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April 26, 1991

Alabama Power
the southern electric system

Docket Nos. 50-348
50-364

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

Joseph M. Farley Nuclear Plant
Annual Environmental Operating Report Radiological

Gentlemen:

The attached "Annual Environmental Operating Report, Part B: Radiological" for calendar year 1990, is transmitted in accordance with the Joseph M. Farley Nuclear Plant Unit 1 and Unit 2 Technical Specifications Section 6.9.1.6.

If you have any questions, please advise.

Respectfully submitted,

J. D. Woodard

JDW/BHW:map 0151

Attachment

cc: U. S. Nuclear Regulatory Commission
Mr. S. D. Ebneter
Mr. S. T. Hoffman
Mr. G. F. Maxwell

State of Alabama
Director, Division of Radiation Control

State of Georgia
Director, Environmental Protection Division

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ALABAMA POWER COMPANY

ANNUAL ENVIRONMENTAL OPERATING REPORT

PART B: RADIOLOGICAL

JOSEPH M. FARLEY NUCLEAR PLANT

UNIT NO. 1

LICENSE NO. NPF-2

AND

UNIT NO. 2

LICENSE NO. NPF-8

PERIOD ENDING DECEMBER 31, 1990

ANNUAL ENVIRONMENTAL OPERATING REPORT
PART B: RADIOLOGICAL

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OPERATIONAL RADIOLOGICAL ENVIRONMENTAL PROGRAM

JOSEPH M. FARLEY NUCLEAR PLANT

UNITS 1 AND 2

I. Introduction

The Joseph M. Farley Nuclear Plant, owned and operated by Alabama Power Company (APCo), located in Houston County, Alabama is approximately fifteen miles east of Dothan, Alabama on the west bank of the Chattahoochee River. Unit 1, a Westinghouse Electric Corporation Pressurized Water Reactor (PWR) with a rated power output of 860 megawatts electrical (MWe) achieved initial criticality on August 9, 1977. The unit was declared "commercial" on December 1, 1977. Unit No. 2, also a 860 MWe Westinghouse PWR, achieved initial criticality on May 8, 1981 and was declared "commercial" on July 30, 1981.

During 1990, Unit II was off-line from October 13, 1990 through the end of the year for the seventh refueling outage.

The sample collection and analysis schedule for the operational off-site radiological environmental monitoring program implemented in May 1977 and as modified on July 1, 1980 with the addition of 14 TLD stations was continued during 1990 for both Units No. 1 and 2. The program was further modified effective April 1982 to reflect Amendment No. 26 to the Unit 1 Technical Specifications issued March 1, 1982. The program was changed a third time in 1989 with the addition of two more control TLDs. This program was designed to monitor any radioactivity contribution to the environment from the plant through either the airborne or waterborne pathways. The type of samples monitored, and number and type of sampling stations are shown in Table 1. Indicator sampling stations are located, where practical, at locations where detection of the radiological effects of the plant's operation is thought to be most likely, where the samples collected should provide a significant indication of potential dose to man, and where an adequate comparison of predicted radiological levels might be made with measured levels. The control stations are placed at locations where radiological levels are not expected to be significantly influenced by plant operation, i.e., at background locations. For some airborne radioactivity samples, community stations are located at the principal population centers between the indicator and the control stations (3-8 miles). Community stations could be used, if desired, as additional control stations, and alternatively, as indicator stations for the nearest population centers in the event of a major airborne release from the plant.

II. Radiological Sampling and Analysis

A detailed outline of the operational radiological sampling and analysis activities for the environmental program to meet the requirements of the Unit 1 and 2 Technical Specifications is given in Tables 1 and 2. For each parameter only one sample was collected and one analysis performed to meet the specifications for both Units No. 1 and 2.

The samples were collected by APCo's technical staff except for the in situ high purity germanium (HP(Ge)) gamma-ray spectroscopy measurements of soil. The latter were collected by staff members of the University of Georgia (UGA), Center for Applied Isotope Studies. All sample analyses except TLDs were contracted to UGA; TLDs are read at the plant. The minimum detectable concentration (MDC), specified for various samples and their respective analyses are given in Table 3. The reporting levels for radioactivity concentrations in environmental samples are provided in Table 4. Sampling and analysis deviations during 1990 are listed in Table 5.

A. Airborne Particulates and Iodine

All airborne particulate and iodine monitoring stations shown in Figures 3.12-1 through 3.12-3 were equipped with Roots vacuum pumps which operated continuously at a flow rate of approximately 0.04 m^3/min (1.5 ft^3/min). The particulates were collected on Gelman Metricel 5μm filters. In series with, but downstream of the particulate filters, F&J 50 mm (or equivalent) activated charcoal cartridges were used for collection of iodine. The Roots system has the sample collector mounted outside of the cabinet horizontally to the ground with a Singer gas meter measuring the cumulative air flow. The gas meters were calibrated against a certified flow meter. Both the particulate filters and charcoal cartridges were collected weekly and sent to UGA for radioactivity analysis.

Gross beta radioactivity measurements were performed on each air particulate filter using a Tennelec low background alpha-beta counting system. The filters from each station, composited at the end of each quarter, were analyzed for gamma emitters using a fifteen percent relative efficiency low background germanium lithium (Ge(Li)) detector and a Canberra 4096 channel computer-based multichannel analyzer (MCA).

All air monitoring station locations shown in Figures 3.12-1 through 3.12-3 have the capability of monitoring airborne iodine. Weekly routine samples were analyzed for I-131 by UGA using a Canberra 1024 channel MCA and two 1" x 3" NaI detectors and matched photomultiplier tubes.

B. External Radiation

For the continuous measurement of environmental gamma radiation, natural Lithium Fluoride (LiF) (TLD-700) chips, manufactured by Harshaw-Filtrol Chemical Company, were used. TLD packets, each containing four annealed LiF chips, were sealed in opaque mylar to produce a packet that was light-tight, weather-proof, and which had a low mass attenuation for radiation (approximately 50mg/cm^2). On the plant site, all TLD packets were kept in a lead safe with 2-inch walls except for those receiving field exposure or those in the process of being exchanged.

At each external radiation monitoring station (shown in Figures 3.12-1, 3.12-2, and 3.12-3), two TLD packets, one changed and read quarterly and one changed and read annually, were exposed side-by-side on metal stakes at a height of one meter above the ground. For the computation of the net field doses, a log of all exposure periods was maintained for each TLD packet.

C. Milk

The milk sample location is as indicated on Figure 3.12-3. All milk samples, collected bi-weekly, were analyzed by UGA for I-131 and gamma emitters. As a preservative for shipment, 1 ml of 25 weight percent merthiolate (Thimerasol) solution was added to each one gallon sample. The I-131 concentration in each sample was determined by collection on anion exchange resin, elution with sodium hypochlorite, followed by organic extraction and counting, by beta-gamma coincidence, the resultant toluene-iodine solution in a low level liquid scintillation counter. Stable iodine carrier was added to each sample for determination of the radiochemical yield.

A one liter quantity of each sample was placed in a marinelli beaker and then analyzed for gamma emitters using a 15 percent relative efficiency low background Ge(Li) detector and a Canberra 4096 channel computer-based MCA.

D. Vegetation: Forage

Monthly, forage was collected from indicator grass plots located near the air monitoring stations at the plant site perimeter in sectors 7 (SSE) and 16 (N), or alternate plots if needed, and from a control grass plot located near the air monitoring station in Dothan, Alabama. After drying and pulverizing, the samples were analyzed by UGA for gamma emitters using a 15 percent relative efficiency low background Ge(Li) detector and a Canberra 4096 channel computer-based MCA.

E. Soil

Annual in situ gamma-ray spectroscopy measurements were made by UGA using a 10 percent relative efficiency high purity germanium detector and gamma-ray spectroscopy system specially designed for field use. Measurements were taken at the six indicator locations and at the five community and control (background) locations listed in Table 2. A 1024 channel Canberra MCA interfaced to a Hewlett-Packard 9825A calculator was used for data storage and analysis.

