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Georgia Power
the southern electric system

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Docket Nos. 50-321
50-366

HL-5147

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

Edwin I. Hatch Nuclear Plant
Radiological Environmental Operating Report for 1995

Gentlemen:

In accordance with Plant Hatch Units 1 and 2 Technical Specifications, Section 5.6.2, Georgia Power Company is submitting the enclosed Radiological Environmental Operating Report for 1995.

If you have any questions in this regard, please contact this office at any time.

Sincerely,

J. T. Beckham, Jr.

WHO/DMC/ld

Enclosure: Radiological Environmental Operating Report for 1995

cc: *Georgia Power Company*
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NORMS

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GEORGIA POWER COMPANY
EDWIN I. HATCH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 1995

EDWIN I. HATCH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

A2LA	American Association of Laboratory Accreditation
ASTM	American Society for Testing and Materials
CL	Confidence Level
EL	Environmental Laboratory
EPA	Environmental Protection Agency
GPC	Georgia Power Company
HNP	Edwin I. Hatch Nuclear Plan
MDC	Minimum Detectable Concentration
MDD	Minimum Detectable Difference
NA	Not Applicable
NDM	No Detectable Measurement(s)
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
REMP	Radiological Environmental Monitoring Program
RL	Reporting Level
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications

EDWIN I. HATCH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

1.0 INTRODUCTION

The objectives of the Radiological Environmental Monitoring Program (REMP) are to ascertain the levels of radiation and concentrations of radioactivity in the environs of the Edwin I. Hatch Nuclear Plant (HNP) and to assess any radiological impact upon the environment due to plant operation.

The bases for such an assessment include appropriate comparisons between results obtained at control stations (locations where radiological levels are not expected to be significantly affected by plant operation) with those obtained at indicator stations (locations where it is anticipated that radiological levels are more likely to be affected by plant operation), and comparisons between results obtained during preoperation with those obtained during operation.

The preoperational stage of the REMP began with the initial operation of REMP stations in January of 1972. The operational stage began with initial criticality which was achieved on September 12, 1974.

The REMP is conducted in accordance with Chapter 4 of the Offsite Dose Calculation Manual (ODCM). The REMP activities for 1995 are reported herein in accordance with Technical Specification (TS) 5.6.2 and ODCM 7.1. This annual report was formerly called the Radiological Environmental Surveillance Report. All dates in this report are for 1995 unless otherwise indicated.

A summary description of the REMP is provided in Section 2 of this report; maps showing the sampling stations are keyed to a table which indicates the direction and distance of each station from the main stack. An annual summary of the main laboratory analysis results obtained from the samples utilized for environmental monitoring is presented in Section 3. A discussion of the results, including assessments of any radiological impacts upon the environment and the results of the land use census and the river survey, is provided in Section 4. The results of the Interlaboratory Comparison Program are presented in Section 5. Conclusions are stated in Section 6.

2.0 SUMMARY DESCRIPTION

A summary description of the REMP is provided in Table 2-1. This table portrays the program in the manner by which it is being regularly carried out. Table 2-1 is essentially a copy of ODCM Table 4-1 which delineates the program's requirements. Sampling locations required by Table 2-1 are described in Table 2-2 and are shown on maps in Figures 2-1 through 2-3. This description of the sample locations closely follows the table and figures in ODCM 4.2.

In accordance with ODCM 4.1.1.2.1, deviations from the required sampling schedule as set forth in Table 2-1 are permitted if samples are unobtainable due to hazardous conditions, unavailability, inclement weather, equipment malfunction or other just reasons. Any deviations are accounted for in the discussions for the particular sample types in Section 4.

All laboratory analyses were performed by Georgia Power Company's (GPC) Environmental Laboratory (EL) in Smyrna, Georgia. Since 1987, the EL has been accredited by the American Association of Laboratory Accreditation (A2LA) for radiochemistry. The A2LA is a nonprofit, nongovernmental, public service, membership society dedicated to the formal recognition of competent laboratories and related activities. Accreditation is based upon internationally accepted criteria for laboratory competence.

TABLE 2-1 (SHEET 1 OF 3)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Approximate Number of Sample Locations	Sampling and Collection Frequency	Type of Analysis and Frequency
1. Airborne Radioiodine and Particulates	6	Continuous operation of sampler with sample collection weekly	Radioiodine canister: I-131 analysis, weekly. Particulate sampler: analyze for gross beta radioactivity not less than 24 hours following filter change, weekly; perform gamma isotopic analysis on affected sample when gross beta activity is 10 times the yearly mean of control samples; and composite (by location) for gamma isotopic analysis, quarterly.
2. Direct Radiation	37	Quarterly	Gamma dose, quarterly.
3. Ingestion Milk (a)	1	Biweekly	Gamma isotopic and I-131 analyses, biweekly.
Fish or Clams (b)	2	Semiannually	Gamma isotopic analysis on edible portions, semiannually.
Grass or Leafy Vegetation	3	Monthly during growing season	Gamma isotopic analysis, monthly (c).

TABLE 2-1 (SHEET 2 OF 3)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Approximate Number of Sample Locations	Sampling and Collection Frequency	Type of Analysis and Frequency
4. Waterborne Surface	2	Composite sample collected monthly (d)	Gamma isotopic analysis, monthly. Composite (by location) for tritium analysis, quarterly.
Sediment	2	Semiannually	Gamma isotopic analysis, semiannually.
Drinking Water (e & f)	One sample of river water near the intake and one sample of finished water from each of one to three of the nearest water supplies which could be affected by HNP discharges.	River water collected near the intake will be a composite sample; the finished water will be a grab sample. These samples will be collected monthly unless the calculated dose due to consumption of the water is greater than 1 mrem/year; then the collection will be biweekly. The collections may revert to monthly should the calculated doses become less than 1 mrem/year.	I-131 analysis on each sample when biweekly collections are required. Gross beta and gamma isotopic analyses on each sample; composite (by location) for tritium analysis, quarterly.

TABLE 2-1 (SHEET 3 OF 3)

SUMMARY DESCRIPTION OF
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

NOTES

a. Up to three sampling locations within 5 miles and in different sectors will be used as available. In addition, one or more control locations beyond 10 miles will be used.

b. Commercially or recreationally important fish may be sampled. Clams may be sampled if difficulties are encountered in obtaining sufficient fish samples.

c. If gamma isotopic analysis is not sensitive enough to meet the Minimum Detectable Concentration (MDC), a separate analysis for I-131 may be performed.

d. The composite samples shall be composed of a series of aliquots collected at intervals not exceeding a few hours.

e. If it is found that river water downstream of the plant is used for drinking, drinking water samples will be collected and analyzed as specified herein.

f. A survey shall be conducted annually at least 50 river miles downstream of the plant to identify those who use water from the Altamaha River for drinking.

