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Operations

Entergy Operations, Inc.
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Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 & 50-368
License Nos. DPR-51 & NFP-6
Annual Radiological Environmental Report - 1991

Gentlemen:

Arkansas Nuclear One, Units 1 and 2 (ANO-1 & 2) Technical Specifications 6.12.2.5 and 6.9.4, respectively, requires the submittal of an annual radiological environmental report for the previous calendar year prior to May 1 of each year.

Attached is the annual radiological environmental report for ANO for the year 1991. This completes the reporting requirements for the referenced specifications.

Should you have any questions regarding this submittal, please contact me.

Very truly yours,

James J. Fisicaro

James J. Fisicaro
Director, Licensing

JJF/RWC/sjf
Attachment

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ARKANSAS NUCLEAR ONE

UNITS 1 AND 2

ANNUAL RADIOLOGICAL ENVIRONMENTAL REPORT

FOR 1991

SUMMARY

The Annual Radiological Environmental Report (ARER) presents data obtained through analyses of environmental samples collected for Arkansas Nuclear One's (ANO) Radiological Environmental Monitoring Program (REMP) for the period January 1, 1991 through December 31, 1991. The ARER fulfills the requirements of ANO Unit 1 Technical Specifications 6.12.2.5 and Unit 2 Technical Specifications 6.9.4.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Radiation and radioactivity are monitored around ANO within a 22-mile radius. The environment around ANO has been monitored for radiation and radioactivity for approximately 19 years. The REMP was established about two years before the station became operational. This program provided data on background radiation and radioactivity which is normally present in the area. Arkansas Nuclear One has continued to monitor the environment by sampling air, milk, water, food products, vegetation, sediment and fish, as well as measuring radiation directly.

Samples are collected from both indicator and control locations. Indicator locations are within approximately five miles of the site, and are expected to show any increases or buildup of radioactivity that might occur due to station operation. Control locations are farther away from the station, and are expected to indicate the presence of only naturally occurring radioactivity. The results obtained from indicator locations are compared with control locations and with concentrations present in the environment before the station became operational. This allows for assessment of any impact the operation of ANO might have had on the surrounding environment.

In 1991, approximately 970 radiological environmental samples were collected and analyzed for radioactivity. Radionuclide concentrations measured at indicator locations were compared with control locations as well as those measured in previous years. Radiological Environmental Monitoring Program personnel assessed plant operations using this data and concluded that no significant impact occurred on the environs surrounding the plant. Radiation levels in the environment were undetectable in many cases and at or near previous levels in significant pathways associated with ANO, as in previous years. Therefore, REMP personnel concluded that ANO operation has had no harmful effects nor resulted in any irreversible damage to the environment.

ATTACHMENTS

Attachment I contains results of air, milk, water, food products, vegetation, sediment and fish samples collected in 1991 and analyzed by Entergy Services, Inc. (ESI) System Chemistry, formerly Arkansas Power & Light's Technical Analysis Section. Results of ESI System Chemistry's participation in the Environmental Protection Agency (EPA) Interlaboratory Comparison Program are also contained in Attachment I.

Attachment II contains results of thermoluminescent dosimeters (TLDs) collected in 1991 and analyzed by ANO Dosimetry.

Attachment III contains the statistical analyses performed and equations that were utilized.

Attachment IV contains dose calculations performed for sediment using generalized equation from Regulatory Guide 1.109.

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INTRODUCTION

INTRODUCTION

1.1 RADIATION

People are always subjected to natural radiation. This radiation exposure comes from the sun and naturally occurring radioactive materials present in the earth, structures we inhabit, and in the food and water we consume. There are radioactive gases in the air we breathe and our bodies are themselves radioactive. The levels of natural or background radiation vary greatly from location to location. In addition, man-made sources of radiation, such as X-rays, radiation for medical purposes, fallout from nuclear explosives testing and radioactive materials from nuclear power plants contribute additional exposure. However, as shown in Figure 1-1, an individual receives the major portion of dose from natural background and other sources with nuclear power plants contributing the least.

1.2 BENEFITS OF RADIATION

The uranium used in nuclear power plays an important part in meeting today's electricity needs, and will continue to serve as an important source of energy well into the future. In addition, other uses of radiation have brought tremendous benefits to our everyday lives during the past 20 or 30 years. Radioisotopes and controlled radiation are used, for example, to sterilize medical supplies, to improve the keeping qualities of foodstuffs, in industrial processes, in medical science, and in the study of environmental pollution, agriculture and hydrology. Medical diagnosis and treatment are the main sources of public exposure to man-made radiation but the benefit in terms of human lives and health is enormous.

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[illegible]d the safety of radiation command considerable public [illegible]cion. However, it is not generally realized that safety regulations are much stricter for radioactive materials than for other dangerous substances. For example, in the case of coal, it has been estimated that in Pennsylvania 30,000 miners died in the mines between 1870 and 1950, an average of about one man a day for 80 years. If the nuclear power industry was compared to this toll, one could see how the safety history would be uniquely encouraging.

In addition, radioactive elements gradually lose their radioactivity and toxicity with time. Other non-radioactive materials, such as arsenic, remain toxic forever. It was reported that three years after an accidental dioxin chemical release in Seveso, Italy, in 1976, the dioxin deposited in the region showed no signs of diminishing. These examples demonstrate how the safety of radiation tends to be viewed separately from other, and sometimes greater safety hazards.

1.4 PURPOSE AND DESIGN CRITERIA OF THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

The REMP was established to ensure that plant operating controls properly function to minimize any associated radiation endangerment to human health or the environment. The purpose of the REMP is:

- To measure radiation levels and their variations in environmental media in the area surrounding the plant
- To determine average levels of radiation and radioactive material in various environmental media
- To evaluate environmental sampling procedures, equipment and techniques
- To detect effects, if any, of ANO operation on the environmental radiation levels and concentrations.

The design criteria for the REMP are:

- To analyze important pathways for anticipated types and quantities of radionuclides released into the environment
- To consider the possibility of a buildup of long-lived radionuclides in the environment and identify physical and biological accumulations that may contribute to human exposures
- To consider the potential radiation exposure to plant and animal life in the environment surrounding ANO
- To correlate levels of radiation and radioactivity in the environment with radioactive releases from station operation.

1.5 DOSE PATHWAYS ASSOCIATED WITH ANO

Figure 1-2 shows potential exposure pathways that could occur as a result of a nuclear power plant. However, the most significant environmental dose pathways from a nuclear power station are direct dose from gaseous effluent and thyroid dose due to the ingestion of milk. ANO operations are expected to have little, if any, impact by these pathways due to the very low levels of radiation released.

1.6 PATHWAYS MONITORED

The airborne, waterborne, ingestion and direct radiation pathways are monitored as required by ANO Technical Specifications. The REMP implements the sampling program required to meet the above intent. This program is supplemented with additional sampling in order to provide a comprehensive and well-balanced program. Sample locations to monitor exposure pathways are described in Table 1-1 and shown in Figure 1-3. Section 2.0 of this report provides a discussion of 1991 sampling results.

1.7 PREVIOUS DATA COMPARISON

A comparison by REMP personnel of 1991 results to preoperational studies, operational controls and previous ARERs shows no significant changes. Results remained at levels, similar to those of previous years. Such results confirm that ANO effluent controls and equipment are performing satisfactorily.

TABLE 1-1

SAMPLE STATIONS

Sample Station Number: 1
Approximate Direction and Distance from Plant: 88° - 0.6 miles
Sample Types: 1) Airborne radioiodines
2) Airborne particulates
3) Direct radiation
Sample Station Location:

The sample station is near the meteorology tower approximately 0.6 miles east of ANO.

Sample Station Number: 2
Approximate Direction and Distance from Plant: 235° - 0.4 miles
Sample Types: 1) Airborne radioiodines
2) Airborne particulates
3) Direct radiation
Sample Station Location:

IF traveling from ANO
THEN go approximately 0.2 miles west toward Gate 4. Turn left and go approximately 0.1 miles. Turn right and go approximately 0.1 miles. The sample station is on the right at the former AP&L lodge location.

IF traveling south on Flatwood Road,
THEN go approximately 0.25 miles from sample station 109. Veer left at fork in road and go approximately 0.2 miles. Turn right and go approximately 0.1 miles. Turn right and go approximately 0.1 miles. The sample station is on the right at the former AP&L lodge location.

Sample Station Number: 3
Approximate Direction and Distance from Plant: 0° - 0.6 miles
Sample Types: 1) Airborne radioiodines
2) Airborne particulates
3) Direct radiation
4) Ground water (alternate)
Sample Station Location:

IF traveling west on Highway 333,
THEN go approximately 0.35 miles from Gate 2 at ANO. Turn left onto gravel road and go approximately 0.05 miles. The sample station is on the left.

IF traveling east on Highway 333,
THEN go approximately 0.9 miles from junction of Highway 333 and Flatwood Road. Turn right onto gravel road and go approximately 0.05 miles. The sample station is on the left.

SAMPLE STATIONS

Sample Station Number: 4
Approximate Direction and Distance from Plant: 180° - 0.7 miles
Sample Types: 1) Airborne radioiodines
2) Airborne particulates
3) Direct radiation
Sample Station Location:

Go approximately 0.25 miles south from bridge over intake canal. Turn right onto gravel road. Proceed approximately 0.1 miles west of May Cemetery entrance. The sample station is on the left approximately 50 feet south of the road.

Sample Station Number: 5
Approximate Direction and Distance from Plant: 298° - 8.2 miles
Sample Types: 1) Direct radiation
Sample Station Location:

While traveling on Highway 64, turn onto Cherry Street in Knoxville, AR and go approximately 0.7 miles. Turn left onto Highway 64 South and go approximately 0.2 miles. The sample station is on the right.

Sample Station Number: 6
Approximate Direction and Distance from Plant: 111° - 7.0 miles
Sample Types: 1) Airborne radioiodines
2) Airborne particulates
3) Direct radiation
Sample Station Location:

Go to the AP&L local office which is located off Highway 7T in Russellville, AR (305 South Knoxville Avenue). The sample station is in the southeast corner of the back lot.

SAMPLE STATIONS

Sample Station Number: 7
Approximate Direction and Distance from Plant: 209° - 19.3 miles
Sample Types: 1) Airborne radioiodines
2) Airborne particulates
3) Direct radiation
Sample Station Location:

Turn west at junction of Highway 7 and Highway 27 in Dardanelle, AR. Proceed to junction of Highway 27 and Highway 10 in Danville, AR. Turn right onto Highway 10 and proceed a short distance to the AP&L supply yard, which is on the right adjacent to an AP&L substation. The sample station is in the southwest corner of the supply yard.

Sample Station Number: 8
Approximate Direction and Distance from Plant: 180° - 0.1 miles
Sample Types: 1) Surface water (composite)
2) Shoreline sediment
3) Fish
Sample Station Location: Plant discharge canal

Sample Station Number: 10
Approximate Direction and Distance from Plant: 95° - 0.9 miles (shoreline sediment and fish)
plant intake structure (surface water)

Sample Types: 1) Surface water (composite)
2) Shoreline sediment
3) Fish
Sample Station Location:

Surface water (composite) is collected at plant intake structure. Shoreline sediment and fish are collected at plant inlet canal.

Sample Station Number: 13
Approximate Direction and Distance from Plant: 271° - 0.5 miles
Sample Types: 1) Broad leaf vegetation
Sample Station Location:

IF traveling south on Flatwood Road,
THEN go approximately 0.2 miles from sample station 109. The sample station is on the left.

IF traveling west from ANO toward Gate 4,
THEN go approximately 0.4 miles from turn right onto Flatwood Road. Go a short distance (approximately 30 yards). The sample station is on the right.

SAMPLE STATIONS

Sample Station Number: 14
Approximate Direction and Distance from Plant: 70° - 5.3 miles
Sample Types: 1) Drinking water
Sample Station Location:

From junction of Highway 7 and Water Works Road, go approximately 0.8 miles west on Water Works Road. The sample station is on the left at the intake to the Russellville city water system from the Illinois Bayou.

Sample Station Number: 16
Approximate Direction and Distance from Plant: 290° - 5.9 miles
Sample Types: 1) Shoreline sediment
Sample Station Location:

From junction of Highway 64 and Highway 359 (Flat Rock Piney Bay Recreational Area turnoff), go approximately 0.7 miles west on Highway 64. The sample station is at the Piney Creek area on Lake Dardanelle.

Sample Station Number: 19
Approximate Direction and Distance from Plant: 95° - 5.1 miles
Sample Types: 1) Milk
Sample Station Location:

Turn from Highway 7 onto Harrell Drive in Russellville, AR and go approximately 0.1 miles. Turn right and go approximately 0.25 miles. The sample station is on the left at the Arkansas Tech Dairy.

Sample Station Number: 29
Approximate Direction and Distance from Plant: 24° - 6.9 miles
Sample Types: 1) Milk (alternate)
Sample Station Location:

Turn south from Highway 333 onto County Road 141 and to approximately 0.55 miles. Turn left and go approximately 0.6 miles. Turn left and go approximately 0.05 miles. The sample station is on the right at the Harold Steuber Dairy.

SAMPLE STATIONS

Sample Station Number: 32
Approximate Direction and Distance from Plant: 132° - 0.9 miles
Sample Types: 1) Ground water
2) Food products
Sample Station Location:

From bridge over intake canal, go south approximately 0.25 miles. Turn left and go approximately 0.25 miles. Turn left on Bunker Hill Lane and go approximately 0.05 miles. The sample station is on the right at Clifton Stewart's residence.

Sample Station Number: 33
Approximate Direction and Distance from Plant: 94° - 3.8 miles
Sample Types: 1) Ground water
Sample Station Location:

From junction of Highway 64 and Highway 326 (Dike Road), go approximately 0.3 miles east on Dike Road. The sample station is on the left at the Quita Lake Recreation Area on the Illinois Bayou.

Sample Station Number: 36
Approximate Direction and Distance from Plant: 140° - 0.05 miles
Sample Types: 1) Pond water
2) Pond sediment
Sample Station Location:

The sample station is at the Settling Pond on the ANO site east of the discharge canal.

Sample Station Number: 37
Approximate Direction and Distance from Plant: 0° - 7.5 miles
Sample Types: 1) Milk
Sample Station Location:

IF traveling north on Highway 333,
THEN go approximately 3.5 miles from junction of Highway 333 and Mill Creek Road on Highway 333. Turn left and go approximately 0.1 miles. The sample station is on the left at the Lawrence Steuber Dairy.

IF traveling from junction of Highway 7 and Highway 333,
THEN go approximately 6.0 miles west on Highway 333. Turn right and go approximately 0.1 miles. The sample station is on the left at the Lawrence Steuber Dairy.

SAMPLE STATIONS

Sample Station Number: 38
Approximate Direction and Distance from Plant: 314° - 2.4 miles
Sample Types: Food products (alternate)
Sample Station Location:

From west junction of Highway 64 and Highway 333 in London, AR, go approximately 0.4 miles west on Highway 64. Turn right at Hornet Estate and go approximately 0.1 miles. Turn left and go approximately 0.1 miles. The sample station is on the left at Ronnie Jones' residence.

Sample Station Number: 40
Approximate Direction and Distance from Plant: 119° - 2.2 miles
Sample Types: 1) Foods products
Sample Station Location:

From junction on Highway 64 and Highway 326 (Marina Road), go approximately 2.0 miles on Marina Road. The sample station is on the left at Horace Hollis' residence just prior to curve.

Sample Station Number: 41
Approximate Direction and Distance from Plant: 358° - 3.8 miles
Sample Types: 1) Milk
Sample Station Location:

IF traveling from junction of Highway 333 and Mill Creek Road,
THEN go approximately 1.8 miles on Mill Creek Road. Turn right onto Lowe Lane and go approximately 0.1 miles. Turn right and go approximately 0.05 miles. The sample station is on the right at the James Gibson Dairy.

IF traveling from junction of Highway 64 and Mill Creek Road,
THEN go approximately 3.6 miles on Mill Creek Road. Turn left onto Lowe Lane and go approximately 0.1 miles. Turn right and go approximately 0.05 miles. The sample station is on the right at the James Gibson Dairy.

Sample Station Number: 42
Approximate Direction and Distance from Plant: 73° - 12.4 miles
Sample Types: 1) Milk
Sample Station Location:

From junction of Highway 124 and Highway 326 in Gum Log, AR, go approximately 1.1 miles northeast on Highway 124. Turn left onto Gravel Hill Road and go approximately 0.6 miles. Turn right onto Hudson Loop and go approximately 0.3 miles. The sample station is on the left at the Hudson Dairy.

SAMPLE STATIONS

Sample Station Number: 45
Approximate Direction and Distance from Plant: 90° - 0.9 miles
Sample Types: 1) Broad leaf vegetation
Sample Station Location:

The sample station is located near mouth of intake canal.

Sample Station Number: 46
Approximate Direction and Distance from Plant: 295° - 4.1 miles
Sample Types: 1) Food products
Sample Station Location:

From west junction of Highway 64 and Highway 333 in London, AR, go west on Highway 64 approximately 2.4 miles. Turn right onto Scottie Lane and go approximately 0.1 miles. The sample location is on the right at Dewey Gregory's residence.

Sample Station Number: 47
Approximate Direction and Distance from Plant: 344° - 2.8 miles
Sample Types: 1) Milk
Sample Station Location:

IF traveling from junction of Highway 64 and Mill Creek Road,
THEN go approximately 1.0 mile on Mill Creek Road. Turn left onto Bailey Loop Road and go approximately 2.4 miles. Turn left at Sims Hollow Road and to approximately 0.35 mile. The sample station is on the right at the Bryan Irby residence.

IF traveling from junction of Highway 333 and Mill Creek Road,
THEN go approximately 1.1 miles on Mill Creek Road. Turn right onto Bailey Loop Road which is located near East Point Baptist Church and go approximately 1.7 miles. Turn right at Sims Hollow Road and go approximately 0.35 mile. The sample station is on the right at the Bryan Irby residence.

Sample Station Number: 108
Approximate Direction and Distance from Plant: 301° - 0.9 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling from Highway 333,
THEN turn south onto Flatwood Road and go approximately 0.4 miles. The sample station is on a utility pole on the right.

IF traveling north on Flatwood Road,
THEN go approximately 0.4 miles from sample station 109. The sample station is on a utility pole on the left.

SAMPLE STATIONS

Sample Station Number: 109
Approximate Direction and Distance from Plant: 285° - 0.5 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling south on Flatwood Road,
THEN go approximately 0.4 miles from sample station 108. Sample station 109 is on a utility pole on the left across from the junction of Flatwood Road and Round Mountain Road just before pavement ends.

IF traveling west from ANO toward Gate 4,
THEN go approximately 0.4 miles and turn right onto Flatwood Road. Go approximately 0.2 miles. The sample station is on a utility pole on the right across from the junction of Flatwood Road and Round Mountain Road just after pavement begins.

Sample Station Number: 110
Approximate Direction and Distance from Plant: 138° - 0.8 miles
Sample Types: 1) Direct radiation
Sample Station Location:

From bridge over intake canal, go south approximately 0.25 miles. Turn left and go approximately 0.25 miles. Turn right on Bunker Hill Lane. The sample station is on the first utility pole on the left.

Sample Station Number: 111
Approximate Direction and Distance from Plant: 121° - 2.2 miles
Sample Types: 1) Direct radiation
Sample Station Location:

From junction of Highway 64 and Highway 326 (Marina Road), go approximately 2.1 miles on Marina Road. The sample station is on a utility pole on the left just prior to curve.

Sample Station Number: 112
Approximate Direction and Distance from Plant: 74° - 2.6 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Go to the junction of Highway 64 and the I-40 exit which is approximately 1.3 miles east of sample station 113. Sample station 112 is on a utility pole on the northeast corner of the junction.

SAMPLE STATIONS

Sample Station Number: 113
Approximate Direction and Distance from Plant: 52° - 1.5 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Go to the east junction of Highway 333 and Highway 64. The sample station is on a utility pole on the southwest corner of the junction.

Sample Station Number: 114
Approximate Direction and Distance from Plant: 31° - 1.3 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling west on Highway 64,
THEN go approximately 0.6 miles west of the east junction of Highway 64 and Highway 333. The sample station is on a utility pole on the right.

IF traveling east on Highway 64,
THEN go approximately 1.1 miles from sample station 115. Sample station 114 is on a utility pole on the left.

Sample Station Number: 115
Approximate Direction and Distance from Plant: 344° - 1.4 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling west on Highway 64,
THEN go approximately 1.1 miles west of sample station 114. Sample station 115 is on a utility pole on the right.

IF traveling east on Highway 64,
THEN go approximately 0.8 miles from the west junction of Highway 64 and Highway 333 in London, AR. The sample station is on a utility pole on the left.

Sample Station Number: 116
Approximate Direction and Distance from Plant: 320° - 1.8 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Go one block south of the west junction of Highway 333 and Highway 64 in London, AR. The sample station is on a utility pole north of the railroad tracks.

SAMPLE STATIONS

Sample Station Number: 117
Approximate Direction and Distance from Plant: 305° - 17.2 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling west on I-40,
THEN take Exit 58 at Clarksville, AR. Turn right onto Rogers Street. At junction of Rogers Street and Highway 64, turn left and proceed west to first stop light. Turn left onto Cravens Street. The sample station is on a utility pole on the right between the county courthouse and the post office.

IF traveling west on Highway 64,
THEN go to first stop light past junction of Rogers Street and Highway 64. Turn left onto Cravens Street. The sample station is on a utility pole on the right between the county courthouse and the post office.

Sample Station Number: 118
Approximate Direction and Distance from Plant: 294° - 5.6 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling east on Highway 64,
THEN go approximately 0.3 miles from bridge which goes across Piney. The sample station is on a utility pole on the left.

IF traveling west on Highway 64,
THEN go approximately 0.4 miles past Flat Rock Piney Bay Recreational Area turnoff. The sample station is on a utility pole on the right.

Sample Station Number: 119
Approximate Direction and Distance from Plant: 309° - 4.8 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Turn west from Highway 333 onto Will Baker Road, which intersects Highway 333 approximately 1.4 miles north of the I-40 Overpass near London, AR. Go approximately 2.0 miles. The sample station is on a utility pole on the left just prior to pavement ending.

SAMPLE STATIONS

Sample Station Number: 120
Approximate Direction and Distance from Plant: 336° - 4.2 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling from I-40 Overpass in London, AR,
THEN go north on Highway 333 approximately 2.4 miles. The sample station is on a utility pole on the right near Martin Chapel.

IF traveling from junction of Mill Creek Road and Highway 333,
THEN go approximately 1.0 mile south on Highway 333. The sample station is on a utility pole on the left near Martin Chapel.

Sample Station Number: 121
Approximate Direction and Distance from Plant: 349° - 4.6 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling from I-40 Overpass in London, AR,
THEN go north on Highway 333 approximately 3.4 miles to Mill Creek Road. Turn right onto Mill Creek Road and go approximately 0.7 miles. The sample station is on a utility pole on the right.

IF traveling northwest on Mill Creek Road,
THEN go approximately 0.4 miles past East Point Baptist Church and Cemetery. The sample station is on a utility pole on the left.

Sample Station Number: 122
Approximate Direction and Distance from Plant: 18° - 3.3 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling north from junction of Highway 64 and Mill Creek Road,
THEN go approximately 2.5 miles. The sample station is on a utility pole on the right.