F. Surface (River) Water

Samples of water from the Chattahoochee River, above and below the plant site at the locations shown in Figure 3.12-4 were collected on a semi-continuous basis with Instrumentation Specialties Company (ISCO) samplers. Monthly composites were sent to UGA for radioactivity analysis. Two liter aliquots from each monthly composite were placed in trays lined with plastic film and evaporated to dryness at 100°C. The residue (on plastic film) was folded to fit a petri-dish and analyzed for gamma emitters using a 15 percent relative efficiency Ge(Li) low background detector and a Canberra 4096 channel computer-based MCA.

At the end of each quarter, for each sampling location, the balance of the three monthly composites were combined to give a quarterly composite sample. Approximately 50 ml from each quarterly composite sample was distilled and a 25 ml aliquot taken for tritium analysis using a large volume (100 ml) Hewlett-Packard 200 low background liquid scintillation counter.

G. Ground (Well) Water

In the Farley Plant area there are no true indicator sources of groundwater. A well which serves Georgia Pacific Paper Company as a source of potable water, located on the east bank of the Chattahoochee River about four miles south-southeast of the plant, was sampled on a quarterly basis and designated as an indicator station. A deep well which supplies water to the Whatley residence located about 1.2 miles southwest of the plant was sampled on a quarterly basis and designated as a control (background) station. Samples from both were sent to UGA for radioactivity analysis. An aliquot from each sample was taken for tritium analysis. After distillation, 25 ml samples were analyzed using a large volume (100 ml) low background liquid scintillation counter. From the remainder of each sample, a two liter aliquot was taken and evaporated to dryness at 100°C in a tray lined with plastic film. The residue (on plastic film) was folded to fit a petri dish and analyzed for gamma emitters using a 15 percent relative efficiency Ge(Li) detector and a Canberra 4096 channel computer-based MCA.

H. Fish (River)

Semi-annually, two types of fish, game and bottom feeding, were collected from the Chattahoochee River at the locations shown in Figure 3.12-4, and sent to UGA for gamma-ray spectroscopy analysis. Both semi-annual fish samples sent to UGA consisted of fish fillets that had been split with Alabama Division of Radiation Control. These fish samples were coarsely chopped at UGA and were anlayzed for gamma emitters using a 15 percent relative efficiency low background Ge(Li) detector and 4096 channel Canberra computer-based MCA.

I. Sediment (River)

Semi-annually, sediment samples were collected from the Chattahoochee River at the locations shown in Figure 3.12-4. Approximately one kilogram of sample was sent to UGA where it was dried, mixed, and analyzed for gamma emitters using a 15 percent relative efficiency low background Ge(Li) detector and a Canberra 4096 channel computer-based MCA. One semi-annual sediment sample was split with Alabama Division of Radiation Control.

III. Results and Discussion

No known atmospheric nuclear tests were conducted during 1990.

For measurements involving radioactivity concentrations by volume or mass the designation "minimum detectable concentration" (MDC) is defined in Table 3.

For measurements involving a quantity of radioactivity or radiation that is independent of the sample volume or mass, the designation "lower limit of detection (LLD)" is used to denote the limit of detection applicable at the 95 percent confidence level. The LLD is defined as "the smallest amount of sample activity that will yield a net count for which there is confidence at a predetermined level that activity is present." Its application is limited to measurement systems which denote a limiting detection capability without respect to the size of sample and/or radiochemical yield and to measurements which by their nature do not involve concentrations, e.g. radiation dose rates (mrad/hr., mrad/qtr., etc.).

A. Airborne Particulates

The results of the radioactivity analyses of airborne particulate filters are shown in Table 1990-01. The mean gross beta activity values for the air particulate indicator, community and control sampling locations were of the same value. The gross beta activity mean for all locations was higher than in 1989 and lower than the preoperational period.

The gross beta and gamma spectroscopy data for the air particulate filter composites showed Cs-137, Cs-134 and I-131 below MDC at all sampling locations.

B. Airborne Iodine

The results of the radioactivity analyses of iodine charcoal cartridges are shown in Table 1990-02. The iodine activity for 1990 samples at all locations was less than the minimum detectable concentration values. The nominal MDC was less than the 1989 value.

C. External Radiation

The results of the external radiation measurements using TLD packets are shown in Table 1990-03. As found during the preoperational period and during 1989, the data reflect the differences in site specific soil radioactivity. Exposures recorded by quarterly TLDs in 1990 were slightly higher than those recorded in 1989 for indicator, community and control sampling locations. The exposures recorded by annual indicator, community, and control TLDs in 1990 were higher than those observed in 1989 and the preoperational period. Also evident in 1990 as in previous years, the exposures recorded by annual TLDs were less than the sum of the exposures from the associated quarterly TLDs.

D. Milk

The results from the radioactivity analyses of milk are shown in Table 1990-04. Milk from the Lewis Dairy was sampled as the control location. There were no indicator samples during 1990. Only K-40 was detected in control samples. The value was increased over the 1989 value.

E. Vegetation

Forage was the only vegetation sampled during 1990. The radioactivity analysis results are shown in Table 1990-05. Forage, as during the preoperational period, continued to be a very effective and sensitive indicator of airborne radioactivity. Traces of Cs-137 were found in some indicator samples. The data for 1990 indicated fewer fission product radionuclides than the preoperational data.

F. Soil

The results of the in situ HP(Ge) gamma-ray spectroscopy analysis of soil during this operational period are shown in Table 1990-06. The only man-made radioactivity found in all measurements was Cs-137. During the preoperational period, the fission products Zr-95, Nb-95 and Cs-134 were seen at most of the locations in addition to Cs-137. The 1990 levels of Cs-137 found at indicator locations were not significantly different from control and community locations and were lower than the 1989 levels and the preoperational levels.

G. Waterborne Activity (Surface Water)

The results of radioactivity analysis of surface water are shown in Table 1990-07. Cs-137 and Cs-134 activity levels were below the measured MDC values. All other radionuclides, excluding tritium were below MDC level as well.

The average surface water indicator tritium level was lower than in 1989.

H. Waterborne Activity (Ground Water)

The results of the radioactivity analysis of ground water are shown in Table 1990-08. The Cs-134, Cs-137, and I-131 activity values for 1990 were less than MDC as was observed in 1989. The Cs-137 value was lower than the preoperational data.

I. River Sediment

The results of radioactivity analysis of sediment samples from the Chattahoochee River are shown in Table 1990-09. Cs-134 and Cs-137 concentrations were below MDC in both 1989 and 1990. The isotopic concentrations of all isotopes greater than MDC, except for K-40, for 1990 indicator locations were greater than those recorded in 1989. The concentrations of isotopes greater than MDC recorded for 1990 control locations were greater than those recorded in 1989, except for K-40 & Ra-226.

J. Game Fish (River)

The results of gamma-ray spectroscopy analysis of the edible portions of game fish taken from the Chattahoochee River are shown in Table 1990-10. Cs-137 was found at low levels in the indicator samples of game fish. The 1990 average indicator Cs-137 value was found to be lower than 1989 and preoperational data.

K. Bottom-Feeding Fish (River)

The results of gamma-ray spectroscopy analysis of the edible portions of bottom feeding fish taken from the Chattahoochee River are shown in Table 1990-11. All isotope values were below MDC, except K-40. The K-40 levels in indicator samples were slightly lower than the 1989 levels. The control sample levels were higher than 1989 levels.

