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Georgia Power
the southern electric system

April 21, 1993

Docket Nos. 50-321
50-366

HL-3255
009404

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

Edwin I. Hatch Nuclear Plant
1992 Annual Radiological Environmental Surveillance Report

Gentlemen:

In accordance with Plant Hatch Units 1 and 2 Technical Specifications Sections 6.9.1.6 and 6.9.1.7, Georgia Power Company is submitting the enclosed Annual Radiological Environmental Surveillance Report for 1992.

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

Sincerely,

J. T. Beckham, Jr.

DMH:sls
ENV-93-145

Enclosure: Annual Radiological Environmental Surveillance Report

cc: (See next page.)

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JE25 1/1

cc: Georgia Power Company
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Enclosure
Edwin I. Hatch Nuclear Plant
1992 Annual Radiological Environmental Surveillance Report

EDWIN I. HATCH NUCLEAR PLANT
1992 ANNUAL RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT

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LIST OF ABBREVIATIONS

CL	Confidence Level
EL	Environmental Laboratory
EPA	Environmental Protection Agency
GPC	Georgia Power Company
HNP	Hatch Nuclear Plant
LLD	Lower Limit of Detection
MDD	Minimum Detectable Difference
MDA	Minimum Detectable Activity
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

EDWIN I. HATCH NUCLEAR PLANT
1992 ANNUAL RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE 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 evaluate any radiological impact upon the environment due to plant operations. Reported herein are the program's activities for calendar year 1992.

The specifications for the REMP are provided in Unit 1 Technical Specification 3/4.16 and in the Unit 2 Technical Specification 3/4.12. The Unit 2 Technical Specifications reference the Unit 1 Technical Specifications. A single program serves both units.

A summary description of the program is provided in Section 2.0. Figures 2-1 through 2-3 are maps showing the sampling locations that are keyed to Table 3-1 indicating the distance and direction of each sampling location 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 3.0. A discussion of the results, including assessments of any radiological impacts upon the environment, is provided in Section 4.0.

The results of the Interlaboratory Comparison Program are presented in Section 5.0. Conclusions are stated in Section 6.0.

2.0 SUMMARY DESCRIPTION

A summary description of the current REMP is provided in Table 2-1. Table 2-1 is essentially a copy of Technical Specifications Table 3.16.1-1 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 Section 3.0 of the Offsite Dose Calculation Manual (ODCM).

Technical Specification 3.16.1.a states that deviations from the required sampling schedule are permitted if samples are unobtainable due to hazardous conditions, unavailability, inclement weather, malfunction of equipment, or other just reasons. (See Table 2-1.) Any deviations are accounted for in the discussion for each particular sample type in Section 4.0.

During 1992, all laboratory analyses, were performed by Georgia Power Company's (GPC's) Environmental Laboratory (EL) in Smyrna, Georgia. During the previous 10 years, the reading of the thermoluminescent dosimeters (TLDs) had been provided by Teledyne Isotopes Midwest Laboratory (or its predecessor, Hazleton Environmental Sciences, Inc.) in Northbrook, Illinois.

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 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 semiannualy.
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 monthly; 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 recreational 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 Lower Limit of Detection (LLD), a separate analysis for I-131 may be performed.

d. Composite samples shall be taken by collecting an aliquot at intervals not exceeding a few hours.

e. If river water downstream of HNP is used for 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 HNP to identify who uses Altamaha River water for drinking.

TABLE 2-2 (SHEET 1 OF 2)

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

Station Number	Station Type (a)	Descriptive Location	Direction (b)	Distance (b) (miles)	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	Upriver	WNW	(d)	R
172	I	Downriver	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 Substation	S	10.0	AD
416	C	Emergency 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.

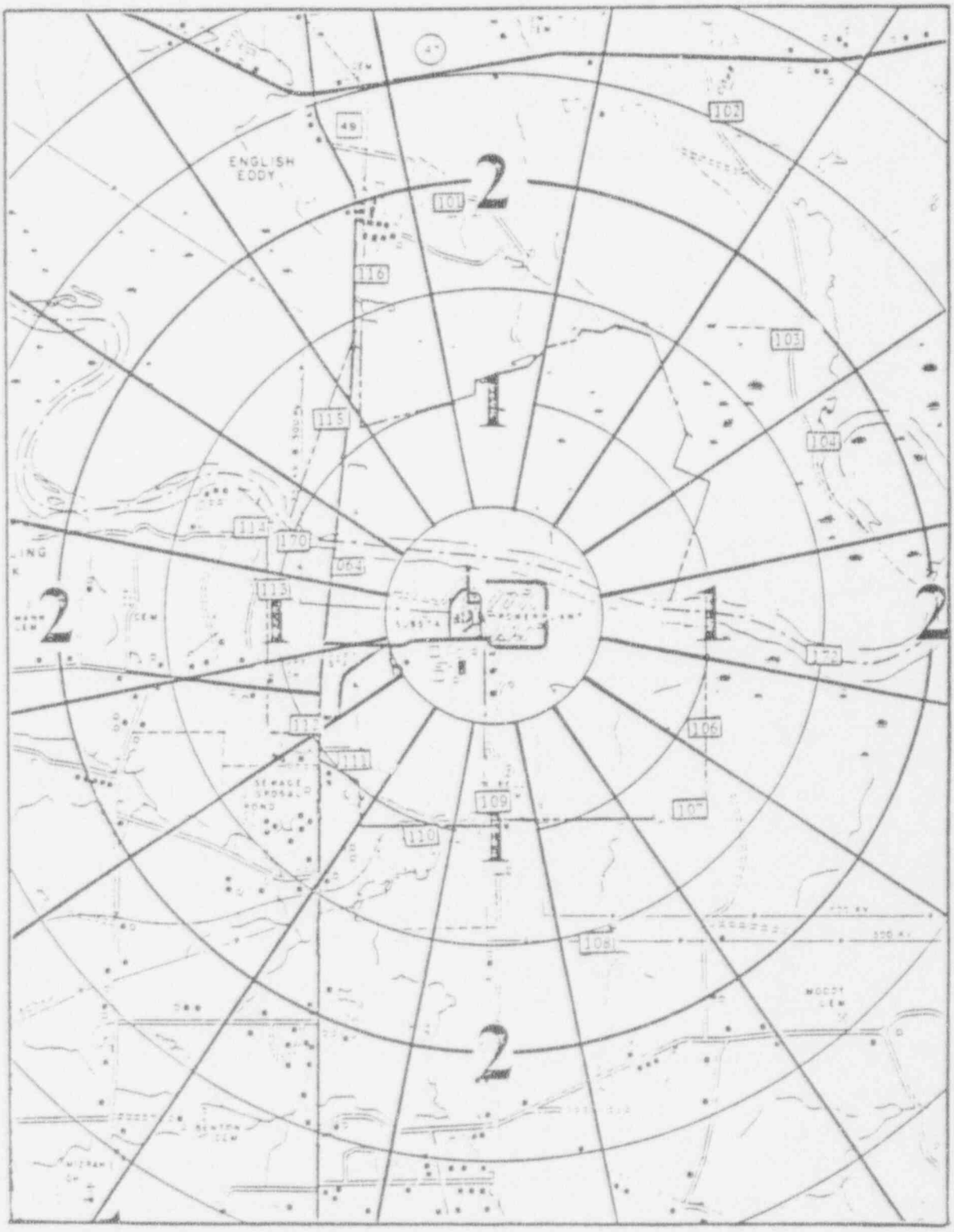
c. Sample types:

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 location from which river water and sediment may be taken cannot be sharply defined. Often, the sampling locations for clams 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 the samples are collected.

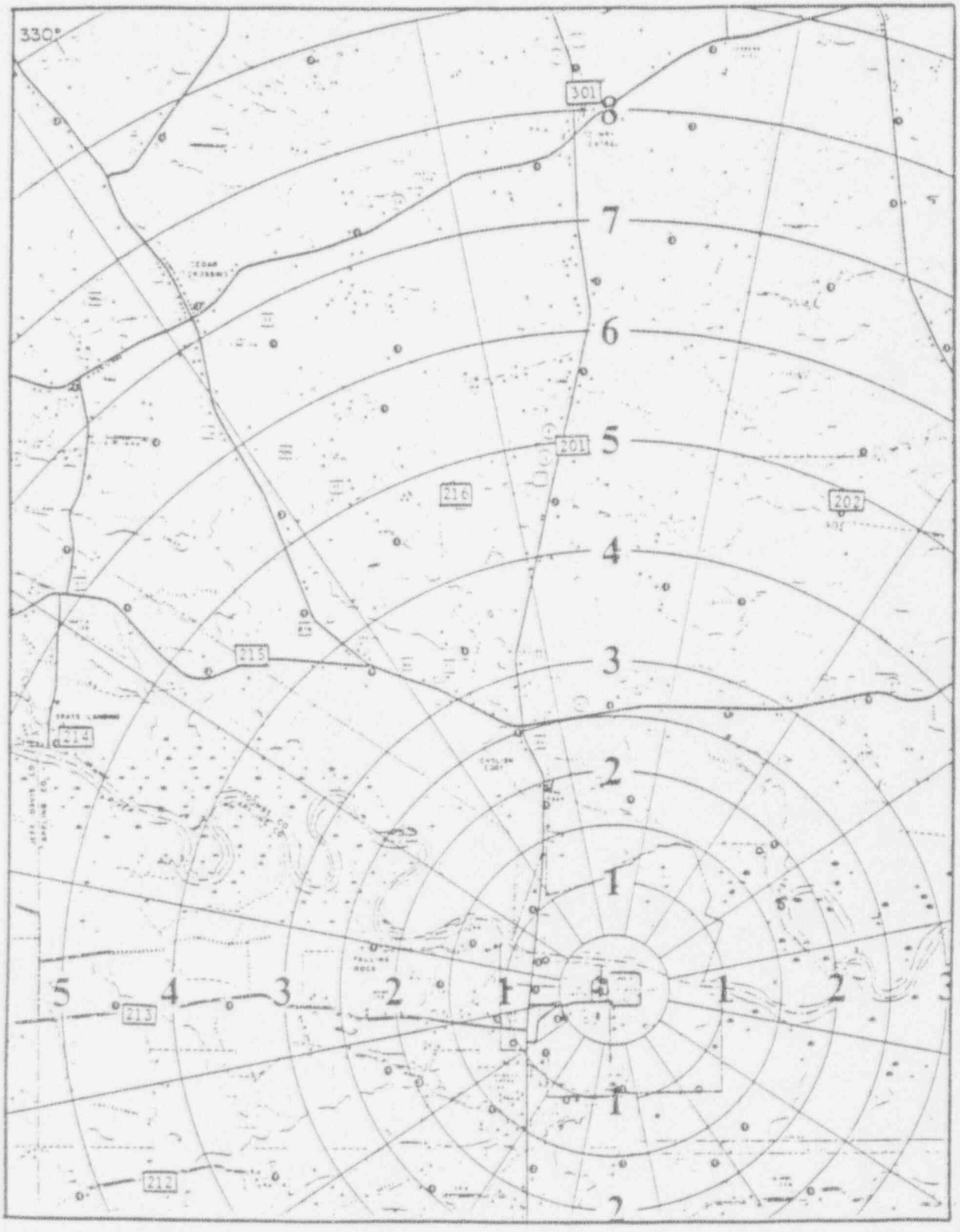


Georgia Power

EDWIN I. HATCH
NUCLEAR PLANT

RADIOLOGICAL ENVIRONMENTAL SAMPLING
LOCATION MAP
(SITE PERIPHERY)