IF traveling southeast on Mill Creek Road,
THEN go approximately 1.9 miles from East Point Baptist Church. The sample station is on a utility pole on the left.

SAMPLE STATIONS

Sample Station Number: 123
Approximate Direction and Distance from Plant: 46° - 3.5 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Turn north from Pleasant View Road onto Bull Mill Road and go approximately 0.8 miles. The sample station is on a utility pole on the left.

Sample Station Number: 124
Approximate Direction and Distance from Plant: 60° - 3.2 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling from junction of Highway 64 and Mill Creek Road,
THEN go north on Mill Creek Road approximately 0.7 miles. Turn right onto Pleasant View Road and go approximately 1.3 miles. The sample station is on the right on a utility pole which is across from a siren and below a transmission line.

IF traveling west from junction of Highway 7 and Pleasant View Road,
THEN go approximately 3.1 miles. The sample station is on the left on a utility pole which is across from a siren and below a transmission line.

Sample Station Number: 125
Approximate Direction and Distance from Plant: 46° - 9.1 miles
Sample Types: 1) Direct radiation
Sample Station Location:

While traveling north on Highway 7, turn left onto Water Street in Dover, AR. Go one block and turn left onto South Elizabeth Street. Go one block and turn right onto College Street. The sample station is on a utility pole at the southeast corner of the red brick school building, which is located on top of hill.

Sample Station Number: 126
Approximate Direction and Distance from Plant: 81° - 5.5 miles
Sample Types: 1) Direct radiation
Sample Station Location:

The sample station is located on the west side of Highway 7 directly across from Shiloh Road, which is approximately 1.3 miles north of the junction of Highway 7 and Dike Road.

SAMPLE STATIONS

Sample Station Number: 127
Approximate Direction and Distance from Plant: 102° - 5.6 miles
Sample Types: 1) Direct radiation
Sample Station Location:

The sample station is located on the Arkansas Tech Campus on West O Street on a security light pole in front of Bryan Hall, which is the first building on the left when traveling from North Arkansas on West O Street.

Sample Station Number: 128
Approximate Direction and Distance from Plant: 113° - 8.6 miles
Sample Types: 1) Direct radiation
Sample Station Location:

The sample station is on a utility pole inside the security fence near the Russellville Airport Office. The airport is located off of East 16th Street and is well marked by airport signs.

Sample Station Number: 129
Approximate Direction and Distance from Plant: 118° - 7.3 miles
Sample Types: 1) Direct radiation
Sample Station Location:

The sample station is on a utility pole north of the Russellville High School sign, which is in front of high school on east side of Highway 7T.

Sample Station Number: 130
Approximate Direction and Distance from Plant: 245° - 4.6 miles
Sample Types: 1) Direct radiation
Sample Station Location:

At junction of Highway 7 and Highway 22 in Dardanelle, AR, take Highway 22 toward Delaware, AR. Go approximately 0.4 miles west of Delaware Recreation Area turnoff. The sample station is on a utility pole on the right in Delaware, AR near Shirley's Beauty Salon.

SAMPLE STATIONS

Sample Station Number: 131
Approximate Direction and Distance from Plant: 244° - 2.4 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Turn north from Highway 22 onto Highway 393 at Delaware Recreation Area turnoff and go approximately 2.9 miles. The sample station is located past the boat ramp on an oak tree near crosstie steps in northeast quadrant of circle drive.

Sample Station Number: 132
Approximate Direction and Distance from Plant: 267° - 5.8 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Turn north from Highway 22 onto Highway 393 at Delaware Recreation Area turnoff and go approximately 0.9 miles. Turn left onto dirt road and go approximately 2.3 miles. The sample station is on a utility pole on the right.

Sample Station Number: 133
Approximate Direction and Distance from Plant: 233° - 3.7 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling west on Highway 22,
THEN go approximately 2.0 miles from sample station 134. Sample station 133 is on the south side of the Highway 22 causeway attached to the first NO PARKING ANY TIME sign west of the bridge.

IF traveling east on Highway 22 from Delaware, AR,
THEN go approximately 0.8 miles from Delaware Recreation Area turnoff. The sample station is on the south side of the Highway 22 causeway attached to the first NO PARKING ANY TIME sign west of the bridge.

Sample Station Number: 134
Approximate Direction and Distance from Plant: 200° - 2.8 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling west on Highway 22,
THEN go approximately 0.8 miles from sample station 135. Sample station 134 is on a utility pole on the right at Mockingbird Lane.

IF traveling east on Highway 22,
THEN go approximately 2.0 miles from sample station 133. Sample station 134 is on a utility pole on the left at Mockingham Lane.

SAMPLE STATIONS

Sample Station Number: 135
Approximate Direction and Distance from Plant: 188° - 3.2 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling northwest on Highway 22,
THEN go approximately 1.7 miles from sample station 136. Sample station 135 is on a utility pole on the right.

IF traveling east on Highway 22,
THEN go approximately 0.8 miles from sample station 134. Sample station 135 is on a utility pole on the left.

Sample Station Number: 136
Approximate Direction and Distance from Plant: 168° - 4.3 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling west on Highway 22,
THEN go approximately 3.7 miles from junction of Highway 22 and Highway 7. The sample station is on the right on the first utility pole west of the Little Hays Creek Bridge.

IF traveling east on Highway 22,
THEN go approximately 1.7 miles from sample station 135. Sample station 136 is on the left on the first utility pole west of the Little Hays Creek Bridge.

Sample Station Number: 137
Approximate Direction and Distance from Plant: 150° - 8.4 miles
Sample Types: 1) Direct radiation
Sample Station Location:

At junction of Highway 7 and Highway 28 in Dardanelle, AR, go approximately 0.2 miles on Highway 28. The sample station is on a speed limit sign on the right in front of the Morris R. Moore Arkansas National Guard Armory.

SAMPLE STATIONS

Sample Station Number: 138
Approximate Direction and Distance from Plant: 193° - 5.8 miles
Sample Types: 1) Direct radiation
Sample Station Location:

At junction of Highway 22 and Highway 155 (Mt. Nebo Road) in Dardanelle, AR, turn west and go to top of mountain. Veer right at stop sign and proceed toward Sunset Point. The sample station is down a dirt road on the right which is approximately 0.1 miles southeast of Sunset Point. The sample station is on the left side of the dirt road on a utility pole near a TV tower.

Sample Station Number: 139
Approximate Direction and Distance from Plant: 178° - 19.2 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Take Highway 7 South through Dardanelle, AR to Ola, AR. Turn left at junction of Highway 7 and Highway 10 West in Ola, AR and go approximately ½ block. The sample station is on a utility pole on the left in front of the U. S. Post Office.

Sample Station Number: 140
Approximate Direction and Distance from Plant: 151° - 21.8 miles
Sample Types: 1) Direct radiation
Sample Station Location:

Proceed through Ola, AR and take Highway 10 East to Casa, AR, which is in Perry County. Turn right at the Perry-Casa High School. The sample station is on a utility pole at the southwest corner of the school.

Sample Station Number: 141
Approximate Direction and Distance from Plant: 125° - 3.8 miles
Sample Types: 1) Direct radiation
Sample Station Location:

While traveling southwest on Highway 326 (Marina Road), go approximately 2.4 miles from sample station 111. Sample station 141 is on the right on a utility pole, which is approximately 50 yards east of a transmission line. (The sample station is approximately 0.35 miles west of the junction of Hilltop Drive and Marina Road.)

SAMPLE STATIONS

Sample Station Number: 142
Approximate Direction and Distance from Plant: 129° - 5.1 miles
Sample Types: 1) Direct radiation
Sample Station Location:

The sample station is on a utility pole at the junction of Skyline Drive and Nordin Lane in Russellville, AR, near a peach orchard.

Sample Station Number: 143
Approximate Direction and Distance from Plant: 106° - 17.5 miles
Sample Types: 1) Direct radiation
Sample Station Location:

IF traveling east on Highway 64 to Atkins, AR,
THEN turn left at junction of Highway 64 and North Church Street. Proceed north. The sample station is on a utility pole on the left in front of Atkins High School near stop sign at corner of North Church Street and Northeast 3rd Street.

IF traveling east on Interstate 40,
THEN take Exit 94 at Atkins, AR. Turn left onto North Church Street and proceed south. The sample station is on a utility pole on the right in front of Atkins High School near stop sign at corner of North Church Street and Northeast 3rd Street.

Sample Station Number: 144
Approximate Direction and Distance from Plant: 313° - 12.7 miles
Sample Types: 1) Direct radiation
Sample Station Location:

While traveling on Highway 64, turn south onto Cumberland Street in Lamar, AR, and go approximately 0.7 miles. Veer left at stop sign. The sample station is on a utility pole across the one way fire lane in front of Lamar Elementary School.

FIGURE 1-1

SOURCES OF RADIATION EXPOSURE

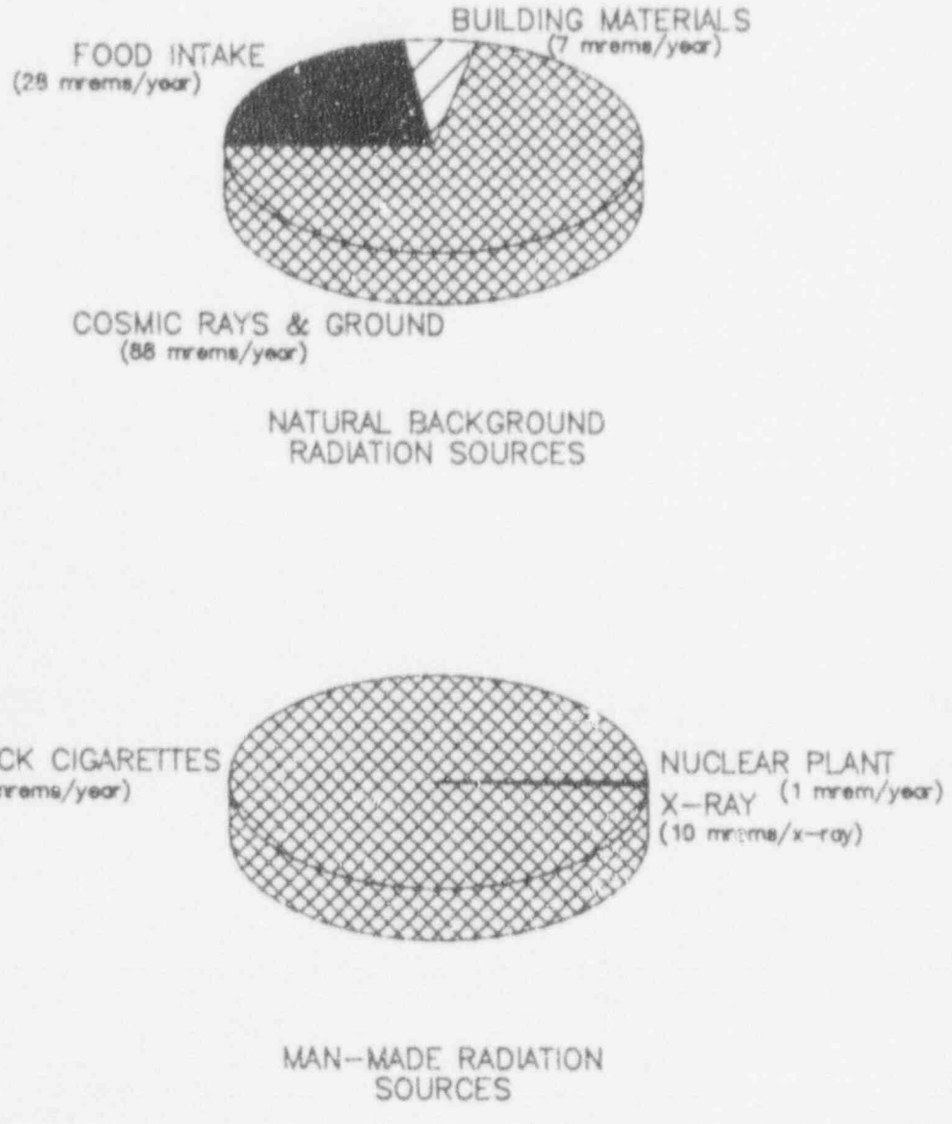


FIGURE 1-2

EXPOSURE PATHWAYS

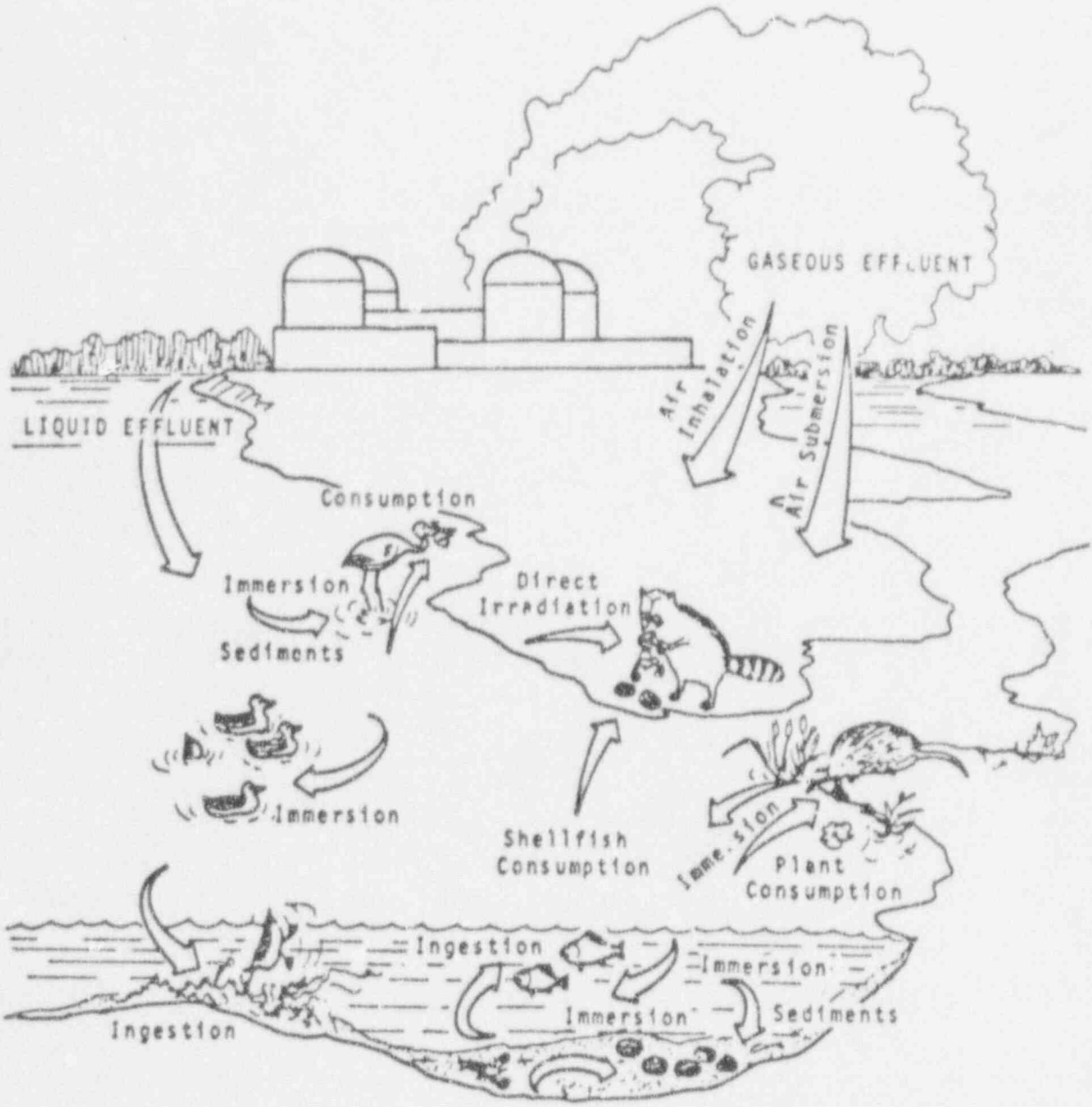
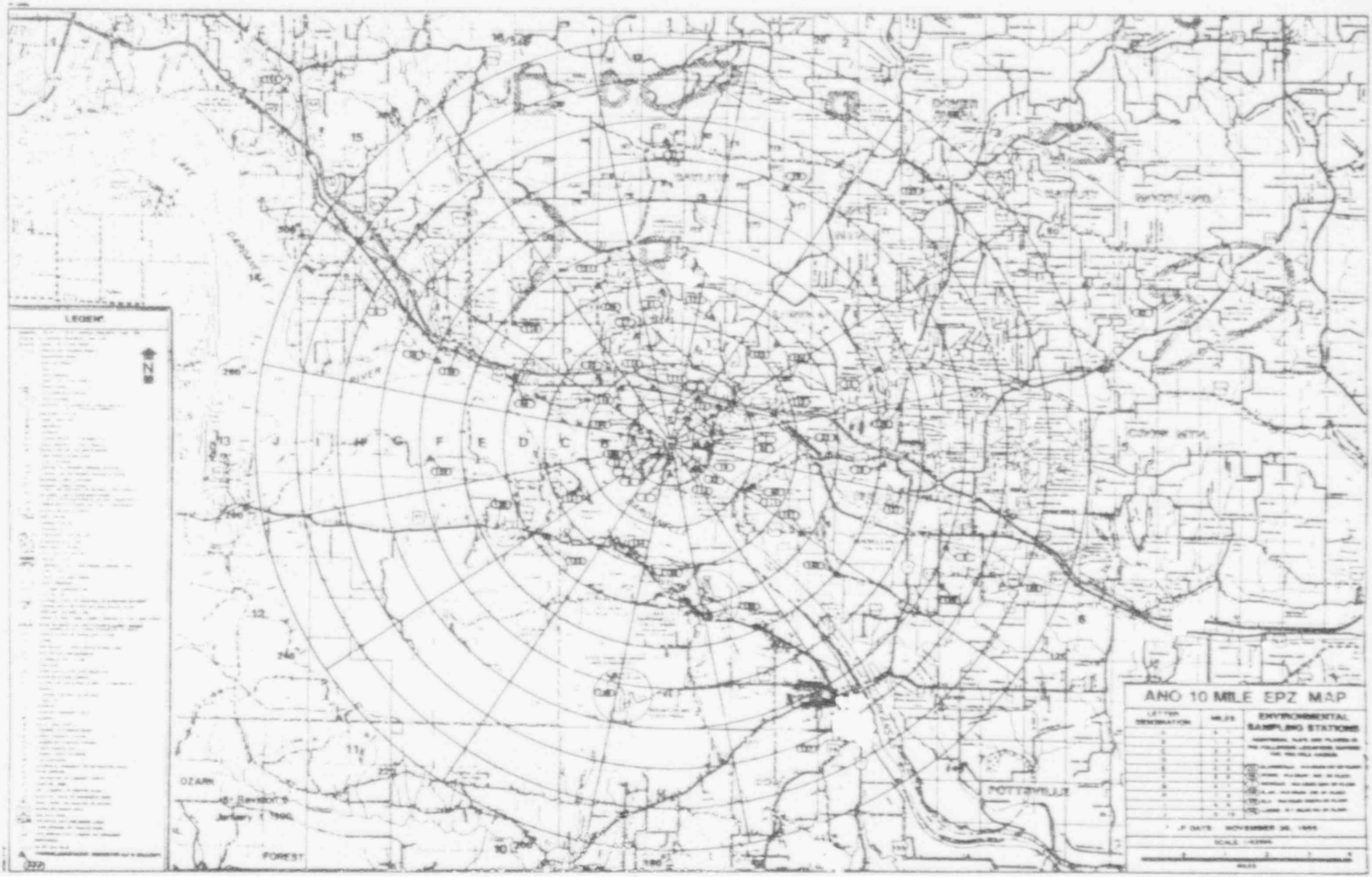


FIGURE 1-3

SAMPLE COLLECTION SITES



SECTION 2.0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

- INTERPRETATIONS AND TRENDS OF RESULTS
- DEVIATIONS FROM THE REMP
- PROGRAM DESCRIPTION

2.1 AIR PARTICULATES AND RADIOIODINES

NOTE: Analytical results are presented in Tables 1.1 through 1.7 of Attachment I and summarized in Section 4.0.

2.1.1 INTERPRETATIONS AND TRENDS OF RESULTS

Air particulate and Iodine-131 results for 1991 were similar to those obtained in previous years of the operational and preoperational REMP. Gross beta results for indicator locations ranged from .001 - .038 pCi/m^3 with an average of .015 pCi/m^3 as compared to control locations which ranged from .004 - .034 pCi/m^3 with an average of .016 pCi/m^3. This indicates the airborne exposure pathway has not been affected by the operation of ANO and that airborne concentrations continue to be at or near background levels.

In addition, when comparing the calculated and tabular "t" values for gross beta concentrations as shown in Attachment III, it can be seen that there is no statistical difference between means from the indicator locations when compared to the control location, with the exception of Station 3. The mean for Station 3 was statistically lower than that of the control.

However, gross beta concentrations shown in Figure 2-1 emphasize that ANO has had no influence on ambient radiation levels. This figure shows 1991 monthly average results compared to preoperational results and 1973 through 1991 yearly average results for indicator locations compared to controls.

2.1.2 DEVIATIONS FROM THE REMP

An air sample was missed at Station 1 located at the meteorological tower on October 8, 1991 due to pump failure. The unit was replaced and air sampling resumed. This problem did not reoccur in 1991, and no other deviations occurred.

