrem/yr)=									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

4-23

*Dose from Broadleaf Vegetation Pathway for 1991 Data
Maximum Exposed Child*

Usage (intake rate) = 26 kg/yr

CHILD *Highest Annual Mean Concentration*

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Food (pCi/kg)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-06	NO DATA	8.98E-06	158	9.50	0.00E+00	2.64E-03	7.04E-04	0.00E+00	7.41E-04	0.00E+00	2.22E-03
Co-58	NO DATA	1.80E-06	5.51E-06	NO DATA	NO DATA	NO DATA	1.05E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.65E-05	2.67E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.79E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	5.29E-06	1.56E-05	NO DATA	NO DATA	NO DATA	2.93E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.37E-05	3.65E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	2.25E-08	8.76E-09	6.26E-09	NO DATA	8.23E-09	NO DATA	1.62E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.16E-07	2.55E-08	2.27E-08	NO DATA	3.65E-08	NO DATA	2.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.72E-05	1.73E-05	9.83E-06	5.72E-03	2.84E-05	NO DATA	1.54E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	3.27E-04	3.13E-04	4.62E-05	NO DATA	1.02E-04	3.67E-05	1.96E-06	125	33.00	2.81E-01	2.69E-01	3.96E-02	0.00E+00	8.75E-02	3.15E-02	1.68E-03
BaLa-140	8.31E-05	7.28E-06	4.35E-06	NO DATA	2.37E-06	4.34E-06	4.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Total Dose (mrem/yr) = 2.81E-01 2.71E-01 4.03E-02 0.00E+00 8.83E-02 3.15E-02 3.90E-03

42-4

**Dose from Fish Pathway for 1991 Data
Maximum Exposed Child**

Usage (intake rate) = 9.8 kg/yr

CHILD **Highest Annual Mean Concentration**

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)							Indicator Location	Fish (pCi/kg)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-05	NO DATA	8.98E-06	129	8.20	0.00E+00	6.37E-04	1.70E-04	0.00E+00	1.79E-04	0.00E+00	5.34E-04
Co-58	NO DATA	1.80E-06	5.51E-08	NO DATA	NO DATA	NO DATA	1.05E-05	129	14.00	0.00E+00	2.42E-04	7.41E-04	0.00E+00	0.00E+00	0.00E+00	1.41E-03
Fe-59	1.85E-05	2.67E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.78E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	5.29E-06	1.58E-05	NO DATA	NO DATA	NO DATA	2.93E-05	129	65.00	0.00E+00	3.30E-03	9.73E-03	0.00E+00	0.00E+00	0.00E+00	1.83E-02
Zn-65	1.37E-05	3.85E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	2.25E-08	8.78E-09	6.26E-09	NO DATA	8.23E-09	NO DATA	1.67E-05	129	3.50	7.56E-07	2.94E-07	2.10E-07	0.00E+00	2.77E-07	0.00E+00	5.44E-04
Zr-95	1.16E-07	2.55E-03	2.27E-08	NO DATA	3.65E-08	NO DATA	2.86E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.72E-05	1.73E-05	9.83E-06	5.72E-03	2.84E-05	NO DATA	1.54E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-06	129	5.90	1.33E-02	2.17E-02	4.59E-03	0.00E+00	6.74E-03	2.42E-03	1.17E-04
Ce-137	3.27E-04	3.13E-04	4.82E-05	NO DATA	1.02E-04	3.67E-05	1.96E-06	129	28.00	8.16E-02	7.81E-02	1.15E-02	0.00E+00	2.55E-02	9.16E-03	4.89E-04
BaLa-140	8.31E-05	7.28E-08	4.85E-06	NO DATA	2.37E-08	4.34E-08	4.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Total Dose (mrem/yr) = 9.49E-02 1.04E-01 2.88E-02 0.00E+00 3.24E-02 1.16E-02 2.14E-02

***Dose from Shoreline Sediment Pathway for 1991 Data
Maximum Exposed Child***

Shoreline Recreation 14 hr/yr
 Shore Width Factor = 0.3 (lake shore - location 129)
 Shore Width Factor = 0.2 (river shoreline - location 130)

Radionuclide	External Dose Factor for Standing on Contaminated Ground (mrem/hr per pCi/m ²)		Indicator Location	Highest Annual Mean Concentration Dose (mrem/yr)		
	T. Body	Skin		Sediment (pCi/kg)	T. Body Skin	
Mn-54	5.80E-09	6.80E-09	129	26.0	2.73E-05	3.20E-05
Co-58	7.00E-09	8.20E-09	129	53.0	8.23E-05	7.30E-05
Fe-59	8.00E-09	9.40E-09	ALL	0.0	0.00E+00	0.00E+00
Co-60	1.70E-08	2.00E-08	129	131.0	3.74E-04	4.40E-04
Zn-65	4.00E-09	4.60E-09	ALL	0.0	0.00E+00	0.00E+00
Nb-95	5.10E-09	8.00E-09	ALL	0.0	0.00E+00	0.00E+00
Zr-95	5.00E-09	5.80E-09	ALL	0.0	0.00E+00	0.00E+00
I-131	2.80E-09	3.40E-09	ALL	0.0	0.00E+00	0.00E+00
Cs-134	1.20E-08	1.40E-08	ALL	0.0	0.00E+00	0.00E+00
Ce-137	4.20E-09	4.90E-09	130	103.0	4.85E-05	5.85E-05
BaLa-140	2.10E-09	2.40E-09	ALL	0.0	0.00E+00	0.00E+00
Total Dose (mrem/yr) =				5.12E-04	6.02E-04	

**Dose from Air Particulate Inhalation Pathway for 1991 Data
Maximum Exposure Infant**

Breathing rate = 1400 m³/yr

Highest Annual Mean Concentration

Radionuclide	INFANT Inhalation Dose Factor (mrem per pCi inhaled led)							Indicator Location	Air (pCi/m ³)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.81E-05	3.58E-08	NO DATA	3.58E-08	7.14E-04	5.04E-08	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	3.71E-07	1.30E-08	NO DATA	NO DATA	5.55E-04	7.95E-08	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	9.89E-08	1.68E-05	8.77E-08	NO DATA	NO DATA	7.25E-04	1.77E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	5.73E-08	8.41E-08	NO DATA	NO DATA	3.22E-03	2.28E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.38E-05	4.47E-05	2.22E-05	NO DATA	2.32E-05	4.82E-04	3.87E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	1.12E-05	4.58E-06	2.70E-08	NO DATA	3.37E-08	3.42E-04	9.05E-08	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	2.24E-05	1.99E-05	1.45E-05	NO DATA	2.22E-05	1.25E-03	1.55E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	2.71E-05	3.17E-05	1.40E-05	1.06E-02	3.70E-05	NO DATA	7.58E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	2.83E-04	5.02E-04	5.32E-05	NO DATA	1.38E-04	5.89E-05	9.53E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	3.92E-04	4.37E-04	3.25E-05	NO DATA	1.23E-04	5.09E-05	9.53E-07	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	4.00E-05	4.00E-08	2.07E-08	NO DATA	9.59E-09	1.14E-03	2.74E-05	ALL	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr)=									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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**Dose from Air Radioiodine Inhalation Pathway for 1991 Data
Maximum Exposed Infant**

Breathing rate = 1400 m³/yr

Highest Annual Mean Concentration

Radionuclide	INFANT Inhalation Dose Factor (mrem per pCi inhaled)							Location	Air (pCi/m ³)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.81E-05	3.56E-06	NO DATA	3.56E-06	7.14E-04	5.04E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	8.71E-07	1.30E-06	NO DATA	NO DATA	5.55E-04	7.95E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	8.69E-06	1.08E-05	6.77E-06	NO DATA	NO DATA	7.25E-04	1.77E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	5.73E-05	8.41E-06	NO DATA	NO DATA	3.22E-03	2.28E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.38E-05	4.47E-05	2.22E-05	NO DATA	2.32E-05	4.62E-04	3.67E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	1.12E-05	4.58E-06	2.70E-06	NO DATA	3.37E-06	3.42E-04	9.05E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	8.24E-05	1.99E-05	1.45E-05	NO DATA	2.22E-05	1.25E-03	1.55E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	2.71E-05	3.17E-05	1.40E-05	1.06E-02	3.70E-05	NO DATA	7.56E-07	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	2.83E-04	5.92E-04	5.32E-05	NO DATA	1.36E-04	5.89E-05	9.53E-07	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	3.92E-04	4.37E-04	3.25E-05	NO DATA	1.23E-04	5.07E-05	9.53E-07	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	4.00E-05	4.00E-08	2.07E-06	NO DATA	2.59E-05	1.14E-03	1.11E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr) =									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*Dose from Milk Pathway for 1991 Data
Maximum Exposed Infant*