IV. Land Use Census and Interlaboratory Comparison Program

A. Land Use Census

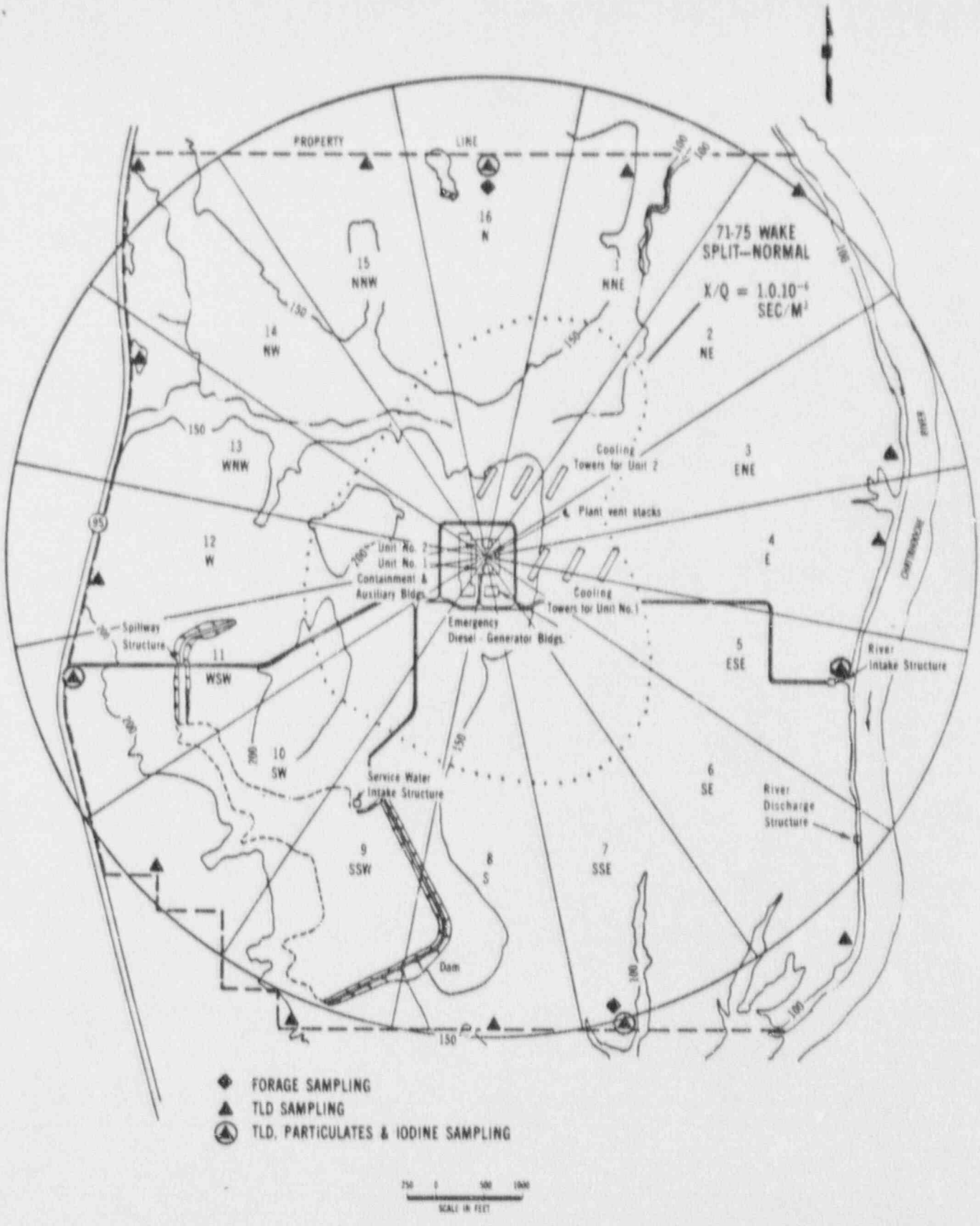
The results of the June, 1990, Land Use Census are given in Attachment 1 to this report.

B. Interlaboratory Comparison Program

During 1990, the University of Georgia Center for Applied Isotope Studies (UGA) was a participant in the EPA Crosscheck Program. The UGA EPA Program code designation is EA. Although Farley Nuclear Plant (FNP) also participates in the EPA Crosscheck Program under code designation FU, only TLD analyses were performed by FNP.

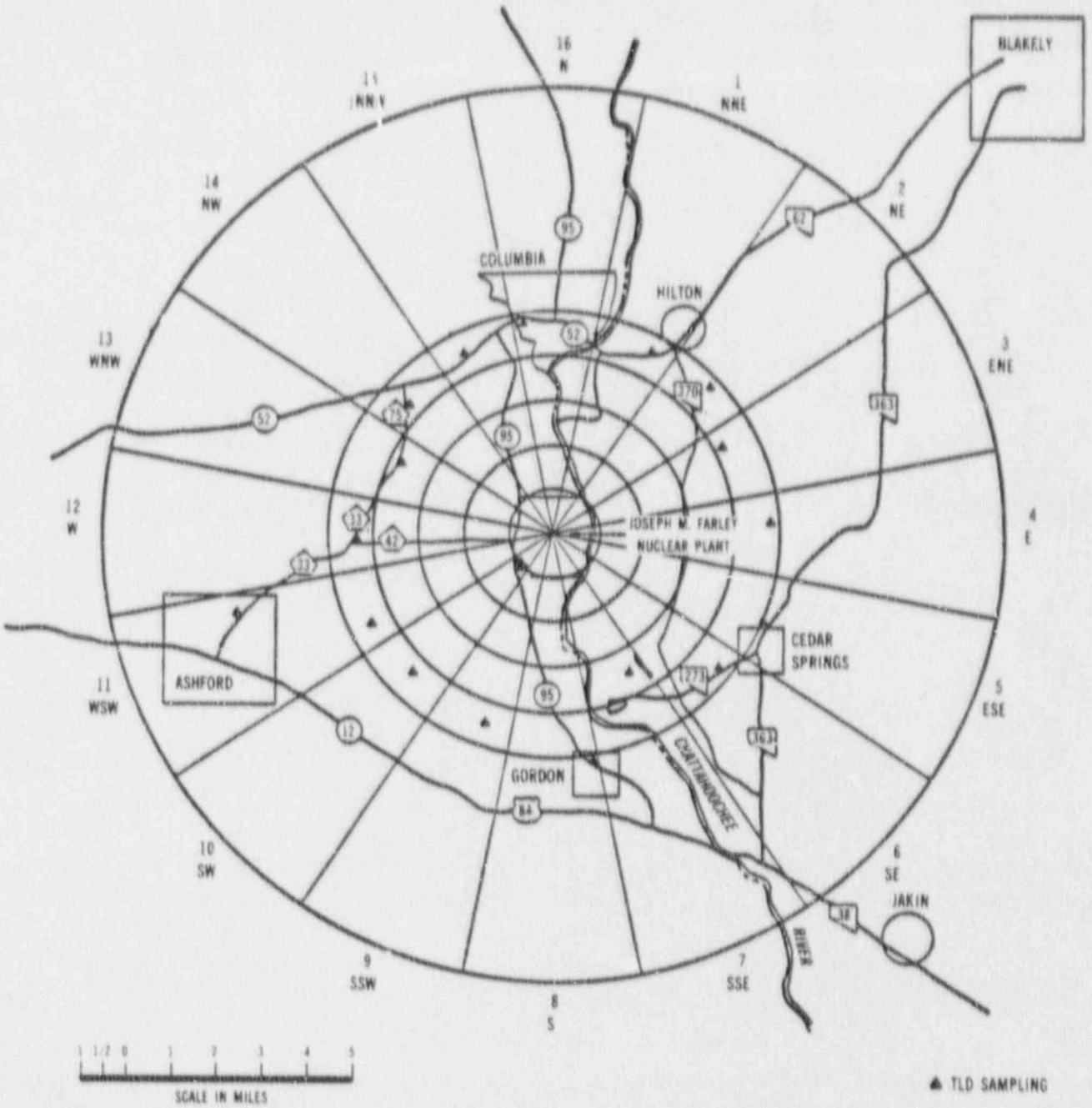
V. Data Trends and Conclusion

A review of the 1990 environmental data indicate some changes in the parameters monitored when compared to 1989 data. Cs-137 was present in some forage indicator samples and game fish samples. The surface water tritium was less than the 1989 levels. The external gamma radiation values were higher as compared to 1989 TLD measurements. Bottom-feeding fish showed slightly higher K-40 levels. K-40 is a naturally occurring isotope and is not related to any plant operations or releases. No significant changes were indicated in air particulates, milk, air iodine, soil, water, game fish and sediment. Therefore, data obtained during the 1990 sampling year demonstrate that there was no adverse impact on the surrounding environs of Farley Nuclear Plant as a result of its operation.