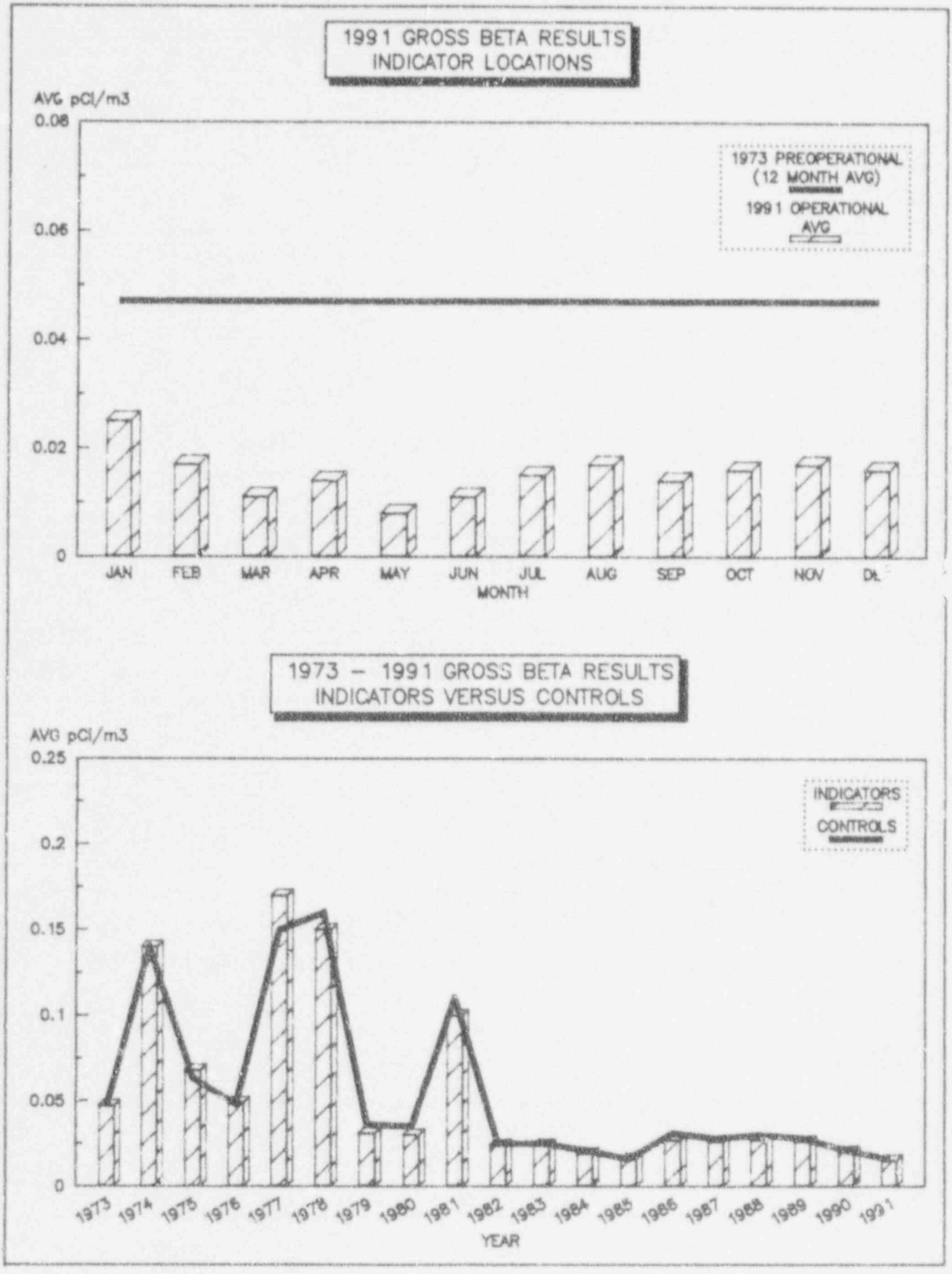
2.1.3 PROGRAM DESCRIPTION

ANO Unit 1 and Unit 2 Technical Specification Tables 4.30-1 and 3.12-1, respectively, require five air sampler locations for measurement of radioactivity in the airborne exposure pathway. The ANO REMP used six continuous air samplers to provide gross beta, gamma and radioiodine activity measurements. Four of the air samplers were used as indicators (Stations 1, 2, 3 and 4) with the remaining two utilized as controls (Stations 6 and 7). These air samplers were placed at distances from 0.4 to 19.3 miles (Table 1-1, Figure 1-3).

The air samplers were placed approximately one meter above the ground in weatherproof houses. A 47-millimeter glass fiber filter was installed in the intake line of the vacuum pump with a charcoal cartridge located directly downstream. Flows were adjusted to 30 $\pm$ 3 liters per minute. Filters and cartridges were changed weekly and analyzed for gross beta radionuclides and radioiodine activity, respectively. In addition, the filters were composited quarterly and analyzed for gamma radionuclides.

FIGURE 2-1

AIR SAMPLES, GROSS BETA CONCENTRATIONS



2.2 THERMOLUMINESCENT DOSIMETRY (TLD)

NOTE #1: Analytical results are presented in Attachment II and summarized in Section 4.0.

2.2.1 INTERPRETATIONS AND TRENDS OF RESULTS

Gamma radiation dose in 1991 was similar to that obtained in previous years as illustrated in table 2-1. Quarterly doses recorded by TLDs were as follows:

- 0 - 2 miles, mean of 27.2 mrem and range of 18 - 43 mrem
- 2 - 5 miles, mean of 24.5 mrem and range of 17 - 46 mrem
- >5 miles, mean of 26.3 mrem and range of 19 - 40 mrem

Semiannual doses recorded by TLDs were as follows:

- 0 - 2 miles, mean of 45.1 mrem and range of 32 - 54 mrem
- >5 miles, mean of 44.5 mrem and range of 34 - 54 mrem

This indicates that the ambient radiation levels remained at or near background and have been uninfluenced by the operation of ANO.

In addition, when comparing the calculated and tabular "t" values for quarterly and semiannually radiation doses as shown in Attachment III, it can be seen that there is no statistical difference between means from 0 - 2 miles when compared to locations >5 miles. The quarterly mean from 2 - 5 miles, however, was statistically lower when compared to locations >5 miles.

However, Figure 2-2, which shows 1991 quarterly average results compared to preoperational and 1973 through 1991 annual quarterly average results for indicator locations compared to controls, indicates that ambient radiation levels have remained at or near background levels.

2.2.2 DEVIATIONS FROM THE REMP

Two quarterly TLDs were lost in the field during 1991 due to vandalism and two semiannual TLDs were damaged due to water. However, TLD losses of this type are characteristic of other TLD programs. The 1991 recovery rate for quarterly and semiannual TLDs was 99% (174 of 176) and 86% (12 of 14), respectively, which is comparable with other TLD programs.

2.2.3 PROGRAM DESCRIPTION

ANO Unit 1 and Unit 2 Technical Specification Tables 4.30-1 and 3.12-1, respectively, require forty TLD locations for measurement of direct radiation doses. The ANO REMP measured ambient radiation in the environment surrounding ANO with 44 quarterly and 7 semiannual TLDs (two lithium borate and calcium sulfate elements) to provide a quantitative measurement of the area radiation levels. ANO REMP personnel placed these environmental TLDs at distances from 0.4 to 21.8 miles (Table 1-1, Figure 1-3).

Each dosimeter was sealed in a plastic protective holder and normally suspended one meter above the ground, where feasible. The dosimeters were collected and analyzed quarterly and semiannually.

The TLD locations may be summarized as follows:

- 11 quarterly stations in the 0 - 2 mile range
- 15 quarterly stations in the 2 - 5 mile range
- 18 quarterly stations > 5 miles
- 4 semiannual stations in the 0 - 2 mile range
- 3 semiannual stations > 5 miles

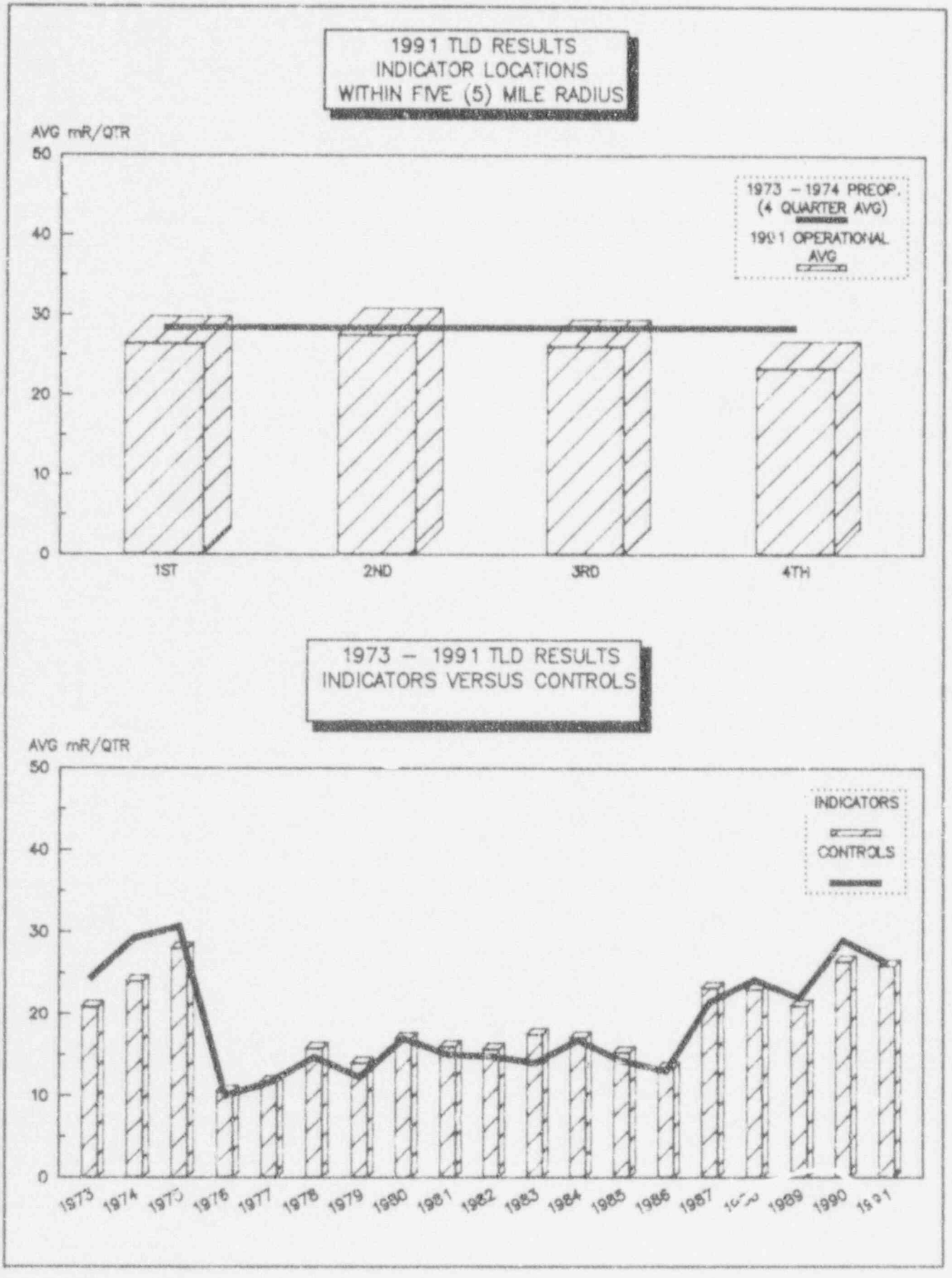
TABLE 2-1

1973-1991 AVERAGE mR/QUARTER TLD DOSE RATES

YEAR	INDICATORS	CONTROLS
1973	20.8	24.3
1974	24.0	29.3
1975	28.0	30.7
1976	10.5	10.0
1977	11.7	11.6
1978	15.8	14.7
1979	14.0	12.3
1980	17.0	17.0
1981	16.0	15.0
1982	15.7	14.8
1983	17.5	14.0
1984	17.1	16.8
1985	15.3	14.3
1986	13.4	13.0
1987	23.2	21.5
1988	23.0	24.2
1989	21.0	22.0
1990	26.4	29.0
1991	25.9	26.3

FIGURE 2-2

TLDs, RADIATION DOSE



2.3 MILK

NOTE #1: Analytical results are presented in Tables 2.1 through 2.5 of Attachment I and summarized in Section 4.0.

2.3.1 INTERPRETATIONS AND TRENDS OF RESULTS

Milk samples were collected monthly from five locations in 1991 and analyzed for Iodine-131 and gamma radionuclides. Positive results of Iodine-131 at a concentration of 1.0 pCi/l and Cesium-137 at a concentration of 4.0 pCi/l were detected once in 1991 at an indicator location (Irby). However, since these concentrations are at or below the maximum lower limit of detection (LLD), a high percentage of counting error exists. In addition, the Cesium-137 may be attributed to international fallout based on preoperational monitoring. Overall, there has been no significant radiological impact to the environment or public.

2.3.2 DEVIATIONS FROM THE REMP

During 1991, an additional milk sampling location (S. Irby) was added and one location (True-X Goat Dairy) was deleted. However, milk samples required by ANO Technical Specifications were collected and analyzed during 1991 without exception.

2.3.3 PROGRAM DESCRIPTION

ANO Unit 1 and Unit 2 Technical Specification Tables 4-30-1 and 3.12-1, respectively, require four milk locations for the measurement of radioactivity by the ingestion exposure pathway. ANO REMP and Arkansas Department of Health personnel collected milk monthly from five locations at distances from 2.8 to 12.4 miles (Table 1-1, Figure 1-3). Four of the locations were utilized as indicators (Arkansas Tech, Steuber, Gibson and Irby) with the remaining location as a control (Hudson).

Milk was collected from each location in two labeled gallon containers. Samples were preserved with formaldehyde and then analyzed for Iodine-131 and gamma radionuclides.

2.4 WATER

NOTE #1: Analytical results are presented in Tables 3.1 through 5.2 of Attachment I and summarized in Section 4.0.

2.4.1 INTERPRETATIONS AND TRENDS OF RESULTS

ANO REMP personnel sampled drinking water, surface water and groundwater as required during 1991. Analytical results were similar to those reported in previous years.

Drinking Water

Drinking water samples were collected monthly from one location and analyzed for gross beta radionuclides, Iodine-131, tritium and gamma radionuclides. Gross beta concentrations ranged from 1.0 - 6.1 pCi/l with a mean of 3.5 pCi/l which are consistent with previous levels. Iodine-131 was detected at a concentration of 0.2 pCi/l. However, since this concentration is below the required LLD, there exists a degree of uncertainty. Overall, concentrations continue to be at or near background levels.

Surface Water

Surface water samples were collected monthly and analyzed for gamma radionuclides and a composite was analyzed quarterly for tritium. In addition, the Arkansas Department of Health and ANO split monthly grab samples from the discharge and Piney Creek locations. These samples were analyzed monthly by each laboratory for gamma radionuclides and tritium.

With the exception of the April discharge split sample, gamma radionuclides were not detected in 1991. The split sample contained a Cobalt-58 concentration of 3 pCi/l. However, this level is well below the required LLD, therefore it contains a degree of uncertainty.

As shown in Section 4.0, tritium levels for the indicator location (Discharge) ranged from 211 - 602 pCi/l with a mean of 390.6 pCi/l in 1991 as compared to the controls (Intake and Piney Creek) range of 235 - 378 pCi/l and mean of 302.8 pCi/l. The levels detected in the discharge may be due to samples being taken during or after controlled releases from the plant. However, as shown in Figure 2-3, 1991 tritium levels in the discharge appear to be similar to those of previous years.

When comparing the calculated and tabular "t" values as shown in Attachment III, it can be concluded that there is no statistical difference between tritium results from the discharge indicator location and Piney Creek control. Overall, 1991 gamma radionuclide and tritium levels did not constitute any significant radiological impact to the environment or public.

Groundwater

Groundwater samples were collected quarterly from two locations and analyzed for gamma radionuclides and tritium. As in previous years, concentrations continue to be at or near background levels.

2.4.2 DEVIATIONS FROM THE REMP

Water samples required by ANO Technical Specifications were collected and analyzed during 1991 without exception.

2.4.3 PROGRAM DESCRIPTION

ANO Unit 1 and Unit 2 Technical Specification Tables 4.30-1 and 3.12-1, respectively, require one drinking water location, two surface water locations, and two groundwater locations for the measurement of radioactivity by the waterborne exposure pathway.

Drinking water was sampled monthly from a control location (Intake to Russellville City Water System from Illinois Bayou) at a distance of 5.3 miles (Table 1.1, Figure 1-3). Water was collected in two labeled gallon containers. Upon return from the field, the samples were acidified with hydrochloric acid and then analyzed for gross beta radionuclides, Iodine-131 and gamma radionuclides. In addition, a composite was analyzed quarterly for tritium.

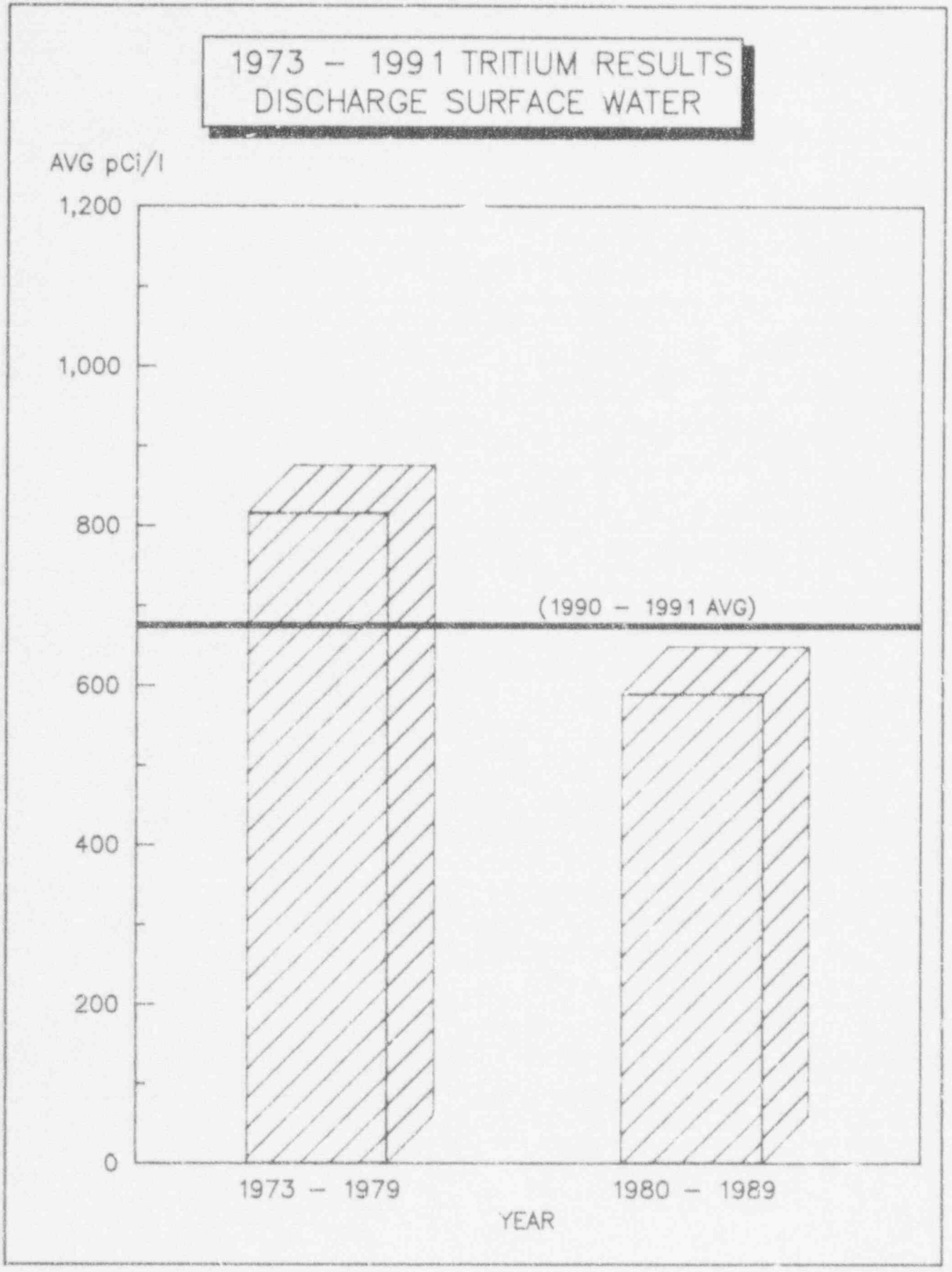
Surface water samples were collected from three locations, an indicator location (Discharge) and two controls (Intake and Piney Creek) at distances from 0.1 to 5.9 miles (Table 1-1, Figure 1-3). The discharge and intake surface water samples were composited with an automatic sampler that collected a preset volume at set intervals (≈ 2 gallons per week). Weekly, one gallon of sample from each location was acidified with hydrochloric acid and placed in an appropriate labeled composite carboy. At the end of the month, a one gallon sample from each composite carboy was placed in a labeled container. The samples were then analyzed for gamma radionuclides and a composite was analyzed quarterly for tritium.

In addition, monthly grab surface water samples from the discharge and Piney Creek locations were collected by the Arkansas Department of Health and split with ANO. These samples were analyzed monthly for gamma radionuclides and tritium.

Groundwater was sampled quarterly from two locations, the Stewart Residence (indicator) and Quita Lake (control), at distances from 0.9 to 3.8 miles (Table 1-1, Figure 1-3). Water was collected from each location in two labeled gallon containers. Upon return from the field, the samples were acidified with hydrochloric acid and then analyzed for gamma radionuclides and tritium.

FIGURE 2-3

DISCHARGE TRITIUM



2.5 VEGETATION AND FOOD PRODUCTS

NOTE #1: Analytical results are presented in Tables 8.1 through 8.6 of Attachment I and summarized in Section 4.0.

2.5.1 INTERPRETATIONS AND TRENDS OF RESULTS

Vegetation and food product samples were collected when available from six locations in 1991 and analyzed for Iodine-131 and gamma radionuclides. As in previous years, concentrations continue to remain at or near background levels.

2.5.2 DEVIATIONS FROM THE REMP

Vegetation and food product samples required by ANO Technical Specifications were collected and analyzed during 1991 without exception.

2.5.3 PROGRAM DESCRIPTION

ANO Unit 1 and Unit 2 Technical Specification Tables 4.30-1 and 3.12-1, respectively, require three food product locations and one vegetation location for measurement of radioactivity by the ingestion exposure pathway. ANO REMP personnel collected, when available, from two vegetation indicator locations (Flatwood Road and Intake Canal) and four food product indicator locations (Stewart, Jones, Hollis and Gregory) at distances of 0.5 to 4.1 miles (Table 1-1, Figure 1-3). In addition, the Arkansas Department of Health and ANO split food product samples from the Stewart residence location.

The preferred source of food products were fruits, flowering vegetables and tubular vegetables. The preferred source of non food products were any vegetation with relatively broad leaves on which airborne radioactive particulate material might be deposited. Normally when available, a minimum of 1000 grams of food products or vegetation was collected. The samples were then analyzed for gamma radionuclides and Iodine-131.

2.6 SEDIMENT

NOTE #1: Analytical results are presented in Table 7.1 of Attachment I and summarized in Section 4.0.

2.6.1 INTERPRETATIONS AND TRENDS OF RESULTS

Sediment samples were collected semiannually from three locations in 1991 and analyzed for gamma radionuclides. As in previous years, radionuclides attributable to ANO was detected in the discharge sediment. Table 2-2 shows the average levels and ranges of radionuclides detected since 1985. Figure 2-4, which is derived from Table 2-2, shows that 1991 levels are similar to those of previous years.

Since reporting levels for radionuclides in sediment have not been established, an evaluation of potential dose to the public from this media was performed as shown in Attachment IV. The annual maximum dose from all radionuclides to the skin and total body was approximately .01 millirem. Design objectives given in 10CFR50, Appendix I for liquid effluents are annual doses of ≤3 millirem total body and ≤10 millirem any organ. The values of .01 millirem for the skin and total body are well within the design objective criteria.

In addition, the dose from Silver-110m is well within the Unit 1 and Unit 2 Specifications 3.25.1.2 and 3.11.1.2 criteria, respectively, of ≤3 millirem total body and ≤10 millirem any organ. Therefore, the level of radionuclides detected in 1991 had no significant impact on the environment or public.

2.6.2 DEVIATIONS FROM THE REMP

Sediment samples required by ANO Technical Specifications were collected and analyzed during 1991 without exception.

2.6.3 PROGRAM DESCRIPTION

ANO Unit 1 and Unit 2 Specification Tables 4.30-1 and 3.12-1, respectively, require two sediment locations for measurement of radioactivity by the waterborne exposure pathway. Contract personnel collected sediment semiannually from three locations, an indicator (Discharge) and two control locations (Intake and Piney Creek), at distances from 0.1 to 5.9 miles (Table 1-1, Figure 1-3).

A minimum of 1.5 liters of sample was collected with a dredge from the top layer of sediment from each location. After foreign objects were discarded, the samples were transferred to, labeled containers and then analyzed for gamma radionuclides.

