Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379

April 26, 1996

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

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) - ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

In accordance with Technical Specification 6.9.1.6 for SQN Units 1 and 2, enclosed is the Annual Radiological Environmental Operating Report for 1995.

No commitments are contained in this submittal. Please direct questions concerning this issue to W. C. Ludwig at (423) 843-7460.

Sincerely,

R. H. Shell

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Enclosure
cc: See page 2

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ENCLOSURE

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

SEQUOYAH NUCLEAR PLANT

1995

(W46 960410 002)

Annual Radiological Environmental Operating Report

Sequoyah
Nuclear Plant
1995

TVA

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT
SEQUOYAH NUCLEAR PLANT
1995

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION

April 1996

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

This report describes the environmental radiological monitoring program conducted by TVA in the vicinity of the Sequoyah Nuclear Plant (SQN) in 1995. The program includes the collection of samples from the environment and the determination of the concentrations of radioactive materials in the samples. Samples are taken from stations in the general area of the plant and from areas not influenced by plant operations. Station locations are selected after careful consideration of the weather patterns and projected radiation doses to the various areas around the plant. Material sampled includes air, water, milk, foods, vegetation, soil, fish, sediment, and direct radiation levels. Results from stations near the plant are compared with concentrations from control stations and with preoperational measurements to determine potential impacts of plant operations.

The vast majority of the exposures calculated from environmental samples were contributed by naturally occurring radioactive materials or from materials commonly found in the environment as a result of atmospheric nuclear weapons fallout.

Small amounts of Co-58, Co-60, and Cs-134 were found in sediment samples downstream from the plant. This activity in stream sediment would result in no measurable increase over background in the dose to the general public.

INTRODUCTION

This report describes and summarizes the results of radioactivity measurements made in the vicinity of SQN and laboratory analyses of samples collected in the area. The measurements are made to comply with the requirements of 10 CFR 50, Appendix A, Criterion 64 and 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3 and IV.C and to determine potential effects on public health and safety. This report satisfies the annual reporting requirements of SQN Technical Specification 6.9.1.6 and Offsite Dose Calculation Manual (ODCM) Administrative Control 5.1. In addition, estimates of the maximum potential doses to the surrounding population are made from radioactivity measured both in plant effluents and in environmental samples. Some of the data presented are prescribed by specific requirements while other data are included which may be useful or interesting to individuals who do not work with this material routinely.

Naturally Occurring and Background Radioactivity

Most materials in our world today contain trace amounts of naturally occurring radioactivity. Approximately 0.01 percent of all potassium is radioactive potassium-40 (K-40). K-40, with a half-life of 1.3 billion years, is one of the major types of radioactive materials found naturally in our environment. An individual weighing 150 pounds contains about 140 grams of potassium (Reference 1). This is equivalent to approximately 100,000 pCi of K-40 which delivers a dose of 15 to 20 mrem per year to the bone and soft tissue of the body. Naturally occurring radioactive materials have always been in our environment. Other examples of naturally occurring radioactive materials are beryllium (Be)-7, bismuth (Bi)-212 and 214, lead (Pb)-212 and 214, thallium (Tl)-208, actinium (Ac)-228, uranium (U)-238, uranium-235, thorium (Th)-234, radium (Ra)-226, radon (Rn)-222, carbon (C)-14, and hydrogen (H)-3 (generally called tritium). These naturally occurring radioactive materials are in the soil, our food, our drinking water, and our bodies. The radiation from these materials makes up a part of the low-level natural background radiation. The remainder of the natural background radiation comes from outer space. We are all exposed to this natural radiation 24 hours per day.

The average dose equivalent at sea level resulting from radiation from outer space (part of natural background radiation) is about 27 mrem/year. This essentially doubles with each 6600-foot increase in altitude in the lower atmosphere. Another part of natural background radiation comes from naturally occurring radioactive materials in the soil and rocks. Because the quantity of naturally occurring radioactive material varies according to geographical location, the part of the natural background radiation coming from this radioactive material also depends upon the geographical location. Most of the remainder of the natural background radiation comes from the radioactive materials within each individual's body. We absorb these materials from the food we eat which contains naturally occurring radioactive materials from the soil. An example of this is K-40 as described above. Even building materials affect the natural background radiation levels in the environment. Living or working in a building which is largely made of earthen material, such as concrete or brick, will generally result in a higher natural background radiation level than would exist if the same structure were made of wood. This is due to the naturally occurring radioisotopes in the concrete or brick, such as trace amounts of uranium, radium, thorium, etc.

Because the city of Denver, Colorado, is over 5000 feet in altitude and the soil and rocks there contain more radioactive material than the U.S. average, the people of Denver receive around 350 mrem/year total natural background radiation dose equivalent compared to about 295 mrem/year for the national average. People in some locations of the world receive over 1000 mrem/year natural background radiation dose equivalent, primarily because of the greater quantity of radioactive materials in the soil and rocks in those locations. Scientists have never been able to show that these levels of radiation have caused physical harm to anyone.

It is possible to get an idea of the relative hazard of different types of radiation sources by evaluating the amount of radiation the U.S. population receives from each general type of radiation source. The information in the following table is primarily adapted from References 2 and 3.

U.S. GENERAL POPULATION AVERAGE DOSE EQUIVALENT ESTIMATES

Source	Millirem/Year Per Person	
Natural background dose equivalent		
Cosmic	27	
Cosmogenic	1	
Terrestrial	28	
In the body	39	
Radon	200	
Total		295
Release of radioactive material in natural gas, mining, ore processing, etc.		5
Medical (effective dose equivalent)		53
Nuclear weapons fallout		less than 1
Nuclear energy		0.28
Consumer products		0.03
Total		355 (approximately)

As can be seen from the table, natural background radiation dose equivalent to the U.S. population normally exceeds that from nuclear plants by several hundred times. This indicates that nuclear plant operations normally result in a population radiation dose equivalent which is insignificant compared to that which results from natural background radiation. It should be noted that the use of radiation and radioactive materials for medical uses has resulted in a similar effective dose equivalent to the U.S. population as that caused by natural background cosmic and terrestrial radiation.

Significant discussion recently has centered around exposures from radon. Radon is an inert gas given off as a result of the decay of naturally occurring radium-226 in soil.

When dispersed in the atmosphere, radon concentrations are relatively low. However, when the gas is trapped in closed spaces, it can build up until concentrations become significant. The National Council of Radiation Protection and Measurements (Reference 2) has estimated that the average annual effective dose equivalent from radon in the United States is approximately 200 mrem/year. This estimated dose is approximately twice the average dose equivalent from all other natural background sources.

Electric Power Production

Nuclear power plants are similar in many respects to conventional coal burning (or other fossil fuel) electrical generating plants. The basic process behind electrical power production in both types of plants is that fuel is used to heat water to produce steam which provides the force to turn turbines and generators. However, nuclear plants include many complex systems to control the nuclear fission process and to safeguard against the possibility of reactor malfunction, which could lead to the release of radioactive materials. Very small amounts of these fission and activation products are released into the plant systems. This radioactive material can be transported throughout plant systems and some of it released to the environment.

All paths through which radioactivity is released are monitored. Liquid and gaseous effluent monitors record the radiation levels for each release. These monitors also provide alarm mechanisms to prompt termination of any release above limits.

Releases are monitored at the onsite points of release and through an environmental monitoring program which measures the environmental radiation in outlying areas around the plant. In this way, not only is the release of radioactive materials from the plant tightly controlled, but measurements are made in surrounding areas to verify that the population is not being exposed to significant levels of radiation or radioactive materials.

The SQN ODCM, which is required by the plant Technical Specifications, prescribes limits for the release of radioactive effluents, as well as limits for doses to the general public from the release of these effluents.

The dose to a member of the general public from radioactive materials released to unrestricted areas, as given in NRC guidelines and the ODCM, is limited as follows:

Liquid Effluents

Total body	<3 mrem/year
Any organ	<10 mrem/year

Gaseous Effluents

Noble gases:

Gamma radiation	<10 mrad/year
Beta radiation	<20 mrad/year

Particulates:

Any organ	<15 mrem/year

The EPA limits for the total dose to the public in the vicinity of a nuclear power plant, established in the Environmental Dose Standard of 40 CFR 190, are as follows.

Total body	25 mrem/year
Thyroid	75 mrem/year
Any other organ	25 mrem/year

Appendix B to10 CFR 20 presents annual average limits for the concentrations of radioactive materials released in gaseous and liquid effluents at the boundary of the unrestricted areas. Table 1 of this report presents the annual average concentration limits for the principal radionuclides associated with nuclear power plant effluents. This table also presents (1) the concentrations of radioactive materials in the environment which would require a special report to the NRC and (2) the detection limits for the listed radionuclides. It should be noted that the levels of radioactive materials measured in the environment are typically below or only slightly above the lower limit of detection. The data presented in this report indicate compliance with the regulation.

SITE/PLANT DESCRIPTION

The SQN is located on a site near the geographical center of Hamilton County, Tennessee, on a peninsula on the western shore of Chickamauga Lake at Tennessee River Mile (TRM) 484.5. Figure 1 shows the site in relation to other TVA projects. The SQN site, containing approximately 525 acres, is approximately 7.5 miles northeast of the nearest city limit of Chattanooga, Tennessee, 14 miles west-northwest of Cleveland, Tennessee, and approximately 31 miles south-southwest of TVA's Watts Bar Nuclear Plant (WBN) site.

Population is distributed rather unevenly within 10 miles of the SQN site. Approximately 60 percent of the population is in the general area between 5 and 10 miles from the plant in the sectors ranging from the south, clockwise, to the northwest sector. This concentration is a reflection of suburban Chattanooga and the town of Soddy-Daisy. This area is characterized by considerable vacant land with scattered residential subdivisions. The northernmost extent of the urbanization around Chattanooga is approximately 4 miles from the site. The population of Chattanooga is about 160,000, while Soddy-Daisy has approximately 8,500 people. The population within a 10-mile radius of SQN is approximately 60,000.

With the exception of the community of Soddy-Daisy, the areas west, north, and east of the plant are sparsely settled. Development consists of scattered semirural and rural dwellings with associated small-scale farming. At least three dairy farms are located within 10 miles of the plant.

Chickamauga Reservoir is one of a series of highly controlled multiple-use reservoirs whose primary uses are flood control, navigation, and the generation of electric power. Secondary uses include industrial and public water supply and waste disposal, commercial fishing, and recreation. Public access areas, boat docks, and residential subdivisions have been developed along the reservoir shoreline.

SQN consists of two pressurized water reactors: each unit is rated at 1171 megawatts (electrical). Fuel was loaded in unit 1 on March 1, 1980, and the unit achieved critically on July 5, 1980. Fuel was loaded in unit 2 in July 1981, and the unit achieved initial criticality on November 5, 1981. The plant, shut down in August 1985, was restarted in 1988.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM

Most of the radiation and radioactivity generated in a nuclear power reactor is contained within the reactor itself or one of the other plant systems. Plant effluent monitors are designed to detect the small amounts released to the environment. Environmental monitoring is a final verification that the systems are performing as planned. The monitoring program is designed to check the pathways between the plant and the people in the immediate vicinity and to most efficiently monitor these pathways. Sample types are chosen so that the potential for detection of radioactivity in the environment will be maximized. The environmental radiological monitoring program is outlined in Appendix A.

There are two primary pathways by which radioactivity can move through the environment to humans: air and water (see Figure 2). The air pathway can be separated into two components: the direct (airborne) pathway and the indirect (ground or terrestrial) pathway. The direct airborne pathway consists of direct radiation and inhalation by humans. In the terrestrial pathway, radioactive materials may be deposited on the ground or on plants and subsequently be ingested by animals and/or humans. Human exposure through the liquid pathway may result from drinking water, eating fish, or by direct exposure at the shoreline. The types of samples collected in this program are designed to monitor these pathways.

A number of factors were considered in determining the locations for collecting environmental samples. The locations for the atmospheric monitoring stations were determined from a critical pathway analysis based on weather patterns, dose projections, population distribution, and land use. Terrestrial sampling stations were selected after reviewing such things as the locations of dairy animals and gardens in conjunction with the air pathway analysis. Liquid pathway stations were selected based on dose projections, water use information, and availability of media such as fish and sediment. Table A-2 (Appendix A, Table 2: This identification system is used for all tables and figures in the appendices.) lists the sampling stations and the types of samples collected. Modifications made to the program in 1995 are described in Appendix B and exceptions to the sampling and analysis schedule are presented in Appendix C.

To determine the amount of radioactivity in the environment prior to the operation of SQN, a preoperational environmental radiological monitoring program was initiated in 1971 and operated until the plant began operation in 1980. Measurements of the same types of radioactive materials that are measured currently were assessed during the preoperational phase to establish normal background levels for various radionuclides in the environment.

The preoperational monitoring program is a very important part of the overall program. During the 1950s, 60s, and 70s, atmospheric nuclear weapons testing released radioactive material to the environment causing fluctuations in background radiation levels. This radioactive material is the same type as that produced in the SQN reactors. Preoperational knowledge of pre-existing radionuclide patterns in the environment permits a determination, through comparison and trending analyses, of whether the operation of SQN is impacting the environment and thus the surrounding population.

The determination of impact during the operating phase also considers the presence of control stations that have been established in the environment. Results of environmental samples taken at control stations (far from the plant) are compared with those from indicator stations (near the plant) to establish the extent of SQN influence.

All samples are analyzed by the Radioanalytical Laboratory of TVA's Environmental Radiological Monitoring and Instrumentation group located at the Western Area Radiological Laboratory (WARL) in Muscle Shoals, Alabama. All analyses are conducted in accordance with written and approved procedures and are based on accepted methods. A summary of the analysis techniques and methodology is presented in Appendix D. Data tables summarizing the sample analysis results are presented in Appendix H.

The radiation detection devices used to determine the radionuclide content of samples collected in the environment are generally quite sensitive to small amounts of radioactivity. The sensitivity of the measurement process is defined in terms of the lower limit of detection (LLD). A description of the nominal LLDs for the Radioanalytical Laboratory is presented in Appendix E.

The Radioanalytical Laboratory employs a comprehensive quality assurance/ quality control program to monitor laboratory performance throughout the year. The program is intended to detect any problems in the measurement process as soon as possible so they can be corrected. This program includes equipment checks to ensure that the radiation detection instruments are working properly and the analysis of special samples which are included alongside routine environmental samples. The laboratory participates in the Environmental Protection Agency (EPA) Interlaboratory Comparison Program. In addition, samples split with the EPA National Air and Radiation Environmental Laboratory and with the State of Tennessee provide an independent verification of the overall performance of the laboratory. A complete description of the program is presented in Appendix F.

DIRECT RADIATION MONITORING

Direct radiation levels are measured at a number of stations around the plant site. These measurements include contributions from cosmic radiation, radioactivity in the ground, fallout from atmospheric nuclear weapons tests conducted in the past, and any radioactivity that may be present as a result of plant operations. Because of the relatively large variations in background radiation as compared to the small levels from the plant, contributions from the plant may be difficult to distinguish.

Radiation levels measured in the area around the SQN site in 1995 were consistent with levels from previous years and with levels measured at other locations in the region.

Measurement Techniques

Direct radiation measurements are made with thermoluminescent dosimeters (TLDs). When certain materials are exposed to ionizing radiation, many of the electrons which become displaced are trapped in the crystalline structure of the material. They remain trapped for long periods of time as long as the material is not heated. When heated (thermo-), the electrons are released, producing a pulse of light (-luminescence). The intensity of the light pulse is proportional to the amount of radiation to which the material was exposed. Materials which display these characteristics are used in the manufacture of TLDs.

From 1971 through 1989, TVA used a Victoreen dosimeter consisting of a manganese activated calcium fluoride (Ca_2F:Mn) TLD material encased in a glass bulb. In 1989, TVA began the process of changing from the Victoreen dosimeter to the Panasonic Model UD-814 dosimeter, and completely changed to the Panasonic dosimeter in 1990. This dosimeter contains four elements consisting of one lithium borate and three calcium sulfate phosphors. The calcium sulfate phosphors are shielded by approximately 1000 mg/cm^2 plastic and lead to compensate for the over-response of the detector to low energy radiation.

The TLDs are placed approximately 1 meter above the ground, with three TLDs at each

station. Sixteen stations are located around the plant near the site boundary, one station in each of the 16 compass sectors. Dosimeters are also placed at the perimeter and remote air monitoring sites and at 19 additional stations out to approximately 32 miles from the site. The TLDs are exchanged every 3 months and the accumulated exposure on the detectors is read with a Panasonic Model UD-710A automatic reader interfaced with a Hewlett Packard Model 9000 computer system. Seven of the locations also have TLDs processed by the NRC. The results from the NRC measurements are reported in NUREG 0837.

Since the calcium sulfate phosphor is much more sensitive than the lithium borate, the measured exposure is taken as the median of the results obtained from the nine calcium sulfate phosphors in three detectors. The values are corrected for gamma response, system variations, and transit exposure, with individual gamma response calibrations for each element. The system meets or exceeds the performance specifications outlined in Regulatory Guide 4.13 for environmental applications of TLDs.

Since 1974, TVA has participated in eight of the ten intercomparisons of environmental dosimeters conducted by the U.S. Department of Energy and other interested parties. The results, shown in Table 2 and Figure 3, demonstrate that direct radiation levels determined by TVA are generally within ten percent of the calculated or known values.

Results

All results are normalized to a standard quarter (91.2 days or 2190 hours). The stations are grouped according to the distance from the plant. The first group consists of all stations within 1 mile of the plant. The second group lies between 1 and 2 miles, the third group between 2 and 4 miles, the fourth between 4 and 6 miles, and the fifth group is made up of all stations greater than 6 miles from the plant. Past data have shown that the average results from all groups more than 2 miles from the plant are essentially the same. Therefore, for purposes of this report, all stations 2 miles or less from the plant are identified as "onsite" stations and all others are considered "offsite."

Prior to 1976, direct radiation measurements in the environment were made with dosimeters that were not as precise at lower exposures. Consequently, environmental radiation levels reported in the early years of the preoperational phase of the monitoring program exceed current measurements of background radiation levels. For this reason, data collected prior to 1976 are not included in this report.

The quarterly gamma radiation levels determined from the TLDs deployed around SQN in 1995 are summarized in Table H-1. The results from all measurements at individual stations are presented in Table H-2. The exposures are measured in milliroentgens and reported in millirem/standard quarter. For purposes of this report, one milliroentgen and one millirem (mrem) are assumed to be equivalent. The rounded average annual exposures are shown below. For comparison purposes, the average direct radiation measurements made in the preoperational phase of the monitoring program are also shown.

	Annual Average Direct Radiation Levels SQN mrem/year	
	1995	Preoperational Average
Onsite Stations	59	79
Offsite Stations	53	63

The data in Table H-1 indicate that the average quarterly radiation levels at the SQN onsite stations are approximately 2 mrem/quarter higher than levels at the offsite stations. This difference has also been noted in the preoperational phase and in the stations at WBN and other nonoperating TVA nuclear power plant construction sites where the average levels onsite are generally 2-6 mrem/quarter higher than levels offsite. The causes of these differences have not been isolated; however, it is postulated that the differences are probably attributable to combinations of influences such as natural variations in environmental radiation

levels, earth-moving activities onsite, and the mass of concrete employed in the construction of the plant. Other undetermined influences may also play a part. These conclusions are supported by the fact that similar differences between onsite and offsite stations are currently observed in the vicinity of the WBN construction site.

Figure H-1 compares plots of the data from the onsite or site boundary stations with those from the offsite stations over the period from 1976 through 1995. To reduce the seasonal variations present in the data sets, a 4-quarter moving average was constructed for each data set. Figure H-2 presents a trend plot of the direct radiation levels as defined by the moving averages. The data follow the same general trend as the raw data, but the curves are much smoother.

All results reported in 1995 are consistent with direct radiation levels identified at locations which are not influenced by the operation of SQN. There is no indication that SQN activities increased the background radiation levels normally observed in the areas surrounding the plant.

ATMOSPHERIC MONITORING

The atmospheric monitoring network is divided into three groups identified as local, perimeter, and remote. Four local air monitoring stations are located on or adjacent to the plant site in the general directions of greatest wind frequency. Four perimeter air monitoring stations are located in communities out to about 10 miles from the plant, and four remote air monitors are located out to 20 miles. The monitoring program and the locations of monitoring stations are identified in the tables and figures of Appendix A. The remote stations are used as control or baseline stations.

Results from the analysis of samples in the atmospheric pathway are presented in Tables H-3 and H-4. Radioactivity levels identified in this reporting period are consistent with background and radionuclides produced as a result of fallout from previous nuclear weapons tests. There is no indication of an increase in atmospheric radioactivity as a result of SQN.

Sample Collection and Analysis

Air particulates are collected by continuously sampling air at a flow rate of approximately 2 cubic feet per minute (cfm) through a 2-inch Hollingsworth and Vose LB5211 glass fiber filter. The sampling system consists of a pump, a magnehelic gauge for measuring the drop in pressure across the system, and a dry gas meter. This allows an accurate determination of the volume of air passing through the filter. This system is housed in a building approximately 2 feet by 3 feet by 4 feet. The filter is contained in a sampling head mounted on the outside of the monitor building. The filter is replaced every 7 days. Each filter is analyzed for gross beta activity about 3 days after collection to allow time for the radon daughters to decay. Every 4 weeks composites of the filters from each location are analyzed by gamma spectroscopy.

Gaseous radioiodine is collected using a commercially available cartridge containing TEDA-impregnated charcoal. This system is designed to collect iodine in both the elemental form and as organic compounds. The cartridge is located in the same sampling head as the air particulate filter and is downstream of the particulate filter. The cartridge is changed at the

same time as the particulate filter and samples the same volume of air. Each cartridge is analyzed for I-131 by a complete gamma spectroscopy analysis.

Rainwater is collected by use of a collection tray attached to the monitor building. The collection tray is protected from debris by a screen cover. As water drains from the tray, it is collected in one of two 5-gallon containers inside the monitor building. A 1-gallon sample is removed from the container every 4 weeks. Any excess water is discarded. Rainwater samples are held to be analyzed only if the air particulate samples indicate the presence of elevated activity levels or if fallout is expected. For example, rainwater samples were analyzed during the period of fallout following the accident at Chernobyl in 1986. Since no plant-related air activity was detected in environmental samples in 1995, no rainwater samples from SQN were analyzed in this reporting period.

Results

The results from the analysis of air particulate samples are summarized in Table H-3. Gross beta activity in 1995 was consistent with levels reported in previous years. The average level at indicator and control stations was 0.020 and 0.021 pCi/m^3, respectively. The annual averages of the gross beta activity in air particulate filters at these stations for the years 1971-1995 are presented in Figure H-3. Increased levels due to fallout from atmospheric nuclear weapons testing are evident, especially in 1971, 1977, 1978, and 1981. Evidence of a small increase resulting from the Chernobyl accident can also be seen in 1986. These patterns are consistent with data from monitoring programs conducted by TVA at nonoperating nuclear power plant construction sites.

Only natural radioactive materials were identified by the monthly gamma spectral analysis of the air particulate samples. No fission or activation products were found at levels greater than the LLDs. As shown in Table H-4, iodine-131 was not detected in any of the charcoal canister samples collected in 1995.

TERRESTRIAL MONITORING

Terrestrial monitoring is accomplished by collecting samples of environmental media that may transport radioactive material from the atmosphere to humans. For example, radioactive material may be deposited on a vegetable garden and be ingested along with the vegetables or it may be deposited on pasture grass where dairy cattle are grazing. When the cow ingests the radioactive material, some of it may be transferred to the milk and consumed by humans who drink the milk. Therefore, samples of milk, vegetation, soil, and food crops are collected and analyzed to determine potential impacts from exposure through this pathway. The results from the analysis of these samples are shown in Tables H-5 through H-13.

A land use survey is conducted annually to locate milk producing animals and gardens within a 5-mile radius of the plant. Three dairy farms are located on the east side of the river between 4 and 6 miles from the plant. Two farms with at least one milk producing animal have been identified within 2 miles of the plant. The locations with the highest calculated doses to people drinking the milk are included in the sampling program. The dairy located about 5 miles northeast of the plant and the two farms near the plant are considered indicator stations. The results of the 1995 land use survey are presented in Appendix G.

Sample Collection and Analysis

Milk samples are purchased every 2 weeks from one dairy, from the two farms within 2 miles of the plant and from at least one of three control dairies. These samples are placed on ice for transport to the Radioanalytical Laboratory. A specific analysis for I-131 and a gamma spectroscopy analysis are performed on each sample and Sr-89,90 analysis is performed quarterly.