FIGURE 2-1



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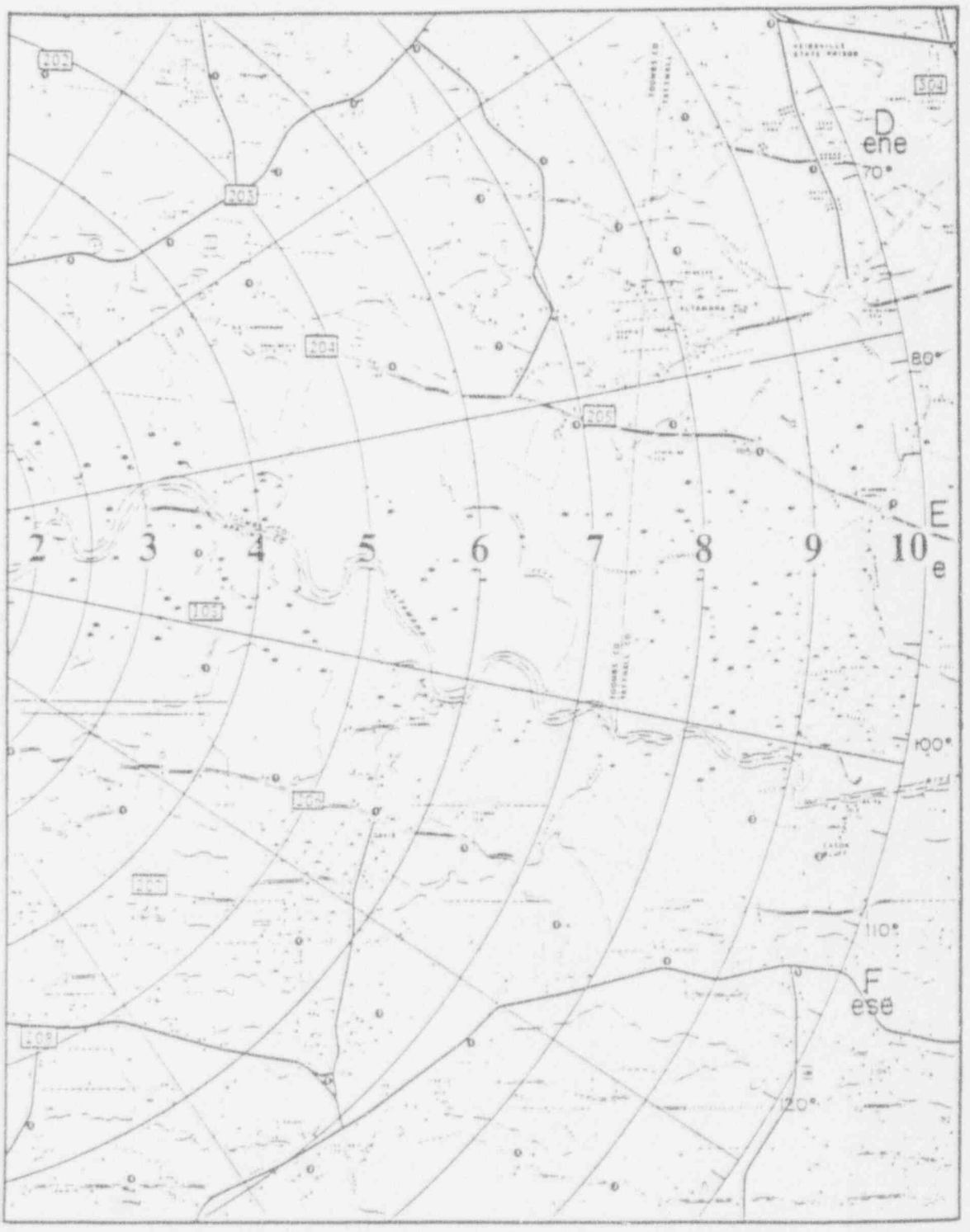
NUCLEAR PLANT

RADIOLOGICAL ENVIRONMENTAL SAMPLING
LOCATION MAP (BEYOND
SITE VICINITY)

FIGURE 2-2 (SHEET 1 OF 3)



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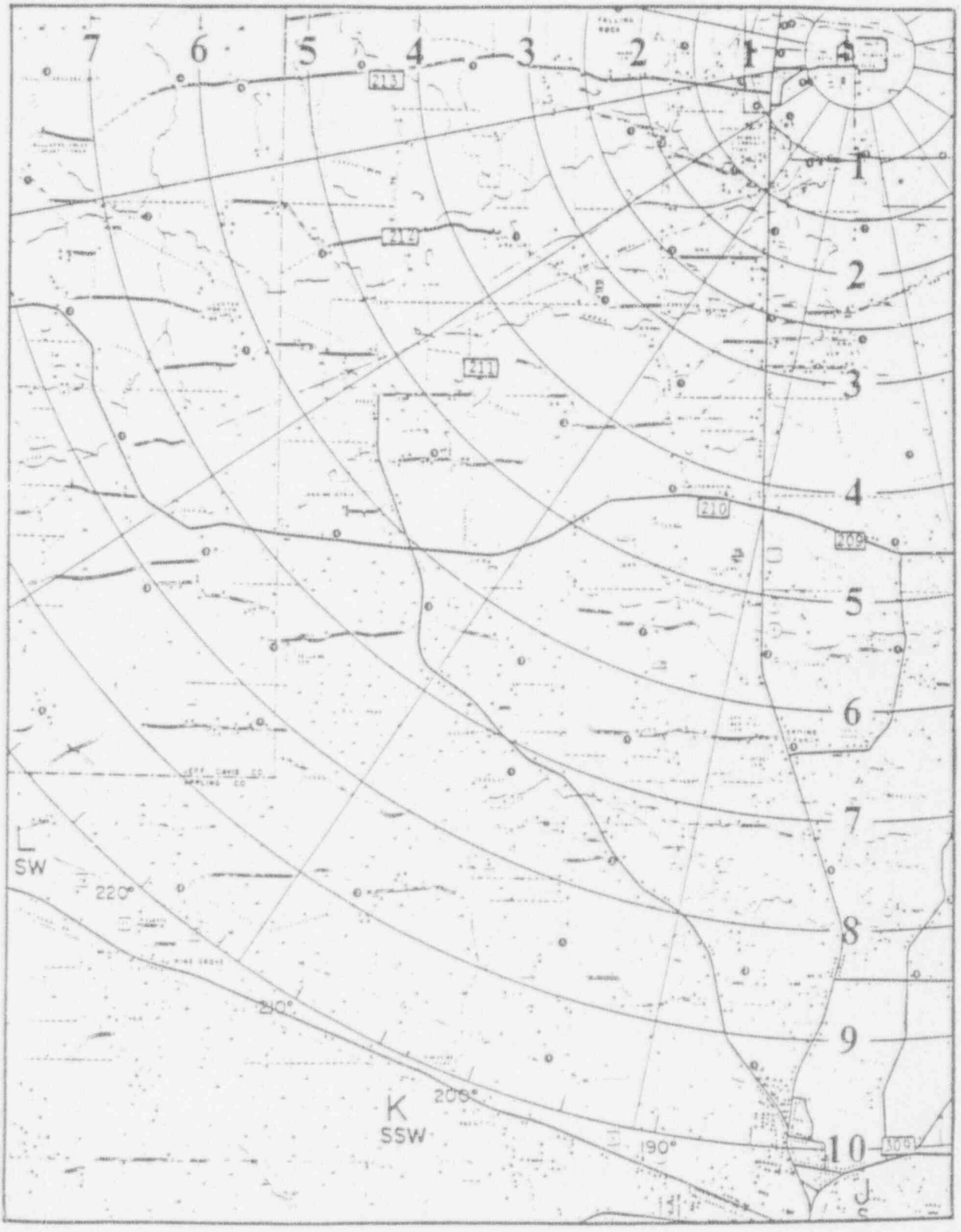
RADIOLOGICAL ENVIRONMENTAL SAMPLING
LOCATION MAP (BEYOND
SITE VICINITY)