TABLE 2-2

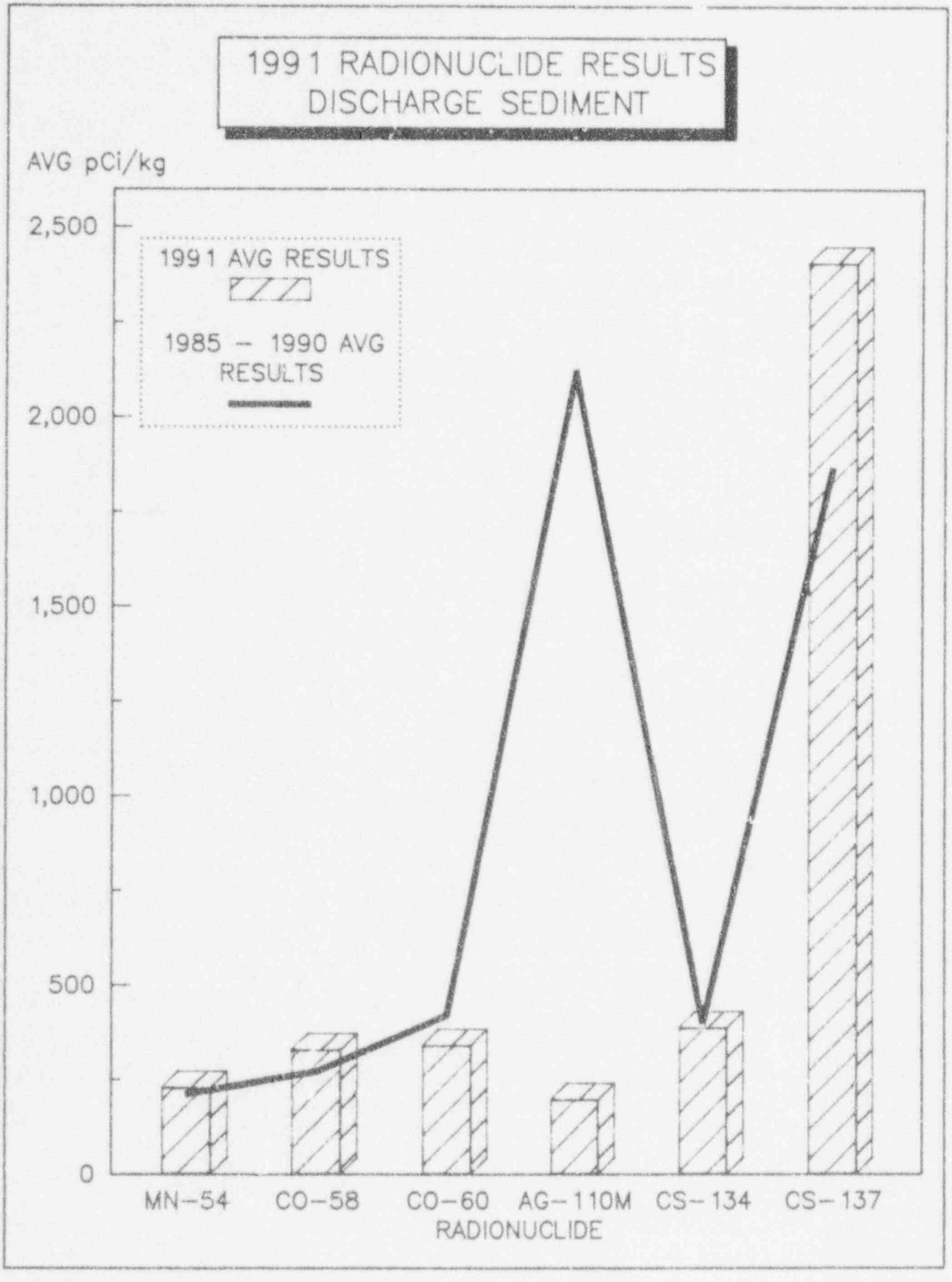
1985 - 1991 DISCHARGE SEDIMENT ANALYTICAL SUMMARY

Radionuclide	1985 Mean (pCi/kg)	1986 Mean (pCi/kg)	1987 Mean (pCi/kg)	1988 Mean (pCi/kg)	1989 Mean (pCi/kg)	1990 Mean (pCi/kg)	1991 Mean (pCi/kg)	1985 - 1991 Range (pCi/kg)
Mn-54	54.6	20	30	359	606	204	228	15 - 953
Co-58	133.2	62	162	901	246	126	338.5	54 - 901
Co-60	654.3	305	326	426	508	304	340.5	40 - 673
Ag-110m	ND*	ND*	ND*	4130	1535	690	197	117 - 4130
Cs-134	329.4	238	316	554	658	290	387	30.6 - 856
Cs-137	1486	1186	1436	1793	3200	2087	2404.5	39 - 4560

* None detected

FIGURE 2-4

DISCHARGE SEDIMENT



2.7 FISH

NOTE #1: Analytical results are presented in Tables 6.1 through 6.3 of Attachment I and summarized in Section 4.0.

2.7.1 INTERPRETATIONS AND TRENDS OF RESULTS

Fish samples were collected semiannually from two locations and analyzed for gamma radionuclides. As in previous years, Cesium-134 and Cesium-137 were detected in fish from the discharge. Cesium-134 activity was at a range of 13 - 36 pCi/kg with a mean of 23 pCi/kg and, Cesium-137 activity at a range of 14 - 73 pCi/kg with a mean of 41.2 pCi/kg.

However, no reporting levels as outlined in ANO Unit 1 and Unit 2 Technical Specification Tables 4.30-3 and 3.12.3, respectively, were exceeded when averaged over any calendar quarter. Also as shown in Figure 2-5, all detectable activities over previous years were well below the required LLD, and therefore, contains a degree of uncertainty. Overall, the operation of ANO had no significant radiological impact upon the environment or public by this pathway.

2.7.2 DEVIATIONS FROM THE REMP

Fish samples required by ANO Technical Specifications were collected and analyzed during 1991 without exception.

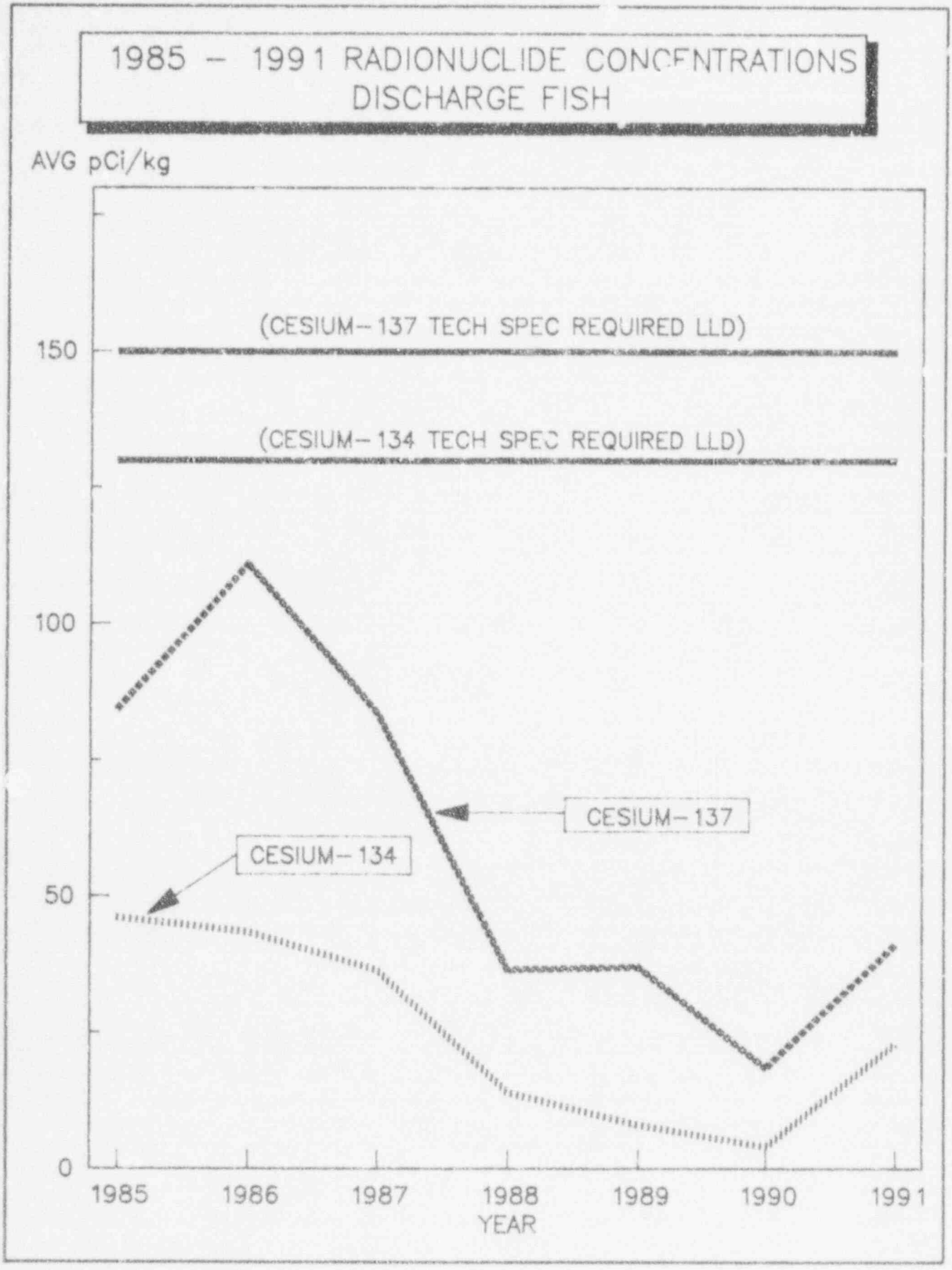
2.7.3 PROGRAM DESCRIPTION

ANO Unit 1 and Unit 2 Technical Specification Tables 4.30-1 and 3.12-1, respectively, requires two fish locations for measurement of radioactivity by the ingestion exposure pathway. Fish were collected semiannually by a contractor from two locations, an indicator (Discharge) and a control (Intake) at distances from 0.1 to 0.9 miles (Table 1-1, Figure 1-3). In addition, the Arkansas Department of Health and ANO split samples at the discharge location.

A sufficient amount was collected from each location to provide a minimum of 1000 grams (wet weight) of eviscerated fish sample. The samples were than analyzed for gamma radionuclides.

FIGURE 2-5

DISCHARGE FISH



2.8 ANNUAL LAND USE CENSUS

2.8.1 INTERPRETATIONS AND TRENDS OF RESULTS

The 1991 Annual Land Use Census identified a new milk-producing location at 345°, 2.8 miles from the plant. These individual milk animals belong to Byran Irby, who agreed to provide milk for the ANO REMP. In addition, the True-X goat dairy has gone out of business since the 1990 Annual Land Use Census.

As a result of the Census, the Offsite Dose Calculation Manual (ODCM) was revised and approved on January 21, 1992 to incorporate these changes. The ODCM revision will be reported in the Semiannual Radioactive Effluent Release Report for the first and second quarters of 1992 to the NRC. Results of the 1991 Land Use Census are presented in Tables 2-3 and 2-4.

2.8.2 DEVIATIONS FROM THE REMP

The Annual Land Use Census required by ANO Technical Specifications was conducted during 1991 without exception.

2.8.3 PROGRAM DESCRIPTION

REMP personnel conducted an Annual Land Use Census, as required by ANO Unit 1 and Unit 2 Technical Specifications 4.30 and 3/4.12.2, respectively. The purpose of the census was to identify changes in uses of land within five miles of ANO which would require modifications to the REMP or ODCM. The most important criteria during the census were to determine location, in each of the 16 meteorological sectors, of the nearest:

- Residence
- Animal milked for human consumption
- Garden of greater than 50 m^2 (500 ft^2) producing broadleaf vegetation.

The method used for conducting the 1991 Land Use Census was as follows:

- o REMP personnel conducted door-to-door field surveys in each meteorological sector out to five miles in order to locate the nearest resident, milk animal and garden.

- o Consultation with local agricultural authorities was used in instances when personal contact could not be made.

- o As a result of these surveys, the following information was obtained in each meteorological sector:

  - Nearest permanent residence
  - Nearest garden and approximate size
  - Nearest milking animal.

- o REMP personnel identified locations on the map, measured distances to ANO and recorded results.

- o REMP personnel compared 1991 Census results to 1990 Census results.

TABLE 2-3

1991 LAND USE CENSUS

LAND USE CENSUS OF MILK-PRODUCING ANIMALS WITHIN A RADIUS OF FIVE (5) MILES OF ARKANSAS NUCLEAR ONE

(July 15 - 16, 1991)

Milk - producing animals are divided into two categories defined as:

1. Class A Dairies: daries in which milk is intended primarily for human consumption as Grade A milk.

2. Individual Milk Animals: family animals in which the milk is intended for home use.

CLASS A DARIES

Dairy	Azimuth - Distance
James Gibson	358 degrees - 3.8 miles

INDIVIDUAL MILK ANIMALS

Bryan Irby	345 degrees - 2.8 miles

CURRENTLY SAMPLED MILK-PRODUCING ANIMALS

CLASS A DARIES

Dairy	Azimuth - Distance
James Gibson	358 degrees - 3.8 miles
Arkansar Tech. Univ. Dairy	95 degrees - 5.1 miles
Harold Steuber (alternate)	24 degrees - 6.9 miles
Lawrence Steuber	0 degrees - 7.5 miles
Hudson Dairy (control)	73 degrees - 12.4 miles

INDIVIDUAL MILK ANIMALS

None

LAND USE CENSUS
ARKANSAS NUCLEAR ONE

(July 15 - 16, 1991)

LOCATION OF NEAREST RESIDENCES

Sector	Resident	Location	Distance (miles)
1	S. Lynn	Hwy 333	0.7
2	R. Horn	Hwy 64	1.2
3	B. West	Hwy 333	1.3
4	Knight	Knight Ln.	0.7
5	O. Bibler	Bibler Ln.	0.9
6	Cravens	Scott Ln.	0.7
7	Douglas	Bunker Hill Ln.	0.8
8	M. Wood	Wood Ln.	0.8
9	J. Kelley	Rt. 2, Box 1204 Dardanelle	2.8
10	Mclurdy	May Rd.	0.8
11	Mhalderman	Hwy 22	3.2
12	G. Shelton	Flatwood Rd.	0.7
13	J. Nichols	Flatwood Rd.	1
14	Shivers	Flatwood Rd.	0.9
15	Stiles	Flatwood Rd.	0.9
16	C. Bohannan	Hwy 64	1.2

TABLE 2-3

1991 LAND USE CENSUS

LAND USE CENSUS
ARKANSAS NUCLEAR ONE

(July 15 - 16, 199[illegible]

DISTANCE TO NEAREST MILK ANIMAL, RESIDENCE AND GARDEN (miles)

Sector	Milk Animal	Residence	Garden
1	3.8	0.7	2.4
2		1.2	3.8
3		1.3	2.3
4		0.7	1.1
5		0.9	0.9
6		0.7	0.[illegible]
7		0.8	0.9
8		0.8	4.2
9		2.8	2.8
10		0.8	0.8
11		3.2	3.4
12		0.7	3.3
13		1	4.2
14		0.9	0
15		0.9	1.6
16	2.8	1.2	1.5

TABLE 2-4

RELATIVE DEPOSITION FOR GARDEN LOCATIONS

Relative Deposition for Garden Locations

(July 15-16,1991)

Sector	Distance (miles)	Distance (meters)	Location or Landowner	Deposition Rate (1/m)	Wind Frequency	Relative Deposition	Notes
1	2.4	3,692	D. Goeden	2.20E-05	3.22E-02	4.89E-10	1
2	3.8	5,846	B. McKenney	1.60E-05	2.67E-02	1.86E-10	1
3	2.3	3,539	A. Horton	2.30E-05	2.25E-02	3.73E-10	1
4	1.1	1,692	Husereau	3.80E-05	4.89E-02	2.80E-09	1
5	0.9	1,385	O. Bibler	4.30E-05	9.03E-02	7.14E-09	1
	0.9	1,385	Intake Canal	4.30E-05	9.03E-02	7.14E-09	2,3
6	0.7	1,077	Cravens	5.00E-05	7.31E-02	8.65E-09	1
	2.2	3,385	H. Hollis	2.30E-05	7.31E-02	1.27E-09	1,3
7	0.9	1,385	C. Stewart	4.80E-05	2.69E-02	2.38E-09	1,3
8	4.2	6,462	T. Race	1.40E-05	1.92E-02	1.06E-10	1
9	2.8	4,308	J. Kelley	1.80E-05	2.63E-02	2.80E-10	1
10	0.8	1,231	McClurdy	4.80E-05	4.47E-02	4.44E-09	1
11	3.4	5,231	D. Johnson	1.70E-05	8.60E-02	7.12E-10	1
12	3.3	5,077	Underwood	1.70E-05	1.37E-01	2.17E-09	1
13	0.5	769	Flatwood Rd.	6.40E-05	1.59E-01	3.37E-08	2,3
	4.2	6,462	B. Garrison	1.40E-05	1.59E-01	8.77E-10	1
14	0.9	1,385	Shivers	4.30E-05	9.08E-02	7.18E-09	1
	4.1	6,308	D Gregory	1.40E-05	9.08E-02	5.13E-10	1,3
15	1.6	2,462	L. Richards	2.80E-05	6.06E-02	1.76E-09	1
	2.4	3,692	R. Jones	2.20E-05	6.06E-02	9.20E-10	1,4
16	1.5	2,308	R. Vincent	2.90E-05	4.03E-02	1.29E-09	1

Note 1 Food product samples
Note 2 Non-food broadleaf samples
Note 3 Location currently sampled
Note 4 Location currently an alternate
Note 5 Locaction to be added

SECTION 3.0

ANALYTICAL PROGRAM TECHNICAL DESCRIPTION

3.1 SAMPLE HANDLING AND TREATMENT

Once a representative sample is received by analytical laboratory, laboratory staff is responsible for properly treating and storing the sample. Environmental samples frequently require treatment prior to analysis. Treatment of the sample after it is received depends on sample and analyses to be performed.

3.1.1 Water Samples

Depending on sample type, one-gallon water samples were acidified with five to twenty ml of concentrated HCl acid when collected. Samples for tritium analyses should not be stored in polyethylene bottles for more than 3 or 4 months because water can evaporate through polyethylene.

3.1.2 Air Filters

Air filters were handled with care when heavy dust loadings were observed because particulate matter is easily removed from filter. Air filters were normally received by laboratory in plastic containers; some extremely low-level analyses required analysis of the container as well as sample.

3.1.3 Milk

Milk samples were usually refrigerated until analyses could be performed. Milk samples analyzed for Iodine-131 had 100 ml formaldehyde added to avoid binding of the iodine that may occur with smaller levels of formaldehyde.

3.1.4 Soil and Bottom Sediment

Soil and sediment samples were dried, pulverized and sieved before analysis. To ensure a homogeneous sample, thorough mixing was required.

3.1.5 Other Samples

Perishable samples were preserved by refrigeration or freezing. Vegetation and other samples may need to be dried, pulverized or ashed before or after analysis for long-term storage.

3.2 ANALYSIS OF AIR SAMPLES FOR GROSS ALPHA/BETA RADIONUCLIDES

Air filters were counted in a low-background alpha-beta counter at least 24 hours after collection in order to allow for decay of short-lived materials such as radon and thoron.

Calculations of the results, two sigma error and lower limit of detection (LLD) were performed as indicated in the following:

ALPHA RESULT (pCi/m3) $= [(N/T)-(B/t)]/(2.22 \cdot V \cdot E)$

BETA RESULT (pCi/m3) $= [(N/T)-(B/t)-(r)(N/T)]/(2.22 \cdot V \cdot E)$

TWO SIGMA ERROR (pCi/m3) $= 1.96 \sqrt{(N/T^2)+(B/t^2)}/(2.22 \cdot V \cdot E)$

LLD (pCi/m3) $= 4.66 \sqrt{(B)}/(2.22 \cdot V \cdot E \cdot t)$

where:

N	=	Gross counts of sample
T	=	Number of minutes sample was counted
B	=	Counts of blank
t	=	Number of minutes blank was counted
2.22	=	dpm/pCi
V	=	Sample aliquot size (cubic meters)
E	=	Counting efficiency
r	=	Ratio of alpha counts in beta counting (cross-talk)

3.3 ANALYSIS OF WATER SAMPLES FOR GROSS ALPHA/BETA RADIONUCLIDES

Section 3.3 describes process used to measure overall alpha-beta radionuclides of water samples without identifying specific radioactive isotope present. No chemical separation techniques were involved. Two hundred ml of sample was evaporated in a beaker at approximately 100°C. The residue was transferred and dried in a 2-inch stainless steel planchet.

The planchets were counted for 100 minutes in a low-background alpha-beta counting system. Calculation of activity includes a self-absorption correction factor for counter efficiency based on weight of residue on each planchet.

Calculations of the results, two sigma error and lower limit of detection (LLD) were performed as indicated in the following:

ALPHA RESULT (pCi/l) $= [(N/T)-(B/t)]/(2.22 \cdot V \cdot E)$

BETA RESULT (pCi/l) $= [(N/T)-(B/t)-(r)(N/T)]/(2.22 \cdot V \cdot E)$

TWO SIGMA ERROR (pCi/l) $= 1.96 \sqrt{(N/T^2)+(B/t^2)}/(2.22 \cdot V \cdot E)$

LLD (pCi/l) $= 4.66 \sqrt{(B)}/(2.22 \cdot V \cdot E \cdot t)$

where:

N	=	Gross counts of sample
T	=	Number of minutes sample was counted
B	=	Counts of blank
t	=	Number of minutes blank was counted
2.22	=	dpm/pCi
V	=	Sample aliquot size (liters)
E	=	Counting efficiency
r	=	Ratio of alpha counts in beta counting (cross-talk)

If net activity [(N/T) - (B/t)] was equal to or less than counting error, the activity on collection date was below limits of detection and was designated less than the lower limit of detection (LLD).

3.4 ANALYSIS OF WATER SAMPLES FOR TRITIUM

Five milliliters of water was added to 15 ml of liquid scintillation solution in a 25 ml vial. The sample was inserted into a liquid scintillation spectrometer and counted for 300-500 minutes.

Calculations of the results, two sigma error and lower limit of detection (LLD) were performed as indicated in the following:

$$\text{RESULT (pCi/l)} = [(N/T)-(B/t)]/[(2.22 \cdot V \cdot E)\ \exp(-\lambda \Delta t_2)]$$

$$\text{TWO SIGMA ERROR (pCi/l)} = 1.96\ \sqrt{(N/T^2)+(B/t^2)}/[(2.22 \cdot V \cdot E)\ \exp(-\lambda \Delta t_2)]$$

$$\text{LLD (pCi/l)} = \frac{4.66\ \sqrt{B}}{2.22 \cdot E \cdot V \cdot t \cdot \exp(-\lambda \Delta t_2)}$$

where:

N	= Gross counts of sample
T	= Number of minutes sample was counted
B	= Counts of blank
t	= Number of minutes blank was counted
2.22	= dpm/pCi
V	= Sample aliquot size (l)
E	= Counting efficiency
$\exp(-\lambda \Delta t_2)$	= Decay correction where Δt_2 is time elapsed between collection of sample and date of counting.