TABLE 2-2 (SHEET 1 OF 2)

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

Station Number	Station Type (a)	Descriptive Location	Direction (b)	Distance (miles) (b)	Sample Type (c)
064	O	Roadside Park	WNW	0.8	D
101	I	Inner Ring	N	1.9	D
102	I	Inner Ring	NNE	2.5	D
103	I	Inner Ring	NE	1.8	AD
104	I	Inner Ring	ENE	1.6	D
105	I	Inner Ring	E	3.7	D
106	I	Inner Ring	ESE	1.1	DV
107	I	Inner Ring	SE	1.2	AD
108	I	Inner Ring	SSE	1.6	D
109	I	Inner Ring	S	0.9	D
110	I	Inner Ring	SSW	1.0	D
111	I	Inner Ring	SW	0.9	D
112	I	Inner Ring	WSW	1.0	ADV
113	I	Inner Ring	W	1.1	D
114	I	Inner Ring	WNW	1.2	D
115	I	Inner Ring	NW	1.1	D
116	I	Inner Ring	NNW	1.6	AD
170	C	Upstream	WNW	(d)	R
172	I	Downstream	E	(d)	R
201	O	Outer Ring	N	5.0	D
202	O	Outer Ring	NNE	4.9	D
203	O	Outer Ring	NE	5.0	D
204	O	Outer Ring	ENE	5.0	D
205	O	Outer Ring	E	7.2	D
206	O	Outer Ring	ESE	4.8	D
207	O	Outer Ring	SE	4.3	D
208	O	Outer Ring	SSE	4.8	D
209	O	Outer Ring	S	4.4	D
210	O	Outer Ring	SSW	4.3	D
211	O	Outer Ring	SW	4.7	D
212	O	Outer Ring	WSW	4.4	D
213	O	Outer Ring	W	4.3	D
214	O	Outer Ring	WNW	5.4	D
215	O	Outer Ring	NW	4.4	D
216	O	Outer Ring	NNW	4.8	D
301	O	Toombs Central	N	8.0	D
304	C	State Prison	ENE	11.2	AD
304	C	State Prison	ENE	10.3	M
309	C	Baxley Substa	S	10.0	AD
416	C	Emer News Ctr	NNW	21.0	DV

TABLE 2-2 (SHEET 2 OF 2)

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

NOTES

a. Station types

C - Control
I - Indicator
O - Other

b. Direction and distance are reckoned from the main stack.

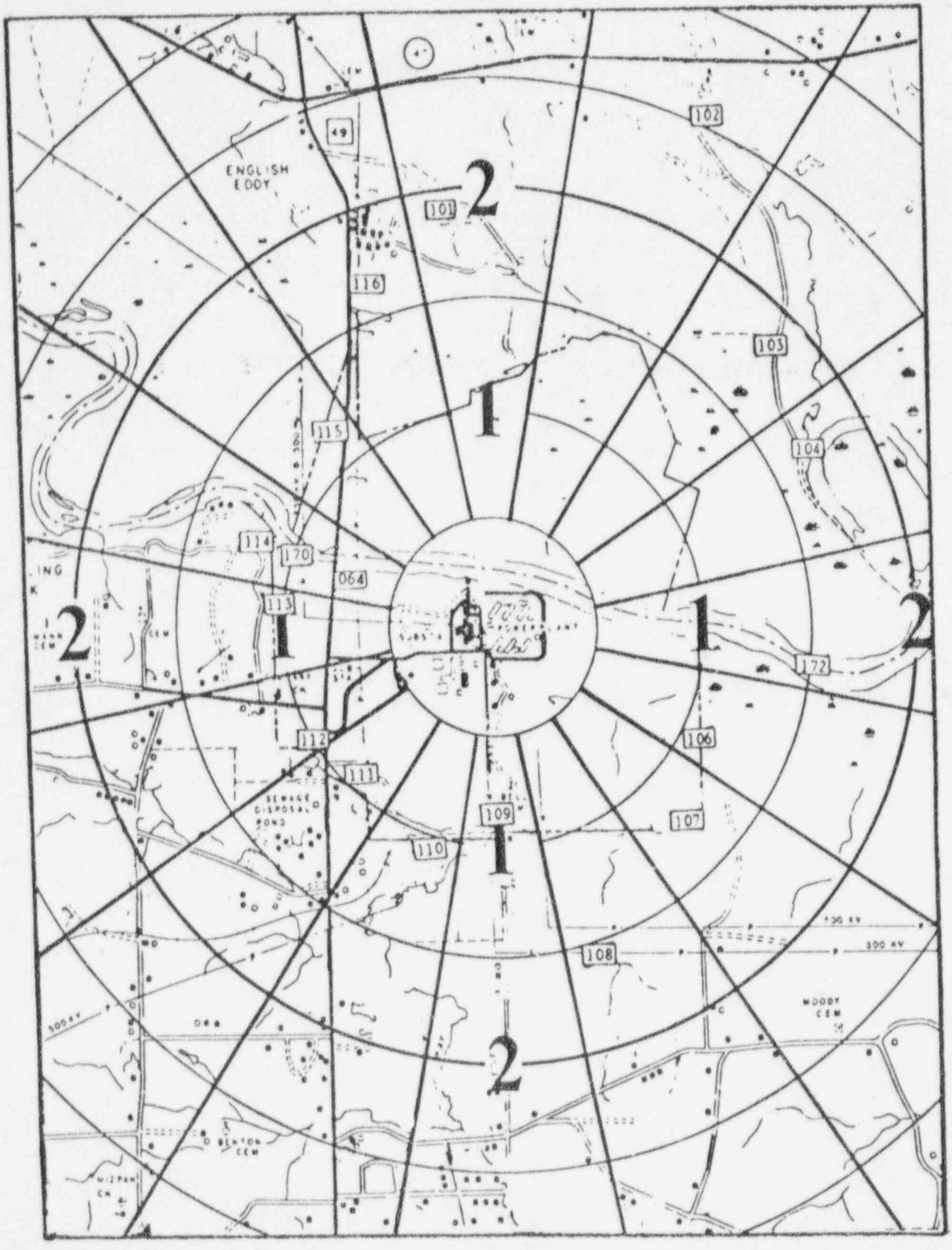
c. Sample types

A - Airborne Radioactivity
D - Direct Radiation
M - Milk
R - River (fish or clams, shoreline sediment, and surface water)
V - Vegetation

d. Station 170 is located approximately 0.6 river miles upstream of the intake structure for river water, 1.1 river miles for sediment and clams, and 1.5 river miles for fish.

Station 172 is located approximately 3.0 river miles downstream of the discharge structure for river water, sediment and clams, and 1.7 river miles for fish.