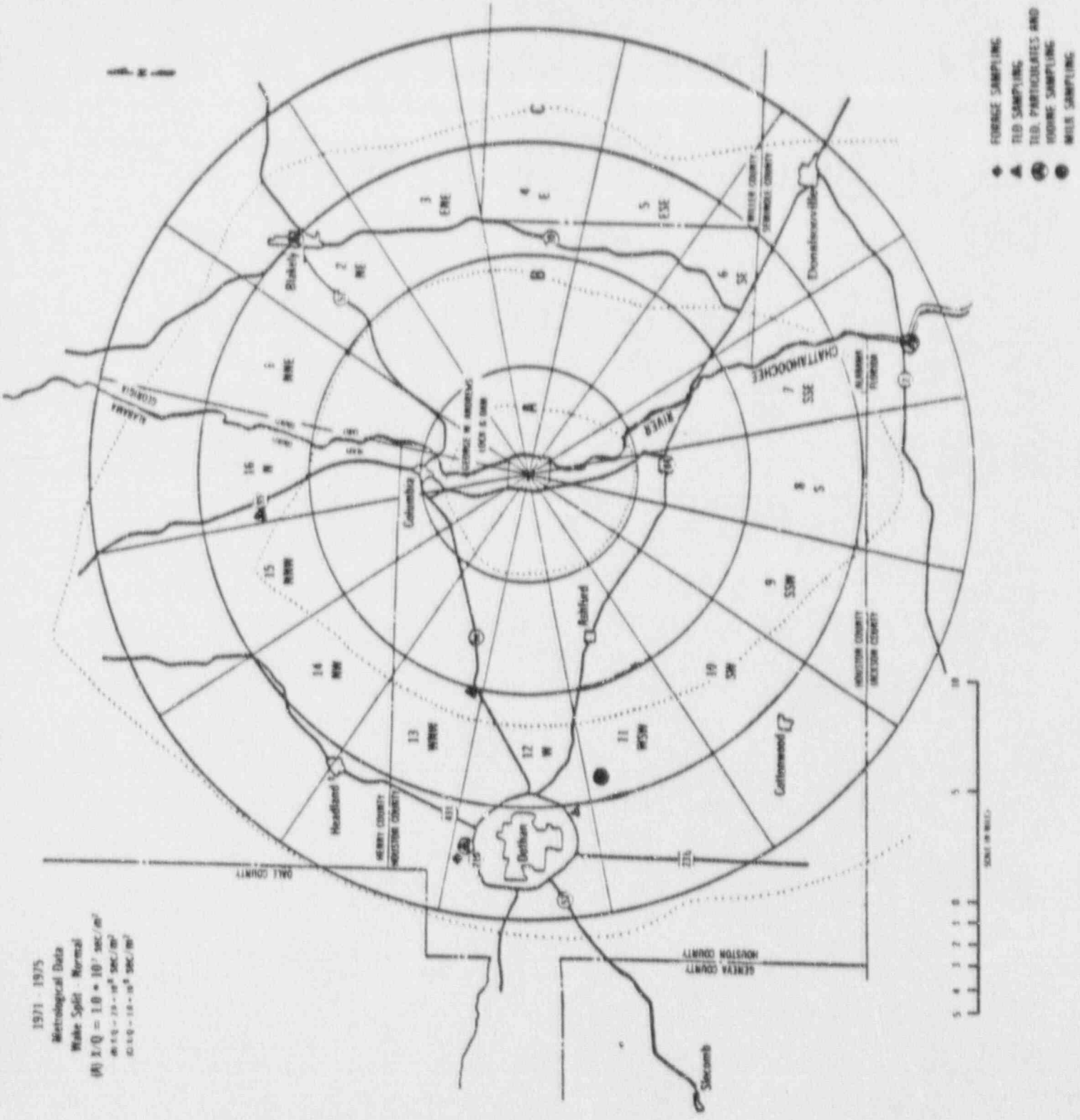
INDICATOR SAMPLING LOCATIONS FOR AIRBORNE ENVIRONMENTAL RADIOACTIVITY AT THE FARLEY NUCLEAR PLANT.

FIGURE 3.12-1



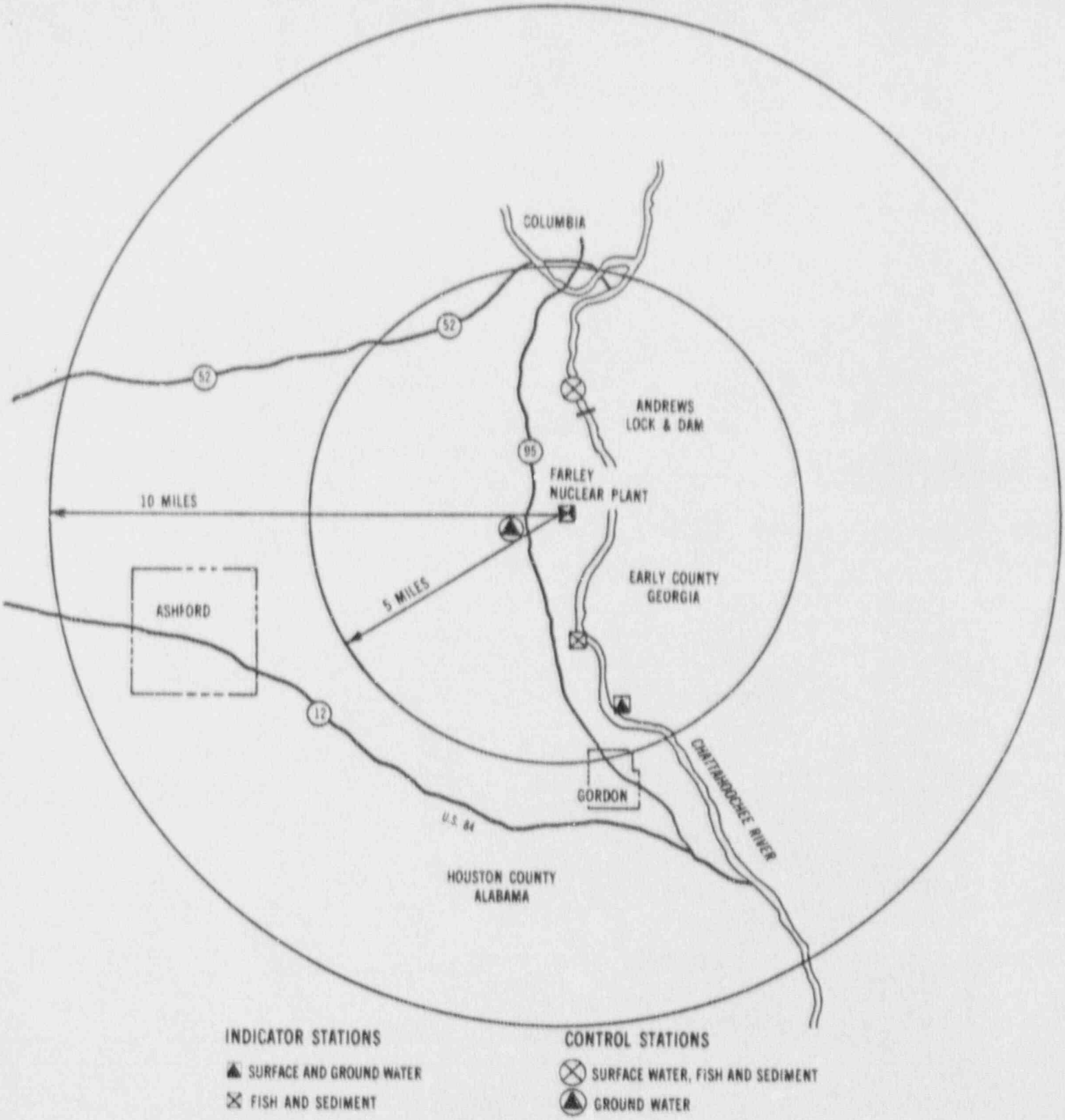
COMMUNITY (INDICATOR II) SAMPLING LOCATIONS FOR DIRECT RADIATION IN THE FARLEY NUCLEAR PLANT AREA.

FIGURE 3.12-2



CONTROL SAMPLING LOCATIONS FOR AIRBORNE ENVIRONMENTAL RADIOACTIVITY IN THE FARLEY NUCLEAR PLANT AREA.