3.5 ANALYSIS OF SAMPLES FOR IODINE-131

Up to four liters of sample was thoroughly mixed with a stable iodine carrier solution. The sample was then passed through an anion exchange resin column to remove iodine from the sample. The iodine was then stripped from the resin with a sodium hypochlorite solution, reduced with hydroxylamine hydrochloride and extracted into carbon tetrachloride as free iodine. It was then back-extracted into sodium bisulfite solution and was precipitated as silver iodide. The precipitate was weighed to determine chemical yield and mounted on a stainless steel planchet for low-level beta counting. The chemical yield was corrected by measuring the stable iodide content of milk or water with a specific ion electrode.

Calculations of the results, two sigma error and lower limit of detection (LLD) were performed as indicated in the following:

$$\text{RESULT (pCi/l)} = (N/t - B/t)/[(2.22 \cdot E \cdot V \cdot Y)\exp(-\lambda \Delta t_2)]$$

$$\text{TWO SIGMA ERROR (pCi/l)} = (1.96 \sqrt{(N/t^2)+(B/t^2)})/[(2.22 \cdot E \cdot V \cdot Y)\exp(-\lambda \Delta t_2)]$$

$$\text{LLD (pCi/l)} = (4.66 \sqrt{(B/t^2)})/[(2.22 \cdot E \cdot V \cdot Y)\exp(-\lambda \Delta t_2)]$$

where:

N	= Total counts from sample (counts)
t	= Counting time for sample (min)
B	= Total counts of blank (counts)
2.22	= dpm/pCi
E	= Efficiency of the counter for Iodine I-131 corrected for self absorption effects
V	= Volume of sample analyzed
Y	= Chemical yield of the amount of sample counted
$\exp(-\lambda \Delta t_2)$	= Decay factor from the time of collection to the counting date

3.6 ANALYSIS OF SAMPLES FOR GAMMA RADIONUCLIDES

3.6.1 Milk and Water

A 3.5-liter Marinelli beaker was filled with a representative aliquot of the sample. The sample was then counted for a minimum of 240 minutes, or until required LLDs were achieved, in a shielded Germanium-Lithium (GeLi) detector coupled to a computer-based data acquisition system which performed a pulse height analysis.

A computer software program defined peaks by certain changes in slope of the spectrum. The program also compared energy of each peak with a library of peaks for radionuclide identification and then performed calculation using appropriate fractional gamma ray abundance, half life, detector efficiency and net counts in the peak region.

3.6.2 Vegetation, Food and Garden Crops, and Fish

A maximum quantity of undried vegetation, food or garden crop sample was loaded into a tared 3.5-liter Marinelli beaker and weighed. The sample was then counted for a minimum of 200 minutes, or until required LLDs were achieved, in a shielded GeLi detector as described in Section 3.6.1.

As much as possible (up to the total sample) of the edible portion of a fish was loaded into a tared Marinelli beaker and weighed. The sample was then diluted with deionized water to weigh 3.5 kg and counted for a minimum of 240 minutes in a shielded GeLi detector as described in Section 3.6.1.

3.6.3 Soils and Sediments

Soils and sediments were dried at a low temperature (less than 100°C), loaded into a tared 1.0-liter Marinelli beaker and weighed. The sample was then counted for 240 minutes, or until required LLDs were achieved, in a shielded GeLi detector as described in Section 3.6.1.

3.6.4 Charcoal Cartridges

Charcoal cartridges were counted in a Marinelli beaker, with one to four cartridges positioned on the face of a GeLi detector and up to seven cartridges on its side. Each detector was calibrated for both top and side positions and a counting efficiency determined. The Iodine-131 detection limit was determined for each charcoal cartridge, assuming no positive results for Iodine-131, by utilizing smallest volume of air recorded for a cartridge within Marinelli

beaker. If Iodine-131 was observed in the screening count of a set of cartridges, each charcoal cartridge was positioned on face of the detector and then counted separately.

3.6.5 Air Particulate

The 12 to 14 (depending on the calendar quarter) air particulate filters for a quarterly composite for each field station were stacked one on top of another and counted for at least four hours, or until required LLDs were achieved, in a shielded GeLi detector as described in Section 3.6.1.

The calculations of results, two sigma error and lower limit of detection (LLD) in pCi/volume or pCi/mass were performed as indicated in the following:

$$\text{RESULT} = (S-B)/[(2.22 \cdot T \cdot E \cdot V \cdot F)\ \exp(-\lambda \Delta t_2)]$$

$$\text{TWO SIGMA ERROR} = (1.96\ \sqrt{S+B})/[(2.22 \cdot T \cdot E \cdot V \cdot F)\ \exp(-\lambda \Delta t_2)]$$

$$\text{LLD} = (4.66\ \sqrt{B})/[(2.22 \cdot T \cdot E \cdot V \cdot F)\ \exp(-\lambda \Delta t_2)]$$

where:

S	=	Area, in counts, of sample peak and background (region of spectrum of interest)
B	=	Background area, in counts, under sample peak, determined by a linear interpolation of the representative backgrounds on either side of the peak
2.22	=	dpm/pCi
T	=	Length of time in minutes the sample was counted
E	=	Detector efficiency for energy of interest and geometry of sample
V	=	Sample aliquot size (liters, cubic meters, kilograms, or grams)
F	=	Fractional gamma abundance (specific for each emitted gamma)
$\exp(-\lambda \Delta t_2)$	=	Decay factor from the time of collection to the counting date

3.7 THERMOLUMINESCENT DOSIMETERS (TLDs)

Environmental radiation doses were measured using TLDs that contained two lithium borate and calcium sulfate elements. Approximately forty-eight hours prior to installation, the TLDs were annealed. After cooling, the TLDs were mounted in appropriate labeled blue clamshell type hangers and double sealed in whirl-pak, or similar protective covering. Upon return from the field, TLDs were read in a Panasonic UD-710A TLD Reader.

SECTION 4.0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

4.1 1991 PROGRAM RESULTS SUMMARY*

Results of the REMP for 1991, which includes all sampling locations, are summarized in Table 4-1. This summary also includes those samples split with the Arkansas Department of Health. Indicator and control locations for this table are summarized in Table 4-2. For determining ranges and means for indicator and control locations, values reported as less than (<) were not used.

* Analytical results were provided by Entergy Services, Inc. System Chemistry Section, formerly Arkansas Power & Light Company's Technical Analysis Section, with exception of thermoluminescent dosimeter analysis provided by ANO Dosimetry Section.

Table 4-1
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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility ANO - Units 1 and 2 Docket No. 50-313 and 50-368

Location of Facility Pope, Arkansas Reporting Period January - December 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
				Location [d]	Mean (F) [Range]		
Air Particulates (pCi/m^3)	GB 311	0.01	.015 (205/207) [.001 - .038]	Station 1 (88°, 0.6 mi)	.018 (50/51) [.008 - .038]	.016 (104/104) [.004 - .034]	0
	GS 24						
	Cs-134	0.01	<LLD	N/A	N/A	<LLD	0
	Cs-137	0.01	<LLD	N/A	N/A	<LLD	0
Airborne Iodine (pCi/m^3)	I-131 311	0.07	<LLD	N/A	N/A	<LLD	0
TLD (0-2 Miles) (mR/Qtr.)	Gamma 44	(f)	27.2 (44/44) [18 - 43]	Station 1 (88°, 0.6 mi.)	31.5 (4/4) [20 - 43]	N/A	0
TLD (2-5 Miles) (mR/Qtr.)	Gamma 57	(f)	24.5 (57/57) [17 - 46]	Station 135 (158°, 3.2 mi.)	31.0 (4/4) [22 - 46]	N/A	0
TLD (>5 Miles) (mR/Qtr.)	Gamma 72	(f)	N/A	N/A	N/A	26.3 (72/72) [19 - 40]	0
TLD (0-2 Miles) (mR/192 Days)	Gamma 8	(f)	45.1 (8/8) [32 - 54]	Station 3 (0°,0.6 mi.)	48.0 (2/2) [42 - 54]	N/A	0
TLD (>5 Miles) (mR/192 Days)	Gamma 4	(f)	N/A	N/A	N/A	44.5 (4/4) [34 - 54]	0

Table 4-1
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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility ANO - Units 1 and 2 Docket No. 50-313 and 50-368

Location of Facility Pope, Arkansas Reporting Period January - December 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean [d] Location	Mean (F) [Range]	Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
Drinking Water (pCi/l)	GB 13	4	N/A	N/A	N/A	3.5 (5/13) [1.0 - 6.1]	0
	I-131 13	1.0	N/A	N/A	N/A	0.2 (1/13) [N/A]	0
	H-3 4	1000	N/A	N/A	N/A	<LLD	0
	GS 13						
	Mn-54	15	N/A	N/A	N/A	<LLD	0
	Fe-59	30	N/A	N/A	N/A	<LLD	0
	Co-58	15	N/A	N/A	N/A	<LLD	0
	Co-60	15	N/A	N/A	N/A	<LLD	0
	Zn-65	30	N/A	N/A	N/A	<LLD	0
	Zr-95	15	N/A	N/A	N/A	<LLD	0
	Nb-95	15	N/A	N/A	N/A	<LLD	0
	Cs-134	10	N/A	N/A	N/A	<LLD	0
	Cs-137	18	N/A	N/A	N/A	<LLD	0
	Ba-140	15	N/A	N/A	N/A	<LLD	0
	La-140	15	N/A	N/A	N/A	<LLD	0
Surface Water (pCi/l)	H-3 32	1000	390.6(5/16) [221-602]	Station 8 (180°, 0.1 mi.)	390.6 (5/16) [221 - 602]	302.8 (4/16) [235 - 378]	0
	GS 48						
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	3.0 (1/24) [N/A]	Station 8 (180°, 0.1 mi.)	3.0(1/24) [N/A]	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	15	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	15	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0

Table 4-1
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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility ANO - Units 1 and 2 Docket No. 50-313 and 50-368

Location of Facility Pope, Arkansas Reporting Period January - December 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
				Location [d]	Mean (F) [Range]		
Groundwater (pCi/l)	H-3 8	1000	<LLD	N/A	N/A	<LLD	0
	GS 8						
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	15	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	15	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0
Milk (pCi/l)	I-131 54	1.0	1.0 (1/42) [N/A]	Station 47 (344°, 2.8 mi.)	1.0 (1/42) [N/A]	<LLD	0
	GS 54						
	Cs-134	15	N/A	N/A	N/A	<LLD	0
	Cs-137	18	4.0 (1/42) [N/A]	Station 47 (344°, 2.8 mi.)	4.0 (1/42) [N/A]	<LLD	0
	Ba-140	15	N/A	N/A	N/A	<LLD	0
	La-140	15	N/A	N/A	N/A	<LLD	0
Vegetation (pCi/kg wet)	I-131 6	60	<LLD	N/A	N/A	N/A	0
	GS 6						
	Cs-134	60	<LLD	N/A	N/A	N/A	0
	Cs-137	80	<LLD	N/A	N/A	N/A	0
Food Products (pCi/kg wet)	I-131 17	60	<LLD	N/A	N/A	N/A	0
	GS 17						
	Cs-134	60	<LLD	N/A	N/A	N/A	0
	Cs-137	80	<LLD	N/A	N/A	N/A	0

Table 4-1
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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility ANO - Units 1 and 2 Docket No. 50-313 and 50-368

Location of Facility Pope, Arkansas Reporting Period January - December 199_
(County, State)

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean: Location [d]	Location with Highest Annual Mean: Mean (F) [Range]	Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
Fish (pCi/kg wet)	GS 10						
	[illegible]	130	<LLD	N/A	N/A	<LLD	0
	[illegible]	260	<LLD	N/A	N/A	<LLD	0
	[illegible]	130	<LLD	N/A	N/A	<LLD	0
	[illegible]	130	<LLD	N/A	N/A	<LLD	0
	Zn-65	260	<LLD	N/A	N/A	<LLD	0
	Cs-134	130	23.0 (3/6) [13 - 36]	Station 8 (180°, 0.1 mi.)	23.0 (3/6) [13 - 36]	<LLD	0
	Cs-137	150	41.2 (6/6) [14 - 73]	Station 8 (180°, 0.1 mi.)	41.2 (6/6) [14 - 73]	20(1/4) [N/A]	0
Bottom Sediments (pCi/kg dry)	GS 6						
	Mn-54	(f)	228 (2/2) [208-248]	Station 8 (180°, 0.1 mi.)	228 (2/2) [208 - 248]	14.5 (2/4) [11 - 18]	0
	Co-58	(f)	338.5 (2/2) [255-422]	Station 8 (180°, 0.1 mi.)	338.5 (2/2) [255 - 422]	15 (2/4) [12 - 18]	0
	Co-60	(f)	340.5 (2/2) [317-364]	Station 8 (180°, 0.1 mi.)	340.5 (2/2) [317 - 364]	<LLD	0
	Ag-110m	(f)	197 (2/2) [117-277]	Station 8 (180°, 0.1 mi.)	197 (2/2) [117 - 277]	<LLD	0
	Cs-134	150	387 (2/2) [315 - 459]	Station 8 (180°, 0.1 mi.)	387 (2/2) [315 - 459]	92 (1/4) [N/A]	0
	Cs-137	180	2404.5 (2/2) [2285 - 2524]	Station 8 (180°, 0.1 mi.)	2404.5 (2/2) [2285 - 2524]	158.8 (4/4) [56-451]	0

a GB = Gross beta; I-131 = Iodine-131; H-3 = Tritium; GS = Gamma scan.

b LLD = Required lower limit of detection based on Arkansas Nuclear One Unit 1 and Unit 2 Technical Specification Tables 4.30-2 and 3.12-2, respectively.

c Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

d Locations are specified (1) by name and (2) degrees relative to reactor site.

e Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

f LLD not defined in ANO Unit 1 and Unit 2 Technical Specification Tables.

TABLE 4-2
Page 1 of 3
INDICATOR & CONTROL LOCATIONS

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
AIR	o Indicators - Station 1 (Met Tower)	51	51 ea. - Gross Beta, I-131; 4-Gamma
	Station 2 (AP&L Lodge)	52	52 ea. - Gross Beta, I-131; 4-Gamma
	Station 3 (Bennett Farm)	52	52 ea. - Gross Beta, I-131; 4-Gamma
	Station 4 (May Cemetary)	52	52 ea. - Gross Beta, I-131; 4-Gamma
	o Controls - Station 6 (Russellville)	52	52 ea. - Gross Beta, I-131; 4-Gamma
	Station 7(AP&L Substation)	52	52 ea. - Gross Beta, I-131; 4-Gamma
TLDs	o Indicators (Quarterly)		
	- 0 - 2 Miles Stations 1, 2, 3, 4, 108, 109, 110, 113, 114, 115, 116	44	44-Gamma
	- 2 - 5 Miles Stations 111, 112, 119, 120, 121, 122, 123, 124, 130, 131, 133, 134, 135, 136, 141	57	57-Gamma
	o Controls (Quarterly)		
	- >5 Miles Stations 5, 6, 7, 117, 118, 125, 126, 127, 128, 129, 132, 137, 138, 139, 140, 142, 143, 144	72	72-Gamma
	o Indicators (Semiannually)		
	- 0 - 2 Miles Station 1, 2, 3, 4	8	8-Gamma
	o Controls (Semiannually)		
	- >5 Miles Stations 5, 6, 7	4	4-Gamma

TABLE 4-2

INDICATOR & CONTROL LOCATIONS

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
· WATER	Drinking		
	o Indicator - None	N/A	N/A
	o Control - Station 14 (Russellville)	13	13 ea. - Gross Beta, I-131, Gamma;
· WATER (cont'd)	Surface		
	o Indicator - Station 8 (Discharge)	24	16-Tritium (H-3); 24-Gamma
	o Controls		
	Station 10 (Intake)	12	4-Tritium (H-3); 12-Gamma
	Station 16 (Piney Creek)	12	12-Tritium (H-3); 12-Gamma
	Groundwater		
	o Indicator - Station 32 (Stewarts)	4	4 ea. - Tritium (H-3), Gamma
	o Control - Station 33 (Quita Lake)	4	4 ea. - Tritium (H-3), Gamma
· MILK	o Indicators	N/A	
	Station 19 (Arkansas Tech)	12	12 ea. - I-131, Gamma
	Station 37 (Steuber)	13	13 ea. - I-131, Gamma
	Station 41 (Gibson)	12	12 ea. - I-131, Gamma
	Station 47 (Irby)	5	5 ea. - I-131, Gamma
	o Control - Station 42 (Hudson)	12	12 ea. - I-131, Gamma

TABLE 4-2
Page 3 of 3
INDICATOR & CONTROL LOCATIONS

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
· VEGETATION	o Indicators -		
	Station 13 (Flatwood Road)	3	3 ea. - I-131, Gamma
	Station 45 (Intake Canal)	3	3 ea. - I-131, Gamma
	o Control - None	N/A	N/A
· FOOD PRODUCTS	o Indicators		
	Station 32 (Stewart Residence)	3	8 ea. - I-131, Gam
	Station 38 (Jones Res[illegible]ce)	3	3 ea. - I-131, Gamma
	Station 40 (Hollis Res[illegible]ence)	4	4 ea. - I-131, Gamma
	Station 46 (Gregory Garden)	2	2 ea. - I-131, Gamma
	o Controls - None	N/A	N/A
· FISH	o Indicator - Station 8 (Discharge)	6	6-Gamma
	o Control - Station 10 (Intake)	4	4-Gamma
· SEDIMENT	o Indicator - Station 8 (Discharge)	2	2-Gamma
	o Controls -		
	Station 10 (Intake)	2	2-Gamma
	Station 16 (Piney Creek)	2	2-Gamma

SECTION 5.0

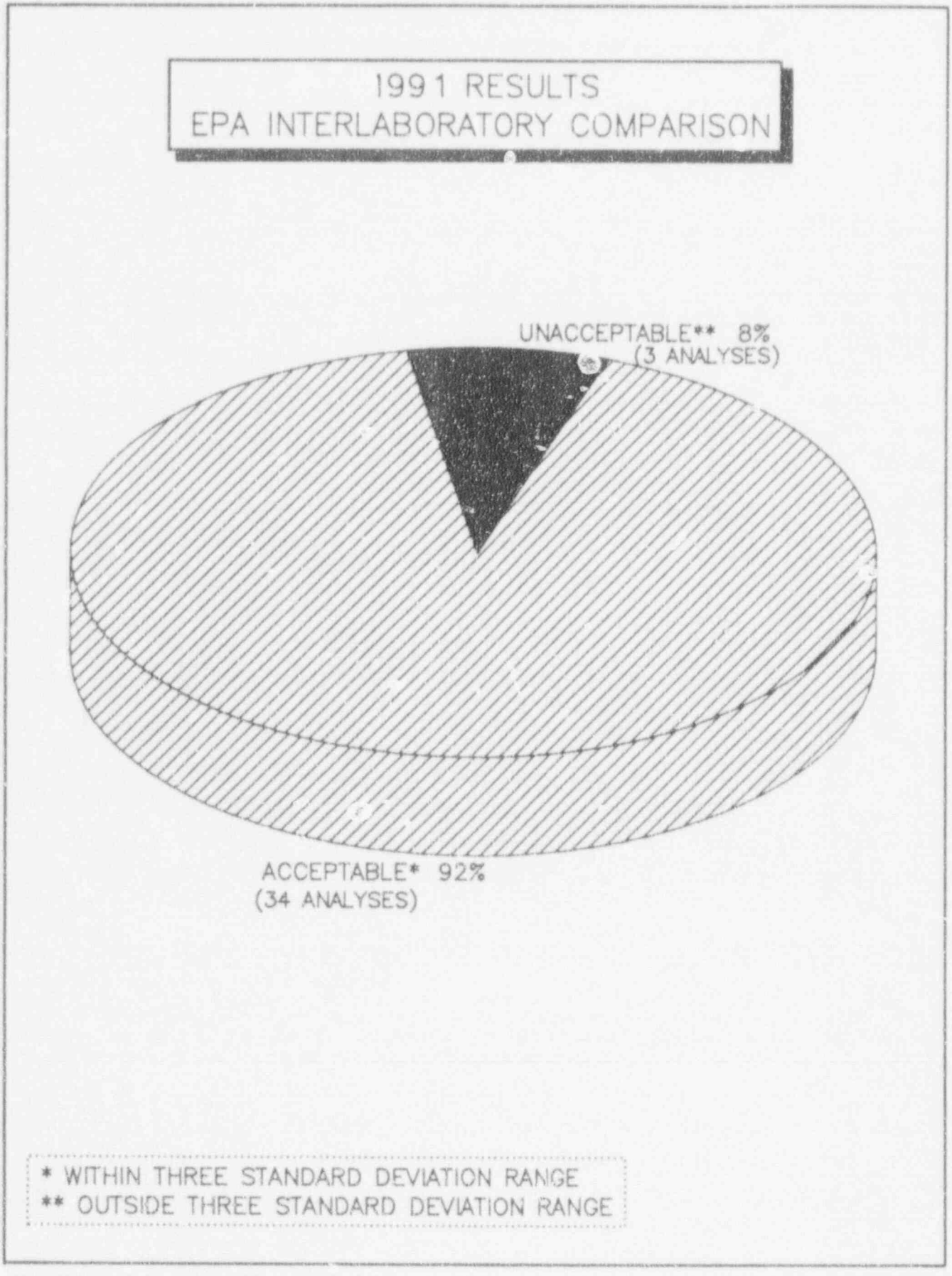
QUALITY CONTROL DATA

5.1 CROSSCHECK PROGRAM RESULTS

To fulfill the requirements of ANO Unit 1 and Unit 2 Technical Specifications 4.30.3 and 3/4.12.3, respectively, Entergy Services, Inc. (ESI) System Chemistry Section, formerly Arkansas Power & Light's Technical Analysis Section analyzed Environmental Protection Agency (EPA) crosscheck samples for ANO. These results are provided in Attachment I, 1991 Radiological Environmental Monitoring Program Report. ESI System Chemistry's analysis participation shown in Figure 5-1, indicate that consistent, valid data is reported based on acceptable sample results.

FIGURE 5-1

EPA INTERCOMPARISON STUDY



SECTION 6.0

1991 SAMPLING AND ANALYTICAL RESULTS

6.1 1991 DATA

Attachments 1 and II presents analytical data obtained by Entergy Services, Inc. (ESI) System Chemistry Section, formerly Arkansas Power and Light's Technical Analysis Section and Arkansas Nuclear One's Dosimetry Section on samples collected from January through December 1991. Data was provided by ESI System Chemistry in monthly progress reports with exception of thermoluminescent dosimeters (TLDs). Arkansas Nuclear One's Dosimetry Section provided TLD data in quarterly and semiannual reports.

Data presented in Attachments I and II is comparable to that encountered in previous years.

6.2 LOWER LIMIT OF DETECTION (LLD)

In many analyses, the LLD achieved by ESI System Chemistry Laboratory was lower than maximum LLD required by ANO Unit 1 and Unit 2 Technical Specification Tables 4.30-2 and 3.12-2, respectively. Factors such as unavoidable small sample size, background fluctuations, presence of interfering radionuclides or other uncontrollable circumstances may cause Technical Specification LLD to be unachievable. However, in 1991 all Technical Specification LLDs were achieved.