Vegetation is being sampled every 4 weeks from one farm that had milk producing animals in the past. An additional sample is collected from one control station. The samples are collected by cutting or breaking enough vegetation to provide between 100 and 200 grams of sample. Care is taken not to include any soil with the vegetation. The sample is placed in a

container with 1650 ml of 0.5 N NaOH for transport back to the Radioanalytical Laboratory for I-131 analysis. A second sample of between 750 and 1000 grams is also collected from each location. After drying and grinding, these samples are analyzed by gamma spectroscopy. Once each quarter, the samples are ashed after the gamma analysis is completed and analyzed for Sr-89,90.

Soil samples are collected annually from the air monitoring locations. The samples are collected with either a "cookie cutter" or an auger type sampler. After drying and grinding, the sample is analyzed by gamma spectroscopy. When the gamma analysis is complete, the sample is ashed and analyzed for Sr-89,90.

Samples representative of food crops raised in the area near the plant are obtained from individual gardens, corner markets, or cooperatives. Types of foods may vary from year to year as a result of changes in the local vegetable gardens. In 1995 samples of apples, cabbage, corn, green beans, potatoes, and tomatoes were collected from local vegetable gardens. The edible portion of each sample is analyzed by gamma spectroscopy.

Results

The results from the analysis of milk samples are presented in Table H-5. No radioactivity which could be attributed to SQN was identified. All I-131 results were less that the established nominal LLD of 0.4 pCi/liter. Strontium-90 was found in less than one-half of the samples. The Sr-90 levels are consistent with concentrations measured in samples collected prior to plant operation and with concentrations reported in milk as a result of fallout from atmospheric nuclear weapons tests (Reference 1). Figure H-4 displays the average Sr-90 concentrations measured in milk since 1971. The concentrations have steadily decreased as a result of the 28-year half-life of Sr-90 and the washout and transport of the element through the soil over the period. The average Sr-90 concentration reported from indicator stations in 1995 was 3.81 pCi/liter. An average of 2.11 pCi/liter was identified in samples from control stations. By far the predominant isotope reported in milk samples was

the naturally occurring K-40. An average of approximately 1300 pCi/liter of K-40 was identified in all milk samples.

As has been noted in this series of reports for previous years, the levels of Sr-90 in milk samples from farms producing milk for private consumption only are up to six times the levels found in milk from commercial dairy farms. Samples of feed and water supplied to the animals were analyzed in 1979 in an effort to determine the source of the strontium. Analysis of dried hay samples indicated levels of Sr-90 slightly higher than those encountered in routine vegetation samples. Analysis of pond water indicated no significant strontium activity.

This phenomenon was observed during the preoperational radiological monitoring near SQN and near the Bellefonte Nuclear Plant construction site at farms where only one or two cows were being milked for private consumption of the milk. It is postulated that the feeding practices of these small farms differ from those of the larger dairy farmers to the extent that fallout from atmospheric nuclear weapons testing may be more concentrated in these instances. Similarly, Hansen, et al. (Reference 4), reported an inverse relationship between the levels of Sr-90 in milk and the quality of fertilization and land management.

Results from the analysis of vegetation samples (Table H-6) were similar to those reported for milk. All I-131 values were less than the nominal LLD. Strontium-90 was identified in six samples at concentrations ranging from 13.1 to 61.2 pCi/Kg. These concentrations are consistent with levels in vegetation from nuclear weapons fallout. Again, the largest concentrations identified were for the naturally occurring isotopes K-40 and Be-7.

The only fission or activation product identified in soil samples was Cs-137. The maximum concentration of Cs-137 was 1.21 pCi/g. This value is consistent with levels previously reported from fallout. All other radionuclides reported were naturally occurring isotopes (Table H-7).

A plot of the annual average Cs-137 concentrations in soil is presented in Figure H-5. Like the levels of Sr-90 in milk, concentrations of Cs-137 in soil are steadily decreasing as a result of the cessation of weapons testing in the atmosphere, the 30-year half-life of Cs-137 and transport through the environment.

All radionuclides reported in food samples were naturally occurring. The maximum K-40 value was 3380 pCi/kg in potatoes. Analysis of these samples indicated no contribution from plant activities. The results are reported in Tables H-8 through H-13.

AQUATIC MONITORING

Potential exposures from the liquid pathway can occur from drinking water, ingestion of edible fish and clams, or from direct radiation exposure from radioactive materials deposited in the river sediment. The aquatic monitoring program includes the collection of samples of river (reservoir) water, groundwater, drinking water supplies, fish, Asiatic clams, and bottom and shoreline sediment. Samples from the reservoir are collected both upstream and downstream from the plant.

Results from the analysis of aquatic samples are presented in Tables H-14 through H-23. Radioactivity levels in water, fish, and clams were consistent with background and/or fallout levels previously reported. The presence of Co-58, Co-60, Cs-134 and Cs-137 was identified in some sediment samples; however, the projected exposure to the public through sediment is less than 0.1 mrem/year.

Sample Collection and Analysis

Samples of surface water are collected from the Tennessee River using automatic sampling pumps from two downstream stations and one upstream station. A timer turns on the pump at least once every 2 hours. The line is flushed and a sample collected into a composite jug. A 1-gallon sample is removed from the composite jug at 4-week intervals and the remaining water in the jug is discarded. The composite sample is analyzed for gamma-emitting radionuclides and for gross beta activity. A quarterly composite sample is analyzed for Sr-89,90 and tritium.

Samples are also collected by an automatic sampling pump at the first downstream drinking water intake. These samples are collected in the same manner as the surface water samples. These monthly samples are analyzed by gamma spectroscopy and for gross beta activity. At other selected locations, grab samples are collected from drinking water systems which use the Tennessee River as their source. These samples are analyzed every 4 weeks by gamma spectroscopy and for gross beta activity. A quarterly composite sample from each station is analyzed for Sr-89,90 and tritium.

The sample collected by the automatic pumping device is taken directly from the river at the intake structure. Since the sample at this point is raw water, not water processed through the water treatment plant, the control sample should also be unprocessed water. Therefore, the upstream surface water sample is also considered as a control sample for drinking water.

Groundwater is sampled from an onsite well and from a private well in an area unaffected by SQN. The samples are composited by location quarterly and analyzed by gamma spectroscopy and for gross beta activity and for strontium and tritium content.

Samples of commercial and game fish species are collected semiannually from each of two reservoirs: the reservoir on which the plant is located (Chickamauga Reservoir) and the upstream reservoir (Watts Bar Reservoir). The samples are collected using a combination of netting techniques and electrofishing. Most of the fish are filleted, but one group is processed whole for analysis. After drying and grinding, the samples are analyzed by gamma spectroscopy. In addition, whole commercial fish species are analyzed for Sr-89 and Sr-90 as a part of commitments in the WBN monitoring program.

Bottom and shoreline sediment are collected semiannually from selected TRM locations using a dredging apparatus or divers. The samples are dried and ground and analyzed by gamma spectroscopy.

Samples of Asiatic clams are collected semiannually from two locations below the plant and one location above the plant. The clams are usually collected in the dredging or diving process with the sediment. However, at times the clams are difficult to find. Enough clams are collected to produce approximately 50 grams of wet flesh. The flesh is separated from the shells, and the dried flesh samples are analyzed by gamma spectroscopy.

Results

Gross beta activity was present in most surface water samples. Concentrations in downstream samples averaged 2.8 pCi/liter while the upstream samples averaged 2.7 pCi/liter. All

values were consistent with previously reported levels from fallout. A trend plot of the gross beta activity in surface water samples from 1971 through 1995 is presented in Figure H-6. A summary table of the results is shown in Table H-14.

The only fission or activation product identified in drinking water samples was tritium. The isotope was found in one sample at a concentration slightly above the LLD. Average gross beta activity was 2.8 pCi/liter at the downstream stations and 2.8 pCi/liter at the control stations. The results are shown in Table H-15 and a trend plot of the gross beta activity in drinking water from 1971 to the present is presented in Figure H-7.

Concentrations of fission and activation products in ground water were all below the LLDs. Only naturally occurring radionuclides were identified in these samples. Gross beta concentrations in samples from the onsite well averaged 2.1 pCi/liter, while the average from the offsite well was 6.0 pCi/liter. The results are presented in Table H-16.

Cesium-137 was identified in four fish samples. The downstream samples contained a maximum of 0.07 pCi/g, while the upstream samples had a maximum of 0.07 pCi/g. Other radioisotopes found in fish were naturally occurring with the most notable being K-40. The concentrations of K-40 ranged from 5.5 pCi/g to 15.6 pCi/g. The results are summarized in Tables H-17, H-18, H-19, and H-20. Plots of the annual Cs-137 concentrations are presented in Figures H-8, H-9, H-10 and H-11. Since the concentrations downstream are essentially equivalent to the upstream levels, the concentrations of Cs-137 are probably a result of fallout or other upstream effluents rather than activities at SQN.

Radionuclides of the types produced by nuclear power plant operations were identified in sediment samples. The materials identified were Cs-137, Cs-134, Co-60, and Co-58. In bottom sediment samples the average levels of Cs-137 were 0.82 pCi/g in downstream samples and 0.79 pCi/g upstream. In shoreline sediment, Cs-137 levels averaged 0.16 pCi/g in downstream samples and were below the LLD in upstream samples. These values are consistent with previously identified fallout levels; therefore, they are probably not a result of SQN operations.

In bottom sediment, Co-60 concentrations in downstream samples averaged 0.23 pCi/g, while levels upstream were below the LLD. The maximum concentration in downstream samples was 0.42 pCi/g. Co-60 was not identified in shoreline sediment samples.

Cs-134 was identified in three downstream stream sediment samples at an average concentration of 0.05 pCi/g. Co-58 was identified in three downstream samples at an average concentration of 0.22 pCi/g. A realistic assessment of the impact to the general public from this activity produces a negligible dose equivalent. Results from the analysis of bottom sediment samples are shown in Table H-21.

Co-58, Co-60, and Cs-134 were not identified in shoreline sediment. Average Cs-137 concentrations downstream were essentially equivalent to previously reported levels. Results from the analysis of shoreline sediment samples are shown in Table H-22.

Graphs of the Cs-137 and Co-60 concentrations in stream sediment are presented in Figures H-12 and H-13, respectively. Figure H-14 presents a plot of the Cs-137 concentrations measured in shoreline sediment since 1980.

Only naturally occurring radioisotopes were identified in clam flesh samples. The results from the analysis of these samples are presented in Table H-23.

ASSESSMENT AND EVALUATION

Potential doses to the public are estimated from measured effluents using computer models. These models were developed by TVA and are based on methodology provided by the NRC in Regulatory Guide 1.109 for determining the potential dose to individuals and populations living in the vicinity of a nuclear power plant. The doses calculated are a representation of the dose to a "maximally exposed individual." Some of the factors used in these calculations (such as ingestion rates) are maximum expected values which will tend to overestimate the dose to this "hypothetical" person. In reality, the expected dose to actual individuals is lower.

The area around the plant is analyzed to determine the pathways through which the public may receive an exposure. As indicated in Figure 2, the two major ways by which radioactivity is introduced into the environment are through liquid and gaseous effluents.

For liquid effluents, the public can be exposed to radiation from three sources: drinking water from the Tennessee River, eating fish caught in the Tennessee River, and direct exposure to radioactive material due to activities on the banks of the river (recreational activities). Data used to determine these doses are based on guidance given by the NRC for maximum ingestion rates, exposure times, and distribution of the material in the river. Whenever possible, data used in the dose calculation are based on specific conditions for the SQN area.

For gaseous effluents, the public can be exposed to radiation from several sources: direct radiation from the radioactivity in the air, direct radiation from radioactivity deposited on the ground, inhalation of radioactivity in the air, ingestion of vegetation which contains radioactivity deposited from the atmosphere, and ingestion of milk or meat from animals which consumed vegetation containing deposited radioactivity. The concentrations of radioactivity in the air and the soil are estimated by computer models which use the actual meteorological conditions to determine the distribution of the effluents in the atmosphere. Again, as many of the parameters as possible are based on actual site specific data.

Results

The estimated doses to the maximally exposed individual due to radioactivity released from SQN in 1995 are presented in Table 3. These estimates were made using the concentrations of the liquids and gases measured at the effluent monitoring points. Also shown are the regulatory limits for these doses and a comparison between the calculated dose and the corresponding limit. The maximum calculated whole body dose equivalent from measured liquid effluents as presented in Table 3 is 0.070 mrem/year, or 2.3 percent of the limit. The maximum organ dose equivalent from gaseous effluents is 0.032 mrem/year. This represents 0.21 percent of the ODCM limit. A more complete description of the effluents released from SQN and the corresponding doses projected from these effluents can be found in the SQN Radioactive Effluent Release Report.

As stated earlier in this report, the estimated increase in radiation dose equivalent to the general public resulting from the operation of SQN is negligible when compared to the dose from natural background radiation. The results from each environmental sample are compared with the concentrations from the corresponding control stations and appropriate preoperational and background data to determine influences from the plant. During this report period, Co-60, Co-58, Cs-134, and Cs-137 were seen in aquatic media. Cs-137 in sediment is consistent with fallout levels identified in samples both upstream and downstream from the plant. Co-60, Co-58, and Cs-134 were identified in sediment samples downstream from the plant in concentrations which would produce no measurable increase in the dose to the general public. No increases of radioactivity attributable to SQN have been seen in water samples.

Dose estimates were made from concentrations of radioactivity found in samples of environmental media. Media evaluated include, but are not limited to, air, milk, food products, drinking water, and fish. Inhalation and ingestion doses estimated for persons at the indicator locations were essentially identical to those determined for persons at control stations. More than 99 percent of those doses were contributed by the naturally occurring radionuclide K-40 and by Sr-90 and Cs-137, which are long-lived radioisotopes found in

fallout from nuclear weapons testing. Concentrations of Sr-90 and Cs-137 are consistent with levels measured in TVA's preoperational environmental radiological monitoring programs. Figures H-4 and H-5 and Figures H-9 through H-12 indicate that concentrations of Sr-90 and Cs-137 in the environment have decreased since the cessation of atmospheric weapons testing in 1981. This decrease is the result of the decay of the two isotopes and the redistribution of the materials in the environment.

Conclusions

It is concluded from the above analysis of the environmental sampling results and from the trend plots presented in Appendix H that the exposure to members of the general public which may have been attributable to SQN is negligible. The radioactivity reported herein is primarily the result of fallout or natural background radiation. Any activity which may be present as a result of plant operations does not represent a significant contribution to the exposure of members of the public.

REFERENCES

1. Merril Eisenbud, Environmental Radioactivity, Academic Press, Inc., New York, NY, 1987.

2. National Council on Radiation Protection and Measurements, Report No. 93, "Ionizing Radiation Exposure of the Population of the United States," September 1987.

3. United States Nuclear Regulatory Commission, Regulatory Guide 8.29, "Instruction Concerning Risks From Occupational Radiation Exposure," July 1981.

4. Hansen, W. G., Campbell, J. E., Fooks, J. H., Mitchell, H. C., and Eller, C. H., Farming Practices and Concentrations of Emission Products in Milk, U.S. Department of Health, Education, and Welfare; Public Health Service Publication No. 999-R-6, May 1964.

Table 1

COMPARISON OF MAXIMUM ANNUAL AVERAGE EFFLUENT CONCENTRATIONS RELEASED TO UNRESTRICTED AREAS WITH REPORTING LEVELS AND LOWER LIMITS OF DETECTION

	Concentrations in Water, pCi/Liter			Concentrations in Air, pCi/Cubic Meter		
	Effluent Concentration[1]	Reporting Level[2]	Lower Limit of Detection[3]	Effluent Concentration[1]	Reporting Level[2]	Lower Limit of Detection[3]
H-3	1,000,000	20,000	250	100,000		
Cr-51	500,000		45	30,000		0.02
Mn-54	30,000	1,000	5	1,000		0.005
Co-58	20,000	1,000	5	1,000		0.005
Co-60	30,000	300	5	50		0.005
Zn-65	5,000	300	10	400		0.005
Sr-89	8,000		3	1,600		0.0006
Sr-90	500		1.4	6		0.0003
Nb-95	30,000	400	5	2,000		0.005
Zr-95	20,000	400	10	400		0.005
Ru-103	30,000		5	900		0.005
Ru-106	3,000		40	20		0.02
I-131	1,000	2	1	200	0.9	0.02
Cs-134	900	30	5	200	10	0.005
Cs-137	1,000	50	5	200	20	0.005
Ce-144	3,000		33	40		0.01
Ba-140	8,000	200	25	2,000		0.01
La-140	9,000	200	8	2,000		0.005

Note: 1 pCi = 3.7×10^{-2} Bq.

Note: For those reporting levels that are blank, no value is given in the reference.

1 Source: Table 2 of Appendix B to 10 CFR 20.1001-20.2401

2 Source: SQN Offsite Dose Calculation Manual, Table 2.3-3

3 Source: Table E-1 of this report

Table 2

Results from the
Intercomparison of Environmental Dosimeters

Year	TVA Results mrem	Average, All Respondents mrem	Calculated Exposure (See Note 1) mrem	% Difference TVA: Calculated	% Difference Respondents: Calculated
Field Dosimeters					
74	15.0	16.3	16.3	-8.0	0.0
77	30.4	31.5	34.9	-12.9	-9.7
79	13.8	16.0	14.1	-2.1	13.5
81	31.8	30.2	30.0	6.0	0.7
82	43.2	45.0	43.5	-0.7	3.4
84	73.0	75.1	75.8	-3.7	-0.9
86a	33.2	28.9	29.7	11.8	-2.7
86b	9.4	10.1	10.4	-9.6	-2.9
93a	24.4	26.4	27.0	-9.6	-2.2
93b	27.6	26.4	27.0	2.2	-2.2
Low Irradiated Dosimeters					
74	27.9	28.5	30.0	-7.0	-5.0
79	12.1	12.1	12.2	-0.8	-0.8
86	18.2	16.2	17.2	5.8	-5.8
93a	24.9	25.0	25.9	-3.9	-3.5
93b	27.8	25.0	25.9	7.3	-3.5
High Irradiated Dosimeters					
77	99.4	86.2	91.7	8.4	-6.0
79	46.1	43.9	45.8	0.7	-4.1
81a	84.1	75.8	75.2	11.8	0.8
81b	102.0	90.7	88.4	15.4	2.6
82a	179.0	191.0	202.0	-11.4	-5.4
82b	136.0	149.0	158.0	-13.9	-5.7
84a	85.6	77.9	79.9	7.1	-2.5
84b	76.8	73.0	75.0	2.4	-2.7
93a	67.8	69.8	72.7	-6.7	-4.0
93b	80.2	69.8	72.7	10.3	-4.0

Notes:
1. The calculated exposure is the "known" exposure determined the testing agency.
2. See Figure 3.

Table 3

Maximum Dose due to Radioactive Effluent Releases
Sequoyah Nuclear Plant
1995
mrem/year

Liquid Effluents

Type	1995 Dose	NRC Limit	Percent of NRC Limit	EPA Limit	Percent of EPA Limit
Total Body	0.070	3	2.3	25	0.28
Any Organ	0.102	10	1.0	25	0.41

Gaseous Effluents

Type	1995 Dose	NRC Limit	Percent of NRC Limit	EPA Limit	Percent of EPA Limit
Noble Gas (Gamma)	0.006	10	0.06	25	0.02
Noble Gas (Beta)	0.012	20	0.06	25	0.05
Any Organ	0.032	15	0.21	25	0.13

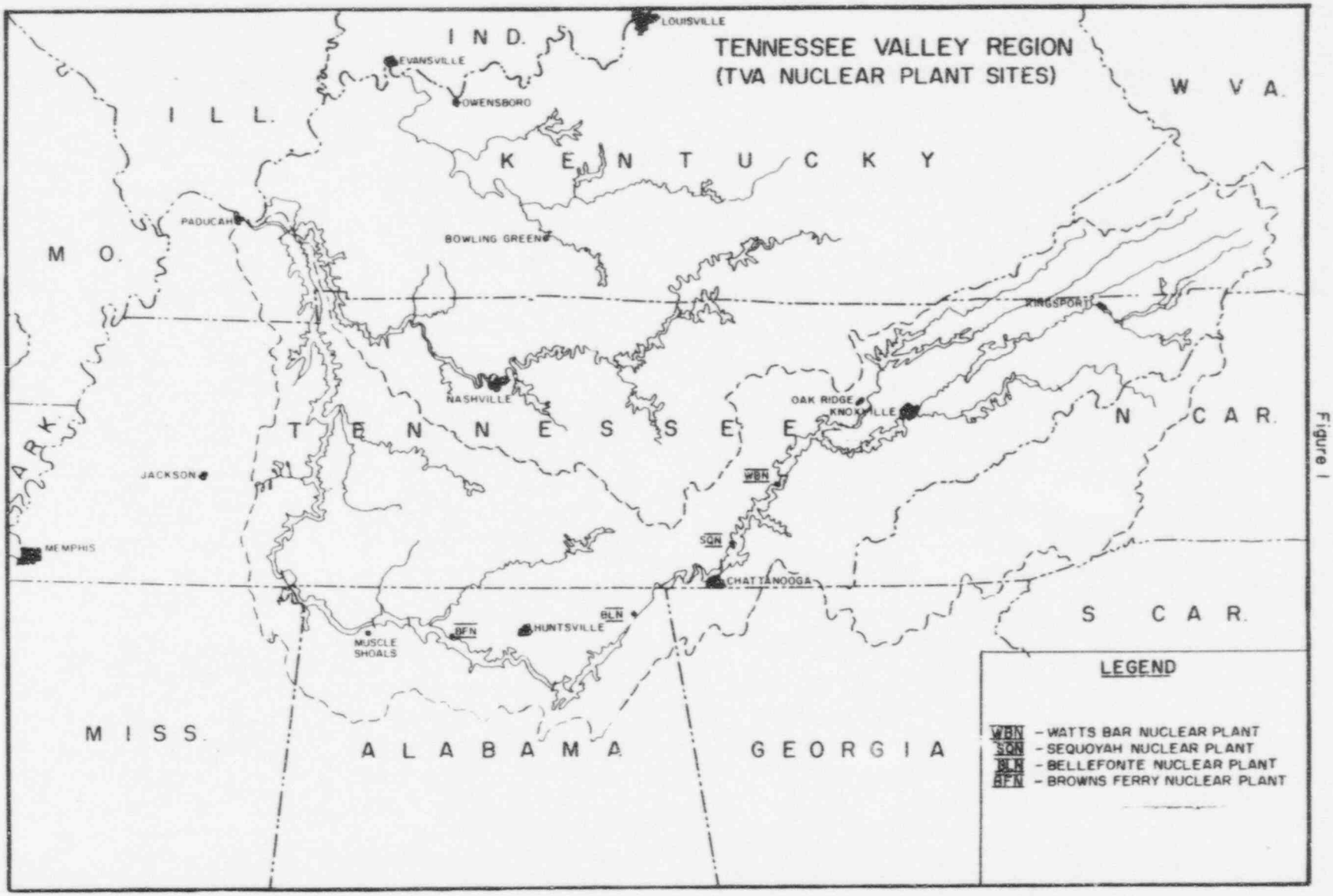
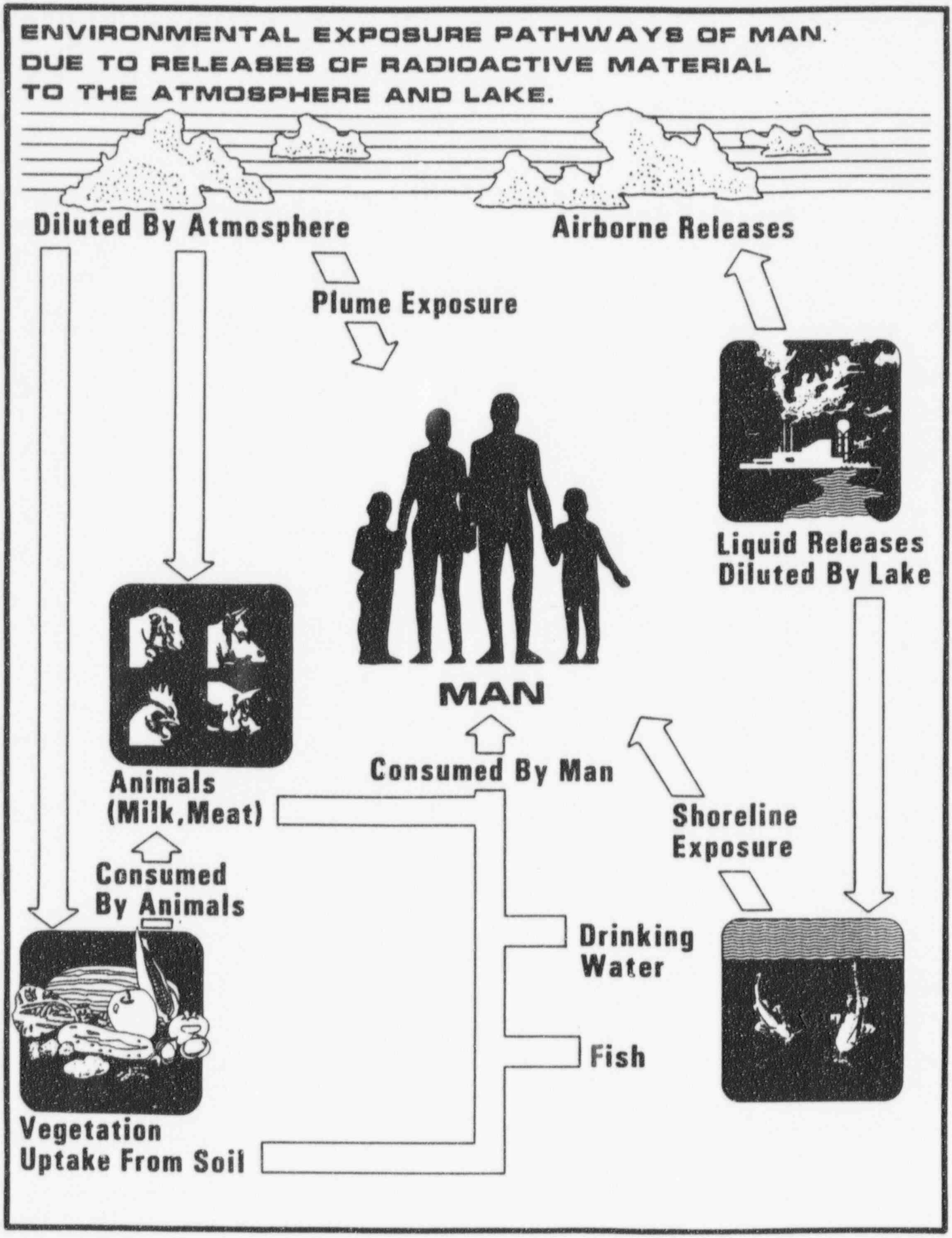