Usage (intake rate) = 330 L/yr

Highest Annual Mean Concentration

Radionuclide	INFANT Ingestion Dose Factor (mrem per pCi Ingested)							Indicator Location	Milk (pCi/L)	Dose (mrem/yr)						
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI			Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.86E-05	4.51E-06	NO DATA	4.41E-06	NO DATA	7.31E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	3.80E-06	8.88E-08	NO DATA	NO DATA	NO DATA	8.87E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	3.06E-05	5.38E-05	2.12E-05	NO DATA	NO DATA	1.58E-05	2.57E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	1.08E-05	2.55E-05	NO DATA	NO DATA	NO DATA	2.57E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.84E-05	8.31E-05	2.91E-05	NO DATA	3.08E-05	NO DATA	5.33E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	4.20E-06	1.73E-08	1.00E-06	NO DATA	1.24E-06	NO DATA	1.48E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	2.06E-07	5.02E-08	3.58E-08	NO DATA	5.41E-08	NO DATA	2.50E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	3.58E-05	4.23E-05	1.88E-05	1.39E-02	4.94E-05	NO DATA	1.51E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-134	3.77E-04	7.03E-04	7.10E-05	NO DATA	1.81E-04	7.42E-05	1.91E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-137	5.22E-04	8.11E-04	4.33E-05	NO DATA	1.84E-04	8.84E-05	1.91E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	1.71E-04	1.71E-07	4.81E-06	NO DATA	4.06E-08	1.05E-07	4.20E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Dose Equivalent (mrem/yr) =									0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Dose from Drinking Water Pathway for 1991 Data Maximum Exposed Infant

Highest Annual Mean Concentration

Usage (intake rate) = 330 L/yr

INFANT

Radionuclide	Ingestion Dose Factor (mrem per pCi ingested)										Indicator Location	Water (pCi/L)	Dose (mrem/yr)				
	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Bone	Liver	T. Body			Thyroid	Kidney	Lung	GI-LLI	
Mn-54	NO DATA	1.90E-05	4.51E-06	NO DATA	4.41E-06	NO DATA	7.31E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Co-58	NO DATA	3.60E-06	8.96E-06	NO DATA	NO DATA	NO DATA	8.87E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Fe-59	3.08E-05	5.38E-05	2.12E-05	NO DATA	NO DATA	1.59E-05	2.57E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Co-60	NO DATA	1.08E-05	2.55E-05	NO DATA	NO DATA	NO DATA	2.57E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Zn-65	1.84E-05	8.31E-05	2.81E-05	NO DATA	3.08E-05	NO DATA	5.33E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Nb-95	4.20E-08	1.73E-08	1.00E-07	NO DATA	1.24E-08	NO DATA	1.48E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Zr-95	2.00E-07	5.02E-08	3.58E-08	NO DATA	5.41E-08	NO DATA	2.50E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
I-131	3.59E-05	4.23E-05	1.88E-05	1.39E-02	4.94E-05	NO DATA	1.51E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Ce-134	3.77E-04	7.03E-04	7.10E-05	NO DATA	1.31E-04	7.42E-05	1.91E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Ce-137	5.22E-04	8.11E-04	4.33E-05	NO DATA	1.84E-04	6.84E-05	1.81E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
BaLa-140	1.71E-04	1.71E-07	8.81E-06	NO DATA	4.06E-08	1.05E-07	4.20E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
H-3	NO DATA	3.08E-07	3.08E-07	3.08E-07	3.08E-07	3.08E-07	3.08E-07	142	522	0.00E+00	5.31E-02	5.31E-02	5.31E-02	5.31E-02	5.31E-02		
Total Dose Equivalent (mrem/yr) =												0.00E+00	5.31E-02	5.31E-02	5.31E-02	5.31E-02	

5.0 QUALITY ASSURANCE

5.1 DUKE POWER COMPANY'S RADIOLOGICAL ENVIRONMENTAL LABORATORIES

5.1.1 SAMPLE COLLECTION

The Radiological and Environmental Services Group and the Fisheries work group perform the environmental sample collections as specified by approved sample collection procedures.

Modifications and improvements made to the environmental sampling program during the past year can be found in Appendix A.

5.1.2 SAMPLE ANALYSIS

The Radiological and Environmental Services Group performed the environmental sample analyses as specified by approved analysis procedures.

In 1989, reviewed data indicated detection of Cs-137 in airborne radiiodine cartridges, but not in associated airborne filters for the same sampling period and location. An extensive investigation was conducted in 1990 to determine reasons why low level Cs-137 activity, approximately 1 to 8 picocuries per total cartridge, was being detected on a low percentage basis of all cartridges counted by the Duke Power Radiological and Environmental Services Group. The possibility of detecting low-level activity was increased due to the installation of low background shields for gamma spectroscopy. In addition to the new shields employed, analysis techniques in some instances used extended count times. Experimental results determined that the Cs-137 activity was due to the activated carbon media and was present prior to placement into field sampling units.

Various airborne radiiodine cartridges were obtained from different vendors nationwide which had similar characteristics as the cartridges that were in current use by the Duke Power Environmental Collection Team. Findings support that low-level Cs-137 is a fallout product that is incorporated into the carbon media.

It is anticipated that continual observance of low activity Cs-137 will be detected on a random basis in airborne radiiodine cartridges and any trending of this data will be reported by the Radiological and Environmental Services Group to appropriate nuclear station personnel for consideration.

5.1.3 DOSIMETRY ANALYSIS

The Dosimetry Laboratory performed environmental dosimetry measurements as specified by approved dosimetry analysis procedures.

5.1.4 INTRALABORATORY QUALITY ASSURANCE

Radiological and Environmental Services has an internal quality assurance program which monitors each type of instrumentation for reliability and accuracy. Daily quality control checks ensure that instruments are in proper working order and these checks are used to monitor instrument performance.

Additionally, National Institute of Standards and Technology (NIST) standards that represent counting geometries are analyzed as unknowns at various frequencies ranging from weekly to annually to verify that efficiency calibrations are valid. The frequency is dependent upon instrument use and performance. Investigations are performed and documented should calibration verification data fall out of limits.

5.1.5 INTERLABORATORY QUALITY ASSURANCE

5.1.5.1 DUKE POWER'S AUDIT DIVISION

The Radiological and Environmental Services Group participated in a Quality Assurance audit in 1991, performed by Duke Power Company's Audit Division. Followup items pertaining to the environmental sampling program were identified in the audit and resulted in the placement of two special interest TLD's inside the site boundary at the N and NNW sectors.

The follow-up items were later closed out by the Audit Division.

5.1.5.2 DUKE POWER'S NUCLEAR PRODUCTION INTERCOMPARISON PROGRAM

The Radiological and Environmental Services Group participated in the Duke Power Nuclear Production Intercomparison Program during 1991.

Interlaboratory cross-check body burden standards, marinelli beakers, air filters, air cartridges, gross alpha/beta on smears, and tritium in water samples were analyzed at various times of the year by the four counting laboratories in Duke Power Company for this program.

5.1.5.3 U.S. NUCLEAR REGULATORY COMMISSION INSPECTIONS

Radiological and Environmental Services was audited by the NRC in 1991. No follow-up items were identified by the

inspector. A non-cited violation was identified concerning the failure to employ a sampling method which resulted in a specimen that was representative of liquid flow at drinking water site #132. A new sample location was found where the pump would continue to operate even during periods of low demand. This location was placed in service on 01/25/91.

5.1.5.4 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY INTERCOMPARISON PROGRAM

The Radiological and Environmental Services Group participated in the Environmental Protection Agency (EPA) Environmental Monitoring Systems Laboratory Intercomparison Program. The EPA sample types included mixed gamma in water (3 times per year), mixed gamma in milk (2 times per year), gamma in air filters (2 times per year), iodine in milk (2 times per year), tritium in water (3 times per year), iodine in water (2 times per year), gross alpha/beta in air filters (2 times per year), and gross alpha/beta in water (2 times per year).