FIGURE 3.12-3



INDICATOR AND CONTROL SAMPLING LOCATIONS FOR WATERBORNE ENVIRONMENTAL RADIOACTIVITY IN THE FARLEY NUCLEAR PLANT AREA

FIGURE 3.12-4

TABLE 1

SCOPE OF OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM AT THE FARLEY NUCLEAR PLANT DURING 1990

Principal Pathway	Type of Samples	Number of Sampling Stations		
		Indicator	Community	Control
Airborne	Airborne Particulates	4	3	3
	Airborne Iodine	4	1	3
	Direct Radiation	16	18	6
	Milk	-	-	1
	Forage[a]	2	-	1
	Soil[b]	6	3	2
Waterborne	River Water	1	-	1
	Groundwater	1	-	1
	River Fish	1	-	1
	River Sediment	1	-	1

[a] Vegetable and fruit sampling discontinued upon implementation of Unit 1 Technical Specification Amendment No. 26, issued March 1, 1982.

[b] Annual In Situ Gamma Measurements continued by choice of licensee during 1990.

TABLE 2

OUTLINE OF OPERATIONAL RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM FOR FARLEY NUCLEAR PLANT DURING 1990

Types of Samples and Sampling Locations (Distances Given in Miles)	Sampling and Collection Frequency	Type and Frequency of Analysis
AIRBORNE		
Particulates	Continuous operation of sampler with sample collection being performed as required by dust loading, but at least once per 7 days.	Particulate sampler Analyze for gross beta radioactivity > 24 hours following filter change. Perform gamma isotopic analysis on each sample when gross beta activity is >10 times the yearly mean of control samples. Perform gamma isotopic analysis on composite (by location) sample at least once per 92 days.
Indicator Stations: North Perimeter (N-0.8) South Perimeter (SSE-1.0) Plant Entrance (WSW-0.9) River Intake Structure (ESE-0.8)		
Community Stations: Columbia, AL. (N-5) Great Southern Paper Co. (SSE-3) Ashford, AL. (WSW-8)		
Control Stations: Blakely, Ga. (NE-15) Dothan, AL (W-18) Neals Landing, FL. (SSE-18)		
Iodine	Continuous sampler operation with charcoal canister collection performed once per 7 days.	Radioiodine canister Analyze at least once per 7 days for I-131.
Indicator Stations: North Perimeter (N-0.8) South Perimeter (SSE-1.0) Plant Entrance - (WSW)-0.9 River Intake Structure (ESE-0.8)		

TABLE 2 (con'd)

Types of Samples and Sampling Locations (Distances Given in Miles)	Sampling and Collection Frequency	Type and Frequency of Analysis
Community Stations: Great Southern Paper Co. (SSE-3) Control Stations: Blakely, GA. (NE-15) Dothan, AL. (W-18) Neals Landing, FL. (SSE-18)		
Soil Indicator Stations: Six Stations along the plant perimeter (NE-1.0, E-0.8, SSE-1.0, SSW-1.0, WSW-0.9, and NNW-0.8) Community Stations: Columbia, AL. (N-5) Great Southern Paper Co.(SSE-3) Ashford, AL. (WSW-8) Control Stations: Blakely, Ga. (NE-15) Dothan, Al. (W-18)	Annual in situ Ge(Li) gamma-ray spectroscopy measurements.	Gamma Isotopic Annually
DIRECT RADIATION	At least once per 92 days	Gamma dose Readout at least once per 92 days

TABLE 2 (con'd)

Types of Samples and Sampling Locations (Distances Given in Miles)	Sampling and Collection Frequency	Type and Frequency of Analysis
Indicator I Stations: Sixteen stations, one in each meteorological sector along the plant perimeter (N-0.8, NNE-0.9, NE-1.0, ENE-0.9, E-0.8, ESE-0.8, SE-1.1, SSE-1.0, S-1.0, SSW-1.0, SW-0.9, WSW-0.9, W-0.8, WNW-0.8, NW-1.1, and NNW-0.9). Indicator II (Community) Stations: Eighteen stations, one in each meteorological sector at a distance of 4-5 miles (NNE-4, NE-4, ENE-4, E-5, ESE-5, SE-5, SSE-3, S-5, SSW-4, SW-5, WSW-4, W-4, WNW-4, NW-4, NNW-4, and N-5). Additional stations located at WSW-8 and SW-1.2. Control Stations: Blakely, Ga. (NE-15) Neals Landing, Fl. (SSE-18) Dothan, AL. (W-18) Dothan, AL. (W-15) Webb, AL. (WNW-11) Haleburg, AL. (N-16)		
WATERBORNE		
Surface Water Indicator Station: Great Southern Paper Co., (3 miles below plant discharge, River Mile-40)	Composite taken with proportional semi-continuous sampler, having a minimum sampling frequency not exceeding two hours collected over a period ≤ 31 days.	Monthly gamma isotopic analysis of each composite sample. Tritium analysis of each composite sample at least once per 92 days.

TABLE 2 (con'd)

Types of Samples and Sampling Locations (Distances Given in Miles)	Sampling and Collection Frequency	Type and Frequency of Analysis
Control Station:		
Upstream of Andrews Lock and Dam (~3 miles above plant intake, River Mile-47)		
Ground Water	Grab sample taken at least once per 92 days.	Gamma isotopic and tritium analyses of each sample once per quarter.
Indicator Station:		
Great Southern Paper Co., Well (SSE-4)		
Control Station:		
Whatley Residence, Well (SW-1.2)		
River Sediment	Grab sample taken at least once per 184 days.	Gamma isotopic analysis of each sample twice per year.
Indicator Station:		
Downstream of plant discharge at Smith's Bend (River Mile - 41)		
Control Station:		
Upstream of plant discharge at Andrews Lock & Dam Reservoir (River Mile - 47)		

TABLE 2 (con'd)

Types of Samples and Sampling Locations (Distances Given in Miles)	Sampling and Collection Frequency	Type and Frequency of Analysis
INGESTION		
Milk		
Lewis Dairy Avon, AL (WSW-14)	At least once per 16 days	Gamma isotopic and I-131 analysis of each bi-weekly sample when animals are on pasture.
Fish		
Indicator Station:	One sample of the following species at least once per 184 days: 1. Game Fish 2. Bottom Feeding Fish	Gamma isotopic analysis on edible portions once per 184 days.
Downstream of plant discharge in vicinity of Smith's Bend (River Mile - 41)		
Control Station: Upstream of plant discharge in Andrews Lock & Dam Reservoir (River Mile - 47)		
Forage	Grab sample cut from green forage at least once per 31 days.	Gamma isotopic analysis which includes I-131 analyses of each monthly sample.
Indicator Station:		
North Perimeter (N-0.8) South Perimeter (SSE-1.0)		
Control Station:		
Dothan, AL. (W-18)		

TABLE 3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS
FOR FARLEY NUCLEAR PLANT

VALUES FOR THE MINIMUM DETECTABLE CONCENTRATION(MDC)[a,b]

Analysis	Water (pCi/l)	Airborne Particulate or Gas (pCi/m^3)	Fish (pCi/kg. wet)	Milk (pCi/l)	Food Products (pCi/kg. wet)	Sediment (pCi/kg. dry)
Gross beta	4	0.01	NA	NA	NA	NA
H-3	2000	NA	NA	NA	NA	NA
Mn-54	15	NA	130	NA	NA	NA
Fe-59	30	NA	260	NA	NA	NA
Co-58, 60	15	NA	130	NA	NA	NA
Zn-65	30	NA	260	NA	NA	NA
Zr-95	30	NA	NA	NA	NA	NA
Nb-95	15	NA	NA	NA	NA	NA
I-131	1[c]	0.07	NA	1	60	NA
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-140	60	NA	NA	60	NA	NA
La-140	15	NA	NA	15	NA	NA

[a] The MDC is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$MDC = \frac{4.66\ S_b}{E \quad V \quad 2.22 \quad Y \quad \exp(-\lambda \Delta t)}$$

Where:

MDC is the "a priori" lower limit of detection as defined above (as picocurie per unit mass or volume).

S_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute).

E is the counting efficiency (as counts per transformation).

V is the sample size (in units of mass or volume).

2.22 is the number of transformations per minute per picocurie.

Y is the fractional radiochemical yield (when applicable).

λ is the radioactive decay constant for the particular radionuclide.

Δt is the elapsed time between sample collection (or end of the sample collection period) and time of counting (for environmental samples, not plant effluent samples).

The value of S_b used in the calculation of the MDC for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the MDC for a radionuclide determined by gamma-ray spectroscopy, the background shall include the typical contributions of other radionuclides normally present in the samples (e.g., Potassium-40 in milk samples). Typical values of E, V, Y and Δt shall be used in the calculations.