Figure 1

FIGURE 1

FIGURE 2


ENVIRONMENTAL EXPOSURE PATHWAYS OF MAN.
DUE TO RELEASES OF RADIOACTIVE MATERIAL
TO THE ATMOSPHERE AND LAKE.
Diluted By Atmosphere
Airborne Releases
Plume Exposure
Liquid Releases
Diluted By Lake
MAN
Animals
(Milk, Meat)
Consumed By Man
Shoreline
Exposure
Consumed
By Animals
Drinking
Water
Fish
Vegetation
Uptake From Soil

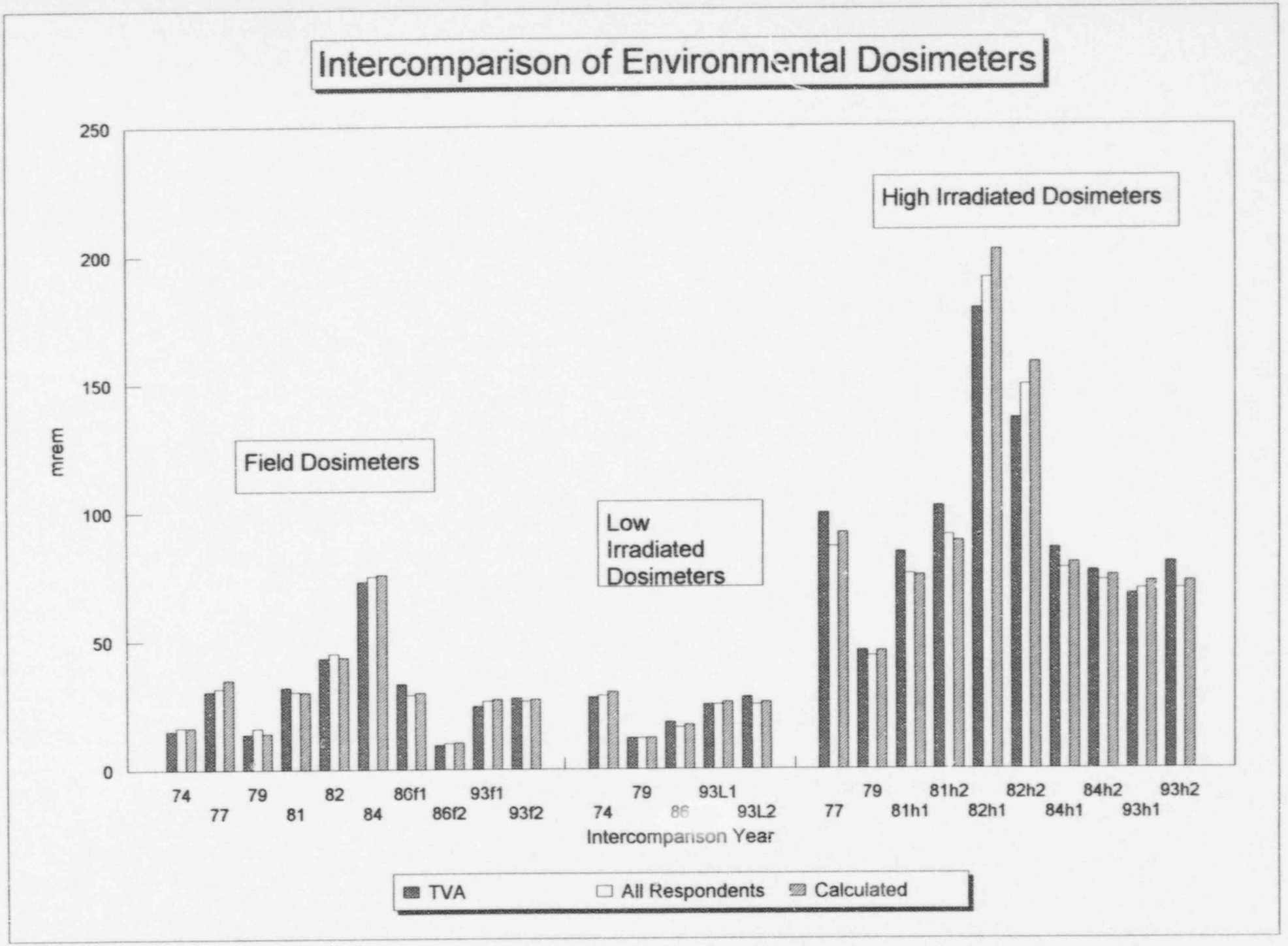

Intercomparison of Environmental Dosimeters
250
200
150
100
50
0
mrem
Field Dosimeters
Low
Irradiated
Dosimeters
High Irradiated Dosimeters
74
77
79
81
82
84
86f1
86f2
93f1
93f2
79
74
86
93L1
93L2
79
77
81h1
81h2
82h1
82h2
84h1
84h2
93h1
93h2
Intercomparison Year
TVA
All Respondents
Calculated

FIGURE 3

APPENDIX A

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM AND SAMPLING LOCATIONS

Table A-1

SEQUOYAH NUCLEAR PLANT
Environmental Radiological Monitoring Program[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
1. AIRBORNE			
a. Particulates	4 samples from locations (in different sectors) at or near boundary site (LM-2, LM-3 LM-4, and LM-5) 4 samples from communities approximately 6-10 miles distance from the plant (PM-2, 3, 8 and 9) 4 samples from control locations greater than 10 miles from the plant (RM-1, RM-2, RM-3, and RM-4)	Continuous sampler operation with sample collection once per 7 days (more frequently if required by dust loading)	Particulate sampler. Analyze for gross beta radioactivity greater than or equal to 24 hours following filter change. Perform gamma isotopic analysis on each sample when gross beta activity is greater than 10 times yearly mean of control samples. Composite at least once per 31 days (by location) for gamma scan.
b. Radioiodine	Same locations as air particulates	Continuous sampler operation with charcoal canister	I-131 at least once per 7 days collection at least once per 7 days
c. Soil	Samples from same locations as air particulates	Once per year	Gamma scan, Sr-89, Sr-90 once per year
d. Rainwater	Same locations as air particulates	Composite sample at least once per 31 days	Analyzed for gamma nuclides only if radioactivity in other media indicates the presence of increased levels of fallout

Table A-1

SEQUOYAH NUCLEAR PLANT
Environmental Radiological Monitoring Program[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
2. DIRECT RADIATION	2 or more dosimeters (TLDs) placed at locations (in different sectors) at or near the site boundary in each of the 16 sectors	At least once per 92 days	Gamma dose at least once per 92 days
	2 or more dosimeters placed at stations located approximately 5 miles from the plant in each of the 16 sectors		
	2 or more dosimeters in approximately 20 locations of special interest		
3. WATERBORNE			
a. Surface Water	TRM 497.0[d] TRM 483.4 TRM 473.2	Collected by automatic sequential-type sampler[c] with composite samples collected over a period of less than or equal to 32 days	Gross beta and gamma scan on each composite sample. Composite for Sr-89, Sr-90 and tritium analysis at least once per 92 days
b. Ground Water	1 sample adjacent to the plant (Well No. 6)	At least once per 31 days	Composited for gross beta, gamma scan, Sr-89, Sr-90 and tritium at least once per 92 days
	1 sample from ground water source upgradient (Farm HW)	At least once per 92 days	Gross beta, gamma scan, Sr-89, Sr-90 and tritium at least once per 92 days

Table A-1

SEQUOYAH NUCLEAR PLANT
Environmental Radiological Monitoring Program[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
c. Drinking Water	1 sample at the first potable surface water supply downstream from the plant (TRM 473.0)	Collected by automatic sequential-type sampler[c] with composite sample collected over a period of less than or equal to 31 days	Gross beta and gamma scan on each composite sample. Composite for tritium, Sr-89 and Sr-90 at least once per 92 days
	1 sample at the next 2 downstream potable surface water suppliers (greater than 10 miles downstream) (TRM 470.5 and TRM 465.3)	Grab sample once per 31 days	
	2 samples at control locations (TRM 497.0[d] and TRM 503.8)	Samples collected by sequential-type sampler[c] with composite sample collected over a period of less than or equal to 31 days	
d. Sediment	TRM 496.5 TRM 483.4 TRM 480.8 TRM 472.8	At least once per 184 days	Gamma scan of each sample
e. Shoreline Sediment	TRM 485 TRM 478 TRM 477	At least once per 184 days	Gamma scan of each sample

Table A-1

SEQUOYAH NUCLEAR PLANT
Environmental Radiological Monitoring Program[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
4. INGESTION			
a. Milk	1 sample from milk producing animals in each of 1-3 areas indicated by the cow census where doses are calculated to be highest. If samples are not available from a milk animal location, doses to that area will be estimated by projecting the doses from concentrations detected in milk from other sectors or by sampling vegetation where milk is not available. At least one sample from control location (Farm S, C and/or B)	At least once per 15 days	Gamma isotopic and I-131 analysis of each sample. Sr-89 and Sr-90 once per quarter
b. Fish	1 sample each from Chickamauga and Watts Bar Reservoirs	At least once per 184 days. One sample of each of the following species: Channel Catfish Crappie Smallmouth Buffalo	Gamma scan on edible portion
c. Invertebrates (Asiatic Clams)	1 sample downstream from the discharge 1 sample upstream from the plant (No permanent stations established; depends on location of clams)	At least once per 184 days	Gamma scan on edible portion

Table A-1

SEQUOYAH NUCLEAR PLANT
Environmental Radiological Monitoring Program[a]

Exposure Pathway and/or Sample	Number of Samples and Locations[b]	Sampling and Collection Frequency	Type and Frequency of Analysis
d. Food Products	1 sample each of principal food products grown at private gardens and/or farms in the immediate vicinity of the plant.	At least once per 365 days at time of harvest. The types of foods available for sampling will vary. Following is a list of typical foods which may be available: Cabbage and/or lettuce Corn Green Beans Potatoes Tomatoes	Gamma scan on edible portion
	One sample of each of the same foods grown at greater than 10 miles distance from the plant		
e. Vegetation	Samples from farms producing milk but not providing a milk sample. (Farm EM)	At least once per 31 days	I-131 and gamma scan at least once per 31 days. Sr-89 and Sr-90 analysis at least once per 92 days.
	Control sample from one control dairy (Farm S)		

a. The sampling program outlined in this table is that which was in effect at the end of 1995.
b. Sampling locations, sector and distance from plant, are described in Table A-2 and A-3 and shown in Figures A-1, A-2, and A-3.
c. Composite samples shall be collected by collecting an aliquot at intervals not exceeding 2 hours.
d. The surface water control sample shall be considered a control for the drinking water sample.

Table A-2

SEQUOYAH NUCLEAR PLANT
Environmental Radiological Monitoring Program
Sampling Locations

Map Location Number[a]	Station	Sector	Approximate Distance (Miles)	Indicator (I) or Control (C)	Samples Collected[b]
2	LM-2	N	0.8	I	AP,CF,R,S
3	LM-3	SSW	2.0	I	AP,CF,R,S
4	LM-4	NE	1.5	I	AP,CF,R,S
5	LM-5	NNE	1.8	I	AP,CF,R,S
7	PM-2	SW	3.8	I	AP,CF,R,S
8	PM-3	W	5.6	I	AP,CF,R,S
9	PM-8	SSW	8.7	I	AP,CF,R,S
10	PM-9	WSW	2.6	I	AP,CF,R,S
11	RM-1	SW	16.7	C	AP,CF,R,S
12	RM-2	NNE	17.8	C	AP,CF,R,S
13	RM-3	ESE	11.3	C	AP,CF,R,S
14	RM-4	WNW	18.9	C	AP,CF,R,S
15	Farm B	NE	43.0	C	M
16	Farm C	NE	16.0	C	M
17	Farm S	NNE	12.0	C	M,V
18	Farm J	WNW	1.1	I	M
19	Farm HW	NW	1.2	I	M,W[c]
20	Farm EM	N	2.6	I	V
24	Well No. 6	NNE	0.15	I	W
31	TRM 473.0 (C.F. Industries)	--	11.5[d]	I	PW
32	TRM 470.5 (E.I. DuPont)	--	14.0[d]	I	PW
33	TRM 465.3 (Chattanooga)	--	19.2[d]	I	PW
34	TRM 497.0	--	12.5[d]	C	SW[e]
35	TRM 503.8 (Dayton)	--	19.3[d]	C	PW
36	TRM 496.5	--	12.0[d]	C	SD
37	TRM 485.0	--	0.5[d]	C	SS
38	TRM 483.4	--	1.1[d]	I	SD,SW
39	TRM 480.8	--	3.7[d]	I	SD
40	TRM 477.0	--	7.5[d]	I	SS
41	TRM 473.2	--	11.3[d]	I	SW
42	TRM 472.8	--	11.7[d]	I	SD
44	TRM 478.8	--	6.5[d]	I	SS
46	Chickamauga Reservoir (TRM 471-530)		--	I/C	F,CL
47	Watts Bar Reservoir (TRM 530-602)		--	C	F
48	Farm H	NE	5.3	I	M

a. See figures A-1, A-2, and A-3

b. Sample Codes

AP = Air particulate filter	PW = Public water	SS = Shoreline sediment
CF = Charcoal filter	R = Rainwater	SW = Surface water
CL = Clams	S = Soil	V = Vegetation
F = Fish	SD = Sediment	W = Well water
M = Milk		

c. A control for well water.

d. Distance from plant discharge (TRM 484.5)

e. Surface water sample also used as a control for public water.

Table A-3
SEQUOYAH NUCLEAR PLANT
Thermoluminescent Dosimeter (TLD) Locations

Map Location Number[a]	Station	Sector	Approximate Distance (miles)	Onsite (On)[b] or Offsite (Off)
3	SSW-1C	SSW	2.0	On
4	NE-1A	NE	1.5	On
5	NNE-1	NNE	1.8	On
7	SW-2	SW	3.8	Off
8	W-3	W	5.6	Off
9	SSW-3	SSW	8.7	Off
10	WSW-2A	WSW	2.6	Off
11	SW-3	SW	16.7	Off
12	NNE-4	NNE	17.8	Off
13	ESE-3	ESE	11.3	Off
14	WNW-3	WNW	18.9	Off
49	N-1	N	0.6	On
50	N-2	N	2.1	Off
51	N-3	N	5.2	Off
52	N-4	N	10.0	Off
53	NNE-2	NNE	4.5	Off
54	NNE-3	NNE	12.1	Off
55	NE-1	NE	2.4	Off
56	NE-2	NE	4.1	Off
57	ENE-1	ENE	0.4	On
58	ENE-2	ENE	5.1	Off
59	E-1	E	1.2	On
60	E-2	E	5.2	Off
61	ESE-A	ESE	0.3	On
62	ESE-1	ESE	1.2	On
63	ESE-2	ESE	4.9	Off
64	SE-A	SE	0.4	On
65	E-A	E	0.3	On
66	SE-1	SE	1.4	On
67	SE-2	SE	1.9	On
68	SE-4	SE	5.2	Off
69	SSE-1	SSE	1.6	On
70	SSE-2	SSE	4.6	Off
71	S-1	S	1.5	On
72	S-2	S	4.7	Off
73	SSW-1	SSW	0.6	On
74	SSW-2	SSW	4.0	Off
75	SW-1	SW	0.9	On
76	WSW-1	WSW	0.9	On
77	WSW-2	WSW	2.5	Off
78	WSW-3	WSW	5.7	Off
79	WSW-4	WSW	7.8	Off
80	WSW-5	WSW	10.1	Off
81	W-1	W	0.8	On
82	W-2	W	4.3	Off
83	WNW-1	WNW	0.4	On
84	WNW-2	WNW	5.3	Off
85	NW-1	NW	0.4	On
86	NW-2	NW	5.2	Off
87	NNW-1	NNW	0.6	On
88	NNW-2	NNW	1.7	On
89	NNW-3	NNW	5.3	Off
90	SSW-1B	SSW	1.5	On

a. See Figures A-1, A-2, and A-3.
b. TLDs designated 'onsite' are located 2 miles or less from the plant; 'offsite' are located more than 2 miles from the plant.