Radiological and Environmental Services prepared and analyzed each sample as quickly as possible. Should the data obtained be out of EPA limits, Radiological and Environmental Services would have performed and documented follow-up investigations. The Radiological and Environmental Services EPA Intercomparison Report code is "CP". A summary of the EPA Intercomparison Reports for 1991 is documented in Table 5.1. Of the thirty-seven (37) analyses performed in 1991, one analysis (Gross Alpha/Beta in Air Filter cross-check, reference date 3/29/91) was out of EPA acceptance limits.

An investigation was performed to find out why these results were not within statistical limits. The following areas were investigated in an effort to resolve these poor results:

1. Geometry of the sample
2. Gas flow
3. Efficiency calibration files
4. Errors in the activity calculation
5. X-checks and calibration checks counted at about the same time of the analysis
6. Trends of past EPA Alpha/Beta X-checks
7. Recounting the EPA X-Check Air Filters
8. McGuire Nuclear Station air filter results for 1991

In the first area of investigation, geometry, it was noticed that the air filter media the EPA uses is considerably thicker than that of our regular air samples, therefore the sample will be placed closer to the counting window during the time of analysis. This closer placement of the sample will then produce a higher alpha count rate than that of a sample that is more distant from the window. This would in turn produce a higher activity reported for alpha, but the beta results would not necessarily change, because of the high energy of the Cs-137 beta.

From the review of the logbooks it was noticed that these samples were analyzed about 2 months before the end of a gas cycle. The gas flow was normal during this time, therefore this could not have adversely affected the results.

The efficiency calibration files were checked and they were up-to-date at the time of the analysis. This was shown by comparing the efficiencies used in calculating the activities for this x-check to those used for previous samples with the same weights.

The activity calculations were also reviewed again very thoroughly to see that all data input was correct, and they were found to be satisfactory. The x-checks and verifications performed at about the same time (April 1991) of the EPA x-check analysis were also reviewed to see if they were indicating a problem with the instrument. It was found that two x-checks, one EPA Drinking Water and one G.O. smear, were analyzed at about the same time of the analysis of this x-check. The results of both were within acceptable limits; therefore the system was operating properly.

The results of the EPA X-Checks for Air Filters and Drinking Water since 1984 were gathered and plotted to see if there were any trends in the results. The EPA started using a new disk media to simulate an air filter in April of 1987. By studying these graphs it was seen that the alpha results, from 1988 to present, start to trend high. This trend can be related to either the change in filter media or change in calibration standards (new standards made in October 1987). By comparing the graphs it was seen that the change in results is due to the change in filter media, because the Drinking Water results did not trend in the same manner as those of the Air Filters.

The EPA Air Filters were analyzed again under the new calibration that was performed in June 1991. These results were satisfactory for Beta activity, but were at the warning limit for Alpha. The Air Filters were also counted while placed directly in the holders (i.e. not in planchets), and these results were within statistical limits (Alpha Normalized Deviation=2.46 and Beta Normalized Deviation=-1.58). These results would support #1 of this investigation for Alpha, because the results were produced with the sample being further away from the counting window and closer to being

the geometry used prior to April 1987. However, this does not support #1 for Beta, because even though the results are within statistical limits, the activity had dropped.

The final part of this investigation was to determine if there was a change or trend in the results of the routine air filter samples for 1991. This study was done by printing all of the alpha and beta results for McGuire Nuclear Station for 1991, and visually checking to see if there was a noticeable change in the results. By doing this, there appeared to be no adverse changes or trends in the activities that were reported; therefore, our counting systems were still operating properly. In the conclusion of this investigation, it appeared that just one reason for the poor results could not be identified. The instruments will continue to be checked on a quarterly basis to ensure they are within calibration limits.

Additional documentation of this investigation is available from Radiological and Environmental Services.

5.1.5.5 NRC/STATE OF S.C. ENVIRONMENTAL MONITORING PROGRAM

The ONS Chemistry Section and Radiological and Environmental Services routinely participate with the State of South Carolina in their NRC/State Contract Environmental Monitoring Program. The ONS Chemistry Section splits water, milk, vegetation, sediment, and fish samples with the Bureau of Radiological Health of the State's Department of Health and Environmental Control (DHEC) for analysis. DHEC collects air samples from two of the locations sampled for air by ONS. Results of the analyses performed on split and duplicate samples by the Radiological and Environmental Services Group and DHEC Laboratory are compiled by DHEC and provided to the NRC. TLDs are also co-located with the State and NRC at various environmental sites.

5.1.5.6 NRC/STATE OF N.C. INTERCOMPARISON PROGRAM

Radiological and Environmental Services, and the Dosimetry Laboratory routinely participate with the State of North Carolina Department of Environmental Health and Natural Resources (DEHNR) in an intercomparison program. Health and Radiological Projects sends air, water, milk, vegetation, sediment, and fish samples which have been collected to the State of North Carolina Radiation Protection Section for intercomparison analysis. TLDs are also co-located with the State and NRC at various environmental sites. Also, every six to eight months, the State of North Carolina Radiation Protection Section irradiates environmental dosimeters and sends them to the Dosimetry Laboratory for analysis of the unknown estimated delivered exposure. A summary of the State of North Carolina Environmental Dosimetry Intercomparison Report for 1991 is documented in Table 5.2.

The Dosimetry Laboratory results were within 8.13% of the State of North Carolina results (excluding Standard Deviation values) for the March 1991 cross-check and 3.79% (excluding Standard Deviation values) for the December 1991 cross-check.

5.1.5.7 U.S. DEPARTMENT OF ENERGY INTERCOMPARISON PROGRAM

There was no DOE intercomparison program during calendar year 1991.

5.2 CONTRACTOR LABORATORY

No contractor laboratories were used during 1991.

TABLE 5.1

(Page 1 of 2)

U.S. ENVIRONMENTAL PROTECTION AGENCY INTERLABORATORY COMPARISON PROGRAM
1991 CROSS-CHECK RESULTS FOR THE RADIOLOGICAL AND ENVIRONMENTAL SERVICES LABORATORY

<u>ANALYSIS</u>	<u>DATE</u>	<u>NUCLIDE(S)</u>	<u>KNOWN VALUE</u>	<u>CONTROL LIMITS (3 SIGMA; N=3)</u>	<u>REPORTED VALUE</u>
Gamma in Water	2/08/91	Ba-133	75 pCi/L	61.1 - 88.9 pCi/L	78.3 pCi/L
		Co-60	40 pCi/L	31.3 - 48.7 pCi/L	42.3 pCi/L
		Zn-65	149 pCi/L	123.0 - 175.0 pCi/L	158.0 pCi/L
		Ru-106	186 pCi/L	153.0 - 215.0 pCi/L	212.3 pCi/L
		Cs-134	8 pCi/L	0.0 - 16.7 pCi/L	8.3 pCi/L
		Cs-137	8 pCi/L	0.0 - 16.7 pCi/L	9.3 pCi/L
	6/07/91	Ba-133	62 pCi/L	51.6 - 72.4 pCi/L	65.0 pCi/L
		Co-60	10 pCi/L	1.3 - 18.7 pCi/L	11.0 pCi/L
		Zn-65	108 pCi/L	88.9 - 127.1 pCi/L	112.7 pCi/L
		Ru-106	149 pCi/L	123.0 - 175.0 pCi/L	159.0 pCi/L
		Cs-134	15 pCi/L	6.3 - 23.7 pCi/L	15.0 pCi/L
		Cs-137	14 pCi/L	5.3 - 22.7 pCi/L	15.3 pCi/L
	10/04/91	Ba-133	98 pCi/L	80.7 - 115.3 pCi/L	100.7 pCi/L
		Co-60	29 pCi/L	20.3 - 37.7 pCi/L	32.7 pCi/L
		Zn-65	73 pCi/L	60.9 - 85.1 pCi/L	83.3 pCi/L
		Ru-106	199 pCi/L	164.3 - 233.7 pCi/L	218.0 pCi/L
		Cs-134	10 pCi/L	1.3 - 18.7 pCi/L	10.3 pCi/L
		Cs-137	10 pCi/L	1.3 - 18.7 pCi/L	11.0 pCi/L
	2/15/91	I-131	75 pCi/L	61.1 - 88.9 pCi/L	78.7 pCi/L
	8/09/91	I-131	20 pCi/L	9.6 - 30.4 pCi/L	20.7 pCi/L
	Air Filter	3/29/91	Cs-137	40 pCi/Filter	34.2 - 45.8 pCi/Filter
Gross Alpha			25 pCi/Filter	18.1 - 31.9 pCi/Filter	41.7 pCi/Filter
Gross Beta			124 pCi/Filter	117.1 - 130.9 pCi/Filter	108.0 pCi/Filter