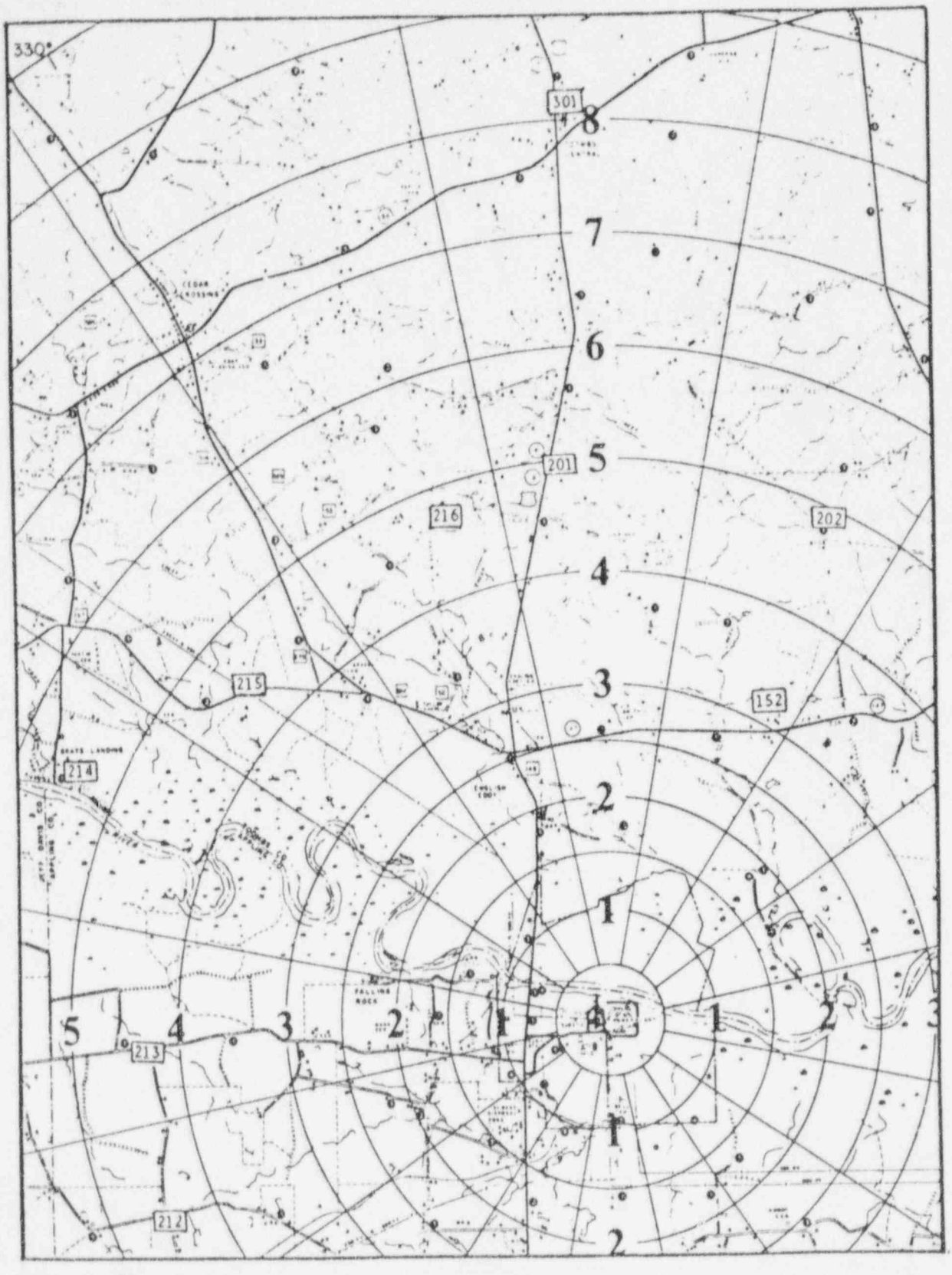
The locations from which river water and sediment may be taken can be sharply defined. However, the sampling locations for clams often have to be extended over a wide area to obtain a sufficient quantity. High water adds to the difficulty in obtaining clam samples and may also make an otherwise suitable location for sediment sampling unavailable. A stretch of the river of a few miles or so is generally needed to obtain adequate fish samples. The mile locations given above represent approximations of the locations where samples are collected.