Figure A-1

Environmental Radiological Sampling Locations

Within 1 Mile of Plant

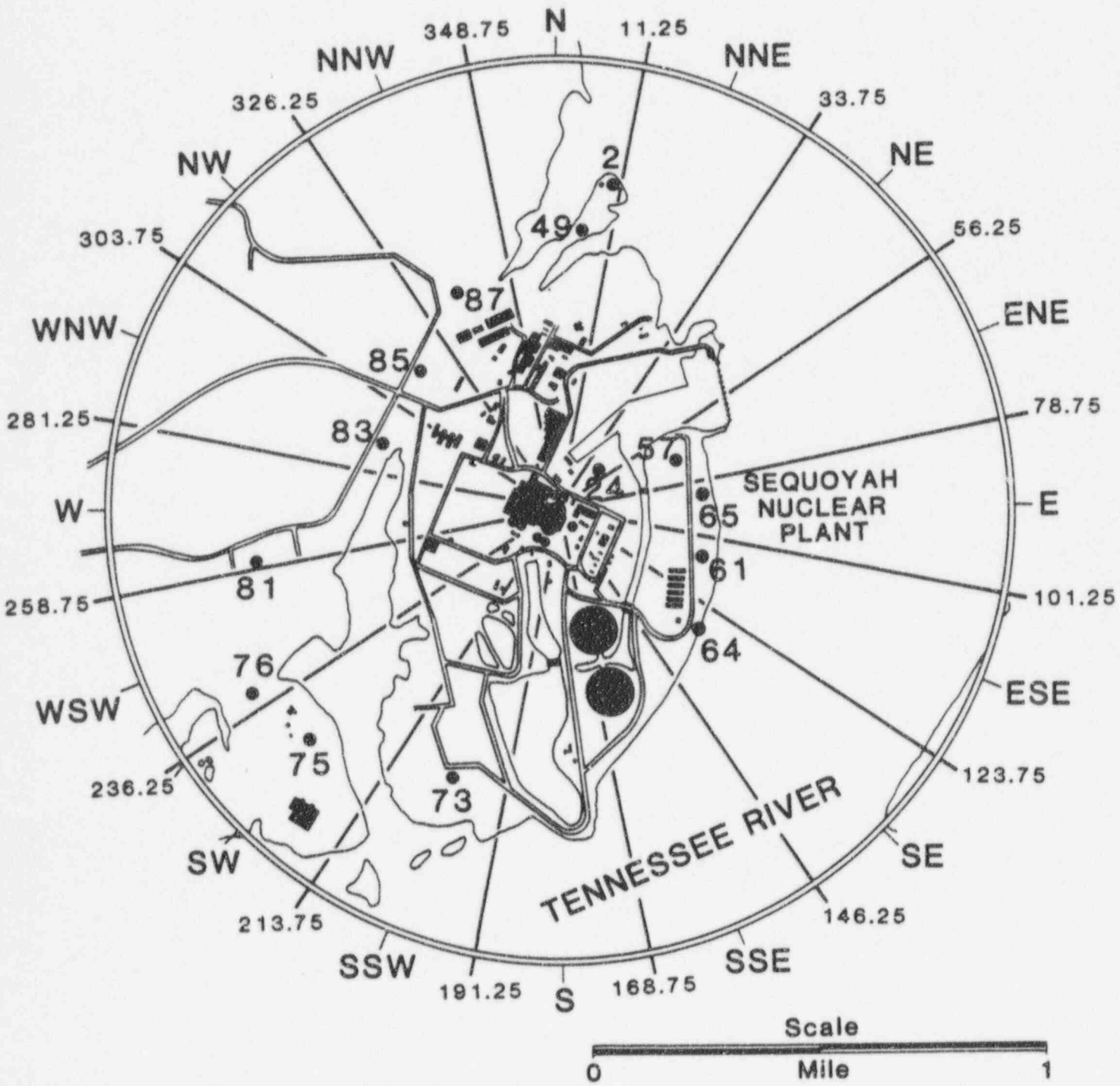


Figure A-2

Environmental Radiological Sampling Locations

From 1 to 5 Miles From the Plant

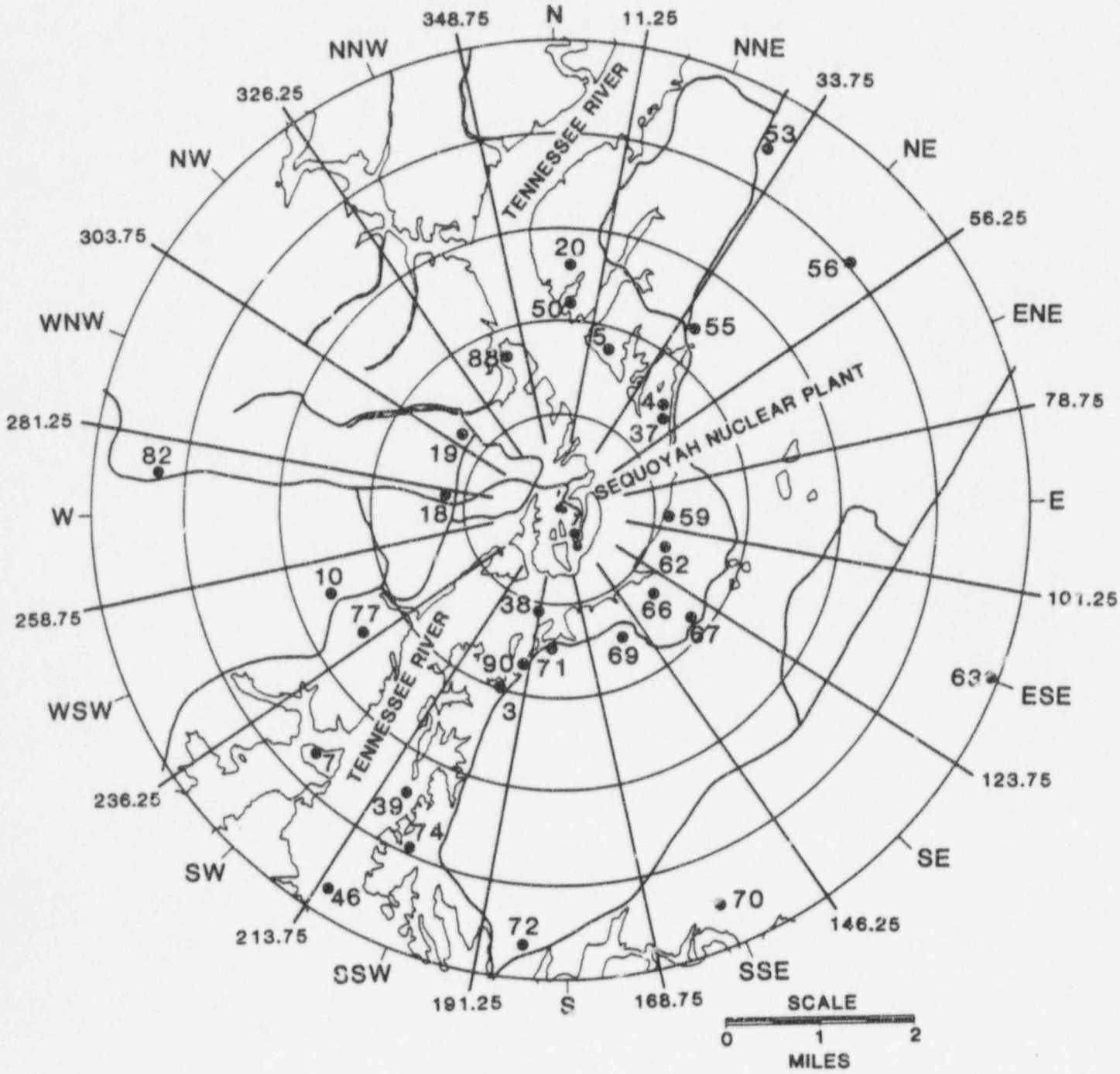
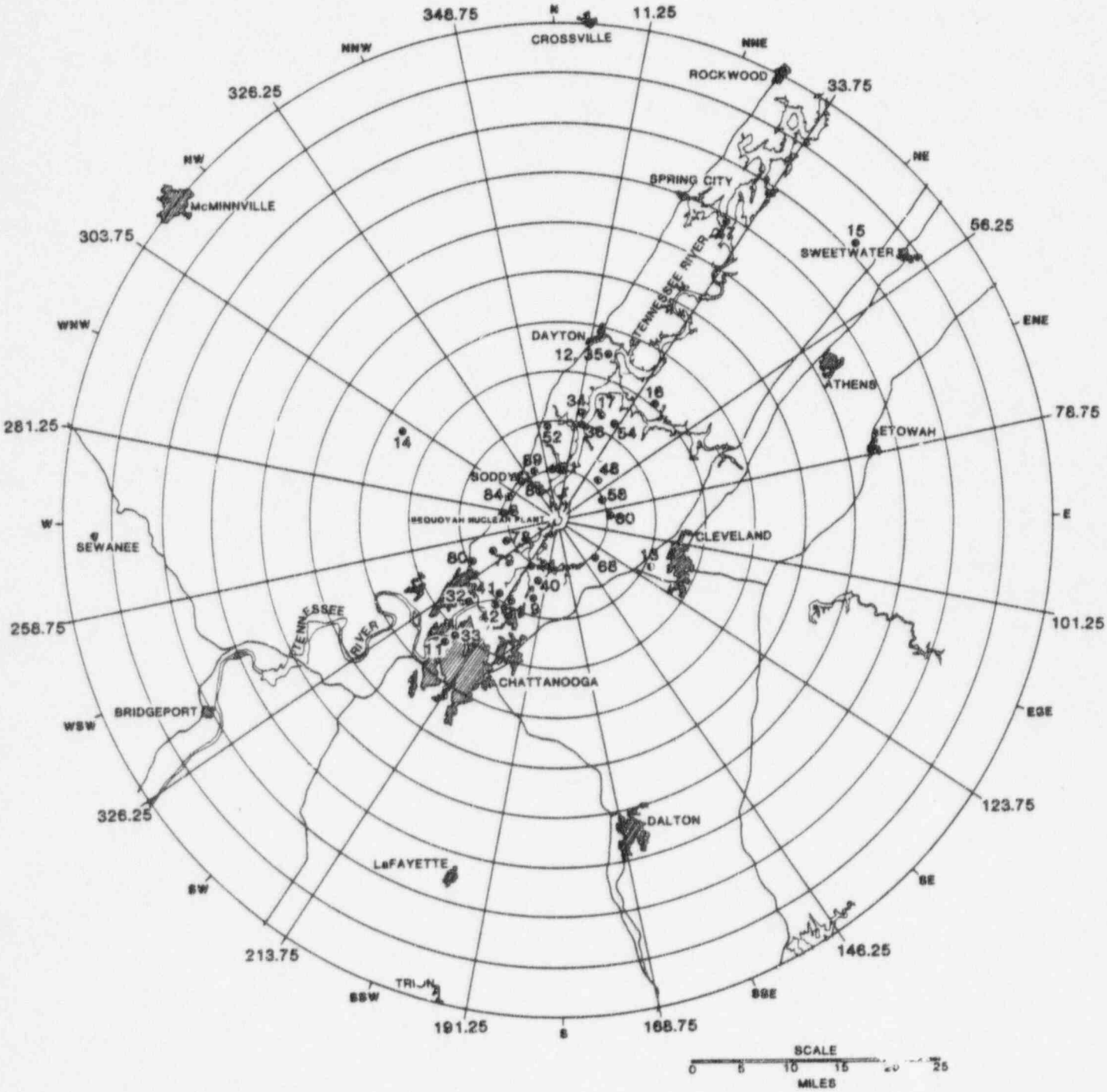


Figure A-3

Environmental Radiological Sampling Locations

Greater Than 5 Miles From the Plant



APPENDIX B

1995 PROGRAM MODIFICATIONS

Appendix B

Environmental Radiological Monitoring Program Modification

During 1995, two modifications were made in the environmental monitoring program. Fish sampling was discontinued from the reservoir downstream from the reservoir on which the plant is located and the number of downstream stations from which clam samples are collected was reduced from two to one.

The following table details the changes made in the SQN REMP in 1995.

Table B-1

SEQUOYAH NUCLEAR PLANT

Environmer al Radiological Monitoring Program Modifications
1995

Da'e	Station	Location	Remarks
1/1/95	Nickajack Reservoir	13.5 miles Downstream	The collection of fish samples from this reservoir was discontinued.
1/1/95	Downstream Clam Stations	1-13.5 miles Downstream	Since clams are becoming more difficult to find, the number of downstream sampling stations was reduced from two to one.

APPENDIX C

PROGRAM DEVIATIONS

Appendix C

Program Deviations

During the 1995 sampling period, three of the scheduled samples were not collected. These occurrences resulted in deviations from the scheduled program but not from the minimum program required by the Offsite Dose Calculation Manual. Table C-1 includes a list of missed samples and analyses and an explanation for the deviations.

Three milk samples were not collected because of the unavailability of milk. All other samples were collected as scheduled.

The missed samples are listed in the following table.

Table C-1

SEQUOYAH NUCLEAR PLANT

Environmental Radiological Monitoring Program
Exceptions

Date	Station	Location	Remarks
2/21/95	Farm J	1.1 miles WNW	Two milk samples were not collected because the cow died. The cow was replaced and sampling resumed on 3/7/95.
6/14/95	Farm B	43 miles NE	Milk had already been picked up by the processor and there was no milk available for a sample. Subsequent samples were collected as scheduled.
10/18/95	Farm H	5.3 miles NE	Milk had already been picked up by the processor and there was no milk available for a sample. Subsequent samples were collected as scheduled.

APPENDIX D

ANALYTICAL PROCEDURES

APPENDIX D

Analytical Procedures

Analyses of environmental samples are performed by the radioanalytical laboratory located at the Western Area Radiological Laboratory facility in Muscle Shoals, Alabama. All analysis procedures are based on accepted methods. A summary of the analysis techniques and methodology follows.

The gross beta measurements are made with an automatic low background counting system. Normal counting times are 50 minutes. Water samples are prepared by evaporating 500 ml of samples to near dryness, transferring to a stainless steel planchet and completing the evaporation process. For solid samples, a specified amount of the sample is packed into a deep stainless steel planchet. Air particulate filters are counted directly in a shallow planchet.

The specific analysis of I-131 in milk, water, or vegetation samples is performed by first isolating and purifying the iodine by radiochemical separation and then counting the final precipitate on a beta-gamma coincidence counting system. The normal count time is 100 minutes. With the beta-gamma coincidence counting system, background counts are virtually eliminated and extremely low levels of activity can be detected.

After a radiochemical separation, samples analyzed for Sr-89,90 are counted on a low background beta counting system. The sample is counted a second time after a 7-day ingrowth period. From the two counts the Sr-89 and Sr-90 concentrations can be determined.

Water samples are analyzed for tritium content by first distilling a portion of the sample and then counting by liquid scintillation. A commercially available scintillation cocktail is used.

Gamma analyses are performed in various counting geometries depending on the sample type and volume. All gamma counts are obtained with germanium type detectors interfaced with a computer based mutlichannel analyzer system. Spectral data reduction is performed by the computer program HYPERMET.

The charcoal cartridges used to sample gaseous radioiodine were analyzed by gamma spectroscopy using a germanium detector.

All of the necessary efficiency values, weight-efficiency curves, and geometry tables are established and maintained on each detector and counting system. A series of daily and periodic quality control checks are performed to monitor counting instrumentation. System logbooks and control charts are used to document the results of the quality control checks.

APPENDIX E

NOMINAL LOWER LIMITS OF DETECTION (LLD)

Appendix E

Nominal Lower Limits of Detection

Sensitive radiation detection devices can produce a signal even when no radioactivity is present in a sample being analyzed. This signal may come from trace amounts of radioactivity in the components of the device, from cosmic rays, from naturally occurring radon gas, or from electronic noise. The signal registered when no activity is present in the sample is called the background.

The point at which the signal is determined to represent radioactivity in the sample is called the critical level. This point is based on statistical analysis of the background readings from any particular device. However, any sample measured over and over in the same device will give different readings, some higher than others. The sample should have a well-defined average reading, but any individual reading will vary from that average. In order to determine the activity present in a sample that will produce a reading above the critical level, additional statistical analysis of the background readings is required. The hypothetical activity calculated from this analysis is called the lower limit of detection (LLD). A listing of typical LLD values that a laboratory publishes is a guide to the sensitivity of the analytical measurements performed by the laboratory.

Every time an activity is calculated from a sample, the background must be subtracted from the sample signal. For the very low levels encountered in environmental monitoring, the sample signals are often very close to the background. The measuring equipment is being used at the limit of its capability. For a sample with no measurable activity, which often happens, about half the time its signal should fall below the average machine background and half the time it should be above the background. If a signal above the background is present, the calculated activity is compared to the calculated LLD to determine if there is really activity present or if the number is an artifact of the way radioactivity is measured.

A number of factors influence the LLD, including sample size, count time, counting efficiency, chemical processes, radioactive decay factors, and interfering isotopes encountered in the sample. The most likely values for these factors have been evaluated for the various analyses performed in the environmental monitoring program. The nominal LLDs calculated from these values, in accordance with the methodology prescribed in the ODCM, are presented in Table E-1. The maximum values for the lower limits of detection specified in the ODCM are shown in Table E-2.

The LLDs are also presented in the data tables. For analyses for which LLDs have not been established, an LLD of zero is assumed in determining if a measured activity is greater than the LLD.

Table E-1

Nominal LLD Values
A. Radiochemical Procedures

	Air Filters (pCi/m^3)	Water (pCi/L)	Milk (pCi/L)	Fish (pCi/g dry)	Wet Vegetation (pCi/Kg wet)	Sediment and Soil (pCi/g dry)
Gross Beta	0.002	1.9				
Tritium		300				
Iodine-131		0.4	0.4		6.0	
Strontium-89	0.0011	5.0	2.0	0.09	31.0	1.6
Strontium-90	0.0004	2.0	2.0	0.03	12.0	0.4

Table E-1
Nominal LLD Values
B. Gamma Analyses (GeLi)

	Air Particulates pCi/m³	Water and Milk pCi/L	Charcoal Filters pCi/m³	Wet Vegetation pCi/kg, wet	Soil and Sediment pCi/g, dry	Fish Vegetation and Grain pCi/g, dry	Clam Flesh pCi/g, dry	Foods: Tomatoes Potatoes, etc. pCi/kg, wet	Meat and Poultry pCi/kg, wet
Ac-228	.01	20	.07	70	.25	.10	.75	50	30
Ba-140	.015	25	.07	130	.30	.30	2.40	50	50
Be-7	.02	45	.15	200	.25	.25	1.90	90	70
Bi-212	.02	50	.20	250	.45	.25	2.00	130	90
Bi-214	.005	20	.05	55	.15	.10	.50	40	25
Ce-141	.005	10	.02	35	.10	.07	.35	20	15
Ce-144	.01	30	.07	115	.20	.15	.85	60	50
Co-58	.005	5	.02	20	.03	.03	.25	10	10
Co-60	.005	5	.02	20	.03	.03	.20	10	10
Cr-51	.02	45	.15	200	.35	.30	2.40	95	75
Cs-134	.005	5	.02	30	.03	.03	.14	10	10
Cs-137	.005	5	.02	25	.03	.03	.15	10	10
Fe-59	.005	10	.04	40	.05	.08	.45	25	20
I-131	.005	10	.03	60	.25	.20	1.70	20	25
K-40	.04	100	.30	400	.75	.40	3.50	250	200
La-140	.01	10	.04	50	.20	.20	1.40	25	30
Mn-54	.005	5	.02	20	.03	.03	.20	10	10
Pa-234m	.50	800	3.20	4000	4.00	4.00	35.00	2500	2000
Nb-95	.005	5	.02	30	.04	.25	.25	10	10
Pb-212	.005	15	.03	40	.10	.04	.30	40	20
Pb-214	.005	20	.07	80	.15	.50	.10	80	40
Ra-224					.75		3.00		
Ra-226					.15		.50		
Ru-103	.005	5	.02	25	.03	.03	.25	25	15
Ru-106	.02	40	.12	190	.20	.15	1.25	190	60
Tl-208	.002	10	.02	30	.06	.03	.25	30	30
Zn-65	.005	10	.03	45	.05	.05	.40	45	20
Zr-95	.005	10	.03	45	.05	.05	.45	45	20

Table E-2

Maximum Values for the Lower Limits of Detection (LLD)
Specified by the SQN Offsite Dose Calculation Manual

Analysis	Water pCi/L	Airborne Particulate or Gases pCi/m3	Fish pCi/Kg,wet	Milk pCi/L	Food Products pci/kg,wet	Sediment pCi/Kg,dry
gross beta	4	1 x 10-2	N.A.	N.A.	N.A.	N.A.
H-3	2000[a]	N.A.	N.A.	N.A.	N.A.	N.A.
Mn-54	15	N.A.	130	N.A.	N.A.	N.A.
Fe-59	30	N.A.	260	N.A.	N.A.	N.A.
Co-58,60	15	N.A.	130	N.A.	N.A.	N.A.
Zn-65	30	N.A.	260	N.A.	N.A.	N.A.
Zr-95	30	N.A.	N.A.	N.A.	N.A.	N.A.
Nb-95	15	N.A.	N.A.	N.A.	N.A.	N.A.
I-131	1[b]	7 x 10-2	N.A.	1	60	N.A.
Cs-134	15	5 x 10-2	130	15	60	150
Cs-137	18	6 x 10-2	150	18	80	180
Ba-140	60	N.A.	N.A.	60	N.A.	N.A.
La-140	15	N.A.	N.A.	15	N.A.	N.A.

a. If no drinking water pathway exists, a value of 3000pCi/L may be used.
b. If no drinking water pathway exists, a value of 15 pCi/L may be used.

APPENDIX F

QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

Appendix F

Quality Assurance/Quality Control Program

A thorough quality assurance program is employed by the laboratory to ensure that the environmental monitoring data are reliable. This program includes the use of written, approved procedures in performing the work, a nonconformance and corrective action tracking system, systematic internal audits, a complete training and retraining system, audits by various external organizations, and a laboratory quality control program.

The quality control program employed by the radioanalytical laboratory is designed to ensure that the sampling and analysis process is working as intended. The program includes equipment checks and the analysis of special samples along with routine samples.

Radiation detection devices can be tested in a number of ways. There are two primary tests which are performed on all devices. In the first type, the device is operated without a sample on the detector to determine the background count rate. The background counts are usually low values and are due to machine noise, cosmic rays, or trace amounts of radioactivity in the materials used to construct the detector. Charts of background counts are kept and monitored to ensure that no unusually high or low values are encountered.

In the second test, the device is operated with a known amount of radioactivity present. The number of counts registered from such a radioactive standard should be very reproducible. These reproducibility checks are also monitored to ensure that they are neither higher nor lower than expected. When counts from either test fall outside the expected range, the device is inspected for malfunction or contamination. It is not placed into service until it is operating properly.

In addition to these two general checks, other quality control checks are performed on the

variety of detectors used in the laboratory. The exact nature of these checks depends on the type of device and the method it uses to detect radiation or store the information obtained.

Quality control samples of a variety of types are used by the laboratory to verify the performance of different portions of the analytical process. These quality control samples may be blanks, replicate samples, blind samples, or cross-checks.

Blanks are samples which contain no measurable radioactivity or no activity of the type being measured. Such samples are analyzed to determine whether there is any contamination of equipment or commercial laboratory chemicals, cross-contamination in the chemical process, or interference from isotopes other than the one being measured.

Duplicate samples are scheduled at random by the same computer program which schedules the collection of the routine samples. For example, if the routine program calls for four milk samples every week, on a random basis each farm might provide an additional sample several times a year. These duplicate samples are analyzed along with the other routine samples. They provide information about the variability of radioactive content in the various sample media.

If enough sample is available for a particular analysis, the laboratory analyst can split it into two portions. Such a sample can provide information about the variability of the analytical process since two identical portions of material are analyzed side by side.

Analytical knowns are another category of quality control sample. A known amount of radioactivity is added to a sample medium by the quality control staff or by the analysts themselves. The analysts are told the radioactive content of the sample. Whenever possible, the analytical knowns contain the same amount of radioactivity each time they are run. In this way, the analysts have immediate knowledge of the quality of the measurement process. A portion of these samples are also blanks.

Blind spikes are samples containing radioactivity which are introduced into the analysis process disguised as ordinary environmental samples. The analyst does not know they contain radioactivity. Since the bulk of the ordinary workload of the environmental laboratory contains no measurable activity or only naturally occurring radioisotopes, blind spikes can be used to test the detection capability of the laboratory or they can be used to test the data review process. If an analysis routinely generates numerous zeros for a particular isotope, the presence of the isotope is brought to the attention of the laboratory supervisor in the daily review process.

Blind spikes test this process since they contain radioactivity at levels high enough to be detected. Furthermore, the activity can be put into such samples at the extreme limit of detection (near the LLD) to determine whether or not the laboratory can find any unusual radioactivity whatsoever.

At present, 5 percent of the laboratory workload is in the category of internal cross-checks. These samples have a known amount of radioactivity added and are presented to the analysts labeled as cross-check samples. This means that the quality control staff knows the radioactive content or "right answer" but the analysts do not. They are aware they are being tested. Such samples test the best performance of the laboratory by determining if the analysts can find the "right answer." These samples provide information about the accuracy of the measurement process. Further information is available about the variability of the process if multiple analyses are requested on the same sample. Internal cross-checks can also tell if there is a difference in performance between two analysts. Like blind spikes or analytical knowns, these samples can also be spiked with low levels of activity to test detection limits.

A series of cross-checks is produced by the EPA in Las Vegas. These interlaboratory comparison samples or "EPA cross-checks" are considered to be the primary indicator of laboratory performance. They provide an independent check of the entire measurement process that cannot be easily provided by the laboratory itself. That is, unlike internal cross-checks, EPA cross-checks test the calibration of the laboratory detection devices since different

radioactive standards produced by individuals outside TVA are used in the cross-checks. The results of the analysis of these samples are reported back to EPA which then issues a report of all the results of all participants. These reports are examined very closely by laboratory supervisory and quality control personnel. They indicate how well the laboratory is doing compared to others across the nation. Like internal cross-checks, the EPA cross-checks provide information to the laboratory about the precision and accuracy of the radioanalytical work it does.

The results of TVA's participation in the EPA Interlaboratory Comparison Program are presented in Table F-1 and Figure F-l. For 1995, all EPA cross-check sample concentrations measured by TVA's laboratory were within ± 3-sigma of the EPA reported values.

TVA splits certain environmental samples with laboratories operated by the States of Alabama and Tennessee and the EPA National Air and Radiation Environmental Laboratory in Montgomery, Alabama. When radioactivity has been present in the environment in measurable quantities, such as following atmospheric nuclear weapons testing, following the Chernobyl incident, or as naturally occurring radionuclides, the split samples have provided TVA with yet another level of information about laboratory performance. These samples demonstrate performance on actual environmental sample matrices rather than on the constructed matrices used in cross-check programs.

All the quality control data are routinely collected, examined, and reported to laboratory supervisory personnel. They are checked for trends, problem areas, or other indications that a portion of the analytical process needs correction or improvement. The end result is a measurement process that provides reliable and verifiable data and is sensitive enough to measure the presence of radioactivity far below the levels which could be harmful to humans.