TABLE 5.1
(Page 2 of 2)

U.S. ENVIRONMENTAL PROTECTION AGENCY INTERLABORATORY COMPARISON PROGRAM
1991 CROSS-CHECK RESULTS FOR THE RADIOLOGICAL AND ENVIRONMENTAL SERVICES LABORATORY

ANALYSIS	DATE	NUCLIDE(S)	KNOWN VALUE	CONTROL LIMITS (3 SIGMA; N=3)		REPORTED VALUE	
Air Filter	8/30/91	Cs-137	30 pCi/Filter	21.3 -	38.7 pCi/Filter	31.7	pCi/Filter
		Gross Alpha	25 pCi/Filter	14.6 -	35.4 pCi/Filter	35.0	pCi/Filter
		Gross Beta	92 pCi/Filter	74.7 -	109.3 pCi/Filter	93.0	pCi/Filter
Tritium in Water	2/22/91	H-3	4418 pCi/L	3651.2 -	5184.8 pCi/L	4676.0	pCi/L
	6/21/91	H-3	12480 pCi/L	10314.8 -	14645.2 pCi/L	12387.7	pCi/L
	10/18/91	H-3	2454 pCi/L	1843.3 -	3064.7 pCi/L	2839.0	pCi/L
Gamma in Milk	04/26/91	I-131	60 pCi/L	49.6 -	70.4 pCi/L	67.0	pCi/L
		Cs-137	49 pCi/L	40.3 -	57.7 pCi/L	49.7	pCi/L
	9/27/91	I-131	108 pCi/L	88.9 -	127.1 pCi/L	110.7	pCi/L
		Cs-137	30 pCi/L	21.3 -	38.7 pCi/L	31.0	pCi/L
Alpha-Beta in Water	1/25/91	Gross Alpha	5 pCi/L	0.0 -	13.7 pCi/L	7.7	pCi/L
		Gross Beta	5 pCi/L	0.0 -	13.7 pCi/L	9.3	pCi/L
	9/20/91	Gross Alpha	10 pCi/L	1.3 -	18.7 pCi/L	10.7	pCi/L
		Gross Beta	20 pCi/L	11.3 -	28.7 pCi/L	21.3	pCi/L

8-5

TABLE 5.2

STATE OF NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL HEALTH AND NATURAL RESOURCES
 ENVIRONMENTAL DOSIMETER CROSS-CHECK 1991

STATE OF N.C. ESTIMATED VALUE			DOSIMETRY LABORATORY ESTIMATED VALUE	
Date of Cross-Check	Exposure (mR)	Estimated Uncertainty (1S.D. mR)	Exposure (mR)	Estimated Uncertainty (1 S.D. mR)
3/91	49.6	± 1.2	47.72	± 1.91
12/91	49.8	± 0.7	45.75	± 1.19

6.0

REFERENCES

1. Final Safety Analysis Report, McGuire 1 & 2, Section 1.2.1.
2. Final Safety Analysis Report, McGuire 1 & 2, Section 2.1.
3. Final Safety Analysis Report, McGuire 1 & 2, Section 2.1.1.
4. Final Safety Analysis Report, McGuire 1 & 2, Section 11.6.1.
5. Final Safety Analysis Report, McGuire 1 & 2, Section 11.6.3.
6. Final Safety Analysis Report, McGuire 1 & 2, Section 11.6.4.
7. Selected Licensee Commitments Manual Section 16.11-13.
8. McGuire Nuclear Station Technical Specification 6.9.1.6.
9. Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I", U.S. Nuclear Regulatory Commission, Rev. 1, October 1977.
10. Probability in Statistics in Engineering and Management Science, Hines and Montgomery, 1969, pp. 287-293.
11. Practical Statistics for the Physical Sciences, American Chemical Society, 1988, pp. 84-100.

APPENDIX A

*ENVIRONMENTAL
SAMPLING AND
ANALYSIS PROCEDURES*

APPENDIX A

ENVIRONMENTAL SAMPLING AND ANALYSIS PROCEDURES

Adherence to established procedures for sampling and analysis of all environmental media at McGuire Nuclear Station was required to ensure compliance with Station Selected Licensee Commitments. Analytical procedures were employed to ensure that Selected Licensee Commitments detection capabilities were achieved.

Environmental sampling and analyses were performed by the Duke Power Generation Services Department Radiological and Environmental Services Group, the Dosimetry Laboratory, and the Fisheries work groups.

Starting at Section A.1, this appendix describes the environmental sampling frequencies and analysis procedures by media type.

I. CHANGE OF SAMPLING PROCEDURES

The Land Use Census identified an additional food products location at the Austin Residence. The Austin Residence was assigned as location number 188, and is located 2.8 miles from the station in the North sector. Sampling at the Austin Residence began October 10, 1991. Location 188 will replace location 185 (Brewer's Residence) for future food products sampling.

Two new TLD locations were added as "SPECIAL INTEREST" monitoring sites. These locations were designated as location 186 (0.2 mi. NNW) and location 187 (0.3 mi. N).

Two additional TLD's were added as site boundary sites in December, 1991 as a result of the GPS Project (see page A-5). These locations were designated as location 189 (0.4 miles SSE) and location 190 (0.5 miles WSW). The results of these TLD's will be summarized in the 1992 Annual Report.

II. CHANGE OF ANALYSIS PROCEDURES

During 1991, a change in the counting procedure was made for gross beta samples. The samples were counted in replicate, three times each, and a mean result was used in the calculation of activity.

The value used to determine if the gross beta activity is less than the critical level was re-evaluated and changed to be 50% of the MDA value rather than 100%. This value is indicated on the activity calculation printout for each sample.

III. SAMPLING AND ANALYSIS PROCEDURES

A.1 AIRBORNE PARTICULATE AND RADIOIODINE

Airborne particulate and radioiodine samples at each of five locations were composited continuously by means of continuous air samplers. Air particulates were collected on a particulate filter and radioiodines were collected in a charcoal cartridge situated behind the filter in the sampler. The samplers are designed to operate at a constant flow rate (in order to compensate for any filter loading) and are set to sample approximately 2 cubic feet per minute. Filters and cartridges were collected weekly. A weekly gamma analysis and gross beta analysis was performed on each filter and a weekly gamma analysis was performed on each charcoal cartridge. The filter and charcoal cartridge were analyzed independently. The continuous composite samples were collected from the locations listed below.

Location 120	=	Site Boundary (0.4 mi. NNE)
Location 121	=	Site Boundary (0.5 mi. NE)
Location 125	=	Site Boundary (0.4 mi. SW)
Location 133	=	Cornelius, NC (6.2 mi. NE)
Location 134	=	East Lincoln Junior High School (8.7 mi. WNW)

A.2 DRINKING WATER

Biweekly composite samples were collected. A low-level Iodine-131 analysis was performed on each composite sample. A gross beta and gamma analysis was performed on monthly composites. Tritium analysis was performed on the quarterly composites. The composites were collected biweekly from the locations listed below.

Location 132	=	Charlotte Municipal Water Supply (11.2 mi. SSE)
Location 136	=	Mooresville Municipal Water Supply (12.5 mi. NNE)
Location 142	=	Davidson Municipal Water Supply (7.5 mi. NE)

A.3 SURFACE WATER

Biweekly composite samples were collected. A low-level Iodine-131 analysis was performed on each composite sample. A gamma analysis was performed on the monthly composites. Tritium analysis was performed on each sample. The composites were collected from the locations listed below.

Location 128	=	Discharge Canal Bridge (0.4 mi. ENE)
Location 131	=	Cowans Ford Dam (0.7 mi. W)
Location 135	=	Plant Marshall Intake Canal (12.0 mi. N)

A.4 MILK

Biweekly grab samples were collected at each dairy and a gamma and low-level Iodine-131 analysis was performed on each. The biweekly grab samples were collected from the locations listed below.

Location 138	=	Henry Cook Dairy (2.75 mi. ESE)
Location 139	=	William Cook Dairy (2.6 mi. E)
Location 140	=	Kidd Dairy - COWS (2.8 mi. SSE)
Location 141	=	Lynch Dairy - COWS (14.8 mi. WNW)

A.5 BROADLEAF VEGETATION

Monthly samples were collected and a gamma analysis was performed on each. The samples were collected from the locations listed below.