EDWIN I. HATCH NUCLEAR PLANT

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS ON SITE PERIPHERY

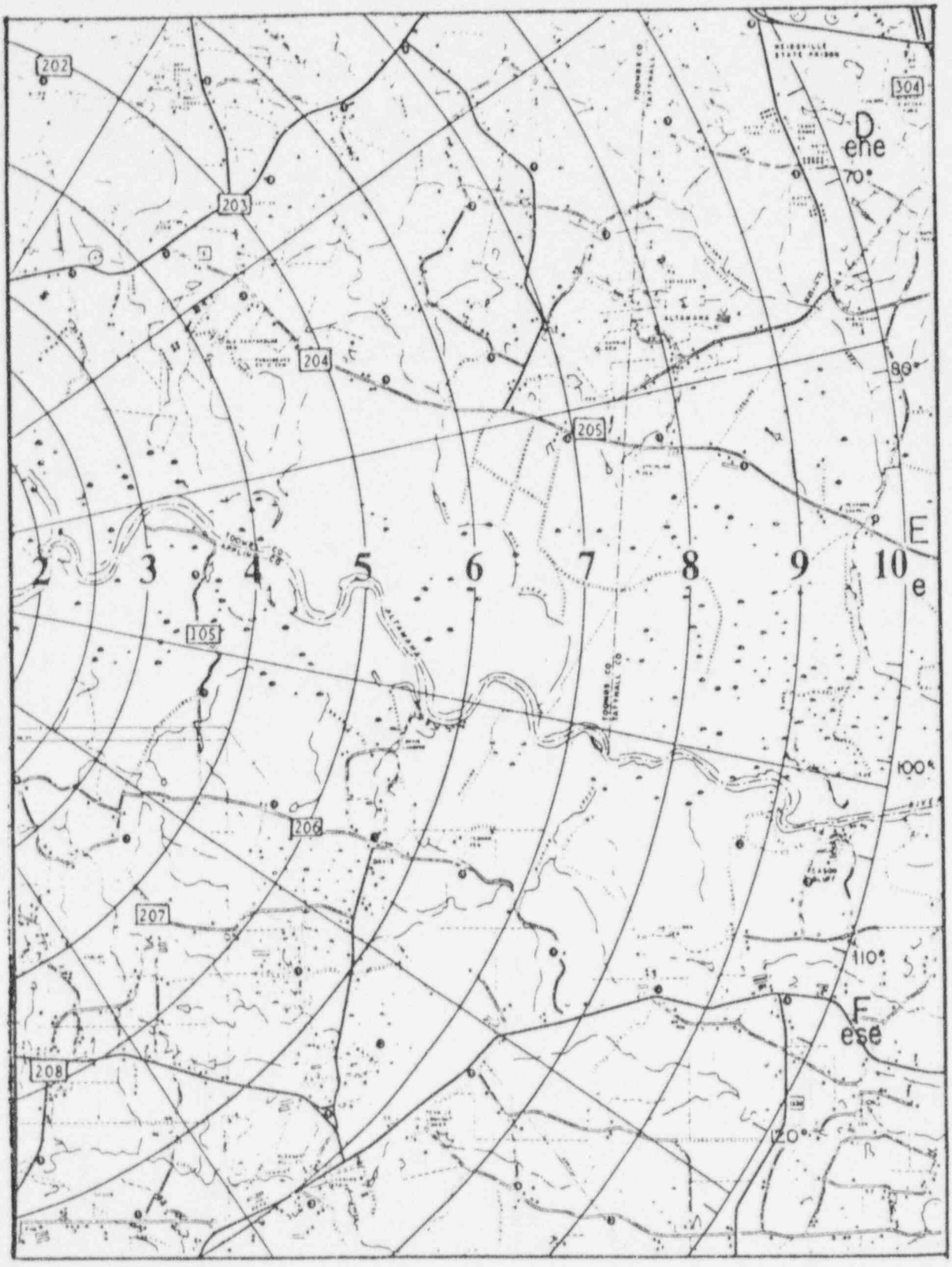
FIGURE 2-1



EDWIN I. HATCH NUCLEAR PLANT

RADIOLOGICAL ENVIRONMENTAL SAMPLING
LOCATIONS BEYOND SITE PERIPHERY

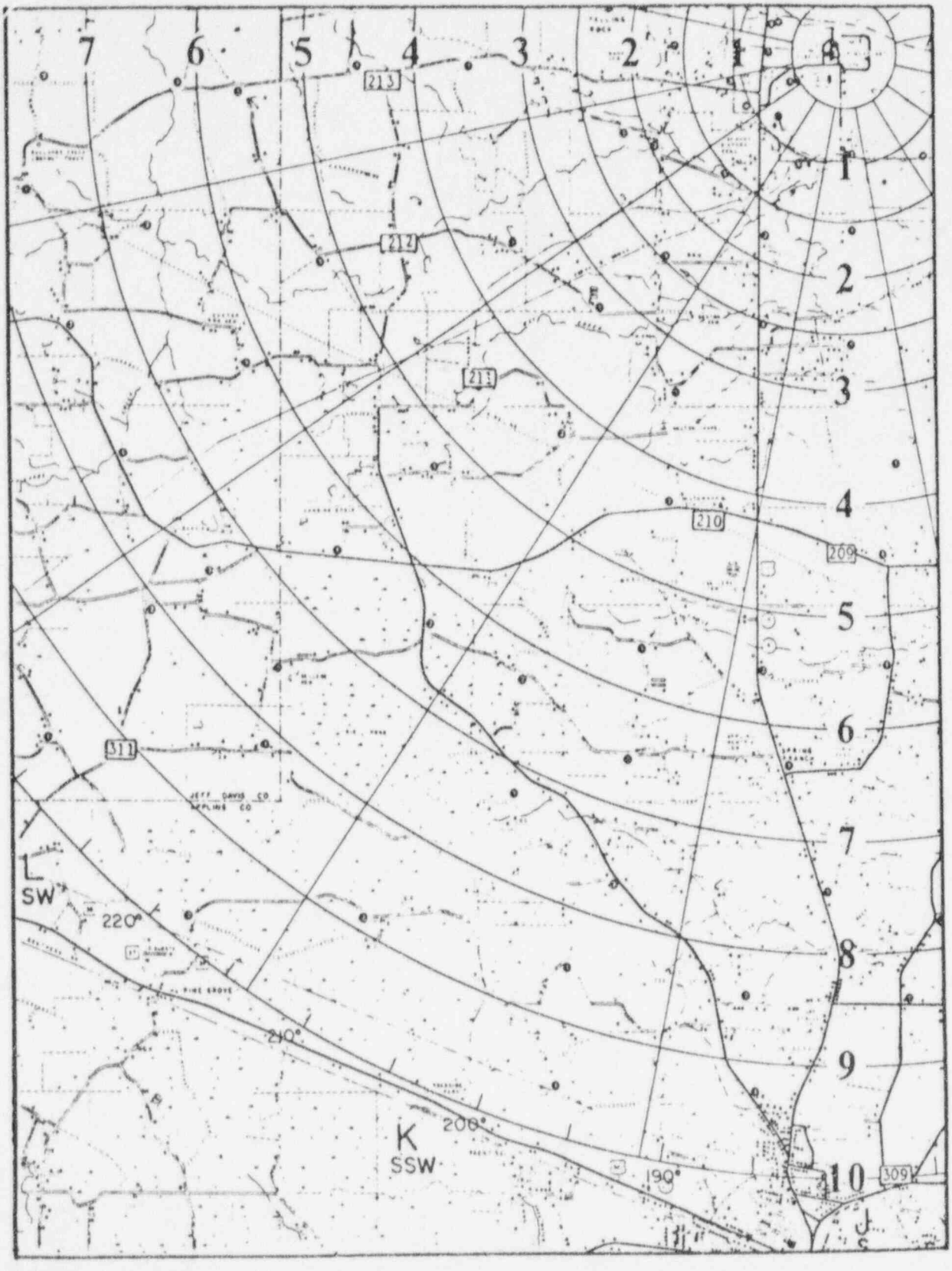
FIGURE 2-2 (SHEET 1 of 3)



EDWIN I. HATCH NUCLEAR PLANT

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS BEYOND SITE PERIPHERY

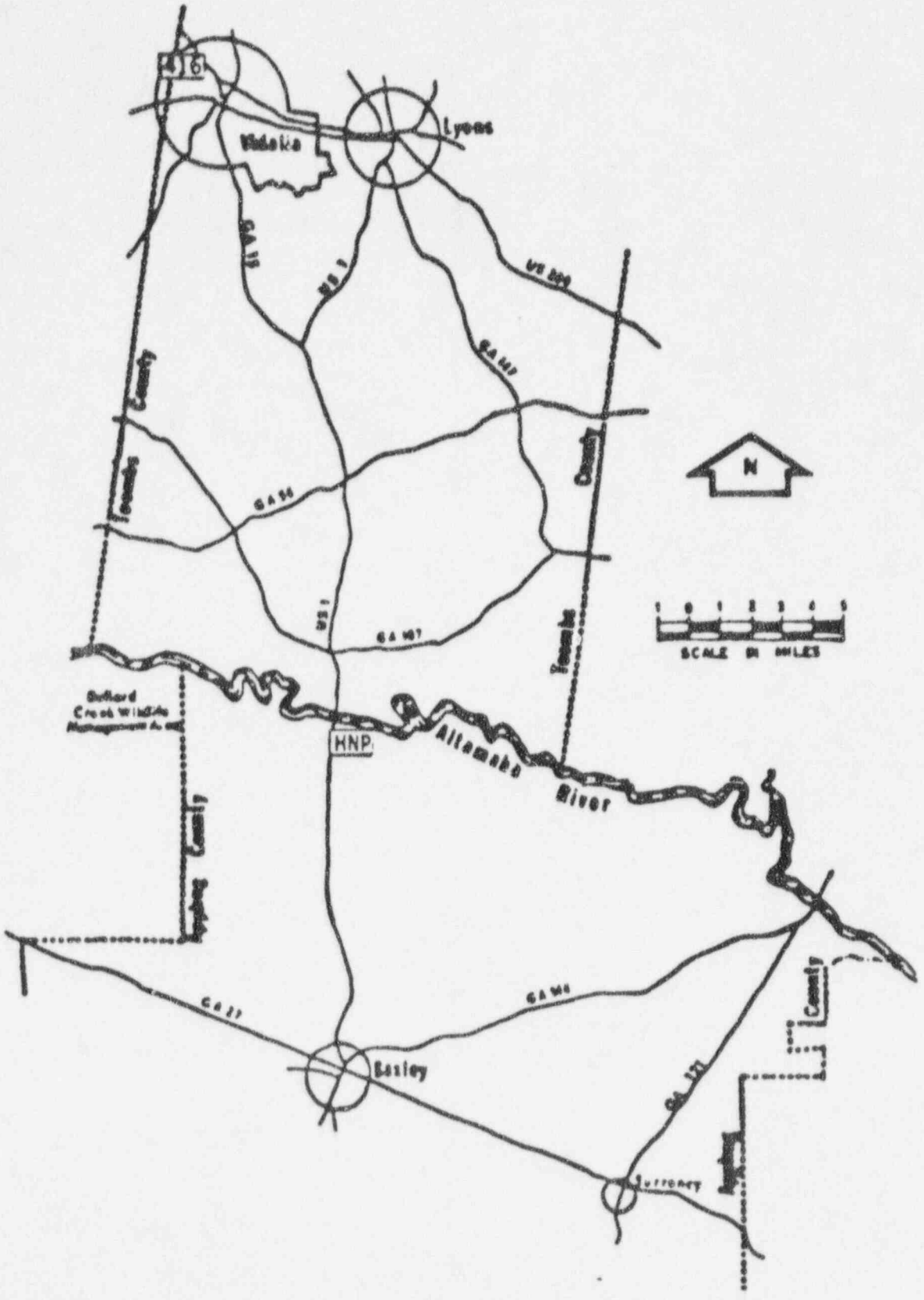
FIGURE 2-2 (SHEET 2 of 3)



EDWIN I. HATCH NUCLEAR PLANT

RADIOLOGICAL ENVIRONMENTAL SAMPLING
LOCATIONS BEYOND SITE PERIPHERY

FIGURE 2-2 (SHEET 3 of 3)



Georgia Power

EDWIN I. HATCH NUCLEAR PLANT

LOCATION OF ADDITIONAL CONTROL STATION FOR TLDs AND VEGETATION

FIGURE 2-3

3.0 RESULTS SUMMARY

In accordance with ODCM 7.1.2.1, summarized and tabulated results for all of the regular samples collected for the year at the designated indicator and control stations are presented in Table 3-1 in a format similar to that of Table 3 of the Nuclear Regulatory Commission (NRC) Radiological Assessment Branch Technical Position, Revision 1, November 1979. Since no reportable occurrences were called for during the year, the column entitled "Number of Reportable Occurrences" has been excluded from Table 3-1. Since no naturally occurring radionuclides were found in the plant's effluent releases, only man-made radionuclides are reported. Results for any samples collected at locations other than indicator or control stations or in addition to those stipulated by Table 2-1 are discussed in Section 4 for the particular sample type.