FIGURE 2-2 (SHEET 2 OF 3)



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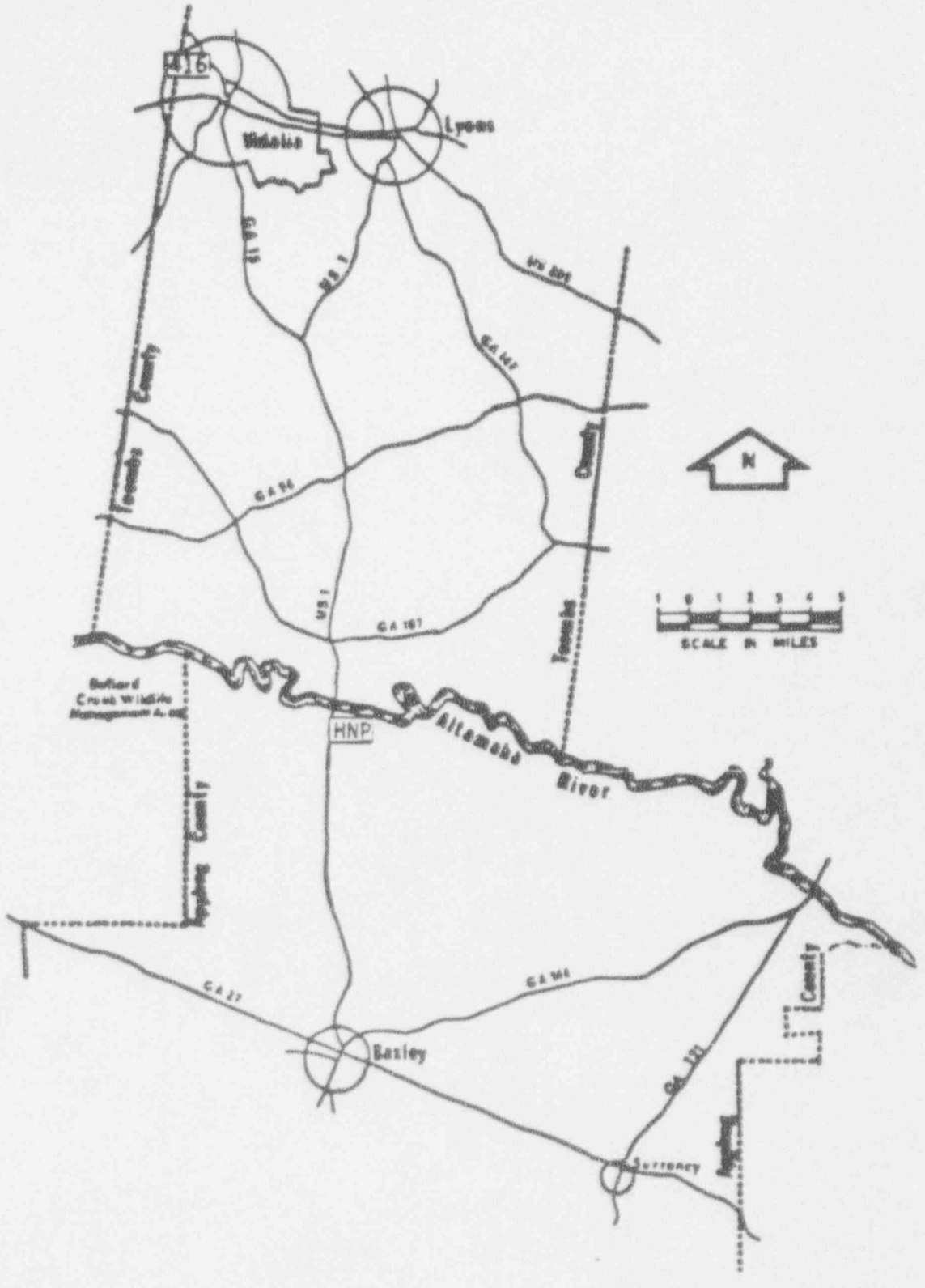
NUCLEAR PLANT

RADIOLOGICAL ENVIRONMENTAL SAMPLING
LOCATION MAP (BEYOND
SITE VICINITY)

FIGURE 2-2 (SHEET 3 OF 3)



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NUCLEAR PLANT

LOCATION OF ADDITIONAL CONTROL STATION FOR TLDs AND VEGETATION

FIGURE 2-3

3.0 RESULTS SUMMARY

In accordance with Technical Specification 6.9.1.7, 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 the format of Technical Specifications Table 6.9.1.7-1. Only man-made radionuclides are reported. Results for samples collected are discussed in Section 4.0.

TABLE 3-1 (SHEET 1 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia, Calendar Year 1992

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (a) (LLD)	All Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)	Number of Reportable Occurrences
Airborne Particulates (fCi/m^3)	Gross Beta 312	10	18.5 7-45 (208/208)	No. 116 Inner Ring 1.6 miles NNW	18.9 9-45 (52/52)	18.4 8-43 (104/104)	0
	Gamma Isotopic 24						
	Cs-134	50	NDM (c)		NDM	NDM	0
	Cs-137	60	NDM		NDM	NDM	0
Airborne Radioiodine (fCi/m^3)	I-131 312	70	NDM		NDM	NDM	0
Direct Radiation (mR/91 days)	Gamma Dose 76	NA (d)	11.9 10-16 (64/64)	No. 104 Inner Ring 1.6 miles ENE	15.3 14-16 (4/4)	10.9 9-13 (12/12)	0
Milk (pCi/l)	Gamma Isotopic 27						
	Cs-134	20	NA		NDM	NDM	0
	Cs-137	20	NA		NDM	NDM	0
	Ba-140	60	NA		NDM	NDM	0
	La-140	20	NA		NDM	NDM	0

TABLE 3-1 (SHEET 2 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia, Calendar Year 1992