Location 120	=	Site Boundary (0.4 mi. NNE)
Location 125	=	Site Boundary (0.4 mi. SW)
Location 134	=	East Lincoln Junior High School (8.7 mi. WNW)
Location 158	=	4-5 Mile Radius (5.0 mi. NNE)

A.6 SHORELINE SEDIMENT

Semiannual samples were collected and a gamma analysis was performed on each following the drying and removal of rocks and clams. The samples were collected from the locations listed below.

Location 129	=	Discharge Canal Entrance to Lake Norman (0.6 mi. ENE)
Location 130	=	Highway 73 Bridge Downstream (0.6 mi. ENE)
Location 137	=	Pinnacle Access Area (12.0 mi. N)

A.7 FISH

Semiannual samples were collected and a gamma analysis was performed on the edible portions of each sample. Boney fish such as Shad were prepared whole minus the head and tail portions. The samples were collected from the locations listed below.

Location 129	=	Discharge Canal Entrance to Lake Norman (0.6 mi. ENE)
Location 137	=	Pinnacle Access Area (12.0 mi. N)

A.8 DIRECT GAMMA RADIATION (TLD)

Thermoluminescent dosimeters (TLD) were collected quarterly at forty-two concentric locations. A gamma dose rate was determined for each TLD. The TLDs were placed as indicated below.

- * An inner ring of 14 TLDs at the site boundary, one in each available meteorological sector. The site boundary locations in the N and NNW sectors are over water; however, two special interest TLD's were placed in these sectors inside the site boundary in March, 1991.
- * An outer ring of 16 TLDs, one in each meteorological sector in the 6 to 8 kilometer range.
- * The remaining TLDs were placed in SPECIAL INTEREST areas such as population centers, residential areas, schools, and CONTROL locations.

A.9 FOOD PRODUCTS

Samples were collected monthly when available during the harvest season and a gamma analysis was performed on each. The samples were collected at the locations listed below.

- Location 184 = 5 Mile Radius (2.5 mi. ENE) - Gardens (Davenport's Residence)
- Location 185 = 5 Mile Radius (4.9 mi. N) - Gardens (Brewer's Residence)
- Location 188 = 5 Mile Radius (2.8 mi. N) - Gardens (Austin's Residence)

A.10 ANNUAL LAND USE CENSUS

An annual Land Use Census was conducted to identify within a distance of 8 kilometers (5.0 miles) from the station, the nearest location from the site boundary in each of the sixteen meteorological sectors, the following:

- * The Nearest Residence
- * The Nearest Meat Animal
- * The Nearest Garden
 - * greater than 50 square meters or 500 square feet
- * The Nearest Milk-giving Animal (cow, goat, etc.)

IV. SAMPLING AND ANALYSIS IMPROVEMENTS

Several enhancements were made to the environmental monitoring program in 1991. Focus was centered on reducing the number of sampling deviations by researching equipment upgrades, establishing acceptance criteria for equipment replacement, implementing equipment labelling and serial number documentation, and carefully reviewing deviations by site location and sample type. Also, the Global Positioning System (GPS) Project was implemented to more accurately determine distance and sector for each sampling location. GPS is a satellite - based radio navigation system which provides precise positioning data.

APPENDIX B

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SUMMARY OF RESULTS

Summary sheets for each media have been included in this Appendix.

B.1 RADIODIODINES

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station Docket Number : 50-369,370
 Location of Facility : Mecklenburg County, N.C. Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Time Report Generated : 14-JAN-1992 13:33:32 Database Name : #DISK1:[USER.ASC]MNS91.SAF.1

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
AIR RADIODIODINES (PCI/M3)				134 (8.7 Mi WNW)			
5 Locations	MN-54 261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	CO-58 261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	FE-59 261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	CO-60 261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	ZM-65 261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	NB-95 261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	TR-95 261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	I-131 261	7.00E-02	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	CS-134 261	5.00E-02	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	CS-137 261	6.00E-02	2.31E-02(3/ 209) 1.28E-02-- 3.56E-02	120 (0.4 Mi NNE) 3.56E-02(1/ 51) 3.56E-02-- 3.56E-02	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0
	BALA-140 261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00		0

Mean and range based upon detectable measurements only
 Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
 Zero range indicates no detectable activity measurements
 LLD is equal to 0, then LLD is not required by Technical Specifications
 The LLDs listed above are the values required by Station Technical Specifications

Location 120 = Site Boundary (0.4 Mi NNE) Location 133 = Cornelius, NC (6.2 Mi NE)
 Location 121 = Site Boundary (0.5 Mi NE) Location 134 = East Lincoln Junior High School (8.7 Mi WNW)
 Location 125 = Site Boundary (0.4 Mi SW)

B.2 PARTICULATE

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station Docket Number : 50-369,370
 Location of Facility : Mecklenburg County, N.C. Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Time Report Generated : 14-JAN-1992 13:33:32 Database Name : %DISK1:[USER.ASC]MNS91.SAF:1

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
AIR PARTICULATE (PCI/M3)				134 (8.7 Mi WNW)			
5 Locations	MN-54	261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	CD-58	261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	FE-59	261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	CD-60	261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	ZN-65	261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	WB-95	261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	TR-95	261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	I-131	260	7.00E-02	0.00E+00(0/ 208) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	CS-134	261	5.00E-02	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	CS-137	261	6.00E-02	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	BALA-140	261	0.0	0.00E+00(0/ 209) 0.00E+00-- 0.00E+00	0.00E+00(0/ 51) 0.00E+00-- 0.00E+00	0.00E+00(0/ 52) 0.00E+00-- 0.00E+00	0
	BETA	261	1.00E-02	2.11E-02(207/ 209) 3.04E-03-- 6.97E-02	133 (6.2 Mi NE) 2.16E-02(52/ 53) 3.04E-03-- 5.09E-02	2.15E-02(52/ 52) 7.14E-03-- 3.79E-02	0

Mean and range based upon detectable measurements only
 Fraction of detectable measurements at specified locations is indicated in parentheses. (Fraction)
 Zero range indicates no detectable activity measurements
 If LLD is equal to 0, then LLD is not required by Technical Specifications
 The LLDs listed above are the values required by Station Technical Specifications

Location 120 = Site Boundary (0.4 Mi NNE) Location 133 = Cornelius, NC (6.2 Mi NE)
 Location 121 = Site Boundary (0.5 Mi NE) Location 134 = East Lincoln Junior High School (8.7 Mi WNW)
 Location 125 = Site Boundary (0.4 Mi SW) B-3

B.3 DRINKING WATER

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station Docket Number : 50-369,370
 Location of Facility : Mecklenburg County, N.C. Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Time Report Generated : 14-JAN-1992 13:33:32 Database Name : #DISK1:[USER.ASC]MNS91.GAF:1

Medium or Pathway Sampler (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		No. of Non-Routine Report Meas.
				Have, Distance and Direction Location Code	Control Locations Mean (Fraction) Range	
DRINKING WATER (PCI/LITER)				136 (12.5 Mi NNE)		
3 Locations	ANAL1-LL 39	1.0	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	ANAL2-LL 39	1.0	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	MN-54 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	CD-58 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	FE-59 39	30.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	CD-60 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	ZN-65 39	30.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	NB-95 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	ZR-95 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	I-131 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	CS-137 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0

Mean and range based upon all measurements only
 Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
 Zero range indicates no detectable activity measurements
 If LLD is equal to 0, then LLD is not required by Technical Specifications
 The LLDs listed above are the values required by Station Technical Specifications

Location 132 = Charlotte Municipal Water Supply (11.2 Mi SSE)
 Location 175 = Charlotte Municipal Water Supply (12.5 Mi NNE)
 Location 142 = Charlotte Municipal Water Supply (7.5 Mi NE)

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station
 Location of Facility : Mecklenburg County, N.C.
 Time Report Generated : 14-JAN-1992 13:33:32

Docket Number : 50-369,370
 Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Database Name : %DISK1:[USER.ASC]MNS91.SAF:1

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
DRINKING WATER (PCI/LITER)							
3 Locations	CS-137 39	18.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00			136 (12.5 Mi NNE) 0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	BALA-140 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00			0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	BETA 39	4.0	2.3 (24/ 26) 1.0 -- 4.3	132 (11.2 Mi SSE)	2.4 (12/ 13) 1.8 -- 3.0	2.5 (13/ 13) 0.97 -- 6.4	0
DM TRITIUM (PCI/LITER)							
6 Locations	H-3 12	2.00E+03	5.22E+02(2/ 8) 4.78E+02-- 5.67E+02	142 (7.5 Mi NE)	5.22E+02(2/ 4) 4.78E+02-- 5.67E+02	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	0