TABLE 3-1 (SHEET 1 OF 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)
Airborne Particulates (fCi/m^3)	Gross Beta 311	10	21.7 9-40 (207/207)	No. 103 Inner Ring 1.8 miles NE	22.6 10-31 (52/52)	21.7 10-34 (104/104)
	Gamma Isotopic 24					
	Cs-134	50	NDM (c)		NDM	NDM
	Cs-137	60	NDM		NDM	NDM
Airborne Radioiodine (fCi/m^3)	I-131 311	70	NDM		NDM	NDM
Direct Radiation (mR/91 days)	Gamma Dose 75	NA (d)	11.5 10-17 (63/63)	No. 104 Inner Ring 1.6 miles ENE	15.1 11-17 (4/4)	10.8 9-12 (12/12)

TABLE 3-1 (SHEET 2 OF 6)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Location with Highest Annual Mean Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)
Milk (pCi/l)	Gamma Isotopic 26					
	Cs-134	15	NA		NDM	NDM
	Cs-137	18	NA		NDM	NDM
	Ba-140	60	NA		NDM	NDM
	La-140	15	NA		NDM	NDM
	I-131 26	1	NA		NDM	NDM
Vegetation (pCi/kg wet)	Gamma Isotopic 36					
	I-131	60	NDM		NDM	NDM
	Cs-134	60	NDM		NDM	NDM
	Cs-137	80	49.8 31-89 (11/24)	No. 106 Inner Ring 1.1 miles ESE	59.9 33-89- (6/12)	47.6 41-58 (3/12)

TABLE 3-1 (SHEET 3 OF 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Location with Highest Annual Mean Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)
River Water (pCi/l)	Gamma Isotopic 24					
	Mn-54	15	NDM		NDM	NDM
	Fe-59	30	NDM		NDM	NDM
	Co-58	15	NDM		NDM	NDM
	Co-60	15	NDM		NDM	NDM
	Zn-65	30	NDM		NDM	NDM
	Zr-95	30	NDM		NDM	NDM
	Nb-95	15	NDM		NDM	NDM
	I-131	15 (e)	NDM		NDM	NDM
	Cs-134	15	NDM		NDM	NDM
	Cs-137	18	NDM		NDM	NDM
	Ba-140	60	NDM		NDM	NDM
	La-140	15	NDM		NDM	NDM

TABLE 3-1 (SHEET 4 OF 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)
	Tritium 8	3000 (f)	200 200-200 (1/4)	No. 172 Downstream 3.0 miles	200 200-200 (1/4)	NDM
Fish (pCi/kg wet)	Gamma Isotopic 8					
	Mn-54	130	NDM		NDM	NDM
	Fe-59	260	NDM		NDM	NDM
	Co-58	130	NDM		NDM	NDM
	Co-60	130	NDM		NDM	NDM
	Zn-65	260	NDM		NDM	NDM
	Cs-134	130	NDM		NDM	NDM
	Cs-137	150	25.0 14-37 (4/4)	No. 170 1.5 miles Upstream	27.9 20-41 (3/4)	27.9 20-41 (3/4)

TABLE 3-1 (SHEET 5 OF 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Location with Highest Annual Mean Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)
Sediment (pCi/kg dry)	Gamma Isotopic 4					
	Cs-134	150	NDM		NDM	NDM
	Cs-137	180	52.3 45-59 (2/2)	No. 170 1.1 miles Upstream	80.6 60-101 (2/2)	80.6 60-101 (2/2)

TABLE 3-1 (SHEET 6 OF 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

NOTES

a. The MDC is defined in ODCM 10.1. Except as noted otherwise, the values listed in this column are the detection capabilities required by ODCM Table 4-3. The values listed in this column are a priori (before the fact) MDCs. In practice, the a posteriori (after the fact) MDCs are generally lower than the values listed. Any a posteriori MDC greater than the value listed in this column is discussed in Section 4.

b. Mean and range are based upon detectable measurements only. The fraction of all measurements at specified locations which is detectable is placed in parenthesis.

c. No Detectable Measurement(s).

d. Not Applicable.

e. If a drinking water pathway were to exist, a MDC of 1 pCi/l would have been used (see Notation c of ODCM Table 4-3).

f. If a drinking water pathway were to exist, a MDC of 2000 pCi/l would have been used (see Notation b of ODCM Table 4-3).

4.0 DISCUSSION OF RESULTS

An interpretation and evaluation, as appropriate, of the laboratory results for each type sample are included in this section. Relevant comparisons were made between the difference in average values for indicator and control stations and the calculated Minimum Detectable Difference (MDD) between these two groups at the 99 percent Confidence Level (CL). The MDD was determined using the standard Student's t-test. A difference in the average values which was less than the MDD was considered to be statistically indiscernible.

Pertinent results were also compared with past results including those obtained during preoperation. The results were examined to perceive any trends. To provide perspective, a result might also be compared with its Reporting Level (RL) or Minimum Detectable Concentration (MDC) whose nominal values are found in ODCM Tables 4-2 and 4-3, respectively. Attempts were made to explain any high radiological levels found in the samples. During the year there were no failures in the laboratory analyses for any of the samples in attaining the MDCs required by ODCM Table 4-3.

All results were tested for conformance to Chauvenet's Criterion[1] to flag any values which might differ from the others in its set by a relatively large amount. Identified outliers were investigated to determine the reason(s) for the deviation from the norm. If due to an equipment malfunction or other valid physical reason, the anomalous result is deemed non-representative and excluded from the data set. No datum was excluded for failing Chauvenet's Criterion only. Any exclusions are discussed in this section under the appropriate sample type.

The annual land use census as required by ODCM 4.1.2 was conducted on November 13 to determine the locations of the nearest permanent residence and milk animal in each of the 16 meteorological sectors within a distance of 5 miles, and the locations of all milk animals within 3 miles. A milk animal is a cow or goat producing milk for human consumption. The locations of gardens greater than 500 square feet producing broad leaf vegetation were also included in the census. The census results are tabulated in Table 4-1.

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1. G. D. Chase and J. L. Rabinowetz, Principles of Radioisotope Methodology, (Burgess Publishing Company, 1962), pages 87-90.

TABLE 4-1

LAND USE CENSUS RESULTS

Distance in Miles to Nearest Location in Each Sector

SECTOR	RESIDENCE	MILK ANIMAL	GARDEN
N	2.0	*	1.9
NNE	2.9	*	2.9
NE	3.2	*	*
ENE	4.2	*	4.7
E	*	*	*
ESE	3.7	*	*
SE	1.8	*	3.5
SSE	2.0	*	3.7
S	1.0	*	1.5
SSW	1.1	*	2.3
SW	1.1	*	1.5
WSW	1.1	*	2.0
W	1.1	*	2.6
WNW	1.1	*	1.2
NW	3.6	*	*
NNW	1.8	*	2.8

* None within 5 miles.