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (a) (LLD)	All Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)	Number of Reportable Occurrences
	I-131 27	1	NA		NDM	NDM	0
Grass (pCi/kg wet)	Gamma Isotopic 36						
	I-131	60	NDM		NDM	NDM	0
	Cs-134	60	NDM		NDM	NDM	0
	Cs-137	80	35.2 17-54 (13/24)	No.416 Em News Ctr 21 miles NNW	41.3 23-87 (7/12)	41.3 23-87 (7/12)	0
River Water (pCi/l)	Gamma Isotopic 24						
	Mn-54	20	NDM		NDM	NDM	0
	Fe-59	30	NDM		NDM	NDM	0
	Co-58	20	NDM		NDM	NDM	0
	Co-60	20	NDM		NDM	NDM	0
	Zn-65	30	NDM		NDM	NDM	0
	Zr-95	30	NDM		NDM	NDM	0
	Nb-95	20	NDM		NDM	NDM	0

TABLE 3-1 (SHEET 3 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia, Calendar Year 1992

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (a) (LLD)	All Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)	Number of Reportable Occurrences
	I-131	20 (e)	NDM		NDM	NDM	0
	Cs-134	20	NDM		NDM	NDM	0
	Cs-137	20	NDM		NDM	NDM	0
	Ba-140	60	NDM		NDM	NDM	0
	La-140	20	NDM		NDM	NDM	0
	Tritium 8	3000 (f)	NDM		NDM	NDM	0
Fish (pCi/kg wet)	Gamma Isotopic 8						
	Mn-54	100	NDM		NDM	NDM	0
	Fe-59	300	NDM		NDM	NDM	0
	Co-58	100	NDM		NDM	NDM	0
	Co-60	100	NDM		NDM	NDM	0
	Zn-65	300	NDM		NDM	NDM	0
	Cs-134	100	NDM		NDM	NDM	0
	Cs-137	200	41.6 27-73 (4/4)	No. 172 1.7 miles Downriver	41.6 27-73 (4/4)	28.8 16-43 (4/4)	0

TABLE 3-1 (SHEET 4 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia, Calendar Year 1992

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (a) (LLD)	All Indicator Locations Mean (b) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (b) Range (Fraction)	Control Locations Mean (b) Range (Fraction)	Number of Reportable Occurrences
Sediment (pCi/kg)	Gamma Isotopic 4						
	Co-60	40(g)	81.4 72-91 (2/2)	No. 172 3.0 miles Downriver	81.4 72-91 (2/2)	NDM	0
	Zn-65	90(g)	83.0 83-83 (1/2)	No. 172 3.0 miles Downriver	83.0 83-83 (1/2)	NDM	0
	Cs-134	200	NDM		NDM	NDM	0
	Cs-137	200	151.0 102-200 (2/2)	No. 170 1.1 miles Upriver	198.5 194-203 (2/2)	198.5 194-203 (2/2)	0

TABLE 3-1 (SHEET 5 OF 5)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia, Calendar Year 1992

NOTES

a. The LLD is defined in table notation a of Technical Specification Table 4.16.1-1. Except as noted otherwise, the values listed herein are the same as the Technical Specification values. In practice, the LLDs are generally much lower than the values listed.

b. Mean and range are based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses.

c. No detectable measurement(s).

d. Not applicable.

e. Since no drinking water pathway exists, the LLD from the gamma isotopic analysis may be used. (See notation c of Technical Specification Table 4.16.1-1.) The value listed is the objective LLD.

f. If a drinking water pathway existed, an LLD of 2000 pCi/l would have been used. (See notation d of Technical Specification Table 4.16.1-1.)

g. The GPC Environmental Laboratory has determined that this value may be routinely attained. No value is provided in Technical Specification Table 4.16.1-1.

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 preoperations. The results were examined to perceive any trends. To provide perspective, a result may be compared with its LLD or Reporting Level (RL) which is provided by Technical Specification Table 3.16.1-2. Attempts were made to explain any RLs or other high radiological levels found in the samples. During the year there were no failures in the laboratory analyses of each of the samples in attaining the LLDs required by Technical Specification Table 4.16.1-1.

The annual land use survey required by Technical Specification 3.16.2 was conducted on October 12, 1992. The location of the nearest permanent residence in each of the 16 meteorological sectors within a distance of 5 miles, as required by the survey, is listed in Table 4-1. The results of the milk animal component of the survey are presented in Subsection 4.3. The results of the annual river survey required by Note f in Table 2-1 are presented in Subsection 4.5.

All results were tested for conformance to Chauvenet's Criterion[a] to flag any which might differ from the others in its set by a significant amount. Identified outliers were investigated to determine reasons for deviating from the norm. If due to an equipment malfunction or other valid physical reason, the anomalous result was deemed non-representative and excluded from the data set. No datum was excluded for failing Chauvenet's Criterion only.

a. G. D. Chase and J. L. Rabinowetz, Principle of Radioisotope Methodology, Burgess Publishing Company, pp 87-90, 1963.

TABLE 4-1

LOCATION OF THE NEAREST
PERMANENT RESIDENCE IN EACH SECTOR

SECTOR	DISTANCE (miles)
N	2.0
NNE	2.9
NE	3.2
ENE	4.2
E	*
ESE	3.7
SE	1.8
SSE	2.0
S	1.0
SSW	1.3
SW	1.1
WSW	1.1
W	1.1
WNW	1.1
NW	3.6
NNW	1.8

* None within 5 miles.

4.1 Airborne

As indicated by Table 2-2, airborne particulates and airborne radioiodine are collected at 4 indicator stations (Nos. 103, 107, 112, and 116) which encircle the site boundary 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 an SAI CP-200 charcoal canister in sequence to retain airborne particulates and airborne radioiodine, respectively. The filters and canisters are collected weekly.

Each of the air particulate filters is counted for gross beta activity. As seen in Table 3-1, the annual average weekly activity of 18.5 fCi/m^3 for the indicator stations was 0.1 fCi/m^3 greater than that for the control stations. However, this difference was not discernible, since it is less than the MDD calculated as 1.8 fCi/m^3. During the 4 years prior to 1992, the absolute value of the difference between the average weekly activities for the indicator and control stations was never greater than 0.9 fCi/m^3. The average activity for the control stations was greater than that for the indicator stations on one occasion. The average activity over this 4-year period for the indicator stations was about 0.3 fCi/m^3 greater than that for the control stations.

The average weekly gross beta activity for all stations during the period from 1989 through 1992 was 19.5 fCi/m^3. In past years, it had been an order of magnitude higher. For example: the average weekly activity was 140 fCi/m^3 during preoperations, 242 fCi/m^3 during 1977, and 195 fCi/m^3 during 1981. The high values were 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 in recent years have become much lower. The annual average was 33 fCi/m^3 for 1982, and this steadily decreased to 22 fCi/m^3 for 1985. However, during 1986 as a consequence to the Chernobyl incident, the average activity increased to 37 fCi/m^3. The annual averages for 1987 and 1988 were 23 and 22 fCi/m^3, respectively.