Table F-1

RESULTS OBTAINED IN INTERLABORATORY COMPARISON PROGRAM

A. Air Filter (pCi/Filter)

	Gross Alpha		Gross Beta		Strontium-90		Cesium-137	
Date	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.
8/95	25±11	29	87±17	90	30±9	29	25±9	23

B. Radiochemical Analysis of Water (pCi/L)

	Gross Beta		Strontium-89		Strontium-90		Tritium		Iodine-131		Plutonium-239	
Date	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg
1/95	5±9	7	20±9	21	15±9	15						
2/95									100±17	93		
3/95							7435± 1289	7172			11± 2	10
4/95[a]			20±9	20	15±9	15						
7/95	19±9	22	20±9	21	8±9	9						
8/95							4872± 844	4747				
10/95	25±9	28							148± 26	148		
10/95[a]			20±9	22	10±9	8						

Table F-1

RESULTS OBTAINED IN INTERLABORATORY COMPARISON PROGRAM (Continued)

C. Gamma-Spectral Analysis of Water (pCi/L)

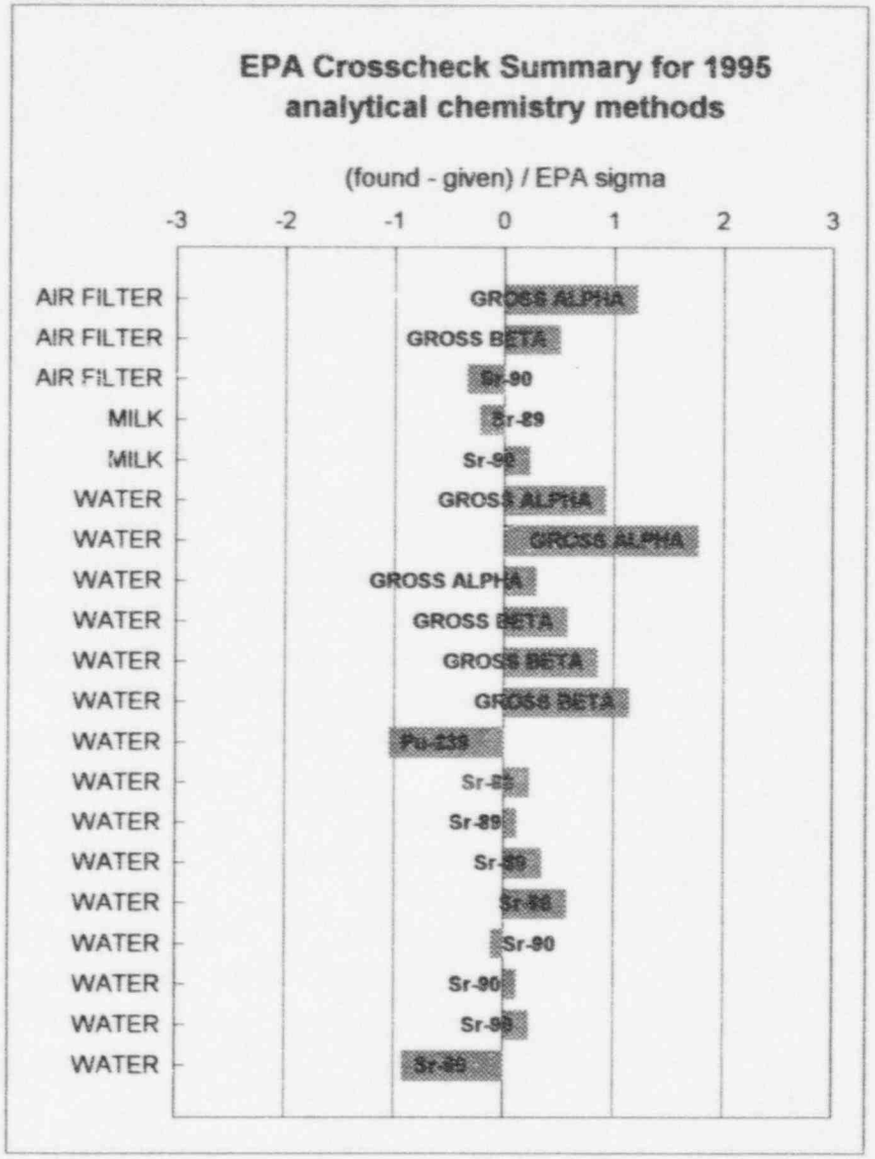
	Barium-133		Cobalt-60		Zinc-65		Cesium-134		Cesium-137	
Date	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.
4/95[a]			29±9	29			20±9	19	11±9	12
6/95	79±14	76	40±9	40	76±14	71	50±9	44	35±9	34
10/95[a]			49±9	50			40±9	38	30±9	30
11/95	99±17	100	60±9	60	125±23	129	40±9	37	49±9	50

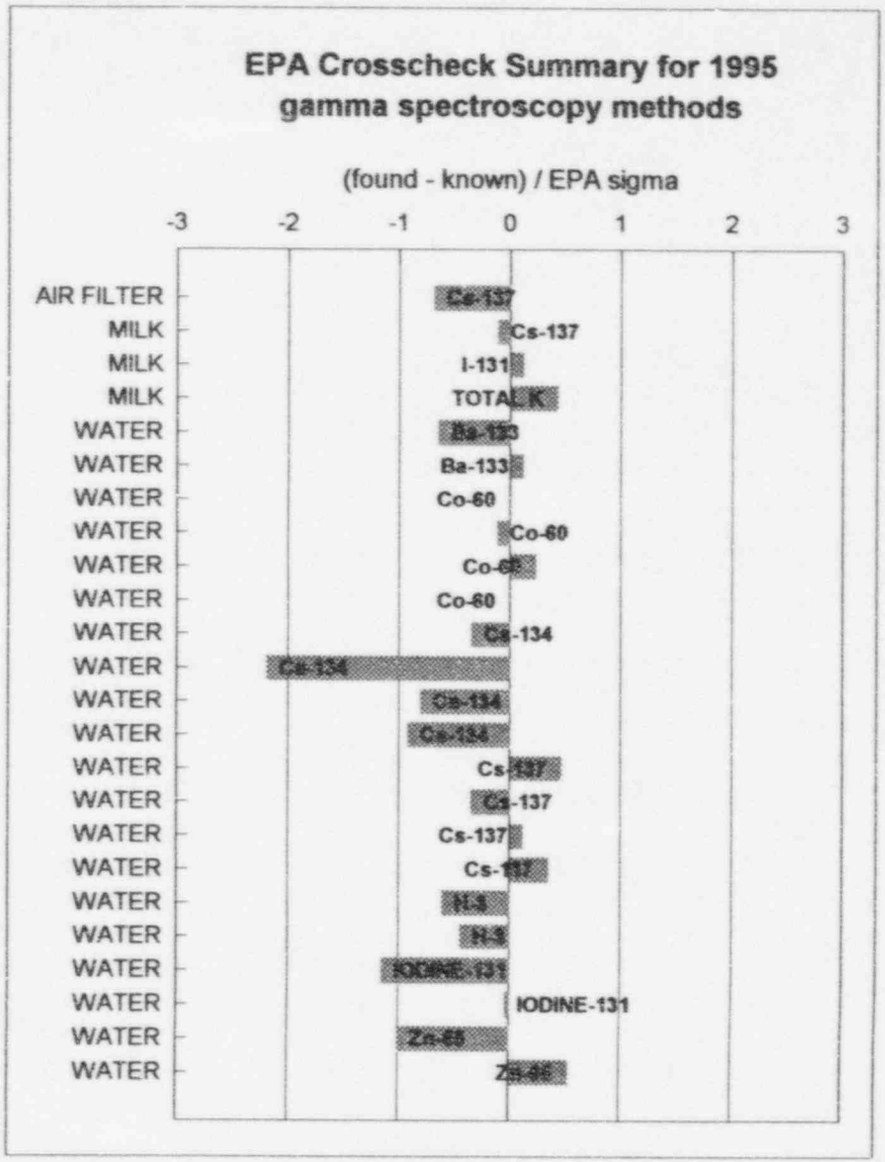
D. Milk (pCi/L)

	Strontium-89		Strontium-90		Iodine-131		Cesium-137		Potassium-40[b]	
Date	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.	EPA Value (±3 sigma)	TVA Avg.
9/95	20±9	19	15±9	16	99±17	100	50±9	50	1654±144	1675

a. Performance Evaluation Intercomparison Study.

b. Units are milligrams of total potassium per liter rather than picocuries of K-40 per liter.





Laboratory objective: abs[(found - given)/EPA sigma] < 3

APPENDIX G

LAND USE SURVEY

Appendix G

Land Use Survey

A land use survey is conducted annually to identify the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 square feet producing fresh leafy vegetables in each of 16 meteorological sectors within a distance of 5 miles from the plant. The land use survey also identifies the location of all milk animals and gardens of greater than 500 square feet producing fresh leafy vegetables within a distance of 3 miles from the plant.

The land use survey is conducted between April 1 and October 1 using appropriate techniques such as door-to-door survey, mail survey, telephone survey, aerial survey, or information from local agricultural authorities or other reliable sources.

In order to identify the locations around SQN which have the greatest relative potential for impact by the plant, radiation doses are projected for individuals living near SQN. These projections use the data obtained in the survey and historical meteorological data. They also assume that the plant is operating and that releases are equivalent to the design basis source terms. The calculated doses are relative in nature and do not reflect actual exposures received by individuals living near SQN. Calculated doses to individuals based on measured effluents from the plant are well below applicable dose limits (see Assessment and Evaluation Section and Table 3).

In response to the 1995 SQN land use survey, annual doses were calculated for air submersion, vegetable ingestion, and milk ingestion. External doses due to radioactivity in air (air submersion) are calculated for the nearest resident in each sector, while doses from drinking milk or eating foods produced near the plant are calculated for the areas with milk producing animals and gardens, respectively.

Air submersion doses were calculated for the same locations as in 1994, with the resulting values almost identical to those calculated for 1994. Doses calculated for ingestion of home-grown foods and milk also were similar to those calculated for 1994.

For milk ingestion, projected doses were consistent with those calculated for 1994. Samples are being taken from the three farms with the highest projected doses and the highest X/Q values.

Tables G-1, G-2, and G-3 show the comparative relative calculated doses for 1994 and 1995.

Table G-1

SEQUOYAH NUCLEAR PLANT

Relative Projected Annual Air Submersion Dose to the Nearest Resident
Within Five Miles of Plant
mrem/year

	1994 Survey		1995 Survey	
Sector	Approximate Distance (Miles)	Annual Dose	Approximate Distance (Miles)	Annual Dose
N	0.8	0.13	0.8	0.12
NNE	1.5	0.07	1.5	0.07
NE	1.5	0.07	1.5	0.06
ENE	1.3	0.03	1.3	0.02
E	1.0	0.02	1.0	0.02
ESE	1.0	0.03	1.0	0.02
SE	1.0	0.03	1.0	0.03
SSE	1.3	0.03	1.3	0.03
S	1.4	0.05	1.4	0.07
SSW	1.3	0.14	1.3	0.15
SW	1.4	0.06	1.4	0.06
WSW	0.7	0.08	0.7	0.04
W	0.6	0.07	0.6	0.06
WNW	1.1	0.02	1.1	0.02
NW	0.8	0.04	0.8	0.04
NNW	0.5	0.13	0.5	0.14

Table G-2

SEQUOYAH NUCLEAR PLANT

Relative Projected Annual Dose to Child's Critical Organ from
Ingestion of Home-Grown Foods
mrem/year

	1994 Survey		1995 Survey	
Sector	Approximate Distance (Miles)	Annual Dose	Approximate Distance (Miles)	Annual Dose
N	1.1	2.41	1.1	2.25
NNE	1.6	1.97	1.6	2.10
NE	2.7	0.89	2.1	1.18
ENE	1.6	0.77	1.6	0.61
E	3.1	0.17	3.1	0.15
ESE	1.3	0.57	1.3	0.40
SE	1.1	0.86	1.1	0.74
SSE	1.3	1.04	1.3	1.00
S	1.4	1.76	1.4	2.45
SSW	1.7	3.23	1.7	3.50
SW	2.1	1.11	2.1	1.21
WSW	1.0	1.49	0.7	1.32
W	1.2	0.87	1.2	0.63
WNW	1.1	0.73	1.1	0.62
NW	0.9	1.09	0.9	1.16
NNW	0.5	3.94	0.5	4.26

Table G-3

SEQUOYAH NUCLEAR PLANT

Relative Projected Annual Dose to Receptor Thyroid
from Ingestion of Milk
mrem/year

Location	Approximate Distance Sector	(Miles)[a]	Annual Dose 1994	1995	X/Q s/m^3
Farm H[b,c]	NE	4.7	0.026	0.023	2.94 E-7
Farm HS[b]	E	4.6	0.005	0.004	6.74 E-8
Farm JH[b]	ESE	3.9	0.006	0.004	6.79 E-8
Farm J[c]	WNW	1.3	0.024	0.021	3.99 E-7
Farm HW[c]	NW	1.3	0.029	0.031	5.48 E-7

a. Distances measured to nearest property line.
b. Grade A dairy
c. Milk sampled at this location.

APPENDIX H

DATA TABLES

Table H-1

DIRECT RADIATION LEVELS

Average External Radiation Levels at Various Distances from
Sequoyah Nuclear Plant for Each Quarter - 1995
mrem/Quarter[a]

Distance Miles	Average External Gamma Radiation Levels			
	1st Quarter (Feb-Apr 95)	2nd Quarter (May-Jul 95)	3rd Quarter (Aug-Oct 95)	4th Quarter (Nov 95-Jan 96)
0-1	15.9 ± 1.5	15.2 ± 1.7	16.0 ± 1.7	16.2 ± 1.6
1-2	13.8 ± 1.6	13.0 ± 1.6	13.6 ± 1.6	13.7 ± 1.7
2-4	13.2 ± 1.6	12.9 ± 1.8	13.2 ± 2.0	13.2 ± 1.9
4-6	13.6 ± 1.4	13.0 ± 1.4	13.5 ± 1.5	13.3 ± 1.5
> 6	13.4 ± 1.4	13.6 ± 1.6	13.7 ± 1.3	13.3 ± 1.3
Average, 0-2 miles (onsite)	14.9 ± 1.9	14.2 ± 1.9	14.9 ± 2.0	15.1 ± 2.0
Average > 2 miles (offsite)	13.4 ± 1.5	13.2 ± 1.6	13.5 ± 1.6	13.3 ± 1.5

a. Data normalized to one quarter (2190 hours).
b. Averages of the individual measurements in the set ±1 standard deviation of the set.

Table H - 2

DIRECT RADIATION LEVELS
Sequoyah Nuclear Plant
Individual Stations

Map Location Number	TLD Station Number	NRC Station No.*	Direction, Degrees	Approx. Distance, Miles	Environmental Radiation Levels mrem/Quarter 1st Quarter February - April 1995	2nd Quarter May - July 1995	3rd Quarter August - Oct. 1995	4th Quarter Nov. 1995- Jan. 1996	Annual Exposure, mrem/Year
49	N-1		3	0.6	16.4	13.1	14.9	15.4	59.8
50	N-2		4	2.1	14.4	12.6	13.6	13.6	54.2
51	N-3		358	5.2	11.9	11.3	11.3	10.9	45.4
52	N-4		355	10	14.2	13.6	14.2	13.8	55.8
5	NNE-1		13	1.8	16.4	15.4	15.8	15.5	63.1
53	NNW-2		31	4.5	12.9	12.2	12.6	12.6	50.3
54	NNE-3		32	12.1	13.4	14.6	12.9	12.7	53.6
12	NNE-4		32	17.8	13.5	12.5	12.9	12.1	51.0
55	NE-1		38	2.4	14.1	13.0	13.3	12.9	53.3
4	NE-1A	11	50	1.5	14.8	14.1	14.0	14.1	57.0
56	NE-2		51	4.1	12.2	10.8	11.6	11.9	46.5
57	ENE-1		73	0.4	13.8	12.3	13.0	13.6	52.7
58	ENE-2		66	5.1	13.6	12.5	12.8	12.8	51.7
65	E-A		91	0.3	16.6	16.2	16.9	17.1	66.8
59	E-1		96	1.2	12.9	11.6	13.1	12.7	50.3
60	E-2		87	5.2	14.5	12.7	13.1	13.0	53.3
61	ESE-A		110	0.3	17.9	15.3	17.0	18.8	69.0
62	ESE-1		110	1.2	13.7	12.7	13.4	13.8	53.6
63	ESE-2		112	4.9	15.4	14.4	14.5	15.4	59.7
13	ESE-3		77	11.3	14.0	14.2	14.4	14.4	57.0
64	SE-A		132	0.4	14.2	13.7	14.1	14.8	56.8
66	SE-1		131	1.4	11.2	10.5	11.0	10.9	43.6
67	SE-2		129	1.9	13.4	12.5	13.2	13.2	52.3
68	SE-4		130	5.2	16.2	15.8	16.2	16.2	64.4
69	SSE-1	6	154	1.6	12.1	11.5	11.8	12.6	48.0
70	SSE-2		158	4.6	15.3	14.5	15.6	15.3	60.7

* Locations with TVA and NRC stations co-located.

Table H - 2

DIRECT RADIATION LEVELS
Sequoyah Nuclear Plant
Individual Stations

Map Location Number	TLD Station Number	NRC Station No.*	Direction, Degrees	Approx. Distance, Miles	Environmental Radiation Levels mrem/Quarter 1st Quarter February - April 1995	2nd Quarter May - July 1995	3rd Quarter August - Oct. 1995	4th Quarter Nov. 1995- Jan. 1996	Annual Exposure, mrem/Year
71	S-1	5	183	1.5	16.3	15.2	16.5	17.5	65.5
72	S-2		185	4.7	13.5	12.5	13.5	13.4	52.9
73	SSW-1		203	0.6	15.1	14.4	14.7	15.8	60.0
90	SSW-1B		192	1.5	14.7	14.2	14.7	14.5	58.1
3	SSW-1C	4	198	2	13.9	14.3	14.3	14.8	57.3
74	SSW-2	3	204	3	15.3	16.3	17.0	16.5	65.1
9	SSW-3		203	8.7	14.2	14.9	15.2	14.5	58.8
75	SW-1		228	0.9	17.2	16.4	17.3	16.8	67.7
7	SW-2		227	3.8	12.6	12.2	12.5	12.2	49.5
11	SW-3		228	16.7	16.0	16.5	15.9	15.4	63.8
76	WSW-1		241	0.9	16.5	15.9	16.4	16.2	65.0
77	WSW-2		238	2.5	10.6	10.6	10.3	10.8	42.3
10	WSW-2A		250	2.6	11.4	11.5	11.8	11.3	46.0
78	WSW-3		248	5.7	15.2	15.3	15.6	14.4	60.5
79	WSW-4		244	7.8	12.3	11.8	12.5	12.4	49.0
80	WSW-5		244	10.1	12.3	12.7	13.0	13.1	51.1
81	W-1		260	0.8	17.8	17.8	17.9	17.8	71.3
82	W-2	37	275	4.3	11.1	11.7	11.8	11.2	45.8
8	W-3	35	280	5.6	13.6	14.1	14.5	14.6	56.8
83	WNW-1		292	0.4	13.9	14.1	14.8	14.5	57.3
84	WNW-2		295	5.3	12.7	12.4	13.2	12.8	51.1
14	WNW-3		299	18.9	10.8	11.4	11.8	11.1	45.1
85	NW-1		315	0.4	17.0	17.8	18.8	18.3	71.9
86	NW-2		318	5.2	13.7	13.4	13.3	13.1	53.5
87	NNW-1		344	0.6	14.1	14.9	15.5	14.9	59.4
88	NNW-2		342	1.7	12.9	12.3	12.4	12.8	50.4
89	NNW-3		334	5.3	12.0	12.0	12.4	12.3	48.7

* Locations with TVA and NRC stations co-located.

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN AIR FILTER
PCI/M3 - 0.037 BQ/M3

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST NAME DISTANCE AND DIRECTION	ANNUAL MEAN MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA						
624						
	2.00E-03	2.05E-02(416/ 416)	PM-3 DAISY TN	2.13E-02(52/ 52)	2.10E-02(208/ 208)	
		8.77E-03- 4.11E-02	5.5 MILES W	1.18E-02- 3.69E-02	1.01E-02- 4.03E-02	
GAMMA SCAN (GELI)						
156						
BE-7	2.00E-02	1.02E-01(104/ 104)	LM2 NORTHEAST	1.13E-01(13/ 13)	1.02E-01(52/ 52)	
		7.09E-02- 2.75E-01	0.75 MILES N	8.49E-02- 2.75E-01	6.79E-02- 1.46E-01	
BI-214	5.00E-03	9.75E-03(27/ 104)	LM-4 SKULL ISLAND	1.23E-02(4/ 13)	9.75E-03(15/ 52)	
		5.00E-03- 1.93E-02	1.5 MILES NE	6.20E-03- 1.71E-02	5.40E-03- 2.16E-02	
PB-214	5.00E-03	1.06E-02(23/ 104)	PM-3 DAISY TN	1.67E-02(2/ 13)	1.06E-02(16/ 52)	
		5.10E-03- 2.28E-02	5.5 MILES W	1.06E-02- 2.28E-02	5.60E-03- 2.54E-02	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CHARCOAL FILTER
PCI/M3 - 0.037 BQ/M3

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 624						
BI-214	5.00E-02	6.15E-02(2/ 416)	SIREN STATION # 27	7.00E-02(1/ 52)	6.36E-02(4/ 208)	
		5.31E-02- 7.00E-02	2.0 MILES SSW	7.00E-02- 7.00E-02	5.00E-02- 8.16E-02	
K-40	3.00E-01	3.57E-01(15/ 416)	PM-8 HARRISON, TN	3.86E-01(2/ 52)	3.39E-01(3/ 208)	
		3.03E-01- 4.61E-01	8.75 MILES SSW	3.12E-01- 4.61E-01	3.01E-01- 3.66E-01	
PB-214	7.00E-02	8.03E-02(2/ 416)	SIREN STATION # 27	8.76E-02(1/ 52)	1.01E-01(3/ 208)	
		7.30E-02- 8.76E-02	2.0 MILES SSW	8.76E-02- 8.76E-02	9.46E-02- 1.12E-01	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN MILK
PCI/L - 0.037 BQ/L

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	ANNUAL MEAN MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
IODINE-131						
153	4.00E-01	76 VALUES < LLD			77 VALUES < LLD	
GAMMA SCAN (GELI)						
153						
BI-214	2.00E+01	3.77E+01(3/ 76)	JONES FARM	3.86E+01(1/ 25)	9.11E+01(15/ 77)	
		2.41E+01- 5.04E+01	1.25 MILES W	3.86E+01- 3.86E+01	2.11E+01- 1.86E+02	
K-40	1.00E+02	1.36E+03(76/ 76)	JONES FARM	1.37E+03(25/ 25)	1.32E+03(77/ 77)	
		4.44E+02- 1.59E+03	1.25 MILES W	4.44E+02- 1.53E+03	8.13E+02- 1.65E+03	
PB-214	2.00E+01	3.41E+01(2/ 76)	HOLDER DAIRY	3.78E+01(1/ 25)	9.47E+01(14/ 77)	
		3.04E+01- 3.78E+01	4.25 MILES NE	3.78E+01- 3.78E+01	2.51E+01- 1.88E+02	
SR 89						
24	2.00E+00	12 VALUES < LLD			12 VALUES < LLD	
SR 90						
24	2.00E+00	3.81E+00(9/ 12)	JONES FARM	4.60E+00(4/ 4)	2.11E+00(1/ 12)	
		2.05E+00- 5.79E+00	1.25 MILES W	2.43E+00- 5.79E+00	2.11E+00- 2.11E+00	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN VEGETATION
PCI/KG - 0.037 BQ/KG (WET WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST NAME DISTANCE AND DIRECTION	ANNUAL MEAN MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
IODINE-131						
26	6.00E+00	13 VALUES < LLD			13 VALUES < LLD	
GAMMA SCAN (GELI)						
26						
BE-7	2.00E+02	1.80E+03(13/ 13) 3.72E+02- 5.35E+03	EDGAR MALONE FARM 2.5 MILES N	1.80E+03(13/ 13) 3.72E+02- 5.35E+03	8.75E+02(12/ 13) 2.68E+02- 2.33E+03	
K-40	4.00E+02	5.31E+03(13/ 13) 1.95E+03- 7.65E+03	EDGAR MALONE FARM 2.5 MILES N	5.31E+03(13/ 13) 1.95E+03- 7.65E+03	5.66E+03(13/ 13) 4.34E+03- 7.49E+03	
SR 89						
8	3.10E+01	4 VALUES < LLD			4 VALUES < LLD	
SR 90						
8	1.20E+01	2.74E+01(4/ 4) 1.31E+01- 6.12E+01	EDGAR MALONE FARM 2.5 MILES N	2.74E+01(4/ 4) 1.31E+01- 6.12E+01	2.25E+01(2/ 4) 2.07E+01- 2.43E+01	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN SOIL
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI)						
13						
AC-228	2.50E-01	1.00E+00(8/ 8)	LM-5 WARE POINT	1.38E+00(1/ 1)	9.01E-01(5/ 5)	
		6.30E-01- 1.38E+00	1.7 MILES NNE	1.38E+00- 1.38E+00	5.54E-01- 1.31E+00	
BI-212	4.50E-01	1.10E+00(8/ 8)	LM-5 WARE POINT	1.36E+00(1/ 1)	9.57E-01(5/ 5)	
		6.12E-01- 1.36E+00	1.7 MILES NNE	1.36E+00- 1.36E+00	6.64E-01- 1.27E+00	
BI-214	1.50E-01	7.98E-01(8/ 8)	LM-5 WARE POINT	9.94E-01(1/ 1)	6.64E-01(5/ 5)	
		6.23E-01- 9.94E-01	1.7 MILES NNE	9.94E-01- 9.94E-01	5.02E-01- 8.10E-01	
CS-137	3.00E-02	6.07E-01(8/ 8)	PM-8 HARRISON, TN	1.21E+00(1/ 1)	3.53E-01(5/ 5)	
		4.48E-02- 1.21E+00	8.75 MILES SSW	1.21E+00- 1.21E+00	1.42E-01- 7.14E-01	
K-40	7.50E-01	5.72E+00(8/ 8)	LM2 NORTHEAST	1.24E+01(1/ 1)	7.63E+00(5/ 5)	
		3.33E+00- 1.24E+01	0.75 MILES N	1.24E+01- 1.24E+01	2.97E+00- 1.95E+01	
PB-212	1.00E-01	9.51E-01(8/ 8)	LM-5 WARE POINT	1.34E+00(1/ 1)	8.98E-01(5/ 5)	
		5.38E-01- 1.34E+00	1.7 MILES NNE	1.34E+00- 1.34E+00	5.48E-01- 1.23E+00	
PB-214	1.50E-01	8.85E-01(8/ 8)	LM-5 WARE POINT	1.13E+00(1/ 1)	7.26E-01(5/ 5)	
		6.91E-01- 1.13E+00	1.7 MILES NNE	1.13E+00- 1.13E+00	5.83E-01- 8.66E-01	
RA-224	7.50E-01	1.09E+00(4/ 8)	LM2 NORTHEAST	1.31E+00(1/ 1)	1.02E+00(4/ 5)	
		9.74E-01- 1.31E+00	0.75 MILES N	1.31E+00- 1.31E+00	8.28E-01- 1.35E+00	
RA-226	1.50E-01	7.98E-01(8/ 8)	LM-5 WARE POINT	9.94E-01(1/ 1)	6.64E-01(5/ 5)	
		6.23E-01- 9.94E-01	1.7 MILES NNE	9.94E-01- 9.94E-01	5.02E-01- 8.10E-01	
TL-208	6.00E-02	3.25E-01(8/ 8)	LM-5 WARE POINT	4.47E-01(1/ 1)	2.95E-01(5/ 5)	
		1.92E-01- 4.47E-01	1.7 MILES NNE	4.47E-01- 4.47E-01	1.90E-01- 4.24E-01	
SR 89						
13						
	1.60E+00	8 VALUES < LLD			5 VALUES < LLD	
SR 90						
13						
	4.00E-01	8 VALUES < LLD			5 VALUES < LLD	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN APPLES
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI)						
K-40	2.50E+02	8.12E+02(1/ 1) 8.12E+02- 8.12E+02	H WALKER FARM 1.25 MILES NW	8.12E+02(1/ 1) 8.12E+02- 8.12E+02	7.73E+02(1/ 1) 7.73E+02- 7.73E+02	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CABBAGE
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 2						
K-40	2.50E+02	1.36E+03(1/ 1) 1.36E+03- 1.36E+03	H WALKER FARM 1.25 MILES NW	1.36E+03(1/ 1) 1.36E+03- 1.36E+03	1.05E+03(1/ 1) 1.05E+03- 1.05E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CORN
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI)						
K-40	2.50E+02	2.03E+03(1/ 1) 2.03E+03- 2.03E+03	H WALKER FARM 1.25 MILES NW	2.03E+03(1/ 1) 2.03E+03- 2.03E+03	1.92E+03(1/ 1) 1.92E+03- 1.92E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN GREEN BEANS
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 2						
K-40	2.50E+02	2.04E+03(1/ 1) 2.04E+03- 2.04E+03	H WALKER FARM 1.25 MILES NW	2.04E+03(1/ 1) 2.04E+03- 2.04E+03	1.81E+03(1/ 1) 1.81E+03- 1.81E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN POTATOES
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI)						
K-40	2.50E+02	3.08E+03(1/ 1)	H WALKER FARM	3.08E+03(1/ 1)	3.38E+03(1/ 1)	
		3.08E+03- 3.08E+03	1.25 MILES NW	3.08E+03- 3.08E+03	3.38E+03- 3.38E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN TOMATOES
PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 2						
K-40	2.50E+02	2.20E+03(1/ 1) 2.20E+03- 2.20E+03	H WALKER FARM 1.25 MILES NW	2.20E+03(1/ 1) 2.20E+03- 2.20E+03	2.04E+03(1/ 1) 2.04E+03- 2.04E+03	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN SURFACE WATER(Total)
PCI/L - 0.037 BQ/L