Mean and range based upon detectable measurements only
 Fraction of detectable measurements at specified locations is indicated in parentheses. (Fraction)
 Zero range indicates no detectable activity measurements
 If LLD is equal to 0, then LLD is not required by Technical Specifications
 The LLDs listed above are the values required by Station Technical Specifications

- 132 = Charlotte Municipal Water Supply (11.2 Mi SSE)
- 136 = Mooresville Municipal Water Supply (12.5 Mi NNE)
- 142 = Davidson Municipal Water Supply (7.5 Mi NE)

B.4 SURFACE WATER

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station
 Location of Facility : Mecklenburg County, N.C.
 Time Report Generated : 14-JAN-1992 13:33:32

Docket Number : 50-369,370
 Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Database Name : \DISK1:[USER.ASC]MNS91.SAF.1

Media or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Control Locations Mean (Fraction) Range	
SURFACE WATER (PC/LITER)				135 (12.0 Mi W)		
3 Locations	ANAL1-LL 39	1.0	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	ANAL2-LL 39	1.0	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	MN-54 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	CD-58 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	FE-59 39	30.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	CD-60 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	ZN-65 39	30.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	NB-95 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	TR-95 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	I-131 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0
	CS-134 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0

Mean and range based upon detectable measurements only
 Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
 Zero range indicates no detectable activity measurements
 LLD is equal to 0, then LLD is not required by Technical Specifications
 The LLDs listed above are the values required by Station Technical Specifications

Location 128 = Discharge Canal Bridge (0.4 Mi ENE)
 Location 131 = Cowans Ford Dam (0.7 Mi W)
 Location 135 = Plant Marshall Intake Canal (12.0 Mi W)

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station Docket Number : 50-369,370
 Location of Facility : Mecklenburg County, N.C. Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Time Report Generated : 14-JAN-1992 13:33:32 Database Name : #DISK1:(USER.ASC)MNS91.SAF:1

Media or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
SURFACE WATER (PCI/LITER)				135 (12.0 Mi W)			
3 Locations	CS-137 39	18.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0	
	BALAN-10 39	15.	0.00E+00(0/ 26) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0.00E+00(0/ 13) 0.00E+00-- 0.00E+00	0	
SW TRITIUM (PCI/LITER)				128 (0.4 Mi ENE)			
3 Locations	H-3 12	2.00E+03	7.22E+02(4/ 8) 4.83E+02-- 9.66E+02	7.53E+02(3/ 4) 4.83E+02-- 9.66E+02	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	0	

Mean and range based upon detectable measurements on
 Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
 Zero range indicates no detectable activity measurements
 If LLD is equal to 0, then LLD is not required by Technical Specifications
 The LLDs listed above are the values required by Station Technical Specifications

Location 128 = Discharge Canal Bridge (0.4 Mi ENE)
 Location 131 = Cowans Ford Dam (0.7 Mi W)
 Location 135 = Plant Marshall Intake Canal (12.0 Mi W)

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station
 Location of Facility : Mecklenburg County, N.C.
 Time Report Generated : 14-JAN-1992 13:33:32

Docket Number : 50-364,370
 Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Database Name : %DISK:[USER.ASC]MMS91.SAF:1

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
MILK (PCI/LITER)						13B (2.75 Mi ESE)	
4 Locations							
	MN-54 108	0.0	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	CD-58 108	0.0	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	FE-59 108	0.0	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	CD-60 108	0.0	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	ZN-65 108	0.0	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	NB-95 108	0.0	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	ZR-95 108	0.0	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	I-131 108	15.	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	LLI-131 108	1.0	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	CS-134 108	15.	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	CS-137 108	18.	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0
	BALA-140 108	15.	0.00E+00(0/ 81) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0.00E+00(0/ 27) 0.00E+00-- 0.00E+00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

If LLD is equal to 0, then LLD is not required by Technical Specifications

The LLDs listed above are the values required by Station Technical Specifications

Location 138 = Henry Cook Dairy (2.75 Mi ESE)

Location 140 = Kidd Dairy - COWS (2.8 Mi SSE)

Location 139 = William Cook Dairy (2.6 Mi E)

Location 141 = Lynch Dairy - COWS (14.8 Mi MNW)

B.6 BROADLEAF VEGETATION

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station
 Location of Facility : Mecklenburg County, M.C.
 Time Report Generated : 14-JAN-1992 13:33:32

Docket Number : 50-369,370
 Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Database Name : %DISK1:[USER.ASC]MMS91.SAF.1

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
BROAD LEAF VEGET (PCI/WET/KG)							
				158 (5.0 Mi NNE)		134 (8.7 Mi WNW)	
4 Locations	MN-54 48	0.0	9.5 (1/ 36) 9.5 -- 9.5	9.5 (1/ 12) 9.5 -- 9.5	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	CD-58 48	0.0	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	FE-59 48	0.0	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	CD-60 48	0.0	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	ZN-65 48	0.0	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	NB-95 48	0.0	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	ZR-95 48	0.0	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	I-131 48	60.	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	CS-134 48	60.	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
				125 (0.4 Mi SW)			
	CS-137 48	80.	33. (1/ 36) 33. -- 33.	33. (1/ 12) 33. -- 33.	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	
	BALA-140 48	0.0	0.00E+00(0/ 36) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0.00E+00(0/ 12) 0.00E+00-- 0.00E+00	0	

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

If LLD is equal to 0, then LLD is not required by Technical Specifications

The LLDs listed above are the values required by Station Technical Specifications

Location 120 = Site Boundary (0.4 Mi NNE)

Location 125 = Site Boundary (0.4 Mi SW)

Location 134 = East Lincoln Junior High School (8.7 Mi WNW)

Location 158 = 4-5 Mile Radius (5.0 Mi NNE)

B.7 SHORELINE SEDIMENT

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station
 Location of Facility : Mecklenburg County, N.C.
 Time Report Generated : 14-JAN-1992 13:33:32

Docket Number : 50-369,370
 Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Database Name : #D:\SK1\USER.ASC\MNS91.SAF

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
SEDIMENT (PCI/DRY/KG)							
3 Locations	MN-54	6	0.0	28. (1/ 4) 28. -- 28.	129 (0.6 Mi ENE) 28. (1/ 2) 28. -- 28.	137 (12.0 Mi N) 0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	CO-58	6	0.0	53. (2/ 4) 23. -- 83.	129 53. (2/ 2) 23. -- 83.	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	FE-59	6	0.0	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	CO-60	6	0.0	1.31E+02(2/ 4) 93. -- 1.70E+02	129 1.31E+02(2/ 2) 93. -- 1.70E+02	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	IM-65	6	0.0	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	NB-95	6	0.0	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	IR-95	6	0.0	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	I-131	6	0.0	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	CS-134	6	1.50E+02	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	CS-137	6	1.80E+02	78. (4/ 4) 37. -- 1.04E+02	130 (0.6 Mi SW) 1.03E+02(2/ 2) 1.03E+02-- 1.04E+02	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0
	BALA-140	6	0.0	0.00E+00(0/ 4) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0.00E+00(0/ 2) 0.00E+00-- 0.00E+00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

If LLD is equal to 0, then LLD is not required by Technical Specifications

The LLDs listed above are the values required by Station Technical Specifications

Location 129 = Discharge Canal Entrance to Lake Norman (0.6 Mi ENE)

Location 130 = Highway 73 Bridge Downstream (0.6 Mi SW)

Location 137 = Pinnacle Access Area (12.0 Mi N)

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station
 Location of Facility : Mecklenburg County, N.C.
 Time Report Generated : 14-JAN-1992 13:33:32

Docket Number : 50-369,370
 Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Database Name : *DISK1:(USER.ASC)MNS91.SAF:1

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
FISH (PCI/WET/KB)						137 (12.0 Mi W)	
2 Locations	MN-54	12	1.30E+02	6.2 (1/ 6) 6.2 -- 6.2	129 (0.6 Mi ENE) 6.2 (1/ 6) 6.2 -- 6.2	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	CO-58	12	1.30E+02	14. (1/ 6) 14. -- 14.	129 14. (1/ 6) 14. -- 14.	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	FE-59	12	2.60E+02	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	CO-60	12	1.30E+02	65. (1/ 6) 65. -- 65.	129 65. (1/ 6) 65. -- 65.	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	ZN-65	12	2.60E+02	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	NB-95	12	0.0	3.5 (1/ 6) 3.5 -- 3.5	129 3.5 (1/ 6) 3.5 -- 3.5	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	ZR-95	12	0.0	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	I-131	12	0.0	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	CS-134	12	1.30E+02	5.9 (1/ 6) 5.9 -- 5.9	129 5.9 (1/ 6) 5.9 -- 5.9	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	CS-137	12	1.50E+02	26. (6/ 6) 11. -- 45.	129 26. (6/ 6) 11. -- 45.	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0
	BALA-140	12	0.0	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	129 0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0.00E+00(0/ 6) 0.00E+00-- 0.00E+00	0