ODCM 4.1.2.2.1 requires a new controlling receptor in ODCM 3.4.3, if the land use census identifies a location that yields a calculated dose greater than that currently being calculated. An analysis of the survey's results showed that there were none.

ODCM 4.1.2.2.2 requires that whenever the land use census identifies a location which would yield a calculated dose (via the same ingestion pathway) 20 percent greater than that from a current indicator station, the new location must become a REMP station (if samples are available). None of the gardens yielded a calculated dose 20 percent greater than that for any of the current indicator stations for vegetation. No milk animals were found in the census. This result was corroborated by inquiries to the county extension agents in 5 counties in the vicinity of the plant on January 20 and again on August 8 in regard to the location of suitable milk animals; none were found.

As required by Note f of Table 2-1, the annual survey of the Altamaha River downstream of the plant for at least 50 miles to identify those who use water from the river for drinking purposes was conducted on September 18. As in all previous surveys, no intakes for drinking water or irrigation were observed. This result was corroborated by information obtained from the Georgia Department of Natural Resources on September 22; it was confirmed that no water withdrawal permits for drinking water or irrigation purposes had been issued for this stretch of the Altamaha River. Should it become known that river water downstream of the plant is used for drinking, the sampling and analysis requirements for drinking water as delineated in Table 2-1 would be implemented.

4.1 Airborne

As indicated by Table 2-2 and Figures 2-1 and 2-2, airborne particulates and airborne radioiodine are collected at 4 indicator stations (Nos. 103, 107, 112 and 116) which encircle the site and are on the site periphery, and at 2 control stations (Nos. 304 and 309) which are at least 10 miles from the plant. At these locations air is continuously drawn through a Gelman Type A/E glass fiber filter and a SAIC CP-200 charcoal canister in sequence to retain airborne particulates and to adsorb airborne radioiodine, respectively.

The filters and canisters are collected weekly. Each of the air particulate filters is counted for gross beta activity. A gamma isotopic analysis is performed quarterly on a composite of the air particulate filters for each station. Each charcoal canister is analyzed for I-131 by gamma spectroscopy.

On December 11 the power was found to be off at Station 116 due to a broken wire which seemed to have failed as a result of high winds. Arrangements were made to have the Altamaha Electric Membership Cooperative which provides power to this station to promptly repair the broken wire. The pump had run for only about 34 hours. The laboratory analysis results were deemed to be unacceptable as the gross beta activity failed to satisfy Chauvenet's criterion.

As seen in Table 3-1, the annual average weekly gross beta activity (to 3 significant figures) during 1995 for both the indicator and control stations was 21.7 fCi/m^3. The average value for the indicator stations was actually 0.018 fCi/m^3 greater than that for the control stations. However, this difference is not discernible, since it is less than the MDD, calculated as 1.4 fCi/m^3. During the past 7 years (1988 through 1994), the average weekly activity for the year at the indicator stations randomly varied from 0.9 fCi/m^3 greater than to 0.3 fCi/m^3 less than that for the control stations. Over the entire 7 year period, the average weekly activity for the indicator stations was 0.15 fCi/m^3 greater than that for the control stations.

During this 7 year period, the annual average weekly gross beta activity for all stations randomly varied from 18.1 pCi/m^3 in 1991 to 22.3 pCi/m^3 in 1988; the average for the entire period was 19.5 fCi/m^3. In past years, it had been an order of magnitude higher. For example: the annual average activity was 140 fCi/m^3 during preoperation, 242 fCi/m^3 during 1977, and 195 fCi/m^3 during 1981. Those high values have been shown to be the result of fallout from numerous nuclear weapons tests conducted on mainland China in the early 1970s and from 1976 through 1980. With the termination of the weapons tests, the gross beta levels diminished. The annual average was 33 fCi/m^3 for 1982, and this steadily decreased to 22 fCi/m^3 for 1985. Then, during 1986 as a consequence to the Chernobyl incident, the average activity increased to 37 fCi/m^3; it dropped to 23 fCi/m^3 in 1987.

During 1995, no man-made radionuclides were detected from the gamma isotopic analysis of the quarterly composites of air particulate filters. During preoperation and each year of operation through 1986, numerous fission products and some activation products were detected. As stated above, these were generally attributed to the nuclear weapons tests and to the Chernobyl incident. On only one occurrence since 1986, has a man-made radionuclide been detected in a quarterly composite; Cs-137 was found at a very low level for the first quarter of 1991 at Station 304.

Airborne I-131 is not normally detected in the charcoal canisters and 1995 was no exception. However, during 1976, 1977 and 1978, positive levels of I-131 were found in nearly all of the samples collected for a period of a few weeks following the arrival of the cloud from each of the Chinese nuclear weapons tests conducted at that time. Some of the levels were on the order of the MDC for airborne I-131 which is 70 fCi/m^3. In 1986, the same phenomenon occurred because of the Chernobyl incident. The highest airborne I-131 level found to date in an individual charcoal canister was 217 fCi/m^3 in 1977. The RL for airborne I-131 is 900 fCi/m^3.

4.2 Direct Radiation

Direct (external) radiation is measured with thermoluminescent dosimeters (TLDs). Two Panasonic UD-814 TLD badges are placed at each station. Each badge contains three phosphors which are composed of calcium sulfate (with thulium impurity) crystals. The gamma dose at each station is nominally based upon the average readings of the phosphors from the two badges. The two badges for each station are sealed in a thin plastic bag for protection from moisture while in the field. The badges are nominally exposed for periods of a quarter of a year (91 days). A visual inspection is made at each station during the second month of the quarter to assure the badges are on-station and to replace any missing or damaged badges.

Two TLD stations are established in each of the 16 meteorological sectors about the plant forming two concentric rings. The stations comprising the inner ring (Nos. 101 through 116) are located near the site boundary, while those comprising the outer ring (Nos. 201 through 216) are generally located at distances of 4 to 5 miles. However, each of the stations in the East Sector is at a radius which is a few miles greater than those for the other stations in its ring. The flood plain in this sector prevents easy access on a year-round basis to the site boundary and to the 4 to 5 mile annulus. This two ring configuration of stations began with the first quarter of 1980.

The 16 stations forming the inner ring are designated as the indicator stations. The 3 control stations (Nos. 304, 309 and 416) are at least 10 miles from the plant. Stations 064 and 301 accommodate special interest areas. Station 064 is located in an onsite roadside park, while Station 301 is adjacent to the Toombs Central School. Station 210 in the outer ring is adjacent to the Altamaha School, the only other nearby school.

As shown in Table 3-1, the average quarterly exposure of 11.5 mR acquired at the indicator stations (inner ring) during 1995 was 0.7 mR greater than that acquired at the control stations. This difference is not discernible since it is less than the MDD of 1.0 mR. During the 15 year period from 1980 through 1994, the average quarterly exposure for the year at the indicator stations randomly varied from 1.4 mR greater than to 1.6 mR less than that for the control stations. The average quarterly exposure for the indicator stations over the entire 15 year period was almost 0.3 mR greater than that for the control stations.

The quarterly exposures acquired at outer ring stations during 1995 ranged from 8.4 to 15.3 mR, with an average of 11.3 mR which is 0.2 mR less than that found for the inner ring. There was no discernible difference between the averages for the inner and the outer rings, since the difference is less than the MDD of 0.7 mR. For the 15 year period beginning in 1980, the average quarterly exposure for the year at the inner ring stations randomly varied from 1.0 mR greater than to 0.5 mR less than that at the outer ring stations. Overall, the average quarterly exposure for the inner ring was about 0.2 mR greater than that for the outer ring.