6.3 REPORTING LEVELS

Radioactivity attributable to ANO was found in surface water, sediment and fish from the discharge. However, no reporting levels for radioactivity concentration in environmental samples, as outlined in ANO Unit 1 and Unit 2 Technical Specification Tables 4.30-3 and 3.12-3, respectively, when averaged over any calendar quarter, were equaled or exceeded due to ANO effluents. One radionuclide (Silver-110m), which is not listed in ANO Technical Specification Tables 4.30-3 and 3.12-3, was detected during 1991 in the discharge sediment. However as seen in Attachment IV, the quantity detected was not capable of causing a dose to a member of the public exceeding calendar year limits of Unit 1 and Unit 2 Technical Specifications 3.25.1.2 and 3.11.1.2, respectively, of 3

millirem total body and 10 millirem any organ. Therefore, the radiological impact to the environment or public from Silver-110m was insignificant and no Radiological Monitoring Special Reports were required.

6.4 SAMPLING DEVIATIONS

Samples required by ANO Unit 1 and Unit 2 Technical Specifications 4.30.1 and 3/4.12.1, respectively, were collected within the scheduled period unless noted otherwise in Attachments I and II.

Sample deviations at locations required by ANO Technical Specifications are discussed in Sections 2.1 through 2.7. These sections provide more explanation concerning reasons why samples were missed and describes corrective action where appropriate.

6.5 RADIOACTIVITY NOT ATTRIBUTABLE TO ANO

Radioactivity attributable to other sources has been detected by the ANO REMP in 1977, 1978 and 1981 following nuclear weapons testing. The most recent incident occurred in May 1986 when the radioactive plume release due to reactor core degradation at Chernobyl Nuclear Power Plant was detected.

6.6 SAMPLING RELOCATION

There were two changes to the ANO REMP that occurred in 1991 as a result of the Annual Land Use Census. An additional milk sampling location (B. Irby) was added and the True-X goat dairy location deleted. Revisions to the ODCM were made and will be reported in the Semiannual Radioactive Effluent Release Report for the first and second quarters of 1992.

6.7 COMPARISON TO FEDERAL AND STATE PROGRAMS

Data from the ANO REMP was compared to federal and state monitoring programs as results became available. The federal monitoring program used for comparison was the U.S. Nuclear Regulatory Commission (NRC) TLD Direct Radiation Monitoring Network. The state program is conducted by the Arkansas Department of Health.

The latest available results from the NRC TLD Network, which cover 16 collocated TLD locations, have been compared to those from the ANO REMP. Prior to 1991, no change in TLD results has been attributed to ANO operation. Radiological monitoring by the Arkansas Department of Health entails similar sampling requirements as the ANO REMP. In many cases air samples and TLDs are collocated, while sample media such as food products, water, milk and fish are shared or split. Through 1991, both programs have obtained results that are within similar ranges. The only common location where radioactivity attributable to ANO has been detected is the ANO discharge. Discharge water, sediment and fish results were above background due to ANO effluents.

6.8 UNAVAILABLE RESULTS

Analytical contractor results were received in adequate time for inclusion. No missing results were identified during REMP personnel's review of these results.

6.9 HARMFUL EFFECTS OR IRREVERSIBLE DAMAGE

No harmful effects or evidence of irreversible damage were detected by REMP monitoring. Therefore, no analysis or planned course of action to alleviate problems was necessary.

ATTACHMENT I

1991 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REPORT

ARKANSAS NUCLEAR ONE
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
December, 1991

PREPARED BY:

SYSTEM CHEMISTRY SECTION
ENTERGY SERVICES, INC.

ANO
RADIOLOGICAL MONITORING REPORT

Table of Contents

Summary of Monitoring Results

Plant-related isotopes were detected in bottom sediments collected from the ANO Discharge Basin.

Table No.: 1.1

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 01,Met Tower

Lab No.	Begin Date	End Date	Gross-Be	I-131
910140	01/01/91	01/08/91	0.038 +/-0.003	< 0.037
910147	01/08/91	01/15/91	0.038 +/-0.003	< 0.018
910184	01/15/91	01/22/91	0.029 +/-0.003	< 0.021
910251	01/22/91	01/29/91	0.033 +/-0.003	< 0.024
910271	01/29/91	02/05/91	0.025 +/-0.003	< 0.031
910313	02/05/91	02/12/91	0.029 +/-0.003	< 0.025
910337	02/12/91	02/19/91	0.016 +/-0.003	< 0.025
910418	02/19/91	02/26/91	0.016 +/-0.003	< 0.034
910454	02/26/91	03/05/91	0.009 +/-0.002	< 0.017
910537	03/05/91	03/12/91	0.018 +/-0.003	< 0.028
910519	03/12/91	03/19/91	0.009 +/-0.002	< 0.017
910618	03/19/91	03/26/91	0.013 +/-0.003	< 0.042
910675	03/26/91	04/02/91	0.017 +/-0.003	< 0.023
910709	04/02/91	04/09/91	0.014 +/-0.003	< 0.037
910765	04/09/91	04/16/91	0.010 +/-0.002	< 0.019
910772	04/16/91	04/24/91	0.016 +/-0.002	< 0.015
910803	04/24/91	04/30/91	0.013 +/-0.003	< 0.043
910854	04/30/91	05/07/91	0.008 +/-0.002	< 0.028
910889	05/07/91	05/14/91	0.012 +/-0.002	< 0.035
910919	05/14/91	05/21/91	0.011 +/-0.002	< 0.019
910949	05/21/91	05/28/91	0.010 +/-0.002	< 0.033
911022	05/28/91	06/04/91	0.011 +/-0.002	< 0.030
911056	06/04/91	06/11/91	0.015 +/-0.002	< 0.026
911091	06/11/91	06/18/91	0.012 +/-0.002	< 0.027
911196	06/18/91	06/25/91	0.015 +/-0.002	< 0.050

= Control Location * = Low Level Analysis

Table No.: 1.1a

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 01,Met Tower

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911232	06/25/91	07/02/91	0.019 +/-0.002	< 0.019
911294	07/02/91	07/09/91	0.012 +/-0.002	< 0.033
911304	07/09/91	07/16/91	0.021 +/-0.002	< 0.019
911365	07/16/91	07/23/91	0.024 +/-0.002	< 0.031
911421	07/23/91	07/30/91	0.017 +/-0.002	< 0.032
911441	07/30/91	08/06/91	0.016 +/-0.002	< 0.029
911455	08/06/91	08/13/91	0.014 +/-0.002	< 0.027
911481	08/13/91	08/20/91	0.016 +/-0.002	< 0.016
911518	08/20/91	08/27/91	0.021 +/-0.002	< 0.036
911583	08/27/91	09/03/91	0.024 +/-0.001	< 0.022
911616	09/03/91	09/10/91	0.012 +/-0.002	< 0.030
911640	09/10/91	09/17/91	0.019 +/-0.002	< 0.036
911706	09/17/91	09/24/91	0.028 +/-0.003	< 0.031
911769	09/24/91	10/01/91	0.016 +/-0.002	< 0.055
911807	10/01/91	10/08/91	PUMPFAILED	
911814	10/08/91	10/15/91	0.022 +/-0.002	< 0.026
911912	10/15/91	10/22/91	0.018 +/-0.002	< 0.021
911979	10/22/91	10/29/91	0.013 +/-0.002	< 0.023
912017	10/29/91	11/05/91	0.025 +/-0.002	< 0.045
912039	11/05/91	11/12/91	0.025 +/-0.003	< 0.021
912058	11/12/91	11/19/91	0.025 +/-0.001	< 0.017
912125	11/19/91	11/26/91	0.008 +/-0.002	< 0.031
912153	11/29/91	12/03/91	< 0.007	< 0.031
912207	12/03/91	12/10/91	0.025 +/-0.003	< 0.039
920032	12/10/91	12/17/91	0.026 +/-0.003	< 0.053

= Control Location * = Low Level Analysis

Table No.: 1.1b

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 01,Met Tower

Lab No.	Begin Date	End Date	Gross-Beta	I-131
920046	12/17/91	12/23/91	0.015 +/-0.002	< 0.070
920039	12/23/91	12/31/91	0.020 +/-0.003	< 0.027

= Control Location * = Low Level Analysis

Table No.: 1.2
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: 02,SW of Site

Lab No.	Begin Date	End Date	Gross-Beta	I-131
910141	01/01/91	01/08/91	0.027 +/-0.003	< 0.037
910148	01/08/91	01/15/91	0.030 +/-0.003	< 0.018
910185	01/15/91	01/22/91	0.021 +/-0.002	< 0.021
910252	01/22/91	01/29/91	0.026 +/-0.003	< 0.024
910275	01/29/91	02/05/91	0.013 +/-0.002	< 0.031
910314	02/05/91	02/12/91	0.024 +/-0.002	< 0.025
910338	02/12/91	02/19/91	0.014 +/-0.002	< 0.025
910419	02/19/91	02/26/91	0.007 +/-0.002	< 0.034
910455	02/26/91	03/05/91	0.011 +/-0.002	< 0.017
910538	03/05/91	03/12/91	0.001 +/-0.001	< 0.028
910520	03/12/91	03/19/91	0.007 +/-0.002	< 0.017
910619	03/19/91	03/26/91	0.013 +/-0.003	< 0.042
910676	03/26/91	04/02/91	0.013 +/-0.002	< 0.023
910710	04/02/91	04/09/91	0.012 +/-0.003	< 0.037
910746	04/09/91	04/16/91	0.014 +/-0.003	< 0.019
910773	04/16/91	04/24/91	0.015 +/-0.002	< 0.015
910804	04/24/91	04/30/91	0.024 +/-0.001	< 0.043
910855	04/30/91	05/07/91	0.013 +/-0.002	< 0.028
910890	05/07/91	05/14/91	0.014 +/-0.002	< 0.035
910920	05/14/91	05/21/91	0.009 +/-0.002	< 0.019
910950	05/21/91	05/28/91	0.005 +/-0.002	< 0.033
911023	05/28/91	06/04/91	0.010 +/-0.002	< 0.030
911057	06/04/91	06/11/91	0.013 +/-0.002	< 0.026
911092	06/11/91	06/18/91	0.009 +/-0.002	< 0.027
911197	06/18/91	06/25/91	0.019 +/-0.002	< 0.050

= Control Location * = Low Level Analysis

Table No.: 1.2a

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 02,SW of Site

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911233	06/25/91	07/02/91	0.013 +/-0.002	< 0.019
911295	07/02/91	07/09/91	0.015 +/-0.002	< 0.033
911305	07/09/91	07/16/91	0.012 +/-0.002	< 0.019
911365	07/16/91	07/23/91	0.019 +/-0.002	< 0.031
911422	07/23/91	07/30/91	0.013 +/-0.002	< 0.032
911442	07/30/91	08/06/91	0.023 +/-0.002	< 0.029
911456	08/06/91	08/13/91	0.015 +/-0.002	< 0.029
911482	08/13/91	08/20/91	0.015 +/-0.002	< 0.016
911519	08/20/91	08/27/91	0.016 +/-0.002	< 0.036
911584	08/27/91	09/03/91	0.011 +/-0.002	< 0.022
911617	09/03/91	09/10/91	0.010 +/-0.002	< 0.030
911641	09/10/91	09/17/91	0.013 +/-0.002	< 0.036
911707	09/17/91	09/24/91	0.012 +/-0.002	< 0.031
911770	09/24/91	10/01/91	0.003 +/-0.001	< 0.055
911808	10/01/91	10/08/91	0.015 +/-0.002	< 0.048
911815	10/08/91	10/15/91	0.025 +/-0.002	< 0.026
911913	10/15/91	10/22/91	0.017 +/-0.002	< 0.021
911980	10/22/91	10/29/91	0.014 +/-0.002	< 0.023
912018	10/29/91	11/05/91	0.021 +/-0.002	< 0.045
912040	11/05/91	11/12/91	0.022 +/-0.003	< 0.021
912059	11/12/91	11/19/91	0.021 +/-0.001	< 0.017
912126	11/19/91	11/26/91	0.007 +/-0.002	< 0.031
912154	11/26/91	12/03/91	0.013 +/-0.002	< 0.031
912208	12/03/91	12/10/91	0.022 +/-0.003	< 0.039
920033	12/10/91	12/17/91	0.010 +/-0.004	< 0.053

= Control Location * = Low Level Analysis

Table No.: T.2b

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: r Samplea,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 02,SW of Site

Lab No.	Begin Date	End Date	Gross-Beta	I-131
920047	12/17/91	12/23/91	0.011 +/-0.004	< 0.070
920040	12/23/91	12/31/91	0.021 +/-0.003	< 0.027

= Control Location * = Low Level Analysis

Table No.: 1.3 Environmental Radiological Monitoring Report Date: 01/21/92

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Location: 03,# of Site

Lab No.	Begin Date	End Date	Gross-Beta	I-131
910142	01/01/91	01/08/91	0.031 +/-0.003	< 0.037
910149	01/08/91	01/15/91	0.024 +/-0.003	< 0.018
910186	01/15/91	01/22/91	0.027 +/-0.003	< 0.021
910253	01/22/91	01/29/91	0.019 +/-0.002	< 0.024
910276	01/29/91	02/05/91	0.019 +/-0.003	< 0.031
910315	02/05/91	02/12/91	0.015 +/-0.002	< 0.025
910339	02/12/91	02/19/91	0.013 +/-0.002	< 0.025
910420	02/19/91	02/26/91	0.006 +/-0.002	< 0.034
910456	02/26/91	03/05/91	0.010 +/-0.002	< 0.017
910539	03/05/91	03/12/91	0.016 +/-0.003	< 0.028
910521	03/12/91	03/19/91	0.008 +/-0.002	< 0.017
910620	03/19/91	03/26/91	< 0.010	< 0.042
910677	03/26/91	04/02/91	0.015 +/-0.003	< 0.023
910711	04/02/91	04/09/91	0.005 +/-0.002	< 0.037
910747	04/09/91	04/16/91	0.009 +/-0.002	< 0.019
910774	04/16/91	04/24/91	0.011 +/-0.002	< 0.015
910805	04/24/91	04/30/91	0.030 +/-0.002	< 0.043
910856	04/30/91	05/07/91	0.009 +/-0.003	< 0.028
910891	05/07/91	05/14/91	0.007 +/-0.002	< 0.035
910921	05/14/91	05/21/91	0.004 +/-0.002	< 0.019
910951	05/21/91	05/28/91	0.005 +/-0.002	< 0.033
911024	05/28/91	06/04/91	0.004 +/-0.002	< 0.030
911058	06/04/91	06/11/91	0.011 +/-0.002	< 0.026
911093	06/11/91	06/18/91	0.005 +/-0.002	< 0.027
911198	06/18/91	06/25/91	0.016 +/-0.002	< 0.050

= Control Location * = Low Level Analysis

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 03,N of Site

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911234	06/25/91	07/02/91	0.011 +/-0.002	< 0.019
911296	07/02/91	07/09/91	0.011 +/-0.002	< 0.033
911306	07/09/19	07/16/91	0.011 +/-0.002	< 0.019
911367	07/16/91	07/23/91	0.019 +/-0.002	< 0.031
911423	07/23/91	07/30/91	0.011 +/-0.002	< 0.032
911443	07/30/91	08/06/91	0.021 +/-0.002	< 0.029
911457	08/06/91	08/13/91	0.012 +/-0.002	< 0.027
911483	08/13/91	08/20/91	0.014 +/-0.002	< 0.016
911520	08/20/91	08/27/91	0.014 +/-0.002	< 0.036
911585	08/27/91	09/03/91	0.010 +/-0.002	< 0.022
911618	09/03/91	09/10/91	0.009 +/-0.002	< 0.030
911642	09/10/91	09/17/91	0.013 +/-0.002	< 0.036
911708	09/17/91	09/24/91	0.010 +/-0.002	< 0.031
911771	09/24/91	10/01/91	0.021 +/-0.002	< 0.055
911809	10/01/91	10/08/91	0.016 +/-0.002	< 0.048
911816	10/08/91	10/15/91	0.018 +/-0.002	< 0.026
911914	10/15/91	10/22/91	0.009 +/-0.002	< 0.021
911981	10/22/91	10/29/91	0.011 +/-0.002	< 0.023
912019	10/29/91	11/05/91	0.016 +/-0.002	< 0.045
912041	11/05/91	11/12/91	0.020 +/-0.002	< 0.021
912060	11/12/91	11/19/91	0.018 +/-0.001	< 0.017
912127	11/19/91	11/26/91	0.006 +/-0.003	< 0.031
912155	11/26/91	12/03/91	0.010 +/-0.002	< 0.031
912209	12/03/91	12/10/91	0.014 +/-0.002	< 0.039
920034	12/10/91	12/17/91	0.016 +/-0.003	< 0.053

= Control Location * = Low Level Analysis

Table No.: 1.3b

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 03,N of Site

Lab No.	Begin Date	End Date	Gross-Beta	I-131
920048	12/17/91	12/23/91	0.011 +/-0.003	< 0.070
920041	12/23/91	12/31/91	0.015 +/-0.002	< 0.027

Ø = Control Location * = Low Level Analysis

Table No.: 1.4 Environmental Radiological Monitoring Report Date: 01/21/92

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Location: 04,May Cemetery

Lab No.	Begin Date	End Date	Gross Beta	I-131
910143	01/01/91	01/08/91	0.029 +/-0.003	< 0.037
910150	01/08/91	01/15/91	0.028 +/-0.003	< 0.018
910187	01/15/91	01/22/91	0.024 +/-0.003	< 0.021
910254	01/22/91	01/29/91	0.019 +/-0.002	< 0.024
910277	01/29/91	02/05/91	0.019 +/-0.003	< 0.031
910316	02/05/91	02/12/91	0.025 +/-0.003	< 0.025
910340	02/12/91	02/19/91	0.014 +/-0.002	< 0.025
910421	02/19/91	02/26/91	0.012 +/-0.003	< 0.034
910457	02/26/91	03/05/91	0.009 +/-0.002	< 0.017
910540	03/05/91	03/12/91	0.014 +/-0.003	< 0.028
910522	03/12/91	03/19/91	0.008 +/-0.002	< 0.017
910521	03/19/91	03/26/91	0.014 +/-0.003	< 0.042
910678	03/26/91	04/02/91	0.013 +/-0.002	< 0.023
910712	04/02/91	04/09/91	0.013 +/-0.003	< 0.037
910748	04/09/91	04/16/91	0.010 +/-0.002	< 0.019
910775	04/16/91	04/24/91	0.015 +/-0.002	< 0.015
910806	04/24/91	04/30/91	0.010 +/-0.003	< 0.043
910857	04/30/91	05/07/91	0.008 +/-0.002	< 0.028
910892	05/07/91	05/14/91	0.008 +/-0.002	< 0.035
910922	05/14/91	05/21/91	0.006 +/-0.002	< 0.019
910952	05/21/91	05/28/91	0.004 +/-0.002	< 0.033
911025	05/28/91	06/04/91	0.005 +/-0.002	< 0.030
911059	06/04/91	06/11/91	0.011 +/-0.002	< 0.026
911094	06/11/91	06/18/91	0.006 +/-0.002	< 0.027
911199	06/18/91	06/25/91	0.012 +/-0.002	< 0.050

= Control Location * = Low Level Analysis

Table No.: 1.4a

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 04,May Cemetery

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911235	06/25/91	07/02/91	0.012 +/-0.002	< 0.019
911297	07/02/91	07/09/91	0.009 +/-0.002	< 0.033
911307	07/09/91	07/16/91	0.010 +/-0.002	< 0.019
911368	07/16/91	07/23/91	0.020 +/-0.003	< 0.031
911424	07/23/91	07/30/91	0.014 +/-0.002	< 0.032
911444	07/30/91	08/06/91	0.018 +/-0.002	< 0.029
911458	08/06/91	08/13/91	0.011 +/-0.002	< 0.027
911484	08/13/91	08/20/91	0.011 +/-0.002	< 0.016
911521	08/20/91	08/27/91	0.031 +/-0.004	< 0.036
911586	08/27/91	09/03/91	0.009 +/-0.002	< 0.022
911619	09/03/91	09/10/91	0.010 +/-0.002	< 0.030
911643	09/10/91	09/17/91	0.016 +/-0.003	< 0.036
911709	09/17/91	09/24/91	0.012 +/-0.002	< 0.031
911772	09/24/91	10/01/91	0.016 +/-0.002	< 0.055
911810	10/01/91	10/08/91	0.016 +/-0.002	< 0.048
911817	10/08/91	10/15/91	0.015 +/-0.002	< 0.026
911915	10/15/91	10/22/91	0.018 +/-0.002	< 0.021
911982	10/22/91	10/29/91	0.011 +/-0.002	< 0.023
912020	10/29/91	11/05/91	0.017 +/-0.002	< 0.045
912042	11/05/91	11/12/91	0.015 +/-0.002	< 0.021
912061	11/12/91	11/19/91	0.023 +/-0.001	< 0.017
912128	11/19/91	11/26/91	0.005 +/-0.002	< 0.031
912156	11/26/91	12/03/91	0.010 +/-0.002	< 0.031
912210	12/03/91	12/10/91	0.013 +/-0.002	< 0.039
920035	12/10/91	12/17/91	0.020 +/-0.003	< 0.053

= Control Location * = Low Level Analysis

Location: 04,May Cemetery

Lab No.	Begin Date	End Date	Gross-Beta	I-131
920049	12/17/91	12/23/91	0.009 +/-0.002	< 0.070
920042	12/23/91	12/31/91	0.017 +/-0.003	< 0.027

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 06,Local Office

Lab No.	Begin Date	End Date	Gross-Beta	I-131
910144	01/01/91	01/08/91	0.026 +/-0.003	< 0.037
910151	01/08/91	01/15/91	0.033 +/-0.003	< 0.018
910188	01/15/91	01/22/91	0.022 +/-0.002	< 0.021
910255	01/22/91	01/29/91	0.029 +/-0.003	< 0.024
910278	01/29/91	02/05/91	0.025 +/-0.003	< 0.031
910317	02/05/91	02/12/91	0.032 +/-0.003	< 0.025
910341	02/12/91	02/19/91	0.014 +/-0.002	< 0.025
910422	02/19/91	02/26/91	0.014 +/-0.002	< 0.034
910458	02/26/91	03/05/91	0.010 +/-0.002	< 0.017
910541	03/05/91	03/12/91	0.015 +/-0.002	< 0.028
910523	03/12/91	03/19/91	0.004 +/-0.002	< 0.017
910622	03/19/91	03/26/91	0.016 +/-0.003	< 0.042
910679	03/26/91	04/02/91	0.014 +/-0.002	< 0.023
910713	04/02/91	04/09/91	0.010 +/-0.003	< 0.037
910749	04/09/91	04/16/91	0.011 +/-0.002	< 0.019
910776	04/16/91	04/24/91	0.017 +/-0.002	< 0.015
910807	04/24/91	04/30/91	0.009 +/-0.002	< 0.043
910858	04/30/91	05/07/91	0.013 +/-0.002	< 0.028
910893	05/07/91	05/14/91	0.009 +/-0.002	< 0.035
910923	05/14/91	05/21/91	0.008 +/-0.002	< 0.019
910953	05/21/91	05/28/91	0.006 +/-0.002	< 0.033
911026	05/28/91	06/04/91	0.009 +/-0.002	< 0.030
911060	06/04/91	06/11/91	0.009 +/-0.002	< 0.026
911095	06/11/91	06/18/91	0.008 +/-0.002	< 0.027
911200	06/18/91	06/25/91	0.014 +/-0.002	< 0.050