Mean and range based upon detectable measurements only
 Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
 Zero range indicates no detectable activity measurements
 If LLD is equal to 0, then LLD is not required by Technical Specifications
 The LLDs listed above are the values required by Station Technical Specifications

Location 129 = Discharge Canal Entrance to Lake Norman (0.6 Mi ENE)
 Location 137 = Pinnacle Access Area (12.0 Mi W)

B.9 DIRECT GAMMA RADIATION

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station
 Location of Facility : Mecklenburg County, N.C.
 Time Report Generated : 21-JAN-1992 16:09:49
 Docket Number : 50-369,370
 Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Database Name : %DISK1:[USER.ASC]MNS91.SAF:1

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
DIRECT RAD-TLD (mR/Quarter)						175 (12.7 mI WNW)	
43 Locations	mR/Qty 170	0.00E+00	14. (166/ 166) 6.0 -- 31.	180 (11.5 mI WNE)	24. (4/ 4) 16. -- 31.	17. (4/ 4) 12. -- 23.	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses. (Fraction)

Zero range indicates no detectable activity measurements

If LLD is equal to 0, then LLD is not required by Technical Specifications

- | | |
|------------------------------------|--------------------------------------|
| 143 = Site Boundary (0.3 mI NW) | 163 = 4-5 Mile Radius (5.0 mI SE) |
| 144 = Site Boundary (0.4 mI WNE) | 164 = 4-5 Mile Radius (4.5 mI SSE) |
| 145 = Site Boundary (0.5 mI NE) | 165 = 4-5 Mile Radius (5.0 mI S) |
| 146 = Site Boundary (0.5 mI ENE) | 166 = 4-5 Mile Radius (5.2 mI SSW) |
| 147 = Site Boundary (0.4 mI E) | 167 = 4-5 Mile Radius (4.9 mI SW) |
| 148 = Site Boundary (0.5 mI ESE) | 168 = 4-5 Mile Radius (4.7 mI WSW) |
| 149 = Site Boundary (0.6 mI SE) | 169 = 4-5 Mile Radius (4.4 mI W) |
| 150 = Site Boundary (0.5 mI SE) | 170 = 4-5 Mile Radius (4.5 mI WNW) |
| 151 = Site Boundary (0.4 mI S) | 171 = 4-5 Mile Radius (4.5 mI NW) |
| 152 = Site Boundary (0.5 mI SSW) | 172 = 4-5 Mile Radius (5.2 mI NNW) |
| 153 = Site Boundary (0.5 mI SW) | 173 = Special Interest (8.5 mI NNW) |
| 154 = Site Boundary (0.5 mI W) | 174 = Special Interest (8.7 mI NNW) |
| 155 = Site Boundary (0.5 mI WNW) | 175 = CONTROL (12.7 mI WNW) |
| 156 = Site Boundary (0.5 mI WNW) | 176 = Special Interest (11.0 mI SW) |
| 157 = 4-5 Mile Radius (4.8 mI N) | 177 = Special Interest (8.6 mI S) |
| 158 = 4-5 Mile Radius (4.4 mI WNE) | 178 = Special Interest (9.2 mI SE) |
| 159 = 4-5 Mile Radius (5.0 mI NE) | 179 = Special Interest (10.4 mI ESE) |
| 160 = 4-5 Mile Radius (4.9 mI ENE) | 180 = Special Interest (11.5 mI WNE) |
| 161 = 4-5 Mile Radius (4.7 mI E) | 181 = Special Interest (6.7 mI NE) |
| 162 = 4-5 Mile Radius (4.6 mI ESE) | 182 = Special Interest (6.0 mI NE) |
| | 183 = Special Interest (5.5 mI S) |
| | 186 = Special Interest (0.2 mI NNW) |
| | 187 = Special Interest (0.3 mI N) |

B.10 FOOD PRODUCTS (CROPS)

Environmental Radiological Monitoring Program Summary

Name of Facility : McGuire Nuclear Station
 Location of Facility : Mecklenburg County, N.C.
 Time Report Generated : 14-JAN-1992 13:33:32

Docket Number : 50-369,370
 Reporting Period : 1-JAN-1991 through 31-DEC-1991
 Database Name : %DISK1:[USEC,ASC]MMS91.SAF:1

Medium or Pathway Sampled (Units)	Type & Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Mean		Control Locations Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Name, Distance and Direction Location Code	Mean (Fraction) Range		
CRDPS (PCI/WET/KB)							
3 Locations							
	MN-54	17	0.0	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	CO-58	17	0.0	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	FE-59	17	0.0	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	CO-60	17	0.0	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	ZN-65	17	0.0	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	NB-95	17	0.0	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	ZR-95	17	0.0	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	I-131	17	80.	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	CS-134	17	80.	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	CS-137	17	80.	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0
	BALA-140	17	0.0	0.00E+00(0/ 17) 0.00E+00-- 0.00E+00	0.00E+00(0/ 7) 0.00E+00-- 0.00E+00	0.00E+00(0/ 0) 0.00E+00-- 0.00E+00	0

Mean and range based upon detectable measurements only
 Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
 Zero range indicates no detectable activity measurements
 If LLD is equal to 0, then LLD is not required by Technical Specifications
 The LLDs listed above are the values required by Station Technical Specifications

Location 184 = 5 mile radius (2.5 Mi ENE) - Gardens (Davenport's Residence)
 Location 185 = 5 mile radius (4.9 Mi N) - Gardens (Brewer's Residence)
 Location 188 = 5 mile radius (2.8 Mi N) - Gardens (Autsin's Residence)

APPENDIX C

*SAMPLING
DEVIATIONS AND
UNAVAILABLE
ANALYSES*

APPENDIX C

SAMPLING DEVIATIONS AND UNAVAILABLE ANALYSES

I. SAMPLING DEVIATIONS

The following deviations from sampling requirements occurred during 1991:

A. AIRBORNE RADIOIODINES AND PARTICULATES

1. Location #134, 1/8/91 to 1/15/91

Reason: Due to power having been cut off at the breaker box, the sampler ran only 124.3 hours out of a normal 168 hour sampling period.

Action: Power was restored and sampler was restarted. Actual sampling period was 1/8/91 @ 10:45 to 1/15/91 @ 15:03.

2. Location #133, 1/15/91 to 1/22/91

Reason: Due to part of the filter not covering the full center of the sample head, air was able to pass through unfiltered, reducing the CPM and Net Weight(mg) which may have affected the analysis. The sampler ran 167.1 hours out of a normal 168 hour sampling period.

Action: Filter and cartridge were changed for new sampling period. All LLD's were met. No nuclides were found on the cartridge attributed to having missed the filter. Actual sampling period was 1/15/91 @ 08:54 to 1/22/91 @ 08:53.

3. Location #134, 3/12/91 to 3/19/91

Reason: Due to the power to the sampler being turned off by vandals, the sampler ran for only 102.5 hours out of a normal 168 hour sampling period.

Action: Restored power and used a tie-wrap to secure breaker box lever in stationary position. Actual sampling period was 3/12/91 @ 11:32 to 3/16/91 @ 18:02.

4. Location #133, 5/7/91 to 5/14/91

Reason: Due to the plug having been disconnected, the sampler only ran 23.7 hours out of a normal 168 hour sampling period.

Action: Plugged in sampler and secured it with a tie-wrap. Actual sampling period was 5/7/91 @ 12:28 to 5/8/91 @ 12:10.

5. Location #120, 5/14/91 to 5/21/91

Reason: Due to an apparent power failure during the sampling period, the sampler only ran 84.8 hours out of a normal 168 hour sampling period. The sampler was running at the time of collection.

Action: Collected P&C and restarted sampler. Actual sampling period was 5/14/91 @ 14:38 to 5/21/91 @ 14:38.

6. Location #120, 5/28/91 to 6/4/91

Reason: Due to a blown fuse, sampler only ran 142.5 hours out of a normal 168 hour sampling period.

Action: Replaced fuse and restarted sampler. Actual sampling period was 5/28/91 @14:40 to 6/3/91 @ 13:10.