The quarterly exposures in units of mR acquired during 1995 at the special interest areas which are listed below are seen to be within the range of those acquired at the other stations.

Station	Average	Minimum	Maximum
064	11.0	10.7	11.3
301	10.5	10.4	10.7

There were two failures in obtaining a quarterly dose measurement during 1995, Station 064 for the first quarter and Station 115 for the fourth quarter. On two occasions, only one badge was available to obtain the quarterly dose, TLDs 105A and 106A both in the second quarter. Two badges (TLD 113B exposed during the second quarter and TLD 101B exposed during the fourth quarter) were not used as the result for each had a standard deviation which was greater than the self imposed limit of 1.4; the companion badge only was used in these cases for determining the quarterly dose.

When exchanges were made at the end of the first quarter, both badges were missing at Station 064. During the midquarter inspection on November 13, both badges were found to have been destroyed at Station 115 as a consequence of logging operations being conducted in the area. Since the badges at Station 115 were only on-station for 50 days, the result were tested for conformance with Chauvenet's criterion; they failed the test and were therefore excluded from the data base.

During the second quarter, TLD 105B was found to have been crushed by loggers and TLD 106B was found to have been stolen.

No reason was determined for the high standard deviations found with the results for TLD 113B for the second quarter and for TLD 101B for the fourth quarter. They were visually inspected under a microscope; the glow curve and test results for the anneal data and the element correction factor were reviewed.

The standard deviation limit of 1.4 was calculated using a method[2] developed by the American Society for Testing and Materials (ASTM). The calculation was based upon the standard deviations obtained with the Panasonic UD-814 badges during 1992. This limit serves as a flag to evoke an investigation. To be conservative, readings with a greater standard deviation are deleted since the high standard deviation is interpreted as an indication of a suspect TLD.

In addition to the above, replacement badges were installed at Station 206 during the midquarter inspection on May 8 when it was discovered they had been stolen. Although the replacements were only on-station for 56 days, the results were acceptable since Chauvenet's criterion was satisfied.

The nominal corrective action taken for the 5 stolen badges mentioned above was to conceal the badges by placing them in a nearby bush or tree. For the badges destroyed by the logging operations, the corrective action was to reinstall the badges on a power pole or other stable object not likely to be affected by such operations in the future.

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2. ASTM Special Technical Publication 15D, ASTM Manual on Presentation of Data and Control Chart Analysis, Fourth Revision, Philadelphia, PA, October 1976.

4.3 Milk

Milk samples from cows are obtained biweekly from Station 304 (the state prison dairy) which is a control station located more than 10 miles from the plant. Gamma isotopic and I-131 analyses are performed on each sample. As discussed in Section 4.0, the land use census and other efforts to locate additional milk animals in the vicinity were unsuccessful.

During 1995 as in the previous 5 years, no man-made radionuclides were detected from the gamma isotopic analysis of the milk samples. Except for 1987, Cs-137 was found in some of the samples each year from 1978 (when this analysis became a requirement) through 1989. No other man-made radionuclides have been detected by this analysis of the samples. During preoperation and the early years of operation, a chemical separation technique was employed to measure the Cs-137 levels in the samples.

During preoperation, the average positive level of Cs-137 was 19.3 pCi/l; during operation, the averages were 14.8 pCi/l for the period from 1978 through 1983, and 9.6 pCi/l from 1984 through 1989. The MDC and RL for Cs-137 in milk are 18 and 70 pCi/l, respectively.

For the past 6 years, I-131 has not been detected in any of the milk samples. During preoperation, all readings were less than 2 pCi/l which was the allowed MDC at that time. Positive results were reported each year during the first 5 years of operation (1974 through 1978); these results ranged from 0.95 to 88 pCi/l. In 1980, positive results ranged from 0.7 to 1.8 pCi/l; then in 1986, from 0.6 to 20 pCi/l. In 1988, a single reading of 0.32 pCi/l which was believed to have resulted from a procedural deficiency, was reported. The MDC and RL for I-131 in milk are 1 and 3 pCi/l, respectively.

All the positive readings for Cs-137 and I-131 are generally attributed to fallout from the nuclear weapons tests and the Chernobyl incident.

4.4 Vegetation

Gamma isotopic analysis is performed on each grass sample collected monthly from two indicator stations (Nos. 106 and 112) and one control station (No. 416). Gamma isotopic analysis on vegetation samples began during 1978 when it became a TS requirement.

The results presented in Table 3-1 show that Cs-137 was the only man-made radionuclide detected during 1995; this has been the case since 1986. The average value of 49.8 pCi/kg wet found at the indicator stations was 2.2 pCi/kg wet greater than that found at the control station. However, this difference is not discernible, since it is less than the MDD, calculated as 30.6 pCi/kg wet.

During the past 5 years (1990 through 1994), the average positive activity found at the indicator stations randomly varied from 32.2 pCi/kg wet greater than to 21.1 pCi/kg wet less than that found at the control station. The average activity for the indicator stations over this 5 year period was 2.3 pCi/kg wet less than that for the control station.

The MDC and RL for Cs-137 in vegetation samples are 80 and 2000 pCi/kg wet, respectively. The presence of Cs-137 in the vegetation samples is attributed to fallout from the nuclear weapons tests of past years and to the Chernobyl incident.

4.5 River Water

Surface water is composited from the Altamaha River at an upstream location (Station 170) and at a downstream location (Station 172) using ISCO automatic samplers. Small quantities are collected at intervals not exceeding a few hours. River water samples collected by these machines are picked up monthly; quarterly composites are made from the monthly collections.

A gamma isotopic analysis is conducted on each monthly collection. As is usually the case, no man-made radionuclides were detected during 1995; positive results are seldom found. The only man-made radionuclides detected previously (by gamma isotopic analysis) are presented below; the levels are in units of pCi/l.

Year	Quarter	Station	Radionuclide	Level
1975	4th	172	Ce-141	78.2
1986	2nd	170	La-140	18.0
1986	2nd	172	Cs-137	12.0
1988	2nd	170	Cs-137	6.8

The positive results for 1986 are attributed to the Chernobyl incident.

Tritium analysis is performed on each quarterly composite. Detectable results were found in only one sample during 1995: the sample collected at the indicator station for the third quarter had an activity of 200 pCi/l. Before 1986, positive results were usually found in each composite at levels typically between 200 and 400 pCi/l. Subsequently, the number of positive results and their levels diminished. The last positive results were found in 1990 when two samples at the indicator station each had levels of approximately 140 pCi/l.

The annual 50 mile downstream survey of the Altamaha River to determine if river water has begun to be used for drinking purposes is discussed in Section 4.0.

4.6 Fish

Gamma isotopic analysis is performed on the edible portion of the fish samples collected at the river stations on April 6 and November 9. The control station (No. 170) is located upstream of the plant while the indicator station (No. 172) is located downstream. Channel catfish were collected at the control station in April; largemouth bass were collected at each station in both April and November; and redear sunfish were collected at the control station in November and at the indicator station in both months.

As shown in Table 3-1, Cs-137 was the only man-made radionuclide detected during 1995. It was found in each sample except the redear sunfish collected at the control station in November. The average level of 25.0 pCi/kg wet at the indicator station is seen to be 2.9 pCi/kg wet less than that at the control station. This difference, however is not discernible since it is less than the MDD of 26.8 pCi/kg wet. The MDC and RL for Cs-137 in fish are 150 and 2000 pCi/kg wet, respectively.

There seems to have been a reduction in the Cs-137 level after 1988. This is illustrated by comparing the range and mean of annual averages in units of pCi/kg wet at the indicator and control stations for the 1984-1988 period with the 1989-1994 period.