During 1992, no man-made radionuclides were detected from the gamma isotopic analysis of the quarterly composites of air particulate filters. During preoperations and each

year of operations 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. Subsequently, the number of radionuclides detected became scant and their levels low. From 1987 through 1990, no man-made radionuclides were detected. During 1991, Cs-137 was detected at a very low level in one sample.

The charcoal canisters used for adsorbing iodine from the atmosphere were analyzed for I-131 by gamma spectroscopy. I-131 was not detected in any samples during 1992. The maximum allowed LLD is 70 fCi/m^3; however, the activity usually attained was about a third of this value.

Positive results for airborne radioiodine are not normally obtained. 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 after 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 maximum allowed LLD (that 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 was 217 fCi/m^3 in 1977. The RL called for in Technical Specification Table 3.16.1-2 is 900 fCi/m^3.

4.2 Direct Radiation

Direct (external) radiation is measured with TLDs. Two TLD badges are placed at each station. Two TLD stations are established in each of the 16 meteorological sectors about the plant. The inner ring of stations (Nos. 101 through 116) is located near the site boundary, while the outer ring (Nos. 201 through 216) is located at a distance of about 4 to 5 miles. These rings were installed in early 1980 to meet the requirements of Revision 1 to the Technical Position of the Radiological Assessment Branch of the Nuclear Regulatory Commission (NRC), dated November 1979. However, each of the stations in the East Sector is at a radius which is a few miles greater than the other stations in its ring. Flood plains in this sector prevent easy access on a year-round basis to the site boundary and to the 4 to 5 mile annulus.

The 16 stations forming the inner ring are designated as the indicator stations. The three 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 located adjacent to Toombs Central School. Station 210 in the outer ring is located adjacent to the Altamaha School, the only other nearby school.

From the start of preoperations through 1986, TLDs with lithium fluoride phosphors were used. In 1987, TLDs from Teledyne, which use calcium sulfate phosphors, replaced those using lithium fluoride phosphors. In early 1992, the Panasonic UD-814 TLD replaced the Teledyne TLD and also the GPC Environmental Laboratory replaced Teledyne Midwest Laboratory as the processor of the TLDs.

The replacement of the TLDs followed a comparative study between the performance of the two types of TLDs. Two Teledyne badges were placed side-by-side with two Panasonic badges at all stations from the third quarter 1990 through the fourth quarter 1991. The Teledyne badges were processed by Teledyne while the Panasonic badges were processed by the GPC Environmental Laboratory.

Having TLDs processed in-house allows more direct control over the operation, the opportunity for an abbreviated reporting time, and allows for the reduction in the transient exposure because the time for off-station exposure can be reduced.

A comparison of the makeup between the two badge types shows several differences. The phosphor for the Teledyne badge is a calcium sulfate (with Dysprosium impurity) impregnated teflon card; whereas, the phosphor for the Panasonic badge consists of calcium sulfate (with thulium impurity) crystals on a polyimide substrate. The Teledyne badge has four read areas, while the Panasonic has three. Each type badge is equipped with a filter on each side of the phosphor to attenuate low energy photons in order to compensate for the overresponse of the calcium sulfate in this portion of the energy spectrum. The filters for the Teledyne badges consist of 500 mg/cm^2 of copper, plus 150 mg/cm^2 of plastic. The filters for the Panasonic badges consist of 700 mg/cm^2 of lead, plus 150 mg/cm^2 of plastic. As shown below, the readings for the Panasonic badges were lower due to greater attenuation being provided by their heavier filters.

The average readings in mR of the Panasonic and the Teledyne TLDs for exposures during 1991 at the indicator (inner ring), outer ring, and control stations, along with a ratio of these readings, are as follows.

Station Group	Panasonic	Teledyne	P/T
Indicator	12.34	15.14	0.815
Outer Ring	12.28	15.60	0.787
Control	11.48	13.65	0.841

This comparison shows the Panasonic readings to be about 20 percent less than the Teledyne readings.

The NRC places Panasonic UD-801 TLDs in the vicinity of commercial nuclear power plants to independently monitor the external radiation levels. Perhaps the main difference between the UD-801 and the UD-814 (used by HNP) is that the UD-801 has two read areas, while the UD-814 has three. There are also procedural differences in the manner the badges are handled and differences in the dates defining each exposure period. Nevertheless, a comparison of results shows good agreement.

Listed below are HNP's average readings for 1991 in mR (as measured with Panasonic UD-814 TLDs), the NRC's reading (as measured with Panasonic UD-801 TLDs), and the ratio of these readings. Averages are presented for the indicator, outer ring, and control station groups. The indicator group for the NRC are the stations located within 2 miles

of the plant stack; the outer ring are those from 2 to 5 miles; and the control group are those at distances greater than 5 miles.

Station Group	UD-814	UD-801	814/801
Indicator	12.34	12.33	1.001
Outer Ring	12.28	11.33	1.084
Control	11.48	12.67	0.906

This comparison shows the UD-814 results processed by the GPC Environmental Laboratory were within approximately 10 percent of those measured by the NRC. This is considered good agreement considering badge and procedural differences, the fact that badges in each station were not side-by-side but only in the general vicinity of each other, and the periods of exposure were not identical.

The results for the field exposures for 1992 using the Panasonic UD-814 TLDs processed by the GPC Environmental Laboratory are discussed in the subsequent paragraphs of this section.

As shown in Table 3-1, the average quarterly exposure of 11.9 mR acquired at the indicator stations (inner ring) was 1.0 mR greater than that acquired at the control stations. This difference was not discernible, since it was less than the MDD of 1.1 mR. For the 13-year period of 1980 through 1992:

1. The absolute value of the difference between the annual average quarterly exposure acquired at these two station groups varied from 0 to 1.6 mR.

2. The average exposure was greater at the indicator station for 8 years.

3. The average exposure at the indicator stations during the entire period was 0.2 mR greater than that at the control stations. No trends in the data for these station groups were recognized.