7. Location #120, 10/8/91 to 10/15/91

Reason: Due to a blown fuse, the sampler only ran for 11.9 hours out of a normal 168 hour sampling period.

Action: Replaced fuse and restarted sampler. Actual sampling period was 10/8/91 @11:25 to 10/8/91 23:15.

8. Location #120, 10/15/91 to 10/22/91

Reason: Due to a blown fuse, the sampler only ran for 85.2 hours out of a normal 168 hour sampling period.

Action: Replaced fuse and restarted sampler. Actual sampling period was 10/15/91 @15:02 to 10/19/91 @ 04:14.

9. Location #133, 10/29/91 to 11/5/91

Reason: Particulate from recent forest fires clogged the particulate filter, preventing air flow and causing the pump to overheat and malfunction. Also, the actual run time was not available due to an inoperable timer on the air sampler. A calculated run time was estimated to be 17.78 hours out of a normal 168 hour sampling period.

Action: Collected sample and replaced sampler. Actual sampling period was calculated to be 10/29/91 @ 09:22 to 10/30/91 @03:09.

10. Location #125 11/5/91 to 11/12/91

Reason: In order to prevent the air sampler pumps from forest fire damage, the Radeco samplers were checked after 2.69 days for flow rate. The sampler only ran 64.4 hours out of a normal 168 hour sampling period.

Action: Collected particulate and charcoal after 2.69 days. Actual sampling period was 11/5/91 @ 15:50 to 11/8/91 @08:17.

11. Location #125 11/5/91 to 11/12/91

Reason: In order to prevent the air sampler pumps from forest fire damage, the Radeco samplers were checked after four (4) days for flow rate. Sampler only ran 97.0 hours out of a normal 168 hour sampling period.

Action: Collected particulate and charcoal after 4.04 days and replaced with new particulate and charcoal. Actual sampling period was 11/8/91 @ 08:18 to 11/12/91 @ 09:18.

12. Location #133, 11/5/91 to 11/12/91

Reason: In order to prevent the air sampler pumps from forest fire damage, the Radeco samplers were checked after 2.8 days for flow rate. Sampler ran for only 67.3 hours out of a normal 168 hour sampling period.

Action: Collected particulate and charcoal after 2.8 days. Actual sampling period was 11/5/91 @ 14:08 to 11/8/91 @09:28.

13. Location #133, 11/5/91 to 11/12/91

Reason: In order to prevent the air sampler pumps from forest fire damage, this sample was collected after running only 3.95 days (94.8 hours).

Action: Collected sample earlier than normal. Actual sampling period was 11/8/91 @09:30 to 11/12/91 08:19.

B. SURFACE WATER

1. Location #128, 2/5/91 to 2/19/91

Reason: Due to a malfunctioning pump, a full composite sample was unavailable.

Action: MNS personnel were notified for corrective maintenance. An abbreviated sample was collected. Actual sampling period 2/5/91 @ 12:00 to 2/19/91 @14:50.

2. Location #128, 2/19/91 to 3/5/91

Reason: Due to a malfunctioning pump, no composite sample was available.

Action: MNS personnel were notified for corrective maintenance. A "grab" sample was collected. Actual sampling period 3/5/91 @ 14:30.

3. Location #128, 3/5/91 to 3/19/91

Reason: Due to a broken intake line, the sampler did not run for the full sampling period. A full composite was unavailable.

Action: Appropriate personnel were notified for repairs. An abbreviated sample was collected. Actual sampling period was 3/7/91 @ 10:45 to 3/19/91 @ 14:50.

4. Location #128, 3/19/91 to 4/2/91

Reason: Due to a clogged intake line, no composite sample was available.

Action: Technical Services were notified for repair. An abbreviated sample was collected. Actual sampling period was 3/19/91 @ 14:50 to 4/2/91 @ 13:45.

5. Location #128, 4/2/91 to 4/16/91

Reason: Due to a malfunctioning pump, a full composite sample was not available.

Action: Pump was repaired. An abbreviated sample was collected. Actual sampling period was 4/9/91 @ 13:20 to 4/16/91 @ 14:30.

6. Location #128, 6/11/91 to 6/25/91

Reason: Due to main feed line being redirected, a full composite sample was not available.

Action: An abbreviated sample was collected. Actual sampling period was 6/13/91 @ 13:00 to 6/25/91 @ 13:30.

C. DRINKING WATER

1. Location #132, 1/8/91 to 1/22/91

Reason: Due to water sample being drawn from a "dead water leg", no composite sample was available. It was determined that the composite sampler was not providing a representative sample due to periodic interruption of flow, due to pump location.

Action: Composite sampler was relocated. A "grab" sample was collected from the new location after the intake line was purged. Actual sampling period was 1/22/91 @ 11:00.

2. Location #132, 1/22/91 to 2/5/91

Reason: Due to the water sampler being moved, a full composite sample was not available.

Action: An abbreviated sample was collected. Actual sampling period was 1/25/91 @14:00 to 2/5/91 @ 11:25.

3. Location #136, 3/19/91 to 4/2/91

Reason: Due to a reduction of water flow, there was not enough pressure to operate the solenoid. No composite sample was available.

Action: Water flow was increased and a "grab" sample was collected. Actual sampling period was 4/2/91 @ 09:35.

4. Location #142, 3/19/91 to 4/2/91

Reason: Due to the water flow being reduced in the sample line, there was no composite sample available.

Action: Water flow was increased. A "grab" sample was collected. Actual sampling period was 4/2/91 @ 09:05.

5. Location #136, 4/2/91 to 4/16/91

Reason: Due to a lack of water flow in the lines, no composite sample available.

Action: Water flow was increased. A "grab" sample was collected. Actual sampling period was 4/16/91 @ 09:40.

6. Location #142, 4/2/91 to 4/16/91

Reason: Due to a lack of water flow, no composite was available.

Action: Water flow was increased. A "grab" sample was collected. Actual sampling period was 4/16/91 @ 09:15.

7. Location #142, 4/30/91 to 5/14/91

Reason: Due to a lack of water pressure, no composite sample was available.

Action: Water flow was adjusted. A "grab" sample was collected. Actual sampling period was 5/14/91 @ 09:00.

8. Location #136, 11/12/91 to 11/26/91

Reason: Due to water supply valve having been cut off by plant personnel, no composite sample was available.

Action: Water supply was turned on and a "grab" sample was collected. Actual sampling period was 11/26/91 @ 09:15.

D. DIRECT GAMMA RADIATION (TLD)

1. Location #166, 9/5/91 to 12/5/91

Reason: TLD was not in the field for the entire 4th quarter. TLD was found on the ground by Riverbend Plant personnel and turned into the Laboratory.

Action: A new TLD was placed in the field. Actual sampling period was 9/5/91 to 10/17/91 and 10/18/91 to 12/5/91.

2. Location #178, 9/5/91 to 12/5/91

Reason: TLD was found to be missing on 11/5/91 due to unknown reasons.

Action: A new TLD was placed in the field on 11/6/91. Actual sampling period was 11/6/91 to 12/5/91. The abbreviated sample period was converted to 672 hours of field monitoring. The normal collection period for the fourth quarter 1991 was 91 days. The collection period of 91 days converted to 2,184 hours of field monitoring. The following action was taken in order to provide a more realistic and representative dose per quarter for this location:

The dose rate of site #178 for the sampling period of 11/6/91 to 12/5/91 was determined to be 0.006 mR/Hour by the Dosimetry Lab. Multiplying 0.006 mR/Hour by 672 hours yielded a quarterly dose of approximately 3.9 mR/Quarter. The dose rate 0.006 mR/Hour for location #178 was next multiplied by 2,184 hours which was the normal collection period for all remaining TLDs. This calculation yielded a dose of 13.1 mR/Quarter.

II. UNAVAILABLE ANALYSES

The following unavailable analyses occurred resulting from inappropriate samples during 1991:

A. AIRBORNE RADIOIODINES AND PARTICULATES

1. Location #120, 6/4/91 to 6/11/91

Reason: Due to a blown fuse, the sampler ran for only 2.6 hours out of a normal 168 hour sampling period. Because of short span of run time, it was technically impossible to meet required ILD's.

Action: Replaced fuse and restarted sampler. Actual sampling period was 6/4/91 @14:35 to 6/4/91 @ 17:11.

APPENDIX D

ANALYTICAL DEVIATIONS LOWER LIMITS OF DETECTION

No analytical deviations were incurred for the
1991 environmental sampling program.