= Control Location * = Low Level Analysis

Table No.: 1.5a

Environmental Radiological Monitoring Report

Date: 01/22/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 06,Local Office

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911236	06/25/91	07/02/91	0.012 +/-0.002	< 0.019
911298	07/02/91	07/09/91	0.010 +/-0.002	< 0.033
911308	07/09/91	07/16/91	0.014 +/-0.002	< 0.019
911369	07/16/91	07/23/91	0.021 +/-0.002	< 0.031
911425	07/23/91	07/30/91	0.014 +/-0.002	< 0.032
911445	07/30/91	08/06/91	0.020 +/-0.002	< 0.029
911459	08/06/91	08/13/91	0.015 +/-0.002	< 0.027
911485	08/13/91	08/20/91	0.015 +/-0.002	< 0.016
911522	08/20/91	08/27/91	0.018 +/-0.002	< 0.036
911587	08/27/91	09/03/91	0.011 +/-0.002	< 0.022
911620	09/03/91	09/10/91	0.010 +/-0.002	< 0.030
911644	09/10/91	09/17/91	0.016 +/-0.002	< 0.036
911710	09/17/91	09/24/91	0.014 +/-0.002	< 0.031
911773	09/24/91	10/01/91	0.021 +/-0.002	< 0.055
911811	10/01/91	10/08/91	0.021 +/-0.002	< 0.048
911818	10/08/91	10/15/91	0.020 +/-0.002	< 0.026
911916	10/15/91	10/22/91	0.020 +/-0.002	< 0.021
911983	10/22/91	10/29/91	0.016 +/-0.002	< 0.023
912021	10/29/91	11/05/91	0.017 +/-0.002	< 0.045
912043	11/05/91	11/12/91	0.013 +/-0.002	< 0.021
912062	11/12/91	11/19/91	0.019 +/-0.001	< 0.017
912129	11/19/91	11/26/91	0.004 +/-[illegible]02	< 0.031
912157	11/26/91	12/03/91	0.012 +/-0.002	< 0.031
912211	12/03/91	12/10/91	0.021 +/-0.002	< 0.039
920036	12/10/91	12/17/91	0.019 +/-0.003	< 0.053

= Control Location * = Low Level Analysis

Table No.: 1.5b

Environmental Radiological Monitoring Report

Date: 01/22/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 06,Local Office

Lab No.	Begin Date	End Date	Gross-Beta	I-131
920050	12/17/91	12/23/91	0.010 +/-0.002	< 0.070
920043	12/23/91	12/31/91	0.020 +/-0.003	< 0.027

= Control Location * = Low Level Analysis

Table No.: 1.6
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/22/92

Location: 07,Danville

Lab No.	Begin Date	End Date	Gross-Beta	I-131
910145	01/01/91	01/08/91	0.034 +/-0.003	< 0.037
910152	01/08/91	01/15/91	0.030 +/-0.003	< 0.018
910189	01/15/91	01/22/91	0.021 +/-0.002	< 0.021
910256	01/22/91	01/29/91	0.024 +/-0.003	< 0.024
910279	01/29/91	02/05/91	0.020 +/-0.003	< 0.031
910318	02/05/91	02/12/91	0.026 +/-0.003	< 0.025
910342	02/12/91	02/19/91	0.015 +/-0.003	< 0.026
910423	02/19/91	02/26/91	0.014 +/-0.002	< 0.034
910459	02/26/91	03/05/91	0.011 +/-0.003	< 0.017
910542	03/05/91	03/12/91	0.017 +/-0.003	< 0.028
910524	03/12/91	03/19/91	0.008 +/-0.002	< 0.017
910623	03/19/91	03/26/91	0.016 +/-0.003	< 0.042
910680	03/26/91	04/02/91	0.015 +/-0.003	< 0.023
910714	04/02/91	04/09/91	0.013 +/-0.003	< 0.037
910750	04/09/91	04/16/91	0.013 +/-0.002	< 0.019
910777	04/16/91	04/24/91	0.016 +/-0.002	< 0.015
910808	04/24/91	04/30/91	0.010 +/-0.003	< 0.043
910859	04/30/91	05/07/91	0.011 +/-0.002	< 0.028
910894	05/07/91	05/14/91	0.011 +/-0.002	< 0.035
910924	05/14/91	05/21/91	0.010 +/-0.002	< 0.019
910954	05/21/91	05/28/91	0.006 +/-0.002	< 0.033
911027	05/28/91	06/04/91	0.010 +/-0.002	< 0.030
911061	06/04/91	06/11/91	0.012 +/-0.002	< 0.026
911096	06/11/91	06/18/91	0.006 +/-0.002	< 0.026
911201	06/18/91	06/25/91	0.016 +/-0.002	< 0.050

= Control Location * = Low Level Analysis

Table No.: 1.6a

Environmental Radiological Monitoring Report

Date: 01/22/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: 07,Danville

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911237	06/25/91	07/02/91	0.015 +/-0.002	< 0.019
911299	07/02/91	07/09/91	0.011 +/-0.002	< 0.033
911309	07/09/91	07/16/91	0.016 +/-0.002	< 0.019
911370	07/16/91	07/23/91	0.018 +/-0.002	< 0.031
911426	07/23/91	07/30/91	0.014 +/-0.002	< 0.032
911446	07/30/91	08/06/91	0.019 +/-0.002	< 0.029
911460	08/06/91	08/13/91	0.016 +/-0.002	< 0.027
911486	08/13/91	08/20/91	0.015 +/-0.002	< 0.016
911523	08/20/91	08/27/91	0.019 +/-0.002	< 0.036
911588	08/27/91	09/03/91	0.012 +/-0.002	< 0.022
911621	09/03/91	09/10/91	0.012 +/-0.002	< 0.030
911645	09/10/91	09/17/91	0.015 +/-0.002	< 0.036
911711	09/17/91	09/24/91	0.014 +/-0.002	< 0.031
911774	09/24/91	10/01/91	0.020 +/-0.002	< 0.055
911812	10/01/91	10/08/91	0.020 +/-0.002	< 0.048
911819	10/08/91	10/15/91	0.023 +/-0.003	< 0.026
911917	10/15/91	10/22/91	0.021 +/-0.002	< 0.021
911984	10/22/91	10/29/91	0.014 +/-0.002	< 0.023
912022	10/29/91	11/05/91	0.021 +/-0.002	< 0.045
912044	11/05/91	11/12/91	0.020 +/-0.002	< 0.021
912063	11/12/91	11/19/91	0.022 +/-0.001	< 0.017
912130	11/19/91	11/26/91	0.006 +/-0.002	< 0.031
912158	11/26/91	12/03/91	0.014 +/-0.002	< 0.031
912212	12/03/91	12/10/91	0.023 +/-0.002	< 0.039
920037	12/10/91	12/17/91	0.021 +/-0.003	< 0.053

= Control Location * = Low Level Analysis

Table No.: 1.6b
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/22/92

Location: 07,Danville

Lab No.	Begin Date	End Date	Gross-Beta	I-131
920051	12/17/91	12/23/91	0.004 +/-0.002	< 0.070
920044	12/23/91	12/31/91	0.019 +/-0.003	< 0.027

$ = Control Location * = Low Level Analysis

Table No.: 1.7 Environmental Radiological Monitoring Report Date: 01/22/92

Sample: Air Samples,(Gamma)

Collection: Quarterly Composite of Weekly Samples

Units: pCi/M**3

Location	Lab No.	Begin Date	End Date	Cs-134	Cs-137
01,Met Tower	910603	01/01/91	03/26/91	< 0.0012	< 0.0012
01,Met Tower	911220	03/26/91	07/02/91	< 0.0011	< 0.0009
01,Met Tower	911864	07/02/91	10/01/91	< 0.0013	< 0.0009
01,Met Tower	920137	10/01/91	12/31/91	< 0.0016	< 0.0010
02,SW of Site	910604	01/01/91	03/26/91	< 0.0018	< 0.0015
02,SW of Site	911221	03/26/91	07/02/91	< 0.0015	< 0.0013
02,SW of Site	911865	07/02/91	10/01/91	< 0.0012	< 0.0011
02,SW of Site	920138	10/01/91	12/31/91	< 0.0026	< 0.0019
03,N of Site	910605	01/01/91	03/26/91	< 0.0013	< 0.0011
03,N of Site	911222	03/26/91	07/02/91	< 0.0009	< 0.0008
03,N of Site	911866	07/02/91	10/01/91	< 0.0014	< 0.0011
03,N of Site	920139	10/01/91	12/31/91	< 0.0012	< 0.0011
04,May Cemetery	910606	01/01/91	03/26/91	< 0.0019	< 0.0015
04,May Cemetery	911223	03/26/91	07/02/91	< 0.0011	< 0.0008
04,May Cemetery	911867	07/02/91	10/01/91	< 0.0017	< 0.0014
04,May Cemetery	920140	10/01/91	12/31/91	< 0.0014	< 0.0013
06,Local Office	910607	01/01/91	03/26/91	< 0.0007	< 0.0006
06,Local Office	911224	03/26/91	07/02/91	< 0.0012	< 0.0010
06,Local Office	911867	07/02/91	10/01/91	< 0.0009	< 0.0007
06,Local Office	920141	10/01/91	12/31/91	< 0.0012	< 0.0012
07,Danville	910608	01/01/91	03/26/91	< 0.0014	< 0.0011
07,Danville	911225	03/26/91	07/02/91	< 0.0009	< 0.0007
07,Danville	911869	07/02/91	10/01/91	< 0.0008	< 0.0007
07,Danville	920142	10/01/91	12/31/91	< 0.0016	< 0.0012

= Control Location * = Low Level Analysis

Table No.: 2.1
Sample: Milk Samples,(I-131*,Gamma)
Collection: Monthly
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/22/92

Location: 19,Ark. Tech.

Lab No.	Collection Date	I-131*	Cs-134	Cs-137	Ba-140	La-140
910079	01/10/91	< 0.4	< 2	< 2	< 6	< 2
910230	02/05/91	< 0.5	< 2	< 2	< 9	< 2
910439	03/05/91	< 0.3	< 2	< 2	< 8	< 2
910647	04/04/91	< 0.3	< 3	< 2	< 8	< 2
910833	05/07/91	< 0.3	< 3	< 3	< 13	< 4
911038	06/11/91	< 0.3	< 3	< 3	< 9	< 2
911263	07/11/91	< 0.3	< 2	< 2	< 8	< 2
911472	08/20/91	< 0.2	< 5	< 4	< 16	< 4
911686	09/30/91	< 0.8	< 2	< 2	< 9	< 2
911783	10/15/91	< 0.3	< 2	< 2	< 8	< 2
912001	11/12/91	< 0.2	< 2	< 2	< 6	< 2
912148	12/10/91	< 0.3	< 3	< 2	< 8	< 3

= Control Location * = Low Level Analysis

Table No.: 2.2
Sample: Milk Samples,(I-131*,Gamma)
Collection: Monthly
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/22/92

Location: 37,Steuber Dairy

Lab No.	Collection Date	I-131*	Cs-134	Cs-137	Ba-140	La-140
910074	01/09/91	< 0.3	< 3	< 3	< 11	< 2
910250	02/06/91	< 0.4	< 3	< 3	< 8	< 3
910445	03/06/91	< 0.6	< 2	< 2	< 6	< 2
910648	04/03/91	< 0.4	< 3	< 2	< 9	< 3
910794	05/03/91	< 0.5	< 3	< 3	< 10	< 3
910947	05/29/91	< 0.3	< 3	< 2	< 11	< 3
911132	06/26/91	< 0.2	< 3	< 3	< 9	< 3
911338	07/24/91	< 0.4	< 2	< 2	< 10	< 3
911475	08/21/91	< 0.2	< 2	< 2	< 7	< 2
911635	09/18/91	< 0.3	< 3	< 3	< 11	< 4
911804	10/16/91	< 0.6	< 3	< 3	< 12	< 4
912004	11/13/91	< 0.3	< 2	< 2	< 7	< 2
912172	12/11/91	< 0.8	< 2	< 2	< 8	< 3

= Control Location * = Low Level Analysis

Table No.: 2.3
Sample: Milk Samples,(I-131*,Gamma)
Collection: Monthly
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/22/92

Location: 41,Gibson Dairy

Lab No.	Collection Date	I-131*	Cs-134	Cs-137	Ba-140	La-140
910086	01/09/91	< 0.4	< 5	< 4	< 16	< 6
910231	02/05/91	< 0.3	< 3	< 3	< 9	< 3
910437	03/05/91	< 0.3	< 3	< 3	< 9	< 3
910645	04/03/91	< 0.3	< 2	< 2	< 7	< 3
910834	05/07/91	< 0.4	< 3	< 2	< 8	< 2
911039	06/11/91	< 0.3	< 2	< 2	< 7	< 2
911264	07/11/91	< 0.3	< 2	< 2	< 6	< 2
911473	08/21/91	< 0.3	< 2	< 2	< 7	< 2
911682	09/30/91	< 0.4	< 3	< 4	< 14	< 4
911784	10/15/91	< 0.3	< 4	< 4	< 14	< 4
912002	11/12/91	< 0.3	< 3	< 2	< 8	< 2
912149	12/10/91	< 0.2	< 3	< 2	< 9	< 3

= Control Location * = Low Level Analysis

Table No.: 2.4
Sample: Milk Samples,(I-131*,Gamma)
Collection: Monthly
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/22/92

Location: 42#,Hudson Dairy

Lab No.	Collection Date	I-131*	Cs-134	Cs-137	Ba-140	La-140
910081	01/09/91	< 0.3	< 2	< 2	< 8	< 2
910232	02/05/91	< 0.4	< 2	< 2	< 7	< 2
910438	03/05/91	< 0.4	< 3	< 3	< 11	< 4
910646	04/03/91	< 0.3	< 3	< 3	< 1	< 6
910835	05/07/91	< 0.4	< 2	< 2	< 10	< 3
911040	06/11/91	< 0.3	< 4	< 3	< 10	< 3
911265	07/11/91	< 0.4	< 4	< 4	< 14	< 3
911474	08/20/91	< 0.2	< 4	< 4	< 13	< 4
911683	09/30/91	< 0.7	< 4	< 3	< 11	< 4
911785	10/15/91	< 0.3	< 3	< 3	< 11	< 4
912003	11/12/91	< 0.4	< 2	< 2	< 8	< 2
912150	12/10/91	< 0.3	< 3	< 3	< 11	< 4

= Control Location * = Low Level Analysis

Table No.: 2.5
Sample: Milk Samples,(I-131*,Gamma)
Collection: Monthly
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/22/92

Location: 47, B.Irby Farm

Lab No.	Collection Date	I-131*	Cs-134	Cs-137	Ba-140	La-140
911470	08/18/91	< 0.2	< 3	< 2	< 9	< 3
911636	09/18/91	< 0.3	< 2	< 2	< 9	< 3
911805	10/17/91	< 0.5	< 4	< 4	< 14	< 4
912015	11/14/91	< 0.2	< 3	< 2	< 9	< 3
912173	12/11/91	1.0 +/-0.7	< 3	4 +/-2	< 10	< 3

= Control Location * = Low Level Analysis

Table No.: 3.1

Environmental Radiological Monitoring Report

Date: 03/16/92

Sample: Drinking Water,(Beta,I-131,Gamma)

Collection: Monthly

Units: pCi/L

Location: 14,City Water

Lab. No.	Collection Date	Beta	I-131*	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
910135	01/16/91	3.0+/-2.4	< 0.3	< 2	< 2	< 2	< 2	< 2	< 2	< 3	< 2	< 2	< 5	< 2
910293	02/12/91	6.1+/-1.7	< 0.2	< 2	< 2	< 3	< 2	< 4	< 2	< 4	< 2	< 2	< 7	< 3
910489	03/12/91	< 3	0.2 +/-0.2	< 3	< 2	< 6	< 2	< 10	< 3	< 5	< 3	< 2	< 8	< 3
910694	04/10/91	< 3	< 0.3	< 2	< 2	< 2	< 2	< 3	< 2	< 4	< 2	< 2	< 7	< 2
910849	05/07/91	< 3.3	< 0.4	< 2	< 2	< 3	< 2	< 4	< 2	< 5	< 2	< 2	< 10	< 3
911003	06/05/91	< 1.4	< 0.3	< 3	< 3	< 5	< 8	< 7	< 3	< 8	< 4	< 4	< 18	< 6
911230	07/03/91	< 2.9	< 0.3	< 2	< 2	< 3	< 2	< 5	< 2	< 5	< 2	< 2	< 11	< 3
911374	07/31/91	< 2.9	< 0.3	< 2	< 2	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 8	< 3
911500	08/27/91	5.7 +/-1.8	< 0.2	< 1	< 2	< 2	< 2	< 4	< 2	< 3	< 2	< 2	< 6	< 2
911670	09/24/91	1.7 +/-0.9	< 0.3	< 2	< 2	< 2	< 2	< 3	< 2	< 3	< 2	< 1	< 6	< 4
911841	10/22/91	< 1.4	< 0.4	< 2	< 2	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 7	< 2
912027	11/19/91	1.0 +/-0.8	< 0.2	< 2	< 2	< 3	< 3	< 5	< 3	< 5	< 3	< 2	< 8	< 3
920013	12/20/91	< 1.5	< 0.5	< 1	< 2	< 2	< 2	< 3	< 2	< 3	< 2	< 1	< 10	< 4

= Control Location * = Low Level Analysis

Table No.: 3.2
Sample: Drinking Water,(H-3)
Collection: Quarterly Composite
Units: pCi/L

Location: 14,City Water

Lab. No.	Begin Date	End Date	H-3
910702	01/16/91	03/12/91	< 300
911cw2	04/10/91	06/05/91	< 390
911881	07/03/91	09/24/91	< 350
920174	10/22/91	12/20/91	< 659

= Control Location * = Low Level Analysis

Table No.: 4.1 Environmental Radiological Monitoring Report Date: 03/16/92

Sample: Surface Water,(Gamma)

Collection: Monthly Composite

Units: pCi/L

Location: 08,Discharge

Lab. No.	Begin Date	End Date	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
920001	11/30/91	01/02/92	< 2	< 3	< 3	< 4	< 5	< 2	< 5	< 3	< 3	< 3	< 9	< 4
910248	12/31/90	01/31/91	< 2	< 2	< 3	< 2	< 4	< 3	< 5	< 5	< 2	< 2	< 12	< 5
910443	01/31/91	02/28/91	< 2	< 2	< 2	< 2	< 4	< 2	< 5	< 5	< 2	< 2	< 10	< 3
910649	02/28/91	03/31/91	< 3	< 3	< 5	< 3	< 6	< 3	< 6	< 6	< 4	< 3	< 15	< 6
910795	03/31/91	04/30/91	< 3	< 2	< 4	< 3	< 6	< 2	< 5	< 4	< 3	< 2	< 12	< 4
911004	04/30/91	05/31/91	< 4	< 3	< 6	< 7	< 8	< 4	< 8	< 7	< 3	< 3	< 18	< 6
911292	05/31/91	06/30/91	< 2	< 2	< 3	< 2	< 4	< 3	< 4	< 8	< 2	< 2	< 15	< 6
911375	06/30/91	08/01/91	< 3	< 3	< 5	< 3	< 7	< 4	< 7	< 5	< 3	< 3	< 15	< 5
911532	08/01/91	08/31/91	< 2	< 2	< 3	< 2	< 5	< 3	< 5	< 4	< 3	< 2	< 10	< 4
911702	08/31/91	09/30/91	< 2	< 2	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 2	< 7	< 3
911977	09/30/91	10/31/91	< 3	< 3	< 4	< 4	< 6	< 3	< 6	< 6	< 4	< 3	< 17	< 5
912097	10/31/91	11/30/91	< 2	< 2	< 2	< 2	< 3	< 2	< 4	< 2	< 2	< 2	< 7	< 3

= Control Location * = Low Level Analysis

Sample: Surface Water,(H-3)
Collection: Quarterly Composite
Units: pCi/L

Location: 08,Discharge

Lab. No.	Begin Date	End Date	H-3
920175	09/30/91	01/02/92	< 659
910703	12/31/90	03/31/91	320 +/-180
911315	03/31/91	06/30/91	< 360
911704	06/30/91	09/30/91	< 350

Table No.: 4.3 Environmental Radiological Monitoring Report Date: 03/16/92

Sample: Surface Water,(Gamma)

Collection: Monthly Composite

Units: pCi/L

Location: 10#,Intake

Lab. No.	Begin Date	End Date	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
920002	11/30/91	01/02/92	< 3	< 3	< 4	< 4	< 5	< 3	< 7	< 4	< 4	< 3	< 12	< 4
910249	12/31/90	01/31/91	< 3	< 3	< 5	< 3	< 6	< 4	< 7	< 8	< 3	< 3	< 16	< 6
910444	01/31/91	02/28/91	< 3	< 3	< 5	< 4	< 7	< 4	< 8	< 6	< 4	< 3	< 17	< 5
910650	02/28/91	03/31/91	< 2	< 2	< 5	< 2	< 7	< 3	< 5	< 7	< 2	< 2	< 15	< 6
910796	03/31/91	04/30/91	< 3	< 3	< 4	< 4	< 7	< 4	< 7	< 6	< 4	< 3	< 14	< 5
911005	04/30/91	05/31/91	< 4	< 4	< 5	< 4	< 8	< 4	< 9	< 9	< 4	< 4	< 22	< 6
911293	05/31/91	06/30/91	< 2	< 2	< 4	< 2	< 5	< 3	< 5	< 11	< 2	< 2	< 22	< 7
911376	06/30/91	08/01/91	< 3	< 3	< 5	< 4	< 6	< 4	< 8	< 6	< 4	< 4	< 15	< 5
911533	08/01/91	08/31/91	< 3	< 3	< 3	< 3	< 6	< 3	< 6	< 5	< 3	< 3	< 14	< 7
911703	08/31/91	09/30/91	< 2	< 2	< 3	< 2	< 4	< 2	< 2	< 3	< 3	< 2	< 9	< 3
911976	09/30/91	10/31/91	< 4	< 4	< 5	< 4	< 8	< 4	< 9	< 8	< 4	< 4	< 21	< 5
912098	10/31/91	11/30/91	< 3	< 3	< 4	< 3	< 7	< 4	< 7	< 5	< 4	< 3	< 14	< 4

= Control Location * = Low Level Analysis

Table No.: 4.4
Sample: Surface Water,(H-3)
Collection: Quarterly Composite
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 03/16/92

Location: 10#,Intake

Lab. No.	Begin Date	End Date	H-3
920176	09/30/91	01/02/92	< 659
910704	12/31/90	03/31/91	330 +/-180
911316	03/31/91	06/30/91	< 360
911705	06/30/91	09/30/91	< 350