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST NAME DISTANCE AND DIRECTION	ANNUAL MEAN MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA						
39	1.90E+00	2.76E+00(20/ 26) 2.16E+00- 3.42E+00	TRM 473.2	2.76E+00(10/ 13) 2.28E+00- 3.42E+00	2.69E+00(11/ 13) 2.15E+00- 3.56E+00	
GAMMA SCAN (GELI)						
39						
BI-214	2.00E+01	1.11E+02(1/ 26) 1.11E+02- 1.11E+02	TRM 473.2	1.11E+02(1/ 13) 1.11E+02- 1.11E+02	13 VALUES < LLD	
PB-214	2.00E+01	5.08E+01(1/ 26) 5.08E+01- 5.08E+01	TRM 473.2	5.08E+01(1/ 13) 5.08E+01- 5.08E+01	13 VALUES < LLD	
SR 89						
12	5.00E+00	8 VALUES < LLD			4 VALUES < LLD	
SR 90						
12	2.00E+00	8 VALUES < LLD			4 VALUES < LLD	
TRITIUM						
12	3.00E+02	8 VALUES < LLD			4 VALUES < LLD	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN PUBLIC WATER(Total)
PCI/L - 0.037 BQ/L

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA						
65	1.90E+00	2.75E+00(17/ 39)	CF INDUSTRIES	3.02E+00(9/ 13)	2.80E+00(23/ 26)	
		2.00E+00- 4.36E+00	TRM 473.0	2.27E+00- 4.36E+00	2.05E+00- 4.83E+00	
GAMMA SCAN (GELI)						
65						
BI-214	2.00E+01	3.41E+01(5/ 39)	CHICKAMAUGA DAM	3.41E+01(5/ 13)	3.56E+01(2/ 26)	
		2.03E+01- 6.97E+01	TRM 465.3	2.03E+01- 6.97E+01	2.10E+01- 5.01E+01	
PB-214	2.00E+01	3.08E+01(4/ 39)	CHICKAMAUGA DAM	3.08E+01(4/ 13)	2.92E+01(1/ 26)	
		2.13E+01- 3.55E+01	TRM 465.3	2.13E+01- 3.55E+01	2.92E+01- 2.92E+01	
SR 89						
20	5.00E+00	12 VALUES < LLD			8 VALUES < LLD	
SR 90						
20	2.00E+00	12 VALUES < LLD			8 VALUES < LLD	
TRITIUM						
20	3.00E+02	3.24E+02(1/ 12)	CF INDUSTRIES	3.24E+02(1/ 4)	8 VALUES < LLD	
		3.24E+02- 3.24E+02	TRM 473.0	3.24E+02- 3.24E+02		

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN WELL WATER(Total)
PCI/L - 0.037 BQ/L

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA						
8	1.90E+00	2.14E+00(3/ 4)	SQN WELL #6	2.14E+00(3/ 4)	6.03E+00(4/ 4)	
		1.91E+00- 2.52E+00	ONSITE NNE	1.91E+00- 2.52E+00	3.25E+00- 9.71E+00	
GAMMA SCAN (GELI)						
8						
BI-214	2.00E+01	3.14E+01(2/ 4)	SQN WELL #6	3.14E+01(2/ 4)	2.87E+02(4/ 4)	
		2.62E+01- 3.65E+01	ONSITE NNE	2.62E+01- 3.65E+01	1.33E+02- 4.80E+02	
PB-214	2.00E+01	3.21E+01(1/ 4)	SQN WELL #6	3.21E+01(1/ 4)	2.89E+02(4/ 4)	
		3.21E+01- 3.21E+01	ONSITE NNE	3.21E+01- 3.21E+01	1.29E+02- 4.89E+02	
SR 89						
8	5.00E+00	4 VALUES < LLD			4 VALUES < LLD	
SR 90						
8	2.00E+00	4 VALUES < LLD			4 VALUES < LLD	
TRITIUM						
8	3.00E+02	4 VALUES < LLD			4 VALUES < LLD	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CHANNEL CATFISH FLESH
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST NAME DISTANCE AND DIRECTION	ANNUAL MEAN MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 4						
K-40	4.00E-01	1.12E+01(2/ 2) 7.88E+00- 1.45E+01	CHICKAMAUGA RES TRM 471-530	1.12E+01(2/ 2) 7.88E+00- 1.45E+01	1.11E+01(2/ 2) 9.47E+00- 1.28E+01	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CRAPPIE FLESH
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST NAME DISTANCE AND DIRECTION	ANNUAL MEAN MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 4						
CS-137	3.00E-02	5.98E-02(2/ 2)	CHICKAMAUGA RES	5.98E-02(2/ 2)	6.44E-02(2/ 2)	
		4.90E-02- 7.06E-02	TRM 471-530	4.90E-02- 7.06E-02	6.24E-02- 6.65E-02	
K-40	4.00E-01	1.41E+01(2/ 2)	CHICKAMAUGA RES	1.41E+01(2/ 2)	1.43E+01(2/ 2)	
		1.30E+01- 1.53E+01	TRM 471-530	1.30E+01- 1.53E+01	1.36E+01- 1.50E+01	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN SMALLMOUTH BUFFALO FLESH
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 4						
K-40	4.00E-01	1.12E+01(2/ 2) 6.89E+00- 1.56E+01	CHICKAMAUGA RES TRM 471-530	1.12E+01(2/ 2) 6.89E+00- 1.56E+01	9.30E+00(2/ 2) 8.96E+00- 9.64E+00	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN SMALLMOUTH BUFFALO WHOLE
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST NAME DISTANCE AND DIRECTION	ANNUAL MEAN MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 4						
AC-228	1.00E-01	1.30E-01(1/ 2) 1.30E-01- 1.30E-01	CHICKAMAUGA RES TRM 471-530	1.30E-01(1/ 2) 1.30E-01- 1.30E-01	2 VALUES < LLD	
K-40	4.00E-01	5.78E+00(2/ 2) 5.50E+00- 6.06E+00	CHICKAMAUGA RES TRM 471-530	5.78E+00(2/ 2) 5.50E+00- 6.06E+00	6.63E+00(2/ 2) 6.36E+00- 6.89E+00	
PB-212	4.00E-02	8.28E-02(1/ 2) 8.28E-02- 8.28E-02	CHICKAMAUGA RES TRM 471-530	8.28E-02(1/ 2) 8.28E-02- 8.28E-02	2 VALUES < LLD	
TL-208	3.00E-02	3.34E-02(1/ 2) 3.34E-02- 3.34E-02	CHICKAMAUGA RES TRM 471-530	3.34E-02(1/ 2) 3.34E-02- 3.34E-02	2 VALUES < LLD	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN SEDIMENT
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 8						
AC-228	2.50E-01	1.65E+00(6/ 6) 1.50E+00- 1.76E+00	TRM 480.82	1.72E+00(2/ 2) 1.68E+00- 1.76E+00	1.38E+00(2/ 2) 1.26E+00- 1.49E+00	
BE-7	2.50E-01	6.29E-01(4/ 6) 2.86E-01- 1.09E+00	TRM 480.82	9.42E-01(2/ 2) 7.93E-01- 1.09E+00	6.52E-01(2/ 2) 2.80E-01- 1.02E+00	
BI-212	4.50E-01	1.53E+00(6/ 6) 1.44E+00- 1.61E+00	TRM 480.82	1.59E+00(2/ 2) 1.56E+00- 1.61E+00	1.36E+00(2/ 2) 1.16E+00- 1.55E+00	
BI-214	1.50E-01	1.03E+00(6/ 6) 8.75E-01- 1.12E+00	TRM 472.80	1.08E+00(2/ 2) 1.03E+00- 1.12E+00	9.32E-01(2/ 2) 8.25E-01- 1.04E+00	
CO-58	3.00E-02	2.17E-01(3/ 6) 9.89E-02- 4.41E-01	TRM 480.82	2.77E-01(2/ 2) 1.12E-01- 4.41E-01	2 VALUES < LLD	
CO-60	3.00E-02	2.32E-01(5/ 6) 3.30E-02- 4.24E-01	TRM 480.82	3.38E-01(2/ 2) 2.52E-01- 4.24E-01	2 VALUES < LLD	
CS-134	3.00E-02	4.92E-02(3/ 6) 3.83E-02- 6.65E-02	TRM 480.82	5.24E-02(2/ 2) 3.83E-02- 6.65E-02	2 VALUES < LLD	
CS-137	3.00E-02	8.24E-01(6/ 6) 2.71E-01- 1.17E+00	TRM 480.82	1.13E+00(2/ 2) 1.09E+00- 1.17E+00	7.87E-01(2/ 2) 7.65E-01- 8.08E-01	
K-40	7.50E-01	1.42E+01(6/ 6) 1.21E+01- 1.63E+01	TRM 472.80	1.54E+01(2/ 2) 1.46E+01- 1.63E+01	1.34E+01(2/ 2) 1.34E+01- 1.35E+01	
PB-212	1.00E-01	1.51E+00(6/ 6) 1.39E+00- 1.67E+00	TRM 483.4	1.56E+00(2/ 2) 1.45E+00- 1.67E+00	1.25E+00(2/ 2) 1.16E+00- 1.34E+00	
PB-214	1.50E-01	1.11E+00(6/ 6) 9.33E-01- 1.23E+00	TRM 480.82	1.15E+00(2/ 2) 1.08E+00- 1.23E+00	9.93E-01(2/ 2) 8.46E-01- 1.14E+00	
RA-224	7.50E-01	1.67E+00(4/ 6) 1.52E+00- 1.79E+00	TRM 480.82	1.79E+00(1/ 2) 1.79E+00- 1.79E+00	1.31E+00(1/ 2) 1.31E+00- 1.31E+00	
RA-226	1.50E-01	1.03E+00(6/ 6) 8.75E-01- 1.12E+00	TRM 472.80	1.08E+00(2/ 2) 1.03E+00- 1.12E+00	9.32E-01(2/ 2) 8.25E-01- 1.04E+00	
TL-208	6.00E-02	4.88E-01(6/ 6) 4.71E-01- 5.17E-01	TRM 483.4	5.00E-01(2/ 2) 4.83E-01- 5.17E-01	4.18E-01(2/ 2) 3.94E-01- 4.42E-01	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN SHORELINE SEDIMENT
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 6						
AC-228	2.50E-01	1.17E+00(4/ 4)	GOLD POINT	1.39E+00(2/ 2)	2.99E-01(1/ 2)	
		6.98E-01- 1.47E+00	TRM 478	1.31E+00- 1.47E+00	2.99E-01- 2.99E-01	
BI-212	4.50E-01	1.28E+00(4/ 4)	GOLD POINT	1.54E+00(2/ 2)	2 VALUES < LLD	
		7.66E-01- 1.69E+00	TRM 478	1.39E+00- 1.69E+00		
BI-214	1.50E-01	9.56E-01(4/ 4)	GOLD POINT	1.11E+00(2/ 2)	2.17E-01(1/ 2)	
		7.54E-01- 1.21E+00	TRM 478	1.02E+00- 1.21E+00	2.17E-01- 2.17E-01	
CS-137	3.00E-02	1.58E-01(2/ 4)	HARRISON FLATS	2.50E-01(1/ 2)	2 VALUES < LLD	
		6.59E-02- 2.50E-01	TRM 477	2.50E-01- 2.50E-01		
K-40	7.50E-01	8.51E+00(4/ 4)	HARRISON FLATS	9.73E+00(2/ 2)	2.79E+00(2/ 2)	
		4.43E+00- 1.50E+01	TRM 477	4.43E+00- 1.50E+01	2.61E+00- 2.97E+00	
PB-212	1.00E-01	1.20E+00(4/ 4)	GOLD POINT	1.43E+00(2/ 2)	2.14E-01(2/ 2)	
		7.41E-01- 1.57E+00	TRM 478	1.28E+00- 1.57E+00	1.69E-01- 2.60E-01	
PB-214	1.50E-01	1.07E+00(4/ 4)	GOLD POINT	1.20E+00(2/ 2)	1.98E-01(2/ 2)	
		9.18E-01- 1.27E+00	TRM 478	1.13E+00- 1.27E+00	1.54E-01- 2.41E-01	
RA-224	7.50E-01	1.47E+00(3/ 4)	GOLD POINT	1.54E+00(2/ 2)	2 VALUES < LLD	
		1.31E+00- 1.62E+00	TRM 478	1.47E+00- 1.62E+00		
RA-226	1.50E-01	9.56E-01(4/ 4)	GOLD POINT	1.11E+00(2/ 2)	2.17E-01(1/ 2)	
		7.54E-01- 1.21E+00	TRM 478	1.02E+00- 1.21E+00	2.17E-01- 2.17E-01	
TL-208	6.00E-02	3.88E-01(4/ 4)	GOLD POINT	4.67E-01(2/ 2)	9.76E-02(1/ 2)	
		2.27E-01- 5.02E-01	TRM 478	4.31E-01- 5.02E-01	9.76E-02- 9.76E-02	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

TENNESSEE VALLEY AUTHORITY
ENVIRONMENTAL RADIOLOGICAL MONITORING AND INSTRUMENTATION
WESTERN AREA RADIOLOGICAL LABORATORY

RADIOACTIVITY IN CLAM FLESH
PCI/GM - 0.037 BQ/G (DRY WEIGHT)

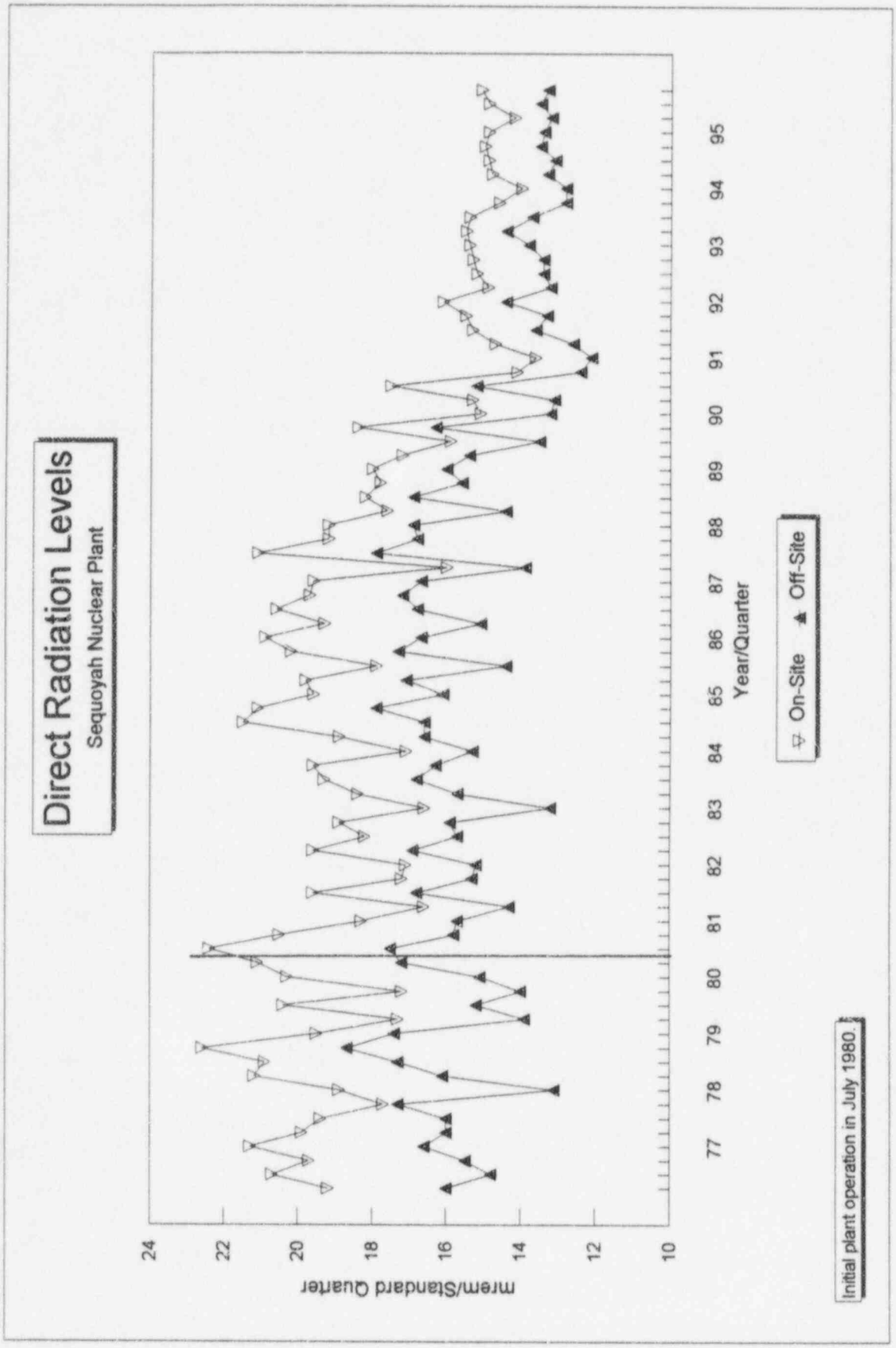
NAME OF FACILITY: SEQUOYAH NUCLEAR PLANT
LOCATION OF FACILITY: HAMILTON TENNESSEE

DOCKET NO.: 50-327,328
REPORTING PERIOD: 1995

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD) SEE NOTE 1	ALL INDICATOR LOCATIONS MEAN (F) RANGE SEE NOTE 2	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F) RANGE SEE NOTE 2	CONTROL LOCATIONS MEAN (F) RANGE SEE NOTE 2	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA SCAN (GELI) 4						
BI-214	5.00E-01	1.00E+00(1/ 2) 1.00E+00- 1.00E+00	SQN Downstream	1.00E+00(1/ 2) 1.00E+00- 1.00E+00	1.19E+00(1/ 2) 1.19E+00- 1.19E+00	
CO-58	2.50E-01	7.23E-01(1/ 2) 7.23E-01- 7.23E-01	SQN Downstream	7.23E-01(1/ 2) 7.23E-01- 7.23E-01	2 VALUES < LLD	
PB-214	1.00E-01	7.00E-01(2/ 2) 4.25E-01- 9.74E-01	SQN Downstream	7.00E-01(2/ 2) 4.25E-01- 9.74E-01	1.02E+00(1/ 2) 1.02E+00- 1.02E+00	

NOTE: 1. NOMINAL LOWER LIMIT OF DETECTION (LLD) AS DESCRIBED IN TABLE E-1 .
NOTE: 2. MEAN AND RANGE BASED UPON DETECTABLE MEASUREMENTS ONLY. FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F).

FIGURE H-1


Direct Radiation Levels
Sequoyah Nuclear Plant
mrem/Standard Quarter
24
22
20
18
16
14
12
10
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
Year/Quarter
On-Site
Off-Site
Initial plant operation in July 1980.

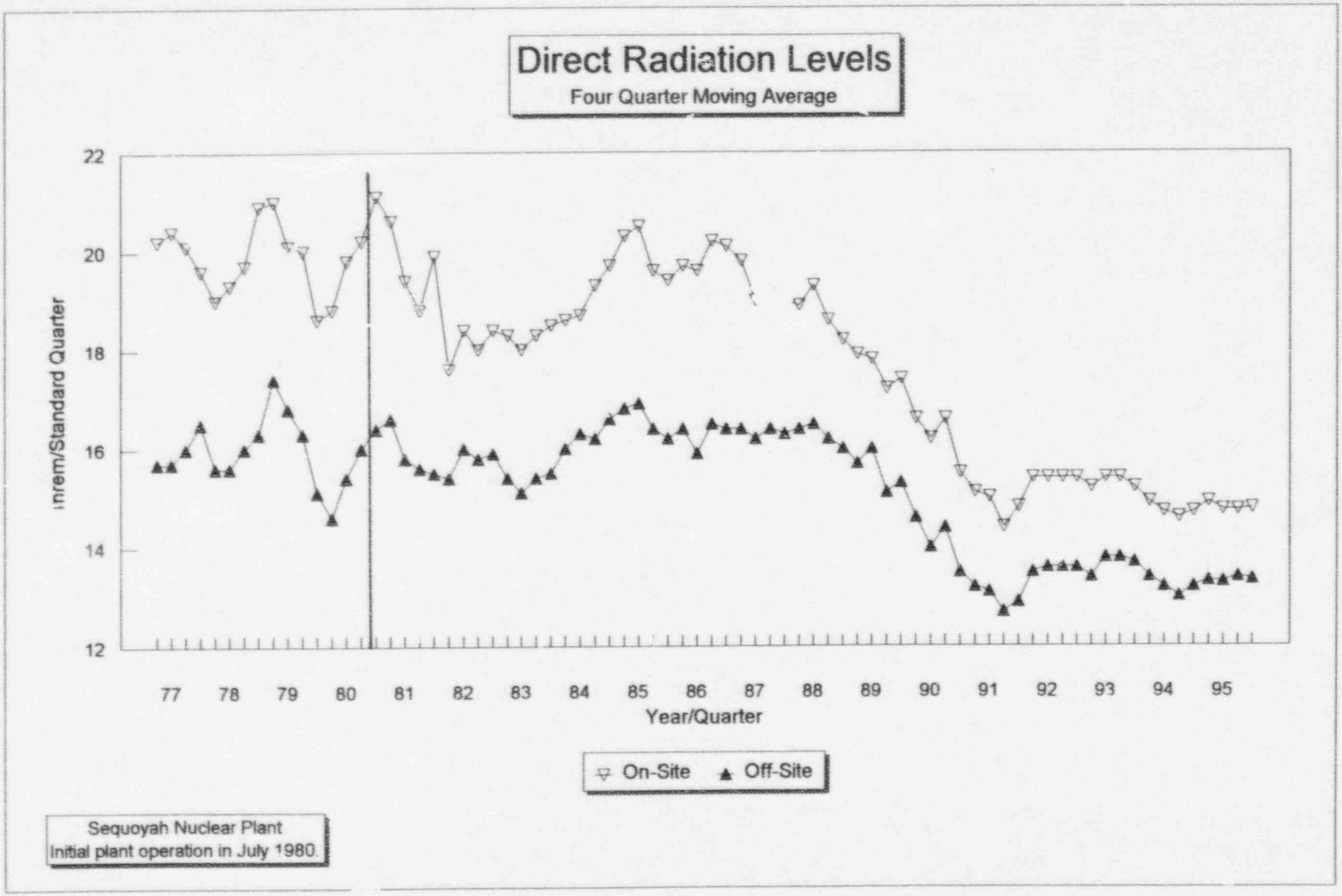

Direct Radiation Levels
Four Quarter Moving Average
22
20
18
16
14
12
mrem/Standard Quarter
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
Year/Quarter
On-Site
Off-Site
Sequoyah Nuclear Plant
Initial plant operation in July 1980.