The quarterly exposures acquired at outer ring stations ranged from 8.7 to 16.2 mR, with an average of 11.8 mR for the year, which is 0.1 mR less than that found for the inner ring. There was no discernible difference between the averages of the inner and outer rings, since the difference was less than the MDD of 0.6 mR. For the

13-year period of 1980 through 1992, the average quarterly exposure for the inner ring was greater than that for the outer ring by amounts up to 1.0 mR for 9 of the years and was less by amounts up to 0.5 mR for the other 4 years. Overall, the average quarterly exposure for the inner ring was 0.3 mR greater than that for the outer ring. No trend was recognized in this data.

The quarterly exposure in units of mR acquired at the special-interest areas were:

Location	Average	Minimum	Maximum
Roadside Park	11.1	10.7	11.3
Toombs Central School	11.5	11.1	12.1

These exposures were on the order of those acquired at the other stations.

Occasionally, TLDs were lost in the field due to theft or damaged due to vandalism or other reasons. Near the middle of each quarter, the TLD stations were checked for missing or damaged badges; replacement badges were provided as needed. If both badges were missing and/or damaged at the end of the quarter, the exposure for the quarter at that location could not be assessed.

TLD 205A was damaged in the field during the third quarter and could not be read. Station 205 is on the right of way of a county road. This badge seems to have been sprayed with a chemical, probably a herbicide. Since TLD 205B was not damaged, it was used to determine the exposure for Station 205 for the third quarter.

During 1992, only one failure to obtain a usable quarter dose reading for a badge occurred. In 1991, there was one failure; in 1990, six failures; and in 1989, eight.

4.3 Milk

Milk samples from cows were obtained biweekly at Station 304 (the state prison dairy) which is a control station. Gamma isotopic and I-131 analyses were performed on each sample.

The annual land use survey to identify the location of the nearest milk animal in each of the 16 meteorological sectors within a distance of 5 miles and the location of all milk animals within a distance of 3 miles was conducted on October 12, 1992. A milk animal is a cow or goat producing milk for human consumption. No milk animals were found. Also, the county extension agents from 5 counties in the vicinity were contacted on January 15, May 13, and October 12, 1992 in the search for suitably located milk animals, but none were found.

Man-made radionuclides have not been detected from the gamma isotopic analysis of milk samples for 3 years. 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. The presence of Cs-137 in those samples was attributed to the nuclear weapons tests and the Chernobyl incident.

For the past several years, I-131 has not been detected in any of the milk samples. During preoperations, all readings for I-131 were less than 2 pCi/l, which was the allowed LLD at that time. Positive results were found during each year of the first 5 years of operations (1974 through 1978). In 1980, positive results ranged from 0.7 to 1.8 pCi/l, while in 1986, positive results ranged 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 LLD and RL for I-131 were 1 and 2 pCi/l, respectively. All positive readings for I-131 were generally attributed to fallout from the nuclear weapons tests and the Chernobyl incident.

4.4 Grass

Gamma isotopic analysis was performed on grass samples collected monthly from two indicator stations (Nos. 106 and 112) and one control station (No. 416). This analysis has been performed on grass samples since 1978.

The results presented in Table 3-1 show that Cs-137 was the only man-made radionuclide detected; this has been the case since 1986. The levels were typical of those generally found. The average value of 35.2 pCi/kg wet found at the indicator stations was 6.1 pCi/kg wet less than that found at the control station. This difference was not discernible, since it is less than the MDD of 19.3 pCi/kg wet. The LLD and RL for Cs-137 were 80 and 2000 pCi/kg wet, respectively. The presence of Cs-137 in grass samples was attributed to fallout from the nuclear weapons tests of years past and to the Chernobyl incident of 1986.

4.5 River Water

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

A gamma isotopic analysis was made on each monthly collection. As usual, no man-made radionuclides were detected. The occurrence of positive results for man-made radionuclides has been infrequent. The only man-made radionuclides detected previously (by gamma isotopic analysis) were as follows:

Year	Quarter	Station	Radionuclide	Level (pCi/l)
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 were attributed to the Chernobyl incident.

Tritium analyses were performed on the quarterly composites. No positive results were found. Before 1986, positive results were usually found for each composite, at levels in the range of 200 to 400 pCi/l.

On September 21, 1992, the annual usage survey of the Altamaha River was conducted downstream of the plant for at least 50 river miles to identify anyone who may use river water for drinking purposes. As in all previous surveys, no intakes for drinking water or irrigation were observed. This was corroborated by information obtained from the State of Georgia that no new surface water permits for drinking water or irrigation purposes on the Altamaha River had been issued. If river water should become used for drinking, the Technical Specification requirements for its sampling and analysis will be implemented.

4.6 Fish

Gamma isotopic analyses were performed on the edible portion of the fish samples collected at the river stations on May 18-19 and October 28-29, 1992. The control station (No. 170) is located upstream of the plant, and the indicator station (No. 172) is located downstream of the plant. In May, large-mouth bass were collected at both stations, whereas in October, large-mouth bass, channel catfish, and redear sunfish were collected at both stations.

As shown in Table 3-1, Cs-137 was the only man-made radionuclide detected and as usual, was found in all of the samples. During 1992, the average level for all samples with positive results was about 21 percent higher than that for the prior 3 years but only about 50 percent of that for the period of 1983 through 1988. The average level of 41.6 pCi/kg wet at the indicator station was 12.8 pCi/kg wet greater than that at the control station. However, this difference was not discernible, since it is less than the MDD of 39.4 pCi/kg wet. The LLD and RL for Cs-137 were 200 and 2000 pCi/kg wet, respectively.

In the past, the only other man-made radionuclides detected in fish samples by the 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

The semiannual collections of sediment took place on April 4 and November 2, 1992 at the river stations. Although the Technical Specification require only an annual collection, a second collection was added in 1989 to increase the statistical base.

A gamma isotopic analysis was performed on each sample. Positive results were obtained for Cs-137 in each sample. Positive results were also found for both Co-60 and Zn-65 in the sample collected at the downstream station (No. 172) in April, and for Co-60 only in the sample collected at the downstream station in November.

Positive readings for Cs-137 have been found in every sample since 1980 and in over 90 percent of the samples collected, including those during preoperations. As shown in Table 3-1, the average level of 151.0 pCi/kg dry found at the indicator (downstream) station was 47.5 pCi/kg dry less than that at the control (upstream) station. This difference was not discernible, since it is less than the MDD of 343 pCi/kg dry. These levels are typical of those found through the years. The LLD for Cs-137 was 200 pCi/kg dry.

The activation product Co-60 was not detected in shoreline sediment until 1986. During the period 1986 through 1992, it was found in over 60 percent of the samples from the indicator station but in less than 30 percent of those from the control station. The levels for 1992 are typical of those found previously.