Item	84-88	89-94
Indicator Station		
Mean	84.0	32.9
Lowest	62.0	26.7
Highest	117.0	41.6
Control Station		
Mean	49.1	25.9
Lowest	33.3	24.2
Highest	63.3	28.9

In the past, the only other man-made radionuclides detected in fish samples by gamma isotopic analysis were Co-60 and Cs-134. During preoperations, Co-60 was detected in one fish sample at a very low level. During the period of 1983 through 1988, Cs-134 was found in about half of the samples at levels on the order of those found for Cs-137.

4.7 Sediment

Sediment is collected along the shoreline of the Altamaha River at an upstream control stations (No. 170) and a downstream indicator station (No. 172). A gamma isotopic analysis is performed on each sample.

During 1995, collections were made on May 1 and November 6. As usual, Cs-137 was detected in each sample. Positive readings for Cs-137 have been found in approximately 93 percent of all of the regular samples collected, including those during preoperation.

As shown in Table 3-1, the average level of 52.3 pCi/kg dry found at the indicator station was 28.3 pCi/kg dry less than that found at the control station. This difference is not discernible as it is less than the MDD of 150 pCi/kg dry. The MDC for Cs-137 in sediment is 180 pCi/kg dry. The Cs-137 levels have varied widely and randomly through the years, during preoperation as well as during operation. The levels for 1995 are typical of and within the range of those found previously.

In past years, various fission and activation products were occasionally found in the sediment samples. Their presence was generally attributed to the nuclear weapons tests or to the Chernobyl incident, although plant releases were not ruled out, especially in recent years. This year (1995) is the first year since 1987 when only Cs-137 was found in the sediment samples.

5.0 INTERLABORATORY COMPARISON PROGRAM

As required by ODCM 4.1.3, the EL participates in an interlaboratory comparison program whose purpose is to ensure that independent checks are performed on the precision and accuracy of the measurements of radioactive materials in environmental sample matrices. Analyses are conducted on radioactive materials supplied by the Performance Evaluation Program managed by the Environmental Protection Agency (EPA) at their Environmental Monitoring Systems Laboratory in Las Vegas, Nevada. In past years, this EPA Program was known as the Intercomparison Studies (Crosscheck) Program. Reported herein, as required by ODCM 4.1.3.3 and 7.1.2.3 is a summary of the results of the EL's participation in the EPA program.

The EPA program was designed for laboratories involved with REMPs and includes environmental media and a variety of radionuclides with activities which might be as low as environmental levels. Simulated environmental samples are distributed regularly to the participants who analyze the samples and return the results to the EPA for statistical analysis and comparisons with known values and with results obtained from other participating laboratories. The EPA then provides each participant with documentation of its performance; this can be helpful in identifying any instrument or procedure problems.

The EL analyzes the EPA supplied samples consistent with the requirements of Table 2-1. Analyses are performed in a normal manner. Each sample is analyzed in triplicate as required by the program. Results obtained during 1995 for the gross beta and gamma isotopic analyses of air filters, the gamma isotopic analysis of milk samples, and the tritium and gamma isotopic analyses of water samples are summarized in Table 5-1.

Delineated in Table 5-1 for each of the environmental media are the type analyses performed, EPA's collection dates, the known values and expected precisions provided by the EPA, the average results obtained and reported by the EL along with the standard deviations of these results, and the normalized deviations and the normalized ranges from the known results. The normalized deviations and normalized ranges were also provided by the EPA.

TABLE 5-1 (SHEET 1 OF 2)

INTERLABORATORY COMPARISON PROGRAM RESULTS

Radionuclide or Analysis	Date Collected	Known Value	Expected Precision	Reported Average	Standard Deviation	Normalized Deviation	Normalized Range
			Air Filters (pCi/filter)				
Gross Beta	08/25/95	86.6	10.0	89.00	3.00	0.42	0.35
Cs-137	08/25/95	25.0	5.0	30.00	3.00	1.73	0.71
			Milk (pCi/l)				
I-131	09/29/95	99.0	10.0	98.33	5.69	-0.12	0.65
Cs-137	09/29/95	50.0	5.0	49.00	1.00	-0.35	0.24
			Water (pCi/l)				
H-3	03/10/95	7435.0	744.0	7033.33	257.16	-0.94	0.38
	08/04/95	4872.0	487.0	4530.00	121.24	-1.22	0.29
Co-60	06/09/95	40.0	5.0	38.67	4.04	-0.46	0.83
	11/03/95	60.0	5.0	58.00	4.00	-0.69	0.95
Zn-65	06/09/95	76.0	8.0	80.33	10.50	0.94	2.05
	11/03/95	125.0	13.0	126.33	6.35	0.16	0.50

TABLE 5-1 (SHEET 2 OF 2)

INTERLABORATORY COMPARISON PROGRAM RESULTS

Radionuclide or Analysis	Date Collected	Known Value	Expected Precision	Reported Average	Standard Deviation	Normalized Deviation	Normalized Range
Cs-134	06/09/95	50.0	5.0	44.00	2.65	-2.08	0.59
	11/03/95	40.0	5.0	34.00	3.46	-2.08	0.71
Cs-137	06/09/95	35.0	5.0	40.00	6.08	1.73	1.57
	11/03/95	49.0	5.0	51.33	1.53	0.81	0.35
Ba-133	06/09/95	79.0	8.0	72.00	4.36	-1.52	0.59

The normalized deviation from the known value provides a measure of the central tendency of the data (accuracy). The normalized range is a measure of the dispersion of the data (precision). An absolute value of 3 standard deviations for the normalized deviation and for the normalized range was established by the EPA as the control limit. An absolute value of 2 standard deviations was established as the warning limit. The EL considers any value greater than the control limit as unacceptable. Investigations are undertaken whenever any value exceeds the warning limit or whenever a plot of the values indicates a trend.

An investigation was undertaken due to the following conditions which may be noted from Table 5-1:

1. The warning limit for the normalized range was exceeded for Zn-65 in the gamma isotopic analysis of the water sample collected on June 9;

2. The warning limit for the normalized deviation was exceeded for Cs-134 in the gamma isotopic analysis of the water sample collected on June 9 and November 3; and

3. A downward trend was indicated from plots of Cs-134 found from the gamma isotopic analysis of water samples.

The EPA samples for gamma isotopic analysis are diluted to produce four separate one liter marinellis. The samples are counted and statistically analyzed. The three samples with the overall best precision are reported to the EPA. The June 9 sample with the Zn-65 was analyzed in this manner. One of the analysis results was determined to be suspect. The remaining three samples were reported to the EPA. The samples in the future will be counted on at least two different detectors to rule out any suspect analysis.

The EPA stated that there were problems with the analysis of Cs-134 and that laboratories using commercial standards for calibration of their gamma counting systems may experience problems with coincidence summing of the primary energy peak for Cs-134. The energy peak is 604 kev. The concentration of the standards used did not produce the adequate summing effects.

The activity for Cs-134 in water is trending low. This indicates a likely problem with the background correction factors. The background correction factors for the gamma counting systems need to be evaluated as the detectors were relocated to a different room in 1994. The background of the room will be evaluated and new correction factors determined.

6.0 CONCLUSIONS

This report confirms the licensee's conformance with the requirements of Chapter 4 of the ODCM during 1995. It shows that all data were carefully examined. A summary and discussion of the results of the laboratory analyses for each type sample were presented.

No discernible radiological impact upon the environment or public as a consequence of plant discharges to the atmosphere and to the river was established.