FIGURE H-2

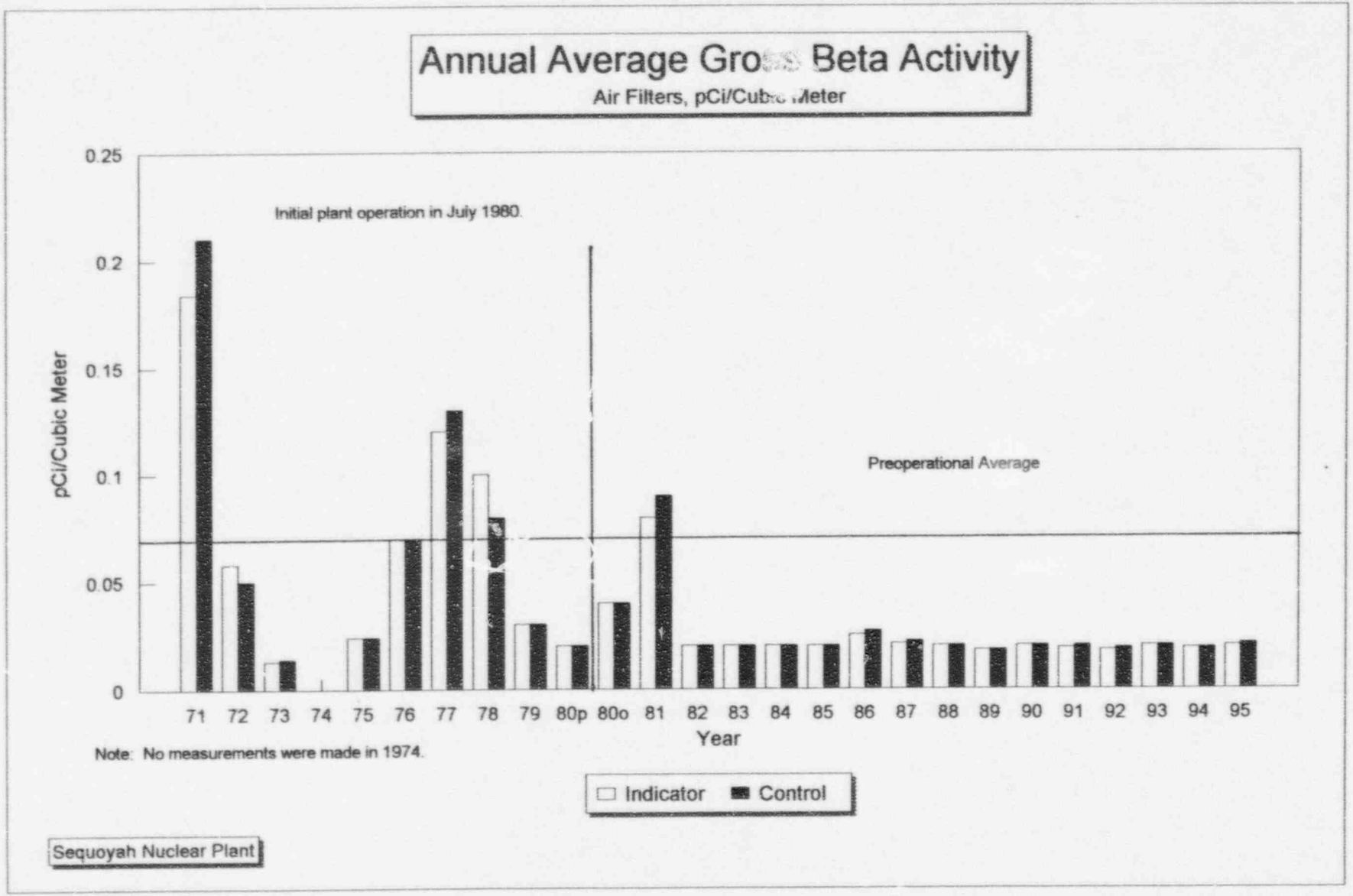

Annual Average Gross Beta Activity
Air Filters, pCi/Cubic Meter
0.25
0.2
0.15
0.1
0.05
0
pCi/Cubic Meter
Initial plant operation in July 1980.
Preoperational Average
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Note: No measurements were made in 1974.
Indicator
Control
Sequoyah Nuclear Plant

FIGURE H-3

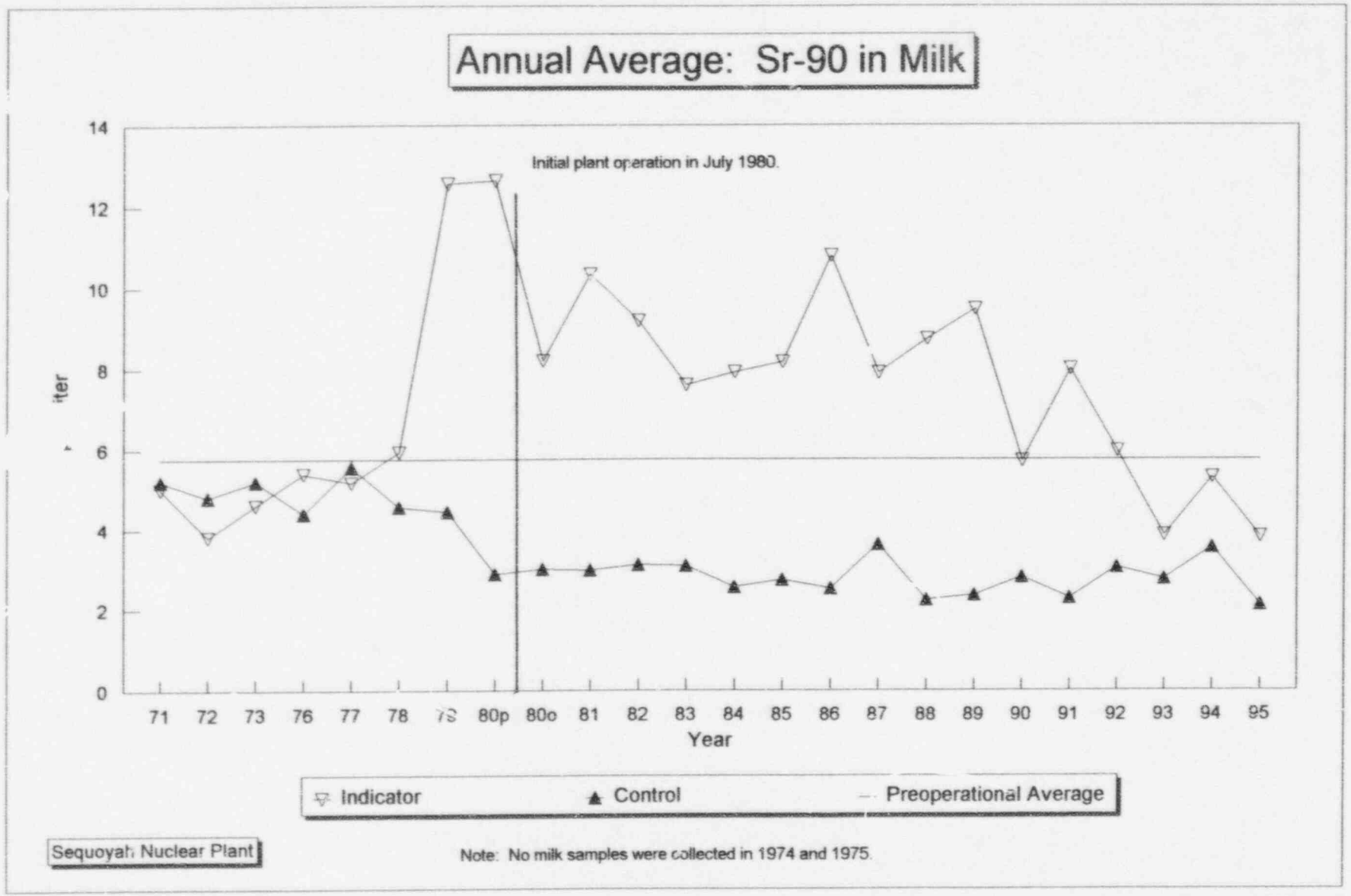
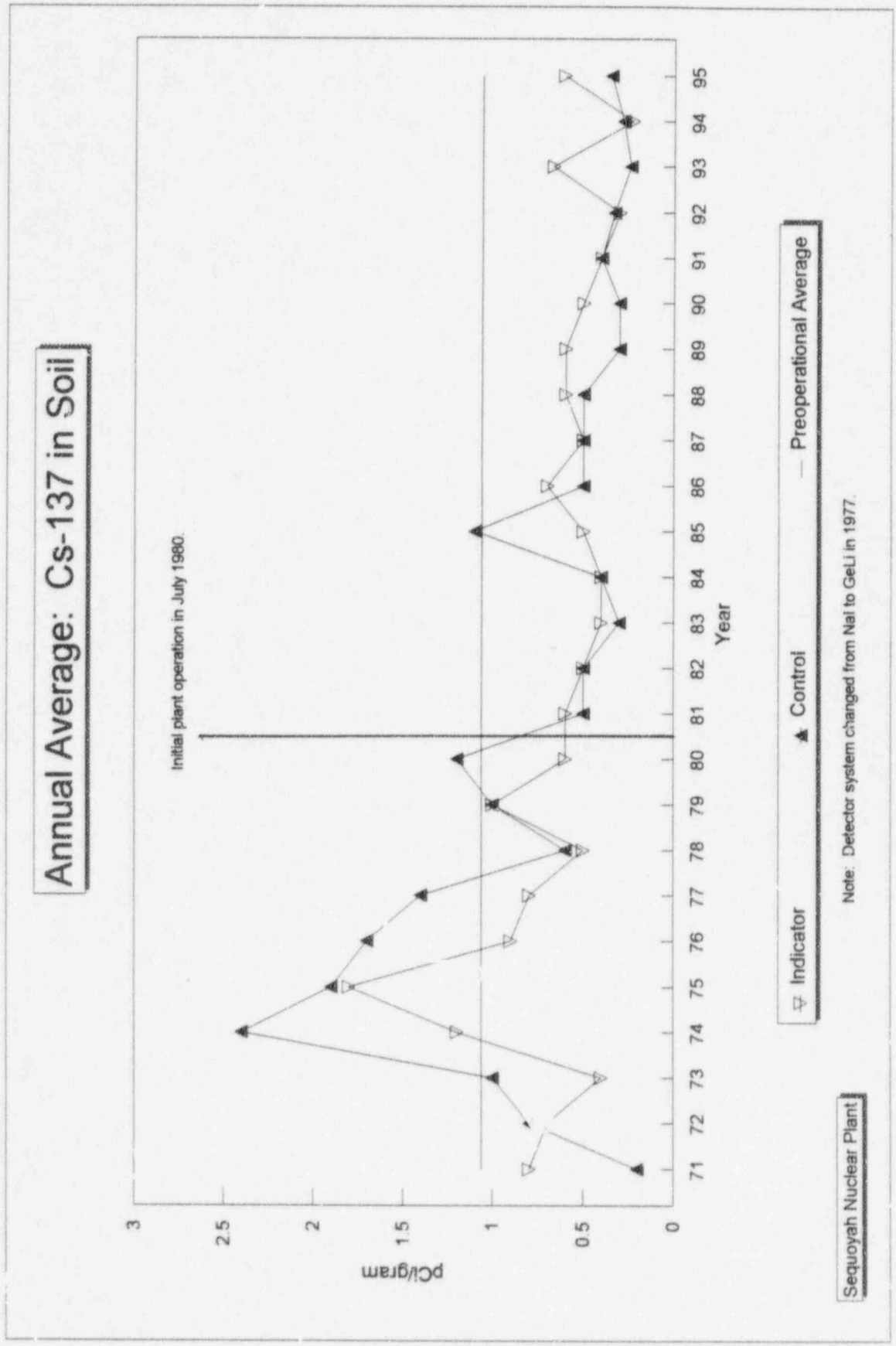

Annual Average: Sr-90 in Milk
Initial plant operation in July 1980.
14
12
10
8
6
4
2
0
71 72 73 76 77 78 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Indicator
Control
Preoperational Average
Sequoyah Nuclear Plant
Note: No milk samples were collected in 1974 and 1975.

FIGURE H-4

FIGURE H-5


Annual Average: Cs-137 in Soil
Initial plant operation in July 1980.
pCi/gram
3
2.5
2
1.5
1
0.5
0
71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Indicator
Control
Preoperational Average
Note: Detector system changed from NaI to GeLi in 1977.
Sequoyah Nuclear Plant

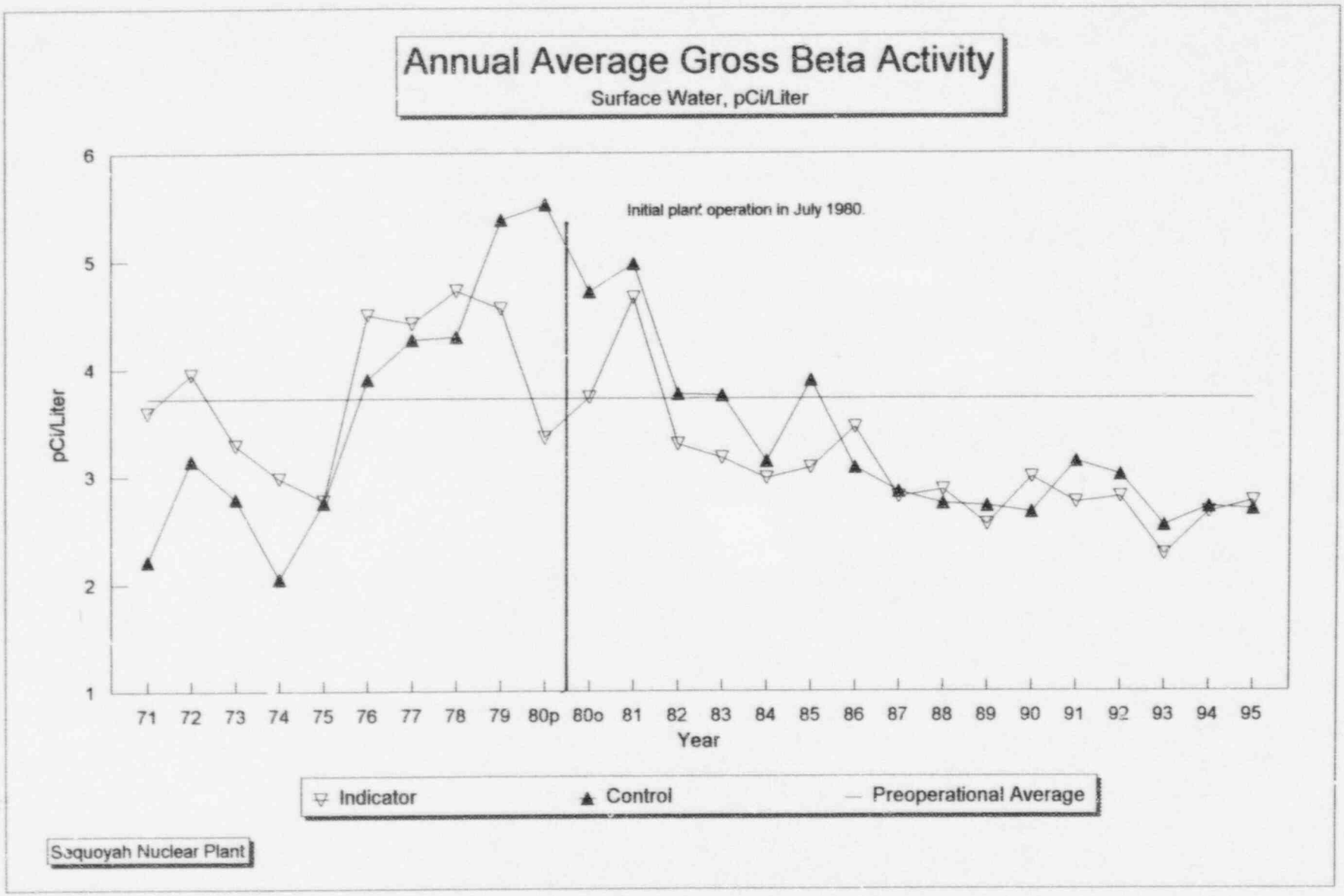

Annual Average Gross Beta Activity
Surface Water, pCi/Liter
Initial plant operation in July 1980.
pCi/Liter
6
5
4
3
2
1
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Indicator
Control
Preoperational Average
Sequoyah Nuclear Plant

FIGURE H-6

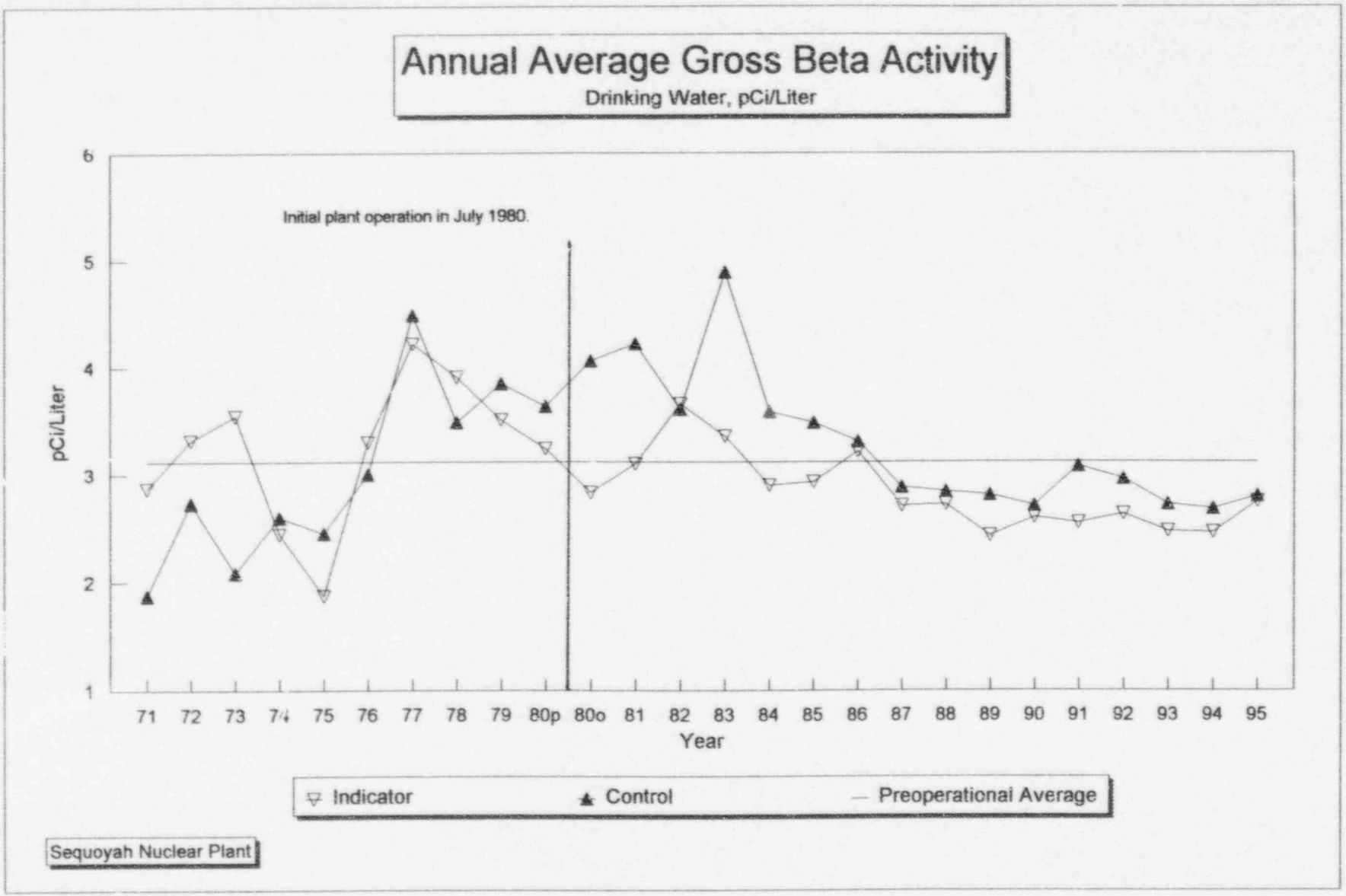

Annual Average Gross Beta Activity
Drinking Water, pCi/Liter
Initial plant operation in July 1980.
pCi/Liter
6
5
4
3
2
1
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Indicator
Control
Preoperational Average
Sequoyah Nuclear Plant

FIGURE H-7

FIGURE H-8

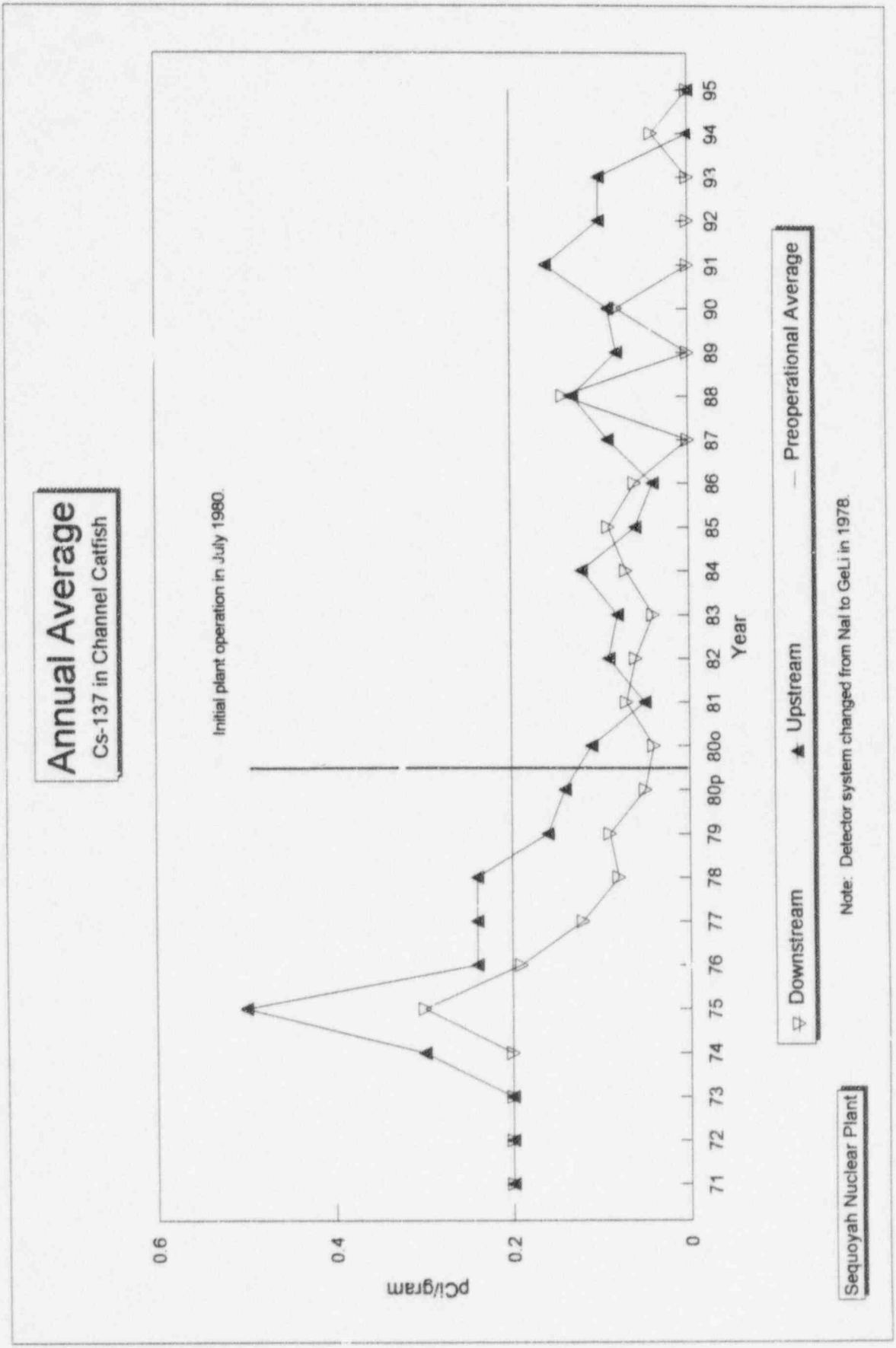
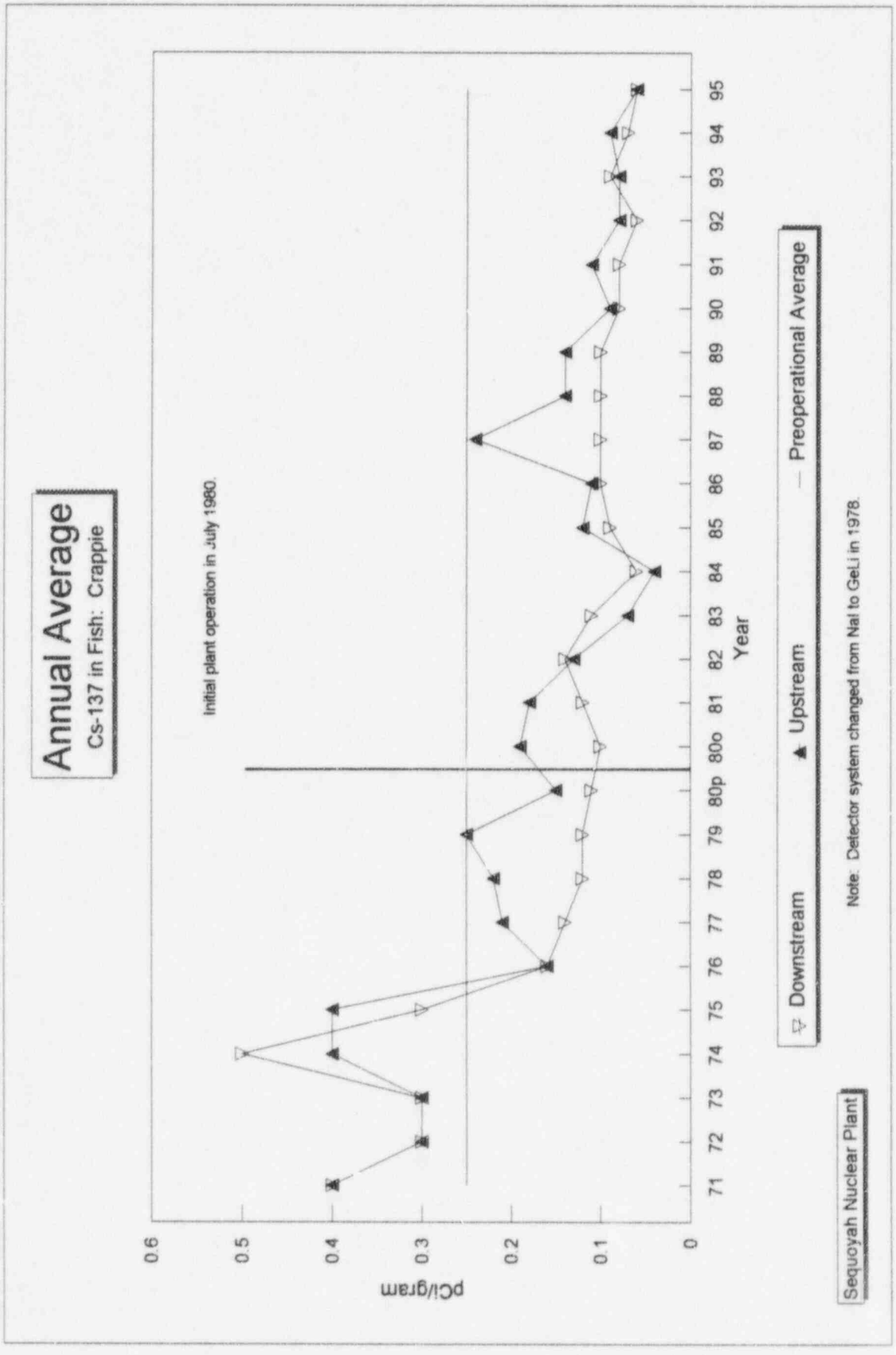