[b] The MDC's for Tritium, Gross beta, and Radioiodine were obtained using blank background (a priori), whereas, for gamma-ray spectroscopy actual sample backgrounds were used (a posteriori).

[c] MDC for drinking water.

TABLE 4

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Water (pCi/l)	Airborne Particulate or Gas (pCi/m^3)	Fish (pCi/kg. wet)	Milk (pCi/l)	Food Products (pCi/kg. wet)
H-3	2×10^{4a}	NA	NA	NA	NA
Mn-54	1×10^3	NA	3×10^4	NA	NA
Fe-59	4×10^2	NA	1×10^4	NA	NA
Co-58	1×10^3	NA	3×10^4	NA	NA
Co-60	3×10^2	NA	1×10^4	NA	NA
Zn-65	3×10^2	NA	2×10^4	NA	NA
Zr/Nb-95	4×10^2	NA	NA	NA	NA
I-131	2	0.9	NA	3	100
Cs-134	30	10	1×10^3	60	1×10^3
Cs-137	50	20	2×10^3	70	2×10^3
Ba/La-140	2×10^2	NA	NA	3×10^2	NA

[a]For drinking water samples.

TABLE 5
SAMPLING AND ANALYSIS DEVIATIONS DURING 1990

Component	Time Period	Reason for Deviation/Comments
Air Monitoring Station 1601	1/23/90-2/6/90	Low air volume due to failed air totalizer; Totalizer replaced 2/4/90.
Air Monitoring Station 1605	1/30/90-2/6/90	Low air volume due to failed motor; Motor replaced 2/8/90.
Air Monitoring Station 0718	3/6/90-3/13/90	Low air flow rate; Flow rate adjusted to 100 scfh.
Air Monitoring Station 1218	3/6/90-3/13/90	Low air volume due to a broken motor pulley; Pulley replaced 3/19/90.
Air Monitoring Station 1601	3/6/90-3/13/90	Low air volume due to failed totalizer; Totalizer replaced 3/19/90.
Air Monitoring Station 0701	3/13/90-3/27/90	Low air volume due to station being out of service as a result of the flooding of the area; Breaker was replaced 3/23/90.
Air Monitoring Station 0501	3/21/90-3/27/90	Low air volume due to low flow rate; Flow rate adjusted to 90 scfh.
Air Monitoring Station 1605	3/21/90-3/27/90	Low air volume and high MDC due to a blown fuse; Fuse replaced.
River Water Sample - Andrews Lock & Dam	3/31/90	Surface water background sample missing for March, 1990 due to the flooding of the river.
Air Monitoring Station 1605	4/10/90-4/17/90	Low air volume and high MDC due to a blown fuse; Fuse replaced.
Air Monitoring Station 0501	4/24/90-5/1/90	Low air volume due to filter loading with dirt.
Air Monitoring Station 1601	4/24/90-5/1/90	Low air volume due to failed motor; Motor replaced 5/4/90.
Air Monitoring Station 1605	4/24/90-5/8/90	Low air volume due to a blown fuse; Fuse replaced.
Air Monitoring Station 1601	5/1/90-5/8/90	Low air volume due to failed pump; Pump replaced 5/3/90.

Component	Time Period	Reason for Deviation/Comments
Air Monitoring Station 1605	5/15/90-5/29/90	Low air volume due to faulty plug receptacle and ground wire; Plug receptacle and ground wire replaced 5/25/90.
Air Monitoring Station 1605	6/5/90-6/19/90	Low air volume due to filter loading with dirt.
Air Monitoring Station 0501	6/12/-6/19/90	Low air volume due to dust loading of filter.
Air Monitoring Station 1601	6/19/90-7/3/90	Low air volume and high MDC due to failed transformer; Transformer replaced 6/29/90.
TLD 1215	2nd Quarter, 1990	TLD fell from stand and damaged by lawn mower (reported as missing).
Air Monitoring Station 1218	7/3/90-7/17/90	Low air volume due to mechanical problems; Plug receptacle and motor cable replaced 7/12/90.
Air Monitoring Station 1218	7/31/90-8/7/90	Low air volume due to motor pulley off shaft; New motor and pulley installed 8/9/90.
Air Monitoring Station 1605	7/31/90-8/10/90	Low air volume due to a broken motor bearing; New motor and pulley installed 8/10/90.
Air Monitoring Station 0501	8/7/90-8/14/90	Low air volume due to dust loading of filter.
Air Monitoring Station 1218	8/7/90-8/14/90	Low air volume due to broken motor pulley; Pulley and fan belt replaced 8/9/90.
Air Monitoring Station 1605	8/7/90-8/21/90	Low air volume due to broken motor bearing; New motor and pulley replaced 8/9/90.
Air Monitoring Station 1605	8/28/90-9/4/90	Low air volume due to broken motor pulley; Both motor and pump pulleys reworked 8/30/90.
Air Monitoring Station 0703	10/9/90-10/16/90	Sample missing due to excess paper obstructing air flow path; Paper removed.
Air Monitoring Station 1108	10/23/90-10/30-90	Low air volume due to oil leak from pump; New pump and belt installed 10/28/90.

Component	Time Period	Reason for Deviation/Comments
Forage Sample 1218	12/5/90	High MDC on background sample due to low volume; Volume low due to unavailability of adequate forage.
Forage Sample 1218	12/5/90	Sample missing due to unavailability of adequate forage.
Air Monitoring Station 1218	12/11/90-12/18/90	Low air volume due to blown fuse; Fuse replaced.
Air Monitoring Station 0703	12/18/90-12/26/90	Low air volume due to blown fuse; Fuse replaced.
TLD 1215	Annual, 1990	TLD was damaged by mower after it fell to ground from TLD stand.
TLD 1311	Annual, 1990	TLD missing.
TLD 1404	Annual, 1990	TLD missing.

TABLE 1990-01
AIRBORNE PARTICULATES- OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED	NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
AIR PARTICULATES (PCI/M**3)	GROSS BETA 515	.002	.010(205/206) (0.001- 0.028)	WEST PERIM. 0.9 MI. NW	.011(51/ 51) (0.003- 0.028)	.010(154/154) (0.001- 0.033)	.010(154/155) (0.004- 0.036)
	BE-7 37	.010	.026(16/ 16) (0.018- 0.031)		.029(3/ 3) (0.027- 0.031)	.025(9/ 9) (0.015- 0.041)	.026(12/ 12) (0.021- 0.035)
	CS-134 38	.001	< MDC (0/ 16)			< MDC (0/ 10)	< MDC (0/ 12)
	CS-137 38	.001	< MDC (0/ 16)			< MDC (0/ 10)	< MDC (0/ 12)
	I-131 38	.001	< MDC (0/ 16)			< MDC (0/ 10)	< MDC (0/ 12)

(A) No Nonroutine Anomalous Measurements Reported During This Period.
(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.
(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.
(D) Total Number of Measurements Taken.

TABLE 1990-02

AIRBORNE: IODINE - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT

LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA

SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED	NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
AIR IODINE (PCI/M**3)	IODINE 411	.039	< MDC (0/206)			< MDC (0/ 51)	< MDC (0/154)

(A) No Nonroutine Anomalous Measurements Reported During This Period.

(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.

(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.

(D) Total Number of Measurements Taken.

TABLE 1990-03
EXTERNAL RADIATION - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED	NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
TLD-QUARTER (MRAD)	GROSS GAMMA	159	10.000	18.892(64/ 64) (12.34- 28.14)	EAST PERIM. 0.9 MI. ENE	24.692(4/ 4) (23.34- 28.14)	15.773(72/ 72) (11.09- 22.23)	16.373(23/ 23) (11.59- 21.84)
TLD-ANNUAL (MRAD)	GROSS GAMMA	37	10.000	60.255(16/ 16) (43.89- 92.89)	SOUTH PERIM. 1.0 MI. S	92.890(1/ 1)	48.016(17/ 17) (36.14- 56.14)	51.040(4/ 4) (40.14- 64.84)
TLD-ANNUAL-E (MRAD)	GROSS GAMMA	40	10.000	75.606(16/ 16) (57.02- 101.02)	SOUTH PERIM. 1.0 MI. S	101.020(1/ 1)	62.942(18/ 18) (51.52- 72.02)	62.615(6/ 6) (47.26- 72.96)

(A) No Nonroutine Anomalous Measurements Reported During This Period.
(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.
(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.
(D) Total Number of Measurements Taken.
(E) Sum Of Four Quarters For Comparative Purposes

TABLE 1990-04
MILK - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED	NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
MILK (PCI/L)	BA-140 261	44.230					< MDC (0/ 26)
	CS-134 261	11.923					< MDC (0/ 26)
	CS-137 261	10.884					< MDC (0/ 26)
	I-131 261	.288					< MDC (0/ 26)
	K-40 261	105.769					1325.230(26/ 26) (705.00- 1620.00)
	LA-140 261	9.423					< MDC (0/ 26)

(A) No Nonroutine Anomalous Measurements Reported During This Period.
(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.
(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.
(D) Total Number of Measurements Taken.