= Control Location * = Low Level Analysis

Table No.: 4.5

Environmental Radiological Monitoring Report

Date: 03/16/92

Sample: Surface Water split w/ADH(H-3,Gamma)
Collection: Monthly
Units: pCi/L

Location: 08,Discharge

Lab. No.	Collection Date	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910136	01/15/91	290 +/-210	< 2	< 2	< 3	< 2	< 5	< 5	< 2	< 3	< 3	< 2	< 8	< 3
910291	02/12/91	< 350	< 3	< 3	< 4	< 3	< 6	< 8	< 4	< 8	< 3	< 3	< 19	< 4
910487	03/12/91	< 350	< 2	< 2	< 4	< 2	< 7	< 4	< 2	< 2	< 2	< 2	< 7	< 3
910693	04/09/91	520+/-180	< 2	3+/-2	< 2	< 3	< 4	< 4	< 2	< 2	< 2	< 2	< 7	< 3
910877	05/14/91	< 350	< 5	< 6	< 8	< 5	< 11	< 13	< 6	< 8	< 6	< 5	< 24	< 8
911075	06/18/91	< 350	< 2	< 2	< 2	< 2	< 3	< 3	< 2	< 2	< 2	< 2	< 5	< 2
911317	07/23/91	< 350	< 2	< 2	< 2	< 2	< 4	< 4	< 2	< 2	< 2	< 2	< 6	< 2
911501	08/27/91	< 350	< 2	< 2	< 2	< 2	< 3	< 3	< 2	< 2	< 2	< 2	< 6	< 2
911684	09/30/91	< 350	< 4	< 4	< 5	< 5	< 10	< 10	< 4	< 5	< 5	< 4	< 17	< 4
911844	10/22/91	600 +/-220	< 2	< 2	< 3	< 2	< 5	< 5	< 2	< 3	< 3	< 2	< 10	< 4
911962	11/05/91	220 +/-220	< 2	< 2	< 3	< 2	< 5	< 5	< 2	< 3	< 3	< 2	< 9	< 3
912151	12/10/91	< 370	< 3	< 3	< 4	< 3	< 6	< 7	< 3	< 4	< 4	< 3	< 12	< 4

= Control Location * = Low Level Analysis

Table No.: 4.6 Environmental Radiological Monitoring Report Date: 03/16/92

Sample: Surface Water split w/ADH(H-3,Gamma)

Collection: Monthly

Units: pCi/L

Location: 16#,Piney Creek

Lab. No.	Collection Date	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910137	01/15/91	< 360	< 2	< 2	< 2	< 2	< 3	< 4	< 2	< 3	< 2	< 2	< 8	< 4
910292	02/12/91	< 350	< 3	< 3	< 4	< 2	< 5	< 6	< 3	< 10	< 3	< 2	< 17	< 6
910488	03/12/91	< 350	< 2	< 2	< 3	< 2	< 5	< 5	< 2	< 3	< 3	< 2	< 8	< 3
910692	04/09/91	< 230	< 3	< 3	< 6	< 3	< 9	< 6	< 3	< 5	< 3	< 2	< 13	< 5
910878	05/14/91	< 350	< 3	< 3	< 4	< 4	< 6	< 6	< 3	< 5	< 4	< 3	< 15	< 4
911076	06/18/91	< 350	< 2	< 2	< 3	< 3	< 5	< 5	< 2	< 3	< 3	< 2	< 8	< 2
911318	07/23/91	270 +/-210	< 2	< 2	< 3	< 2	< 4	< 5	< 2	< 3	< 3	< 2	< 8	< 3
911502	08/27/91	380 +/-210	< 2	< 2	< 3	< 2	< 4	< 4	< 2	< 3	< 2	< 2	< 8	< 2
911687	09/30/91	< 350	< 4	< 4	< 5	< 4	< 9	< 9	< 4	< 5	< 4	< 4	< 16	< 4
911845	10/22/91	230 +/-220	< 4	< 4	< 5	< 4	< 10	< 9	< 4	< 5	< 5	< 4	< 18	< 5
911963	11/05/91	< 360	< 2	< 2	< 3	< 2	< 4	< 4	< 2	< 3	< 2	< 2	< 8	< 3
912152	12/10/91	< 370	< 6	< 4	< 8	< 6	< 13	< 13	< 6	< 8	< 7	< 6	< 26	< 7

= Control Location * = Low Level Analysis

Sample: Ground Water,(H-3,Gamma)
Collection: Quarterly
Units: pCi/L

Location: 32,Stewart Res.

Lab. No.	Collection Date	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910296	02/12/91	< 350	< 2	< 2	< 3	< 2	< 5	< 5	< 3	< 5	< 3	< 2	< 12	< 4
910851	05/07/91	< 350	< 2	< 2	< 2	< 2	< 3	< 4	< 2	< 3	< 2	< 2	< 8	< 3
911377	07/31/91	< 424	< 2	< 2	< 3	< 2	< 4	< 5	< 2	< 4	< 2	< 2	< 11	< 4
911842	10/22/91	< 355	< 2	< 2	< 3	< 3	< 5	< 5	< 2	< 3	< 3	< 2	< 9	< 3

= Control Location * = Low Level Analysis

Table No.: 5.2

Environmental Radiological Monitoring Report

Date: 01/22/92

Sample: Ground Water,(H-3,Gamma)
Collection: Quarterly
Units: pCi/L

Location: 33,Quita Rec.

Lab. No.	Collection Date	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910295	02/12/91	< 350	< 2	< 2	< 3	< 2	< 5	< 5	< 2	< 4	< 3	< 2	< 10	< 4
910852	05/07/91	< 350	< 2	< 3	< 3	< 2	< 5	< 5	< 3	< 4	< 3	< 2	< 11	< 5
911378	07/31/91	< 424	< 4	< 4	< 5	< 3	< 8	< 9	< 4	< 7	< 4	< 4	< 20	< 5
911843	10/22/91	< 355	< 3	< 3	< 4	< 3	< 7	< 6	< 3	< 4	< 3	< 3	< 12	< 4

= Control Location * = Low Level Analysis

Table No.: 6.1 Environmental Radiological Monitoring Report Date: 01/22/92

Sample: Fish Samples,(Gamma)

Collection: Semiannually

Units: pCi/Kg

Location: 08,Discharge

Lab No.	Collection Date	Sample type	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
910728	03/16/91	CATFISH	< 4	< 6	< 10	< 5	< 11	< 5	14 +/-5
910729	03/16/91	BASS & CRAPPIE	< 8	< 11	< 21	< 10	< 23	< 10	27 +/-8
911728	10/07/91	CATFISH	< 6	< 6	< 9	< 6	< 15	13 +/-6	39 +/-7
911729	10/07/91	BASS & CRAPPIE	< 5	< 6	< 8	< 6	< 14	36 +/-8	70 +/-8

= Control Location * = Low Level Analysis

Sample: Fish Samples,(Gamma)
Collection: Semiannually
Units: pCi/Kg

Location: 10#,Intake

Lab No.	Collection Date	Sample type	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
910726	03/17/91	CATFISH	< 4	< 6	< 11	< 5	< 12	< 5	< 4
910727	03/17/91	BASS & CRAPPIE	< 6	< 8	< 14	< 6	< 15	< 7	< 7
911726	10/07/91	CATFISH	< 11	< 15	< 16	< 11	< 27	< 13	< 12
11727	10/07/91	BASS & CRAPPIE	< 7	< 7	< 11	< 8	< 17	< 9	20 +/-6

Environmental Radiological Monitoring Report

Date: 03/16/92

Table No.: 6.3
Sample: Fish samples split w/ADH. (Gamma)
Collection: As requested.
Units: pCi/kg

Location: 08,Discharge

Lab No.	Collection Date	Sample type	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
910762	04/25/91	TYPE NOT GIVEN	< 5	< 6	< 7	< 6	< 13	< 6	24 +/-6
911603	09/16/91	TYPE NOT GIVEN	< 4	< 3	< 5	< 5	< 9	20 +/-5	73 +/-5

= Control Location * = Low Level Analysis

Table No.: 7.1

Environmental Radiological Monitoring Report

Date: 01/22/92

Sample: Sediment,(Gamma)
Collection: Semiannually
Units: pCi/Kg

Location	Lab No.	Collection Date	Mn-54	Co-58	Co-60	Ag-110m	Cs-134	Cs-137
08,Discharge	910472	03/09/91	248 +/-21	422 +/-21	317 +/-21	417 +/-48	315 +/-22	2524+/-35
08,Discharge	911612	09/14/91	208 +/-16	255 +/-14	364 +/-18	277 +/-50	459 +/-20	2285 +/-25
10#,Intake	910473	03/09/91	18 +/-7	12 +/-5	< 7	< 50	< 10	56 +/-6
10#,Intake	911611	09/14/91	< 16	< 14	< 17		92 +/-16	451 +/-22
16#,Piney Creek	910474	03/09/91	11 +/-6	18 +/-6	< 8	< 51	< 9	57 +/-7
16#,Piney Creek	911613	09/14/91	< 7	< 7	< 7		< 9	71 +/-7

= Control Location * = Low Level Analysis

Table No.: 8.1

Environmental Radiological Monitoring Report

Date: 01/22/92

Sample: Vegetation: Broadleaf,(I-131,Gamma)

Collection: Monthly when available.

Units: pCi/Kg

Location: 13,W of Site

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911001	06/04/91		< 40	< 31	< 24
911229	07/03/91		< 16	< 10	< 9
911372	07/31/91		< 29	< 22	< 17

= Control Location * = Low Level Analysis

Sample: Vegetation: Broadleaf,(I-131,Gamma)

Collection: Monthly when available.

Units: pCi/Kg

Location: 45,E of Site

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911002	06/04/91		< 54	< 34	< 32
911228	07/03/91		< 26	< 21	< 18
911373	07/31/91		< 35	< 23	< 22

= Control Location * = Low Level Analysis

Sample: Veg.:Food Prod. split w/ADH (Gamma)
Collection: As requested.
Units: pCi/kg

Location: 32,Stewart Res.

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911073	06/18/91	CARROTS & ONION	< 16	< 17	< 14
911074	06/18/91	TOMATOES&SQUASH	< 18	< 18	< 16
911087	06/18/91	SNAP BEANS	< 32	< 29	< 28
911108	06/20/91	POTATOES	< 8	< 7	< 6
911111	06/20/91	SQUASH & CUCUMB	< 17	< 12	< 11
911775	10/15/91	PEPPER&TOMATOES	< 14	< 13	< 12
911776	10/15/91	TURNIP GREENS	< 16	< 15	< 14
911777	10/15/91	TURNIPS	< 12	< 14	< 11

= Control Location * = Low Level Analysis

Location: 40,Hollis Res.

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911106	06/20/91	SNAP BEANS	< 7	< 6	< 5
911107	06/20/91	TOMATOES& PLUMS	< 9	< 6	< 6
911109	06/20/91	TURNIPS	< 11	< 10	< 10
911110	06/20/91	PEACHES	< 6	< 5	< 4

= Control Location * = Low Level Analysis

Table No.: 8.5 Environmental Radiological Monitoring Report Date: 03/16/92

Sample: Vegetation: Food Products,(Gamma)

Collection: At Time of Harvest

Units: pCi/Kg

Location: 46,Gregory res.

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911271	07/11/91	CUCUMBERS	< 9	< 6	< 6
911270	07/15/91	POTATOES	< 8	< 9	< 8

= Control Location * = Low Level Analysis

Table No.: 8.6
Sample: Vegetation: Food Products,(Gamma)
Collection: At Time of Harvest
Units: pCi/Kg

Environmental Radiological Monitoring Report

Date: 01/22/92

Location: 38,Jones Res.

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911126	06/25/91	TOMATOES	< 6	< 5	< 5
911127	06/25/91	LETTUCE	< 13	< 14	< 11
911128	06/25/91	CUCUMBERS	< 10	< 10	< 9

= Control Location * = Low Level Analysis

EPA CROSS CHECK RESULTS

EPA PREP DATE	DATE EPA ISSUED RESULTS	MEDIA	NUCLIDE	EPA RESULTS	AP&L RESULTS	NORM DEV KNOWN
4th Qtr. 1190						
CC36036-74	1/11/91	Analytic, Inc. Iodine Cartridge (uCi/cc)	I-131	3.18E-2	3.43E-2	1.08 Ratio
02/08/91	04/15/91	Water (pCi/L)	Co-60	40.0	40.67	0.23
			Zn-65	149.0	145.67	-0.38
			Ru-106	196.0	196.67	0.97
			Cs-134	8.0	9.00	0.35
			Cs-137	8.0	9.00	0.35
			Ba-133	75.0	85.33	2.24
02/22/91	04/16/91	Water (pCi/L)	H-3	4418.0	4613.33	0.77
03/29/91	07/19/91	Air Filter (pCi/Filter)	Beta	124.0	122.33	-0.40
			Cs-137	40.0	59.33	6.70**[1]
05/17/91	07/22/91	Water (pCi/L)	Beta	46.0	47.00	0.35
04/16/91	07/25/91	Water Blind B (pCi/L)	Beta	115.0	73.33	-4.25**[2]
			Cs-134	24.0	23.33	-0.23
			Cs-137	25.0	25.67	0.23
06/07/91	09/11/91	Water (pCi/L)	Co-60	10.0	10.33	0.12
			Zn-65	108.0	106.00	-0.31
			Ru-106	149.0	146.00	-0.35
			Cs-134	15.0	14.67	-0.12
			Cs-137	14.0	14.67	0.23
			Ba-133	62.0	63.67	0.48
08/30/91	11/15/91	Air Filter (pCi/Filter)	Beta	92.0	93.67	0.29
			Cs-137	30.0	30.00	0
09/09/91	10/25/91	Water (pCi/L)	I-131	20.0	17.67	-0.67
10/04/91	12/02/91	Water (pCi/L)	Co-60	29.0	28.00	-0.35
			Zn-65	73.0	73.33	0.08
			Ru-106	199.0	194.00	-0.43
			Cs-134	10.0	9.67	-0.12
			Cs-137	10.0	10.33	0.12
			Ba-133	98.0	100.00	0.35

EPA CROSS CHECK RESULTS

EPA PREP DATE	DATE EPA ISSUED RESULTS	MEDIA	NUCLIDE	EPA RESULTS	AP&L RESULTS	NORM DI KNO
10/18/91	12/05/91	Water (pCi/L)	H-3	2454.0	2336.67	-0.58
09/27/91	01/03/92	Milk (pCi/L)	I-131	108.0	102.00	-0.94
			Cs-137	30.0	30.33	0.12
			K	1740.0	1570.00	-3.38**3
10/22/91	01/24/92	Water Blind B (pCi/L)	Beta	65.0	52.00	-2.25
			Cs-134	10.0	11.00	0.35
			Cs-137	11.0	11.00	0.00
			Co-60	20.0	20.33	0.12

**1 A new efficiency curve was constructed using a blank EPA plastic air filter. Efficiencies calculated using this air filter geometry were approximately 30% high than previous geometries using air particulate filters.

**2 Blind water samples contain several isotopes which have different beta energies. T efficiency curve for beta in water was constructed using Cs-137. Because t strontium isotopes have different beta energies than Cs-137, the results may always agree with the standard beta in water efficiency using only Cs-137.

**3 The results submitted by System Chemistry for Total Potassium (K) were less than t lower control unit established by EPA for this sample. System Chemistry wi investigate possible sources of error within the gamma spectrometer efficiency curv and the calculations used to convert K-40 measurements into Total Potassium result The results of these investigations will be included in the next monthly report.

It should be noted that the mean result submitted by 63 laboratories whose resul were included in the Grand Average was 1.5 standard deviations below the value us by the EPA as the "known value" for Total Potassium for this cross-check sampl Of the results classified as outside the control limits by EPA, 17 were outside the lower control limit set by the EPA while only 3 results were outside of t higher control limit. The submitted results were drastically shifted below the E established "known value". A request will be made to EPA to recheck the publish "known value" for Total Potassium of this sample. Results of this inquiry will included in the next monthly report after receipt of a reply from the EPA.

The U.S. EPA was contacted and confirmed that the "known value" for Total Potassi was correct. An independent experiment was developed to measure Total Potassi using a known mass on Potassium Nitrate dissolved in 3.5L of water. The experiment value was calculated to be 0.993 of the theoretical value.

ATTACHMENT II

1991 ENVIRONMENTAL MONITORING THERMOLUMINESCENT DOSIMETRY REPORT

1991 ANO TLD RESULTS

0-2 MILES

(mrem/QTR)

STATION	1ST QTR	2ND QTR	3RD QTR	4TH QTR	MEAN
1	32	43	31	20	31.5
2	29	24	32	23	27.0
3	26	37	35	22	30.0
4	27	19	20	22	22.0
108	25	25	28	24	25.5
109	29	33	25	28	28.8
110	31	22	30	22	26.3
113	18	26	32	26	25.5
114	28	26	30	30	28.5
115	23	42	32	24	30.3
116	21	27	25	23	24.0
Average	26.3	29.4	28.8	24.0	--

1991 ANO TLD RESULTS

2-5 MILES

(mrem/QTR)

STATION	1ST QTR	2ND QTR	3RD QTR	4TH QTR	MEAN
111	38	28	21	22	27.3
112	22	27	24	28	25.3
119	24	35	21	28	27.0
120	20	19	21	21	20.3
121	ND[a]	ND[a]	23	21	22.0
122	21	22	23	23	22.3
123	18	20	22	21	20.3
124	25	30	33	26	28.5
130	28	29	23	24	26.0
131	22	22	22	24	22.5
133	26	19	17	19	20.3
134	27	33	28	25	25.8
135	46	25	ND[b]	22	31.0
136	30	24	23	17	23.5
141	22	25	25	21	23.3
Average	26.4	25.6	23.3	22.8	--

ND[a] - No Data; TLD lost in field.

ND[b] - No Data; Value was "0", therefore not used.

1991 ANO TLD RESULTS

> 5 MILES

(mrem/QTR)

STATION	1ST QTR	2ND QTR	3RD QTR	4TH QTR	MEAN
5	20	26	25	22	23.3
6	23	23	40	30	29.0
7	24	30	24	26	26.0
117	19	36	28	22	26.3
118	24	26	25	26	25.3
125	21	24	23	23	22.8
126	23	31	26	27	26.8
127	22	36	23	26	26.8
128	33	23	28	24	27.0
129	36	39	26	25	31.5
132	28	26	26	28	27.0
137	26	30	19	26	25.3
138	20	[illegible]	20	20	22.0
139	30	[illegible]	31	26	28.8
140	23	29	22	23	24.3
142	36	28	25	23	28.0
143	30	[illegible]	20	24	26.8
144	28	22	26	29	26.3
Average	25.9	28.8	25.4	25.0	--

1991 ANO TLD RESULTS

(mrem/192 Days)

0-2 MILES

STATION	1ST 6 MONTHS	2ND 6 MONTHS	MEAN
1	52	42	47.0
2	52	41	46.5
3	54	42	48.0
4	46	32	39.0

> 5 MILES

STATION	1ST 6 MONTHS	2ND 6 MONTHS	MEAN
5	ND*	ND*	N/A
6	54	34	44.0
7	47	43	45.0

ND* - No data; TLD damaged by water.

ATTACHMENT III

STATISTICAL ANALYSES

- Calculation of the mean, standard deviation and "t" values are as follows:

MEAN: $\bar{X} = \Sigma Xi/n$

where: $\bar{X}$ = Mean of sample results

Xi = Sum of individual results

n = Number of Samples

STANDARD DEVIATION:

$$Sd = \sqrt{\frac{\Sigma (X-\bar{X})^2}{n-1}}$$

where: Sd = Standard deviation

X = Individual sample result

$\bar{X}$ = Mean of sample results

n = Number of samples

"t" VALUE:

$$t = \frac{(\bar{x} - \bar{y})}{\sqrt{\frac{(n_x - 1)s_x^2 + (n_y - 1)s_y^2}{n_x + n_y - 2}} \quad \sqrt{\frac{1}{n_x} + \frac{1}{n_y}}}$$

where: t = Calculated "t" value

$\bar{x}$ = Mean of first data set

$\bar{y}$ = Mean of second data set

n_x = Number of variables in first data set

s_x = Standard deviation of first data set

n_y = Number of variables in second data set

s_y = Standard deviation of second data set

- Calculated "t" values were compared to tabular "t" values obtained from the CRC Standard Mathematical Tables, 26th Edition (1981) to test the hypothesis that the true mean of the first population is equal to the true mean of the second population. The "t" test was performed for air samples, TLDs and surface water tritium as shown below and on the following pages.

AIR SAMPLES

Parameter	1	2	3	4	6	7
Gross Beta Mean (10E-3 pCi/m^3)	18	15	13	14	15	16
Gross Beta Standard Deviation (10E-3 pCi/m^3)	7.4	6.2	6.3	6.2	6.5	6.0
Number in Sample	50	52	51	52	52	52
Calculated "t" Value to Comparison with Control Station (7)	-1.503	0.836	2.475	1.672	0.816	N/A
Tabular "t" Value at 95% Confidence (t, 0.025, n)	1.987	1.986	1.986	1.986	1.986	N/A

QUARTERLY TLDs

Parameter	0 - 2 Miles	2 - 5 Miles	> 5 Miles
Mean (mrem/Qtr)	27.2	24.5	26.3
Standard Deviation (mrem/Qtr)	5.5	5.2	4.7
Number in Sample	44	57	72
Calculated "t" Value to Comparison with Stations Located > 5 Miles	-0.939	2.064	N/A
Tabular "t" Value at 95% Confidence (t, 0.025, n)	1.982	1.978	N/A

SEMIANNUAL TLDs

Parameter	0 - 2 Miles	> 5 Miles
Mean (mrem/192 Days)	45.1	44.5
Standard Deviation (mrem/192 Days)	7.4	8.3
Number in Sample	8	4
Calculated "t" Value to Comparison with Stations Located > 5 Miles	-0.128	N/A
Tabular "t" Value at 95% Confidence (t, 0.025, n)	2.228	N/A

STATISTICAL ANALYSES

SURFACE WATER

Parameter	Discharge (All Samples)	Piney Creek (ADH Split)
Tritium Mean (pCi/1)	390.6	293.7
Tritium Standard Deviation (pCi/1)	162.3	74.9
Number in Sample	4	3
Calculated "t" Value to Comparison with Control Location (Piney Creek)	-0.944	N/A
Tabular "t" Value at 95% Confidence (t, 0.025, n)	2.571	N/A

ATTACHMENT IV

DOSE CALCULATIONS

DOSE CALCULATIONS

o Dose calculation for the discharge sediment was performed using generalized equation found in Regulatory Guide 1.109, Appendix A as follows:

$$R = (40)(C)(U)(D)(W)$$

where: R = Annual dose to skin or total body in mrem/year;

40 = Area-mass conversion factor given in Appendix A of Regulatory Guide 1.109 in Kg/m^2;

C = 1991 maximum radionuclide concentration in pCi/kg;

U = Maximum exposure time given in Table E-5 of Regulatory Guide 1.109 (67 hours for teenager);

D = External dose conversion factor for standing on contaminated ground given in Table E-6 of Regulatory Guide 1.109 in mrem/hr per pCi/m^2, and

W = Shore-width factor (0.1) given in Table A-2 of Regulatory Guide 1.109

DOSE FROM SEDIMENT IN MILLIREM/YEAR

Radionuclide	Maximum Concentration	Conversion Factor For Skin	Total Skin Dose	Conversion Factor For Total Body	Total Body Dose
Mn-54	248	6.80E-09	4.52E-04	5.80E-09	3.85E-04
Co-58	422	8.20E-09	9.27E-04	7.00E-09	7.92E-04
Co-60	364	2.00E-08	1.95E-03	1.70E-08	1.66E-03
Ag-110m	277	2.10E-08	1.56E-03	1.80E-08	1.34E-03
Cs-134	459	1.40E-08	1.72E-03	1.20E-08	1.48E-03
Cs-137	2524	4.90E-09	3.31E-03	4.20E-09	2.84E-03
		TOTAL	9.92E-03		8.50E-03