Annual Average
Cs-137 in Channel Catfish
Initial plant operation in July 1980.
pCi/gram
0.6
0.4
0.2
0
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Downstream
Upstream
Preoperational Average
Note: Detector system changed from NaI to GeLi in 1978.
Sequoyah Nuclear Plant

FIGURE H-9


Annual Average
Cs-137 in Fish: Crappie
Initial plant operation in July 1980.
pCi/gram
0.6
0.5
0.4
0.3
0.2
0.1
0
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Downstream
Upstream
Preoperational Average
Note: Detector system changed from NaI to GeLi in 1978.
Sequoyah Nuclear Plant

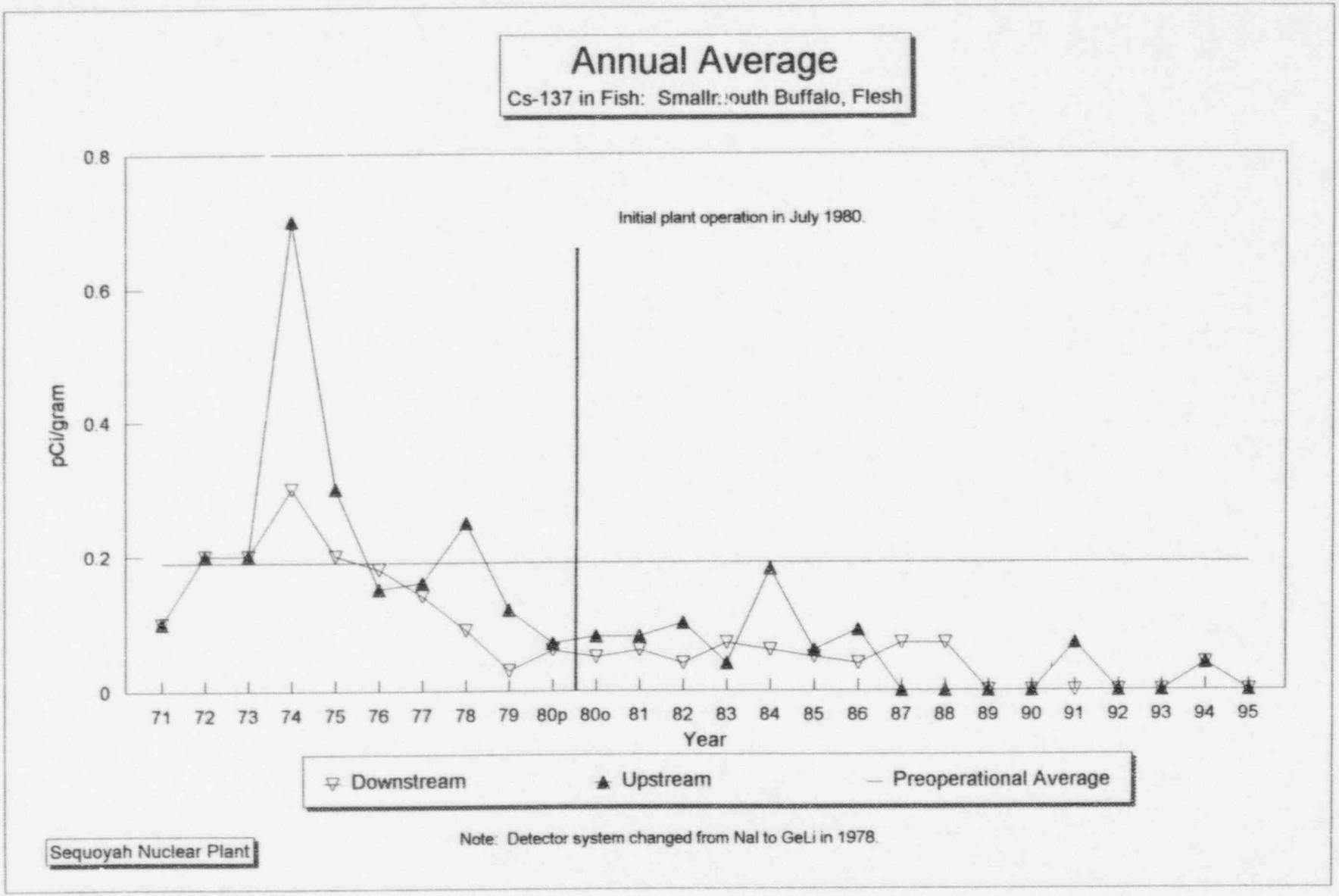

Annual Average
Cs-137 in Fish: Smallmouth Buffalo, Flesh
Initial plant operation in July 1980.
pCi/gram
0.8
0.6
0.4
0.2
0
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Downstream
Upstream
Preoperational Average
Note: Detector system changed from NaI to GeLi in 1978.
Sequoyah Nuclear Plant

FIGURE H-10

FIGURE H-11

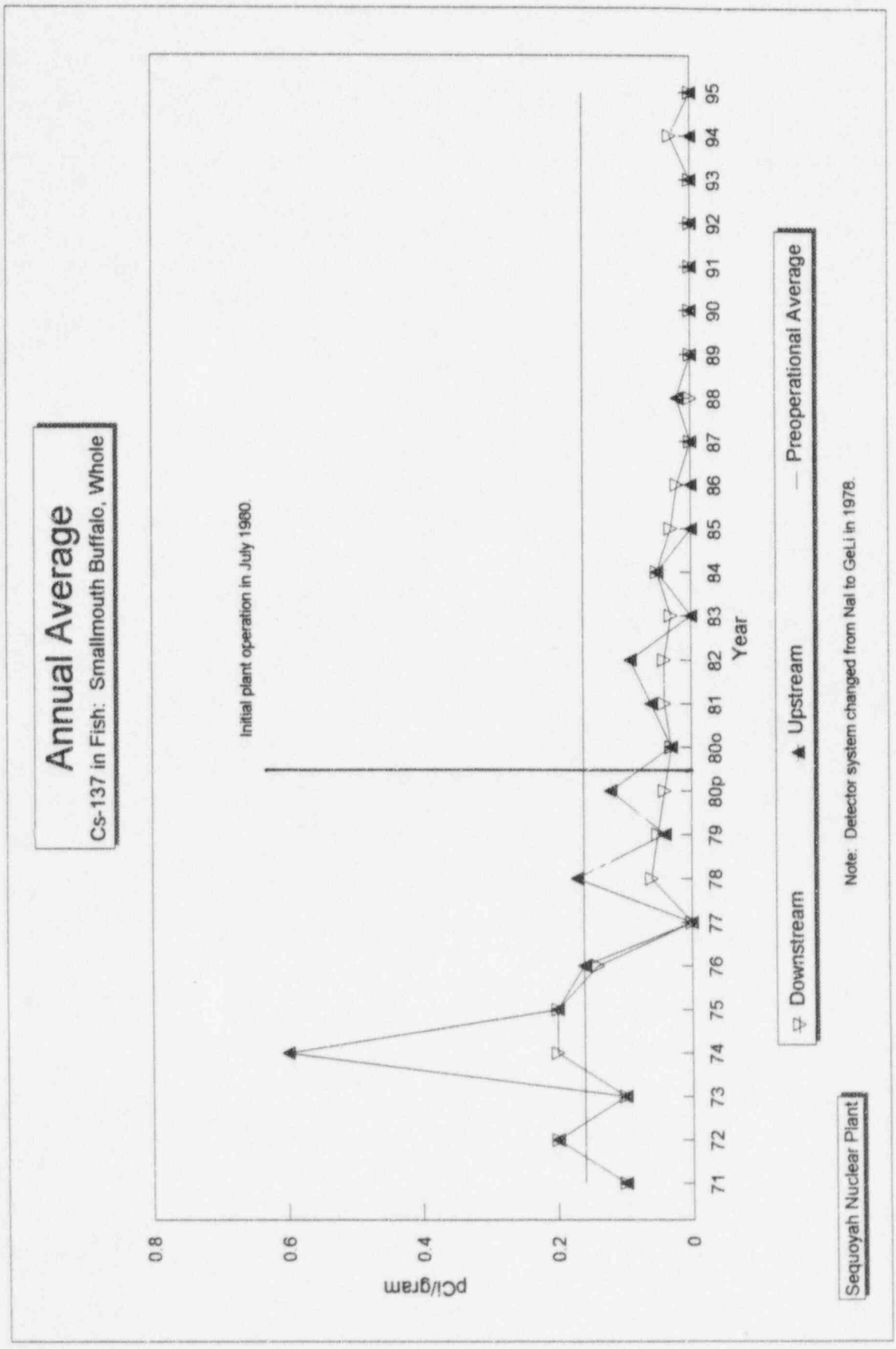

Annual Average
Cs-137 in Fish: Smallmouth Buffalo, Whole
Initial plant operation in July 1980.
pCi/gram
0.8
0.6
0.4
0.2
0
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Downstream
Upstream
Preoperational Average
Note: Detector system changed from NaI to GeLi in 1978.
Sequoyah Nuclear Plant

FIGURE H-12

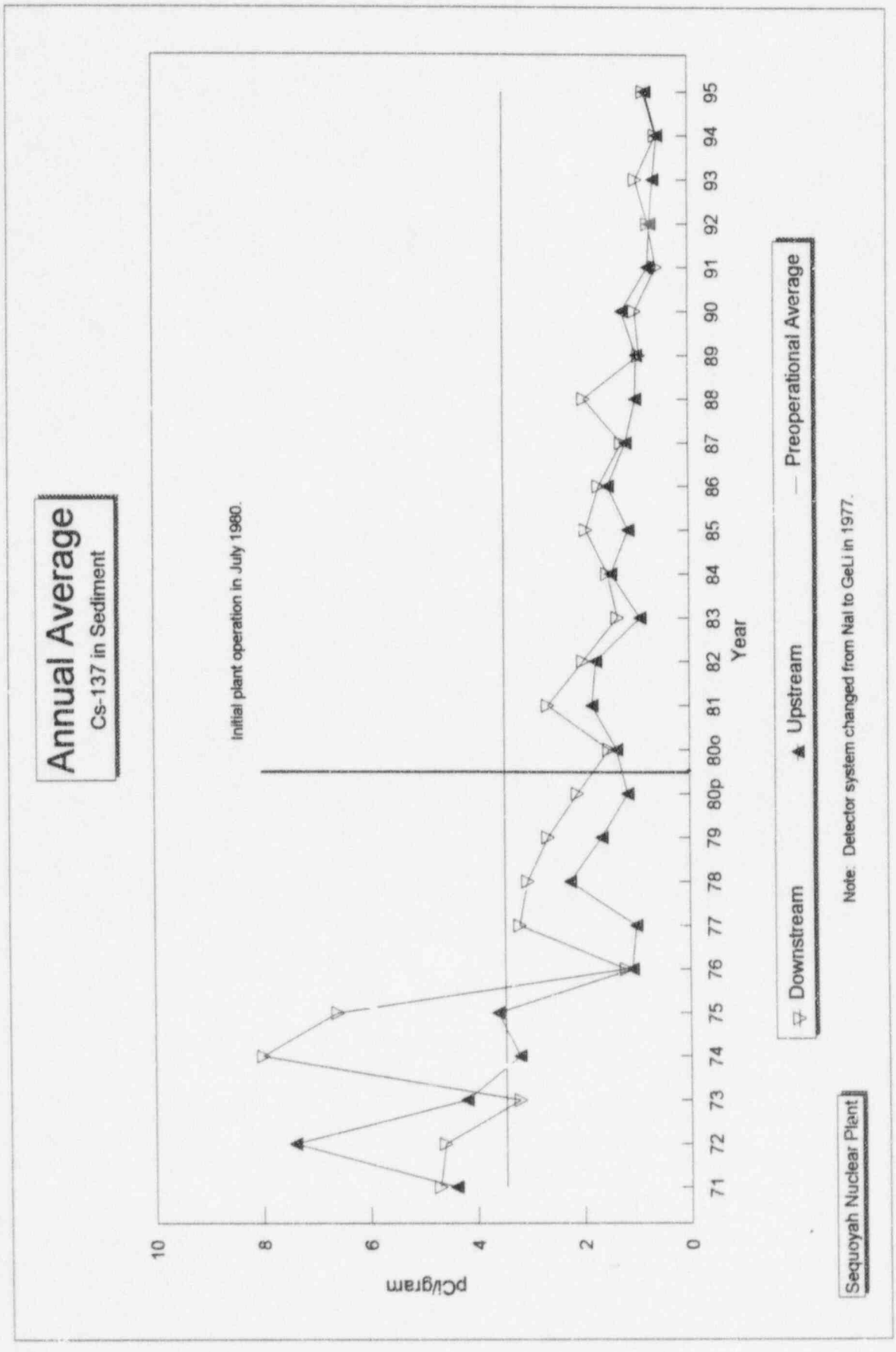

Annual Average
Cs-137 in Sediment
Initial plant operation in July 1980.
pCi/gram
10
8
6
4
2
0
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Downstream
Upstream
Preoperational Average
Note: Detector system changed from NaI to GeLi in 1977.
Sequoyah Nuclear Plant

FIGURE H-13

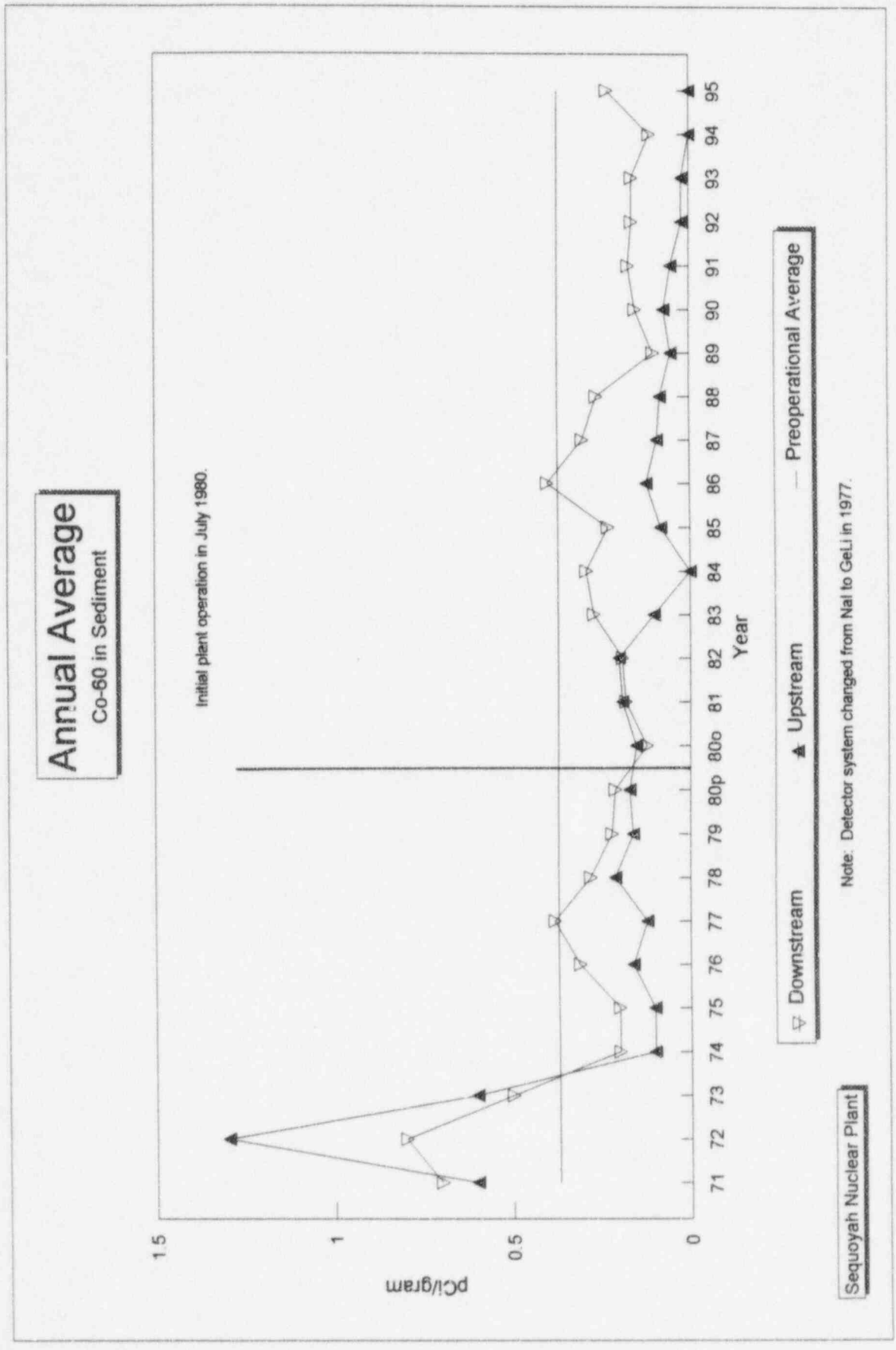
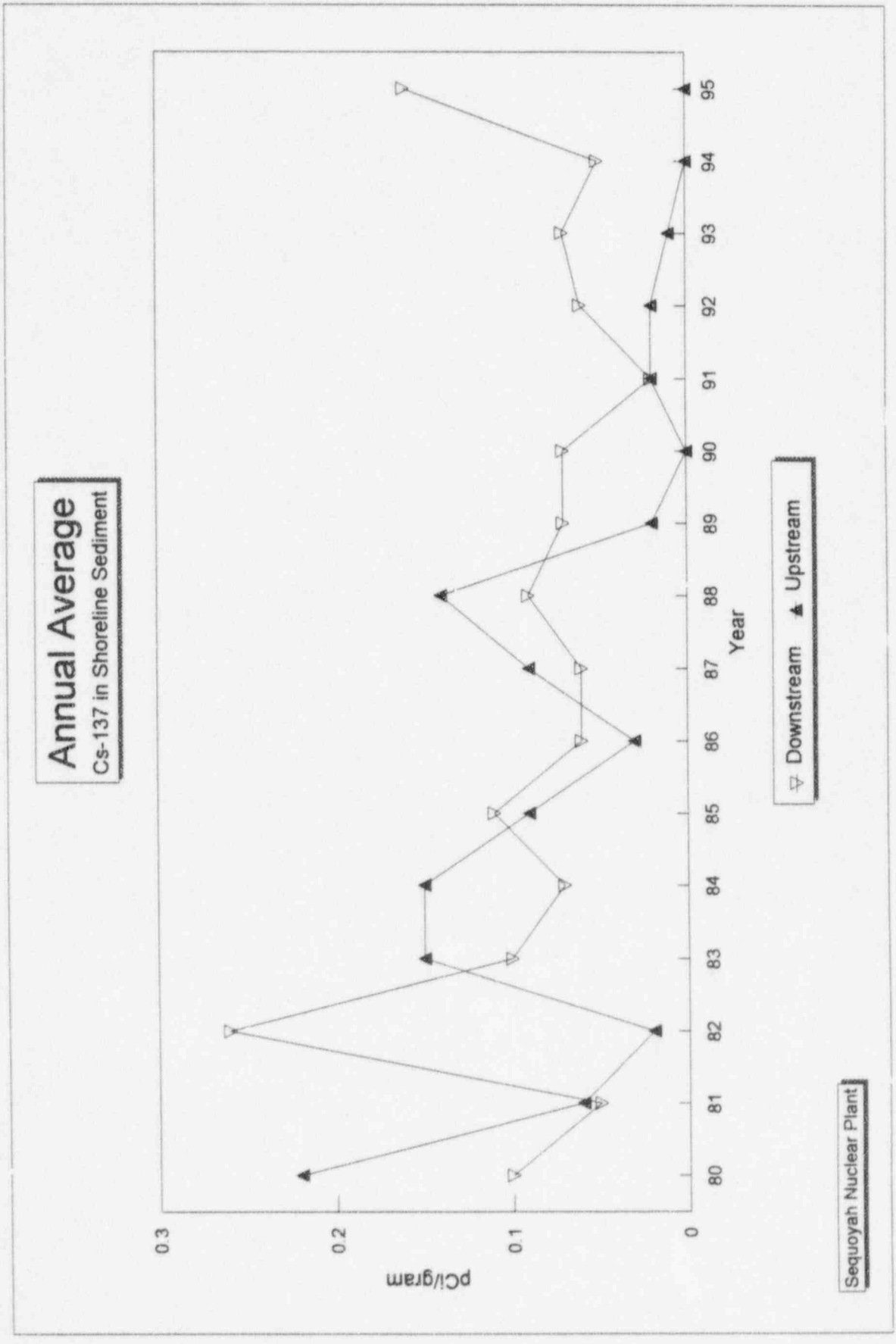

Annual Average
Co-60 in Sediment
Initial plant operation in July 1980.
pCi/gram
1.5
1
0.5
0
71 72 73 74 75 76 77 78 79 80p 80o 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Year
Downstream
Upstream
Preoperational Average
Note: Detector system changed from NaI to GeLi in 1977.
Sequoyah Nuclear Plant

FIGURE H-14


Annual Average
Cs-137 in Shoreline Sediment
pCi/gram
0.3
0.2
0.1
0
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
Year
Downstream
Upstream
Sequoyah Nuclear Plant