TABLE 1990-05
VEGETATION: FORAGE - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED	NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
FORAGE(E) (PCI/KG) WET	AC-228 11	110.000	196.000(1/ 1) (196.000- 196.000)	SOUTH PERIM. 1.0 MI. SSE	196.000(1/ 1) (196.000- 196.000)		
	BE-7 35	189.000	1841.541(24/ 24) (109.00-10500.00)	SOUTH PERIM. 1.0 MI. SSE	1564.000(11/ 11) (109.00-10500.00)		2816.545(11/ 11) (179.00-11100.00)
	BI-214 3	43.666	97.000(2/ 3) (96.00- 98.00)	SOUTH PERIM. 1.0 MI. SSE	97.000(2/ 2) (96.00- 98.00)		
	CS-134 34	22.500	< MDC < 0/ 23)				< MDC (0/ 11)
	CS-137 35	19.571	56.000(1/ 24) (56.000- 56.000)	SOUTH PERIM. 1.0 MI. SSE	56.000(1/ 1) (56.000- 56.000)		< MDC (0/ 11)
	I-131 35	25.085	< MDC (0/ 24)				< MDC (0/ 11)
	K-40 35	195.428	4552.375(24/ 24) (741.00- 9640.00)	NORTH PERIM. 0.8 MI. N	4501.333(12/ 12) (746.00 - 9640.00)		4320.000(10/ 11) (1010.00- 8460.00)
	PB-214 3	42.000	69.500(2/ 3) (54.00- 85.00)	SOUTH PERIM. 1.0 MI. SSE	69.500(2/ 2) (54.00- 85.00)		
	PB-212 3	30.333	62.500(2/ 3) (40.00- 85.00)	SOUTH PERIM. 1.0 MI. SSE	85.000(1/ 1) (85.000- 85.000)		
	TL-208 1	28.000	42.000(1/ 1) (42.000- 42.000)	SOUTH PERIM. 1.0 MI. SSE	42.000(1/ 1) (42.000- 42.000)		

(A) No Nonroutine Anomalous Measurements Reported During This Period.
(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.
(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.
(D) Total Number of Measurements Taken.
(E) Mean Wet/Dry Ratio for 1990 was 3.701

TABLE 1990-06
SOIL - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED		ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
SOIL-IN-SITU (PCI/KG-DRY)	AC-228	12 324.333	1766.285(7/ 7) (1026.00- 3136.00)	EAST PERIM. 0.9 MI. ENE	3136.000(1/ 1)	1188.000(3/ 3) (1038.00- 1410.00)	1657.000(2/ 2) (1222.00- 2092.00)
	BI-212	12 803.000	1623.500(6/ 7) (806.00- 2750.00)	SOUTH PERIM. 1.0 MI. S	2750.000(1/ 1)	900.500(2/ 3) (735.00- 1066.00)	1446.000(1/ 2)
	BI-214	12 162.250	1330.571(7/ 7) (912.00- 2112.00)	SOUTH PERIM. 1.0 MI. S	2112.000(1/ 1)	948.666(3/ 3) (781.00- 1099.00)	1130.500(2/ 2) (828.00- 1433.00)
	CS-137	12 41.916	128.857(7/ 7) (58.00- 295.00)		295.000(1/ 1)	154.666(3/ 3) (79.00- 266.00)	155.000(2/ 2) (155.00- 155.00)
	K-40	12 480.333	6288.714(7/ 7) (1109.00-15810.00)	SOUTH PERIM. 1.0 MI. S	15810.000(1/ 1)	1483.000(3/ 3) (878.00- 2160.00)	2626.000(2/ 2) (1508.00- 3744.00)
	PB-214	12 272.166	1302.142(7/ 7) (786.00- 2203.00)	EAST PERIM. 0.9 MI. ENE	2203.000(1/ 1)	1091.666(3/ 3) (845.00- 1291.00)	1617.500(2/ 2) (1032.00- 2203.00)
	PB-212	12 295.000	1487.428(7/ 7) (591.00- 2504.00)	EAST PERIM. 0.9 MI. ENE	2504.000(1/ 1)	1002.666(3/ 3) (734.00- 1175.00)	1737.500(2/ 2) (1414.00- 2061.00)
	TL-208	12 113.166	654.142(7/ 7) (303.00- 1130.00)	SOUTH PERIM. 1.0 MI. S	1130.000(1/ 1)	394.000(3/ 3) (305.00- 537.00)	539.000(2/ 2) (410.00- 668.00)

(A) No Nonroutine Anomalous Measurements Reported During This Period.
(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.
(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.
(D) Total Number of Measurements Taken.

TABLE 1990-07
WATERBORNE: SURFACE WATER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED		NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
SURFACE WATER-RIVER (PCI/L)	TRITIUM	8	90.000	166.000(3/ 4) (112.00- 208.00)	GPPC RIVER MI. 40	166.000(3/ 3) (112.00- 208.00)		< MDC (0/ 4)
	BA-140	23	15.521	< MDC (0/ 12)				< MDC (0/ 11)
	CS-134	23	4.173	< MDC (0/ 12)				< MDC (0/ 11)
	CS-137	23	3.739	< MDC (0/ 12)				< MDC (0/ 11)
	CO-58	23	3.652	< MDC (0/ 12)				< MDC (0/ 11)
	CO-60	23	3.000	< MDC (0/ 12)				< MDC (0/ 11)
	FE-59	23	6.478	< MDC (0/ 12)				< MDC (0/ 11)
	LA-140	23	3.086	< MDC (0/ 12)				< MDC (0/ 11)
	MN-54	22	3.727	< MDC (0/ 12)				< MDC (0/ 10)
	NB-95	23	3.695	< MDC (0/ 12)				< MDC (0/ 11)
	ZN-65	23	7.391	< MDC (0/ 12)				< MDC (0/ 11)
	ZR-95	23	6.478	< MDC (0/ 12)				< MDC (0/ 11)

TABLE 1990-08
WATERBORNE: GROUND WATER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED		NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D)	RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
GROUND WATER-WELL (PCI/L)	TRITIUM	4	105.000	< MDC (0/ 2)				< MDC (0/ 2)	
	BA-140	8	15.750	< MDC (0/ 4)				< MDC (0/ 4)	
	CS-134	8	4.125	< MDC (0/ 4)				< MDC (0/ 4)	
	CS-137	8	3.875	< MDC (0/ 4)				< MDC (0/ 4)	
	CO-58	8	3.625	< MDC (0/ 4)				< MDC (0/ 4)	
	CO-60	8	3.250	< MDC (0/ 4)				< MDC (0/ 4)	
	FE-59	8	7.000	< MDC (0/ 4)				< MDC (0/ 4)	
	I-131	8	.288	< MDC (0/ 4)				< MDC (0/ 4)	
	LA-140	8	2.750	< MDC (0/ 4)				< MDC (0/ 4)	
	MN-54	8	3.285	< MDC (0/ 4)				< MDC (0/ 4)	
	NB-95	8	4.000	< MDC (0/ 4)				< MDC (0/ 4)	
	ZN-65	8	8.125	< MDC (0/ 4)				< MDC (0/ 4)	

TABLE 1990-08
WATERBORNE: GROUND WATER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED		NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
GROUND WATER-WELL (PCI/L)	ZR-95	81	6.875	< MDC (0/ 4)				< MDC (0/ 4)

(A) No Nonroutine Anomalous Measurements Reported During This Period.
(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.
(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.
(D) Total Number of Measurements Taken.