The activation product Zn-65 was only detected at the indicator station, starting in 1986. From 1986 through 1992, it was found in more than a third of the samples collected. The level for 1992 was only about half of those found previously.

In past years, various fission and activation products were found in sediment samples; the levels were significant in some of the samples. Their presence was generally attributed to the nuclear weapons tests or the Chernobyl incident, but plant releases were not ruled out. The levels measured were insignificant with respect to radiation dose and regulatory limits.

5.0 INTERLABORATORY COMPARISON PROGRAM

Technical Specification 3.16.3 requires that analyses be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program approved by the NRC. The Environmental Protection Agency's (EPA's) Environmental Radioactivity Laboratory Intercomparison Studies (Crosscheck) Program conducted by the Environmental Monitoring and Support Laboratory in Las Vegas, Nevada, provides such a program. Reported herein, as required by Technical Specification 4.16.3 are the results of the GPC Environmental Laboratory's participation in the EPA Crosscheck Program.

The Crosscheck Program was designed for laboratories involved with REMPs and includes environmental media and a variety of radionuclides with activities at or near environmental levels. Participation in the program ensures that independent checks on the precision and accuracy of the measurements of radioactive materials in environmental sample matrices are performed. REMP results can thereby be demonstrated to be reasonably valid.

Simulated environmental samples are distributed regularly to the participants who analyze the samples and return the results to the EPA for statistical analysis and comparison with known values and results obtained from other participating laboratories. The Crosscheck Program provides each participant with documentation of its performance; this can be helpful in identifying any instrument or procedural problems.

The GPC Environmental Laboratory analyzes radioactive materials, consistent with Table 2-1, supplied by the EPA's Crosscheck Program. Analyses were performed in a normal manner. Each sample was analyzed in triplicate as required by the program. Results obtained for the gross beta and gamma isotopic analyses of air filters, the gamma isotopic and I-131 analyses 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 analysis performed, EPA's collection date, the known value and expected precision (one standard deviation) provided by the EPA, the average result obtained by the GPC Environmental Laboratory, the standard deviation of the GPC Environmental Laboratory's result, the normalized deviation (from the known result), and the normalized range. The normalized deviation and normalized range were also provided by the EPA.

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 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 GPC Environmental Laboratory 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.

The following information relative to the normalized deviation is shown in Table 5-1:

1. The warning limit for the gamma analyses of Co-60 in water was exceeded on October 9, 1992 and for Ru-106 on June 5, 1992.

2. Positive biases from the gamma analyses of Co-60, Ru-106 and Cs-137 in water, and of Cs-137 in air filters are shown.

An investigation was conducted which concluded that these anomalies were due to changes in the background count rate. The control limit, in each case, was not exceeded. Computer software to revise peak background correction values has been developed and will be implemented in 1993.

TABLE 5-1 (SHEET 1 OF 2)

CROSSCHECK PROGRAM RESULTS

Analysis	Date Collected	Known Value	Expected Precision	Reported Average	Standard Deviation	Normalized Deviation	Normalized Range
			Air Filters (pCi/filter)				
Gross Beta	03/27/92	41.0	5.0	44.67	1.15	1.27	0.24
	08/28/92	69.0	10.0	65.33	2.08	-0.64	0.24
Cs-137	03/27/92	10.0	5.0	14.00	0.00	1.39	0.00
	08/28/92	18.0	5.0	22.33	1.53	1.50	0.35
			Milk (pCi/l)				
I-131	04/24/92	78.0	8.0	80.33	4.04	0.51	0.59
	09/25/92	100.0	10.0	105.70	5.51	0.99	0.65
Cs-137	04/24/92	39.0	5.0	41.00	2.65	0.69	0.59
	09/25/92	15.0	5.0	18.00	2.00	1.04	0.47
			Water (pCi/l)				
H-3	02/21/92	7904.0	790.0	8380.00	115.34	1.04	0.16
	06/19/92	2125.0	347.0	1913.33	30.55	-1.06	0.10
	10/23/92	5962.0	596.0	5650.00	30.03	-0.91	0.06
Co-60	02/14/92	49.0	5.0	52.67	0.58	1.27	0.12
	04/14/92	22.0	5.0	26.33	2.08	1.50	0.47
	06/05/92	15.0	5.0	16.67	0.58	0.58	0.12
	10/09/92	8.0	5.0	11.67	1.53	1.27	0.35
	10/20/92	8.0	5.0	10.00	2.65	0.69	0.59
Zn-65	02/14/92	148.0	15.0	145.67	1.53	-0.27	0.12
	06/05/92	99.0	10.0	99.67	1.53	0.12	0.18
	10/09/92	148.0	15.0	156.00	2.00	0.92	0.16

TABLE 5-1 (SHEET 2 OF 2)

CROSSCHECK PROGRAM RESULTS

Analysis	Date Collected	Known Value	Expected Precision	Reported Average	Standard Deviation	Normalized Deviation	Normalized Range
Ru-106	02/14/92	203.0	20.0	199.0	7.00	-0.35	0.38
	06/05/92	141.0	14.0	157.67	1.53	2.06	0.13
	10/09/92	175.0	18.0	191.33	10.07	1.57	0.66
Cs-134	02/14/92	31.0	5.0	30.00	0.00	-0.35	0.00
	04/14/92	24.0	5.0	26.33	0.58	0.81	0.12
	06/05/92	15.0	5.0	14.00	1.73	-0.35	0.35
	10/09/92	8.0	5.0	9.67	0.58	0.58	0.12
	10/20/92	5.0	5.0	6.33	1.53	0.46	0.35
Cs-137	02/14/92	49.0	5.0	52.67	0.58	1.27	0.12
	04/14/92	22.0	5.0	26.33	2.08	1.50	0.47
	06/05/92	15.0	5.0	16.67	0.58	0.58	0.12
	10/09/92	8.0	5.0	11.67	1.53	1.27	0.35
	10/20/92	8.0	5.0	10.00	2.65	0.69	0.59
Ba-133	02/14/92	76.0	8.0	79.00	1.00	0.65	0.15
	06/05/92	98.0	10.0	98.67	1.53	0.12	0.18
	10/09/92	74.0	7.0	76.33	4.04	0.58	0.59

6.0 CONCLUSIONS

This report confirms the licensee's conformance with Technical Specification 3/4.16 during 1992 and it shows that all data were carefully examined. A summary and a discussion of the results of the laboratory analyses for each type sample collected were presented.

No Technical Specifications reportable limits were exceeded.

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