TABLE 1990-09

SEDIMENT, RIVER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT

LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA

SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED	NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
SEDIMENT-RIVER (PCI/KG-DRY)	AC-228 41	148.000	1200.000(2/ 2) (900.00- 1500.00)	SMITH'S BEND RIV.MI. 41-42	1200.000(2/ 2) (900.00 - 1500.00)		1555.000(2/ 2) (1130.00- 1980.00)
	BI-212 41	584.750	1445.000(2/ 2) (1100.00- 1790.00)	SMITH'S BEND	1445.000(2/ 2) (1100.00-1790.00)		1825.000(2/ 2) (1491.00- 2160.00)
	BI-214 41	81.500	637.000(2/ 2) (561.00- 713.00)	SMITH'S BEND	637.000(2/ 2) (561.00- 713.00)		843.500(2/ 2) (597.00- 1090.00)
	CS-134 41	44.750	< MDC (0/ 2)				< MDC (0/ 2)
	CS-137 41	39.750	< MDC (0/ 2)				< MDC (0/ 2)
	K-40 41	305.000	2675.000(2/ 2) (1930.00- 3420.00)	SMITH'S BEND	2675.000(2/ 2) (1930.00-3420.00)		2100.000(2/ 2) (1970.00- 2230.00)
	PB-214 41	86.250	643.000(2/ 2) (568.00- 718.00)	SMITH'S BEND	643.000(2/ 2) (568.00- 718.00)		846.500(2/ 2) (573.00- 1120.00)
	PB-212 41	84.250	790.000(1/ 2)	SMITH'S BEND	790.000(1/ 1)		1139.500(2/ 2) (819.00- 1460.00)
	RA-226 21	520.000	786.000(1/ 1)	SMITH'S BEND	786.000(1/ 1)		786.000(1/ 1)
	TL-208 41	47.750	435.500(2/ 2) (274.00- 597.00)	SMITH S BEND	435.500(2/ 2) (274.00- 597.00)		553.500(2/ 2) (416.00- 691.00)

(A) No Nonroutine Anomalous Measurements Reported During This Period.

(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.

(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.

(D) Total Number of Measurements Taken.

TABLE 1990-10
FISH: RIVER(GAME) OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA
SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED		NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
FISH-GAME (PCI/KG) WET TISSUE	CS-134	4	25.500	< MDC (0/ 2)				< MDC (0/ 2)
	CS-137	4	24.000	28.000(1/ 2)	SMITH'S BEND RIV.MI.41-42	28.000(1/ 1)		< MDC (0/ 2)
	CO-58	4	25.250	< MDC (0/ 2)				< MDC (0/ 2)
	CO-60	4	23.000	< MDC (0/ 2)				< MDC (0/ 2)
	FE-59	4	55.500	< MDC (0/ 2)				< MDC (0/ 2)
	K-40	4	161.500	3010.000(2/ 2) (2880.00- 3140.00)	SMITH'S BEND	3010.000(2/ 2) (2880.00-3140.00)		3420.000(2/ 2) (3000.00- 3840.00)
	MN-54	4	23.250	< MDC (0/ 2)				< MDC (0/ 2)
	ZN-65	4	53.000	< MDC (0/ 2)				< MDC (0/ 2)

(A) No Nonroutine Anomalous Measurements Reported During This Period.
(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.
(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.
(D) Total Number of Measurements Taken.

TABLE 1990-11

FISH: RIVER (BOTTOM FEEDING) OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT

LICENSE NOS. NPF-2 AND NPF-8 HOUSTON COUNTY ALABAMA

SUMMARY REPORT FROM 010190 TO 123190 (A)

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBERS OF ANALYSIS PERFORMED		NOMINAL MDC(B)	ALL INDICATOR LOCATIONS MEAN (C/D) RANGE(C)	INDICATOR LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (C/D) RANGE (C)	COMMUNITY LOCATIONS MEAN (C/D) RANGE (C)	CONTROL LOCATION MEAN (C/D) RANGE (C)
FISH (BOTTOM FEEDING) (PCI/KG) WET TISSUE	CS-134	41	26.500	< MDC (0/ 2)				< MDC (0/ 2)
	CS-137	41	25.500	< MDC (0/ 2)				< MDC (0/ 2)
	CO-58	41	25.750	< MDC (0/ 2)				< MDC (0/ 2)
	CO-60	41	26.750	< MDC (0/ 2)				< MDC (0/ 2)
	FE-59	41	63.750	< MDC (0/ 2)				< MDC (0/ 2)
	K-40	41	220.000	2500.000(2/ 2) (2320.00- 2680.00)	SMITH'S BEND RIV.MI. 41-42	2500.000(2/ 2) (2320.00-2680.00)		3240.000(2/ 2) (2710.00- 3770.00)
	MN-54	41	24.500	< MDC (0/ 2)				< MDC (0/ 2)
	ZN-65	41	56.750	< MDC (0/ 2)				< MDC (0/ 2)

(A) No Nonroutine Anomalous Measurements Reported During This Period.

(B) Mean Minimum Detectable Concentration Calculated Per Table 3 Of This Report.

(C) Mean and Range Of Number Of Measurements With Detectable Activity Only.

(D) Total Number of Measurements Taken.

ATTACHMENT 1

LAND USE SURVEY
FOR
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
JOSEPH M. FARLEY NUCLEAR PLANT
JUNE 9, 1990

This Land Use Survey was performed to meet the requirements of the Farley Units 1 and 2 Technical Specifications, Section 3.12.2 and 4.12.2.

A. Houston County, Alabama

Lamar Nichols, Houston County Livestock Agent, was contacted for the purpose of reviewing known locations of milk animals in the county. He knew of no individual milk cows in the county. Mr. Thomas Dean of Gordon, AL, still has milk goats. His residence is located in sector 08, 6 miles from FNP. There are goats located in sector 10, SW, owned by the Rathels. The goats are not being milked.

A house-to-house canvas of Alabama residents in a five-mile radius of the plant was conducted along Highways 95 and 52, Houston County Roads 42, 33, 75 and the interconnecting light-duty roads. No milk animals were located. Individuals interviewed were: Mrs. Gilbert, Mr. Respress, Lyteasa Ryals, Lois Brown, Bertha Stewart, Mrs. Marvin Hoomes, and Anne Rathel.

Simultaneous with the milk animal survey, the nearest resident in each meteorological sector was identified. There were no new residents found.

B. Early County, Georgia

Mr. Micky Fouracres, Early County Extension Agent, was contacted to determine if any milk animals were currently present in the county. He knew of no individual milk animals nor dairies in Early County.

A house-to-house canvas of residents in the area across the Chattahoochee River east of Farley Nuclear Plant revealed several goats in Sectors 5, ESE & 6, SE. The goats were not being milked. There were no milk cows located. The census of Georgia residents was conducted along Highways 62 and 370, Early County Roads 219, 239, 140 and the interconnecting light-duty roads. Individuals interviewed were Mr. Tony Knighton and Mrs. Mary Allums.

Simultaneous with the milk animal survey, the nearest resident in each meteorological sector was identified. No new residences were found.

C. Results and Conclusions

The results of the Land Use Survey are shown in Table 1 of Attachment 1. The survey located milk goats 6 miles from FNP; however, no action is required for animals located outside a 5 mile radius. Therefore, based on the survey results, no change in the present milk sampling program is required.

TABLE 1
OF
ATTACHMENT 1

JOSEPH M. FARLEY NUCLEAR PLANT
LAND USE SURVEY
JUNE 9, 1990

RADIAL SECTORS (22.5 DEGREES)	(DISTANCE MILES TO NEAREST) RESIDENT	MILK ANIMAL
North Northeast (01)	2.5	> 5
Northeast (02)	2.4	> 5
East Northeast (03)	2.4	> 5
East (04)	2.8	> 5
East Southeast (05)	2.8	> 5
Southeast (06)	3.4	> 5
South Southeast (07)	> 5	> 5
South (08)	4.3	> 5
South Southwest (09)	2.9	> 5
Southwest (10)	1.2	> 5
West Southwest (11)	2.4	> 5
West (12)	1.3	> 5
West Northwest (13)	2.1	> 5
Northwest (14)	1.5	> 5
North Northwest (15)	2.0	> 5
North (16)	2.6	> 5